

BULLETS OF THE FAIRWAY

POPULAR MECHANICS

GAZINE

YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF.

SEPT.
25 CENTS

SEE PAGE 409



I'm your
best friend
I am your
Lucky Strike

It's the Tobacco That
Counts. There Are No
Finer Tobaccos Than
Those Used in Luckies.

© 1937 R.J.R.T.C.
Lucky Strike is a registered trademark of R.J.R.T.C.

*Try me
I'll never
let you
down*



So that you may know . . . PYROIL SAFEGUARDS ALLOY BEARINGS!

**CONTAINS NO
HARMFUL
OILS or ACIDS**

By all means use Pyroil in your car.

Only an ounce or two of Pyroil, as required, gives you marvelously increased operating results. At the same time it protects frictional areas against damage—during the break-in period and for the life of your car. Safeguards bearings—both the new alloy type and the conventional—protects gears, frees valves, seals rings. Increases power.

Use Pyroil regularly. Sold and recommended the world over. At service stations, garages and other dealers. Mail coupon for further facts. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Pres., 59 Pyroil Bldg., LaCrosse, Wis., U. S. A.

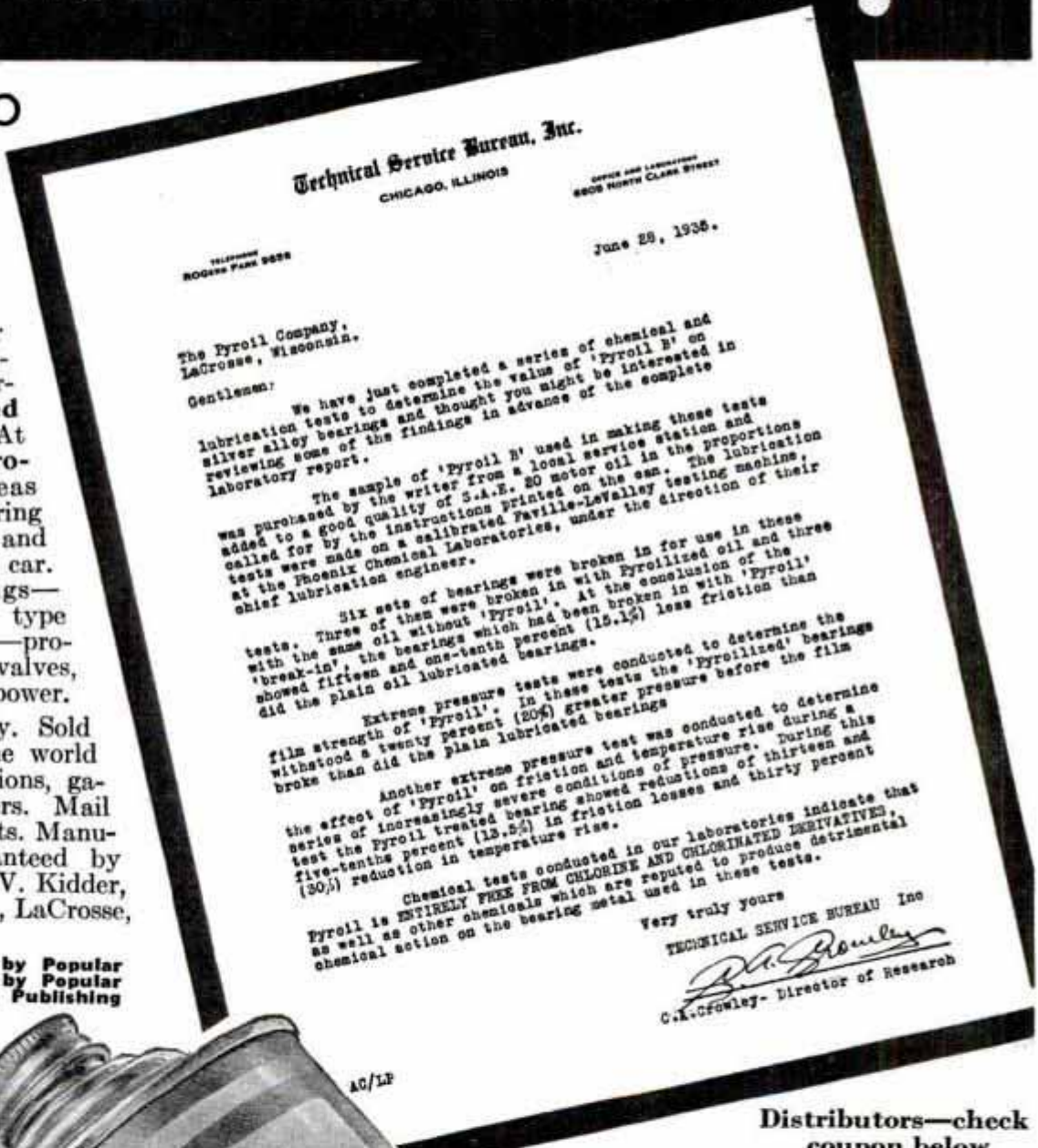
Pyroil has been tested by Popular Mechanics and is used by Popular Mechanics' Presses and Publishing Equipment.

Look for this signature on every can.

W. V. Kidder
Pres.



Simply
ADD TO
GAS-OIL
& GREASE



Distributors—check coupon below

PYROIL COMPANY,
59 Pyroil Bldg.,
LaCrosse, Wis., U. S. A.

Please send further interesting Pyroil facts.
 Please send details of the Pyroil Sales Opportunity for me.

This One



5BDS-PYD-J698

When they call you "Old Man" you want them to smile



NOBODY really wants to look old. But the world takes you at face value. To women and to employers you are always as old as you look.

Millions of men look older than they really are because their skin is prematurely wrinkled and dried out. They do not realize what harm shaving can do, when it robs the skin of its natural oils.

And millions of other men keep looking young and fit simply because they keep their faces in perfect condition with Barbasol.

Barbasol is no male beauty treatment. It is the most modern, the most scientific shaving method.

It needs no brush, no lather, no rub-in. And, so soothing and healing is its action that many people use it for windburn, sunburn and chapping.

Barbasol has body enough to support each hair so the blade can snip it off clean at the base. This prevents ingrown hairs.

And finally the bland oils contained in Barbasol leave the skin in perfect condition so that premature wrinkles and old age lines cannot intrude.

Sooner or later you'll come round to Barbasol.

Already it's America's most popular shaving cream.

Tune in Singin' Sam—the Barbasol Man—every Tuesday evening over the Columbia Broadcasting System. (See your local newspaper for time.)



**For Modern Shaving:
No Brush • No Lather • No Rub-In**

**BARBASOL
BLADES**
now 5 for 15¢

For only fifteen cents you can now buy 5 of those scalpel-keen Barbasol Blades that make shaving a joy.

They're going like hot cakes, men. Step up and get yours today.

Shave the Barbasol way.

Soften your whiskers with Barbasol Shaving Cream and mow 'em down with Barbasol Blades. It's the perfect shaving combination.

Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

September, 1935

Vol. 64, No. 3

Special Features

Television for Millions	321
What's New in Movies, Part II--Coloroto	
Farming by Magic	340
Radio Traces Planes	346
Etching with Celluloid Plates	351
Fighting Fires with Photographs ..	354
Borrowed Eyes for the Blind	360
Billiards—and How to Play It	364
Trains without Tracks	370
Pigeons of the Midnight Patrol	376
Doing It Backwards	382
Chinese Magic	386
Half an Acre and Independence	392
Bullets of the Fairway	398
Million Milers of the Air, Part II	402
Gar Wood's Mystery Boat	407
Be Your Own Weather Man, Part II	411

(Continued on next page)

A Hobby Worth Money to You

LOOK around your home and note the innumerable articles made of sheet metal—trays, baskets, tables, lamps, bird cages, lawn ornaments and dozens of other pieces. A four-piece metal-working outfit makes it possible for the home craftsman to construct articles of sheet metal almost as easily as though he were building with cardboard. The equipment applies to the home workshop on a miniature scale the same methods used by the factory and offers an interesting and absorbing hobby with many money-making possibilities. Look for the article next month—you will find it illustrated by photographs in natural color.

Next Month

FOOTBALL is just around the corner and the coaches are beginning to issue their mournful predictions. Building a winning gridiron team today has become a scientific process involving a host of mechanical devices from tackling dummies to machines which drill players in charging, blocking and tackling. An article in the October issue describes the latest aids developed by clever coaches.

Flying Cross Heroes

FLYING over San Francisco, an army plane bursts into flames. The pilot orders his companion to jump and the mechanic leaps to safety—but not the pilot. He stays with his burning ship, risking a flaming death high in the clouds rather than allow his plane to descend on the city beneath him. It is for such deeds that Uncle Sam confers the Distinguished Flying Cross. Read next month of the many feats of courage which have won this high honor.

Sit Up, Fido

THERE is no deep, dark mystery about training a dog. Patience and common sense are the principal elements involved. If you have them, and if your dog is intelligent, there is no reason why he should not be taught many interesting stunts. Circus animal trainers tell you how to go about it in an article next month.

Published monthly by POPULAR MECHANICS CO., 200 East Ontario Street, Chicago, U. S. A. Single copy in United States, 25 cents; \$2.50 a year, \$4.00 for two years in United States and possessions, and countries of the Pan American Postal Union; for Canada, Newfoundland and Labrador, add 50 cents a year extra for postage; to all other countries add \$1.00 a year extra for 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, 1935, by Popular Mechanics Co. in the United States, Australia and France.

"Simoniz makes 'em Beautiful to Stay!"

... So says Mr. Don Mayes of Carthage, Mo., whose Dodge still looks new after covering 42,300 miles.



ONLY SIMONIZING INSURES A CAR'S BEAUTY FOR LIFE

There's one thing on which millions of motorists agree. And that is—nothing compares with the world-famous Simoniz and Simoniz Kleener for making and keeping cars beautiful. So, if you want the finish of your car to last longer and stay beautiful, always insist on Simoniz and Simoniz Kleener. See to it that the famous trade-mark "Simoniz" is on each can. It's put there for your protection.

MOTORISTS WISE SIMONIZ



(Contents—Continued)

Airplane	
flying midget, movie star's hobby	395
ground speed measured by pendulum	358
heater inside cover warms engine	397
insect, "elytrope," plane built like	414
tiny power-driven, tested in tunnel	405
Alarm—bell tells when bathtub is full	338
Autogiro—port on roof may speed air mails	359
Automobile	
cripple boy's, finger-tip control for	394
homemade three-wheeled car	385
lock for hood installed without tool	384
paddle wheel, travels on land or sea	374
servicing, late models make easy	397
skeleton shows use of metal tubing	389
transmission unit, gear range tripled by	374
Awning—worked from inside, is adjustable	396
Balloons, Toy—hats blocked on for cleaning	384
Bicycle	
light for, used also as flashlamp	363
trailer fitted with airplane tires	394
Bottles—labeler for, easy to operate	405
Bridge	
catwalk, cables strung from	410
concrete span supports	413
Firth of Forth, painting is an endless task	396
Bullet—light stops when wire is hit	390
Buoy—angler's, marks where fish bite	379
Camera—bank teller's vest hides	410
Camouflage—glass walls of Japanese building decorated for	368
Casting—river deepening aided by	415
Club, Police—electric shock from disperses crowd	401
Cooler, Room—ice and fan used in	406
Cotton—fingers, iron, pick	406
Cutter—bolt, rivet and nut, for close places	401
Dams	
Boulder, zinc model shows every detail of	339
piling, steel, driven in solid rock	389
Diving—robot ball for deep-sea salvage	420
Drawings—lifelike, lined paper used for	396
Examinations—student papers graded by weighing	338
Fingerprints	
fish, study habits with	381
silver-nitrate process makes visible on cloth	358
telephone and teletype used to send	380
Fire Alarm—low voltage operates	395
Fire Engine—reckoner, data computed by	375
Fish and Fishing	
bow and arrow for shooting	363
echo recorder locates schools of	352
Gas Meter—how to read, and how to check bill	379
Glass—sun's heat kept out and light let in by	344
Glider	
motorcycle engine drives across channel	417
plank, greased, used to launch	409
Golf	
arrow fixed to tee, golfer guided by	369
croquet combined with	373
left hand trained to swing	380
recorder, automatic, analyzes stroke	344
Hammer—fulcrum head makes pulling easy	380
Household Devices	418, 419
Lamps—sodium vapor, to light bay bridge	384
Lathe	
gap in bed, big work turned on	375
hydraulic control changes speed	359
Light—wrist, sets both hands free	409
Lighthouses—Gray's Reef, replaced by the latest construction	358
Lighting—art exhibits enhanced by artificial	337
Locomotives	
miniature, passengers hauled on	375
styles, age of speed sets	373
Map—illuminated, glass room covered by	353
Masks—nurses wear for gas drill	415
Motor—youth builds for radio-controlled boat	338
Moving Pictures—projector, theater-type drive used in	414

(Continued to page 6A)

HOW CHEVROLET KNEE-ACTION gives you a more comfortable ride



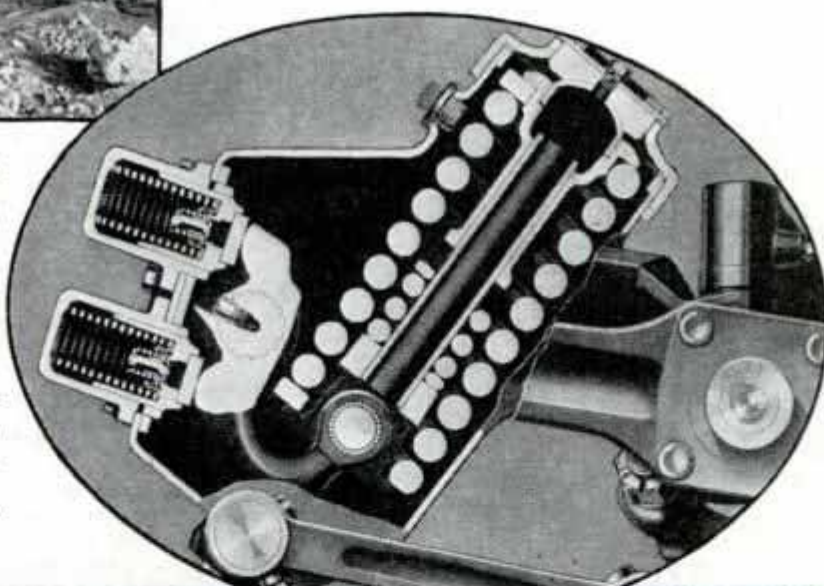
MEN who know mechanics, hardly need be told how Chevrolet Knee-Action works. But they will appreciate the results of Knee-Action every bit as fully as other motorists. Among these results are a

smooth *gliding* ride for all passengers; *added safety* at high speeds; and *shock-proof steering*, which minimizes driving fatigue. Only genuine Knee-Action can give you Chevrolet's splendid Knee-Action results.

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

Compare Chevrolet's low delivered prices and easy G.M.A.C. terms. A General Motors Value

With Chevrolet Knee-Action, the front wheels are built into the car in such a way that they are free to move *up* and *down* independently of each other in *fixed* paths. Also, the wheels are mounted on *soft-acting* coil springs which have only one duty—to *spring* the weight of the car.



**CHOOSE CHEVROLET
FOR QUALITY AT
LOW COST**

The Master De Luxe Chevrolet is the *lowest-priced* car in the world with the outstanding comfort and safety advantages of the Knee-Action Ride. Try Chevrolet Knee-Action yourself over your own favorite road. And choose Chevrolet for quality at low cost.

ONLY CHEVROLET GIVES YOU ALL THESE ADVANTAGES

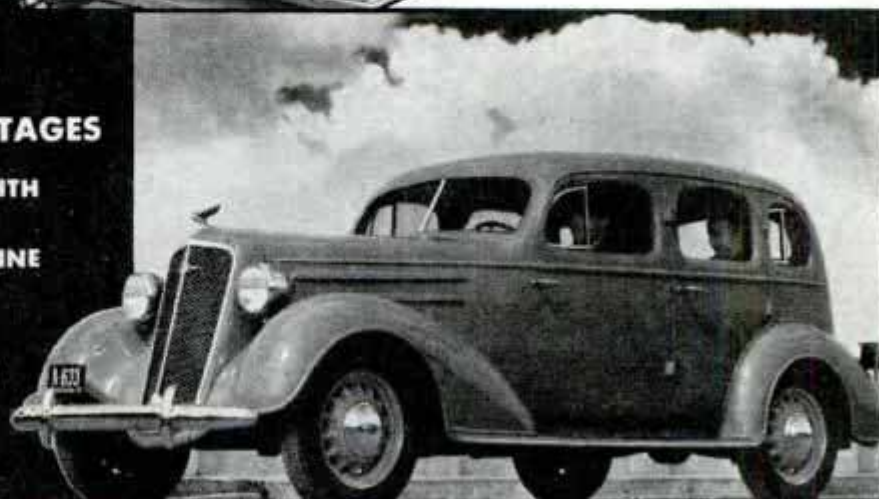
TURRET-TOP BODY BY FISHER (WITH NO DRAFT VENTILATION)

BLUE-FLAME VALVE-IN-HEAD ENGINE WITH PRESSURE STREAM OILING

IMPROVED KNEE-ACTION RIDE

WEATHERPROOF CABLE-CONTROLLED BRAKES

SHOCK-PROOF STEERING



When writing to advertisers please mention Popular Mechanics

THREE WHIFFS AND O-U-T!



KILL THE "UMP"? No—reform him. Make him clean out that bad-smelling briar, give up foul-ball tobacco, and turn to Sir Walter Raleigh's pleasanter blend. One whiff of *that* and you've discovered the hit of a lifetime. We claim this well-aged mixture is cooler on the tongue and delightful to the nose. We insist Sir Walter's milder. But more convincing yet, sales grow and grow as thousands try and cheer the magic recipe for a perfect smoke: "Sir Walter Raleigh and a well-kept pipe!"

Brown & Williamson Tobacco Corporation
Louisville, Kentucky. Dept. P-59



It's 15¢
—AND IT'S
MILDER

(Contents—Continued)

Office, Port—resembles pilot house	406
Organ—auto headlight bulbs help produce music	395
Parachute	
injured persons, 'chute for, tested	416
tower, practice, makes jump safe	369
Pistol—bullets fired between fingers	338
Playhouse—oil cans used to build	391
Radio	
amplifier and phonograph unit	426
antenna installations	424
charger, wind driven, for batteries	426
locator, how to build	422
set, portable, operates from car battery	426
suggestions, practical	425
tubes, metal, and midget acorns	421
Railroads—grapes hauled from vineyard to crusher by	340
Refrigeration—ice, colder, made in ribbons	345
Roadside Stand—dog made of concrete houses	379
Roofing—steel decking makes fire-safe	363
Saws and Sawing—power driven, on pole, speeds forest pruning	385
Scales—heater, electric, keeps out moisture	368
Ships and Shipping—"talking ship" uses radio instead of wires	350
Skyscrapers—steel and cement cut cost of	391
Stamps, Postage—box, transparent, has bins for sorting	379
Sundial—man's shadow tells time on	390
Telephone—calls, 200, one cable carries	410
Tennis—ball with nap restored gives longer life	405
Vending Machines—first-aid outfits in street phone booths	401
Vise—tilted for angle work	394
X-Ray—flaws caught as goods are manufactured	416

AMATEUR MECHANICS

Ants—grease barriers keep off table	430
Aquaplane—fin on bottom makes handling easy	446
Arrows—jig for gluing feathers to	458
Ash Tray—pelican, holds matches and cigarettes	448
Baskets—sewing, easy to make	441
Blocks—building, junior construction engineers use	427
Boats and Boating	
anchor, lightweight, easily made	454
Catalina glass-bottomed	443
Clamps	
bar, inexpensive to make	430
gluing, lathe used as	442
Coal—hose wets as it enters basement	445
Cords—motor used to twist	454
Disks	
perforated, filtering liquids through cotton speeded by	435
sandpaper, renewed quickly	446
Drawing—spirals, easy method of making	440
Drill—expanding, using in lathe	434
Duster, Wall—wire coat hanger converts broom into	432
Electric Light—black light reveals secrets and mystifies	450
Emery Wheels—knife sharpener, disk type, for dressing	448
Enamel—shellac, colored, substituted for	438
Fountain, Drinking—brake drum used as bowl	440
Furniture	
smoke, soft coal, causes varnish to look cloudy	435
table, modern coffee	455
Gun—loaded, sheath on tent pole keeps safe	434
Hammer—tack, faucet handle makes	434
Handwheel—pulley on lathe converted into	448
Ice Pick—nuts, small, started with	432
Kitchen Utensils—jars, fruit, powdered substances dispensed from	449
Lathe—fluid to prevent work slipping on faceplate	429
Lawn—cement border simplifies mowing	449
Lock—key cut so it is the only one that fits	458

(Continued to page 8A)

Are You STILL in the DEPRESSION??

TIMES are better. Business is out of the rut—well ahead of a year ago. Millions of men have gone back to work. There's more money in lots of pay envelopes. But what good is that to you, if *your* pay check is still written in depression figures?

You weren't so discontented a year ago. In fact, you considered yourself lucky to have a job. But now—you have begun to wonder and worry why the oncoming tide of prosperity hasn't reached you yet. The situation is getting desperate. Bills continue to pile up. You can't get along forever on a "shoe string" budget. You *must* win back those pay cuts. Other men are doing it—how can you?

Certainly, you can't work any harder than you have been. And it isn't a question of your intelligence, honesty or ambition. Those virtues do not solve today's problem—they are often insufficient to hold down a job, as millions unemployed sadly testify.

But there *is* a way to get back to the prosperity pay check. A way that's probably far easier than you have dreamed. A *plan* that has been "depression-tested."

During the worst period of the depression, this plan was helping thousands of men and women forge ahead. Today, during recovery, these same men and women—their ranks swelled by thousands more—are being picked for top positions. They are escaping years of monotonous, routine service—achieving their dreams while they are young enough to enjoy success in its fullest measure.

Since this plan brings results in bad times as well as



good, it obviously works independently of business conditions. As unbelievable as that may sound, remember that success is largely up to the individual. Most men struggle through a depression all their lives. The few who forge ahead ride to success the same business tides that sweep the majority to failure.

The LaSalle Success-Building Plan is made for men like you—men with courage, ambition, persistence, who need expert guidance to make the most of their efforts. But LaSalle supplies even *more* than that. Not only individualized training and coaching to help you meet today's crying needs . . . but also the very steps you need to take to fill the job ahead, and force that pay raise *quickly*. Any synopsis of this plan, which we might include here, could give you only a vague idea of this service. We suggest you mail the coupon for complete details on your own line of work.

Today's Danger

There's a real danger to accepting "depression pay" these days. A danger that lower wages will continue to dog you—for no employer will pay more until he is convinced you are worth more. Some day, some way, you've got to convince him. There's no time to lose. The sooner you begin, the better.

If the LaSalle Plan has fulfilled this aim for thousands, isn't it logical to expect it can do as much for you? This coupon can easily become your passport to better times. Mail it today.



LaSalle Extension University, Dept. 964-R, Chicago

I would like to know about your Success-Building Plan and service in the business field I have checked.

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

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

Address.....

**LaSalle
Extension University**



*"Here's a
SAVINGS BANK
that's open
DAY and NIGHT"*

The Purolator Oil Filter has been truly termed, "The Motorist's Savings Bank."

Its deposits are composed of dirt and grit and fine metal particles and hard carbon. Its job is to remove these destructive abrasives from the oil stream—and for about 8,000 miles of driving it keeps the oil pure . . . and clean . . . and effective . . . prevents scored cylinders, worn valves and broken bearings.

*But the PUROLATOR
must be reserviced*

Its reservoir is filled with this destructive sludge after about 8,000 miles of driving. That means a Purolator Filter replacement—and all good service garages will attend to that job in a very few minutes.

Keep your Purolator at work. It will save you oil, repairs and replacements . . . and will add years to the life of your car. Motor Improvements, Inc., Newark, New Jersey, makers of



The Motorist's
"Savings Bank"

PUROLATOR

The Oil Filter on Your Motorcar

LICENSED UNDER SWEETLAND PATENTS

(Contents—Continued)

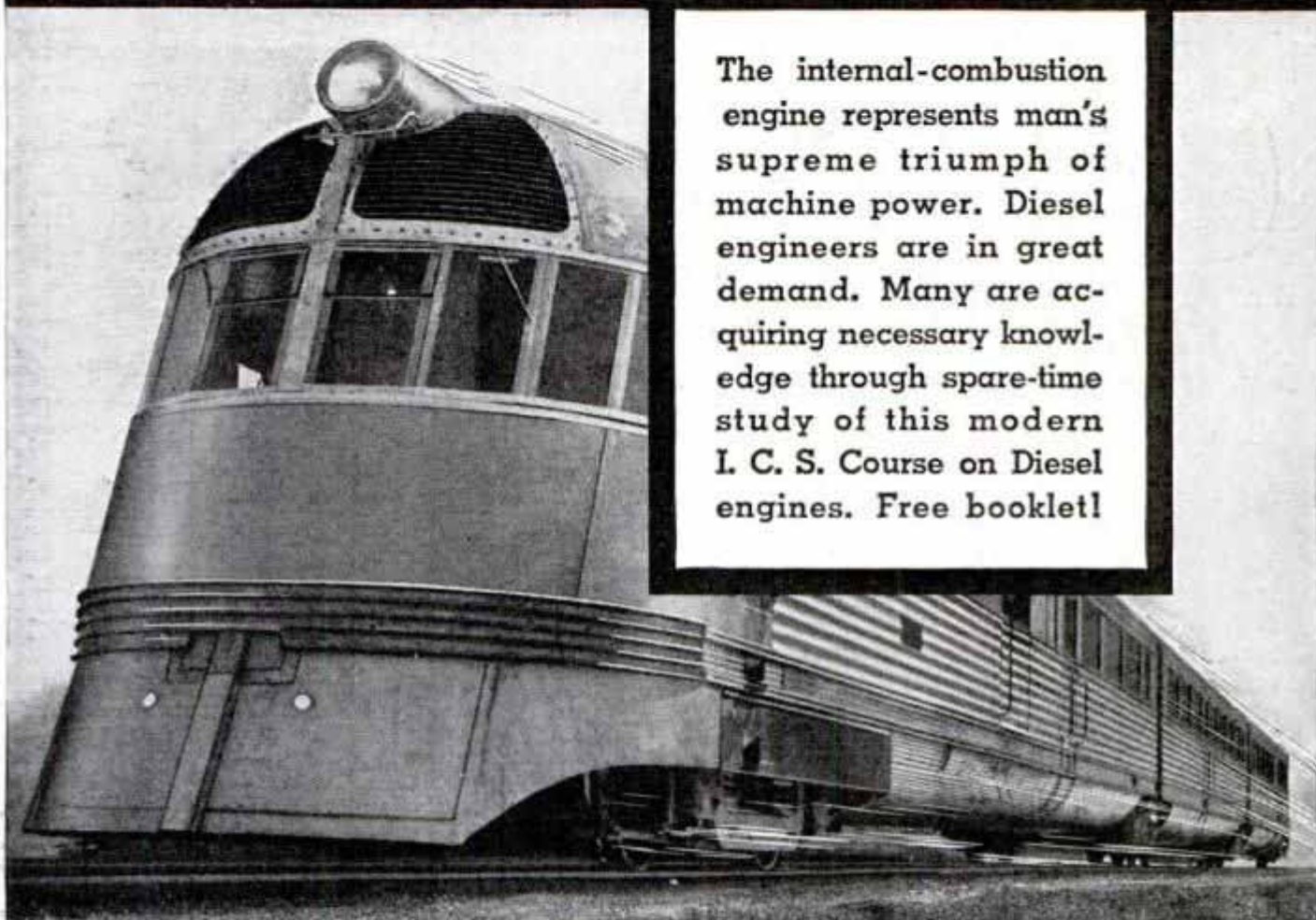
Magazine Rack—serving trays combined with	439
Mallet—faces are replaceable	429
Merry-Go-Round—iron pipe used to make	447
Metal—aluminum paint protects	449
Models	
boat, interchangeable power plant for	436
ship, attaching topmast deadeyes	460
toggle switch, radio, used to reverse locomotive	453
Nails—cuttings, rubber guard retains	442
Novelties—beads and old jewelry used to make	433
Oars—screw eyes hold vertically	432
Photography—safelight for darkroom	442
Plants—potted, Excelsior assures drainage of	434
Plumbing—bathroom fixtures, sunken, how to install	445
Potatoes—ventilate when stored	433
Punch Marks—jig for spacing	446
Sander—grinder, hand, converted into	435
Sanding Block	
doorstop, rubber, used as	458
model makers aided by	435
Scissors—notched to cut flower stems	430
Scraper—glass, rubber bands make handle for	430
Scroll-Sawing—clamp for foot	440
Skate—strap, fruit-jar ring serves as	442
Tacks—hammer handle, handy place to keep	454
Tam—launder by stretching over dinner plate	435
Tenons—jig helps when cutting	439
Toys	
hobby-horse, sturdy	458
whirligig, child's, made from drill	454
Trellis—support, removable, looped wire makes	448
Tripod—shelf, cloth, holds photo accessories	429
Tubing—broken, cork connects	458
Vacuum Sweeper—brushes, worn, how to use	430
Wall Outlets—shocks from, protecting children against	432
Weather-vanes—silhouette patterns of	431
Window Shade—thumb tacks keep close to window	440
Workbench—puzzlers for	459
Writing—glass or metal, how to write black on	432

SHOP NOTES

Advertising—vacuum cups hold signs to windows	465
Automobiles	
brake chatter eliminated	478
brake linings, how to wear down	478
coil spring, determining if right or left hand	479
gasket, rubber, reflectors destroyed by	479
pipe stand holds differential	478
reseating tool, use ice pick to apply pressure	479
windshield wiper, sheepskin used for	479
Automobiles, Repairing	
crankcase, support aids in replacing on motor	478
hub cap, removing from rear wheel	479
ring gear, replacing on flywheel	480
Battery Charger—generator, old auto, used as	477
Canoe—rack protects against theft	469
Chisels—jig for sharpening	466
Drilling—block on carriage of lathe used for	468
Electromagnets—designing and building	470
Fish and Fishing—tanks, illuminated, improve display of fish	469
Gun Cabinet—how to build	467
Hoe, Mortar—handle, adjustable, improves	466
Lathe	
jig for slotting pins	466
tools, cutting, clamped to tool holder	466
Micrometer—frame makes reading easy	468
Nut—starting on marred threads	465
Rack—hat and coat, folds for storage	465
Refrigerator—trucking company uses	480
Sawhorse—tool box, hinged, used as	468
Shafts—eccentric, centering	464
Straw—how to save when harvesting	464
Tape—packages kept in order with	477
Tools—metal-turning, how to set	461

DIESEL POWER

A Coming American Industry



The internal-combustion engine represents man's supreme triumph of machine power. Diesel engineers are in great demand. Many are acquiring necessary knowledge through spare-time study of this modern I. C. S. Course on Diesel engines. Free booklet!

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 5593-H, SCRANTON, PENNA.



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



TECHNICAL AND INDUSTRIAL COURSES

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

BUSINESS TRAINING COURSES

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

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

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

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

When writing to advertisers please mention Popular Mechanics



The Editor's MAIL BAG

Who Wants Television?

ALL IN
FAVOR
SAY
AYE



"I am pleased with your radio articles, but I wish you would run a diagram of a simple television receiver. How about it? I think other readers would approve of it, too."—*Peary Cooke*, Mullens, W. Va.

"Full of Facts"

"I hope you will continue to keep *Popular Mechanics*' pages free from fiction and full of facts and useful information as you have in the years gone by. The boys of this country, and their parents, need a publication of this type which presents in simple language the mechanical developments and ideas of the times."

—*E. B. Dale*, U. S. Indian Service, Billings, Mont.



The "J. M. White"

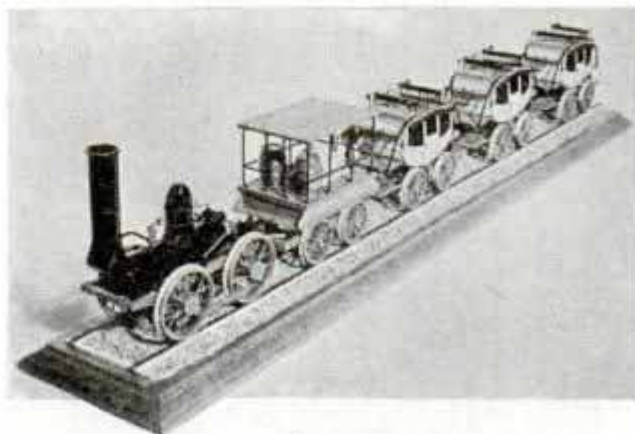
"From a *Popular Mechanics* of 1930, I got information which helped me build a model of the "J. M. White," one of the largest and fastest of the Mississippi packets. I



Mr. Simmons with His Model Packet

would like to hear from others interested in these models of river boats."—*F. B. Simmons*, Steubenville, Ohio.

The "DeWitt Clinton"



Frank Smith's Model Train

"Enclosed you will find a photograph of a model of the "DeWitt Clinton" train which I constructed from the instructions in your magazine some time ago."—*Frank H. Smith*, West Lafayette, Ind.

Invading the Yukon

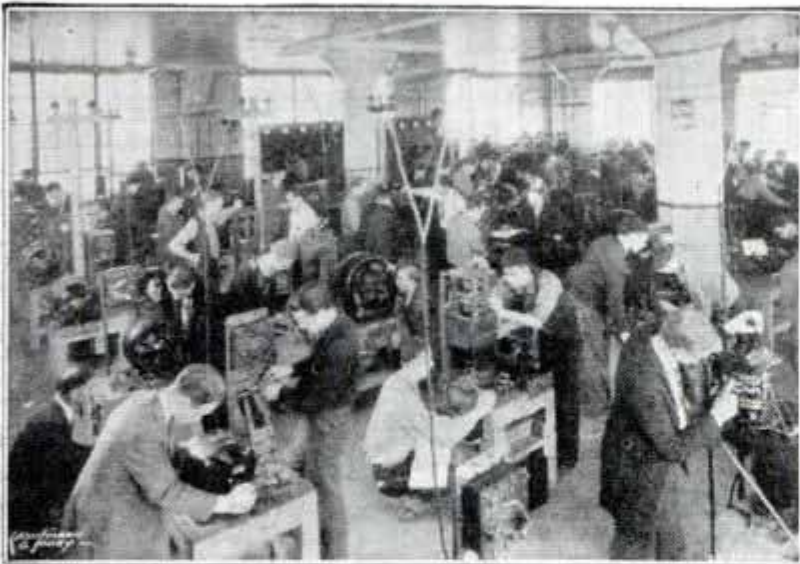
"During the past summer in Alaska, I saw *Popular Mechanics* in many isolated cabins along the Yukon river."—*Elizabeth Hayes*, Williamsburg, Va.



Who'll Write First?

"I am serving my apprenticeship as a patternmaker for a large locomotive works near here. We, over here, have little home workshop machinery but I recently attached our electric vacuum cleaner to my bench grinder and got good results. I would be very pleased to hear

(Continued to page 16A)



STUDENTS BUSY AT WORK IN GREAT COYNE SHOPS

Learn ELECTRICITY

SEND TODAY FOR DETAILS OF MY Pay-Tuition-after-Graduation Plan!

Get training in 90 days, right here in the great Coyne Shops — **not by correspondence** — but on real electrical machinery. **Mail the coupon below.** If you are short of money I'll send you all details of my finance plan and consider your application. If accepted, you won't have to start paying tuition back until **five months from the date you start school**, and then you'll have **over a year** to complete your payments.

Tremendous Developments Ahead in Electricity!

HERE is YOUR opportunity to cash in. Every day brings news of new developments in every branch of Electricity, with more opportunities, more jobs, and a greater future for the trained man than ever before. I consider the fellow who is ambitious enough to want to get ahead by taking my Training, worthy of my help. **MAIL THE COUPON BELOW** and you can prove to me that you are willing to spend just **THREE MONTHS** in the Coyne Training Shops Learning **ELECTRICITY**. Then, I'll tell you about my finance plan, which has enabled many to get complete Training and pay tuition back later.

Learn By Doing In 90 Days

Lack of experience or advanced education bars no one. I don't care if you don't know an armature from an air brake—I don't expect you to! It makes no difference! Don't let lack of money hold you back from getting all details of my amazing plan.

MANY EARN While LEARNING

If you need part-time work to help pay your living expenses and will tell us your problems we may be able to help you as we have thousands of others. Then in 12 brief weeks, in the great roaring shops of Coyne, we train you as you never dreamed you could be trained... on one of the greatest outlays of electrical apparatus ever assembled... real dynamos, engines, power plants, auto, switch-boards, transmitting stations... everything from doorbells to farm power and lighting... full-sized... in full operation every day!

TRAINING By Actual Work

No dull books... you get individual training... real actual work with only the theory you will need. Building real batteries... winding real arma-



Prepare for Jobs Like These
Here are a few of hundreds of positions in the electrical field. Our free employment bureau gives you a lifetime employment service.
ARMATURE OPERATOR
SUBSTATION OPERATOR
AUTO ELECTRICIAN
INVENTOR
MAINTENANCE ENGINEER
SERVICE STATION OWNER
RADIO EXPERT

tures, operating real motors, dynamos and generators, wiring houses, etc. That's a glimpse of how we help to make you a master electrician, and fit you to qualify for jobs leading to the biggest pay.

Jobs - Pay - Future

"I owe my Electrical success to your 12 week shop course," says R. B. Umbarger of Tennessee. "Two weeks after leaving school I took a wiring job," reports E. O. Berndt of Illinois, "and the profits from this one job alone more than paid for the entire course." A. C. Hoehnle of Ohio says "Received several raises in pay, due to the training I received at Coyne." And I could quote from hundreds of letters of successful Coyne Trained Men. *What they have done, you should be able to do!*

Electric Refrigeration — Air Conditioning

Right now I am including my big new Electric Refrigeration and Air Conditioning course at no extra cost.

GET THE FACTS

Coyne is your one great chance to get into electricity. This school is 36 years old—Coyne training is tested—proven beyond all doubt—endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book with photographs... facts... jobs... salaries... opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. This does not obligate you. So act at once. Just mail coupon.

Get This **FREE** Book



Home of Coyne School

This is our fireproof modern home where-in is installed thousands of dollars' worth of Electrical equipment of all kinds. Every comfort and convenience has been arranged to make you happy and contented during your training.



COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 65-72, Chicago, Ill.

H. C. LEWIS, President
Coyne Electrical School, Dept. 65-72
500 S. Paulina St., Chicago, Ill.

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

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

BETTER JOBS

More pay

"I'll train you RIGHT—the practical easy way!"
Engineer DOBE

Training Until in POSITION

Send Coupon!



Learn DRAFTING

at Home from an Engineer

Now is YOUR big opportunity! Boost your pay! Get a better job. Business is picking up. Draftsmen are the FIRST needed! I furnish you all tools and a drawing table. And I'll teach you in a very short time by mail in your spare time until you actually have a desirable draftsman's position so that you are fully satisfied with your easy work and better pay. Earn while you learn! No previous experience required. High School education not needed. Everything made plain by my practical method right from the start. You'll be amazed how quickly you can prepare yourself in your spare time for MORE PAY by my practical method—now used for over 34 years. Thousands of successful graduates, aged 16 and 18 to past 50.

JOB OPEN NOW!

After training you I help you to a job without charging you a cent for this service. For 30 years employers of Draftsmen have been writing me when they want help. Aviation, Electricity, Machinery, Auto Work, Building Work—All these industries and others, too, must have draftsmen in their offices. These industries are now growing fast; be prepared.

- AUTOMOBILE
- MOTOR BUS
- AVIATION
- ELECTRICITY
- MACHINE BUILDING
- BUILDING
- CONSTRUCTION

Start Now and get the training. Then YOU will be ready for that bigger, better pay job. Send the coupon NOW—TODAY, while I select my students for this personal, practical training to a limited number.

FREE BOOK COUPON

ENGINEER DOBE, Div. 33-76 Libertyville, Ill.
Send me your free book, "Successful Draftsmanship" and explain how you will assist me to a good position as a draftsman.

Name Age

Address

Post Office State

When writing please mention Popular Mechanics

ELECTRICAL ENGINEERING

A broad, basic, intensive course

Complete in One School Year

Includes the fundamentals of Refrigeration, Air Conditioning and Electronics

PREPARATION under skilled instructors for new opportunities in electrical field. Approved by educators, endorsed by industry. 42 years' successful experience.

Theory and Practice Combined

Theory and practice are closely interwoven in classroom and laboratory. Fireproof dormitories, dining hall, laboratories and shops.

Prepare Now

Bliss men hold responsible technical and executive positions. Catalog on request.

BLISS ELECTRICAL SCHOOL
119 Takoma Ave., Washington, D. C.

Learn Public Speaking

At home—in spare time—20 minutes a day. Overcome "stage-fright", gain self-confidence, increase your salary, through ability to sway others by effective speech. Write now for free booklet, How to Work Wonders With Words.

NORTH AMERICAN INSTITUTE, Dept. 1356
3601 Michigan Avenue, Chicago, Illinois

RADIO ENGINEERING

RCA Institutes offers an intensive course of high standard embracing all phases of Radio. Practical training with modern equipment at New York and Chicago schools. Also specialized courses and Home Study Courses under "No obligation" plan. Illustrated Catalog on request

RCA INSTITUTES, Inc. Dept. PC-35
75 Varick Street, New York, N. Y.
1154 Merchandise Mart, Chicago

Recognized Standard in Radio Instruction Since 1909

Learn Write

Begin Today. Write for my Free Book, "How to Become a Good Penman." It contains specimens and tells how others learned to write in spare time. Your name elegantly written on a card if you enclose stamp for postage. Write today. **F. W. TAMBLYN, 418 Ridge Bldg., Kansas City, Mo.**

CAMPION Jesuit High School FOR BOYS

Boarding School, Highest academic standing. Prepares for all colleges and universities—and for Life. Finest, most healthful location in middle west. Beautiful, large campus. Complete, modern equipment. All sports, Golf and Ice Hockey, R. O. T. C. Catalog FREE.

CAMPION BOX 20 PRAIRIE DU CHIEN, WIS.

How To Secure A Government Position

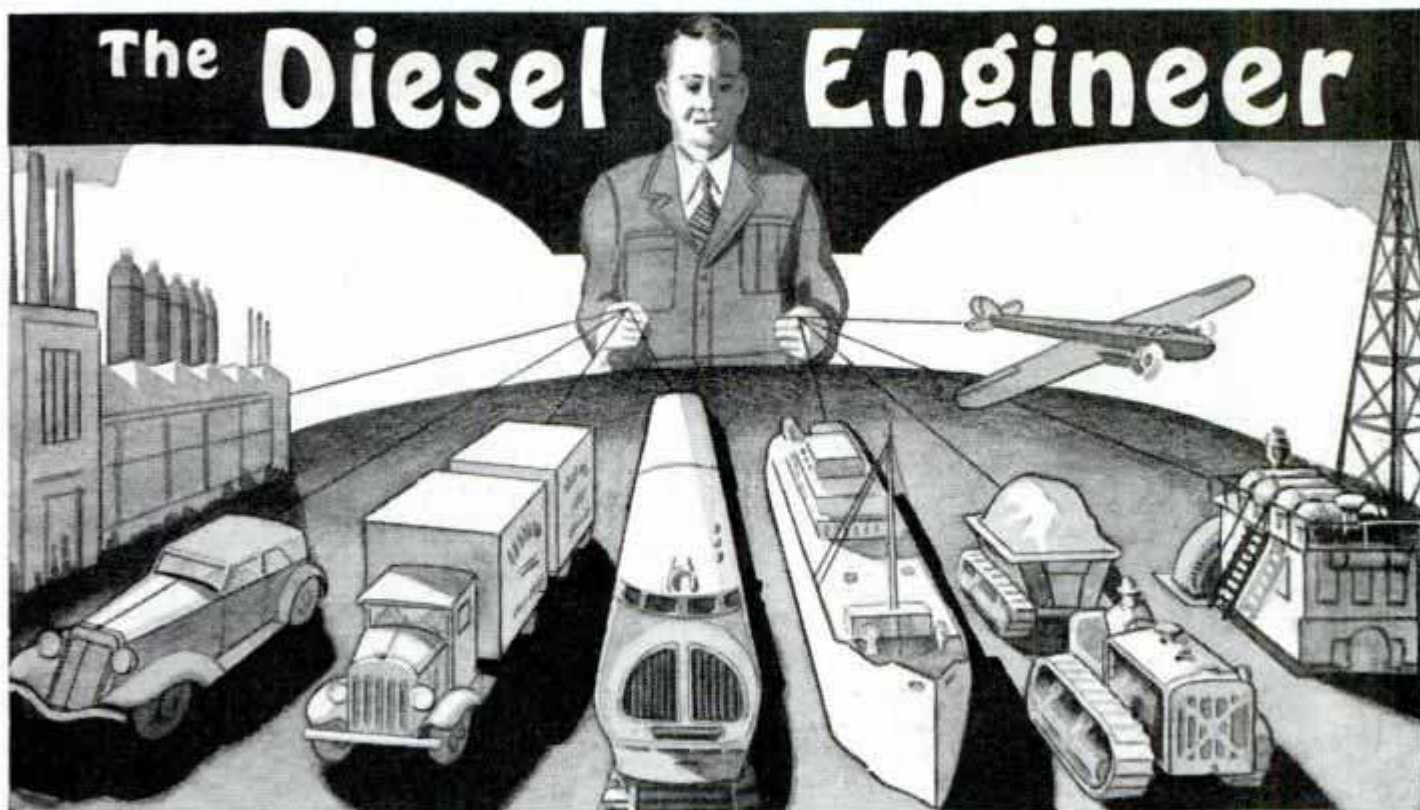
Why worry about strikes, layoffs, hard times? Train now for a Government job. Many examinations expected! Increased salaries, steady work, travel, good pay. Let me help you become a Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—or help you get into any other Government job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

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

A. R. Patterson, Civil Service Expert
PATTERSON SCHOOL, 89 Case Bldg., Rochester, N. Y.
Please send me, without obligation, your free book "How to Secure a Government Position."

Name.....

Address.....



Not since the Gasoline Engine was perfected for use in automobiles and trucks 30 years ago, has there been such a sweeping change in the power and transportation fields as the Diesel Engine is now bringing about.

Think of the Opportunity for You

Diesel engines—because of their high efficiency, dependability, and economy of operation—are fast replacing steam and gasoline engines on land and water, and in the air—threatening the present jobs of thousands of workers. **Is your job safe?**

Power for Manufacturing and Construction Work—All over the country, Diesel stationary plants are providing shops and factories with low cost electric light and power—producing power and light for public utility companies, municipalities, railroads, city street car and interurban systems—drilling oil wells and pumping the oil to markets a thousand miles away—operating dredges and excavating machinery in river improvement and reclamation work—furnishing dependable and economical power on isolated construction jobs.

Power for Transportation—Diesel engines are producing the electric power that enables the "Zephyr," "M 10,000," and "Flying Yankee" to break railroad records for both speed and economy of operation—driving ocean liners and freighters, ferry boats and tugs, lake and river boats, barges and pleasure craft—operating huge motor trucks on long and difficult hauls, and busses on city streets and transcontinental highways—powering tractors hauling all kinds of equipment on farms and construction jobs, and in lumber camps—driving giant airplanes and racing automobiles.

Steady Employment

To be sure of steady employment in any line, you must understand the principles and operations of that line. The Diesel industry has made amazing progress during the last 3 years—in 1934 the horsepower sold was more than double that sold in 1933. And every new Diesel installed means more jobs—greater opportunities—for Diesel-trained men. If jobs in your line are steadily growing scarcer, investigate this new, progressive, uncrowded line, that is offering an increasing number of good openings.

Today there is practically no competition in the Diesel field, but the increasing use of Diesel engines will result in keen competition for jobs after a few years. If you start your training now and get established in this field, you need not worry about competition.

Get your Free Diesel Booklet and find out what the Diesel field offers you—how quickly you can obtain a complete understanding of Diesel engine principles and operation by spare-time study at home. Course includes all text material—with special diagrams making it easy to understand this new type of power.

American School, Drexel at 58th St., Chicago

Engineering and Business

If you are interested in some other Engineering line—or in the field of Business—we can give you equally complete, simplified, and practical training service for any of the desirable positions listed below.

Asking for information involves no obligation—but mailing the coupon may mark the turning point in your life. Check and mail the coupon today.

American School

Dept. D-645, Drexel at 58th St., Chicago

Send me, without obligation, full information on position checked.

Diesel Engineer

- | | |
|--|---|
| <input type="checkbox"/> Air Conditioning Engineer | <input type="checkbox"/> Draftsman & Designer |
| <input type="checkbox"/> Aircraft Pilot | <input type="checkbox"/> Electrical Engineer |
| <input type="checkbox"/> Architect & Builder | <input type="checkbox"/> High School Graduate |
| <input type="checkbox"/> Automobile Engineer | <input type="checkbox"/> Lawyer |
| <input type="checkbox"/> Bookkeeper & Accountant | <input type="checkbox"/> Mechanical Engineer |
| <input type="checkbox"/> Business Law | <input type="checkbox"/> Radio & Television |
| <input type="checkbox"/> Business Manager | <input type="checkbox"/> Refrigerating Engineer |
| <input type="checkbox"/> Cert. Public Accountant | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Structural Engineer |

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

Address.....

Turn Your Spare Time into Dollars

When writing to advertisers please mention Popular Mechanics



Follow this Man

Secret Service Operator 38 is on the job

FOLLOW him through all the excitement of his chase of the counterfeit gang. See how a crafty operator works. Telltale finger prints on the lamp stand in the murdered girl's room! The detective's cigarette case is handled by the unsuspecting gangster, and a great mystery is solved. Better than fiction. It's true, every word of it. No obligation. Just send the coupon and get—

FREE!

The Confidential Reports No. 38 Made to His Chief

And the best part of it all is this—it may open your eyes to the great opportunity for YOU as a well paid Finger Print Expert. This is a young, fast-growing profession. This school has taken men and trained them for high official positions. This is the kind of work you would like. Days full of excitement. A regular monthly salary. Rewards.

Can you meet this test?

Are you of average intelligence? Are you ambitious? Would you give 30 minutes a day of your spare time preparing yourself for this profession? Answer "yes" and I'll show you how it is possible for you to attain all this. Send the coupon and I'll also send the Free Reports.

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 13-56 Chicago, Illinois

Institute of Applied Science
1920 Sunnyside Ave., Dept. 13-56 Chicago, Illinois

Gentlemen:—Without any obligation whatever, send me the Reports of Operator No. 38, also your illustrated Free Book on Finger Prints and your low prices and Easy Terms Offer. Literature will NOT be sent to boys under 17 years of age.

Name

Address

Age

When writing please mention Popular Mechanics

Foremen! Increase Your Pay •

No matter how many years you've been on the job, you'll find LaSalle home-study training in Modern Foremanship a real money-maker for you. Here's why: Right after the war, Hugo Diemer, Meyer Bloomfield and a number of other experts who had won distinction in the field of production engineering, undertook to gather, analyze and organize for LaSalle the experience of more than 5,000 practical foremen and production men in every line of industry. Upon this basic material they built a truly remarkable training course covering every phase of the foreman's job. "Have received two promotions and a 'raise' in salary of \$75 a month"—"Have increased the production of my department 20%"—"My monthly salary is now \$310—a 'raise' of \$125 a month"—these are but a few of the many tributes paid LaSalle home-study training in Modern Foremanship. Low cost; easy terms. Complete details in an attractive 64-page book, "Modern Foremanship," sent you free upon request. Write for it today.

LaSalle Extension University, Dept. 964-MF, Chicago

ENGINEERING



INTENSIVE PRACTICAL TECHNICAL COURSES. Non-essentials omitted. TIME AND MONEY SAVED. Degree in 2 yrs. Electrical, Mechanical, Structural, Architectural, Civil, Aeronautical, Highway. Also shorter courses in Electricity, Radio, Electric Refrigeration, Power Plant, Drafting, Building, Low tuition. Extensive modern equipment. Part-time work for board and room. 34 yrs. experience producing successful men, located all over U. S. and foreign lands, holding responsible positions. Approved by industry, endorsed by graduates and educators. Catalog free.

FINLAY ENGINEERING COLLEGE
1001 Indiana Avenue Kansas City, Mo.

You Can Regain Perfect Speech, if you

STAMMER

Send today for beautifully illustrated book entitled "DON'T STAMMER," which describes the Bogue Unit Method for the scientific correction of stammering and stuttering. Method successfully used at Bogue Institute for 33 years—since 1901. Endorsed by physicians. Full information concerning correction of stammering sent free. No obligation. Benjamin N. Bogue, Dept. 152, Circle Tower, Indianapolis, Indiana.

Enjoy a fascinating money-making business



There are big opportunities in PHOTOGRAPHY. We can show you more than 50 ways to make money in this growing profession—COMMERCIAL, NEWS, PORTRAIT or MOTION PICTURE Photography, Personal Attendance and Home Study training. 25th year. Free booklet.

New York Institute of Photography
10 West 33 St. (Dept. 49) New York City

PHOTO ENLARGEMENTS 10c

Enlargements, size 5x7 inches, made from your favorite kodak negatives (films). Send as many different negatives as you wish. They will ALL be returned. Take advantage of this AMAZING OFFER today. Address **DARNER PHOTO LAB.** Enlarging Dept. 90 **DES MOINES, IOWA** EACH 3 for 25c

AU ACCREDITED **AVIATION** 2 Yr. B. S. Degree Course in Aeronautical Engineering. Also Pilot's Ground, Master Mechanic and Administrative Courses, Days and Evenings. U. S. Approval. Write for "Aviation Facts." **AERONAUTICAL UNIVERSITY** Curtiss-Wright Bldg. 1342 S. Michigan Blvd. Chicago, Illinois

GOV'T. JOBS

SALARY TO START \$90 to \$175 MONTHLY MEN WOMEN Age Range 18 to 50

- () Ry. Mail Clerk
- () P. O. Laborer
- () R. F. D. Carrier
- () Special Agent
- () Customs Inspector
- () City Mail Carrier
- () P. O. Clerk
- () Matron
- () Immig't Inspector
- () Typist
- () POSTMASTER
- () Seamstress
- () Auditor
- () Stenographer
- () U.S. Border Patrol
- () Telephone Opr.
- () Watchman
- () Meat Inspector
- () Statistical Clerk
- () File Clerk

OZMENT INSTRUCTION BUREAU
Dept. 111 St. Louis, Mo.

Send me FREE particulars "How to Qualify for Government Positions" marked "X". Salaries, locations, opportunities, etc. ALL SENT FREE.

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

Learn to Mount Birds

and Animals—Send Coupon for Free Book

HELLO, SON. SPENDING THE EVENING AT YOUR WORK-BENCH AS USUAL?

COME IN, DAD. I WAS JUST READING THIS AD OF THE NORTHWESTERN SCHOOL OF TAXIDERMISTRY. IT SAYS THAT MOUNTING BIRDS AND ANIMALS IS A GREAT HOBBY FOR THE MAN WITH A WORK-BENCH—AND PROFITABLE, TOO. WHAT DO YOU THINK?

1

WELL, SON, I DO KNOW THAT THAT SCHOOL WAS TEACHING TAXIDERMISTRY WHEN I WAS YOUR AGE—THIRTY YEARS AGO. I OFTEN WANTED TO LEARN IT MYSELF.

IF IT'S AS INTERESTING AS IT SOUNDS, I'M AT LEAST GOING TO INVESTIGATE. AND I COULD SURE USE SOME EXTRA MONEY RIGHT NOW—ALICE WANTS A NEW DRESS AND I'D LIKE A NEW SET OF TOOLS.

2

NOT SO BAD FOR A BEGINNER. THERE'S A LAMP THAT WILL LOOK DANDY IN MY DEN.

GUESS I'LL ASK DAD TO DROP OVER TONIGHT AND TAKE A LOOK.

3

WHY BOB, YOU CERTAINLY DID TAKE UP TAXIDERMISTRY IN EARNEST, DIDN'T YOU?

I SURE DID. I'VE MADE AND SOLD A BUNCH OF BOOK-ENDS, MIRRORS AND SO ON TO HUNTERS FOR THEIR DENS. AND FUN? SAY DAD, TAXIDERMISTRY'S THE GRANDEST HOBBY IN THE WORLD!

4

THAT SQUIRREL BOXING GROUP IS ONE I MADE FOR GREEN'S SPORTING GOODS STORE FOR A WINDOW DISPLAY. SO FAR, THIS MONTH I'VE BOUGHT THOSE THINGS I WANTED, AND MADE MY WORK-BENCH PAY ME AN EXTRA \$68—JUST FROM TAXIDERMISTRY.

5

AND I NOT ONLY MOUNT TROPHIES FOR OTHER SPORTSMEN, BUT MOUNT MY BEST ONES FOR THE DEN HERE.

WHY DAD, I NOW GET TWICE AS MUCH FUN FROM MY HUNTING AS I USED TO. YOU WOULD TOO IF YOU LEARNED TAXIDERMISTRY.

IT SOUNDS GREAT, SON. WHEN DO I START?

6

Fun—Fascination—Profits

Be a Taxidermist. All Secrets Revealed. Learn at Home



Save Your Hunting Trophies

Mount (stuff) expertly your valuable **game-birds, animals, fish, game-heads**. Preserve them just like **life**. That is Taxidermy. Learn at home by **mail**. Decorate home and den with nature's art. Make undreamed-of **profits** in spare time, in your shop. You can. Will you? Win fame as a taxidermist. Investigate. Mail **coupon NOW**.



Success Guaranteed

This old reliable school has graduated 200,000 students in Taxidermy. 30 years in business. Our great success permits this **guarantee**. We **know** we can teach **you**. It's a grand money-making **hobby**. You **must** be interested, if you hunt or fish or have a work-shop. **Ask** for the **free book** and learn all about Taxidermy.



Mail Coupon

Or a postcard will do. No obligation on your part. The beautiful **Book**, with hundreds of entrancing **Pictures** is **Free**. Don't miss your **Only Chance** to get this remarkable book **Free and Postpaid**. Write today. State your **Age**.

Wild Game Not Needed

Use **common** specimens; squirrels, rabbits, chicks, pets, owls, pigeons—even frogs. Make useful articles like those shown here. Mount them in human and humorous positions. This is craft and novelty taxidermy. It's **fun—and profitable**. All included in our unique lessons. It's **marvelous**. Write the school this minute.

BIG PROFITS From Your Shop

In Spare Time
Many students earn from \$40 to \$75 monthly in spare time. Some earn thousands of dollars each year. Sportsmen bring their trophies to be mounted. Besides you can sell your own **Novelty** groups for homes, dens and for merchants' window display.

LEARN TANNING

The lessons teach tanning harness; sole, chrome leather; also furs. Expert methods. **Very profitable**.

FREE BOOK

Northwestern School of Taxidermy, 3376 Elwood Bldg., Omaha, Neb. Gentlemen: Please send at once, your free 48-page book on Taxidermy without any obligation on my part. Tell me how I can learn Scientific Taxidermy at home.



Northwestern School of Taxidermy
3376 Elwood Bldg. Omaha, Neb.

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

TELEVISION

has arrived

**AMERICA'S
First Complete
TRAINING
COURSE
—now ready**



Students operate actual equipment in NATIONAL STUDIOS



BROADCASTING

**LEARN
TELEVISION
ELECTRICITY
RADIO** *all branches*

Actual Television Equipment

The newest radio science and profession—TELEVISION—has arrived. National has pioneered Television instruction. Easy-to-learn, practical Television. Easy-to-learn, practical Television.

vision training is part of our complete Radio and Electrical course. You actually operate genuine Television equipment. Learn this fascinating profession and be qualified for good Jobs in this rapidly growing field.

RADIO ENGINEERING, BROADCASTING

Our complete Television, Radio and Electricity courses offer training in all these branches. Radio instruction includes construction, operation and repair of all types of radios, radio station operation, marine and airplane operation, etc. We maintain our own complete modern broadcasting studios in which you operate actual broadcasting and receiving equipment.

ELECTRICAL, TALKING PICTURE TRAINING

All students receive complete instruction in all fundamental branches of Electricity as well as National's special course, given without extra charge, in talking picture training. You learn the operation and servicing of talking picture equipment used in motion picture studios and theatres.

Qualify for These Jobs in Los Angeles

National's thorough training qualifies you for many positions in these fields that require trained experts. With limited finances you can enroll. Los Angeles, the ideal city in which to train, is the center of the greatest activity in radio, television, talking pictures and electricity.

EARN ROOM AND BOARD

The majority of students earn living expenses while learning. You can enroll regardless of age or education. We assist you in obtaining part-time jobs.

RAILROAD FARE ALLOWED

For a limited time, your coach railroad fare from any part of U. S. to Los Angeles will be allowed.

SEND COUPON RIGHT NOW

Send the coupon today for big FREE illustrated book telling you about the great opportunities awaiting you in Television, Radio and Electricity and acquainting you with this million-dollar school.

NATIONAL SCHOOLS

Oldest, Largest Trade School in West
Est. 1905 30,000 graduates

NATIONAL SCHOOLS

Dept. 9-PMR, 4000 So. Figueroa St., Los Angeles
Send free Catalog.

NAME _____

ADDRESS _____

CITY _____ STATE _____



The Editor's MAIL BAG

(Continued from page 10A)

from any of your readers."—*Horace Bridge*,
18 A Harrington Rd., Ashton-in-Makesfield,
Lancashire, England.

The Basement Mechanics

"A. A. Frame,
John Weber, Jr.,
Harold E. Morey,
Wm. H. Stuhr,
Vernon L. Grant
and myself, have



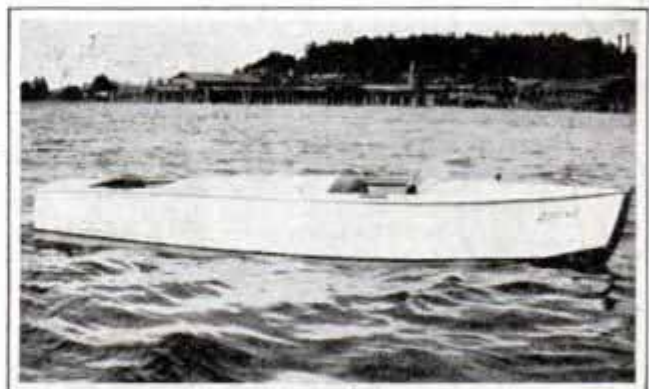
Members of Club; Above, Model One of Them Built

formed the Local Order of Basement Mechanics. The official organ is Popular Mechanics. We meet once a month. One of our members has purchased a display in which are hundreds of samples of wood from all over the world."—*Frank J. Sadilek*,
Des Moines, Iowa.

For Whole Family

"Popular Mechanics is the magazine for mother, father and all the young ones."—*Mrs. E. L. Ellmaker*, Glendale, California.

Finds "Rambler" Speedy



Donald Graves' Fast Boat

"I am sending you a few pictures of my boat "Rambler." This boat is one of the

(Continued to page 22A)

NOT WANTED



MEN CONTENT WITH THEIR PRESENT INCOMES

IF YOU'RE satisfied with what you're making—If you're content to just hold onto your present job—If you see no advantage in modernizing your training—Then—This coupon doesn't interest you! • BUT—If

you'd like to follow the path to more money, already blazed by thousands of ambitious men, then this coupon may be the turning point in your earning career! Mail it for free information.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 5594-H, SCRANTON, PENNA.



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



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

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

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

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

When writing to advertisers please mention Popular Mechanics

BECOME A TRAINED AUTO EXPERT

GOOD JOBS—GOOD PAY

Say good-bye to layoffs and low pay! Get into the Auto Service and Repair Business... a field of opportunity where practical training has brought big pay... promotion... shops of their own... to hundreds of fellows just like you.

PRACTICAL "JOB WAY" TRAINING BROUGHT TO YOUR HOME

Whether or not you are now employed... you can get this complete training right at home in your spare time. By this simple, easy "Job Way" method you can learn—in a few short months—what it would take you years to learn by ordinary methods. And we show you how to earn extra money while you are learning... doing actual JOBS on real autos.

SPARE-TIME MONEY

MOTOR TESTING OUTFITS FURNISHED

For those who act promptly we are including complete Motor Testing equipment at no extra cost. This practical working equipment helps your training, and will enable you to start making extra spare-time money soon after you enroll.

COMMON SCHOOLING ALL YOU NEED

Men between 15 and 50 with no previous auto experience or special education, quickly master "Job Way" Training and become skilled experts in every branch of auto work. We know what training you need, and give it to you in a way that is easy to understand.



GET THE FACTS! Mail the Coupon, NOW, for Big FREE Auto Book, facts about "Job Way" Training, Free Employment and Consultation Service, Motor Testing equipment included with Course, and details of amazing **MONEY-BACK OFFER.**

MAKE BIG MONEY!

EARN WHILE YOU LEARN AT HOME

MAIL COUPON FOR FREE AUTO BOOK

MOTOR INSTITUTE of AMERICA
2140 Lawrence Ave., Chicago, Ill., Dept. J-11

Without cost or obligation to me, send Free Auto Book, with full details of "Job Way" Home Training and your Money-Back Offer.

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



BE A SEAVER EXTERMINATOR IN 10 DAYS

Joseph E. Seaver, now 74 years old, at last reveals his priceless lifetime secrets for **GUARANTEED** extermination—not control—of rats, mice, roaches and other destructive pests. Amazingly easy to learn his unfailling methods in nine fascinating lessons. Prepare in a few hours of spare time at home to earn up to \$15,000 a year in this essential profession. Write TODAY for FREE book "Where Fortune Lies Waiting."

SEAVER EXTERMINATING SYSTEMS

185 N. Wabash Ave. Dept. P-8 Chicago, Ill.

RADIO ENGINEERING, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. Nine months' engineering course equivalent to three years' college radio work. School established 1874. All expenses low. Catalog free.
Dodge's Institute, Ada St., Valparaiso, Ind.

Play the Hawaiian Guitar like the Hawaiians!

FAMOUS NATIVE HAWAIIAN INSTRUCTORS teach you to play this fascinating instrument. ONLY 4 MOTIONS—No previous musical knowledge needed. OUR 52 EASY LESSONS teach you the enchanting music you hear over the radio.

GIVEN—when you enroll—a sweet toned HAWAIIAN GUITAR, complete playing outfit and carrying case. **WRITE AT ONCE** for attractive offer and easy terms.

FIRST HAWAIIAN CONSERVATORY OF MUSIC, Inc.
9th Floor, Woolworth Bldg. Dept. 250 New York, N. Y.

Approved by New York State Board of Regents

When writing please mention Popular Mechanics



FREE LESSON HomeArt Crafts

GOOD MONEY FOR SPARE TIME

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

NO CANVASSING

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

FIRESIDE INDUSTRIES
Dept. 66-M, Adrian, Mich.

TRI-STATE COLLEGE



B. S. Degree in 2 years. World famous for technical 2-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering; Business Administration and Accounting. Equivalent in technical hours to 4-year course. Those who lack high school may make up work. Low tuition. Low living costs. Located in picturesque hill and lake region. Students from every state and many foreign countries. 52nd year. Enter Sept., Jan., March and June. Write for catalog.

495 COLLEGE AVE.,

ANGOLA, IND.

LEARN WATCH REPAIRING



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



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 700%... Write for wonderful voice book—sent free, Learn WHY you can now have the voice you want. No literature sent to anyone under 17 years unless signed by parent.

PERFECT VOICE INSTITUTE, Studio 13-56
64 E. Lake St., Chicago



"BECOME A LIGHTNING TRICK CARTOONIST"

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

Learn PHOTOGRAPHY at Home

Make money taking pictures. Photographs in big demand. Commercial Photography also pays big money. Learn quickly at home in spare time. No experience necessary. Write today for new free book, *Opportunities in Modern Photography.* **American School of Photography, Dept. 1356, 3601 Michigan Avenue, Chicago.**

YOUR OPPORTUNITY—NEON and Other Gaseous Tubes

Today's biggest opportunity is in NEON or "gaseous-tube" lighting—the most widely-used medium of lighted signs—the future's greatest source of illumination. Get started while it is still new!
FREE—Send name for free booklet, and excerpts of our practical, low-cost, home-study course that teaches everything! **WRITE NOW!**
COMMERCIALITE LABORATORIES, Dept. 47, Omaha, Neb.

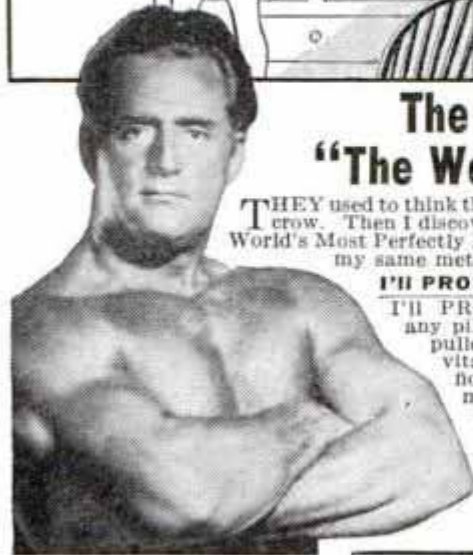


SECRET SERVICE BOOK FREE

For 30 Days Reading No Money Down—Actual Crime Cases—If You Act Quick!—We will send you this stirring book on Crime Detection, Secret Service and Identification Work for 30 days free reading. Send no money. If you decide to keep it, then send only \$1.00. If not, return it. **WRITE TODAY. Not sent to boys under 17 years of age.**

T. G. Cooke, Dept. 13-56, 1920 Sunnyside Ave., Chicago

THE INSULT THAT MADE A MAN OUT OF "MAC"



CHARLES ATLAS

Holder of the title: "The World's Most Perfectly Developed Man" won in open competition in the only National and International Contests held during the past fifteen years.

The 97-Pound Weakling Who Became "The World's Most Perfectly Developed Man"

THEY used to think there wasn't much hope for me. I weighed only 97 pounds. I was a sickly scarecrow. Then I discovered Dynamic-Tension. It gave me the body that twice won the title "The World's Most Perfectly Developed Man." At my own risk I'll give you PROOF in just 7 days that my same method can make you over into a NEW MAN of giant power and energy.

I'LL PROVE You Can Have a Body Like Mine!

I'LL PROVE that Dynamic-Tension—without any pills, or unnatural dieting or weights and pulleys that may strain your heart or other vital organs—can make you a healthy, confident, powerful HE-MAN! In just a few minutes a day! Mail coupon NOW for my illustrated book about "Everlasting Health and Strength." Tells all about Dynamic-Tension. Shows actual photos. It's a valuable book! And it's FREE. Send for your copy today. Address me personally. **CHARLES ATLAS, Dept. 89, 115 E. 23rd St., New York, N. Y.**

THIS STERLING SILVER CUP BEING GIVEN AWAY

This valuable cup stands about 14 inches high on a black mahogany base. I will award it to my pupil who makes the most improvement in his development within the next three months.



Mail Coupon for FREE Book

CHARLES ATLAS, Dept. 89, 115 East 23rd Street, New York City

I want the proof that your system of Dynamic-Tension will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

Name.....
(Please print or write plainly)

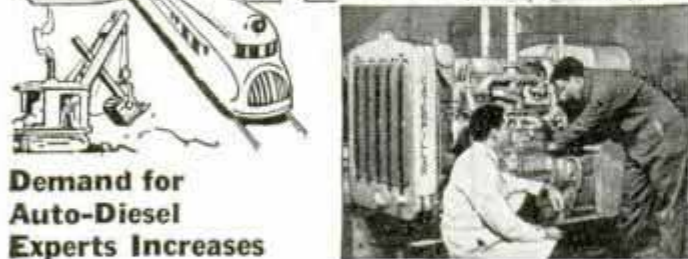
Address.....

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

© 1935 C.A.Ltd.

LEARN THE BEST PAY TRADES

DIESELS



Demand for Auto-Diesel Experts Increases

TRAIN AT NATIONAL SCHOOLS

Diesel operation and repairing calls for trained men. Everywhere you hear Diesels discussed and you can see the application of Diesels in trucks, tractors, trains, boats, busses, airplanes, power shovels, etc. To qualify for a good job you must first become trained. In the National Schools in Los Angeles you receive the most practical training under the guidance of expert instructors who teach you by proven methods.

Learn in Los Angeles

Not only do we instruct you in all branches of Diesel training, but also give you complete Auto Training, qualifying you for jobs in garages, service stations, factory branches and transportation departments. Here in Los Angeles you receive instruction in the most modern trade school.

AUTOS

Opportunities for Good Jobs

National's method of training you is most comprehensive. You receive two complete courses for the price of one—Autos and Diesels. We offer full training in Auto Repair which is essential to all Diesel operators. Upon graduation you have a complete understanding of, and experience in, the operation of gas, gasoline, butane and Diesel engines.

A Fortune in Brand New Equipment

There is absolutely no dummy equipment at National. Tens of thousands of dollars have been recently invested in brand new equipment which you will actually work on during your training period. We have just completed enlargement of our Diesel School, tripling its capacity. Equipment includes Diesel and gas engines of most modern design, testing equipment, late model autos, machine tools, etc.

Oldest, Largest Trade School in West

Established 1905. More than 30,000 successful graduates. National Schools is a million-dollar institution, occupying a magnificent building in Los Angeles.

Earn Room and Board While Learning

The majority of National students earn room and board while learning. With limited finances you can enroll. We assist students to obtain part-time jobs. Cash R. R. fare allowed to L. A.

Mail Coupon for Free Book

This book gives full information regarding the combined Auto and Diesel Courses. Profusely illustrated.

Quality for These Good Jobs

Diesel Mechanic; Fuel Injection Expert; Diesel Service Man; Diesel Trouble Shooter; Auto Mechanic; Auto Electrician; Battery Expert; Carburetor Expert, etc.

NATIONAL AUTOMOTIVE SCHOOLS
 Dept. 9-PMA, 4000 So. Figueroa St., Los Angeles

NAME _____

ADDRESS _____

CITY _____ STATE _____



When writing please mention Popular Mechanics

Amazing Sensational Discovery
REFINISHES AUTOS
Like NEW!



PAYS UP TO \$7.00 IN AN HOUR

Kar-Nu is a new, miracle discovery—a transparent, magic-like fluid with which anyone can refinish any color automobile easily, quickly and economically without polishing, waxing, rubbing or painting. Just wipe it on with a cloth! Immediately dullness, discoloration, shabbiness, sun fade disappear. Instantly, as if by magic, the old finish is rejuvenated and restored to the lustre, life glow and beauty of the original factory finish. As KAR-NU dries it seals the pigment and protects the finish from further wear. Lasts 8 to 12 months. GUARANTEED. Equal in beauty to a repaint or refinishing job which costs \$25.00 to \$75.00.

Not A Wax Polish or Paint
Lasts 8 to 12 Months
GUARANTEED

FREE SAMPLE

Enormous demand! Millions want it! W. L. Morgan of Mass. earned \$10.41 in a single hour. Sell KAR-NU to individuals, fleet owners, garages, auto accessory stores, used car dealers, etc. No experience necessary. Write for FREE sample to prove our claims and territory offer.

Distributors Wanted for Foreign Countries

KAR-NU CO., Dept. O-30, Oakley Station, Cincinnati, Ohio

"Why VOICE Students Fail"

SENT FREE No Obligation to Buy

If you act quick!—we will send postpaid—for 30 days' free reading—new Voice Book disclosing startling VOICE FACTS that may save hundreds of dollars to every man or woman seeking a strong, rich voice for either singing or speaking. 30 days' free reading—then send \$1.00. Otherwise, return it—that's all! PROF. E. FEUCHTINGER - Studio 93-56 64 East Lake Street - Chicago



Learn to Dance

You can learn all the modern dances—the latest Tango steps, the new Fox Trots, dreamy Waltzes, smart Collegiate Steps, and popular Society Steps at home, easily and quickly. New chart method makes dancing as simple as A-B-C. No music or partner required. Don't be a wallflower. Learn to dance. Complete course—256 pages, 54 illustrations, sent on 5 Days' Free Trial. Equals \$20.00 course. Send no money. Pay postman only \$1.98, plus postage upon arrival. Money back if not delighted. Catalog Free.



Franklin Pub. Co., 800 No. Clark St., Dept. 9476, Chicago

ARTISTS MAKE MONEY

Find out your ability. Send name, age, occupation and address for Free Vocational Art Test.

Federal Schools, Inc., 9135 Federal Schools Bldg., Minneapolis, Minn.

Repeating Slingshot



AMAZING NEW repeating slingshot. Shoots 150 B.B. shot. Loads from handle. Just the thing for hunters and trappers, young and old. Shoots thru ordinary 100 page magazine. More powerful than an air rifle. Send 25c in coin or money order for one of these REPEATERS.

THE SLINGO CORP.
 Dept. PM-8 Toledo, Ohio

MAIL FOR FREE INFORMATION

BEDFORD
YMCA
TRADE
SCHOOL

1117 Bedford Ave., Dept. PM-28
 Brooklyn, New York City, N. Y.

- Auto Mechanic
- Aviation Mechanic
- Aeronautical Engineering
- Refrigeration
- Oil Burner
- Air Conditioning
- Electrical
- Radio and Television Mechanic
- Architectural-Mechanical Drafting
- Armature Winding
- Diesel Engines
- Talking Pictures
- Welding
- Machine Shop
- Commercial Art
- Sign Painting
- Window Display

Name _____

Address _____

SAVE UP TO 50% by BUYING YOUR RADIO *Direct from* MIDWEST LABORATORIES

Exciting World-Wide Entertainment... Glorious New Acousti-Tone
Guaranteed with Amazing New 1936 SUPER Deluxe

MIDWEST

18-TUBE

SIX-IN-ONE Radio

(ALL WAVE - 6 BANDS)



ONLY RADIO COVERING
4½ TO 2,400
METERS.

30 Days FREE Trial!

EVERYWHERE radio enthusiasts are saying: "Have you seen the new 18 tube, 6-band, Acousti-Tone V-Spread Midwest?" It's an improvement over Midwest's 16-tube set, so popular last season. This amazingly beautiful, bigger, better, more powerful, super selective, 18-tube radio . . . is not obtainable in retail stores . . . but is sold direct to you from Midwest Laboratories at a positive saving of 30% to 50%. (This statement has been verified by a Certified Public Accountant!) Out-performs \$250.00 sets. Approved by over 120,000 customers. Before you buy any radio, write for FREE 40-page catalog. Never before so much radio for so little money. Why pay more? You are triple-protected with: One-Year Guarantee, Foreign Reception Guarantee and Money-Back Guarantee.

80 ADVANCED 1936 FEATURES

Scores of marvelous features, many exclusive, explain Midwest super performance and world-wide reception . . . enable Midwest to bring in weak distant foreign stations, with full loud speaker volume, on channels adjacent to locals. They prove why many orchestra leaders use Midwest radios to study types of harmony and rhythmic beats followed by leading American and foreign orchestras. Only Midwest tunes as low as 4½ meters . . . only Midwest offers push button tuning and Acousti-Tone V-spread design. See pages 12 to 20 in FREE catalog. Read about advantages of 6 bands—offered for first time—E, A, L, M, H and U . . . that make this super de luxe 18-tube set the equivalent of six different radios . . . offer wave bands not obtainable in other radios at any price.

Deal Direct with Laboratories

No middlemen's profits to pay—you buy at wholesale price direct from laboratories . . . having 30% to 50%. Increasing costs are sure to result in higher radio prices soon. Buy before the big advance . . . NOW . . . while you can take advantage of Midwest's sensational values. You can order your 1936 Full Scope High Fidelity Acousti-Tone radio from the 40-page catalog with as much certainty of satisfaction as if you were to come yourself to our great radio laboratories. You save 30% to 50% . . . you get 30 days FREE trial . . . as little as \$5.00 puts a Midwest radio in your home. Satisfaction guaranteed or money back. Write today, for FREE catalog.

WORLD'S
GREATEST RADIO VALUE

\$59.50
with New
GIANT
THEATRE-
SONIC
(LESS TUBES) SPEAKER

TERMS AS LOW AS \$5.00 DOWN

METAL TUBES

This Midwest is furnished with the new glass-metal counterpart tubes. Set sockets are designed to accept glass-metal or METAL tubes, without change. Write for FREE facts.

Thrill to new explorations in sections of radio spectrum that are strangers to you. Every type of broadcast from North and South America, Europe, Asia, Africa and Australia is now yours. Send today for money-saving facts.

Two Strikes on Other Radios!

Chicago, Ill.—It's as big a thrill as smacking one over the fence to bring in distant foreign stations like locals. Midwest radios are best obtainable and have two strikes on any other make.

Gaby Hartnett

"Gabby" Hartnett (Chicago Cubs)



England, Spain, Italy,

Most Every Night

Washington, D. C.—We are more pleased with our Midwest every day. We tune in GSB, London—EAQ. Spain—DJG, Germany—12RO, Rounc, etc., most every evening with local volume. Robert H. Gerhardt



MAIL COUPON TODAY! FOR
FREE 30-DAY TRIAL OFFER and 40-
PAGE FOUR-COLOR FREE CATALOG

MIDWEST RADIO CORP.,
Dept. 15C Cincinnati, Ohio.
Without obligation on my part, send me
your new FREE catalog, complete details
of your liberal 30-day FREE trial
offer, and FREE Miniature Rotating
18-tube Dial. This is NOT an order.
User-Agents
Make Easy
Extra Money
Check Here
for
Details

Name _____
Address _____
Town _____ State _____
 Check here, if interested in a Midwest Auto Radio.



PUSH-BUTTON TUNING
(Noises Suppressed)

Now, Push Button Silent Tuning is offered for first time! Simply pushing Silencer Button hushes set between stations . . . suppresses noises. Pressing Station Finder Button automatically indicates proper dial position for bringing in extremely weak stations.

Acousti-Tone V-Spread Design
(Patent Pending)

. . . Establishes new radio style overnight! The V-Front Dispersing Vanes were developed by Midwest engineers as a result of study of directional effect of the Midwest Full Scope High Fidelity Speaker. These Vanes spread the beautiful lace-work of the "highs" throughout the entire room in a scientific manner . . . directing the High Fidelity waves uniformly to the ear. Send for new FREE 40-page catalog. It pictures the complete line of beautiful 1936 Acousti-Tone V-Spread consoles . . . and chassis . . . in four colors.

FULL SCOPE HIGH FIDELITY
Brilliant Concert Tone



Now, get complete range of audible frequencies from 30 to 16,000 cycles, being transmitted by four new High Fidelity Broadcasting stations—WIXBS, W9XBY, W2XR and W6XAL. Glorious new Acousti-Tone is achieved . . . assuring life-like, crystal-clear "concert" realism.

V-FRONT

MIDWEST RADIO CORP.

DEPT. 15C CINCINNATI, OHIO U.S.A.

Established 1920 Cable Address MIRACO All Codes

When writing to advertisers please mention Popular Mechanics



Become an Expert Accountant

The Profession That Pays

The demand for skilled accountants—men who really know their business—is increasing rapidly. The new national and state legislation is requiring of business—both big and small—much more in matters relating to Auditing, Cost Accounting, Business Law, Organization, Management, Finance. Men who prove their qualifications in this important field are rapidly promoted to responsible executive positions—given an opportunity to earn real salaries. The range is from \$3,000 to \$15,000 a year—even to higher income-figures.

Send for Free Book—

“Accountancy, the Profession that Pays”

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

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

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

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

LaSalle Extension University

The school that has trained over 1,200 C. P. A.'s

Dept. 964-HR Chicago

I would welcome details of the new opportunities in accounting, together with copy of “Accountancy, the Profession that Pays,” without obligation.

Higher Accountancy

Other LaSalle Opportunities:

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

- | | |
|---|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Law—Degree of LL.B. |
| <input type="checkbox"/> Modern Salesmanship | <input type="checkbox"/> Commercial Law |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Modern Business Correspondence |
| <input type="checkbox"/> Railway Accounting | <input type="checkbox"/> Stenography—Stenotypy |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Expert Bookkeeping |
| <input type="checkbox"/> Modern Foremanship | <input type="checkbox"/> C. P. A. Coaching |
| <input type="checkbox"/> Effective Speaking | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Credit and Collection Correspondence | |
| <input type="checkbox"/> Practical Accounting and Office Management | |



Name

Present Position

Address



The Editor's MAIL BAG

(Continued from page 16A)

fastest hulls in its class in this vicinity. The balance is exceptionally fine and sets out of the water nicely. I want to compliment you on the excellent way you describe and explain how to build things in Popular Mechanics.”—*Donald Graves, 1441 East 22nd St., S., Portland, Oregon.*

Builds Saxophone



Builder with Homemade Saxophone

“I am enclosing a snapshot of a Bb bass saxophone which I made in my spare time. The materials were obtained mostly in the hardware store at a cost of about \$22. I have found the instrument quite satisfactory in the bass section of band or orchestra. I have never had any special training in wood or metal working.”—*P. M. McLean, West St. John, N. B.*

A Photographic Section?

“May I suggest that you put in a section for the amateur photographers? I think it would interest quite a number of your readers.”—*Everett Leyland, Toronto, Canada.*



THESE FREE BOOKS ARE FOR INVENTORS

AND OTHER MEN WITH IDEAS

"We're only entering the great period of inventive advancement"
—says C. F. Kettering, Vice Pres., General Motors.

SOMETIMES we hear people say: "Well, there isn't much left to invent." But Charles F. Kettering, Vice-Pres. and head of Research of General Motors, who helped develop the self-starter, Duco and many other outstanding inventions, **doesn't think that at all.** Not long ago in a published statement, he said:

"If we took half the men employed in tool making and put them to working out new inventions, new things, we could snap out of this depression in no time. Our return to normal times depends on new manufactured products that will catch the purchaser's eye, get him to buy and thus start the ball rolling. Change and buying go together. We are only entering the great period of inventive advancement."

Many Little Ideas Have Big Commercial Possibilities

Some of the world's best inventions came from men who didn't consider themselves inventors at all. The telegraph was invented by a painter, the typewriter by a farmer, the hand camera by a bank clerk, the stock ticker by a dentist. Or look at small inventions. A husband noticed his wife bending a hair pin to make it stay put. That gave him the idea of the crinkly hair pin. One day a golfer got the idea to make a wooden tee. Now wooden tees are sold by the millions every year. There are many similar examples in inventive history. That is why we say that the books shown here are for INVENTORS and Other Men with IDEAS. Whether you consider yourself an inventor or not—if you have an idea that will make money, save time, save labor, or give pleasure—find out how you can protect your rights to it.

Our Business Is To Help You

For thirty-six years, this organization has been in the business of helping inventors. During that time inventions from every corner of the country have been turned over to us to protect. Some ideas have represented complicated mechanisms; others have been small, practical articles, like a can opener or a new toy. All this has given us a wealth of experience to use for the inventor of today. Here in Washington, we maintain a large staff of experienced Patent Specialists to give you prompt and expert service. Yet because we work efficiently—our fees are low; and if desired we help you with deferred payments. But first, find out exactly what to do to protect yourself. **Decide on that today by sending for your FREE copies of the books shown above.**

Suggestions
on
WHEN
and
HOW
to Sell an
INVENTION

THESE BOOKS TELL YOU:

How the Patent Laws protect an inventor. Simple steps to take promptly, without cost, to claim your right to your idea. Kind of sketch or model needed. How you can go about selling an invention. They are full of valuable facts, simple, easily understood suggestions and interesting bits of inventive history. We gladly send them to serious men. No charge, no obligation. Write us or use the coupon below. Get that much done today.

**PATENT
PROTECTION**

VICTOR J.
EVANS & Co.

REGISTERED PATENT ATTORNEYS
MAIN OFFICE: 500-K, VICTOR BUILDING
WASHINGTON, D. C.

Other Offices: 1640-N Conway Bldg., Chicago; 1007-N Woolworth Bldg., New York; 514-N Empire Bldg., Pittsburgh; 1010-N Hobart Bldg., San Francisco; 736-N Security Bldg., Los Angeles.

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

Name.....

Street and No.....

City or Town.....

When writing to advertisers please mention Popular Mechanics

★ HEMPHILL DIESEL SCHOOLS ★

play an important part
in the growth of the
DIESEL INDUSTRY

HERE ARE THE REASONS

1. Hemphill SELECTS its students. Only those applicants are accepted whose character references pass investigation and whose natural abilities show obvious promise of developing, through proper training, into capable Diesel men. 2. Hemphill TRAINS its students ON DIESEL ENGINES. Each Hemphill School is equipped with a LARGE ASSEMBLAGE OF DIESEL ENGINES. Hemphill instructors [both Theory and Shop] are particularly qualified for their work. 3. Hemphill ISSUES its Certificates only to those selected students who, during their specialized training, pass exacting tests and practical examinations. 4. Hemphill RECOMMENDS for responsible positions in Diesel Installation, Operation, Maintenance and Sales Work only those men whose reliability, sincerity of purpose and school record prove them worthy of accepting the responsibilities to which they are assigned. Not only in these ways but also in widely publicizing the uses of Diesel power, the Hemphill Diesel Schools are contributing actively to the solid growth and nation-wide development of the Diesel Industry.



★ NEW YORK SCHOOLS
31-28 Queen's Boulevard
Long Island City, N. Y.



★ CHICAGO SCHOOLS
1251 Diversey Parkway, Chicago, Ill.



★ LOS ANGELES SCHOOLS
2121 San Fernando Rd., Los Angeles



★ SEATTLE SCHOOLS
503 Westlake North, Seattle, Wash.

★ DETROIT SCHOOLS
2341 LaFayette Blvd., Detroit, Mich.
Also Schools at Vancouver, B. C.



Hemphill Schools Waukesha Comet recently broke the world's Diesel speed record at Daytona Beach, Florida, thus helping to make Diesel history and increasing public interest in Diesel development.

Write or visit the nearest Hemphill School for information about Day, Night, and Combination Home Study Courses. A copy of "Diesel News" is free on request.

HEMPHILL DIESEL SCHOOLS
NEW YORK CHICAGO LOS ANGELES
DETROIT SEATTLE VANCOUVER, B. C.

Caution: We operate Schools ONLY at the locations listed above and are in NO WAY connected with any other schools.

AMERICA'S ORIGINAL EXCLUSIVE DIESEL TRAINING SCHOOLS



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



Over 300 pages on DIESEL Engines

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

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

AMERICAN TECHNICAL SOCIETY
Drexel Avenue & 58th St., Dept. A619, Chicago, Ill.

CAN YOU FIX IT?

These wonder books tell step by step HOW to take out "rains" in differential—to kill the shimmy in steering—to set TIMING—how to put your finger instantly on engine trouble—and then the quick expert way to FIX it. Newest improvements fully covered. Equal to a complete trade course at less than a fourth the cost.

6 Big Volumes 1935 Edition

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

AMERICAN TECHNICAL SOCIETY
Drexel Ave. & 58th St., Dept. A619, Chicago, Ill.

I would like to see the new 6-volume edition of your AUTO BOOKS. I will pay the few cents delivery charges only, but if I choose to, I may return them express collect. If after 10 days use I prefer to keep them, I will send you \$2 and pay the balance at the rate of only \$3 a month, until \$24.80 is paid. Please include free consulting membership as per your offer above. Send brand new 1935 edition.

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



START
\$1260 to \$2100 YEAR
MEN — WOMEN

Get ready immediately

Common Education Usually Sufficient

Mail Coupon

Today—

SURE

Franklin Institute
Dept. A174
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, vacations, hours, work, and full particulars on how to get one of these jobs.

COUPON

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

60 ART LESSONS

Only **1.95** POST PAID COURSE COMPLETE

Become Talented Artist with Big Income
 This thorough Course by Alexander Murray, famous Art School instructor, makes it easy to learn art in spare time; teaches commercial art, cartooning, lettering, anatomy, perspective, adv. layout, etc., without bother or expense of corresponding. You get all 60 lessons at once—no waiting for next lesson. Over 815 instruction illustrations. 135 pages of drawing paper FREE. Send only \$1.95 for Complete Course postpaid—or pay postman plus postage. **MONEY BACK** if not delighted after inspecting. Start now turning your spare time into MONEY!

EDUCATIONAL SUPPLY CO., Dept. A101-J, Racine, Wis.

BE A PASSENGER TRAFFIC INSPECTOR



Your Job is Waiting—Interesting, Well Paid Work
TRAINED MEN—19 to 50—are in demand for *Railway and Bus Passenger Traffic Inspection work*. You can earn good pay to start; travel if you like. Our few weeks' know-study course quickly trains you and upon completion we will help place you at up to \$135 per month, plus expenses, to start, or refund tuition. Experience brings rapid advancement. Free Booklet. **STANDARD BUSINESS TRAINING INSTITUTE**, Div. 209, Buffalo, N.Y.


LEARN MECHANICAL DENTISTRY



A profession that cannot be affected by machinery. Make plates, crowns, bridges, etc., for dentists—or have a business of your own. Easily and quickly learned, in day or night school. Individual instruction. No books—no classes. Write for Catalogue and **FREE TOOL OFFER.**

Dept. 701
McCARRIE SCHOOL OF MECHANICAL DENTISTRY
 207 N. Broad St. Phila., Pa.

CARTOON YOUR WAY TO SUCCESS!



DON'T COPY—LEARN TO ORIGINATE!

RAYE BURNS will teach you **HOW TO CREATE ORIGINAL CARTOONS** at home that you can **SELL!** Course contains **26 lessons** and **over 600 illustrations.** All for **Only \$2.85**

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

AUTO-MECHANICS & WELDERS

Auto Mechanics and Welders are in big demand. Complete courses in arc and acetylene welding, body and fender bumping, spray painting and metal finishing. Pay while you learn. Enroll now at special low rates. Write today.

MICHIGAN TRADE SCHOOL
 3758 Woodward Ave., Detroit, Mich.

Write for FREE CIRCULAR

Come to WASHINGTON

Train for a Fine Hotel Position
Graduates earning substantial salaries
 Good positions for trained men in hotel, restaurant and institutional field. Qualify in 4 months—learn on real hotel equipment. Placement Service **FREE** of extra charge. New day classes start Sept., Oct., Jan. Catalogue **FREE!**

LEWIS HOTEL TRAINING SCHOOLS
 Division RLP-398 Washington, D. C.

EARN MONEY AT HOME

Home Industries Book describes all kinds of up-to-date plans for a business of your own. Home extra money plans, Local occupations, Home mfg. enterprises, Formulas, Mail Order, Advertising, Books, Duplicators, Outdoor Opportunities, Plastic Novelties, Success Secrets, Agent Plans, Workshops, Backyard Plans, Homecraft, Preparations, Unusual Ideas, Wholesale Supply. Forty pages. Price only 10c.

HOME INDUSTRIES, BOX 84, IRVINGTON, NEBR.

INDIANA TECH DEGREE IN TWO YEARS

B. S. Degree in Electrical, Civil, Chemical, Radio, Mechanical or Aeronautical Engineering in two years. Located in Electrical Hub of West. Earn Board. Low tuition. Enter Sept., Dec., Mar. Catalogue.

INDIANA TECHNICAL COLLEGE, 229 E. Washington St., Fort Wayne, Indiana

5¢ LITTLE BLUE BOOKS

Send postcard for our free catalogue. Thousands of Bargains. Address: **LITTLE BLUE BOOK CO., Catalogue Dept., Desk 492, Girard, Kansas.**

Be a RADIO EXPERT



Learn at Home to Make \$40, \$60, \$75 a WEEK

\$500 a Year in Spare Time

"Doing spare time Radio work only, I have averaged about \$100 a year in addition to my regular income. Full time Radio work would net me many times that amount."
 Edward H. Fawcett, Slough Rd., Ladner, B. C., Canada.

Get my **FREE** book about the opportunities in Radio. Mail the coupon now. Get the facts about this field with a future. N. R. I. training fits you for jobs making, selling, servicing short and long wave Radio sets, to have your own business; to operate Radio apparatus on board ships, in a broadcasting or commercial land station; for television, aviation, police Radio, and many other branches. My **FREE** book gives full information and tells how you quickly learn at home in spare time. Stop struggling along in a dull job with low pay and no future. Start training now for the live-wire Radio field. I have doubled and tripled salaries of many.

\$6,000 in 2 Years

"Soon after the depression started, I found myself without a job, but I was well retrained with N. R. I. training. I swung right to full time Radio Servicing and made over \$6,000 in a little over 2 years." William Spartivent, Sparty Radio Servicing, 93 Broadway, Newark, N. J.

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

Hold your job. I'll train you in a few hours of your spare time a week. The day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio repair jobs common in most every neighborhood. I give you radio equipment that teaches you to build and service practically every type of receiving set made. Fred J. Dubuque, 19 Church St., Oswego, N. Y., writes: "I have made about \$1200 in a little over two years' spare time Radio work."

Nets About \$50 a Week besides Sales

"I have been getting along fine. I net about \$50 a week, not counting profits on sales. I have serviced almost every make of set and have earned more than I ever expected. I owe my success to the N. R. I." Bernard Costa, 150 Franklin St., Brooklyn, N. Y.

Get My Book—FREE—Now

My book has shown hundreds of fellows how to make more money and win success. It's **FREE** to any ambitious fellow over 15 years of age. Investigate. Find out what Radio offers; about my Course; what others who have taken it are doing and making; about my Money Back Agreement, and the many other N. R. I. features. Mail coupon **NOW.**

J. E. SMITH, Pres. National Radio Institute, Dept. 5JP Washington, D. C.

MAIL NOW for FREE PROOF

J. E. SMITH, President National Radio Institute Dept. 5JP Washington, D. C.

Dear Mr. Smith:
 Without obligating me, send free book about spare time and full time Radio opportunities, and how I can train for them at home in spare time. (Please print plainly.)

Rich Rewards in Radio

NAME..... AGE.....
 ADDRESS.....
 CITY..... STATE.....

AUDELS Carpenters and Builders Guides



4 vols. \$6

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

Inside Trade Information On:

How to use the steel square—How to file and set saw—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 hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint.



THEO. AUDEL & CO., 65 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.



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

Earn \$2,000 to \$5,000 a Year or Have a Business of Your Own!

Whether you want a job at good pay or a highly profitable business of your own—the Poultry Industry offers you more than any other. There's a shortage of poultry meat and eggs—a shortage of trained poultrymen. I'll train you quickly at home—to fill a good job in Poultry—and our FREE Students' Employment Dept. will help you get one!

Spare Time or Full Time YOU CAN Cash-in BIG
 No matter where you live—city, town or country—or what you do now, my proved methods will assure your success right from the start. I'll help you make from \$2,000 to \$5,000 a year and UP! And, if you choose to start your own business, I'll show you how to make your tiny investment multiply itself automatically. What I've done for thousands of others—I can do for you.

FREE Book Shows the Way to Big Pay and BIG Profits

Mail coupon below TODAY—for my Big NEW FREE Book, "How to Raise Poultry for Profit." My forty years of experience are yours. The Poultry Industry needs YOU. You need my book. Get it—and get in line for the BIG Money that's waiting for you in POULTRY.



Mail NOW for FREE Book

NATIONAL POULTRY INSTITUTE, Dept. 39, Adams Center, N.Y., Att'n: Harry N. Lamson, Pres.

Dear Mr. Lamson: Send me your FREE Book, "How to Raise Poultry for Profit." I want to know more about my opportunity to make \$2,000 to \$5,000 a year, spare or full time.

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

When writing to advertisers please mention Popular Mechanics

We Want to PERSONALLY INTERVIEW MEN WILLING TO QUALIFY FOR JOBS IN AIR CONDITIONING ELECTRIC REFRIGERATION

Big pay opportunities for young men in America's two newest, fastest-growing businesses. Men who can qualify as installation and service experts on all kinds of commercial and domestic Air Conditioning and Electric Refrigeration equipment can command large salaries. Complete training offered men aged 21 to 40 with fair education, mechanically inclined and now employed at least part time. Character references required. Do not reply unless you are willing to devote some spare time to study at small cost to you. Write giving age, education and present occupation.

UTILITIES ENGINEERING INSTITUTE
 Established 1927
 400-410 N. Wells St. Dept. PM9 Chicago, Ill.

Mysterious Power of Pelmanism

Let us send you a free copy of "Scientific Mind Training." An instructive book which explains an amazing system of mind training already used by more than 750,000 people. It will show you how and why Pelmanism is the *only* system of teaching for developing all the mental powers at the same time. Endorsed by such distinguished men as Frank P. Walsh, Sir Harry Lauder, Jerome K. Jerome, Prince Charles of Sweden and hundreds of others. Write TODAY to

THE PELMAN INSTITUTE OF AMERICA
 271 NORTH AVE. DEPT. 69 NEW ROCHELLE, N. Y.

New York Electrical School Established 1902
 Ask for free booklet
 44 West 17th St., N. Y. C.

LEARN WATCHMAKING AND ENGRAVING
 BY OUR PROFIT-SHARING PLAN
OUR GRADUATES SUCCEED
 One of our Iowa students started in a very small way—now doing over \$30,000 a year. Another in Wisconsin, over \$10,000 the first year. Day or night classes. Call or write for FREE BOOK.
 Chicago School of Watchmaking, Dept. 3101, 155 N. Clark St., CHICAGO.

LEARN CARTOONING
 by the method that has developed hundreds successfully. Send name, address and age for free chart to test your ability.
 The Landon School, 1738 National Bldg., Cleveland, Ohio

STOP Your Rupture Worries!
 Why worry, suffer with that rupture? Learn about my perfected invention. It has automatic Air Cushions which bind and draw the broken parts together as you would a broken limb. No obnoxious springs or pads. No salves or plasters. Sent on trial to prove it. Beware of imitations. Never sold in stores. Write today for full information sent free in plain, sealed envelope.
 H. C. BROOKS, 111-B State Street, Marshall, Michigan

HIGH POWERED TELESCOPE
 GENUINE BROWNSCOPIES AT AMAZING PRICES
 Most powerful in America for the money!
 15 power long range telescope. Can see moon's craters or time on pocket watch a block away. 5 sections. Approx. 3 ft. long. Fine lenses. Brass bound. Can be used as powerful microscope.
 Vol. magn. 512X. Only \$1.69 postpaid. C. O. D. 24c extra.
 Special Super-Power 30X Telescope. Similar to above but more powerful. Guaranteed to see 900 times larger in surface and 30 times closer. 31 mm. objective 4 powerful lenses. Large field. Includes powerful microscope feature. Only \$1.98 postpaid.
\$1.69
BROWNSCOPE CO. Dept. 49 234 Fifth Ave., New York, N. Y.

QUICK WAY to make money in

TRAIN WITH R.T.A. NOW

RADIO

Modern receivers are demanding men with modern training for service work. New training method and service equipment offer starts you earning almost at once. Up to \$3 an hour easy in a short time. Write today for FREE book of details.

Radio Training Association of America
Dept. PM-59, 4513 Ravenswood Ave., Chicago

BECOME AN ARTIST!

FOR ONLY 19¢ A LESSON! New, Easy system. No talent necessary. Profusely illustrated with simple feel charts, diagrams and figure photographs of PROFESSIONAL ARTISTS' MODELS. Complete 20-Lesson Course—ONLY \$3.99 Postpaid (Cloth-bound 10¢ extra). Or write for free details.
BEECHWOLD STUDIOS 852 Ashland Ave. N.E., ATLANTA, GA.

EARN BIG MONEY AT HOME!

FREE BOOK
Raise mushrooms in your basement, cellar, garage, idle places. We buy crop. Experience unnecessary. FREE Book.
MUSHROOM GROWERS OF AMERICA, HK-433, N. Clark St., CHICAGO, ILL.

Get These Tricks on CAMPING

Now—before you start touring, camping, vacationing, get this book that tells HOW to enjoy each minute; How to avoid hardships, discomforts, disappointments. Every sport enthusiast will welcome this book, "OUTDOOR SPORTS."
352 PAGES—650 PICTURES of time and labor-saving camping suggestions. Fishing, Fly Casting, Boating, Canoeing, Swimming, and hundreds of helpful ideas for making outdoor sports enjoyable. **Price \$2.00.** Sent prepaid or C. O. D. anywhere in U. S. Catalog listing 5,000 other books Free.
Popular Mechanics Press, Room P9, 200 E. Ontario, Chicago

It's easy to have BIG MUSCLES like these STARS and CHAMPIONS!

TOM TYLER (Western Star) One of World's Strongest Men

- ★ **CLARK GABLE** (M-G-M Star)
- ★ **JACK DEMPSEY** (Former Champion)
- ★ **MAX BAER** (Ex-Champion)
- ★ **GARY COOPER** (Paramount Star)

who says: "Your System is just like having a Physical Trainer in your home."

★ For many years Terry Hunt and Gus Wilson, World Famous physical culture experts, have kept Champions and Movie Stars in perfect condition. NOW!—they offer this identical method to YOU—to every man who envies and desires a manly "two-fisted" physique! An Amazing System!

All in one volume—40 actual photographs and illustrations. No pills—no silly diets. Simple, complete instructions. Step-by-step method guaranteed to give you a healthy, manly body and muscular development immediately.

Mail Coupon today. We'll send the System, in a plain wrapper, AT ONCE! Pay Postman \$2.75, plus a few pennies postage. This is the total price—nothing else to buy. Start now to enjoy a new lease on life and health! If you care to send cash with order, we will prepay postage charges.

DON'T WAIT! MAIL COUPON NOW!

TERRY HUNT * GUS WILSON
Hollywood Studios of Physical Culture
Dept. 9, 6715 Hollywood Blvd., Hollywood, California.

I want your System. I understand this is the IDENTICAL System you use for Champions and Stars.

If not satisfied after five days' trial I can return System and get my money back without question.

I will pay Postman \$2.75, plus postage, on delivery.
NAME.....
ADDRESS.....
CITY..... STATE.....
(Print Plainly)

NOTE: When ordering outside the United States, cash MUST be sent with order.

LEARN AUTO MECHANICS

in 8 weeks!

Earn \$35 to \$75 a week as an Auto Mechanic. Never in the history of the automotive business has there been such a demand for TRAINED men. 8 weeks training fits you for a job that's waiting for you or to open your own repair shop. Read what two McSweeney trained men have done. Hundreds of others can tell you facts equally interesting. Don't look for a job! TRAIN for it!

Farrell, Pa.
Dear Mac: Please forward me your catalog. I want it to add to my traveling souvenirs. I am working in a modern garage although I have been out of school only four weeks, thanks to McSweeney Training. My best regards to all. M. Klushauk

Rector, Ark.
Dear Mac: Just a few lines which might interest you. I left your school two years ago last May. Since I left I have not seen a day I could call "hard times." I have been working ever since I left and have averaged in my earnings \$173.00 a month, in spite of the hard times. Many thanks. Thos. J. Sharp

EIGHT WEEKS of Actual Shop Training

No books or lessons the McSweeney way. First you learn the "why" of everything you do; then under competent instructors, you DO the job. You work on real equipment and machines, with the real tools of the auto expert. In eight short weeks 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.

AVIATION GROUND COURSE

Aviation is coming and coming fast! Prepare now for the wonderful opportunities of the future. Each plane needs many mechanics on the ground.

MONEY BACK GUARANTEE!

In eight weeks of intensive training; actual shop work with real tools on real equipment; you will be qualified to accept a Big Pay Job as an Auto Mechanic. If you are not satisfied with your qualifications, your tuition will be refunded.

FREE Write today for Big Free Book on AUTOS. Get the facts about jobs; and Low Tuition Offers. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in eight short weeks. Address Dept. 10-21

McSWEENEY SCHOOLS AUTOMOBILE—AVIATION CLEVELAND, OHIO or KANSAS CITY, MO.

Write Our School Nearest You

McSweeney Auto and Aviation School,
Dept. 10-21, Cleveland, Ohio or Kansas City, Mo.

Without cost or obligation, send me your Big FREE Book on Autos; also full information about your low tuition offer.

Name.....

Street.....

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

When writing please mention Popular Mechanics

Here's Why AVIATION
Offers **BIG PAY SUCCESS** to
LINCOLN-Trained Men!



Because LINCOLN Training is Complete, Thorough and Under Govt. Supervision

and it is the kind of training aviation executives demand in the pilots and mechanics they hire for the big pay jobs in aviation. All of Lincoln's modern resources are devoted to perfecting your aeronautical education for a career of romance and success.

WE TRAIN YOU FOR MASTER AIRPLANE & ENGINE MECHANIC. Not just theory but actual experience rebuilding Whirlwinds, Wasps, Cyclones, Aircraft Diesels and many other aircraft engines; also practical experience rebuilding modern airplanes under factory standards. Training also includes aerial radio, welding, instrument repair, Machine shop practice. Full experience for the big pay jobs offered by airline companies and factories.

WE TRAIN YOU FOR TRANSPORT, LIMITED COMMERCIAL, PRIVATE or AMATEUR PILOT'S LICENSE according to Government standards. Complete experience learning to fly high and low wing monoplanes, biplanes, cabin planes and other types. You learn straight flying, night flying, blind flying by instrument, aerobatics, cross country flying, etc. under skilled Gov't Licensed instructors.

LINCOLN-TRAINED MEN MAKE AVIATION HISTORY. Numbered among our graduates are men who have made some of the greatest contributions to the aviation industry. Our graduates now employed by many of the best known companies in the industry, with which Lincoln is in constant touch with the view of placing properly trained men.

Tremendous expansion programs make aviation one of the fastest growing industries of today, with thousands of new jobs being created. Let Lincoln train you for real success. Write for full facts. Please state your age.

LINCOLN AIRPLANE & FLYING SCHOOL
208E Aircraft Bldg., Lincoln, Nebraska

Be An ARTIST



Make \$50 to \$100 a Week
Learn at Home This Amazingly Simple Way

More and more trained Artists are needed each year. 28,531 magazines, advertisers, newspapers, printing houses, etc., pay good money for art work. Our simple, proven, personalized method makes it fun to learn Commercial Art, Cartooning and Designing quickly, AT HOME, in spare time.

Big Artist's Outfit Given

Drawing board, paints, brushes and all materials you need to learn and earn come with very first lessons. Actual fun learning to draw this new way. Be an artist and make big money!

Send for FREE BOOK

Our big Free Book describes latest developments and wonderful opportunities in this fascinating field and gives full details of this quick, simple method. Tells all about our students—their successes—what they say—actual reproductions of their work—and how many earned big money even while learning. Mail coupon below or postcard today. State age. (No salesman will call.)

\$125 a Week!
—that's what our graduate, Miss L. F. of Brighton, Ontario, is making—selling her work in Montreal.

\$3000 for W.R.K.—of Newark, N. J. He writes that just two contracts brought him that neat sum!

\$3380 a Year!
—that's what our graduate R. K. K., of Michigan, is drawing as Art Director of a big engraving house.



Free Book shows how

Washington School of Art, Studio 129
1115—15th St., N. W., Washington, D. C.
Please send me, without obligation, your Free Book, "Art for Pleasure and Profit."

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

ENGINEERING OPPORTUNITIES



Home study courses in
High Speed Diesel
and
Television Eng.,

Also specialized courses in every branch of
CIVIL, STRUCTURAL, MECHANICAL, RADIO, ELECTRICAL, AUTOMOBILE and AERONAUTICAL ENGINEERING.

Write for "ENGINEERING OPPORTUNITIES" our 250 page hand-book packed with valuable information sent to you FREE.

CANADIAN COLLEGE OF SCIENCE AND TECHNOLOGY
Dept. P.M., 219 Bay St., Toronto, Canada
North American Division, British Institute of Engineering Technology, London, England.

Law!

LEARN AT HOME

Are you adult, alert, ambitious, willing to study? Investigate LAW! We guide you step by step—furnish all texts, including 14-volume Law Library. Training prepared by leading law professors and given by members of bar. Degree of LL. B. conferred. Low cost, easy terms. Send NOW for Free, 64-page "Law Training for Leadership."

LaSalle Extension University, Dept. 964-L, Chicago

PHOTO-ENGRAVING LEARN IT AT HOME



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

A copper plate to print above picture size 8 by 10 inches sells for \$15.37.

Aurora School of Photo-Engraving, Dept. 195, Aurora, Mo.

NEW YORK SCHOOL OF MECHANICAL DENTISTRY

★ ★

Become a TRAINED Dental Lab Technician. We show you how! Oldest school. Practical training. Day, Eve. Easy terms. Tools FREE. Ask for Catalog P. N. Y. SCHOOL of MECHANICAL DENTISTRY, 125 W. 31 St., N. Y. C.

Learn Radio in 12 WEEKS

SEND TODAY FOR DETAILS OF MY "Pay-Tuition-After-Graduation" Plan

Prepare for jobs in Radio Broadcast, Talking Pictures, Television by 12 weeks of practical shop work in the great Coyne Radio Shops, on real machinery and equipment. You don't need advanced education or experience. Free Employment Service for life. Many earn while learning. Electric Refrigeration—Air Conditioning included. MAIL COUPON TODAY for free book which tells you how hundreds have become successful Radio Men after taking my training.

H. C. LEWIS, Pres., COYNE ELECTRICAL & RADIO SCHOOL
500 S. Paulina Street, Dept. 65-311, Chicago, Illinois

Send Free Radio Book and facts. Tell me about your "Pay-Tuition-After-Graduation" Plan.

NAME.....
ADDRESS.....
TOWN.....STATE.....



When it came to parties—I was a "wash-out." No wonder I wasn't popular with the other sex.



Until I read how a fellow became popular by learning to play music through a new, easy method. I wrote to investigate.



It was so quick and easy that the next time I went to a party, my playing amazed everyone. Now I am invited everywhere.

Friends...Good Times...Popularity

—so easy when you learn music this short-cut way

Think of the most popular people you know. What is there about them that makes them the center of attraction wherever they go? Isn't it because they entertain and make people happy? There's no question about it. A person who can play a musical instrument is welcome everywhere.

And now it's easy as A-B-C to learn to play your favorite instrument by the U. S. School of Music's amazing "print and picture" method. This course is easy as A-B-C. First you are told what to do—then a picture shows you how to do it. Then you play it and hear it! Sooner than you ever expected you are entertaining your friends . . . playing popular hits, jazz and classical pieces. And—this method costs but a few cents a day—no expensive teachers—no tiresome hours of practice. You play real tunes from the start. Over 700,000 people have learned to play, have found new

popularity by this quick, easy method.

Prove to yourself without cost how easily and quickly you can learn to play. Send today for Free Demonstration Lesson and Free Booklet which explains everything in detail. See the simple principles around which this remarkable method is built. If you really want to learn music—enjoy good times—mail the coupon below. Don't delay—act NOW. Instruments supplied when needed, cash or credit. U. S. School of Music, 79 Brunswick Bldg., New York City.

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

Send me your amazing free book, "How You Can Master Music in Your Own Home," with inspiring message by Dr. Frank Crane; also Free Demonstration Lesson. This does not put me under any obligation.

Name

Address

Instrument

LEARN BY NOTE

- Piano
- Guitar
- Organ
- Tenor Banjo
- Hawaiian Guitar
- Piano Accordion
- or any other Instrument
- Violin
- Saxophone
- Ukulele

\$ RADIO PAYS!

You, too, can be in the big pay class. Trained Radio and Television men make big money in interesting work. For FREE details write First National Television, Power & Light Building, Kansas City, Missouri. Dept. AA-9

CIVIL SERVICE

VALUABLE INFORMATION FREE
COLUMBIAN CORRESPONDENCE COLLEGE
WASHINGTON, D. C.

Be a Draftsman Make BIG PAY

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

These 5 Big Books Shipped FREE!

Quick Way to Learn

Competent draftsmen are urgently needed right now in all building and manufacturing lines at \$30.00 to \$75.00 a week. That's just the beginning—FOR DRAFTSMEN HAVE THE BEST CHANCES FOR ADVANCEMENT. Pleasant, fascinating work, easy to learn and do. Learn quickly with these books. Complete set of drawing instruments if you send for these drafting books NOW.

American Technical Society, Drexel at 58th St., Dept. D619, Chicago, Ill. Send for 10 days' free use New 5-volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return the 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 \$24.80, the special introductory price, is paid. Send latest edition and include drawing instruments.

Name.....

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

Turn JUNK TIRES IN TO CASH! START AT HOME

The Most Sensational Business Opportunity Since 1929

Like turning lead into gold, here is a business with gigantic possibilities. Factories, Clubs, Stores, Schools, Homes, spend millions every year for rubber mats. Think of your profit when a

HAND MACHINE and

5¢ TIRE MAKES \$2.00 MAT

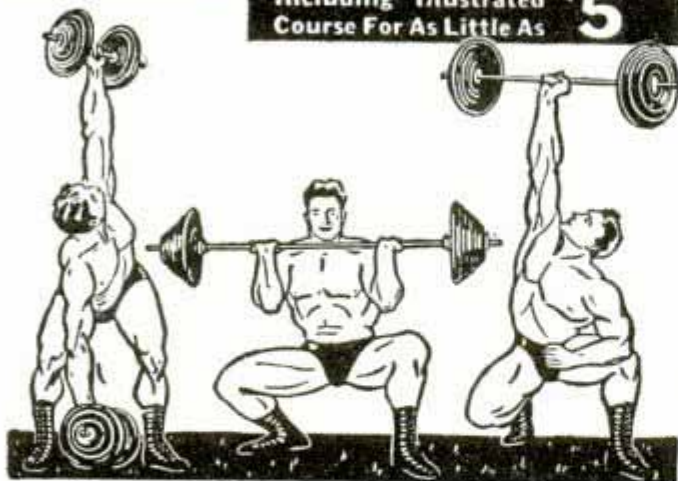
Brand new. Fully patented. Few men already started report unprecedented success. Wm. Eagle writes: "Can't make mats fast enough. First week brought over 200 orders for \$1.00 to \$10.00 each." Flash from Harris says: "Orders enough to keep 15 men busy all the time." Gunter got big order from County Commissioners and now reports: "Just signed up order for all Grade Schools and High Schools." No wonder responsible men are throwing everything else aside to establish local FABRIX factories.

COSTS NOTHING to get complete facts. Just send name and address. We'll send description of simple hand machine that quickly slices old tire into strips; show you how patented method forms strips into thick, springy, long-wearing FABRIX Mats—how five cents worth of Junk Tires makes a \$2.00 Mat; how you can start on a reasonable investment and build a business so big, so fast, that it will take your breath away. Don't delay a minute. Write or wire today. All information is free.

FABRIX, Inc., Dept. 79, 325 W. Huron St., Chicago, Ill.

When writing please mention Popular Mechanics

NOW... YOU CAN BUY A COMPLETE BARBELL OUTFIT
Including Illustrated Course For As Little As \$5



Strong Men of All Times Have Used Barbells to Gain Their Great Strength

NOW for the first time Barbells are within the reach of every man. Formerly as high as \$50.00 they now can be obtained for as little as \$5.00. Of course you want a symmetrical he-man's body that commands admiration wherever you go! And you want the most inexpensive way—by the Saxon Super System. Now is the ideal time to start.

Look at the Records of Saxon Pupils!

Saxon pupils are famous for their strength and development. He will teach you to be as successful if you will follow the Saxon System.

Full Course of Instructions Included FREE!

An illustrated instruction charted course, "The Saxon Super System," is included free with each outfit. Get your outfit while the prices are drastically reduced.

World's Finest Barbell Sets

We are the inventors of the best modernized Barbell sets. Our newly invented features make handling and training easier. Better results. These rights are exclusively Saxons to make and sell. Write for free information.

SAXON SUPER SYSTEM

4324 Paul St. Dept. 169 Philadelphia, Pa.



FREE—if you act now—Kushlan's HANDBOOK OF INDUSTRIAL ELECTRICITY

with the

Croft Library of Practical ELECTRICITY

Regular McGraw-Hill 500-page manual of practical information for those engaged in electrical construction, maintenance, testing, inspection and contracting. Yours without charge on receipt of your first payment for the Croft Library.

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 59,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of seven volumes for ten days' Free Examination. We take all the risk—you assume no obligation. If you decide to keep the books, send \$1.50 in ten days and the balance at the rate of \$2.00 a month and get Kushlan's useful Handbook free, in addition. Send the coupon NOW and see the books for yourself.

FREE EXAMINATION COUPON

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

Send me for ten days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until price of \$19.50 is paid. If not wanted, I will return the books postpaid. Upon receipt of my first payment of \$1.50 you are to send me a copy of Kushlan's Handbook of Industrial Electricity, absolutely free.

Name.....
Home Address.....
City and State.....
Position.....
Name of Company.....

PM-9-35

When writing please mention Popular Mechanics

Professional DRAFTING SET
for OFFICE PLANT SCHOOL HOME
13 PIECE SET \$2.95

Use a real professional drafting set! It costs no more. Flat type instruments of nickel silver. Tool steel working parts. Compass can make 24-in. circles! 13 pieces including a leatherette case lined with velvet for only \$2.95 Postpaid. (Small postal charges extra if C. O. D.). Send for FREE catalog of drafting sets, slide rules, microscopes, etc.

Scientific Products Co., Dept. A1, 49 W. 23 St., New York

Write and Speak MASTERLY ENGLISH



Learn correct English with Sherwin Cody's new invention. No rules to memorize. Like a fascinating game. Spare-time study. 15 minutes each day, quickly gives you command of English. Send for free book, "How You Can Master Good English in 15 Minutes a Day." Write today. SHERWIN CODY SCHOOL OF ENGLISH, 59 Searle Bldg., Rochester, N. Y.

HOW TO GET A BETTER JOB
by EUGENE WHITMORE



YOU can get the JOB YOU WANT! Leading authority on American business tells what industries need men, how to sell yourself, get the job and win promotion. FREE CHART of actual salaries paid in 76 lines. KNOW WHAT YOU WANT and GET IT. Handsome cloth-bound volume, 128 pages, sent postpaid with money-back guarantee if not satisfied. MAIL DOLLAR BILL TODAY to

The Dartnell Corporation, Dept. PM, 4660 Ravenswood Avenue, Chicago, Illinois

BE A CARTOONIST



AT HOME IN YOUR SPARE TIME under supervision of NORMAN MARSH, creator of the famous comic strip "DAN DUNN, SECRET OPERATIVE 48," appearing in the big newspapers. Success—fame—real money may be yours when you learn the easy simple methods and secrets which make the MARSH cartoons so successful. Send name for free details of this personal course. Act Today!

MARSH CARTOON SCHOOL, Chicago Daily News Bldg., Dept. I-1, Chicago, Ill.

Wrestling Book FREE



Wrestling taught at home, by mail, by greatest of all world's champions—Farmer Burns and Frank Gotch. Be a wonderful athlete. Handle bigger, stronger men with ease. Learn the secrets of experts, Jiu-Jitsu, Physical Culture. Have perfect health, fame, a perfect body admired by both sexes.

FREE 32 page illustrated prospectus, full of thrilling information, sent free. Tell us we teach expert wrestling at home. Send 2c to cover postage. Write now for your copy. State age.

FARMER BURNS SCHOOL, 3376 Elwood Bldg., Omaha, Neb.

Correspondence Courses in RADIO & ELECTRICAL ENG.



Course No. 1: ELECTRICAL ENGINEERING—Simplified mathematics, covers complete electrical field, easy to understand. Modern and up-to-date. Course No. 2: RADIO AND ELECTRONIC ENGINEERING—An ultra modern course in radio, public address, photo electric work. Trains you to be super-service man and real vacuum tube technician. Tuition \$25 either course. Deferred payment plan for worthy students. Student magazine. School pin. Run like a college. WRITE TODAY for school catalogs.

LINCOLN ENGINEERING SCHOOL, 855-K S. 37th St., Lincoln, Nebr.

Learn AIR CONDITIONING, DRAFTING, ELECTRICITY, RADIO ENGINEERING (ACCREDITED) 32nd YEAR



the fields in which jobs are opening and money being made. No time to lose. Start now. B. S. Degree or shorter training. Earn while learning. FREE 80-PAGE BLUE BOOK tells about big opportunities.

CHICAGO TECHNICAL COLLEGE, M78 Tech Bldg., 118 East 26th St., Chicago, Ill.

**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 October issue, copy should be in our office August 14th
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.

Popular Mechanics Magazine, Chicago, Ill.

Gentlemen:—I have used Popular Mechanics classified column for nearly 20 years and have found it always to be a steady, dependable puller. It seems to appeal to a very wide variety of people, its circulation not being specialized as its name would imply. Through it I have heard from doctors, lawyers, dentists, clerks, bookkeepers, and every variety of business man besides the strictly "mechanics fans." Replies come from all corners of the globe. Its long-time appeal is something remarkable in that I often receive letters stating "I saw your advertisement in Popular Mechanics of several years ago." Our record is a reply from an advertisement eight years after your magazine appeared.

Yours cordially,
ROSS D. BRENISER.

(Original letter on file in our office)

AUTOMOBILES

BUILD A racer! Kuns tells how you can build 125-135 m.p.h. stock cars and speedway racers. New book fully describes mid-gets, conversions. Contains all speed records, drawings, pictures, full description record cars. \$1 postpaid, \$1.12 e.o.d. 3c tax in Ohio. Ray F. Kuns, Dept. B-12, Madisonville, Cincinnati, Ohio.

200 MILES 35c. Burn stove distillate in your car. Get parts in any junk yard. Complete detailed information and blueprint 50c (coin). C. C. Carmichael, 5013 2nd Ave., Los Angeles, Calif.

AUTO SUPPLIES—EQUIPMENT

AUTO Owners save 75%! Fuel oil conversions \$9.00. Write Desogas Co., 1349 Josephine, Berkeley, California.

AUTOMOBILE Owners, protect your battery from low water damage by installing an indicator on your instrument board. Accurate, simple. Price \$2.00. Thomas B. Cox, 42 Halifax Street, Petersburg, Va.

AUTO Beds. Sensational new invention makes your car a practical year 'round bed room. Unquestionable comfort. Packed in jiffy. Coupes, coaches, sedans. Also make it yourself plans. Auto Bed Manufacturing, Box 16, Chartley, Mass.

MOTORISTS: Remove grease spots from car upholstery, clothes, gloves and white shoes quickly, without effort or injury, with Gild's Glove Glow, clever cleaner for fabrics and leather. Leaves them soft and pliable. 25 cents. E. G. Glidden, 89 Elder, Schenectady, N. Y.

DEMONSTRATORS. Compressor, test bench, 8-hour battery charger—are welder. Guaranteed. Trial and terms. Ken's Equipment Exchange, Box M-952, Troy, Ohio.

AUTO Paint striper, 1/16 inch, \$1.00 postpaid. Guaranteed. See page 783, May Popular Mechanics. Alexander Mfg. Co., 1821 Leavenworth, Omaha, Nebr.

POLICE Sirens, mechanically or motor driven. For cars, boats, aeroplanes. Particulars free. Norfolk Machine Shops, 1611 Goodfellow Blvd., St. Louis, Mo.

JOBBER'S Dealers, make and sell your own automotive specialties. Ten guaranteed formulas \$1.00. Guy Terrell, 1065 Field, Detroit, Mich.

USED Auto parts at half price for all cars. Century Parts Co., 1712 Lafayette Ave., St. Louis, Mo.

NICKEL Plating outfits, connect to your battery. No tanks used, thousands in use. \$3.00 prepaid. Gunmetal Co., Ave. J, Deatur, Ill.

A. C. GENERATORS

TWENTY New practical changes for automobile generators. See our advertisement at bottom of page 137A. Auto Power, Inc.

AUTO TRAILERS

BOOK Of camp trailer plans containing fifteen modern designs ranging from 8 to 16 feet. Copy sent postpaid for \$1.00. Toellen Coach Company, Box 25, College Park Sta., Detroit, Mich.

