

HEROES OF THE FIRE LINES

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



REG'D. TRADE MARK, GREAT BRITAIN, NO. 40428

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25 CENTS



SEE PAGE 806

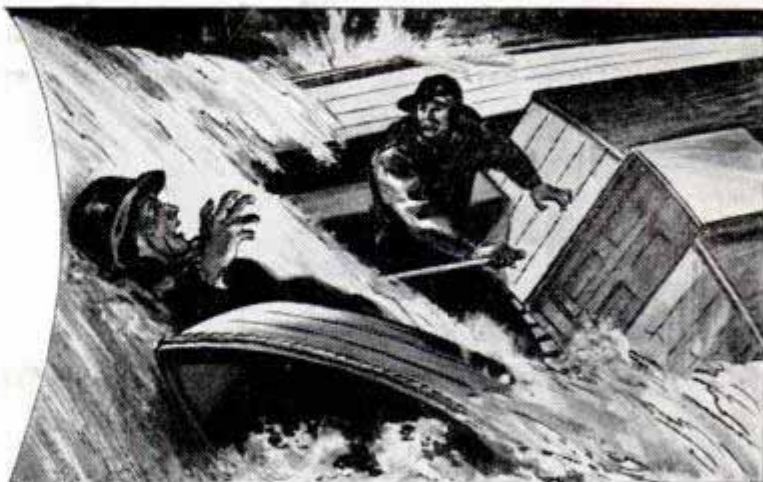
"GOODBYE WORLD! MY SHIP FADED INTO THE NIGHT!"

OVERBOARD IN STORM, YACHTSMAN CLINGS TO CAPSIZED DORY AS SLOOP HOLDS COURSE



① "My 40-foot sloop was footing it up Long Island Sound like a scared cat before a stiff sou'-west breeze," writes Tom Meyer

of 280 Bronxville Road, Bronxville, N. Y. "At midnight...



② ...off Smithtown Bay, it really began to blow. My partner, Larry Starr, was asleep below, and I gave the tiller to a friend who had done no sailing before, so I could get the dinghy in on deck before it got away from us. Then, with the darn thing half-way on board a big comber pounded over the stern, swept my feet out from under me and overboard I went, weighted down with boots and oilskins. I still clung to the dinghy, but its line had parted and my ship faded quickly into the black night!

③ "The lad at the tiller didn't know how to bring the ship about, and although he would wake Larry, they'd be too far away to ever find me in that roaring darkness.

"I was growing numb with cold. I couldn't hang on much longer. I rolled against the gunwale of the dinghy for a fresh grip on the world that was slipping away from me. Something hard dug into my side... the flashlight in my pocket! Soaked, though it was, here was a chance!



④ "I pressed the switch. A finger of light stabbed through the storm. Time dragged on as I played the light about me. I cursed my shipmates. 'Why can't the fools see my light?' and then...the beam caught the white sail! I screamed for joy. An arm waved encouragement. Minutes later, thanks to those *fresh* DATED 'Eveready' batteries that kept working under the toughest conditions imaginable, I was warm and happy in my own bunk on my own ship, our Block Island cruise resumed.

(Signed)

Tom Meyer

FRESH BATTERIES LAST LONGER... Look for the DATE-LINE



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Unit of Union Carbide  and Carbon Corporation

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8. 100% Hydraulic Brakes.

ISN'T IT great news about the new 1939 Plymouth—the value is up, but the prices are down!

There's new shifting ease in Plymouth's Perfected Remote Control Shifting with All-Silent Auto-Mesh Transmission—standard on "De Luxe"... a great new ride with new Amola Steel Coil Springs!

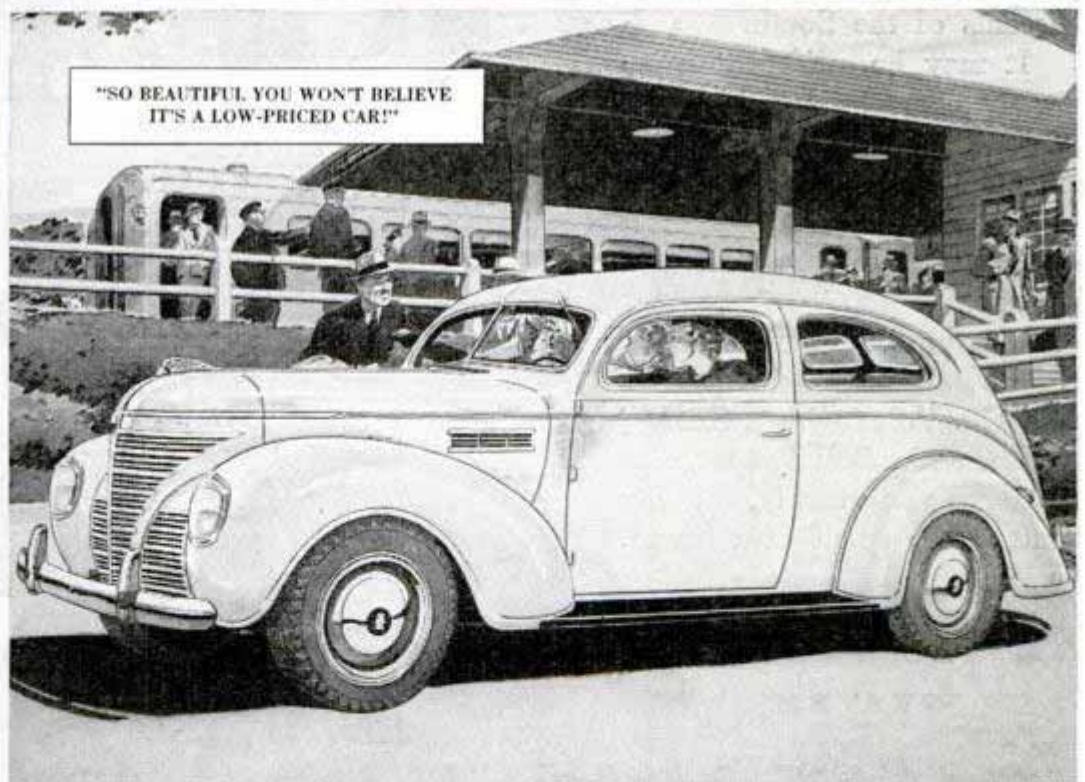
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"Detroit delivered prices" include front and rear bumpers and bumper guards, spare wheel, tire and tube, foot control for headlight beam with indicator on instrument panel, ash-tray front and rear, sun visor, safety glass and big trunk space (19.3 cu. ft.). Plymouth "Roadking" models start at \$645; "De Luxe" models slightly higher. Plymouth prices include all federal taxes. Transportation and state, local taxes, if any, not included. See your Plymouth dealer for local delivered prices.

MAJOR BOWES' Amateur Hour, C.B.S. Network, Thurs., 9-10 P. M., E. S. T.



THE 1939 PLYMOUTH "ROADKING" Two-Door Touring Sedan...all-steel body completely rust-proofed.

PLYMOUTH BUILDS GREAT CARS

THE "ROADKING"
THE "DE LUXE"



THE VOICE WITH

A Smile



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SOUTH

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It may be swift and crisp in the New York manner or full of the pleasant rolling r's in the style of the West.

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It's the all-American voice of the Bell Telephone operator — "The Voice with a Smile."

The entire Bell System seeks to serve you quickly, capably and in the spirit of a friend.



EAST



WEST

**BELL
TELEPHONE
SYSTEM**



Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

December, 1938

Vol. 70, No. 6

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Taming Wild Wells

AN ominous roar sends men scurrying away from the derrick. A gray column of gas and oil screams in its sudden release from the ground. Timbers swish into the air like toothpicks. Then a thundering detonation shakes the earth and rocketing flames a hundred feet high envelop the oil-well derrick and machinery. A call for help flashes over telephone and telegraph wires. Autos, trains and planes rush the wild-well tamers to the scene—men in asbestos suits who use nitroglycerine and complicated apparatus to battle the inferno. An exciting word-and-picture story in the January issue will tell you how these daring fire fighters go calmly about their dangerous job on which the chances are about two to one that some of them will be badly hurt or burned or blown to bits before it is finished.

Next Month

TEACHING a lion to walk a tightrope is no more difficult than teaching a seal to turn on the water in the bathtub. But watch the lion's eyes! When his pupils begin to enlarge, he's getting angry, and trouble may be brewing. An article next month, illustrated by eight pages of Coloroto pictures, tells how animals are trained for the movies.

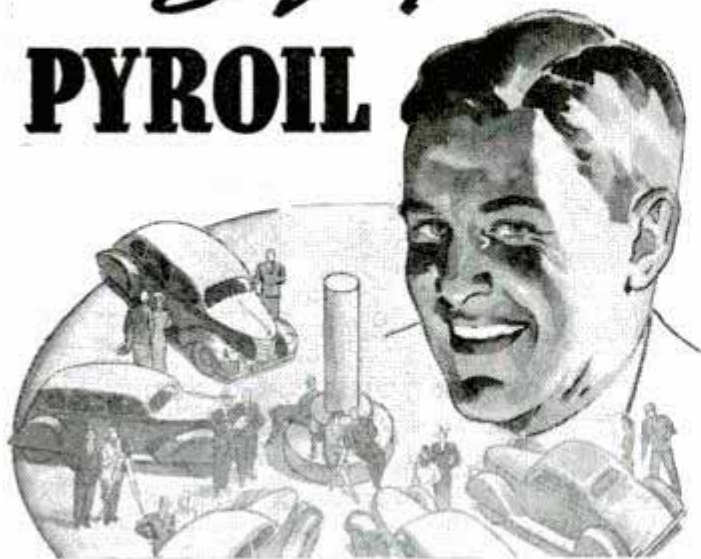
Flight over Weather

FLIGHT at 100,000 feet? Not in our lifetime, says Capt. D. W. Tomlinson, stratosphere research pilot for TWA. But he tells you in the January issue how it will feel next summer to take a trip in the sealed, supercharged cabin of a skyliner roaring across the continent at an altitude of 20,000 feet.

Highway Trackers

JUST as Indian scouts in pioneer days "read" the footprints of the man whose trail they were following, so do modern trackers of the asphalt street and rural highway read in tire prints about the motorist they are hunting—his character and habits, the type and condition of his car. The tire sleuth may look for a fugitive driving a car with brake drums irregularly worn, or wheels out of alinement. Thus they track the modern cattle thief and highwayman. Read about this infant branch of criminology in the January issue.

Treat your new car *Safely* with **PYROIL**



Keep Performance Up to the Manufacturer's Intended Standards

★ Mr. A. F. W., of Newton, Pennsylvania, says: "I bought a car new and used Pyroil in both gas and oil. After more than 25,000 miles I cannot get any oil in it between changes. It still has all the power and pep of a new motor."

★ And, Mr. H. J. J., of Los Angeles, California, has this to say: "I began to use Pyroil over three years ago, and since that time I have used it in both my oil and gasoline. My motor has gone 62,000 miles, runs smooth and quiet, has good compression and power. I am very well pleased with Pyroil."

Your investment in a new car is an important one. And, Pyroil is mighty good "insurance" with which to back that investment. Pyroil keeps carbon, gum, sludge and corrosion from creating early damage in your new car. These contaminations rob your engine of power, cause higher operation costs, create excessive wear.

Ask your service station or garage salesman for an inexpensive Pyroil treatment, today! Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 512 Pyroil Bldg., LaCrosse, Wisconsin, U. S. A.



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 Also send details of your plan for Distributors.

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Address.....

City..... County..... State.....

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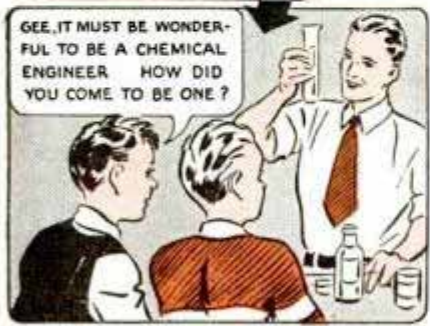
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**How a "Toy" Present
LED TO A
BUSINESS
CAREER**



**DAD... THIS IS REAL
ADVENTURE!... MY
CHEMCRAFT OUTFIT IS THE
BEST PRESENT I EVER HAD!**



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A FRIEND OF FATHER'S WAS WATCHING ME ONE DAY...



SEVERAL YEARS EARLIER.

YOU FIND THAT WORK VERY INTERESTING, DON'T YOU? HOW WOULD YOU LIKE TO WORK IN OUR PLANT LABORATORY WHEN SCHOOL'S OUT?