\$1 VALUE For 50c. Get facts on trailer coach design. This 50-page book can save you 100 times its cost. Order direct from author. Money back if not satisfied. 2c tax in Ohio. Ray F. Kuns, Dept. 114, Madisonville, Cincinnati, O.

TRAILERS, 4'x6'—\$27.50, Undercarriages \$15.50. Plans, utility 50c, house \$1.00. Shamrock, 12321 Turner, Detroit, Mich.

REFINISH Your own car. New instruction book treats all phases of painting and refinishing autos and trucks. Written for the man who wants to renew his own car, but covers also the business end of refinishing for the professional. \$1.65 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

MOTORCYCLES, BICYCLES AND SUPPLIES

POWER Your bike with low priced Speed-bike motor. Attach in one hour. Eighty miles to gallon. Thirty miles an hour. Free folder. Guaranteed. Outboard Motor Corp., 4029 N. 28th St., Milwaukee, Wis.

LATEST Midget motorcycle. Boy's "Race-bike." 90 miles per gallon. Practical, serviceable, streamlined design. Easily built from old bicycle parts. Fine working plans, explain, show everything \$1.10. Picture circulars dime. Bates Midgets, 4877 Armlage, Chicago.

REBUILT Motorcycles. All makes. New and used parts. Expert repair work by factory trained mechanics. We are the authorized Harley-Davidson distributors. Send 10c for bulletin. Western, 914 E. 15th St., Kansas City, Mo.

HENDERSON, Excelsior, Harley, Indian, used parts, alloy pistons, catalogue and wings pin 10c. Ballak, 1115 Chestnut Street, St. Louis, Mo.

MOTORCYCLE Bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 129 West Main St., Rochester, N. Y.

SIXTY Reconditioned motorcycles. New and used parts for all makes. Whitman Motorcycle & Supply Co., 405 Southwest Blvd., Kansas City, Mo.

MOTOR Bicycles \$45.00, motorcycles \$40.00, new cord tires \$3.95, used tires, \$2.50. Bicycles \$11.50. (Bicycles for two \$35.00.) Used motorcycle parts, wheels \$1.00. Chains \$1.00. Engines \$10.00 to \$75.00. Frames \$5.00, all parts. Balloon tired wheels for boys automobiles. Send 6c. Price Cutter Deninger, Rochester, N. Y.

SEND 15c For illustrated used motorcycle catalog. New and used parts. Accessories. Largest stock. Indian Motorcycle Sales, Kansas City, Mo.

AVIATION

A BIG Package of model ship and airplane samples. Send 10c for packing and postage. Aero Shop, 3050 Hurbit Ave., Detroit, Mich.

HUNDREDS Planes, crackups dirt cheap. Directory, 20c. Aircraft Directory, Athens, Ohio.

AIRMINDED Young men interested in entering the field of aviation as apprentices. Write, enclosing stamp. Mechanix Universal Aviation Service, Inc., P. O. Box 33E, Detroit, Mich.

NEW Aeroplanes, \$98.00; motors, \$19.98; propellers, \$2.98. Send 25c for data, information. Hibbs, Ft. Worth, Texas.

GET Into aviation. Air transport pilots get up to \$7,000 per year; mechanics, \$2,500. Learn at this government approved school. Write for complete information. State age. Lincoln Flying School, 2001 Aircraft Building, Lincoln, Nebr.

BATTERIES, GENERATORS, ETC.

6-32 VOLT Wind electric plants. Kits \$10.00 up. Parts catalog, plans 25c. Currier Mfg. Co., Minneapolis, Minn.

WIND Driven battery charger and light plant. Complete plans to build 35c. Farm Service, 1214 E. Jefferson, Bloomington, Ill.

WESTINGHOUSE Power generators. Output 200 watts, 110 volts a.c., \$8.00 each. National Electric Tool Co., 500 Washington Blvd., Chicago.

GENERATORS Cheap—Brand new Robbins Myers 1000 watts, 32 volts, \$25.00. Victor Mfg. Co., Adrian, Mich.

EDISON Storage batteries for all types of lighting systems. Uses no acid. Odorless. Long life. Guaranteed. Generating plants, motor bargains. Free interesting literature. Hawley Smith Company, Croton Falls, New York.

GENERATOR Propellers, expertly designed at factory prices. Hibbs, Ft. Worth, Texas.

EDISON Storage batteries for power and lighting systems. Replace your old lead batteries with the Edison. Built like a battleship. Non-acid. Non-corrosive. Exceptionally long life. Liberal guarantees. Free illustrated literature. See Jay Battery Company, 82 Sterling Avenue, Yonkers, N. Y.

ELECTRIC Lights—Wind driven—You build them. Write Wind Motor Electric, Ridgway, Mont.

ELECTRICAL SUPPLIES—EQUIPMENT

BUILD Your own electric refrigerator or build for profit. Low cost. New manual explains theory, construction, operation, source of supplies, 40 illustrations, \$1.00 postpaid. L. K. Wright, Box 527, 5 West 63rd Street, New York City.

ELECTRICAL Experimental laboratory—Contains, generator, motor, microphone, transformer, polarized ringer, condensers, electroplating chemical, carbons, electromagnets, etc. 25 piece apparatus. Makes arc furnaces, eavesdropping detectophone, giant light, extension telephone, generates electricity, etc. Instructions. Educational, fascinating, useful. Original cost \$17.75. Special \$2.79. Stamp for bargain catalog. Electrical Salvage, Box 524-AG, Lincoln, Nebraska.

MAKE Your own washed air cooling outfit, we furnish complete instructions for \$1.00. A. & D. Electric Mfg. Co., Minneapolis, Minn.

PHOTOCELL Selenium. 3 grams with instructions 25c. Box 6, Barberton, Ohio.

INSULATION, Wire, varnishes, supplies, etc. Send 3c stamp for bulletin. Autopower, 408-B Hoyne Ave., Chicago.

ELECTRICAL Supplies, appliances, lighting fixtures, radios. Write for free catalog. Germantown Electric Supply Co., 3054 Germantown Ave., Philadelphia, Penna.

HOW To make efficient small electric spot welder, hundreds other useful devices in Shop Notes, Vol. 29, only 50 cents postpaid. Popular Mechanics Press, Room C 35, 200 E. Ontario St., Chicago.

WELDING AND SOLDERING

BLOWTORCH—Gasoline automatic, 1900 Fahrenheit, 45c. Agents \$3.00 dozen. Grant Laboratories, Independence, Missouri.

DEMONSTRATORS, Electric arc welders. Money-saving prices. Used by the government. Trial and terms guaranteed. Hobart Welders, M-953, Troy, Ohio.

COMBINATION Spot, butt, arc welder. Blueprints \$1.50. Other welders and workshop machines 50c up. Dewey Engineering, 20493 Hawthorne, Detroit.

ARC-WELDING Outfit \$1.25. Weld fenders, braze, solder. Larrow, 4368-W. Warren, Detroit. Stamp appreciated.

WELDING And brazing oxy-acetylene equipment, new and rebuilt. Superior Oxy-Acetylene Company, Hamilton, Ohio.

PRACTICAL 200 Amp. welder made from farm light plant generator, small cash outlay, gets the job done. Blueprints, specifications \$5.00. City Electric Shop, Snyder, Oklahoma.

ENGINES—MOTORS—DYNAMOS

FOR Sale—150 hp. 3-cylinder Werkspoor Diesel engine just overhauled, guaranteed first-class condition, with 125 kva. a.c. generator direct driven and exciter belt driven. Field rheostat, switch, voltmeter and ammeter included. Price \$3,850. L. L. Adcox Trade School, 237 N. E. Broadway, Portland, Oregon.

REBUILT Motors, ¼ h.p., 60 c., I. B. R. O. B. L., \$10. N. P. & M. Wks., 1367 Niagara St., Buffalo, N. Y.

FIVE KVA 110 volt alternating generators \$89.50. Other sizes. Converters, motors. Queen City Electric, 1736 Grand Avenue, Chicago.

GOVERNORS Control auto engines—stationary or portable power uses. New big discount. No cash down. Special foreign terms. Agents wanted. Candee-Smith Governor Co., 215 North Los Angeles St., Los Angeles.

WINDING Data, 100 AC motors, various horsepower and voltage, \$1.00. Motor Data Co., 3002 Monroe, Kansas City, Mo.

REWINDING Motors and 330 other valuable articles in Shop Notes for 1935—50 cents postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

MACHINERY—TOOLS—SUPPLIES

CONCRETE Building block machines and molds. Easy payments. Catalog free. Concrete Machine Co., 5 North Main St., St. Louis, Mo.

CONVERT Scrap material into finished dowels with Dowelmakers. Use with lathe or power drill. Nine sizes, ¼" to ¾" by 14ths. Complete set, \$9.95; five for \$5.95; three for \$4.25; each, \$1.50. State sizes. Shipping weight, each, 12 oz. The Triumvirate, Dowelmaker Division, Mansfield, Pa.

POWERFUL 1000 Watt floodlights \$6.50. Serplus, 938 North Homan, Chicago.

ELECTRIC Drills—¼ inch, \$5.75. Description free. Kolataze, 118 East 28th Street, New York City.

14"x6' LODGE & Shipley lathe, quick change, good condition, price \$175.00. 2" Peerless motor driven bench pipe machine, \$100.00. No. 60 Heald cylinder grinder \$175.00. All sizes of machine tools. Send for catalogue listing other bargains. Terms to suit. Cincinnati Machinery & Supply Company, 27 West Second Street, Cincinnati, Ohio.

BARGAINS, Demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Ken's Equipment, Box M-954, Troy, Ohio.

BOATS, OUTBOARD MOTORS, ETC.

EXPLORE New world. Blueprints practical diving outfit \$1.00. 130 Center Street, Redlands, Calif.

AIROBOATS \$7.50 up. America's finest portable boats and kayaks. Fast. Safe. Strong. Complete free information. Ai-roboats, Dept. J, Dedham, Mass.

12 FOOT Flat bottom rowboat—Complete plans 25c. Free boatbuilding catalog. The Rudder, 15 Murray Street, New York.

CUT-TO-FIT Kayaks, canoes, \$6.95 up. Catalog for dime, refunded with order. Boat Shop, 737P, Greenville, Pa.

BUILD Your own boat and save ½ cost. 38 designs. Send 10c for catalog. Brooks Boat Co., Inc., Box E-20, Saginaw, Mich.

PROPELLERS, Stuffing boxes, gear pumps, bearings, etc. Wm. Baker, Pond St., Quincy, Mass.

OUTBOARD Parts—New or used—All makes—What do you need? Crandall-Hicks Company, 782 Commonwealth Avenue, Boston, Mass.

BOATS, Camps, motor camping, trailers, outdoor sports, etc. Send for list of special books on. It's free. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

GUNS, FISHING TACKLE AND SPORTING GOODS

CAMPING Moccasins. Thick, oil-tanned steerhide. Send shoe size and \$1.75 for regulation model; \$2 with extra sole. Other camp specials; write: Seawanhaka Trader, 710-B Monroe Street, Brooklyn, N. Y.

MAKE Dipsies for use or sale. Free folder. Reading Instrument Co., Box 78, Reading, Pa.

FIELD GLASSES, TELESCOPES AND MICROSCOPES

USED Binoculars, microscopes, astronomical telescopes, accessories. New microscope slides, natural history subjects. Engineers levels. P. O. Box 256, Amsterdam, N. Y.

BUILD An astronomical telescope. Catalogue free. John Pierce, Springfield, Vt.

ANTIQUES, RELICS, INDIAN GOODS

5 ARROWHEADS 20c. 3 Birdpoints 18c. Knife, birdpoint, scraper, spearhead 45c. Catalogue. Coins, Minerals, Curios. Lemley Curio Store, Northbranch, Kansas.

ANTIQUE Guns, Indian relics. List five cents. Elmer Ellis, Webster Groves, Mo.

TAXIDERMY

TAXIDERMY Supplies—Quality artificial eyes, teeth, genuine Jonas head forms. Tools, materials, etc. Everything for the progressive taxidermist. Send for big illustrated catalogue—Free. Jonas Bros., 1049 Broadway, Denver, Colorado.

LEARN Taxidermy. Five courses. Blue Beaver Taxidermy School, Lemont, Ill.

PROFIT And pleasure in taxidermy. Complete guide for the preparing and mounting of animals, birds, fish, reptiles, etc., for home, den, or office. \$1.65 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

DOGS, BIRDS, POULTRY, PETS

STANDARD Pet Journal, Milton, Pa. Sample dime, 6 months 25c.

BIRDS! Rare and beautiful varieties! Featherian, Modoc Rd., Santa Barbara, California.

POULTRY Tribune—Leading poultry magazine. Five years \$1.00; six months trial 10c in U. S. Poultry Tribune, Dept. C-93, Mount Morris, Ill.

PEDIGREED St. Bernard puppies. Also Newfoundlands. Ruby Thurston, Hartsville, Indiana.

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

ROOTS, HERBS, TREES AND SHRUBS

ROCK Garden specials. Ornamental, medicinal. Henderson's Botanical Gardens, Greensburg, Indiana.

EARN Profit—Roots, barks, evergreens of value in fields; forests. Stamped envelope brings "Collector's Guide." Botanical, New Haven, Connecticut.

SEND For this amazing new "Herbalist Almanac." Interesting! Instructive! Educational! Contains hundreds tested recipes for old-fashioned home remedies, salves and herb teas. Beautiful natural colored illustrations herbs and plants. Weather forecasts. When to plant and harvest. Best fishing days and baits. Recipes for cooking and baking. Weights and measures. Signs of the moon. Historical events. Valuable information on poultry and building. Many other great features. Only 10c postpaid. Write today! Botanics, 145 West 112th St., Chicago.

FARMS AND FARM LANDS

NEW Deal in farms, Minnesota, North Dakota, Montana, Idaho, Washington, Oregon. Rents are cheaper, prices lower. New low rates. Write for free book. E. C. Leedy, Dept. 1257, Great Northern Railway, St. Paul, Minnesota.

MODERN Farm on U. S. highway, fronting lovely river in pretty depot village; 5 acres, fruit; roadstead, tourist location; slate-roof 7-room house, bath, furnace, electricity, good barn, garage, hen house; bldgs. insured \$2000, price only \$1800, easy terms; page 49 big new summer-fall catalog. Free. Strout Agency, 255-P 4th Ave., New York City.

\$5 DOWN, \$5 Monthly, 20 acres in Missouri Ozarks, \$100. Fishing, hunting, trapping. Hubbard, 216 Grossman Bldg., Kansas City, Kansas.

INDEPENDENCE, Security assured, North Dakota, Minnesota, Montana, Idaho, Washington, Oregon farms. Bargain prices, easy terms. Descriptive literature, impartial advice. Mention state. J. W. Haw, 119 Northern Pacific Railway, St. Paul, Minn.

PROFITABLE OCCUPATIONS

MAKE Beautiful new products. Particulars 35c. Box 362, Glendale, California.

RAISE Rabbits for us. We pay you up to \$5.00 each. Also put you in touch with markets everywhere. Large illustrated book and catalog; also copy of the American Rabbit Farmer and monthly market bulletin showing names of buyers in various parts of America who continuously buy all rabbits offered them. All for 10 cents. Address Outdoor Enterprise Co., Box 10, Holmes Park, Mo.

IF Interested in raising frogs we guarantee to save you money. Send 10c for literature. American Frog Industries, Rayne, La.

BOOKS AND PERIODICALS

EARN A living. Sell your snapshots? Booklet describing 100 markets, with the world's lowest priced book catalogue. Yours for 25c stamps or coin. Busy Bazaar, 176, Port Carbon, Pa.

CASH For college texts. Mail lists, amount, author, edition, and conditional agreements. Polisky's, 3738 W. 15th St., Chicago.

McDONALD'S Electrical dictionary, 192 pages, cloth, \$1.50 prepaid; latest electrical dictionary; needed wherever electricity is used; discounts to dealers. Meador Publishing Company, 470 Atlantic Ave., Boston.

PICTURES AND POSTCARDS

AN Illustrated "Trip Through Hell" with the immortal Dante. Interesting, educational. 25 views 25c. Richard Supply Company, Dept. B, 125 - 12th, Augusta, Georgia.

GAMES—ENTERTAINMENT

PLAYS, Operettas, musical comedies, complete minstrel first-parts with song programs, blackface skits, vaudeville acts, monologs, dialogues, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denton & Co., 623 So. Wabash, Dept. 11, Chicago.

SURPRISE Your friends—Read their true personalities through what they write or say! Startling new method. Analyze others—become more forceful yourself. Marvelous new book tells easy method. Send 25c (coin) today. Maci, 2421 "O" Street, Omaha, Nebraska.

MAGIC TRICKS, PUZZLES JOKER NOVELTIES

SUPER Magic, card miracles, joke items. Buy direct, send 10c for illustrated catalog. Address Mail Order Division, The Joke Shop, Manchester, N. H.

FREE Book "Puzzles and Brain teasers," with 6-month trial subscription. Send only 50c. American Freeman, Box 1896, Girard, Kansas.

MAGIC Catalog free. Lynn, 105 Beach, Jersey City, N. J.

PROFESSIONAL Tricks. Free catalogue. Frank Lane, 5 Little Bldg., Boston.

AIRPLANES. Smartfivers. Copyrighted materials 25c. Aeroshoppe, 1965 Muskego, Milwaukee, Wis.

LEARN Ventriloquism, 3c stamp brings particulars. Smith, 125 North Jefferson, Peoria, Ill.

BE A magician. Large professional magic catalogue of latest tricks 25c. Ireland's Magic Factory, 431 North Clark, Chicago, Illinois.

LARGE Professional magic catalogue, 25c. Holden, 220 W. 42nd St., New York.

STAMP COLLECTING

UNITED States—Approvals. References. Bicentennial complete 15c. Traffic Station, Box 81, Minneapolis, Minnesota.

APPROVALS. Penny up. Fine items. Priced right. Eldridge, Cassadaga, Florida.

20 DIFFERENT Airmail—5c with approvals. Berry's, 219 Barrett, Syracuse, N. Y.

AIRMAILS! Pictorials! 65 different stamps from strange countries (no Europe), including beautiful New Guinea airmail, smallest stamp, Zanzibar, Tasmania, etc., 10c. Bargain Co., Box 39P, Station H, New York.

100 DIFFERENT. Catalog value \$2.25 and price list 10c. Approvals. Carpenter's Stampco, Manti, Utah.

GREAT Bargain! Packet triangles, assortment airmails, lot old and recent U. S. including \$2.00 and \$5.00 stamps, multitude others and useful souvenir. Everything only 10c to approval applicants. Union Stamps, P. O. Box 134, Toledo, Ohio.

CANADA Catalog only 10c, with 50 diff. Canada 25c. World specials—500 diff. 30c, 1000 diff. 85c, 2000 diff. \$2.50. Approvals with each order. Victoria Stamp Company, London 4, Canada.

FREE Bavarian railway set. Atwood, 908 McMillan Ave., Birmingham, Ala.

BRITISH Turkislands—Also Congo's, Montecarlo, Nigercoast, Uganda, Djibouti, Ecuadorian, Ivorycoast, Ubangi, countries collectors need. Free for 5c postage. Empire-stampshop, Dept. PM, Toronto, Canada.

SURPRISE Stamps free to approval applicants. Premium for every 50c spent. Bill Bloss, 1173 North Kingsley Drive, Los Angeles, California.

EXCHANGE Stamps, postcards by "Ex-changers," 51 Passage Bureau, Paris, 126, France. Information free.

THE World in a packet—105 different stamps from 105 different countries, including Abyssinia, Afghanistan, Brunel, Falkland, Zanzibar, and others from Africa, Asia, South America, West Indies, etc. Our pamphlet which tells "How to Make a Stamp Collection Properly," together with our large bargain list of albums, packets, sets, etc., all for only 28c. Queen City Stamp Co., Room 36, 604 Race St., Cincinnati, Ohio.

1000 UNITED States, including airmails, commemoratives, 25c. Wholesale Stamp Mart, Storm Lake, Iowa.

FAMOUS Piccard balloon, Columbus galleon, Bosnian assassination set, 10 airmails; all only 3c with approvals. Peegee Stampco, Station H-76, New York.

DEALERS! Novelty mixture, many commemoratives, \$5.00 catalogue, 39c. Ed. Hammond, Auburndale, Mass.

UNITED States mixtures 50c, Canada 75c, foreign \$1.00 lb. Mission Co., 4512 North Racine, Chicago.

5000 MIXED United States and foreign, \$1.00! Approvals included. Clifton English Co., 65, Nashua, New Hampshire.

COLONIAL Packet free! 25 beautiful French and British colonials sent to applicants for bargain approvals. Postage 3c. Kumlir, King, Lancaster, Ohio.

ABYSSINIA No. 120-128, dime with approvals, 1/2c up. Barrington Stamp Brokers, Barrington, Illinois.

STAMPS Wanted. Will pay \$100.00 for 1924, 1c green, Franklin (rotary, perforated eleven) \$1000.00 if unused. Cash paid for certain stamps found in old trunks, etc., also on daily mail, and in postoffices. Save all stamps, old and new. Information 10c. Philatelic Broker, 431-E. Broad, Elyria, Ohio.

200 DIFFERENT Stamps, triangle, airmail, etc., 10c. R. H. Carlton, 610 Hillstreet Bldg., Los Angeles, Calif.

25 DIFFERENT British colonials to approval applicants sending 3c postage. C. Isch, McGehee, Arkansas.

40 DIFFERENT South and Central America, including airmails, commemoratives, bicolors, pictorials; 10c with approvals. Bell, 4404-M Ethland, Baltimore, Md.

PENNY Approvals by country. Stamp Exchange, Montville, N. J.

200 DIFFERENT Beauties 10c. Approvals. Ide, Box 1875m, Milwaukee, Wisconsin.

BILLPOSTERS—Russia's brilliant Sport Issue 7c, with low-priced commemorative, pictorial approvals. References. Watson, Summitave, Clifton, N. J.

MAMMOTH Mystery packet rare stamps only 10c to serious approval applicants, also valuable free premiums with every selection afterwards. Our stamps are better, our service is different. Fair-Play Stamp Service, 1215 Browning Blvd., Los Angeles, Calif.

EXCEPTIONAL Bargains in rare coins. Lists and one foreign coin 10c. Joseph Co'tin, 1182 Broadway, New York.

FINE U. S. Large stock, reasonable prices. \$2.00, \$5.00 current, both 80c; \$1000.00 doc. rev., beauties, \$5.00; set "Parks" issue, 45c; \$5.00 dues, 10c. Voorhees, 7 So. Dearborn St., Chicago.

COLOSSAL Premiums free with bargain approvals. Send 5c. Acorn Stamp Co., South Norwalk, Conn.

1000 ASSORTED U. S., 25c; 100 commemoratives, 25c; 125 revenues, 25c; 1000 foreign, 25c. Jewett, 1204 West Onondaga, Syracuse, N. Y.

200 DIFFERENT Including 50 different British with Fiji, Newfoundland, Canadian commemoratives 10c, approvals included. Mantle Stamp Company, London, Canada.

FREE—Beautiful airmails, commemoratives, pictorials, from 10 countries to approval applicants. Green & Co., Norwood, Ohio.

1000 MIXED United States 20c. Majestic, Box 4783, Kansas City, Mo.

SENSATIONAL! Packet triangles, also Zanzibar, Trengganu, Transcaucasia, Latakia, numerous others, and useful souvenir. Everything only 10c to approval applicants. F. Westerstrom, McKees Rocks, Penna.

WASHINGTON Bicentennial set complete, 11c with approvals. Ledue, St. Petersburg, Florida.

THE Most historic issue in existence. "The Bosnian Assassination, the Spark That Set the World Afire"! We include this complete set, along with a complete Russian commemorative set; complete Denmark Ancient-Ship set; and 3 of the oldest stamps ever issued, all for only 10c! Pearson Bros., 68 Nassau St., Dept. 19, New York.

25 URUGUAY 10c; 25 Luxemburg 15c; 25 China 10c; 25 Egypt 10c. To approval applicants. Ancher Stampco, Rutherford, N. J.

FREE! Scarce triangle! Set airmails! Packet ship stamps! Set 50-year old U. S. Watermark detector! This \$\$\$ combination absolutely free with bargain approvals! Postage 3c. Midwood Stampco, Midwood Station, Brooklyn, N. Y.

ILLUSTRATED U. S. list, price 50c, large complete U. S. price list free. Stanley Gibbons, 38P Park Row, N. Y.

NEWFOUNDLAND, 15 Different 5c with approvals. Hudson Co., Plainfield, N. J.

TRANSJORDANIA, Distant Trengganu, \$5 U. S., Turks Calcos Islands, Brunel, genuine Baden and Imperforated "Park"—all for 5c to approval applicants. Viking Stamp Company, Williamsburgh Bank Building, Brooklyn, N. Y.

300 DIFFERENT 20c; 1,100, \$1; 2,000, \$2.50. Fred Onken, 630 79th St., Brooklyn, N. Y.

SCARCE Ecuador airmail in gigantic packet 104 different, Guinea, Congo, Hyderabad, etc., 5c to approval applicants. Hunziker, Box 225-M, Minneapolis, Minn.

UNITED States—89 different 25c; approvals. Chas. Reitter, Box 329, Chicago.

FREE! 100 Different stamps with approvals. Postage 3c. Aladdin, 1550 Carroll, St. Paul, Minn.

BARGAIN Penny approval. Good Sweep-er, 101 Monmouth St., Newark, N. J.

AMAZING Value—35 different U. S. early commemoratives, air mail, etc., 10c to approval applicants. Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

UNITED States approvals for serious collectors. References essential. Monitor Company, Box 212, Pasadena, California.

UNITED States—40 different with comprehensive pricelist 10c. Seidenberg, Baroda, Michigan.

BARGAINS Galore. Penny approvals. Choice of thousands. Flood, Clinton, Mich.

GIANT-SIZED Russian Zepelin stamp (cat. val. 20c!) and beautiful Lithuania airmail triangle; also big packet of 53 dif. stamps including Azerbailian, Epirus, new Martinique, etc. and illustrated lists—all for 5c to approval applicants! World-Wide Stamp Co., Box 600, Camden, New York.

\$2.00 U. S. Capitol, No. 572, current postal issue. Cataloging 50c, only 5c, with approvals! Giant U. S. list, free! Tatham Stampco, Springfield, Mass.

EIGHTH Wholesale review—Greatly enlarged, sent free on application. Empire Stampco, Dept. MP., Toronto, Canada.

LIBERIA Snake triangle, Guatemala triangle, 50 other stamps, 5c. Crowder's, Carroll, Baltimore, Md.

ASCENSION, Grenada, pictorial commemoratives. Also other scarce islands 10c. Provided you desire approvals. Grandstamps, 919 South Grand, Los Angeles, California.

MOZAMBIQUE, Jamaica, Portugal, British Colonials—30 different, 5c. Depraw, Ocean Park, California.

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

WEEKLY Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

FREE!!! Russia ethnographic set. Postage 3c. Roberts, 901F Fourth, Baycity, Michigan.

50 STAMPS 1c, Mostly obsolete. Album 3c. Bullard, 446 Tremont, Boston.

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.

STAMPS Sent on approval. 50% discount. Fred Herzberg, 197 Grantley Ave., Elmhurst, Illinois.

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

200 DIFFERENT 10c. Big 50% approvals. Covert Stamp, 39 State, Rochester, N. Y.

THIS Ad worth 25c. If you send for our approvals and buy 50c worth or more—large selection of U. S. and foreign—reasonable prices. Morton Stamp Co., 1121 Olive, St. Louis, Mo.

FREE Dollar packet with penny approvals. Harlan, 5297 South Marshfield, Chicago.

KOOKABURRA Bird!! Bolivia triangle! Packet of unusual stamps containing rare Kookaburra Bird, scarce Bolivia triangle, famous money stamp (printed on cardboard and also used as currency!); airmails from Mexico and Brazil; map, ship, animal, commemorative, etc. No Europe. Only 10c to approval applicants. DeSoto Stamp & Coin Co., 105 No. Clark St., Chicago, Ill.

IMPERFORATE National Park, 2 diff. and 33 U. S., including early issues; high values; commemoratives; airmail; envelopes; special delivery; postage due; revenues cataloging over 85c. All for 7c to approval applicants. Illustrated pricelist free. Curhan Stamp Co., Dept. P, Gloucester, Mass.

FREE—25 Different United States stamps to approval applicants. Brownie Stamp Shop, Flint, Mich.

RARE COINS

COMMEMORATIVE Half dollars, Arkansas, Connecticut, Kentucky, Maryland, Texas, San Diego, Pilgrim, Grant, Monroe, Patriot, Stone Mountain, Sesquicentennial, Oregon Trail, Bennington, \$1.50 each. 80¢ selling list 10¢. Norman Shultz, Salt Lake, Utah.

2 COINS, 4 Notes, different and big bargain list, all 10¢. Hubert Carcaba, St. Augustine, Fla.

\$2000.00 for 1c. We pay the world's highest prices for old coins, and paper money. Large cents up to \$2000.00 each, half cents \$250.00, 1909 cent \$10.00, Indian head cents \$50.00, half dimes \$150.00, 25c before 1873 \$300.00, 50c before 1879 \$750.00, silver dollars before 1874 \$2500.00, gold dollars \$1000.00, trade dollars \$250.00, 1822 \$5 gold \$5000.00, old paper money \$26.00, encased postage stamps \$12.00, certain foreign coin \$150.00, etc., send dime for large illustrated list before sending coins. Romanocoinshop, Dept. 564, Springfield, Mass.

HIGHEST Prices paid for all coins. Dimes dated before 1895 \$300; pennies \$2000; Liberty head nickels \$200; other coins up to \$5000; etc. Send 15c complete 1935 catalogue. Nationalcoin Company (BB), Springfield, Massachusetts.

UNITED States large cent and bargain list 10¢. 10 large cents 80¢. Frank Lenz, 50 Station L, New York City.

OLD Money wanted. Will pay \$100.00 for 1894 dime, S. mint; \$50.00 for 1913 Liberty head nickel (not buffalo). I pay big premiums for rare coins. Send 4c for large coin folder. May mean much profit to you. B. Max Mehl, H Mehl Bldg., Fort Worth, Tex.

SPECIAL Prices on uncirculated United States commemorative half dollars; Columbian 69c, Lincoln \$1.23, Pilgrim \$1.23, Monroe \$1.19, Lexington \$1.29, Stone Mountain 89c, Bennington \$1.29. Bargain selling price list and California 50¢ gold token 25¢. Arey, Box 483, Muskogee, Okla.

WE Buy 1907 Indian head cents. Full information one dime (coin). Mattick, Box 3450, Altoona, Pa.

FREE! Foreign coin, banknote, and large illustrated coin catalogue. Send 4c postage. Coin approvals sent. Tatham Coinco, Springfield-125, Mass.

RARE United States, foreign coins, war medals. Catalogue 10¢. Mengelle, Colorado Springs, Colorado.

UNITED States. Large cent, 2c bronze, 3c nickel and bargain list, 25c. Thirteen dates large cents, \$1.00. George P. Coffin, Augusta, Maine.

\$5.00 TO \$500.00 Each paid for old coins. Keep all old money. Send 10 cents for illustrated coin value book. 4x6. Guaranteed prices. Buying and selling. Coin Exchange, Box 5, Le Roy, N. Y.

U. S. COIN Book—Guide to values, just issued. Many special features. Order Burt's, the leader among American coin books, only 50 cents postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

CAMERAS AND PHOTO SUPPLIES

MAKE Money—Save money! Print films yourself for 1/2 cent each! Complete starting outfit, printing frame, graduate, chemicals, paper, easy instructions—only 89¢ postpaid or C.O.D. plus postage. FilmCraft, 4869 N. Talman, Chicago.

WRITE For free booklet "35 New Discoveries in Photography." International Laboratories, 2618 North Halsted, Chicago.

EARN Money with any camera. Saunders, 518 Hudson, Albany, New York.

MAKE Money in photography. Learn quickly at home. Spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 343-B, 3601 Michigan Avenue, Chicago.

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.

INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. 104, 10 West 33rd St., New York.

SILVERING Mirrors made easy and 460 other useful articles in Shop Notes, Volume 28—50 cents postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

PHOTO FINISHING

PHOTOGRAPHS And enlargements, (gloss or any finish) beautifully colored. 15c (coin). Satisfaction guaranteed. Lee Studios, Des Moines, Iowa.

FILMS Developed, 2 prints of each 25¢; 20 reprints 25¢. Pine Photo, M-5134 Nevada, Chicago.

KODAK Snap-shot titles, a new novelty for kodakers, 25¢ per book, 4 books for \$1.00. You'll get a big laugh out of these. Ford's Photo Studio, Ellensburg, Wash.

ASK For the surprise. Send roll and 25¢ coin. Griffin's, Winona, Minn.

35 REPRINTS 25¢ (Trial). Larger orders 1c per reprint. Professional 8x10 enlargements 25¢, send picture or negative. Studio, RiverGrove, Ill.

INTIMATE, Valuable snapshots finished. 35c roll. McKinley's, 304 Medbury, Detroit, Michigan.

JUST Published! Newest methods for developing, printing, reduction, intensifying. Money saving and money making photo ideas out of photos. 16 pages present inside professional theories and ideas. 25¢ postpaid, 25¢ redemption coupon with order. Send today! Winn, 124C West 23 St., N. Y.

SNAPSHOTS Enlarged, colored. 8x10, 45c. (Coins) Send negative (film). Beautiful work guaranteed. Lee Studios, Des Moines, Iowa.

20 REPRINTS 25¢. Films developed, 16 prints 25¢. Enlargements 8x10—25¢; 5x7—10¢. Low Photo, M-2657 Neva, Chicago.

ONLY Projection sensitizer made. \$1. Enlarges pictures onto cloth, wood, metal, anything. LeroProducts, 2618 North Halsted, Chicago.

BEAUTIFUL Panel-Art enlargement with each roll developed and printed 25¢. Ideal Photo Service, Box 2255, Paterson, N. J.

FILMS Developed. Any size. 25¢ coin, including 2 enlargements. Century Photo Service, Box 829, LaCrosse, Wisconsin.

25c FOR Remarkable colored print process. Sensitize own paper inexpensively. Donovan, 647 Warburton, Yonkers, N. Y.

BEAUTIFUL Glistening prints, roll developed, 8 guaranteed glistening prints, 2 enlargements 25¢. American Photo Service, 2946 Nicolet, Minneapolis, Minn.

20 REPRINTS 25¢. 100 Reprints \$1.00. Rolls developed with 16 prints 25¢. Nordskog, 4, Maywood, Ill.

ROLL Developed, 8 prints, oil painted enlargement, also valuable 8x10 painted enlargement coupon 25¢. Quick service. Guaranteed work. Individual attention to each picture. Janesville, Film, Janesville, Wis.

HAND Colored enlargement with each roll 25¢. 40 reprints 50¢. Colorgraph, Dunning Station, Chicago.

YOUR Favorite kodak pictures enlarged, size 5x7, 10c. Three for quarter, coin. Send best negatives (film) today. Address Darmer Photo Lab., Enlarging Dept. 9, Des Moines, Iowa.

FINER Finishing. Rolls developed and printed. Colored enlargement, or two double professional enlargements all for 25¢ (coin). Genuine, nationally known. Moentone superior quality. Moen Photo Service, Box P-867, LaCrosse, Wis.

BEAUTIFUL Colored enlargement with each film 25¢. Speedy service. Satisfaction guaranteed or money refunded. LaCrosse Film Company, LaCrosse, Wis.

ROLL Developed, two prints each negative 25¢. Reprints 2 1/2¢. Enlargement coupon. Willard's, Box 3535-A, Cleveland Heights, Ohio.

ROLL Developed and 16 prints 25¢. Smart Photo, Winona, Minn.

SPECIAL Trial offer! Your next Kodak film developed 5c, prints 2c each. Moser & Son, Dept. 23, Walnut Hills, Cincinnati, O.

30 BEAUTIFUL Guaranteed kodak prints from your negatives only 25¢. Rapid Film Service, Unionville, Mo.

ROLLS Developed. Two beautiful double-weight professional enlargements and 8 guaranteed Never Fade Perfect Tone prints. 25¢ coin. Rays Photo Service, LaCrosse, Wisconsin.

FILMS Developed 5c per roll; prints 3c each. Ask for special bargain list. Roanoke Photo Finishing Company, 161 Bell Ave., Roanoke, Va.

20 REPRINTS 25¢. Films developed, two prints each negative, 25¢. Skrudland, 4118-8 Overhill, Chicago.

ROLLS Developed, two sets guaranteed prints and enlargement coupon 25c, reprints 3c each, over 19, 2 1/2¢. Jones Studios, Davenport, Iowa. "Where the West Begins."

KODAK Prints 1c each. Imperial Film Service, Unionville, Mo.

ANY Size kodak film developed 2 prints of each negative and two free enlargement coupons, 25c. Reprints 2c each. Summer's Studio, Unionville, Mo.

MOTION PICTURES AND SOUND EQUIPMENT

EASY Terms! 16mm. movie equipment. Elder, Dept. B-15, Chelsea, Massachusetts.

BIG Discounts on still, motion picture projectors, cameras, films, accessories, sound-silent library, trades accepted, catalogue, membership free. Mogull's, 1944-N Boston Road, New York City.

HIGHEST Prices paid for used still-movie equipment. Send description. Photoshop, 136A West 32, New York.

35MM. COMPLETE Stories. Stamp for lists. Calderaro, 5119 S. St. Louis, Chicago.

GUARANTEED, 100 Feet 16mm camera film, also complete reversal formula \$2.00. Arlington Cine, Box 134, Arlington, Mass.

BARGAINS. Used sound projectors, parts, soundheads, turntables, amplifiers, horns. Catalog mailed. S.O.S. Corp., 1600 Broadway, New York.

DEVELOP Your own movies, reversal and negative-positive instructions, 50c. Millio, 622 Myrtle Ave., Brooklyn, N. Y.

BASS Bargain counter: Cine headquarters offers 100 ft. Mono film including developing \$2.95. Bell & Howell Filmo 70C, spider turret, three lenses, case, \$77.50. DeVry 47, 100 ft. automatic 16 mm. camera, F3.5 lens, \$21.50. New book on 8 mm. Cine photography complete \$1.00. Hundreds of other bargains in Bass Bargaingram No. 215. Send to headquarters for free copy. Bass Camera Company, 179 W. Madison St., Chicago, Ill.

LEARN Motion picture theatre business. Catalog. Theatre Institute, Elmira, N. Y.

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

SUPER SPEED Panchromatic 16mm film, 100 ft., \$3.75. Other films from \$2.19. Bargains in new, used equipment. Send for circular. Fotoshop, 136A West 32, New York.

PICTURE Machines \$5.00. Talkies. Amplifiers. Lenses. Hundreds of bargains. Send for list. Fairall, Danville, Illinois.

16MM FILMS Bought, sold, exchanged. Catalogue, 10c. Fotoshop, 136A West 32, New York.

35MM. BARGAIN Lists 3c. Hoffman Film Service, 57 Broad, Albany, N. Y.

8MM OWNERS: New titling film, home finishing data, reversing, new accessories, better pictures. Information free. Corpe, Box 177-A, El Monte, Calif.

FREE 16MM Bargain lists. Films 35c up. Projectors \$1.00 up. Home Movies, Box 32, Easton, Pennsylvania.

FILMS, Projectors, 10c coin for lists. Capital Productions, Rosedale, Kansas.

RADIOS, INSTRUCTION AND SUPPLIES

TRANSFORMERS, Coils—Rebuilt like new. Send old transformer. Name model number tubes. Coils built to specifications. Rakay Electric Co., 1022 W. Taylor St., Chicago, Ill.

FREE—Crosley book "Simplicity of Radio," with 6-month trial subscription. Send only 50c. American Freeman, Box 1808, Girard, Kansas.

D X AND Short wave fans, "Toonrite" dial brings them in. 50c prepaid. "Toonrite," Babylon, N. Y.

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.

AUTO Radio noise eliminated. Throw away sparkplug suppressors. Special filter, easily installed. \$2.00 postpaid. State Radio Service, K-2002 State Street, Chicago.

RADIO. All phases. Amateur, shortwave, experimenting, set building, broadcasting, servicing, etc. Complete list recommended books free. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

MUSIC AND MUSICAL INSTRUMENTS

NATIONALLY Known band and orchestra instruments, used-rebuilt, bargain prices. Free list. Tom Brown Music Co., 315-S. Wabash, Chicago.

YOU Can play your favorite instruments in 12 weeks. A Canadian method. Personal supervision, nothing mechanical. Many outstanding successes. Terms for course and instrument. Folder "Music by Mail" sent free. Marrazza Music School, 1247 Bleury St., Montreal, Canada.

DUO-FLEX Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

COMPOSERS, Verse—Music. Brilliant opportunity. Write immediately. Vanburen, 50 McClurg Bldg., Chicago.

SONG-WRITERS Opportunity phonograph record of your song. Music composed to words by hit writers. Free information. Paramount Song-Recording Studio, C. Warner Bros. Theatre Building, Hollywood, California.

SONGS And song poems wanted immediately for early release. 50-50 plan. Submit material. Prompt report. Radio Artists' League, Binghamton, N. Y.

FREE Book "Harmony Self-Taught," with 6-month trial subscription. American Freeman, Box 1809, Girard, Kansas.

SONGWRITERS—Get all the inside facts. Free booklet by famous Broadway composer. Songwriters Institute, 330C Wadsworth Avenue, New York.

LITTLE Ruth Lee (waltz song). Sale, trade, lease. Laser Sales, Greenwich, Ohio.

SONG Poems wanted immediately. Writer of hit tunes for radio stars will collaborate. Brilliant opportunity. Ray Cameron, 3 Crandall St., Binghamton, N. Y.

NEW Deal. Write Sequoia Songwriters Service, Sherman Branch, Los Angeles, Calif.

WANTED: Original poems, songs. Get our proposition first. MMM Publishers, Studio Bldg., Portland, Ore.

SONGWRITING. Good money being made from songs through talking pictures, radio, phonograph, music publishers. "Hit" writers revise, arrange, compose music to your lyrics, lyrics to your music. We submit to studios and other markets. Free reading. Send for booklet. Universal Song Service, 671 Meyer Bldg., Hollywood, Calif.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oaksho, Wis.

SONG Writers. Send for our "Publishing Agreement." McKinley Music Printers, 1501 E. 55th St., Chicago.

SONG Poems wanted, free examination, 50-50 plan. Song Bureau, Salem, Ind.

BUSINESS OPPORTUNITIES

AMAZING Invention engraves names, initials, trade marks, etc., on brass, copper, gold, silver, aluminum, nickel, Bakelite. Writes like pencil—cuts like chisel. Make money engraving articles for stores, gift shops, jewelers, surgeons, contractors, manufacturers, etc. Or sell "Engrav-rite" at double your cost. Described page 46 July Popular Mechanics. Free circular. Quality Mfg. Co., Dept. P.M.9, 2306 Lincolnwood Dr., Evanston, Ill.

LIQUID Marble—Anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money making these! Particulars free. Marbleizing Service, Edwardsville, Illinois.

MANUFACTURING Business (mail). \$200 handles. Typograph, 45 West 45, New York.

LEARN Flexible mold making with our Synthetic Rubber Composition. Inexpensive cold process. Equals pure rubber. Learn snow-white composition marbleizing for novelties and decorating. New methods. New materials. Free assorted marble and rubber samples. Illustrated literature. Cowell Institute, Grayling, Mich.

WAYS To wealth Magazine, Box 745, Minneapolis, Minn., 9th year. Tips, plans, formulas, schemes, home workers' opportunities. Three months, 25c.

FREE Information on only practical, workable, different, profitable homework I know anything about. A proven, positive success. Stands strictest investigation. "Perfecto," 2415 N. Broadway, St. Louis, Mo.

EXCLUSIVE Representation, specialties. Paramount Agencies, 77 Victoria, Toronto, Canada.

ROACHES Easily exterminated. Instructions \$1. Moneyback guarantee. Parkers, Wetumpka, Ala.

MAKE \$100 To \$500 weekly in a business all your own. Our system specialty manufacturing offers you this opportunity. Free book explaining everything. National Scientific Laboratories, 1950W Broad, Richmond, Va.

FREE—Books, mail order business. Stamp appreciated. Dolsen Herald, 75 Gates Ave., Brooklyn, New York.

NEW Money maker supreme. \$50 up weekly. Big premium offered makes customers your agents. Keeps you busy delivering. Complete details 25c, worth dollars. Flemco, St. Clair Shores, Michigan.

START Mail business! Beginners guaranteed plan 25c. Haas, Oakford, Pa.

BARGAINS—Paint spray outfit, gasoline engine drive. Terms—trial. Helmick Paint Spray Exchange, M-955, Troy, Ohio.

MODERN Method brings steady income in circular mailing business. Particulars for stamp. Dixie Publishing Company, Station-9, Greensboro, N. Car.

CAST Artificial marble in rubber moulds. Novelties, floors, tabletops, homes. Cement secrets. Colorful glossy titles, no polishing, uncanny. Amazing samples 3c. John A. Payne, 945 Grande Vista Avenue, Los Angeles, Calif.

PROFITABLE Business or side line. Repeat orders without solicitation. Information free. State age, whether married or single. Toss Specialty Co., Box 5711, Cleveland, Ohio.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

GROW Mushrooms right now—a steady income—in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! We buy. Book free. American Mushroom Industries, Dept. 399, Toronto, Ont.

OPPORTUNITIES Galore! New letter duplicator complete \$3.00. Profitable sales rights! Details. Mailmarts, PM-9, Cincinnati.

175 WAYS of making money. Particulars free. Alkahn Press, Paterson, N. J.

POSTCARD Addressed Box 500, Shreveport, Louisiana, brings best proposition ever received.

"PROSPERITY" For home workers. 52 page magazine. Sample, dime. Sizemore, 4917 N. Kostner, Chicago.

STEADY Income from 17 discarded articles. Instructions 25c. Charles, 12-AV, Norwood, Ohio.

SPECIAL Notice. This is worth investigating. Free booklet describes big money-making opportunities. Also free: "Improving Your Personality for Greater Success." Write immediately. Everything to gain—nothing to lose. Bentley Brooks, 306B Argyle Bldg., Dallas, Texas.

COUNTY Distributor—Must qualify. Write Gas Kracker Sales and Engineering, 2644 Michigan, Chicago.

BIG Profits silvering mirrors, patented process, easily learned. Complete course \$1.00 postpaid. Wear Mirror Works, Excelsior Springs, Mo.

STEADY Cash income resilvering mirrors; replating fixtures, tableware. Easy factory methods. Experience unnecessary. Make outfits. O'Custer, HP-224 Highland, Detroit, Michigan.

EARN Large profits: \$25 to \$50 weekly. Small capital required. Start your own candy business at home. Send 50c for complete information. Janice Institute, Box 697-A, Altoona, Pa.

OPPORTUNITY Mail 10c, three months 25c. Victor, East Lyme, Conn.

GET Yourself a new deal. Be independent. Establish a business of your own on small investment. Information concerning various tested plans 10 cents. Weaver-Boyce-Weaver, Box 106, Usona, Calif.

53 ADVERTISEMENTS And plans 25c. Detail, 3347 Wall St., Chicago.

INVESTIGATE Frog raising—a profitable side line. New book explains and illustrates every phase of subject. Covers very latest developments such as plans of constructing ponds, combination frog feeder and fly traps, getting other live food electrically, also the roly poly, a new mechanical feeder. \$2.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

NEED Cash? Raise patented all-season mushroom; cellar, shed. Wholesaler (ten branch offices) supplies materials; instructs, buys crops. Details free. United, 3848-A173 Lincoln Ave., Chicago.

SILVER Mirrors. Plate auto fixtures, tableware. Portable outfit. Metalcraft, Arcade Bldg., St. Louis, Mo.

HOME Business brings handsome income—Booklet describing many proven business opportunities sent free; no peddling; little or no investment necessary. Midwest Supply Co., Moberly, Mo.

TWENTY New successful mailorder propositions. J. Home, 3949 Metropolitan, Chicago.

MAIL Order business your big opportunity. 3c stamp brings details. Stewart Morse, 1009 Oak, Elmira, N. Y.

"TURN Ideas into cash." Free details. Martinez-PM, San Bernardino, Calif.

CASH Income daily resilvering mirrors; replating metalware; making glass signs. Portable outfit. Sprinkle, Plater, 127, Marion, Ind.

ARTIFICIAL Marble sanitary flooring, instructions covering wood or cement flooring ½ inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris. Mahler, Elmont, N. Y.

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

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager, Classified Advertising, 200 E. Ontario St., Chicago, Ill.

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. You are just in time for the big 1935 business. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

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. Brenner, 257 South 21st, Philadelphia.

CHEMICAL Expert will furnish formulas and trade secrets. All lines. Lists free. W. L. Cummings, Ph. D., 223 Gordon Ave., Syracuse, N. Y.

SELL By mail. Books, novelties. Bargains! Big profits. Particulars free. B. Eifco, 525 S. Dearborn, Chicago.

"SCHEMER Magazine," Alliance, Ohio, prints schemes, ideas, business starters, formulas; winners—\$10,000 to \$50,000 reported. 37th year. \$1. Subscribe now. Six months special, only 30c.

TURN Scrap into money. Convert old auto generators into A.C. generators for auto radio, camp and home lighting, power and other uses. Complete instructions \$1.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

OPEN A key-making shop. Start a permanent profitable business with a small sum. No skill necessary. Write for particulars. Beisser Mfg. Co., 411 E. Fort, Detroit, Michigan.

FREE Circulars describing how you can make big money in mail order business at home in spare time. Write today. Mail Order Institute, 669-H Marcy Avenue, Brooklyn, N. Y.

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

GET Lots of mail. Your name in 10,000 opportunity directories, 25c. Roseco, 4627 Glenshade, Cincinnati.

SUCCEED With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

CHEMISTRY

BECOME A trained chemist! Earn big money! Equip your own laboratory. Supplies as low as 5c! Send 10c for informative catalogs. Kemkit Chemical Corporation, 135 P Johnson Street, Brooklyn, New York.

CHEMICALS. Apparatus. New catalogue 5c. Economy—Quality. Damon Chemical Company, Alliance, Ohio.

FREE Book "Chemistry Self-Taught," with 6-month trial subscription. Send only 50c. American Freeman, Box 1810, Girard, Kansas.

NEW Big catalog. Chemical sets, microscope outfits, laboratory, biological, chemical supplies. Approved by experimental laboratories. Special 30 day offer. Send 10c. Winn, 124D West 23rd St., N. Y.

CHEMICAL Set. Performs 35 experiments. 25c. Fleischer's Laboratories, Everett, Mass.

CHEMICAL Analysis and industrial problems. Estimates free. Lowell Bunting, Consultant Chemist, Royal Oak, Michigan.

CHEMICALS. Laboratory glassware and apparatus. Catalog CP. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

PRACTICAL Everyday chemistry—How to make what you use. 2342 practical workable formulas of widely used products. Save 4%. Start a paying business of your own. \$2.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

FORMULAS, PLANS, ETC.

"METALLIC Liquid" formula, guaranteed, 10c. Donald Greenwood, 65 River, Southbridge, Mass.

FORMULAS. All kinds. Guaranteed best. Catalog. "Special Offer Free." Kemico, 32, Park Ridge, Ill.

500 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teepie, Decatur, Indiana.

LATEST Formulas of the best sellers used by leading manufacturers and our own factory. Send for list. Superior Products Co., Box 571, Cincinnati, O.

EGGOTINE. For general baking purposes. Formula \$1.00. Monroe Sales Service, P. O. Box 262, Monitlon, Ark.

FORMULAS \$1.00. Remedies. We send completed samples, 25c each. Missense Products, Box 372, Columbus, Ohio.

3 FINEST Liniment formulas 25c. Guaranteed. L. Ives, Gen. Del., Boise, Idaho.

TWENTY Latest formulas, trade secrets. One dime. Kuhn, Weisel, Pa.

FORMULAS—3 Money making products that sell fast, 25c. Haas, Oakford, Penna.

NEWEST Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson, Chemist, BD-4702 No. Racine, Chicago.

FORMULAS—In a class by themselves. The kind that produce that which you carry to the bank. Felders, 317 W. National, Milwaukee, Wis.

FORMULAS—Business ideas. Literature free. Belfort, 4042 N. Keeler, Chicago.

ICELESS Ice! Colder! Cleaner! Cheaper! Instructions 25c. Duffy, Covington, Ky.

BEAUTY Formulas—Ten for 50c. Getz, 127 Brick St., Dickson, Penna.

SPECIAL! Professional trained chemist of New York. Any general formula, drugs, cosmetics. \$1.00. Every inquiry treated individually. Guaranteed latest scientific discoveries. Fader, 532 Riverside Drive, New York.

4000 FORMULAS—\$1.00; 100—10c. Service, 412 North 48th, Omaha, Nebr.

FORMULA Catalog free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

10 MONEY Making formulas, guaranteed 50c. Special formulas \$1.00. Jirmol Laboratories, Western Springs, Ill.

MONEYMAKING Secrets; 3,000 formulas \$1.00. Box 73, Sta. A, Brooklyn, N. Y.

SUCCEED With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

3,000 FORMULAS. Facts, processes, trade secrets in Dr. Brown's Book of Formulas—380 pages. Price, postpaid \$1.00. Ogilvie Publishing Co., 57 Rose Street, Dept. 23, New York.

TESTED Formulas—Largest, most complete line. Newest—guaranteed. Catalog free. Grinstead Laboratory, Edwardsville, Illinois.

FRUIT Nectars, root beer extract, ginger ale. Particulars 10c. Ralph Brooks, Arkansas, Wis.

SCORES Of tested money making ideas for home, shop, farm. Send for list. It's free. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

MONEYMAKING OPPORTUNITIES

BIG Money in renovating rusty survaults and tombstones, corroded bath tubs and wash bowls like new. A profitable business the year around with no competition. F. E. Weidlich, Pierre, So. Dak.

AQUARIUMS Easy to construct. Copyright instructions 10c. "Aquarium," Fullerton, Pa.

GIVE Your income a boost. Go into spare time occupation. Pays generously. We supply you the ideas and the way to work them. No goods to sell. Free information. Publishers Sales, Box A76, Nelson, Georgia.

ADVANCE Yourself! Earn big money home, outdoors, anywhere. "Income Ideas," free offers help you succeed quickly. 10 cents—get started now! New Idea Service Co., 217-T Seventh Avenue, New York.

HUGE Profits selling Magic Soldering Iron. Clips on any battery. Instantaneous heat. Solders anything, anywhere. Easily made. Simple instructions, one dollar. Dominion Distributors, 2164 Queen East, Toronto, Ont.

MONEY Making plans. Book of 150 pages \$1.00. Rappe, Box 1189, Phoenix, Ariz.

HOME Mailing stunts! (Operate your own business.) Fascinating. Profitable. Particulars free. National Services, Fairview, Birmingham, Alabama.

PRODUCE Your own beautiful pearls. For a few dollars you can have your own interesting pearl culture in your aquarium or fishbowl. In mussels you can produce beautiful pearls for yourself and dear ones, or produce them outdoors and earn big money in spare time. Scientific method. Wonderful opportunity. One dollar for complete details and prescription. American Pearl Culture Company, Box 64, Station G, New York, N. Y.

OPERATE Local clothing store on consignment basis. Details, supply source—\$1.00. Kent Specialties, Eldorado, Texas.

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

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

HOW To identify and determine value of old precious metals. Where to buy. To whom to sell. Reliable and up-to-date information. Complete instructions only \$1.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

AGENTS WANTED

DISTRIBUTORS: A few quick easy sales daily nets you \$58.00 weekly. Represent manufacturer—Latex—amazing self-sealing bandage that breathes. Wonderful demonstrator. Irresistible appeal. Exclusive territory. Neway, 39-H South Clifton, Chicago.

AGENTS, Sell Neon-like signs, catalog free. Sample 10c. Roscoe Lynch, Bausman, Pa.

MEN And women to sell big line food products, extracts, household necessities. Free premiums. Build big business quickly. Details free. M. Kennedy Corp., Kokomo, Ind.

SELL Water power beater to homes. Attaches to all faucets. Mixes food, drinks, malted milk, etc. Sample \$1.00 postpaid. World Beater Products, Dept. P49, 3954 Drexel Blvd., Chicago.

MAKE Quick money (over 300% profit) selling Dream Lustre. Every car owner a prospect. Car lustered in 10 minutes. Sample covers 3 cars, postpaid 50c. Dream Lustre, 4918 Sunset, Hollywood, Calif.

NO-STITCH Amazing fluid mends hosiery, clothing without sewing; guaranteed; sure seller. Free sample of work. Queen City Mfg. Co., Dept. PM-95, Cincinnati, Ohio.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 9A, 4563 Ravenswood, Chicago.

\$6.00 HOURLY. Amazing Karnu refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. O-108, Cincinnati, Ohio.

AGENTS: Make up to 1000% profit selling cleaner, polish, shampoo, vanilla, tonic laxative, spot remover, etc. Your name on labels. Free sample. Standard Chemical, Dept. E95, Dayton, Ohio.

BIG Commissions selling personal Christmas cards and stationery. Extra bonuses. New 21 folder \$1 Christmas assortment. 100% profit. Free album and box on approval. Wallace Brown, Inc., 225 Fifth Ave., Dept. 210, New York.

BUILD Your own business. Sell guaranteed double-edged blades. Advertising price \$1.00 per hundred. Steven Spencer, 2830 W. 27th, Brooklyn, N. Y.

BE Your own boss! Splendid chance to make \$42.50 a week supplying famous "Zanol" products to steady consumers on weekly route. I send everything; no money risk. Details free. Albert Mills, 9099 Monmouth, Cincinnati, Ohio.

MAKE Your own products. Guaranteed formulas for fast sellers. Catalog free. Kemico, 45, Park Ridge, Ill.

CHRISTMAS Cards! Absolutely finest assortment. Big profits. Write for samples. Robinson Cards, 85 Orange, Clinton, Mass.

WANTED—Direct purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

DOUBLE-EYED. Self-threading needle packages, size 3/9. Blind people thread them. Invaluable to failing sight, necessary for good sight. Five samples 25c, twenty samples dollar bill. Particulars. Agents wanted. Wm. Oglesby, Vandalia, Ill.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

MANUFACTURE At home—Flavorings, polishes, lotions, shampoos, medicines. Just add water to our concentrates. Your name on labels. Free sample. Quality Chemicals, E-5735 15th, Detroit.

SANITARY Splashless 25c water filters. Accepted everywhere. 200% profit. Valuable local tryout. Box 63, Times Square Station, New York.

AUTOMATIC Gas-Lok. Agents make big money on new, improved model. Sells as low as \$1.00. Fits all cars. Prevents theft. Special offer. Send \$1.00 for sample. Satisfaction or money back. Get our proposition. Automatic Gas-Lok Mfg. Co., 21 E. Van Buren, Dept. 90, Chicago.

AGENTS—New safety cup-hooks prevent cups falling. Instant appeal, every home. Cup-Eez Co., Dept. M, 1123 Broadway, New York.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

FORMULAS—Money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

DOLLARS Daily! Start home! Mailorder business. Details. Duffy, Covington, Ky.

DEMONSTRATE Latest silk hose sensation. Guaranteed to wear without holes or replaced free. Easy pleasant work. Up to \$21 weekly. Everything furnished. Send size. Wilknit Hosiery, Desk K-37, Greenfield, Ohio.

CHRISTMAS Greeting cards, folders, booklets—Box of 21 sells for \$1.00. Sample box 40c. Also birthday, convalescent, cheer up, congratulations—12 samples 25c. A. H. Klees, 1712 Undercliff Ave., New York.

NO Matter what you're selling, address postcard to Henglage, St. Louis, Mo., will bring you best big profit money-making proposition you ever received.

SELL Neckwear. 100% profit. Quick sellers. Low wholesale prices. Free catalog. Artstyle Neckwear, Elmira, New York.

100% PROFIT. Sell new 21 all-folder \$1 Christmas assortment. 10 other fast selling money making boxes. Extra bonus. Samples on approval. Write Schwer, Dept. 49M, Westfield, Mass.

MILLIONS Of motorists need amazing new auto invention. 35c seller. 250% profit. No competition. Experience unnecessary. Particulars free. Cascadden Bros., Lapel, Indiana.

SELL New food specialty. Spicy butter. Colavit's Co., Perkasio, Penna.

DISTRIBUTORS For outstanding inexpensive novelty glass signs for every business. Everlight Signs, 30 East 20th, New York.

MAKE More money taking orders shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Write quick. Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

"WINDOW-RITER"—Magic pencil writes on glass. All colors. Storekeepers buy quickly. Ideal for baseball scores. Large profits. Big repeaters. Free sample. Lake Chemical, 6 E. Lake, Dept. 9-PM, Chicago.

BANANA Su'prise—An ice cream filled banana. Peel as you eat. Biggest sensation in years! Amazing device takes core out of banana slick as a whistle—ejects it—and fills center with any flavor ice cream. Millions of ice cream dealers sure buyers. Tremendous sales appeal. Big profits for agents. Write Banana Su'prise, Inc., Dept. 9, Hamilton, Ohio.

MAKE Big money manufacturing amazing new auto refinishing discovery. Restores color and finish to old cars in 30 minutes. Today's fastest money maker. \$14.00 gallon profit. Write for free formula offer! Glass & Company, Factory Avenue, Ellwood City, Pa.

SELL By mail. Make thousands of dollars. Home. Spare time. Mail Order Institute, 669-G Marcy Ave., Brooklyn, N. Y.

WHOLESALE Catalog free. 500 best sellers. Paty Co., 1167 Broadway, Somerville, Mass.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., P.M.-33, Bradford, Pa.

SELL Christmas cards. Beautiful 21 card assortment sells fast at 60c. To avoid delay send 30c for sample box or particulars free. New England Art Publishers, North Abington, 105, Mass.

WHY Work for others? Make and sell your own goods. We show you how. Free book explains everything. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AMAZING Profits selling latest "New Feature" radio receivers. Booklet free. Orr Mfg. Co., 1116 Berwyn, Chicago.

100% PROFIT in the "Self Starting Cigar Lighter." No flint or friction. What makes it light? No wind can blow it out. Retail 25c. Costs \$1.75 per dozen. Sample and sales plan 25c. New Method Company, Desk PM-33, New Method Bldg., Bradford, Pa.

YOU Are the salesman we want to sell our pre-shrunk, vat dye broadcloth shirts. Liberal commissions. Postage prepaid on shipments. Write for free sample outfit. Glenmont-Chadwell Corporation, Nashville, Tenn.

EARN Living year around sell men's dress shirts. Finest pre-shrunk broadcloth. Once sold, repeaters follow. Commission advance. Outfit free! Best-Uv-All, 1133B Milwaukee, Chicago.

\$3.00 HOURLY: Amazing automobile accessory. Produces revolving colored light. Free offer. Propell-o-lite Company, Mt. Washington, Ohio.

MEXICAN Feather pictures. Great profit. Send 25c (stamps) for \$1.00 worth sample and details. Mexican Art, Apartado 1593, Mexico City.

INITIALING Automobiles biggest money maker today. New type requiring no varnish to apply. Write for samples. International Monogram & Transfer Co., Box 6365, Philadelphia, Pa.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Experience unnecessary. Write Carnation Co., P.O. St. Louis, Mo.

SENSATIONAL Guaranteed flavoring extracts. Eleven flavors. Assortment worth \$3.50, sells 99c! Cost 49c and less. Free allowances. Freight prepaid. Cosmetics, spices, polishes. Edison Laboratories, Duluth, Minnesota.

100 PROFITABLE Mail order and local business plans. A. Pruitt, Elburn, Ill.

SUCCEED—With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

CALIFORNIA Flower beads sure fire fast sellers. Big profits. Low prices. Catalog free. Mission No. 16, 2328 W. Pico, Los Angeles, Calif.

BIGGEST And quickest sales are made in brushes. Write for proposition. Wire-Grip Sanitary Brush Corporation, 45 East Eleventh Street, New York.

CASH Income daily resilvering mirrors; replating metalware; making glass signs. Portable outfit. Sprinkle, Plater, 128, Marion, Ind.

NEW Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Ralco," 1084 Washington, Boston, Mass.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

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.

AGENTS—Opportunity to make money; book containing 87 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mullages, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. \$5.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

HIGH-GRADE SALESMEN

SOMETHING New in fire extinguishers. Red Comet Automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write Red Comet, 404 Comet Building, Littleton, Colorado.

DON'T Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3000 to \$5000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh, Dept. I-U-PPM, Freeport, Ill.

SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgra, 2635 N. Third St., Milwaukee, Wisconsin.

HERSHEYS, Baby Ruth, Oh Henry! candy deals. 1c-5c display and punch deals. Living scale. Steady employment. Casterline Bros., 1924 Sunnyside, Chicago.

SALESMEN And representatives: Include fire extinguishers with present lines. Approved by Underwriters Laboratories. Real money making plan. The General Fire Truck Corporation, 4131 Forestpark Avenue, St. Louis, Missouri.

SALESMEN—Make big profits with this splendid line! Prices slashed on carded aspirin, razor blades, laxatives, notions, etc. Experience unnecessary. Better Products Co., Dept. 2641, Marion, Ind.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

SELL Process raised letter printing \$3.95 thousand. Free cut service. Worth \$6.00. Commission \$1.00 advanced. Experience unnecessary. Outfit free. United, F-6155 South State, Chicago.

AUTO Accessory salesmen. Free deal for dealers. Irresistible appeal. Complete line auto accessories priced right. 25% commission daily. Exclusive territory. Outfit free. National, 1910-DH Wentworth, Chicago.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 767 Burkhardt, Dayton, Ohio.

PRINTING Salesman for fast selling, non-competitive item. No competition. Appeals large and small buyer. Mascoutah (Ill.) Publishing Company.

SALESMEN To call upon wholesale and retail trade. Finest shampoos and shaving cream. Interview Ver-O Products Co., Rochester, Indiana.

SALESMEN, Distributors, we pay higher commission 125 varieties brushes, mops, chemicals. Exclusive territory. Newway Brush Factory, Hartford, Conn.

NEW Federal and state tax laws force, under severe penalties, the keeping of proper business records. Immense demand for our officially approved tax record. Sells at sight. Repeat commissions without callbacks. Men selling 5 to 25 daily. \$3.50 cash profit every sale. Commonwealth Publishing Co., 508 So. Dearborn, Chicago.

SELL Stores or homes. Big new line. Over 60 items. Up to 600% profits. Repeats. Superba Co., 8411, Baltimore, Md.

NEW Butchers steak machine. Quick money. Federal Engineering Co., Minneapolis, Minn.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

START A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 200 East Ontario Street, Room 235, Chicago.

SALESMEN—Sell collection systems. 400% commission. Sayers Systems, 2801-123 Sheffield, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Foyer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

SELL Punchboards direct to dealers from world's leading punchboard factory. Wholesale prices. Enormous profits. Big commissions. Sales kit free. Harlich Co., 1407 Jackson, Chicago.

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

OUTDOOR Sports for everyone—Enjoy them all year round with aid of book published by Popular Mechanics. Hundreds of ideas for new and popular sports for every season; complete instruction for making necessary equipment at small cost. 350 pages and 650 illustrations. \$2 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

NATIONAL Organization developing all territories. Selecting experienced retail salespeople. References, past salary. Northwest Manufacturers, 2129 Western, Seattle, Wash.

SALESMEN—Get in now on Gras-Shaver, the super sickle, edged with razor blades, retails one dollar. Write for terms and territory, references. Gras Shaver, 901 Ames Bldg., Boston, Mass.

NEW Drycleaning clothes brush. Revolutionary invention. Cleans clothes like magic. Homes, offices buy instantly. Phenomenal profits. Outfit free. Kristee, Dept. 259, Akron, Ohio.

MAKE More money taking orders shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Write quick. Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

STRANGE Discovery overhauls automobile engines, fraction former rebore costs. Pays in oil, gas savings. Free trial sample unusual money making plan. B. L. Mellinger, 251, Kansas City, Mo.

MAN—Handle regular store route. Place nationally advertised 5c-10c counter card mds. New aspirin deal—6 tablets 5c. 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 9810, Spencer, Ind.

CALIFORNIA'S Sensation—New true fruit product; one package makes five glasses home type jelly in five minutes without use of fruit juices. Should make \$10,000 first year. Minute Maid Products Co., Dept. 500, 257 Werdin Place, Los Angeles, Calif.

HELP WANTED

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. W-217, 500 Throop, Chicago.

IF You want to get your groceries and household supplies at wholesale, and a wonderful chance to make \$15 a day besides, send me your name immediately. No experience necessary. New Ford sedans given producers as bonus. Albert Mills, 9095 Monmouth, Cincinnati, Ohio.

NEED Cash? Raise patented all-season mushrooms; cellar, shed. Wholesaler (ten branch offices) supplies materials; instructs, buys crops. Details free. United, 3848-A177 Lincoln Ave., Chicago.

MAN Wanted—Old established manufacturer will finance responsible man with complete stock guaranteed food products, farm and household necessities. Very pleasant work. Excellent opportunity for good living and extra money to save every week. Pays better than most occupations. B. M. Anderson sold over \$402.70. A. M. Karel over \$347.48 and H. E. McMillen over \$314.15 in one week. No slack seasons or layoffs. Experience unnecessary. Write today for No-Investment offer. McConnon and Company, Room 66JT, Winona, Minnesota.

GROW Mushrooms right now—a steady income—in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! We buy. Book free. American Mushroom Industries, Dept. 400, Toronto, Ont.

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36MD, 1956 S. Troy, Chicago.

USE \$500? Raise canaries for us. Free particulars, contract. Crimmins, 3741 60th Street, Woodside, N. Y.

AGENTS—Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 54 Searle Bldg., Rochester, N. Y.

LEARN Air conditioning—America's next big industry. Thousands of opportunities for far seeing men. Get your start with complete new book by E. W. Biesbeck, \$3.50 postpaid. Popular Mechanics Press, Room C35, 209 E. Ontario St., Chicago.

EDUCATIONAL AND INSTRUCTION

AUTOMOBILE Instructions simplified; four booklets; Beginners—Driving, Trouble Shooting, Appraising, Master—Driving; 25c each, set \$1.00. James Publications, Box 124, San Francisco, California.

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Company, 691 Lake Street, Chicago.

SECRET Service. Valuable information free. International Secret Service Institute, PM-95, Hoboken, N. J.

BECOME A landscape architect. Easy to learn by mail. Wonderful opportunity for money-making. Earn while you learn. Write for free opportunity booklet and details. American Landscape School, 805 Plymouth Bldg., Des Moines, Iowa.

LEARN Shorthand in eight weeks. Get our simplified system \$1.00. Severance, Box 3022, Knoxville, Tenn.

GOVERNMENT Jobs. Start \$105-\$175 month. Men-women. Prepare now for next examinations. Common education. List positions free. Write immediately. Franklin Institute, Dept. A3, Rochester, N. Y.

WINDOW Trimming, crepe paper, etc., practical method. Learn and earn in 4 weeks. Division 19, Advance Displays, 1553 Madison, Chicago.

MAKE Big money corresponding for newspapers. Sure-fire winner. Write, enclosing stamp. Cutler Publishers, Reading, Pennsylvania.

LEARN Fast and correct figuring. Frederick A. Smith, 2410 Smalley Court, Chicago.

CHIROPODY Taught by correspondence. Evans School of Chiropractic, Montgomery, Alabama.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt University, Chicago.

GET U. S. government job—start \$105-\$175 month. Men-women. age 18-53. Are you eligible for eligibility test? Get our free questionnaire—find out. No obligation whatever. Instruction Bureau, 101, St. Louis, Missouri.

U. S. GOVERNMENT Positions, \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

CARTOONING—COMMERCIAL ART

MODERN Cartooning methods. \$1. Cooperative Research Company, 132 West 14th Street, New York.

CARTOONING, Sketching, drawing for advertisements, etc. 46 lessons, over 600 illustrations, sketching paper, pens, etc., \$1.00 postpaid. Fraba Service, Cashton, Wis.

CARTOONING Course—30 lessons, 500 illustrations with drawing pens and pencils. \$1.00 complete. Scovell Studios, Box 610-P, Hollywood, Calif.

HUNDREDS Making money sketching, duplicating. Experience unnecessary. Details free. Paisley, 421-C Kinloch Bldg., St. Louis, Mo.

ANIMATED Cartoons. New fascinating profession. Learn the secrets of cartoon drawing at home. Film producers paying big money. Portfolio free. Write, Secretary, Filmograph Institute, 6331 Hollywood Blvd., Hollywood, California.

AMATEUR Cartoonists can earn \$35.00 weekly, spare time, duplicating cartoon advertisements. 3-M Syndicate, Argyle, Wis.

COLORS—Fast drying. New crafts work finish. Send 3 cent stamp for color card list. Pyramid Supply Co., 139 Boulevard, Long Island City, N. Y.

ADVERTISING AGENCIES

INCH Display advertisement 30 magazines, year \$24. Wood's Popular Services, Atlantic City, N. J.

LEARN Advertising quickly at home. New easy practical plan. No text books. Interesting booklet free. Page-Davis School of Advertising, 3601 Michigan, Dept. 343-B, Chicago.

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

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine rate-guide, free. Chicago Union Agency, 20 West Jackson, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago.

FOR ADVERTISERS

5000 NEGRO Names, \$3.00—1000. Universal, 4629 Michigan, St. Louis, Mo.

SPECIALIZE Writing sales letters, advertisements and folders on approval. Thompson Advertising Agency, Madison Ave., Youngstown, Ohio.

SALES Letters, folders, circulars, advertisements and complete mail campaigns planned and written to produce "plus" profits for you. Write for folder or send details now. Raymond W. Walter, Box 626, Ridgewood, N. J.

30 WORDS 25 Magazines \$1.00. Goodall Adv. Company, Box 1592, San Francisco.

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Service Bureau, 4650 Drexel, Chicago.

BUSINESS SERVICE

ALL International legal matters. Lic. Victor Prieto, Mexican Attorney at Law, P. O. Box 122 M. Juarez, Mexico.

MANUSCRIPT Typing 300 words ten cents. Mimeographing, addressing, sales letters. Hansen Stenographic Service, 611 Larkin, San Francisco.

WHERE To buy anything—Manufacturers, wholesalers. 25c (coin). W-King, 702 Lakeview, Jamestown, New York.

WE Mail circulars promptly. \$2.00—1000. Empire Service, Shawano, Wis.

BRAND New technique in collecting bills. No "system" but modern cash-impeller. Adaptable to any business. Folder free. National Business Systems, 8 S. College, Akron, Ohio.

DELAWARE Charters; fees small; free forms. Chas. G. Guyer, 901 Market St., Wilmington, Del.

RUBBER STAMPS AND OFFICE SUPPLIES

CUSHION Mounted, one—two lines, 25c. Three 35c coin. Stamp Works, 814 Bradley, Peoria, Ill.

3 LINES 25c. Knob handles. Pads 10c. Owl, 6452 Kenwood, Chicago.

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

QUALITY Printing—Lowest prices! Beard Printery, 1422 East 55th, Chicago.

DISTINCTIVE Printing for the discriminating individual, business, profession or industry. Community Press, Kewanee, Ill.

CHOICE, \$1.00 Postpaid:—250 envelopes, 250 letterheads, 250 billheads, 250 labels, 250 business cards, 250 blotters. Polzin, 1702 Winona, Chicago.

LETTERHEADS, Envelopes, approval booklets, low prices. Samples free. Willis, 1307 Chapman Ave. S. W., Roanoke, Va.

"NU-STYLE", 200 Sheets, 100 envelopes, \$1.00. Audreypress, 249 Pearl, New York.

BETTER Labels for less. Samples. Labelers, 6618H Quimby, Cleveland, Ohio.

1000 LETTERHEADS Or 6% envelopes \$2.25. Agents wanted. Advance, 4719 Wisconsin, Milwaukee.

2000 3"x6" Circulars printed \$1.00. Postpaid. Miller Printshop, Lawrence, Kansas.

MIMEOGRAPHING Letters, \$3.00 per 1,000. Box 73, Sta. A, Brooklyn, N. Y.

125 LETTERHEADS Or envelopes 60c, both \$1.00. Richards, Stow, Ohio.

REASONABLY Priced—Catalogs, pamphlets, broadsides, circulars, factory, office stationery. Send sample or dummy for quotation. Theo. Rozek & Co., 2511 Maypole Ave., Chicago.

MODERNISTIC Quality printing. Reasonable. Samples. Messenger Press, Ballston Spa, N. Y.

BOND Letterheads \$1.29 per thousand. Discount to dealers. Send dime for samples. Rannev, Jamestown, N. Dak.

SAVE Money on printed circulars, folders, booklets, etc. Samples free! Fantus, 523 South Dearborn, Chicago.

BOOK, Magazine, pamphlet and catalog printing done quickly at low prices. Our \$50,000 plant is always ready for service. The Meador Press, 470 Atlantic Ave., Boston, Mass.

ILLUSTRATED Mimeographing. Books, folders, cards, letters. Commercial art work. Send stamp for samples. Copying, enlarging. Commercial Art Studio, 904 E. California St., Pasadena, Calif.

1000 CARDS \$1.00. Illustrated printing reasonable. Bradshaw, 3214 Huron, Chicago.

500 LETTERHEADS, Envelopes, statements \$1.10 plus postage. Raymonds', Newport, New York.

5000 ELEGANT Envelope slips, \$3.90 pre-paid. Circulars, stationery, cards, folders, labels, low prices. Samples. Goodprint, Harrisonburg, Va.

2000 BUSINESS Cards neatly printed \$1.50. Atlas Distributing Co., 1814 Bedford Ave., Pittsburgh, Pa.

1000 BUSINESS CARDS, card case, \$1.50. Miller, Printer, Ambler, Pa.

BETTER Grade printing, reasonable priced. Free samples. Economic Press, Leonia, N. J.

DOLLAR Printers' nation wide mailorder service. "Business necessity" items \$1.00. Samples. VanDorn Dollarpress, (Established 1897), Ottawa, Illinois.

500 CARDS \$1.00—Business, personal; deluxe. VanDorn Dollarpress, Ottawa, Illinois.

250 LETTERHEADS \$1.00—8½x11 white Ourbond. VanDorn Dollarpress, Ottawa, Illinois.

250 ENVELOPES \$1.00—Regulation 6% Whitewove. VanDorn Dollarpress, Ottawa, Illinois.

250 STATEMENTS \$1.00—5½x8½ colored bond. VanDorn Dollarpress, Ottawa, Illinois.

500 PARCELPOST Labels \$1.00—2½x4½ gummed. VanDorn Dollarpress, Ottawa, Illinois.

250 BLOTTERS \$1.00—3¼x6 choice colors. VanDorn Dollarpress, Ottawa, Illinois.

250 SHIPPING Tags \$1.00—Dennisons "3". VanDorn Dollarpress, Ottawa, Illinois.

DOLLAR Printers' customers have expressed confidence; ordered direct; acknowledged utmost satisfaction. VanDorn Dollarpress, Ottawa, Illinois.

PRINTING OUTFITS AND SUPPLIES

PRINT Your own cards, stationery, circulars, advertising, etc. Save money. Easy rules furnished. Print for others, big profits. Junior press, \$5.00; job presses, \$11, \$29 up. Write for details. Kelsey Co., Z-11, Meriden, Conn.

REBUILT Presses, guaranteed like new, list 3c. Exchange D10, 22 Orient, Meriden, Connecticut.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Pfeiffer, 52-A; 6 Columbia St., Newark, N. J.

PRINTING Presses, supplies, 3c for complete lists. Landis, Richland, Pa.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

BARGAINS Used presses, type. Send stamp. Box 15, Cambridge, Mass.

BUILD Your own printing press for \$1.00. Prints all colors! Free samples. Handpress, Box 101, Sacramento, California.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

STENCIL Duplicators and show card printing machines. New machines \$12.50 up. Details free. Gensco, Box 3643, Washington, D. C.

DATING, Marking and numbering devices. Write Ford Company, Bristol, Connecticut.

TYPEWRITER \$12. Multigraph, mimeograph, and other office machines. Write 816 Pruitt Bldg., 170 North LaSalle, Chicago.

INCREASE Business. "Excellograph" rotary stencil, clay and film duplicators \$3.85 to \$37.50. Prints anything. Typewritten, penned, drawn, traced. Colors. Folder free. Pittsburgh Typewriter Supply, Suite 518, Pittsburgh, Pa.

NEW \$4.75 Automatic adding machine. Fully guaranteed. Bassett, 1458J Hollywood Avenue, Chicago.

PATENT ATTORNEYS

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 400K Victor Building, Washington, D. C.

PATENTS. Protect your idea by securing free "Proof of Invention" folder. Write E. E. Vrooman, 871 Woodward Building, Washington, D. C.

PATENT Lawyer: Charles F. Haden, 4309 Kansas Avenue, Washington, D. C.

PRACTICAL Inventions now saleable before patenting. What have you? Write Chartered Institute of American Inventors, Dept. 4B, Washington, D. C.

INVENTORS—Small ideas may have large commercial possibilities. Write immediately for new free book "Patent Guide for the Inventor," and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 583 Adams Building, Washington, D. C.

"INVENTOR'S Guide," 100 mechanical movements, free; advises on patenting, selling inventions. Frank Ledermann, Tribune Bldg., New York.

PATENTS. Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

A BETTER Deal for inventors; valuable manufacturing and sales suggestions combined with skillful patent protection. My fee to secure patent \$50.00. Trade-marks registered \$35.00. Copyright \$6.00. 22 years patent, engineering experience. J. J. O'Brien, 108 West 42nd, New York.

PATENTS Procured; trade marks registered—preliminary advice furnished without charge. Booklet and form for disclosing idea free. Irving L. McCathran, 700A International Bldg., Washington, D. C.

L. F. RANDOLPH, 302-B Victor Building, Washington, D. C. Low cost. Book and information free.

PATENTS. Instructions "How to Establish Your Rights" and form, "Evidence of Conception"—sent free! Lancaster, Allwine & Rommel, 411 Bowen Building, Washington, D. C.

INVENTORS—Send for free booklet "Patent-Sense." Information based on 64 years experience. Lacey & Lacey, Dept. 5A, 635 F St., Washington, D. C.

ECONOMY For inventors. Write for booklet. Thos. H. Johnston, 635 F St., N. W., Washington, D. C.

FOR INVENTORS

FREE Book "How to Get Patents," with 6-month trial subscription. Send only 50c. American Freeman, Box 1812, Girard, Kans.

HAVE You a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 4A, Washington, D. C.

INVENTORS—Small ideas may have large commercial possibilities. Write immediately for new free book "Patent Guide for the Inventor," and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 583 Adams Building, Washington, D. C.

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 400K Victor Building, Washington, D. C.

INVENTION For sale? Write Inventive Age, (Inventive Trade Journal), Carlstadt, N. J., immediately! Inventors recommend. Results. Copy, dime; 12 months, dollar.

DEVELOP Your ideas, examine similar patents 50c per copy. A. W. Francis, 6120 Burns Avenue, Detroit, Michigan.

TO Inventors: We are in the market to purchase a good patent, preferably a five and ten cent store item. Will purchase outright or royalty. Purchasing Agent, 241 Front St., New York, N. Y.

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, 200 E. Ontario St., Chicago.

INVENTOR'S Universal Educator: contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1.00 postpaid in U.S.A. Address Albert E. Dietrich, 511-B Colorado Bldg., Washington, D. C.

UNPATENTED Ideas can be sold. I tell you how and help you make the sale. Free particulars. (Copyrighted.) Write W. T. Greene, 944 Barrister Bldg., Washington, D. C.

I SELL Patents. Established in 1900. Charles A. Scott, 773PM Garson Ave, Rochester, N. Y.

INVENTORS: "Making Inventions Pay," our 32-page illustrated book, mailed upon receipt of 3c postage. Crescent Tool Company, Dent, 3c, Cincinnati, Ohio.

PATENTS. Low cost. Book and information free. L. F. Randolph, 302-C Victor Building, Washington, D. C.

INVENTIONS WANTED

SMALL Inventions wanted by manufacturers. I'll help you sell your invention. Stanley Hull, 7829 Euclid Ave., Cleveland, Ohio.

INVENTIONS Wanted—Patented, unpatented. If you have an idea for sale, write Hartley's, Inc., Box 928-E, Bangor, Maine.

PATENTS FOR SALE

ELECTRIC Jack-O-Lantern light—2,006,251 outright, royalty. Irving Rollins, 453 Park Ave., Worcester, Mass.

GAS Mantle protector. Ideal for portable outdoor lanterns. Emil Koebnick, Stewart, Minn.

MANUFACTURERS Looking for new inventions should write W. T. Greene, 939 Barrister Bldg., Washington, D. C.

MANUFACTURING

MANUFACTURING, Models, dies, stampings, brasswork? Casting moulds. Stamp for catalog. Baums Metal Specialties, Kansas City, Mo.

MANUFACTURING Dies and models made at low cost. J. J. O'Brien, Patent-Development Engineer, 106 West 42nd, New York.

INVENTIONS Manufactured in any quantity at low cost. Stampings, dies, models, etc. Estimates and free catalog. Crescent Tool Co., Dept. X, Cincinnati, Ohio.

MODELS AND MODEL SUPPLIES

MODEL Makers! Device you make yourself. Cast in metal small parts for all kinds of models. Instructive, bonafide offer. 20c (coins) brings plans, information. Sta. "C," P. O. Box 50, Brooklyn, N. Y.

YACHT Fittings for Marblehead (50-800) and Class-A model yachts. Illustrated list free. A. J. Fisher, 1002-1 Etowah Ave., Royal Oak, Mich.

RAILWAY Model supplies—Track, signals, locomotives, cars. List 10c. Crovan Railway Models, Stamford, Conn.

MODELMAKERS—Magazines edited just for you: The Modelmaker and The Model Railroader. Either, \$1.50 per year. Both, \$2.50 per year. Sample of either, 15 cents; both, 25 cents. Modelmaker Corp, Wauwatosa, Wis.

MODEL Airplane supplies, kits. Metals for homecrafters. Pricelists 5c. Victor Specialties, New-Rochelle, N. Y.

BRASS Gears and model supplies. Send for catalog. The Pierce Model Works, Tinley Park, Ill.

MODELS—Your ideas developed into practical working models. 30 years' successful experience; thousands of satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32-page book—"Making Inventions Pay." Crescent Tool Company, Dept. Y, Cincinnati, Ohio.

MODEL Steam locomotive $\frac{3}{8}$ " scale. Easily made. Particulars, casting list, photo, 25c. Little Engines, Box 15, Wilmington, California.

SHIP Models—Build 18" Flying Cloud, Constitution or Galleon. All materials including full-sized plans only \$1.50 from Hancock, 323 Douglass Ave., Portsmouth, Virginia.

EVRAY'S Engine catalog (No. 34) or supply catalog (No. 35) postpaid 20c. Evraymesco, 28 N. Clinton, Chicago.

HOME CRAFTSMEN

WOOD For homecraft, archery, boats. Catalog free. Sportswood, Ironton, Mo.

CLOCKS:—Grandfather's, banjo, shelf. Build your own as thousands have. Some with wonderful chimes. Full directions for a dime. Particulars free. Clock Company, Station B, Philadelphia.

CATALOGUE, Samples. Leathercraft Supply Co., Station "B," Long Beach, Calif.

DIAMONDS, WATCHES, JEWELRY

ANY Average watch thoroughly overhauled \$2.50—guaranteed. We buy old gold, watches, jewelry. Ontyme Watch Co., Box 999-A, Chicago, Ill.

OLD GOLD WANTED

CASH For gold, teeth, jewelry, watches. High prices paid day shipment received. Satisfaction absolutely guaranteed or articles cheerfully returned. Information free. Chicago Gold Smelting & Refining Co., 357 Champlain Bldg., Chicago.

MAIL Us your discarded jewelry, gold crowns and bridges, watches, diamonds, silver and platinum. New high prices paid, remittance mailed immediately. Goods returned if our offer is refused. United Smelting Works, (The Old Reliable,) Backed by 50 years of experience. 39 So. State St., Dept. 71, Chicago.

TOBACCO

SWEET Oronoko and Gold Leaf chewing tobacco. 4 pounds \$1.25. Subac smoking 3 pounds \$1.10 postpaid. Belmont Farms, Chatham, Va.

FOR MEN

GENUINE Panama hats—Order direct from manufacturer in South America and save enormous difference. Write immediately. Carlos Palacio, Pasto (Narino) Colombia, S. A.

RAZOR BLADES—SHARPENING

LOOK—100 Double edge blue blades 75c. Postpaid. Satisfaction guaranteed. C. Logan, Adel, Ga.

RAZOR Blades—Hundred, guaranteed, doubleedge blades, dollar. Idealserviceco, 839 North Fulton Avenue, Baltimore.

100 BLUE Steel doubleedge blades \$1.00. Guaranteed. Rappe, Box 1189, Phoenix, Ariz.

TATTOOING

TATTOOING Outfits, supplies, 1935 illustrated list. "Waters," 965 Putnam, Detroit.

ENORMOUS Profits tattooing; get our free illustrated folder! Chicago Tattoo Supply House, 651A South State, Chicago.

SURVEYING INSTRUMENTS

GUARANTEED Factory rebuilt instruments for rent (with purchase option) or sale (cash or terms). Largest selection in United States. Ten day free trial. Liberal allowance for old instruments. Save money by buying now. Write for new list M-99. Warren-Knight Co., 136 North 12th St., Philadelphia, Pa. Manufacturers Sterling Transits and Levels. Headquarters for repairs any make surveying instruments.

FOR SALE—MISCELLANEOUS

SHIRT-TRO-GRIP Holds shirt down, holds trousers up. \$1.00 postpaid. Agents wanted. Shirt-Tro-Grip, 600-B Roosevelt Building, Los Angeles.

LEARN Air conditioning—America's next big industry. Thousands of opportunities for far seeing men. Get your start with complete new book by E. W. Hiesbeck. \$3.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

WANTED—MISCELLANEOUS

CASH For used microscopes, binoculars, cameras, slide rules, drawing sets, surveying, scientific instruments, marine equipment. Highest prices paid day shipment received. Satisfaction guaranteed or shipment cheerfully returned. Elman's, 2302 Van-Buren, Chicago. We repair microscopes, transits.

PERSONAL

WONDERFUL! Stops hair loss. Promotes new growth, formula \$1.00. "Healthway," 60 Weldon, Rochester, New York.

PROSPER! Establish lucrative business at home. Stamp. Lonk Institute, D-1613, Palatine, Illinois.

RAZOR Blades sharpened keen. 1c each. Petter Wetterquist, Rockford, Ill.

INDIAN And Lincoln head pennies wanted. Will pay up to \$2 each for pennies, unc. Certain pennies worth \$53. Latest listing 10c. American Coin Co., Box 219, Grand Rapids, Mich.

MISCELLANEOUS

CUTS—Make them yourself. Simple, inexpensive etching process. Information free. Hughes Products, 67 Miami, Terrace Park, Ohio.

FREE Book "Lightning Shorthand Self-taught," with 6-month trial subscription. Send only 50c. American Freeman, Box 1813, Girard, Kansas.

MUCILAGE-PENCIL. Newest, most economical adhesive for home, office and school. Pencil in handy sanitary container. One dime. E. G. Glidden, 89 Elder, Schenectady, N. Y.

TREASURE Hunters. Complete circuit plans guaranteed gold finder \$1.50. Prof. Mineral rods \$1.75. Golden B. Ray Co., 440 Market, San Francisco.

ZINC Etching instructions 50c. Simple, inexpensive process. Nist, 729 Evergreen Ave., Millvale, Pa.

REFRIGERATOR. Cheap. Home made. Only common chemicals needed. Instructions 50c. Metromalis, Cincinnati.

METALLASCOPE Absolutely guaranteed find buried gold, silver, etc. Users all over world report finding buried treasure and valuable ore. New de luxe model five times as sensitive as any previous instrument. Operate it expertly after few minutes practice. Write for free interesting information. Metallascope Sales Co., 1031 South Broadway, Los Angeles, Calif.

TREASURE Buried. Send for free literature, photographs. Fisher, Palmer Building, Hollywood.

NAVIGATION Easily understood. Illustrated. 50c. Candlerco, 1810 - 34th., Seattle, Washington.

NEW Discovery—Eye glass cleaner, cleans glasses perfectly. Send 25c. Camas Co., P. O. Box 253, Fresno, Calif.

TREASURE Seekers—Make your own gold finders. Wyss, 104½ Frances, St. Joseph, Missouri.

CUTS Anybody can make. Zinc etching process. Specimens, particulars, testimonials, for stamp. J. C. Day, Windfall, Ind.

ELECTRIC Lawn pistol kills weeds. H. and D. Electric Co., Great Falls, Mont.

SWAPPER'S Friend, R4, Saline, Michigan. Interests swappers, collectors, sportsmen. 50c year, sample 10c.

ELECTRIC Or gasoline portable lamp kills insects automatically, indoor or outside. \$1.75 up. Literature free. Sauer Bros., East Oakland, California.

CASH Income daily resilvering mirrors; replating metalware; making glass signs. Portable outfit. Sprinkle, Plater, 288, Marion, Ind.

BRONZE Tablets, desk plates, wall plates, memorials, grave markers. Bronze, brass and aluminum casting. Wandkey Pattern & Foundry Co., Anderson, Ind.

GARDENING. Flower growing, lawn making, landscaping, house repairing, etc. Send for free list of books on. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

CAN You use tools? Build your own perfected treasure finder. High efficiency assured. This one really works. Full details free. Famous booklet "Successful Prospecting," mailed for only thirty cents. Write: The Goldak Co., Western Pacific Bldg., Los Angeles, Calif.

NOW—You Can Really Afford

Automatic OIL HEAT At It's Best

New Improved LACO—\$60 Under Usual Prices! Burns Cheap Oil New Way—LESS THAN COAL!

Here's an astounding new-type Oil Burner—offered at the World's Lowest Price—that will heat your home perfectly—for Less Than You Pay For Coal! Many users report fuel savings of 25% to 50%!

Now you can get away forever from the drudgery of starting furnace fires—handling dirty, costly coal or wood—carrying out ashes!

This new LACO "Model F" is built—and sold on a positive Money-Back Guarantee—by the world's largest manufacturer of oil burners, exclusively. It's a full size, full capacity burner, approved by the Underwriters' Lab. Embodies many new features that eliminate servicing cost—make it the safest—give it utmost durability. Over 50,000 LACOs in use.

Works Automatically Heat turns "on" and "off" without the slightest attention, to keep your home at exactly the temperature you want, constantly. Is magically responsive to changes in temperature.

How It Saves! Burns "heavy" oil which costs less, yet contains more heat! New patented "High Pressure Carburetor" uses 96% AIR, only 4% cheap OIL—mixes them perfectly—creates a Quiet-ized Flame that burns very slowly—to get every bit of heat from every drop of oil.

Fits all furnaces. Is very easy to install. Write! Get Free Book, Low Price, and Special Offer! See if LACO isn't just what you want for your home. Send NOW!

L. A. Cocklin, Pres., LACO OIL BURNER CO., 195 Union St. Griswold, Iowa



Get SAMPLE BURNER

DEALERS:

Thousands interested in LACO's Low-Cost Oil Heat! Get these easy profits! Have me ship you a Sample Burner—subject to examination—WITHOUT OBLIGATION! Write today for plan.

Home Owners: Have your local LACO dealer quote you the very low price. If he does not carry LACO, write for Free Book and Low Price. Send NOW!



MAKE GLAZED GARDEN POTTERY

Beautiful, colored, glazed concrete pottery made without molds. No experience needed. Use only sand and cement. 2,500 different designs birdbaths, vases, jars, etc. Big profits. Send 10c for Booklet, color plate, etc.

NATIONAL POTTERIES CO., 424 Second Ave., So., Minneapolis, Minn. Room 21

Learn ADVERTISING at Home

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

Page-Davis School of Advertising Dept. 1356, 3601 Mich. Ave., Chicago

BE AN ARTIST

WE CAN TEACH YOU DRAWING in your own home during your spare time. Thirty-five years of successful teaching proves our ability. Artists receive large salaries.

Write today for Art Year Book SCHOOL OF APPLIED ART Dept. 165, 10 E. Huron St., Chicago, Ill.



Get into RADIO REAL JOBS REAL PAY

RADIO AND TELEVISION INSTITUTE, Inc. 2130 Lawrence Ave.,

Earn While Learning at Home!

Television, Photo Electric Cells, Public Address

Many R-T-I Trained Men make \$35-\$75 a week and more in full-time radio jobs—\$5-\$15 in spare time alone. More trained men needed. Learn at home by quick, easy, R-T-I WAY. Endorsed by 50 big concerns. Write for big Opportunity Book FREE.

RADIO AND TELEVISION INSTITUTE, Inc. 2130 Lawrence Ave.,

Dept. 16, CHICAGO, ILL.

PHILCO CROSLY ZENITH GRUNOW and 46 other mfrs. endorse R-T-I

for
quick
action

SEND
TO-DAY

MAIL COUPON NOW

for Free Book and Record of Invention Form

CLARENCE A. O'BRIEN
Registered Patent Attorney

70-A Adams Building, Washington, D. C.

Please send me at once your Big Free 48-Page Book "Patent Guide For the Inventor" and your specially prepared "Record of Invention" Form. This request does not obligate me.

Name.....

Address.....

(Please write or print plainly)

YOU CAN PATENT

NEW IDEAS FOR IMPROVEMENTS IN MACHINERY, ARTICLES, DESIGNS, FORMULAS, ETC.

Every year thousands of Patents are granted. Very few, however, represent the discovery of entirely new principles. Most of them provide new methods of doing some every-day thing in a better way—changes for greater efficiency, usefulness, adaptability, or beauty in some previously Patented thing. These IMPROVEMENTS are Patentable if new, and actually represent new invention. These Improvement Patents offer large chances for profit if commercially useful. The business world wants improved products and services.

MODELS and FINISHED DRAWINGS UNNECESSARY

My Big Book tells you how you can start immediately to apply for Patent Protection even if you haven't finished models or drawings available now. It will tell you how I can prepare the specifications and finished drawings necessary in the form prescribed by the Patent Office—so as to secure for you full Patent Protection. **Mail Coupon for My Big Book TODAY.**

MY SERVICES TO YOU

I am a registered Patent and Trade-Mark Attorney, serving Inventors all over the United States and abroad. My Organization is complete. I have Draftsmen, experienced Searchers and Attorneys to serve your interests. I can act as your legal adviser in all Patent Matters. My complete service is described in My Big Book. **Mail Coupon for it NOW.**

IN CASE YOU FEEL THAT YOU HAVE NOT SUFFICIENT FUNDS AVAILABLE FOR PATENT FEES

My Big Book tells you how to legally assign an interest in your invention—before filing application—to some friend willing to aid you. Better to do this than to delay indefinitely and see another inventor develop your idea and Patent it before you do. **Send Coupon NOW.**

REASONABLE FEES—CONVENIENT TERMS

Don't worry about finances. My fees are very reasonable—I can arrange convenient terms of payment. It is my custom to permit clients to pay for my services in installments as the application progresses in my office. See my Big Book for fees in obtaining Patent. It explains my arrangements clearly. **Send for it NOW.**



REQUEST MY BOOK—NOW!

Know exactly what you should do to secure a Patent—what must be done every step of the way—how the Patent Law protects you—what I, as a Registered Patent Attorney, can do for you. **Mail the coupon NOW for My Big Booklet and "Record of Invention" Form.**

CLARENCE A. O'BRIEN

Registered Patent Attorney

70-A Adams Building

Washington, D. C.

PATENTS

Booklet Free Highest References
Promptness Assured Best Results

Send drawing or model.

ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION

Listed Patent Lawyer in the latest editions of the Rand-McNally Directory of Bankers and Bank-Recommended Attorneys, published by Rand-McNally & Co., Chicago, Ill.; The Baggott & Ryall Directory of Guaranteed Attorneys, published by Legal Directory Corporation, Boston, Mass.; Flugel's Law List, published by Legal Directory Publishing Co., St. Louis, Mo.; American Lawyers Annual, Cleveland, Ohio; Bankers Service Legal Directory, Bankers Service Co., Boston, Mass.; Eyre's Law List, 9 Park Place, New York City, and the Central Guarantee Co., Bankers and Lawyers Directories, Empire State Bldg., New York City.

WATSON E. COLEMAN,
REGISTERED PATENT LAWYER

Victor Building, 724 Ninth Street, N. W.
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

1638 Woolworth Bldg., Dept. 95A, New York City
MILLER BUILDING, Dept. 95A, WASHINGTON, D. C.

Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME.....

ADDRESS.....

PATENTS—TRADE MARKS

All inventions submitted held confidential and given personal attention by members of the firm.

Form, "Evidence of Conception" and instructions, "How to Establish Your Rights"—FREE!

LANCASTER, ALLWINE & ROMMEL
Patent Law Offices

412 Bowen Bldg. Washington, D. C.

No JOKE TO BE DEAF

—Every deaf person knows that—

Mr. Way made himself hear his watch tick after being deaf for twenty-five years, with his Artificial Ear Drums. He wore them day and night. They stopped his head noises. They are invisible and comfortable, no wires or batteries. Write for TRUE STORY. Also booklet on Deafness.



Artificial Ear Drum

THE WAY COMPANY

729 Hofmann Bldg.

Detroit, Michigan

Inventions Wanted Patented or Unpatented

Have you a sound, practical invention for sale, patented or unpatented? If so, write

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

"World's Largest Organization of Inventors"

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.

EARN WEEKLY PAY

raising PR ROYAL birds. Orders waiting for hundreds of thousands. Easy to raise. You get your money for them when only 25 days old. Particulars for three-cent stamp. PR Company, 633 Howard St., Melrose, Massachusetts.



RAISE RABBITS FOR US

WE PAY YOU UP TO \$5.00 EACH. ALSO PUT YOU IN TOUCH WITH MARKETS EVERYWHERE. Large illustrated book and catalog, also copy of the AMERICAN RABBIT FARMER and monthly market bulletin showing us more of buyers in various parts of America who continuously buy all rabbits offered them. All for 10 cents. Address

OUTDOOR ENTERPRISE CO., 101 Main Street, NEW CITY, N. Y.



ARMY AND NAVY SUPPLY CO.

Bargains—Army, Sport Goods, Firearms, Clothes, Shoes, etc. Send 10c for new catalog, to be redeemed on first order

Army & Navy Supply Co. 4772 Lester St. Richmond, Va.



AGENTS Make \$380 Monthly

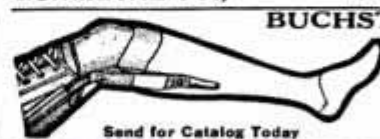
selling 10 CARTER WINDOW WASHERS daily. Cleans, dries, polishes. No mess. Good Housekeeping approval. Restricted territory. Write today.

Carter Products Corp., 998 Front Ave., Cleveland, Ohio

MAN IN EACH TOWN To Plate auto parts

reflectors, mirrors, etc., by new method; no capital or experience required. Outfits furnished. Free particulars. Write Today!

GUNMETAL CO., Ave. M, Decatur, Ill.



BUCHSTEIN'S FIBRE LIMB

is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities. Agents wanted.

D. BUCHSTEIN CO.
610 3rd Ave., So., MINNEAPOLIS, MINN.

Send for Catalog Today

To PROTECT YOUR INVENTION - Use 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 37 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



High School Course in 2 Years

You never heard anyone express regret at having a High School education—and you never will. But many, who failed to get their training at the usual time, don't realize that they can get it by home study in their spare time. A High School education is definitely required for—

- College Entrance and Teacher's Certificate
- The Better Positions in Business and Industry
- State and Municipal License Examinations
- Ability to Meet Others and Express Your Ideas

You can complete your High School education at home—in 2 years or less. Course meets requirements for entrance to college, business, and industry. Standard High School texts supplied. Diploma awarded. Full credit for U. S. subjects already completed.

You Can Qualify for a Better Position

If you are interested in business or industry, consider the opportunities for good pay and steady advancement offered to men with the proper training and then make up your mind that you are soon going to be holding one of those better positions. Through home study in your spare time, we can train you in 2 to 3 years for your choice of the desirable positions listed in the coupon.

Get Ready to Earn Big Money!

You can rapidly learn to prepare estimates and figure costs; to write effective business letters; to design and build buildings and machines—in your spare time. Don't doubt your ability to make good—get ready for the good position you want by getting the training that will bring you success and big money.

This is your big opportunity to put part of your spare time into getting by home study the training you know you need. If you did not finish High School, here is your chance to do so. If you never yet have had the chance to get specialized prepara-

tion for advancement in your chosen line, start now to give yourself that training.

Facts—The Gateway to Opportunity

Asking for information about the line that interests you involves no obligation—but it may mark the turning point in your life. Check the position you want and mail the coupon today.

American School
Dept. H-645, Drexel at 58th St., Chicago

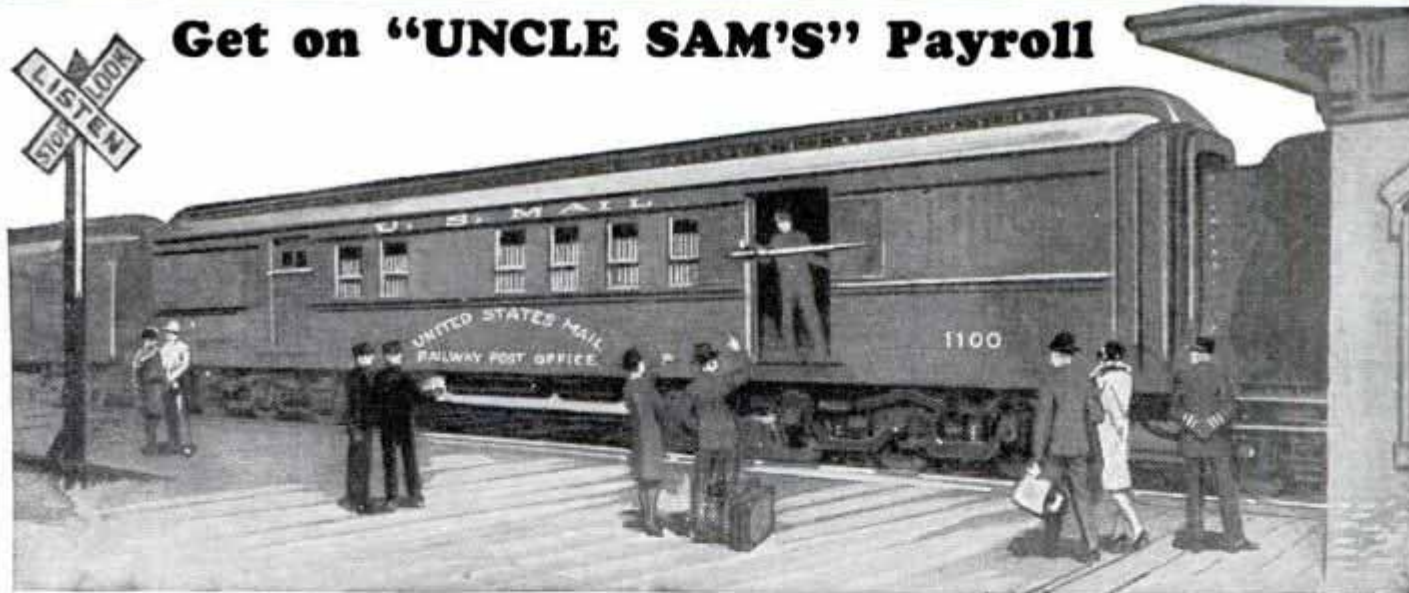
Send me, without obligation, full information on position checked:

<input type="checkbox"/> Air Conditioning Engineer	<input type="checkbox"/> Draftsman & Designer
<input type="checkbox"/> Aircraft Pilot	<input type="checkbox"/> Electrical Engineer
<input type="checkbox"/> Architect & Builder	<input type="checkbox"/> High School Graduate
<input type="checkbox"/> Automobile Engineer	<input type="checkbox"/> Lawyer
<input type="checkbox"/> Bookkeeper & Accountant	<input type="checkbox"/> Mechanical Engineer
<input type="checkbox"/> Business Manager	<input type="checkbox"/> Radio & Television
<input type="checkbox"/> Cert. Public Accountant	<input type="checkbox"/> Refrigerating Engineer
<input type="checkbox"/> Civil Engineer	<input type="checkbox"/> Steam Engineer
<input type="checkbox"/> Diesel Engineer	<input type="checkbox"/> Structural Engineer

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

Turn Your Spare Time into Dollars

Get on "UNCLE SAM'S" Payroll



Railway Postal Clerks

MANY OTHER U. S. GOVERNMENT POSITIONS

MEN — BOYS

Short Hours Common Education Sufficient

Automatic Salary Increases—Paid Vacations

MAIL COUPON TODAY. TOMORROW YOU MAY FORGET

FRANKLIN INSTITUTE, Dept. A185, Rochester, N. Y.

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

<input type="checkbox"/> Railway Postal Clerk.....	(Start \$1900 year on regular)
<input type="checkbox"/> Post Office Clerk.....	(Start 1700 year on regular)
<input type="checkbox"/> City Mail Carrier.....	(Start 1700 year on regular)
<input type="checkbox"/> Office Clerk—File Clerk.....	(Start \$1260 year)
<input type="checkbox"/> Inspector of Customs.....	(Start 2100 year)
<input type="checkbox"/> Immigrant Inspector.....	(Start 2100 year)
<input type="checkbox"/> Liquor Gauger-Storekeeper.....	(Start 2000 year)

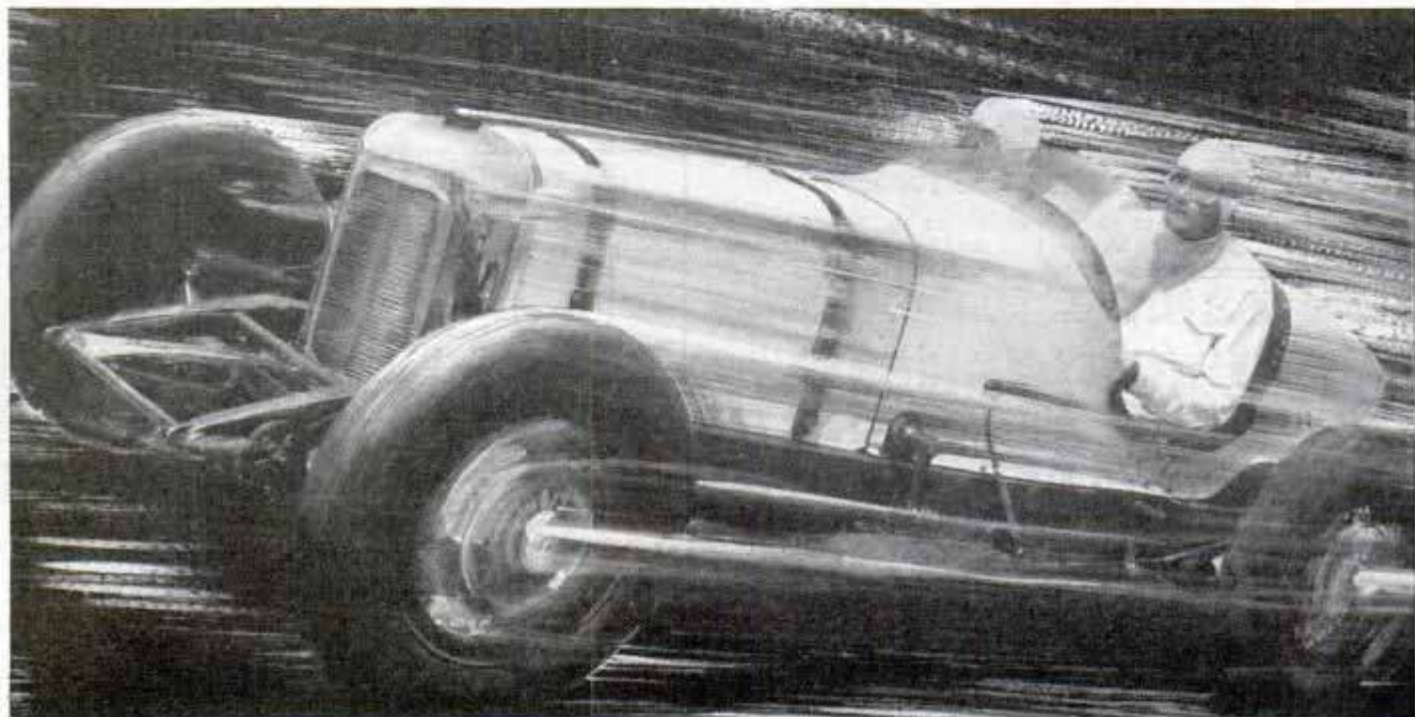
Name.....
Address.....

Use This Coupon Before You Mislays It

When writing to advertisers please mention Popular Mechanics

INDIANAPOLIS RACE *Proves* PENNZOIL!

**RACE DRIVERS USE NEW PENNZOIL IN CARS
INSTEAD OF USUAL RACING CASTOR OIL**



DON'T TAKE CHANCES WITH YOUR CAR—PLAY SAFE BY USING NEW PENNZOIL

THIS year's spectacular 500-mile Indianapolis Race marked an achievement more important from a lubrication standpoint than new speed records. For the first time in 23 years of racing history made on this track, *a regular passenger-car oil*—the same New Pennzoil you can buy for *your* car—was used by more race drivers than castor oil! Not only castor oil, but all other brands of oil, ran second to New Pennzoil as the choice of these oil-wise speed demons,

Stands up at high speeds

Think of it! At speeds at which motors actually burn themselves up . . . speeds that only special racing castor oil was formerly expected to withstand . . . *New Pennzoil* allowed motors to work freely, run faster and cooler, kept moving parts *safely* lubricated.

Here is one more evidence that New Pennzoil's tough film *stands up*. With New Pennzoil you go

farther, faster, *safer*. Why be satisfied with plain oil when you can buy New Pennzoil? It costs no more—from any bonded Pennzoil Dealer.



Wilbur Shaw
105.990 m.p.h.

Chet Gardner
101.129 m.p.h.

Deacon Litz
100.907 m.p.h.

Doc Mackenzie
100.598 m.p.h.

**FOR COMPLETE "SAFETY SYSTEM"
LUBRICATION, LOOK FOR THIS SIGN**



Every dealer who displays it can give your car the 7 special lubricants it needs—and save you costly repair bills later on.

THE OIL THAT GOES FARTHER . . . FASTER . . . SAFER

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

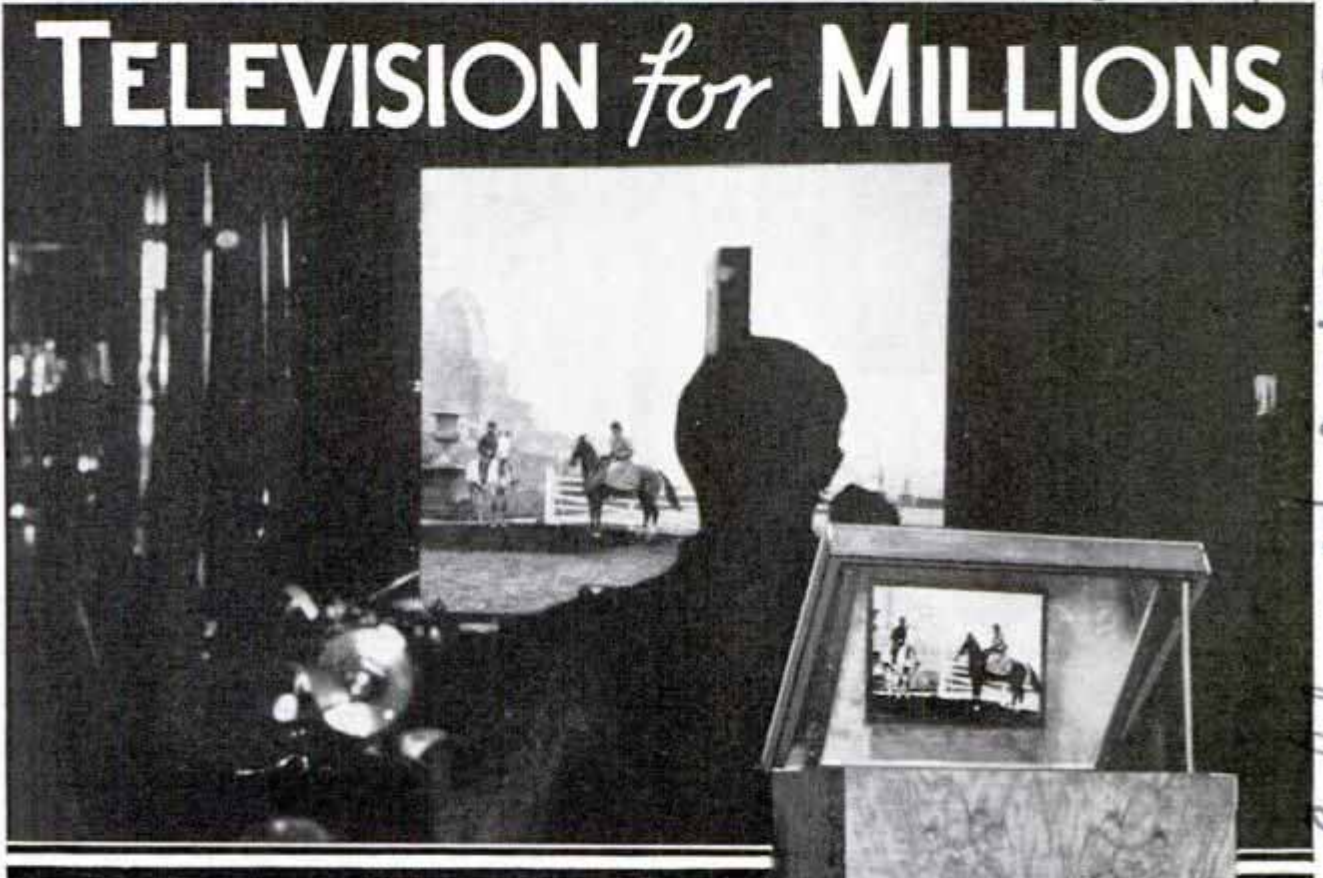
Vol. 64

SEPTEMBER, 1935

No. 3

8787

TELEVISION *for* MILLIONS

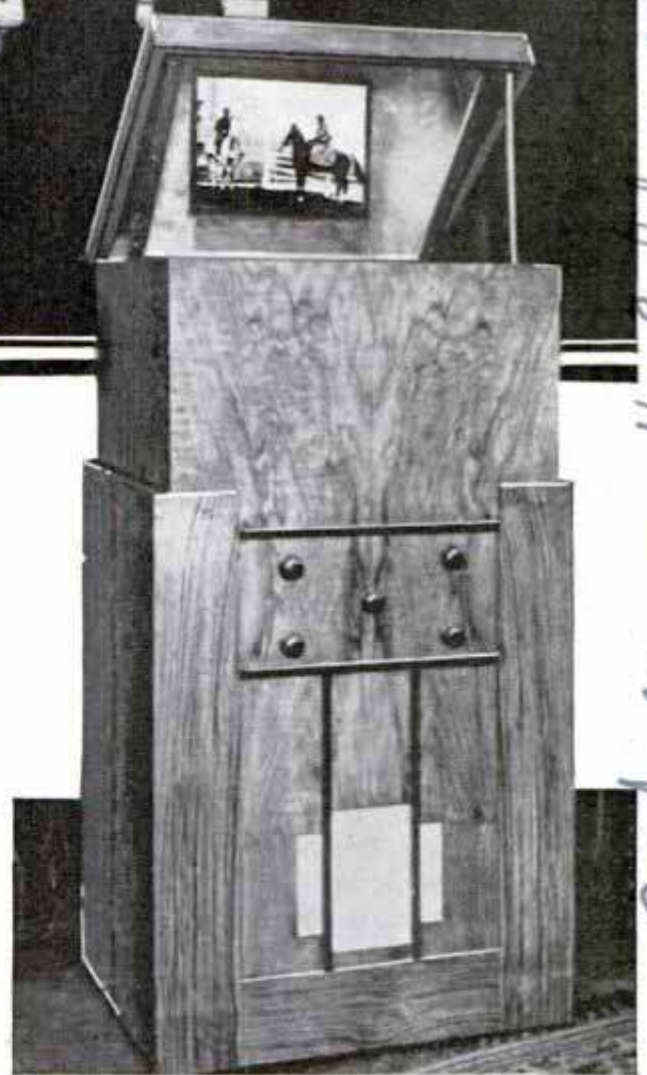


Not a Movie Screen, but Televising Scene through Window by Intermediate Film Process

TELEVISION is no longer "just around the corner" for several million people. It is actually available today to those who live in the London and Berlin metropolitan areas, and in a few months will be offered to several other millions living in or near New York City.

The London broadcasts from the Crystal Palace station of Baird Television, Ltd., covering a radius of thirty miles, have achieved a high degree of success with daily programs chosen principally for their artistic and entertainment value. It is a ten-kilowatt station, which has been found sufficient to insure good reception in the thirty-mile radius, but the power soon is to be raised to thirty kilowatts.

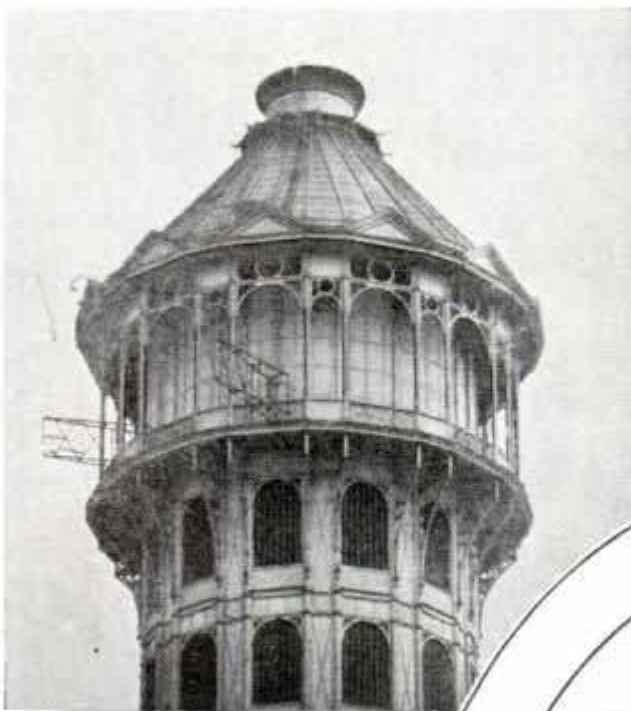
More than half the equipment, both for transmission and reception, is of American



Television Receiver Which Produces an Image Twelve Inches by Eight Inches

Cont. George H. Eckhardt, 2047 N. Park Ave. Chelsea

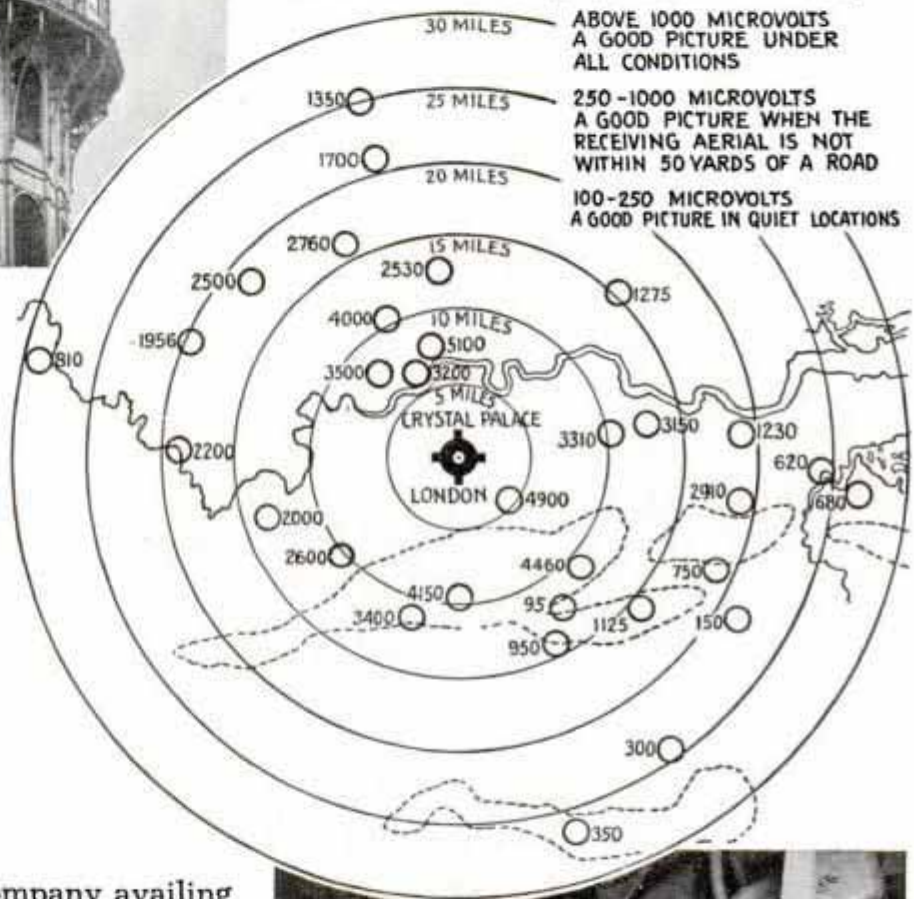
32 Frith St.



station, one for sound and one for vision, but only one is needed for the reception of both sound and vision. Three methods of pick-up are used by the Baird station. One is a direct pick-up, in which the television camera is trained upon the scene. The second method is known as the intermediate film process, developed in Germany. In this, the scene is first taken on

(Continued to page 142A)

MAP OF SIGNAL STRENGTHS RECEIVED 7 METER, 10 KW. TRANSMITTER THE FIGURES REPRESENT MICROVOLTS



design and construction. This is made possible because Baird Television, Ltd., and Farnsworth Television, Inc., of this country, have an agreement for a complete interchange of patents and technique. Both companies have a similar agreement with Fernseh, A. G., of Germany, hence the development of television in Germany, England and the United States is likely to proceed along similar lines, each company availing itself of the technical advances and developments of the other two.

The London broadcasts have had their greatest interference to reception from the electrical equipment of automobiles, but this has been overcome, to a considerable extent, by increasing the power of the station. It also has been found that placing receiving aerials at least seventy-five feet from heavily traveled streets eliminates much of this trouble. Tests have shown that a density of from 500 to 800 microvolts in any section of greater London is sufficient to overcome automobile interference and 1,000 microvolts is enough to insure good reception under any conditions.

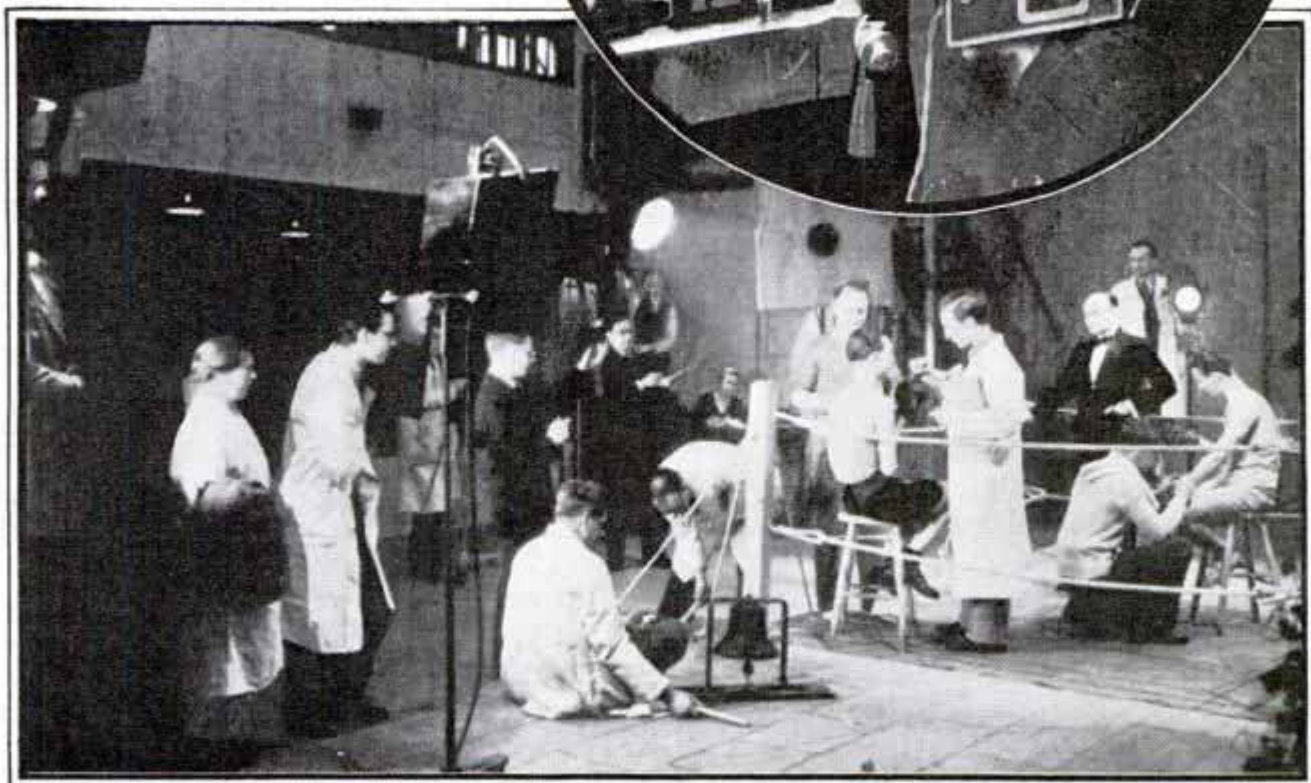
Two antennas are used by the London



South Tower of Crystal Palace, Showing Sound Aerial on Balcony, and Map of Signal Strength Received; Bottom, Transmitting Scene



Above, Scene Being Transmitted from Crystal Palace by Intermediate Film Process; Right, Telecine Apparatus for Transmitting Talking Pictures; Below, Preparing to Transmit a Boxing Exhibition by Radio

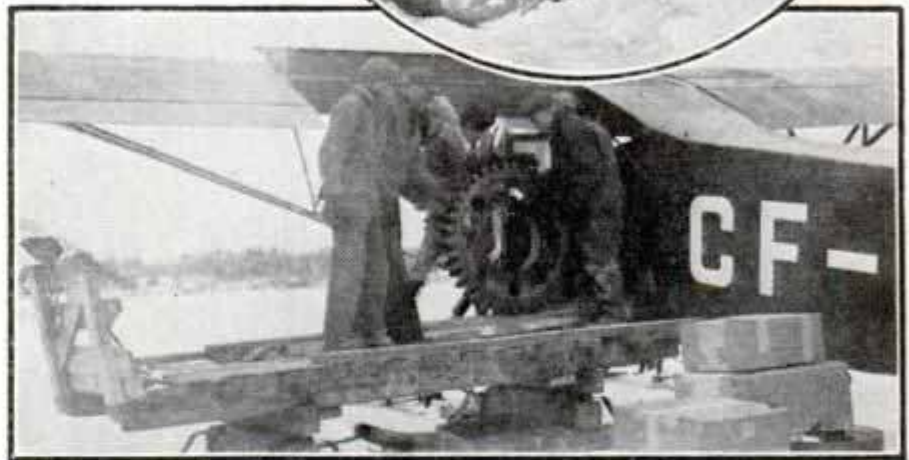


Strange Cargo Rides Skies of Far Northwest



You can expect anything from oxen to dynamite as fellow travelers when you book a ride over the northwest wilderness on a Canadian Airways plane. The air is the principal thoroughfare in the Canadian northwest, and it pays to fly when the cargo coming back is gold, radium and other minerals from the rich frontier diggings, or valuable furs. There is no other way to reach the isolated outposts in the short summer season. At the air-line base at Oskelanaio one day a man inquired of Pilot Lymburner the fare for flying a pair of oxen to Chibougamou, site of a new gold strike. The oxen were needed to fill a wood-hauling contract up north. They were roped, wrapped in stout canvas and skidded up a gangplank to the plane. An hour and ten minutes later the ship dropped down at Chibougamou, about 150

Top, Ox Is Roped and Strapped in Canvas Bag, then Skidded Up Gangplank Aboard Plane Bound for Isolated Outpost in Canadian Northwest; Center and Bottom, Boilers and Heavy Machinery for Mines Are Transported by Air



miles away. One ox was a bit air sick. Pigs fly, too. Pork chops came high on the table at Cameron Bay, so the trading post proprietor decided to raise them. A pair of pigs was loaded on a plane for a 1,400-mile flight to Cameron Bay, where they

were to start a pig colony, and on the same plane were shipped a case of tennis balls, a crate of head lettuce and a bunch of bananas—the bananas selling out at twenty-five cents each ten minutes after the plane landed. Four-thousand-pound cargoes are common on these airways. Forty tons of cement and an engine for a new mine were shipped by air. Here was one plane's bill of lading: five rolls of tar paper, a tin stove, ten cases of canned goods, a barrel of kerosene, two rolls of barbed wire, two bags of oats and five boxes of dynamite stowed among six bales of hay. Pilot Lymburner made several trips to carry eighty tons of dynamite to Dore Lake, 130 miles from the railroad. Six hundred pounds of baby fish were flown north to restock a lake, and were dumped out while the plane swooped low at 145 miles an hour. Air friction slowed their fall and they pattered into the lake like raindrops. Coming back, the ship brought 2,200 pounds of fish for Chicago markets. Sometimes fur is shipped out alive to start fur farms. Pilot "Con" Farrel, who flew the pigs north, once made a forced landing when fifteen "huskies" broke their leashes and waged a dog fight royal in the cabin, attacking two trappers who were fellow passengers. Fourteen hundred pounds of embattled dogs had the plane wobbling until it skidded to a stop on the ice. Strange cargoes—dynamite, dogs and canoes, sugar and fish, kerosene, cheese and gold.

☞ Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.



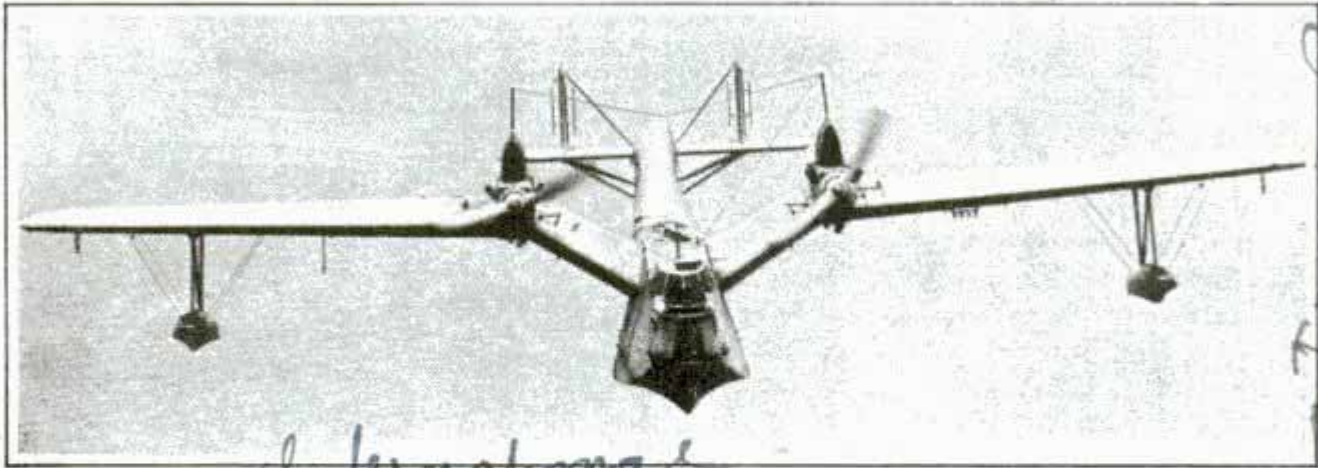
Sandee
High-Speed Electric Grinder Which Revolves 25,000 Times per Minute, and Set of Accessories for Working with All Types of Material

HIGH-SPEED GRINDER IS USED LIKE A FOUNTAIN PEN.

Weighing only twelve ounces, a high-speed electric grinder, which revolves at 25,000 revolutions per minute, is shaped so it can be held and operated like a fountain pen. Its accessories enable the operator to grind, drill, polish, cut, carve, sand, saw, rout and engrave on virtually all types of material. Parts are statically and dynamically balanced, thus eliminating vibration. A special chuck is provided for the accessories, and it can be used in places difficult to reach. Pattern making and wood carving are speeded up and the delicate balance makes possible the carrying out of intricate designs. All types of materials can be given a high polish with the aid of various wheels provided for the purpose, and wire brushes have been developed for cleaning deep cavities quickly. Model makers set up the tool in a special model-maker's lathe for turning small wood parts for miniature locomotives and airplanes.

Chicago Wheel & Mfg. Co., 1101 W. Monroe Chicago

British Test Angular "Ugly Duckling" Plane



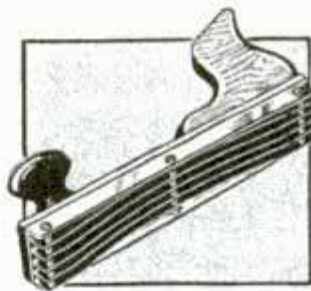
International
Seaplane of New Type Being Tested for British Royal Air Force; Its Twin Motors Rest at Apex of Wide Angle Formed Where Wings Slant Down to Cabin

"Ugly Duckling" of the Royal Air Force of Britain is the new twin-motored seaplane "R 24/31." Instead of being straight or curved, its wings are angular, slanting down from each engine to the cabin. The body extends back, wasp-like. The ship is being tested at the Marine Aircraft Experimental station in Suffolk.

SURFACING TOOL LIKE A PLANE IS EASY TO OPERATE

Handled like an ordinary carpenter's plane, a new surfacing tool is effective for removing varnish, smoothing the ends of

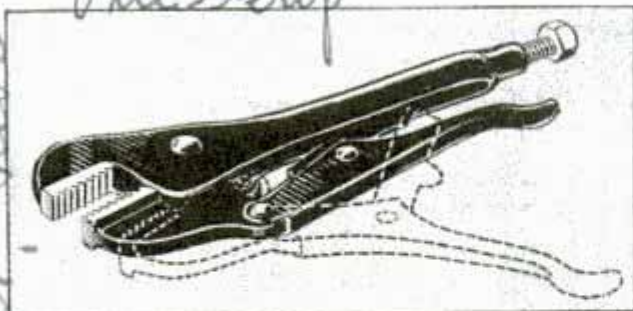
grained lumber and working with fiber and rubber. It has five cutting tooth edges mounted in a rust-proof steel channel, with a hard maple handle. The tool is passed over



the surface in the same manner as a plane. The five blades eliminate the resistance found in working with the plane, giving a smooth follow-up cutting action.

WRENCH WITH VISE-LIKE GRIP KEEPS WORK FROM SLIPPING

Rounded nuts and pipes that might slip from the hold of an ordinary wrench can be held firmly in the jaws of a vise-grip wrench manufactured in Nebraska. The

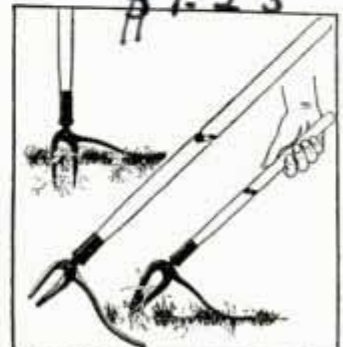


Teeth of This Wrench Will Grasp Round Pipe or Nut Firmly until Lever Is Released

jaws are adjustable up to one and one-fourth inches and stay as they are set until the lever grip is snapped open. The wrench can twist a half-inch rod, is useful as a pump wrench to hold a rod while threads are cut, and is handy in removing corroded battery bolts, broken studs and screws with worn slits. Strongly built, it weighs little more than a pound.

WEEDING LAWN IS MADE EASY BY FORK GRIP

Weeds are removed completely and not merely pinched off by an automatic weeder with a long handle that takes the back-breaking drudgery out of lawn and garden work. The two prongs of its fork are pressed down over the weed and when the tool is pulled back the prongs tighten and pull taproot and all.



Chicago
2453 Irving Park Blvd
Surfacer Mfg Co

Superior Metal
Products Co

The Peterson Mfg Co.
Chicago, Ill.

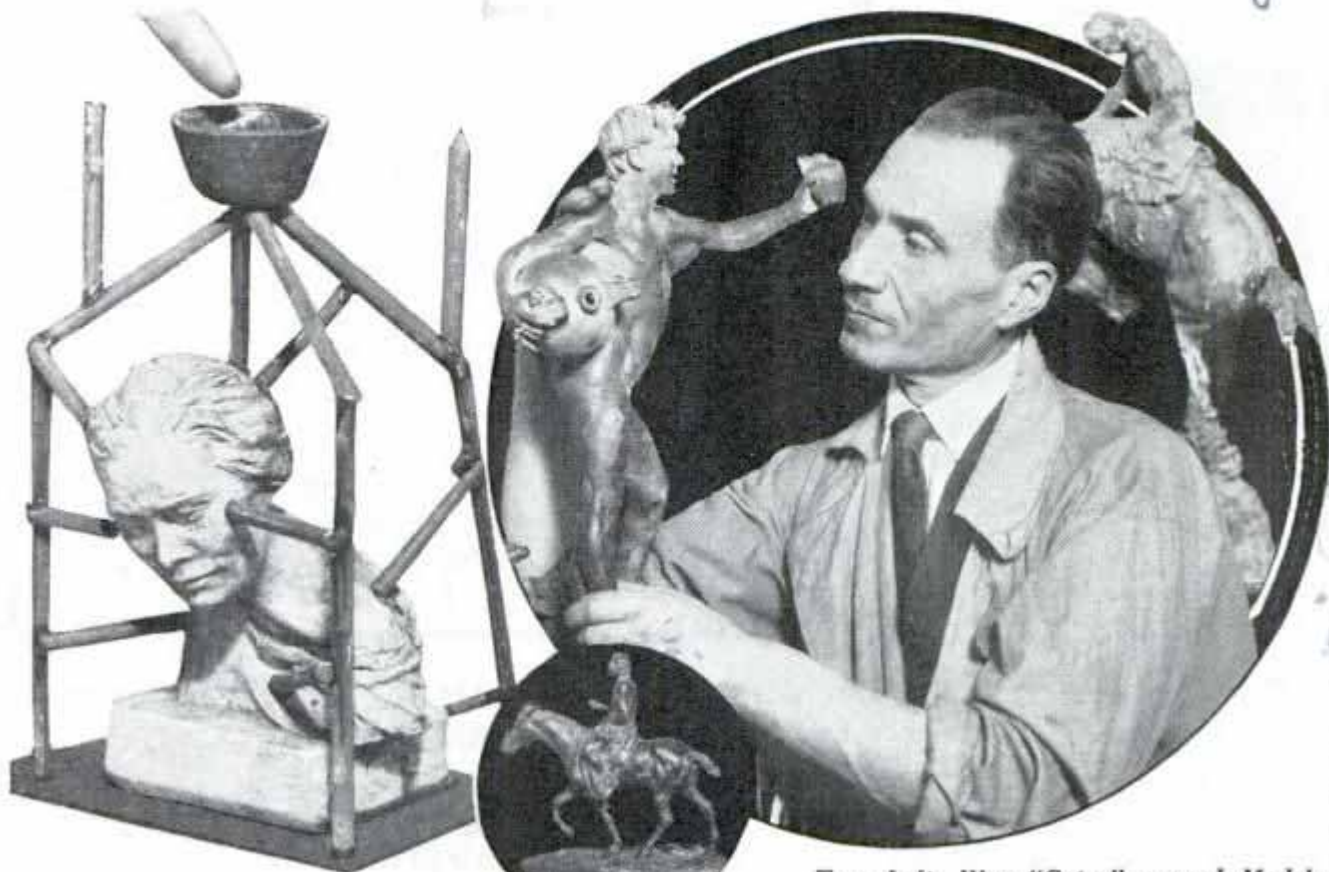
8740

8698

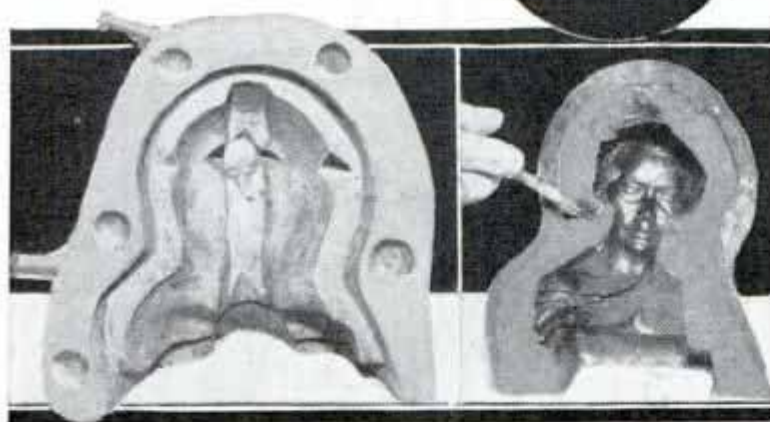
8739

\$1.25

Los Angeles, Calif.
 Secrets of Cellini's Bronze Art Are Revealed



Top, Left, Wax "Gates" around Model; Bronze Pours into Cup; Right, Sculptor Examines Figures; Bottom, Left, Plaster Shell; Right, Brushing Wax on Gelatin



Sculptures as delicate as a rose petal or the hair-like tendrils of a thistle can be poured in molten bronze by the "lost wax" method, secret for 400 years of the famous craftsman, Benvenuto Cellini, and his successors. Guido Nelli, Italian sculptor, has brought to America the artistic secret passed from father to son in the Roman family Nelli since the sixteenth century. First the sculptor's model is covered with molder's clay and the clay coated with a plaster layer or "shell." When dry, the shell is removed, the clay center destroyed and the shell replaced over the model. Liquid gelatin is poured into the space formerly filled with clay. When it is set, the

shell is again removed; the gelatin, with its exact impression, is pulled off the model and replaced inside the plaster shell to become the "negative." Warm wax is brushed over the gelatin, and this wax layer, faithfully reproducing the original model, becomes the exact thickness of the bronze in the finished statue. The core is filled with clay or similar material. Next, cylindrical bars or "gates" of wax are built around the model like scaffolding. Heat at the contact points holds them together. Over gates and all a heat-resistant plaster is laid and when baked in a kiln the wax gates and wax layer around the core are "lost" by melting. Fire-hardened core and plaster outer shell remain, the gates being empty channels through which molten bronze is poured, filling the space left by the melted wax impression and thus taking the shape of the original model. When the metal has cooled, the plaster cast is removed, the bronze gates filed off, and the statue is finished.

2213 Learmet. Los Angeles

Light "Piped" in Glass Rods for Decorating

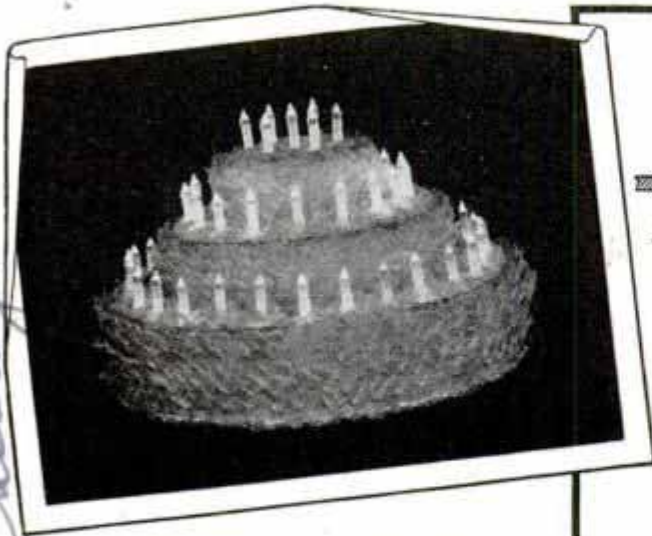
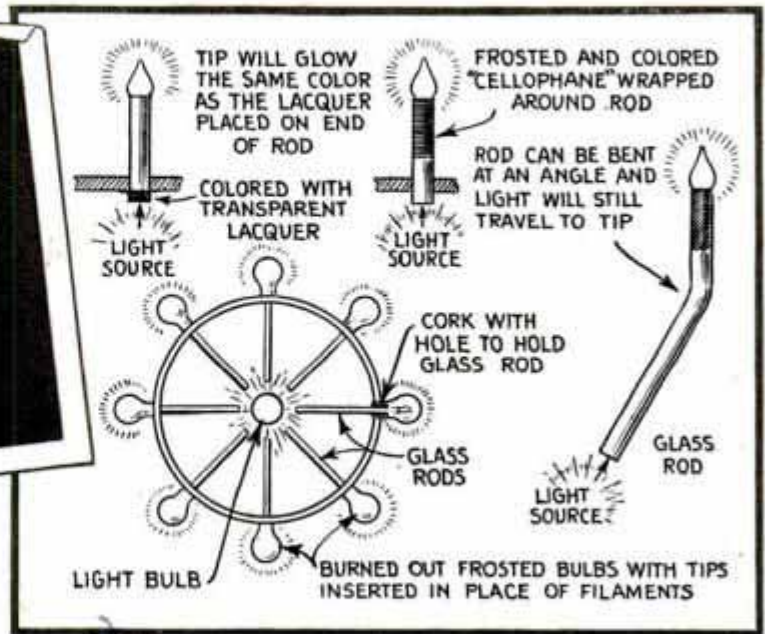


Diagram Showing How Light Is "Piped" through Glass Rods to Dummy Bulbs, and Decorative Cake Lighted by This Method

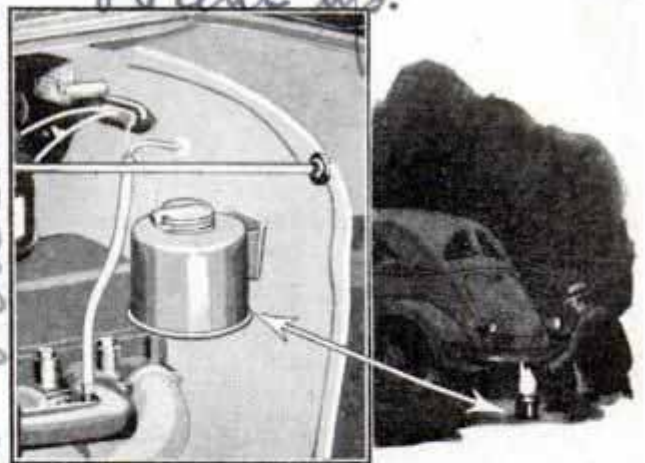


Cone-shaped glass rods instead of miniature electric-light bulbs are being used as an inexpensive method for lighting signs, exhibit maps and for decorative effects. The rods are cheaper to install than bulbs and are also less expensive to operate since there are no filaments to burn out. The source light for the rods is a regular light bulb placed behind them, its wattage being governed by the number of rods and the area to be lighted. The rods are made of clear, transparent glass, shaped at the light-distributing end so as to focus the light traveling from the source bulb at the opposite end. The rods can be bent without affecting the diffusion of light at the top, and for color effects the flat ends of the rods can be covered with transparent lacquer. If frosted, the rods will spread light at the sides and this light can be colored by wrapping the tubes with Cellophane. The distance the retracted light travels depends on the diameter of the glass and the wattage of the source light. As many as 100 burned-out frosted bulbs have been illuminated from one source light by inserting the glass tips in the bulbs in place of the filaments.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

HIGHWAY FLARE FOR MOTORIST WARNS OF STALLED CAR

Warning flares to be posted on the highway behind a stalled passenger automobile or truck at night are now available in the form of a compact unit mounted on a bracket underneath the hood. The motorist finds it equally useful on camping and fishing trips, as well as for illumination and traffic warning while changing tires



Left, Auto Flare Mounted on Bracket; Right, It Lights Repairs and Warns Highway Traffic

on the road. Its burner telescopes into the top, and need only be stepped on to put it out. The burner rises fully primed and is easily lighted. A screw cap prevents loss of fuel when the flare is not in use. It burns ten to twenty hours with one filling of fuel and stays lighted in a sixty-mile-an-hour wind.

*Ans John Frei, Jr. 2050
Carahue St. Chicago*

Arthes Force

Arthes Force

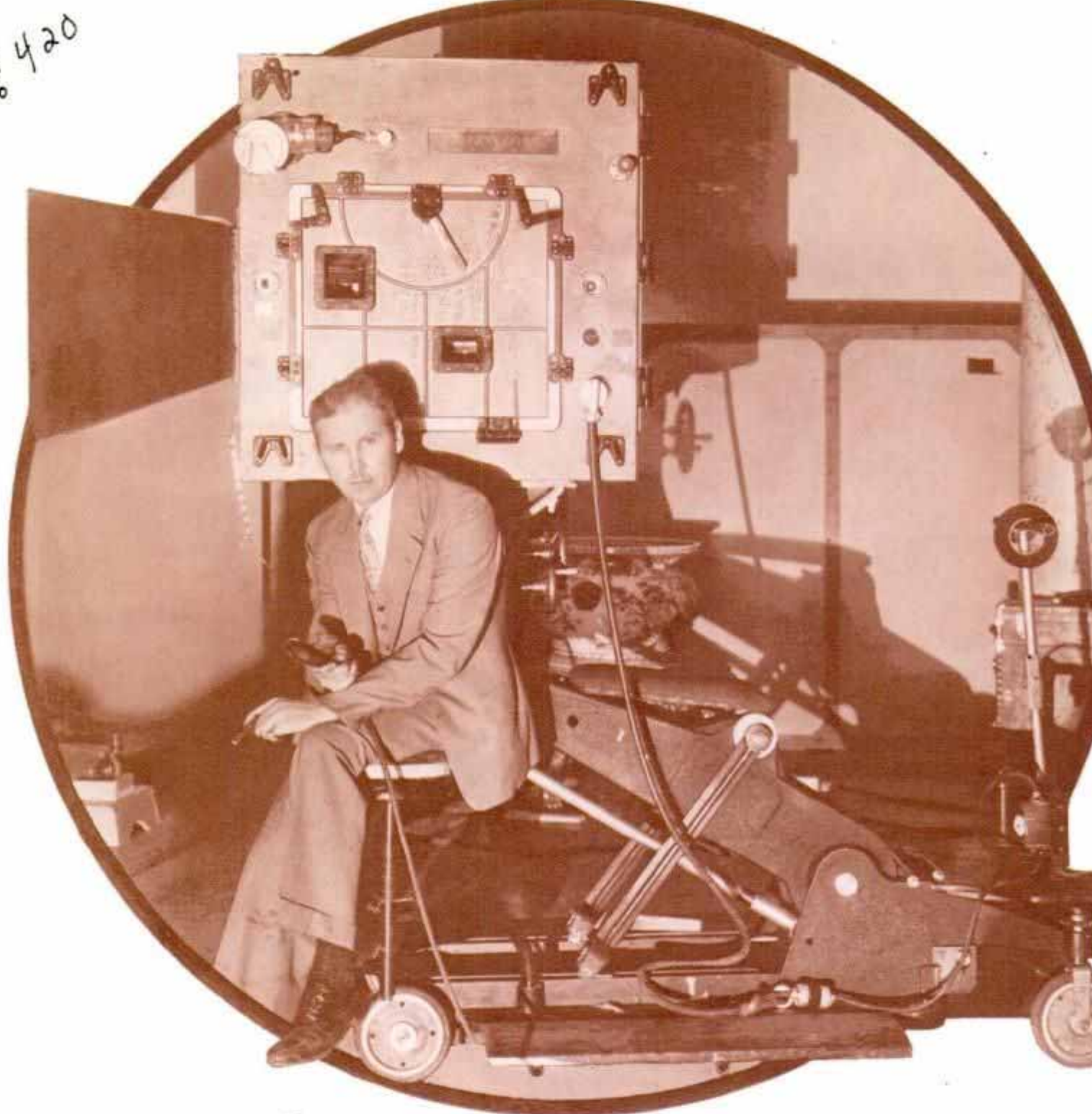


THIS Chinese street scene erected on a Hollywood back lot illustrates how the movies are able to duplicate any corner of the world right in their own studios.

What's New
in the
MOVIES

E 420
Part I
in
August

8420



ONE of the Technicolor cameras used by Radio Pictures and Ray Rannehan, the chief cameraman.

PART II

WE need a moonbeam along which a hundred fairies can dance out of sight into the heavens."

That was the amazing order Max Reinhardt sent to the technical department of Warner Brothers' studio when he was directing the movie, "A Midsummer Night's Dream."

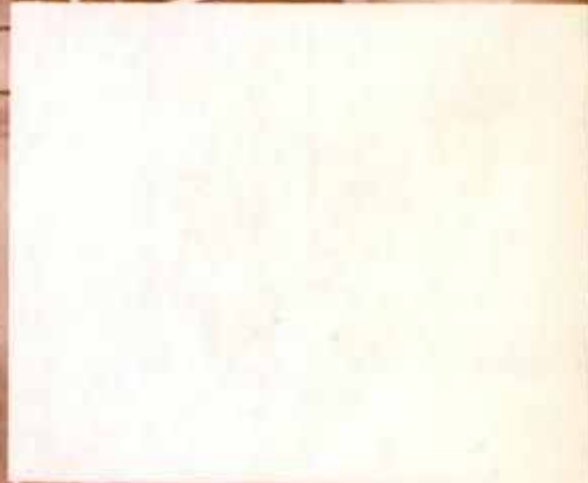
And the strange thing is that he got the moonbeam, a path of dazzling light, that weighed seven tons. It was woven

from 50,000 yards of Cellophane strands that reflected a million candlepower glow from batteries of lights and was strong enough to support the weight of 104 persons.

Not even the ingenuity of the technical experts could cope with the problem of having the fairies dancing among the twinkling stars, but the cameraman, Hal Mohr, was equal to the occasion. He obtained the effect by blowing artificial cobwebs on a frame, sprinkling it with tiny fragments of silver and then shooting through it.

8720

GRACE MOORE in a scene from her current Columbia production, "Love Me Forever," and an original and novel stage used in the production. The background rolls back to reveal a large stage behind it, as shown by the partly open section.



ANOTHER scene from Miss Moore's current film, "Love Me Forever," showing a section of the unusual stage which can be manipulated as indicated above.





A STAGE shot from the Warner Brothers' picture, "Midsummer Night's Dream," and the woodland scene from the same production. Note the fantastic masks. Left, cameraman spraying a screen through which he expects to shoot in order to obtain a special effect.



E420

Ninety per cent of the beauty seen on the motion-picture screen is artificial, created by the tools and brains of Hollywood's expert builders of stage settings and "props," equipment such as the seven-ton moonbeam. So perfect in every detail is the average set that few of the most experienced critics can tell whether an outside scene has been photographed a hundred miles from the studio or in the heart of a sound stage.

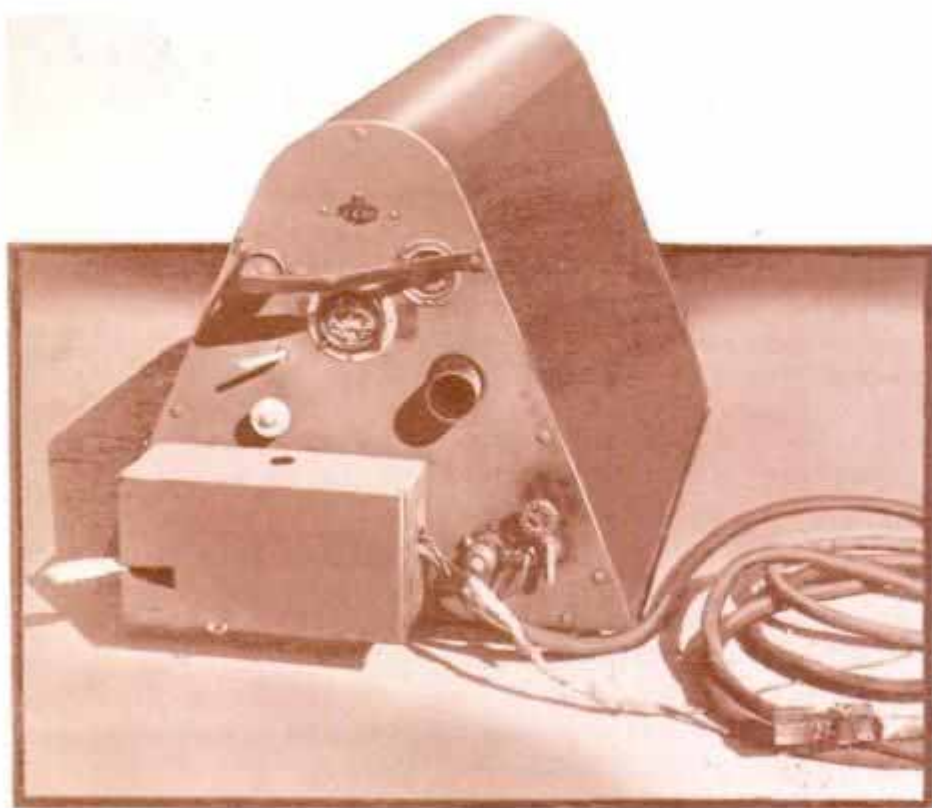
Under the deft touch of the man in overalls, an old whaling boat becomes a racy rum runner in one picture and a battleship in another; a rock-strewn vacant lot becomes a Moorish stronghold; a stage is turned into a rodeo, and the world is made to order between scenes.

And behind these builders, ranging from structural steel workers to silversmiths and miniature painters, are technicians plying sharp pencils to calculate the combined weight of one hundred fairies so that a moonbeam will not crumple in the midst of the big scene, or working out new miracles for the screen.

Movies' homemade locations, that bring the outdoors inside the studio, are not always optical illusions created by photographing through painted glass, but are actual steel and concrete structures. Take for instance, the \$75,000 waterfall set in "Footlight Parade," in which a giant hydraulic jack raised ninety-six girls on revolving platforms more than thirty feet up while myriad



STIPPLED screen in position for making a special effect shot for the Warner Brothers' First National production, "Midsummer Night's Dream."



THREE times three guesses would not be too many for you to take in trying to identify this piece of apparatus—and even then you probably wouldn't even come close. It is a fog-making machine which produces a nice mist whenever the script of a Warner Brothers' production calls for it.



A STAGE setting depicting a roof garden scene with a reproduction of a metropolitan skyline in the distance. Tiny electric signs flash among the silhouette buildings against the sky-drop background.

fountains gushed. It took 300 men, working day and night in shifts of seventy-five men each, five weeks to build this set. And when the scene had been photographed, the jack was dismantled and its component parts put back into the studio's stock room.

Instead of going on expensive "location" trips, the movies are moving indoors for several reasons: first, because of the inaccessibility of unusual locations; second, because of the loss of time in traveling; third, because of better lighting, since the sun not always can be depended upon when a picture that entails perhaps \$50,000 per day is being made; and fourth, because of better sound recording.

The microphone's uncanny knack of picking up foreign noises so common to outdoor locations costs studios literally

millions of dollars per year. So the studios would rather build their own "locations." One of them employs forty draftsmen whose job it is to draw plans for stage and lot sets, and 1,500 to 2,000 men to build and operate these sets. Included in this group are workers in practically every science, art and trade, from chemists and sculptors to iron workers and explosive specialists.

For certain sequences in "Flirtation Walk," there was a call for a convincing substitute for a beauty spot in Hawaii. The technical department took over the job and a color drawing was made. Next the director of the department did some close figuring, because the drawing called for an ocean, fishing, a swimming pool, huge rocks with ferns, a running stream, mountains with palm trees, islands, and the correct perspec-



MIRIAM HOPKINS rehearsing a scene from "Becky Sharp," an all-color picture, as the crew stands by, ready for the take.

tive for all. The set had to be made so that a hundred players could blend into the background, doing the things that Hawaiians would do.

After the drawing was scaled to size, it went to the model room, where it was reproduced in plaster paris, with every contour exact. The model then was cut into strips and the strips were built to set size in shops and on the stage. These sections were built of steel and lumber and reinforced with a two-inch layer of concrete, piped for plumbing, wired for electricity and built to withstand heavy traffic. No chances could be taken, for the lives of leading actors and actresses and of a hundred dancers and extra girls

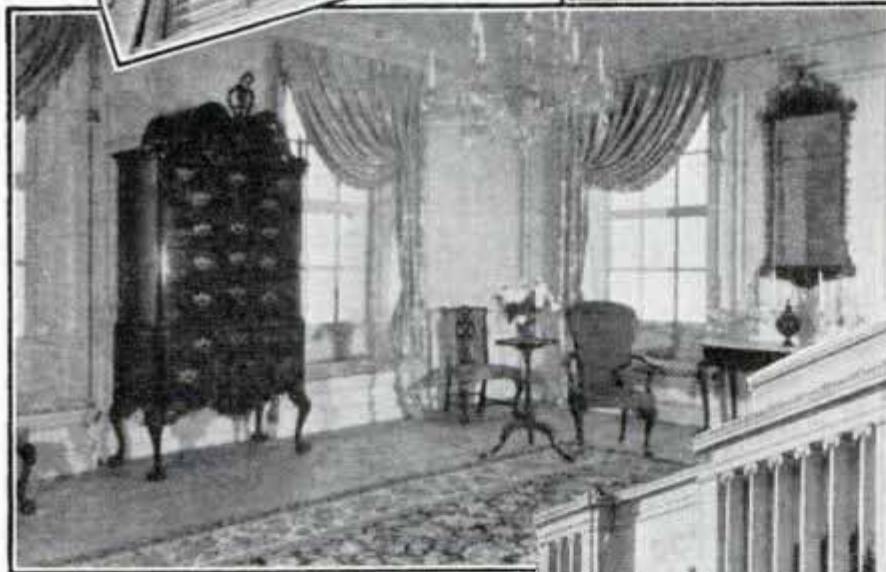
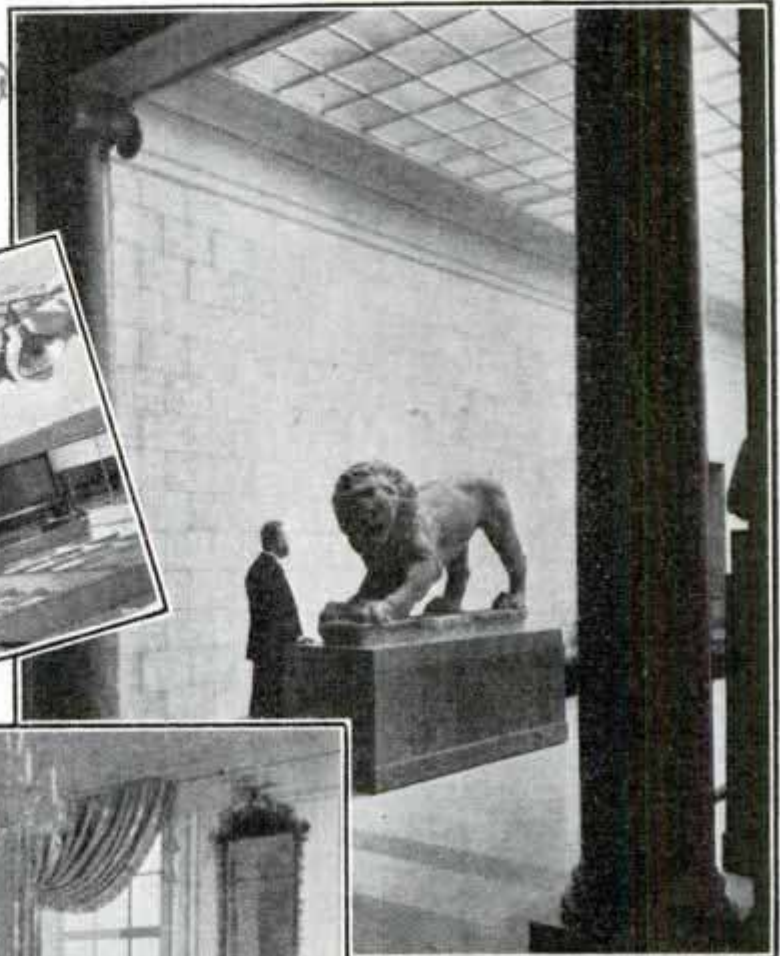
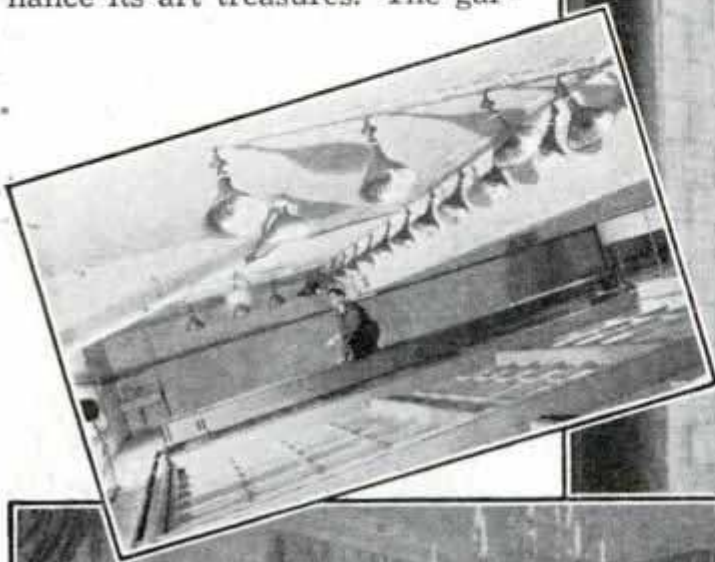
depended upon the structure's safety.

The cost was slightly more than \$13,000, for ocean, mountains and all effects, not one-third as expensive as one number in "Dames," where a huge turntable, ferris wheel and automatic stairway device was designed to carry eighty girls high over the heads of other players. This odd "prop" was operated by two electric motors through a battery of three automobile transmissions to give forty-two different speeds. It was built of structural steel, ten times the strength necessary.

Skydrops and silhouettes enable the industry to dispense with outside scenery. A (Continued to page 130A)

Artificial Lighting Enhances Exhibits of Art

On the theory that the museum or art gallery must compete with the theater, the William Rockhill Nelson gallery in Kansas City employs dramatic lighting effects and other aids to staging to enhance its art treasures. The gal-



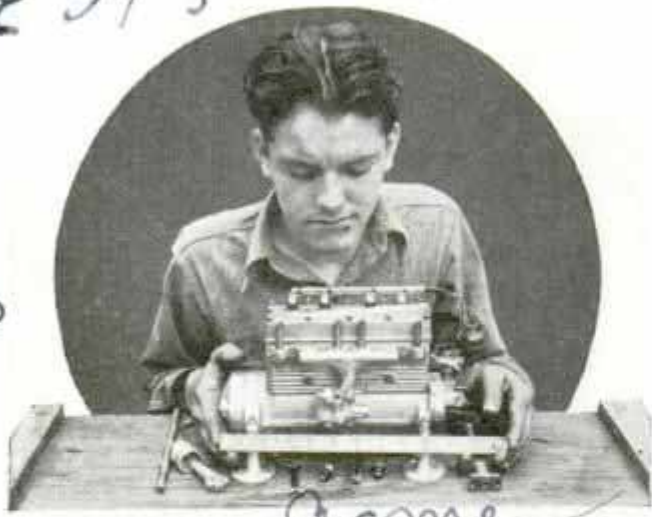
Kansas City Art Gallery and Some of Artificial Lighting Effects; Note Lights Set above Glass Ceiling



lery is artificially illuminated which not only provides just the proper degree of light for each exhibit but makes the institution independent of climatic and weather conditions. Neither does the artificial light have the fading and deteriorating effect on paintings, tapestries and other rare materials which natural daylight does. Uniform quality of illumination is obtained by using reflector equipment in an attic space above a glass ceiling. Period rooms requiring the effect of natural daylight are

illuminated by reflected light through false windows. Each week one particular piece is featured and it is displayed in a semi-darkened room by directing light on the picture or piece of sculpture in such a manner that spectators are aware neither of the source of the light nor the shaft of the beam. This is accomplished with the aid of a stereopticon machine with a metal slide placed in an alcove above the ceiling.

E 375



Builder Is Shown with Small Motor for Operating Midget Boat by Radio

YOUTH BUILDS TEN-INCH MOTOR FOR RADIO-CONTROLLED BOAT

Ten inches long and seven inches high, an aluminum motor was put together by a Venice, Calif., boy in his back-yard workshop. He used molds and castings to construct the tiny engine, spending a year at the task. It was designed for a thirty-nine inch motorboat controlled by radio.

Lathiel Morris Jr

E 724

BATHTUB ALARM BELL TELLS WHEN TO TURN OFF WATER

To warn you when the water in the bathtub has reached the proper level, a German manufacturer has devised an alarm bell which is equally useful to check the level of fluids in industrial tanks. A



chromed brass rod set on a tripod carries a floater with an adjustable sleeve, the upper end of which closes an electrical contact when the floater rises to the desired water level. It can be connected with a house bell line or operate a portable

alarm by battery. It is especially suitable for public baths and hotels, but is also of service in private homes and in factories.

Stoltenberg Leachy & Co
Inching & Lowe Home

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Husseldorf

GUN HIDDEN IN PALM OF HAND SHOOTS BETWEEN FINGERS

So small that it is easily concealed in the palm, an automatic pistol of radical design fires its bullet through a barrel between two fingers which pass through loops, similar to brass knuckles at the front of the weapon. The trigger is a bar pressed by the heel of the hand. Holes in the side allow gas from exploding shells to escape.



no information as to maker.

E 731

STUDENT PAPERS ARE GRADED BY WEIGHING ANSWERS

Examinations are actually graded by weight on a scale devised by Prof. Noel B. Cuff of Eastern Kentucky State Teachers College. The student is given two perforated answer cards with paper between. There are several choices of answer to each test question. The student punches a hole corresponding to the answer he believes correct. His answer card then is placed over the scales, beneath a group of small weights. Wherever a correct answer appears a weight falls through the card to the scale platter and correct answers are tallied by ounce. This method can check 75,000 questions an hour, save ninety-seven per cent of the time required by the old system of test correcting, and do it fifty to 120 times as accurately.

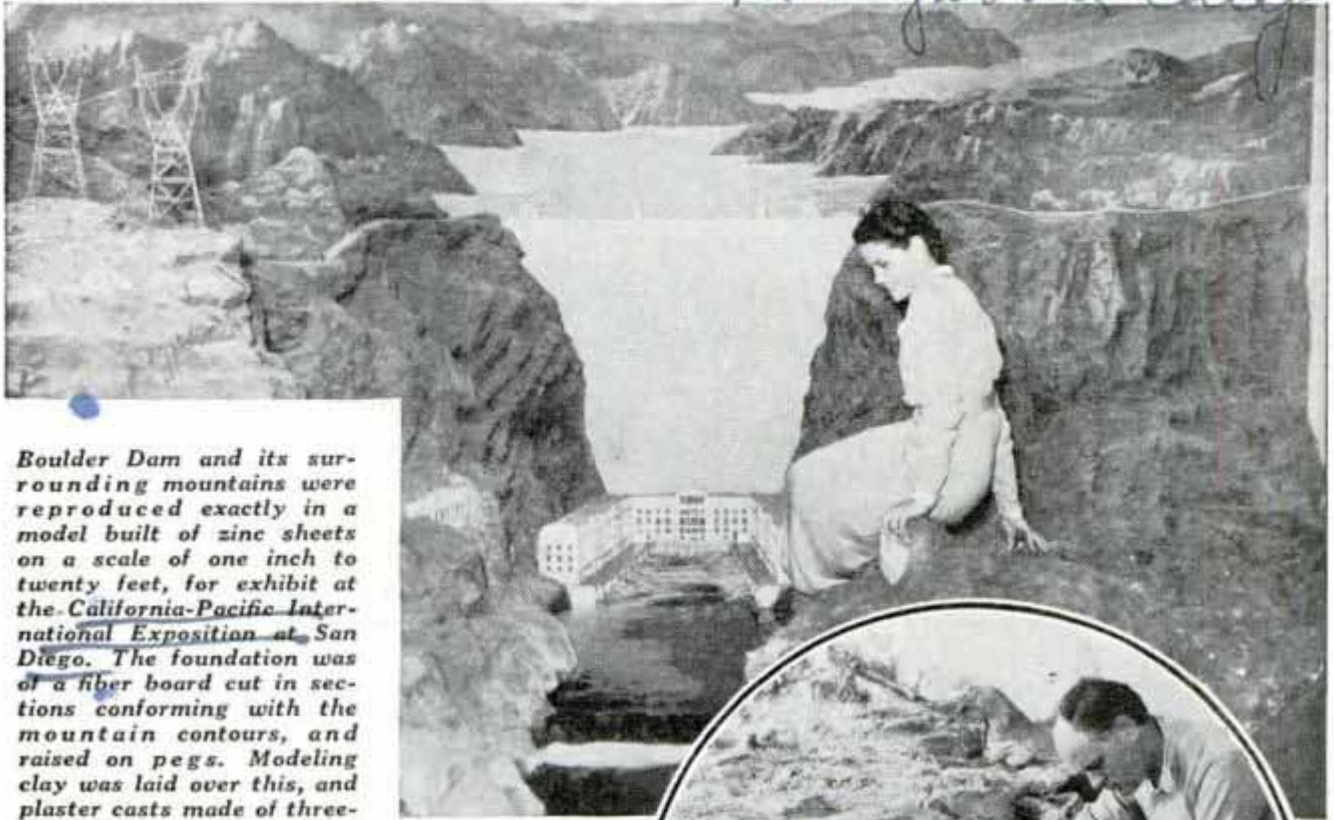


Weighing the Answers to Determine a Student's Grade on Examination

Richmond, Ky.

Boyle, 1924
 Witter Place
 Hollywood Calif

Zinc Model Shows Every Detail of Big Dam



Boulder Dam and its surrounding mountains were reproduced exactly in a model built of zinc sheets on a scale of one inch to twenty feet, for exhibit at the California-Pacific International Exposition at San Diego. The foundation was of a fiber board cut in sections conforming with the mountain contours, and raised on pegs. Modeling clay was laid over this, and plaster casts made of three-foot-square sections. Zinc was pounded into these molds, thus reproducing the contours in solid zinc, and then was soldered in place on the boards. Wire mesh covered the zinc, and cement and rocks were laid over this, following the contours exactly and tinted the color of Boulder Dam rocks. The artificial lake behind the dam holds 2,000 gallons of water which flows through the spillways. Eleven men spent six weeks building the model

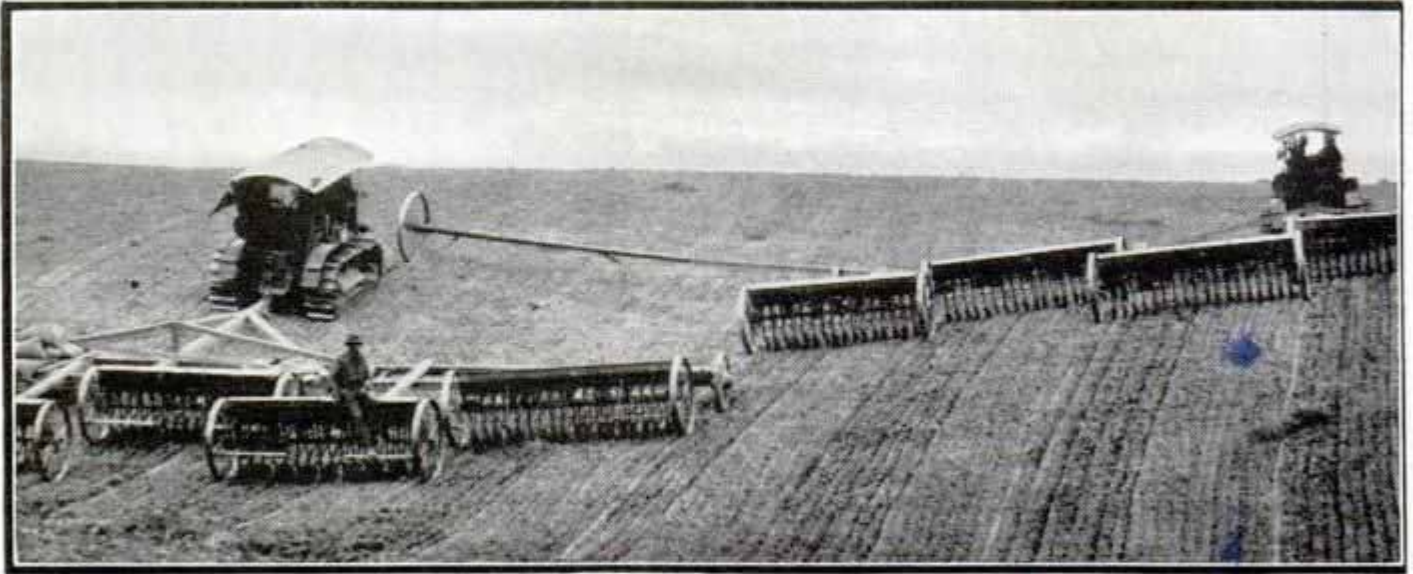


Boyle, 1924
 Witter Place
 Hollywood Calif

268

Sowing Wheat at a Rate of 250 Acres per Day without Any Undue Human Exertion

FARMING



By CHARLES MORROW WILSON

Route 1, Newfane, Vt.
AMERICA steps forward into a new age of mechanical farming.

Our newest and most spectacular step is the cotton picker, which can cover an acre in an hour at a cost of about ninety-eight cents, doing the work of about 100 pairs of deft hands and reducing costs of cotton harvest to about one-fifth its present level.

Eli Whitney's cotton gin changed cotton from a trivial garden crop to America's foremost export crop, giving new wealth

and employment to millions throughout the world. The harvester, logical successor to the mechanical gin, has come a century and a quarter later.

Eli Whitney, a Georgia schoolmaster, is said to have devised the principle of cotton ginning from watching the women-folks card wool, preparatory to spinning the fabric. John D. and Mack D. Rust, youthful Texans who have produced the new mechanical cotton picker, got the idea watching their old grandmother working her spinning wheel. After extensive picking tests, it is said that with mechanical

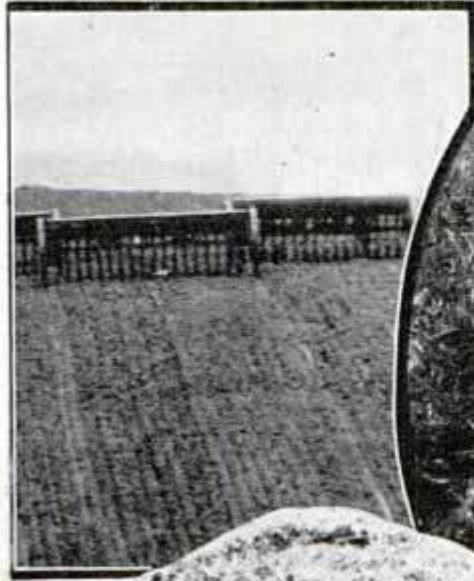


Left, Modern Orchard Tractor, Low-Built and Able to Go Wherever a Hoe Can Reach; Right, Rear View of Rust Cotton Picker at Work on a Louisiana Plantation

John D. and Mack Rust,

*Sluckmore also
- 20 Lloyd Mc Cray.*

By MAGIC



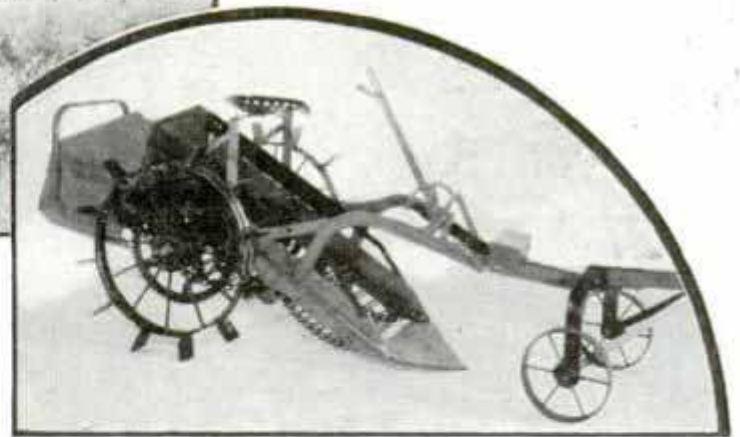
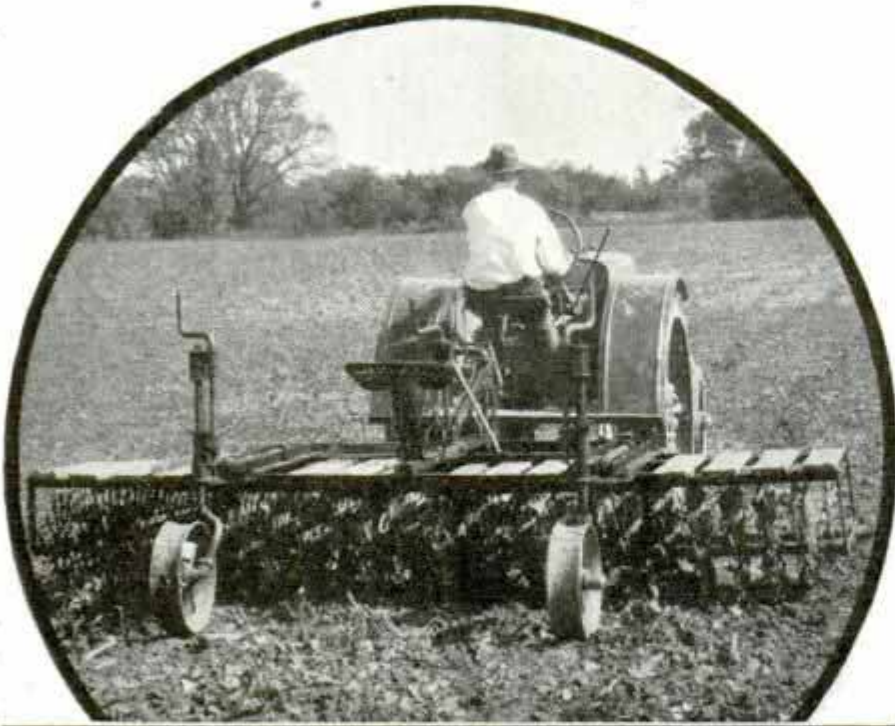
Planting Corn the Modern Way—Thirty Acres in a Seven-Hour Day and No Sore Feet

68
*Dr. Wm. Nelson M. Goldermani Commandant.
Veterans Home of California, Yreaville, Calif.*

*John Steer Co. Inc.
Moline, Ill.*
Corn Harvester Which Picks and Husks Hundreds of Bushels per Day, and a Modern Hay Loader

Being patented
harvest cotton can prove a profitable crop even at five cents a pound, whereas with hand-picking, profits are next to impossible at any price below ten cents.

This new triumph in mechanical farming continues to destroy the meaning of the word "acre," our standard measure of farm land and work. An acre is a plot of land containing 4,840 square yards or 43,560 square feet; about four times the size of an average residence lot. But originally an acre was the amount of land that



as tobacco, cabbage, tomato or pepper, sets them at evenly spaced intervals, covers the roots snugly with soil, waters them, and drops fertilizer to insure the plants good growth, all at one operation. This machine does the work of between forty and fifty men with superhuman accuracy.

Since the dawn of agriculture, men have planned to plow before they plant. But the newer machines do plowing and planting at a single operation, as in the case of the newly developed disk drill, wherein revolving steel disks pulverize the soil, and behind each disk, connected to a gravity-feed seed box above, is an automatic seed dropper. The weight of the disk drill is carried on two low-set wheels, and each

a man and two oxen could plow between dawn and dusk. Then horses came into use and King James of England decreed that the acre be described in feet and rods.

Even with horses, an acre stayed the practical measure of a good day's work on the farm. To plow an acre with a single plow ten inches wide a man must walk at least ten miles, and he needs a certain amount of time off for hitching and turning. But today there are types of plows with which one man can turn as many as 200 acres in one day. Such is the new magic of farming.

Probably the most widespread increase in farm mechanics at the present time is in planting. We have recently seen the arrival of the transplanter, which automatically takes any kind of young plants, such

Top, Rotary Hoe Which Weeds Forty-Five Acres per Day and Answers the Farm Boy's Prayers; Center, Harvest Combine Which Handles 2,000 Bushels of Grain per Day; Below, Automatic Potato Digger

wheel is geared to transmit power to the adjacent half of the thirty-foot line of disks. Six groups of eight disks each are controlled by separate lifting levers, by means of which the mechanism can be protected from rocks or stumps.

When drawn by a fast tractor the work capacity is from fifty to sixty-five acres a day. And for use in dust-storm areas, where plants, even seed, are literally



Top, Power Sheller Which Shells Two Tons of Corn in a Forenoon; Below, Power Hoist Saves Farmer's Back

blown out of the ground, there has been made a press drill with low-set metal wheels that follow each disk and pack the earth firmly over the seed. Where revolving steel disks are not well suited to breaking the soil, blunt plows or furrow-openers shaped like shoes are interchangeable. These plows are "spring-trip," that is, set on springs which yield whenever the point meets an obstruction; then having passed the root or rock, force the point back into place. Mechanical seeding is more economical than broadside sowing, and trials conducted by the department of agriculture indicate that mechanical drilling increases grain yields from three and one half to five bushels to the acre.

For corn, which is still the greatest of all American crops, the double-row "lister"

breaks soil and plants at a single operation. Drawn by four horses, a lister breaks the ground and plants the corn at the rate of about an acre an hour, and when tractor-drawn, the speed can be approximately doubled. Each of its two deep-set plows is followed by a pair of pulverizing disks and above each set of rotating disks is set a mechanical corn dropper, which is so placed that the corn seed has a short straight drop into the seed beds opened by the plows and covered by the rotating disks.

An efficient corn lister does the work of from eight to twelve plowmen. But the fastest coverage of land is possible by means of the flexible "pipe-bar" harrow. If tractor drawn, this device can prepare land for seeding at the rate of 200 acres a day.

Anyone who was raised on the farm is apt to remember the backaches and hand blisters that came of hoe wielding. Therefore he may find comfort in noting the new mechanical hoes, which can easily weed forty to eighty acres in a day, ruin all weed growth while the sun is shining, do the work of forty hoemen and replace mortal weariness with mechanical accuracy and speed. The mechanical hoe is truly the farm boy's dream come true.

(Continued to page 132A)

Hotel State
Stockton, Calif

Truck chassis
(done San Francisco Calif)
69 44



Locomotive Powered with a Gasoline Engine Hauling Cars of Grapes over Narrow-Gauge Railroad from Vineyards to Crushers in California

SMALL RAILROAD HAULS GRAPES FROM VINEYARD TO CRUSHERS

Grapes are hauled from the vineyards to crushers at Guasti, Calif. over a narrow-gauge railroad eighteen miles long which handles no other commodities. Originally a little steam locomotive was used for power but it has been replaced by a gasoline engine. The V-shaped dump cars tip their loads automatically.

8 172

GLASS KEEPS OUT HEAT OF SUN BUT LETS IN LIGHT

Plate glass has now been developed which lets seventy to seventy-five per cent of the sun's light pass through but absorbs much of its heat, transmitting less than forty-three per cent of the solar heat to the room. This glass also admits less than twenty-eight per cent of the infra-red rays and virtually stops the ultra-violet rays. This makes it valuable for school windows in warm regions where light without heat is needed. It is also useful for factory windows where heat is inconvenient or dangerous, and for plants and warehouses

Pittsburgh Plate Glass Co
Grant Coldy Pittsburgh Pa

where the sun's rays might bleach or otherwise harm textiles. It is not an insulating glass except in absorbing solar rays. The panes are one-fourth inch thick.

STROKE OF GOLFER IS ANALYZED BY RECORDER

Golf strokes can be analyzed accurately by employing an automatic recorder which shows on a dial the yardage a ball would have traveled with a corresponding stroke on the fairway and also indicates whether the player has hooked or sliced and the extent of the deflection. The recorder is a compact unit which fits into a small suitcase. A button operated by the foot resets the dial after each stroke and places the ball in position. Any type of club can be used. By adding a coin attachment, the analyzer can be employed in amusement parks.

8 743



This Automatic Recorder Analyzes Your Golf Stroke, Showing Yardage and Whether You Hooked or Sliced

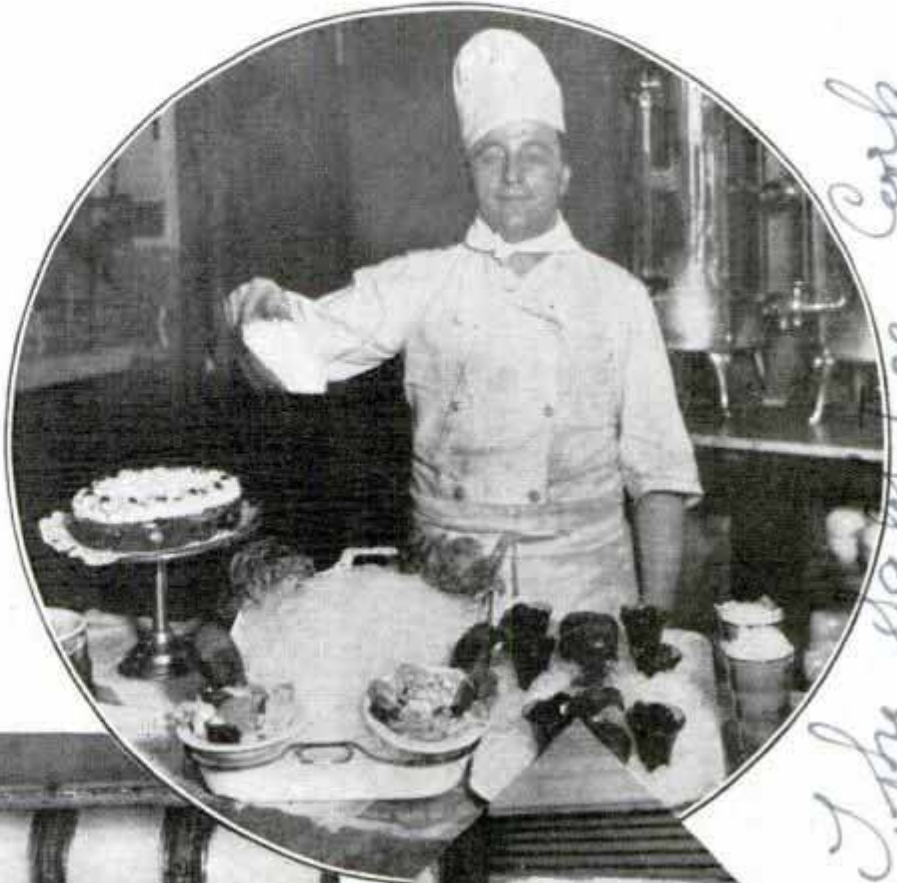
Golfometer

1/33 S Euclid Ave. Oak Park, Ill.

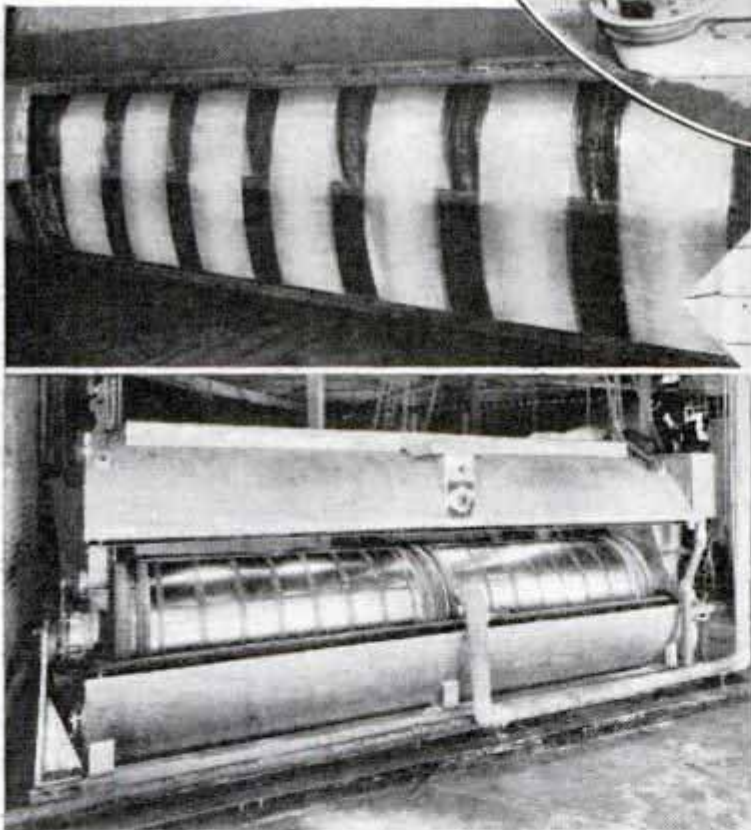
Dr. J. M. Schuck
303 N. East Ave. Oak

Colder Ice Made in Ribbons Is More Efficient

Colder and more efficient forms of ice in both flakes and blocks are the latest developments of refrigeration. The ice comes from the machine in a series of frosty white ribbons that are about one-eighth of an inch thick and which break into irregular wafers as they fall on metal trays. Ten degrees colder than ordinary ice, the flakes present no sharp points to injure delicate foodstuffs. One ton of flakes will do the work of about one and one-fourth tons of



*The Iceberg Ice Corp
The Flake Ice Corp
185 Montague*



Top, Using Ice Flakes; Center, Left, Ice in Ribbons and, Right, in Blocks; Bottom, Machine for Producing This Ice of Lower Temperature

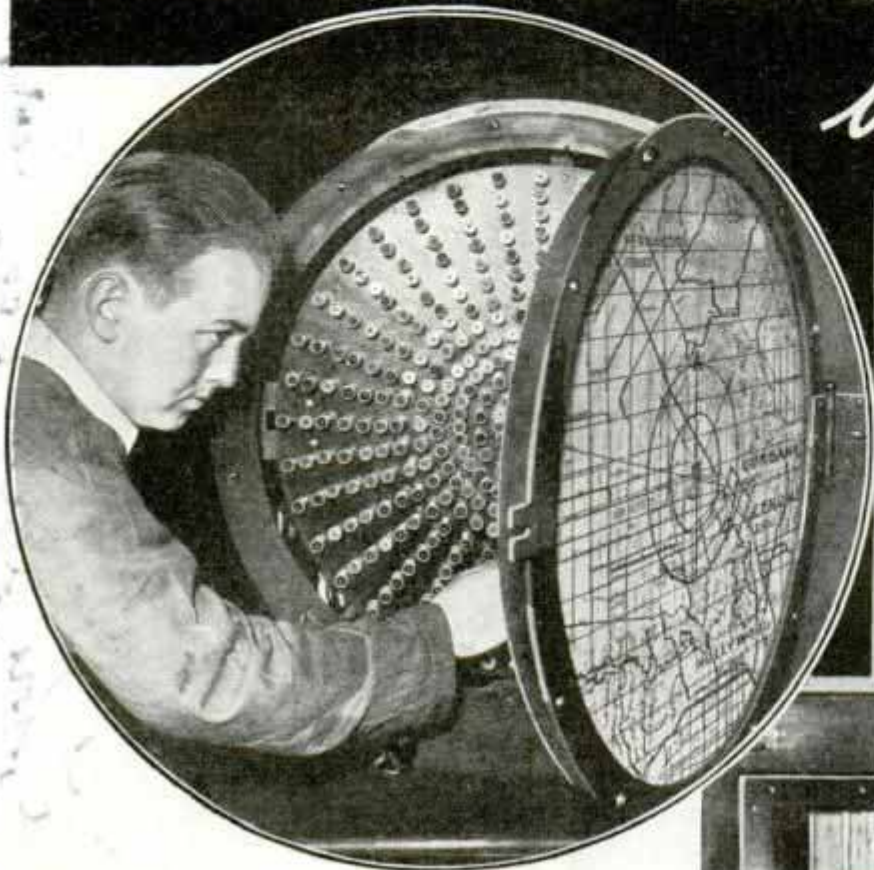
cracked ice. The same machines, with slight changes, will produce the new blocks, made from freezing twenty-three per cent sodium chloride and nearly seventy-seven per cent water, a brine. The solution is frozen into ribbons and then compressed into snow-white blocks that are intensely cold, having a melting point of six degrees below zero. The blocks, being so cold, are

not for using in beverages or food, but can be used in food cabinets, storage boxes, railroad cars and trucks engaged in moving large quantities of ice cream, milk, meats, fish and other perishables.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

8747
% United Air Lines
Union Air Terminal Los Angeles, Calif

MOVING LIGHTS *on* *in the*



Tiny Balls and Pin Points of Light behind the Squares of a Localized Airport Map

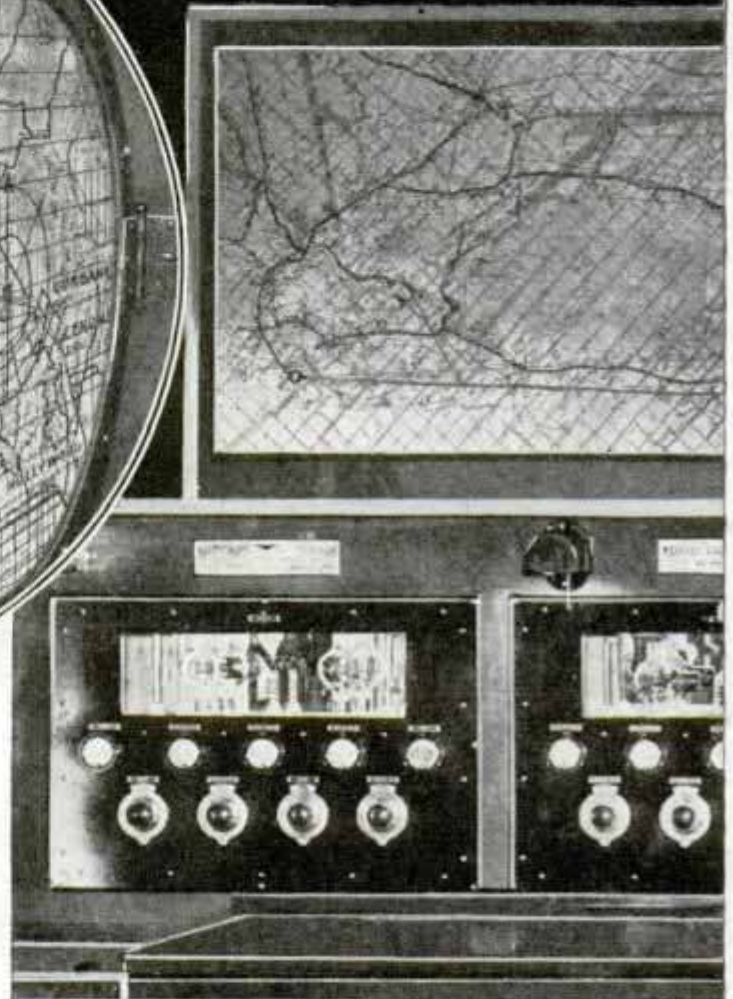
By DON BLACK

IF an air-line dispatcher could watch on a big map the progress and moment-by-moment position of every plane in a great coast-to-coast transport fleet speeding across the nation . . .

If naval officers on a similar map could spot the approach of submerged enemy submarines, could thus visualize the onrush of swift destroyers in heavy fog or of other surface craft in inky darkness . . .

If the high command in Washington could follow on another such map the progress of hostile air squadrons across the Atlantic or Pacific, know precisely the number of planes flying toward our shores and exactly where to intercept them with defense craft of overwhelming strength . . .

If such a magic mirror of the heavens were available, it requires no stretch of the imagination to perceive how vital such a facility would be to the safety of air transportation and to our national security. Such a prospect is by no means vision-



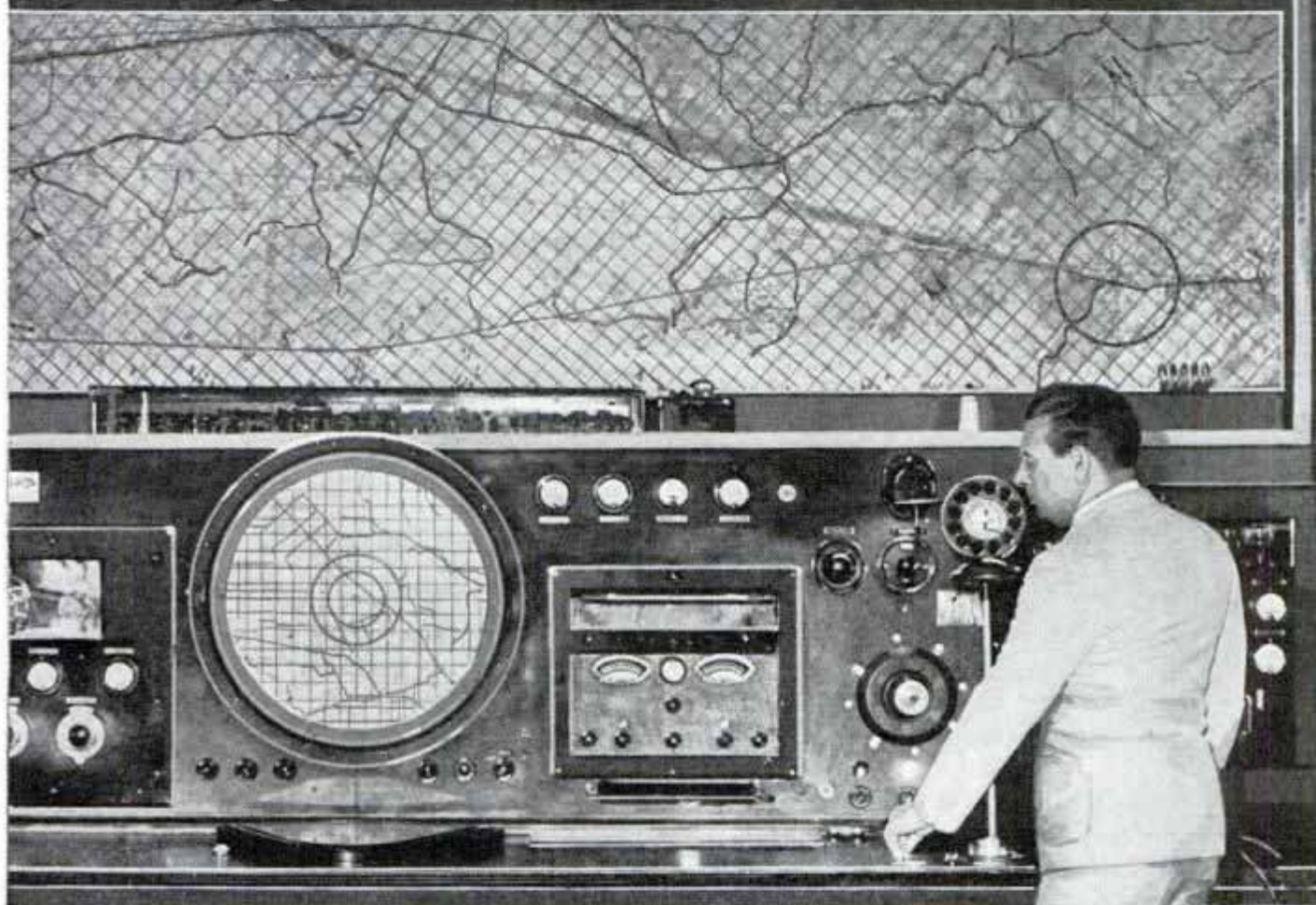
ary. It is a virtually accomplished fact if claims for a revolutionary new device are borne out by the striking success of initial experiments.

This instrument, known as the "Spitz flight recorder," is the invention of Dr. Samuel Spitz, retired navy commander, whose ocean sounding "marimeter" is now standard navigating equipment on navy and merchant marine vessels.

Dr. Spitz already has invested more than \$25,000 on his recorder, which has been developed at Union air terminal, Los Angeles. Here, for more than two years, the inventor and his assistants have been working out the practical application of sonic principles to the exact moment-by-moment location of speeding aircraft. In

Union Air
L. P. Burbank

Map **TRACE PLANES** *Sky*

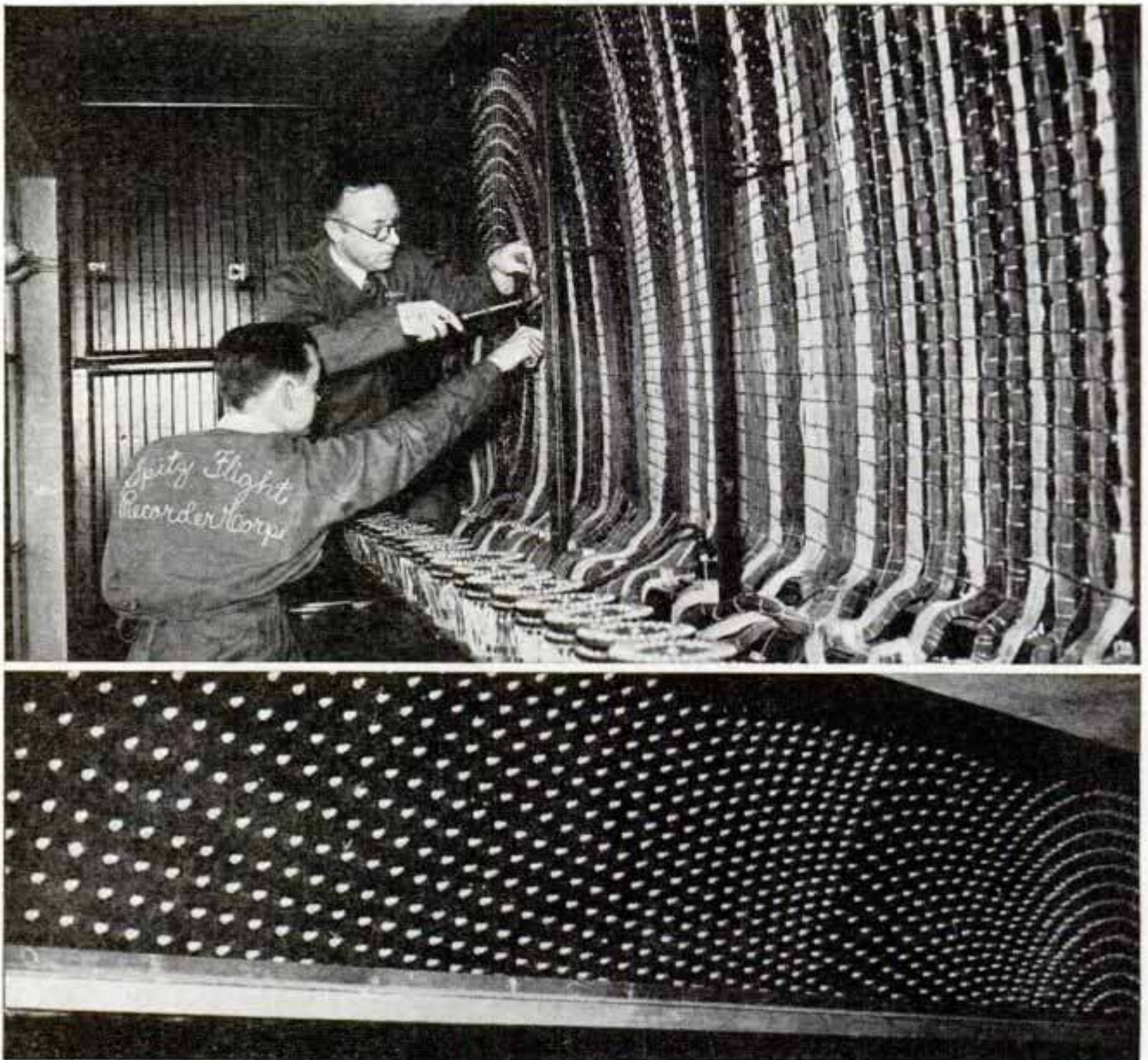


flight experiments conducted by Jim Kinney, of the department of commerce, Dr. Spitz and his operators were able to follow on a small localized map the progress of Kinney's plane flying at random over towns and landmarks miles distant.

In his determination of a plane's position, Dr. Spitz utilizes the sound of its propellers. Picked up by two small microphones, weighing less than five pounds, in the cockpit, these sound vibrations are relayed by the plane's regular radio telephone transmitter to ground stations. In the airline dispatch room they are converted into audible sound. During the process the sound vibrations operate an electrically controlled mechanism actuating an intricate system of tiny lights be-



Top, Spitz Flight Recorder with Inventor at Voice Transmitting Microphone; Below, Divergence Wave Meter Which Shows Distance of Radio Signal from the Flight Recorder's Location



Top, View behind Board of Flight Recorder, Showing Intricate Wiring System; Below, Airway Map Partly Lowered to Expose the Bulb Lighting System Back of It

hind a large-scale translucent map of the particular area in which the plane is flying. Thus on the experimental board of the Los Angeles-San Francisco commercial airway there are more than 3,000 lights and squares for the 335-mile route, each representing one square mile. The inventor says there is no limit to the number of craft whose movements may be recorded, but his present apparatus is equipped to handle sixty-three airplanes.

There are three unique instruments around which the apparatus is centered. One is an automatic tuning device which is integrally a part of the ground station short-wave receiver which converts the propeller vibrations into audible sound. Another is the "binural indicator," whose function is to determine accurately the di-

rection from which the plane's signals are coming. While of the same basic principles as a department of commerce radio beacon, the binural indicator embodies some notable advances over the familiar "beam."

Most extraordinary of all is what Dr. Spitz designates as a "divergence wave meter" which fixes distance away of the emanating plane signal, a hitherto unknown quantity. Here the inventor has applied the principle that spherical waves of sound diverge radially from the source of origin.

"Suppose," explains the scientist, "a transport plane leaves Los Angeles for Salt Lake City, Cheyenne, Omaha, Chicago. Its progress across the Mojave desert, over Boulder dam and alongside the towering Wasatch mountains would be recorded

mile by mile by the lights behind each square of our map and at all times under the watchful eye of the airline dispatcher.

"Let us assume that the weather is thick, that clouds obscure the ground, that the mountain peaks are fog-shrouded. Flying by instrument alone the pilot gets slightly off course. This divergence would be noted instantly by the ground operators at both the point of dispatch and at Salt Lake City, the immediate destination. One or both promptly would notify the pilot by radio telephone. They might

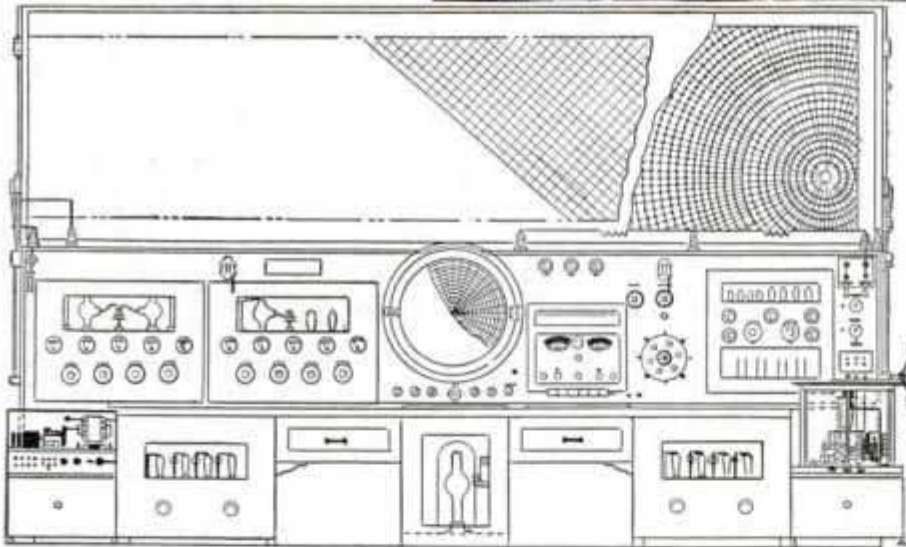


Diagram of Recorder and Part of Wiring System to 3,000 Lights behind a Five by Twenty-Foot Map of the Los Angeles-San Francisco Airway

also warn him that unless this course was corrected and unless he was flying at an altitude of 10,000 feet a dangerous peak of known height loomed in his path.

"Again, suppose conditions are clear and unlimited but that motor trouble makes it advisable for the pilot to land where there is no ground communication. Assuming furthermore that the plane's radio equipment is inoperative, and you have an emergency in which the flight recorder renders exceptional service. When the plane stops, so does its light which remains lit and stationary on the map board. Thus the dispatcher knows to within a square

mile exactly where to send his relief plane."

Dr. Spitz's plane dispatcher can direct aircraft to an airport in bad weather by simply switching his instrument to a supplementary map showing the immediately contiguous area on a scale of feet instead of miles.

Instead of attempting to inform the pilot by telephone after listening to the overhead motors, the dispatcher merely reports to the pilot that his plane

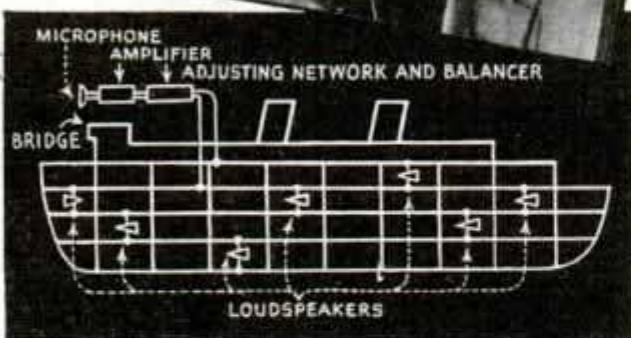
is in "Square 16" or some other equally definite sector on the localized map. By reference to a similar map in his cockpit, the pilot knows exactly where he is at any moment.

Although Dr. Spitz has not divulged how his instrument may be adapted to the location of enemy planes and seacraft approaching our shores, he claims it is as practical a further development as the successfully demonstrated flight recorder. He has already developed a sound-receiving apparatus to pick up sonic vibrations from planes thousands of miles away and record them in map positions.

"Talking Ship" Uses Radio Instead of Wires

3741-83rd St.
Jackson Heights New York City

17 Battery Place New York
Cmdr Mr Francis L. Satterlee



Top, Lifeboat Drill Is Carried Out under Directions from Bridge by Loudspeakers, Simulating Conditions of Emergency; in Circle, Passenger Adjusts Life Belt with Steward's Aid While Listening to Instructions from Captain over Loudspeaker in Stateroom; Left, First Officer Peter Stolt of S.S. "Pastores" Calls Commands into Portable Microphone on Bridge as Loudspeaker Brings Him Messages from Engine Room; Diagram Shows Circuit of "Talking Ship"

Use of the ship's hull as a circuit to carry the voice of the captain from the bridge to passengers and crew by means of loudspeakers is the latest development in communication at sea. The method was successfully demonstrated on the steamers "Colombia" and "Pastores" of the Colombian line. Turning a switch and talking into a portable microphone, the captain

sent his voice over the steel hull to loudspeakers located in engine room, staterooms, steering-control room, lifeboat deck and other posts throughout the vessel. Another switch allows him to speak over ordinary cables to the crew if he wishes to cut out the passenger cabins. With the entire hull as circuit there would be no breaking of communication in case of collision. If the ship's current fails, storage batteries are automatically connected. The loudspeaker in the engine room acts as microphone for the crew in addressing the captain on the bridge.

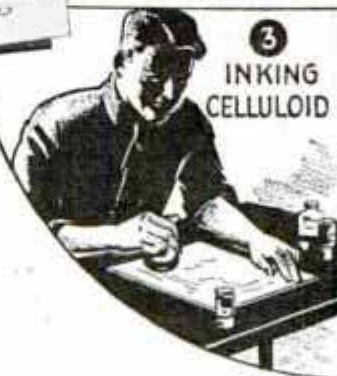
Schwabacher. Free
776 Broadway

FINE ETCHINGS

Easy with Celluloid Plates

ANYONE can easily create fine etchings with a little training by following the methods used by June Constable, great niece of John Constable, the famous English artist. Called neography, the new method can be used for producing striking bookplates, greeting cards, or wall hangings.

The process is virtually the same as in etching on copper, except that transparent celluloid is used. This allows a beginner to lay the celluloid sheet directly over a snapshot, pencil sketch, or illustration and cut a lifelike tracing directly into the material.



Later the student may rough in only the major outlines and use his creative ability in filling in details. Simplified tools that include a special etching knife and a needle-like dry point are used. Several tools and steps in ordinary etching are eliminated although a number of effects not available in

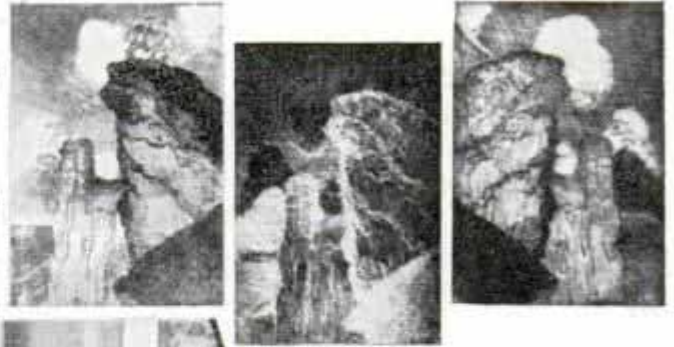
Inking the Thin Celluloid Plate before Transferring Impression to Paper, a Landscape Etching Made in Less Than Two Hours, and the Four Simple Steps in the Process

Los Angeles
735 Market St.
San Francisco
June Constable
844 S Westlake
Los Angeles, Calif.

Pres. J. Weber, Co. Inc. 1220 Buttonwood, Phila



only cost
we hope of



Above, in Finished Proof, the Artist Has Eliminated the Figures on Original



Etching of Dog Traced Directly from Snapshot, Desert Scene Reproduced from Pencil Sketch, and Placing Damp-Proof Paper over Inked Plate, Preparatory to Running through Etcher's Press in Making Celluloid Etching

copper etching may be obtained.

Ink is wiped into the lines of the finished celluloid plate and the plate is then covered with dampened paper and is run through a small etcher's press, which transfers the ink from the plate to the paper. In lieu of a special press, fairly good impressions can be obtained by using a clothes wringer equipped with hard rollers. Although regular grades of etching paper produce the best results, good prints can be obtained on silk, canvas, and even heavy wrapping paper. As many proofs can be pulled as with copper plates, it is claimed.

Sharp, distinct lines or soft, lithographic effects may be produced at will and aquatinting and mezzo-tinting are greatly simplified by the process. As many colors as desired may be applied directly to parts of

the plate at the same time for color etchings instead of reprinting for each color as is necessary in ordinary etching work.

SCHOOLS OF FISH ARE LOCATED WITH ECHO RECORDER

Echo-recording apparatus, such as ships use in making soundings of depth, can also be employed in locating schools of fish for commercial purposes. A

Norwegian fisheries scientist observed that sound waves sent from a ship's bottom were reflected from the backs of fishes in large schools just as the echoes bounced back from the rock or mud bottom. It is expected that information of this kind will be of importance in conservation work.

Oscar Sund science & service 6/28/35

Illuminated Map Covers Round Glass Room

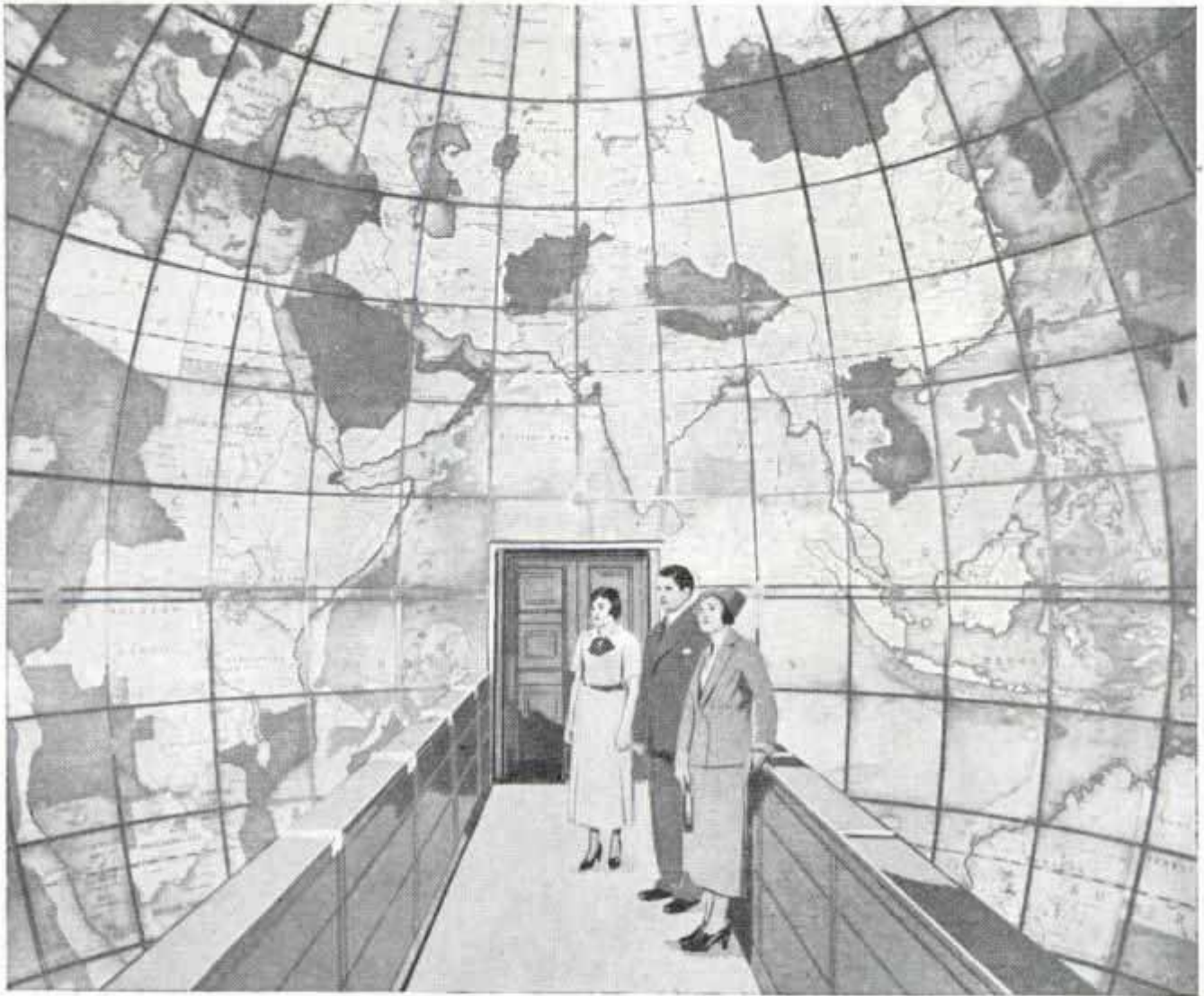


Photo Courtesy Christian Science Monitor

Six Hundred Sections of Glass Curved to Form a Huge Globe Make Up This Map of the World; Light Shining through from Outside Throws Land and Sea Areas into Bold Color Contrasts

Thirty feet in diameter and built to a scale of one inch to twenty-two statute miles, an illuminated spherical room permits the visitor to view the map of the earth from the inside. The room is covered with more than 600 sections of glass cast in proper contours, painted in correct colors and fitted into the bronze frame, the sections of which comprise latitude and longitudinal lines representing ten-degree intervals. The curvature of the globe corresponds to that of the earth. Illumination coming from outside the globe produces a surprising effect of glowing colors, with each country, each body of water and other features of the earth's surface sharply defined. The visitor stands on a narrow strip of carpet that protects the glass "runway" in the room, with the north polar star shining directly overhead and

the Weddell Sea and the Antarctic region some twelve feet beneath the runway. Painted instructions, occupying the ocean spaces, tell the story of the room, called the "mapparium." Clocks on the equator show the time around the world. The illuminated map is a feature of the Christian Science Publishing House in Boston.

BODY OF MAN HOLDS LESS IRON THAN WEIGHT OF A NICKEL

You need only three thousandths of an ounce of iron in your daily diet to maintain the body supply of that element. Dr. Walter A. Bloedorn, professor of medicine at George Washington University, estimates the iron in the human body would make a slug weighing a little less than a five-cent piece.

*Science Service
6/19/35
Washington*

2222

Sherman Ave
Evanston, Ill

FIGHTING FIRES



Allen Hotel, Michigan

AN exciting job combining the thrills of a fireman's life and those of a news cameraman has been developed by S. H. McElroy, of Chicago, out of a hobby.

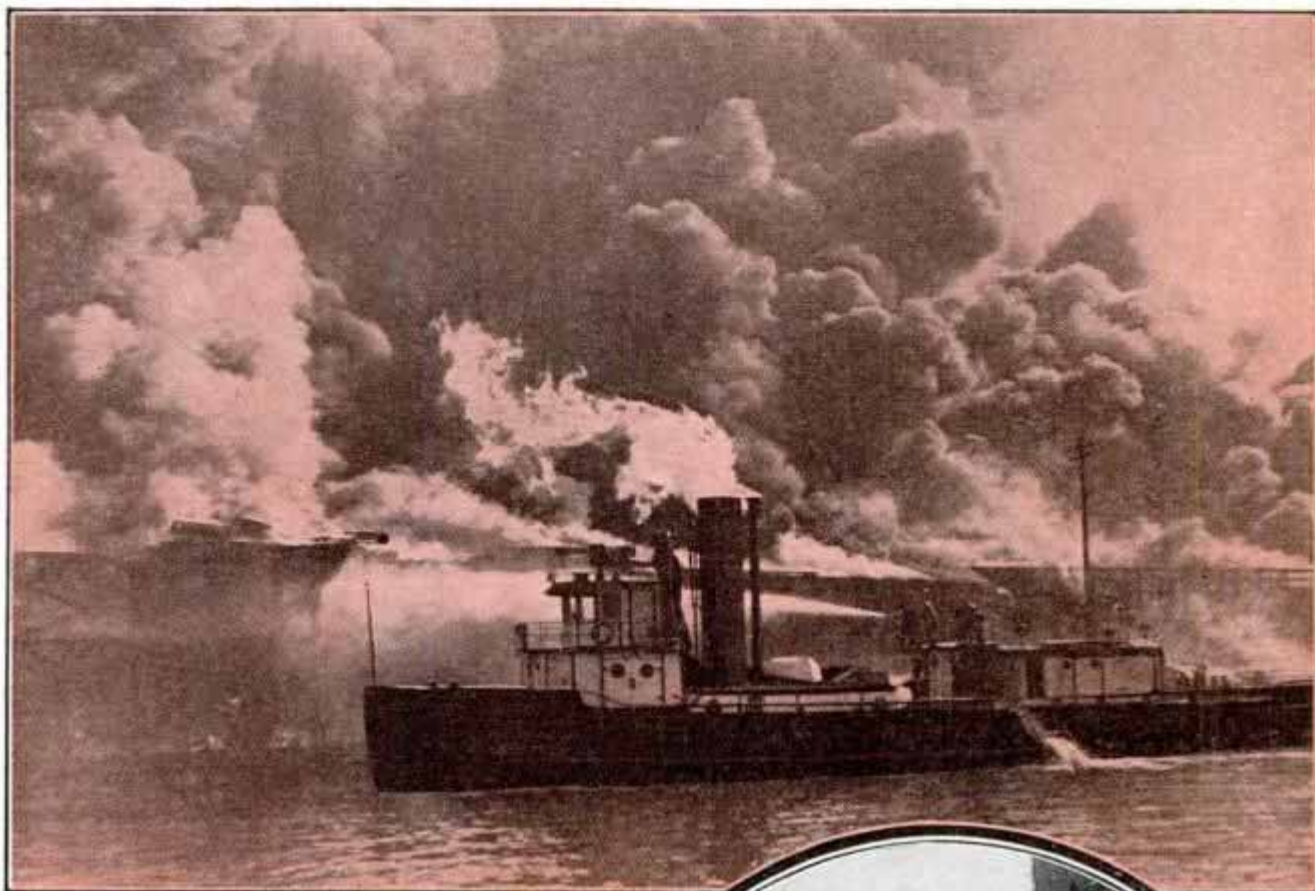
He is engaged in the hazardous task of taking pictures of fires for use in educating the public in their prevention, and for the settlement of insurance claims involving litigation.

A few years ago, this Chicago radio engineer was just a fire fan. Even in the middle of the night the sound of sirens and bells would send him flying into his clothes and out of the house in mad pursuit. There was too much lost motion in this system,



Above, Firemen Battling a Difficult Blaze; Below, Fire Photographer Making Picture of a Factory Blaze from the Rear of the Fire Truck in the Center of the Photograph

with PHOTOGRAPHS



however. Frequently, the sirens and bells would be out of hearing before he could give chase. He decided to improve on his hit-and-miss method of attending fires. He struck up an acquaintance with the men in the fire-alarm office and they obligingly telephoned him whenever the report of a promising fire was received.

But still he wasn't satisfied. The views of fires from police lines were often hardly worth the bother of coming. And it rankled him to see newspaper photographers and reporters nodding their way past the sentries. So he decided to take pictures too. At the next big fire, McElroy brought along a regulation size news camera and used it to brush his way past the policemen. He snapped a few pictures to give his "act" the authentic touch. When developed they turned out so well he decided to make



Fire Boat Fighting a Railway Yards Blaze; Below, S. H. McElroy, the Fire Photographer, in His Office

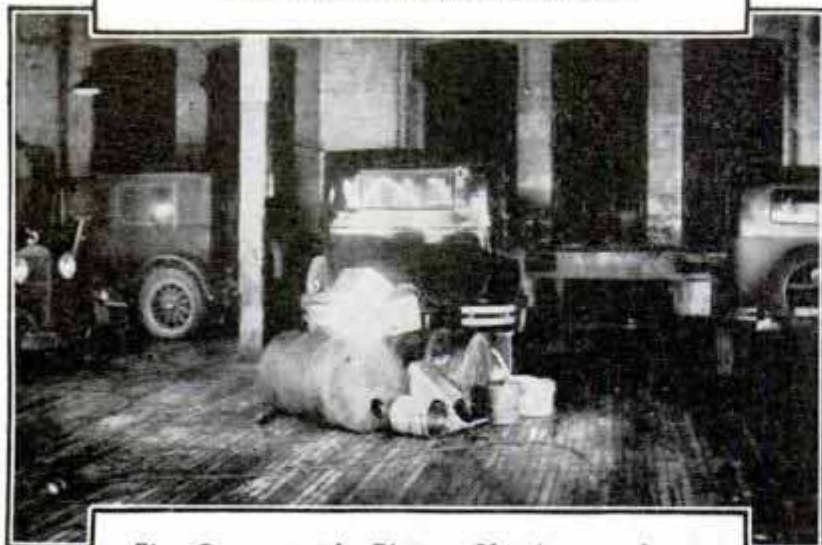
more. After a year's experience in picture-taking coupled with an intensive study of fires, camera angles and lighting, McElroy became very proficient. Most of the prints he gave away to admiring firemen and



This Picture, Which Brought Out the Force of an Explosion in a Restaurant, Aided in Sending Two Fire Plotters to Prison; the Third Man, Who Set Off the Blaze, Lost His Life



Note the Evenly Burned Walls Indicating They Had Been Sprayed with Some Combustible Liquid; the Man Who Started the Fire Confessed after This Picture Was Presented



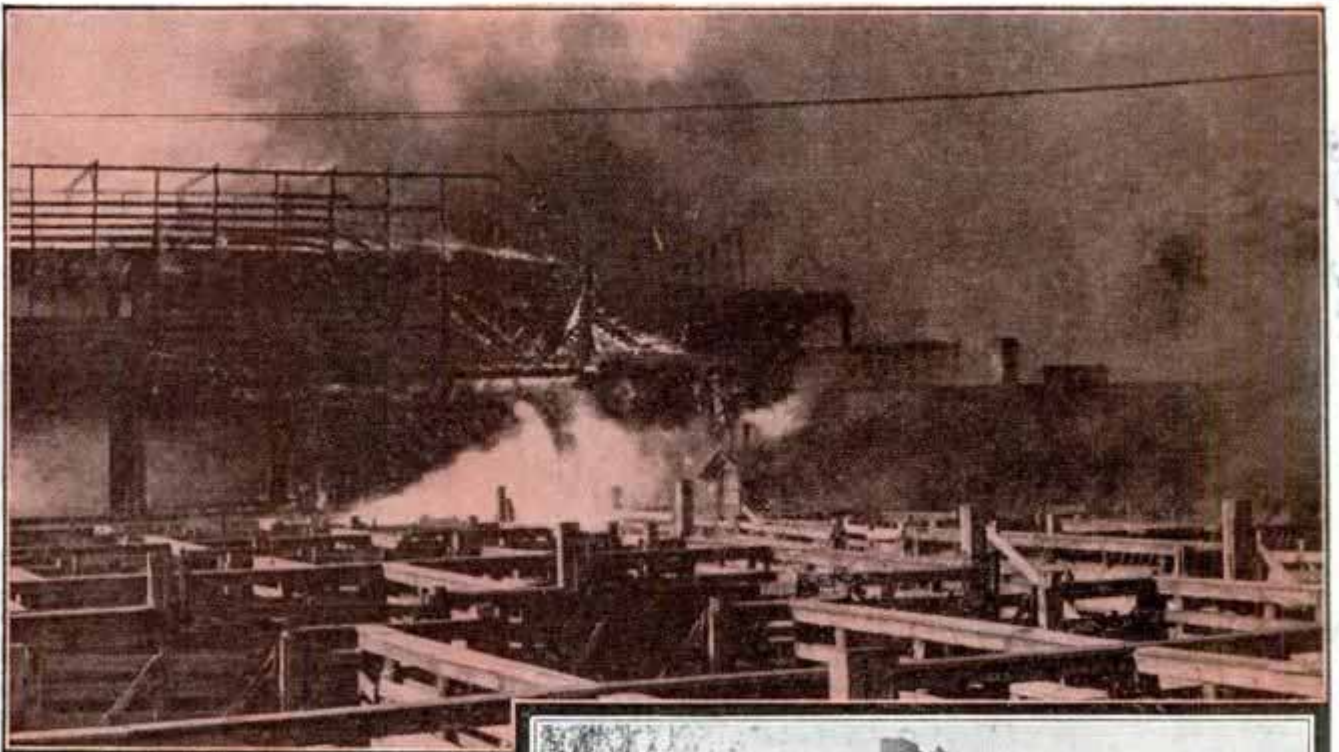
Fire Cameraman's Picture Showing an Arson Plot Nipped in the Bud; the Wind from an Open Door Extinguished a Fuse after the Plotters Left the Gasoline-Soaked Premises

friends, until one day an insurance company inquired about some pictures he had made. When he sent the company the pictures, it forwarded a substantial check. When several other insurance companies made requests for other pictures, the commercial possibilities of his hobby dawned on him.

Now it's no longer a hobby with him. In addition to pictures for fire-prevention purposes, McElroy photographs thousands for risk firms. He has large files of fire pictures with which he services the adjustment companies representing insurance companies. His negatives are so important they must be stored in a fireproof vault and his dark-room and studio equipment could pass for those of a metropolitan newspaper.

His photographic tools are the finest that can be obtained. For detail pictures, he uses an eight by ten view camera and a news camera for fast action stuff. He has a wide variety of lenses, filters, and infra-red plates, the latter being used when there is a small amount of smoke or fog hovering about the scene. In making pictures where time is not an important consideration, he uses his 500 feet of cable and floodlight equipment.

His studio in his apartment is equipped with the regular fire-alarm apparatus found in engine houses. He receives a record of every alarm turned in, either by telephone or at the boxes. At night, the alarm system is wired to an apparatus in his bedroom so a gong is struck from one to five times, depending on the type of alarm sent in. Just like a fire chief, he drives a special red roadster with siren going when on official busi-



ness. McElroy has learned to take pictures that will carry weight in fighting a dishonest fire claim. Of course, arson cannot be proved by photographs but they can be of great assistance. One authentic picture of a suspicious fire can give a jury a better idea of it than an hour's description by a lawyer. In several cases, dishonest persons either have been exposed or have confessed when their alibis were discredited by pictures made right after the fire was out, or before.

His pictures aided in bringing to light a several million dollar arson ring in Chicago. One woman fainted on the stand when photographic evidence was adduced to show the fire in her apartment was of incendiary origin.

How can a picture aid in fighting a dishonest claim? There are many ways. For example, the photographer recently attended a fire in an elaborately furnished apartment. When the chief asked for an investigation by the fire attorney, McElroy considered this sufficient cause to make pictures of the apartment for the adjustment company. He noticed walls and woodwork were evenly burned, so he made a shot of each wall. As a result, the claim was not paid because the pictures



*Above, Originating Point of Disastrous Chicago Stockyards Fire;
Below, House Wrecked by Gasoline Explosion*

helped to prove the fire to be the handiwork of an incendiarist. If the fire had originated naturally, it was pointed out, some corner of the room would have been burned out. The pictures indicated the walls had been sprayed with gasoline and the defendant admitted that fact later.

In another case, pictures were introduced in a claim suit to repudiate the statements of the owner of the company that had been partly damaged by fire. Evidences of a "flasher," a knotted strip of newspapers laid around the baseboard of the room to expedite the spread of flames, were found when the blaze was extinguished shortly after it had started. Pictures of this room, of the basement free of

(Continued to page 125A)

FINGERPRINT VISIBLE ON CLOTH BY SILVER-NITRATE PROCESS



Palm Print Brought Out on Cloth by Chemical Treatment Is Plainly Seen under Sun Lamp

By treating cloth, paper and similar substances with a silver-nitrate process it is possible to bring to light fingerprints heretofore invisible. After the special treatment, the material is held under a sun lamp and telltale imprints are seen plainly. The discovery is expected to be valuable in crime detection.

GROUND SPEED OF AIRPLANE MEASURED BY PENDULUM

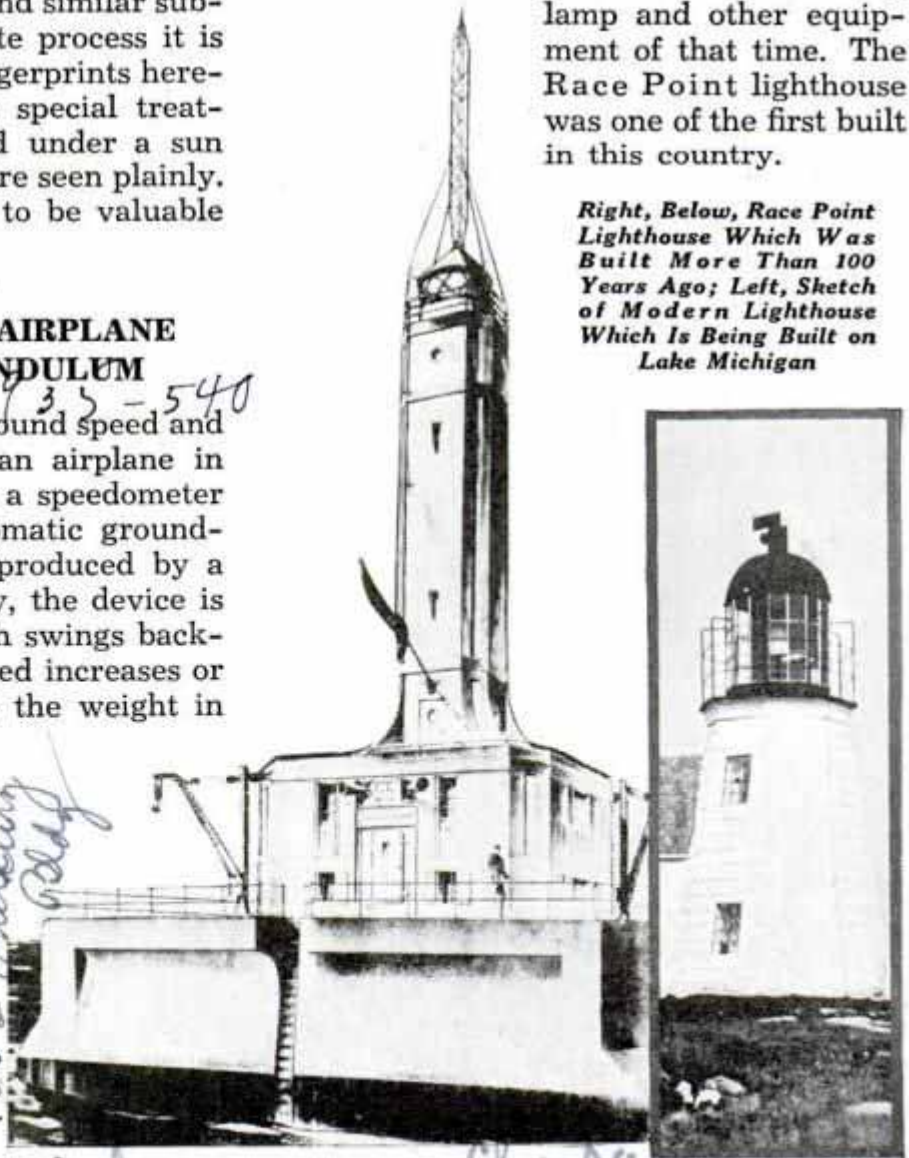
Intended to record the ground speed and the distance traveled by an airplane in much the same manner as a speedometer serves a motorist, an automatic ground-speed indicator has been produced by a Texas inventor. Essentially, the device is operated by a weight which swings backward or forward as the speed increases or decreases. The position of the weight in turn controls the position of a friction wheel on a disk which regulates the "speedometer" on the instrument panel. It is claimed the speedometer records actual distance traveled and actual speed of travel much more accurately than the usual air-speed indicator which is not very reliable when

flying against a headwind, for instance. The equipment, which weighs only twelve pounds and is contained in a box nine by nine inches, can be located anywhere about the ship. A governor-controlled motor, run by the plane's battery, is the source of power which motivates the disk while the weight, which swings much like a pendulum, determines the position of the friction wheel. When a ship is ascending, only the forward motion, and not the climb, is shown.

LATEST IN LAKE LIGHTHOUSES FAR AHEAD OF EARLIEST

To replace the Gray's Reef lightship on eastern Lake Michigan, the latest thing in lighthouses is being constructed. It has the most modern equipment, including apparatus for automatic operation of the beam. In comparison, the Race Point, Mass., lighthouse, constructed in 1816, had only a stationary oil-burning lamp and other equipment of that time. The Race Point lighthouse was one of the first built in this country.

Right, Below, Race Point Lighthouse Which Was Built More Than 100 Years Ago; Left, Sketch of Modern Lighthouse Which Is Being Built on Lake Michigan



*Designed by Dr. E. M. Henderson
New York City
no other address
Emb. M. J. Somers,
126 W. 8th St.
Cincinnati Ohio
1002 Fidelity Bldg*

Clarence A. Pichey

Autogiro Port on Roof May Speed Air Mails



©W. Wallace Kellett

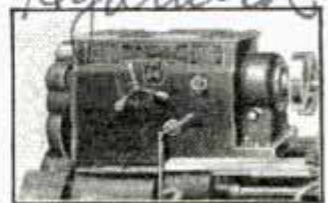
Acme
 Architect's Drawing Shows How Roof of Post Office Building Could Be Rebuilt as Landing Field for Autogiros Supplying Shuttle Service for Air Mail Between Newark Airport and Downtown New York

31st and 8th Ave
 Conversion of the roof of the New York Parcel Post building into a landing platform for autogiros has been proposed with the purpose of speeding transportation of air mail between downtown New York and the Newark airport. Planes could cut the transit time from an hour to ten minutes. An architect's plan calls for a 200 by 750 foot surface to be built at an estimated cost of \$1,000,000. Similar projects have been suggested for other large cities.

that basis forest lands of the entire country, 670 million acres, capture energy equal to 1,403 million tons of coal, two and one-half times the tonnage mined in 1930.

8912
LATHE SPEED CHANGED QUICKLY WITH HYDRAULIC CONTROL

Instantaneous change of speed, both forward and reverse, is made possible in a lathe equipped with hydraulic clutches and brakes. The lathe has sixteen speeds forward and eight in reverse, controlled by a three-lever handle which can be turned without intermediate stop to the desired velocity. An automatic slide-rule mechanism indicates, just above the control handle, the spindle revolutions per minute and cutting speeds in feet per minute.



8925
FORESTS STORE SUN'S ENERGY FASTER THAN COAL IS USED

More energy is absorbed from the sun and stored away in American forests than is expended every year in coal mined. Dr. Hardy L. Shirley, of a forest experiment station at St. Paul, estimated that every acre of white pine in Wisconsin annually stores in wood, bark and leaves the equivalent of a ton of coal in solar energy. On

Sun's Energy 6/9/35

Lake State

Lehigh Machine Co

8483

Morristown, N.J.

BORROWED EYES



IN an eastern city a man earns a living by house-to-house selling and servicing candy machines. This man is blind. Yet he walks eight or ten miles through city streets each day, crosses busy intersections, dodges automobiles and street cars, visits 300 or more strange homes, climbs innumerable stairs and encounters all the usual hazards of city travel.

No one could make such trips without the aid of sight. This blind man "sees" through the two alert and intelligent eyes of a German shepherd dog, one of the many "graduates" of "The Seeing Eye," a philanthropic institution at Morristown, N. J., where dogs are educated to act as guides for the blind.

This man has a mental picture of the streets he travels. He indicates to his four-footed companion the direction he wishes to go. She assumes all the responsibility of taking him safely to his destination and bringing him safely home. The man does not tap cautiously with a cane as he walks. His guide sets a rapid pace and the master walks confidently beside her, certain that she will warn him of any obstacle in his way.

Top, Guide Dog Pulling Blind Master Away from Obstruction on Ground, and Teaching Dog to Watch for Overhead Obstruction Which Might Injure or Startle the Master; Center, in Negotiating Stairs, Dog Stops at Landing to Let Master Know It Is Bottom or Top; Below, Dog Is Taught to Bring Dropped Articles to Left Side so Master Knows Where to Reach

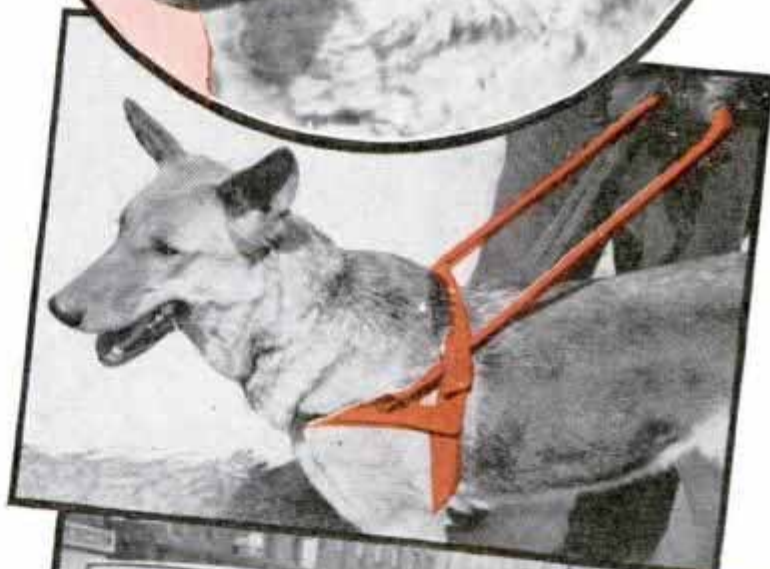
for the BLIND



The dog carefully selects a path which will not allow her master to brush against other pedestrians. She warns him of a step up or down, she watches the traffic when crossing a street, she leads him around obstructions and is even careful to guide him around a hanging awning which might startle him by striking his head.

This dog's keen eyes and intelligent brain have made her master independent. She and other graduates of the Morristown dog college are bringing freedom to many blind people whose activities otherwise would be restricted to the confines of four walls or, at most, to their homes.

The education of a guide dog actually involves three separate courses of instruction—one for the dog's teacher, one for the dog itself, and one for the dog's blind master. The first step in training a guide dog is to train the trainer. It takes four years to make an instructor after the man himself has been carefully selected for the work. Not all persons have the necessary tact, patience and instinct for such a task. The instructor is not an animal trainer, but a teacher, and the dogs are



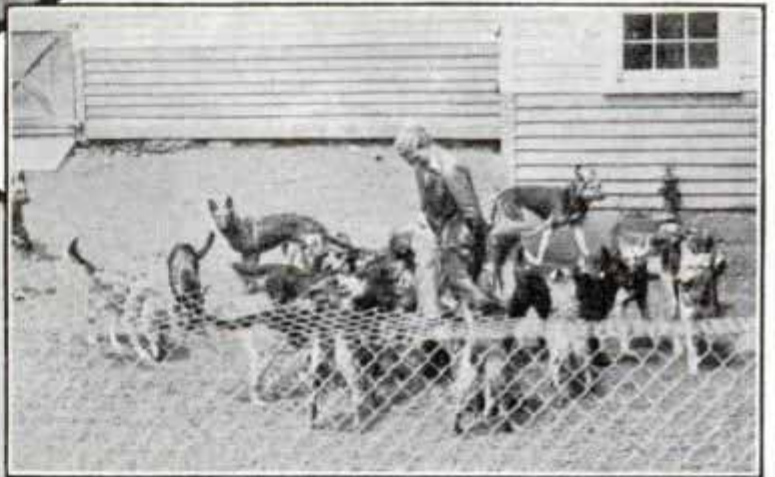
Top, the Intelligent Head of a Typical Guide Dog and Dog Stopping at Curb Until Master Finds It with His Foot; Center, Harness by Means of Which the Dog and Master Communicate Information to Each Other; Below, the Guide Dog Leads Her Master through Heavy Traffic by Observing the General Direction of Movement of the Vehicles

E483
362



ent from the man's. Thus he is better able to make the dog realize that a reward or a correction is a direct result of an act rather than an arbitrary action on the part of the teacher.

The animals selected for this work are nearly all German shepherds—which, incidentally, do not have "wolf blood" and which are not "police" dogs, as many believe. Females are used almost exclusively because they are less easily distracted. The guide dogs are carefully selected to obtain certain characteristics. They must be highly intelligent, they must have a sense of responsibility and



Top, Teaching Dog to Sit or Stand at Left of Master; Center, Future Guide Dogs at Play; Below, Indicating Bus Entrance

not trained, but educated to think for themselves.

The main difference between an amateur and a professional in teaching dogs is that the professional, through experience, is better able to "think like a dog." He understands animal psychology and dog intelligence and comes to know the dog's point of view—which often is quite differ-

they must be gun-sure, because of back-firing in auto traffic.

Since they must not be distracted by inviting scents along the street, they are chosen for a lack of, rather than the possession of a sensitive nose. But they must have excellent eyesight and good hearing. One of these dogs can hear many times as well as a man and their eye sensitiveness to movement is amazing. Frequently a guide dog checks her master at the curb long before he can hear

an approaching car. The dog not only hears the car, but detects the motion and gauges the speed.