I'VE BEEN HERE SEVERAL YEARS NOW, AND THEY'VE JUST MADE ME ASSISTANT TO THE MANAGER

THAT'S WONDERFUL, I'M GOING TO ASK DAD TO GIVE ME A CHEMCRAFT OUTFIT FOR CHRISTMAS

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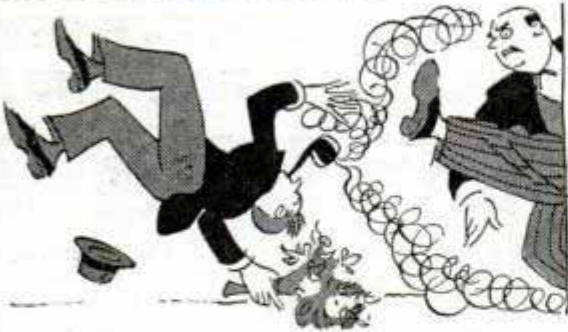
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TUNE IN Tommy Dorsey and his orchestra. Every Wednesday night, coast-to-coast, NBC Red Network.

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WHICH OF THESE MEN IS YOU?



Is This You?

OR

Is This You?



1. "My name is Stark. I'm never late mornings. I get back promptly from lunch—often work overtime cheerfully. I carefully do every single job they give me and in six years I have done each job so many times that I'm letter-perfect! Only one little raise so far, but some day I ought to get a good one. I'm probably the steadiest, most loyal employee in the whole office. One of these days the boss will realize that I'm the best man who ever worked on this job. Then I'll show these other fellows a thing or two!"

2. "My name is Baker. I've only been here a year, but the jobs they give men like Stark and me are too easy. In three months I saw I could never get far ahead on routine work like this. So I began to look for ways to increase and improve the work in my department. I'm taking home-study training that's helping me a lot. My boss heard about it and complimented me. Next month I'm going to be made Assistant Department Head at 40% more money. After that—well, we'll see. But you can bet I'm still studying!"

DON'T you recognize both these men in your office? One is a slow plodder—the other an energetic go-getter. Stark thinks of himself—Baker, of his company.

Stark runs along comfortably in a rut—*hopes* for a big raise. Baker pulls himself out of ruts—*gets* a big raise. And goes right on training for *another* one!

It's men like Baker who turn to LaSalle business training because of what it *gets* them! And they know it gets them *plenty* because the proof is plain to read in the grateful letters—and the successful lives—of thousands of LaSalle graduates.

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job you've got—to get the job ahead!" It all depends on you—the height of your ambition and your readiness to investigate, then study systematically and seriously.

The LaSalle Success Road is cleared and ready for earnest adults—has been traveled for thirty years. Its first sign-post has always been a man's name on a coupon like the one below.

It costs absolutely nothing to send such a coupon. But sending it may mean the turning-point in your whole life. Mail it! At least *find out* about LaSalle's road to better jobs—more money—success! There's no time like *NOW!*

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Dept. 1264-R CHICAGO

I am ambitious like Baker. Tell me how I can prepare for larger success—and send me your free booklet on the field I have checked below:

Executive Management Law: LL.B. Degree Salesmanship
 Accounting Traffic Management

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Position.....

Address.....



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Possibilities like these are ever present to the householder, but invite no delays, repair bills or expensive new purchases if you have a copy of the Smooth-On Home Repair Book, and a can of Smooth-On No. 1 on the shelf and like to prove yourself equal to the emergency.

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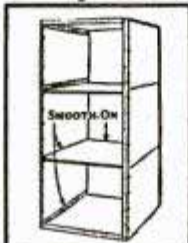
Radiator



Leaky Pail



Leaky Kettle



Leaky Tank



Stove Pipe



Oil Leaks

Mail the coupon for the Smooth-On Repair Book and get Smooth-On No. 1 in 7-ounce or 1 or 5-pound can from any hardware store.

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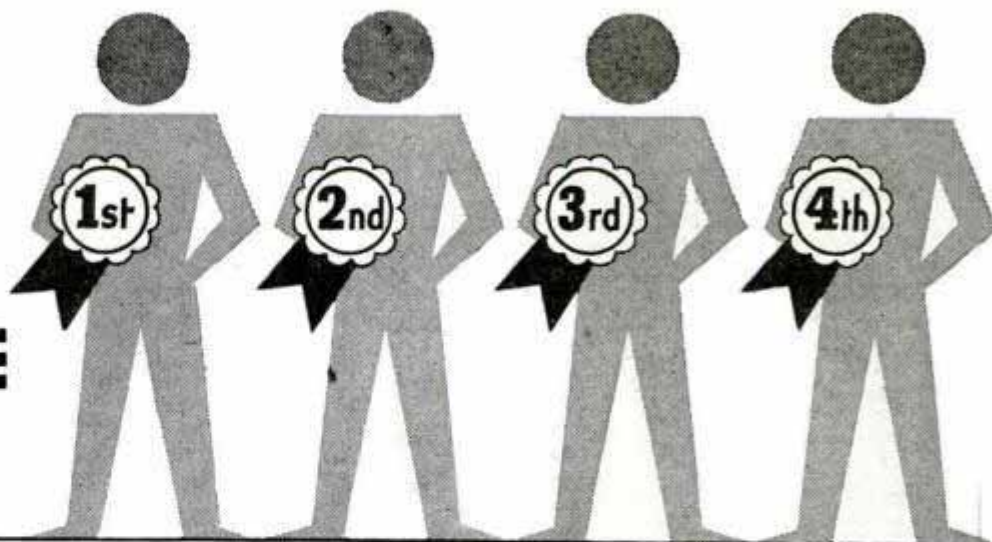
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| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio | <input type="checkbox"/> Air Conditioning and Cooling | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Steam Engineer | <input type="checkbox"/> Coal Mining |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Steam Electric Engineer | <input type="checkbox"/> Mine Foreman <input type="checkbox"/> Fire Bosses |
| <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Marine Engineer | <input type="checkbox"/> Navigation |
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| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> R. R. Section Foreman | <input type="checkbox"/> Woolen Manufacturing |
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City.....State.....Present Position.....

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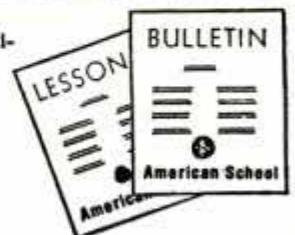
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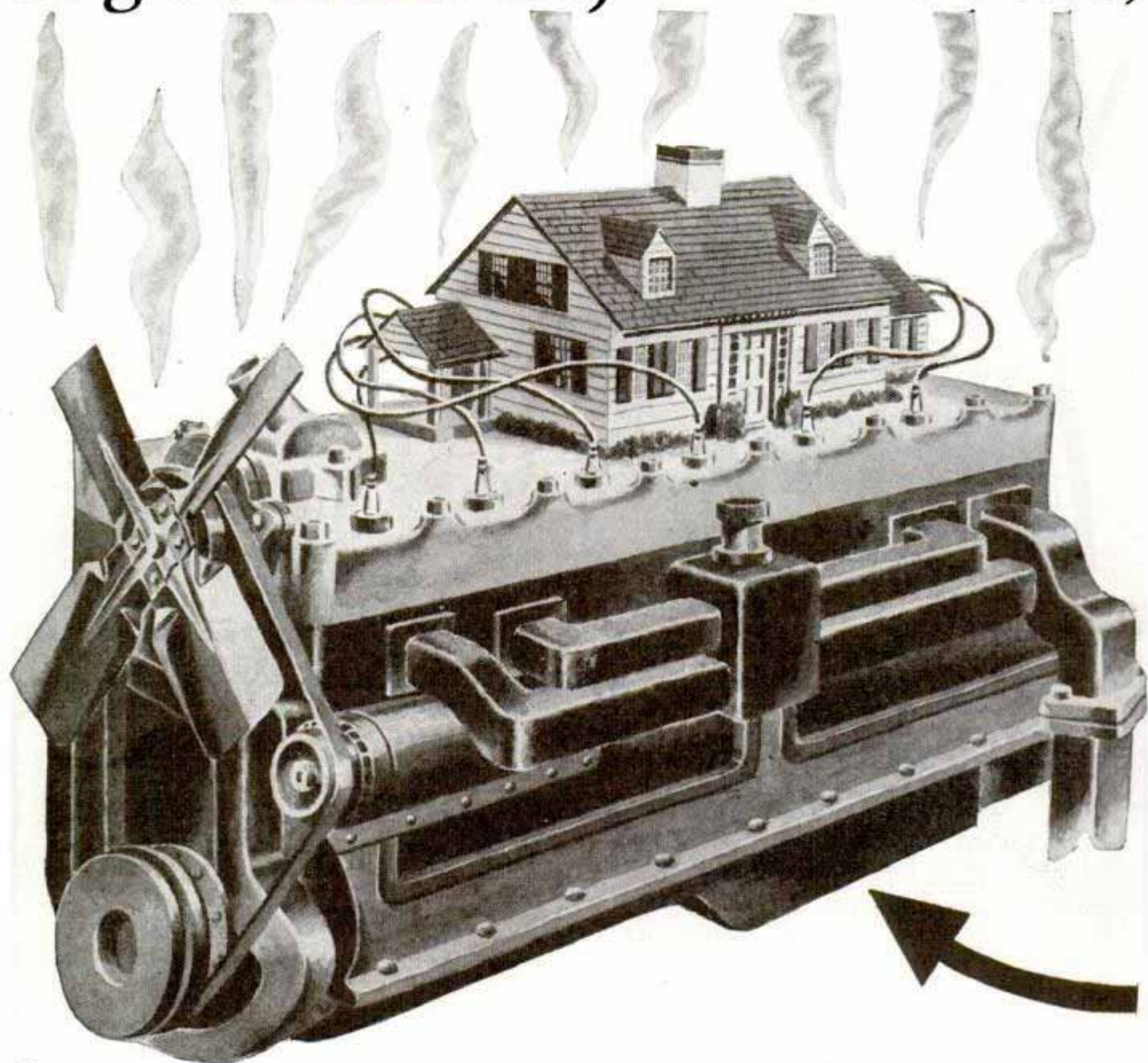
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YOUR MOTOR
WOULD WARM
A SIX ROOM HOUSE!**

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Even if these solution losses are small, they soon add up to a serious total loss of anti-freeze protection with the many stops a car makes in normal driving. Since the driver is rarely conscious of this *hidden boiling* that steals his anti-freeze, a freeze-up in the next cold snap is usually his first warning.

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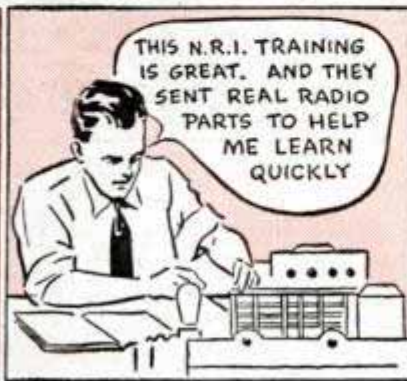
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YES- I'M CONVINCED THAT I CAN MAKE GOOD MONEY IN RADIO. I'M GOING TO START TRAINING FOR RADIO RIGHT NOW.

NO- NOT ME. I'M NOT GOING TO WASTE MY TIME. SUCCESS IS JUST A MATTER OF LUCK AND I WASN'T BORN LUCKY.

BILL SAID "YES" HE'S MAKING GOOD MONEY IN RADIO NOW



THIS N.R.I. TRAINING IS GREAT. AND THEY SENT REAL RADIO PARTS TO HELP ME LEARN QUICKLY



YOU CERTAINLY KNOW RADIO. MINE NEVER SOUNDED BETTER.

I'VE BEEN STUDYING RADIO ONLY A FEW MONTHS AND I'M ALREADY MAKING GOOD MONEY IN MY SPARE TIME

THANKS



OH BILL! I'M SO PROUD OF YOU. YOU'VE GONE AHEAD SO FAST IN RADIO

YES! I'VE GOT A GOOD JOB NOW AND A REAL FUTURE. THANKS TO N.R.I. TRAINING

TOM SAID "NO" HE'S STILL WAITING FOR LUCK



BILL'S A SAP TO WASTE HIS TIME STUDYING RADIO AT HOME



SAME OLD GRIND -- SAME SKINNY PAY ENVELOPE -- I'M JUST WHERE I WAS FIVE YEARS AGO



GUESS I'M A FAILURE. LOOKS LIKE I'LL NEVER GET ANYWHERE

YOU'LL ALWAYS BE A FAILURE, TOM, UNLESS YOU DO SOMETHING ABOUT IT. WISHING AND WAITING WON'T GET YOU ANYWHERE

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NAME.....AGE.....
 ADDRESS.....
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as \$30, \$50, \$75 a week. Many Radio Experts open full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, and pay up to \$6,000 a year. Automobile, police, aviation, commercial Radio, loud-speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read how they got their jobs. Mail coupon.

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| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Plumbing <input type="checkbox"/> Heating |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Air Conditioning and Cooling |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Commercial Refrigeration |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Steam Electric Engineer |
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BUSINESS TRAINING COURSES

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| <input type="checkbox"/> C. P. Accountancy | <input type="checkbox"/> Railway Mail Clerk |
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|---|--|
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| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |
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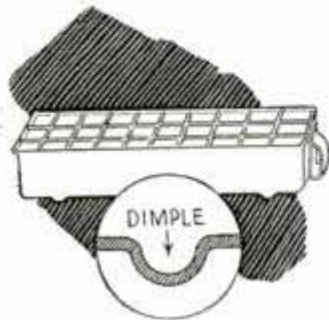
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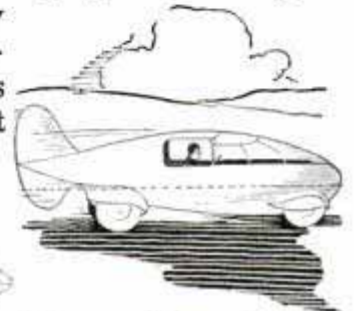
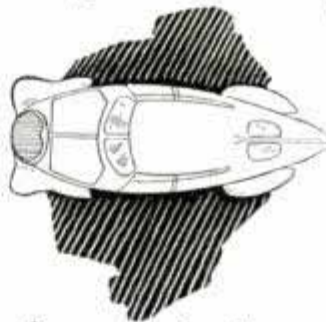
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trucking purposes, a new vehicle has been patented. It is a semi-trailer, designed for attachment to a motorcycle by suitable coupling. Under usual conditions, the two

wheels at the rear alone would be used, but heavy loads and disconnection from the motorcycle are problems solved by a small wheel at the front. This wheel can be retracted when not needed.

STREAMLINING of the automobile is carried to a new high point under patent issued recently to a French designer. The body is shaped somewhat



like a fish, viewed from the side, and is provided with a fin at the rear. Fairing

for each wheel permits smooth flow of air, decreasing resistance. The driver would be seated well forward, indicating that the design is intended for a rear-engine vehicle. A curved windshield permits unusually wide vision.

GREATER safety for the bicycle rider is the purpose of a stop-light switch

patented recently. The switch is actuated through the brake mechanism to turn on a warning light at the rear of the bike when the brakes are applied. Connections run from the brake mechanism to the battery case mounted beneath the seat. Any standard warning lamp may be used.



(Continued to page 33A)

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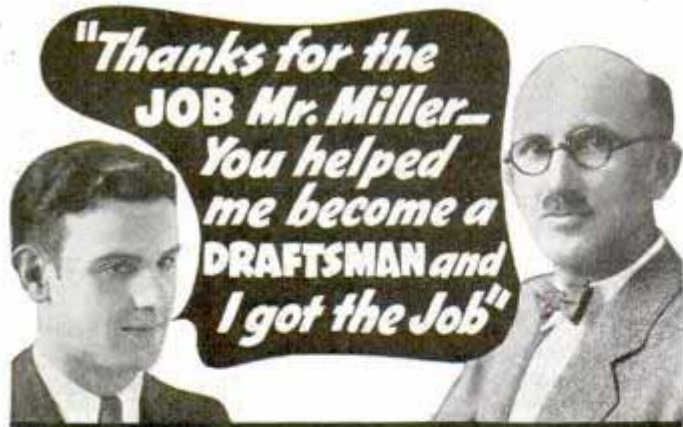
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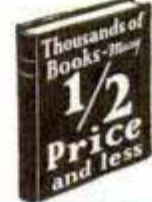
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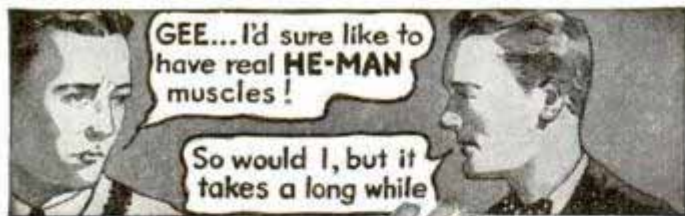
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State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who having been duly sworn according to law, deposes and says that he is the Editor of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 290 East Ontario St., Chicago, Ill.; Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill.; Managing Editor, L. K. Weber, 200 East Ontario St., Chicago, Ill.; Business Manager, Willis S. Brown, 200 East Ontario St., Chicago, Ill. Second. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Popular Mechanics Company, 200 East Ontario St., Chicago, Ill.; L. B. Windsor, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill.; L. H. Windsor, 200 East Ontario St., Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgage, or other securities are: (If there are none, so state.) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. Windsor, Jr., Editor, Sworn to and subscribed before me this 23rd day of September, 1938. J. GRAHAM, Notary Public. (My commission expires June 16, 1940.)



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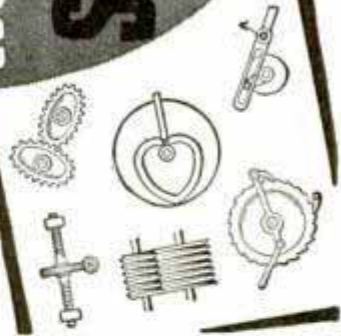
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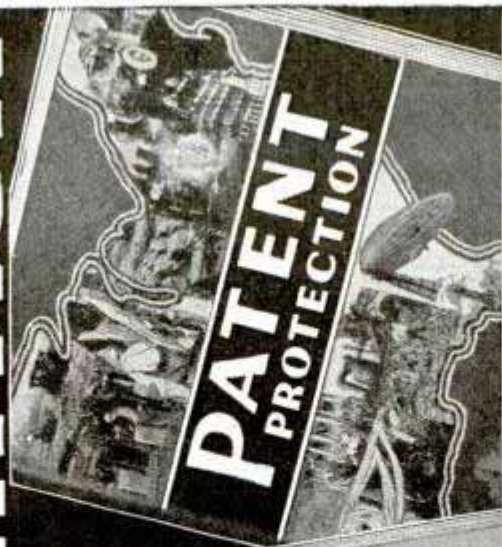
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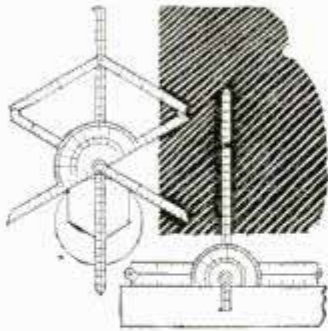
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(Continued from page 18A)

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ing tool, marking gauge, bevel protractor or protractor square, rule or a tool for laying out or drawing any number sided figures or objects. The tool is for students, draftsmen, architects, carpenters, cabinet-makers, sheet-metal workers, steel workers, tool and die makers and others.

HANDY for the small home or apartment is a newly patented washboard designed for use in sinks. The board has a rubbing plate mounted between two legs which extend into the sink. The frame is shaped so that metal arms grip the edge of sink to hold the board steady while it is in use. The board is particularly useful for small washings.



A COMBINED ceiling light, radio receiver and loudspeaker, which is hung like an electric lighting fixture, has been patented. The purpose of the ceiling mounted radio is to conserve room space and eliminate chance of damage. Tuning is accomplished by long, telescoping shafts with knobs on the end. The shafts hang so that all a listener need do is raise his hand from his chair to tune the receiver.

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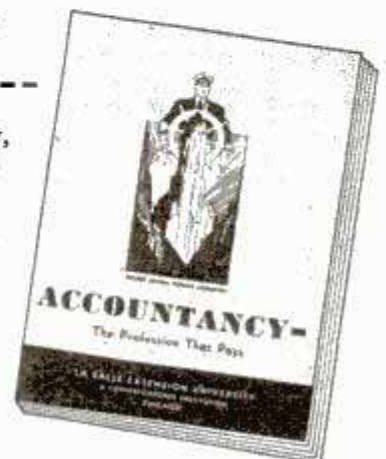
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50 OLD Coins, all different \$1.00; 20 dates large cents, \$2.00. Claud Denney, Box 1825, Dallas, Texas.

BIG Prices paid for certain wanted coins. 1909 cent \$10.00, some silver dollars \$4000, 1864-1865 Indian head cents \$100.00 each, dimes before 1895, \$600; liberty head nickels before 1914, \$500; encased postage stamps; some large pennies \$2000; half cents, \$275.00; paper money, gold dollars \$1500, foreign coins \$165, some worth \$6000 each. You may have coins for which we pay big premiums. Therefore send 15c today for 1939 big illustrated coin book for certain wanted coins. National Coin Corporation (80), Daytona Beach, Florida.

WILL Pay 40% premium for gold coins. A. French, Numismatist, Route 1, Troy, N. Y.

CERTAIN Large cents worth \$750.00; small cents \$12.00; nickels \$250.00; dimes \$300.00. Send 15c for latest 1938 complete 36 page illustrated buying book. American Coin Co., Box 3507-A, Cleveland, Ohio.

COMMEMORATIVE Half dollars; Columbus 65c; Lincoln \$1.25; Cleveland \$1.25. Bargain selling price list and California 50c gold token, 25c. Bob Cohen, Box 3507-G, Cleveland, Ohio.

INDIAN Head cents—25 diff. dates, \$1.00 postpaid. Lakewood Coin Co., Box 113, Lakewood, N. J.

FINE Foreign 1700 coin, 2 notes and catalog 10c. Geo. Best, Cedar Rapids, Iowa.

COMMEMORATIVE Half dollars, Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island, \$1.50 each. Illustrated catalogue No. 14, 25c. Norman Shultz, Salt Lake, Utah.

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

\$5 TO \$500 Each paid for hundreds of old or odd coins. Keep all until posted. Many very valuable. Send 10 cents for illustrated Coin Value Book, 4x6. Guaranteed buying and selling prices. 31 years in business. Coin Exchange, Box 5, Le Roy, N. Y.

UNITED States. Large cent, 2c bronze, 3c nickel and bargain list, 25c. Eleven dates large cents, \$1. George P. Coffin Co., Augusta, Maine.

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

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WILL Pay \$85.00 for 1924 1c green Franklin stamp, rotary perforated eleven (\$1,000.00 if unused). Send 6c today for large illustrated folder showing amazing prices paid. Vernon Baker, 444PM-12, Elyria, Ohio.

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PRODIGIOUS Gift! Fantastic Indochina, German State, savage Somalicoast, Perak, Selangor, Negri Sembilan, bicolored Banana airmail, Siberia—Absolutely free with approvals! Postage 3c. Saxon Company, 408-A Jay St., Brooklyn, N. Y.

A REAL Bargain. 200 all different foreign and 60 different U. S. stamps—our pamphlet on "How to Make a Stamp Collection Properly" and our big bargain list of sets, packets and album—all for only 18c. Queen City Stamp & Coin Company, Room 36, 604 Race Street, Cincinnati, O.

NICKEL-PLATED, Flexible steel stamp tongs, perforation gauge, rule and 20 different choice airmails and commemoratives including Zepp. All only 10c with United States and foreign approvals. Marco Stamp Co., Box 888, San Francisco, Calif.

NO Approvals: 150 different stamps 10c; 150, your choice from 200 (discontinued jumbo approval stock) for 27c. Have 50,000—Immediate refund when out. W. Booher, Lomita, California.

FREE—Tripolitania airmail, 1863 Lombardy Venetia, Alaouites, Carinthia "love" stamp, Western Samoa, etc. Everything 3c with approvals. Viking, Williamsburgh Bank Building, Dept. 9, Brooklyn, N. Y.

TWENTY Airmails, dime, with interesting approvals. Notro Stamps, 4909 North Seeley, Chicago.

USED United States approvals. References required. Donald Unger, Columbus, Indiana.

GIANT Diamond-shaped stamp! Big packet 105 all different including Alexandretta (new country), Congo, Epirus, Manchukuo, Ecuador constitution, Costa Rica triangle, air-mails commemoratives; giant diamond-shaped stamp, \$5 United States; set United States telegraphs, cataloging 30c. Packet British colonies including Burma (new country), jubilee and coronations; scarce Venezuela, cataloging 50c. Illustrated lists. Everything for only 5c to approval applicants! Write to-day! Mystic Stamp Co., Dept. 80, Camden, New York.