Guide dogs start to school at fourteen months and their education requires three months. This is divided into three steps. First, each dog is taught obedience. She learns to fetch, to sit up, to lie down and to retrieve dropped articles by bringing

them to a certain position where the blind master will always know where to reach for them. She must learn not to chase other animals or chickens, so she is given an opportunity to try it. As she starts after a chicken, her name is called by the instructor and a light chain is flicked into the hind legs. The dog associates the chain with the chicken. She returns to her instructor and receives a caress instead of a reprimand. Then she wags her tail—and starts after another chicken. The chain lesson is repeated. Soon she learns a chicken means only discomfort.

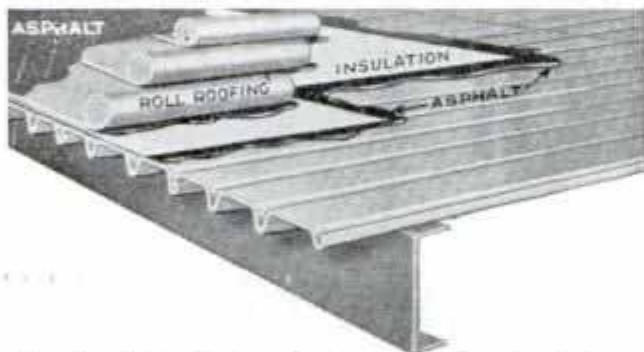
During the second period the dog acquires the rudiments of guiding. She is taught to stop at curbs until her instructor, feigning blindness, finds the edge with his foot or a cane. She learns the meaning of "forward," "right" and "left," the three commands her future master will use to direct her; she learns to lead her teacher around obstructions and to watch that his head does not strike anything. Then she goes into traffic and is taught to dodge pedestrians with her charge.

Because it is not definitely known whether dogs recognize colors and because motorists do not always obey them, the

(Continued to page 120A)

STEEL ROOF DECK IS FIRE-SAFE AND EASY TO INSTALL

Adaptable to all types of commercial buildings and modern residences, steel roof decking is available for constructing smooth roof surfaces. Fabricated from copper alloy or galvanized steel, the decking is lightweight and easy to install, in addition to being fire-safe. An unusual offset facilitates nesting of ribs. After insulation has been applied, composition roofing may be laid to complete the job.



Showing How Roofing Is Applied After Steel Decking Has Been Placed on Building

Milcor Steel Co.
4125 111 Ave -

BOW AND ARROW FOR FISHING INTRODUCES NEW SPORT



Shooting Fish in Clear Water; Bow Has Reel and Line to Which Arrow Is Attached

Use of the bow and arrow for shooting fish has been introduced in California, the latest in sport. A reel attached to the bow carries 150 yards of line. As the sportsman sights a fish in clear water, he quickly releases the arrow. If a strike is scored, the fisherman may manipulate the reel and bow to "play" the fish until it tires and can be brought to net.

BICYCLE LIGHT WITH CLAMP ALSO USED AS FLASHLAMP

Serving the double purpose of bicycle light and flashlamp, a new two-cell spotlight with clamp is on the market. It may be removed for use as an ordinary flashlight. With this lamp is sold a red tail-light with clamp.



Bond Electric Corp.
257 Cornhill Ave

I saw Joe Thomas in
 Dearborn Mich. Calif

8635

8671

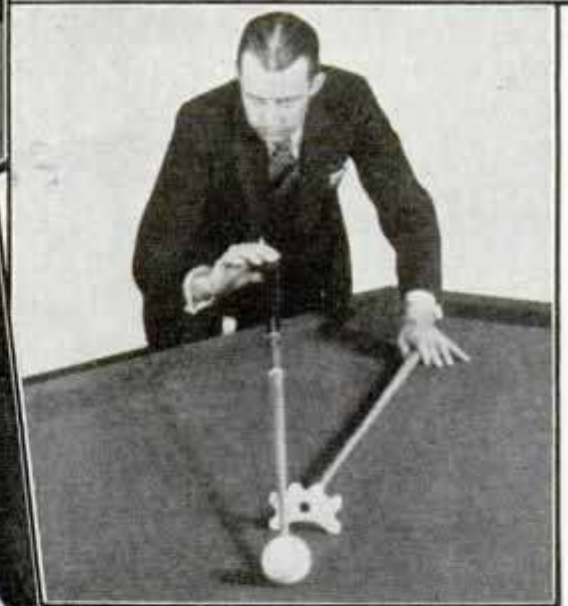
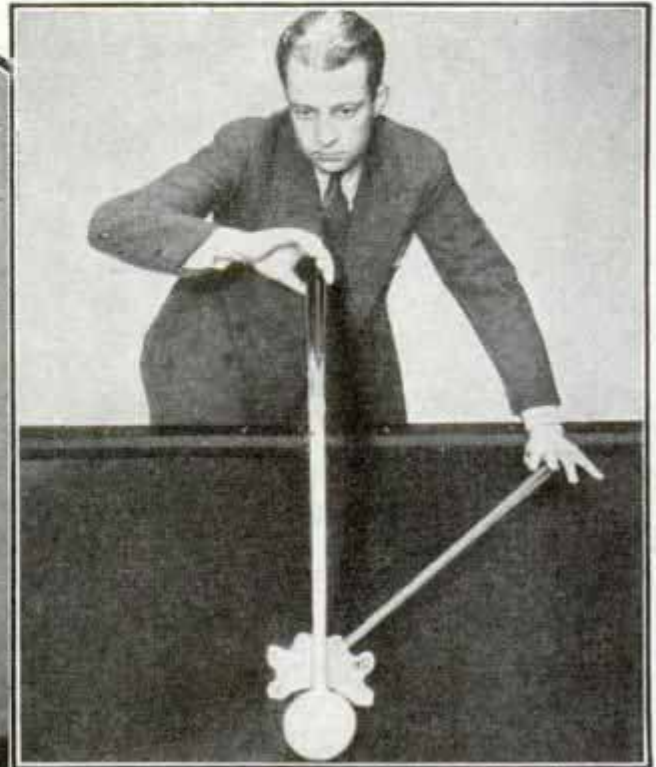
\$1.60

8613.

2222 Sherman Ave
Evanston, Ill

BILLIARDS -

National Billiard Association of America
R. 602, 629 S. Wabash, Chicago



By WILLIE HOPPE

1934 World's 18.1 Balk-Line and Cushion Carom Billiards Champion

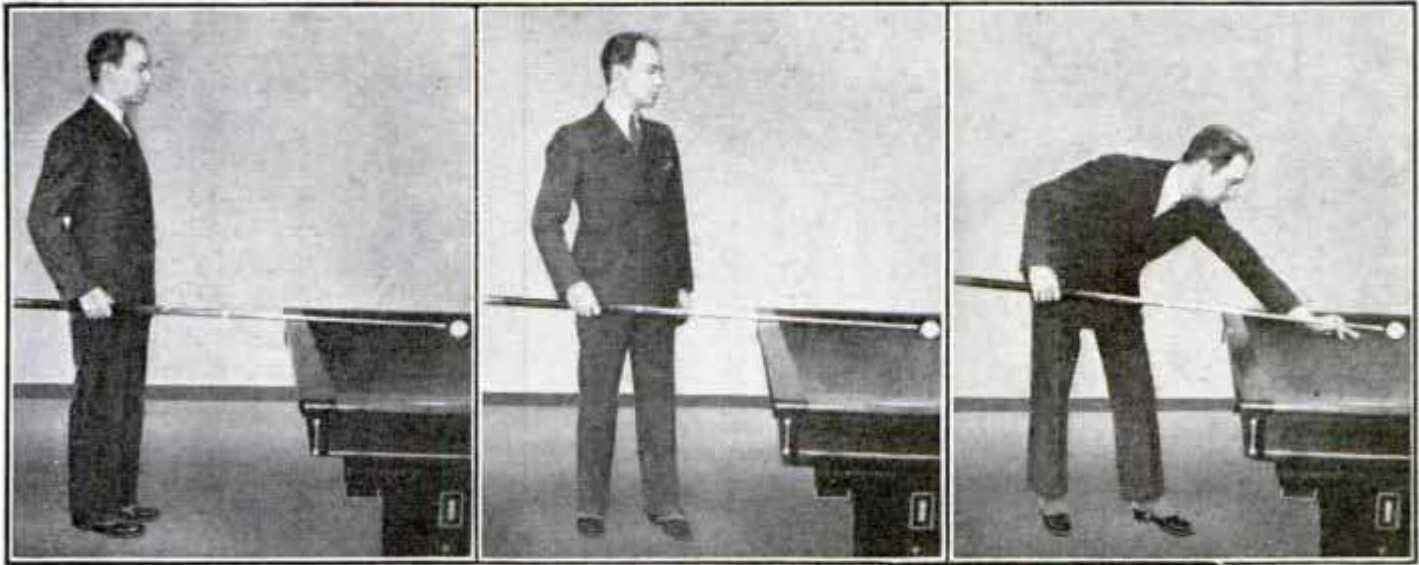
BILLIARDS is not a hard game to learn but if you aspire to become a really good player, you must first understand the three important fundamentals: the "bridge" hand on the table, how to grip the cue at the butt end, and stance, or position at the table. These three points are the principal elements governing the stroke. But you can learn these fundamentals at any age. A child may run up a high score, and a man taking up the game late in life may develop into an expert.

Let us take first the position of the hand on the table, or bridge. A bridge for ordinary shots can be built by forming a circle

with the thumb and first finger of your left hand, placing the tip of each together. Your middle finger should then be moved downward as far as possible toward the palm. Now slide the tip of your cue through this circle. It should pass over the top of the middle finger, touching it at, or a little above, the middle joint. Tighten

Left, Hoppe Holds Butt Lightly between Two Fingers and Thumb; Right, in Using Substitute "Bridge," Grip at Butt Is Inverted; Eyes Are in Direct Line for Shot

and HOW to PLAY it

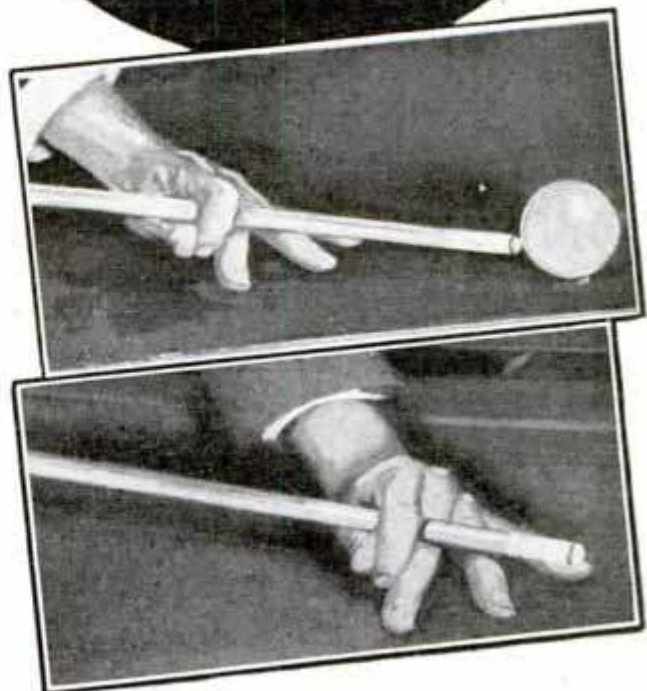
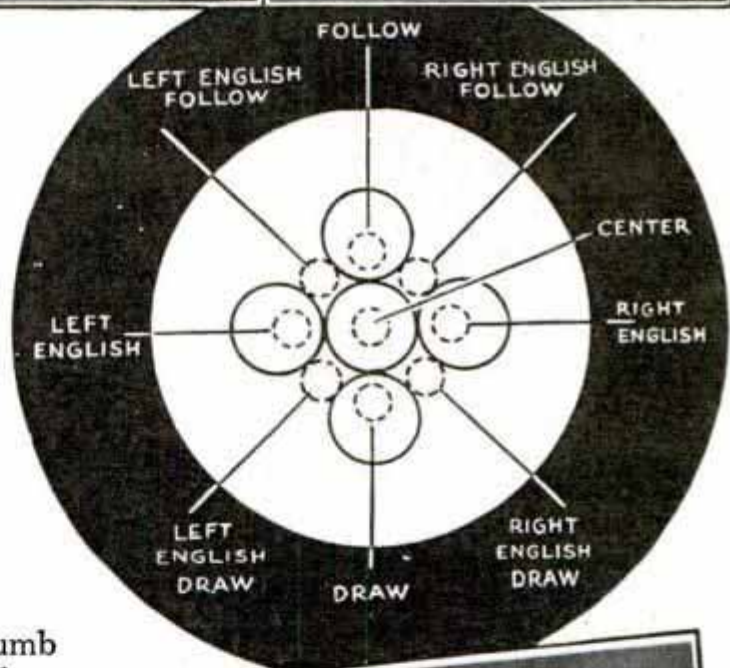


Top, Taking Stance at Table; Diagram Indicates Where to Hit Ball for Draw, Follow and English Shots; Bottom Picture Shows Proper "Bridge" Position of Hand on Table; Above It, Bridge Is Lowered for Draw Shot

the circle around the cue until both fingers and thumb are touching the cue on all sides with just enough snugness to permit the cue to slide through without wobbling. Place your hand on the table with its outside "heel" resting firmly and the fingers well spread.

Of course, you may make adjustments for comfort. If your hand is chubby, and you have difficulty in placing your first finger in the position described, try placing your thumb against the side of your second finger, then pull your first finger down, making the tip of it meet the end of your thumb. For complex shots, this bridge can be lowered by pushing the fingers forward on the table or raised by pulling the finger ends toward the wrist.

In billiards, as in golf and baseball, there are many forms of stance, and the player should adopt one suited to his height and build. There is a tendency among many players to stroke with the cue butt too close to the body. This throws the eyes in the wrong position for lining up the shot accurately. The hand gripping the butt should be at least six inches from the body. Better twelve, but don't hold it so far away that it cramps your style.





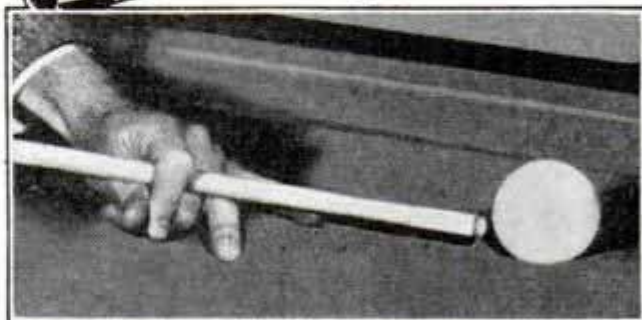
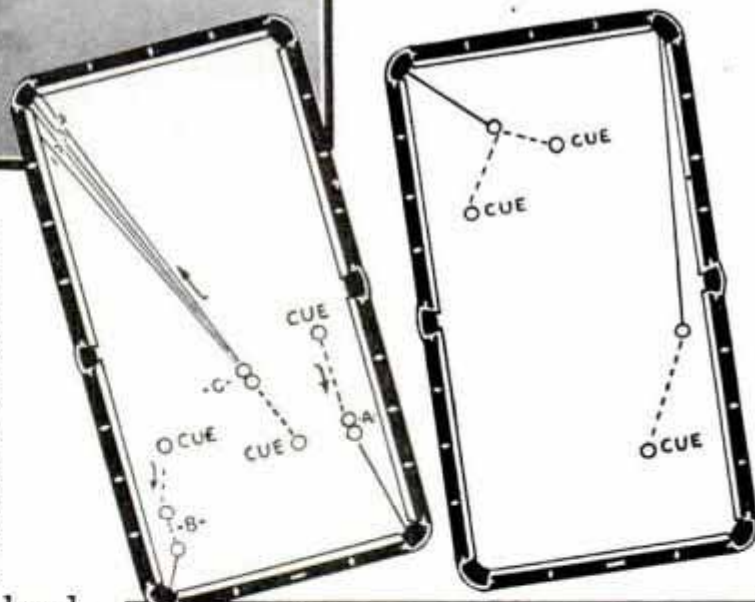
Here is one way of attaining a natural, correct stance. Face your shot squarely, holding the butt of the cue about twelve inches from the end with your hand touching your right hip. Turn to the right toward the cue on the ball of your right foot without lifting the foot or moving the right hand, holding the cue, from their original positions. The left foot may be moved forward any distance required to give balance when you bend. In bending over, place your cue in your bridge hand and lean forward until your eyes are directly over the cue which is in line with your shot. Above all, don't stand rigid. Relax! Tight muscles have no place in billiards.

Before telling you how a billiard cue should be gripped, let me repeat the time-honored "don'ts": Don't hold the cue tightly in your hand; don't hold the cue too far back; don't hold the cue too far

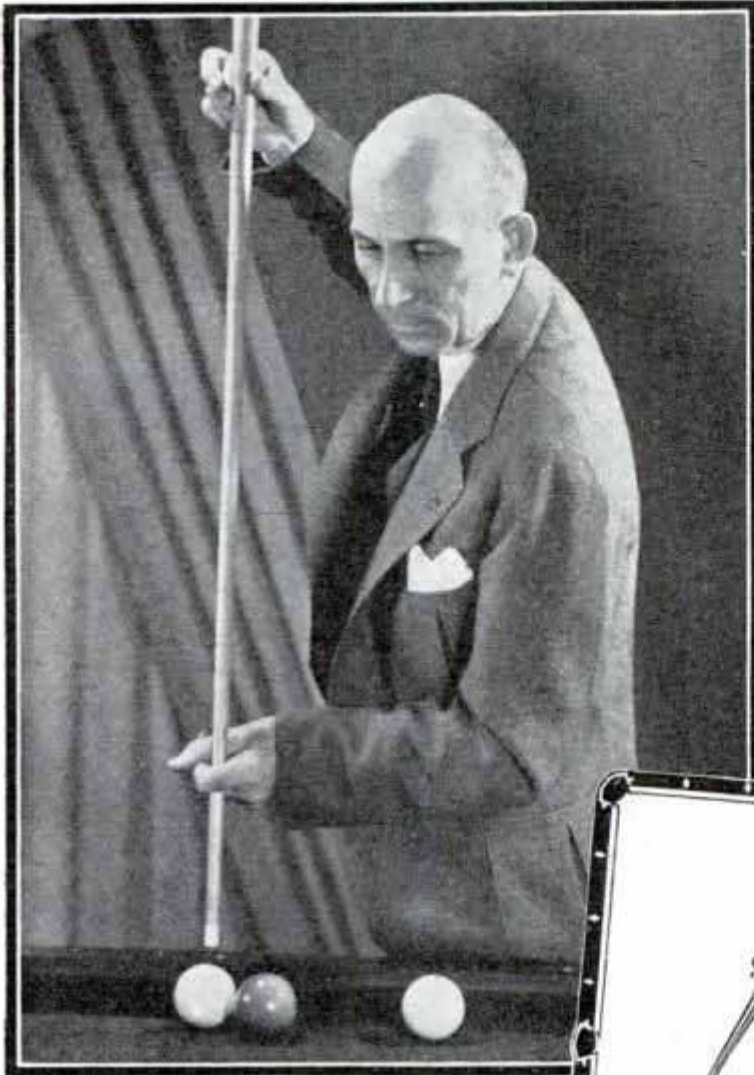
forward. A cue should not be held by more than two fingers and the thumb. In reality, it simply rests on the first two fingers and is held secure by the thumb.

There's no shoulder action in the billiard shot. It's all done from the elbow down—not unlike a clock pendulum in action—with the proper follow through and free and easy wrist action. The cue should not be stopped or jerked back until after full contact with the cue ball. It should follow right through the ball. The more proficient you become in these fundamentals, the greater your success will be in mastering the subtleties of the game.

Top-notch players nev-



Top, Ruth McGinnis, Women's Champion, Exhibits Stance; Diagrams Show How to Hit Angle and Combination Shots; Bottom, One Way to Lower "Bridge"

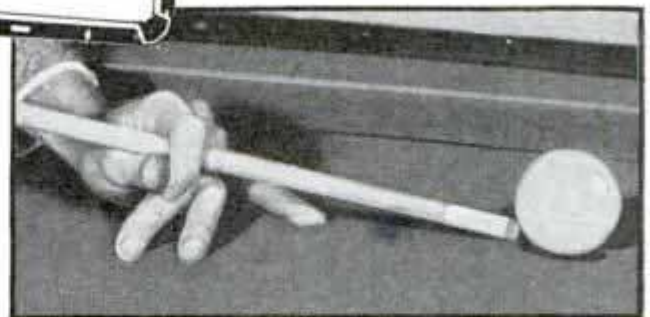
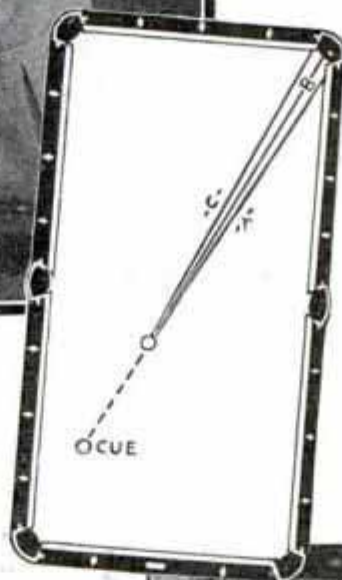


er miscue. They know where and how to hit the ball. With a little concentration, you can learn the same thing. The diagram on page 365 explains where to strike the cue ball. It represents a regulation ball for a straight rail, balk-line, and three cushion. Pocket-billiard balls are a trifle smaller. The five larger circles on this ball represent the width of the usual cue tip. The four large circles around the center one indicate the extreme distance you should ever cue the ball away from the center. The small dotted line circles inside the larger ones show the approximate space covered on the ball by the cue tip when it strikes. The small dotted line circles between the four outside large circles indicate where you hit when executing the extreme follow or draw shot with the addition of left or right hand English. It is dangerous to cue your ball farther away from the center than the outside circles. In fact, there is seldom a shot that requires such extreme off-center

cueing. You will be surprised at the follow, draw and English action attained by striking the ball just a little off center. Remember, too, that the speed of your shot has much to do with the action of your cue ball, after contact with the object ball. Many shots are missed because they are played too hard or too easy.

In playing the follow shot, you don't have to cue your ball as far to the top as possible, as is popularly supposed. Never cue more than the width of the tip above center, and remember to have your bridge at such a height that you deliver your stroke with the cue as near on a level as possible.

In pocket billiards, the first thing to know is where to strike the object ball. In the three shots shown in the figure at the right on page 366 it is clear you should cue your ball center. The heavy black lines show the angle from the pocket to the ball. The point of contact by the cue ball on the object ball is indicated by the dotted lines. In pocketing balls, avoid using English. Cueing the ball on the right or left

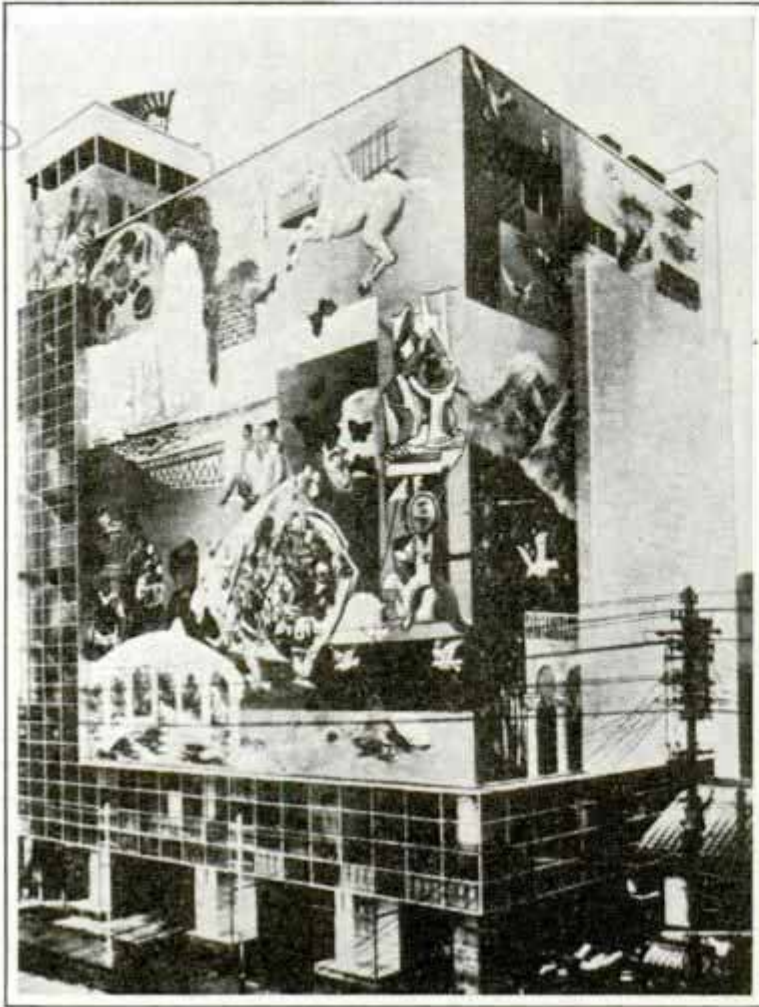


Top, Charles C. Peterson, Fancy Billiard-Shot Champion, Demonstrating Trick Shot; Bottom, Wrong Aim for Draw Shot, Cue Angle Preventing Any Follow Through; Diagram Shows How English on Cue Ball Can Throw Object Ball Out of Line

side has a tendency to throw the object ball out of line with the pocket. The illustration on this page shows the course of the object ball as the result of three ways of striking the cue ball. The ball following

(Continued to page 126A)

Orbelman Syndicate
507-5th Ave
New York



View of Two Sides of Japanese Newspaper Plant, with Odd Designs That Would Camouflage the Building in War

ODD DESIGNS ON GLASS WALLS CAMOUFLAGE BUILDING

Strange figures decorating the glass walls of one of Japan's latest buildings are not intended for ornament in peace time but for camouflage in war. The designs, including the figure of a prancing horse and a bathing-beach scene, were painted on the walls to conceal from the eyes of enemy pilots the big plant housing the Osaka Asahi, Japan's largest newspaper. Viewed from the ground, the building has a fantastic appearance.

IT TAKES NERVE TO REPAIR LEAKING GAS MAINS

An excited voice on the telephone reports: "The main is broken!" Immediately the gas company calls out its "trouble shooters," linemen who always are on call to stop dangerous leaks. The men clamber into their truck, loaded with the necessary tools and equipment, ready for the dangerous job. Out on the highway, they lo-

cate the leak. The air is heavy with fumes. This time an old pipe, laid years before, has given away almost directly under the curbing, and at a point where small brick provided drainage beneath the concrete highway. There is no chance to reach the leaky pipe except through the solid concrete of the broad highway or by prying loose the brick base. The foreman calls for picks and crowbars to tear the brick out so the men can get beneath the pipe and repair it, without disturbing traffic on the heavily traveled highway. The gas cannot be cut off because thousands of homes are dependent on an uninterrupted supply. So gas masks are donned quickly and the men work fast. Danger is at their side constantly. So heavy is the gas that a spark from an iron crowbar in prying a brick out of the ground may mean a terrific explosion. Every person in the danger zone is warned to extinguish cigars or cigarettes, and automobile drivers are asked to coast through so no sparks from motor or exhaust will set off the gas.

Making every move count in the battle against time, the crew finally completes the repairs, each man weary but unmindful of the part he played in this drama of peace time. It's all in the day's work.

ELECTRIC HEATER IN SCALES KEEPS OUT MOISTURE

For scales used in close proximity to water, salt solutions, acid fumes or temperature extremes, an electric heating unit is offered. When placed inside the scale and connected to any convenient wall outlet, the unit creates a blanket of warm, dry air around the vital parts. This prevents moisture from filtering in where it might cause destructive corrosion.



899.

8704

Cont U. K. Wilcox

Driver Scales
+ Mrs. ...

Practice Tower Makes Parachute Jump Safe

Learning to make a parachute jump with the risk eliminated is now possible, using a "captive" open parachute swung from a 125-foot training tower. The jumper is hoisted by cable to a point ninety-five feet above the ground where the open "umbrella" is automatically released and

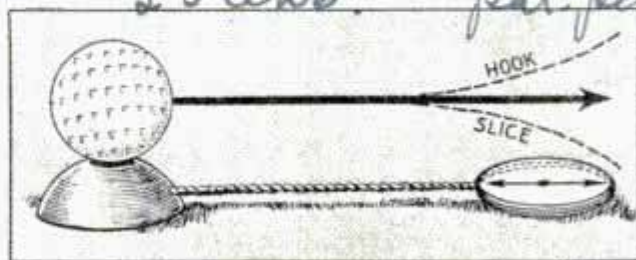


Left, Student Makes Practice Jump after Being Hauled Up by Cable; Right, Closeup of Parachute



GOLFER IS GUIDED IN DRIVING BY ARROW FIXED TO TEE

To help the golfer drive straight a dome-shaped tee with a weighted arrow attached by a cord is offered. It enables the player to line up his shot for the flag. The ball is always at uniform height. By lining up the arrow for the green, then driving the club head through the ball and over the cord and arrow, the golfer learns to keep his head down and eliminate slice and hook.



Arrow Helps Follow Through for Straight Shot; Ball Is Always Teed Same Height

he floats down. The parachute can also be released at any other height by pulling the rip cord. Confidence is instilled in the student jumper by making the leap under control yet simulating actual flying conditions. A ring at the outer rim of the silk umbrella keeps it open at all times. The first such tower was built about twenty miles east of Trenton, N. J.

Switlicky Parachute & Equipment Co. Trenton, N.J.

Switlicky Tower, Plantation, Classy Tee Co.

683
457 S. Serrano Ave
Los Angeles Calif

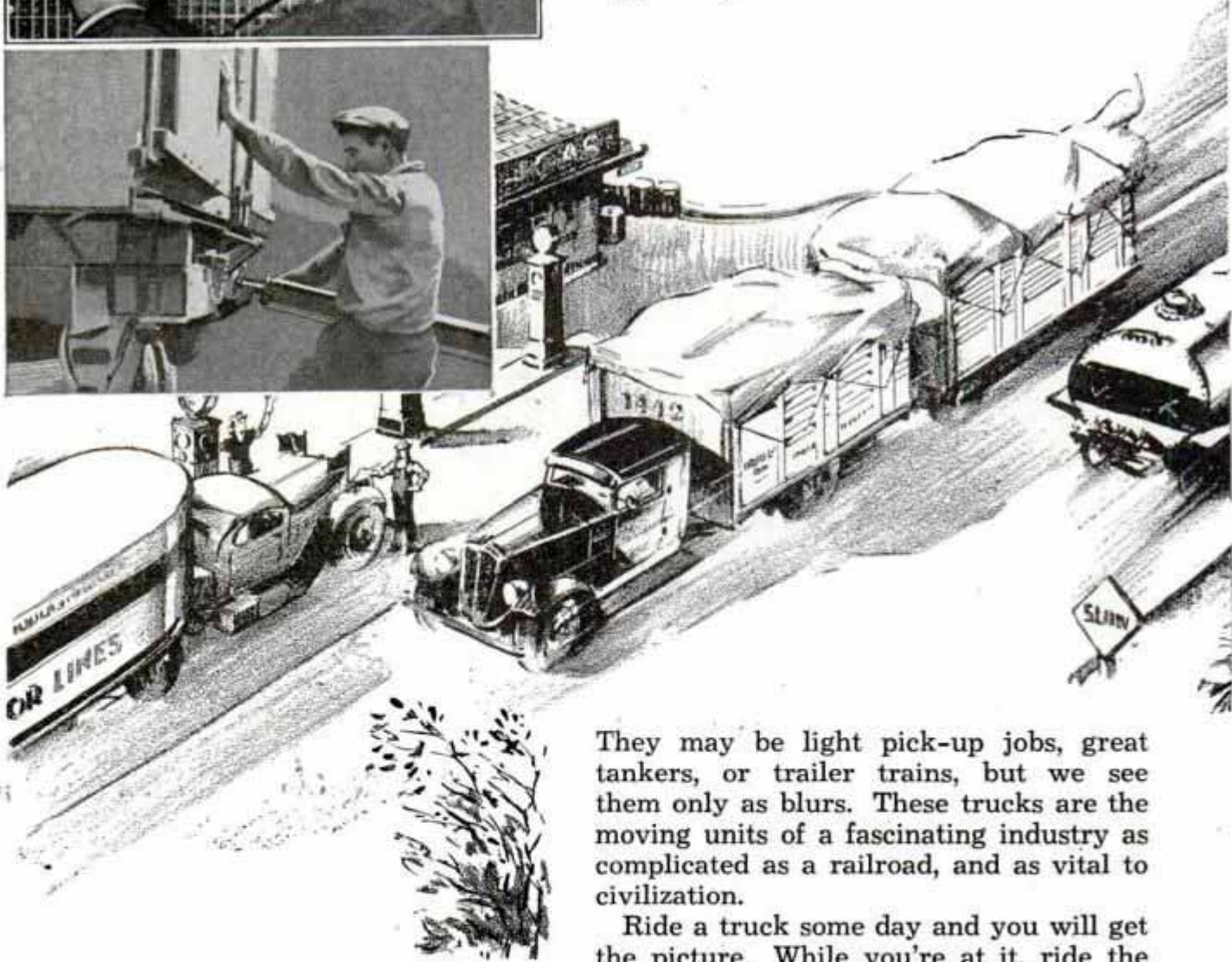


TRAINS

THE foreshortened truck-tractor backs up to a waiting van. Couplings clash as they meet. A moment later it backs up to an open-body trailer. Again couplings clash. The train is made up.

It is a train in every sense of the word—except that it has no tracks. It has a power unit as separate from the cars as a locomotive is separate from its coaches. The cars are coupled and uncoupled, spotted for loading, switched, and handled like railway cars. But the track is the public highway.

To most of us, a truck is just a lumbering, clumsy vehicle that slows down traffic.



They may be light pick-up jobs, great tankers, or trailer trains, but we see them only as blurs. These trucks are the moving units of a fascinating industry as complicated as a railroad, and as vital to civilization.

Ride a truck some day and you will get the picture. While you're at it, ride the very latest thing in heavy transportation, the truck-tractor and trailer train.

A long line of empty trailers and semi-trailers are in front of a terminal loading

Top, Truck Dispatcher Transmitting Orders by Telephone and Moving Pegs on Board to Indicate Position of Trailer Units; Center, Swamper Coupling Trailer after the Driver Has Maneuvered to Place the Hook under a Four-Inch Ring

without TRACKS

Below, Right, Truck Driver Stopping a Twenty-Ton Load with Air Brakes Which also Are Connected to Trailers; Below, Left, Rolling Down Wheels of Semi-Trailer



dock. Light pick-up trucks are backing up to the platform with loads of freight gathered about the city. As each draws up, the "swampers" crowd around it, trundling the freight in hand trucks across the dock and into the waiting trailers routed to three different cities. The dock foreman separates the freight, assigns it to its proper destination and superintends the weighing. A tractor rumbles up and the driver goes to the dispatcher's cubbyhole for his orders.

"You've got a load of plunder for the harbor," the dispatcher growls. "Those oil drums have to make a boat that's leaving tonight, so get moving."



Top, Washing Power Unit of Truck-Tractor; Center, Waiting for Loads; Below, Coupling Air Line

The dispatcher is busy because the equipment has gotten out of balance. There are too many empty trailers at one terminal, and not enough at another. Just as railroad divisions have car shortages, so the terminals of a line-haul trucking company are faced with trailer shortages. The dispatcher yells into two phones, and moves pegs in the equipment board before him. Then he turns to the teletype machine and sends a message to the harbor, reporting the leaving of the oil drums.

Meanwhile the driver checks his air brakes which are energized by a huge suction cylinder connected to the motor. The tractor couples to a semi-trailer. The retractable front wheels are wound up and the weight of the cargo is borne by the rear wheels of the tractor. The semi-trailer swings on a swivel, or "fifth wheel." This makes the equipment flexible, and able to negotiate sharp turns. Air lines are connected. The safety

chain is hooked. "O.K.," the swamper calls.

The tractor and semi-trailer roll out. In the yard the driver jockies for position. It is a tricky business. In backing, the semi swings the opposite way from the tractor. It is like trying to back an automobile with a hinge in the middle.

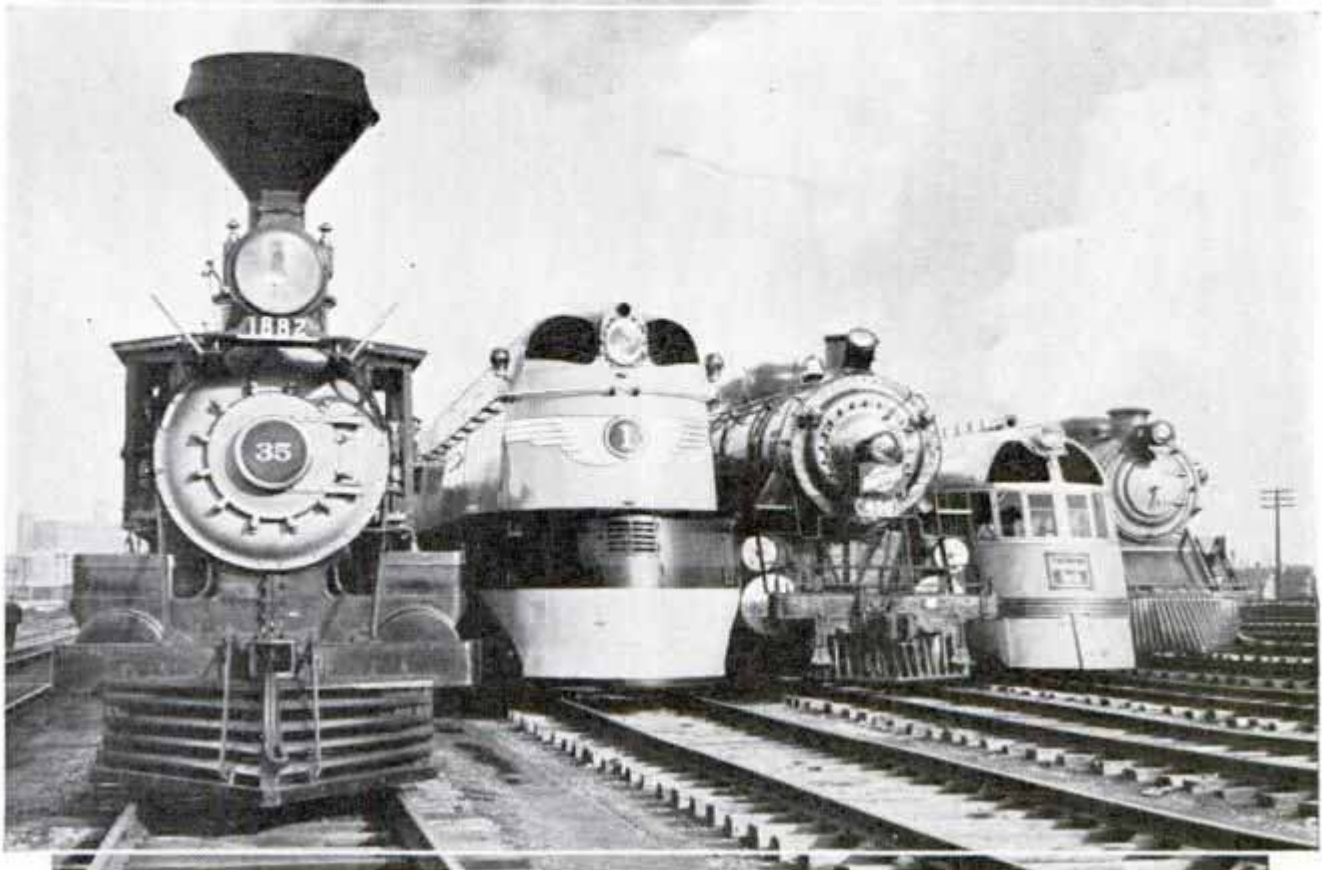
A loaded trailer is the object of the switching. Back comes the semi. A swamper stands ready, holding the trailer tongue. The four-inch ring on the end of the tongue must drop over the hook on the rear of the semi. There are four inches leeway. Back comes the tractor. The hook slips under the ring. The driver has hit! They don't often miss. They are steering fifteen tons of equipment, thirty feet long, but they can slip a hook under a four-inch ring. The swamper locks the coupling, the tractor slips into the first of its twelve speeds and rumbles out of the yard, the semi and trailer swaying behind it.

Ahead lies the traffic of the city. Beyond is the open road, and beyond that the harbor where a freighter waits for the oil drums. The powerful motor roars. Gears clash as the driver slips into second, then into over-drive between second and high. A traffic light shows red. The driver checks with the air, checks again, then uses the foot brake to come to a stop.

Slowly the train again gathers speed. It takes a long time to get it rolling. The

(Continued to page 122A)

Locomotive Styles Are Set by Age of Speed



Left to Right, High-Funneled Burlington Locomotive of 1882; "Hiawatha," Milwaukee Road's Steam Engine; North Western's "400"; Burlington's Diesel "Zephyr"; "Abraham Lincoln" of Alton Line

Fifty-three years old and still running, a Burlington railroad wood-burning locomotive posed for its picture with four spry young engines that pull the new high-speed trains of the west. The old-timer with its tall smokestack hauled the "Burlington Limited" in 1882. Lined up in the

Chicago yards were the speed-lined oil-burning steam locomotive of the Milwaukee railroad's "Hiawatha"; the conventional oil-burner of the North Western's "400"; the Diesel electric "Zephyr" of the Burlington, and the Alton road's steam-driven engine of the "Abraham Lincoln."

Golf and Croquet Are Combined on Homemade Course

Played on a homemade course twenty feet long by ten feet wide, a combination of golf and croquet has been introduced in Ohio. Golf balls and putters are used on the course which is laid out like a croquet court. Iron stakes replace the croquet wickets on the packed clay course. One feature is the variety of carom shots that can be made off the wooden retaining rails around the course.



Croquet Court Has Walls for Carom Shots with Golf Balls and Putter

Club Steve Cleveland Ohio

Designed and built by J. J. Cleveland

Paddle-Wheel Auto Travels on Land or Sea

The English channel, scene of many unusual passages, including ones by mermaids, mermen, water bicyclists and a

German who tried to walk across on water skis, was negotiated recently by another German in an amphibian automobile. The

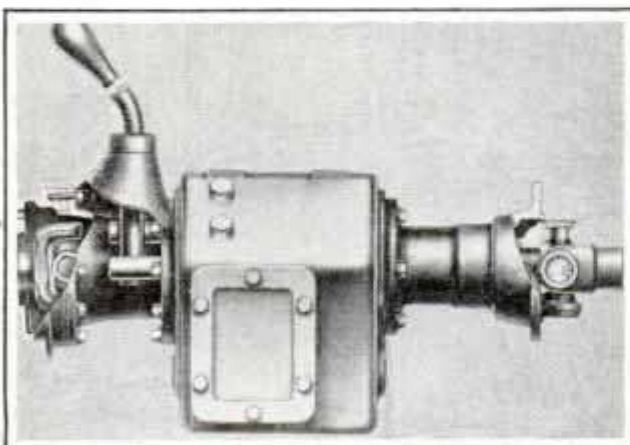


car was equipped with paddles on the rear wheels and crossed from Calais to Dover in eight hours and twenty minutes, clambered onto dry land and proceeded on to London. The driver had motored by land from his home in Germany to start the crossing. The vehicle has a land speed of about twenty miles an hour and a water speed of five miles per hour. At sea the water level is even with the running board.



Top, Amphibian Automobile Landing on English Shore; Right, Cruising across British Channel; It Can Travel Twenty Miles an Hour on Road and Paddle Five Miles an Hour on Sea

Special Transmission Unit Triples Truck Gear Range



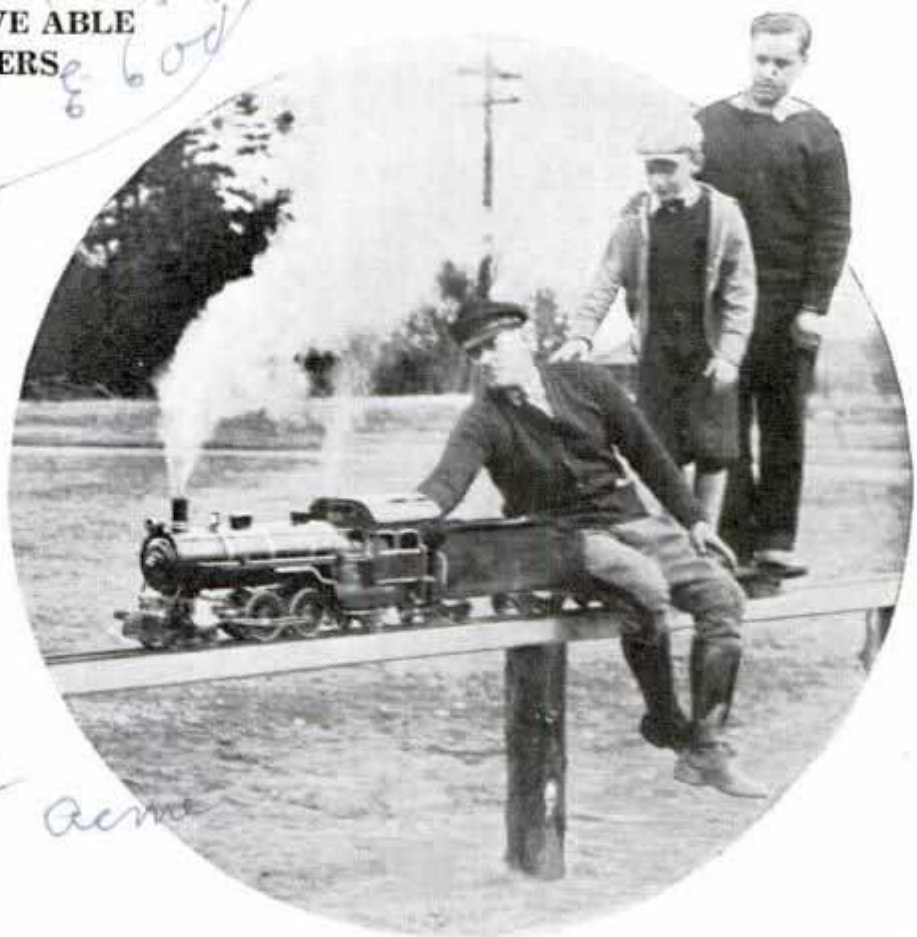
Easily Installed Transmission Unit Gives Trucks Twelve Forward and Three Reverse Speeds

Designed to replace the present transmission in late model Ford or Chevrolet trucks, a new unit gives twelve speeds forward and three reverse. From the wide range of ratios, there is one to serve almost any demand of the driver for maximum power or speed. There are four compound gears with a high-high for either fast travel at usual engine speed or for regular road time with the engine running twenty per cent slower, with less wear and less gasoline and oil consumption. It combines in one unit the standard ratios, the "underdrive" and the "overdrive."

8657
H. S. Watson Co. 522
H. S. Watson Co. 522

MINIATURE LOCOMOTIVE ABLE TO HAUL PASSENGERS

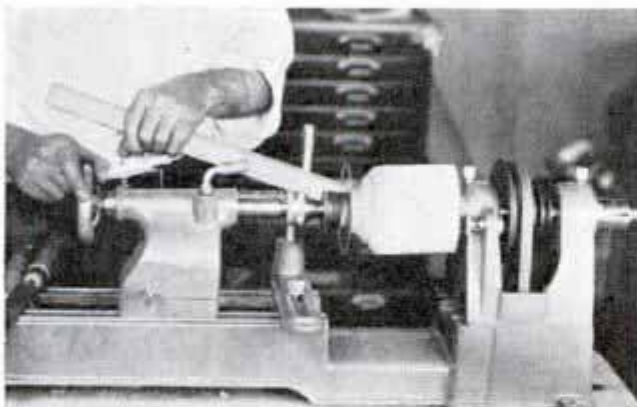
Exact copy of the real thing, a homemade locomotive built at Norway, Me., hauls passengers on an "elevated railway" laid on four-by-six timbers atop cedar posts. It weighs 150 pounds, carries six pounds of coal and can pull nearly a ton of cargo. Its boiler holds two gallons of water and the tender stores another two and one-half gallons. There are four driving wheels and a thimble-sized steam gauge which registers 120 pounds of steam pressure.



Despite Its Size This Steam Engine Running on Fence-Top Railway Can Pull Nearly a Ton

DEEP GAP IN LATHE BED FOR TURNING BIG WORK

Objects of larger diameter than can be turned on the ordinary bench type lathe are handled easily by a new bench lathe with a deep gap in its bed. The swing at the gap is thirteen and one-half inches. Developed primarily for the popular hobby of metal



Thirteen and One-Half Inch Swing Is Provided in This Lathe Built for Metal Spinning Hobby

spinning, the extra capacity is useful for large faceplate work on ordinary wood or metal turning.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

FIRE-ENGINE DATA COMPUTED BY HANDY RECKONER

Answers to practically all hydraulic questions in the fire department can be found quickly by using a handy computer. The machine determines the required engine pressure for all nozzles from seven-eighths inch to two inches, with nozzle pressures of twenty to 100 pounds on hose lines 100 to 1,000 feet long. It will give the gallons per minute, vertical reach and horizontal reach of streams and 1,900 answers to other hydraulic questions. The machine contains two spools on which is a paper ribbon with numbers. By turning a knob, the ribbon passes a small window and a small electric lamp illuminates the number giving the answer to some particular question. The machine is made of steel, chromium-plated, and mounts on the side of the fire truck.



Walker-Turner Co. Inc. Plainfield, N.J.

8684

8682

Capt. L.A. Baradg
Monica Calif

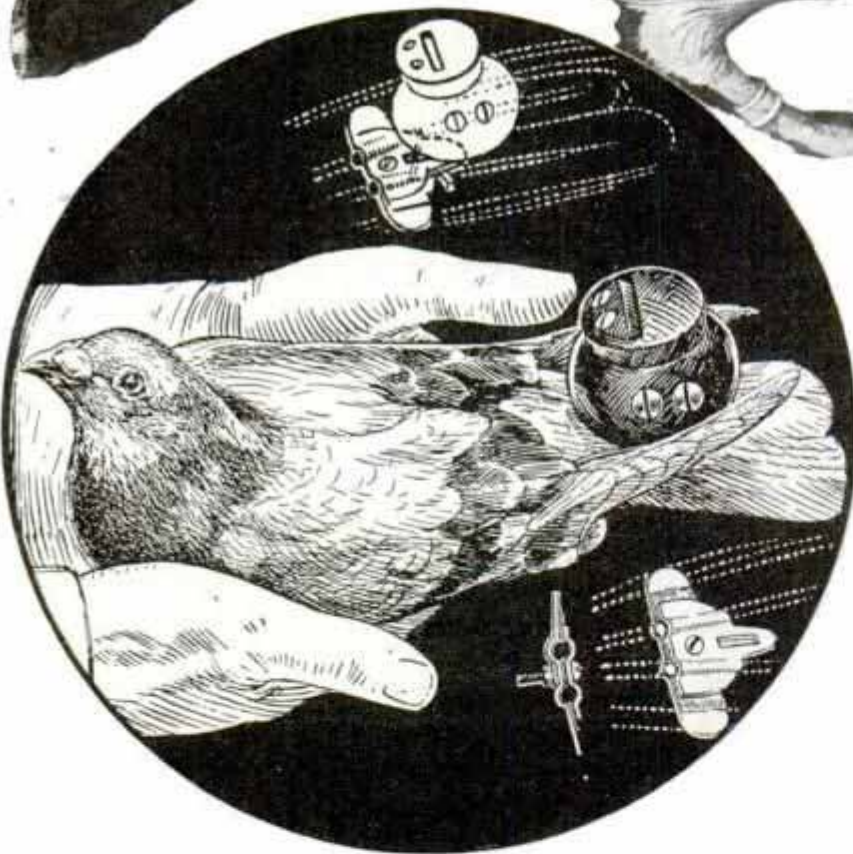
E 470

2107-1922 St. N.W.
Washington, D.C.

PIGEONS of the



Bird of the Midnight Patrol with Banded Leg, and Diagram Showing How Bamboo Whistle to Frighten Birds of Prey Is Attached to Pigeon



signal corps. Day flying has long been established, but only recently has night flying been started and only a few birds capable of this extraordinary feat are in existence in America.

In developing the night flyers many obstacles had to be overcome. For pigeons, like most birds, settle down at dusk. Night flying was a trick that had to be superimposed on natural instincts. So the signal corps selected its best birds, both as to intelligence and physical endurance, for this work.

"The first thing needed to train night flyers," says Private Henry Hegge, ace trainer for the corps, "is a satisfactory loft condition. The training must be at night and night conditions must prevail, either artificially or naturally, for the exercise of the pigeons."

At Fort Monmouth, N. J., where training takes place, it is necessary to create night-flying conditions. This is accom-

UNCLE SAM'S newest combat unit, the midnight patrol, is ready for service. Tom, Jim and Jerry are prepared for any emergency where night messages are concerned. Tom, Jim and Jerry are the army's ace night-flying pigeons.

Training pigeons for night flying in time of war is a new development of the army

E 478

MIDNIGHT PATROL

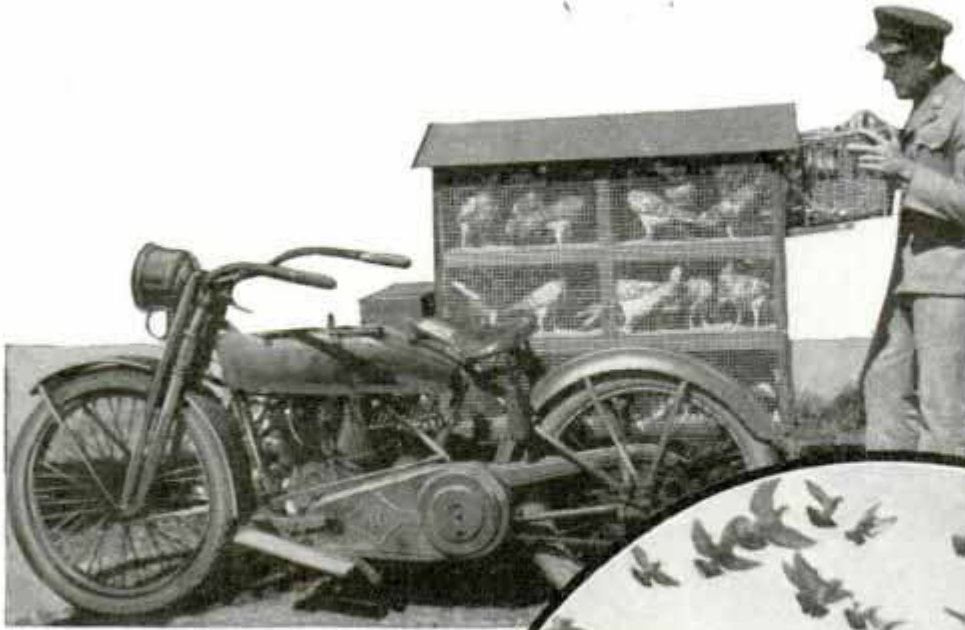


Removing Message from a Capsule Used by Members of the Bird Patrol to Transmit Information

plished by darkening the loft during the day and lighting it only at feeding time in the morning and at night during the training period. The first step is to get the birds to come into the loft from near-by spots. This is accomplished by letting them out at dusk for a few minutes and letting them in when they return. The light on the landing board is turned on when their wings are heard fluttering around the loft. Perhaps at first they make no attempt to come in. In this case they are "stirred up."

This training period, which usually lasts six or seven months, is followed by taking the birds out a little later at night. Here again it may be necessary to stir them up before they learn to come in on the "light" or of their own accord. This period is followed by a third which consists of dis-

Method of Wing Marking Formerly Used, and Carrier Pigeon Which Was Wounded in Action



which might interfere with their homing. Messenger pigeons are valuable and care is taken to prevent injury during the training period. War casualties, however, are expected.

The homing pigeon used by the army is the product of sev-

tance and "road flying."

Road training consists first of taking the birds out about three miles and liberating them one by one in the twilight. This provides the incentive for the birds to return to the loft. Otherwise they might bunch and settle down somewhere outside. After the birds learn to come in from the three-mile distance by twilight, darkness is substituted. As the birds learn, they are released still further away. By the time the extension of their homing has been increased to twenty miles it is possible to release the birds as a unit. To date, these night flyers have been taught to come in from a distance of fifty-one miles on land. On the sea the distance has been increased to sixty miles—a world record for night flying. It is not impossible, says Private Hegge, to teach these birds to fly 100 miles at night with messages.

The best birds for the night patrol are the descendants of the best army flyers. It seems these birds hand down to their offspring their flying ability, developed by their human trainers. Birds are taken for training at the age of three or four months. Precautions are taken to see that the loft where they are kept is not surrounded by wires, buildings, trees or other objects



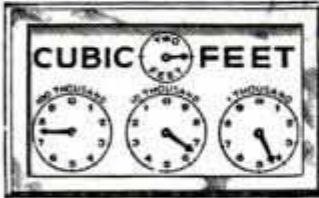
Method of Transporting Members of Midnight Patrol, and Group of Army Pigeons Returning Home in Early Morning after Long Night Flight

eral years of crossbreeding. They are all the descendants of the rock pigeon or bizet of Europe. These birds are noted for their superior intelligence and physique and for their homing characteristics. If kept in perfect condition, they can fly great distances in all kinds of weather. Great care is taken not to overburden them with flight tasks. Normally most birds of good breeding can fly 300 miles, but over this distance extreme care must be taken in selecting the birds. Only one bird in ten is capable of a 500-mile flight and such flights should never be imposed on the bird without giving it a month's rest.

(Continued to page 122A)

HOW TO READ YOUR GAS METER AND CHECK YOUR BILLS

It is easy to read the gas meter in your home and check on your gas bill. The ordinary gas meter has four dials whose hands begin moving slowly as soon as you turn on the gas. The needle of the dial marked "Two Feet" revolves perceptibly and is used only



for test purposes. The other three dials, which move more slowly and register gas consumption, show

the number of cubic feet used in ten thousands, thousands and hundreds. If the hand is between two figures, always take the lower number. Thus, in the dials illustrated, the hand at the left registers 70,000; the middle one 6,000; the right, 400, or a total of 76,400 cubic feet. Subtract your previous reading from this to determine the amount of gas used in the period.

TRANSPARENT BOX HAS BINS FOR SORTING STAMPS

Designed primarily for stamp collectors, a transparent box with eight compartments may be found equally convenient as a catchall for small objects in the machine shop or the sewing room. It is made of strong but light, rigid celluloid with a tight-fitting hinged top that protects the contents from humidity.



Hinged Top of This Transparent Box Fits Tightly and Keeps Out Humidity



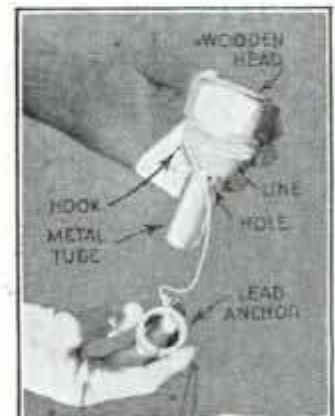
"Eyes" of This "Hot Dog" Stand Glem with Electric Lights; Side Opens to Shelter Patrons

GIANT DOG MADE OF CONCRETE HOUSES ROADSIDE STAND

Located beside the Pacific highway in Oregon is a large concrete, lumber and stucco dog that houses a refreshment stand. The "eyes" gleam at night, being electrically lighted. The dog is nearly ten feet high, six feet wide and thirteen feet long. A trap door opening at one side provides a canopy under which patrons may sit while being served. A shelf folds down to form the counter. The structure is piped for water, wired and equipped with cooking and refrigerating apparatus.

ANGLER'S "VEST POCKET" BUOY MARKS WHERE FISH BITE

To mark the pool where the fish are biting or the spot where your angling or hunting equipment fell overboard, there is a handy "vest pocket" size buoy that stays where it is dropped. A lead ring acts as an anchor. As the anchor line unreels, water enters five holes in the tubular base of the buoy and keeps it upright. When the anchor reaches bottom a screw hook prevents further unwinding of the line. Different colored line at intervals tells the depth of the water.



near collage-larone

2683

Shoe Form Co. W. J. Mac... 10/18

Co. 737 St. Paul
Rochester, NY
POPULAR MECHANICS



Apparatus for Sending Fingerprints by Wire; Note Equipment for Quick Comparison of Prints Received by the New System

FINGERPRINTS SENT BY WIRE TO SPEED UP JUSTICE

Fingerprint information can be transmitted by telephone or teletype with a new system designed to speed up crime detection. The system consists of a magnifying glass and a disk of 100 squares, each two millimeters in size. Letters are used to indicate particular squares by which a certain suspect's prints may be compared with a set taken at an earlier date. Fitted to the magnifier, the letters indexing outstanding characteristics run from left to right. The method of assembling information for transmitting by wire is based on the fundamental principles involved in the general classification of fingerprints.

HAMMER FOR EASY PULLING HAS FULCRUM HEAD

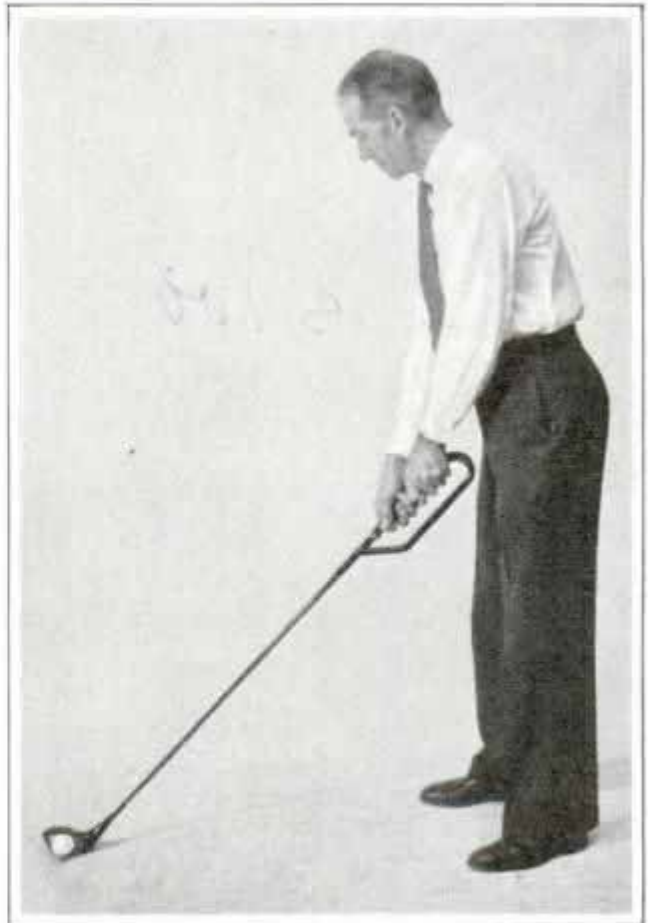


Equipped with a head that has a small fulcrum cast directly into the metal, a new hammer pulls nails easily without the danger of breaking the handle. The hammer has a long, easy angle

claw with plenty of space between the claw and the handle to get under a two-inch plank. The neck is shaped so the nail will not move away while being driven. The large diameter of the face makes driving more accurate.

GOLF IS IMPROVED BY TRAINING LEFT HAND TO SWING

Expert golfers tell you the left hand and arm must control the swing, so a practice club has been designed which forces the left hand to take charge of the stroke. That portion of the grip held by the right hand is kept in position by an adjustable spring, and pressure pulls the grip loose whenever the golfer's right hand overpowers the left in raising the club or bringing it down.



Practice Club Has Grip Which Is Pulled Loose When Right Hand Takes Improper Control of Swing

8669
Carrall
Iselle Club Corp
Carrall
\$1.00
Carrall

517 Harbour
 Commission Bldg
 Toronto, 2 Ont.
 Canada

Fish Are "Fingerprinted" and Bred as Game

Fish are now being "fingerprinted" to study their habits and travels and are scientifically interbred in efforts to keep the lakes and rivers stocked with the sportiest species of game fish. The scales of salmon have distinctive individual markings just as human fingers have. To trace the Atlantic coast salmon to their spawning grounds and learn their ages, fishery scientists caught them in nets, numbered them

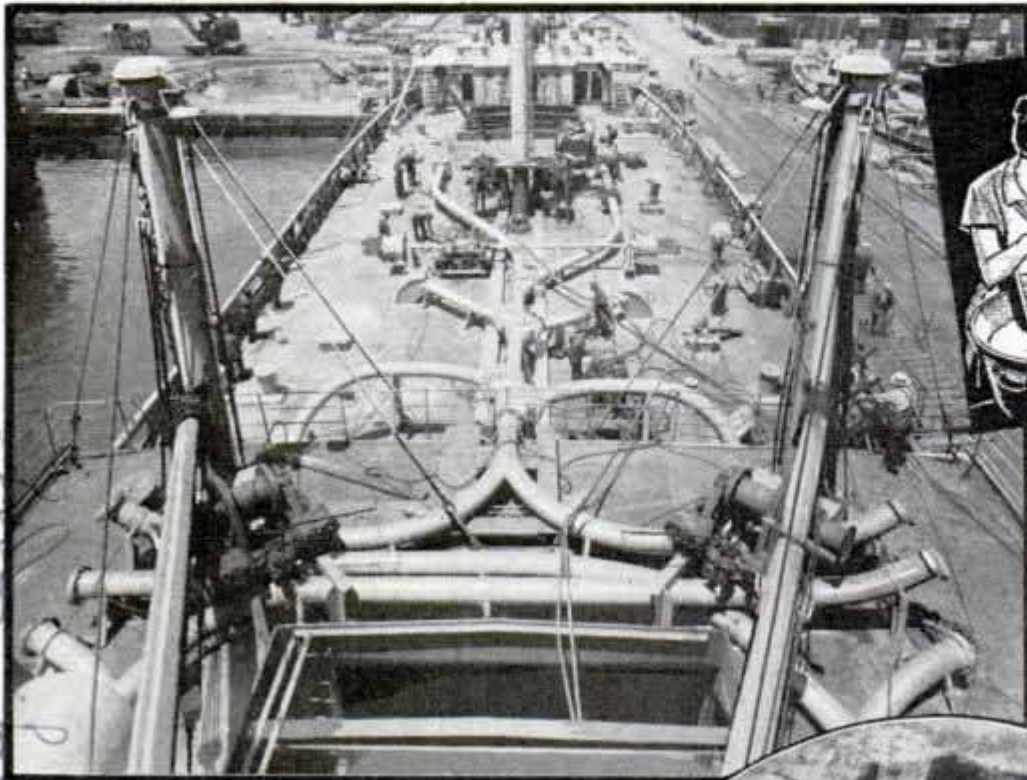


Top, Planting Fish Eggs in Gravel Bed of Stream; Left, Fertilizing Salmon Eggs in Pan; Center, Pike Chokes to Death Trying to Swallow Whitefish

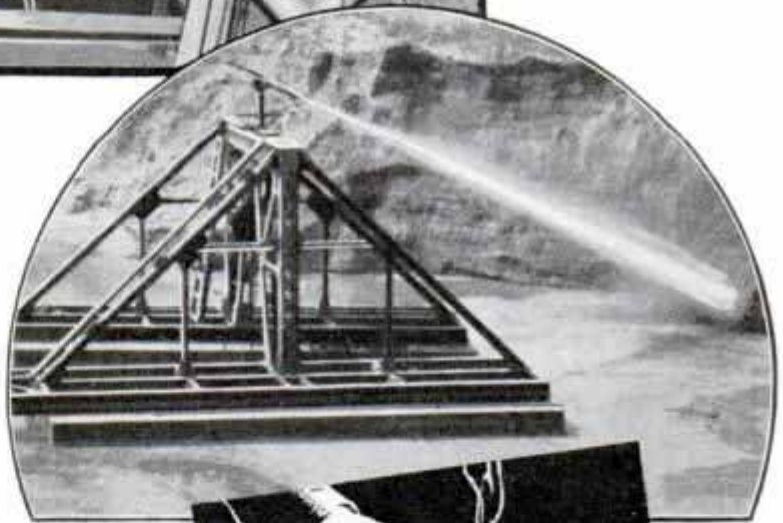
with tiny metal tags and released them after recording the day and place and scale prints. Rewards were given for the return of the tags with samples of the scales whenever the fish were caught, the scales double-checking the identity of the fish. Ocean salmon and fresh-water salmon have been interbred at fisheries, and by breeding brown trout and Atlantic salmon the scientists produced a new trout combining the best fighting game qualities of the two species. European brown trout

had been killed off by predatory fish were treated with copper sulphate, which killed the predatory fish and prepared for restocking the water afterward with sporty varieties. To determine whether artificially hatched fish were as healthy as others, natural born speckled trout, well-fed hatchery trout and hatchery trout that had been starved were placed in test pools to forage for themselves. After two days all three groups were found to be in equally good condition.

DOING IT



A Washerwoman Discovered How to Make Lead Float; Left, Loading Boat with Cement Pumped through Pipes; Below, Thawing Ground with Cold Water and Burning Sugar with Cigar Ash



GREAT inventions have often come about by slight changes of a trite and time-worn experiment. The old law then appears to have fallen apart and to run exactly opposite to expectations. If you are asked, "Will lead float?" or "Can you pump dry Portland cement?" you probably will answer in the negative. But wait!

Years ago an observing woman was washing the shirts of the miners in a Colorado town. Surrounded on all sides by mining activities she had absorbed a general knowledge of the subject. As she swished the clothes in the soapy water she noted the glistening black mineral, galena, floating on the foam.

"That's strange," she said to herself, "lead minerals are too heavy to float, but they are floating just the same—it must be the oil in my soap."

The oil in the soap was the changed condition that caused the lead minerals to float. She made lead float. Her intelligent observation gave to the world the oil flotation process in which the heavy minerals float to the top of the water, and the lighter ones are made to sink. By far the great-

er bulk of the world's copper, its lead, and its zinc, even the heaviest minerals of all, gold, silver, and platinum, are now processed by this woman's discovery. She reversed the natural order of things.

A man in Chicago was obsessed with the idea of a machine to fill sacks. He wanted a simple machine that would function with

Emt. Walter B. Lenthart, Bennett, Cal.

8464

E-464

BACKWARDS



a minimum of attention. There were machines on the market but they were too slow, or did not weigh accurately or did not fit into his ideas. And then one day the flash came to him. He tied the sack first and then filled it.

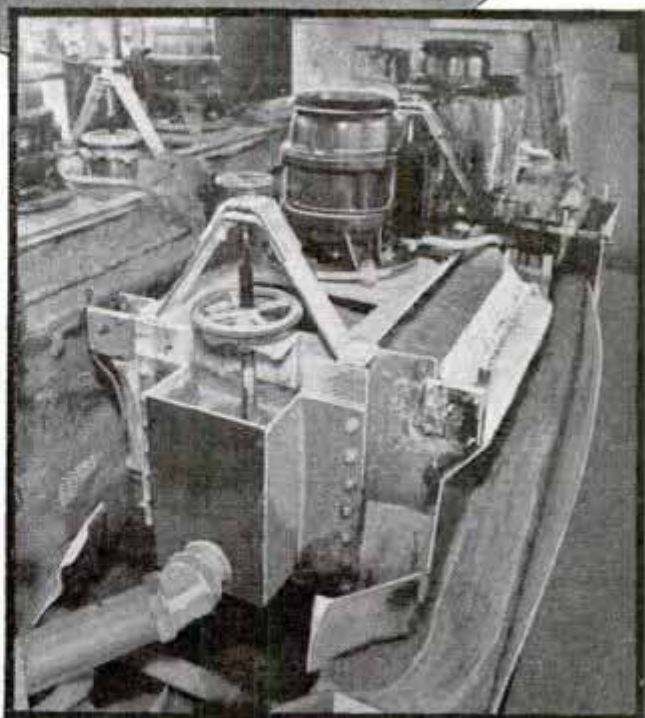
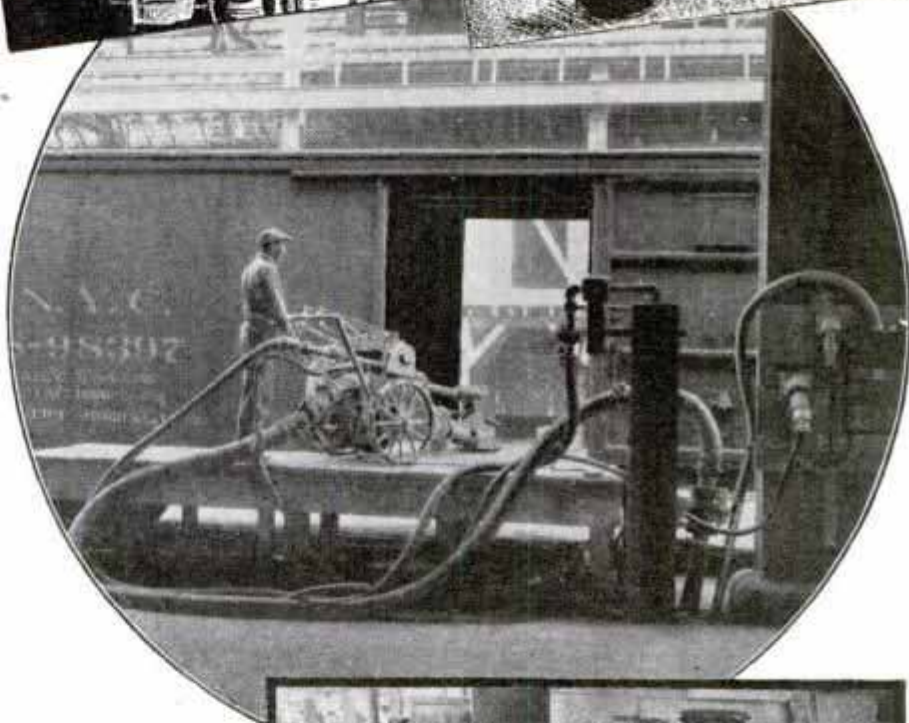
Last year in America alone more than a billion sacks were first tied for shipment—and then filled. He simply cut a hole in one corner of the sack, stuck a tube in the hole and forced the material through the hole into the sack. He cut the hole so that a fragment of the burlap acted as a little flapper gate which sealed the hole when the sack was filled. This man also reversed the natural order of things and made a fortune.

Another man wanted to move finely ground rock cheaply and in large quantities over bridges, through tunnels, under the water—any place. Sucking the dust into fans was one solution but catching it again was not so simple. "Too dusty," he said, "I'll pump it like water." So he built a pump and he pumped the dust through the long pipes, up hill and down hill, around corners and through the earth.

Try this simple experiment and you will see how it is done:

Place a few pounds of dry Portland cement in a bucket and stir the powder with

(Continued to page 124A)



Pumping Cement into Freight Car, and Flotation Unit Which Causes Heavy Minerals to Come to Top

E 629

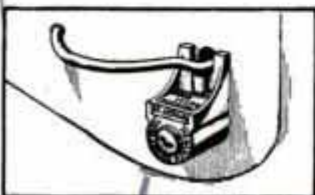
Toy Balloon Blocks Hats for Easy Cleaning at Home



Left, Balloon Is Inflated; Right, Hat Is Placed over Balloon and Card-board Laid on Brim; Below, Hat Ready for Cleaning and Blocking

Cleaning and blocking your own hat at home is easy with a rubber balloon inflated for the "block," which has just been placed on the market. The stem of the balloon is inserted through a hole in the side of a metal base on which the hat rests. After the balloon is inflated to fill the hat firmly, a cardboard is placed over the felt brim to keep it in place and the hat crown presents a firm surface for cleaning.

LOCK FOR AUTOMOBILE HOOD INSTALLED WITHOUT TOOL



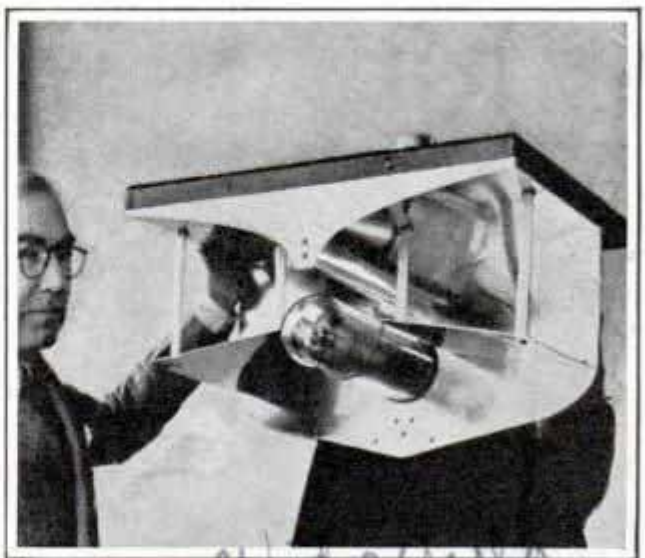
Requiring no tools to install it, a small automobile hood lock to prevent tampering with the engine is

now on the market. It is designed for 1935 Fords and Studebakers and cars using the same type of auto hood catch. A locking bar is inserted through the rear catch slot, the hood catch handle is placed in its locked position, and when the key is turned it becomes impossible to release the hood catch. Turning the key hard to the right acts as a screw and prevents hood rattles.

GLARELESS LAMPS TO LIGHT GIANT BAY BRIDGE

When the San Francisco-Oakland Bay bridge is completed, it will be illuminated by the latest sodium vapor lamps. So free from glare are these lamps that anyone looking directly into the powerful glow from a few feet away will not be blinded. The lights will be posted twenty-six feet above the roadway on 1,000 standards which will

be spaced at 150-foot intervals from one shore to the other, and on both decks of the giant bridge.



Sodium Vapor Unit to Light Double-Deck Bridge

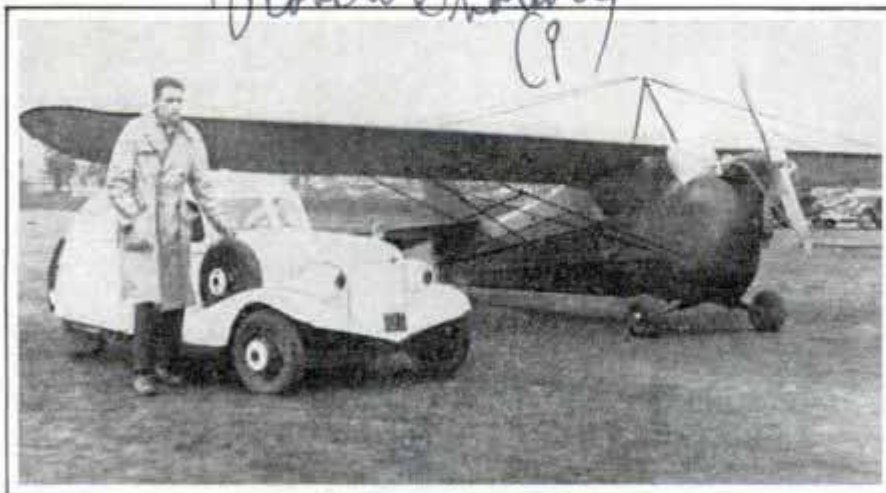
Merchen, Portable

**RUST BILL IS CUT BY COAL CAR
MADE OF STAINLESS STEEL**

Rust costs American railroads an estimated \$150,000,000 every year. In an effort to stop this waste a stainless steel coal car has been built, eliminating the necessity of repainting. The stainless steel is lighter than ordinary steel, thus increasing the ratio of pay load to total weight. Being harder, it endures the wear of ore loads better and resists the corrosive effects of weather and chemicals. Rain falling on a load of coal frees sulphuric acid, which acts on ordinary steel injuriously, and calcium loads are also harmful.

**HOMEMADE THREE-WHEEL CAR
IS HARD TO UPSET**

Built by a young Minneapolis mechanic during spare time, a three-wheeled streamline automobile driven by a standard four-cylinder motorcycle engine has defied deliberate attempts to upset it. Taking curves at high speed it tipped to a forty-five degree angle without turning over. The car is forty-six inches high and accommodates two passengers. It will travel eighty-five miles an hour and run forty miles to a gallon of gasoline. The engine is at the rear, leaving space for battery, tank, and luggage under the hood. Conventional controls and front-wheel steering are provided. Frame, body and top are all steel. Front axle and brakes are standard Ford, and Ford wheels were cut down to carry twenty by four airplane tires. The motor is cooled by air scooped through vents in the top.



Compare Size of Midget Three-Wheeled Car with Small Plane; Motorcycle Engine at Rear of Auto Drives It Eighty-Five Miles an Hour



Forester Prunes Low Branches with Circular Saw Atop Pole, Driven by Engine Hauled on Toboggan

**POWER-DRIVEN SAW ON POLE
SPEEDS FOREST PRUNING**

Mounted on a hollow aluminum pole to reach up into the trees, a power-driven circular saw manned by one forester can do the work of four men using hand saws. The sixty-pound outfit consists of a small gasoline engine, flexible shaft with housing, pole and saw. It can be hauled through the woods on a small toboggan or wheel gig by one man. The circular saw makes a smoother cut, and climbing and hand labor are obviated.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped envelope.

hc
out

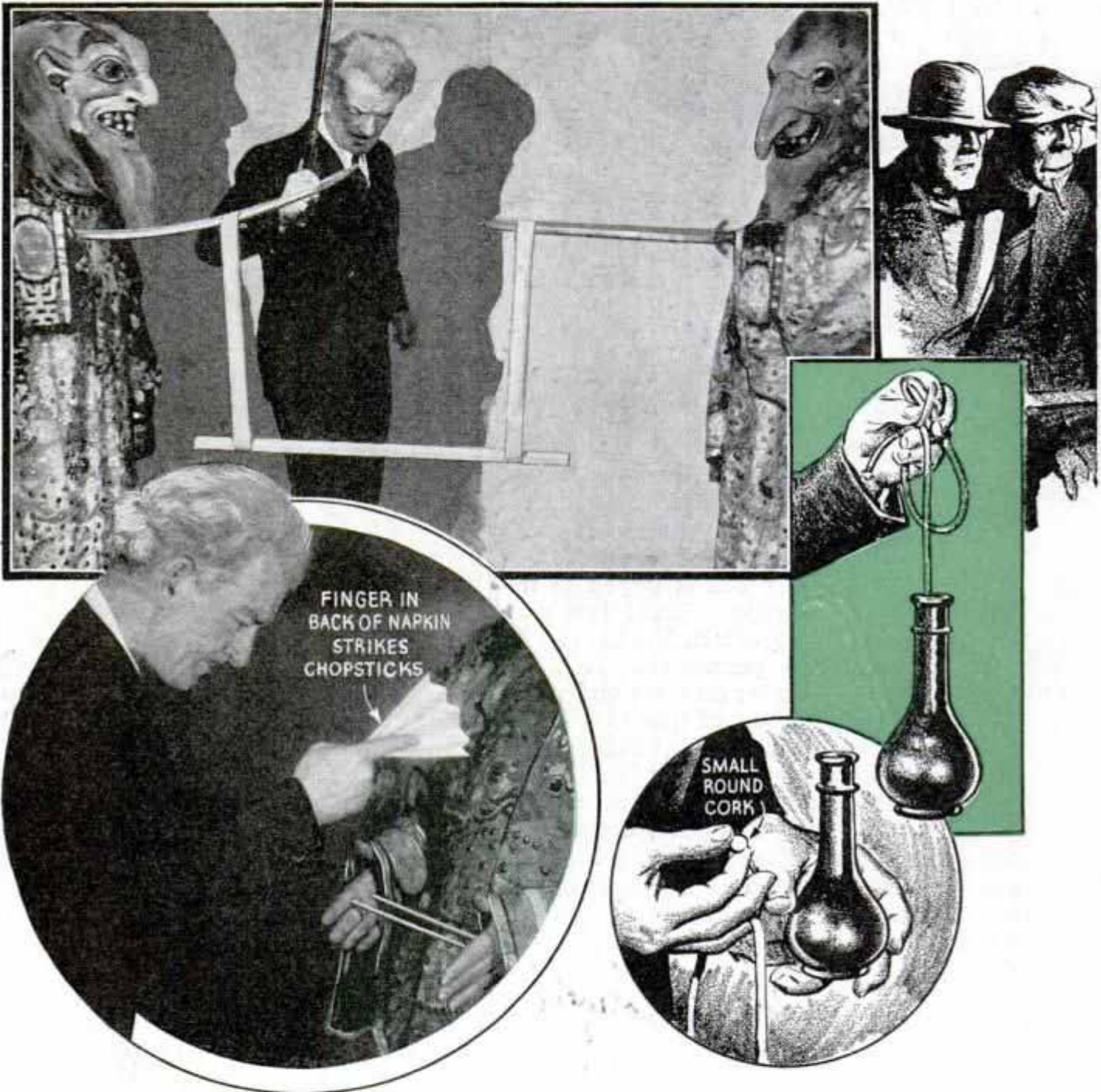
not on market 8/3/36
Henry

Robert Shattwell
C.P.

V. H. Carlisle

8463

CHINESE



Top, the Chinese Sword Trick; Below, Breaking Chopsticks with a Paper Napkin, and Supporting a Glass Bottle by a Rope Stuffed in the Neck; the Small Ball Is the Secret

By **HARRY BLACKSTONE**

Famous Magician

THE real magicians of the Orient are the Chinese and not the Hindus. Most magicians in India are street-corner fakirs who perform the old tricks of their great-grandfathers, their methods being handed down from one to another. In contrast, Chinese magicians have a true stagecraft,

and many of the best tricks presented by American and European magicians are of Chinese origin.

To illustrate the ingenuity of Chinese magic, let us examine some of their simpler tricks, most of which require such common objects that you can perform them yourself.

The broken chopstick trick is an excellent close-range mystery. A spectator

MAGIC



holds two light chopsticks between his hands, keeping them in a horizontal position. As the magician, you take several strips of paper and slap them downward against the sticks. You deliver a final stroke and the strips of paper break the chopstick squarely in half.

There is a trick to the final stroke. As you bring the papers downward, extend your forefinger. Completely hidden by the papers, the forefinger strikes the sticks and breaks them. A variation of this trick consists of breaking a lead pencil with the creased edge of a dollar bill. This is inferior to the original Chinese version, for the strips of paper cover the finger better.

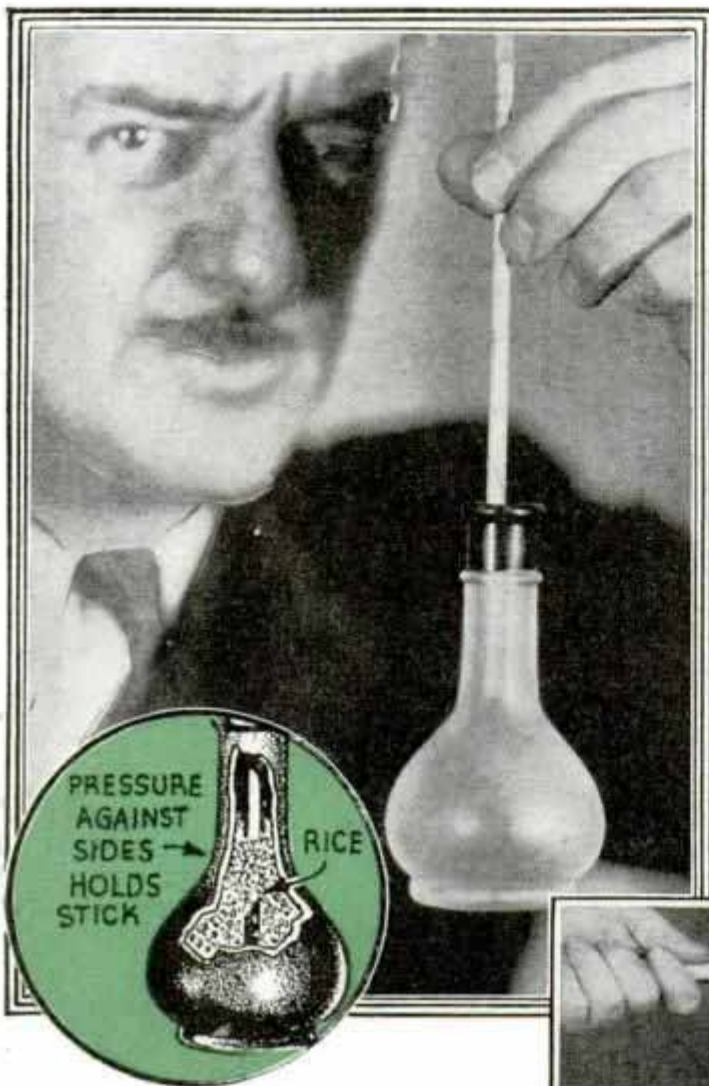
Here's another chopstick trick. One chopstick is balanced on end on the table, while you attach the other stick to the string of a tiny bow. From a distance of several feet, you shoot the chopstick arrow



The Decapitation Trick Used in a Movie; Note Body of Man Concealed in Headless Dummy

and strike the standing target. Both sticks are weighted in one end. That makes it easy to stand the first one on the table. When the second chopstick is discharged from the bow, its weighted end causes it to turn in flight. Swinging sidewise, it strikes the standing stick and sweeps it from the table.

A single chopstick and a rounded bottle of rice are the "props" for another Chinese perplexity. Fill the bottle with rice,



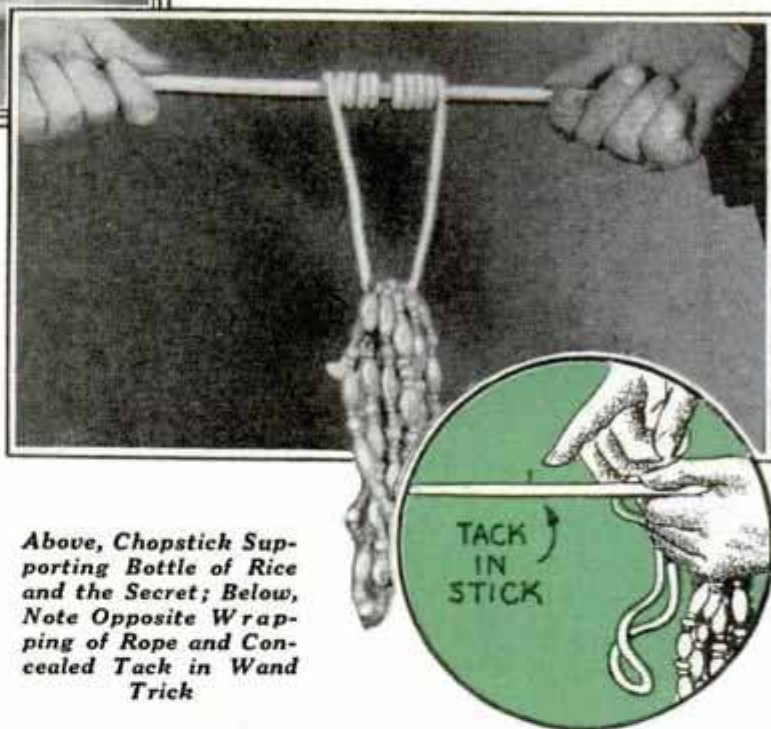
thrust the chopstick down into the rice, deliver an incantation and lift the chopstick. Up comes the bottle of rice, "magnetized" to the stick. This trick works itself. When thrust into the rice, the chopstick forces the grains to the side of the bottle and the pressure is sufficient to lift the full weight with the chopstick alone. To remove the stick, grip the bottle with one hand and twist the stick with the other.

Chinese magicians also do this trick in a different form. This version requires an empty bottle and a piece of rope. After lowering a loose end of the rope into the bottle, the magician wraps the rope around the neck, then turns the bottle over. The outer end of the rope falls free, but the rope does not drop from the bottle. Instead, it hangs suspended, one end still in the bottle. Then the magician grips the free end of the rope and lets the bottle hang dangling from it. After

that, he draws the rope from the bottle and gives both for inspection.

The bottle used is an opaque one, more of a vase than a bottle. Inside it is a small ball of cork or rubber about half the diameter of the neck of the bottle. The magician inserts the rope. When he winds it about the neck, he tilts the bottle and the ball rolls into the neck. It cannot roll out because of the rope; and when the magician tugs the rope slightly, the ball wedges between it and the bottle neck. At the finish, the magician holds the bottle by the neck and draws the rope clear. The tiny ball, pulled along, falls unnoticed into his hand.

Another unusual trick is performed with an assistant, who holds a large wand between both hands. The magician winds a stout cord about the wand and ties the ends around the neck of a vase, which is suspended beneath the wand. At the magician's



Above, Chopstick Supporting Bottle of Rice and the Secret; Below, Note Opposite Wrapping of Rope and Concealed Tack in Wand Trick

command, the vase drops, carrying the ropes with it. The magician catches it before it reaches the floor. He shows the wand to be quite solid, despite the fact that the ropes apparently cut through its center.

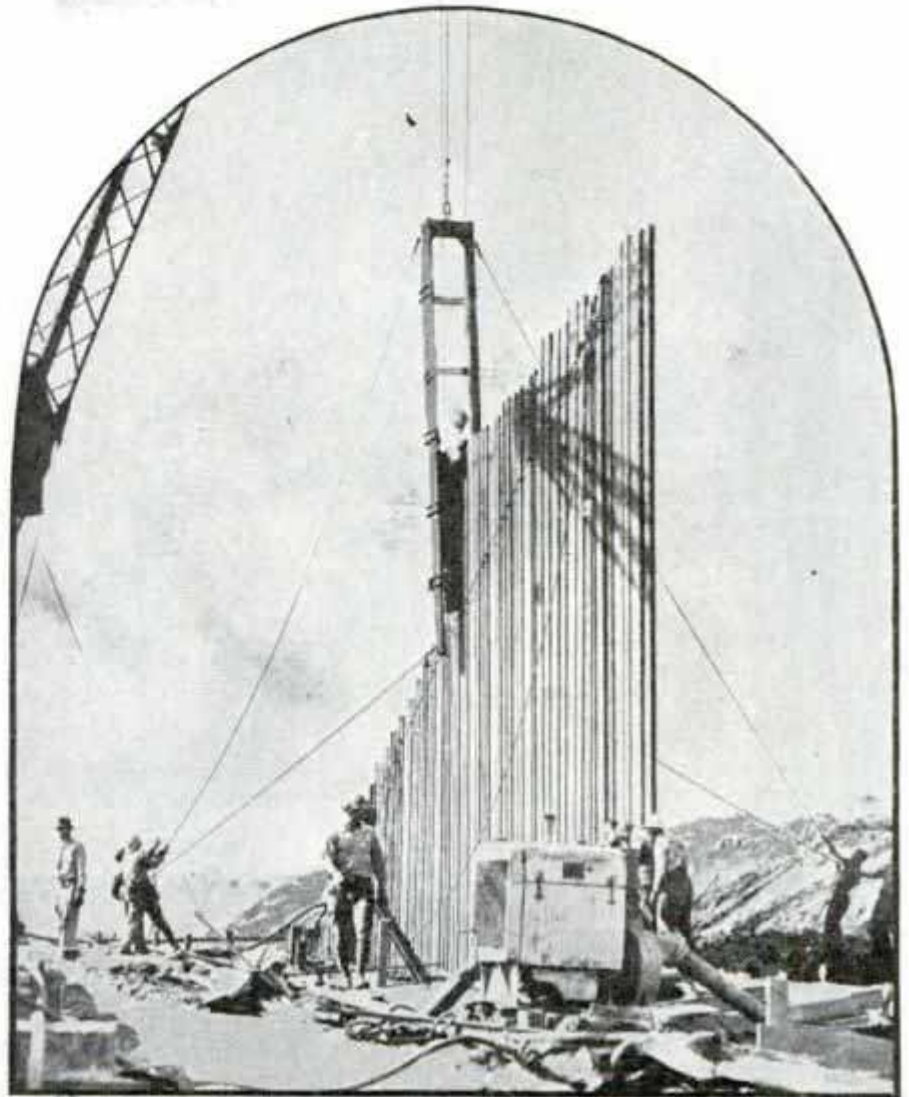
This trick depends upon a short pin, or a tiny tack, previously pressed into the center of the wand. The assistant holds

(Continued to page 116A)

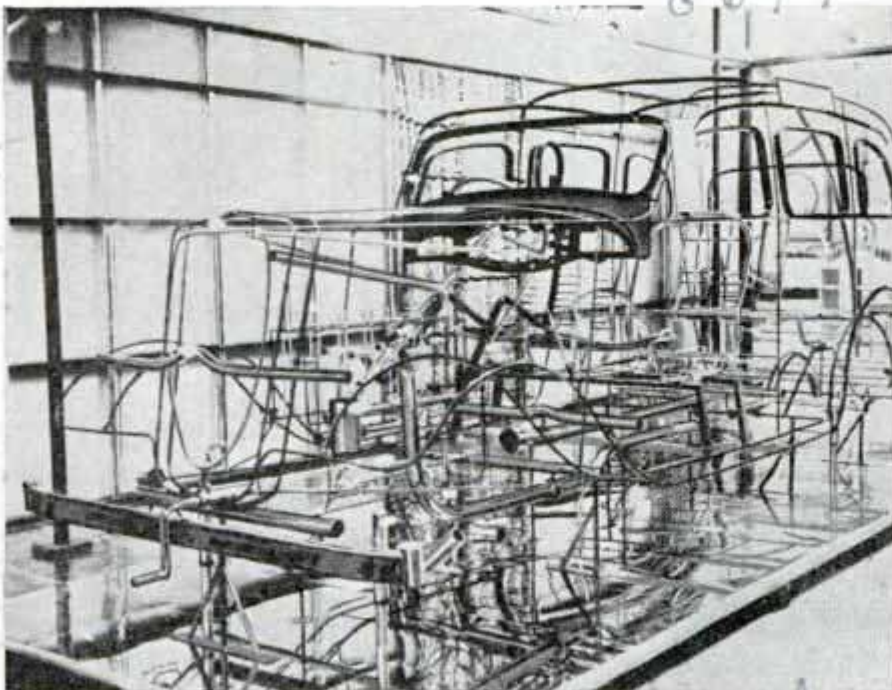
Steel Piling for Dam Is Driven in Solid Rock

Drilling a steel "picket fence" fifty feet high and nearly a mile in length down into a solid rock bed was one of the tough assignments of the construction crew in the Tennessee Valley project. A mile-long earth dam on one side of the river at Pickwick Landing, Tenn., had to be protected from the danger of being undermined by water above the triple dam, which, when completed, will consist of a concrete span across the river and connecting dams of earth on either bank. For the reinforcing wall, the builders used sheet steel, which they pounded deep through the earth until it was firmly imbedded in the rock bottom. A huge pile driver did the job.

Driving Steel Pilings into Ground to Form Solid Wall That Will Protect Earthen Dam in the Tennessee Valley



"Skeleton" of Modern Auto Shows Use of Metal Tubing

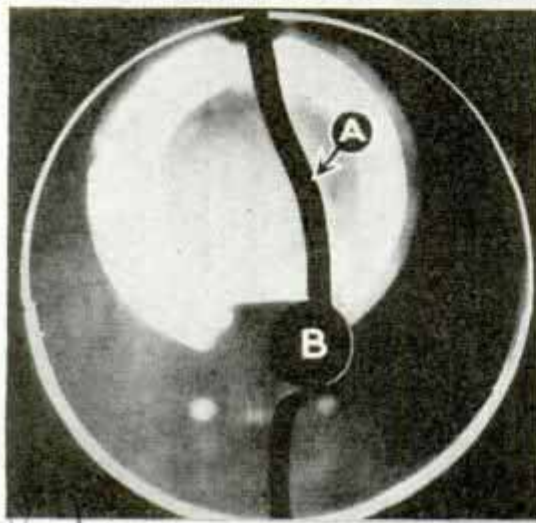


To demonstrate the amount of metal tubing required in the building of a modern automobile, an "invisible car"—merely the "skeleton" in tubing—was placed on exhibition recently at the British Industries Fair in London. Its weird outlines showed exactly how much metal tubing goes into the 1935 car and what purposes it serves in body and motor.

Outlines of Fenders, Doors and Windows, Running Board, Hood and Radiator Grille Are Easily Identified in Skeleton Car Demonstrating All Parts Made of Metal Tubing

8558

BULLET "STOPPED" BY LIGHT WHEN IT STRIKES WIRE



Top, Gun Firing Bullet; Bottom, Bullet "B" Caught by Camera Lens as It Severs Wire "A"

Fired from a small gun at 250 miles an hour, a ball was made to appear motionless in air when it was momentarily illuminated by a glow tube. When the bullet severed a wire in its path, current was discharged in the tube and the light had the effect of "stopping" the ball. The photograph was taken at the instant the wire was broken.

8753

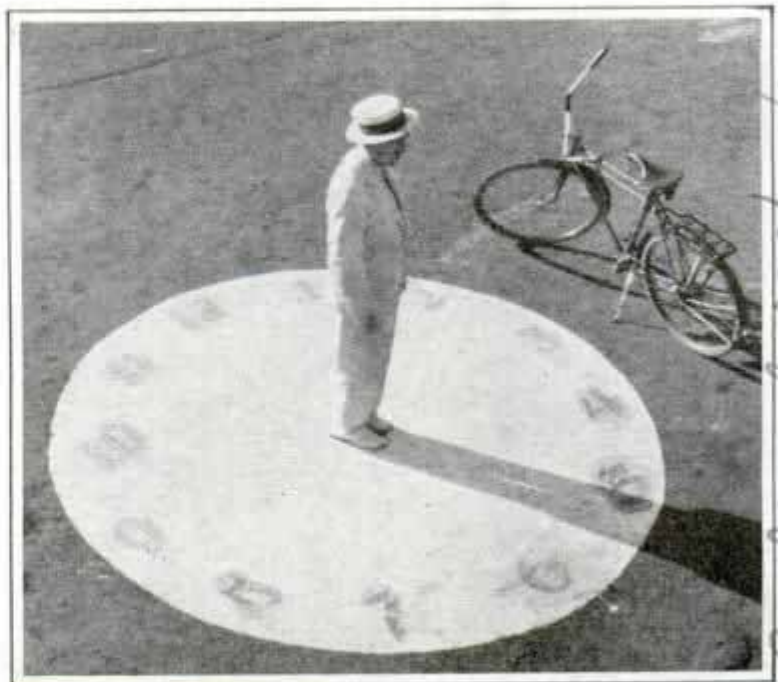
SOFT WOOD IS MADE HARD BY RESIN TREATMENT

Wood can be hardened, resisting abrasion and moisture, by a newly developed treatment with synthetic resin. Golf club heads are being thus treated to give them maximum hardness. Baseball bats gain high resistance to

chipping and splitting; wooden airplane parts are made stronger and more weather-proof. One of the objectionable characteristics of wood is its change of volume with moisture content. Warping and checking are caused by uneven moisture distribution. This is prevented by the resin treatment. The wood is first maintained in a vacuum and then submerged in a synthetic liquid resin of the phenol and formaldehyde condensation type. Pressure of several atmospheres is introduced, and afterward the wood is cured for 100 hours at 200 degrees Fahrenheit. The manufacturers say the process assures absolute uniformity of resin distribution throughout the wood. The surface is hardened, taking lacquer and varnish readily and obviating any primer coat. If a high gloss is desired, a second resin application gives a durable finish bringing out the natural grain. Wood doubly coated can be submerged in water six weeks before reaching normal moisture content, eight per cent.

MAN'S SHADOW TELLS THE TIME ON SUNDIAL IN PAVEMENT

Painted on a street in Walla Walla, Wash., is a large sundial that tells time with a human shadow. When a pedestrian wants to know the time, he steps to the center of the dial and his shadow falls through the hour.



When This Man Stepped on the Street Sundial His Shadow Told Him It Was About 5:15

Pyratone Products

Deliveries estimated. The shadows are cast.

**"BLIND SPOT" IN MAP OF YUKON
ERASED BY EXPLORERS**

Yukon's "blind spot," a two-thousand square mile mountain wilderness never before on the North American map, has been surveyed and charted by an expedition that spent four months in the field. Led by Bradford Washburn, the explorers reported the discovery of several gigantic mountain peaks, located their position with instruments and put them on the map. Carrying cameras and surveying apparatus up to a height of more than 12,000 feet on Mount Hubbard, the expedition established the highest survey station in Alaska or Canada. Two of the newly found mountains were named "King George" and "Queen Mary" in honor of the silver jubilee year of the British king and queen. The men were the first to cross the St. Elias mountain range near the border of Alaska and Yukon on foot, and this was the greatest test of their stamina. The region is extremely rough, with lofty mountain ranges cut by deep gorges and wide, glacier-filled valleys.

Duane Service 6/26/30

8757

8713

**PLAYHOUSE BUILT OF OIL CANS
MODELED AFTER LOG CABIN**

More than two thousand oil cans form the walls, chimney and roof of a "log cabin" type playhouse built by a garage man at Muskogee, Okla. Tin cans were flattened out for the roof, and solder holds the structure together.

Barry Rader



Garage Man Soldered Oil Cans Together to Build "Log Cabin" Playhouse



Sixteen-Story Apartment House Skyscraper in Paris Suburb Built of Steel Units and Cement

Dracy

**APARTMENT TOWER COSTS CUT
WITH STEEL AND CEMENT**

Apartment house skyscrapers of steel and cement are being built in a suburb of Paris. Their construction is simple and economical, the framework of the towers being of standardized steel units. Each skyscraper is sixteen stories high and accommodates 150 apartments.

8758

**REST TIME OF SEEDS IS VARIED
BY TEMPERATURE AND LIGHT**

Light rays and temperature affect "sleep" time of seeds. Experiments show cereal seeds rest short periods at high temperature, but lie dormant for weeks near freezing with other conditions good for germination. Red light rays of around 7,600 angstrom units tend to make lettuce seeds sleep, while 7,000 angstrom red rays and 5,200 angstroms yellow stimulate the seeds.

*Cont. Harold G. Board
of The Daily Oklahoman*

*Duane Service
6/26/30*

6800 see clip. Chicago Tribune no 24, 1935, in May issue

HALF an ACRE and

By H. W. MAGEE

WOULD you like to own a home?

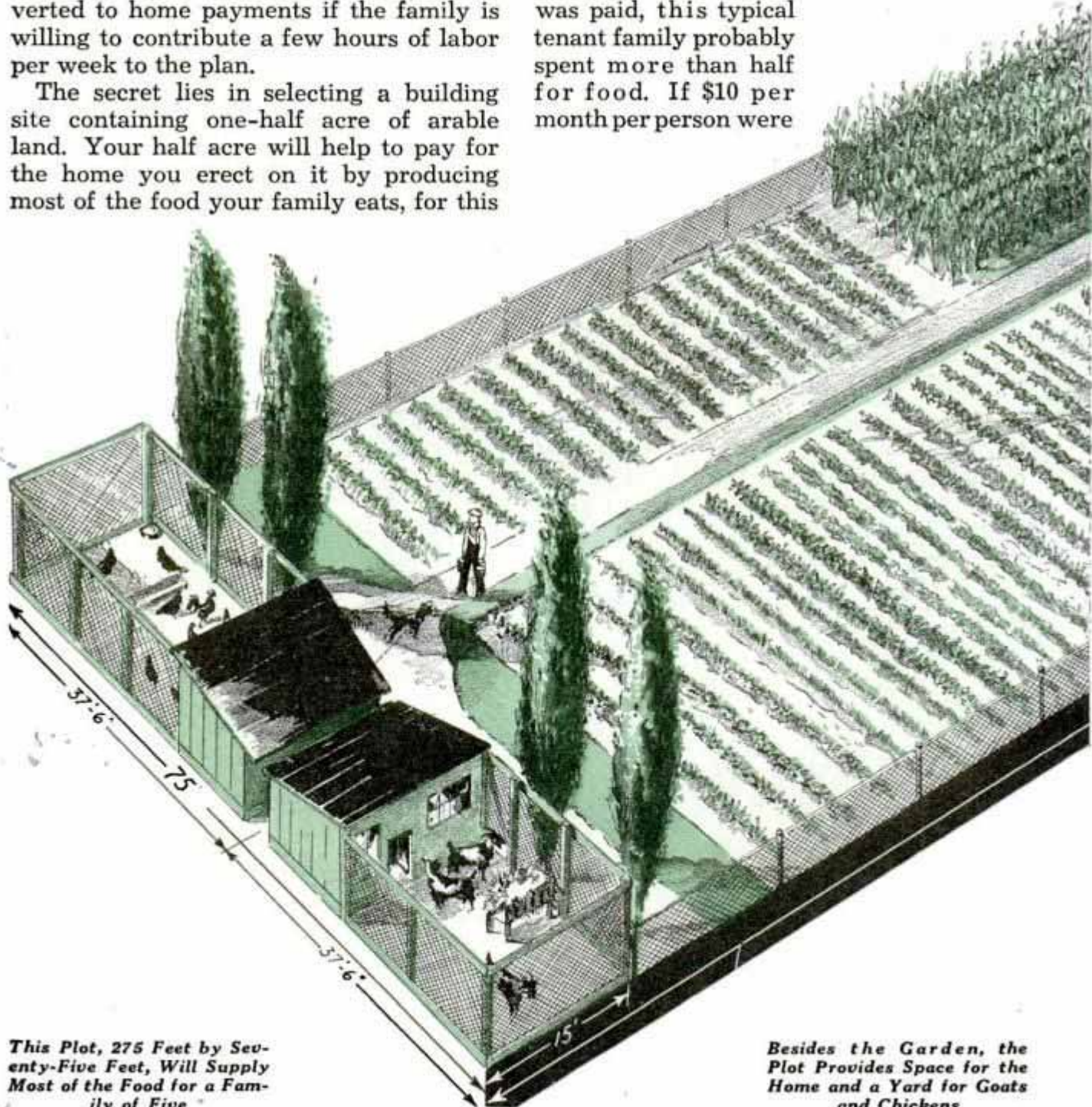
Why not buy it and let your grocer and landlord pay for it?

Thousands of urban tenant families have this opportunity. Most such families pay enough for food and rent in a few years to purchase a home. All the rent money and much of the food money can be diverted to home payments if the family is willing to contribute a few hours of labor per week to the plan.

The secret lies in selecting a building site containing one-half acre of arable land. Your half acre will help to pay for the home you erect on it by producing most of the food your family eats, for this

amount of ground will almost support five persons. It is surprising how much food can be grown on a few hundred square feet of good soil.

The average urban tenant family in 1933 had an annual income of \$1,062 of which \$252 went for rent, according to a department of commerce survey covering sixty-one cities. These figures probably are not far wrong today. Of the \$810 left after rent was paid, this typical tenant family probably spent more than half for food. If \$10 per month per person were

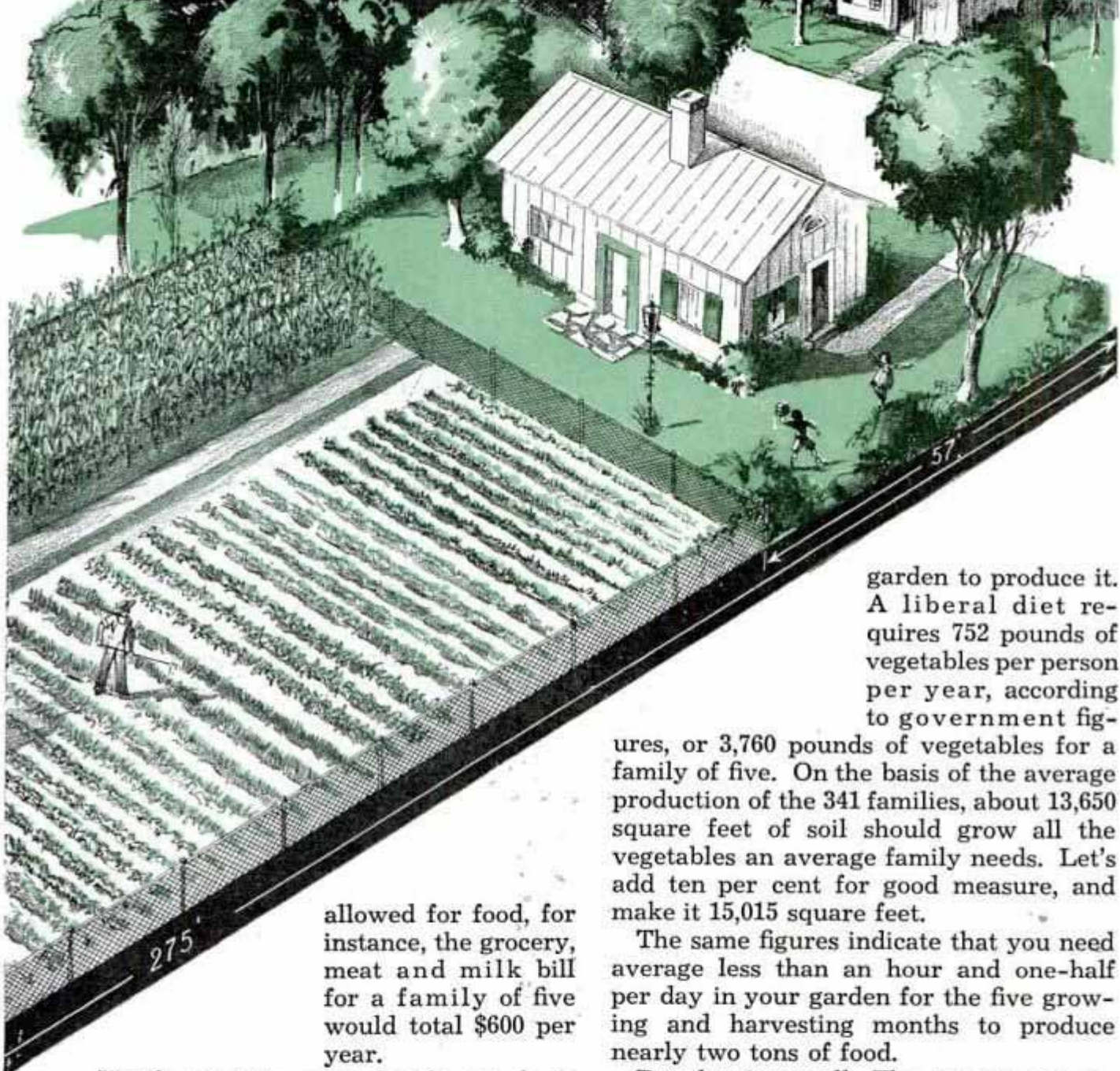


This Plot, 275 Feet by Seventy-Five Feet, Will Supply Most of the Food for a Family of Five

Besides the Garden, the Plot Provides Space for the Home and a Yard for Goats and Chickens

same as May. 1950 6 5 02
S. L. Co., 59 W. Austin Ave
Chicago

Independence



allowed for food, for instance, the grocery, meat and milk bill for a family of five would total \$600 per year.

Here's what the same family can do in the way of feeding itself from half an acre. The Illinois Emergency Relief Commission last year provided garden plots containing 5,000 square feet each to many needy families, and in one section of 45.9 acres, 341 families raised 417,658 pounds of vegetables, an average production per plot of 1,420 pounds. Each family averaged about one-half hour of garden work daily for five months.

This provides a yardstick to measure the food your half acre will produce and the amount of time you must spend in your

garden to produce it. A liberal diet requires 752 pounds of vegetables per person per year, according to government figures, or 3,760 pounds of vegetables for a family of five. On the basis of the average production of the 341 families, about 13,650 square feet of soil should grow all the vegetables an average family needs. Let's add ten per cent for good measure, and make it 15,015 square feet.

The same figures indicate that you need average less than an hour and one-half per day in your garden for the five growing and harvesting months to produce nearly two tons of food.

But that is not all. The government estimates that 305 quarts of milk per person per year are needed in a liberal diet, or 1,525 quarts for a family of five. Two milk goats, living partly on vegetable tops from your garden and scraps from your table, will supply all your milk. The government also figures thirty dozen eggs per year are required in a liberal diet for one person. A flock of twenty-five laying hens, a dozen other hens and a score of young chickens will furnish all the eggs needed for five persons, plus about 125 pounds of meat

(Continued to page 119A)

6259 St. Clair Ave
Cleveland Ohio



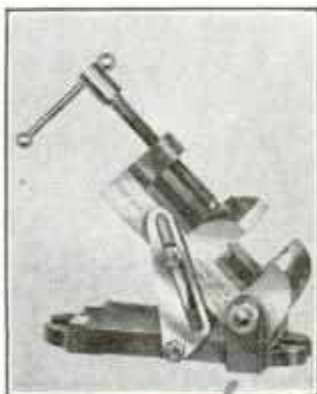
Passengers or Freight Ride Smoothly in This All-Steel Trailer, Two Feet Wide and Thirty Inches Long, Easily Towed by Bicyclist

AIRPLANE-TIRED BIKE TRAILER HAULS FIFTH-TON LOADS

Fitted with small airplane tires that carry low pressure, the latest bicycle trailer is capable of carrying 400-pound loads with easy pedaling. The wheels have fully adjustable bearings and the axle has an end brace to support overloads. The body is all-steel, thirty inches long, twenty-four wide and twenty deep.

TILTING VISE FOR ANGLE WORK CAN BE SET QUICKLY

Lending itself to accurate setting without clamps, wedges or other make-shift methods, a new vise can be tilted for angle work. All the operator has to do is raise the vise to the required angle and lock adjustable supports. The tool is accurately



graduated, its base, body and sliding jaw are of semi-steel cast and its adjusting screw has a fine pitch thread and long bearing in the vise body. The swivel base permits turning of 360 degrees. Drill press, milling

machine, grinder and bench vise work can be accomplished with the handy tool.

FINGER-TIP CONTROL RUNS ELECTRIC CAR FOR BOY CRIPPLE

Finger-tip control on the steering wheel for both forward and reverse motion and for brakes is provided on a small car built by a Wisconsin man for his crippled son. An automobile starting motor, slightly modified to operate on low current and to reverse, propels the tiny automobile twelve miles an hour with current from two six-volt

auto batteries. The wheels are driven by V-belts, arranged with just enough slip-page to allow smooth starting and differential for turning corners. The car is driven easily by the boy despite the fact that injury deprived him of the use of his



Automobile Starting Motor Operating on Two Six-Volt Batteries Drives This Tiny Car

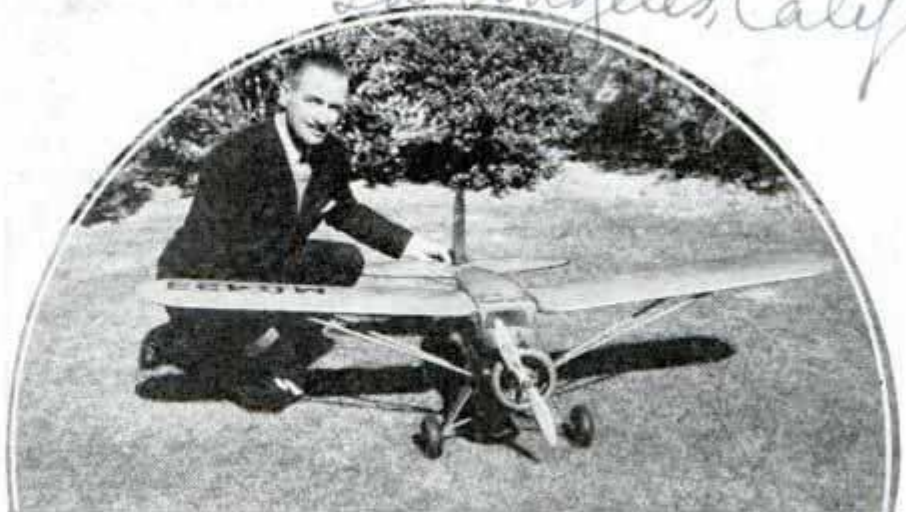
right hand and both legs. Batteries are re-charged overnight on an ordinary house circuit. One night's charging provides sufficient power for many hours of daytime driving. The builder estimated the cost of the car at not more than \$45.

Chicago Tool + Engineering Co
18389

Patented by James Fisher
Kenosha, Wis.

Flying Midget Plane Is Movie Star's Hobby

Building and flying model planes is the hobby of Reginald Denny, motion-picture actor. One of his latest midget aircraft is a scale model of a Fairchild monoplane. It is equipped with a one-fifth-horsepower engine that gives the plane a speed of forty miles per hour and a ceiling of 9,000 feet. Special construction features make the ship almost proof against damage in "crack-ups." The fuel tank holds two ounces of gasoline, sufficient for flights of twenty-four minutes. When the tank becomes empty, the plane automatically assumes a three-point landing position and glides to the ground. The model is built of bass, spruce, balsa and duralumin, fabric covered. It weighs four and one-half pounds and carries a "pay load" of five pounds. The wing spread is seventy-one inches. Complete to plush-covered chairs in its cabin, the model has been tested by the actor, who plans to extend his hobby by producing the small ship commercially.



Reginald Denny, Film Actor, with Model That Flies Forty Miles an Hour, Burning Two Ounces of Gasoline in Twenty-Four Minutes

AUTO BULBS FLASHING IN ORGAN PRODUCE MUSICAL NOTES

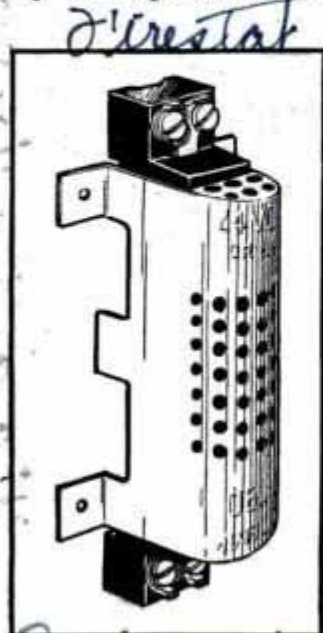
Ordinary automobile headlight bulbs connected with the keys and stops help produce the music in an electric organ operated on the principle of photo cells and light choppers. The organist playing the keys causes the lights to flash behind the light choppers, of which there are twelve,



Organ Operates on Principle of Photo-Electric Cell; Synchronous Motor Keeps It in Tune Constantly

HOME FIRE-ALARM SYSTEM WORKS ON LOW VOLTAGE

Less than twenty-four volts of electricity will operate a small fire-alarm system designed for protection of the home.



Five-inch fire detectors can be placed at strategic points throughout house and garage. When a predetermined temperature is reached a loud gong is started. There are no fusible links or metals to be damaged and the unit is ready to be used again without repair.

driven by an endless belt from a synchronous motor. Each light chopper has six rows of apertures for octaves, the "C" chopper, for example, playing "C" at six different octaves. The synchronous motor keeps the instrument in tune, unaffected by atmosphere or temperature.

Automatic Fire Alarm System 3135 Park Ave. New York, N.Y. 1622

Industries J. Orange Grove Co. Los Angeles, Calif.

Electromec 33-232

Latest Autos Built to Make Servicing Easier

Auto manufacturers are fashioning the latest models so the service-station attendant and the mechanic may reach vital parts more easily. For instance, the hood that opens from the side is being replaced by a hood-and-radiator grille unit that swings upward from the front to expose the entire motor instead of just one side. Pioneered several years ago by the maker of an air-cooled car, the front-opening hood is gaining ground as wider fenders make it harder for the mechanic to reach the engine. One of the latest aids to servicing is a small door that opens on top of the hood near the ornament to permit filling the car with oil and water. This eliminates raising the hood unless the motor requires attention. Checking the oil level, formerly one of the service-station operator's duties, is eliminated in one of the new models. The driver of the car may determine the oil level quickly by pressing a button on the

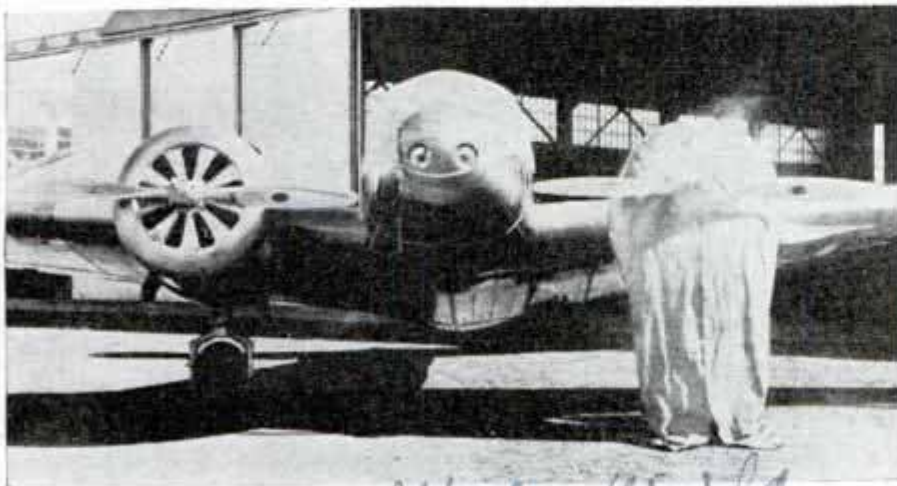


Top, Hood and Grille Lift as Unit; Left, Fuel Gauge Tells Oil Level on Pressing Button; Right, Door in Hood for Water and Oil

instrument panel, converting the gasoline gauge temporarily into an oil gauge. Built-in jack pads for facilitating removal of tires are among other aids to servicing.

8676

Cover to Warm Plane Engine Has Heater at the Bottom



Motor at Right Is Being Warmed by Heater Inside Cover

Designed to warm the motor while the plane is on the ground, a new cover has a heater at the bottom. The cover, which conveys the warmth from heating unit to the plane's motor and keeps it from escaping, extends from the ground and laces about the engine. Another innovation is an adjustable shutter for the motor that keeps out cold air while flying.