"DEVILS Island"—Beautiful set of five stamps from this famous French penal colony. Set portraying historic Grecian Acropolis, famous Corinth Canal. Set of 10 commemorating foundation of Rome. Plus package stamp-mounts, watermark detector, stamp-tongs, and stamp-wallet with perforation gauge. All for 10c. Approvals. Bison Stamp Company, Lackawanna, N. Y.

500 MIXED Stamps 20c. Barcus, 1631 S. Lincoln, Denver, Colorado.

RECEIVE Beautiful first day covers as issued. Seven cents over face. \$1.00 deposit. "Covers," 314 Gunter Building, San Antonio, Texas.

U. S. Price list free. M. G. Hanna, 335 Fifth Ave., Pittsburgh, Penna.

FREE—3 Diamond shaped airmails with dime purchase from bargain approvals. Vic. Grunau, Winkler, Man., Canada.

SEALED Sacks containing 1500 British Colonials from Empire Missions, \$1.00. Price, 9, Blythe Street, Liverpool, England.

FREE—20 Different Canada to approval applicants. Fort Dearborn, 5439 Aberdeen, Chicago.

FOUR Mint five colored Ecuador Constitution stamps 5c with approvals. Wright Philatelic, Box 611, Kansas City, Mo.

ILLUSTRATED Album. Spaces 4000 stamps; with penny approvals 20c. Swan Stamps, 604 Swan, Dunkirk, N. Y.

COLLECTION 2200, \$1.25 Cash. Mall Rubin, 11 Pitt St., New York City.

UNITED States stamps on approval. Ranneger's, Box 134, Pittsburg, Kansas.

ASSORTMENT U. S. and foreign stamps 25c. Richard Sander, 1421 Arch Street, Philadelphia, Penna.

WE Buy stamps. Illustrated buying list, 10c. Liberty Stamp Co., St. Louis.

DENMARK 150 Different \$1.00. Sweden 150 different \$1.00. Madsen, Tollose, Denmark.

EXCHANGE Stamps, postcards. Universe. "Exchangers," Bry 226 pres, Paris, France. Particulars free.

WHOLESALE! United States commemoratives, 50 different 38c; British Colonies, 200 different 88c; French Colonies, 200 different 88c. Fuld, Dickmann Building, St. Louis, Mo.

31 DIFFERENT Manchukuo for 25c. 60 different Colombian Republic, including Antioquia \$1.00. Approvals also sent. John Hays, South Gate, Calif.

SENSATIONAL Offer! 100 stamps including triangle, airmails, commemoratives, pictorials, colonials, only 5c with approvals. Leo, 853 North Martel, Los Angeles, California.

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STAMP Collectors—Get Canadian Annual—Features Canadian, United States, Newfoundland, Colonial and foreign stamps, philatelic supplies. Sixty pages, with hundreds of illustrations. Sent free. Gray Stamp Company, Dept. PM, Toronto, Canada.

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50 DIFFERENT Chile 20c with approvals and lists. W. C. Kohl, Reading, Mass.

FREE—Coronation, airmails, commemoratives, revenues, 3c postage with approvals. Warren Pomeroy, Richfield, Minneapolis, Minn.

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40000 VARIETIES First quality stamps available on approvals 1/4c up. Representative selection on request. Adults only. PKEigwin Company, Vineland, N. J.

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\$1.00 PACKET Free! Inclose postage, request approvals. Secrist, Muscatine, Iowa.

WORLDWIDE Mixture. Packet containing 1000, 25c. Plaza Stamp Co., Box 1161, Santa Fe, N. Mex.

FREE Treasure packet. 3c please. Oromoto Stamps, Kitchener, Ontario, Canada.

\$2.00 PACKET 3c To approval applicants. Quality Stamp Shop, Englewood, Colorado.

NEW Ecuador Constitution (airmail-regular) stamps and Netherlands triangle 10c with approvals. 25 different U. S. commemoratives 10c. Century Stamp Shop, 104-P Fifth, Gary, Indiana.

SPECIAL! 20 Different commemoratives to applicants for my fine foreign approvals with stamps 1c and up. Postage 3c. Dolve, 621 - 15th Ave., Southeast, Minneapolis.

DUPLICATE Book! Premiums! 5c to approval applicants. Haskins, 701 Monroe, Spokane, Washington.

PENNY Up approvals by countries. Hanslick, 180 South Ogden, Buffalo, N. Y.

BEAUTIFUL Pictorial packet 5c to approval applicants. Scheblein, Rosedale, N. Y.

BEST One cent approvals in America. Elvin Stanton, Niantic, Conn.

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AT 1/10 Cat.—U. S. and foreign. Meyrowitz, 1756Y - 70 St., Brooklyn, N. Y.

A VERY Unusual bargain. Once every 30 often we make a drive to add to our mailing list desirable collectors who appreciate the best approval service in existence. Therefore we are offering a bargain of such amazing proportions that no one can possibly pass it up: Sets:—Mexico 641-643 complete mint (all high values); New Zealand 1935, 2 values; Czechoslovakia 1919 complete mint; Mongolia 3 values; Denmark Viking ships complete; Germany Schiller complete; Roumania aviation complete; Germany Saar 2 values and Philippine 905-906. Singles:—Philippine 389 (Magellan landing); Canada 143 (scarce red parliament); Newfoundland 206 (Prince of Wales); Piume 206 (3 lire value); Ecuador 927 (Seebeck); Cape of Good Hope 24; India 64 and Netherland copper triangle. Illustrated almanac—"Famous Stamps and Their Stories." All of the above (total catalog value \$5.04) for only 10c to approval applicants. However, to prevent a loss from triflers, we reserve the right of refusal. Approval Headquarters, Globus Stamp Company, 268 Fourth Ave., New York City, Dept. 201.

1000 DIFFERENT All world, catalog \$27.00 for \$1.00. French, 241 Euclid, Cleveland, Ohio.

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U. S. Constitution stamp of Ecuador, gorgeous six-color stamp showing U. S. flag in natural colors and George Washington, also Marvel packet 33 different including new Cayman Islands, Gen. Franco Spanish Morocco "war stamp" 60 yr. old Luxemburg, "bull-fight" stamp, largest diamond, tropical triangle, Chinese "mid-et" stamp, etc., all for 5c with approvals. Potomac Stamp Co., Dept. 112-D, Washington, D. C.

300 DIFFERENT Stamps 20c; 600, 50c! 1000, \$1; 2000, \$3; 3000, \$7. Fred Onken, 630 79th St., Brooklyn, N. Y.

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62 CORONATION, Jubilees, British Colonies, 10c with approvals. Sachse Stamps, London, Canada.

25 DIFFERENT U. S. 5c with approvals. Benken, 2439 South 9th Street, Milwaukee, Wisconsin.

10,000 VARIETIES 1c Each! Gordon Davison, Box a568, Manchester, N. H.

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APPROVAL Applicants—Free stamps, 25 countries. Postage 3c. Harlan, 5307 S. Marshfield, Chicago.

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WORLD'S Smallest airmail, free stamp magazine, \$2.00 U. S., animals, bird, Indian, airplane, commemoratives, scarce stamps 25 countries, 5c with approvals. Capital Stamps, Dept. PM, Little Rock, Arkansas.

MONTHLY Stamp and coin magazine, six months and 25 foreign stamps, 25c. American Stamp Journal, Cedar Rapids, Iowa.

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BEAUTIFUL Irish girls. Second set of souvenir stamps issued by Irish Hospitals' Trust Limited, Dublin. Specimen sheet of 20 stamps supplied free of charge to all writing to Mr. J. O'Sheehan, Department PM, 28 Earlsfort Terrace, Dublin, Ireland.

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UNBELIEVABLE! 62 Different, six triangles and diamonds; airmail, animal, war stamps—China, Japan, Manchukuo, insurgent Spain; Asia, Africa, South Seas. Everything, 5c! Crowder's, 127E North, Baltimore, Md.

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50 DIFFERENT, Fine U. S. including perforation gauge, 10c with approvals. The Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

BRAZIL, 50 Different 10c with bargain approvals. Davis, Silver Lake, Ind.

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

30 DIFFERENT Angola, Cape Verde, Guinea, Portugal, Mozambique, St. Thomas and Prince 5c. Approvals. Depraw, Ocean Park, Calif.

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.

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25 UNITED States, including \$4 and \$5 stamps free to approval applicants. 3c postage. Brownie Stamp Shop, Flint, Mich.

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

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FINEST Work in colored photographs. 8x10—50c, 5x7—25c. Lake Studio, 52 Ambrose St., Rochester, N. Y.

THE Best snapshot pictures in America. All size pictures one price from 12c to 127 each 3c. Enlargements contact style from smallest film to 3x4 5c, from 127 to 116, 4x6 8c. Helen Art Photo Service, Albany, N. Y.

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MAIL Your rolls to film center of the world. Any 6 or 8 exposure roll developed and printed 25c coin. DeLuxe enlargement coupon free! Photo Finishing Shop, Est. 23 yrs., 411-BB Genesee Valley Trust Bldg., Rochester, N. Y. "The Camera City."

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PHOTOGRAPHY For pleasure and profit. Prepare for profitable business or fascinating hobby at home. Previous experience unnecessary. Common school education sufficient. Write for information and requirements. American School of Photography, 3601 Michigan Ave., Dept. 3459, Chicago.

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SIXTEEN Sparkling prints, 2 Hollystyle enlargements with roll developed—25c. 20 reprints 25c; 100, \$1.00. Photographic Christmas cards—10 for 49c; sample, 5c. Lifetone Studios, A-29, Des Moines, Iowa.

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ROLL Developed, 16 prints 25c. Eastman's Studio, 732 - 37th, Des Moines, Iowa.

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SENSATIONAL Offer. Five 5x7 enlargements 25c. Eight candid enlargements, 3x4 1/2, 25c. Cardinal Photoers, Summit, N. J.

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IMMEDIATE Service! Better pictures. Sixteen guaranteed prints from roll, 25c. One colored or two plain enlargements and 8 guaranteed prints 25c. Sixteen reprints only 25c coin. Candid rolls developed free! Prints enlarged to 3x4, only 4c each. One day service. Details and mailers free on request. American Studios, Box B, LaCrosse, Wis.

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MILLIONS Now know "Hollytints Means Better Prints." Two professional enlargements with trial roll—25c. Fascinating premiums. Unequaled service. Hollytints, P-1350, Hollywood, California.

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ROLLS Developed and printed 10c. Trial. Quality Finishers, Maywood, Ill.

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WILLARD'S Gives your pictures a beauty treatment—they're clear, brilliant, full of life. Roll developed, 2 prints each negative 25c. Enlargement coupon. Willard's, Box 3535-A, Cleveland Heights, Ohio.

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ROLLS Developed, 2 prints each and 2 free enlargement coupons, 25c; reprints, 2c each; 100 or more, 1c. Summer's Studio, Unionville, Mo.

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CAMERAS On time! 10% down, 10% monthly. Liberal trade-in allowance on your old camera. New catalog illustrates, describes, prices, latest models, all makes. Contains expert advice on choosing your camera. Send 10 cents for your copy. National Target and Supply Company, Dept. P-37, 1255 - 25th Street, Northwest, Washington, D. C.

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MILLIONS Jobless! Get dollars in mail for satisfying employment information. Keep dollars! We fill your orders. Details for stamp. Co-Operative Service, 77 Swan, Buffalo, New York.

FREE—100 Wonderful business, mail-order and home work moneymaking offers. Lewis Co., 828-C Carpenter, Oak, Park, Illinois.

60 PAGES 100 Money making plans, formulas 25c. Beck, 317 W. 109th, New York.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CS-1142 Sunnyside, Chicago.

MAKE Money growing plants in water indoors during winter. Weighed chemicals, formula, instructions \$1.00. Gordon Laboratories, 509-E Fifth Ave., New York.

IMPRINTS! Sell by mail. Big profits. Fast sellers. Low priced. Samples, prices 10c (refunded.) Success, P-13032 Chicago St., Blue Island, Illinois.

TYPISTS Earn extra money. Send 25c (coin) for "Twenty-One Ways to Make Money With the Typewriter." H. Robbins, Box 6048, Kansas City, Missouri.

LEARN New, profitable profession. Wonderful opportunity. Photocolor Institute, San Francisco.

FREE Circular. Make money with doughnuts. Complete instructions two dollars. Muller System, Glen Moore, Penna.

HUGE Profits daily. Rush stamp for particulars. Box 423, Warren, Penna.

EMERGENCY! Need extra money. Ten ways, spare time. Anyone. No experience. 25c complete information. Swan System, 509 - 5th Avenue, New York.

"\$10.00 A DAY." Booklet 25c prep. Unity Service, 286 Wayne, Jersey City, N. J.

TODAY'S Biggest moneymaker! Few dollars starts you. 97c profit new dollar specialty. Big daily mail newest moneymakers. 10c (silver.) Fuller Publications, Drawer 1144, Kalamazoo, Michigan.

ARCHITECTURAL Modelmaking. Fascinating hobby, profitable business. Home study. Particulars. Weidler, 4589 Lexington, Hollywood, California.

XTRA Money daily. Supply information millions want. Unlimited possibilities. A. E. Jacobson, Upsala, Minnesota.

SAMPLE Reflecting skeleton face for motorists 10c. Superior Specialties, Springfield, Illinois.

1,000,000 ARTICLES Wholesale. Directory 10c. Amazing opportunities. Jelsmith, Waltham, Mass.

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

YOUR Choice of hundreds of moneymaking ideas outlined. Something entirely different. Business Service, P. O. Box 537, Muskogee, Oklahoma.

BALLGAMES. Movies afternoons. Work mornings home, your own business. Introductory booklet free. Stamford, 3762-d Broadway, New York.

TYPISTS Earn extra money. Send 25c (coin) for "Twenty-one Ways to Make Money With the Typewriter." H. Robbins, Box 6048, Kansas City, Missouri.

PENNIES In Hamilton scales produce assured income without canvassing or selling. 1910 Vermont, Toledo, Ohio.

ADDRESS Folders for us. Big profits. Malonite Corporation, Bayside, New York.

YOUR Name—5,000 mailing lists—25c. Get samples, opportunities galore from all over world. Pines, 583-A Monroe, Brooklyn, N. Y.

MAILORDER Opportunities, plans, formulas, information. Circulars free. Harvey Teeple, Decatur, Indiana.

"SCHEMER," Alliance, Ohio, (40th year) prints schemes, tips, opportunities, formulas; big producers: \$10,000 to \$25,000 reported. Year, \$1.00. Get wise! Six months trial only 30c.

"\$10.00 DAILY." Stamping names on keychecks. Sample and details 25c. Bohn Co., Box 86P, Wilkes-Barre, Penna.

STOP Squealing—Start crowing! Work mornings home—country drives or movies—afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

FORMULAS, PLANS, ETC.

FORMULAS, Analysis, free literature. Hertstein, 128 So Diamond Ave., Grand Rapids, Mich.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49K, Park Ridge, Ill.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

REFINE Used oil without cost. Particulars. F. Gerwin, Fairview, Oklahoma.

SIXTEEN Selected moneymaking formulas \$1.00. Pryor, Box 2066, Atlanta, Ga.

KILLS Moths: New. Never offered before. Money maker. Guaranteed formula. \$1.00. Chemist, 711 No. Ridgewood Pl., Hollywood, Calif.

INDUSTRIAL Chemist (established 1912) sends free catalogue latest, profitable formulas. Pierce, 412 West 90th, Los Angeles, Calif.

BEST—Not cheapest! Here's guaranteed certified formulas, detailed instructions insuring absolute success for producing ultra-modern products. Stamp brings amazing information! Miller, Chemist, Tampa, Florida.

ANY Formula \$1.00! (35 candy formulas \$2.00; C.O.D. \$2.20)! Galluzzo, Wilkingsburg, Pennsylvania.

FORMULAS—50c, Three \$1.00. Franklin-Allen Laboratories, South Paris, Maine.

ANY Formula 25c or money back. Just name it. Satisfaction guaranteed. Worl's Formulas, Tampa, Florida.

"ANYTHING In formulas." Particulars free. "Research Bureau," 100 Chelsea, Charlestown, Massachusetts.

BELIEVE It or not. The world's best 3 mirror formulas \$10.00. Gold, silver, gunmetal. 35 years in business. Nashville Mirror Co., Nashville, Tenn.

FORMULAS: Three famous money makers \$1.00 cash. Mobley, Box 3176, Hollywood, California.

FORMULAS: Ten big moneymakers 20c. R. Barnes, Cornwall-on-Hudson, N. Y.

FORMULAS. Proved successful by test and experience. Buchman, 718 E. Fayette, Syracuse, N. Y.

GUARANTEED Formulas! None better! Lowest prices! Catalog free. Hodge Laboratories, Elkhart, Ind.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

ANY Formula 25c. Six for \$1.00. Satisfaction guaranteed. Clover Formulary, Niles Center, Ill.

FORMULAS: 15 Proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

FORMULAS: Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

CHEMISTRY

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

FREE—40 Page catalog of chemical and laboratory supplies for amateur chemists. Wollensak microscopes and supplies, scientific books at big discount. J. D. Winn, 124 West 23 Street, New York City.

JOIN American Amateur Chemists Society. Journal, particulars 10c. Haslett, Michigan.

CHEMICALS, Rare and common. Catalogue, stamp. Chemical Service, 2827 N. Rockwell, Chicago.

HANDBOOK For chemical experimenters, hundreds of experiments, illustrated, 50c. Experiment booklet, 15c. Chemical catalogue, 10c. Reading Scientific Co., Reading, Penna.

STUDY Chemistry at home, 35c complete. Jeray, 2731 Vine, Cincinnati, Ohio.

CHEMICALS, Laboratory, glassware, apparatus. Send 3c for catalog CPI. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

TELESOPES, Microscopes, chemistry, mineralogy. Scientific catalog free. Tracey Laboratories, Evanston, Illinois.

AGENTS WANTED

NEWLY Designed patented wonder pie pan bakes bottom as thoroughly as top—up to 20% faster. Saves fuel and time. Prevents dough sweating. Pies retain freshness longer and are more nourishing, entirely digestible. Every family and bakery are prospects. Big profits for agents, salesmen, crew workers. Ideal sideline. Send 25c for full size sample and wholesale prices. Dept. 160, Bake-Right Utensil Co., Kansas City, Missouri.

GRAB This—Amazing new "Cream Making Machine" (patented) government tested. Low priced. Saves users 50%. No competition. Fastest seller in years. Exclusive territory open to livewires. Don't hesitate. Get facts now. Rudell Corp., Burnside, Penna.

SELL Finest Puerto Rican cigars, factory to consumer. Big profits. Samples free. Infanzon & Rodriguez, Mayaguez, P. R.

SOMETHING New! Sure-fire Christmas item. 100% profit on Can-O-Lites lighter. 1000 lights without refueling. 25c, 50c, \$1.00 models. Write for sample offer. Uni-Lite Mfg. Corp., Middlefield, Ohio.

80% PROFIT Selling key locks. Trial outfit \$1.00. Edjohn Company, 8 Baltimore, Middletown, Ohio.

THOUSANDS Earning big profits! So can you! Establish a spare-time subscription business, representing world's greatest magazine publishers. No experience needed. Clip this ad and mail with name and address to International Circulation Co., Inc., Dept. 452-PM, 57th St. at 8th Ave., New York, N. Y.

RAWLEIGH Men make good money. Supply everyday household necessities to Rawleigh routes of 800 family users. Ambitious men can make good earnings at start. We furnish everything but the car. Write today. Rawleigh's, Dept. L-A-PPM, Freeport, Ill.

BUSINESS Proposition: Resilvering mirrors, autoperators, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128 Marion, Indiana.

500% PROFIT With new perfected (1938) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 5c. New Method Co., Box PMG-72, Bradford, Penna.

AGENTS To sell truck and auto necessity, large field, exclusive territory. Reese, 4234 Taylor St., Chicago, Ill.

MEXICAN Novelties! 100%-300% profit. Free particulars. Samples 10c stamps. Marquez-PC, Apartado 1176, Mexico City.

DEPROSTS Windshields without heat. New invention. Fits auto pocket. Defies frost, sleet, ice. Samples sent on trial. Rush name. Kristee, 108, Akron, Ohio.

NEED Money quick? Here's a genuine opportunity to make up to \$42.50 in a week. Operate grocery business from your own home. Supply friends, neighbors, others. I send complete outfit on 30-day trial; no money risk. Details free. Albert Mills, 6273 Monmouth, Cincinnati, Ohio.

SNAPPY, Flashy two colored comic Xmas cards, fast 10c sellers. Enormous profits. 20 designs with envelopes. 20 samples \$1.00; 100, \$2.50; 500, \$10.00 prepaid. Comic Shop, 2463-G Kensington Ave., Philadelphia.

COSTS 2c—Sells 25c. Fast selling necessity for agents, crews, demonstrators. Sample 10c. Linnell, Box 1963-E, Cleveland, Ohio.

NEW Discovery of ancient secret cream perfume. Sells on sight. Big profits. Persian Perfume Company, 1231 Olive, Desk 7, St. Louis.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

SOCIAL Security gold bronze life time card. Sells 35c. Cost 5c in lots of 100—Engraving tool \$7.50. Hustlers get investment out plus \$15.00 profit 1st day. Information free. Machinery Sales, 192 North Clark, Chicago.

500% PROFIT. Modernistic guaranteed Stick-on letters for windows, offices, trucks. Large sizes 1c. Easily applied by agents or customers. Free samples. Modernistic, B-3000 Lincoln, Chicago.

ELGIN, Waltham watches \$3.95. Make big profits. Send for free jewelry catalog. Plymouth Jewelry Exchange, 163 Canal St., New York.

FOOT Trouble vanishes when White Bear Powder is used. Thousands get permanent relief. 15 and 35c prepaid. Agents wanted. G. D. Wiederkehr, Stryker, Ohio.

DATED Freshness, unobtainable elsewhere, clinches sale for vitamin tablets. Selling direct guarantees laboratory freshness. Dated and sealed when packed. Certified quality. Exceptional opportunity. Vitamins, P. O. Box 4510, Philadelphia, Penna.

PARING Knife. New. Peels, slices, cores, 200% profit. Sample 10c. Three other household necessities. Apex Co., 400 Dakota Bldg., St. Paul, Minn.

NEW Leather keycase gives only the right key. Samples three styles 25c, or stamps. Mercer, 101W 76, New York.

MEN, Women sell Sanasol, professionally approved first aid solution; unexcelled treatment athlete's foot, ringworm and similar skin troubles. Dignified and profitable. Request details. Schmedding Laboratories, 2343 Scarff, Los Angeles, Calif.

BIG Money for agents selling U-Te-Lite reflectors. Low priced, economical to use. For full particulars address Hodge and Blackall, Hotel Sherman, Chicago.

DON'T Wait, investigate, profits! Silver vanity cosmetics. Brindel Mfg., Muncie, Ind.

AGENTS, Sell household reminders. Big sellers and repeaters. Retail ten and fifteen cents, cost 75c dozen, \$8.50 gross. Samples 10c each. Jordan Box Co., Syracuse, N. Y.

AGENTS—Auto accessory. Brand new—no competition—good side line. Manufacturers Distributing Co., 2257 W. Madison Street, Chicago, Ill.

SALESMEN: Agents. Unlimited moneymaking possibilities selling our high-grade, guaranteed line of diamonds and watches. No investment, no competition. Cash commissions daily. Protected territories available for ambitious, alert, responsible salesmen with followings. Write today for information. R. A. Press, Inc., 812 Sansom Street, Philadelphia, Penna.

BIG Profits in fine rebuilt watches direct from wholesaler. Exceptional values. Write for free catalog. Kane Watch Co., 105M Canal St., New York, N. Y.

AUTOMOTIVE Salesmen! Distribute auto product needed by millions. Up to 500% profit. Information free. Thermo-Works, Peoria, Ill.

PROFIT 100% Selling calling cards. Bonus, prizes to workers. Outfit free. Universal, Orange, Massachusetts.

NEW Skeleton face reflector. Motorist's safety device. Sample 25c. Superior Specialties, Springfield, Illinois.

FREE Sample world's best seller. G. Mfg. Co., Washingtonville, Ohio.

PATENTED Die-stock oiling handle \$5.00. Agents sample \$1.50. Circular, Malonite, Bayside, New York.

EVERY Man needs shirts! He will gladly buy from you when you offer choice of 90 sizes for customized fit, huge selection and sensational one year guarantee backed by 45 years of shirt making experience. Half price offer creates terrific values. Repeat orders give permanent income. Simply write orders, we'll deliver prepaid and collect. World's largest concern of its kind. We paid over \$100,000 commissions past year. Get your share! Big cash commissions daily, cash bonuses regularly. Experience unnecessary. Complete self-selling outfit free. Write quick to Dept. 143, Rosecliff-Quaker Corp., 1239 Broadway, New York.