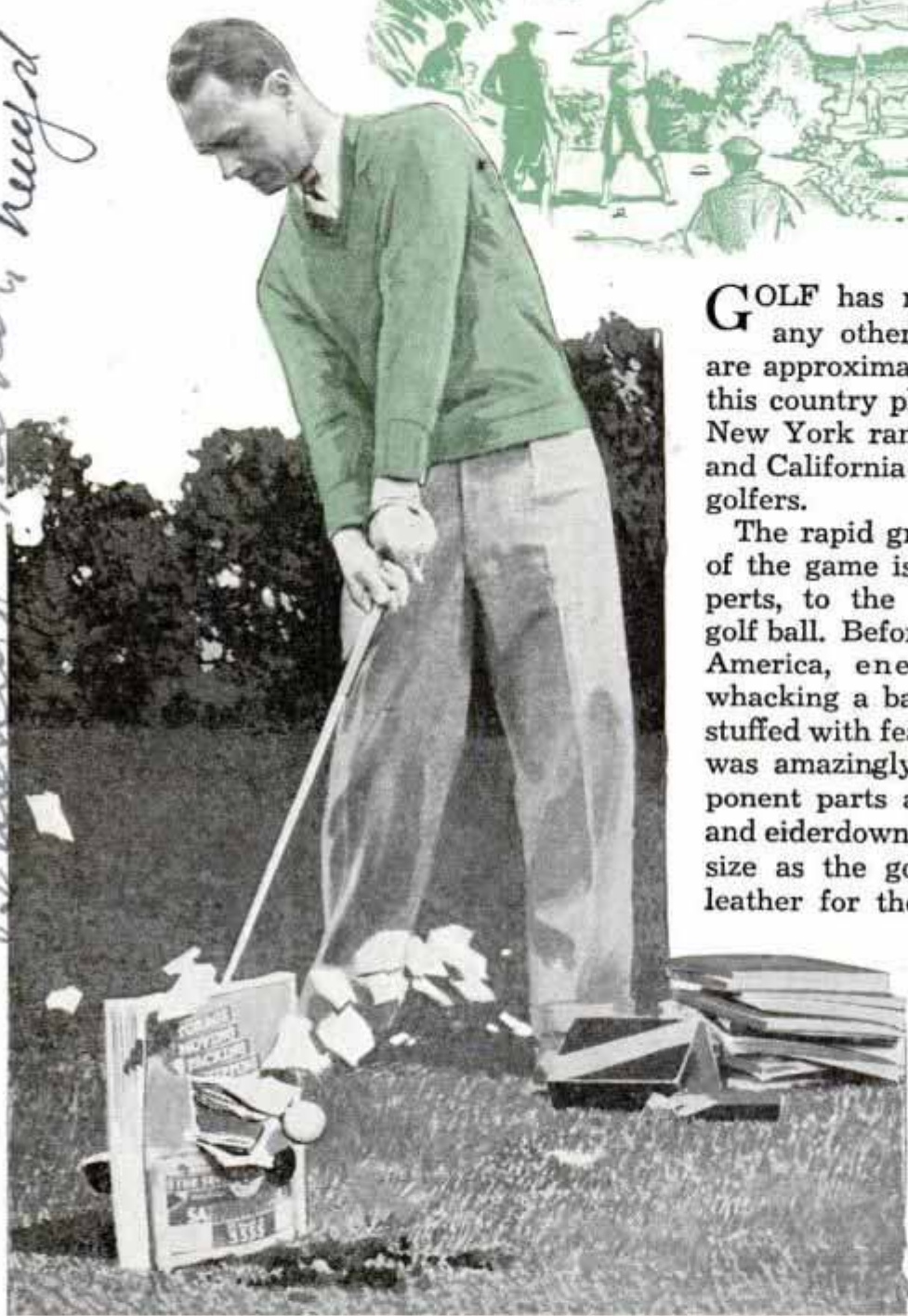
Wide World
Used in Pacific Alaska

8591

1992 Broadway
New York

BULLETS

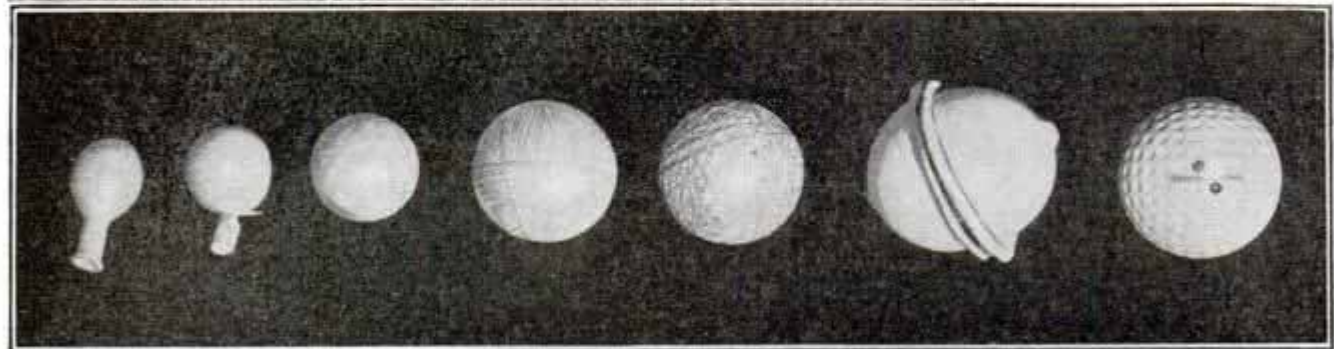
Com. Joseph Bond Route 1, Box 23,
Brazelton, Tenn., received



GOLF has more participants than any other outdoor sport. There are approximately 1,500,000 golfers in this country playing on 4,572 courses. New York ranks first, Illinois second and California third in the number of golfers.

The rapid growth in the popularity of the game is due, according to experts, to the modern, long-distance golf ball. Before Columbus discovered America, energetic golfers were whacking a ball made of leather and stuffed with feathers. The feather ball was amazingly lively when its component parts are considered—leather and eiderdown. It was about the same size as the golf ball of today. The leather for the cover was soaked in water until it was pliable. It was then sewed into the shape of a ball and stuffed with a good gallon of eiderdown.

Rubber golf balls appeared in America in 1887. They were made of solid gutta percha and had one

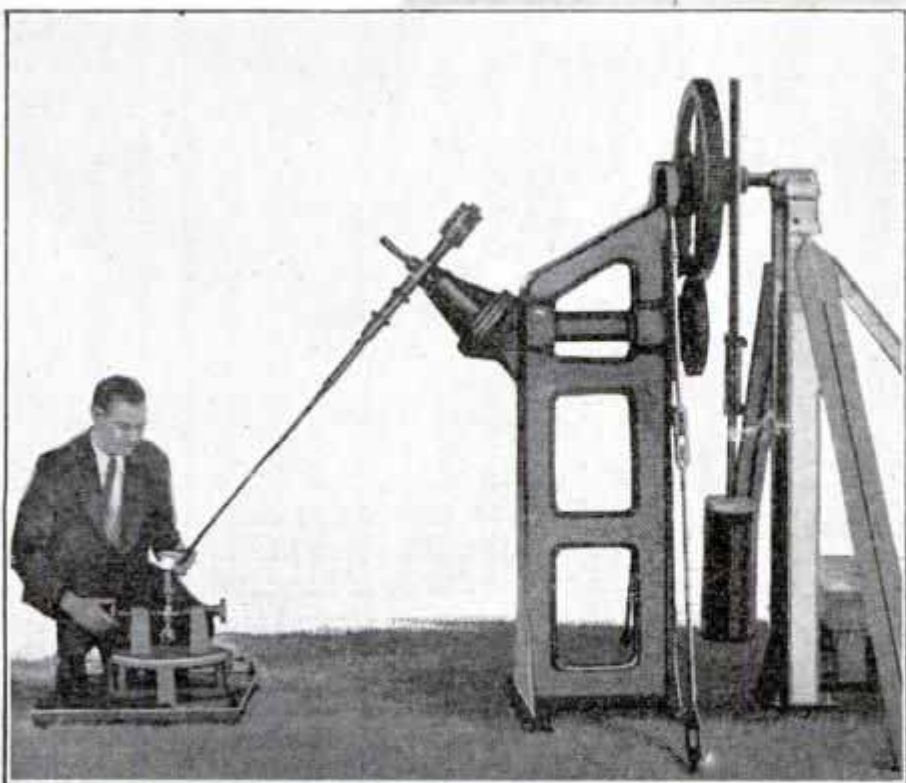


Top, Driving a Modern Golf Ball through a 500-Page Telephone Directory; Below, the Seven Major Stages in Making a Golf Ball, Starting with the Center Sac at the Left

of the FAIRWAY



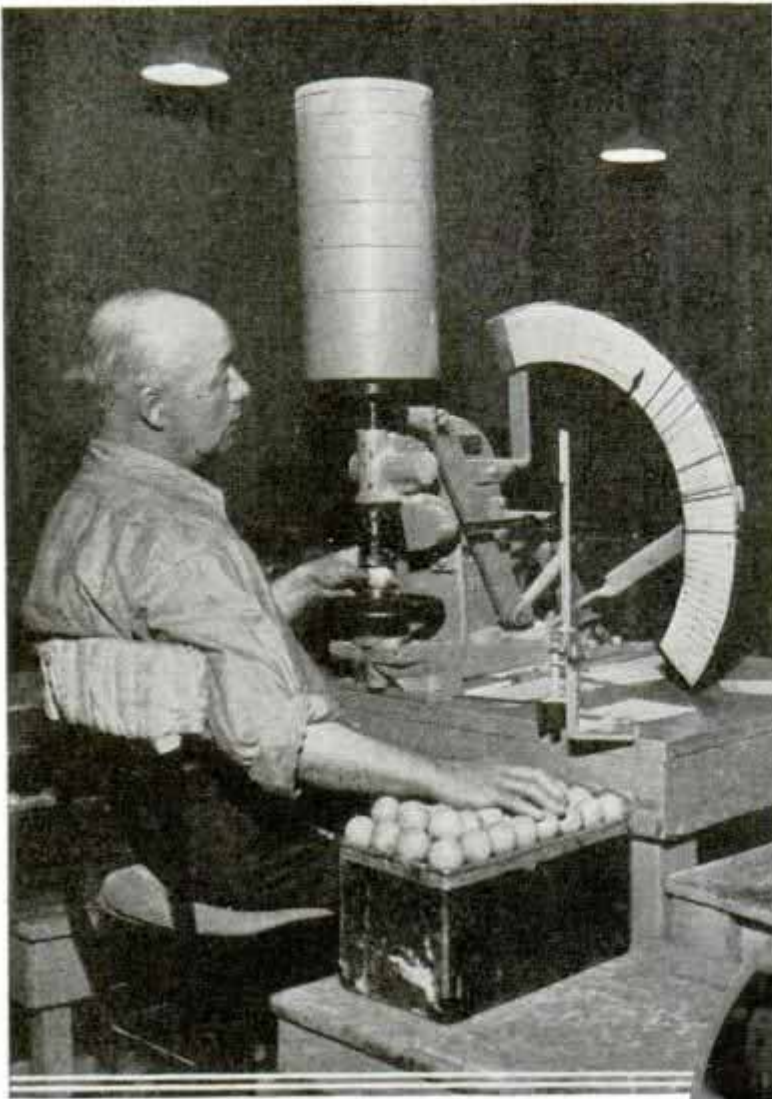
advantage over the feather ball—they went farther. For accuracy they were nearly as bad as their predecessors. On a hot day they would get soft and flatten out when hit and go hopping along like a rabbit with a sprained ankle. It is recorded that one especially warm day in 1896, the contestants in a tournament at a New York country club equipped their caddies with tins full of ice in which to carry their extra golf



balls to keep them from melting.

An American, Coburn Haskell, made the first golf ball wound with rubber thread thirty-seven years ago. Haskell reasoned that if he could make a ball of rubber thread it would have more resiliency and would stay round longer. He obtained the thread and after considerable difficulty managed to wind it into a ball. The ball was teed up and Joe Mitchell, a golfer of some prowess, was asked to try it. Mitchell, not knowing it was a new ball, hit it and nearly dropped dead

Top, Inspecting Finished Golf Balls; Below, Driving Machine Which Exerts Uniform Force and Is Used in Testing the Balls More Accurately Than Any Human Golfer Could Do It



would go when hit is about 119 yards. Golf balls were made with smooth covers until the caddies on Scotch courses noticed that those which had been played and were cut as a result, went farther and straighter than new balls. The caddies then started cutting new balls with their knives. Recent experiments with a modern ball having a smooth cover indicated the longest drive possible with it was only 119 yards. Science explains it in this way. When a ball is hit properly it spins backward at a rate of from 4,000 to 7,000 revolutions per minute. This underspin, due to the recesses in the cover, creates an air cushion which tends to keep the ball in flight. The recesses are designed by ballistic experts who design the

for it sailed high over a wall, 200 yards from the tee—a wall which no one had ever driven over before.

This was the first really revolutionary advance in the making of golf balls. Today, Joe Mitchell's 200-yard drive is duplicated a thousand times a day by "duffers" all over the world. The longest drive on record today, made on an automatic driving machine, carried in the air 257 yards. The distance it rolled was not considered. The longest drive, roll not considered, under normal conditions by a human being is about 250 yards.

The golf ball of today is more than a piece of molded rubber attractively painted. There are as many as ninety operations in its manufacture and from thirty-five to fifty inspections. There are so many factors to be considered that eighteen days are required to complete one. One most important factor is the indentations on the cover of a golf ball. Without these indentations the maximum distance the ball



Top, Testing Resiliency under Pressure; Below, Centers Frozen in Molds to Insure Roundness

borings in rifles, and the molds used in casting the covers are checked to half of one-thousandth of an inch.

Another factor of importance is the tension at which the thread is wound onto the core. There is a distinct ratio between the tension and the distance the ball will go. The tighter it is wound the farther it will go. On the other hand, the tighter it is wound the easier the cover will cut. Designers have had to hit a happy medium between distance and toughness in de-

signing a ball for popular use. Many make a long-distance ball for professional use and a tougher but "shorter" ball for the average player.

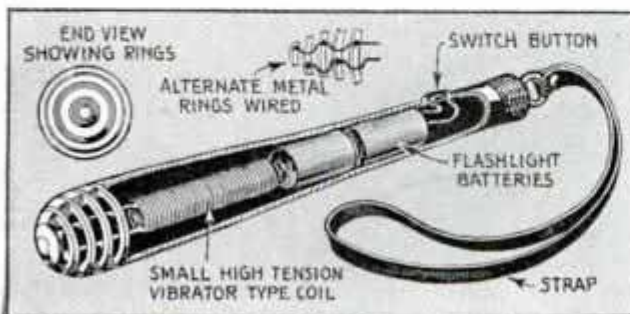
Many substances are used for the centers, including paste, water and glue. The paste center, made of gum acacia or the sap of the acacia tree, is one of the most satisfactory materials. Designers claim this paste or liquid center imparts more buoyancy to the finished ball. These bullets of the fairway travel at high speeds and with terrific force. One professional drove a ball completely through a telephone book one inch thick. After passing through the book it carried fifty yards in the air and rolled another fifty yards. He also drove the same ball through a one-inch pine board.

The golf club and the ball are together for a traveling distance of one-half inch or less and within that distance the ball attains a speed of about 114 miles an hour. The ball receives most of its resiliency from the manner in which the rubber thread is wound. The thread must be kept uniform and at a fixed tension. Machines have been produced which wind the thread automatically. The United States Rubber company has developed a process

(Continued to page 132A)

POLICE CLUB'S ELECTRIC SHOCK HELPS DISPERSE CROWDS

Delivering an electrical shock powerful enough to help disperse rioting crowds, a new police club is available for law-enforcing officers. It is made of bakelite, with six metal rings at one end. If a rioter comes in contact with the rings while the policeman presses a button on the handle, he receives a violent jolt. A small high-tension vibrator coil and small flashlight batteries produce the shock.



Sketch of Police Club with Button Which Wielder Presses to Shock Rioter

COIN-IN-SLOT FIRST-AID OUTFIT IN STREET PHONE BOOTHS



Demonstrating Stretcher and Medical Equipment Housed in Telephone Booth

First-aid outfits ranging from bandages and antiseptic to a complete miniature hospital may be obtained at telephone booths along Berlin's streets by dropping a coin into vending machines. The denomination of the coin varies according to the severity of the accident. In extreme cases, a completely equipped wheeled stretcher is available, together with every medical necessity for the most serious injury.

BOLT, RIVET AND NUT CUTTER WORKS IN CLOSE PLACES

Small enough to lay in the palm of the user's hand, a compact tool for cutting bolts, rivets and nuts exerts 10,000 pounds of pressure. It weighs only two pounds. Bolts up to five-eighths inch diameter and nuts up to seven-eighths inch diameter can be cut. The tool is easy to use in close quarters where other types of bolt cutters are useless.



Schelman - indicate
 54708
 The Car
 Number

Scientific Develop
 Vaughan and Bushne

E 315

magee

Million-Milers



went aloft to take a look. At 1,000 feet visibility closed in and Virden was left "flying blind."

He hesitated to come down again because of near-by mountains, so he climbed up and broke out of the clouds at 16,000 feet. He talked with Oakland by radio and found there was a 2,000-foot ceiling there, so he headed for Oakland on a compass course. He knew there was a cross-wind and tried to compensate for it. For three hours he flew until he was sure he must be over the Sacramento valley. He continued a while longer and finally spotted a hole in the clouds and glimpsed a lighted landing field through it. He came down, sure it must be the Oakland airport—and found himself on an intermediate field in Nevada, 150 miles distant.

It was then that he figured out that at the point when he first believed he was

PART II

COULD you hope to drive an automobile forty times around the world without so much as denting a fender?

Ralph Virden, pint-size pilot and one of the forty flyers for United Air Lines who has traveled 1,000,000 miles or more, holds a record as remarkable as that. He has flown more than 1,000,000 miles and never as much as scratched a wing.

Virden is one pilot who attests, by experience, the value of the directive radio beacon, the system which marks the course of airways by code signals. On a flight along the Pacific coast several years ago, before the installation of radio beacons, Virden landed at an intermediate field and sent his passengers by train because of threatening weather ahead. He was instructed to return to Oakland when weather permitted and as soon as the clouds seemed to be breaking up, he and his crew



Top, Heber Miller, Bundled Up as an Early Mail Pilot, and Al Smith, Wearing the Modern Uniform; Center, the Monomail of 1930, First Transport with Retractable Landing Gear; Below, Charles Peeples, One of the Million-Milers

58 E 42 no Al Virden

of the AIR

near Oakland, he actually was above the lofty Sierra Nevada mountains. A cross-wind of unusual velocity had swept him off his course. Such things do not happen today for the code signals of the directive radio beam constitute a virtual fence along the airways and a pilot knows immediately if he strays from his route.

Back in 1922 when the coast-to-coast airway was not lighted or equipped with radio, flying the Cheyenne-Salt Lake run in winter was tricky business. One January day Bob Ellis, another million-miler, climbed into his mail ship at the little Rock Springs field, went up to 8,500 feet and headed west. As he roared over the 7,800-foot summit of White mountain,



Bob Ellis and Ralph Virden, Two of the Veteran Flyers, and Drawing Showing How Ellis Landed in a Snowdrift Near the Top of a Mountain



above. There was no way to climb up and there was no way to climb down. Philosophically Ellis sat down to wait for something to happen. And it did. Someone at Rock Springs had seen him drop on the ledge. A few hours later a searching party reached the top of the mountain. A rope was lowered and Ellis and his mail were pulled up. The plane stayed where it was. The ship Ellis flies today has four times the horsepower of the one he left in a snowdrift on the top of White mountain.

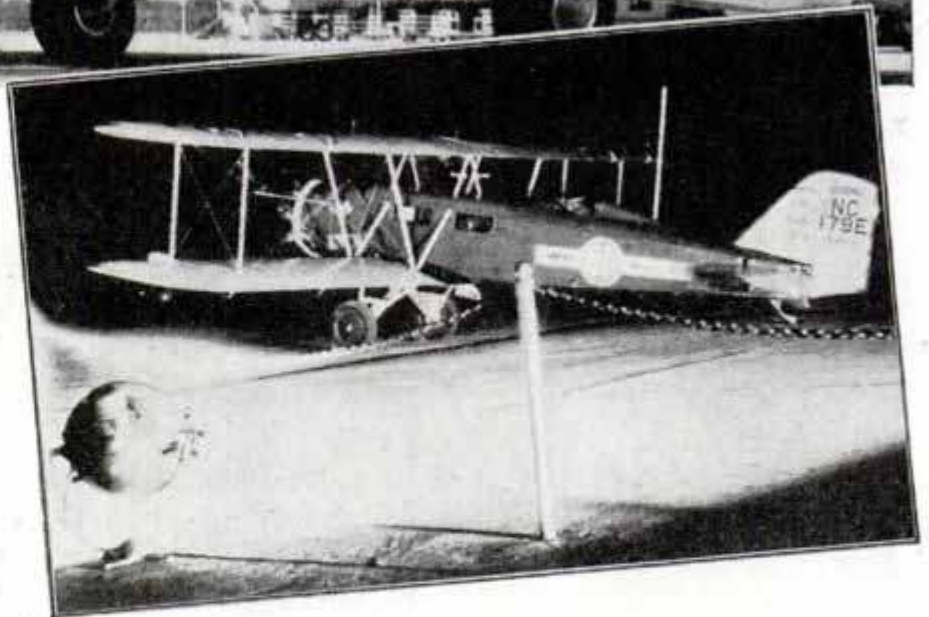
Bill Williams, chief pilot of United's midwest division, is said to have the uncanny ability to handle a transport plane as smoothly as though it were being flown



W. O. Williams, Who Jumped to Membership in the Caterpillar Club; the Latest Boeing Transport and a Boeing Mail Plane of Seven Years Ago

just west of Rock Springs, a down draft of air caught his plane, and before he could right the little DeHaviland, he had been dumped into a twelve-foot snowbank about 200 feet below the mountain's summit.

Just before he hit, he cut his switch, pulled back hard on the stick, and "pancaked" into the drift. It looked like a long, cold winter for Ellis. He was perched on a ledge with a 1,500-foot sheer drop below and the top frowned down on him 200 feet



by an automatic pilot. He learned to fly as a boy in Savannah, Ga., did border patrol flying with the Mexican expedition in 1916, entered an aviation unit during the World War and was graduated from the

9315

advance course of a French flying school the day the armistice was signed. To continue with his flying, he joined the air mail and soon after jumped into the Caterpillar club—a mythical organization of pilots who have been forced to bail out of their ships to save their lives. Williams was trapped one night when unexpected icing conditions logged down his plane. He jumped and landed safely with his parachute. In his only other accident, he stayed with the ship. A propeller shattered as he was taking off in Cleveland in 1926. The plane and pilot crashed but the flyer was unhurt.

James Lemont Brandon—"Monty" along the Cleveland-New York airway—has a record that reads like a fiction thriller. He might be called an international pilot. Some twenty years ago he joined a cavalry regiment but found airplanes were faster than horses, so in 1916 he transferred to the Canadian Royal Flying Corps, went to England for training and was placed in charge of combat instruction at one of the aviation training camps abroad. There he was pigeonholed until the armistice. Then he flew in Turkey and Greece, and later became a captain in the White army in Russia. He returned to the

(Continued to page 128A)

BOTTLE LABELER FOR HOME IS EASY TO OPERATE

Scarcely larger than a cigar box is a hand-operated machine for applying labels to bottles. Because of its economy it is particularly



adapted to small industries or home use. After the wet gummed label is laid on the bottle, it is pressed gently against a flexible rubber belt held by two protruding arms. The pressure

causes a compound gear action to lower the arms toward each other, wrapping the label around the bottle tightly and evenly without wrinkling so that no additional smoothing with the hand or cloth is necessary.

Also Engineering
Pat. 295101 60 1/2

TINY POWER-DRIVEN PLANE IS TESTED IN WIND TUNNEL

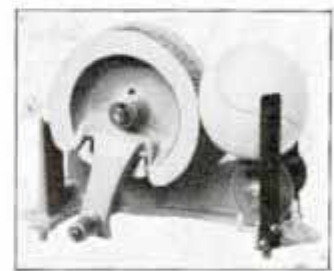


These Propeller Blades Traveled Faster than Sound When Driven by Motor in Wind-Tunnel Test

Wind-tunnel studies of the performance of propellers were made at California Institute of Technology by installing a twelve-horsepower electric motor to drive a three-blade miniature propeller on a model plane. Army and navy aviation experts were investigating propeller wash and its effect on stability, using a low-wing monoplane one-sixth normal size. With the engine driving at 12,000 revolutions a minute, it was estimated the tips of the blades traveled more than 1,130 feet a second, faster than sound waves.

TENNIS BALL GIVEN LONGER LIFE BY RESTORING NAP

Restoring the nap of a worn tennis ball extends its life and brings back the heavier "feel" of the new ball. With a rotary napper operated by a hand crank the nap can be renewed. As the fuzzy covering of a ball wears down and mats, the ball seems to lose weight, but tests



have shown that less than one-tenth of one per cent of weight is lost every ten games. Stirring up the nap restores the air resistance and the accuracy and control of the new ball.

Isardier. Sara chie.
1121-21st St

Dr. Russell. J. S. J. hang H. M.
Pasadena
The Army Air Corps
me say



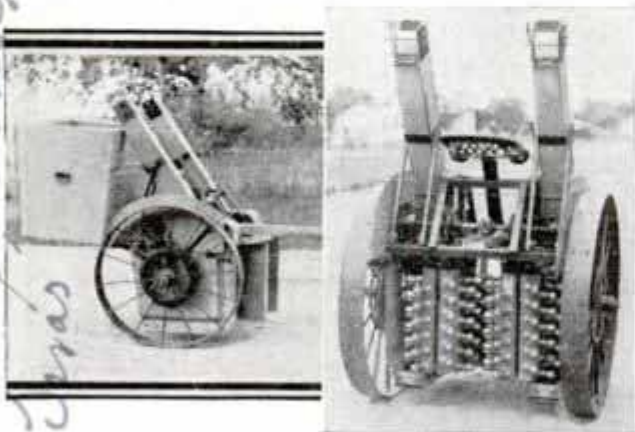
Port Official in Office Fitted with Ship's Wheel and Compass to Give It a Maritime Atmosphere

PORT OFFICE LIKE PILOT HOUSE OVERLOOKS SHIP CHANNEL

Eighty miles inland from the Pacific ocean, the Port of Stockton, Calif., has been visited by more than 500 deep-sea vessels since it was opened early in 1933. Among its features is the director's office which resembles the pilot house of a ship, even containing a full-size ship's wheel and a compass. Triangular in shape, it overlooks the main channel on one side and the shipping activities in one of the slips on the other. An enclosed bridge permits access to the office.

IRON FINGERS PICK COTTON WITHOUT HURTING PLANT.

Revolving fingers of iron on a mechanical cotton picker go over the plant like a fine-tooth comb and harvest the cotton without injuring foliage or stem. This

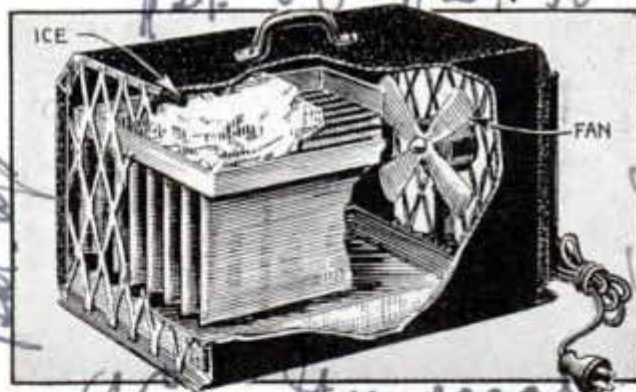


Left, Basket Set to Receive Cotton from Conveyors; Right, Picker Arms Shown on Slats between Wheels

reaper, invented by a Texan, can be drawn by horse or tractor. As it moves along the row, power transmitted by a belt from the two wheels keeps a dozen slats moving backward on each side of the plant. Six picker arms, with tiny revolving points that collect the cotton from the open bolls, are mounted on each slat. The backward motion of the slats equals the forward motion of the wheels, thus preventing any tearing of the plant. As the arms travel around the back and past the wheels on each side they reach a conveyor, the revolving points reverse direction and drop the cotton which is carried up and dumped into a detachable basket behind the driver's seat.

ROOM COOLED BY ICE AND FAN IN PORTABLE UNIT

Taking in the air at one end and expelling it at the other after removal of much of the heat, the latest room-cooling unit is



Cutaway View of Portable Room Cooler That Operates Cheaply on Ice

inexpensive to operate. It has a small motor and fan for forcing air over an ice shelf and through nine partitions of a "heat transfer element" at the rate of 200 cubic feet per minute. Only two pounds of ice will start the machine's cooling stream of air, this amount lasting one hour. Fins in the cooler hold the low temperature much longer, however. Any kind of ice may be used. Cost of electricity is less than one-fourth cent per hour. The machine weighs only twelve pounds and is sixteen inches long. It plugs into any convenient light socket.

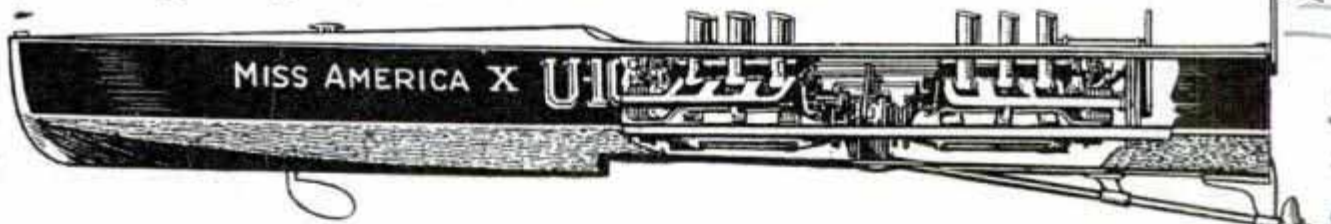
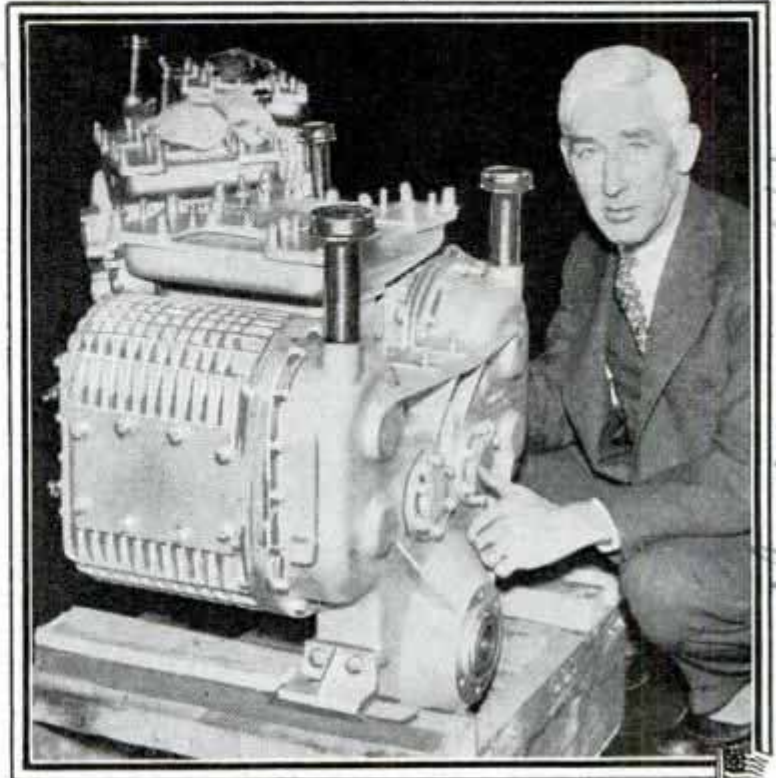
Handwritten notes and signatures are scattered throughout the page. At the top left, '8523' is written. On the left margin, 'Emb. Donata M. Taylor, 479 31st St. Portland, Ore.' is written vertically. In the center, '8634' is written above the 'ROOM COOLED BY ICE AND FAN' section. Below that, '\$21.50' and '\$24.50' are written. At the bottom left, 'Wm. P. P. Hanning, Box 237, Escondido, Cal.' is written vertically. On the right margin, '1100 m. J. K. 6/20/41' and 'Petter Air Corp, 155 E 44th, New York' are written vertically.

GAR WOOD'S Mystery BOAT..

IT is more powerful than three locomotives! It contains the largest man-made bolt of lightning! It digests its food at the rate of more than 700 feet per second! It swallows 480 gallons of oil an hour! It drinks 600 gallons of water a minute! It is the fastest thing of its kind in the world!

It is Garfield A. Wood's Miss America X, holder of the world record for speed on water and present possessor of the Harmsworth Trophy, emblematic of the championship in marine racing.

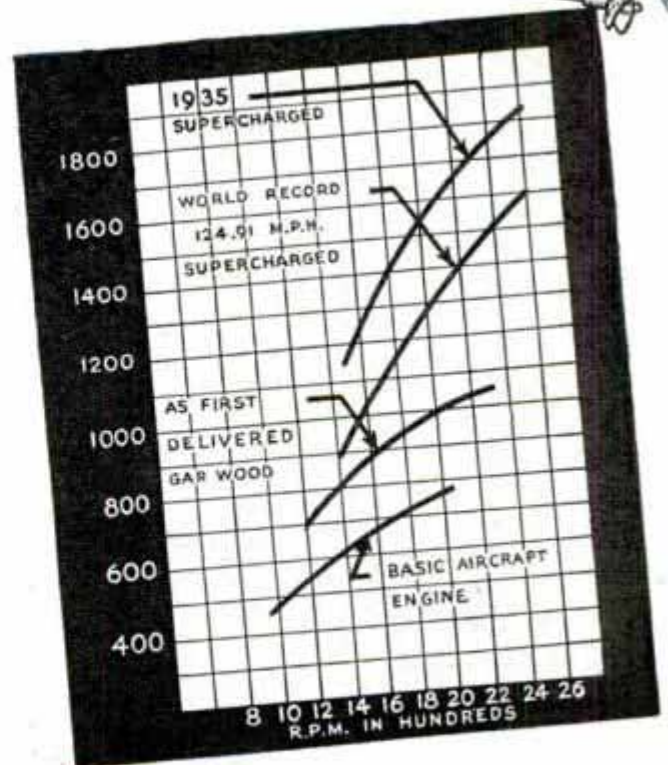
When you consider Miss America X, think of a thundering 7,200-horsepower plant, of rotors



in four giant superchargers whirring at 6,400 revolutions per minute, of air and gas being compressed into chambers and shot into manifolds under a total pressure of forty-two pounds, of crankshafts so timed that there are twelve explosions every time they revolve, of pistons as large as old-fashioned round paving blocks jumping up and down thirteen inches in cylinders as large as cuspidors and of ninety-six spark plugs giving 124,800 detonating sparks every minute.

The boat's present power plant, as originally designed, had a total horsepower of 3,000. The New York Central's finest locomotive boasts 2,109. Today three such locomotives wouldn't match the Miss America's power.

The achievement dates from 1932 when Wood, almost beaten in 1931 by the Britisher, Kaye Don, determined to put four Packard marine-converted motors into one hull which he called the Miss America

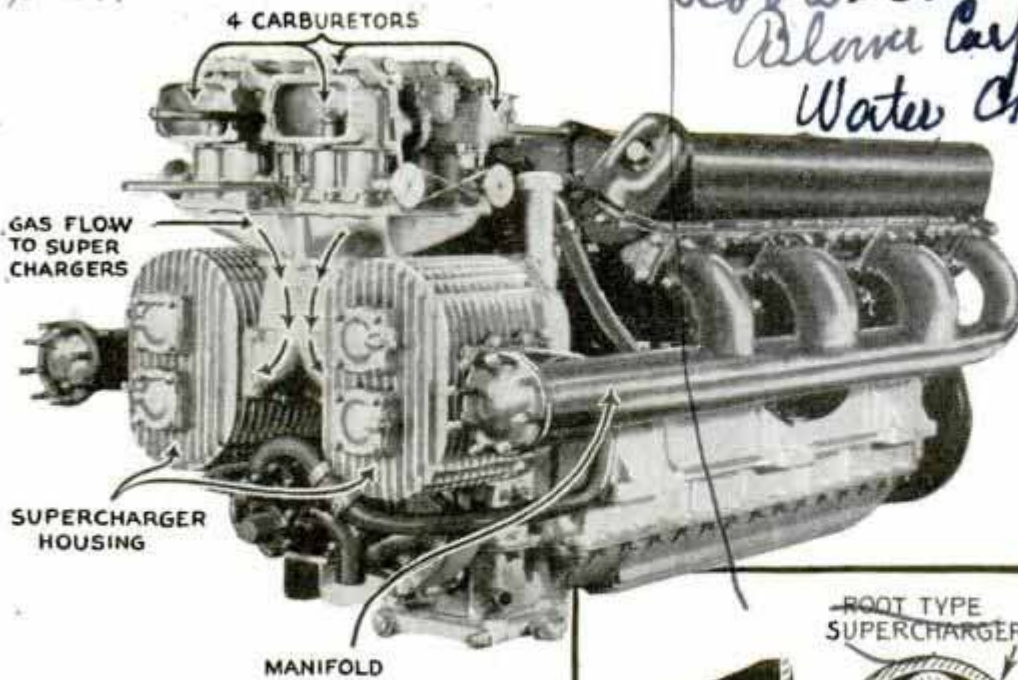


Gar Wood and One of Miss America's Superchargers; Cutaway of Boat and Engine Horsepower Curves

*post of Keelson St
Detroit, Mich*

Cont. Harry G. Dyer o. Detroit news

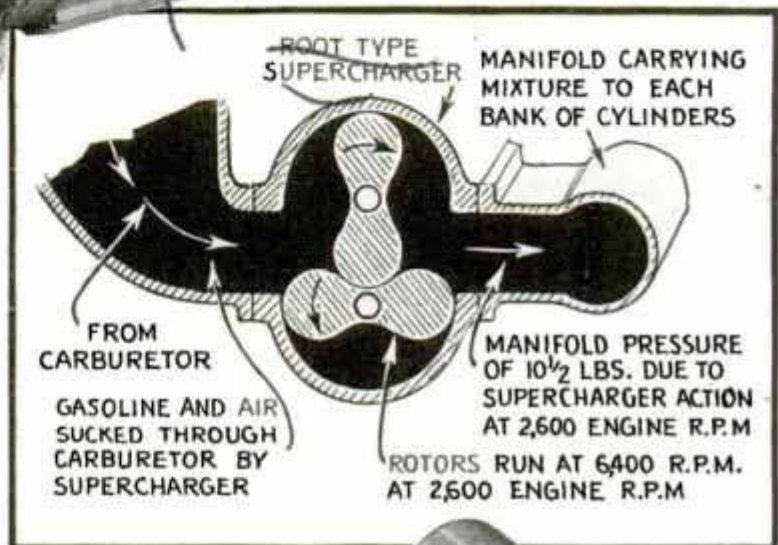
*Roots-Commerville
Below Corp. 12 Lane
Water Commerville
Ind.*



Left, One of the Supercharged Power Units of Miss America X; Below, Diagram Showing Operation of Supercharger, and One of Two Rotors in Each of the Superchargers

X. Packard engineers already had increased the engine speed of the motors so they were pulling 1,100 horsepower instead of 770. The 4,400-horsepower total, however, was not enough for Wood. He installed four low-speed superchargers designed by Louis Schwitzer of Indianapolis and boosted the horsepower to 6,400. Kaye Don was beaten easily and the boat set a new world record of 124.86 miles an hour.

Before the boat would perform, Wood had to solve two problems, the hooking up of the four motors and the balancing of the hull to carry the power. M. J. Steele, Packard's chief engineer, helped him solve the first problem by arranging the motors in tandem, two and two, and connecting their power through gear boxes. Engineers did not think two crankshafts could be synchronized. Wood, by splining the shafts in each gear box, proved it could be done. Then he had to synchronize the time of the twenty-four cylinders in each bank to make the two engines fire as one motor. As single twelve-cylinder jobs they had fired every sixty degrees but never had two motors been hooked up and so synchronized that the firing would take place every thirty degrees. By rotating the shaft of one thirty degrees as compared to the other this was done and the two were working as a unit! Previously motors had been hooked up but always their crankshafts had turned separately into the gear



box. Picture what goes on inside the two banks of four motors when Miss America's engines are running wide open at 2,600 revolutions a minute. Four valves to every one of the forty-eight cylinders, ten springs to every valve, these valves traveling up and down at the rate of better than 2,000 miles an hour! With a stroke of six and one-half inches, the forty-eight pistons, traveling up and down thirteen inches, move an equivalent of more than 1,500 miles an hour.

There are two spark plugs to every cyl-

8381

Wristlight Freehand
**LIGHT STRAPPED TO THE WRIST
LEAVES TWO HANDS FREE**

inder and each delivers a spark every other crankshaft revolution. Each plug fires 1,300 sparks a minute, the ninety-six plugs firing 124,808 sparks per minute. Each spark is twenty-five one-thousandths of an inch long—a three-mile long spark for a single hour, surely the longest man-made bolt of lightning in the world!

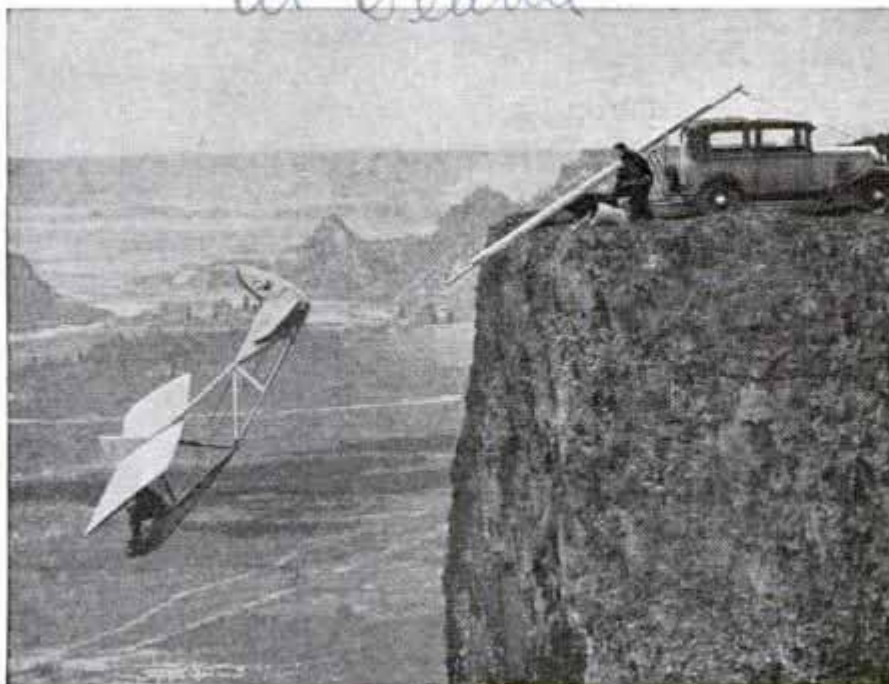
The "breathing" capacity of Miss America X is equivalent to that of 32,800 average human beings. Every revolution of a crankshaft takes in 1,270 cubic inches of air and at 2,600 revolutions a minute, each engine breathes 1,910 cubic feet and the superchargers increase the air "breathed" to a point where all four motors take in 656,000 cubic feet an hour. This is 46,000 pounds of air an hour for the four motors. The average human breathes about twenty cubic feet per hour.

Wood had the power. Now to employ it. He had to build a hull to take it, and it

(Continued to page 136A)

**GLIDER LAUNCHED FROM CLIFF
ON GREASED-PLANK RUNWAY**

Launched into space by sliding down a greased plank, a glider took off from the brink of a 1,000-foot precipice in the state of Washington and landed safely. The board runway, about twenty feet long, slanted toward the abyss from the top of an automobile.



For Runway in a Daring Dive from the Crest of a 1,000-Foot Cliff, This Glider Used a Greased Board Attached to an Automobile



*Work Around Home and Car at Night Is Easier
When Wrist Light Sets Both Hands Free*

Shaped to fit the wrist, a small flashlight that can be strapped to either arm sets both hands free to work. The motorist or mechanic finds it useful as a third arm when tinkering in the dark. Farmers doing late chores, sportsmen reeling in brook trout when twilight darkens the woods, or the home owner working in basement or garage, all find uses for the wrist light. When not strapped to the wrist, it can be used as an ordinary flashlight, and by means of a small wire handle it can be hung or propped to point up or down as needed.

❑Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information on receipt of a stamped, self-addressed envelope.

6658

at Seattle

*Plancy by the
1110. To addland av. Kansas City*

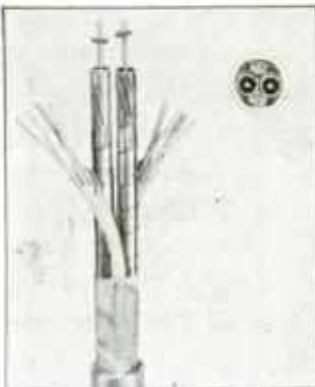
Tiny Catwalk on Big Bridge Holds Men Spinning Cables



Daring Workers Are Shown Stretching Narrow Catwalk That Will Be Used in Stringing Cables to Support Big Bay Bridge

Four hundred and fifty feet above the water, workmen braved death to string the mesh flooring for the tiny catwalk on which other daring men are stringing the miles of cable for the San Francisco-Oakland Bay bridge. From this narrow walkway, 71,000 miles of cable wire will be stretched to support the giant bridge. The cables, twenty-eight and three-fourths inches in diameter, will support greater loads than the mighty span ever will be required to carry between the two cities.

TWO HUNDRED CALLS CARRIED ON ONE TELEPHONE CABLE



Simultaneous transmission of 200 conversations over one circuit is possible with a coaxial cable developed at the Bell Telephone laboratories. Ordinary telephone lines in use today

can carry four conversations. The coaxial cable, capable of conducting frequencies as high as 1,000 kilocycles, is adapted to the transmission of television and the linking of broadcasting stations long distances apart, and will be useful for long-distance telephone service when additional channels are required. At the sending end, conversations from 200 lines are gathered together on the single coaxial line, then separated at the receiving end and sent along on 200 other circuits.

BANK TELLER'S VEST HIDES CAMERA TO SNAP SUSPECTS

If a suspicious-looking person cashes a check at the "paying" window, the teller may snap a photograph of the "suspect" if a new camera is adopted for use in banks. The camera, which is small, is fitted with a cowl that is inserted into the buttonhole of the teller's vest and the



Tiny Camera That Is Concealed by Teller's Vest When Ready for Operation

camera is pinned on the inside of the vest. A tube from the camera extends within a few inches of the teller's fingers to facilitate snapping the photograph. Thus, instead of trying to remember the features of a suspect, the teller can produce his small photo to aid police. The camera operates silently.

*463 West St
Scientific Develop
ment Laboratories*

*0111
e 654
e 667*

2151
C. Theodor, 280
Broadway, New York

Be your Own Weather Man



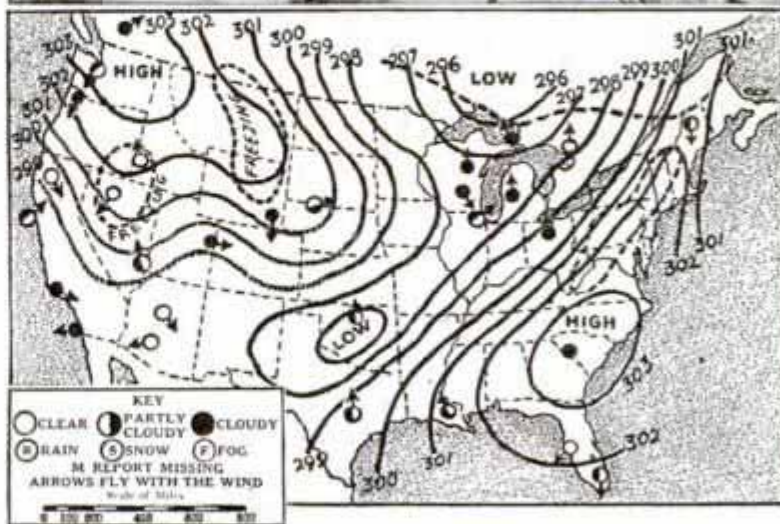
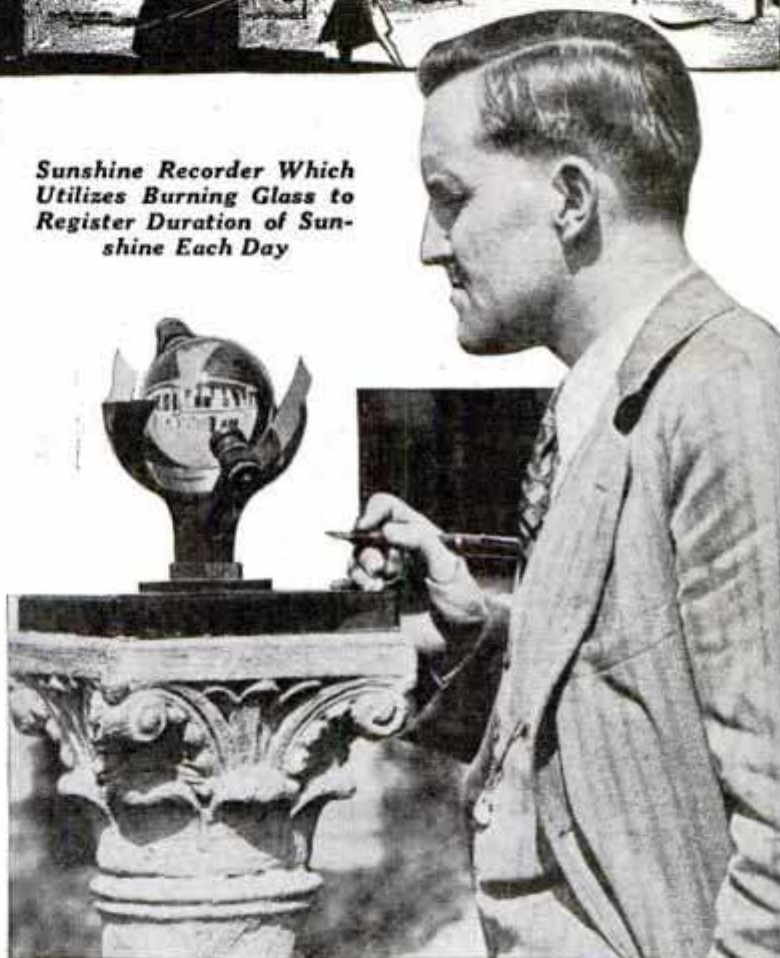
PART II

THE amateur weather forecaster who has taken up the drama of the weather as an exciting hobby will find the daily maps made up by the weather bureau are vivid pictures of weather conditions not only in his own locality at the moment, but of the weather that is coming within the next twenty-four or thirty-six hours.

They are an invaluable supplement to his own forecasts from a regular reading of his barometer and his observations of the direction of the wind. Knowing the simple rules for the direction of the winds around the barometric "lows" and "highs," he can easily figure what is likely to happen in his particular district when the map shows it is already under the influence of a high or a low, or that one of them is drifting in his direction.

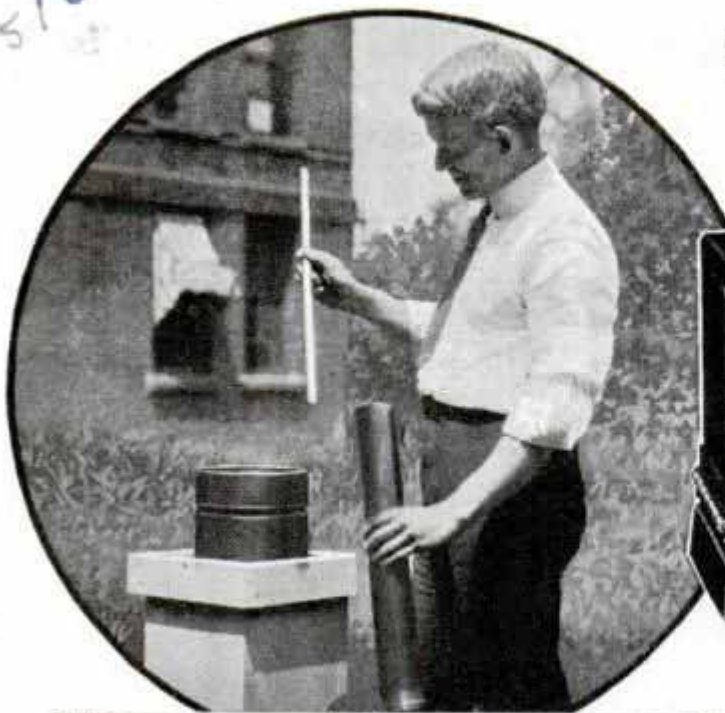
The map is simply a graphic picture of the outlines of those big pressure areas. It is, in fact, the weather's fingerprint record at the moment the map was made, which is generally eight o'clock in the morning or eight o'clock in the evening. The waving, curving, parallel lines traced over the face of the United States are called "isobars." They are the actual outlines of the various stages of the high and low areas, for they run through the principal weather stations that have the same baro-

Sunshine Recorder Which Utilizes Burning Glass to Register Duration of Sunshine Each Day

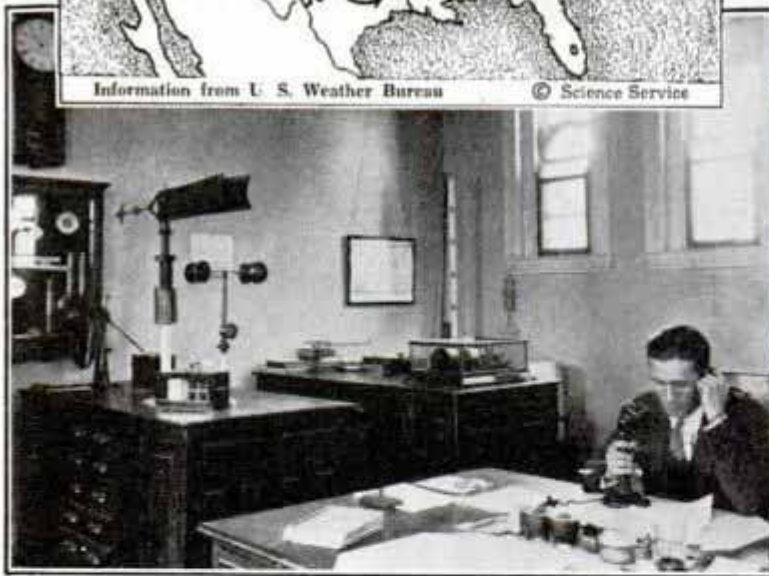
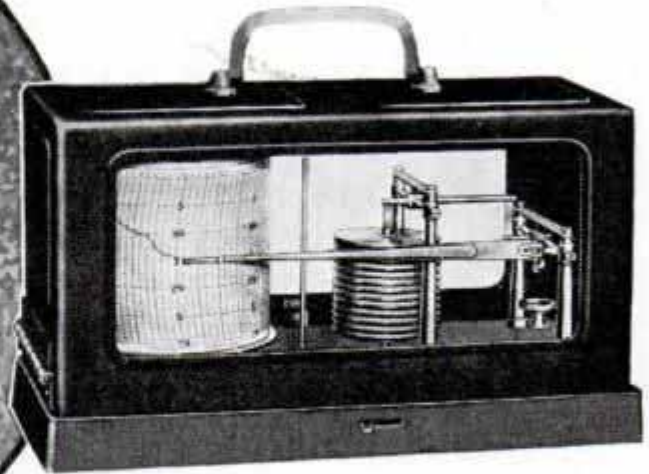


Typical Weather Map from Which Amateur Can See Drift of "Highs" and "Lows" and Make His Own Forecasts

D1516



Left, Measuring Rainfall; Below, Barograph Which Keeps a Chart Record of Changes in Atmospheric Pressure



Observatory in Washington Weather Bureau, and Map Showing Storm Paths during Summer Drought of 1934

metric pressure at the hour of recording.

As those pressure areas drift across the country in a general west-to-east direction, they usually alternate—first a low and then a high. It is the weather man's business to estimate how fast and in what direction a given pressure area will move. To do this yourself, you must take into

consideration the effect the attendant winds will have on the atmosphere in your own locality, for you know that if a low in a certain position is sweeping warm winds from a southerly direction toward you, the temperature is going to rise, while a different pressure area will normally shoot cooler or cold winds from the north toward you, and the thermometer is bound to drop.

Taking wind direction into consideration, you are prepared to issue a forecast—to yourself, if to nobody else—on the probabilities for the next twelve hours or so. You may be wrong, of course. Even the forecast experts, who have spent years studying the weather, are wrong about fifteen per cent of the time. But it is fun to pit your skill and knowledge against the huge atmospheric disturbances that make up highs and lows, and to see how many times you are right. Sometimes you may even hit it right when the official weather man fails, although you are more likely, as your skill develops through experience, to reach the same conclusions he does.

Some newspapers in the larger cities publish the maps daily, or the weather bureau in the nearest large city will supply a map service six days a week for twenty cents a month. If you want a map that shows the highs and lows outside the

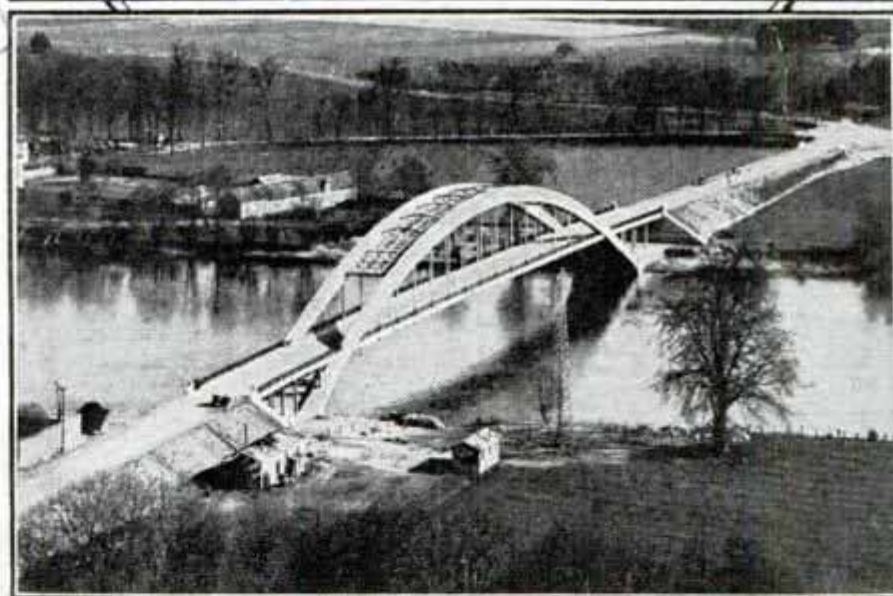
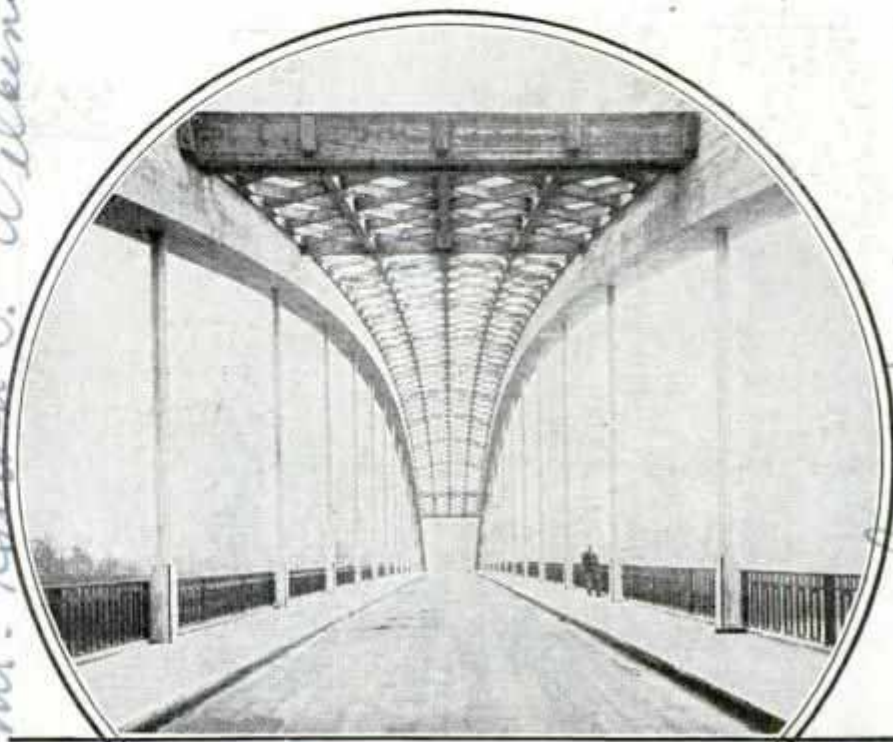
One Concrete Span Supports Suspension Bridge

United States, and comes 365 days a year, it can be obtained from the weather bureau in Washington for three dollars a year. The money must be sent by check or money order, as currency and stamps are not accepted.

You can increase your enjoyment if, when you receive your map, you refuse to look at it until you have examined your own barometer, inspected the drift of the clouds or the pointing of the weather-vane, and made your own forecast. Then look at the official prediction and see how close you come to being right.

Once you begin to see how the weather works, you become fascinated and want to know more. Before you know it, you have invested in a barograph to do your pressure recording for you. A barograph is simply a barometer that traces the pressure stages of the atmosphere on a revolving chart. Then you want a hygrometer to keep charts of the humidity. None of the instruments for deeper studies is prohibitively expensive. A satisfactory barograph can be bought for as little as \$50, and a hygrometer for \$3.50.

But those studies come later. In the beginning it is better simply to keep a regular record of your barometer, observe the direction of the wind, and try making your own forecasts. If you want a simple and non-technical introduction to your hobby, write to the government printing office in Washington for a booklet on "Weather Forecasting" by Meteorologist George S. Bliss. It costs only five cents and offers much useful information for the person starting to follow the weather as a hobby.



Top, Looking Along Roadway Which Is Supported by Single Concrete Span; Bottom, Distant View of the Unusual Bridge

Unusual in that one single span of concrete supports the roadway, a suspension bridge recently has been opened to traffic over the river Seine. The span is the single-arch type, 528 feet long, with massive blocks of concrete serving as abutments at each end of the bridge. Transverse crossties of wood, together with trellis work supported by intermediate spans, take the thrust of the wind against the middle of the concrete span and transfer it to a point under the floor.

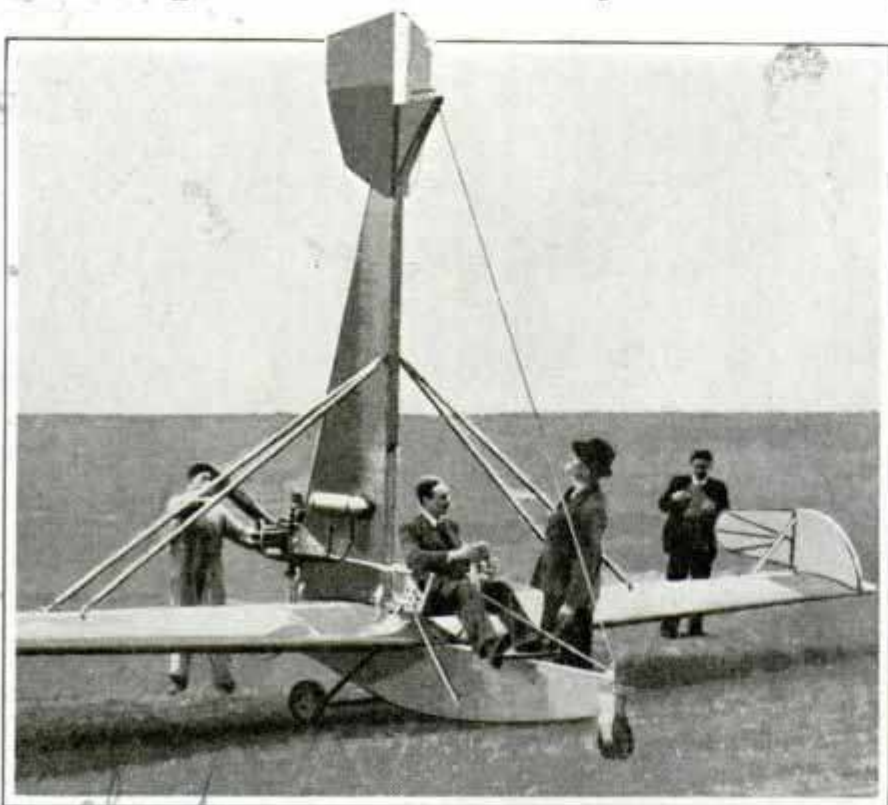
Cmd. Harold J. Wilkins

Le genie civil
A. D. Courcier

Engineer - A. D. Courcier

ads via Rochel sur on

Plane Built Like Odd Insect Keeps Level in Any Weather



This Looks Like a "Crack-Up," But It Actually Is an Odd Pusher Plane Fitted with Vertical Tail Instead of Horizontal

Unusual in its light weight, the latest airplane resembles an insect known as the "elytrope" because the tail assembly is vertical instead of horizontal. The weight is only 440 pounds. It is driven by a twenty-five horsepower engine. Developed by M. de Rougie of Paris, the plane is said to be capable of maintaining a horizontal position in all kinds of weather, not being affected by cross currents of wind as are conventional planes. The designer conceived the idea while watching the elytrope's flight.

FEW PLANT PATENTS GRANTED IN LAST FIVE YEARS

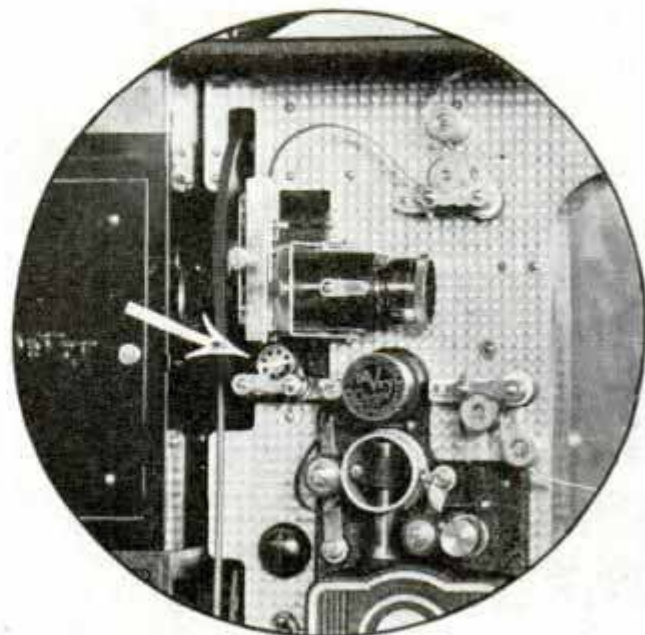
In comparison to the thousands of patents on mechanical devices, only 124 patents on plants have been issued since the law went into effect in May, 1930. These patents have been divided into four classifications: roses, other flowers, fruits and "plants," the latter being a catch-all for everything not classified as either flowers or fruit. Aside from roses, patented flowers run strongly to carnations, dahlias,

chrysanthemums and freesias. Among patented fruits, apples, plums, grapes and avocados are conspicuous. There is one patented mushroom.

THEATER TYPE DRIVE USED IN PROJECTOR FOR HOME MOVIES

Sprocket movement similar to that used in professional motion-picture projectors is now available in a home projector. Ordinarily, home movie film is driven by a claw movement in the projector, hammer-like blows into the film perforations carrying the ribbon along. The sprocket intermittent type being built in a sixteen-millimeter projector has a smooth rotary motion, and is adaptable to sound movie film which can be

perforated only on one side. The projector also has a silent chain drive, a double exciter lamp socket which prevents interruption if a lamp burns out, and an illuminated radio-type dial on the sound box. It can be used for homes or large halls.



Arrow Shows Sprocket Intermittent Movement Used in Home Movie Projector with Sound Attachments

Science Service *Idemman, de Vry*

near Winchester England

Nurses Wear Grotesque Masks for Gas Drill

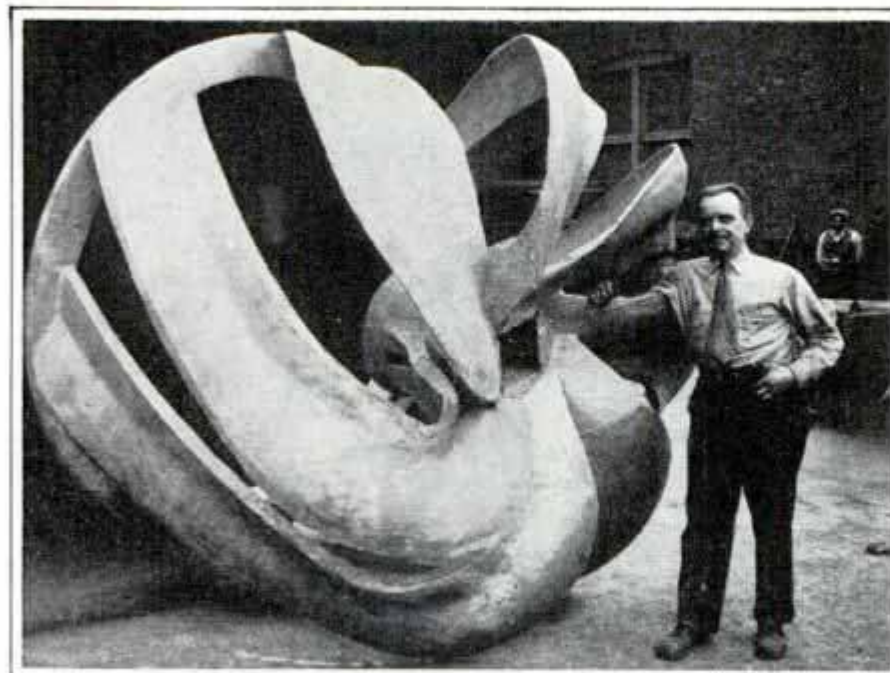


Looking Like an Assemblage of Monsters or Human Death's Heads, These Are Really English Student Nurses Being Trained in the Use of Gas Masks for Protection during Wartime Attack

When instruction was given English girl nurses recently about what to do in a gas attack by the "enemy," scores of pretty faces were hidden behind grotesque masks. The training course was a part of the na-

Red Cross
tion's program for preparing the public for the terrors of war. Military experts expect poison gas to be used generally in the next war and European governments are training their citizens for defense.

Casting Larger Than Man Built to Aid River Deepening



This Revolving Dredge Cutter Head, More Than Seven Feet Tall, Was Specially Cast for Use on Channel Deepening Project

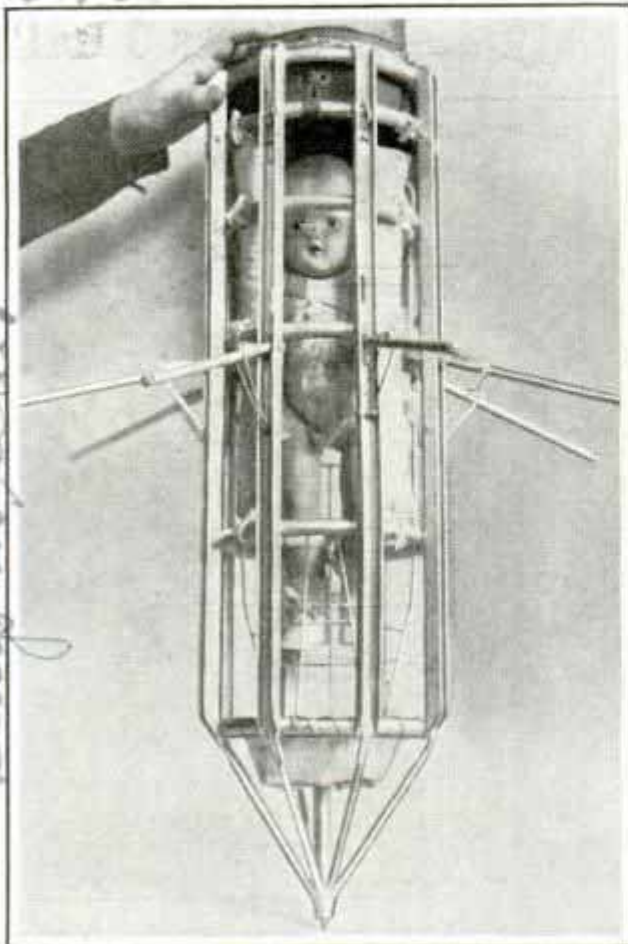
To dredge a deeper channel in the bayous around New Orleans, a special casting of intricate design, resembling a ship's propeller in appearance, was "tailored" to order in a Chicago foundry. The dredge cutter head of alloy steel is seven feet and two inches in diameter, five feet and eight inches long, and weighs 9,424 pounds. The blades revolve about a square shaft, taking a big bite of river bottom each time. The dredging is part of a government project on a tributary of the Mississippi.

Link-Belt Co 910 So

Hartford, Conn.

8653

8983



Parachute, Pneumatic Shock Absorber and Rods at Side Protect Patient When Cage Drops from Plane

'CHUTE FOR INJURED PERSON TESTED IN MODEL FORM

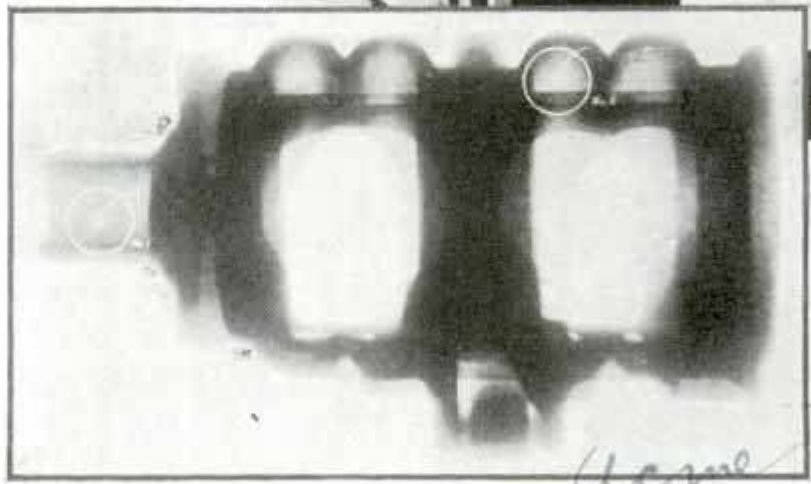
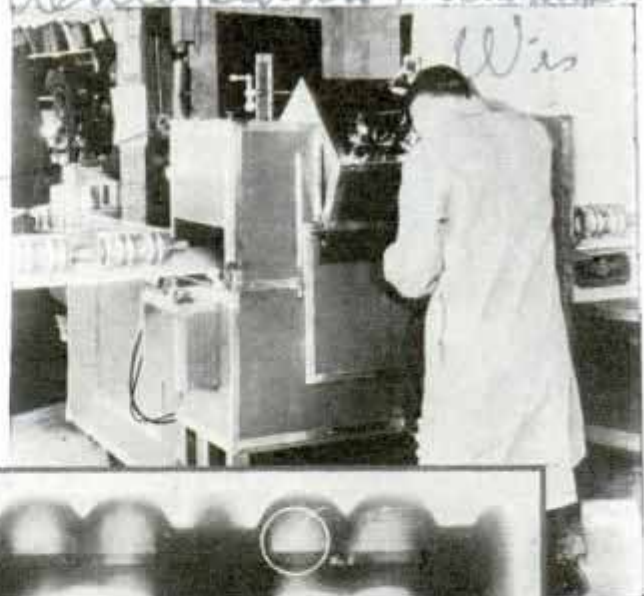
For lowering injured persons from disabled airplanes, army air corps engineers at Wright field have developed a parachute device that has undergone severe tests. Built in model form, it consists of a close-fitting padded cage for the standard airplane litter, with a thirty-foot parachute packed in the top. As the injured person's cage is released from the plane, the parachute is jerked open by a breakable cord attached to the ship. The litter protector is tapered at the bottom, ending in a pointed rod intended to anchor in the ground on impact. Between the foot of the litter and the rod is a pneumatic shock absorber. Spring rods resembling the ribs of an opened umbrella encircle the cage radially to prevent it striking the ground flat.

PLASTIC ASBESTOS LIKE PUTTY SOLVES MENDING PROBLEM

Plastic and therefore easy to handle, an asbestos filler solves the problem of mending cracks and holes in woodwork, roofs, gutters and many other places in the home. The putty does not crack or dry out and contains no oil. It takes paint easily and is waterproof, acid-proof and non-inflammable. The filler also can be used to advantage in calking boats, large or small.

X-RAY VIEWS MOVING PARTS TO CATCH HIDDEN FLAWS

Hidden defects can be caught along the production line by means of an X-ray machine which gives its operator an interior view of the product while it moves along. X-ray photographs hitherto have shown the inner structure of stationary metal castings, canned goods and similar solids. Peering into the eyepiece of this X-ray instrument, however, the inspector can keep watch on a moving belt to catch flaws in manufactured articles before they reach the shipping room.



Top, Inspector Watches Products on Production Line Moving through X-Ray Machine; Bottom, What Operator Sees; Circle Shows Flaw

Em. C. J. Bayer, % Dayton News, Dayton, Ohio

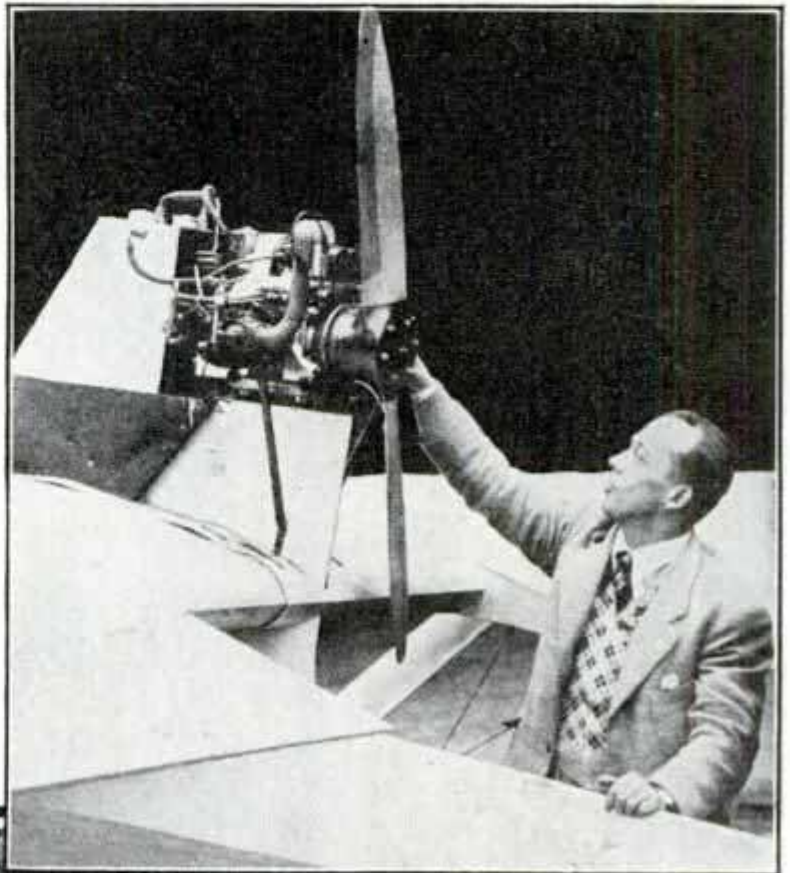
developed in Milwaukee

Adrian X-Ray Mfg. Co.

POWER GLIDER CROSSES CHANNEL

Motorcycle Engine Drives Tiny Craft from London to Paris

Powered by only a light motorcycle engine, a glider has conquered the English Channel. Total cost of gasoline and oil was only \$1.50. The pilot, Robert Kronfeld, Austrian gliding expert, not only flew the channel, but negotiated the distance from Croydon airport, located near London, to Paris, France, an air-line mileage of 210 miles, in less than five hours. Uncertainty of weather over the channel always has made hazardous any attempt to cross from England to France by glider, since craft lacking motors depend entirely upon lifting air currents and are at the mercy of cross winds. With his small motorcycle engine, rated at only five horsepower, the Austrian pilot was able to maintain the glider at a safe level and



Top, Small Pusher Motor with Which Glider Is Propelled; Bottom, Wheeling the Motor Glider into Hangar after Trial Flight

on its course. The addition of a motor actually converts a glider into a light airplane, with an unusual wing spread.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

of Epsom salts; 90,000,000 pounds of metallic magnesium from which could be constructed 90,000 modern airplanes; one \$20,000 cube of gold; eighty tons of strontium; eight and one-half tons of copper; three and one-half tons of iodine; potassium to make 1,000,000 tons of fertilizer, and eighty tons of calcium chloride. The bromine is used in anti-knock gasoline.

RICH BY-PRODUCTS PASS THROUGH BROMINE PLANT

If by-products in sea water that passed through the Ethyl-Dow Chemical company's bromine plant in one year could have been extracted and sold, the company would have been \$50,000,000 richer. In the 140,000,000,000 pounds of sea water pumped through the plant were: 750,000 tons of common salt; 450,000 tons

667
see June 1934-808.
at Kure Beach

Making HOME TASKS



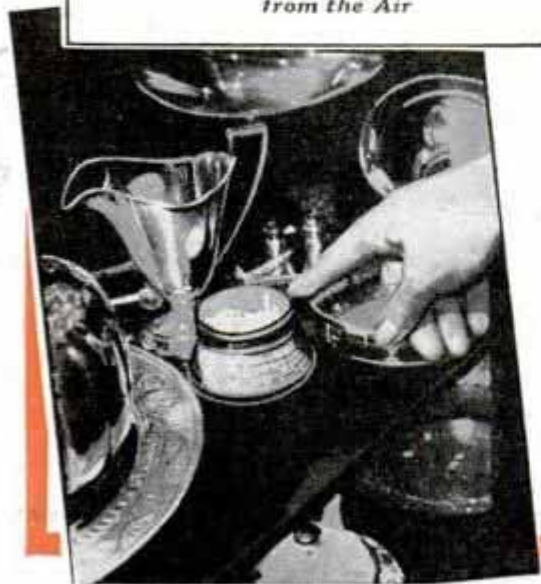
Top, Combination Shower and Spout with Elbow Joints Is Easily Adjustable to Convenient Positions at Height of Man or Child; Slight Turn Converts Spray into Solid Stream for Filling Tub; Bottom, Silverware Can Be Kept Constantly Bright by Placing a Chemical, Available in Attractive Jar, in Cabinet or Chest with It to Absorb Hydrogen Sulphide, Cause of Tarnish, from the Air



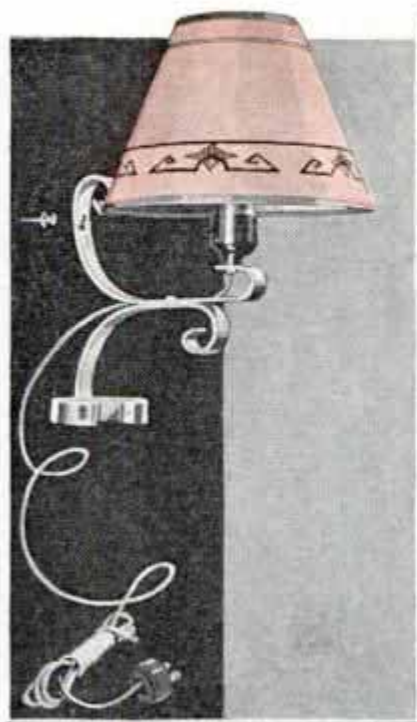
Top, Right, Water Boils Almost Instantly in This Teakettle; at Center of Its Interior Is a Cone, Point Upward, with Corrugated Sides That Greatly Increase the Amount of Heat-Radiating Surface in Contact with Water; Direct and Radiated Heat Passes Up Inside Cone



Above, Right, to Connect Faucet with Hose for Washing Machine, Garden, Bath or Vegetable Spray, Adapter Is Pushed into Faucet and Lever Thrown, Which Presses It Firmly in Spout; Bottom, Right, Two-Heat Electric Casserole Uses 100 or 325 Watts, Retaining Natural Food Juices; Dinner Can Be Left Cooking Slowly for Hours While Housewife Is Away



a PLEASURE



Top, Left, Portable Lamp with Decorative Wrought-Iron Bracket Is Readily Installed on Porch or Interior Walls with Push Pin; It Can Be Plugged in Wherever Light Is Needed



Above, Waffle Iron Has Ejector Which Lifts Waffle from Grid as Cover Is Raised, Making It Unnecessary to Pry and Scrape with Fork; Below, Piano Combining Features of Grand and Upright Has Large Sound Board and Vertical Strings Longer than Five-Foot Grand, Obtaining Fine Tone Quality While Saving Space



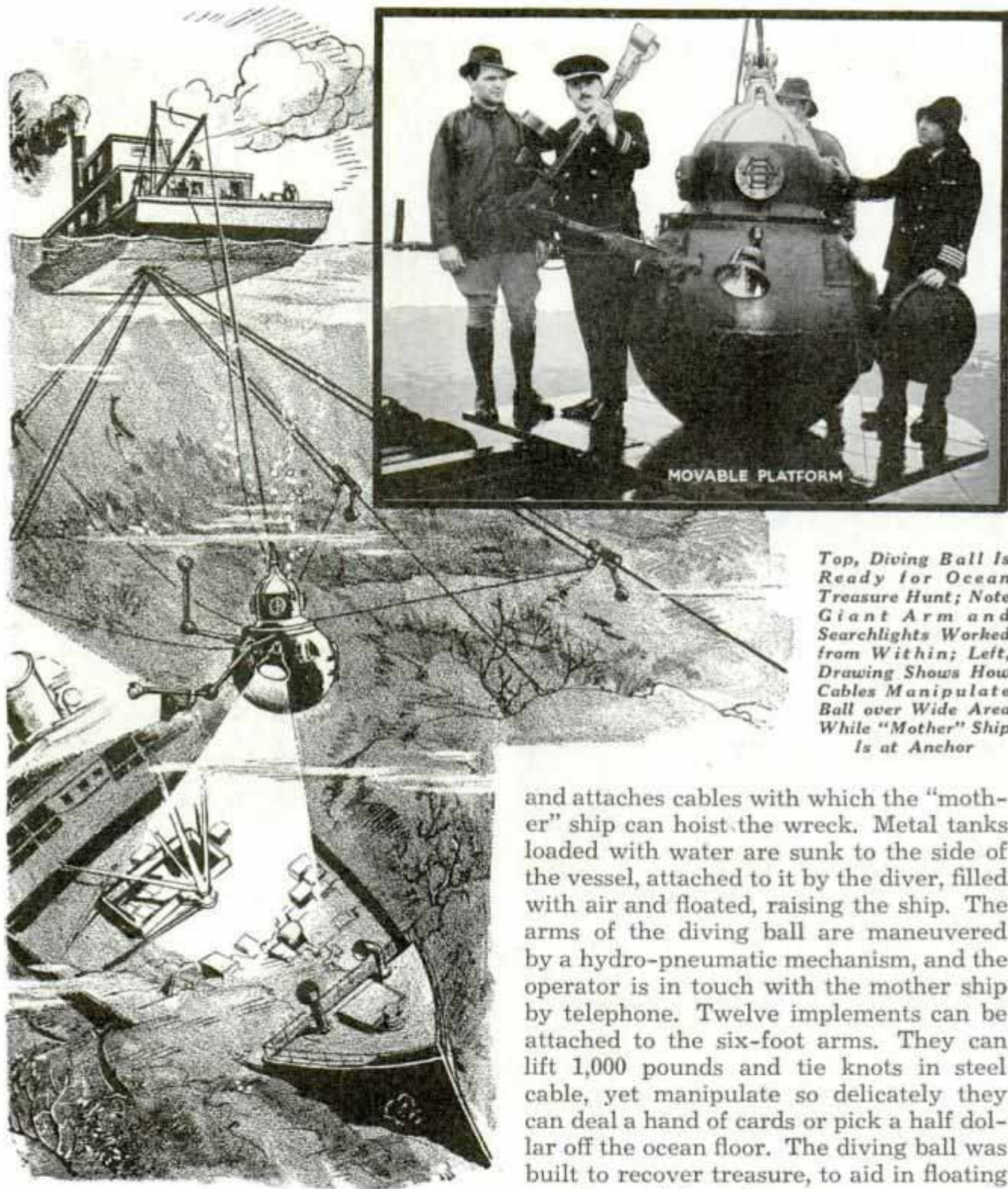
Above, Combination Knife Has Small Paring Blade Like Safety Razor Forged Out of Larger Cutting Blade; It Peels Fruit Smooth without Spoiling Shape for Canning; Below, Spotlight Illuminates Ironing; Handle Is Air-Cooled



8626

Robot Diving Ball to Speed Deep-Sea Salvage

from Science Service 5/135



Top, Diving Ball Is Ready for Ocean Treasure Hunt; Note Giant Arm and Searchlights Worked from Within; Left, Drawing Shows How Cables Manipulate Ball over Wide Area While "Mother" Ship Is at Anchor

Termed by navy inspectors "the greatest invention since the diving suit," a diving sphere with two giant arms designed for commercial salvage work has met tests at depths beyond 800 feet. The ball weighs two tons and can withstand pressure 2,500 feet down in the ocean. Guided by searchlights, its operator locates the sunken ship, then bores through its plating with a drill

and attaches cables with which the "mother" ship can hoist the wreck. Metal tanks loaded with water are sunk to the side of the vessel, attached to it by the diver, filled with air and floated, raising the ship. The arms of the diving ball are maneuvered by a hydro-pneumatic mechanism, and the operator is in touch with the mother ship by telephone. Twelve implements can be attached to the six-foot arms. They can lift 1,000 pounds and tie knots in steel cable, yet manipulate so delicately they can deal a hand of cards or pick a half dollar off the ocean floor. The diving ball was built to recover treasure, to aid in floating wrecks and in submarine rescue work. Oxygen tanks and carbon-dioxide absorber permit the diver to remain under sea twelve hours. The ball can be worked over a wide area of sea bottom while the mother ship is stationary. Anchors are dropped at four corners. From the anchor cables hang other cables by means of which the sphere can be manipulated vertically and horizontally.

Radio



Metal Tubes and Midget Acorns

ALTHOUGH metal radio tubes have been on the market in Europe for some time they are quite new to us. Improved American-made tubes of this description will be used in several all-wave receivers soon to be announced.

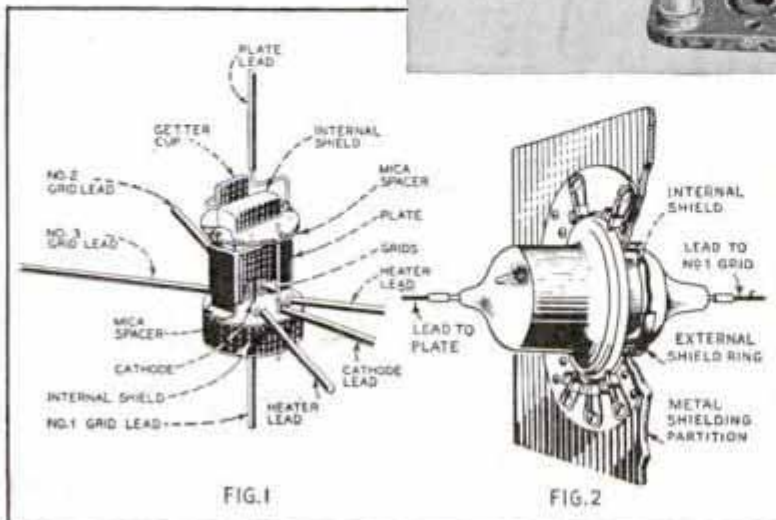
They are smaller than ordinary glass tubes used for the same purposes, as will be noted in the photo at the right. These tubes require special sockets and are not interchangeable with standard types. About ten varieties have been made including a new type which has two cathodes and two diode plates.

The base pins are all the same size and a center key-plug extends down through the socket. These all-metal tubes are self-shielded and have 6.3-volt filaments. The shell is made of thin iron which is a

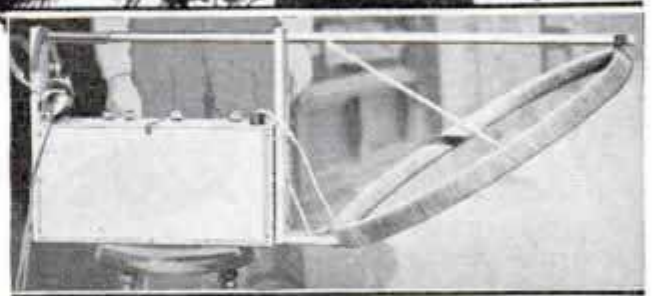


better heat radiator than glass. They are said to be very efficient on short waves, having greater amplification at higher frequencies and lower internal capacities.

The midget "acorn" type tubes, shown in the lower photo, are available to experimenters but do not appear in commercial receivers at the present time. They are especially designed for ultra-short wave operation; amateurs and experimenters are using them on wavelengths as short as 0.7 meter. The internal structure of the RCA type-954 detector-amplifier pentode is shown in Fig. 1 and a suggested method for shielding in Fig. 2.



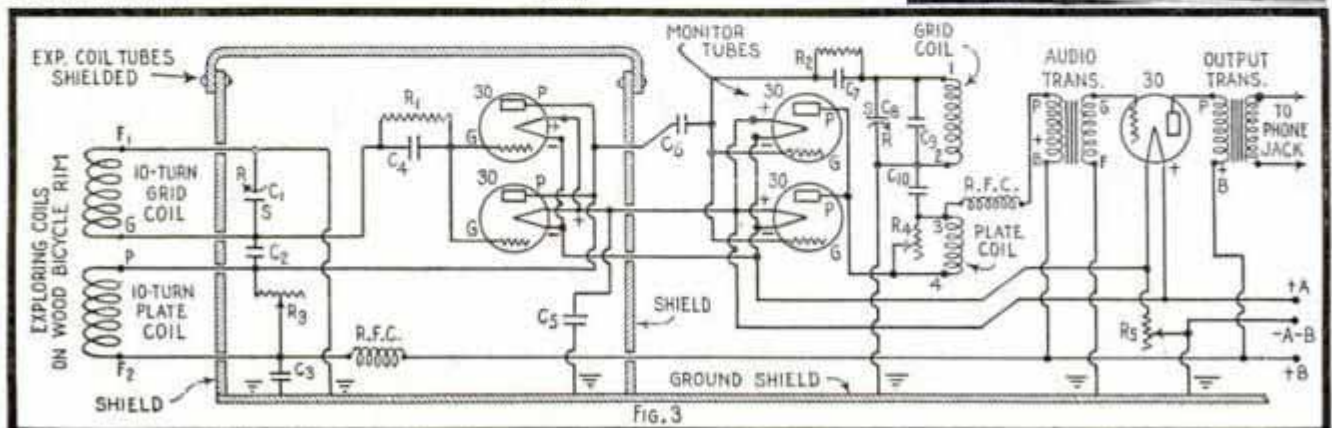
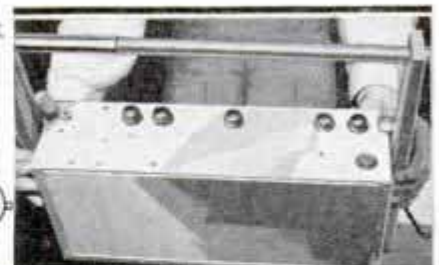
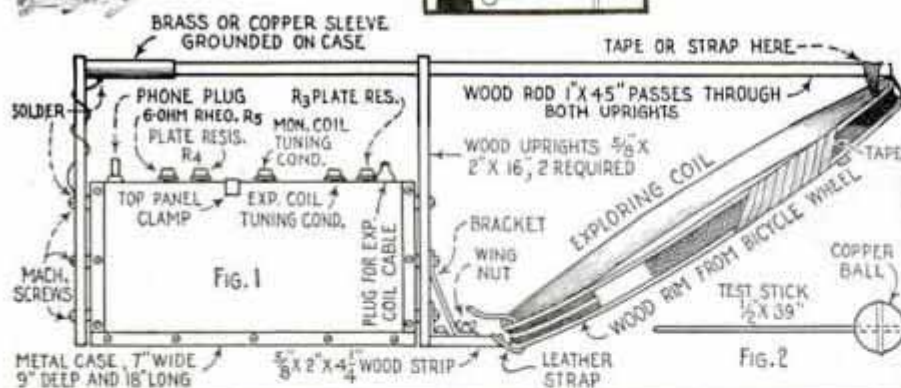
How to build an inexpensive



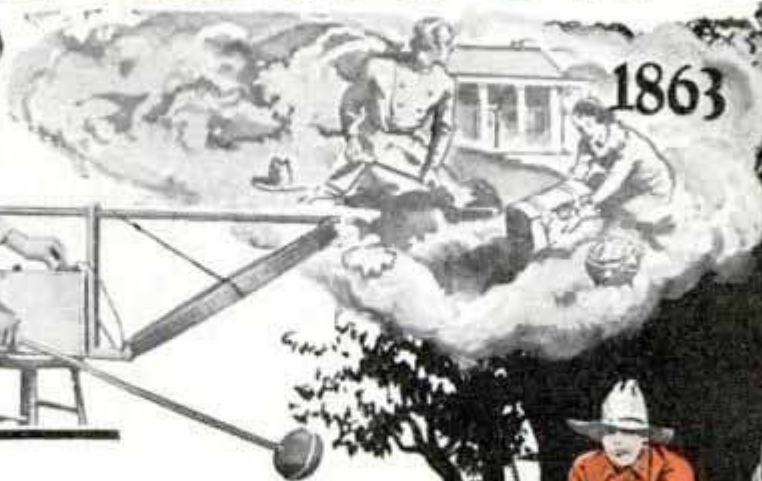
By BEN A. ELLIOTT

BURIED or hidden metals are easily located with this practical radio exploring device. It provides a sensitive instrument for treasure hunting and has many other useful applications. The metal detector to be described was designed originally for the purpose of locating buried shut-off boxes on the campus of one of our large state universities:

Concealed pipes and light wires may be located quickly without tearing out large wall sections in preliminary investigations. In common with any other exploring device in use today, it must be brought within a reasonable distance of the pipes, wiring, treasure or ore deposit in order

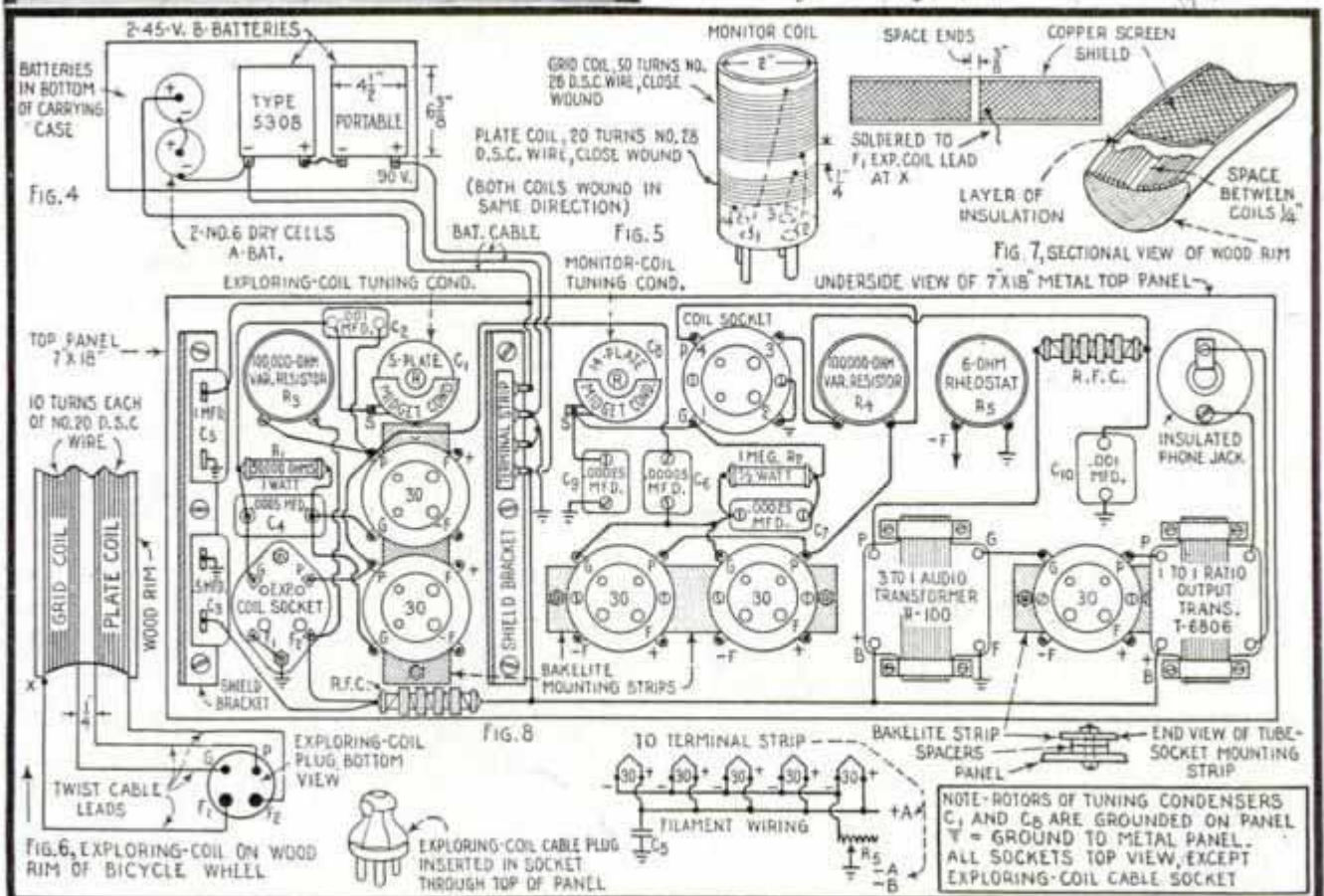
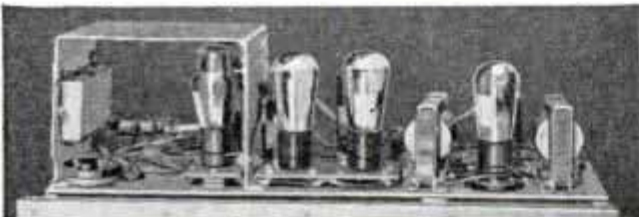


METAL LOCATOR



that it may be affected by them. The useful range of the instrument is directly proportional to the diameter of the exploring coil used, which, in this case, is wound on the wooden rim of a 28 or 30-in. bicycle wheel. Within this range the re-

(Continued to page 138A)



ANTENNA INSTALLATIONS

Part II

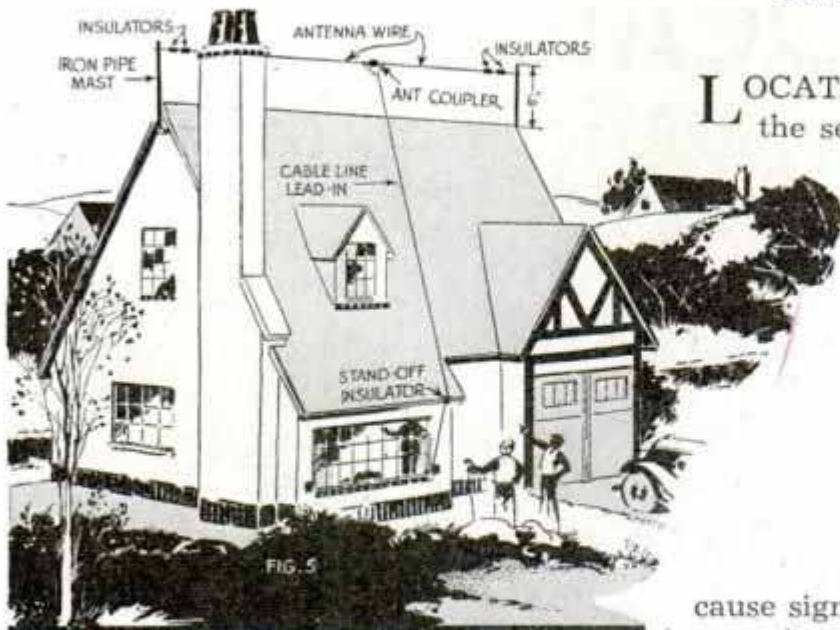


FIG. 5

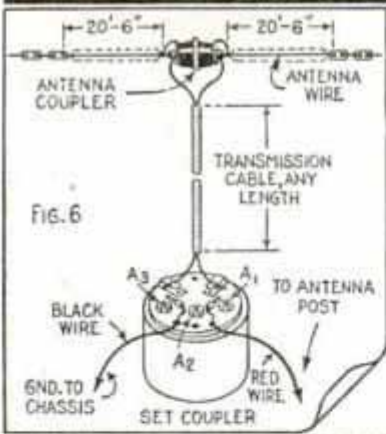


FIG. 6

LOCATED at any convenient point near the set, the through-the-wall permanent lead-in unit, previously mentioned, provides a good outside ground connection for the receiver as well as other desirable features.

Those who prefer to use a separate rubber-covered wire for the lead-in must be sure that it is soldered securely to the flat top portion of the antenna. A poorly soldered connection at this point will cause signal losses, therefore the continuous wire referred to in Part I of this article is preferred.

For temporary installations, the lead-in wire may be brought into the building by means of an insulated flat metal strip, known as a "window-strip lead-in." This is placed on the sill and the window is closed down upon it. These strips are provided with spring clips at each end.

Another method is to bring the lead-in wire, without a break, through a porcelain-tube insulator inserted in a hole drilled through the side of the building or window casing. The hole should be drilled slightly larger than the tubular insulator and should slant down toward the outside so that rain cannot enter.

The inverted L-type antenna will give satisfactory results in average locations. However, if troublesome interference from electrically operated apparatus in the home should be picked up by the lead-in, it will be necessary to employ a

noise-eliminating lead-in system. There are several varieties available both in the shielded and transposed-feeder forms that may be used with the L-type antenna.

In really noisy locations, especially where an all-wave receiver is used, the best results are obtained with one of the newer all-wave noise-reducing doublet antenna systems. This type of installation is illustrated in Fig. 5. A clear space of about 50 feet is required,

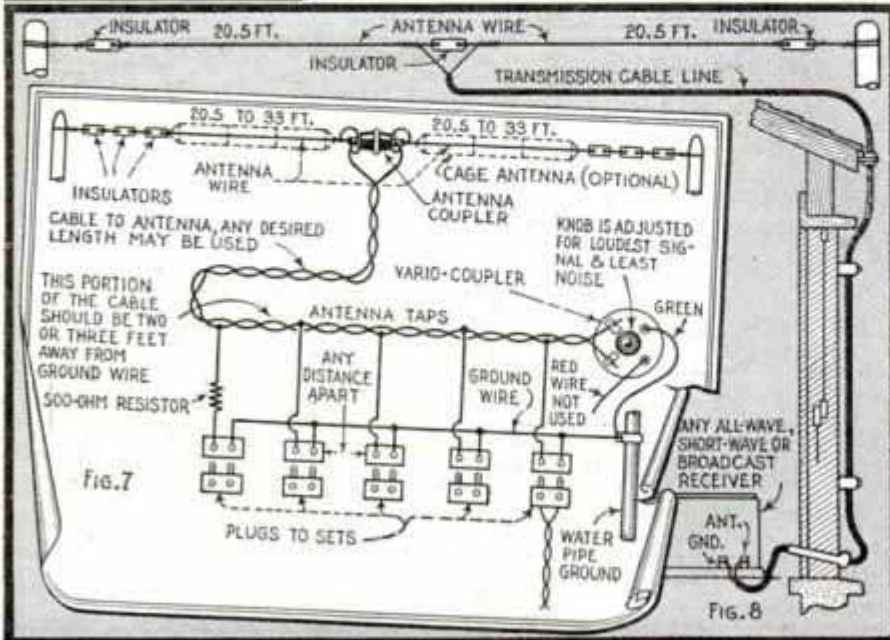


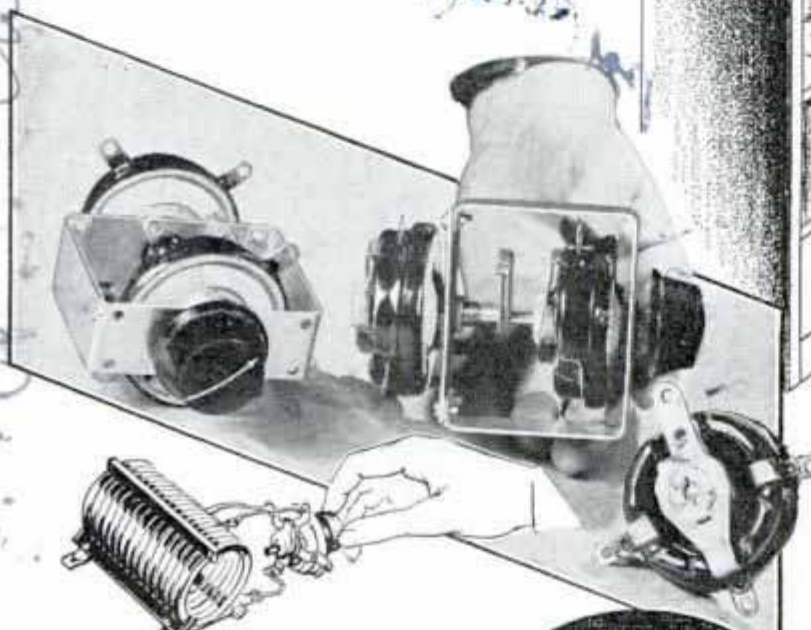
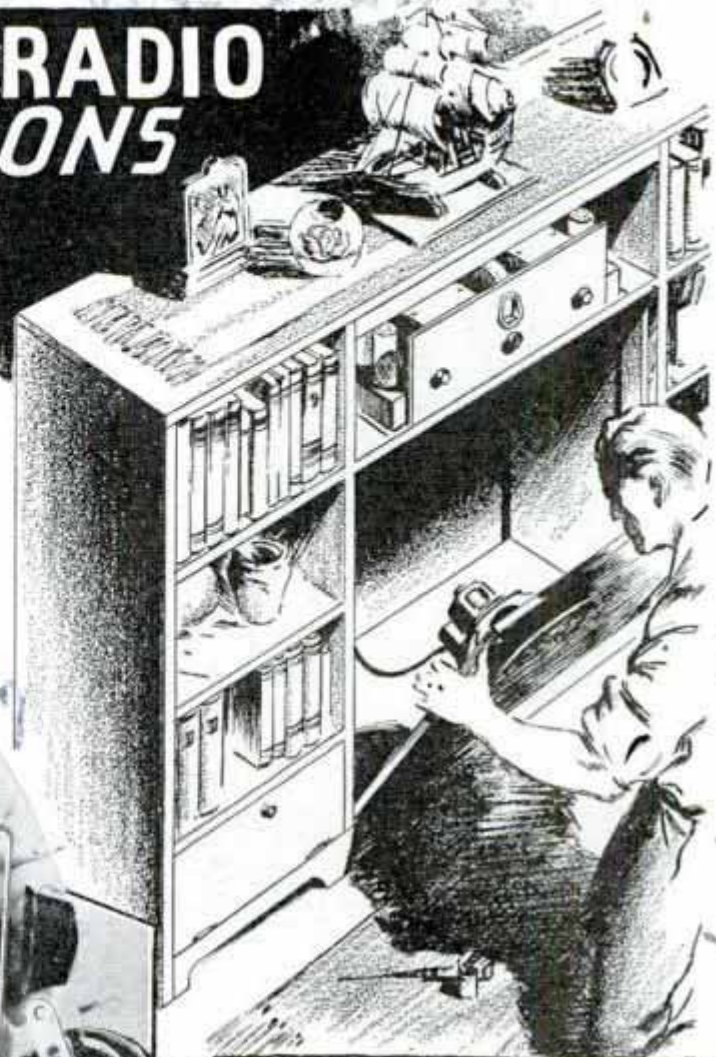
FIG. 7

FIG. 8

(Continued to page 140A)

PRACTICAL RADIO SUGGESTIONS

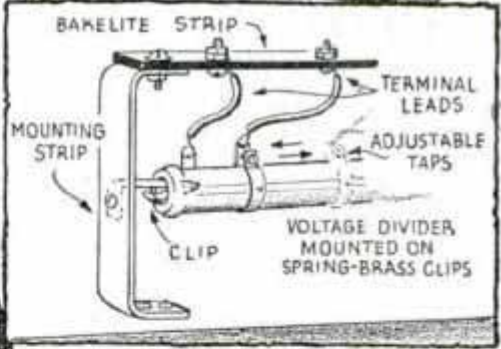
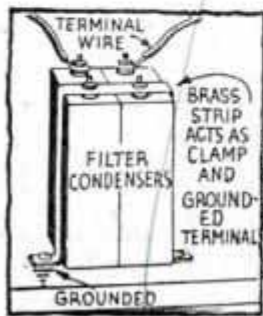
Your Bookcase Offers a Good Location for Installing a Radio Chassis and Loud-Speaker Baffle; One or More Shelves May Be Removed to Provide Ample Room for a Large Baffle to Insure Maximum Tone Quality; Attractive Panel and Base Materials Are Available for Homemade Sets, and This Type of Installation Provides Easy Access to the Receiver for Balancing and Tube Replacements



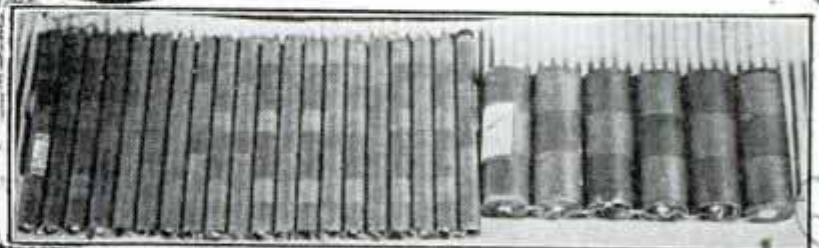
Above, Porcelain Insulated Band-Changing Switches Enable Amateurs to Shift Their Transmitters Quickly from One Band to Another without the Usual Delay in Making Re-adjustments; Right, Useful Radio Tool Easily Reaches Difficult Locations



Below, Hold-Down Clamp for Power-Unit Filter Condensers, Also Provides for Grounded Terminal Connections



Above, This Handy Mounting for a Tapped Voltage Divider Is Made from Scrap Material; the Metal Brackets Are Formed from $\frac{1}{8}$ by $\frac{3}{4}$ -In. Brass Strip; the Length of the Insulated Terminal Strip Will Depend upon the Size of the Resistor Used

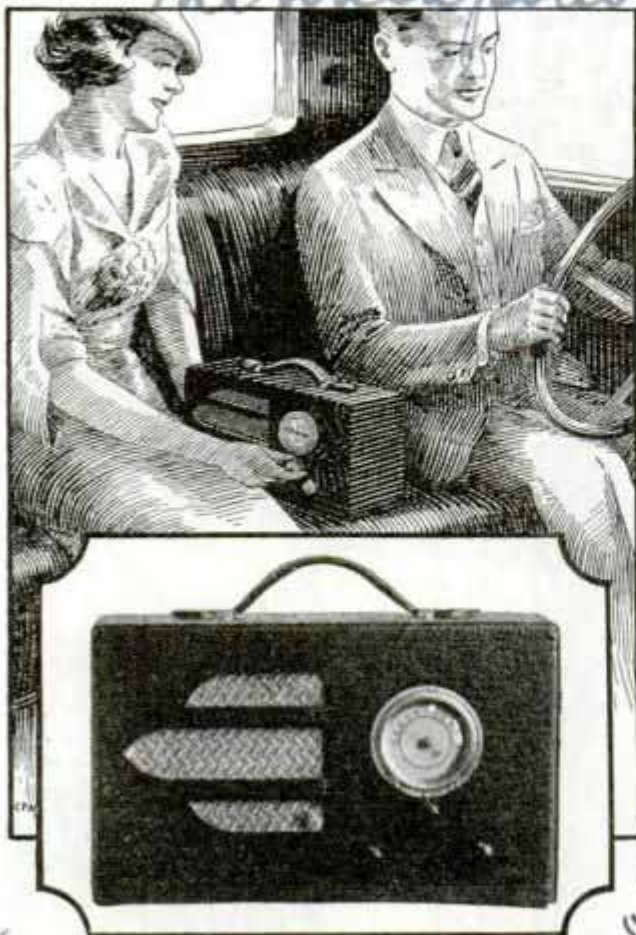


Small Ribbon-Type A and B-Batteries Now Available for Portable Sets; Especially Useful for Belt Receivers; the A-Battery, at Right, Is a Long-Life 3-Volt Unit

Write my C-636 R. Albany Co.

Douglas Battery & Fresh Cell

Mueller Electric Co.



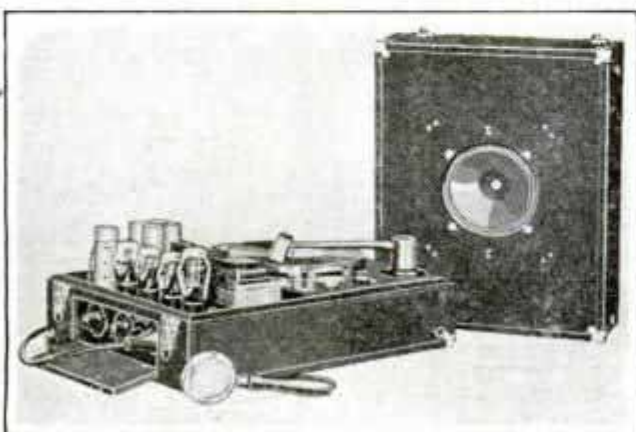
Dual-Purpose Receiver for Car or Home

Portable Set Operates from Car Battery

No B or C-batteries are required for this portable receiver. It may be operated directly from the 6-volt storage battery in the car, or on a 110-volt a.c. line if desired for use in the home or hotel room. A special plug-in arrangement automatically makes the necessary changes from 6 to 110-volt operation.

Compact Amplifier and Phonograph Unit

This compact unit consists of a portable sound system with a built-in power am-

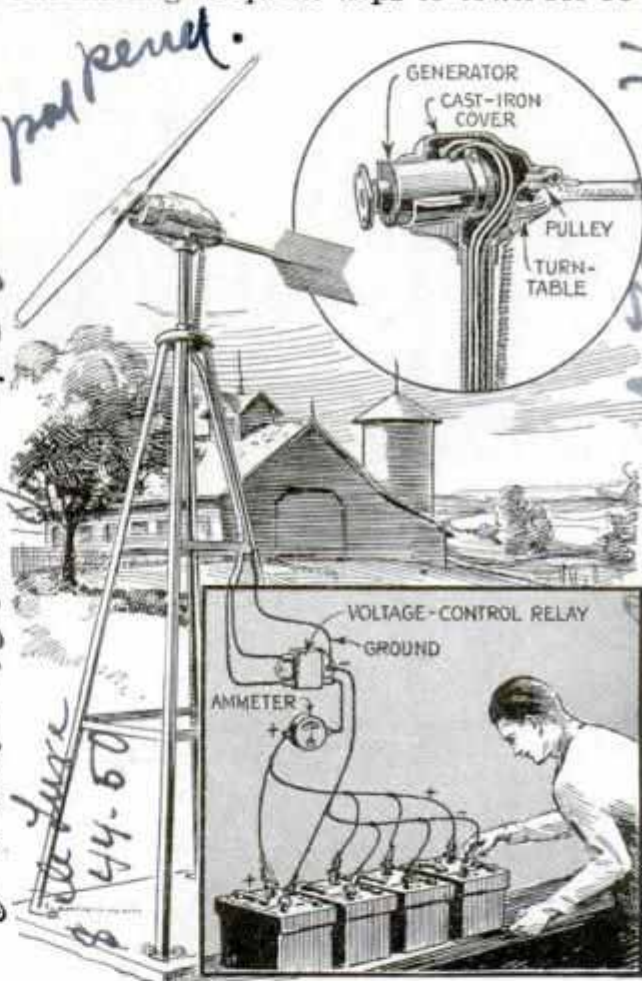


Complete Sound System Ready for Use

plifier the output of which is rated at 7 watts from a crystal microphone input. It includes mixing controls for the microphone and phonograph, with a choice of output impedances and field supply for dynamic speakers.

Wind-Driven Charger for Radio Batteries

Several ordinary radio or auto batteries can be kept fully charged at all times by means of this direct-drive, wind-driven battery charger. Those living where a.c. or d.c. current is not available can now operate 6-volt all-electric receivers without making frequent trips to town for re-



Wind Charger with Batteries Connected

charging. Available in two sizes, the large model shown in the illustration can be used also to provide a small home lighting plant which will carry from four to six 6-volt 30-watt lamps.

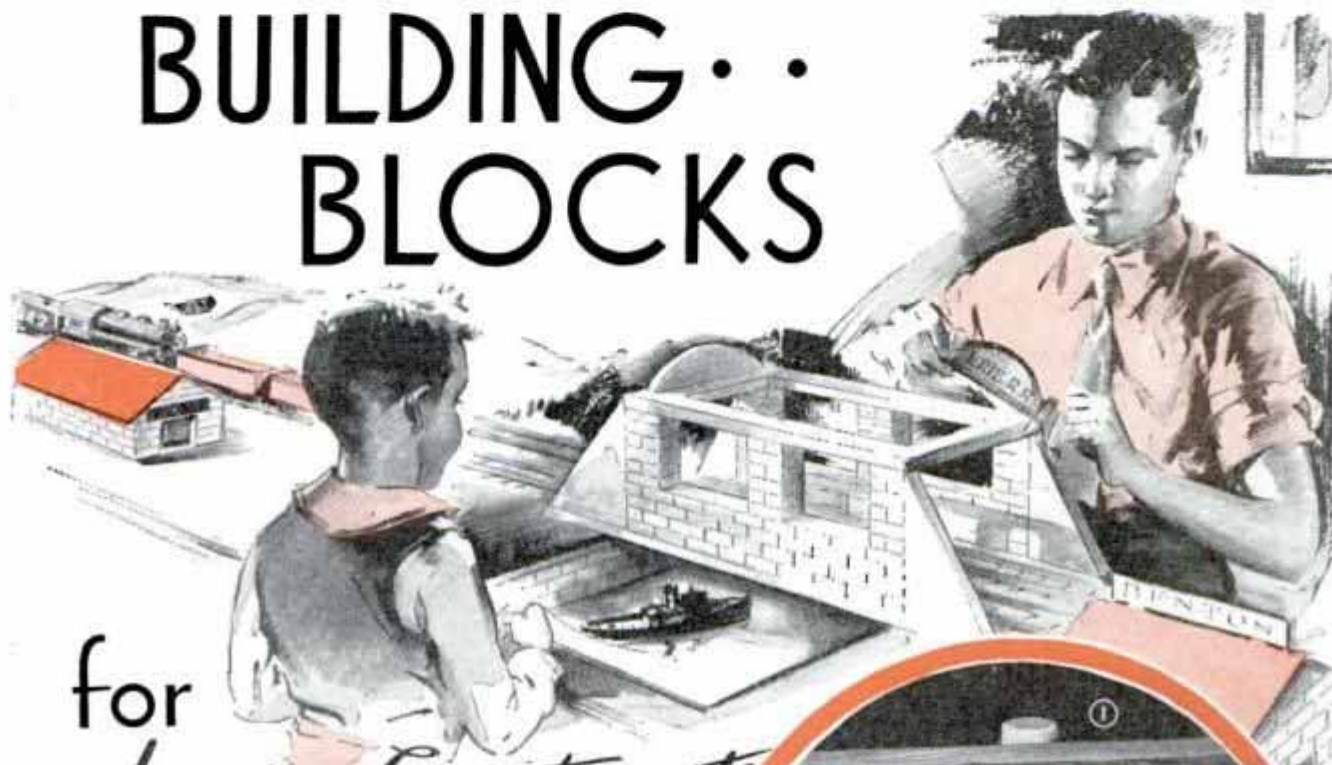
Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.

Webster Electric Co.

103
Minnneapolis, Minn
402 Broadway
St. Louis, Missouri
City, Mo.



BUILDING · · BLOCKS



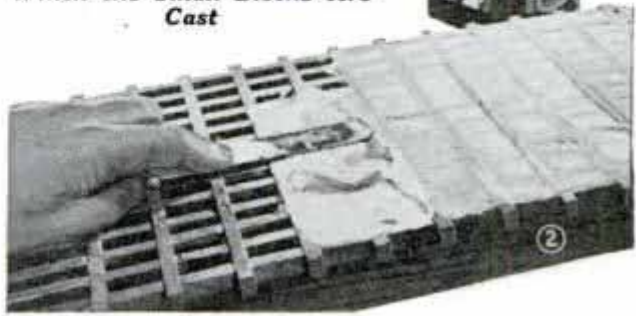
for
*Junior Construction
Engineers*

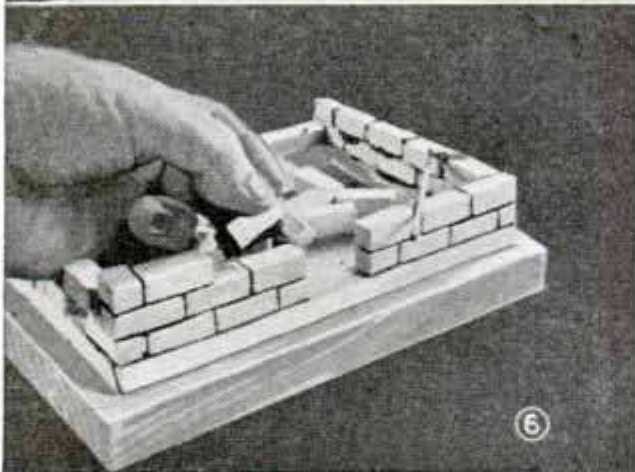
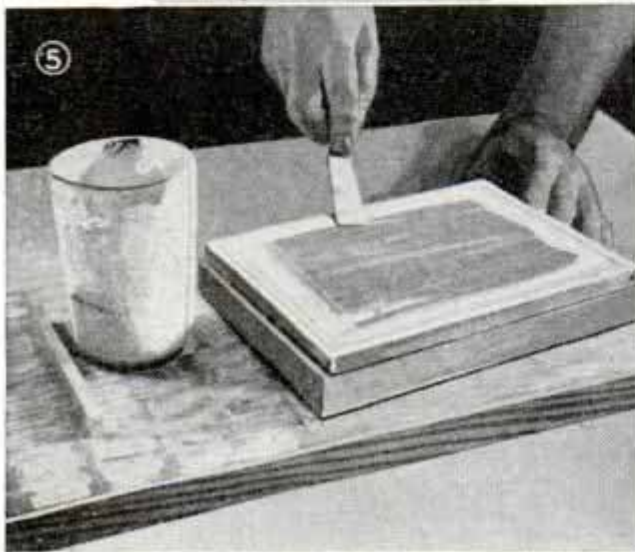
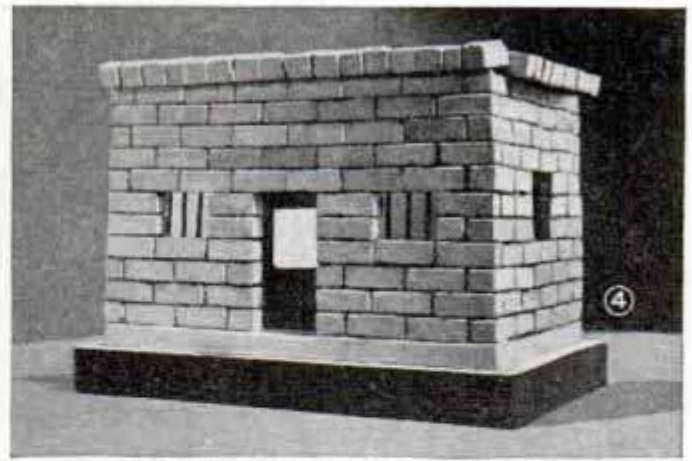
YOU'LL find it enjoyable to watch a model skyscraper go up, floor after floor; to build a scale model of the local post office for a mantel decoration, or to make a realistic depot, bridge and other buildings as an addition to the electric railroad received at Christmas. All of this is possible with miniature building blocks made in a few hours' time.

Ordinary patching plaster was found satisfactory for casting the blocks; it will not set too quickly nor too slowly, it can be colored and otherwise treated and does not shrink. The latter is important when models are to be made to scale. Now, to make some bricks and blocks we need a form that will turn out at least a hundred blocks at a time. A satisfactory form is a



*Notched Strips of Hardwood
Assembled to Form a Grille in
Which the Small Blocks Are
Cast*





grille made from oiled strips of wood. The spaces should be an inch long, $\frac{3}{8}$ in. wide and $\frac{3}{8}$ in. deep. To be sure that the strips will mesh accurately, use the jig for a circular saw with dado head, as shown in Fig. 1. A board screwed to the miter gauge has a small pin fixed to act as a guide in advancing the strips each time they are passed over the cutters.