BIG Money with radiator alcohol seal—only 25c postpaid. Write quick. Midwest Sales, 1337 Monadnock Block, Chicago.

SCHOOL Graduates, sell best line graduation name cards. Wonderful commissions. Monthly bulletins. Agent prizes. Big catalogue. Write Craft-Cards, 235(A), Pittsburgh.

BALLGAMES, Movies afternoons. Work mornings home, your own business. Introductory booklet free. Stamford, 3762-F Broadway, New York.

ATTENTION Salesmen! Sell doctors, dentists, offices, homes new articles. Repeat orders come by phone without solicitation! No competition! Quick, sure-fire demonstration and sales plan. Write at once! Territories going fast! Derby Products, 19 Jackson St., Middleboro, Mass.

LARGE Profits selling Magic Fluid. Repairs instantly any fabric or rubber, heat and laundry proof. Eureka, 1911 S. Wabash, Chicago.

BLACK Walnut cracker \$8.50 prepaid. Pecan cracker \$2. Agents wanted. Money back guarantee. Clark Nut Crackers, Harrisburg, Penna.

AGENTS— Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2310-R Dodier, St. Louis, Mo.

AGENTS-DISTRIBUTORS. To mail sample herbs and literature in their territory. Establish profitable trade. Samples particulars free. Kendall Company, 155M Lake, Elmira, N. Y.

BIG Money taking orders: shirts, ties, hosiery, underwear, raincoats, pants, dresses, etc. Sales equipment free! Experience unnecessary. Write Nimrod, 4922-AN Lincoln, Chicago.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8 $\frac{1}{2}$ c. Razor blades 10 for 8 $\frac{1}{2}$ c. 100 sticks chewing gum 12c. Christmas cards, 21 in box 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO. St. Louis, Mo.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

NEW—Amazing cigarette case. Beautiful grained solid wood. Automatic ejector. Whirlwind seller. Large profits. Free sample offer. See display ad page 146A. Willott Novelty Co., Box 520, Grand Rapids, Mich.

HERE'S A "new deal" that gets the money. Agents cleaning up. Write immediately for details. Davis Specialty Co., Onamia, Minn.

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.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

GUARANTEED Gold leaf letters for store and office windows. 300% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

ATLAS Window sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

HIGH-GRADE SALESMEN

STARK Needs 1000 salesmen quick. Cash income weekly. Many make \$200.00 in month. Easy, interesting outdoor work. Spare time or full time. No cash or experience needed. Write quick for free sales making outfit and weekly income plan. If you can't sell—buy Stark trees. Largest nurseries in world. Nearly 125 years old. Highest quality trees, shrubs, roses, etc. Write for catalog. Stark Nurseries, Box C-8128, Louisiana, Mo.

SELL Mirror silhouettes! Best sellers in 35 years manufacturing advertising specialties. Also sensational calendar values. Harvest selling season starting now. Ad-Nov-Co, Newton, Iowa.

AMAZING Invention closes all doors silently, automatically. New oil principle. Easily installed. Never needs attention. Priced dollars less than other checks. Unlimited market, stores, offices, factories. Free demonstrator furnished workers. Kant-Slam, Dept. F-62, Bloomfield, Ind.

DID You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Start with little as \$2.50. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 1210, Spencer, Ind.

SALESMEN Call on garages and filling stations. Sell Champion and AC spark plugs about 1/2 price. Unconditionally guaranteed. Write Fall, 1734 Lawrence, Denver, Colorado.

SALESMEN. Distributors—200 items—brushes, mops. Marvelous magnetic brush excels vacuum cleaner. Big profits. Neway Brush Company, Hartford, Conn.

BRUSH Salesmen—If you ever sold brushes write for our money making proposition. Donald Brush Co., Dept. P.M., Camden, N. J.

RAWLEIGH Men make good money. Supply everyday household necessities to Rawleigh routes of 800 family users. Ambitious men can make \$30 weekly and up. We furnish everything but the car. Write today. Rawleigh's, Dept. L-A-PMSW, Freeport, Ill.

SELL Business cards \$1.50 thousand. Business stationery. Xmas cards, calendars, book matches, advertising tape, paper towels, pencils, sales-books, rubber stamps, tags, menu covers. Free sales portfolio. 35% comm. daily. Money making specials. Willens, 2130 Gladys, Dept. BR, Chicago.

BIG Commission selling celluloid pricing tickets, metal shelf moulding, menu covers, changeable signs, celluloid advertising buttons. P. Pricing Press, 124 White St., New York.

ADVERTISING Book matches—calendars. Lowest prices. Big commission. Free matches to producers. Outfit free. Gem Match, 84 West Washington, Chicago.

CARDED Merchandise, attractive displays. Priced low. Free goods. Prepared. Aspercol Products, Oakland, Calif.

AT Home, your own manufacturing business, making popular \$1 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. M-842, Cincinnati, Ohio.

SELL America's most complete line of business necessities. Regular and novelty size book matches, gummed labels, political items, pricing sets, restaurant supplies, salesbooks, embossed stationery, shipping supplies, office supplies, printed gummed tape, advertising pencils, thermometers, business stimulators, holiday novelties, sensational line of calendars and greeting cards at new low prices. Complete line printed business forms and hundreds of other fast sellers. Undersell all competition. Cash commissions advanced daily, extra bonus. Experience unnecessary. Complete sales outfit free. Federal, BA-301 South DesPlaines, Chicago.

DISTRICT Managers, field representatives, age 30 to 60 for a well established company to investigate and interview dealers for a new automatic system all cars need; method makes sensational and truly convincing demonstration; a proved dealer merchandising plan, which is covered by insurance; large earnings now and on repeat business; exclusive territory protection. Craver-Jay Corporation, Dept. 109, Kansas City, Mo.

MAKE Big daily cash profits selling Top Quality Advertising Book Matches. Low prices. Experience unnecessary. Full time profits unlimited. Free sales kit. Zipper case offer. Match Corporation of America, Dept. E-12, 3433 West 48th Place, Chicago.

UNEMPLOYED Mechanics and salesman, steady work, no competition, exclusive territory. Send postal for details. Keen Kut Machine Co., Columbus, Ohio.

SELL The Driving Master—Shows miles per gallon, when driving. Analyzes motor. Exceptional opportunity for men of ability. Driving Master Company, Sioux City, Iowa.

SALESMEN—Distributors, sell complete line automobile bulbs. Davis Lamp Co., 17 East 42nd Street, New York City.

NEW Type door knob lights key hole. Fast seller. Big profits. Jaxon, 327 N. Front, Grand Rapids, Michigan.

TIRE Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 648 Burkhardt, Dayton, Ohio.

MYSTERY Invention, carried in pocket, keeps hands, feet, ears, body warm on coldest days. Everybody buys. Low price—big profits. Kumfy Warmer, 4208 Davis Lane, Dept. R-2301, Cincinnati, Ohio.

KEY-HOLE Illuminator. Distributors, salesmen, dealers—cash in. Non-competitive, nice profits. Sample complete \$1.50 postpaid. Babco Products, Denver, Colorado; Davenport, Iowa.

\$192—K's Weekly earnings. Above average, but maybe you are too! 205 money-making plans. Introductory booklet free. Stamford, 3762-g Broadway, New York.

CHRISTMAS And calendar bargains! Catalogue free! Twenty-one piece boxes 15c; twelve pieces 8c; fifty imprint folders 25c. More profits! Easter sales! Elfko, 436 North Wells, Chicago.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

BIG Money taking orders; shirts, ties, hosiery, underwear, raincoats, pants, dresses, etc. Sales equipment free! Experience unnecessary. Write Nimrod, 4922-AP Lincoln, Chicago.

SELL New Hexagon portraits. Big profits. Lowest prices portraits, frames. Catalogue free. Picture-Man Friedman, Dept. 9, 528 Cornelia, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

SALESMEN—Sell calendars, complete line, all sizes, including jumbos; beautiful subjects. Samples free! Fleming Calendar Co., 6539 Cottage Grove, Chicago.

GUARANTEED Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

HELP WANTED

WEAR Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 37-L, Greenfield, Ohio.

LOCAL Agents wanted to wear and demonstrate suits to friends. No canvassers. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, 1300 Harrison, Dept. M-817, Chicago.

MEN! Call on stores with nationally advertised counter card item—"Sure" Breath Purifier. Known to millions. Lightening seller everywhere. Big repeats. Juicy profits for retailers and you. Build route. Territories going. See our display ad page 146A. Write Sure Laboratories, 840 N. Wash, Dept. PC-1, Chicago, Ill.

INSTRUCTION—Obtaining positions, homework. Free offers. Henry, 126-B Lexington, New York.

EDUCATIONAL AND INSTRUCTION

CHICAGO Painting School. 36th year teaching painting, paperhanging, decorating, sign painting, show card writing, graining and marbling, pictorial painting. Courses from 6 to 16 weeks. Folder free. 437 N. Clark Street, Chicago, Ill.

BE An ad writer. Learn at home, taught by head of successful advertising agency. Full preparatory course, 7 lessons, supplements, 56,000-word, self-teaching manuals. \$12.50 brings all. Information free. Ad writing pays! Romer Educator System, 809-C Thirteenth St., N. W., Washington, D. C.

LEARN Watchmaking. Complete instructions \$1.90. Catalog wholesale tool, material, watches 5c. Stewart's, 721 Olive, St. Louis, Mo.

CHESS. Instructive, interesting. Particulars free. Chess Thoughts, Pearl River, N. Y.

DON'T Stammer. A permanent cure. Learn at home. A great saving. Perfect Speech, Dawson, Minn.

HOW Inventive minded become independent. Explanation free! C. Higbee, Cantil, Calif.

FOR An extremely profitable lifetime business, operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

BECOME Practical scientific investigator. Modern, illustrated course. Thorough training by former agent U. S. secret service. Particulars free. International Secret Service Institute, PM-128, Hoboken, N. J.

WORK For "Uncle Sam." \$1260-\$2100 year. Try next examinations. List jobs—particulars telling how to qualify—sample tests, free. Write today. Franklin Institute, Dept. E3, Rochester, N. Y.

WATCH Repairing is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., 2012 Manhattan Building, Chicago.

LEARN Electric arc welding at home by experienced welder. Free particulars. Roy Ankerman, Wapakoneta, Ohio.

LEARN Watchmaking at home. Book \$1.00. Carter, 1107 N. Mayfield, Chicago, Ill.

LEARN To sell in one powerful lesson from successful salesman, \$1.00. Louis D. Maynard, 156 Sandwich St., Plymouth, Mass.

CIVIL Service examinations. Customs, investigator, stenographer, no experience required. For valuable information free list opportunities write Pergande Publishers, D11, Milwaukee, Wis.

LEARN Advertising \$10. Trial lesson \$1. Cleveland's, 102 East Chestnut, Chicago.

AMAZE Your friends with this easy but baffling memory feat. Complete instructions 25 cents. E. Schieve, 1714 Wyoming, Dayton, Ohio.

LEARN Shoe dyeing, repairing. Particulars 25c. Frank Lento, Punxsutawney, Penna.

PENMANSHIP. Finest self-instructor lettering text 25c; 12 superbly written cards 25c; variety beautiful samples 10c. Courses offered. Portfolio free. L. H. Hausam, Emporia, Kansas.

BLUEPRINT Reading taught by mail. Write Blueprint Reading Institute, Dept. A. Box 5662 Metropolitan Sta., Los Angeles.

SONGWRITERS Wanted. Instruction book free. Song Bureau, Dept. 44, Salem, Indiana.

ATTAIN Mastery! Nervousness, fear, worry! Psychological instructions. Literature gladly mailed. John A. Englund, Box 335, Ironwood, Mich.

LEARN Skilled trade. Practical instruction, twelve trades. Learn by doing, in trade school not operated for profit. Request bulletin M. Ranken Trade School, St. Louis, Mo.

SECRET Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligations. Age 18-50. Write Ozment Instruction Service, 101, St. Louis, Mo., immediately.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration. Diesel. Stevenson's, 2008A Main, Kansas City, Mo.