The water with which the patching plaster is mixed is first tinted with water color so that all of the blocks will be of a uniform brown or sand color. When blocks of marble are to be imitated a little water glass may be added, and a trace of black color stirred in just before the forms are to be filled. A common putty knife is convenient for filling the forms, as shown in Fig. 2. The material will set in about an hour. Then, instead of trying to punch the blocks out of the grille, take it apart strip by strip as shown in Fig. 3. Clean the strips before assembling them for casting another batch.

The model buildings are best built up on a thick wood base on which has been poured, in a wood form, a narrow foundation as in Fig. 5. To securely anchor the foundation, place small brads part way into the wood base before the plaster is poured. An ordinary plaster and water cement is not satisfactory for "laying" the bricks or blocks, but if patching plaster and ordinary black enamel are mixed to the consistency of a salve, an excellent cement is produced. With a small putty knife, coat two sides of each brick with cement and carefully lay it in place as shown in Fig. 6. A straight-edge may be used to keep the bricks properly lined up. After a

few bricks have been laid, take the broad end of a toothpick and clean out the excess cement from between. When bricks of odd lengths are required, use a hand coping saw, which is better than cutting them with a knife. Your first project should be something simple, such as the "country jail" shown in Fig. 4. The door is of blackened thin veneer. The window bars are match sticks given a grayish-black color with liquid shoe polish.

Now we come to another type of construction; the reproduction of old buildings built of stones, of which the crumbling castle shown in Fig. 7 is an example. Patching plaster was first mixed with white enamel to the consistency of a thick dough, and when well kneaded, a trace of black enamel was worked in. A small piece of the material was placed in the palm of the hand and rolled into a ball, then set in place on a wood base without the use of cement. If care is taken to make the dough quite thick it is possible to cut the imitation stones in half with a knife, placing the flat surfaces to the front. This material should be left to dry over night, after which it will hold together quite as well as if it were cemented. The model engineer will learn quickly that it is easy to build realistic models of any building with this material. Also, he will learn that it is possible to give bricks a glazed effect with a coating of water glass, (sodium silicate) and to mix small quantities of ground mica with the patching plaster to make blocks that will shine with pin points of light when properly illuminated.

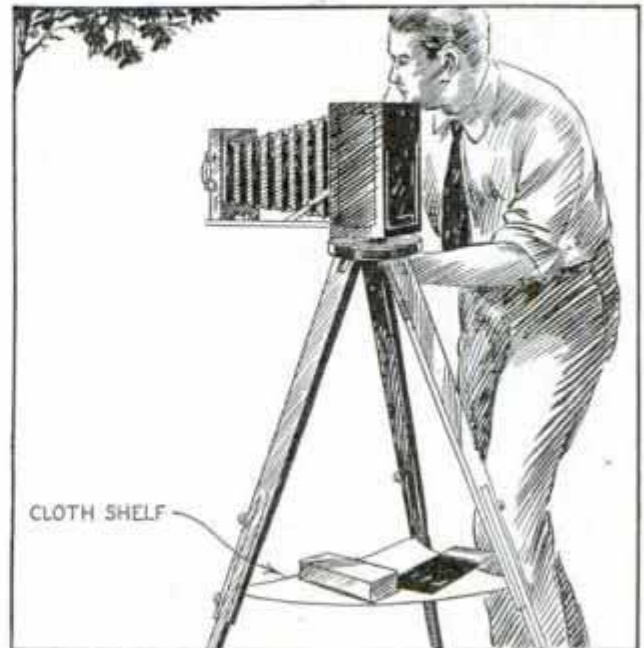
Fluid to Prevent Work Slipping on Lathe Faceplate



When making faceplate turnings, which are held only by the center screw, a photographer applies retouching fluid to the faceplate so that the turnings will not slip. As this fluid has a rosin base, a satisfactory substitute may be made by dissolving ordinary lump rosin in turpentine. One coat lasts for some time.

When making faceplate turnings, which are held only by the center screw, a photographer applies retouching fluid to the faceplate so that the turnings will not slip. As this fluid has a

Cloth Shelf in Tripod Holds Photo Accessories



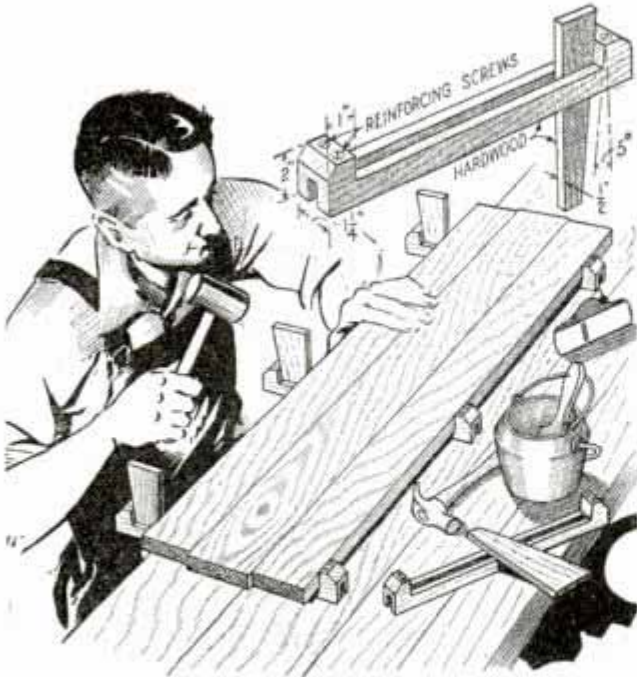
Cloth Shelf Suspended between Tripod Legs Holds Extra Plates, Gloves, Focusing Cloth, Etc.

A cloth shelf, that spreads or folds within the tripod, will be found very convenient for outdoor photographers to hold extra plate holders, focusing cloth, gloves, etc., and keep them readily at hand. The cloth may be provided with metal rings which are snapped over screw hooks inside the tripod legs. This makes it possible to detach the shelf when not in use.

Mallet Has Replaceable Faces

After a wood mallet has been used for a short time, the faces often become so dented that it is useless for anything but rough work. To avoid this, it is more satisfactory to turn a mallet from hickory and fit it with replaceable faces. The mallet shown has a hickory insert on one end, and several layers of rubber on the other. While turning it on the lathe, make a shallow hole $\frac{1}{8}$ in. deep in one end, and a hole $\frac{1}{2}$ in. deep in the other end, and then turn a number of the face pieces for future use. The rubber faces are built up of disks cut from inner tubes, and are held in place with rubber cement.





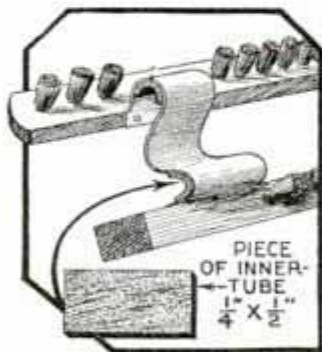
Made of Scrap Stock, These Bar Clamps Will Draw Up a Joint Tightly

You Can Make These Inexpensive Bar Clamps

These simple bar clamps can be made of scrap material found around the shop. They may be made any convenient length as wood wedges can be inserted between the tailpiece and the work to take up surplus length. The slot through which the wedge extends is cut on a circular saw, and runs only to the headpiece. The wedge has a 5° slant. After blocking the work in place, a few hammer blows on the wedge will draw up a joint tightly. A set of four clamps of uniform length is suggested.

Repairing Worn Brushes on Your Vacuum Sweeper

If the bristles of the brush on your vacuum cleaner have worn down so that they



do not touch the carpet, and there is no adjustment provided for lowering the brush, it can be made to work effectively by lowering it with pieces of rubber cemented to the spring clamp as shown. Rubber for this purpose may be cut from an old inner tube, using one or more thicknesses. —C. M. Boyce, Schenectady, N. Y.

Rubber Bands Make Safe Handle for Glass Scraper

Using small squares of window glass for scraping and smoothing woodwork saves much of the time and labor usually spent in rough sanding, but your hands or fingers may be injured on the sharp edges of the glass. As protection against such accident, cut a couple of bands and a rectangular piece of rubber from a discarded inner tube and fit these over the glass square to provide a safe and comfortable hand grip.



Scissors Notched to Cut Flower Stems

Have you ever tried to cut rose stems with an old pair of scissors and found that the stem just slid along between the blades? This difficulty is caused by the scissors being dull and can be remedied by filing or grinding a notch in one of the blades which will hold the stem while the other blade is cutting it off. —W. Barnes, Midland, Tex.



Keeping Ants Off Table with Grease Barrier

Here is a method used successfully by a camping party to keep ants off tables and cupboards. A large rubber disk and two or three smaller ones were placed under each table leg, after which the large disk was coated liberally with cup grease, the small disks being placed on top to keep the leg from coming in contact with the grease. The disks may be cut from an old inner tube, oilcloth or other material.

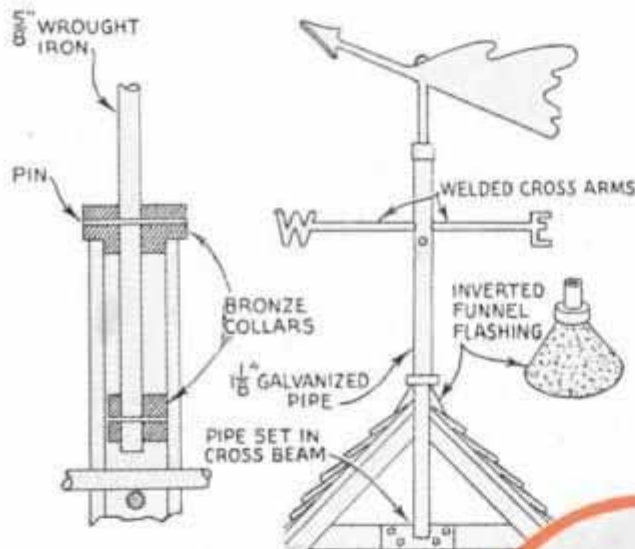


WHITHER BLOWS THE WIND?

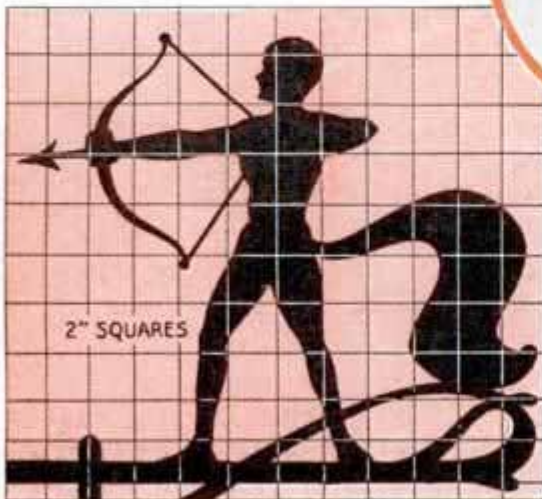
The Iron Weathervane, Like Its Contemporary, the Brass Knocker, is Returning to Popularity, and an Attractive Design is Within the Means of the Average Family, as it Can be Made Mostly at Home



Black Sheet Iron Is Generally Used for Making Weathervane Silhouettes although Other Materials, Such as Duralumin and Brass, Painted Black When Finished, Are Also Suitable; the Thickness Depends on the Size of the Figure, 1/16 In. Being the Minimum; Action, with a Touch of Caricature, Has a Universal Appeal

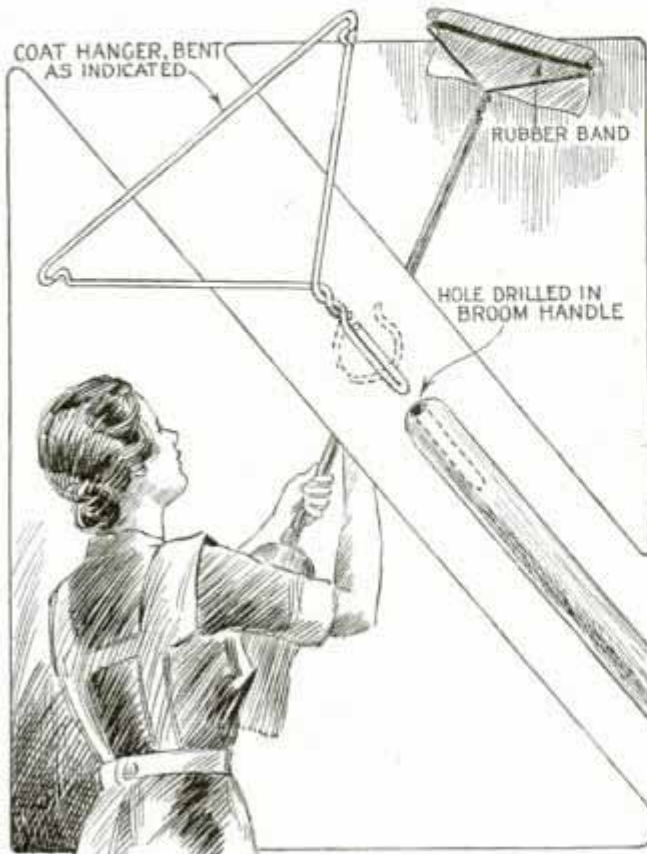


Details Showing Method of Mounting; Two Cross Arms, Indicating East and West, May Be Attached to the Support; Roof Leaks Are Avoided by Use of Flashing



Here Are Two Lively Silhouettes That You Can Enlarge on a Sheet of Paper and Transfer to the Metal; Hobbies as Well as Professions Can Be Represented

Wire Coat Hanger Converts Broom into Wall Duster

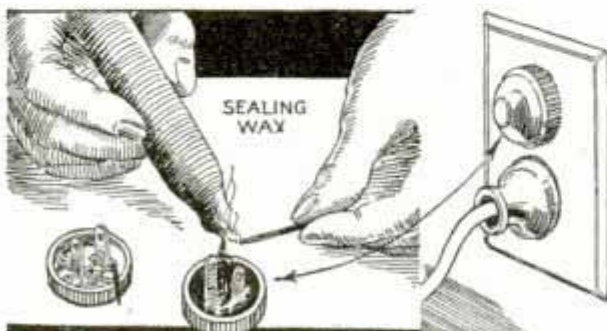


Wire Coat Hanger in End of Broom Handle Holds Dust Cloth for Wiping High Walls and Ceilings

To simplify the task of wiping high walls and ceilings with a dust cloth, one housekeeper uses a wire coat hanger, which she inserts into a hole drilled in the end of her broom handle. The hanger is bent as indicated, and the dust cloth is held in place with a heavy rubber band.

Protecting Children against Electrical Shocks from Wall Outlets

The impulse of a small child to stick things into any hole it may find, has resulted in many children receiving severe electrical shocks by sticking pins, forks,

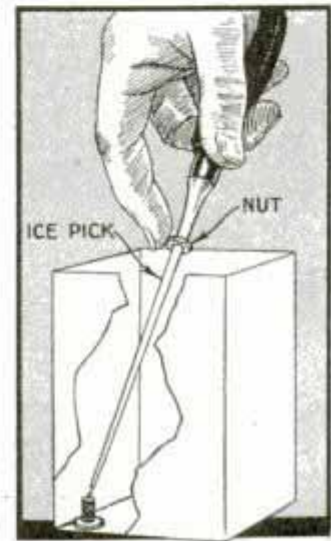


Attachment Plugs Filled with Wax Protect Child against Electrical Shocks from Wall Outlets

and other metal pieces into exposed wall outlets. This danger to your child can be avoided by filling some extra attachment plugs with sealing wax and keeping them in the unused outlets. Round plugs are best for this purpose as they are more difficult for a baby to pull out than other types. As an additional safety factor, bend the plug points together slightly so that they make a tight fit in the outlets.—Philip A. Eyrick, Arlington, Mass.

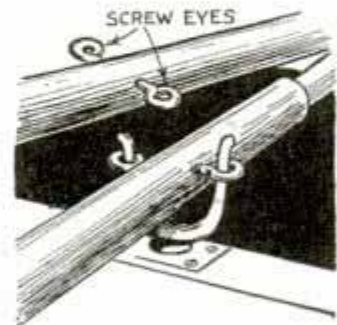
Ice Pick Aids in Starting Small Nuts

The next time you have a small nut to start on a bolt, which is located where it is difficult to reach with the hand, try using an ice pick, as shown, to get the nut on the threaded end of the bolt. This idea is handy where the head end of the bolt can be reached to turn it with a wrench or screwdriver, although it may take a little patience to get the nut started straight on the threads.—John Modroch, Chicago.



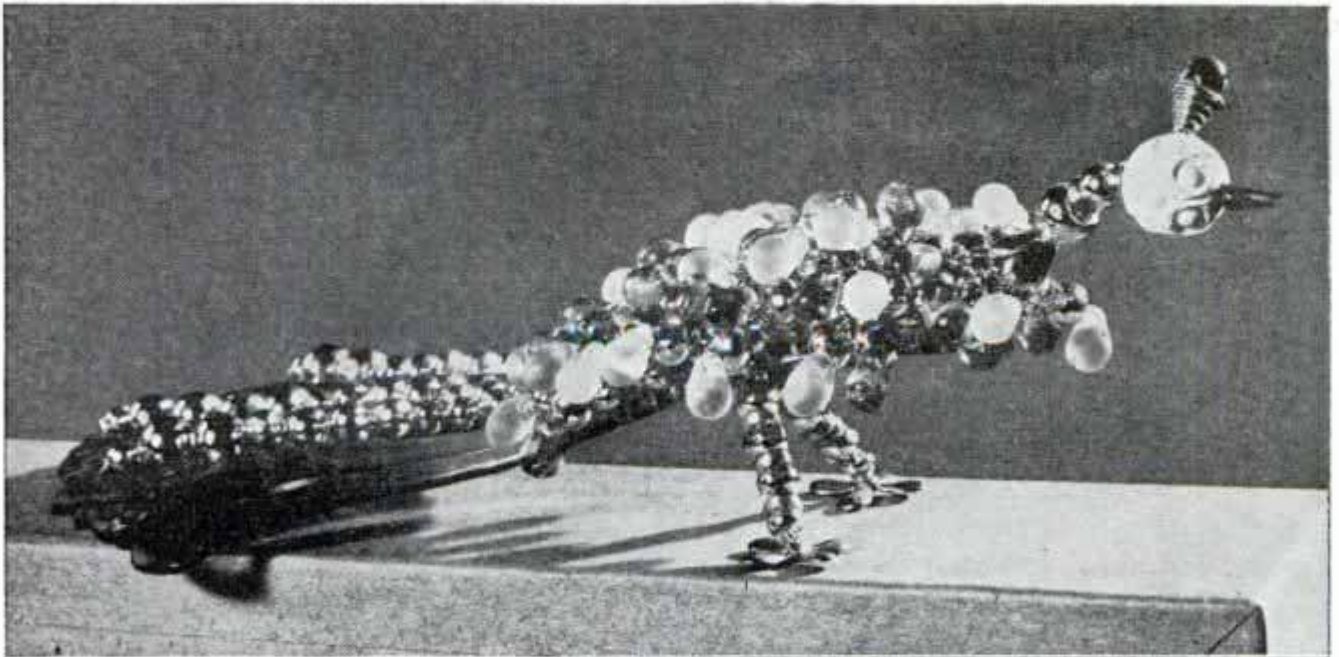
Screw Eyes Hold Oar Blades Vertically

In rowing with oars in open locks, many amateurs find it difficult to hold the oar blades in a vertical position. To overcome this, one resort manager drove a pair of screw eyes into each oar as shown, so that they would engage the forks of the locks, and prevent the oar blades from turning.

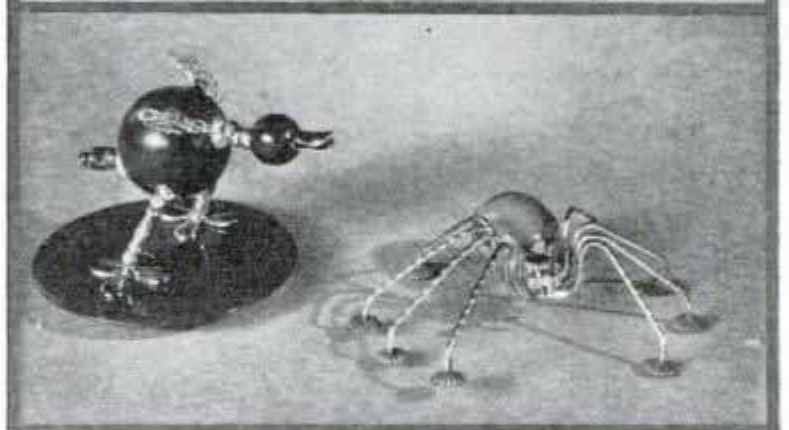
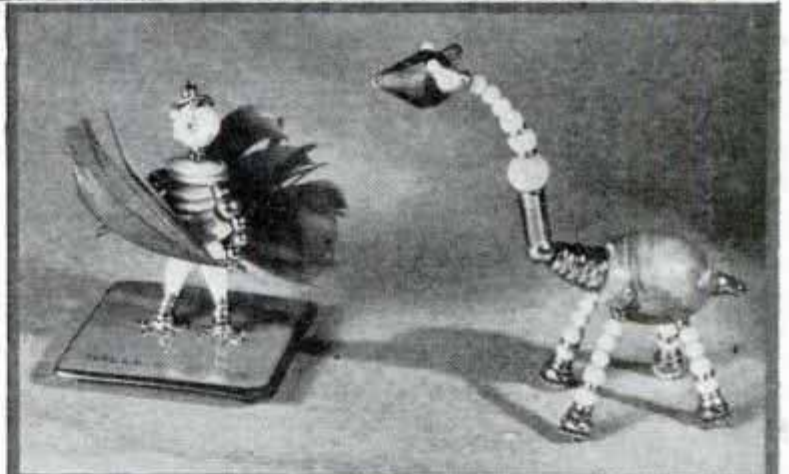


☞ To write black on glass or bright metal, use a mixture of water glass, 1 to 2 parts, and liquid India ink, 10 parts; clean the surface and use a steel pen.

Novelties Made from Beads and Old Jewelry



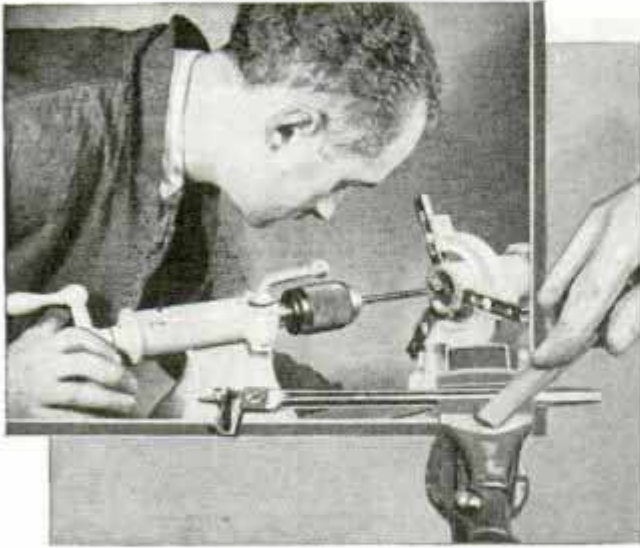
Gold and colored glass beads, from necklaces, bits of discarded jewelry and other suitable material found around the average home, can be made into attractive novelties for mantels and tables. Besides the figures shown, many other novel designs will suggest themselves as you progress with the work, the beauty of which depends largely on the care and thought exercised in the selection of contrasting colors, and the judicious use of sparkling stones. In forming the various figures, brass or gold-plated wire is used for stringing the beads and for most of the body members; it is soldered, twisted or tied together, whichever method is most suitable. One of the most ornate of all the figures is the peacock shown above. The broad, graceful tail, as well as the foundation for the back, is an old-fashioned back comb, which is ornamented with strings of colored beads, the colors being blended to get a beautiful effect and the body covered with colored-glass "teardrops." The neck, which terminates in a stone head surmounted by a "topknot," is a stiff piece of gold wire covered with beads. The legs are of similar material and the feet consist of rosettes taken from ten-cent store jewelry. The other figures are



made in a somewhat similar manner. The bodies of the giraffe, spider and duck are large beads or stones fitted with legs of bead-covered wire ending in suitable feet, an exception being the spider's legs, which are plain gold wire.

☐ Ventilation is necessary for stored potatoes to keep them in good condition.

Using an Expanding Drill in a Lathe



Turned Boxes, Vases and Similar Articles Hollowed Out with Expanding Drill Held in a Lathe

When turning vases and similar articles on a lathe, considerable skill is required to hollow out the interior with a chisel. Also, it is difficult to do the job beforehand with an expanding drill, as the hole is not likely to be straight. A better method is to round off the corners of the squared end of the drill shank so that it can be used in a chuck in the tailstock of the lathe. If the latter has a very slow speed adjustment, the hole can be drilled with the power on; otherwise the lathe should be turned by hand. Filing the end of the drill will not prevent it from being used in a brace chuck.

Excelsior Assures Drainage of Potted Plants

An experienced gardener claims that potted flowers make better growth if the

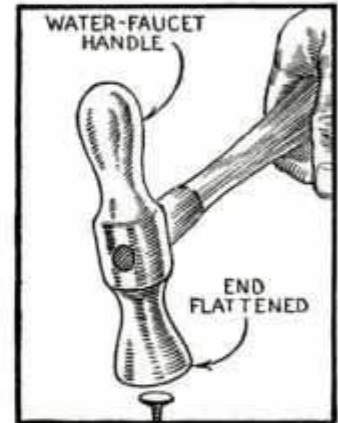


earth is not allowed to pack solidly over the drain opening in the bottom of the pot. To prevent this, he places a wad of excelsior in the bottom of the pot directly over the opening, before the pot is filled with dirt, to assure proper drainage and keep the soil sweet. Other methods recommended are to use steel wool, gravel or

a curved piece of metal, or even a piece of the curved side of a broken flower pot.

Tack Hammer Made from Faucet Handle

If you have any old water faucets lying around, their handles can be made into tack hammers very easily by fitting them with suitable handles. Flatten one end of the faucet handle with a file or grinding wheel, and, if necessary, ream the screw hole a little to take the handle.—Fred Cornelius, El Paso, Tex.



Canvas Sheath on Tent Pole Holds Loaded Gun Safely

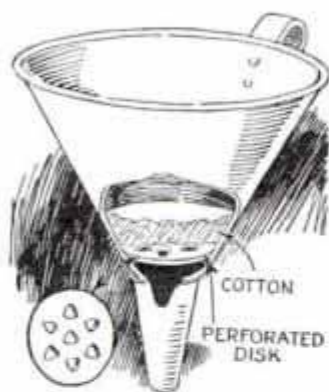
The problem of safely storing your gun in camp is solved by tacking a canvas sheath to one of the tent poles as shown. This keeps your loaded gun out of the way where it is not likely to be discharged accidentally, yet it is readily available any time it may be needed.



Tacked to a Tent Pole, a Canvas Sheath Keeps Your Gun Safe, Yet Easily Accessible

When you are in need of shoe polish, and none is at hand, try a little paste floor wax; this has a neutral color and may be used on either dark or light shoes.

Perforated Disk Speeds Filtering of Liquids through Cotton



When filtering liquids through a funnel partly filled with cotton, you will find that the work can be done much faster if a perforated cardboard disk is placed in the bottom of the funnel to keep the cotton from packing in the mouth of the spout. After perforating the disk, dip it in hot paraffin to make it waterproof.

Sanding Sleeves for Small Hand Grinder Made Quickly

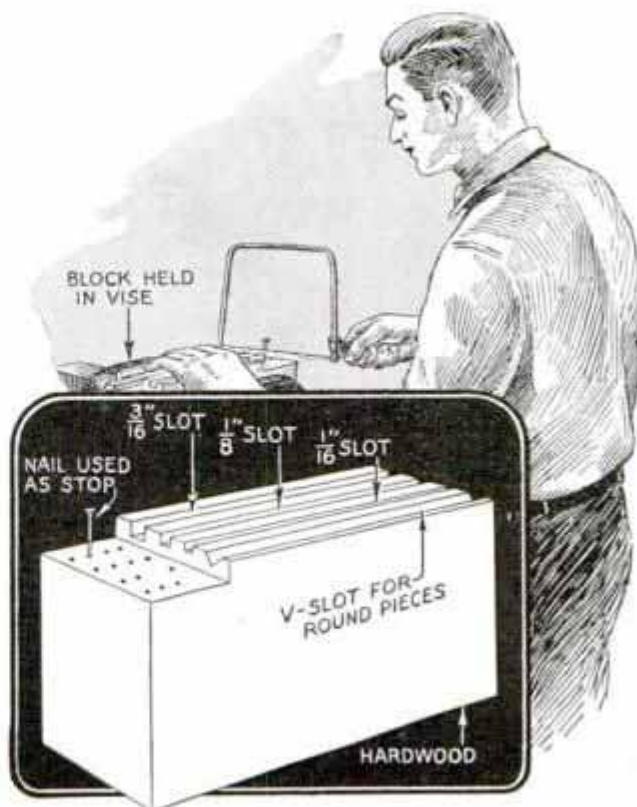
If you have a small hand grinder, it may be converted quickly into a high-speed sander for intricate work. Select a grinding wheel of the desired shape and wrap it tightly with gummed paper. Wrap the paper with the gummed side out, overlapping



Abrasive Wheels Wrapped with Sandpaper Convert Small Hand Grinder into Sander for Intricate Work

the ends slightly and sticking them together. Then moisten the gummed surface and apply a strip of abrasive paper, first beveling the ends to make a neat joint. The gum will dry quickly so that the sander may be used immediately. When the job is finished, the paper can be removed from the wheel without damaging it in any way.

☛ Smoke from soft coal will cause varnished furniture to look cloudy.



Block with Slots in Top Surface Saves Time in Cutting and Sanding Small Parts for Models

Combination Sanding Block Aids Model Makers

Made of hardwood, this combination sanding and cut-off block will aid when making small wood parts for models. Slots of various sizes in the top surface hold the parts to be cut off, or to be sanded, while a step at one end has a series of holes in line with each slot, in which a nail is used as a stop. The saw is guided by the face of the step. Long pieces are sanded by placing them in the grooves where friction holds them firmly to prevent slipping.

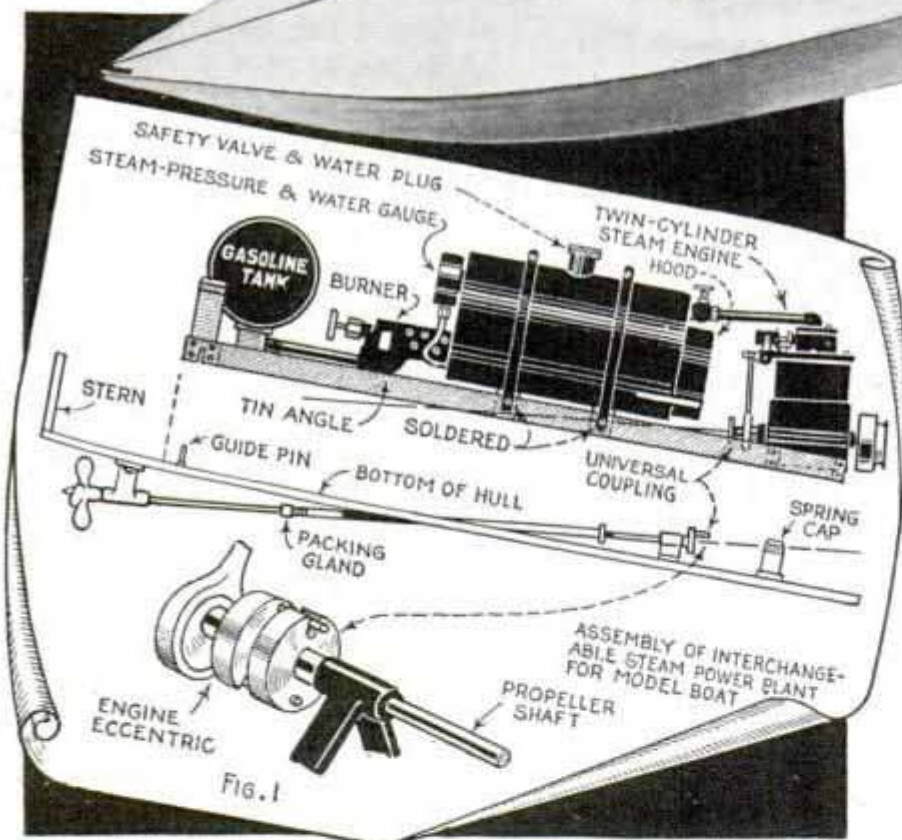
Laundered Tam Shaped over Dinner Plate

After laundering a knitted wool or silk tam, stretch it over a dinner plate and lay it on a clean paper to dry. If the plate is of the proper size, the tam will hold its shape, and further stretching or pressing will be unnecessary. As the tam will shape itself to the exact size of the plate, one with a smooth edge should be used.



Interchangeable POWER

By
C. E. PACKER



drive any model from a speed boat to a stern-wheeler, and it can be switched from one hull to another in a few moments. In addition to boats, the unit may be used to operate model cars, tractors, derricks, steam shovels, etc.

The first thing needed is the engine, which can be purchased from several sources. It is best to get a boiler at the same time, although one may be made from large, brass pipe. If this is done, a safety valve and water plug should be installed as well as a water and a steam-pressure gauge.

THE amateur skipper who would like a number of model boats, but cannot afford a power plant for each hull, will find the solution to his problem in this interchangeable steam unit. It consists of a twin-cylinder engine and a boiler, which is fired by a blowtorch. The unit will han-

Two lengths of tin or aluminum angles, cross-braced at the ends and center, form the base of the unit. The blowtorch burner and boiler are fastened to the base with brass strips, while the engine is screwed to it. It probably will be necessary to tilt the engine slightly so that its crank shaft

PLANT *for* Model Boats

aligns with the propeller shaft. After assembling the unit compactly on the base, the hulls are made ready to accommodate it. Figs. 1 and 2 show how this is done for boats that are driven by screw propellers, while the arrangement for a stern-wheeler is shown in Fig. 3. After placing the hull in water, the unit is shifted fore and aft until the boat trims. Then, the position is marked and a spring clip and pegs are put in the bottom of the hull to hold the base in position as shown in Fig. 2.

Next comes the propeller assembly, which is mounted so that the shaft terminates just behind the engine eccentric. Metal disks, keyed to the engine crank shaft and to the end of the propeller shaft, form a universal coupling, steel pins engaging slots in each disk as shown in Fig. 1. The engine is connected to the propeller by guiding the pins into the slots as the unit is slipped into the hull. To get maximum speed from a model, it is important that all parts turn freely, which makes it necessary that the propeller and engine be in perfect alignment. To mount the propeller assembly, cut a slot in the center of the hull where the shaft and its housing are to pass. Then bolt the bear-

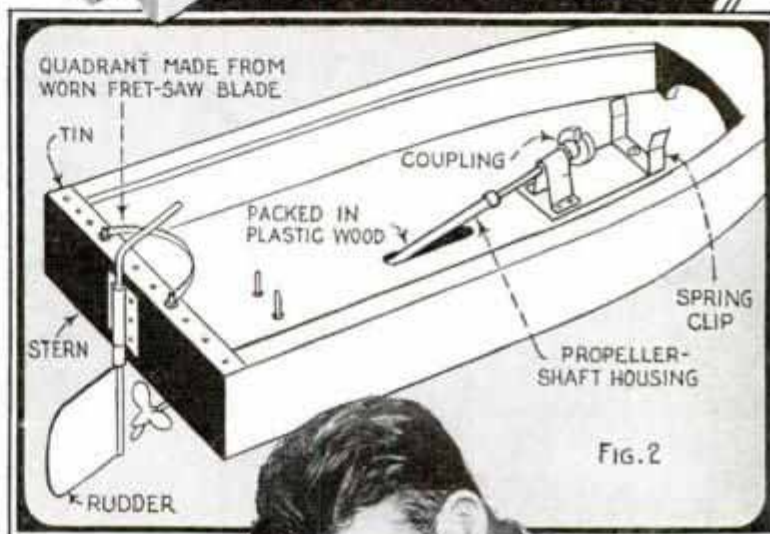
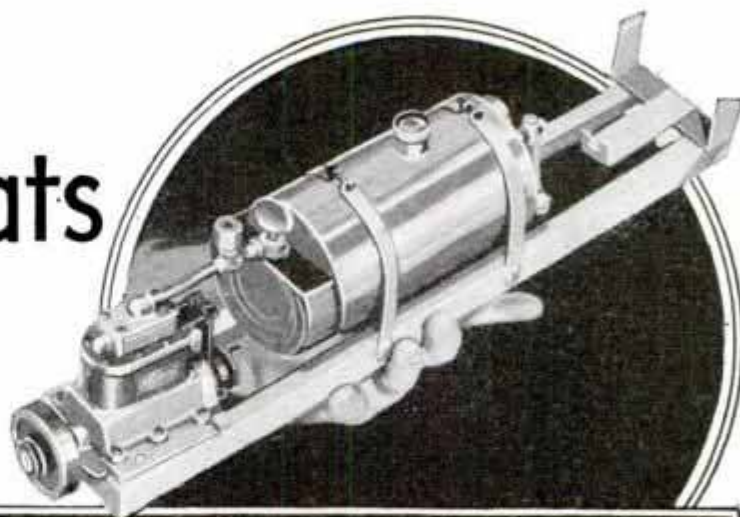
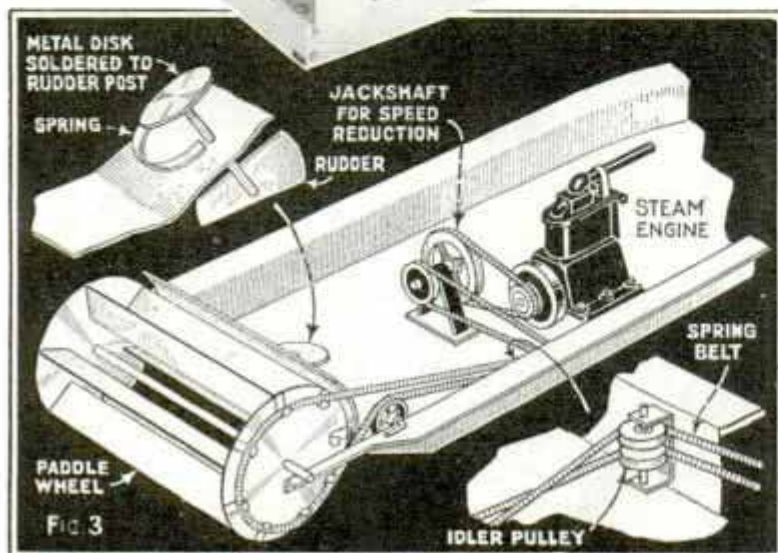
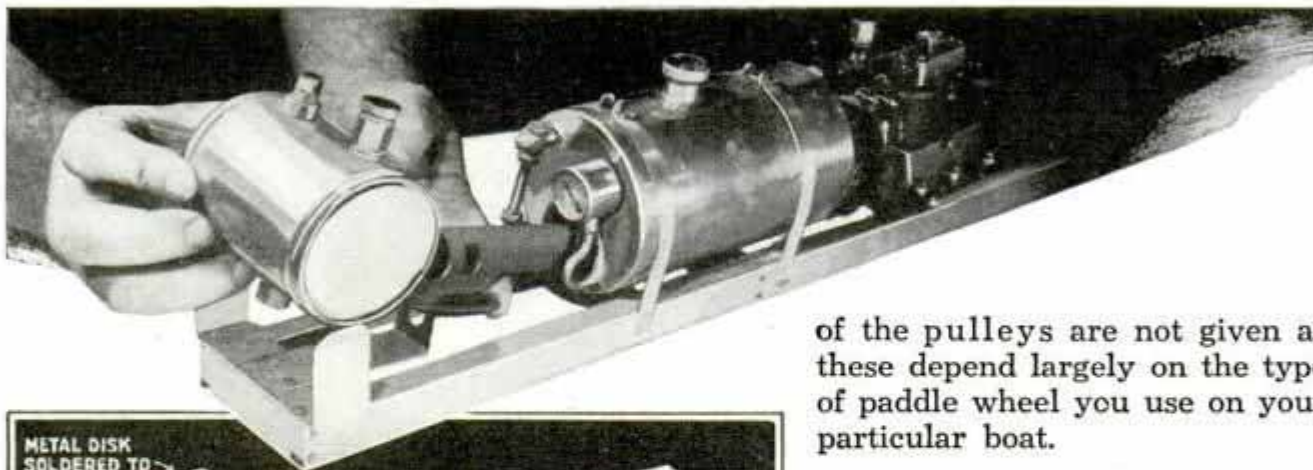


FIG. 2





ings in place, being sure that the propeller shaft lines up with the engine shaft. Pack the space between the propeller housing and the bottom of the boat with plastic wood to assure a water-tight job. This completes the work with the exception of a rudder, which can be made from brass and fastened to the stern of the boat as shown in Fig. 2, using a fret-saw blade with the teeth turned up as a quadrant.

For stern-wheelers, mounting of the unit is done in a similar manner. However, in this case the driving mechanism consists of reduction pulleys and small coil springs, which are used as belts. This hook-up is shown in Fig. 3. Sizes and speeds

of the pulleys are not given as these depend largely on the type of paddle wheel you use on your particular boat.

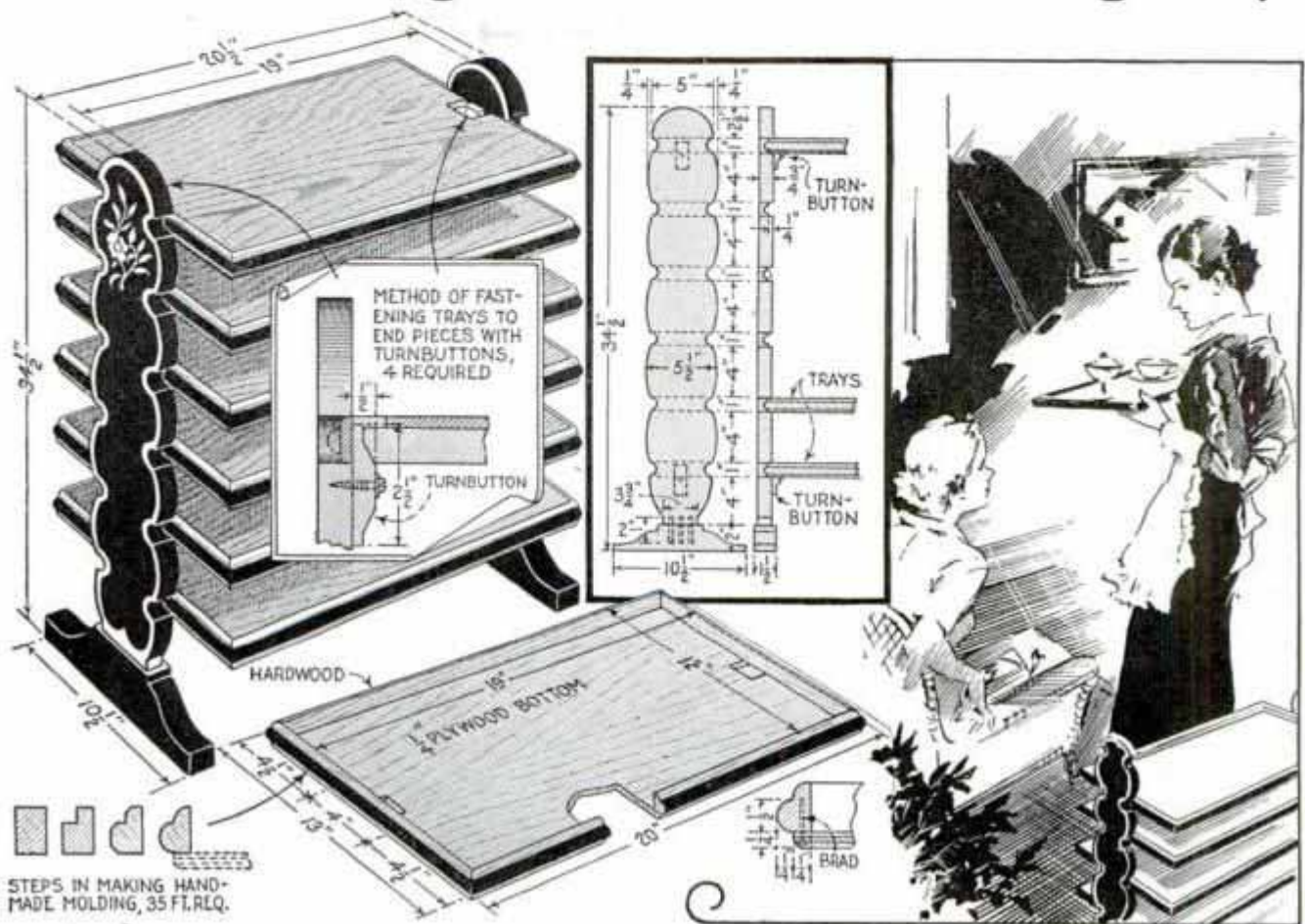
Colored Shellac Substituted for Enamel

Colored, white shellac will serve practically all the purposes for which enamel is used in coloring models, toys, etc. Shellac has the advantage of being less expensive and quicker drying than enamel, and it produces a durable, glossy finish that will stand rubbing down with pumice or rottenstone. In fact, shellac will stand almost anything that enamel will, except exposure to water. A dime's worth of each of the following colors in dry form will give you a good start: lamp black, burnt umber, burnt sienna, chrome green, chrome yellow, ultramarine blue, vermilion red and dry white lead.

In mixing the colors, pour into a container about the amount of shellac required for the job at hand, and then stir in the dry color, a bit at a time, until the desired intensity is obtained. By mixing, an almost limitless number of shades can be made. For instance, red added to blue, yellow or white produces purple, green or pink respectively, while yellow added to blue produces green, and black mixed with red produces brown. Pink added to yellow produces flesh, and black added to blue produces gray. By this mixing of colors, paints and enamels can be matched for repairing present objects, or for painting furniture, walls, etc., to match some you already have in your home.

☛ A good soldering flux may be made by melting tallow and rosin together, forming it into sticks when cool.

Combined Magazine Rack and Serving Trays

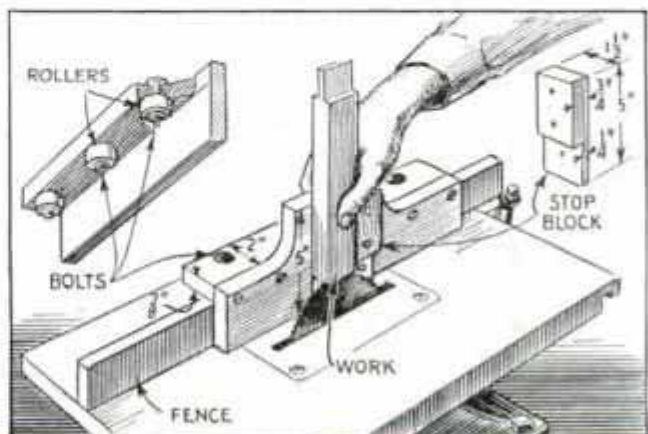


Serving the dual purpose of a magazine rack and serving trays, this unusual piece of furniture consists of six shelves, which are locked between two ornamental ends by means of four turnbuttons. Soft or hard wood may be used, but the moldings around the trays should be hardwood, as they take the strain of holding the stand rigidly. The shelf dados should be cut in

the end pieces before curving the edges as the work will be easier to hold, and any edge splintering will be removed with the waste stock. Care must be taken to drill the three dowel holes accurately in each foot and upright, otherwise the narrow foot boards may split when they are assembled with the uprights.—Edwin M. Love, East San Gabriel, Calif.

Sliding Jig Helps When Cutting Tenons on Circular Saw

To avoid any possibility of work turning in your hands when cutting tenons on the ends of long or narrow stock, use this jig, which slides between the fence and the saw blade to aid in holding the work rigidly. Three rollers, fitted as shown, bear against the rear face of the fence and guide the assembly, while a stop block, cut as shown in the right-hand detail and screwed to the front of the jig, aids in holding the work as it is pushed over the saw.



A Jig That Holds Work and Guides It over Saw to Cut Tenons on Long or Narrow Stock

Quicklime added to benzine, in the proportion of about 3 oz. to the gallon, will deodorize it; shake well and strain.

Foot Clamp for Scroll-Sawing

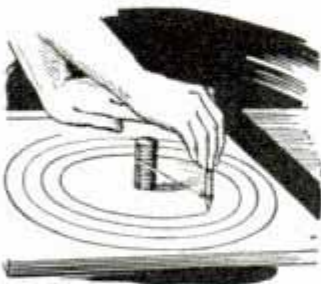


Spring and Stirrup Enable You to Tighten or Release C-Clamp Quickly When Doing Scroll-Saw Work

To save time and eliminate the difficulty of tightening and loosening a C-clamp when doing scroll-saw work, attach a screen-door spring to the thumbscrew of the clamp and suspend a stirrup of heavy wire from the opposite end. In use, leave the screw of the clamp open and place your foot in the stirrup to hold or release the pressure on the work.

Easy Method of Drawing Spirals

Anyone who experiences difficulty in drawing neat spirals will profit by this method, which an experimenter in television used to scribe spirals on his scanning disks. A bolt or rod, having a diameter equal to approximately one-third the distance desired between the spirals, is tied to a fine wire, and a loop is provided at the

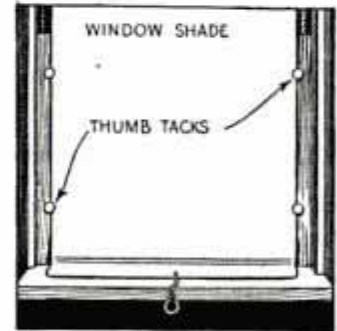


other end of the wire for a pencil or scriber. In use, the rod is set in the center of the work on which the spiral is to be made. Then, as the pencil is pulled around the rod, keeping the wire taut, the coils of the spiral will be spaced a distance equal to

the circumference of the rod, provided the wire is not allowed to overlap as it winds on the rod. If the spiral spacings are critical, the exact diameter of the rod to be used can be found by dividing the desired distance between the spirals by 3.1416.

Thumb Tacks Keep Shade Close to Window

When a shade warps or bulges so that it will not lay close to a window, a few thumb tacks pushed into the inner edges of the sash will serve as guides to keep the shade in place.



If the tacks are of the same color as the sash, they will not be noticed, and the edges of the shade are easily inserted under the tack heads when it is pulled down. —C. E. Edson, Cleveland, Ohio.

Brake Drum Used as Bowl of Fountain

A drinking fountain in the athletic field at the Costa Mesa, Calif., junior high school is built around a truck brake drum. Part of the drum is cut away and a flat plate is welded to it as shown. The drum is bolted to the side of a building, or it may be mounted on a standard, which then serves as a drain for waste water.

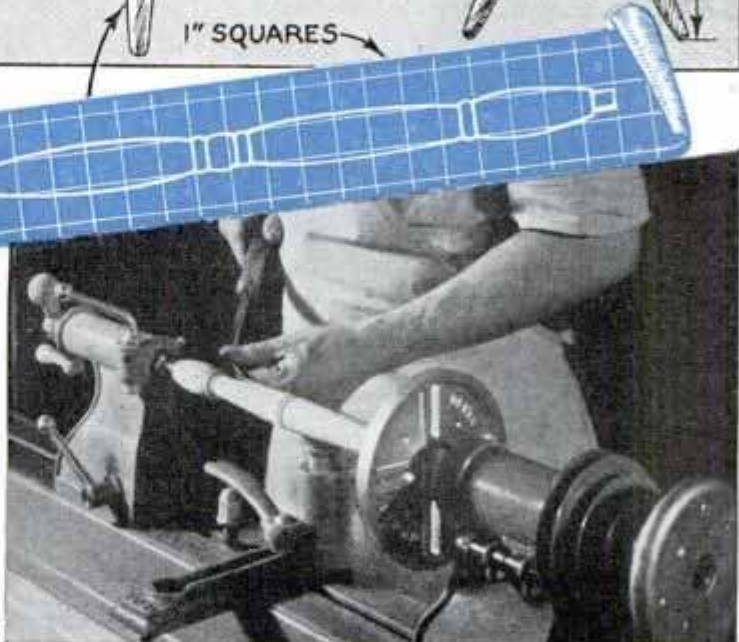
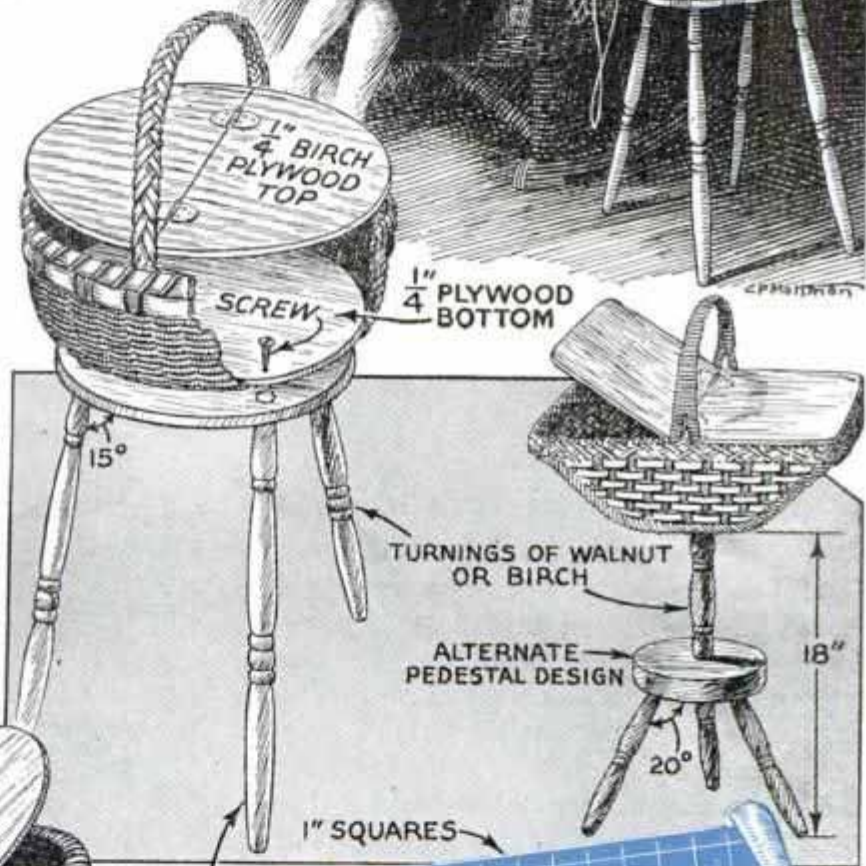


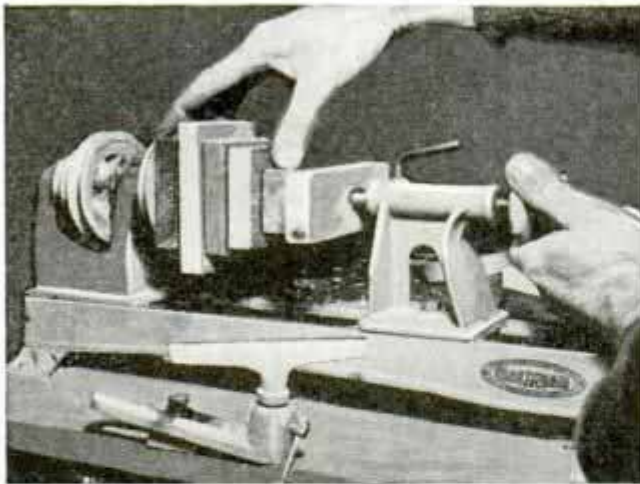
Old Car Brake Drum Mounted on Pipe Standard Serves as Bowl of Drinking Fountain

Sewing Baskets

YOU CAN MAKE *by* Floyd Mix

ALMOST any fruit or shopping basket can be converted into a useful chair-side sewing kit by attaching a set of turned legs. As each basket presents a separate problem in base design, a little ingenuity on the part of the builder will be required to work out something appropriate. The legs are held in place securely by gluing them into a piece of plywood, and by driving screws into the ends, as indicated in the center detail. Plywood is also used for the lid. One end is fastened to the rim of the basket, while the other is hinged, as indicated. Finish for the wooden parts consists of a coat of oil stain and a coat of shellac well rubbed down with fine sandpaper. Cloth lining may be added, if desired. Also, cleats can be glued inside the basket for a shelf to divide the kit into compartments.





When a Clamp Is Not Available for Holding Glued Stock, Try Clamping It between Lathe Centers

Lathe Used as a Gluing Clamp

When you have a number of pieces to glue together, and no clamp is available, your lathe may be used as a substitute. Glue the pieces and place them between the lathe centers, using a small faceplate on the headstock, and adjusting the tailstock to apply pressure. An extra block of wood should be used in front of the dead center to prevent the point from marring the work.

Movable Safelight for Your Darkroom

Where an overhead safelight is used in a small darkroom, the pulley arrangement shown will be found useful as it permits the light to be shifted to any position above the workbench or sink without the cord becoming entangled with bottles, trays, etc. The lamp is provided with a long, flexible cord, and two pulleys are screwed to the wall or ceiling above the bench. The cord is run through a counterweighted

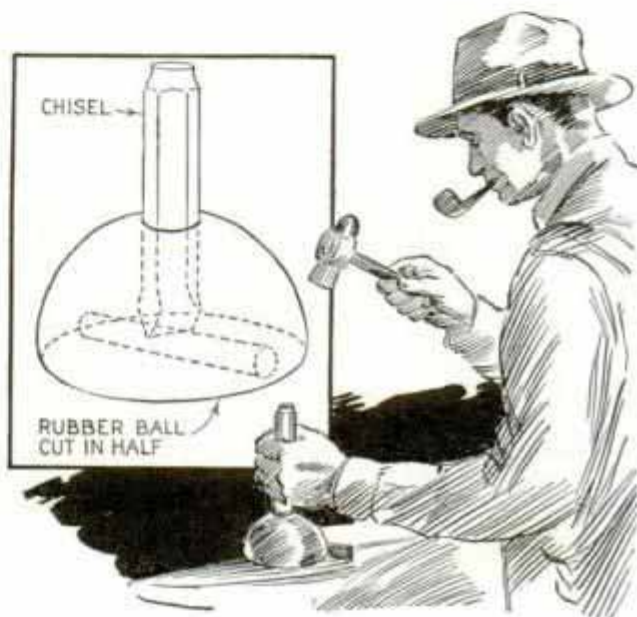


Darkroom Safelight Suspended between Pulleys above Workbench Is Moved Easily to Any Position

pulley and then over one of the pulleys on the wall. A small rope, with a weight at one end, is run over the other pulley and tied to the cord near the lamp as shown.—Paulmer Beck, Los Angeles, Calif.

Half of Hollow Rubber Ball Aids in Cutting Nails with Chisel

Have you ever tried to cut off a short piece from a nail, pin or a length of wire with a cold chisel and lost the piece when it flew off? One half of a hollow rubber ball, slipped over the chisel as shown, will

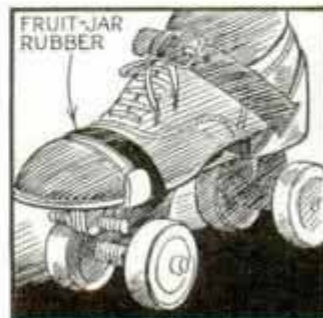


Rubber Guard on Cold Chisel Retains Short Pieces Cut from Nails, Wire and Pins

prevent this trouble. It is a good idea to make the hole in the rubber a loose fit on the chisel so that it can be raised to set the tool on the work.

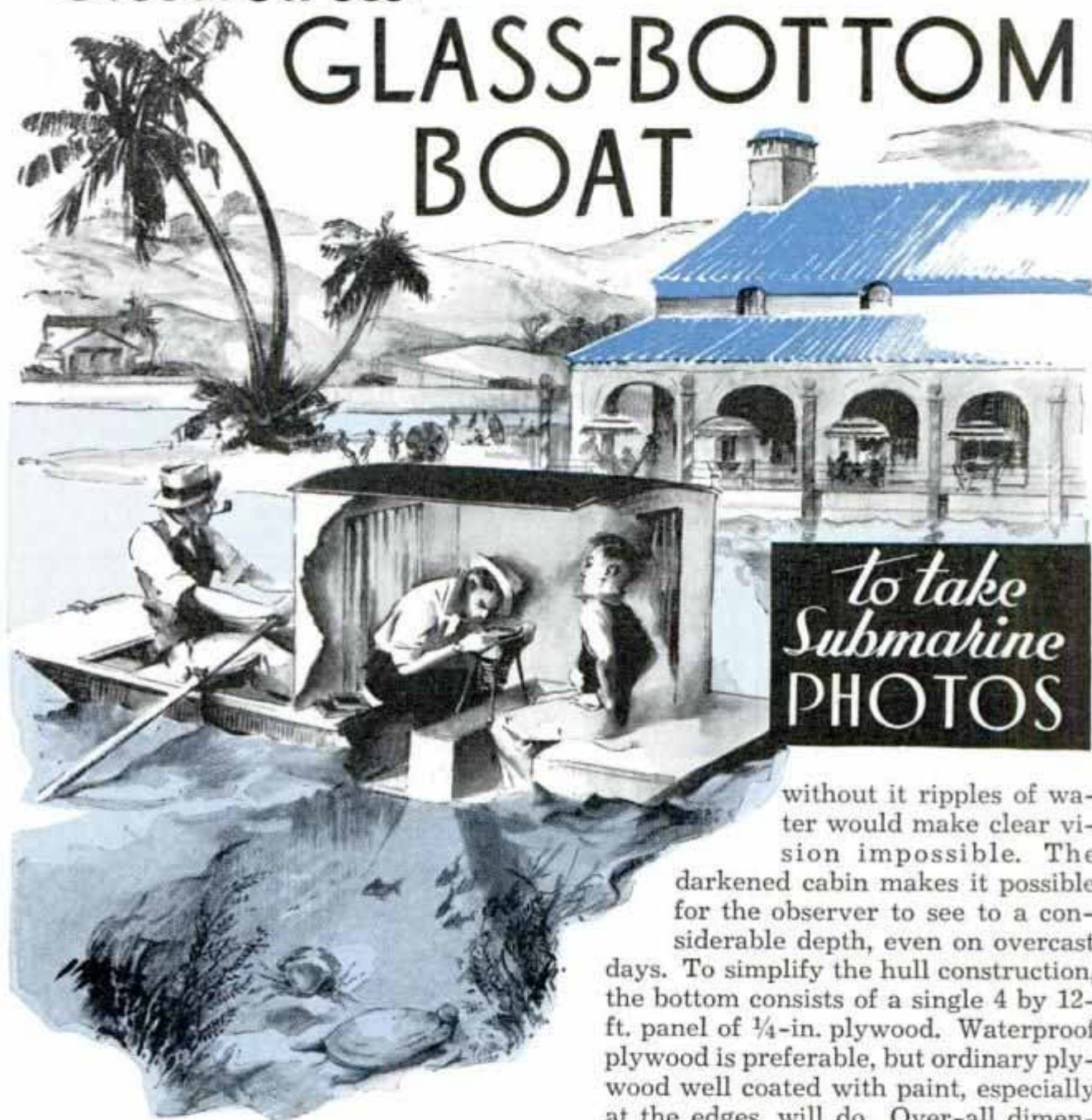
Fruit-Jar Rubber Serves as Emergency Skate Strap

When your skates have a tendency to slip off your shoes, a fruit-jar rubber will serve nicely as an emergency skate strap, especially if your shoe soles are thin and flex under the strain of the skate clamps. The rubber is slipped over the skate and the toe of the shoe as shown in the illustration.



Catalina

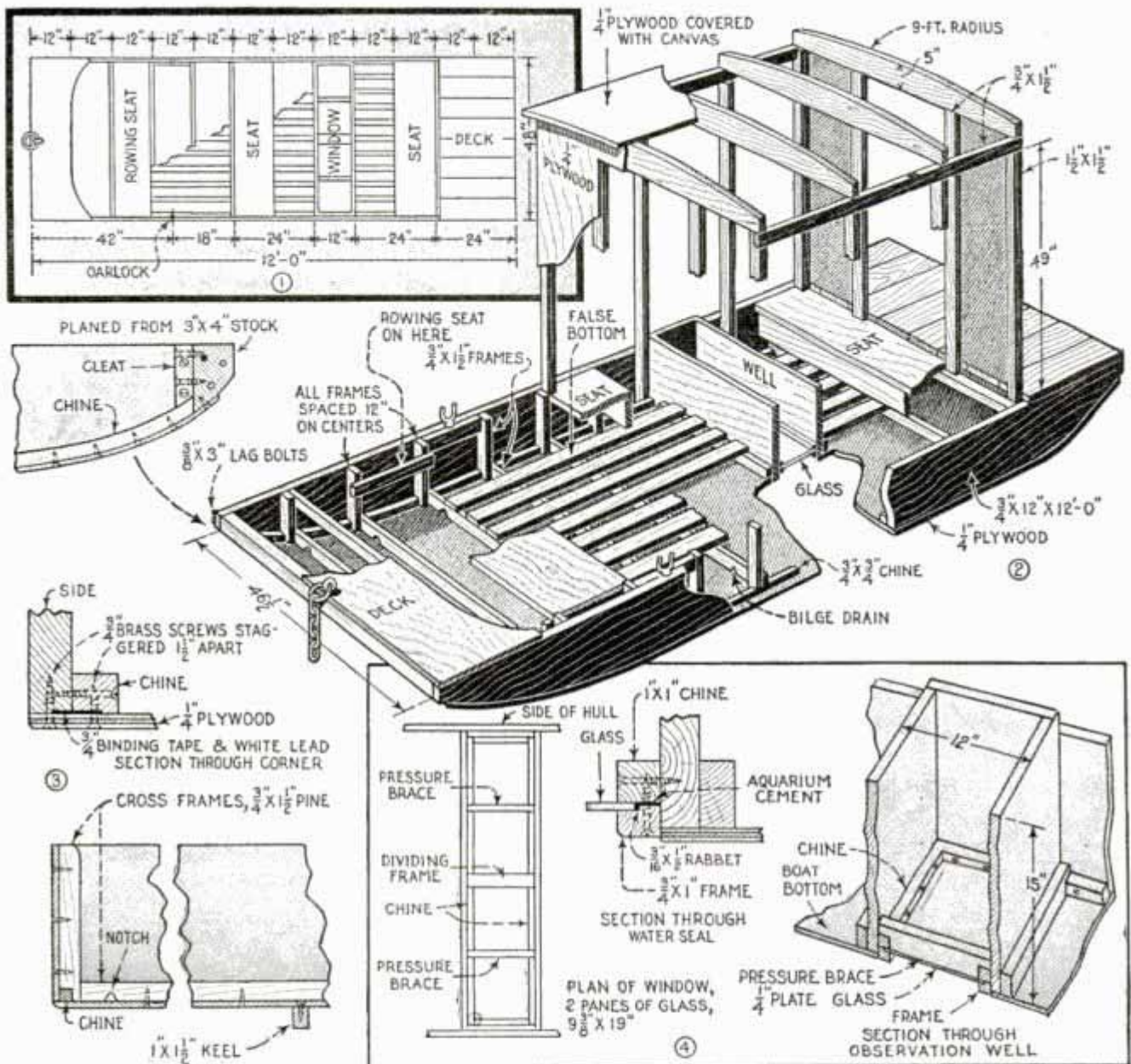
GLASS-BOTTOM BOAT



*To take
Submarine
PHOTOS*

ANY body of clear water large enough to contain fish has interesting possibilities for the submarine observer. A glass-bottom boat for this purpose provides the means of a profitable and pleasant summer occupation. The design shown is a simplified adaptation of the well known glass-bottom boats of Catalina island. Of course, the bottom is really wood with the exception of an observation window of comparatively small area. As this window is set in a well, the boat does not fill even if the glass should be broken. But it is necessary to use the window because

without it ripples of water would make clear vision impossible. The darkened cabin makes it possible for the observer to see to a considerable depth, even on overcast days. To simplify the hull construction, the bottom consists of a single 4 by 12-ft. panel of $\frac{1}{4}$ -in. plywood. Waterproof plywood is preferable, but ordinary plywood well coated with paint, especially at the edges, will do. Over-all dimensions are given in Fig. 1 and the construction in Fig. 2. First cut the side members and fasten the chine along the bottom edges with $1\frac{1}{4}$ -in. brass or galvanized screws. Plane or sandpaper wherever the joint is uneven. It must be absolutely smooth. It may be necessary to notch the chine on the upper side to bend it at bow and stern. When the two sides are completed, join them with the cross-members at the ends. These are cut from 3 by 4-in. stock and planed to shape. Apply white lead on the ends and fasten the sides to them with lag screws. Now turn the assembly upside down, and over



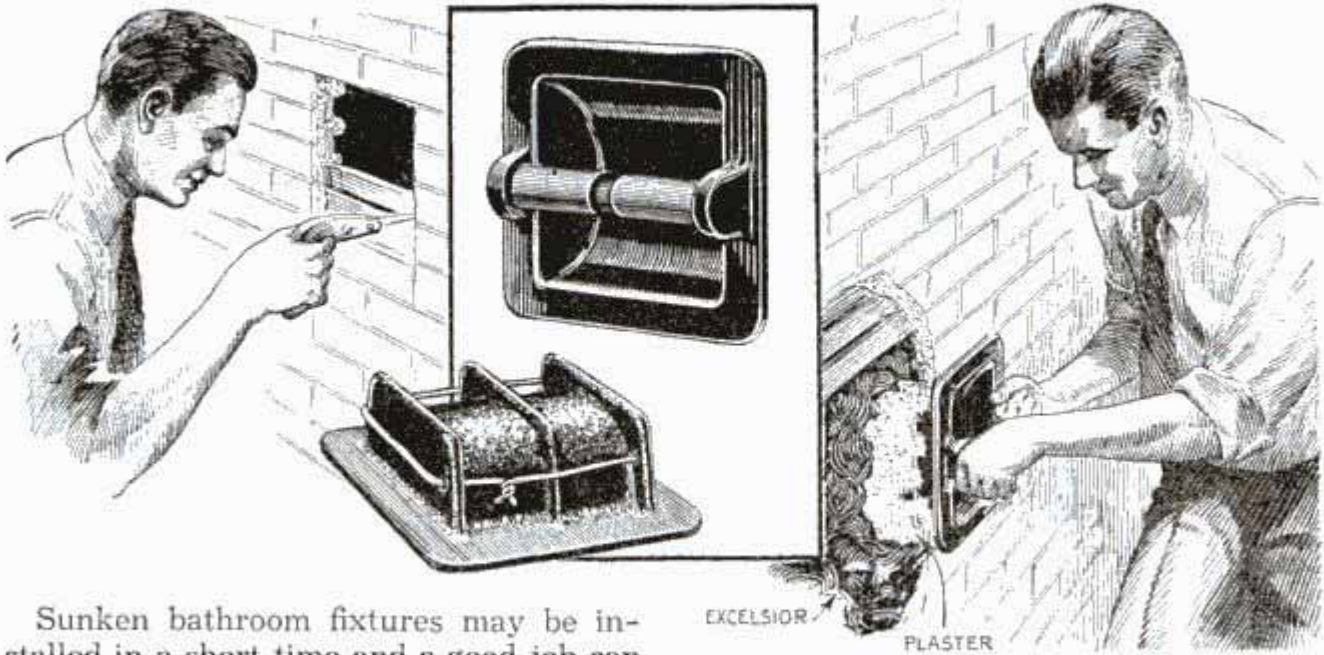
the joint between chine and side member lay a $\frac{3}{4}$ -in. strip of binding tape soaked with white lead. Lay the plywood over this, fasten temporarily with finishing nails, and then permanently with $\frac{3}{4}$ -in. brass screws, staggered as indicated in Fig. 3. This detail also shows the manner of screwing the cross frames in place. After all the cross frames have been installed, build the well and window between the fifth and sixth frames as illustrated in Fig. 4. Note that a 1 by 1-in. chine is fitted near the bottom of the well, and fastened with $1\frac{1}{2}$ -in. galvanized screws. The glass is clamped against this by means of a rabbeted frame, the joint being filled with aquarium cement before screwing down. The window is made up of two panes of $\frac{1}{4}$ -in. plate glass, and besides the dividing frame between them, there

are two pressure braces on the top side. Seats are installed on each side of the well, making a capacity of six children or four adults. A false bottom is laid, as shown, and the cabin built up on a light framework. It can be covered with $\frac{1}{4}$ -in. plywood or simply with canvas. Two doorways are provided, and a sliding curtain hung over them to shut out the light. The oarsman can shove his feet under the forward passenger seat, if he needs room.

While this craft is only 12 ft. long, in order to use a single panel of standard-size plywood, a longer hull can be made by using separate pieces for the bottom on either side of the well.

Old phonograph needles make excellent glaziers' points; drive them into the sash in the usual way, before putty is applied.

How to Install Sunken Bathroom Fixtures



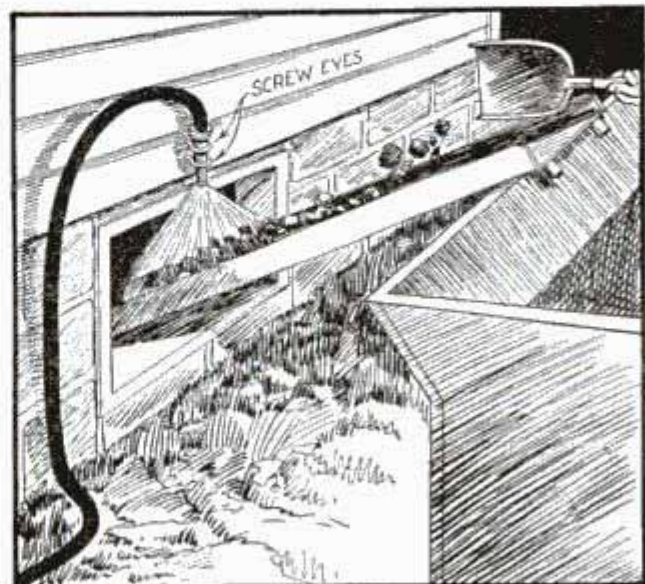
Sunken bathroom fixtures may be installed in a short time and a good job can be done without marring the wall if you proceed carefully. First measure the back of the fixture and mark this off on the wall. Drill a hole at each corner and saw along the penciled line with a keyhole saw. Do not use a chisel as this may cause such large chips to break off the edge of the hole that the broken portion cannot be covered by the fixture. The next step is to run a piece of wire through holes in the ribs and around them as shown in one of the details. This is to help in anchoring the fixture in patching plaster. Now take enough excelsior to form a "nest" in the wall to hold plaster so that it will not drop

down inside of the wall. Pack the excelsior tightly at the bottom and on both sides. After the nest has been made, apply the plaster or a rich mixture of cement to the excelsior so that the fixture, when pressed into place, will bury its ribs deeply into the plaster-covered excelsior. Also smear some plaster over the back of the fixture, getting it well into all corners and under the anchor wire so that this plaster will unite with that packed on the excelsior. Then press the fixture firmly in place and, with a moist cloth, wipe off the excess plaster that has been squeezed out. Allow the plaster to set overnight.

Hose Attached to House Wets Coal as It Enters Basement

Instead of flooding his lawn by spraying each load of coal with water before it was unloaded into the cellar, a home owner drove a couple of large screw eyes into the side of the house just above the coal window. By slipping the nozzle of the garden hose into these and adjusting it for a fine spray, each shovelful of coal was dampened as it passed down the chute.

It has been found by experiment that lime flour, if sprinkled in liberal quantities on a freshly tarred roof, will do much toward lengthening the life of the latter; the lime causes the tar to set somewhat like concrete and also prevents defects in the coating caused by the weather.





Tapered Hardwood Fin Screwed to Bottom of Aquaplane Makes It Easy to Handle

Fin Makes Aquaplane Easy to Handle

If you have difficulty in riding an aquaplane, fit a fin on the bottom as shown, which makes it easier to handle. A length of 2 by 6-in. hardwood is used for the fin, which is rounded at the nose, and tapered from a full 2 in. at the top edge to about $\frac{1}{4}$ in. at the bottom edge. It is best to attach the fin with brass screws, the heads of which should be countersunk and the holes filled with putty. Care must be taken to get the fin exactly in the center and parallel with the edges of the aquaplane.

Jig for Spacing Punch Marks

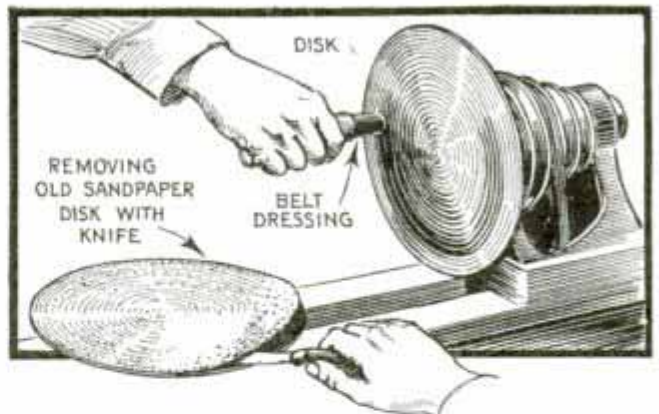


When it is necessary to make a series of uniformly spaced punch marks on metal, this simple wire jig will enable you to do the work more accurately and in less time than it would take

to measure each space. As shown, the jig consists of a coil of wire wrapped around the punch so that it terminates in a pointed hook, which is bent at right angles at the end. The desired spacing of the marks determines the length of the projecting end of the wire. In use, the hook is held in each preceding punch mark as the following one is made.—F. L. Yerzley, Ithaca, N. Y.

Sandpaper Disks Quickly Renewed

Sandpaper can be fastened to a metal sanding disk and used almost immediately if it is cemented with stick belt dressing, which comes in cardboard tubes. The worn paper is removed by inserting a knife blade under it as shown, after which the disk is mounted in a lathe and rotated at high speed, meanwhile pressing a stick of soft wood rather firmly against the disk to heat it. After it is thoroughly warmed, the belt dressing is substituted for the stick and the paste-like substance well distributed over the surface by working repeatedly from the center out to the edge. Now, stop the lathe



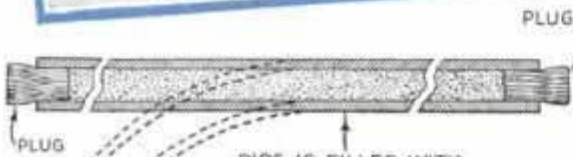
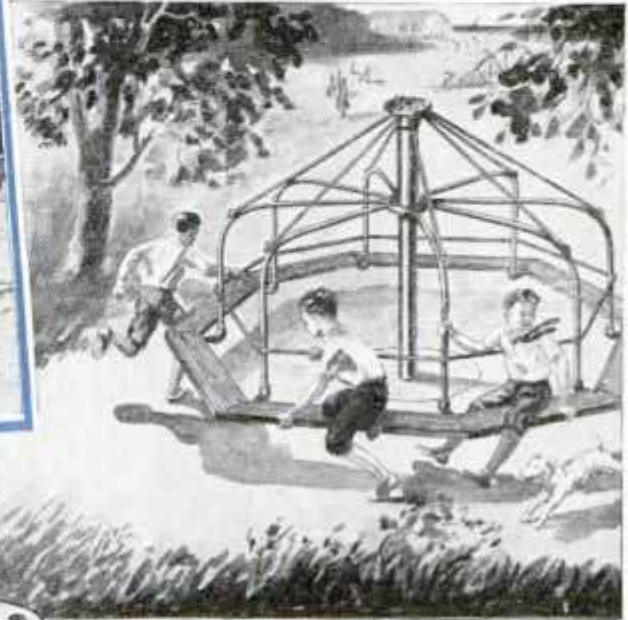
New Abrasive Paper Applied to Sanding Disks by Using Stick Belt Dressing as a Cement

and apply the sandpaper disk while the dressing is soft and sticky. Rotating the lathe a few minutes at low speed to cool the disk completes the operation.

☛ Bright colored glass marbles placed in crevices among the rocks add color and brightness to the rock garden.

Merry-Go-Round

made of IRON PIPE



PIPE IS FILLED WITH DRY SAND, HEATED AND BENT

18" RADIUS

$1\frac{1}{2}$ " ROD

5" PIPE

1" PIPE SPOKE, 8 REQUIRED

ONE LENGTH OF PIPE RAIL SERVES TWO SECTIONS

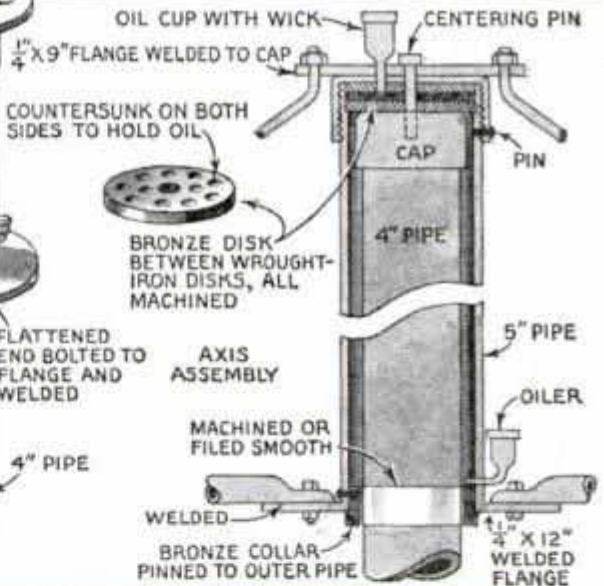
CARRIAGE BOLTS

WELDED TO PREVENT TWISTING

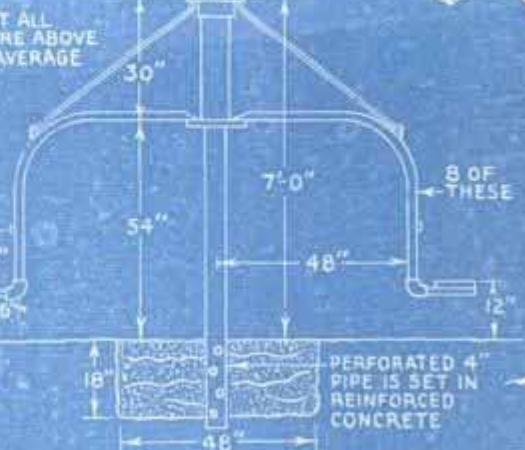
1" X 9" MAPLE

8 1/2" LONG

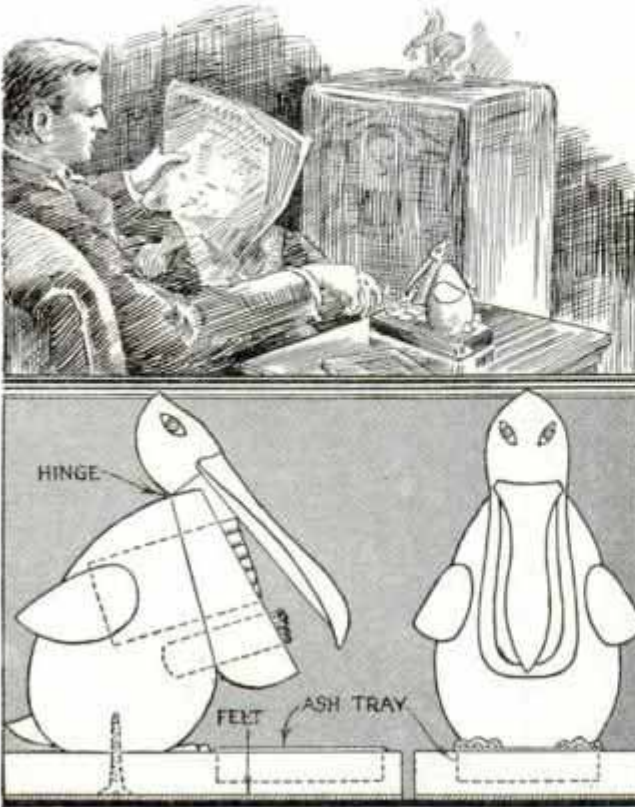
PLATE WELDED TO PIPE



NOTE THAT ALL SPOKES ARE ABOVE HEAD OF AVERAGE CHILD



Pelican Ash Tray Holds Matches and Cigarettes

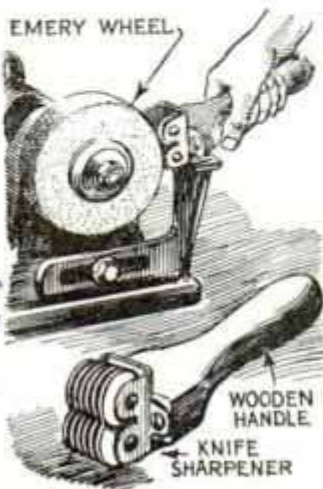


Opening the Pelican's Beak on This Ash Tray Exposes a Cigarette and Match Compartment

Resembling a pelican, this novel ash tray has a match and cigarette compartment which is exposed by tipping the bird's hinged head to open its beak. The bird is carved from any suitable soft wood, and it is screwed to a base, which is recessed to take a small ash tray.—Emory Morris, Jr., Atlanta, Ga.

Grinding Wheel Dressed with Disk Type Knife Sharpener

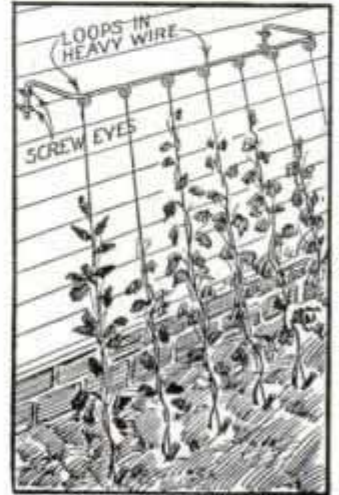
A satisfactory tool for dressing emery wheels can be made by mounting a disk-type knife sharpener on a suitable handle. It is best to get a sharpener that has an open top, although the closed type may be used by cutting away the housing with a file and hack saw. To dress a wheel, move the sharpener back and forth against



it as it rotates, resting the handle on the tool support. It is always advisable to wear goggles when doing this work to keep flying particles of emery out of the eyes.

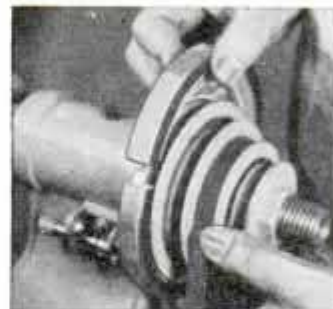
Looped Wire Makes Removable Trellis Support

A string trellis attached to the side of the house with tacks or nails is not only difficult to remove for repairs, but it also brings the growth of vines against the siding to retain moisture and damage the paint. To avoid this, and at the same time provide a trellis support which will be neat and practical, bend a heavy wire as indicated and drive screw eyes into the siding to receive it.



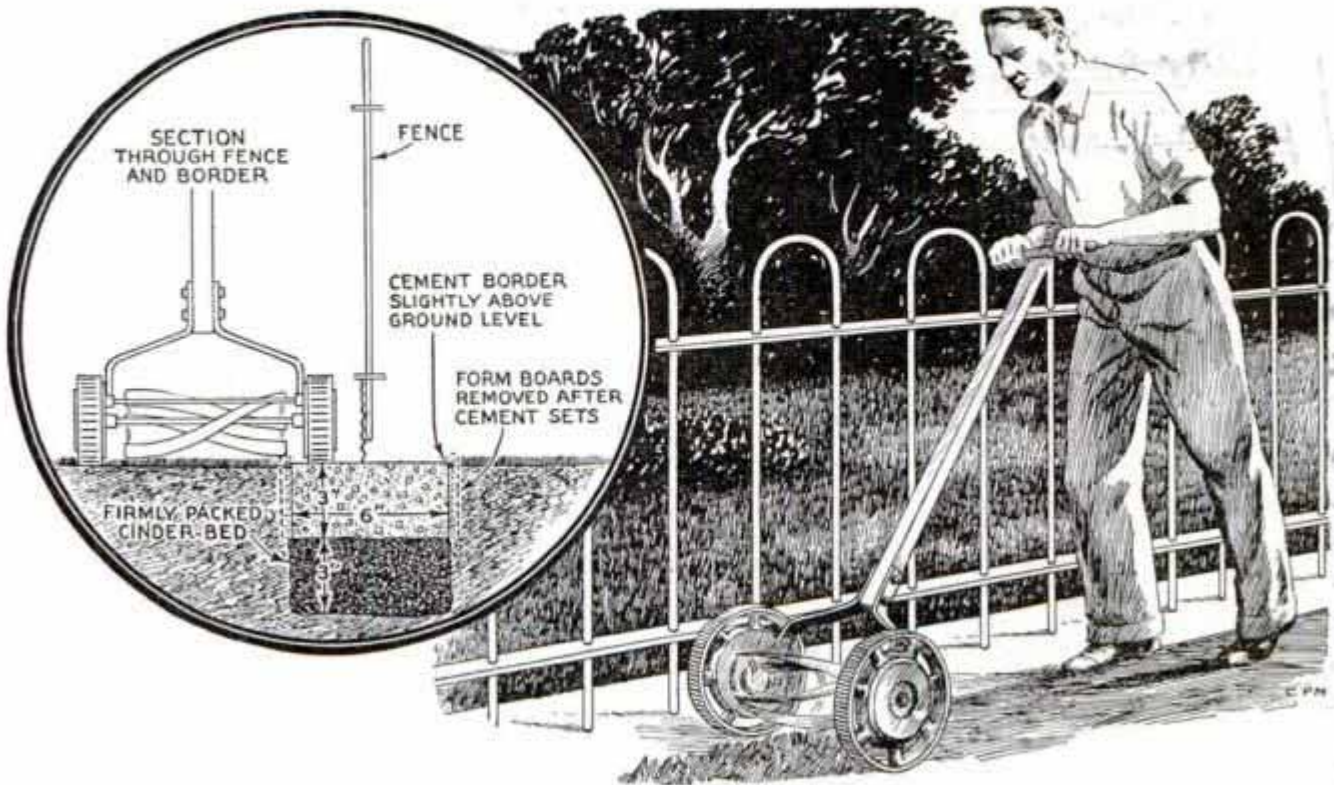
Large Pulley on Lathe Converted into Handwheel

If you are not in the habit of using the large pulley on your woodturning lathe, it can be converted into a handwheel for stopping the lathe quickly or for turning the headstock when indexing, etc. To do this, turn a wood disk to the same diameter as the pulley, or slightly larger, and then saw out the center to produce a ring which will fit the pulley snugly, beveling the inner edges of the ring to fit in the V-groove of the pulley. Now cut the ring in half, and drill the ends for dowels. Then fit the ring in place, using glue on the dowels. Sanding the ring and giving it several coats of shellac finishes the job.



☐ To clean plaster ornaments such as busts, vases, etc., dip them in a solution of starch and water, let it dry and then brush it off.

Cement Border Simplifies Mowing of Lawn



Time and labor required to trim a lawn along a fence where the grass cannot be cut with a lawn mower will be saved if the fence is set on a strip of cement. This will keep the grass from growing next to the

fence, and the posts can be set in the cement for longer life. For best results, the border should be about 6 in. wide and 3 in. deep, and it should set on a 3-in. cinder bed.—L. N. Olsen, Philadelphia, Pa.

Powdered Kitchen Substances Dispensed from Fruit Jars

Here is a handy arrangement for dispensing powdered and granular substances in your pantry or kitchen cabinet. It consists simply of a number of fruit jars mounted upside down on a shelf or rack, which may be set on a table, placed on your cabinet or hung on a wall. A hole in the center of each jar lid is provided with a pivoted tin cover, cut as shown, for measuring out the contents of the jars.

Aluminum Paint Protects Metal

Actual tests have proved that aluminum paint makes an ideal covering for metal exposed to the weather. By giving the metal a coat of lead and then an application of aluminum paint, the work is not only covered well and fully protected, but it is made quite attractive.



Fruit Jars Mounted in Racks Serve as Handy Dispensers for Salt, Sugar, Flour, Etc.

Before painting window sash, rub a cloth soaked in kerosene over the glass.

See No. 1934
721

National Marking Machine Co
4026 Cherry St. Cincinnati
Ohio

Black Light Reveals

Article about Fluorescent
Paints
Luminescent Products Co.
National Marking Machine Products Co. 2437



Unusual Miniature Stage Displays Obtained by Using Paints That Fluoresce under Black Light; the Dancing Skeleton with Pivoted Arms and Legs Is Operated with a Thread

SECRET messages written with colorless ink on ordinary white paper, stand out legibly as if luminescent ink had been used, when they are held under the dim blue glow of a black-light bulb. Removing the paper from the bulb again causes the writing to fade out so that you can see nothing but a piece of blank paper. The colorless ink used for this purpose is made by dissolving the contents of two 5-grain capsules of ordinary quinine sulphate in a 1/2-oz. mixture consisting of water 2 parts, and rubbing alcohol 1 part. When this solution is used instead of ink, with a clean pen, it dries quickly without leaving the slightest trace of writing. Lemon juice in water, aspirin tablets dissolved in water

Secrets and Mystifies



Invisible Inks, Made by Dissolving Quinine in Solution of Water and Alcohol, Lemon Juice or Aspirin Tablets in Water, Stand Out as if Luminescent Ink Had Been Used, When Viewed under the Dim Blue Glow of a Black-Light Bulb

and many other common substances may also be used as secret inks, which are invisible except when viewed in a dark room under the ultra-violet light of the black bulb. It has been found by the Scientific Crime Detection laboratory that all known secret inks can be read easily under ultra-violet rays. This fact makes the examination of documents and letters, which are suspected of containing secret messages, very simple. Even secret inks that are usually heated or treated with chemicals, show up clearly under black light without any other treatment.

An amusing application of the use of invisible ink for the purpose of entertainment at parties, is a fortune-telling stunt in which each guest picks up an apparently blank sheet of paper and takes it into the dark room of the fortune teller, who, after suitable incantations, slowly brings the paper under the range of a black-light bulb. As if by magic, the fortune, previ-

ously written on the blank sheets with invisible ink, will appear legibly. After the message has been read, the performer folds the paper while it is still under the light, and gives it to the guest to keep. Of course, the message will be invisible when re-examined under ordinary light, which adds greatly to the perplexity of the guest.

Although there are many ultra-violet lights available, the black-light bulbs, which are made from dark-blue glass, are the best for most purposes. These bulbs are also effective as health lamps and will produce sunburn in about 25 min. when the lamp is at a distance of 18 in. from the untanned skin.

Anyone can rig up a black light to work on 110-volt current, either alternating or direct, with which these and hundreds of other interesting and useful experiments may be performed. Any kind of a floor or table lamp having a reflector may be used provided it is connected with a resistance

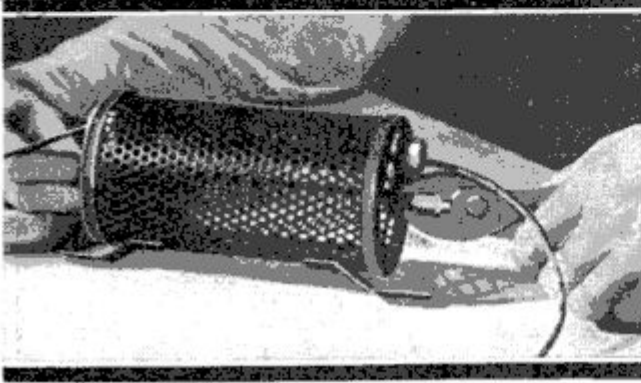
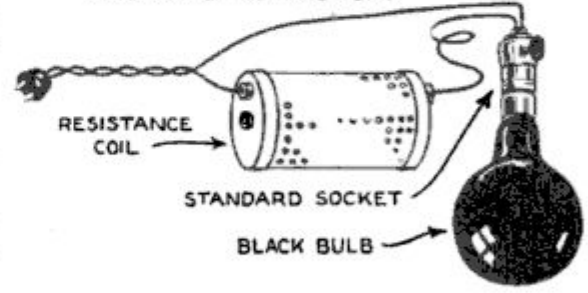
or write Westinghouse Lamp Co
 POPULAR MECHANICS
 Bloomfield, N.J. for suggestions



Black-Light
 Bulbs Cannot Be
 Connected Directly to
 110-Volt Lighting Cir-
 cuit but Must Be Pro-
 tected by a Suitable
 Resistance Coil or
 Reactor

WIRE REQUIRED FOR RESISTANCE COIL		
110 VOLTS A.C. OR D.C.		
5-AMPERE BLACK BULB	30 FT.	#20 NICHROME WIRE
2-AMPERE BLACK BULB	30 FT.	#24 NICHROME WIRE
32-VOLT SUPPLY		
5-AMPERE BLACK BULB	5 FT. 1 IN.	#20 NICHROME WIRE
2-AMPERE BLACK BULB	5 FT. 1 IN.	#24 NICHROME WIRE

DIAGRAM OF CONNECTIONS



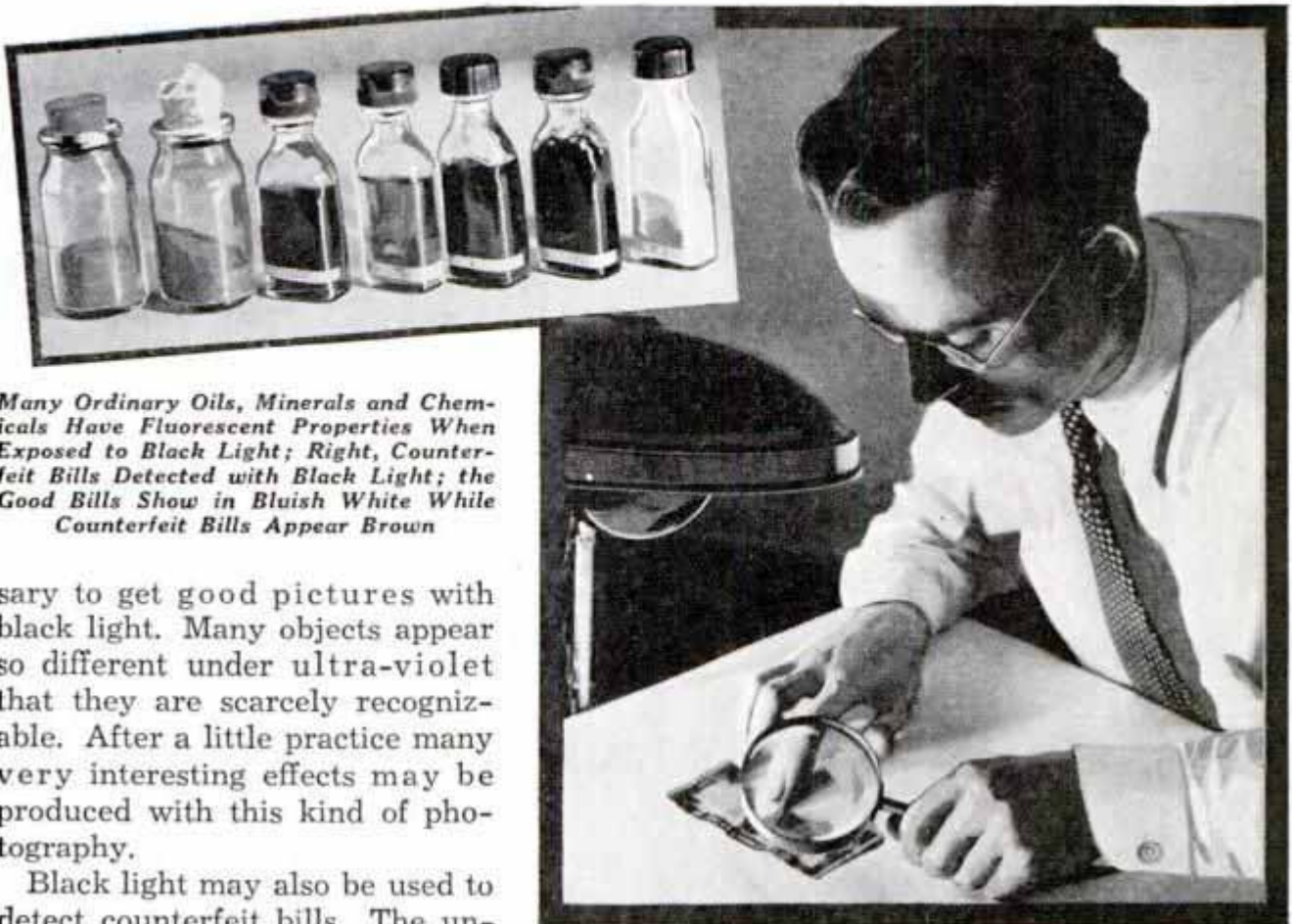
coil. The correct amount of Nichrome wire used in making resistors for this purpose is given in the chart. Black-light bulbs must not be connected directly to the 110-volt light line because they will burn out almost instantly. Therefore, they must be protected either by means of a suitable resistance coil or the more expensive reactor. The resistance coil will get hot when the bulb is being used and should therefore be rigidly mounted in a perforated metal housing, as shown in the illustration, to avoid fire hazard.

Many chemicals that ordinarily do not phosphoresce at all, glow brilliantly and in unexpected colors when placed under black light. A dilute solution of the dye "Fluorescein," which is clear and almost transparent under ordinary light, becomes opaque green. Some varieties of red ink appear canary yellow and mercurochrome solution glows with an equally unexpected color change. Many minerals, chemicals and crystals fluoresce in colors under black light. ~~Catomel~~, uranium nitrate, anthracene, moth balls, and many oils and minerals glow brilliantly with characteristic colors. Paints, which change color and glow with a fiery brilliance under black

light, are made by mixing powdered chemicals or minerals which fluoresce with clear shellac, lacquer or gum solutions. Better results are had by buying ultra-violet paints ready prepared. These are available in a large variety of colors and with them designs may be painted such as those used in decorating the scenery for the model stage shown in the illustrations. These model stage fittings present an entirely different appearance in ordinary light and in black light. The paper skeleton may be made to dance and jump by pulling strings from which it is suspended. Under ordinary light it is simply a likeness to a skeleton with the black lines shown in the photograph, but when the black light is turned on only the painted portions appear, thus presenting a likeness to a real skeleton in which each bone is visible by the glowing light it emits. Various colors of ultra-violet paint are used to make the show realistic. The stage itself is also decorated with designs and colors, both of which change under black light. In all experiments with ultra-violet the room should be darkened in order to produce the best effect.

Although the ordinary glass in camera lenses will not transmit all of the ultra-violet light, it is possible to produce very unusual photographs by illuminating the object with black light. Any common object may be photographed first with ordinary light and then with black light only. Of course, time exposures will be neces-

Paints. Central Acetylene Co
 460 E. Ohio St. Cleveland



Many Ordinary Oils, Minerals and Chemicals Have Fluorescent Properties When Exposed to Black Light; Right, Counterfeit Bills Detected with Black Light; the Good Bills Show in Bluish White While Counterfeit Bills Appear Brown

sary to get good pictures with black light. Many objects appear so different under ultra-violet that they are scarcely recognizable. After a little practice many very interesting effects may be produced with this kind of photography.

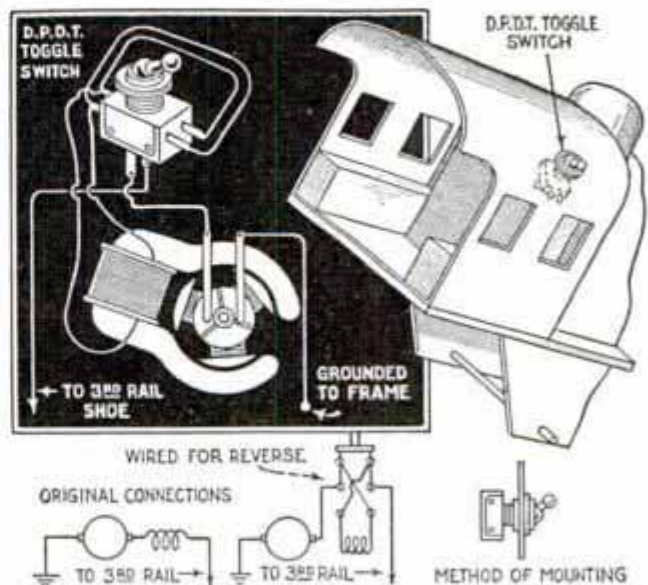
Black light may also be used to detect counterfeit bills. The unprinted sections of paper in good bills fluoresce with a bluish white color, while almost all counterfeit bills appear yellowish brown under black light. Various grades of paper show characteristic colors when viewed under black light and when all but one page of a document show

the same color, that page may be suspected as being a forgery. Altered writing may also be detected under ultra-violet light due to the fact that a different ink is invariably used in making the alteration, and the difference is easily discernible.

Radio Toggle Switch Used to Reverse Model Locomotive

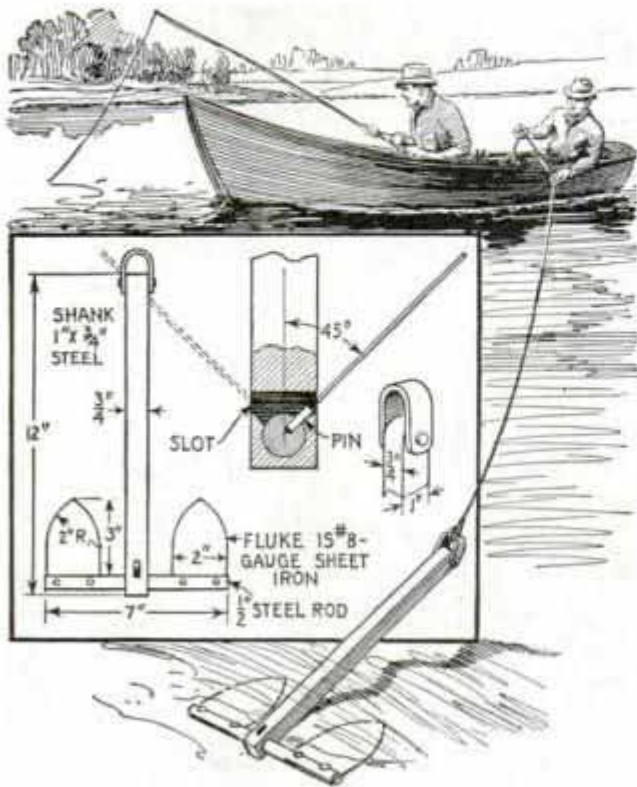
Model railway builders who have trouble in getting a reversing switch that is sufficiently compact for the limited space available in a locomotive will find a radio toggle switch of the type shown ideal for the purpose. It must be of the double-pole, double-throw type having six terminals, which are wired according to the diagram. The terminal lugs at opposite ends of the switch are cross-connected, then wired to the field coil. The center terminals are connected to the third-rail shoe and motor brush as shown. A 1/2-in. hole drilled in the desired position on the cab or frame serves to mount the switch.

When you have a hole in your pocket, turn the latter inside out and cover the hole with adhesive tape.



Electric Motor in Model Locomotive Reversed by Radio Toggle Switch Mounted in Cab

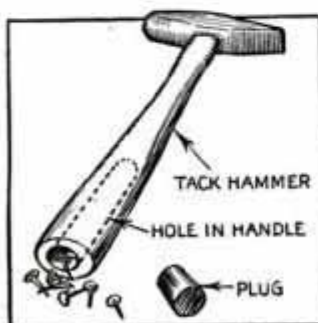
Light Anchor for Small Boats Is Made Easily



Lightweight Anchor Has Movable Flukes, Which Dig into Lake Bed and Hold Boat Securely

Here is just the type of an anchor you have wanted for your small boat. It is light in weight and will hold your boat securely. The shank is a length of bar iron or steel, having a clevis at one end for the anchor chain, and a hole drilled near the other end to take a $\frac{1}{2}$ -in. steel rod. The latter is slotted with a hack saw at both ends to take the flukes, which are riveted in place and move in a 45° arc. This movement is made possible by a slot in the shank just above the hole for the rod, as indicated in the cutaway view. A steel pin in the rod strikes the edges of the slot and limits the movement of the flukes.—Charles E. Albridge, Lima, Ohio.

Tacks Kept Handy in Hole in End of Hammer Handle

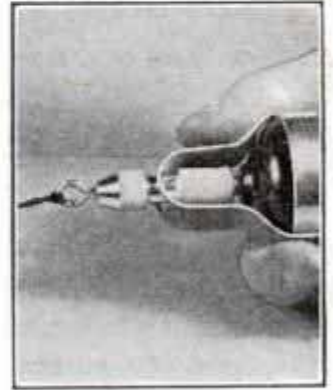


Kept in a hole drilled in the end of a hammer handle, tacks are always at hand, and will save you many steps in looking for them when needed. A

$\frac{3}{8}$ -in. hole drilled 3 in. deep into the handle will hold a small box of tacks, and it can be plugged with a cork or a short piece of dowel rod.

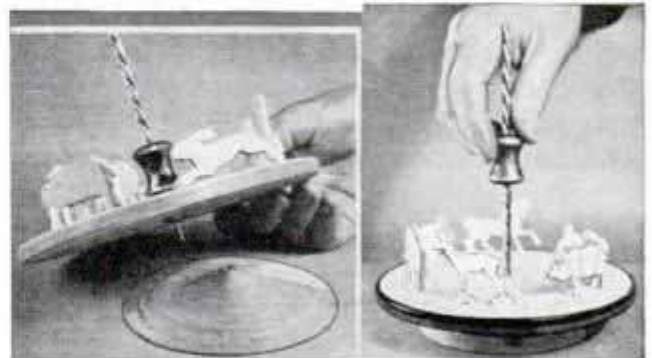
Motor Used to Twist Cords

When making woven articles, it is often desirable to twist narrow strips of Cellophane, crepe paper and other materials into strong cords or ropes. A quick method of doing this is to use a hand drill or a small motor fitted with a chuck. One end of each strip to be twisted is attached to a screw eye, which is clamped in the chuck, while the other end is fastened to a wall or workbench with a bent nail or screw eye.



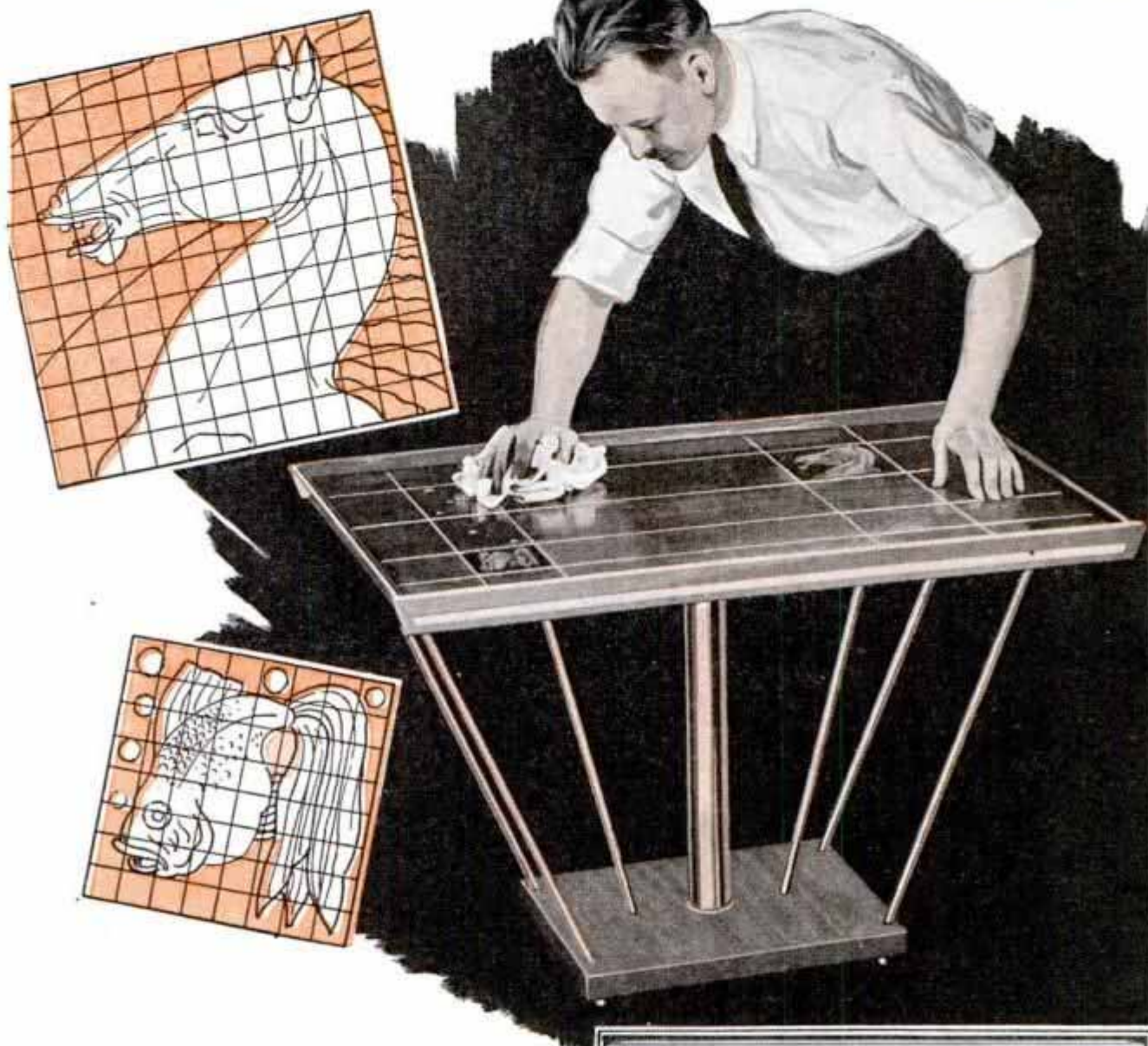
Child's Whirligig Toy Made from Ten-Cent Drill

Whirling at a merry spin with toy animals playing "follow the leader," this whirligig will prove an interesting toy for your youngster. It is made from a wood disk and a ten-cent push drill, the shaft of the latter being mounted on the disk so that the toy will spin when the push knob is pressed down. The animals are cut from thin plywood and are painted in appropriate colors, making the outlines and necessary markings with black enamel. The toy will spin on any level surface, but if it is to be used on a rug, it is a good idea to make a supporting disk or cone with a hole in the top in which to spin it.



Whirligig with Animal Cutouts Makes an Attractive and Interesting Toy for Your Child

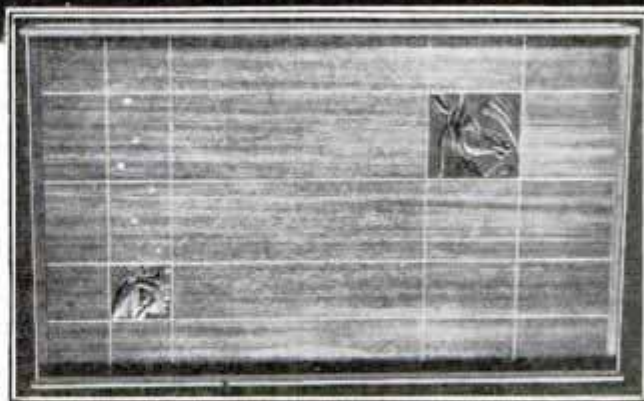
Modern COFFEE TABLE



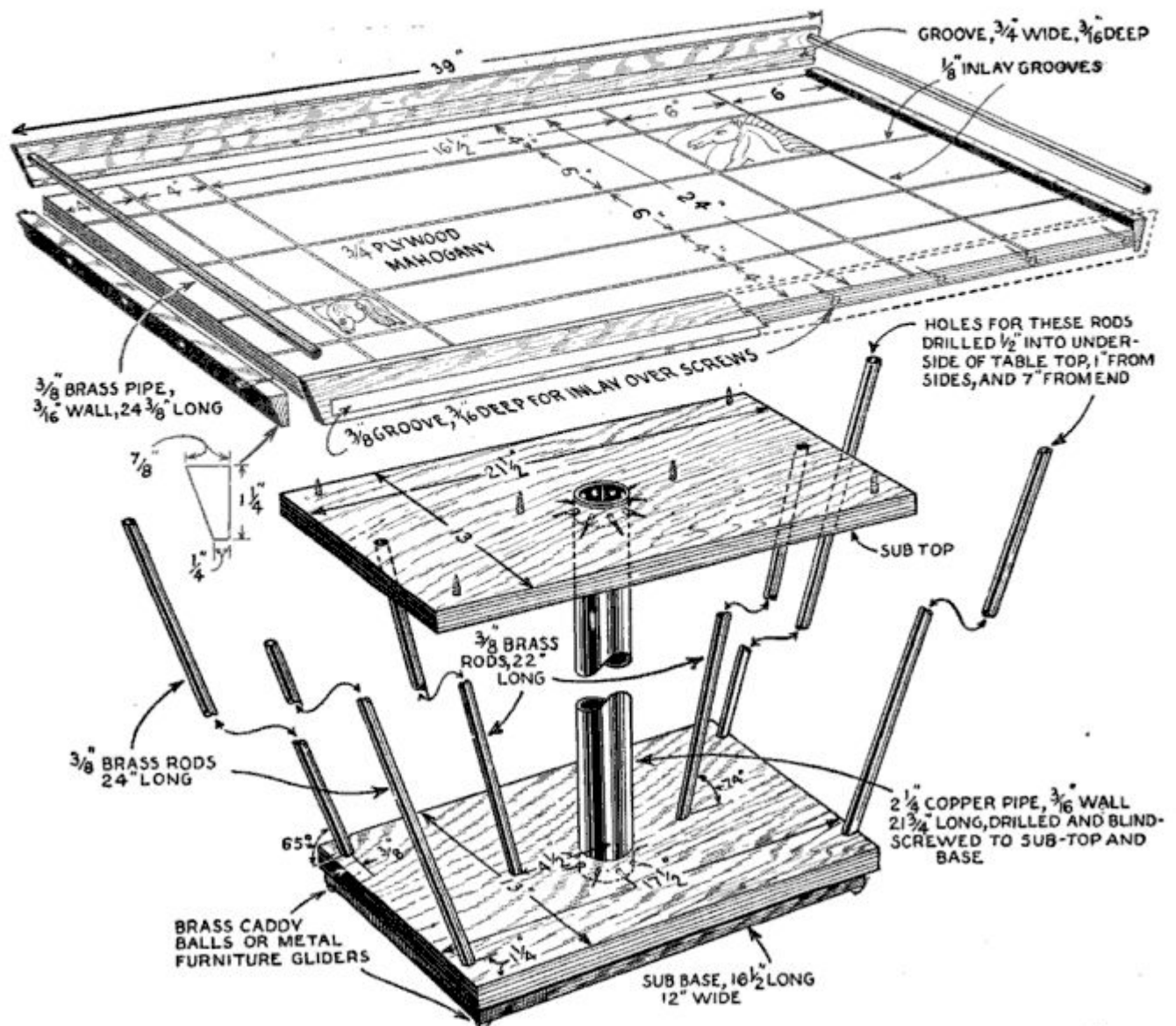
By OSKAR J. W. HANSEN

THIS modern coffee table incorporates both wood and metal, a large copper column forming the main support for the top, and six brass rods assuring the necessary rigidity. Inlay work and two copper plates in repousse greatly enhance the top.

Five-ply, $\frac{3}{4}$ -in. mahogany veneer is carefully squared and grooves are cut for inlay strips. The grooves are $\frac{3}{16}$ in. deep and as wide as the saw blade or dado cutter. In this case the width of the dado cutter used was $\frac{1}{8}$ in. Before inlaying the strips, make the repousse pieces of .0005-in. sheet copper, allowing an extra $\frac{3}{16}$ -in. width at each edge for bending into the inlay grooves. To be sure that the edges



are bent over at right angles, press them over a square piece of plywood, cut to the exact size required. Now crosshatch the reverse side of the copper in $\frac{1}{2}$ -in. squares, trace or draw in the design and press the outline into the metal with the rounded edge of an old wood chisel. Next, lay the



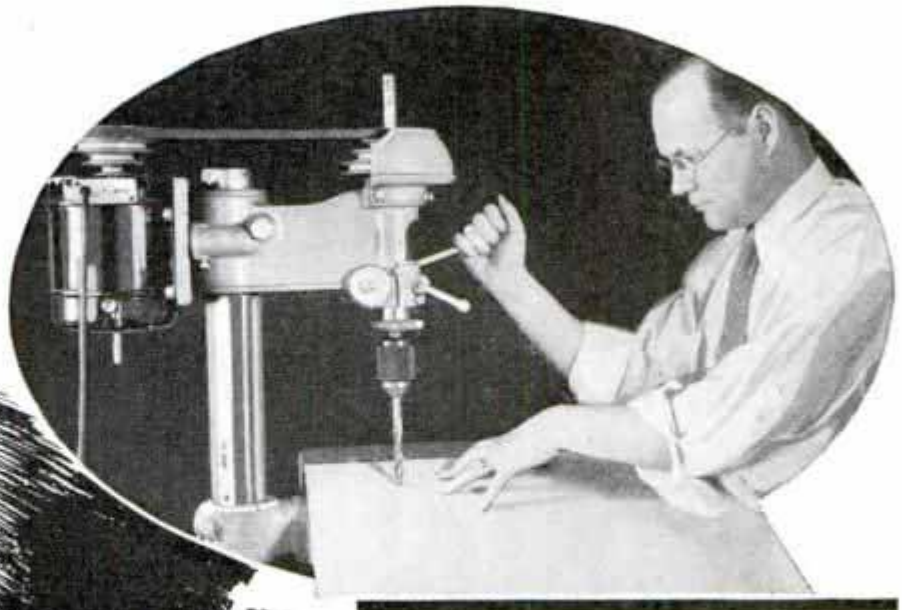
copper on a piece of corrugated cardboard and, with an orange-wood manicuring stick, press down the spaces inside of the outline to the desired depth. It is well to practice doing this on some scrap pieces of copper before making the piece you are to use on the table. After the repousse pieces have been finished, check carefully to see if they fit snugly around the edge of the portion to be covered. Then mix some shellac with plaster of paris to make a soft paste, which is smeared on the underside of the copper, filling all the depressions, and the piece is pressed into position permanently. After polishing the copper, apply a coat of transparent metal lacquer to prevent tarnishing.

For inlay strips, use a light wood such as white holly. For the portion around the repousse pieces, special strips have to be cut of narrower width than the rest, to make allowance for the copper. Apply a thin, even coat of glue to the strips so that

there will be no excess to smear up the work, which will interfere with finishing. One way of getting the glue on evenly is to draw the strip through the crease of a folded piece of flannel, previously coated with glue. The side rails are 3/8 by 2-in. mahogany plywood. Holes to receive 3/8-in. rods or tubes are drilled at the ends of the rails and about two-thirds through them. Then both sides are grooved, the inside to fit the edge of the top and the outside to accommodate screws for attachment. A strip of light wood is later inlaid to fill the grooves. From the drawing you will also note how a beveled strip of mahogany is screwed to the ends of the top. Another method of attaching it is to use dowels in blind holes.

Next, the sub-top is cut from 1-in. white pine and drilled for the 2 1/4-in. center column of heavy copper tubing and for the two inner braces, which are 3/8-in. brass rods, set at the angle designated. The end

A Perfectly Smooth Job of Sanding So That the Inlay Strips Are Flush, Shows Fine Workmanship



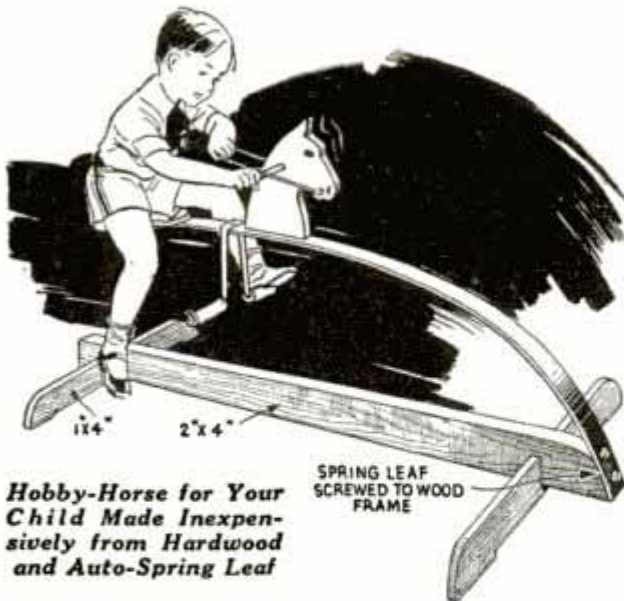
of the column is drilled for wood screws, which are used to attach it to the sub-top and base, as shown. The sub-top and base are drilled clear through while the hole may be continued into the top and sub-base about $\frac{1}{4}$ in. deep to receive the end of the pipe. In drilling the holes for the brass rods, note that the two inner ones are set at a different angle than the four outer ones. Their exact location is carefully plotted and a jig is fixed on the drill press to drill the holes accurately. The tops of the outer rods go $\frac{1}{2}$ in. into the underside of the table top. Small holes are drilled through the rods, near the ends, for slender wood screws to hold them snugly in position. At the bottom these screws are driven into the underside of the base. After assembling the top, sub-top, column, braces and base, the sub-base is screwed on and four caddy balls or furniture glides are fitted to serve as feet.

You are now ready for finishing. First apply a light filler, consisting of benzine, whiting, a little raw sienna or burnt umber

and a generous quantity of boiled linseed oil. After a couple hours wipe off the surplus with cotton waste. The work is then allowed to dry for 24 hrs., after which it is sanded with No. 000 sandpaper and finished. Any good spar varnish may be applied and after drying three or four days, the work may be hand rubbed with rubbing felt to which has been applied rubbing oil and powdered rottenstone. A final fine rub may

be given by a dry felt and whiting or silica. French polish is more difficult. One takes a clean linen rag and makes a pad. To this pad a quantity of white shellac and a small quantity of oil are applied. Then at once to this a certain amount of denatured alcohol is added and the work is rubbed with a brisk motion. The quantity of each of these ingredients varies with the progress of the work and can only be learned by experience and observation. Enough oil should be used so the pad will glide easily; enough alcohol to make the shellac liquid without disturbing the layer already applied. A waxed finish may be had by applying any good grade of paste wax and rubbing it vigorously with a flannel cloth to a high polish.

☛ Turpentine, or a solution of oxalic acid, applied to the tops of enameled letters, on glass, and allowed to soak down through the cement, will loosen the latter so that the letters can be removed from a window without any trouble.



Hobby-Horse for Your Child Made Inexpensively from Hardwood and Auto-Spring Leaf

SPRING LEAF
SCREWED TO WOOD
FRAME

Sturdy Hobby-Horse

One of the long leaves from a discarded auto spring supplies the "action" for this hobby-horse. The frame, which consists of a length of 2 by 4-in. hardwood slightly longer than the leaf, is held on edge by fitting it into notches cut in crosspieces. Flat-iron stirrups are bolted, or clamped to the spring between the saddle and horse's head, and serve as bumpers that strike the floor when the rider puts the horse into a "gallop." Pieces of rubber hose are slipped over the stirrups to cushion the bump. The horse's head is cut from plywood and has a 6-in. length of dowel rod run through it to serve as handles.

Just One Key Fits This Lock

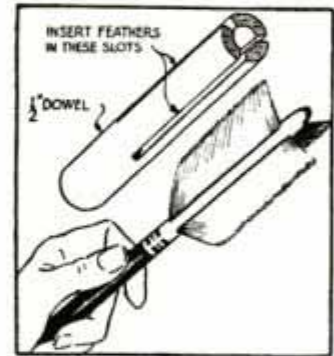
If you are suspicious that there are supplementary keys to a cylinder lock, here is a method of fixing it so that only one key will fit it. With a fine coping saw, cut your key in half as shown. Cut it at an angle so that the pieces will fit together only when placed right side up. Then insert the tip end of the key into the lock



as far as it will go. When the remaining part of the key is inserted into the lock it will work, but when any other key is used, the piece inside serves as an obstruction.—William H. Leach, Cleveland, Ohio.

Jig for Gluing Feathers to Arrows

Here is a handy jig that was used by one archer to glue feathers to his arrows. It is a short length of $\frac{1}{2}$ -in. dowel rod, which is drilled lengthwise through the center to take the arrow snugly, and slotted at one end to take the feathers. The slots hold the feathers in alignment while the glue is drying, after which the jig is slipped off. To prevent the jig from becoming fastened to the arrow, the hole in the dowel is made slightly larger at the slotted end.



Rubber Doorstop Used as Sanding Block



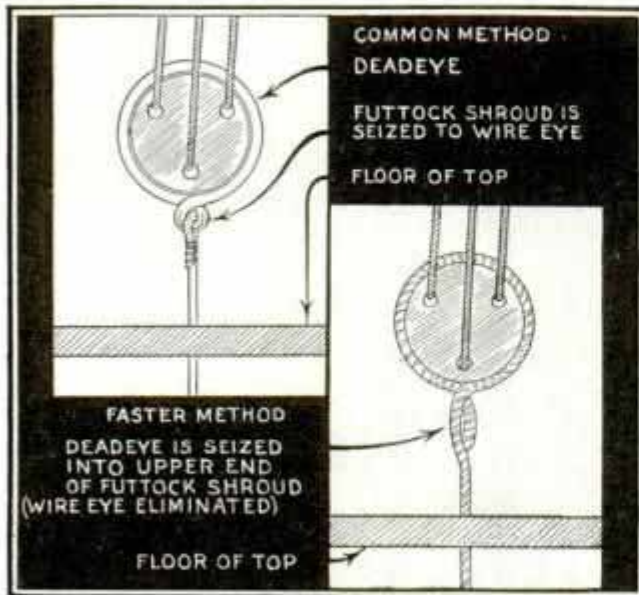
Here is a sanding block to which the paper may be attached or removed in an instant. Two cuts are made at opposite angles in one side of a rubber doorstop to receive the ends of the sandpaper strip, which is wrapped lengthwise around it. The rubber, on resuming its original shape when released, grips the paper and stretches it to provide a smooth sanding surface.

Cork Connects Broken Glass Tubing

A broken glass tube can be repaired by inserting the ends tightly into a hole drilled lengthwise through a bottle cork. The repair will be handy for glass tubing used on chemical apparatus which would have to be replaced if the broken part could not be repaired.



Attaching Topmast Deadeyes on Ship Models



Simple Method of Attaching Topmast Deadeyes

When the lower row of topmast deadeyes rest on the floor of a top, ship-model plans usually specify that these are to be stropped with wire, thus forming a loop on the bottom of the deadeye through which a thread is attached to lead downward to a fastening with the lower mast shrouds. While this method truly copies actual ship practice, a faster method, and one that will save some work by eliminating the wire strop, consists of seizing the deadeye into the looped end of a thread, which then is passed down through the floor of the top and fastened to the lower shrouds.—H. T. Bodkin, Chicago.

Oil paint often has a tendency to wrinkle upon exposure to extreme cold, but this may be prevented by thoroughly mixing a little turpentine with the paint.

WHAT DO YOU WANT TO MAKE?

Is it a boat, garden chair, midget car or an old-fashioned spinning wheel? You will find just what you are looking for among our blueprints, which sell for 25 cents each or six for \$1.00



"Hi-Ho," a 14-ft. Family Runabout for Inboard or Outboard Motor. Six Prints, 840 to 845, \$1.00

"WHAT TO MAKE"

This 80-page Craftsman's Guide is just crammed full of practical information and valuable reference data for the home workshop. It not only suggests hundreds of items that you can make, but also tells where to purchase hard-to-get materials. Will be sent postpaid on receipt of 12c.

OUTSTANDING SUMMER NUMBERS

- 15-FT. ROWBOAT—644—Flat bottom with heavy transom for outboard motor—25c.
- MIDGET AUTO—906 to 909—Driven by small gasoline engine. Four prints for \$1.00.
- 12-IN. BAND SAW—836—Plywood construction. Smooth running and sturdy—25c.
- CABINET WORKBENCH—898—27 in. wide and 7 ft. 10 in. long. Has 20 drawers—25c.
- "ZIP," MODEL RACING YACHT—880 to 883—50-in. length. Four prints—\$1.00.
- LAWN CHAIR—529—Plain sawed from ¾-in. stock. Easy to make with few tools—25c.



POPULAR MECHANICS MAGAZINE, Dept. B.P.E., 200 E. Ontario St., Chicago

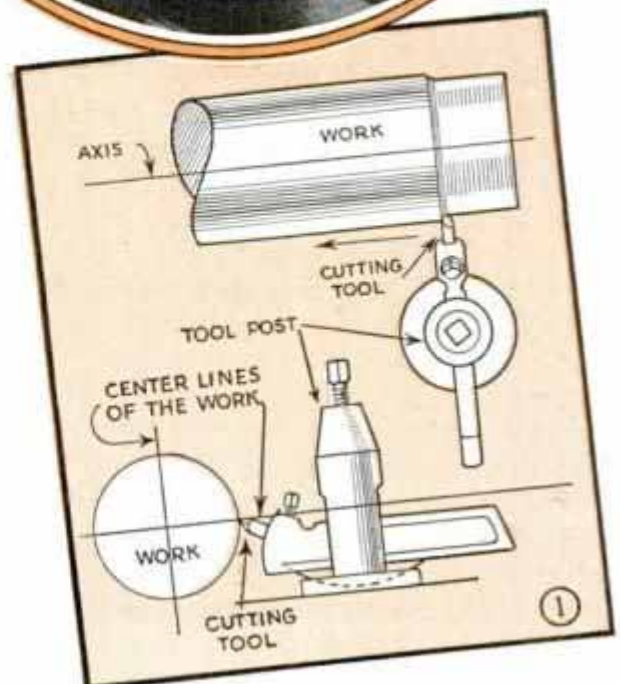
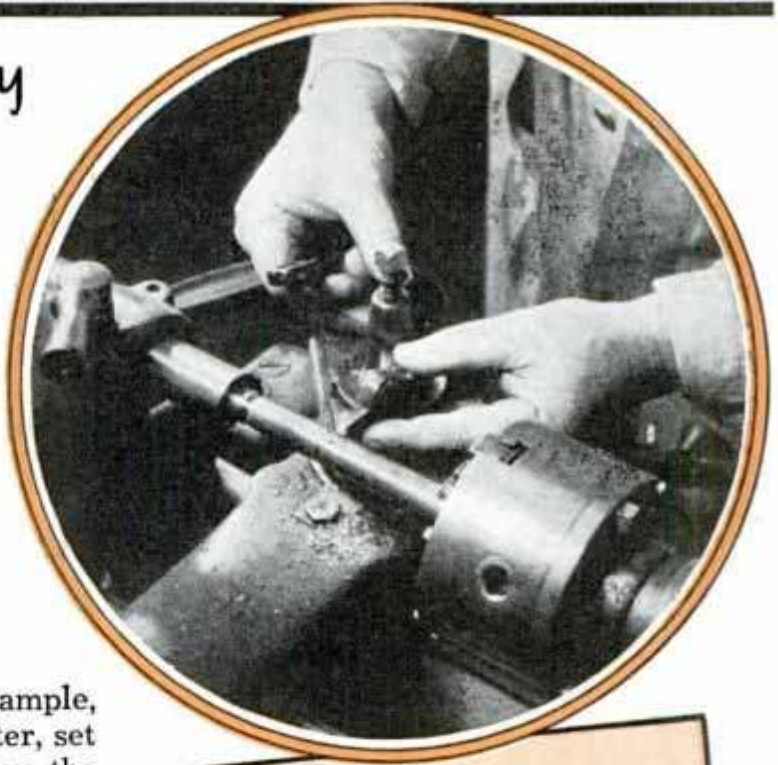


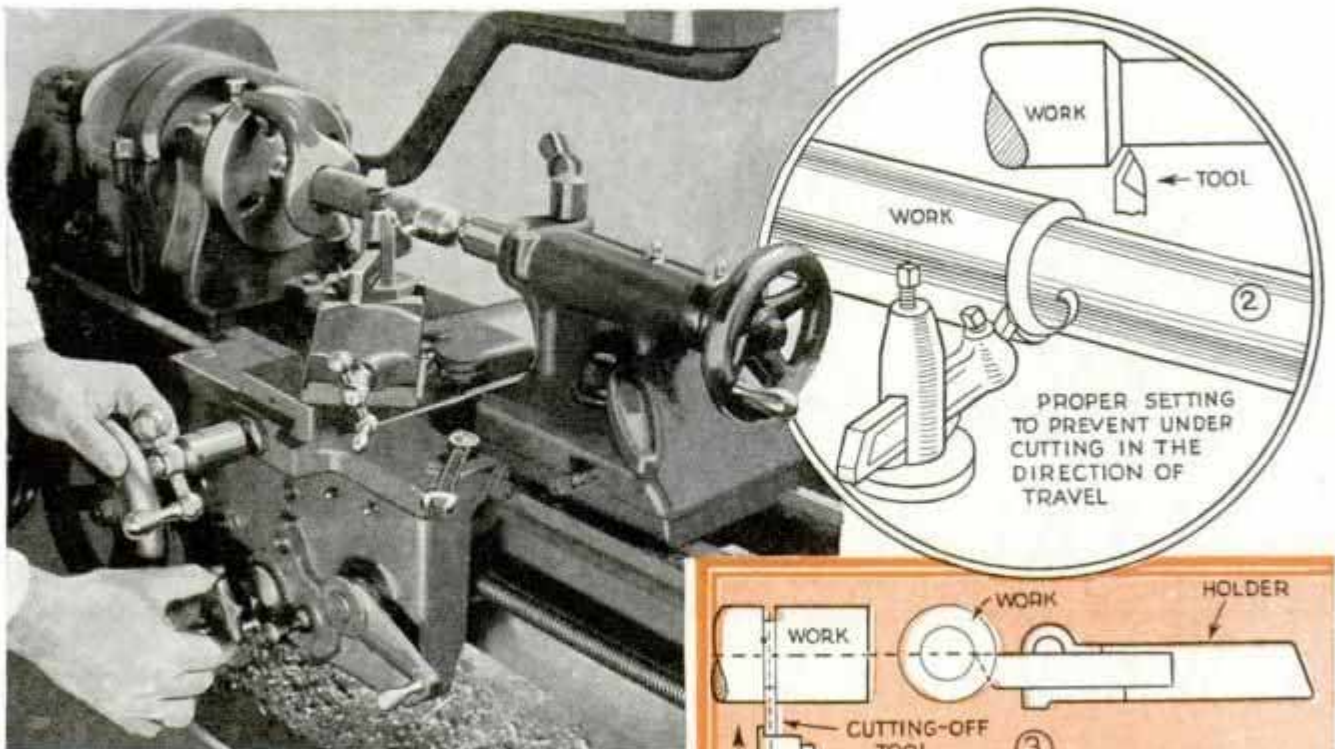
How to Set Your METAL-TURNING TOOLS

by W. Clyde Lammey

SMOOTH cuts on metal are the result of a properly ground cutting edge and a correct setting of the tool with relation to the axis of the work. In turning down straight cylindrical steel under 1 in. diameter the cutting tool is set exactly on the axis of the stock as in Fig. 1. This position of the tool tends to lessen the bending strains on work of small diameter mounted between centers. On heavier materials in steel, bronze and cast iron the cutting tool will lift the chip more cleanly if it is set slightly above the axis. As an example, if your stock is 1 to 1½ in. in diameter, set the cutter approximately $\frac{1}{32}$ in. above the center line. On larger diameters the tool can be raised proportionally higher; $\frac{3}{64}$ in. above the center for each inch of diameter of the stock. These settings vary, however, with the kind of metal and the nature of the work. To turn down brass of any diameter the tool is invariably set on the axis of the stock. The same is true when you are facing small or large diameter disks or castings in the chuck or mounted on a faceplate.

It is also important to set the tool holder at right angles to the axis, as in Fig. 1, the tool being supported in a straight holder in this case. Though the straight holder is better for certain types of work, machinists generally use an angle holder, either right

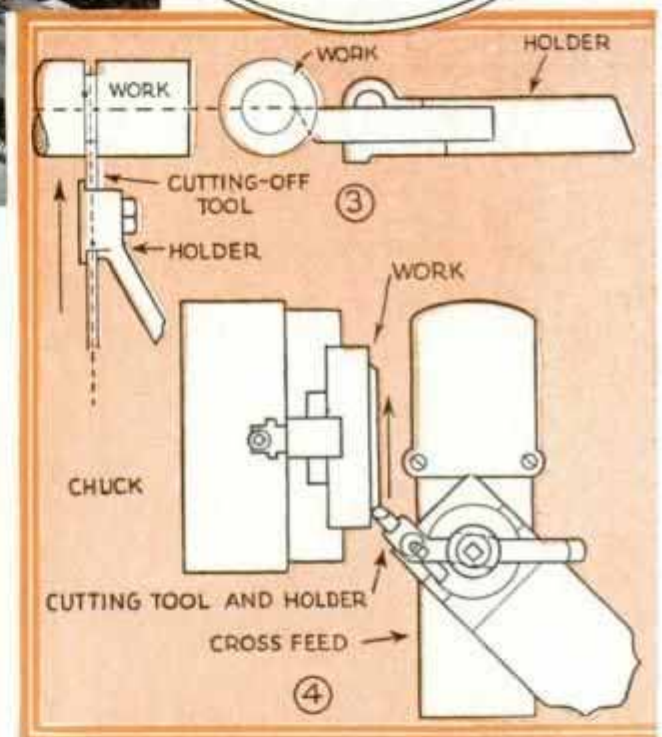




or left hand, particularly for heavy cuts where there is considerable lateral pressure on the tool. The angle of the holder offsets the tendency of the tool to pull sideways under the chip.

When you require a shoulder cut on light work between centers, it is a good practice to run in a sizing cut with the cutting-off tool as in Fig. 3, the sizing cut made at the limit of the shoulder along the length. The several heavier cuts necessary to remove the surplus stock to the required diameter can then be run up to the sizing cut with a tool ground and set as in Fig. 2. This method leaves a very smooth surface that requires little extra finishing and avoids any possibility of undercutting either at the shoulder or along the length as the cut is progressing. Fig. 3 shows the setting of the cutting-off tool. The only precaution to be taken in setting the cutting-off tool is to see that it is set exactly at right angles with the axis of the work. If it is set even slightly out of line it is likely to bind and break in a deep cut. To assure safety about the metal lathe it is necessary that the operator take every precaution against breakage.

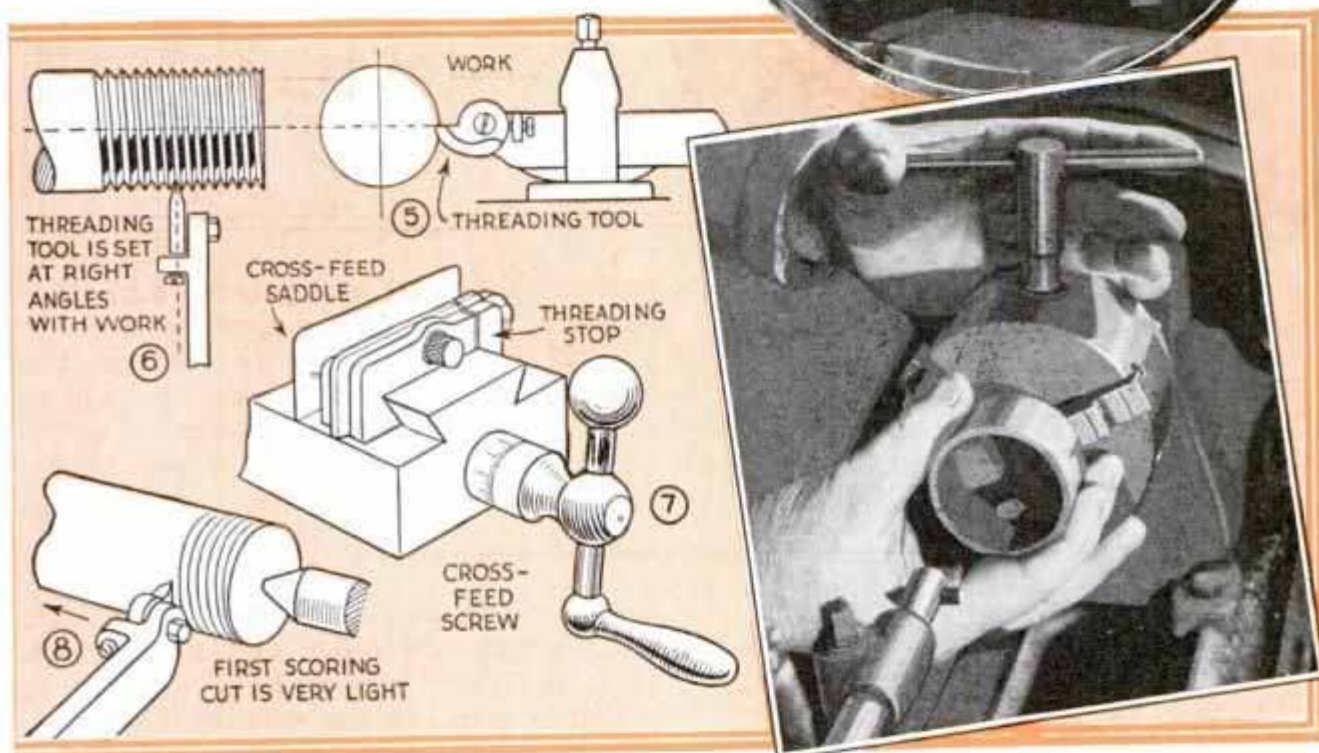
Fig. 4 shows the operation of facing work in the chuck. You have probably noticed that there is considerable slack between the tool holder and the opening in the tool post. It is important in certain operations, of which this is an example, that the slack



be taken up when the tool is set. Note that when the tool holder is placed in the slot it is turned so that it bears against opposite sides of the slot, which is indicated with dotted lines, and the tool-post screw is then tightened with the holder in this position. This prevents the tool holder from slipping sideways on the rocker and drawing into the work. With the tool set in this position, it would be necessary that the strain be great enough to move the whole tool-post assembly.

The same rule for setting the cutter on the center line holds when cutting threads with a special threading tool as shown in Figs. 5 and 6. The threading stop, Fig. 7, is handy when cutting threads on a small lathe as it provides a means of accurately setting the tool for depth at each pass

along the work from the first light scoring, as in Fig. 8, to the final finish cut to complete the thread. The principal reason for failure in cutting threads is an improper setting and the attempt to cut far too deep at each pass of the tool along the work. The danger of irreparable damage to the thread is during the last two or three cuts just before the thread is brought to its final form. Make sure before the thread is started that the tool-post screw is drawn down tight so that the



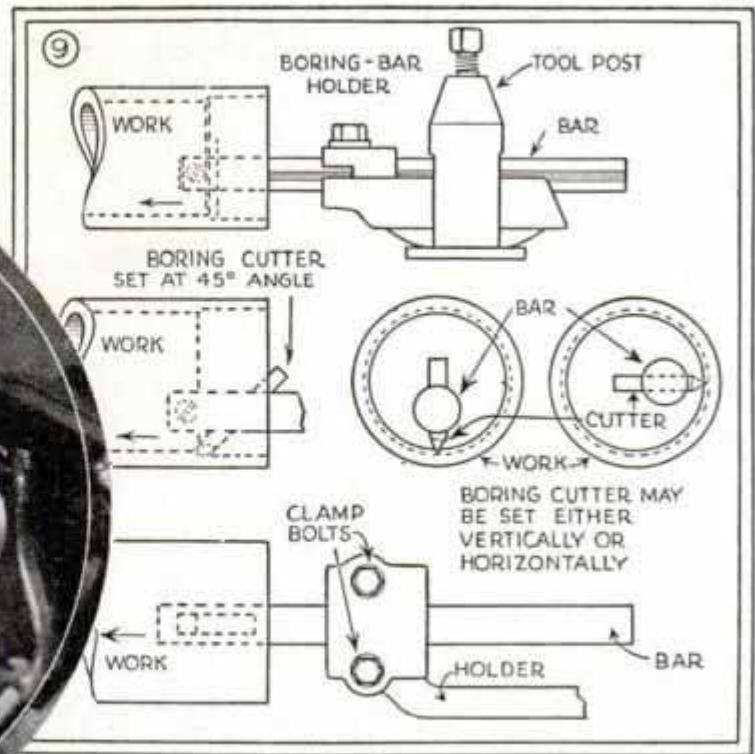
holder cannot shift out of position. Be sure also that the cutter is set exactly at right angles to the work and on the horizontal center line.

Fig. 9 details several common methods of setting a boring tool of the conventional type. The details require little comment as they clearly show the generally accepted practice. However, no infallible rule covers the setting of the boring tool even on the common types of work. It often happens that the tool will show a tendency to chatter, which is most difficult to overcome. Should this happen, first check the holder for alinement, change the setting or the depth of cut slightly, change from the power feed to hand feed if you have been using the former and make sure that the cutter and the bar are tight in the

holder. Occasionally a stubborn chatter can be eliminated by setting the tool from a vertical to a horizontal position and adjusting the cutting point slightly above or below the horizontal center line. Also a washer of paper or thin leather placed under the tool-post ring will sometimes correct the trouble. When cutting internal threads the threading tool is held in the bar in the same manner as the boring tool, but must be set horizontally in order to obtain the necessary close adjustment for depth. Always keep the tools and cutters ground and honed sharp. If you do not ordinarily wear glasses, it is good practice to put on a pair of industrial goggles when you work around your lathe. The goggles are not uncomfortable to wear and they may save your eyes from a flying chip of



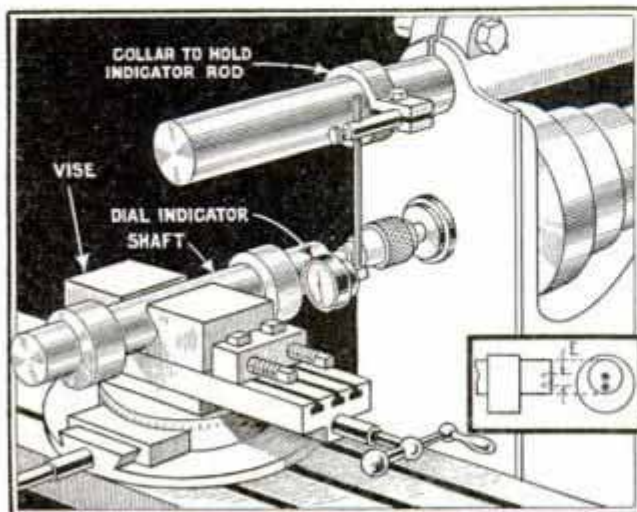
metal. Another care one should observe in setting lathe tools is to avoid drawing the setscrews and bolts on the carriage and tool post too tightly. The tool-post screw,



particularly, must be tightened and loosened many times in the course of a single job. If undue pressure is used on the wrench, looseness and inaccuracy are likely to result. Tighten the screw just sufficiently to keep the cutting-tool holder firmly in place.

Centering Eccentric Shafts

Here is one of the best methods I have found for centering a shaft eccentrically in a milling machine, especially where the limits are critical. The shaft is held in a universal vise and, after centering one end, a dial indicator, which is set up as shown,



Method of Centering Shafts Eccentrically in a Milling Machine to Assure Accuracy

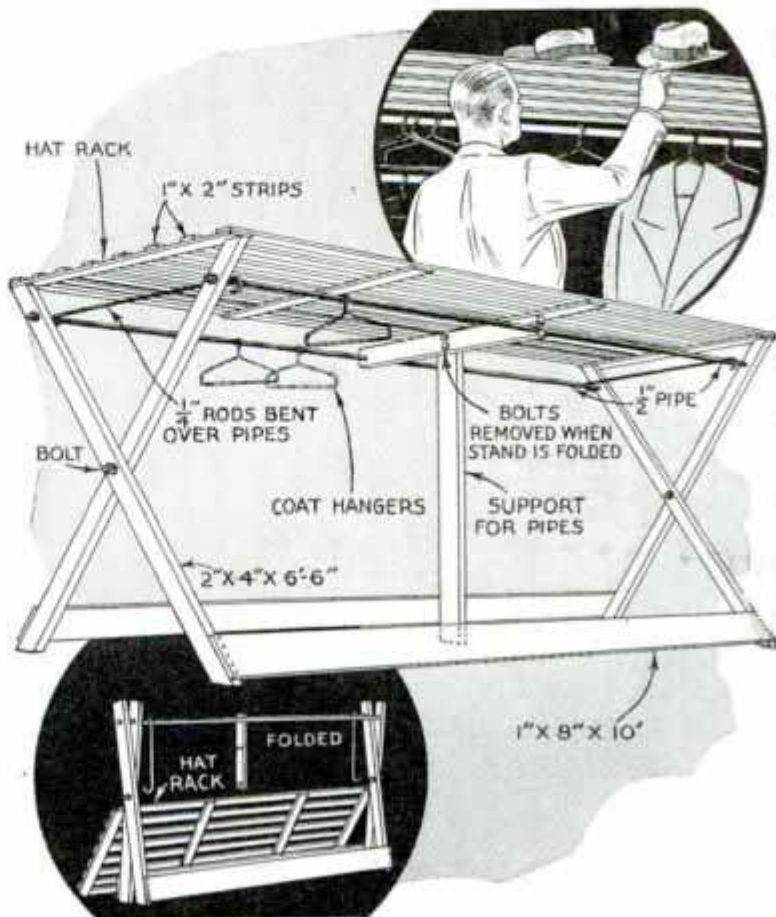
is adjusted until the indicator reads zero, after which the other end is centered. Now, the table is moved the distance E , which is equal to the eccentricity of the shaft, and the above process is repeated. —Charles Kugler, Philadelphia, Pa.

Saving Straw That Is Harvested with Combine Thresher

Saving straw at a low cost is an important problem on many farms where combine harvesters are used. For stacking outdoors, many pick up the straw windrowed by the combine with a buck rake, and then stack it with a grapple fork. Another good way of stacking or putting the straw into a barn, is to load the windrow with a hay-loader onto a basket rack, using slings to unload the rack, one being used on the bottom of the rack and the other about halfway up the load. Hitching a wagon or trailer behind the combine, and blowing the straw directly into the rack takes less labor and saves the chaff.

Portable Hat and Coat Rack Folds for Storage

Folding flat so that it can be stored or transported on the running board of a car, this rack will accommodate about one hundred coats and hats. It is intended for temporary use in club rooms, meeting halls and similar places where cloak rooms are not available, and where some convenient rack for holding garments must be provided. Also, the rack serves nicely when the capacity of cloak rooms is overtaxed by large crowds. To get the necessary strength, in addition to compactness, it is best to use hardwood for the rack, although the upper part, which consists of 1 by 2-in. strips, can be made of pine or other soft wood, as there is very little strain here. Two folding X-braces serve as legs to support the rack, while lengths of pipe between the braces hold coat hangers. For additional strength when the rack is heavily loaded, a single leg supports it in the center. The leg is bolted to a horizontal crosspiece, which is pivoted to one of the pipes and notched at the free end to slip over the other as indicated. In use,



iron rods, with hooks bent on the ends, are slipped over the pipes running along each side of the rack to prevent it from collapsing.—Frank Beatty, Chicago.

Vacuum Cups Increase Prominence of Advertising Signs



Merchant Increases Prominence of Advertising Posters by Suspending Them with Vacuum Cups

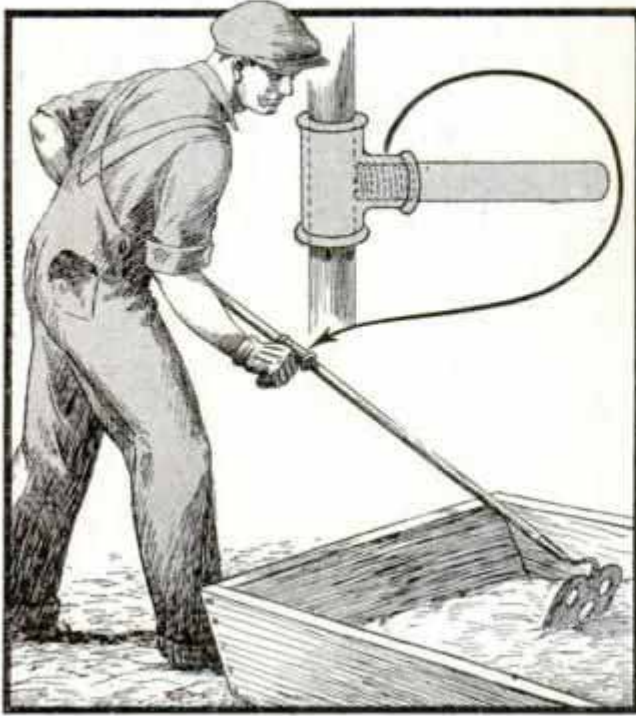
To increase the prominence of his special-day advertising signs so that they attract attention to the public readily, a hardware dealer displays them above the sidewalk by suspending them from the handles of rubber vacuum cups, which he sticks to the store windows. When moistened with a little glycerine and pressed against the window, these cups adhere to the glass indefinitely. Posters and pennants are attached as indicated.

Starting a Nut on Marred Threads

When it is necessary to cut off part of the threaded end of a long bolt, first drive a nut up to the end of the threads. Then, saw off the end and unscrew the nut. This will remove the burrs where the threads were cut so that a nut can be started.

Mayer Mfg. Co. 1436 W. Randolph

Auxiliary Handle Improves Masons' Mortar Hoe

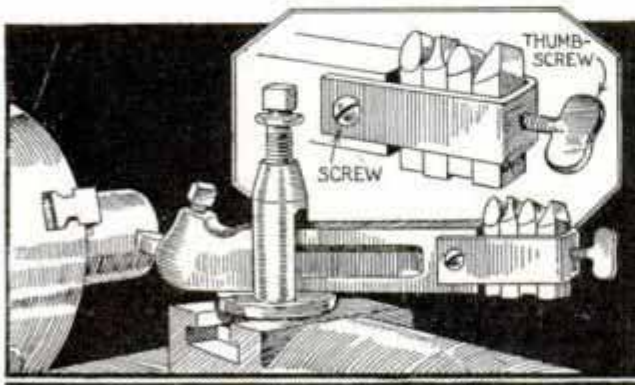


Adjustable Handle Makes Mortar Hoe Easy to Use and Relieves Wrist Strain

To relieve hand and wrist strain, when using a mortar-mixing hoe for long periods of time, one mason uses an auxiliary handle, which can be attached or removed in a moment. The extra handle consists of a pipe tee large enough to slip over the hoe handle, and a nipple which is threaded so that it may be turned into the tee to engage the wood. The extra handle is easily adjusted to suit.

Extra Cutting Tools Kept Handy on Tool Holder

To keep his cutting tools handy, one lathe operator attached them to the tool holder as shown in the detail. A thumb-

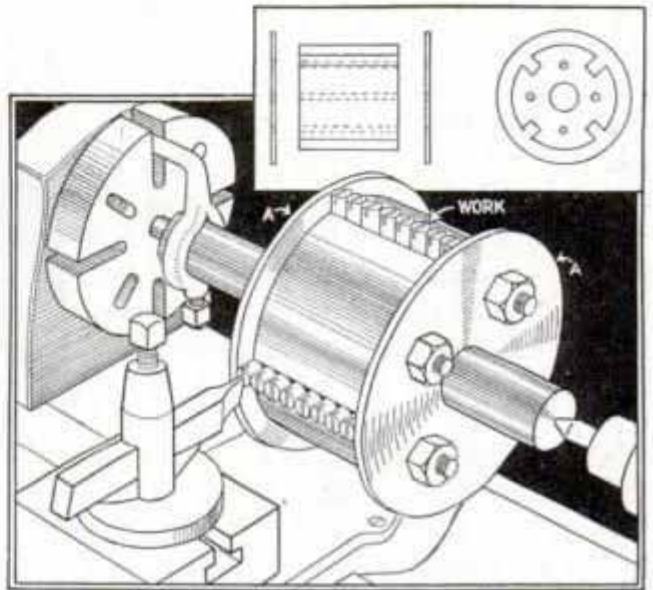


Cutting Tools Are Always at Hand When Clamped to the End of the Lathe Tool Holder

screw at the rear end of the improvised holder clamps the tools in place. It is loosened slightly when one of them is to be removed or replaced.—Peter L. Budwitz, Meriden, Conn.

Slotting Pins in a Lathe

In a small shop where there was no milling machine, this jig was used in a lathe to slot the ends of a number of steel pins. It is a piece of round steel having four equally spaced slots cut to a depth equal to a little more than one-half the length of the pins, and just wide enough to take



Jig Made Up to Slot the Ends of a Number of Steel Pins in a Lathe

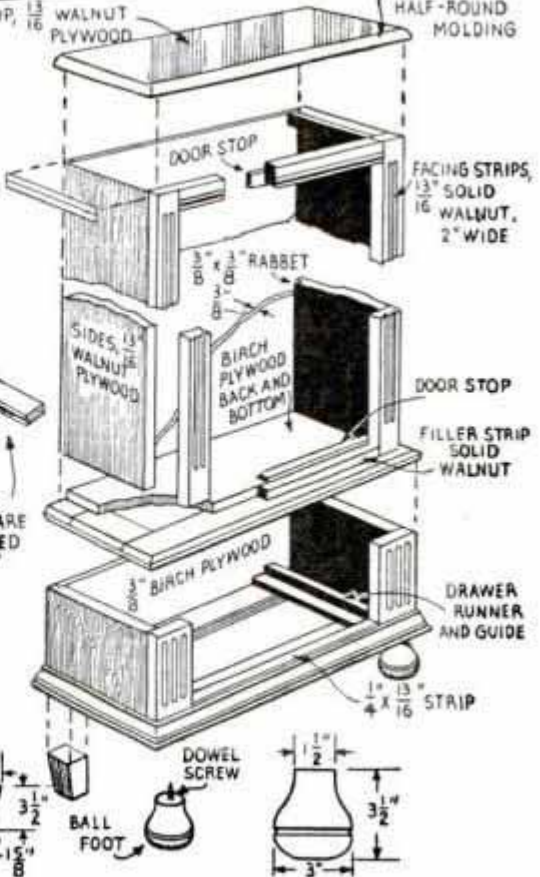
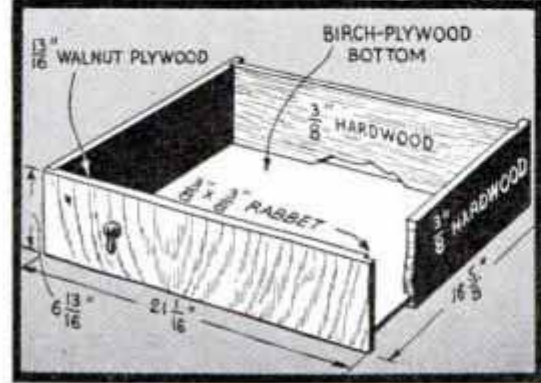
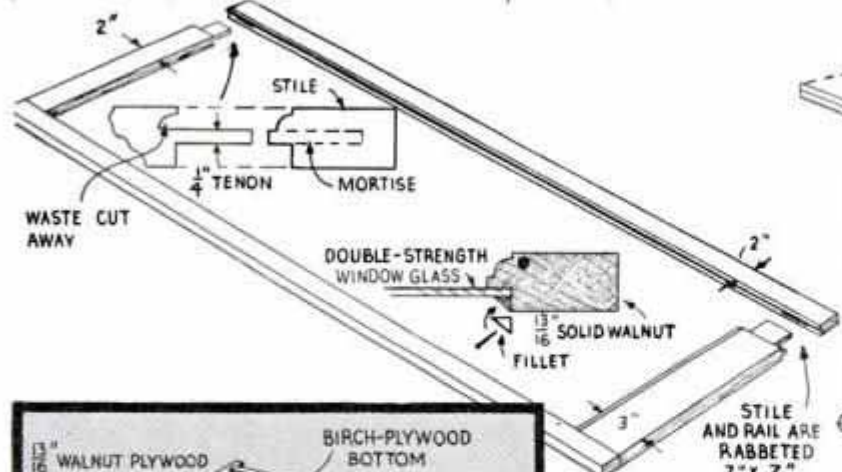
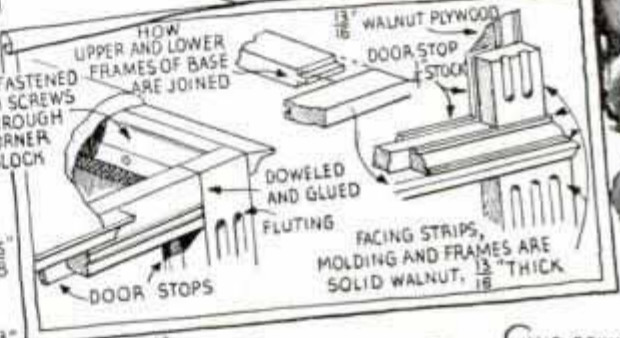
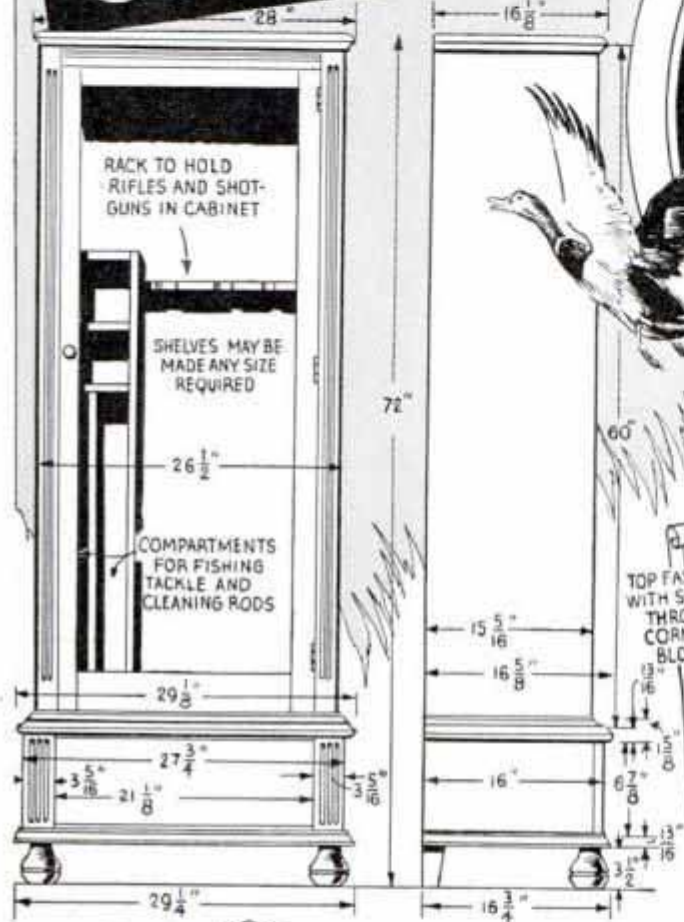
them snugly. The pins are held tightly in the slots by means of disks A, which are bolted in place as shown.

Jig for Sharpening Chisels

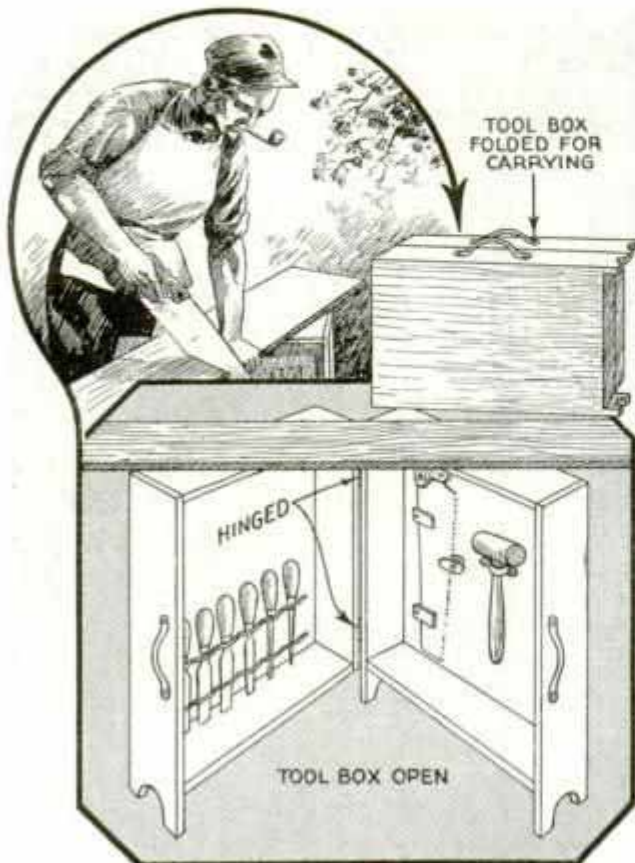
Difficulty of maintaining the correct bevel, when sharpening wood-cutting and turning tools, can be eliminated by using this simple jig, which is especially useful with round-nose gouges. It is a block of wood with a hole drilled through it at an angle as shown. In use, both block and chisel are moved over the surface of the stone.



Build this handy GUN CABINET...



Hinged Tool Box Used as Sawhorse by Repairman

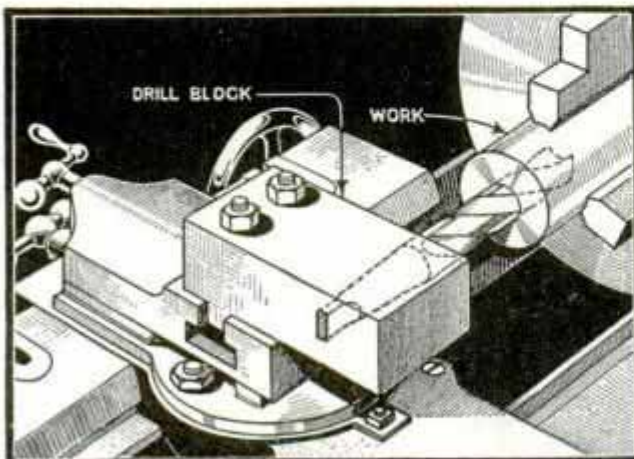


Hinged Tool Box with Short Extensions at One End Serves as Sawhorse on Odd Repair Jobs

Carpenters, who do screen or storm-window fitting and similar work away from the shop, are frequently inconvenienced by lack of a sawhorse. If a stout folding tool box is made, as shown, it may be opened on the job and used as a practical substitute for the purpose.

Drilling in a Lathe

The practice of using large drills in the tailstock of a lathe is not only a tiresome

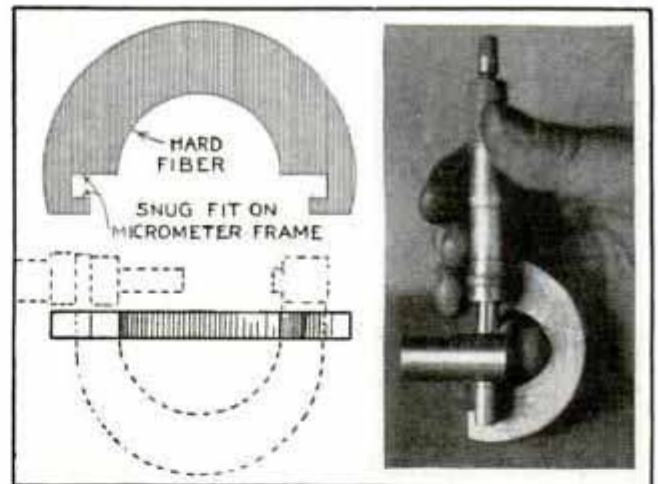


Drills Held in Block on Carriage to Avoid Damaging Tailstock When Drilling in a Lathe

job, but should the drill shank turn in the tailstock and score the hole, its center will be out of line with the live center in the headstock. To avoid this damage, workmen in one shop use the block shown, which is mounted on the compound rest, thus allowing the lead screw to be used to feed the drill to the work. In addition to the safety factor, use of the power feed was found to increase production. The block is held on the compound rest by bolts, and a tongue, machined on one side to fit in the T-slot, keeps it from turning. Drills are held in a tapered hole which is bored horizontally near the outer end. This hole is made to take the largest drill, reducing collets being used to accommodate smaller drills in the block.

Auxiliary Frame Makes Micrometer Easy to Read

When work that is finished to close limits is checked with a micrometer, the operator usually notes only the vernier lines



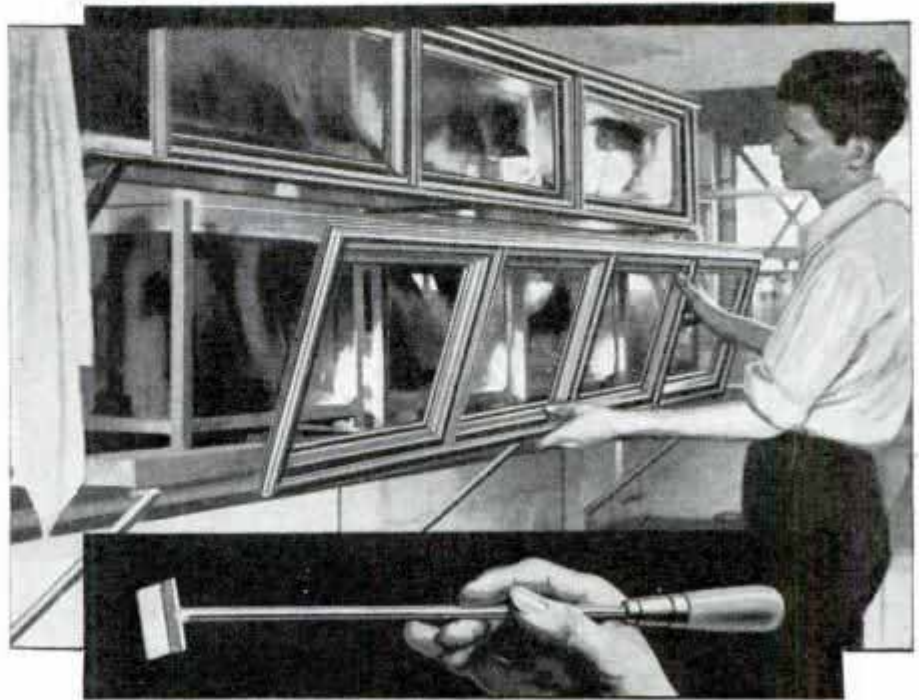
Auxiliary Frame on Micrometer Enables User to Hold Instrument to View Vernier Lines

of the instrument with an occasional reference to the thousandths reading. As a micrometer is not so handy when the vernier lines are watched exclusively, because these lines are at right angles to the thousandths reading, the user must bend his wrist sharply each time to bring the lines into view. To eliminate this trouble, a mechanic made an auxiliary frame from a piece of hard fiber and slipped it on the micrometer at right angles to the frame as shown. This permits the tool to be held just as comfortably as the regular frame, and the vernier lines are in full view.

Illuminated Tanks Improve Display of Fish

One shopkeeper who specializes in raising and selling fish, increases the effectiveness of the display by illuminating the aquariums, showcase lamps being arranged in the space between them. The lamps are concealed with attractively finished wooden frames set in front of the tanks. In order to reduce the cost of raising tropical fish, he circulates the water by means of a small rotary pump, driven with a $\frac{1}{20}$ -hp. electric motor. This was found much more economical than constantly drawing water from the city mains.

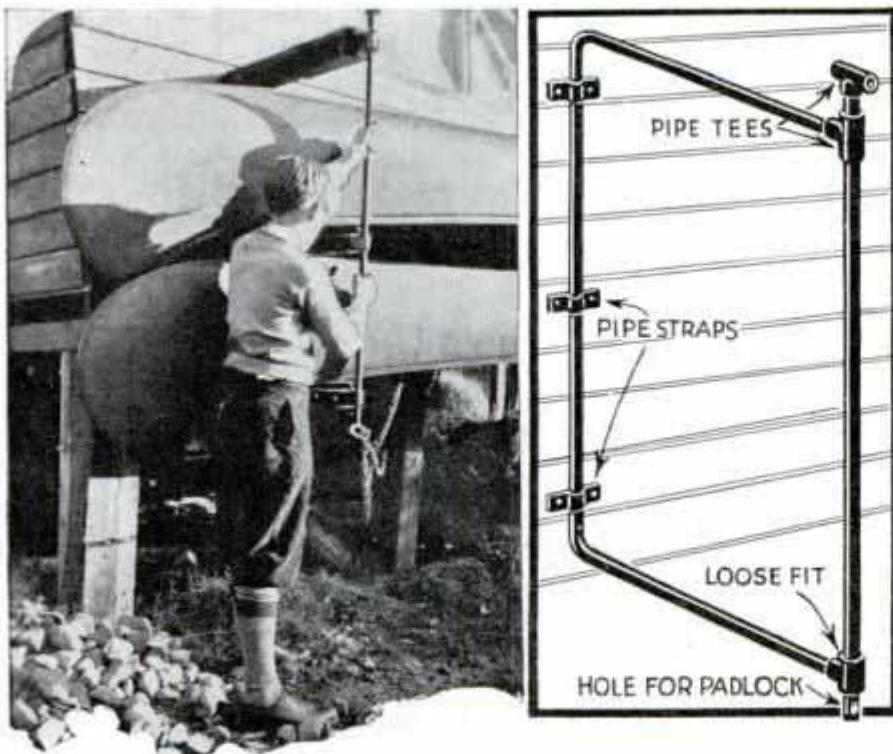
As a side line, which proved to be profitable, he sells aquarium scrapers, which are made by attaching old one-edge razor blades to suitable handles. The blades are brazed to 10-in. lengths of $\frac{1}{4}$ -in. iron rods,



Stained Wood Frames Set in Front of Aquariums in Small Store Improve the General Appearance and Conceal Lamps That Illuminate the Fish

which are fitted with wood handles. In brazing the rods to the blades, care must be taken to get the latter at a slight angle to the rods so that the scraper can be used conveniently.

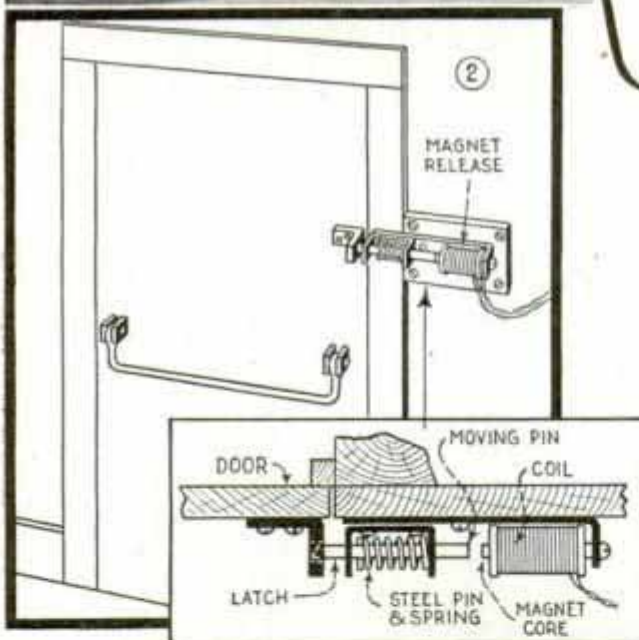
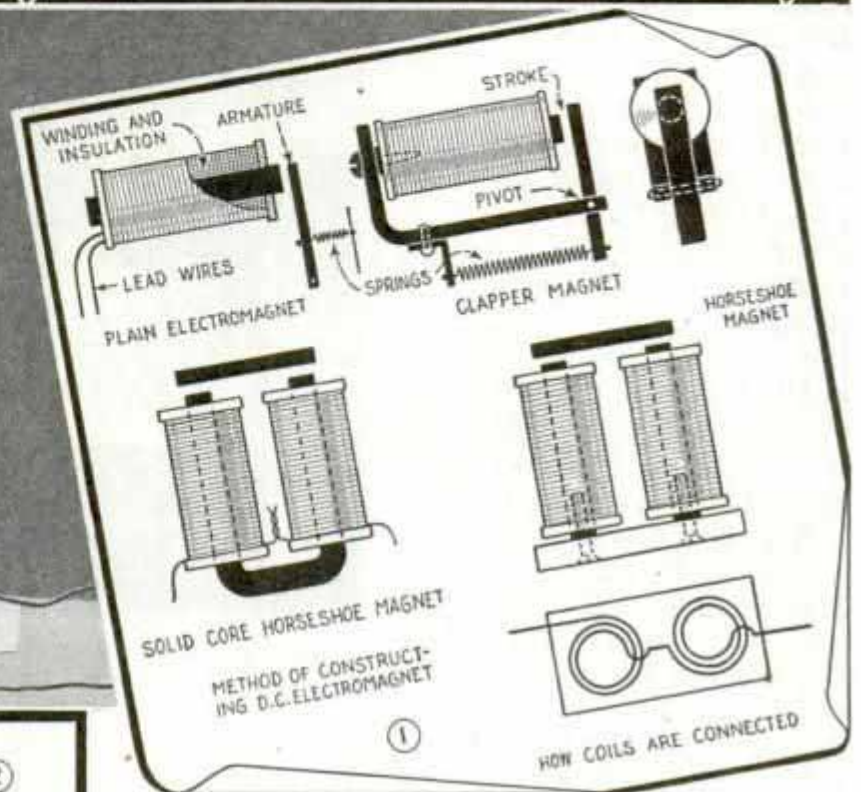
Rack Protects Your Canoe against Theft at Summer Camp



With This Rack, Which Is Made of Pipe and Fittings, You Can Lock Your Canoe Safely at Camp

At summer cottages, camps or boating clubs, this rack will help protect the canoes against theft. It can be attached to the side of cottage, garage or boathouse. The rack consists of two lengths of pipe bent to a large U-shape, the ends being fitted with tees. These take lengths of pipe, the upper ends being fitted with tees while the lower ends are flattened and drilled for padlocks as shown. The U-shaped pieces must be of a size to take the bow and stern of the canoe, yet small enough to prevent the wider amidships section from being pulled through them.

Designing and Building



By C. A. CROWLEY

YOU can design and build electromagnets for almost any purpose without becoming involved in the difficulties of complicated mathematics. In this article we have brought the subject down to a few simple rules, which, if followed carefully, will give results that are entirely satisfactory.

However, like any other piece of electrical apparatus in which iron is used, the

final performance of an electromagnet will vary slightly from the figured value because it is not possible to look at iron and tell exactly how effective it will be. To make the work as accurate as possible, values for four grades of iron will be given.

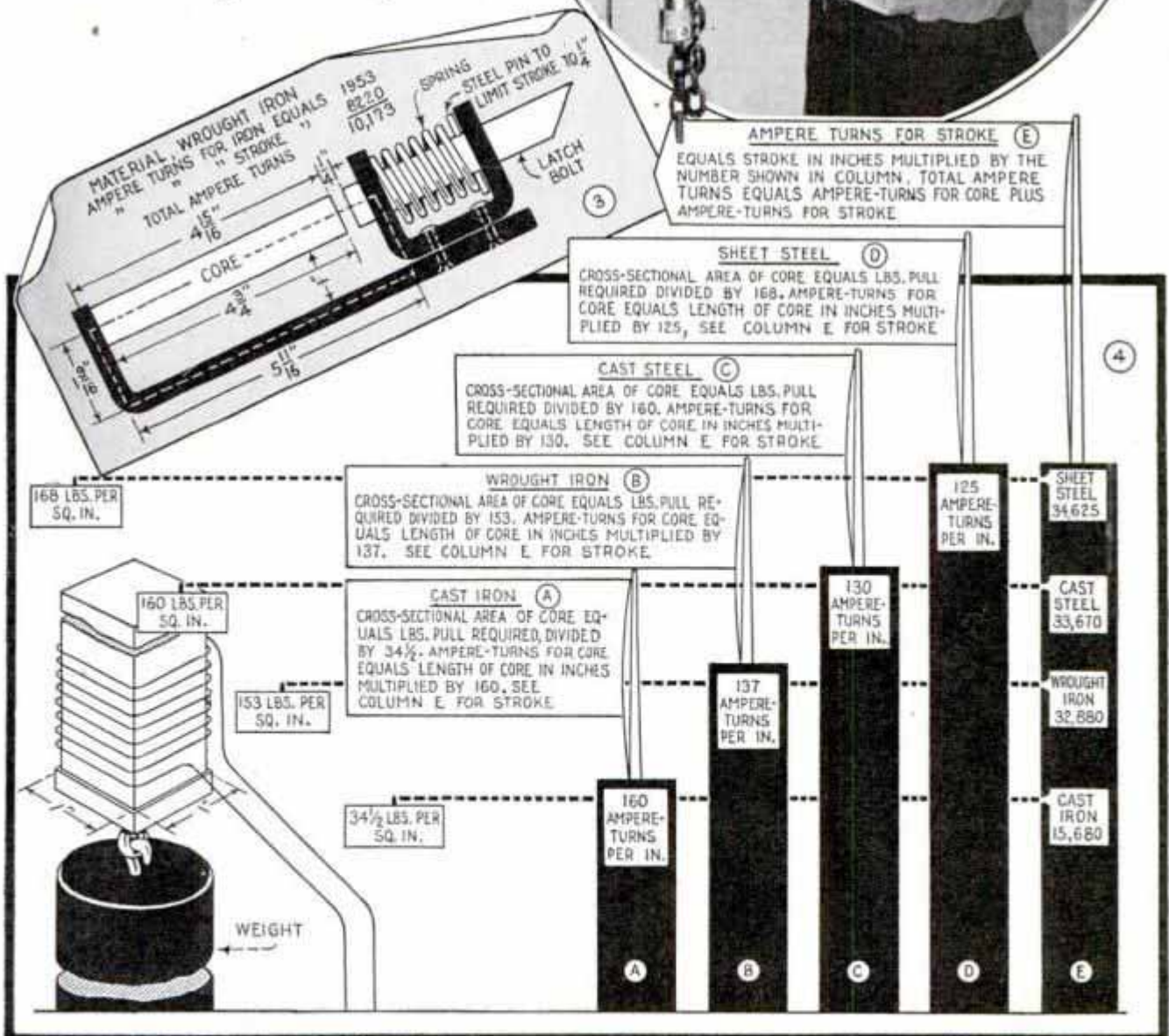
Direct-Current Magnets

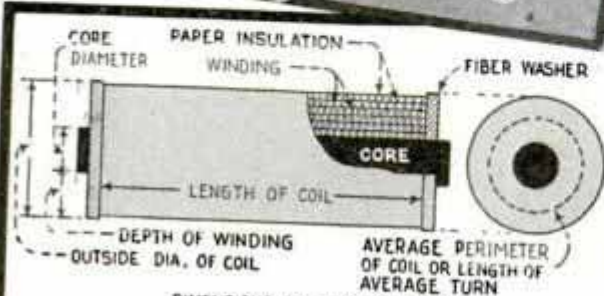
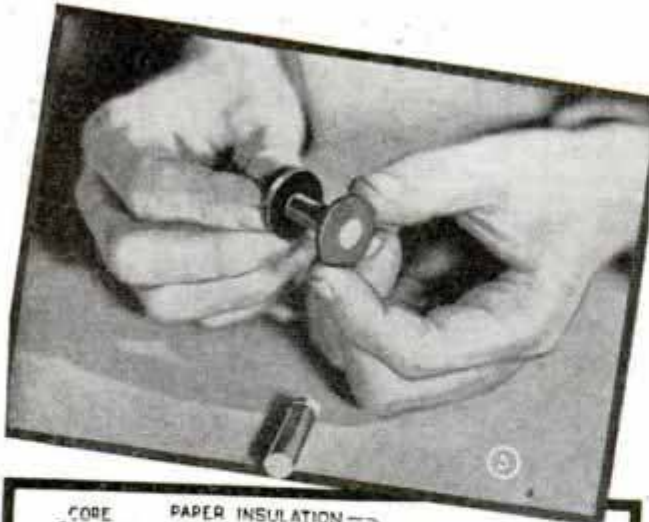
Although the general principles are the same for a.c. or d.c. magnets, we will start with the d.c. types, a number of which are illustrated in Fig. 1. In order to illustrate the method of design, we will show how to make a magnetic door latch, Figs. 2 and 3. In this latch the bolt stroke need only be $\frac{1}{4}$ in. For long strokes, simple electromagnets are very inefficient. The first thing to do is to get a coil spring to hold the latch closed so that its tension can be tested. In the case illustrated it was found that a pressure of 25 lbs. was required to compress it $\frac{1}{4}$ in. Now, as there will be considerable friction in operating the latch, it is advisable to design the magnet so that it will exert a pull of about 50 lbs.

The latch can be forged conveniently from wrought iron so we will make our magnet core and frame from the same ma-

ELECTROMAGNETS

terial. Consulting Fig. 4 we find from the flag B, labeled "wrought iron," that the cross-sectional area of the core is found by dividing the pull required, or 50 lbs. in our case, by 153. Performing the division we get .327 sq. in. It is convenient to use iron rod of standard diameter for the core, so we will select a size of rod which has the nearest area over this required value. Accordingly, we will use 3/4-in. rod for the core. Next we will again refer to flag B, labeled "wrought iron" in Fig. 4, and figure the number of ampere turns which we will need to give our magnet the





DIMENSIONS FOR ELECTROMAGNETS
 FOR DIAMETER OF CORE SEE FIG 4, LENGTH OF COIL EQUALS 6 TIMES THE CORE DIAMETER. WINDING DEPTH EQUALS THE DIAMETER OF THE CORE. OUTSIDE DIA. OF COIL EQUALS 3 TIMES THE CORE DIA. AVERAGE PERIMETER OF COIL EQUALS 6.28 TIMES CORE DIAMETER

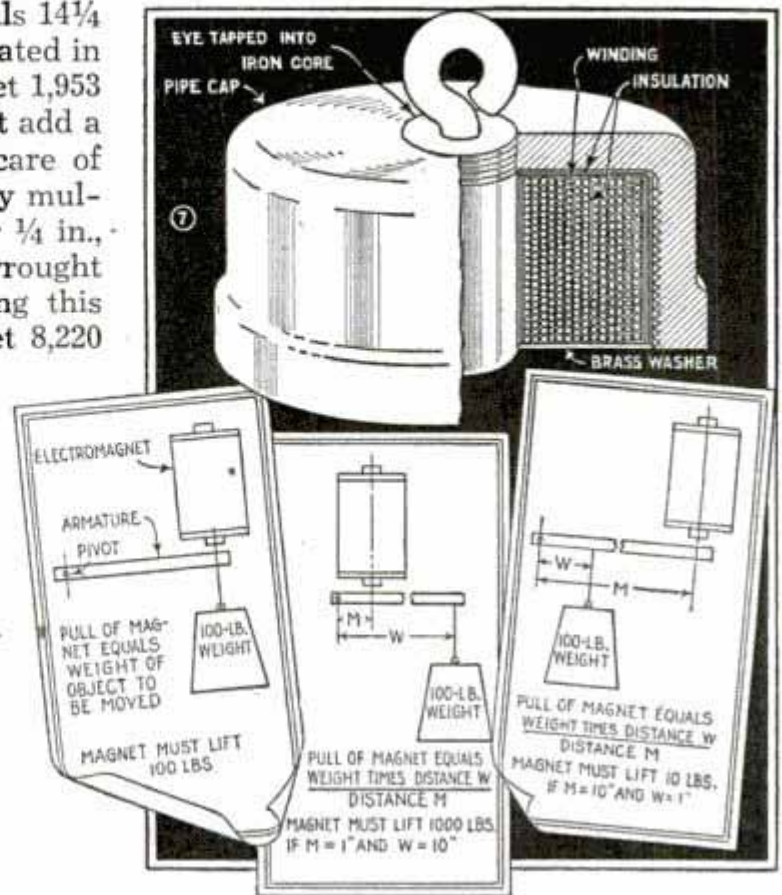
TO DETERMINE WIRE SIZE TO USE (6)
 FIRST, MULTIPLY THE VOLTS TIMES 12,000
 SECOND, MULTIPLY AMPERE-TURNS TIMES AVERAGE PERIMETER OF COIL
 THIRD, DIVIDE THE SECOND ANSWER INTO THE FIRST ANSWER. THE RESULT IS THE WIRE SIZE IN OHMS PER 1,000 FT. FOR GAUGE NO. SEE WIRE TABLE

strength required. Here we find that the number of ampere turns required to magnetize the iron is found by multiplying the length of the magnet core by 137. Ampere turns is the name for the value found by multiplying the number of amperes flowing through a coil by the number of turns of wire in the coil. A coil, which passes 10 amperes and has 50 turns of wire, has 10 times 50, or 500 ampere turns. Similarly, a coil wound with 250 turns of wire and passing 2 amperes has 2 times 250 or 500 ampere turns. Before applying the formula to ascertain the number of ampere turns required, we will have to assume some reasonable value for the length of the coil and iron parts. A good rule to follow is given in Fig. 6. Applying this, our coil will be wound to a depth of 3/4 in. This means that the outside diameter of the coil will be 2 1/4 in. Multiplying 3/4 in. by 6 gives 4 1/2 in. as the length of the coil. To leave space for insulation, the iron core should be cut to a length of 4 3/4 in. Referring to the sketch of the magnetic latch shown in Fig. 3, we can readily add up the total length of the iron core. The length of the dotted lines represents the length we will have to measure. In other words, we must find out how far the magnetism

		WIRE TABLE									
		TURNS PER SQUARE INCH						OHMS PER CUBIC INCH			
B & S or A. W. G. Number	Ohms per 1000 Ft at Coil Temperature	Circular Mils	Enamel Covered	Single Cotton Covered or Double Silk Covered	Double Cotton Covered	Enameled and Single Cotton Covered	Enamel Covered	Single Cotton Covered or Double Silk Covered	Double Cotton Covered	Enameled and Single Cotton Covered	
8	764	16510									
9	963	13090									
10	1.215	10380	92.2	87.5	80	84.8	.00765	.00725	.00662	.00704	
11	1.532	8234	116	110	97.5	105	.0121	.0115	.0102	.0110	
12	1.931	6530	146	136	121	131	.0193	.0181	.0160	.0173	
13	2.436	5178	184	170	150	162	.0308	.0283	.0250	.0271	
14	3.071	4107	232	211	183	198	.0493	.0443	.0385	.0417	
15	3.873	3257	293	262	223	250	.078	.0697	.0592	.0665	
16	4.884	2583	365	321	271	306	.122	.107	.0907	.102	
17	6.158	2048	460	397	329	372	.194	.168	.139	.157	
18	7.765	1624	572	493	399	454	.304	.263	.213	.242	
19	9.792	1288	718	592	479	553	.477	.397	.318	.370	
20	12.35	1022	912	775	625	725	.774	.657	.530	.615	
21	15.57	810	1150	940	754	895	1.23	1.01	.806	.957	
22	19.63	642	1430	1150	910	1070	1.91	1.54	1.22	1.43	
23	24.76	510	1780	1400	1080	1300	3.01	2.38	1.82	2.20	
24	31.22	404	2240	1700	1260	1570	4.78	3.64	2.70	3.37	
25	39.36	320	2820	2060	1510	1910	7.66	5.61	4.10	5.18	
26	49.64	254	3560	2500	1750	2300	12.1	8.50	5.95	7.82	
27	62.59	202	4420	3030	2020	2780	19.0	13.0	8.66	11.9	
28	78.93	160	5580	3670	2310	3350	30.2	19.8	12.5	18.1	
29	99.52	127	6900	4300	2700	3900	47.3	29.5	18.5	26.7	
30	125.5	101	8700	5040	3070	4660	75.2	43.6	26.2	40.3	
31	158.2	80	10700	5920		5280	116	64.0		57.0	
32	199.5	63	13500	7060		6250	185	96.5		85.5	
33	251.6	50	17000	8120		7360	293	140.		127.	
34	317.7	40	21100	9600		8310	460	209		181	
35	400.1	32	26300	10900		8700	721	300		266.	
36	504.5	25	32000	12200		10700	1110	422		370	
37	636.2	20	39800				1740				
38	802.2	16	49400				2710				
39	1012	12	61200				4250				
40	1276	10	76100				6660				

must travel through iron. This totals $14\frac{1}{4}$ in. Multiplying this by 137, as indicated in Fig. 4, under "wrought iron," we get 1,953 ampere turns. In addition, we must add a number of ampere turns to take care of the stroke. This amount is found by multiplying the length of the stroke, or $\frac{1}{4}$ in., by the number shown opposite "wrought iron" under the flag E. Multiplying this number, or 32,880, by $\frac{1}{4}$ in. we get 8,220 as the number of ampere turns to be added. Adding 1,953 to 8,220 we get 10,173 as the total number of ampere turns required for the coil. This same procedure may be used for any d.c. magnet. In all cases the total length of the iron through which the magnetism must pass to make a complete circle, must be measured. In case a core is used which does not have a return path for the magnetism, only the core length and length of stroke are considered in figuring the ampere turns required for magnets having short strokes. For long strokes, solenoids or plunger magnets should be used. Construction of solenoids will be explained completely in another article entirely devoted to this subject.

Next we figure the size of wire required to wind the coil. Fig. 6 shows a simple rule for doing this. After figuring the average perimeter, which, according to the rule, is 6.28 times the core diameter, or in this case 4.71, we can then determine the wire size to use. If the coil is to be operated on 110 volts d.c. we first multiply this voltage, or 110, by 12,000, which gives us 1,320,000. Next we multiply the total number of ampere turns found as above, or 10,173, by the average perimeter, which we have just figured, or by 4.71, which gives us 47,915. Then we divide this number into 1,320,000, which gives us 27.55 ohms as the resistance of 1,000 feet of the size wire we need. Referring to the wire table, we find that this resistance corresponds to a size of wire between Nos. 23 and 24. We may choose either of these. The larger, or No. 23 wire, will increase the strength of the magnet slightly and cause it to become somewhat hotter; however, as this magnet is to be used intermittently, No. 23 wire may be used without danger of overheating. In winding the



coil figured by these methods, it is not necessary to count the turns of wire, as the selected size of wire will produce the correct number of ampere turns regardless of the exact number of turns wound. Changing either the voltage or the coil diameter will prevent the coil from performing as it should. The coil may be increased in length or shortened without changing the number of ampere turns or strength. If the coil is shortened it will run hot and if it is lengthened it will run cooler and consume less current but will deliver the same pull. Washers of suitable size to slip over the core tightly as in Fig. 5, should be made from bakelite or fiber. The outside diameter of the washers should be slightly over the outside diameter of the coil. With the end washers in place, the iron core between them is covered with two or three layers of heavy brown paper. This should be held in place with shellac, which also improves the insulating quality. One layer of paper should be placed between every two or three layers of wire for added insulation. Wire with any type of insulation may be used without changing the ampere turns in the coil. When the coil is finished, it is a good idea to coat it with shellac as shown in Fig. 14.

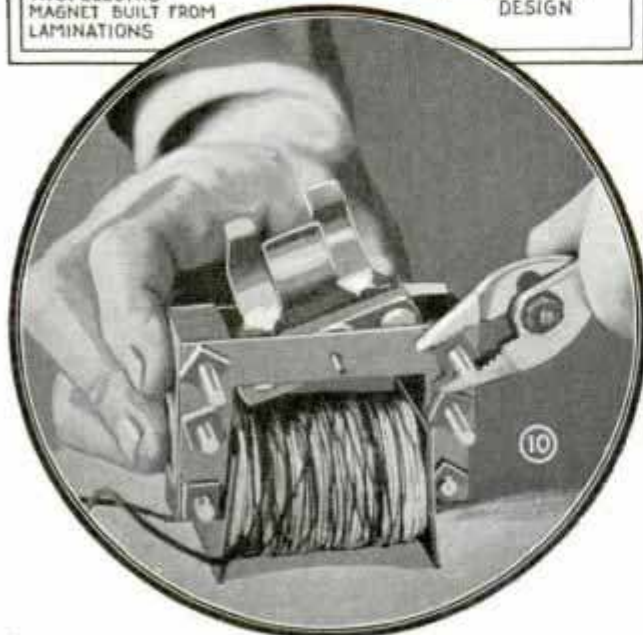
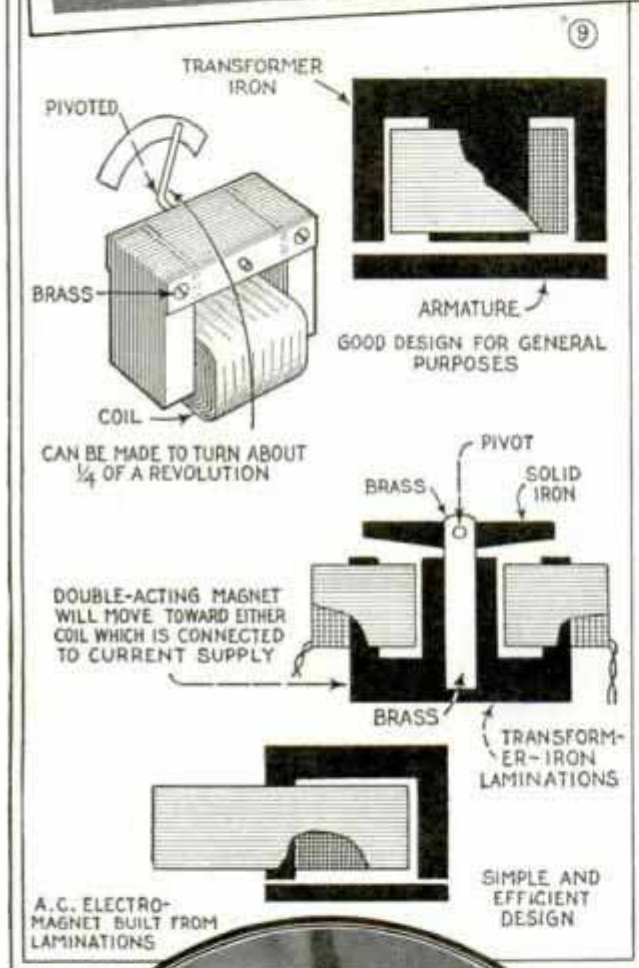
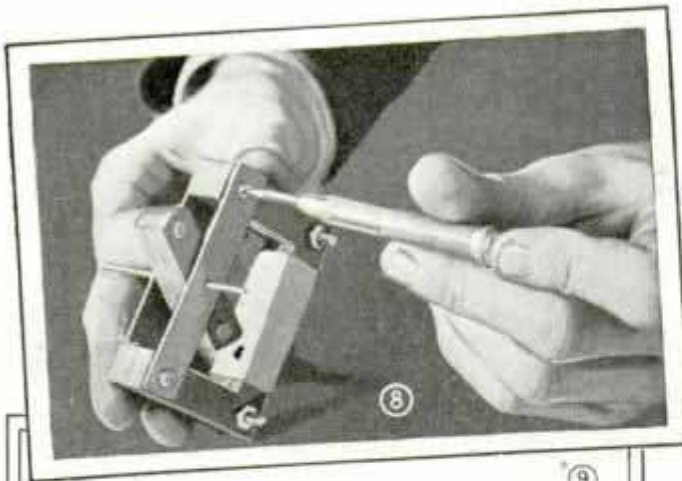


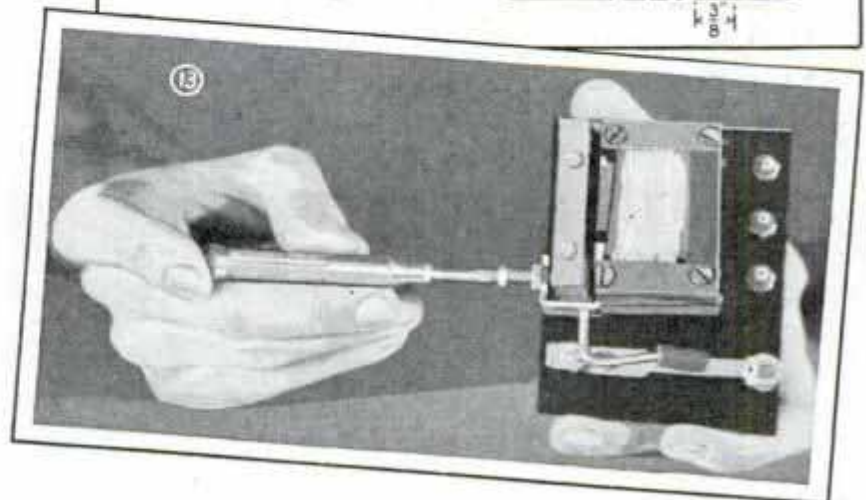
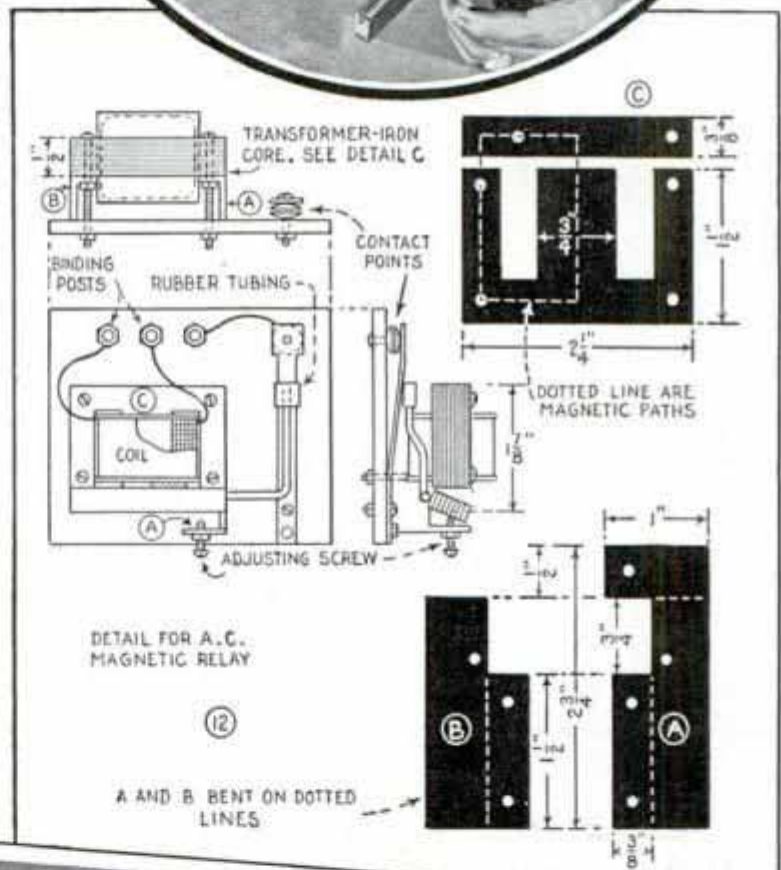
Fig. 7 shows a simple design for a lifting magnet. The frame for this type of magnet may be built from a pipe cap. The core is turned from a piece of cast iron or steel. The number of ampere turns required for a magnet of this type is figured exactly as explained above except that no allowance is made for stroke. Other special types of magnets may be worked out by similar methods. It must be remembered that enclosed windings or short coils tend to pull more amperes and therefore get hotter than long-exposed coils that can radiate their heat. Magnets used to operate systems of levers must be designed to allow for the variation in pull required due to the lever system. Some simple methods of figuring the pull required of lever magnets are given in the three details which are shown below Fig. 7.

Alternating-Current Magnets

Alternating-current electromagnets may be designed for many purposes if care is taken to design the metal parts so that the iron makes a complete circuit around the coil when the magnet arm is closed. Plain magnets without a return path for the magnetism are not satisfactory for a.c. The cores for a.c. magnets must be built up from sheets of steel the same as the core of a transformer. Fig. 9 shows a number of a.c. magnets. Silicon steel or stovepipe iron, tightly assembled by means of stove bolts, as shown in Figs. 8 and 10, may be used for the cores of this type of magnet. The moving part, or clapper as it is called, may be made from solid metal if it is small, but the core upon which the coil is wound must be built up from laminations as shown; otherwise trouble will be experienced from excessive heating.

To make clear the application of simplified methods for designing a.c. magnets, we will construct an a.c. magnet suitable for closing an electrical switch. Magnets that are arranged to close or open electrical switches are called relays. Inasmuch as the core from an old transformer is usually available we will use one of these for our magnet. A sketch of the core together with the mechanical arrangement is shown in Figs. 12 and 13. From the sketch we can see that the length of the iron face that will be effective in giving pull to the mag-

net is divided into three parts. The outside legs are $\frac{3}{8}$ in. wide and the center leg is $\frac{3}{4}$ in. long. Adding these together gives $1\frac{1}{2}$ in. as the total length of the effective pulling surface. Multiplying this length by the thickness of the core, or $\frac{1}{2}$ in., we get $\frac{3}{4}$ sq. in. as the cross-sectional area of the core that is effective in giving pull to the magnet. For a.c. magnets it is safe to figure that each square inch of pull surface will produce a pull of 88 lbs. The pull of our magnet will therefore be $\frac{3}{4}$ multiplied by 88 or 66 lbs. As this value is ample for our purposes we will use the core as it is. The number of turns of wire required for the coil will depend upon the voltage to be used and upon the frequency or cycles of our current supply. If our magnet is to be operated on 110 volts, 60 cycles, a.c., we see from Fig. 15 that the turns are figured by multiplying the voltage by 4.7 and then dividing this answer by the cross-sectional area of the core. The cross-sectional area of the core in this case is the cross-sectional area of the leg upon which the coil is wound. Referring to Fig. 12 we see that this leg is $\frac{3}{4}$ in. wide and $\frac{1}{2}$ in. thick. Multiplying these together gives us $\frac{3}{8}$ or .375 sq. in. as the cross-sectional area. Then the turns are found by multiplying the voltage, or 110 by 4.7 which gives us 517, and then dividing this number by the cross-sectional area, or .375, which gives us 1,352 as the required number of turns. The method of figuring the wire size is also indicated in Fig. 15. Applying this rule, we first measure the length of the shortest path through which the magnetism must pass. This is indicated by dotted lines in Fig. 12, and totals $4\frac{7}{8}$ or 4.875 in. Applying the rule for wire size, we first multiply 4.875 times 50,000, which gives us 243,-





what is termed a "shading coil," which is simply a turn of very heavy copper wire wound into a slot in the core as shown in Fig. 16. Either of the methods shown is effective. For the magnet just described a piece of No. 8 or larger copper wire should be used. The ends should be carefully lapped together and soldered as shown in Fig. 11. Care must be taken to completely sweat the splice together, otherwise it will not be effective.

These methods for designing magnets may be applied to almost any kind of problem. In doing this kind of work it is

TO FIND THE PROPER SIZE OF WIRE TO USE

- 1-MEASURE TOTAL LENGTH OF DOTTED LINES
- 2-MULTIPLY THIS BY 50,000
- 3-DIVIDE THE LAST NUMBER BY THE NUMBER OF TURNS TO BE WOUND, THIS GIVES THE WIRE SIZE IN CIRCULAR MILS, SEE TABLE FOR CORRESPONDING GAUGE NUMBER

TURNS OF WIRE REQUIRED	
25 CYCLES	60 CYCLES
$\text{TURNS} = \frac{11.3 \times \text{VOLTS}}{\text{(WINDING CORE AREA)}}$	$\text{TURNS} = \frac{4.7 \times \text{VOLTS}}{\text{(WINDING CORE AREA)}}$
ILLUSTRATION IN ABOVE ILLUSTRATION (T) THICKNESS OF CORE, EQUALS 1"; (W) WIDTH OF CORE, EQUALS 1". AREA OF WINDING SPACE EQUALS 1 X 1 OR 1 SQ. IN.	
FOR 25 CYCLES 110 VOLTS $\text{TURNS} = \frac{11.3 \times 110}{1}$ EQUALS 1243 TURNS	FOR 60 CYCLES 110 VOLTS $\text{TURNS} = \frac{4.7 \times 110}{1}$ EQUALS 517 TURNS

MAGNETIC PULL OR TRACTION

EACH SQUARE INCH OF MAGNETIC CONTACT AREA WILL HOLD 88 LBS.

PULL = 88 X CONTACT AREA

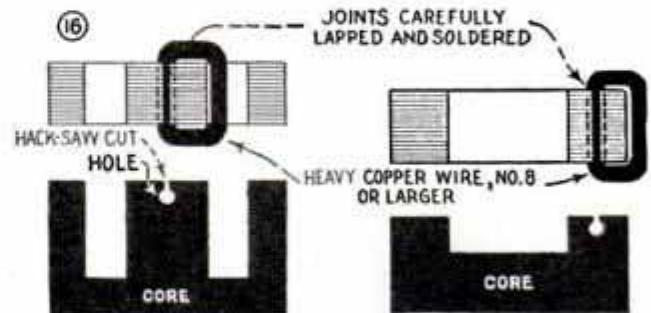
ILLUSTRATION - IF W IS 1 INCH
 N " 1/2 "
 T " 1 "

CONTACT AREA 2 SQUARE INCHES
 PULL EQUALS 88 TIMES 2 OR 176 LBS.

DESIGNING A.C. ELECTROMAGNETS

750. Dividing this number by the turns, or by 1,352, gives us 180 circular mils as the wire size required. Referring to the wire table, we find that this falls between Nos. 27 and 28. As we do not require the full power of the magnet for operating the relay, we will select the smaller wire size, or No. 28. The coil may be wound on a form and installed on the core by the same methods as are used in transformer construction. Before the coils are fitted over the cores, the latter are covered with insulating paper.

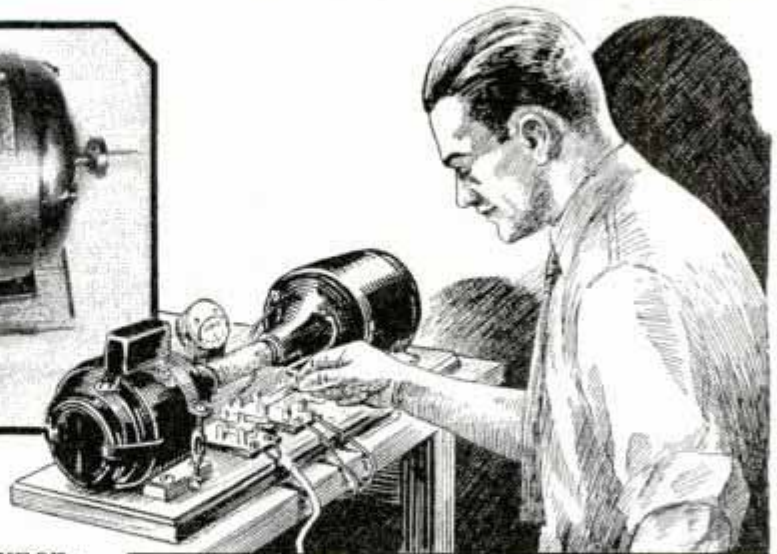
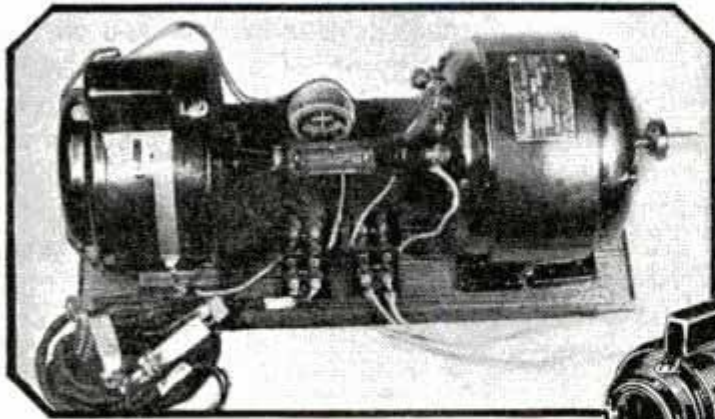
Alternating-current magnets tend to hum badly unless they are equipped with



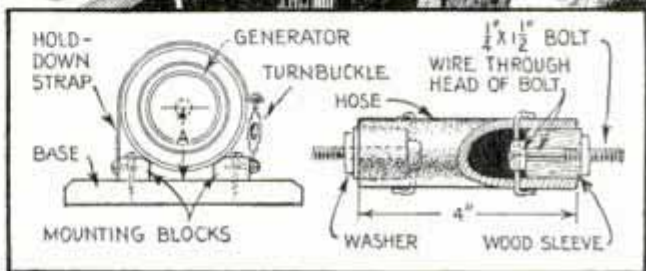
SHADING COIL TO STOP HUM IN A.C. MAGNETS

best practice to figure out the design you need and then make minor variations by experimenting until you get exactly what you want.

Old Auto Generator Used as Battery Charger



In small shops and garages where there is occasional need of a battery charger, one may be made inexpensively from a $\frac{1}{4}$ -hp. electric motor and an old 6-volt auto generator. The motor and generator are mounted on a base so that their shafts are in perfect alignment. They are coupled together by means of a short length of garden hose, as shown in the lower right-hand detail. The generator should be wired to the battery through a switch, and the electrical cut-out of the generator is retained to prevent discharging the battery should the motor happen to stop. An ammeter wired in series with the battery, will show the charging rate. This should not exceed 10 amps. at the be-



ginning of the charge, and should be reduced gradually to 2 amps. as the battery becomes charged. As most auto generators can be set to produce at least 20 amps, two or three 6-volt batteries, wired in parallel, may be charged at the same time.

Gummed Paper Tape to Keep Small Packages in Order

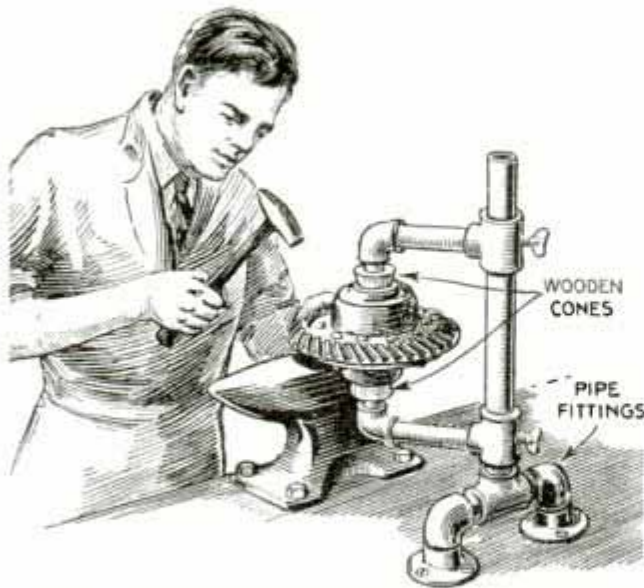
To keep small packages of screws, brads, tacks, etc., from becoming mixed on his shelves, a hardware merchant uses the following novel method: Packages containing one size of screws are laid end to end for the depth of the shelf, and are held together with a strip of gummed paper tape, which is fastened to the top side of each row. When needed, the top row is simply pulled forward and a package torn off.—Wayne C. Leckey, Aurora, Ill.

To Grow Beautiful Roses

Among the precautions to be observed in the successful growing of roses, perhaps the least heeded is the necessity of adding iron to the soil. A handful of iron shavings, buried around the roots of a rose bush, will rapidly rust and the iron will then be available as plant food.



Pipe Stand Holds Differential

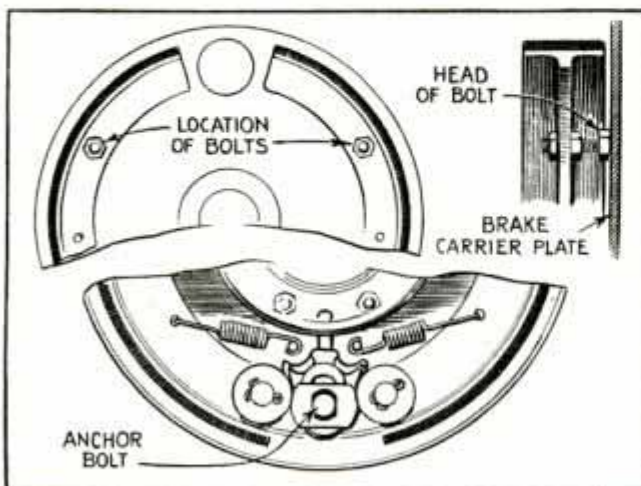


Stand of Pipe and Fittings Holds Differential for Riveting the Ring Gear in Place

Riveting a ring gear to the differential case is usually a two-man job, but with the use of this adjustable stand, one man can handle the job easily. With a few odds and ends of scrap pipe, a good stand may be made. The vertical pipe should be 2 in. in diameter and 2 ft. long. The arms are of 1½-in. pipe, with an elbow and a 2-in. nipple on the end to hold wooden cones, which fit into the differential as shown. These cones are the type used in rolls of wrapping paper to mount them in a rack, and may be had at most grocery or dry-goods stores.

Eliminating Brake Chatter

Some car owners who have had the brakes chatter, have effectively eliminated this trouble by installing ¼-in. bolts in

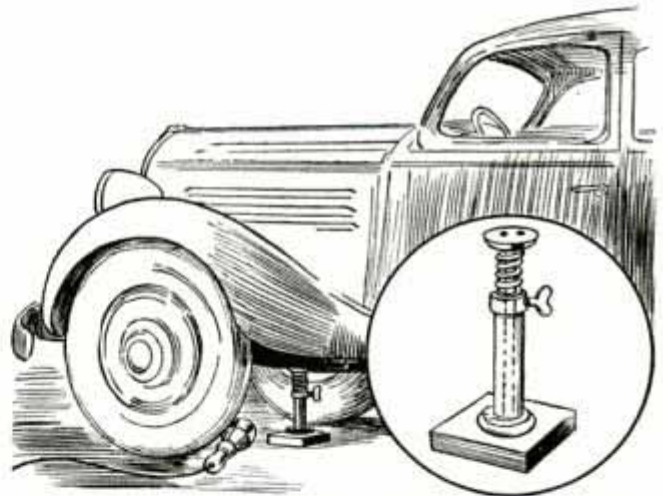


Two Ideas That Have Been Found Helpful by Auto Owners in Eliminating Brake Chatter

the brake shoes, as shown in the upper detail, so that the heads contact the brake carrier plates. The bolts should have a nut on each side of the brake-shoe web. This prevents tipping of the shoes when the brakes are applied. Other owners who have cars on which the brake shoes are controlled by a wedge, as shown in the lower detail, have eliminated chatter by filing about 1/16 in. of the metal from the front side of the anchor bolt. This filing gives the bolt a slight horizontal motion so that the assembly is self-centering.

Adjustable Support Aids in Replacing Crankcase on Car Motor

The usual difficult job of replacing a crankcase single-handed is greatly simplified with this adjustable support, which is made from an old valve and a length of pipe. A cap on the upper end of the pipe is drilled for the valve stem and is tapped at one side through the pipe for a thumb-



Tool Made from Old Valve and Pipe Holds Crankcase in Place to Start Screws

screw, after which the assembly is mounted on a wood base by means of a floor flange. In use, the valve, which has a spring under the head, is pushed down to compress the spring where it is held with the thumbscrew. The tool is slid under the motor and the valve released to hold the crankcase in place until the screws can be started. Small blocks placed under the base will adjust the tool for height.

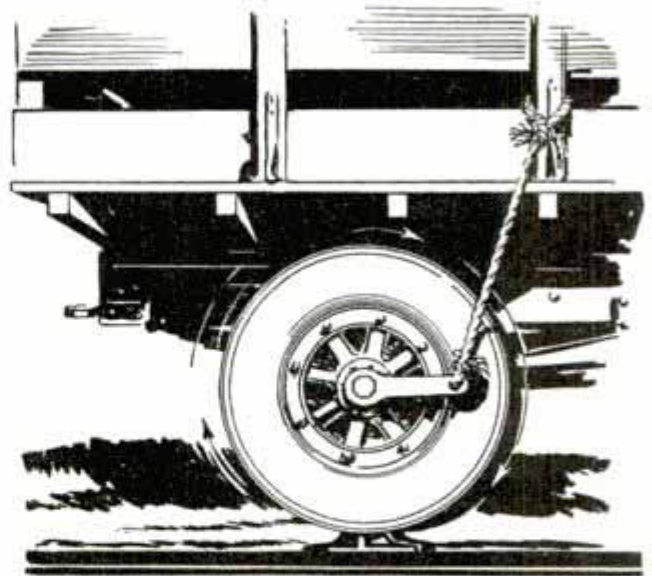
☞ To wear down new brake linings that have a tendency to grab, drive the car a block or two with the brakes applied to wear down the high spots.

Rubber Gasket Destroys Reflectors in Auto Headlamps

Rubber should not be used as a gasket between the lens and reflector in an auto headlamp because the rubber contains sulphur. Decomposition of the rubber releases enough sulphurous acid to quickly destroy the finest silvered reflector. Headlamp gaskets should be made of small cotton rope laid carefully in the groove at the outer edge of the reflector. If a groove is not provided for this purpose, cork of the proper thickness should be used.

To Determine Whether Coil Spring Is Right or Left Hand

On page 959 of our June, 1935, issue the information on how to tell whether a coil spring is right or left was incorrectly given. On torsion springs, it is very important that the direction of loading the spring is the same as the direction in which the wire was wound. The coils of a right-hand spring lie in the same direction as a right-hand screw; those of a left-hand spring can be similarly compared to a left-hand screw. Determining this is a simple matter by looking at the end of the spring. On a right-hand spring, the end of the coil points in the same direction as the bent index finger of your right hand, as shown in the illustration. On a left-hand spring, the end of the coil will point in the same direction as the bent index finger of the left hand.



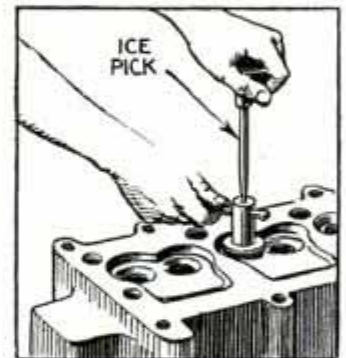
Tight Hub Cap Removed by Tying Free End of Wrench to Body and Starting Motor

Removing Tight Hub Cap from Rear Wheel on Truck

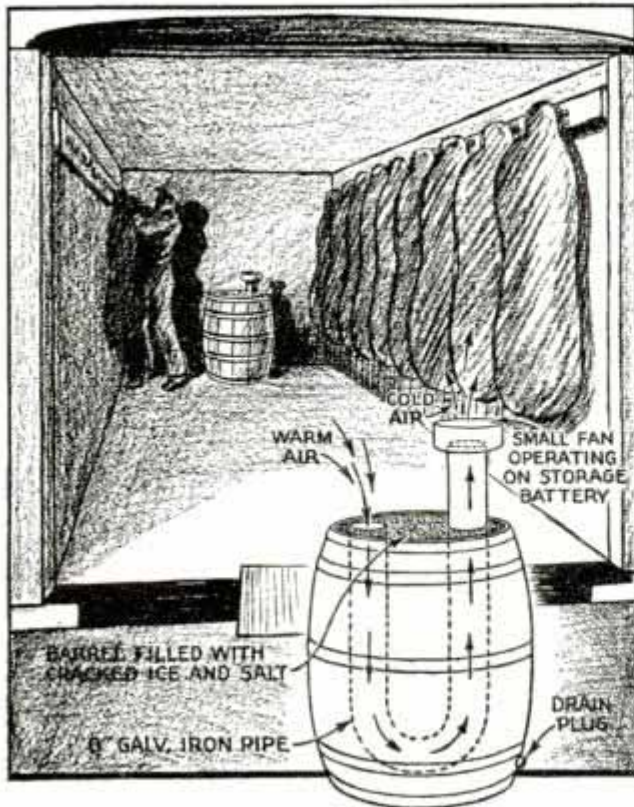
I recently saw a driver remove a very tight hub cap from the rear wheel of his truck as shown. He first put the wrench on the cap and ran a rope from the free end of the wrench to the truck body. Then he jacked up the rear wheel and started the motor, putting it in low gear to loosen the right rear hub cap. The arrangement is just reversed for the left side.—Theodore Zeitz, Cleveland, Ohio.

Applying Pressure to Valve Reseating Tool

I have found an old ice pick handy for applying pressure to a valve reseating tool, as it is difficult to get the right pressure on the tool by pushing down on the short handle provided. The end of the tool shank usually has a center mark in which the point of the ice pick can be held with one hand, while the handle of the reseating tool is turned with the other one.—E. T. Gunderson, Jr., Humboldt, Ia.



☐ A piece of sheepskin with the raw wool on it makes a good windshield wiper that will keep the glass clear of frost and dew.



Air Circulated through Tube around Which Ice Is Packed Lowers Temperature inside Truck and Protects Perishable Freight on Long Hauls

Inexpensive Truck Refrigerator

Used by a large trucking company to protect perishable freight over a 400-mile haul, this inexpensive cooler operates at a cost of approximately five dollars for the entire trip. It is claimed that the cooler will keep the temperature inside of the truck at least 18° below the outside temperature. The cooler is a large barrel filled with cracked ice, which is packed around a U-shaped sheet-metal pipe. At the upper end of this, an electric fan is mounted to draw air through the pipe and distribute it through the truck. The fan is operated from the truck battery.

Replacing Ring Gear on Flywheel

To save time in replacing flywheel ring gears on Essex cars, first remove the transmission bell housing and then break off the old gear with a hammer and chisel. Heat the new gear and slip it over the flywheel. With this method, it is not necessary to remove the flywheel or clutch.

The Next Issue

A DROP-LEAF TABLE BY DUNCAN PHYFE

Copy of historical masterpiece owned by the Metropolitan Museum of Art. The original is considered one of the finest works of this master cabinetmaker. Table has concave feet, ornamented with distinctive Phyfe leaf carving.

DESIGNING A SOLENOID FOR EVERY PURPOSE

Tells you how to build a solenoid for almost any job. Practical information without complicated mathematics to figure size of core, wire, turns, etc.

METAL FINISHING IN YOUR HOME SHOP

Important shop practice of producing attractive finishes. Textures achieved largely by mechanical treatment. Also chemical treatments for colored effects.

EXPERIMENTS WITH AMMONIA

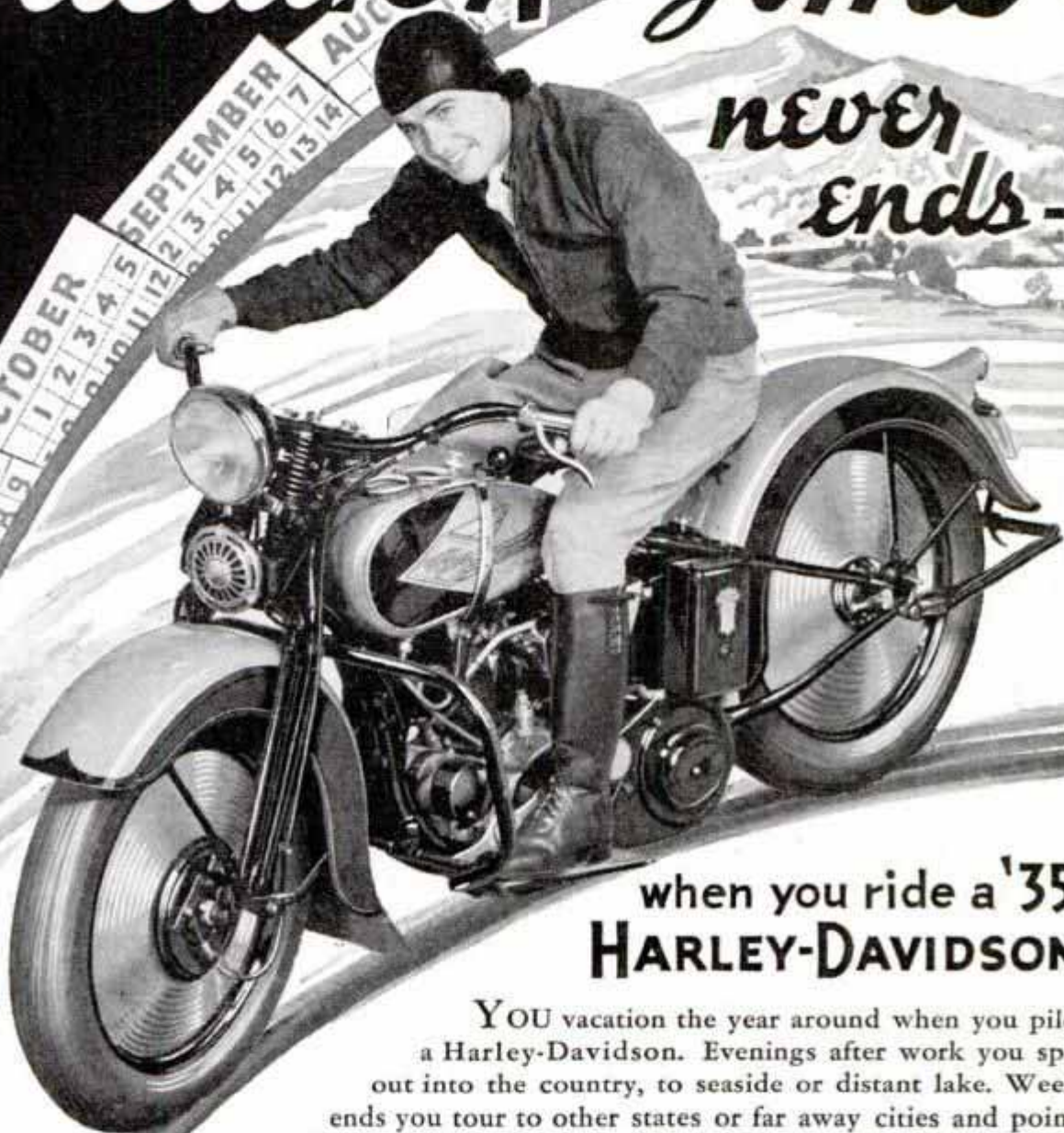
Practical experiments showing how ammonia is used in cleaners, polishes, insecticides, etc. Gives formulas to develop products for specific purposes.

SMART LAMP BASES

Stunning lamp bases of elegant, modern design that will go well with furniture of any kind and will also help materially to dress up your living room.

Vacation Time

never ends—



when you ride a '35 HARLEY-DAVIDSON

YOU vacation the year around when you pilot a Harley-Davidson. Evenings after work you spin out into the country, to seaside or distant lake. Weekends you tour to other states or far away cities and points of interest—you see the country. Then there are club runs, picnics, tours, race meets, hillclimbs. You join hundreds of happy knights of the open road, all on pleasure bent . . . There is sport and thrill in every mile you ride a Harley-Davidson. Best of all you cover the roads at a mere fraction of the cost of running a car . . .

Don't wait any longer — see your nearest Harley-Davidson dealer NOW! Ask him for a Free Ride — let him explain his Easy Pay Plans—and send in this coupon.

Ride a

HARLEY-DAVIDSON

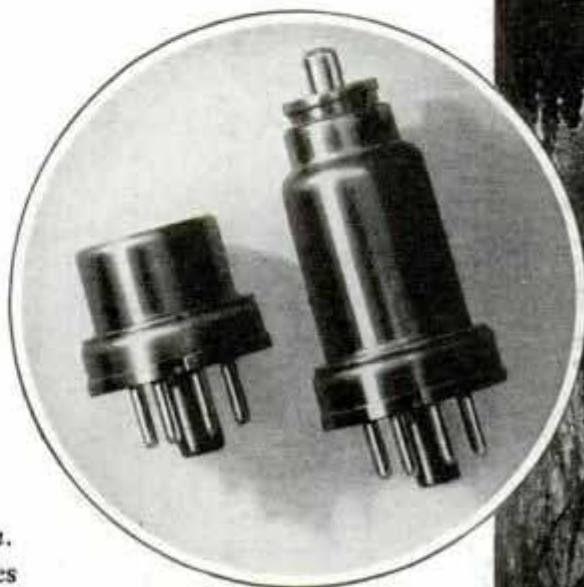
MAIL THIS COUPON
HARLEY-DAVIDSON MOTOR CO.
Dept. P, Milwaukee, Wis.

Interested in Motorcycling. Send illustrated literature.
Postage stamp is enclosed to cover cost of mailing.

Name.....
Address.....
My age is 16-19 years. 20-30 years. 31 years
and up. under 16 years. Check your age group.

Out of the "HOUSE OF MAGIC"

**THE NEW METAL TUBE...
A DEVELOPMENT SO IMPORTANT
THAT A COMPLETELY NEW
RADIO HAS BEEN BUILT AROUND IT**



IN RADIO TUBES, glass now gives way to steel... to new metal tubes*... created in the General Electric "House of Magic."

Tubes so superior that they need be only half the size of glass tubes... inspiring the making of a completely new receiver—the 1936 General Electric Radio!

**Noises suppressed...
brilliance gained**

These new metal tubes have silenced forever the annoying crackle caused by "shielding cans"...subdued the microphonic

twang that clouds reception.

And these sturdy metal tubes are enduringly strong... giving you performance invariably brilliant throughout a long and active life.

A radio always at "Concert Pitch"

Sensational as it is, the metal tube is but one of several great G-E Radio features.

There's a finer, more stable speaker—sired in the "House of Magic"... a speaker so supremely sensitive that speech and music now come to you clear, mirror-true.

And there's the new and amazing Permaliner, sealing out those twin enemies of distant reception—moisture and dirt. Keeping the set at "concert pitch" over a long and brilliant career.

A sentinel out of "The Arabian Nights"

In the heart of this new G-E Radio, you'll also find the Sentry Box... controlling as many as five separate broadcasting bands... housing the most alert watchman in all the world!

**NEW METAL TUBES...
small, efficient, long-lived...
designed to meet modern broad-
casting conditions, short-wave
and long-wave alike.**

A thousand and one radio waves rush in upon him...all demanding entrance. But he permits only *one* wave to pass—the wave to which you are dialed!

**See it! Hear it! Make
comparisons!**

Because of these features, the New 1936 General Electric Radio gives not only a new brilliance of performance... but a lasting brilliance that the years cannot dim.

It is now on display at your nearest G-E Radio Dealer's—in table models and consoles... priced from \$34.50 up.

(Prices slightly higher in West, Mid-West and South. Subject to change without notice.)

**Metal radio tubes, invented and perfected by General Electric, are made for General Electric by the RCA Mfg. Co. Complete receivers manufactured by General Electric at Bridgeport, Conn.*

For 1936, General Electric offers, in addition to the new metal tubes, these notably new features that keep the set at "concert pitch".

- G-E Permaliner
- G-E Sentry-Box
- G-E Stabilized Dynamic Speaker
- G-E Tuning Bands for domestic and foreign broadcasting—plus extended long-wave and ultra short-wave bands
- G-E Lo-note Compensation
- G-E Noise-Control
- G-E High- and Low-Speed Station-Finder
- G-E Sliding-rule Tuning-Scale
- G-E Precision-tuning Indicator
- G-E Shadow-band Tuner

The new 1936 GENERAL

... a new Radio Miracle!



Roam the world with these distance-defying sets . . . priced as low as \$34.50.



Model A-125—Twelve-tube superheterodyne, with five broadcasting bands. Completely equipped with new metal tubes. Walnut cabinet of neo-classic design.



Model A-63—Six-tube superheterodyne, with new metal tubes throughout. Two reception bands. Distinctive cabinet of walnut veneer.

MAKING MUSIC COME OUT OF A GAS-PIPE! An early step in a two-year search for a practical and efficient metal radio tube—conducted in the General Electric "House of Magic." A search that made use of a newly created alloy, Fernico . . . that utilized an ingenious method of welding that applies 75,000 amperes, for one-twentieth of a second, to fuse two metals into one! Such research development, typical of the "House of Magic," alone made the new metal tube possible . . . marking a milestone in radio progress.



ELECTRIC RADIO

When writing to advertisers please mention Popular Mechanics

Chinese Magic

(Continued from page 388)

the wand so the tack is turned away from the spectators. The magician lays the cord across the wand, at the left of the tack. Letting the ends dangle, he draws the back one downward, so it hangs below the front. He then winds the long end of the string three times around the wand, keeping to the left of the pin. At the end of the third turn, he loops the string around the tack. He then winds the string three times about the wand, but in the opposite direction and on the right side of the tack.

In his first turns, the magician winds the string away from himself; in the second series of turns, he winds the string toward himself. From the front, the wand appears to be girded six times by the cord. Actually, the string has been wound and unwound; all that holds it to the wand is the loop about the tack. Both ends of the cord are hanging below the wand; the magician ties them to the vase. The assistant twists the wand between his hands, revolving it away from his body. This action eliminates the coils, two at a time, until the full weight is borne by the tack. The pull of the cord snaps the tack from the wand.

The Chinese sword trick is also most astonishing. I use two assistants, one on either side, and each holds a large sword, blade upward. From these swords, I hang loops of flimsy rice paper; the two loops serve as a cradle for a stick of wood, about two feet in length. Taking a third sword, I make a downward stroke and cut the stick in half. The ends clatter to the floor but the rice paper loops remain uninjured. The secret is as surprising as is the trick itself. The stick absorbs the entire force of the sword blow; there is virtually no strain upon the paper loops.

The flying rice trick is a favorite among Chinese and Japanese magicians. The magician exhibits a large box filled with rice. He levels off the loose grains and covers the box with a silk cloth. When he removes the cloth, the box is empty. The magician calls upon the audience to return the rice. Dipping their hands in their pockets, the spectators are astonished to find quantities of loose rice.

This trick begins when the customers enter the hall. Courteous attendants usher them to their seats. These fellows plant

small handfuls of rice in the pockets of the spectators. The box has a recessed bottom, with rice glued beneath. The magician exhibits the box upside down; hence it appears to be a box of rice. The loose grains add to the deception. The magician levels these off, so only the glued rice remains. Beneath the cloth, he turns the box right side up. Before the spectators can decide where the rice has gone, the magician starts them reaching into their own pockets.

One distinctly Chinese illusion is the decapitation trick, in which a man's head is cut off and later restored to his shoulders. During the filming of Harold Lloyd's picture, "The Cat's Paw," it was necessary to plan a spectacular Chinese illusion, startling enough to impress the hoodlums in the drama. I developed an illusion which was largely original, yet retained the full atmosphere of Chinese magic.

A headless dummy was placed upon a stretcher. A man was inside the dummy; his head extended upward through an opening in the dummy's chest. The next item was a plate, divided into two sections. The segments were fitted about the man's neck, like a collar, then locked so closely that the joints were not noticeable. Two Chinese carried the stretcher; and the burden gave the perfect semblance of a decapitated man whose head was resting in a salver conveniently placed upon his body. Those who saw the picture were highly amused when the trick was exposed in a later scene. There are certain illusions which never can be fully appreciated until they have been seen from back stage; and this is one of them.

NON-DISSOLVING RUBBER GLOVE GIVES BETTER PROTECTION

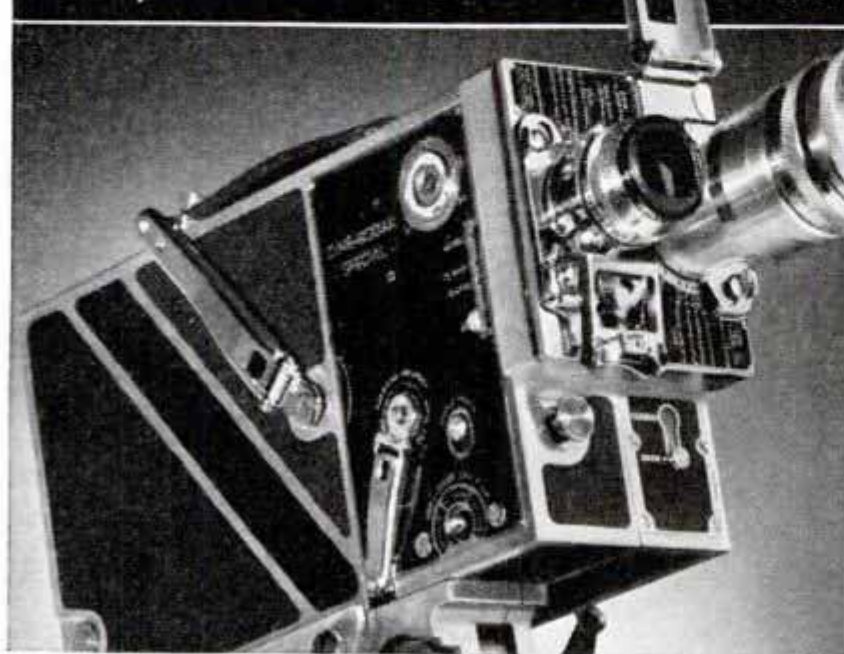
Gloves now are being made of a synthetic rubber compound which will not dissolve in solutions that are solvents of natural rubber. The material is not disintegrated by hot or cold oil, caustics or alkalies and it is claimed it withstands the effects of sulphuric acid better than natural rubber. The same compound is being used for aprons, sleeves, suits and similar garments to give extra protection.

E 702. —————
Industrial Product

WRITE YOUR OWN MOVIE SPECIFICATIONS

There's a Ciné-Kodak to fit...

The "Special"—world's finest 16 mm. camera



CINÉ-KODAK SPECIAL gives unlimited scope to your movie-making ideas . . . permits unusual effects and tricks with both black-and-

white and full-color Kodachrome Film far beyond the range of any other amateur movie camera.

The basic model—with $f.1.9$ lens, 100-foot film chamber, and a set of six masks—is priced at \$375.

FEATURES—Ground-glass focusing, reverse take-up, simplified mask system, adjustable-opening shutter, interchangeable 100- and 200-foot film chambers, single-frame release, one- and eight-frame hand cranks, interchangeable lenses. **EFFECTS**—Fades, dissolves, double and multiple exposures, slow motion, animation.

The "EIGHT"—for lowest cost

The famous "K"—leader of the 16 mm. field



● Though lacking many of the exclusive features of the "Special," Ciné-Kodak "K" couples a wide range of movie-making effects with simplified operation. It loads with black-and-white film and with Kodachrome Film for movies in full, natural color.

Standard equipment includes built-in exposure guide, automatic footage indicator, two speeds, reflecting and eye-level finders.

Competent, but not complicated, the "K" is deservedly the most popular 16 mm. movie camera in the world. Price, with $f.1.9$ lens, \$112.50.



**SEE THESE CINÉ-KODAKS
AT YOUR DEALER'S**

CINÉ-KODAK EIGHT is easy to buy . . . amazingly easy to operate. It makes movies at the lowest cost ever. A \$2.25 roll of Ciné-Kodak Eight Film makes two dozen or more sparkling-clear movie scenes, each of which lasts a full 10 seconds on the screen. And that's all you pay because the first low cost includes finishing by Eastman.

Every ounce a movie camera, ruggedly built—simple to use as a Brownie—the "Eight," with $f.3.5$ lens, is priced at but \$34.50.

FREE Complete information about Ciné-Kodaks

Just check the model you're interested in. You'll get all the facts about it—promptly. Send this coupon, today.

Eastman Kodak Company, Rochester, N. Y.

Ciné-Kodak Special Ciné-Kodak "K"

Ciné-Kodak Eight

Name _____

Address _____

City _____ State _____

PM-9-35

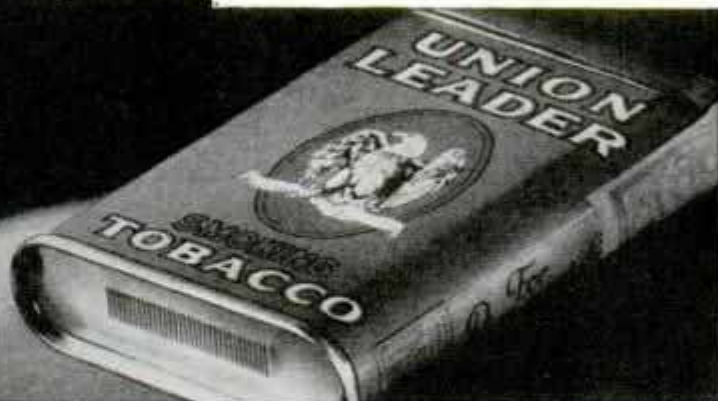
“The smartest **dime**
I EVER SPENT!”



I'VE smoked long enough to feel that I know something about smoking tobacco. But it wasn't until I tried my first tin of Union Leader that I discovered a dime will buy all the pipe pleasure that any expensive tobacco mixture can give.

Fine tobacco is fine tobacco no matter what the price tag reads, and the mellow, *old* Kentucky Burley in Union Leader is *tops* with me. So, why pay more, says I. And I save lots of nickels. (Great in cigarettes, too!)

© P. Lorillard Co., Inc.



GEORGE BRENT, starring in Warner Bros.' picture, "The Goose and the Gander,"
Union Leader smoker since 1925

UNION LEADER
THE GREAT AMERICAN SMOKE

10¢

When writing to advertisers please mention Popular Mechanics

Half an Acre and Independence

(Continued from page 393)

2502

per year—a chicken for every Sunday.

You will need a yard about fifteen by thirty-seven and one-half feet for your goats and a yard of similar dimensions for the chickens, a total of 1,125 square feet. Suppose you provide an area seventy-five by fifty-seven feet for your house and yard, or 4,275 square feet. This makes a total of 20,415 square feet, less than half an acre, in a plot seventy-five by 275 feet.

Feed for your goats and chickens, in addition to vegetable tops and table scraps, will cost you about \$65 per year. Preparing and planting the garden will probably cost \$15, plus nine dollars for supervision.

The yearly food requirements remaining to be purchased for a liberal diet, according to government figures, are 100 pounds of flour and cereals per person, sixty pounds of sugar per person and 165 pounds of meat, poultry and fish per person, from which is subtracted the 125 pounds of meat from the chicken yard. Suppose flour averages four cents per pound, sugar five and one-quarter cents, and meat, poultry and fish sixteen cents.

Then your total yearly outlay for retail purchased food, aside from occasional incidentals, is \$147.75 for a family of five. Add to this the feed purchased for your goats and chickens and the cost of supervising and planting the garden, and the total is \$236.75, or \$47.35 per person per year—less than a dollar a week per person for food. If you include the original cost of the two goats and the chickens—about \$100—your total for the year is \$336.75.

Let's be liberal and allow a whole dollar per day for food for five—\$365 per year. What about the cost of your half acre? Prices vary with location. Since you live in a city now, you probably are employed in a city, so you must select a half acre near transportation to your work. That means a plot on the fringe of the city, probably near or outside city limits, possibly with some improvements available. Suppose we estimate the cost of your lot at \$300. Some locations will be higher, some considerably lower.

By taking advantage of new building materials and methods, you can erect on this lot a five-room, all-metal, well-insulated and thoroughly substantial home for

as little as \$1,750, including the cost of construction. On such a home you can obtain a loan from your bank or home loan company up to eighty per cent of the value of the house.

So if your lot costs \$300, you have an opportunity to erect on it a modern five-room house costing \$1,750, erected, for a cash outlay of \$350, or twenty per cent of the value of the house. Your long-term loan can be liquidated like rent over a period of years, your small monthly payments totaling about \$200 per year.

Now, let's recapitulate. The first year is your big expense year. Your lot cost an estimated \$300, the down payment on your house is \$350, the first year's payments on your loan on the house represent about \$200, and your food bill is \$365—a total of \$1,215. After the first year, food and home payments—about \$565 per year—are your big items of expense. If you add to this taxes, depreciation and upkeep costs, your total expense after the first year should still be less than two dollars per day for food and home payments. And remember that part of this money is going to build up your equity in your home each year.

Is such a project feasible for the typical urban family with an income of \$1,062 per year? It is if the family really desires a home enough to save the small amount needed the first year to launch the venture. After the first year, this average income provides a margin of between \$300 and \$350 above the total amount of food bills and home payments.

Once the lot is purchased, the ground itself can begin to pay for the house by reducing the food bills if it is made into a garden immediately. Thus the initial payment for the house can be augmented by the savings on food if the family income will not cover both the cost of the lot and the initial payment on the home.

As far as finding your half acre is concerned, just travel to the edge of your city and look around. A survey in the Chicago territory last year, for instance, revealed there are 254,000 arable acres within twenty miles of the downtown area. This represents more than half a million half acres, enough to feed 2,500,000 people. The same is true of almost any other American city.

Borrowed Eyes for the Blind

(Continued from page 363)

guide dogs, at street intersections, learn to watch, not the lights, but the traffic itself. They are taught to stop at doors and elevators with noses pointing to the knob or button, to lead their charges through revolving doors and to stop at steps and curbs until ordered to proceed.

The most difficult and most important stage of instruction is the third, when the dog learns disobedience. In this stage, the dog must master the why of her work—she must understand that she is providing the eyes for a sightless man. The instructor gives an order which is obviously impossible. Perhaps he says "forward" when a truck is blocking the sidewalk. Gradually the dog learns that it is the spirit of the command, rather than the word, that is to be obeyed. Thus she comes to think first of the safety of her charge and will ignore an unsafe order or figure out a solution.

When she has mastered all the fine points of obedience, guiding and the proper time for disobedience, she is ready to demonstrate her ability in the blindfold test. Her instructor, blindfolded, takes her on the street and uses her exactly as her future master will. When she can guide her teacher along strange streets, through busy traffic, around puddles, icy bits of pavements, ladders and manholes, she is ready to be introduced to her owner.

But her master is not ready to receive his guide dog until he has undergone a course of training and instruction himself. He comes to the same school from which his dog has graduated and spends a month there with her, learning through practice and instruction how to direct his dog and follow her guidance. The man gradually acquires confidence in the ability of his guide and from the time he is introduced to his dog, the two are inseparable.

The guide dog communicates information to her master through a U-shaped, semi-rigid handle attached to her harness. Her pace is fast, and any slackening of gait is felt through the handle, held in the master's left hand. For a step or any obstacle the dog stops until her master locates it with his foot or cane. If he finds steps, he commands "forward" and she pauses at each one until his foot has found it. At a curb, regardless of the command, the dog

waits until traffic is moving in the direction she is to take before proceeding. For pedestrians, trees and puddles, she leans away from or toward her master and he follows the gentle pressure or pull.

Never has a "Seeing Eye" dog led a master into a serious accident. As a matter of fact, those who have watched one of the dogs leading her blind charge often have observed that the man apparently was in less danger of accident than if he could see. One reason for this is that the dog does not take the chances which a seeing person might. She does not try to beat a light, she does not jaywalk and she does not dash into cross traffic. But she does make good time, for her pace is faster than that of the average pedestrian.

Harsh methods of instruction never are used in teaching or correcting these guides. Such methods would instill fear, break the dog's confidence in herself and rob her of her sense of responsibility. "Phui" is the strongest term employed when a guide makes a mistake during training. She is praised and caressed for each correct act rather than blamed and scolded when she makes mistakes. Thus the greatest reward her blind master can bestow is a friendly pat and a word of praise for a task well done. Like most humans, the guide dog thrives on flattery.

The working life of one of these guides is about ten years, and to breed and train one such animal costs about \$1,000, but the blind master who acquires one of these educated guides is asked by the philanthropic institution which breeds them to pay only \$150 for the dog, the equipment, and the man's tuition, board and lodging during the four weeks of instruction. Many make these payments in small installments over a period of years.

Not all blind persons, of course, can use these guides. Some are too old, some are too young, and some do not like dogs. However, it is estimated that if the dogs could be provided, there are more than 10,000 sightless people in the United States today who would benefit by them. Just as Braille has freed these people in the mental world, these educated guide dogs have proved their ability to free the blind in the physical world.

Ingram's cooler shaves explained by3 COLD FACTS

1

Ingram's softens every whisker right down to the skin line.



2

Tightens the skin; prepares it for easy, scuffless shaving.



3

Cools the shave; prevents burning and after-shave soreness.



The cool shaves men get with Ingram's are directly due to three special ingredients which help shavers these three ways—

1st, whiskers are thoroughly wilted but held erect for clean once-over shaving. 2nd, skin is smoothed and lubricated so your razor can glide in long even strokes. 3rd, the shave is cooled; no stinging or smarting.