MASSAGE. Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

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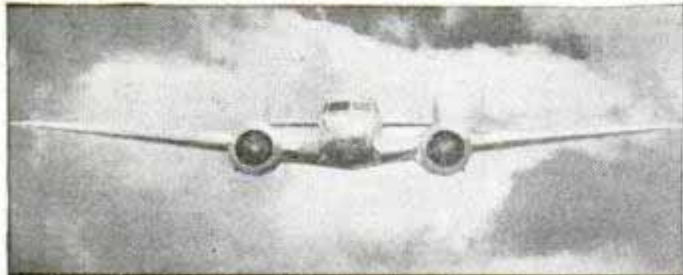
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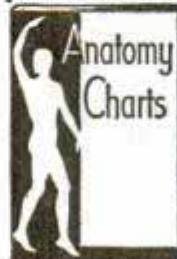
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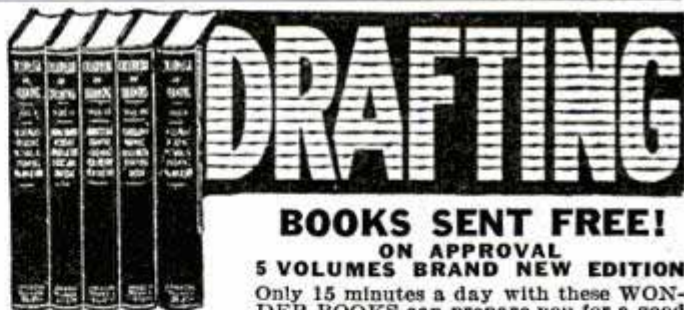


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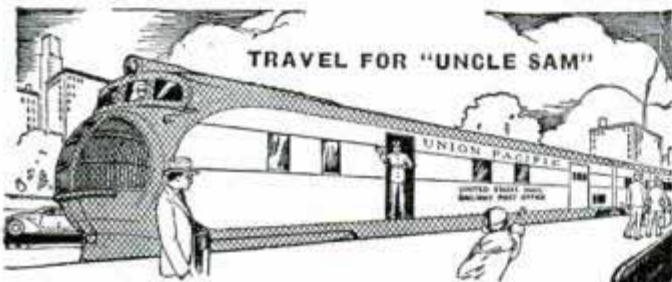


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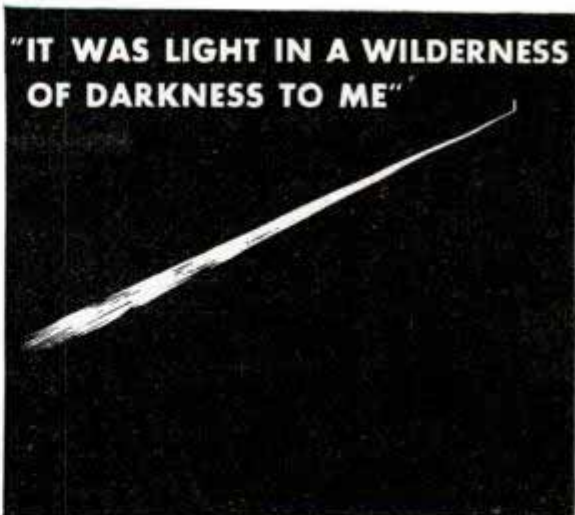
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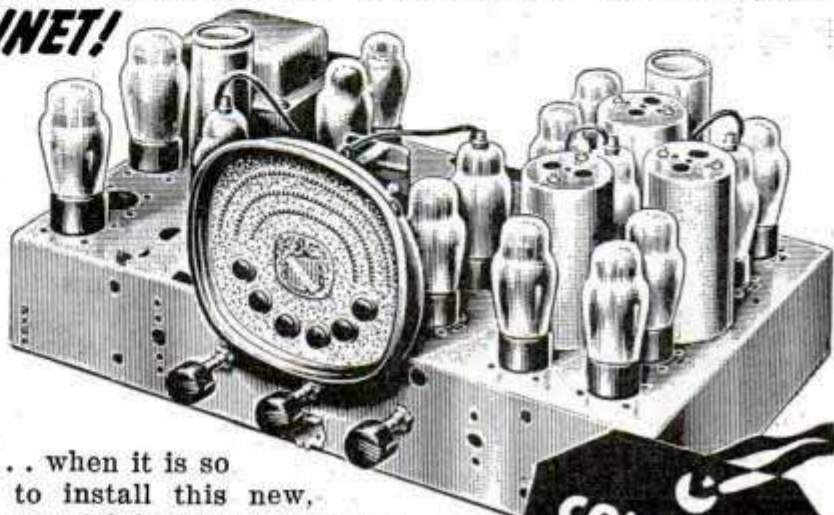
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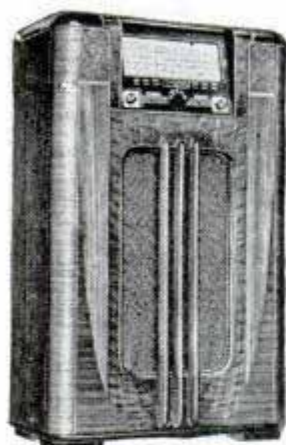
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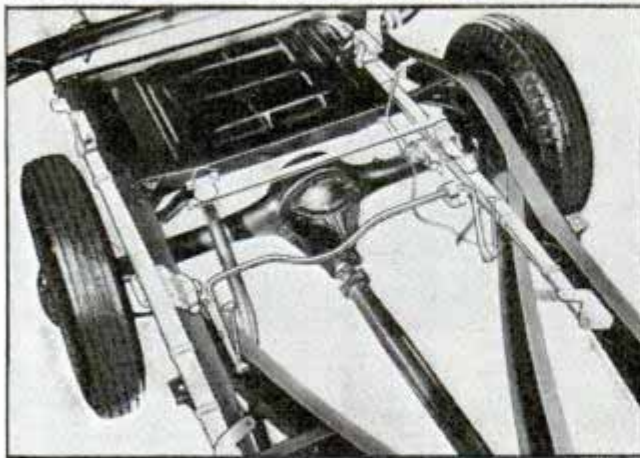
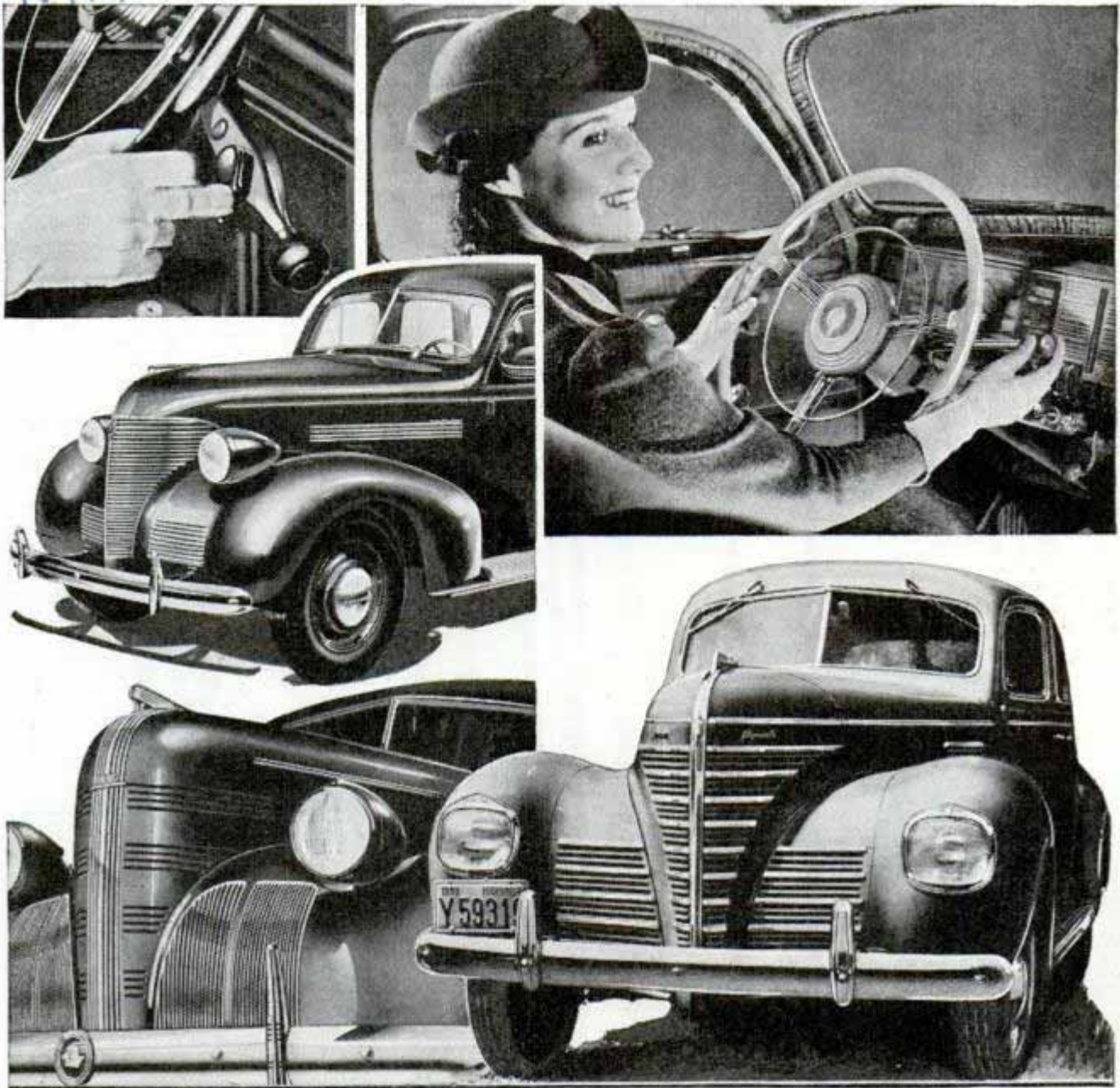
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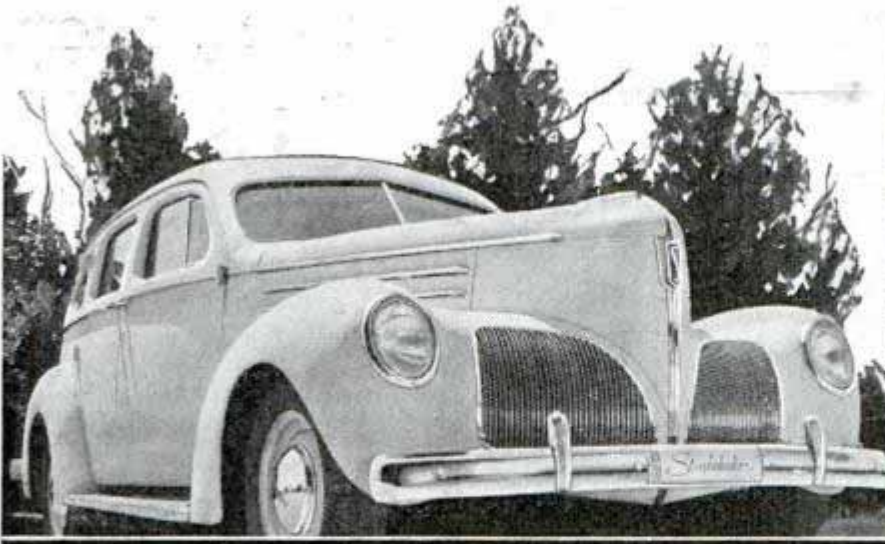


Top, left, Buick's rear signal control, located on gear lever. Right, De Soto's substitute for "wobble-stick"; Center, left, front of new Chevrolet, and (just below) new Pontiac Six; Right, "lateral airfoil" design of Plymouth's front end. Note headlamps in fenders. Bottom, Packard's rear spring suspension

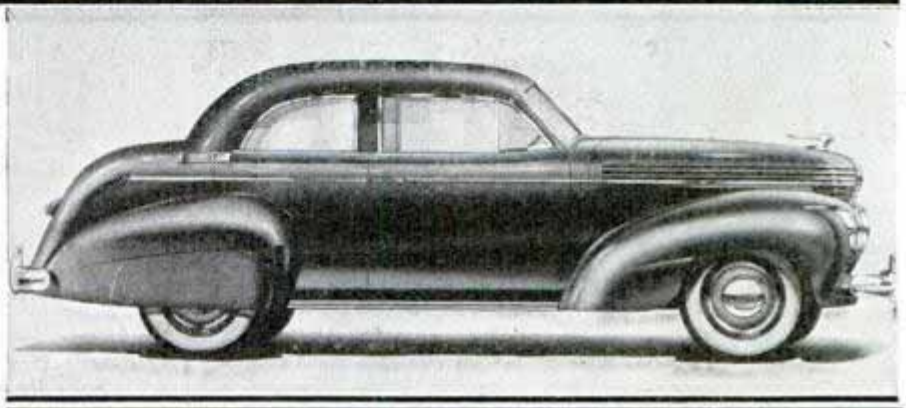
doesn't have to learn how to drive all over again. It does the same job of changing gears and it does it in the same way, in conjunction with the clutch, as did the wobble-stick. From the maker's standpoint, it is so inexpensive that in most cases it can be included without increasing the price of the automobile. However, on some cars, particularly those in the lowest price field, it can be offered only as optional equipment. Chevrolet presents the shift, with a vacuum booster that takes eighty per cent of the work out of gear changing, for ten dollars extra. Deluxe models of Plymouth, and all models of DeSoto, Dodge and Chrysler have the feature as standard equipment.