Ingram's makes shaves so soothing you'll never need a lotion. And because it is *concentrated* it will make your shaves cost less! Three months of happy shaving from each tube or jar.



TRY THE WORLD'S COOLEST SHAVE *free*

BRISTOL-MYERS CO., Dept. E-95
110 Washington St., New York, N. Y.

I'm in favor of better shaves! Send me the free 10-day tube of Ingram's.

Name _____

Street _____

City _____ State _____

INGRAM'S SHAVING CREAM

When writing to advertisers please mention Popular Mechanics

653 11
TRAINS WITHOUT TRACKS

(Continued from page 372)

roar of the motor is deafening. The driver's hands are in constant motion between the two gear levers and the air valve. Suddenly a light car swings directly in front of the tractor. The truck driver throws the air clear over. On the trailer and semi, brakes lock on the drums. Twenty tons of equipment slide to a crawl.

Outside the traffic zone the speed begins to climb. The speedometer steadies at thirty. The miles roll away. The sound of the motor stops conversation. The road looks level but the driver knows differently. With each change of gradient, imperceptible though it is to the eye, there is an alteration in the sound of the motor. Those subtle changes in rhythm have a meaning to the driver. If the motor is laboring, he shifts into a lower gear; if it is taking things too easy, he slips into over-drive.

At last the tractor swings from the highway and the trailer-train rolls sinuously into the yard of the harbor terminal. The tractor maneuvers for a moment, and by some black magic the rear trailer is spotted with barely a foot to spare on each side. The coupling and air lines are cut and the tractor again swings out and back, and the semi-trailer is spotted. Already the oil drums are being trundled into the light delivery truck which will take them to the waiting steamer.

The driver hands the harbor dispatcher his bills of lading and the dispatcher checks the train in. The teletype beside him reports the arrival of the oil drums to the city terminal.

The driver gets fresh orders and makes up a new train which goes to the company's third terminal, thirty miles away. Day and night the tractors keep on the move. They meet their schedules like clockwork. Each movement of the system is recorded on the teletype.

Occasionally a tractor breaks down but the delay is slight. Another is sent to take its place. No cargo is shifted. It is a matter of coupling on a new power unit.

If every railroad locomotive was permanently fastened to a string of freight cars, the iron horse would never have roamed America. Trucking companies have learned that vital fact. So a new type of heavy transportation has been born—trains that never have known rails.

 6490
PIGEONS OF THE MIDNIGHT PATROL

(Continued from page 378)

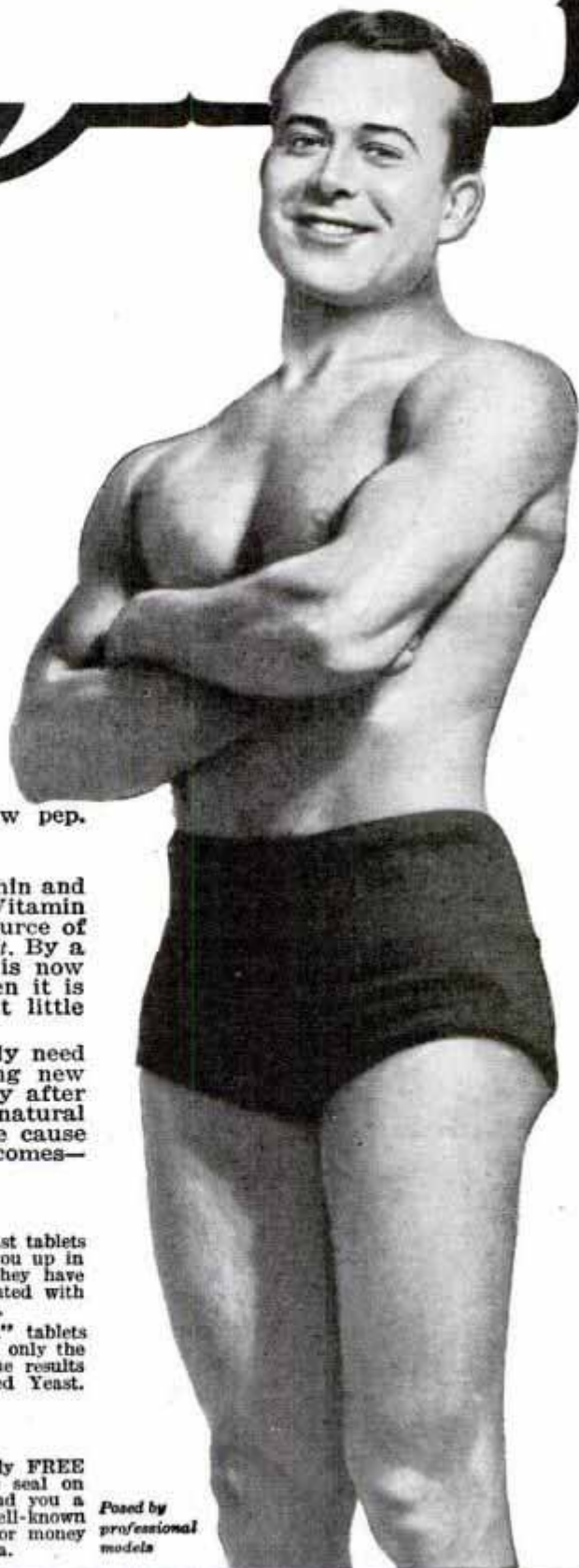
Homing pigeons from one to five years of age are usually faster in flight than old birds, but older birds are more reliable and consistent and the females are more dependable for long, hard flights than the males. Fanciers have discarded the old system of training birds to fly from each of the four directions of the compass during their instruction period. It has been learned that these birds are smart enough to come home from any direction without being trained to do so.

Pigeons are very intelligent and can learn many tricks if you have the patience to work with them. No better example of this can be found than in their ability to overcome their hereditary instinct to settle down at dusk—to keep on flying during the night, in storm and wind and rain. In case of storm these birds have been known to fly 100 miles out of their way to circumvent it.

What makes homing pigeons come home? It used to be thought that electrical currents guided them and this, it seems, is somewhat borne out by the assertion that radio waves affect the flight of homers. But if radio waves interfere with the homing instinct of these birds why do they not also interfere with the migratory instinct of other birds? No one seems to know the answer. The homing pigeon as a messenger carrier is very old. They were used to carry to the distant cities of Greece the names of the Olympic winners and for post service in the time of Napoleon. They brought word of this great general's defeat at Waterloo to the coast of Belgium where it was released by fast boat to England.

Our war pigeons are the result of the World War. It was then that the government set up its lofts. In all about 10,000 birds were used during the war. At the Aisne-Marne battle, the St. Mihiel drive and in the Meuse-Argonne offensive they were used effectively. But few birds were lost and the lives of many men were saved by the silencing of batteries on information of locations brought in by them. Messages are carried in small cylinders attached to their legs. To keep falcons, sent out by the enemy forces, from catching them, whistles are attached to the upper parts of their tails. These frighten away the birds of prey.

**YOU'RE TWICE AS HANDSOME
SINCE YOU GAINED 10 LBS.**



It's a crime to be **SKINNY**

**When Thousands Gain 10 to 15
Pounds This Special, Quick Way**

EVEN if you never could gain an ounce—even if you seem "born" to be skinny and friendless—remember thousands have gained solid, naturally attractive flesh this new, easy way—in just a few weeks!

And not only has this new discovery given great numbers normal pounds, but also a naturally clear, radiant skin, freedom from indigestion and constipation, wonderful new pep.

Sensational new discovery

Scientists recently discovered that thousands of people are thin and rundown for the single reason that they do not get enough Vitamin B and iron in their daily food. Now the richest known source of body-building, digestion-strengthening Vitamin B is *ale yeast*. By a new process the finest ale yeast, imported from Europe, is now concentrated 7 times, making it 7 times more powerful. Then it is combined with 3 kinds of blood-building iron in pleasant little tablets known as Ironized Yeast tablets.

If you, too, are one of the hosts of thin people who only need these vital elements to build them up, get these amazing new Ironized Yeast tablets from your druggist today. Then day after day watch flat chest develop and skinny limbs round out to natural attractiveness. Constipation and indigestion from the same cause quickly vanish, skin clears to normal good looks, new pep comes—you're an entirely new person.

Try it—guaranteed

No matter how skinny and rundown you may be, try these new Ironized Yeast tablets just a short time, and note the marvelous change. See if they don't build you up in just a few weeks, give you new health and new normal good looks, as they have thousands of others. Results are positively guaranteed. If you're not delighted with the benefits of the very first package, your money will be instantly refunded.

Only don't be deceived by the many cheaply prepared "Yeast and Iron" tablets sold in imitation of Ironized Yeast. These cheap counterfeits usually contain only the lowest grade of ordinary yeast and iron, and cannot possibly give the same results as the scientific Ironized Yeast formula. Be sure you get genuine Ironized Yeast. Look for "IY" stamped on each tablet.

Special FREE offer!

To start you building up your health right away, we make this absolutely FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body," by a well-known authority. Remember, results are guaranteed with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 539, Atlanta, Ga.

Posed by
professional
models

UNRULY HAIR

*-Now Neatly
Combed*

**Costs but a few
cents to use—**

IS YOUR HAIR difficult to keep in place? Does it lack natural gloss and lustre?

It is very easy to give your hair that rich, glossy and orderly appearance so essential to well-groomed boys. Just rub a little Glostora through your hair once or twice a week—or after shampooing, and your hair will then stay, each day, just as you comb it.

Glostora softens the hair and makes it pliable. Then, even stubborn hair will stay in place of its own accord.

It gives your hair that natural, rich, well-groomed effect, instead of leaving it stiff and artificial looking as waxy pastes and creams do.

Glostora also keeps the scalp soft, and the hair healthy by restoring the natural oils from which the hair derives its health, life, gloss and lustre.

A bottle lasts for months

Try it!—See how easy it is to keep your hair combed—any style you like—whether parted on the side, in the center, or brushed straight back.

A bottle of Glostora can be bought for a trifle at any drug store and will last for months.



Glostora
FOR THE HAIR



DOING IT BACKWARDS

(Continued from page 383)

6464
a stick. At first it is packed and hard to stir but as you keep on the dry powder becomes fluffy and the faster you stir the easier the work becomes. Should you now pour the dry cement on the floor it flows out over a large area like water. This semi-frictionless movement of the dry powder is due to the small amount of entrained air that literally lubricates the dust particles. So this man built a pump, lubricated the dry dust with an infinitesimally small amount of air and pumped the dry powder over hill and dale. Last year almost a million tons of dry powder were pumped in this way.

In Alaska there are vast areas of gravel beds that contain free gold in the form of nuggets and dust. But the ground was frozen hard the year around and made mining so expensive that profitable operation was out of the question. They tried steam jets to thaw out the ground, and they tried hot water and then someone asked: "Why don't you run cold water over the ground and thaw it out?" They tried it and it worked—even better than hot water. Today a large part of Alaska's gold production results from this reversal of the natural order.

Many other industrial processes are only reversals of the older order. In the chemical industries we put in impurities to get out impurities. We pump sulphur from the bowels of the earth by melting the sulphur first with steam. We pump metals like they were water. The ingenuity of man finds its highest expression in this, the ability to reverse the natural order.

This little experiment will show you how simple it is to do the impossible. Try to make an ordinary cube of sugar burn with a match. The sugar just turns black and melts. Now touch the melted portion on your cigar ashes and try again. The sugar will burst into flames. So when you are stuck with your problem, keep trying—try anything. Try reversing the natural order.

¶ Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

FIGHTING FIRES WITH PHOTOGRAPHS

(Continued from page 357)

combustible materials, and the floor above, shut off by an all-metal covering, were introduced in court in fighting the claim.

Three restaurant partners entered into a conspiracy to set fire to their business to collect the insurance. One of the trio saturated the fixtures with gasoline but allowed the fumes to accumulate before igniting the fuse and was knocked unconscious and perished in the fire. The photographs brought out the force of the explosion and startling details that sent the other two partners to prison.

Possessing a flair for details, McElroy often gets a picture that surprises even the most experienced insurance adjuster. While digging around in the smoldering ruins of a factory basement, he noted the stem of a gate valve was not protruding from the controlling wheel on the sprinkler system, indicating it to be closed. The valve indicators substantiated this and, to strengthen the point, he made a picture of the sectional valve marked "shut." These pictures were used to discredit testimony that the sprinkler was on during the fire.

Fire pictures also save insurance companies thousands of dollars where unscrupulous merchants try to drag undamaged stock through mud and water to collect the insurance. Pictures made at the time of the fire in the store where it occurred or in adjoining ones that might claim water losses helped to discourage this practice.

McElroy operates with all the speed and efficiency of his newspaper contemporaries. He got pictures of the Chicago stockyards fire, making a shot of its originating location six minutes after the alarm box had been pulled. It was used in the official report of the board of underwriters. His most dangerous shot was made in an Indiana electrical substation when he had to climb around some 132,000-volt transformers to get a shot of a coil that had broken down electrically. The flooring of a two-story house gave way under him once but he escaped injury. On another occasion, the explosion of his flashlight powder brought part of a crumbling brick wall down but he jumped to safety.

The only trouble, McElroy says, is that fires today are not as interesting as when they were just a hobby with him.

AMAZING INVENTION SAVES 50% ON MOTOR OVERHAUL

PERFECT CIRCLE PISTON EXPANDERS

Stop Piston Slap—Save Gas
and Oil—Can Be Installed
by Any Good
Mechanic



Showing Perfect Circle Piston Expander Being Installed in Piston

● You need no longer dread the expense and labor of overhauling your motor. Perfect Circle motor reconditioning gives you new-car performance and economy, at HALF the cost of the old-style overhaul!

After 20,000 or 25,000 miles, aluminum pistons usually are worn and distorted—no longer deliver maximum efficiency. Simply install Perfect Circle Piston Expanders—piston slap disappears—pistons are restored to their original shape and fit—are good as new. No cylinder resizing—no new pistons... You'll want new Perfect Circle Piston Rings, too. Oil pumping will stop—you'll have new-car pep and economy—and save 50% of regular overhaul cost!

Any good mechanic can install Perfect Circle Piston Expanders and Rings. Mail coupon for further information.

INDIVIDUALLY DESIGNED
AND ENGINEERED FOR
THE FOLLOWING CARS:

Auburn 8	Ford A-B-V-8
Chevrolet 4	Graham 6-8
Chrysler 4-6-8	Hudson 6-8
DeSoto 6-8	Nash 6
Dodge 4-6-8	Pierce-Arrow 8
Essex 6	Plymouth 4-6
Terraplane 6-8	Studebaker 6-8
	Whippet 4-6

THE PERFECT CIRCLE CO., Dept. M
Hagerstown, Indiana or Toronto, Canada

Gentlemen: Please send me full details and prices on the Perfect Circle Method of Motor Reconditioning.

Name.....

Street.....

City and State.....

Make and Model of Car.....

CHAMPION OUTBOARD RACER



WOOD IN CANS

For covering countersunk screws, loose bolts, dented stems, transom rot, imperfect blank edges, splintered plank ends, stem rot, spar check, gasket for setting propeller stuffing boxes, knot holes, and 1001 other uses.

For Permanent Repairs use the «Genuine»

Genuine Plastic Wood handles like putty, when dry it can be planed, sawed, sanded, turned on a lathe, will hold nails, screws—will adhere to any clean dry surface, wood, metal, stone, glass or porcelain. Genuine Plastic Wood is waterproof, weatherproof and greaseproof—takes paint, varnish and lacquer perfectly.

Get your can or tube of Genuine Plastic Wood at all leading Paint, Hardware or Department Stores.

Albany to New York Marathon Outboard Winner, Fred Jacoby and his "Flyaway."

Genuine **PLASTIC WOOD**

Electroplating with Gold & Silver

and other plating information in Shop Notes for 1933. Illustrated. 50 cents, postpaid.

Popular Mechanics Press, 200 E. Ontario Street, Chicago

AMAZING AUTO COMPASS



Don't lose time and money by taking the wrong road and going many miles out of your way. This new AIRPLANE TYPE COMPASS constantly tells your direction of travel. Sticks to windshield. Base 1 1/4" diameter. ONLY \$1.95 POSTPAID, including Compensator. SATISFACTION GUARANTEED.

If your dealer cannot supply you, order direct.

HULL MFG. CO., Box 245-D, WARREN, OHIO

BILLIARDS—AND HOW TO PLAY IT

(Continued from page 367)

"A" course is the result of left-hand English; "B" when no English is used, and "C" the result of English on the right-hand side. If the cue ball is twisting, it will naturally throw the object ball to one side.

Combinations are more complex. In the left figure on page 366 combinations with balls frozen and spread apart are indicated. The lines show you where the point of contact is on each ball on shots A and B. For a frozen ball combination, shot C explains the direction the ball takes according to where you strike the first object ball. The two object balls are lined straight for the edge of the pocket. No English is used in any of the variations of this shot. If you hit the first object ball one-fourth full to the right, you will force the ball you intend to pocket into the side rail. When you hit the first ball center, the second one goes straight to the edge of the pocket as shown by line two. To pocket the ball, hit just a trifle to the left of center. Hitting one-fourth full to the left will cause a miss as shown by line four.

NOISE TREATMENT FOR MILK MAKES IT DIGEST EASIER

Milk is affected by noise, and experiments at the University of Pennsylvania have demonstrated that it can be made more digestible by a sound treatment. Dr. Leslie A. Chambers of the university caused a thin stream of milk to flow over a heavy steel diaphragm while it was made to vibrate strongly. The mechanism was similar to the type used for submarine signaling. Its lowest vibration rate was 360 cycles a second, the pitch of F-sharp at the middle of a piano keyboard, and the highest 3,000 cycles, three octaves higher. The sound caused the milk, when acted on by stomach pepsin, to form a soft, easily digested curd while milk normally formed a hard curd. The experiments developed a simple mechanical method of making soft-curd milk.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

10" WOOD WORKING LATHE



S K F Ball-Bearing Head
36" Between Centers
100 Lb. Weight **\$21⁷⁵**
Less Motor

A real master wood-working lathe, with which you can do work to be proud of. Very heavy construction of seasoned cast iron. Bed, 50 inches long, cross-braced every 5 inches, is absolutely rigid. Ways are integral with bed. Extra heavy, wide headstock. Hollow steel spindle, threaded both ends, lets you turn large diameters (table tops, etc.) over the end of the bench. Speeds 700, 1300, 2300 and 4000. SKF ball-bearings both sides of spindle drive pulley. Motor can be mounted either below or back of lathe. Hand tool rest 12" long.

ATLAS DRILL PRESSES
\$13.95 to \$33.45
Less Motor



INDEXING MECHANISM

For dividing, fluting, etc., on your lathe, there is an indexing mechanism consisting of 60 holes in the face of the spindle pulley, in which engages a pin which goes through the headstock. You can divide accurately into any number of sections divisible into 60. Write for copy of NEW catalog describing wood lathes, metal lathes, drill presses, etc.

ATLAS PRESS CO.

1843 N. Pitcher St. Kalamazoo, Mich.

Complete display in Chicago at

ATLAS SALES CO., 35 E. Wacker Drive

ATLAS QUALITY
Shop Equipment Since 1911



Systematic Care of Tools Makes your Work Easier. Free Catalog for Machinists and Toolmakers shows how.

GERSTNER TOOL CHESTS

445 Columbia St., Dayton, Ohio

BURN YOUR NAME ON TOOLS

WITH THE
ARKOGRAF

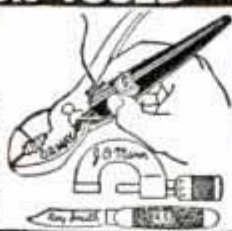
PROTECT YOUR TOOLS FROM THEFT

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—Prepaid Anywhere.

Interesting Illustrated circular free. Write today.

Agents wanted. ARKOGRAF PEN CO., 3927 S.E. Stark St., Portland, Ore.



BUILD IT YOURSELF

JIM DANDY CABIN TRAILER

Classy! Roomy! Easy to build at low cost! Plans and instructions only \$1.00—includes all Diagrams, Sketches, Photos, Material List, etc.—Big Value! Mail Dollar Bill to Jim Dandy, Box 125-A, Wausau, Wis.



Catch Fish!

Fels, Mink, Muskrats, with our new folding galvanized STEEL

WIRE TRAP. Write for our FREE TRAP OFFER and Bargain Catalog. \$1 Box of our famous Fish Bait FREE to introduce our traps. WALTON SUPPLY CO., 3509 JUNIATA AVE., ST. LOUIS, MO.



ENGINES

DIESEL-GASOLINE-KEROSENE
 Enclosed • Self-Oiling • Roller Bearing

A size and style for every purpose. Most economical power for farm or factory. Put one to work and watch it pay for itself. Sold Direct from Factory to You! Write today for FREE Catalog and Literature.

WITTE ENGINE WORKS
 1746 Oakland Ave., KANSAS CITY, MO. 2151 So 2nd St., HARRISBURG, PA.

IS YOUR CAR ALWAYS READY TO GO ?

A friend of ours, without meaning to be, is an "original model" for practical economics.

He is an independent taxi owner in New York. Owns an old cab, with over 110,000 miles on it. But there is one thing about him—he is always on the job, rain or shine, snow or sleet, and in the same cab.

We asked him the other day how he did it, and this is what he said (with certain modifications of expression):

"This is a tough job in which to make a living. The only way I have of getting cash is with this cab. In spite of slim pickings, I'll bet I pay more for oil than most cabbies; but it's worth it, because I found out long ago that repair bills can eat up the profits.

"I've used Quaker State Motor Oil for years. Hear that motor? Well she won't turn over more than 45 on level ground any more—but, boy, I won't trade her in until the body falls apart. She's one sweet engine.

"Believe me, I've got to keep on the job and out of the repair shop—and I know Quaker State helps me do it."

The problem of keeping the motor car ready to run at any and all times confronts every owner. A large group of experienced motorists has discovered that the regular use of Quaker State Motor Oil and Superfine Lubricants is a practical and economical way to accomplish this. If you would like to enjoy this same satisfaction in owning a car, start today to use Quaker State. Quaker State Oil Refining Co., Oil City, Pa.

"First choice of Experience"
**QUAKER STATE
 MOTOR OILS**

35¢ per quart

When writing please mention Popular Mechanics

Million-Milers of the Air

(Continued from page 405)

United States, flew the inaugural passenger trip of Stout Airlines from Cleveland to Detroit and has 12,000 hours in the air.

Charles Peeples is an old army flyer who turned mail carrier. Shoving north from Dallas a few years ago in a mail plane, he encountered bad weather as he neared Oklahoma City. Land visibility dropped to zero and his retreat was cut off. He knew he was in the vicinity of Oklahoma City but the fog prevented him from landing, so he stayed aloft and flew by instruments until his fuel was nearly gone. Those were the days before radiotelephones and radio beacons, but the ground crew at Oklahoma City heard his engine and dotted the airport with all the flares they could find. Peeples decided to make one more attempt to land, then bail out. Watching his instruments like a hawk, he descended until he sighted flares through the fog. Much to his surprise he set down in the center of the airport.

Heber Miller, another million-miler, and his single-engine mail plane, had a less thrilling but more amusing experience with fog on the west coast several years ago. Miller was flying mail from Portland to Los Angeles and arrived at Vancouver airport, near Portland, one morning to find the field effectively masked by fog. A telephone call to a weather station on a high elevation near Portland brought information, however, that the top of the fog was only 1,000 feet above the ground. Miller decided he could take off, climb over the fog and proceed on his way.

He taxied out on the field to line himself along the runway for the take-off. The fog was so heavy, however, that he lost his sense of direction and soon stopped to get his bearings. The ground crew started after him in a truck but soon they too were lost in the murk. For the next hour the ground crew hunted aimlessly for Miller or the hangar and found neither. Miller, meanwhile, sat in his cockpit with his motor idling, occasionally shouting for some help from the ground personnel. Then the fog suddenly lifted, revealing Miller and his ship at one end of the runway and the ground crew still wandering about at the other end.

Richard Lee Dobie boasts more hours of

flying exclusively with United than any other pilot. His total is 8,000 with this line and 2,500 more hours before he joined the air-mail service. In his own estimation, his prize accomplishment occurred many, many years ago.

"I once led a formation of 105 'Jennies' at Kelly field," he explains. "In those days that seemed to me to be a whole sky full of airplanes. Today all I can think of is the immense amount of baling wire in such a mess of ships."

While the million-milers are the aces and rate as the veterans, the other pilots on the line boast air mileage ranging from just under the million mark to a little less than half a million miles, the average for all United pilots being 7,000 hours.

The pilots today have much easier jobs than were the lot of those first mail flyers, as any million-mile pilot will tell you. Let's let Jack Knight, who participated in that first day-and-night flight fourteen years ago, compare his flight then with a trip over the same route today.

"On that first night flight," says Knight, "I flew a single-engine DeHaviland equipped with just a few instruments. I had no night-flying apparatus, no radio, no directive beam, no airway lighting.

"Today I fly that same route in a twin-motor transport with two 550-horsepower engines, each capable of sustaining the plane in flight. In the cockpit are more than a score of instruments and devices to make navigation a science instead of a guess. I have powerful landing lights and flares in case I want to come down on one of the scores of emergency fields dotting my path. Instead of bonfires and flares, there are signal lights and radio beams. Instead of being isolated, I talk by radiotelephone with ground stations whenever I wish. I can't get off the course because the radio code signals keep me headed right. I know what the weather ahead is before I start and if it changes after I leave the ground, I get reports by radio.

"It may have been a lot more exciting to fly in the good old days, but I'll take things as they are today in preference to the good old days any time. And so, I guess, will the passengers, in the comfortable cabin, who ride with me."

Measurements 300 times finer than a human hair

EVEN though automobile parts are produced by highly developed methods on special machines there is only one way to insure their accuracy. That is by careful inspection.

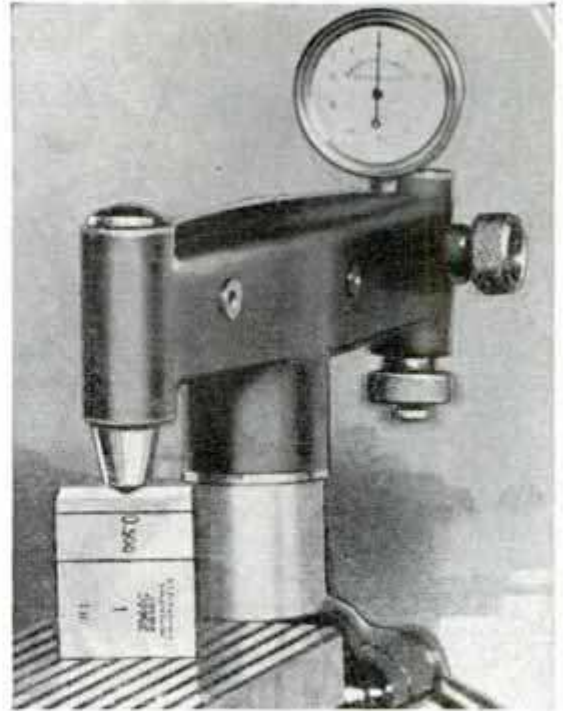
For the inspection of Ford parts many of the gages used are of the amplifying type with each graduation on the dial indicating one ten-thousandth part of an inch. The precision of the parts can be no greater than the accuracy of the gages used to inspect them. Because of this all Ford inspection gages are checked by Johansson Gage Blocks—the world's standard of measurement and the most accurate system known.

These gage blocks are accurate within a few millionths of an inch. It is possible to measure with them in hundred thousandths of an inch—that's approximately 300 times finer than a human hair. They are manufactured by the Johansson Division of the Ford Motor Company and are used by scientific laboratories and all industries where precision is a requisite.

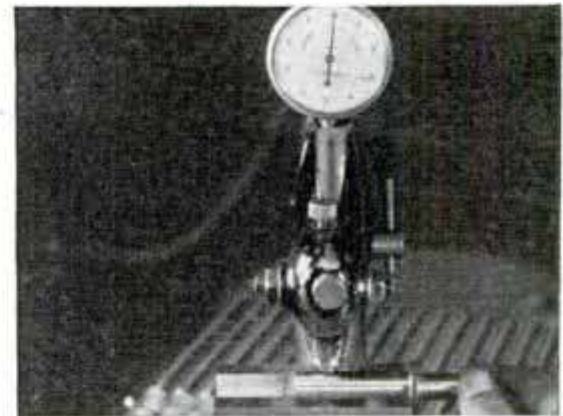
Many of the tolerances now held on Ford parts were considered impossible for large production until just a few years ago. At that time limits of one-thousandth of an inch were considered close. Many Ford limits have been cut to one-tenth of this. Piston pins and piston-pin holes are but two examples where tolerance is within one ten-thousandth of an inch.

Holding to such close tolerances increases costs because all machines and tools must be kept in first-class condition to produce parts that will pass the rigid Ford inspections. In spite of this, the price you pay for Genuine Ford Parts is consistently low.

There is only one standard of limits established for Ford parts regardless of whether they are for production or for replacement. That's why you can depend on Genuine Ford Parts to fit as accurately and function as efficiently as the original parts.



This shows how the accuracy of an Amplifier Gage is checked with Johansson Gage Blocks.



An Amplifier Gage being used to inspect Water-pump Shafts.



Special Amplifier Gages are used to inspect Connecting-rod Bearings.

**FORD MOTOR COMPANY
DEARBORN, MICHIGAN**



When writing to advertisers please mention Popular Mechanics



A DIRTY or clogged radiator overheats the motor, robs power, wastes money. It's unnecessary. Sani-Flush removes rust and scale from radiators. Not caustic. Cannot harm aluminum cylinder-heads or cooling-system. You can use it in a few minutes for a few cents.

Simple directions are on the can. Clean your radiator twice a year with Sani-Flush. Sani-Flush is used in thousands of homes to clean toilet bowls. Sold by grocery, drug, and hardware stores—25c and 10c sizes. The Hygienic Products Co., Canton, Ohio.

Sani-Flush KEEPS
RADIATORS CLEAN—NON-CAUSTIC

WEAVING MATERIALS BAMBOO
RATTAN
Reed, Colored Raffle, China Grass, Chair Caning, Chair Frames and
Stools, Basketry and Furniture Weaving. Send 10c for Catalog. In-
structions Free. **AMERICAN REEDCRAFT CORPORATION**
Dept. P 130 Beekman Street New York, N. Y.

LUNCHEE

STOPPED IN ONE MINUTE

Are you tormented with the itching tortures of eczema, rashes, eruptions, or other skin afflictions? For quick and happy relief, use Dr. Dennis' cooling, antiseptic, liquid D. D. D. PRESCRIPTION. Its gentle oils soothe the irritated and inflamed skin. Clear, greaseless and stainless—dries fast. Stops itching instantly. A 35c trial bottle, at drug stores, proves it—or money back.

D. D. D. Prescription

WHAT'S NEW IN THE MOVIES

(Continued from Coloroto Section)

skydrop, from the exterior, looks like an enormous tent surrounding the entire set. It furnishes the "sky" against which "outside" shots are made. Often the lower parts of these drops are painted into backgrounds, perhaps of a city, a country skyline, mountains or the oceans with ships. In front of the painted background drops are placed silhouettes of painted canvas stretched over light wooden frames to blend foreground and background and to give perspective. These silhouettes may be in the form of ships, office buildings or whatever may be required to carry the scene into the distance. In the Hawaiian set in "Flirtation Walk," palm trees only eighteen inches high were used to obtain the effect of distance. And in "Man's Castle," a silhouette of New York's skyline and a miniature Brooklyn bridge, with tiny electric trains running across it, combined to give the effect that squalid shacks really lay in the shadow of Manhattan.

In one picture, a man's head had to be transformed gradually and convincingly into that of a donkey. It was done by making a plaster cast and then life-size molds of the actor's head to which various features of the donkey were added by degrees. At each step, liquid rubber was blown on the casts or molds and when it dried, rubber masks were made representing the various stages. Finally the donkey's head was ready on a mold that fitted the actor's head. It was set with teeth and equipped with springs to work the lips and ears as the actor talked. A series of springs and saddles did the trick, one saddle fitting under the player's chin and two more at the corners of his mouth, with strings leading to weights and springs that operated the jaws and lips of the donkey head.

Supplying black fog was another problem encountered in "A Midsummer Night's Dream." Already the fog machine had been devised to blow an extremely fine mist, but it was so fine that no coloring would show. The solution was to rub a mixture of vaseline and lampblack over an extra lens and shoot through it.

So rapidly do new developments occur in the movies that little effort is made to patent the inventions of the technical departments. Instead, the experts are always preparing for new problems.

NEW TYPE CHEAP OIL BURNER

COOK and BAKE Without Coal or Wood

Slips into Any Old Stove, Range or Furnace. No Ashes, Dirt—Twice the Heat, HALF THE COST.

COOKS A MEAL for 1¢

Beats any oil burner ever gotten out for low cost, perfect performance. Slips into any old stove, range or furnace; burns cheap oil a new way, without generating or clogging up. Intense heat instantly by Simple Turn of Valve.

Try At Our Risk 30 DAYS' TRIAL

Prove it ends drudgery and dirt of coal or wood; cuts fuel bills in half, pays for itself quickly by what IT SAVES.

FREE SAMPLE FOR AGENTS

offered to one energetic man or woman in each locality who will demonstrate and take orders. Write quick, be first to learn how to make REAL MONEY right now, spare or full time—mail 1c postcard today.

UNITED FACTORIES, L-751 Exchange Bldg., Kansas City, Mo.

Quick Heat at TURN OF VALVE

AGENTS Salesmen BIG MONEY

It's sweeping the country. Clark of Ind., sold 93 in 30 days. O'Tools of Mass., sold 164 in July. Get YOUR OWN oil burner FREE and make REAL Money. Write quick.



COOLER KITCHEN IN SUMMER

LOG SAWS

MAKE MONEY—BE YOUR OWN BOSS
Turn Your Trees Into Cash

Be independent, start a wood sawing business, have money coming in all the time. Use the portable engine year 'round. Pays for itself. Low factory prices. Big FREE Catalog.

WITTE ENGINE WORKS
6746 OAKLAND AVE. KANSAS CITY, MO.

BIG 1935 LEADER

Genuine Leather Ties, 4-In-Hands and Boys'. Beautiful new stripes and plaids. Look like silk. Cleaned with a damp cloth. Durable; won't wrinkle. SELL ON SIGHT. Big profits; repeat orders. Be independent; have your own business. Young man sold 23 one night after school. No sales ability needed. Send 50c or stamps for sample and kit. Information free.
CENTURY TIE CO., Dept. 2, 2333 W. Grand Blvd. 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.

DRIVER POWER TOOLS

Make furniture, toys and novelties in your spare time. Earn extra money. Easy to operate. You can start a show for \$10.00. Mfrs. of Lotion, 216 Saw, Band Saws, Drill Presses, Planers and Bench Saws. Write for Free 49 Page Catalog. Walker-Turner Co. Inc., Dept. 25, Plainfield, N. J.

Print Your Own

Cards, stationery, circulars, tags, labels, advertising, etc. Save money. **Print for Others; Big Profits;** easy rules sent. Will do popular Raised Printing Like Engraving. Junior press \$5.90, job presses \$11 up, power \$149. Send for free catalog and all details. **THE KELSEY COMPANY, B-37, MERIDEN, CONN.**

WILL YOU WEAR THIS SUIT

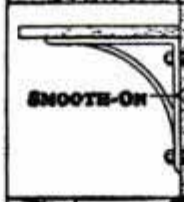
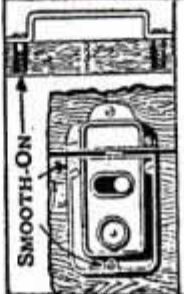
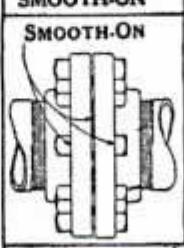
and Make up to \$12 in a Day!

Let me send you this fine all-wool tailored suit **FREE OF COST**. Just follow my easy plan and show the suit to your friends. Make up to \$12 in a day easily. **No experience—no canvassing necessary.**

Send for **Samples—FREE OF COST**. Write today for **FREE details, ACTUAL SAMPLES** and "sure-fire" money getting plans. Send no money. **H. J. Golin, Progress Tailoring Co., Dept. W-216 500 S. Throop St. Chicago, Ill.**

YOU NEED THIS FREE HOME REPAIR BOOKLET

Contains diagrams and simple instructions for emergency and routine repairs that every home and auto owner can and should make himself. Revised edition, greatly enlarged and completely rewritten. Get a copy for your workshop.



Be thrifty—do your own work—and keep the money otherwise paid to plumbers, repair men and for new parts.

With Smooth-On No. 1, you can stop leaks at joints, seams and cracks in pipes, boilers, heating systems, tanks, pails, auto radiators, water jackets and crank cases, tighten loose parts, reset stripped screws, bolts and nuts, and make dozens of other equally practical repairs—all at almost no cost, and in emergencies without the delay of waiting for outside help.

Smooth-On No. 1 is applied without heat or special tools, hardens into metallic iron and holds permanently under any pressure and on any metal, masonry, wood and tile. Leading power and industrial plants have used it for 35 years, and with this new booklet as a guide, you can make equally successful applications.

When you know where and how to apply Smooth-On No. 1, you will make constant savings. Be prepared. Ask us for the booklet and buy Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. can from your hardware store.

Do it with SMOOTH-ON

SMOOTH-ON MFG. CO., Dept. 37
574 Communipaw Ave., Jersey City, N. J.
Please send the free Smooth-On Repair Book.

Name.....
Address.....
9-35.....

8591
BULLETS OF THE FAIRWAY

(Continued from page 401)



This Girl Is Weighing Each Paste Center Carefully Before It Is Approved for Use

for making rubber golf-ball thread from the natural milk of the rubber tree. The company claims it is the first real advance in the process of manufacturing rubber thread since it was originally developed 100 years ago. The liquid rubber milk is forced through a nozzle into a coagulating bath which solidifies it. It is then dried and cured and is ready for use.

The covers of golf balls are made of either tjiptir or balata—both forms of rubber tough enough to take a lot of punishment and resilient enough to transmit the liveliness of the thread underneath.

A ball is in contact with the club head for one-five-thousandths of a second and in the cover markings of the standard golf ball designed by the ballistic experts there are 336 recesses. As the ball is leaving the face of the driver its traveling speed is approximately 167 feet per second. Mathematicians have figured the odds against making a hole-in-one are 107,510 to one, but Mike Brady scored two holes-in-one during one round at Buzzards Bay some years ago and another man made two successive holes-in-one in 1921 on a golf course at Newport, R. I.

 8687
FARMING BY MAGIC

(Continued from page 343)

A new and increasing theme in most types of modern farm tractors is the use of rubber tires in place of metal wheels or lugs. Machinery manufacturers name several reasons for the change—low-pressure tires grip more dependably upon more types of loose soil; to gain the necessary traction rubber tires do not compress or roll the soil, the equipment can be driven on roads and pavements without legal violation; tire replacement is not expensive because in field use the tread is not worn by skidding as is inevitably the case on hard-surface driving.

There is also an outstanding tendency toward fewer and sturdier parts for farm tractors. Costs continue to be cut by feeding with cheaper fuels. Steering gears are becoming as easy to operate and as efficient as those of the best automobiles. Four forward speeds have come into vogue. Oil and dust filters, force-feed lubricating systems, automatic oilers, crankcase ventilators, hydraulic power lifts, differential brakes, mufflers and changeable wheel rims varying with traction needs are becoming routine features of the once noisy farm tractor.

American mechanical genius continues to make rapid strides in the harvest of corn, our three-billion bushel crop. There is the automatic corn picker, capable of picking and husking from ten to twenty acres of corn a day. This is strictly a one-man outfit. A tractor draws the harvester and the wagon or truck beside it. The new corn binder cuts and stacks from ten to fifteen acres of cornstalks a day. Power-driven blades cut the stalks about a foot above the ground, automatic bundle-carriers and elevators load them into accompanying wagons or trucks or drop them in uniform stacks. The automatic stalk converter, a sort of lengthy and glorified lawnmower, hitches behind the tractor and cuts stalks, stems or other crop litter left in the field after harvest into fine bits, which decay and therefore save annoyance in next season's plowing.

Three men operating the new types of mechanical corn shellers can shell corn grain from the cobs at the rate of 125 to 200 bushels an hour. Corn ears are fed into the machine by gravity, and the ma-

(Continued to page 135A)

Soon.. New "DELTA" Tools for Woodworking



Delta engineers continue their steady year after year development and pioneering of new tools and new improvements in the motor-driven equipment field. Important announcements will be released shortly that will be of great interest to all Homecrafters. If you are contemplating additions to your shop—be sure to see the 1936 Delta line which includes **Circular Saws, Jointers, Scroll Saws, Drill Presses, Band Saws, Routers, Lathes,** and a complete assortment of attachments.

1936 Catalog Will Be Out Shortly..

Within a short time the 1936 catalog of Delta quality tools will be off the press. It is crowded with photographs and information about the new line of 1936 Delta tools. It contains much valuable information that every man interested in wood-working tools should have. It shows how Delta tools are built to stand the grind of production work, and yet are so low priced as to be within the reach of all, how they save time, money and labor—and quickly pay for themselves.



NEW BOOK for Woodworkers

32 page book "Practical Delta Projects"—crowded with new and "out of the ordinary" things to make—with numerous working drawings, photographs, and easy-to-understand illustrations. Simple, complete instructions make every project easy to follow. Every woodworker should have this book. Send only 10 cents with coupon. Book and 1936 Delta catalog, will be mailed postpaid.



Mail Coupon Today

So your name will be placed on the mailing list to receive the 1936 Delta catalog without delay. Enclose only 10 cents at same time for Book of Practical Delta Projects, 32 pages of new and novel things to make, with numerous blue prints, working drawings, photographs and illustrations—and complete directions.

DELTA MANUFACTURING CO. Dept. A735, 600-634 E. Vienna Ave., Milwaukee, Wis.

DELTA MANUFACTURING COMPANY, Dept. A735
600-634 E. Vienna Ave., MILWAUKEE, WISCONSIN

I enclose 10c (stamps or coin), for which please send me one copy of "practical Delta Projects". Also place me on your mailing list to receive 1936 Delta catalog of quality motor-driven woodworking tools.

Name..... Age?.....

Address.....

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

100 PAGE BOOK No. 8

It is full of beautiful things that you can easily make—hard to find material such as foreign woods—lovely crotch, butt, burl, fiddleback, etc. Veneers, panels and Solid Woods. Lists and illustrates 76 Blue Print Designs for Scroll Patterns, Inlay Table Tops, etc.

CRAFTSMAN WOOD SERVICE CO.

We Ship All Over the World

2726 MARY STREET CHICAGO

NEW ONE-WHEEL TRAILER

Attaches at two places to car, making car and trailer one unit. SWIVEL WHEEL at rear. Backs up straight with car. NO SIDE SWAY. Aircraft tire. Coil spring eliminates jolts. Most simple, practical trailer for pleasure car owners or delivery purposes. Write for literature.

MONO-WHEEL TRAILER CO., 411 So. Fort St., Detroit, Mich.



Automatic Air Service

\$12 MONTHLY

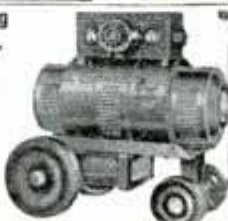
This dependable outfit brings business right to your door. Extra profits from grease, oil, gas will pay for it. Upright, beltless, space saving, fully automatic. Our liberal trial plan lets you see how profitable it can be, before you buy. Ask for details.



8 Hr. Battery Charging

ONLY \$10 MONTHLY

Earn \$50 to \$100 monthly profit with this charger. Puts your shop above competition. Cuts electric bills in half—no expensive bulbs to replace. Recommended by leading battery makers. Liberal Trial at our expense. Ask for details.



Electric Arc Welding

EASY MONTHLY TERMS

You can earn \$300 to \$400 monthly profit on garage and general repair work with Simplified Arc Welding. No special experience required. Electric, gas engine or belt drive. 30 Days Trial—at our expense to prove its profit making ability. Write for details.



20 Minute Car Washing

\$10 MONTHLY

Big profits washing cars. Saves two-thirds time, does better job. Saver pay for it. Tear out and mail this ad, checking items of interest to

HOBART BROS.

Box M95
TROY, OHIO

DOUBLE YOUR PROFITS... 30 Days Use to Prove it NO INVESTMENT TERMS Write Today

Good Old POP!

He works while you sleep!



He burns the midnight oil, catching up with office work, typing out new ideas to show the boss, getting ahead... and he never disturbs you. Pop's smart... he's got a

CORONA SILENT

The finest portable made; it's "got everything." Yet you can buy it brand-new for as low as \$5.00 per month—or the fine CORONA STANDARD for only \$1.00 per week. Send coupon for booklet. Ask your dealer about these amazingly liberal terms.



CORONA SILENT

MAIL COUPON TODAY.

L C Smith & Corona Typewriters, Desk 9
723 E. Washington St., Syracuse, N. Y.

Please send Corona booklet, also tell me where I can arrange free trial.

Name.....

Street.....

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



FREE FALL CATALOG

Just Off the Press

Showing Hunting Footwear, Clothing, and forty other leather and canvas specialties of our own manufacture for campers and hunters.

L. L. BEAN, Inc.
Mfrs.
100 Main Street
FREEPORT, MAINE



Air Tires or Steel Wheels

GET YOUR

TRACTOR AT FACTORY PRICE

3 Speeds
Forward and Reverse.
Runs 4 to 8 hours
per gal.

Amazing money maker for farms, truck gardens, orchards, nurseries, poultry ranches, country homes, etc. Plows, discs, harrows, cultivates, mows lawns, cuts weeds, runs belt machinery, 1 to 5 H.P. riding or walking types. Write for **FREE CATALOG**, Low Factory Prices and 10 Day Trial Plan. Address Nearest Office.

SHAW MFG. CO. Desk 4509
Galesburg, Kans. or Columbus, Ohio
or 5812 Magnolia Ave., Chicago, Ill.

SHAW DU-ALL TRACTOR



LOOK MEN

MAGIC CASE HANDS YOU LIGHTED CIGARETTE

Take a beautiful enameled Case from your vest pocket. Press a magic button! Automatically there is a spark, a flame. A LIGHTED Cigarette is delivered to your lips. You PUFF and SMOKE. A revolutionary invention, perfected, guaranteed, amazingly low priced. Get it Magic Case for 15 Days' Trial at our risk.

AGENTS!
Big Profits—Easy—Quick! New—No-Selling—Plan starts you. Get trial offer.

MAGIC CASE MFRS., Dept. M-370
4234 Cozens Ave. St. Louis, Mo.

LET THESE GREAT BOOKS
HELP YOU TO



Start Your Climb!

*"the Man
who KNOWS
is the Man who WINS"*

Easy to train yourself! These books have helped thousands—

AIR CONDITIONING
Live Field; Great Future.....\$3.50

AUTO ENCYCLOPEDIA
The Famous Dyke's Latest Edition.....\$6.00

110-V. GENERATORS
Made From Old Auto Units.....\$1.00

BIRD HOUSES
Build to Sell; Easy Designs.....\$1.00

BOAT BOOK
Power, Sail, Rowing, Paddle Plans.....\$3.00

BOY MECHANIC
Hundreds Things Boys Can Make.....\$2.00

BUILT-IN FURNITURE
Take Orders, Make Money!.....\$2.50

CARPENTRY HANDBOOK
336 Practical Short-Cuts.....\$1.50

CHEMISTRY, PRACTICAL
Make Hundreds Things Daily Use.....\$2.00

CONCRETE WORK
173 Uses Described, Pictured.....\$1.00

DIESEL HANDBOOK
New! Latest Information.....\$5.00

DOG TRAINING
Home, Stage, Movies, Etc.....\$1.50

ELECTROPLATING
Modern Practice Including Nickel, Zinc, Cadmium and Chromium.....\$2.25

FARMERS' BOOK
861 Kinks for Field, Home.....\$1.00

V-8 FORDS
Also "A" and "B" Models. All New!.....\$2.50

FORMULAS
10,000 Money Making.....\$4.00

FROG INDUSTRY
New! Raise and Sell Profits!.....\$2.00

FURNITURE MAKING
Tools, Materials, Designs.....\$2.50

LATHE WORK (Metal)
Drilling, Threading....\$1.00

LOCOMOTIVE
Folding Chart Shows all Parts.....\$1.00

LOG CABINS
Easy Plans; Build for Profit. Value!.....\$2.50

MATHEMATICS
Easy Guide for the Practical Man.....\$1.50

MECHANICAL DRAWING
Learn Drafting; Good Salaries.....\$1.00

MONEY MAKING IDEAS
1000 Spare Time.....\$1.00

OCEAN LINER "EUROPA"
Atlantic Speed Queen; Charted.....\$1.00

PLUMBING
500 Facts Every Homeowner Should Know.....\$1.50

POULTRY
Breeding, Management. Protect Your Profits!.....\$2.00

PRECIOUS METALS
Identify—Buy—Sell. Only book on.....\$1.00

PROSPECTORS' HANDBOOK
How to Mine, Appraise, Equip.....\$3.00

RADIO
Amateurs' Handbook; Circuits, Repairs, Etc.....\$1.00

RADIO SERVICING
Profit by Knowing Costs, Kinks, Etc!.....\$4.00

REFRIGERATION
Electric. Gas. Be a Service Expert.....\$4.00

REWINDING ELECTRIC MOTORS
Fractional Sizes. Value!.....\$2.50

SHIP MODEL
Entire Text, Famous "Sovereign" of 1637.....\$1.00

SHOP NOTES LIBRARY
5 Vol. 2000 Wonderful Shop Ideas.....\$2.50

STAMP ALBUM
Modern. 400 Pages...\$1.00

STEEL SQUARE
How to Figure Angles of Rafters, Roofs, Etc.....\$1.00

STORAGE BATTERIES
New! How to Build, Repair, Charge....\$2.50

TOYS
For Amusement or Profit. Saleable Designs.....\$1.50

UPHOLSTERY
Always a Big Market. Start Own Business.....\$1.60

WELDING ENCYCLOPEDIA
All Methods; Hard Jobs Made Easy.....\$5.00

WIRING
Approved Economy Methods for Homes, Buildings.....\$2.50

WOOD TURNING
Woods, Tools, Methods; Practical Teacher...\$1.50

WRIGHT ENGINE
Chart of "Whirlwind"; All Parts.....\$1.00

Books sent C.O.D. anywhere in U.S.

Just check the books you want, write your name and address below, and mail the advertisement. It is your order blank. When postman hands you books, pay him the price and few cents postage. If you send remittance when ordering, please include 10 cents per book extra for postage. Write for information about books on other subjects you are interested in.

Name.....

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

Address.....

Mail to **Popular Mechanics Press,**
Room 85—200 East Ontario St., Chicago, Ill.

When writing please mention *Popular Mechanics*

FARMING BY MAGIC

(Continued from page 132A)

chine shells the corn, cleans off chaff and lint by means of power blowers, and by means of miniature elevators stores it in bins or cribs.

We are applying similar harvest skill to our old Irish stand-by, the potato, which is by far the greatest American vegetable crop. Anyone who has ever lived on a farm knows that potato digging by hand and hoe is hard, hot work. Nowadays strong, impersonal machines do the work.

Our leading vegetable crop also has the benefit of the automatic potato planter, a special version of the gravity seed drill, which prepares the seed row, drops the seed potatoes at desired intervals, drops a helping of fertilizer near each seed, then covers the seed, all with reliable accuracy and at a work speed ranging from fifteen to twenty-five acres a day.

On the whole, the new magic of farming is a fast magic. Reliable rumor says the coming year will see many new wonders offered for the convenience and profit of our great wonderlands of farms. There is more and more reason to believe that you or I may live to see the day when farms can be operated by pressing buttons; when crops will grow in winter from stored sunlight; when a well-run farm will be as efficient mechanically as a well-run factory.

QUICK WAY TO MAKE MIRRORS FOR GIANT TELESCOPES

Instead of rubbing and grinding a spherical mirror for months until it attains the parabolic shape necessary for telescopes, a new method deposits aluminum in just the right places to change the sphere into a parabola. The amount to be deposited can be calculated in advance. If something goes wrong, it is only necessary to remove the aluminum and repeat the process, instead of re-working the whole mirror. The process eliminates much time and labor in the preparation of mirrors for giant telescopes, in addition to reducing the cost considerably. To grind the mirror of the 100-inch telescope at Mt. Wilson observatory, three men labored five years.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

SHORTER WORKING HOURS

FOR HOME-CRAFTSMEN

WITH



**Genuine
MASONITE
TEMPERED
PRESWOOD**

IF YOU want to build things faster—and better—Genuine Masonite Tempered PRESWOOD is the material to use, because:

- 1 It provides easier workability. Can be cut or sawed to any size or shape with regular saw. No grain—no knots.
 - 2 It is uniform in quality, regardless of where purchased. Available in three thicknesses . . . $\frac{3}{8}$ " , $\frac{1}{2}$ " , and $\frac{3}{4}$ " . Standardizing on Tempered PRESWOOD avoids the costly "accidents" and mistakes you are apt to make experimenting with different materials.
 - 3 Tempered PRESWOOD is a permanent material. Moisture-resisting, it will not warp, chip, split or crack. Joints and sides stay fitted exactly according to specifications.
 - 4 It requires no finishing treatment. Tempered PRESWOOD'S own natural warm-brown surface makes a beautiful final appearance. But it can be varnished, lacquered, painted or enameled with standard applications, if desired.
- Mail us the coupon below for free sample of Masonite Tempered PRESWOOD to experiment with in your own shop, and for additional literature. *Genuine Masonite Tempered PRESWOOD and Insulation are ideal for home-building and remodeling. Easy to finance under F.H.A. Ask your Masonite dealer.*

MASONITE CORPORATION PM-9
111 W. Washington St., Chicago, Ill.

Please send me free sample of Genuine Masonite Tempered PRESWOOD and additional literature.

Name _____

Address _____

City _____ State _____

Sumner Deuce 62 2/3 5

Announced by Dr. John Strong, and

Prof Enrique

of Technology, Pasadena, Calif.

PAYS ITS WAY



**3-IN-ONE OIL'S
TRIPLE ACTION
ASSURES BETTER
PROTECTION FOR
TOOLS AND SHOP
EQUIPMENT . . .**

When you use 3-in-One Oil, you actually use *three* oils—selected for special protective qualities and scientifically blended to give your shop equipment the best of care. As 3-in-One Oil lubricates, it also cleans working parts and keeps them free from rust. Use it regularly to save money. Handy cans and bottles at your dealer's.

NEW BENJAMIN AIR PISTOLS

Powerful—Accurate—Economical—Practical—Adjustable Shooting Force—Amazing Maximum Velocity—cal. 177 or 22 and BB—For Target and Small Game—the Only Genuine Compressed Air Pistol on the market—Bolt Action—Hammer Fire—Hair Trigger—Safety. Also 177 and 22 Single Shot Air Rifles \$7.50—Single Shot BB \$6.00—25 Shot BB Repeater \$7.50—at Dealer or Direct—FULL DETAILS—FREE—WRITE TODAY.
BENJAMIN AIR RIFLE CO.
691 N. Broadway St. Louis, Mo.



MEND ANYTHING.. MAKE ANYTHING

with Du Pont
DUCO Cement



HOLDS WOOD, CHINA, GLASS, METAL, FABRICS, firm and strong. Permanently. Anything except rubber. Du Pont Duco Cement is impervious to heat or cold. It's waterproof, transparent, flexible, quick-drying, easy to apply. At drug, hardware and stationery stores. For free model plans of Aircraft Carrier "Saratoga" send green carton or red disc from 25c tube to DU PONT, Dept. B-3, Wilmington, Del.

**TRANSPARENT
WATERPROOF**

DU PONT Household
DUCO CEMENT

GAR WOOD'S MYSTERY BOAT

6387

(Continued from page 409)

had to be a different hull and a stronger one than ever had been built before. Thirty-eight feet long and ten feet and eight inches wide, with four heavy stringers of Oregon spruce running the full length of the ship to serve as stout engine beds, Wood knew he could never spring the bow and bend it to get the proper planing angle at the forward step. Having figured the weight to be carried, Wood built the boat with a variable forward plane, one he could add to or subtract from. In trials he did this until he found its best planing angle.

That was the Miss America until this year when the horsepower was increased from 6,400 to 7,200, an engineering feat achieved by increasing the gear ratios in the superchargers from 2.25 to one to 2.45 to one. Again it meant adventuring into the unknown and this time it was highly dangerous. For months the four motors, one after the other, were on the dynamometer in the Packard plant. Each day the engine speed was boosted a little higher. A new and highly volatile fuel was being used, and it was so explosive that special blowers had to be built to carry off the fumes. Finally new superchargers, their rotors whirling air and gas into chambers and from there into the manifolds leading to the cylinders at a pressure of ten and one-half pounds each—or a total of forty-two pounds pressure—were making 6,400 revolutions a minute when the engines were wide open at 2,600 revolutions per minute. When that performance was attained the dial on the dynamometer registered a horsepower pull of 7,200, but not before there had been several backfires that sent great sheets of flame across the room. Then the motors were placed in the hull and Miss America X was shipped to Florida for its recent record trials.

What will be the speed of Miss America X if pressed to the ultimate of her 7,200 horsepower? No one knows. The boat has not been driven anything like her limit and probably never will be.

"I will not drive it to the limit unless I have to—either to win a Harmsworth race or, if my record is broken, to regain it for this country," Wood has said.

Thus Miss America X remains not only a miracle but a mystery boat.

New Invention Revolutionizes Home Heating Costs Only 1½¢ An Hour!



An Ohio inventor, J. C. Steese, of Akron, has hit upon a discovery which revolutionizes heating costs in every home. It replaces old-fashioned stoves, and even furnaces. Gives a room full of healthful heat for about 1½¢ an hour. Is portable. Makes and burns its own gas. Absolutely safe. Now offered on a 30-day trial right in your home, at our risk!

**CHEAPER THAN COAL!
NO SOOT... NO ASHES!**

Mr. Steese calls his invention the Diamond Radiant Heater. Although amazingly inexpensive, it is a complete heating unit and works perfectly, even in zero weather. You adjust it instantly to get as much or as little heat as you want. No need in chilly Spring or Fall to keep expensive, mussy coal fires going day and night. You get heat instantly with this invention, with no waste, no fussing, no waiting, as with coal or wood. There are no wires, no tubes, no attachments to fuss with. In 60 seconds after you get it, this invention starts producing clean, healthful "radiant" heat for you, almost like heat from the sun itself.



30-DAY TRIAL IN YOUR HOME

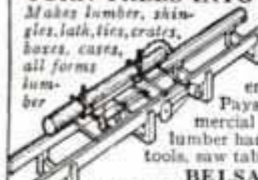
Try this remarkable new invention right in your own home for 30 days—test it in every way—enjoy this new comfort. Write today for full description and trial offer!

AKRON LAMP & MFG. CO. 1199 High Street AKRON, OHIO

AGENTS
New Item! New Plan!
wonderful chance for
big weekly income,
part or full time.
BUT ACT QUICK!

ONE-MAN SAWMILL FARM MODEL 549

TURN TREES INTO MONEY WITH A BELSAW!
Makes lumber, shingles, lath, ties, crates, boxes, casks, all forms lumber.
Three capacities: 10, 14 and 20 feet. Accurate set works, positive dogs. Full or one-way type power feed runs on low power—many owners use old auto engine.
Pays for itself quickly—thousands in commercial service, everywhere. Write for free lumber handbook and catalog of mills, supplies, tools, saw tables, and woodworking equipment.
BELSAW MACHINERY CO.
811-F Davidson Bldg., Kansas City, Mo.



HANDEE
Tool of 1001 Uses

Grinds, routs, drills, carves, sharpens, cuts, engraves. Over 100 wheel shapes available. Fits the hand perfectly. Weighs 1 pound. For use at home, in the shop or take to the job. Do away with slow hand work! A.C. or D.C., 110 volt, 13,000 r.p.m.



Plug in any light socket

\$10.00
and up
Postpaid
U.S.A.
with 3 wheel shapes Free.
Order today.

Order on 5-day trial. Satisfaction guaranteed. Ask for FREE booklet.

New MASTER CRAFTSMAN'S SET
17 useful accessories to grind, drill, polish, sand, cut, carve, engrave, etc. Prepaid \$5.00

CHICAGO WHEEL & MFG. CO., 108 S. Aberdeen Street, Chicago, Ill.

S AGENTS 500% PROFIT
GUARANTEED GOLD LEAF 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

DEAFNESS IS MISERY



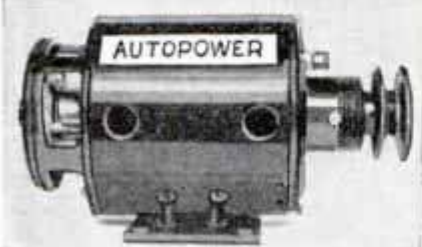
Many people with defective hearing and Head Noises enjoy Conversation, Movies, Church and Radio, because they use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor who washed himself deaf.



A. O. LEONARD, Inc., Suite 699, 70 5th Ave., New York

BUILD DUTCH WINDMILLS

Lighthouses, Lawn Fountains, Etc. BIG PROFITS, GREAT FUN. BEAUTIFY YOUR GARDEN. 24 in. x 20 in. Dutch Windmill. Wings operate farmer at buck saw. BLUEPRINT—65c. 40 in. Octagon Lighthouse. BLUEPRINT—\$1.00. 20 in. Lawn Fountains. (Dutch Schoolboy, Tulip Girl, Holland Fair, Soubertest Girl) PATTERNS 35c. ALL 4—\$1.00. Send 10c for Blue. Catalog CRAFTSMAN'S MODEL CO., Dept. P22, 2030 N. 41st St., MILWAUKEE, WIS.



TURN SCRAP INTO MONEY

The new and revised edition of "Auto Power" with all the ten original specifications and ten new ones is now off the press. Convert old generators into A. C. and D. C. generators and motors with voltages of 6 to 400 volts, for power, light, welding, and radio operation. Create new generators adaptable for home, automobiles, or trucks. They can be driven by fan belt, wind, or water. This book, with complete illustrations, tells you how easily and economically these changes can be made. Also instructions for rewinding auto armatures. 350 definitions of electrical terms, etc. Already used and endorsed by thousands. Price, \$1. Postpaid. **AUTO POWER, Dept. B, 410 S. Hoyne Ave., Chicago**



AUTO POWER

Here it is Men! THE NEW
BLACK & DECKER 1/4" DRILL
*That Every Mechanic, Every Small
 Shop, can Afford—Mail Coupon now*



**A Quality Drill
 In The Low-Priced Field**

MAN—you'll get the kick of your life when you first pick up the new Black & Decker 1/4-Inch Junior Drill. Flip the switch. Feel its power as the motor takes hold. Watch it drive a bit through metal at lightning speed. Get its feel—its balance. Notice its light weight. It's the kind of fast-working tool that every practical man wants handy—ready to speed through a thousand and one different metal and wood drilling jobs around the shop, home or garage.

Also, despite its amazingly low price, there's plenty of "high-priced quality" in the way the 1/4-Inch Junior is built. Husky aluminum casings. "Compo" oil-less bearings. Powerful universal motor. Genuine Black & Decker quality through and through.

Mail the coupon today for the name of the nearest dealer where you can see the new 1/4-Inch Junior Drill—and for a free copy of our complete new catalog. There are more new low-priced Black & Decker Electric tools that you'll want to know about. Mail the coupon—now!

BLACK & DECKER

MAIL TODAY FOR FREE CATALOG

The Black & Decker Mfg., Co., Towson, Md.

Please send me your FREE Electric Tool Catalog, and the address of my nearest B. & D. dealer.

Name.....

Occupation.....

Address.....

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

INEXPENSIVE METAL LOCATOR

(Continued from page 423)

response to metal bodies is all that could be desired. The location of battlefield relics, and valuables buried during the Civil war, are interesting possibilities within the reach of this portable low-cost unit.

The instrument is housed in a sheet-metal case, the dimensions of which are given in Fig. 1. Narrow strips of the same metal are bent to form the angle brackets for the bottom and corners. The metal top panel, with the tubes and other parts fastened to the underside, is held in position by means of a metal clamp. The wood uprights at the ends are supported by means of machine screws and short metal bushings. A hand grip, consisting of a metal sleeve prevents body-capacity effects.

The circuit consists of a shielded oscillator for the exploring coil and a regenerative detector for the monitor stage which can be thrown into oscillation easily. Two type-30 tubes are employed in each of these stages, with a single 30 tube in the audio amplifier, as shown in Fig. 3 and the simplified wiring diagram, Fig. 8. All of the parts should be arranged and mounted exactly as indicated in Fig. 8. The batteries fit into the bottom of the case and all connections are shown in Fig. 4. Winding data for the monitor coil are given in Fig. 5, and the exploring-coil windings are detailed in Figs. 6 and 7. The sectional view of the wood rim shows the spaced windings held in position with collodion. A layer of insulating tape is placed over these windings. The copper-screen shield and a final wrapping of friction tape are applied after the cable connections have been made. A complete material list with further operating data can be obtained upon application, without charge.

To place the instrument in operation, use the test stick shown in Fig. 2; the copper ball is from a flush box. Adjust both controls until a whistling note is heard in the phones, then re-tune the monitor control to zero beat, or until no signal is received except when the copper test ball is brought within the field of the exploring coil. An enlarged blueprint of the layout and wiring diagrams is available; those who wish it should specify blueprint R-213. When operating in the field, make frequent checks with the test ball to be sure that the instrument is correctly adjusted.

SEND FOR YOUR COPY

Free! THE STORY OF THE SAXOPHONE

For every music-lover. Tells how Antoine Saxe invented today's most popular instrument. Write now for this thrilling booklet; no obligation.

EASY to play. Buescher True-Tone Saxophones, improved and simplified so you can play tunes immediately. Join school or community band for fun, travel, education. Write for details of **FREE TRIAL** on any band or orchestra instrument—saxophone, cornet, trombone, etc.

Buescher Band Instrument Co., 910 Buescher Bldg., Elkhart, Indiana



Carl James, Springfield, Ill., first division winner National High School Contest, 1935, plays a Buescher. (5-31-35)



RITZY STANDARD
Uses Auto Axle with Low Mounting Idea. Size 6'x13'



RITZY COUPE CRUISER



RITZY AIR CUTTER
MAIL DOLLAR TO-DAY for all three Plans to THE RITZY CABIN TRAILER Box 200 & Wapakoneta, Ohio

START IN BUSINESS

Fadaway, nationally known household necessity, offers you the opportunity to start a profitable business of your own. Whole or part time. Steady earnings. Protected territory. Write for details. **FADAWAY PRODUCTS CO., MT. VERNON, O.**



MUSHROOM SPAWN Free
To convince you there is money in mushrooms we will furnish enough spawn **FREE** to grow up to 10 lbs. of mushrooms. To cover cost of instructions—boxing and mailing send 25c coin to **NATIONAL MUSHROOMERS ASS'N., Box 208, Park Ridge, Ill.**

Profit from Books

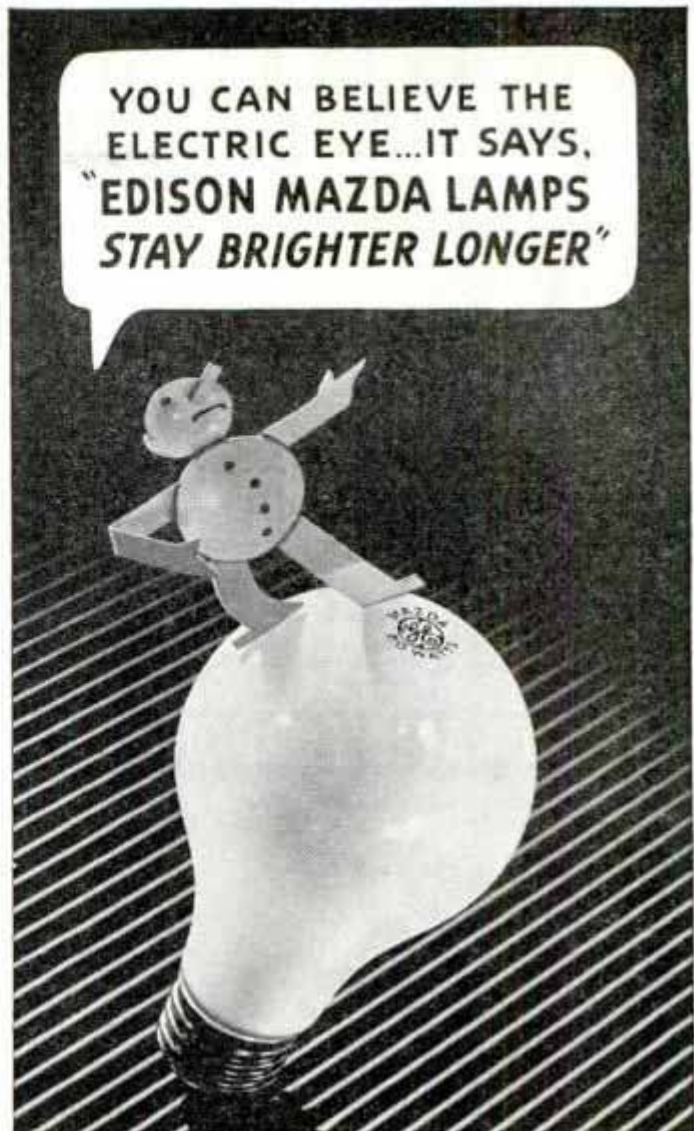
Popular Mechanics Press specializes in supplying books on any subject. Look over this list. Check the books you want, and mail this advertisement as your order blank. Write for information about books on any special subject you may be interested in.

- | | |
|--|--|
| <p>AIR CONDITIONING SERVICE MANUAL
Small Unit Apparatus. \$5.00</p> <p>ARMATURE WINDING and Motor Repair..... \$3.00</p> <p>AUTO RACING
How to Build Dirt Track Racers..... \$1.00</p> <p>AUTO REFINISHING
Duco With Spray Gun. \$1.50</p> <p>BRICKLAYING
Plain and Fancy..... \$1.50</p> <p>CAMPS AND LOG Cabins (Building)..... \$2.00</p> <p>CARBURETORS (All Makes)
New, Revised Edition. \$2.50</p> <p>CHEMICAL MAGIC
Experiment, Entertain, Mystify..... \$1.00</p> <p>DANCE
Learn at Home Without Music or a Partner... \$2.00</p> <p>DRAWING
Freehand and Perspective..... \$1.50</p> <p>DRY CLEANING (Practical) and Dyer..... \$3.00</p> <p>ENGINEERS' VESTPOCKET Reference Book..... \$1.50</p> <p>FURNITURE REPAIRING
Finishing and Decoration..... \$3.00</p> <p>HYPNOTISM
How to Become an Expert..... \$2.00</p> <p>INVENTION, YOUR
How to Protect and Merchandise..... \$1.50</p> | <p>LANDSCAPE GARDENING
Practical..... \$2.50</p> <p>LEATHER MAKING AND Home Tanning..... \$1.00</p> <p>LOCKSMITHING
Revised Edition..... \$2.00</p> <p>MONEY MAKING FORMULAS
15,000 Practical..... \$5.50</p> <p>MUSHROOMS
Raise for Market..... \$1.75</p> <p>NEON SIGNS
Only book on. New... \$3.00</p> <p>PATTERN MAKING
Excellent New Book... \$1.50</p> <p>PLASTERING
Best Instruction Manual..... \$1.25</p> <p>RADIO PHYSICS COURSE
New edition. Everything about Radio from A to Z..... \$4.00</p> <p>REFRIGERATION SERVICE Manual
(All Makes)..... \$5.00</p> <p>RUBBER ARTICLES
How to Make..... \$2.00</p> <p>SHEET METAL
Construction Work... \$2.00</p> <p>STAMP COLLECTING
Why and How..... \$1.50</p> <p>Steam Engineer's License
How to Obtain..... \$2.00</p> <p>TAXIDERMY, HOME
Mount Trophies Profit, Pleasure..... \$1.50</p> <p>WROUGHT IRON WORK
Practical..... \$1.35</p> |
|--|--|


Books sent C. O. D. anywhere in U. S.

Just check the books you want, and mail the whole advertisement. It is your order blank. When postman hands you books, pay him the price and few cents postage. If you send remittance when ordering please include 10 cents per book extra for postage.

POPULAR MECHANICS PRESS, Room P-8, 200 East Ontario St., Chicago, Ill.



YOUR eye may be fooled by a "bargain" lamp, but the electric eye tells the truth. This marvelous scientific instrument proves conclusively that Edison MAZDA lamps *stay brighter longer* than lamps of inferior make... that they give more light for every dollar's worth of electricity consumed.

There's just one safe course to follow when you buy lamps...look carefully at the trademark on the bulb. If you find this monogram  on the bulb you may rest assured that you are buying good light at low cost. General Electric Company, Nela Park, Cleveland, Ohio.

NOW ONLY
15¢
for popular sizes

EDISON MAZDA LAMPS
GENERAL ELECTRIC

When writing to advertisers please mention Popular Mechanics



BUILD these POPULAR MECHANICS RADIO circuits

Thousands are building the successful Radio Receiver, Transmitter, and Amplifier circuits described each month in Popular Mechanics Magazine. It pays to build these circuits which bear the approval of the Popular Mechanics Radio Laboratory and which are selected on the basis of excellence, simplicity and low price. When you build your Popular Mechanics set, use only approved parts, offered in kit form exclusively for you at lowest wholesale prices by ALLIED-Radio Parts Headquarters. Write to us for FREE Parts Lists covering such popular circuits as the 1 Tube Portable Receiver (R209), the 2 Tube AC-DC set (R211), the 6 Tube 32-Volt Farm Radio (R208), the All-Star Jr., the Browning '35, and many others. We can supply parts for building Popular Mechanics circuits described in this or any other issue.

FREE!

Be sure to send for our 106 page complete Radio Catalog!



ALLIED RADIO CORPORATION

ALLIED RADIO CORPORATION
833 W. Jackson Blvd., Chicago, Ill., Dept. K.

- Send me your FREE 1935 Radio Catalog.
- Send me "Popular Mechanics" Parts List No.

Name.....

Address.....

Iron Aluminum Brass MAKE YOUR OWN—CASTINGS

Operate your own home foundry for pleasure and profit!

By following the LeROY SYSTEM OF SIMPLIFIED METAL CASTING you can build and operate your own small foundry to cast all metals with materials and equipment in the average home or workshop, at little cost. The LeRoy course consists of lessons, instructions, drawings, blueprints, and money making suggestions. Pattern making, moulding, melting, etc., are fully covered. Blueprints of five easily made efficient melting furnaces included. Reader says, "worth ten times the cost." Send \$5 for course prepaid, or \$1. balance plus charges C.O. D.
1144 1/2 N.E. Union Ave., LeROY TECHNICAL SERVICE, Portland, Oregon

Venetian Blind Materials

We furnish all necessary parts to make your own Venetian Blinds, viz. Head Rails, Tilt Rails, Bottom Rails, Basswood Slats, Imported English Ladder Tape, Cords and Complete Hardware.
Write for prices.
R. A. PETERSON
6900 N. Ashland Blvd. Chicago, Ill.

SAVE MONEY with a THERM Diesel BURNER



In YOUR COOK STOVE, HEATER or FURNACE
Quickly, easily installed. Gives white, hot heat, free from Smoke, Soot, Odor. Safe and simple. . . lowest operating cost with Diesel oil. For Homes, Restaurants, Stores, Garages, Shops and Boats. Send for illustrated folder, prices and all information.

WRITE FOR OUR LIBERAL PROPOSITION TO DEALERS
THE THERM BURNER CO., 2105 Westlake, Seattle, Wn.

THE Smooth WAY TO "ROUGH" IT

Self-Built DeLuxe House Trailer gives you economical travel-convenience. Complete interiors—4 models. Progressive Buying Plan. Any workman can build. Beautiful new Trailer Builders' Guide, 136 illustrations: Famous Ball and Socket Hitches; Chumbi-Chandi styles; Parking Legs; Sinks; Stoves; Inner Spring Beds. Send only 50c for Trailer Builders' Guide.



Full Size Blueprints FREE With Parts.

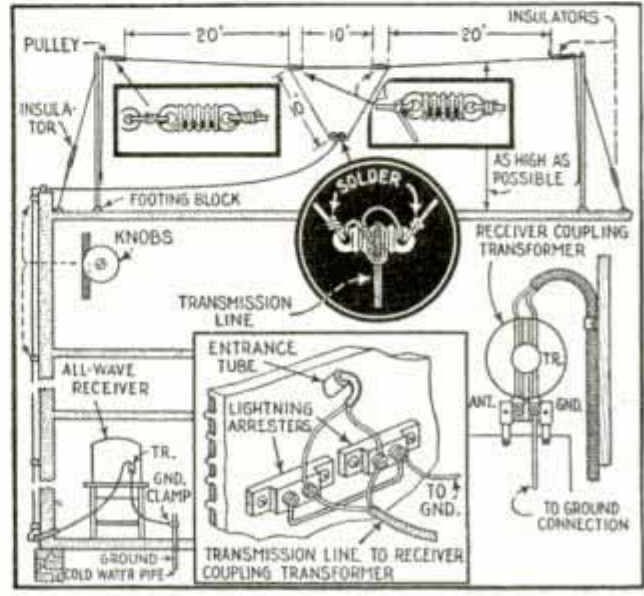
HAMMERBLOW TOOL CO. Dept. 19, 606 Third St. Wausau, Wis.

ANTENNA INSTALLATIONS

(Continued from page 424)

so located that the lead-in, or transmission cable may be brought down conveniently at right angles from the center of the antenna. Most standard kits for this system include antenna wire, insulators, transmission cable, and the necessary coupling transformers. A single-receiver installation is shown in Fig. 6. Complete instructions accompany each kit as various makes differ in minor details.

Anyone can erect a doublet antenna system of this description with very few

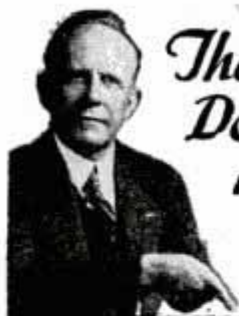


tools. The dotted lines on the flat top portions indicate a cage type of construction which is entirely optional. The antenna-coupling unit is connected in the center of the flat top and the insulated transmission cable line is brought down to the set coupler mounted in or near the receiver.

Fig. 7 shows a multiple system for a number of all-wave receivers which is suitable for use in radio stores or small apartment houses. The 500-ohm resistor, indicated in the diagram, should be used in each top leg to prevent reaction between sets when more than five are used at once.

One of the least expensive and simplest doublet systems possible is illustrated in Fig. 8. Lynch antenna wire and "Giant-Killer" transmission cable are employed. The "V-Doublet" antenna, also supplied in kit form, is detailed in the above sketch. This system is based on discoveries made by General Electric engineers in designing the antennas of short-wave stations W2XAD and W2XAF.

(To be continued)



*They Said I Couldn't
Do It. But Here It Is
my 1935 OFFER*

**WEAR A WATCH
OR DIAMOND**

30 Days FREE!
then Make Your Own Terms



My confidence in YOU; my confidence in my standard, dependable watches and beautiful genuine diamonds, and my confidence in business conditions cause me to make this unheard of offer. I am going to place as many watches and diamonds in the hands of men and women throughout the land as possible in 1935 NO MATTER WHAT THE SACRIFICE, because each watch and diamond will act as a salesman to sell another.

Direct-to-You, Rock Bottom Prices on Nationally Advertised Watches, Diamond Rings and Silverware

What an offer! Nationally advertised watches, diamonds and silverware offered at lowest direct-to-you prices. For nearly a half century we have sold highest quality jewelry all over the world. And now this remarkable offer.

Send for Beautiful FREE CATALOG

Write now—before this offer is withdrawn and get the beautiful FREE Catalog. Select the watch or diamond you want, wear it, examine it, and then write us the terms you desire.

SANTA FE WATCH COMPANY
96 Thomas Bldg., Topeka, Kan.
We Buy OLD GOLD and STERLING SILVER



HIGH POWERED TELESCOPE

GENUINE BROWNSCOPIES AT AMAZING PRICES

Most powerful in America for the money!

15 power long range telescope. Can see moon's craters or time on pocket watch a block away. 5 sections. Approx. 3 ft. long. Fine lenses. Brass bound. Can be used as powerful microscope. Vol. magn. 512X. Only \$1.69 postpaid. C. O. D. 24c extra.

\$1.69

BROWNSCOPE CO. Dept. 409, 234 Fifth Ave., New York, N. Y.

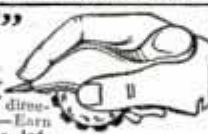
SELL PLAYING CARDS

New easy way to **earn money** at once. Take orders from friends and others for popular low priced Playing Cards, including new **Initial and Monogram decks** not sold in stores. Just show attractive samples. Easy to sell. Big profits. Men or women, write for **FREE SAMPLE OUTFIT**.

GENERAL CARD CO., 1201 W. Jackson Blvd., Dept. 130, Chicago, Ill.

PRINT MUSIC—"by hand"

The Manotype, a rotary hand stamp with pen, for making all expressions and music characters. Set includes Manotype, Staff Line Stamp, Stamp Pad, Ink, Mechanical Arranging & Transposition Chart and directions. Complete \$3.75 in U. S. A. Print Music Plainly—Earn Extra Money! Manotype Co., 1206 Harmer St., Ft. Wayne, Ind.



\$150 TO \$300 EXTRA MONTHLY WITH THIS NEW Simplified 40 VOLT ARC WELDING



Jobs like these are every day occurrences when you are equipped to go right to the job.

Only a few dollars monthly puts this profitable "Simplified" Arc Welder into your shop—lets you handle every type of repair job as well as contract for many and varied steel construction jobs. Profits will easily pay for it, comes on

30 DAYS' TRIAL—at our risk

Used by the U. S. Govt., leading automobile and steel plants. Write today for complete details, no obligation.

HOBART BROS., Box M-951, TROY, OHIO



WRITE FOR
FREE BOOK
ON MANY
PROFITABLE
USES

**TRY
IT FREE!**

Students, Business People—Everyone! Here is a real opportunity! Send no money. Merely mail coupon for details of Royal's free trial offer on the New Royal Portable. If you like this amazing new typewriter—keep it. If not, return it—no questions asked!

1 EXCLUSIVE ROYAL FEATURES
Touch Control—Finger Comfort Keys—many others—make New Royal Portable easier to use—faster—more durable!

2 FREE LEARN TOUCH TYPING
New scientific method. 50 to 60 words a minute! Easily learned at home in your spare time.

3 FREE CARRYING CASE
Handsome double-purpose luggage-style case. Typewriter quickly removed by releasing four catches.

4 LOWEST MONTHLY TERMS
Small down payment. Balance—only a few cents a day. Pay as you use it!

**LATEST MODEL
NEW
ROYAL
PORTABLE
with
TOUCH
CONTROL**



Royal Typewriter Company, Inc., Dept. PM-9
2 Park Avenue, New York City

Please send me complete details concerning special **FREE TRIAL OFFER** on the New Royal Portable Typewriter with **TOUCH CONTROL**.

Name _____
Street _____
City _____ State _____

Study TEXTILES

If you sell, buy or use fabrics, apply technical facts. Quickly learned at home. Write for details of the Textile Digest.

N. R. MILLER & CO., Central Bldg., Toronto, Canada

Here Goes.. THE 48TH TRIP TO THE WASH TUB



**MORE YARN
IN EVERY INCH
OF JELT DENIM . . .**

*It Won't Wash Thin
and Flimsy!*

AMAZING! 48 successful trips to the wash tub . . . while ordinary overalls are thin and flimsy after just a few scrubblings. The difference is in the denim! Only Lee Overalls are made from heavier, tough *Jelt* denim . . . woven tighter, with 1716 extra feet of yarn to the pair. No wonder Lee Overalls can *guarantee* extra months of wear. Nearly 50 comfort and appearance features in Lee Overalls, too. Buy a Lee next time. It **PAYS**.

UNION-MADE
Lee
OVERALLS
UNION-ALLS . . . SHIRTS
PANTS . . . PLAY-SUITS

The H. D. LEE MERC. CO.
Dept. M-172
Kansas City, Mo.; Salina, Kan.
Trenton, N. J.; South Bend,
Ind.; Minneapolis, Minn.; San
Francisco, Cal.

FREE Write us today for your free sample of Jelt Denim, and name of your nearest Lee Dealer.



HOME AUTOMATIC CIGARETTE MACHINE

Have YOUR OWN Monogrammed Cigarettes.

Put tobacco and block of papers on machine. **TURN THE CRANK**—PLESTO—CIGARETTES. Easy—simple. All metal construction. Guaranteed. No cloth ribbon; no special tube or gummed papers required. **ASK FOR FREE ILLUSTRATED FOLDER.** AUTOMATIC CIGARETTE MACHINE WKS., PM-9, 1056-57 Devon Ave., Chicago, Ill.

WHY BE MISERABLE WITH

Itchy Scalp

When Lucky Tiger Stops It Now? Why be embarrassed with dandruff and annoyed by scalp irritations when **Lucky Tiger** quickly corrects those conditions? A real dandruff remover . . . safe for adults or children—and among the world's largest sellers . . . costs little at druggists and barbers. **GUARANTEED.**



YOURS

for the Asking

(1)—**FREE NEW CATALOG** of Condensers, Transformers, Chokes, Sockets and general equipment for receiving and transmitting.

(2)—**SEND 10c** for New 32-page Manual of most popular Short-Wave Receivers, with illustrations, diagrams and parts lists.

Address Dept. PM-9

HAMMARLUND MANUFACTURING CO.
424-438 W. 33rd St., New York



TELEVISION FOR MILLIONS

Continued from page 322)

movie film with a motion-picture camera. This film is then developed in a "dark room" incorporated in the equipment. Instead of winding the film on a reel as it is taken, it passes into a developer, then a washer, then a fixing bath, and then another washer, the process being continuous as the film is exposed.

As it leaves the last washer, the wet film is projected onto a screen and picked up by the television camera, being transmitted two minutes after it is taken. It is unnecessary to print it, as in motion-picture projection. The third process utilizes the "telecine," a device through which movie film or still scenes are transmitted. By this method the film must be developed and printed, as for movie projection. The telecine has a device for picking up and transmitting the sound track of talking pictures at the same time the picture is transmitted. The Baird company is affiliated with a British film company and the actors and directors of the movie company provide many of the programs.

One Berlin station is transmitting daily programs, mostly speeches, the receiving sets picking up both the words and the features of the speaker. Ten other stations are being planned for Germany, and receivers are being built to sell for about \$200. The different stations are to be connected by wireless and cables which can be used for telephone traffic when not employed for television. The receivers are equipped with cold-cathode tubes which project the received image on a screen set up in the cabinet.

David Sarnoff, president of Radio Corporation of America, has announced that \$1,000,000 will be spent in building a transmitting station in the New York metropolitan district, in constructing receivers and in program service. Transmission, in the beginning, will be limited to a radius of about twenty-five miles but this will make television available to several million New Yorkers. The images are expected to show ten times the detail of crude experimental pictures of a few years ago. Because of the high cost of the many wires necessary to transmit television, it is expected that its general development must await the building of transmitting stations to serve limited areas.



NEW models EASIER TO PLAY

Find out about these sensations. new Conn Band Instruments. Many wonderful, exclusive features! Today, *more than ever*, Conns are the "choice of the artists." You'll advance faster and take more pride in a genuine Conn—made by the world's largest manufacturer. See your dealer or write us for Home Trial, Easy Payment offer. Mention instrument.

C. G. CONN, LTD.
931 Conn Bldg., Elkhart, Ind.

CONN
BAND INSTRUMENTS

WRITE FOR FREE BOOK

START OWN BUSINESS RESILVERING MIRRORS, REFINISHING Metal, plated articles, auto parts, tableware. Experience unnecessary. Small investment for portable home outfit.

SPRINKLE, PLATER, 129A, MARION, INDIANA.

MAKE YOUR OWN ELECTRIC DRILL



\$17.85 MOTOR MADE from Model T Ford Generator. We furnish all other parts already assembled. Performs like \$55 to \$65 DRILLS. Fan cooled, continuous duty motor develops well over 1/2 H. P. 110 volts AC or DC or 32 volts. Many in use. Guaranteed to work. Get your Drill Kit now. Costs going up.

RAND CO., 2004 PM Grand Ave., Kansas City, Mo.

NEW DIESEL BOOK

Learn Diesel Engineering. Continually growing demand for Diesel-trained men. Steady, well-paid jobs for years to come. Think of the need for Diesel experts to service and operate trucks, tractors, trains, boats, airplanes, power shovels, donkeys, motors in mines, pumps, busses, power plants, etc. Why not enter what is conceded to be the most

Rapidly Expanding Engineering Field

Make your start through home study. Get Diesel Handbook by Rosbloom, new edition, covering all latest Diesel developments. Treats thoroughly all fundamentals and principles. Question and answer form. Contains Tables, Latest Formulae, Practical Instruction on Diesel Engines of High and Low-speed, Auxiliaries and Accessories for Land, Marine, Locomotive, Automotive, Aero and Portable Services.

A standard book. Strictly authentic. 544 pages. Profusely illustrated. Flexible Cover. Price \$5.00 Postpaid. Sent C. O. D. in U. S. if preferred. Small amount extra for postage charged.

Popular Mechanics Press, Room 835, 200 E. Ontario St., Chicago

AIR CONDITIONING



Learn Air Conditioning. Be one of the far seeing men to get in early and take advantage of the many new opportunities. Thousands of installations have been made and are being made. Air Conditioning means not only comfortable living, but, in industry, the perfecting of ideal conditions for the manufacture of many products. The creation and control of indoor weather is

AMERICA'S NEXT BIG INDUSTRY

Get your start with the new book by E. W. Riesbeck, International authority. It is complete, non-technical; tells what A. C. is; difference between complete conditioning and cooling; humidification and filtration; all methods and types of equipment; how to figure requirements; make installations; adapt present heating plants to new systems; equip old buildings; use of ozone, etc. 369 Pages. Illustrated. Flexible. Price \$3.50 postpaid. Sent C. O. D. in U. S. if preferred. Small amount extra for postage charged.

Popular Mechanics Press Room 835 200 E. Ontario St., Chicago.

Another "CREATIVE WHITTLER" who uses a Remington



ASK the accomplished wood-carver or whittler for his secret of success, and he'll tell you: "It's a good knife!" You must have a knife that holds a razor-sharp edge... with blades of forged, high-carbon steel... with a comfortable handle... with rugged joints that don't work loose. That's why "Bud" Blake and many others use only Remington knives. Try a Remington, and see for yourself!

Remington
DU PONT

SEND 3c FOR WHITTLIN' BOOK

Remington Arms Co., Inc., Cutlery Div., Dept. E6, Bridgeport, Conn.

Please send "Things To Do With a Pocket Knife." I enclose 3c stamp.

Name.....

Street.....

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

RENEW OLD BUILDINGS WITH PLASTIC STUCCO



New process—Fuses a plastic, waterproof mixture on any surface. Renews old buildings with a permanent overcoat in any thickness desired and in 30 colors. Proven over six years actual use in practically every climate.

BIG EARNINGS OFFERED—Operators report profits of 10c to 30c per sq. yd. covered. Machine capacity 40 sq. yds. surface per hour. One job often pays for machine. Enjoy the profits connected with big government renovizing campaign. Machine furnished on free trial, easy payments. Write today for complete details.

COLORCRETE INDUSTRIES, Inc.
570 Ottawa Ave., Holland, Mich.



Stoves AT FACTORY PRICES!



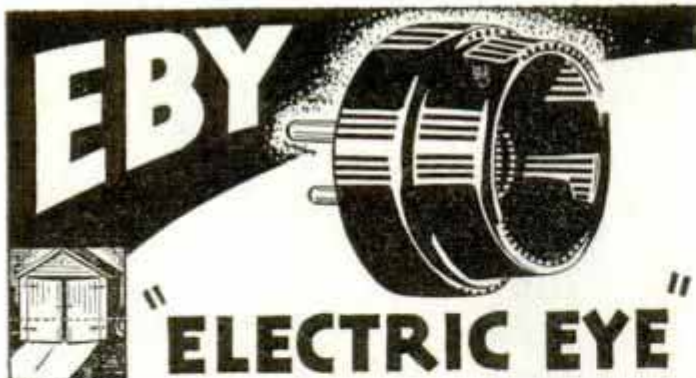
Sale Catalog—FREE

Over 200 Styles and Sizes of Stoves, Ranges, Furnaces at Factory Prices and Easy Terms—as little as 18c a day. More Bargains than in 20 Big Stores. New styles, new features, new colors. Year to Pay—30 days free trial—360 days approval test—24-hour shipments. Over 950,000 Satisfied Users. 35 Years in Business.

Write for FREE Catalog.

THE KALAMAZOO STOVE CO., MFRS.
391 Rochester Avenue
Kalamazoo, Michigan

"A Kalamazoo Direct to You"



**OPENS
DOORS**



**BURGLAR
ALARM**



**LIGHT
CONTROL**



**FILM
PRINTING AND
COUNTLESS
OTHER USES**

HANDY KITS FOR HOME AND LABORATORY EXPERIMENTERS

For years you've been hearing about the mysterious "Electric Eye" (Photo Electric Cell). More recently you have seen it in actual use—opening doors as if by magic, controlling lighting, etc. And now, with the inexpensive new Eby Electric Eye Kits you can put this amazing device to work in your own home or show. We tell you how—we supply the materials. Order today.

EXPERIMENTAL KIT No. 1—Includes EBY ELECTRIC EYE, Relay, Resistors, Condenser, Sockets, etc., and full instructions. Only \$19.50 postpaid.

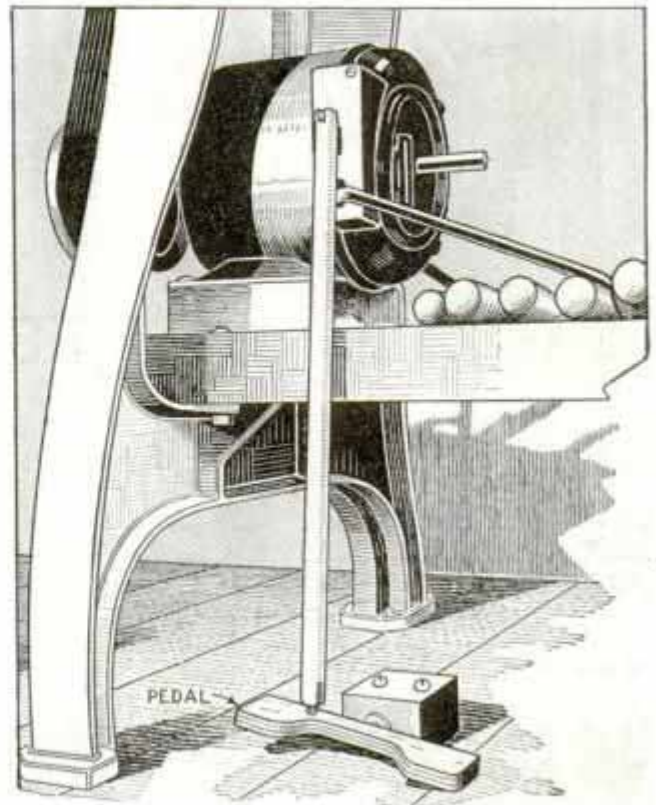
EBY ELECTRIC EYE (only) and instructions, \$5.00 postpaid. Write for our Electric Eye Catalog.

HUGH H. EBY, Inc.
2066 Hunting Park Ave.
PHILADELPHIA, PA.

FREE! Our 32-page illustrated book "THE ELECTRIC EYE IN THEORY AND PRACTICE" given with every Kit or sold separately for 50c. Send for copy.



Handy Foot Control for Lathe Motor Switch



Pedal Fastened to Floor Permits Lathe Motor Switch to Be Operated with the Foot

Both hands are left free for handling the work when a foot-operated switch, like the one shown, is used with a wood-turning lathe. Construction is very simple. A length of dowel rod is slotted at both ends, one pinned to the switch lever, and the other to a screw eye in the pedal. The latter pivots on a short dowel passing through a wood block, which is screwed to the floor. Foot pressure on opposite sides of the pedal turns the switch on and off to start or stop the lathe.

COMPLETE ELECTRIC PLANTS



ONAN A.C. PLANTS furnish the same current as city service. Operate Radio, Water System, Refrigerator, all Appliances.

SIZES 350 WATTS UP

Have A.C. Current anywhere. Models \$110 and up. Easy to install. Available from stock. Ideal for farms, camps, lake homes, commercial purposes—anywhere electricity is needed.

D. W. ONAN & SONS
953 Royalston Ave., Minneapolis, Minn.

BUILD YOUR OWN

Streamlined Trailer at little cost. Send dollar for plans and blueprints of two models—the light standard and the Deluxe Model as shown. Mail a dollar to D. VAN OOSTVELDT, 111 MARSTON, DETROIT, MICHIGAN.

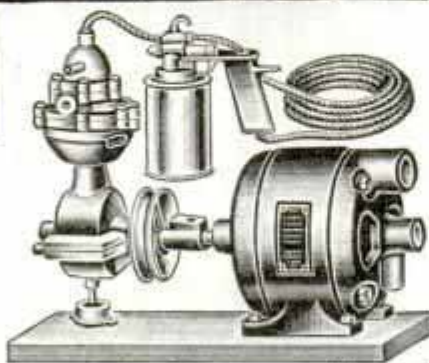


Electric Paint Sprayer

**ONLY
\$14.50**
Complete Outfit
and Spray Gun

Startling offer! Famous spraying outfit includes pressure internal mix spray gun, adjustable, non-clogging, fan and round spray nozzles. Ideal for spraying paint, varnish, enamel, lacquer, shoe dyes, aluminum paints, insecticides, etc. The power way saves time and labor and does better work.

Outfit complete with spray gun, National Compressor with sealed piston, (cannot pump oil) heavy duty Westinghouse motor, 110 volt, 60 cycle, A.C., plug and cord, safety valve, 15 ft. air hose. Just plug into light socket and it is ready for operation. **\$14.50 complete.** Send \$5.00 dep. sit, balance C. O. D. Shipping weight, 30 lbs. **Sold on money-back guarantee basis.**



NATIONAL ELECTRIC TOOL CO.
560 Washington Blvd. Dept. 349 Chicago, Ill.

Simple Method of Removing Valve Springs

An auto mechanic in Texas has a method of removing and replacing valve springs in Whippet cars that saves him considerable time and makes it unnecessary to loosen the guide blocks to insert a compressing tool. He unscrews the spark plug in the cylinder he is working on and inserts a small screwdriver through the hole and underneath the valve head to hold it up after the locking key has been removed. In this way, after taking out the spring retainer, the spring can be removed or replaced quickly with the fingers.—J. L. Baker, Cooper, Tex.

SPORS
1933
NO. 46 SUMMER EDITION
WHOLESALE CATALOG
SHOWING OVER
3000
FAST SELLING
SPECIALTIES
FROM ALL PARTS
OF THE WORLD
MORE SALES—
BIGGER PROFITS
SPECIALTY SALESMEN
WHOLESALE MANAGERS,
JURORS,
SALES OPERATORS



SPORS COMPANY
WHOLESALES—IMPORTERS—MANUFACTURERS
LE CENTER, MINN.

3000 ITEMS FREE WHOLESALE CATALOG

of 152 pages, for agents, salesmen, dealers, etc. Shows 3000 items at rock bottom wholesale prices. Deals, flavors, gifts, premiums, toiletries, hosiery, etc. are illustrated. Send for the Newest Summer Issue, TODAY.

SPORS CO.

7-35 Main St., Le Center, Minn.

Metal Castings Inventors and Craftsmen

Make your own castings of aluminum, copper, bronze, silver, brass. Outfit contains gas furnace with 110 volt, 60 cycle motor blower, moulding sand, crucibles, tongs, rubber hose, flask, parting materials and instructions for use. For making models, trays, dishes, art objects, tools, shop equipment, etc.; also used for forging, case hardening and heat treating. Crucible capacity 6 cubic inches. Price of outfit No. 351, capacity 6 cubic inches, \$9.50. Weight 25 lbs. Price of outfit No. 352, capacity 12 cubic inches, \$13.00. Weight 40 lbs. Prices f. o. b. K. C. Check or money order acceptable, express charges C.O.D. Write for Free Circular. See page 44 July issue.


KANSAS CITY SPECIALTIES CO.

P. O. Box 6022

Kansas City, Mo.

Men & Women Earn Cash at Home!
Grow fancy giant mushrooms in cellar, attic, barn. Easy, odorless method. We show you how, furnish guaranteed materials and buy crops. Valuable big book, pictures free if you write quickly. (Est. 1908.)
UNITED CO. 3848 Lincoln Ave. Dept. 129 CHICAGO

MIND POWER



A FREE BOOK

Develop your personal, creative power! Awaken the silent sleeping forces in your own consciousness. Become Master of your own life. Push aside all obstacles with a new energy you have overlooked. The ROSICRUCIANS know how, and will help you apply the greatest of all powers in man's control. Create health and abundance for yourself. Write for FREE book, "The Wisdom of the Sages". It tells how you may receive these teachings for study and use. It means the dawn of a new day for you. Address,

Scribe N.Z.G.
ROSICRUCIAN BROTHERHOOD
San Jose (AMORC) California



ONE MAN BRICK MACHINE

A new and revolutionary process of brick making. Plants make brick in single, double and triple units and complete range of forty colors. Continuous line production and direct delivery from plant to builder provides greater efficiency than large central plants, at a fraction of the cost.

In territories where they are located, plants in operation demonstrate earning possibilities beyond anticipation, and have cut the cost of fire-safe buildings down to that of frame.

Sold under exclusive franchise with initial investment as low as \$1500. Write for "4 KEYS TO SUCCESS."

W. E. DUNN MFG. CO.

600 W. 24th St.

Holland, Mich.

TRIMM EXCELLOPHONE
The Best **\$32.50**
Hearing Aid
for Most People *And Up*

HAS— { **Bone Conduction**
AMPLIFIED { **Air Conduction**

The lowest current drain. The least operating cost; uses ordinary flash light batteries; is lightweight and really comfortable to wear. Built by the world's foremost manufacturer of GROUP HEARING AID equipment. Write for free literature of either individual or group hearing aids.

TRIMM RADIO MANUFACTURING CO.
Dept. PM, 1528 Armitage Av., Chicago

Raise Giant Frogs

A NEW INDUSTRY!



MAKE BIG MONEY raising giant frogs. Breeder lays 10,000 eggs each year. Bull-frogs sell \$1 to \$5 dozen. Biggest money-maker you can raise. Back-yard ponds start you. Any climate suitable. Our FREE book "A Fortune in Frogs" explains everything. Write today.



FREE BOOK

AMERICAN FROG CANNING CO.

(World's Largest Frog Market)

Dept. 133-S

NEW ORLEANS, LA.

When writing to advertisers please mention Popular Mechanics

AMAZING TYPEWRITER BARGAIN

New Remington Portable only 10¢ a day!



10-DAY FREE TRIAL OFFER

Only 10¢ a day buys this latest model machine. Not a used or rebuilt typewriter. Not an incomplete machine. A beautiful brand new regulation Remington Portable. Standard 4-row keyboard; standard width carriage; margin release on keyboard; back spacer; automatic ribbon reverse; every essential feature found in standard typewriters. Carrying case and typing course free . . . absolutely the biggest typewriter value ever offered! Try it in your home or office 10 days free. If you do not agree that it is the finest portable at any price, return it at our expense. Don't delay. We pay cost of shipment direct from the factory to you. You save on the purchase price and you do not risk one penny. Write today!

FREE HOME TYPING COURSE

Write Remington Rand Inc., Dept. 152-9, 205 E. 42nd St., N.Y.C.



Over 95 SHOE STYLES FOR WORK and DRESS WEAR

New line ready. Collect liberal commissions representing Tanners Shoe Company in your locality. Famous for over 20 years as leader in direct selling shoe industry. Over a million customers. Our complete line of MEN'S, WOMEN'S and CHILDREN'S SHOES enables you to get every possible sale. Simpler styled Superior quality! Sensational values! Special arch support! \$10,000 Gold Bond guarantees satisfaction! Extra bonuses to producers. Experience unnecessary. Free fitting, measuring and selling instructions. We start you. Free delivery. We pay postage. Best selling season here. Write today.



OUTFIT FREE
TANNERS SHOE CO. 405 C Street Boston, Mass.

Cheaper HEAT Without COAL



New Invention Fits Any Stove or Furnace

Remarkable invention burns 96% air, 4% of a cheap variety of oil obtainable everywhere. Does away with coal, wood, ashes, dirt and drudgery. Quick, clean, silent heat. 3 times hotter than coal, and cheaper. Temperature control gives any amount of heat desired—no more getting up on bitter cold, wintry mornings. Many automatic features. No gas or electricity needed. Safe as ordinary kitchen range. Easy to install—no damage to stove—simply sits in firebox of any stove range, or furnace. Costs just a few cents a day to operate.

EARN \$60 A WEEK!

Write for FREE Burner offer and protected territory

Men and women wanted to demonstrate and take orders for this wonderful invention. This year's sales are tremendous. Make big money. Experience unnecessary.

TRY 30 DAYS AT OUR RISK

Low introductory price and 30 day trial. Write for free catalog. AGENTS and spare time workers: Oil heat saves money this year; people buy to save! Write immediately for free burner offer that starts you in business for yourself. Act NOW!

BRIGHAM OIL BURNER CO.

2927-J Clark Ave.

St. Louis, Mo.



BIG MONEY Assembling NEW KI-YAK IN 3 DAYS

Make big money on each 20 lb. Mead KI-YAK you easily assemble at home in 3 days from complete "cut-to-fit" Kit at amazing LOW COST! Seaworthy. Fast! Snappiest thing afloat. (Complete Sailing Rig, a few dollars extra.) Rush 10c for illustrated folder and \$6 Paddle GIFT OFFER! MEAD GLIDERS, 15 S. Market, Dept. B-9, CHICAGO, ILL.

GIVEN!
\$6 Double-blade Paddle now given with your Ki-Yak . . . if you hurry!

WANTED MEN

MANAGE POTATO CHIP STORES

We furnish everything—help finance and locate you. No experience needed. Tremendous profits. Sensational introductory starting plan. No house-to-house canvassing. Wonderful opportunity. Rush name for free book of Profit Facts—today!

LONG-EAKINS COMPANY
928-S High Street, Springfield, Ohio

LONG RANGE TELESCOPE

YOU WILL ENJOY using this terrestrial telescope. Fine 1 1/4 inch objective lens. ALL BRASS body over one foot long. Folds to pocket size! Easy draw. Special eye-cup for true aid vision. C. O. D. 15c extra.

For only \$1.00
We Pay Postage

SEND FOR CATALOG
BINOCULARS, FIELD GLASSES,
MICROSCOPES, AIR GUNS, ETC.

DWIGHT-CARLSON LABORATORIES
Dept. P-9 175 Fifth Ave. New York, N. Y.

Files Up To 50 Saws a Day!

F. L. Kuehn, III, writes "Having good success with my FOLEY Automatic Saw Filer. It does perfect work on all saws, hand, circle and band saws. People bring work from 30 miles away. Often file 40 to 50 saws a day." No experience needed. Steady, growing, cash business. Small investment. Send postcard for FREE PLAN.

FOLEY MFG. CO., 916-5 Foley Bldg.
11 Main St., N. E., Minneapolis, Minn.

NEW!! MIDGET POCKET RADIO

Fits in any pocket easily. Weighs only 4 ozs. as shown! NO tubes, batteries or electrical connections needed! Nothing to wear out or need replacement—only one moving part. Separates and receives stations with beautiful clear tone. Range up to 50 miles—much greater under good conditions—very little static! Can be used by ANYONE ANYWHERE! Footpedal—No Crystals to adjust! Absolutely complete with midget phone and directions to use on Bicycles, Autos, in office, hotels, camps, at home, etc. No messy hookups! THESE ARE FACTS! Send only \$1.00 and pay postman \$1.99 plus postage or send \$2.99 (Cash, Money Order or Check). Ideal gift. Guaranteed. Order NOW! (Foreign orders 65c extra.) At Better Dealers.

TINYTONE RADIO CO. Dept. P-9 **KEARNEY, NEB.**

new Invention SAVES GAS!

CUTS GASOLINE COSTS up to 30%

Creates New Mileage Records
It's Here! VACU-MATIC—"The Carburetor That Breathes!" AUTOMATIC CONTROL guarantees constant peak performance. More power, smoother running, quicker starting. Fits all cars; installed in a few minutes.

TRIAL Don't wait! Just send name and address for details about VACU-MATIC and our FREE TRIAL OFFER. Write Today! **AGENTS WANTED**

VACU-MATIC CO., 7617-114 W. State St., Wauwatosa, Wis.

MAKE MONEY PRINTING

letter and billheads, circulars, cards for friends, spare time. Easy to learn, easy to get jobs. **Printing Presses \$12;** new type faces, complete supplies, lowest prices. Send stamp for catalog.

PEIFFER CO., 51-A; 6 Columbia St., Newark, N. J.

EXHAUST AND VENTILATING FANS \$2250

WITH AEROPLANE PROPELLER BLADES, DELIVER MORE AIR . . . and up to 25% more!

For restaurants, homes, any place needing ventilation. Special 20 inch propeller blades for one-half inch shaft motors \$3.75 Collect. Circular for stamp.

A. & D. ELEC. MFG. CO., Minneapolis, Minn.

Make Money at Home!

GROW MUSHROOMS in your cellar or shed. Exclusive new process. Bigger, better, quicker crops. More money for you! Enormous new demand. Write for Free Book.

American Mushroom Industries Ltd., Dept. 390, Toronto, Ont.

TALK-SING-PLAY thru your own radio



BROADCAST your voice on programs coming through your radio set—make announcements from any part of house—inject wise cracks, josh and mystify friends. "World's Mike" made especially for home use, attached in jiffy, any set. **Not a Toy.** Also put on own programs at home, parties, club affairs. Barrels of fun! Easy to operate. **PRICE**

ONLY 25c POSTPAID

Mammoth 600 page catalog of novelties, jokes, tricks, books, etc. 10c.

JOHNSON SMITH CO.,

Dept. 853 RACINE, WIS.

THE ART OF DANCING THE CARLO, CONTINENTAL, RHUMBA, KISS DANCE, ETC.

LEARN TO DANCE THE LATEST STEPS. Be popular this season. Really good dancers are always admired—always popular guests. Partners welcome them eagerly. With the aid of this book you can learn the newest, smartest steps without a teacher and become a dancer who is sought after. After following the instructions in this new book you won't need to make excuses when the dance music starts. Besides you'll get lots of fun out of parties and dances. If you want to become a perfect dancer, learn to dance at home this new, easy way.

WHAT THE BOOK TELLS: How to develop poise and control, how to improve your dance steps, the art of holding, how to walk to music, how to lead, how to do the latest Fox Trot Steps, Natural and Reverse Turns, the Reverse Wave and Change of Direction Steps, the Quickstep, swaying to music, how to Waltz, Backward Changes, how to do the Continental, the famous Kiss dance, the Manhattan Dance, the College Rhumba, the Carlo, the Charleston, etc., etc. 16 chapters, nearly 100 illustrations are given; everything is made so plain that you'll be dancing before you know it. **PRICE 25 CENTS, POSTPAID**

JOHNSON SMITH & CO., Dept. 853, RACINE, WIS.



Learn to be a Tap Dancer

Why envy the easy rhythm and fascinating grace of Step'n Fetchit, Fred Astaire and others? Now you can learn to tap dance in **ONLY 6 HOURS** by a new, simplified course of lessons by Prof. Hawley Wilson. No special ability needed.

PRICE 25c

Be smart! Learn tap dancing. Everybody's tapping. The whole town is tapping. Learn to beat out a tune with your feet. Hostesses love it. Friends adore it. It's fun and you'll thoroughly enjoy the lessons. Besides, tap dancing is not only an invigorating and entertaining accomplishment, but it is also an invigorating and health-giving exercise for making the limbs supple and giving a "springy" feeling of fitness to the whole body. It promotes slimmness—nature's way, without pills, drugs or dieting. Here is what some of our readers say: "... wonderful benefit. Thank you for adding tap dancing to my accomplishments."

And another: "My friends were amazed. I dare not recommend your course for fear of competition." **PRICE 25 cents. JOHNSON SMITH & CO., Dept. 853, Racine, Wis.**

Boy Electrician with 75 illustrations for making Batteries, Dynamos, Motors, Telegraph apparatus, Telephone, Lights, Bells, Alarms, Colls, "Wireless" Current Reverser, Electric Engine, Radio, etc. **Price 10c Postpaid. J.S. & Co.**

50 SIMPLE TRICKS OF SELF DEFENSE

Contains more than 50 simple means of discomfiting a chance assailant either with the bare hands or with implements of wood or metal. A walking stick, or an umbrella, for example, is familiar enough to all, but their effective use offensively or defensively are comparatively unknown. Fully Illustrated. **Price 25 Cents Postpaid.**

BLANK CARTRIDGE PISTOL REVOLVER STYLE

Three new models now out. 25c, 50c and \$1.00. Well made and effective. Modelled on pattern of latest type of Revolver. Appearance alone enough to scare a burglar. Takes 22 Cal. Blank Cartridges obtainable everywhere. Great protection against burglars, tramps, dogs. Have it lying around without the danger attached to other revolvers. Fine for 4th of July, New Year's, for stage work, starting pistol, etc. **SMALL SIZE 4 in. long 25c. MEDIUM SIZE 5 in. long 50c. LARGE SIZE 6 in. long \$1.00. BLANK CARTRIDGES 50c per 100. HOLSTER (Cowboy type) 50c. Shipped by Express only not prepaid. Big novelty catalog 10c. JOHNSON SMITH & CO., Dept. 853, Racine, Wis.**



CRYSTAL RADIO DETECTOR 25c

COMPLETE WITH CRYSTAL RECEPTION POSITIVELY GUARANTEED



This Detector is practically a radio in itself, as it is possible to get reception with it alone, provided you are within 25 miles of a broadcasting station (or up to 100 miles under very favorable conditions). All you need is an aerial and an ear phone and you are all set. It is completely assembled and wired, all ready for use.

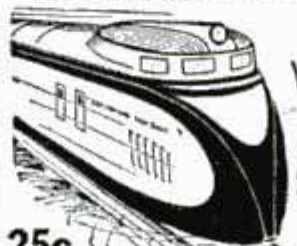
It has two posts, making connection much easier, also making it possible to make changes quickly. Everything complete, including the stand, crystal cup, arm with catwhisker and necessary screws, an ultra sensitive crystal of the finest grade, two terminals for wire connections mounted on base—**EVERYTHING COMPLETE FOR ONLY 25c POSTPAID.**

BOOK ON RADIOS 10c

Add 10c and we will send you a book titled "EFFICIENT RADIO SETS." Tells how to make inexpensive radio receiving sets, crystal as well as electrical, how to make short wave set, etc. Fully illustrated. **Price 10c Postpaid.**

JOHNSON SMITH & CO. Dept. 853, RACINE, WIS.

NEW STREAMLINED ELECTRIC TRAIN "THE SILVER BULLET" 25c



A complete Electric Train for **ONLY 25 CENTS.** Of course the **SILVER BULLET** isn't a \$20.00 train, but just listen to what you get for your quarter: All the parts for a fast, peppy motor—complete base, wheels, wire, etc.—the beautiful black and silver cover—etc., etc. Needs no tracks or transformer—a big saving. And as for building it, why some kids say they have twice as much fun building it as running it—it's so simple. This neat and flashy kit ready to assemble is only 25c, plus 10c postage and packing.

25c and 10c postage and packing. JOHNSON SMITH & CO., Dept. 853, RACINE, WIS.

THE SCIENCE OF JIU JITSU



"THE SCIENCE OF JIU JITSU" is the title of a new book, dealing with the Japanese art of self-defense from entirely different angles. Many new methods of attack and defense, etc., are given, illustrated with specially drawn diagrams so that you cannot fail to understand them. The book deals fully with breakfalls, trips and throws, groundlocks, wrist locks, "shake-hand" trick, body hold under arms, arm press, defense against revolvers, defense for strangling, knee and ankle throw, straight and reverse armlocks, "the scissors," the splits, head lock and kidney squeeze, holding a man down, the kick at stomach, the body lever, double knee throw, defense against stick, stick attack, defense against knife, knee kick and ankle jerk, armpit leg lock, one hand grip on throat, defense against two assailants, the colique rolling breakfall, the stomach throw, secret thumb knockout, producing unconsciousness, various nerve pinches, defenses for women, etc., etc. With the aid of this book you can learn to protect yourself everywhere under all circumstances with nature's weapons. **PRICE 30 CENTS POSTPAID.**

FEAR NO MAN
JOHNSON SMITH & CO., Dept. 853, RACINE, WIS.

BOYS! THROW YOUR VOICE



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



THE VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. Never fails. A 64-page Book on Ventriloquism and the Ventrilo. **ALL FOR 10c POSTPAID.**

JOHNSON SMITH & CO. Dept. 853 RACINE, WIS.

LATEST CATALOG
A copy of our NEW CATALOG mailed on receipt of 10c., or the De Luxe Edition with cloth binding 25c. Bigger and better than ever. Only book of its kind in existence. Nearly 600 pages of the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocureable elsewhere. Remit by Coin, Money Order, or Stamps, for all articles listed above. If by Check, add 15c for exchange. Canadian money and stamps, and British P. O. Orders accepted.

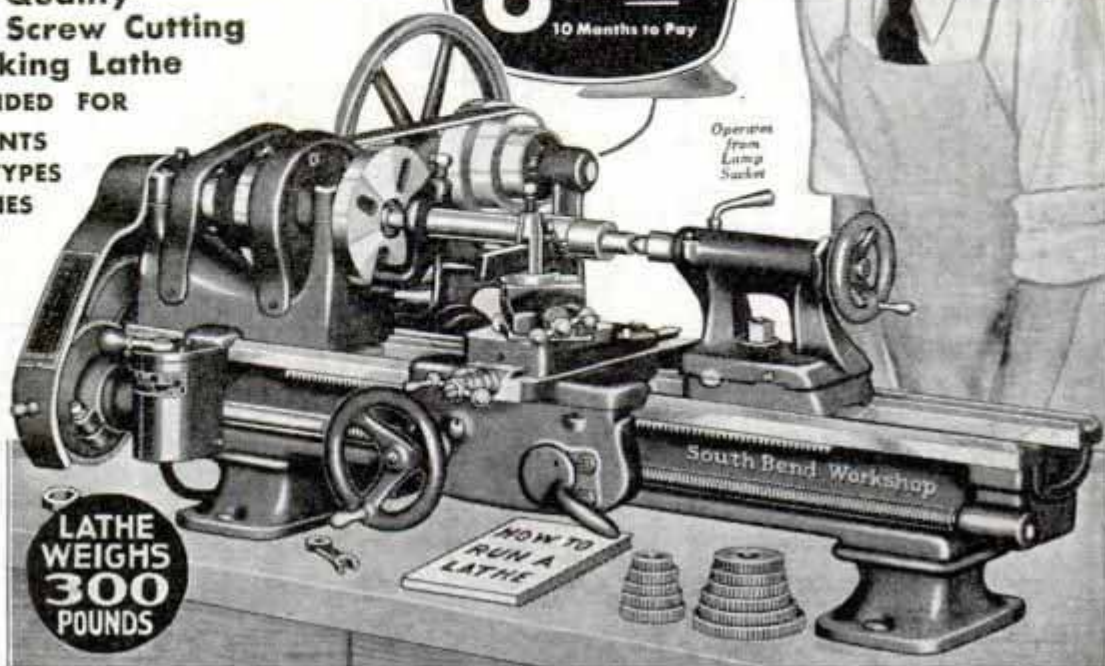
South Bend 9" x 3' WORKSHOP Precision Lathe

A High Quality
Back-Geared, Screw Cutting
Metal Working Lathe

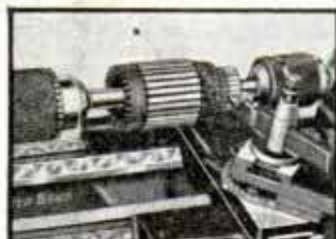
RECOMMENDED FOR

- MANUFACTURING PLANTS
- MACHINE SHOPS, ALL TYPES
- U. S. GOV. LABORATORIES
- AUTO SERVICE SHOPS
- ELECTRICAL SHOPS
- HOME WORKSHOPS
- INVENTORS
- SCHOOL SHOPS
- WASHING MACHINE
and REFRIGERATOR
REPAIR

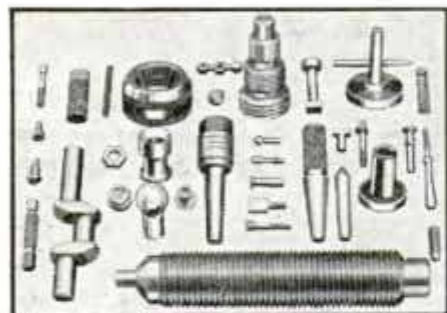
This Lathe
TURNS, BORES, FACES,
CUTS SCREW THREADS,
DOES CHUCKING,
REAMS, FILES,
POLISHES, DRILLS
AND DOES HUNDREDS
OF OTHER MACHINE
OPERATIONS



9 1/2" swing x 3' bed Workshop Lathe with Horizontal Countershaft, 1/4 h.p. reversing motor, reversing switch, and belting. \$24.00 Down, \$7.00 a Month. **\$94.00**
11 Months to Pay. (Special tools extra.) For other sizes see prices below.



Truing an Armature.



Metal Parts Machined in this Lathe.

Lathe Machines Metals, Woods, Compositions, Etc.

The 9" x 3' Workshop South Bend Lathe is the greatest value we have ever offered in our 28 years of lathe building. It is practical for making and servicing mechanical devices of every kind. Recommended for all classes of accurate machine work, wood turning, radio, auto and electrical repair; also for model, tool and instrument work. This precision lathe performs all general machining operations on cast iron, steel, other metals, woods, hard rubber, fibre, bakelite, and similar compositions.

FEATURES: The 9" Workshop Lathe is a rigid, powerful, accurate, modern lathe. It is constructed entirely of cast iron and steel and all gears are machine-cut and tested. Has six spindle speeds; cuts screw threads 4 to 40 per inch; has automatic longitudinal feed to carriage; 1/4" hole through spindle; graduated compound rest; micrometer graduations on feed screws; reverse for threads and feeds; three V-ways and one flat-way on bed. Can be fitted with 38 practical attachments.

30-DAY TRIAL. Send in your order and down payment today and try this genuine South Bend Lathe for 30 days in your own shop. The lathe will be shipped immediately. Satisfaction guaranteed or your money back.

EASY PAYMENT PRICES 9-inch WORKSHOP LATHES—10 to 12 Months to Pay										
Size of Lathe			Lathe Less Countershaft				Lathe with Motor Drive			
Swing Over Bed	Length of Bed	Distance Between Centers	Wgt. Lbs.	Net Price	Down Payment	Monthly Paym'ts Each	Wgt. Lbs.	Net Price	Down Payment	Monthly Paym'ts Each
9 1/2"	3'	18"	240	\$ 75	\$19	\$6.50	300	\$ 94	\$24	\$7.00
9 3/8"	3 1/2'	24"	265	87	21	7.00	325	106	28	7.00
9 1/2"	4'	30"	290	99	24	7.00	350	118	29	8.00
9 3/4"	4 1/2'	36"	340	116	29	8.00	400	135	31	9.00

MAIL COUPON FOR BULLETIN No. 5-W FREE

SOUTH BEND LATHE WORKS 6-38
609 E. Madison St., South Bend, Ind., U.S.A.

Please send me free quotation and illustration on the following lathe:

Swing.....Length of Bed.....
 Countershaft Drive Motor Drive

My work is.....
 9-inch "Workshop" Lathe Bulletin No. 5-W (free)
 How to Run a Lathe (160 Pages) (25c)

Name.....

Address.....

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

South Bend Lathes are Displayed in over 400 Cities of the U. S. A., also in Principal Cities throughout the World.

POPULAR MECHANICS PRESS, PRINTED IN U. S. A.



WRITE FOR BULLETIN 5-W—FREE

Bulletin No. 5-W fully describes and prices the 9" Workshop Lathe in its various sizes together with all its accessories and attachments. This 20 page bulletin mailed free postpaid to any address. Send coupon now.

If interested in larger size lathes, write for Catalog No. 94, which shows South Bend lathes from 9" to 18" swing inclusive. Catalog mailed free postpaid.



SOUTH BEND LATHE WORKS
609 East Madison St., South Bend, Ind., U. S. A.

Lathe Builders Since 1906—Users in 97 Countries

MUTT AND JEFF NEARLY LOSE THEIR JOBS ---



"I'LL NEVER JOKE ABOUT A BLOW-OUT AGAIN" says **BUD FISHER**
Famous Creator of Mutt and Jeff



PLAY SAFE WITH SILVERTOWNS!

"MANY a time I've joked about a blow-out," says **BUD FISHER**, "but never again! On the way to Saratoga for the races, my car was completely overturned due to a blow-out. I was compelled to spend several months in the hospital, during which I had plenty of time to think of how important a part tires play in the safety of motoring. I'm not taking any more chances. I've equipped my car with Goodrich Silvertowns."

At today's high speeds, the *inside* of the tire gets as hot as boiling water. Sooner or later, this internal heat must escape. And it does. A tiny blister forms on the inside of the tire—between the rubber and

fabric!—This blister grows bigger—**BIGGER**, until, sooner or later, **BANG!** A blow-out!

To protect motorists, **GOODRICH** engineers invented the amazing Life-Saver Golden Ply—which resists internal tire heat and protects against these treacherous, *high-speed blow-outs*.

And examine the husky-cleated tread on these big Silvertowns. Then you'll see why they keep your car "straight-in-line" on wet slippery roads and give you months of extra "trouble-free" mileage! Equip your car with **GOODRICH Silvertowns**. They cost not a penny more than other standard tires... and they may be the means of saving your life!



The **NEW Goodrich Safety Silvertown** 
WITH LIFE-SAVER GOLDEN PLY



ATHLETES SAY :
"THEY DON'T
GET
YOUR WIND"



JOSEPHINE McKIM, Olympic swimmer and former holder of U. S. national and world records in many free-style events. "One of my rules in connection with smoking," she says, "is that I always choose a Camel. 'I'd walk a mile for a Camel!'"

GENE SARAZEN: "It's an important point that Camels are milder. They never get my wind or upset my nerves."



LOU GEHRIG, "Iron Man of Baseball," says of Camels: "Camels are so mild they never interfere with my wind."



"**CAMELS ARE** such a mild cigarette!" Miss McKim says. "I smoke them steadily. They never bother my wind."

LESTER STOEFFEN, U.S. doubles champion. Stoeffen says: "Camels are so mild. They never get my wind."

YOU'LL LIKE
THEIR
MILDNESS
TOO!



WHEN CHAMPIONS say: "Camels don't get your wind"—it's a guide to every one who wishes to keep fit. Camels are so mild—never get on your nerves...never tire your taste.

Camels

SO MILD YOU CAN SMOKE
ALL YOU WANT



COSTLIER TOBACCOS!

● Camels are made from finer, MORE EXPENSIVE TOBACCOS—Turkish and Domestic—than any other popular brand.

(Signed) R. J. Reynolds Tobacco Co.
Winston-Salem, N. C.