Pontiac found the shifter popular as an extra-cost item last year, so all new models

H 1143



Top, left, 1939 Studebaker, with headlamps in fenders. Right, Pontiac's recessed controls. Below is new Graham combination coupe. Next to bottom, De Soto's safety-signal speedometer, with indicator illuminated. Bottom, Chevrolet's twin shock absorber that makes for better riding



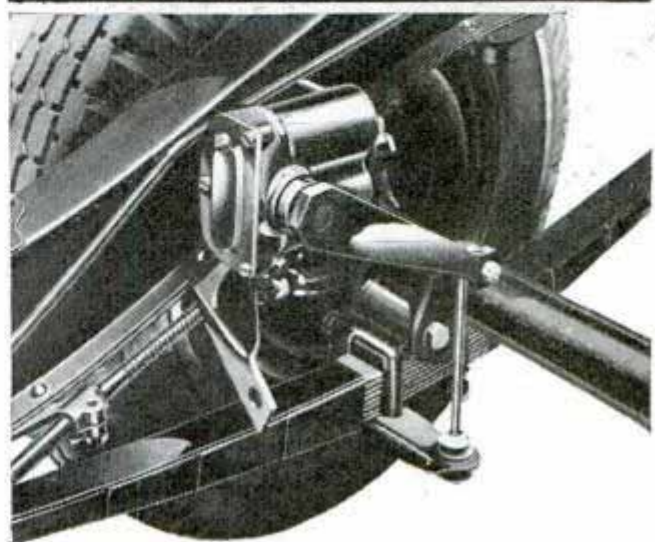
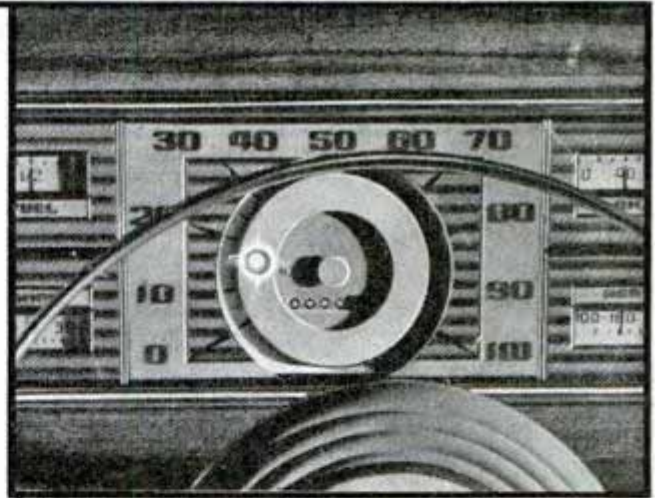
have it, plus a booster spring that does half the work, as standard equipment. Packard joins the parade by introducing the Handishift. Buick turns from the optional automatic transmission of 1938 to the steering-post shift, standard on all models in 1939.

Use of the remote-control shift permits manufacturers to redesign the transmission, making it shorter without altering gear face widths or torque transmitting capacity. Of importance to the driver is the fact that some types of the shift may be adjusted to suit the reach of the individual.

The overdrive, which permits reduction in engine speed without losing car speed, seems to be gaining ground, although it continues as an optional feature in most cases. Packard introduces the Econo-drive, which automatically disengages at speeds under thirty miles per hour.

Chrysler and De Soto introduce a new transmission with the overdrive as optional equipment on all models except the Custom Imperial Chrysler, on which it is standard. The overdrive cuts in between twenty-three and twenty-eight miles per hour. A solenoid device, actuated by press-

(Continued to page 153A)



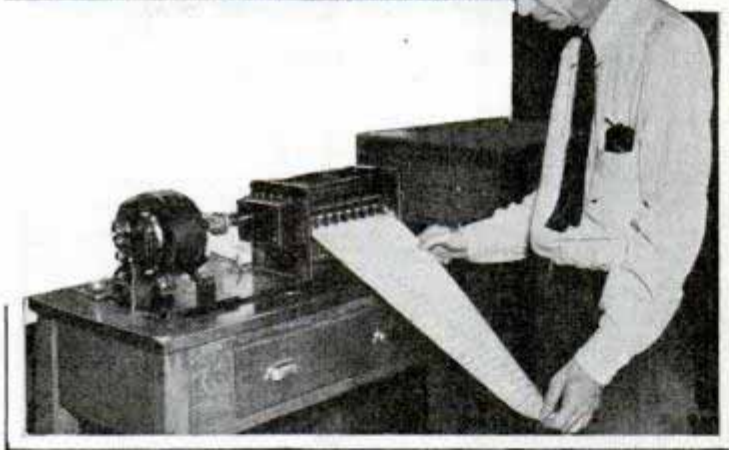
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Master Timekeepers Watch Clock for Nation

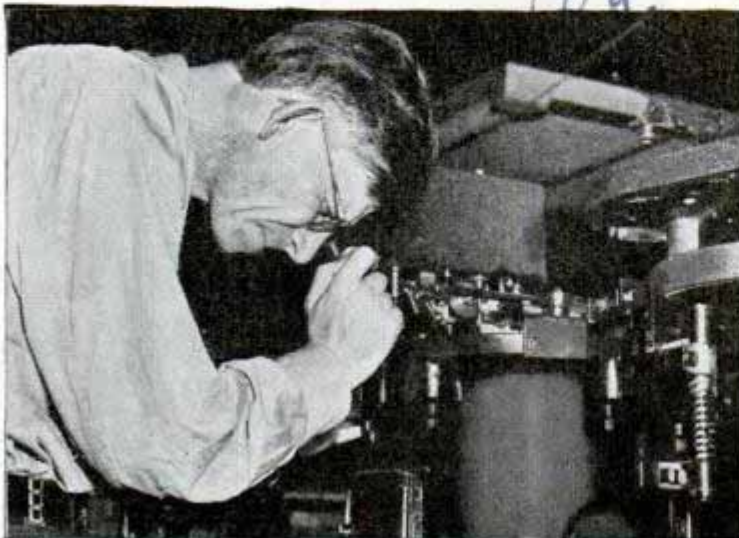
International News Photos



Above, granddaddy of all clocks in U. S. shows time in this country and corresponding time in other parts of world

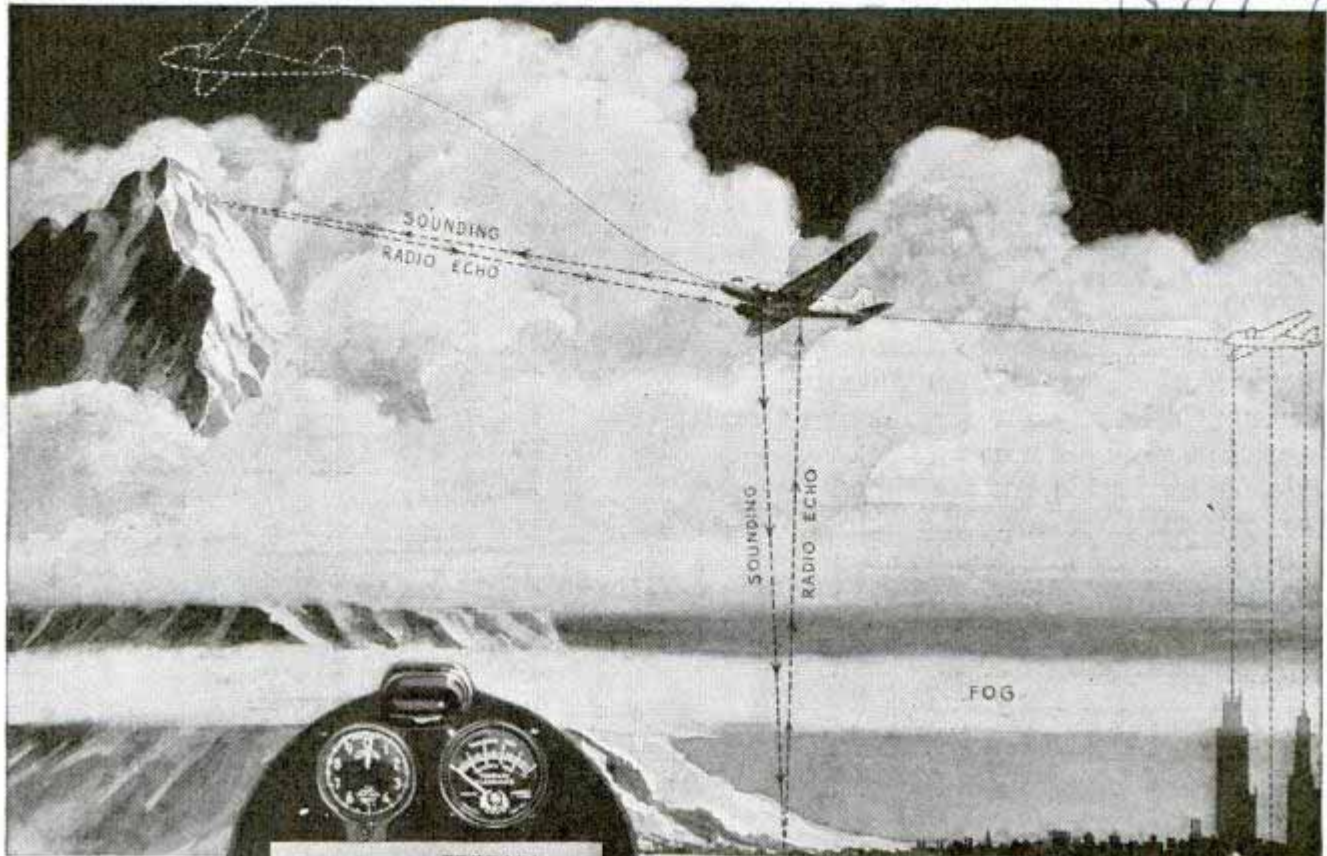


Top, tuning radio at naval observatory to receive time signal from naval radio station at Arlington. Center, reading tape from chronograph which checks synchronization of clocks in thousands of a second



Left, astronomer at naval observatory operating "Zenith tube," which checks master clocks. It photographs stars crossing the zenith. Chronograph records time of stars' crossing. Above, master clock at observatory at exact noon, eastern standard time, but its face shows seventeen o'clock, which is Greenwich time. P. H. Tobleman points to mechanism that flashes long dash over radio to give correct time

Radio Robot Warns Pilot of Mountain Ahead



Here's how absolute altimeter protects airplane by indicating exact distance above ground, as shown by vertical lines denoting radio signal and rebound. Pointing instrument ahead enables pilot to learn whether mountain lies in his path, but instrument does not work earthward and ahead at same time. Left, standard altimeter mounted beside the new instrument in test plane

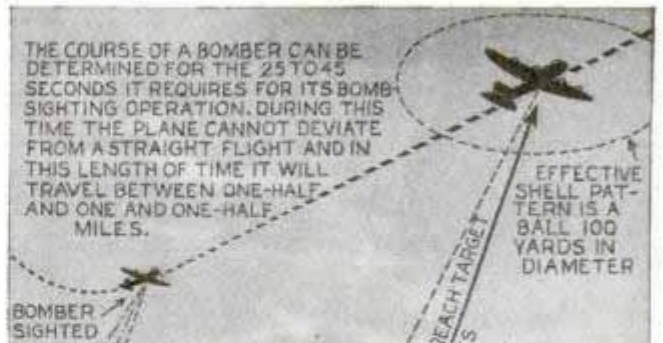
DESIGNED to meet one of aviation's greatest needs—informing the pilot how high above the ground his plane is flying—an instrument called the terrain clearance indicator has been tested successfully. The standard altimeter tells how high the plane is above sea level, but gives no indication of mountains or other obstructions beneath the ship. The instrument, developed by Bell Telephone Laboratories and United Air Lines, also warns of any obstruction ahead if the pilot points it forward. It operates by shooting a stream of radio impulses earthward. These impulses echo or rebound to the plane and an electrical device measures the time for the impulses to make the round trip. Using the speed of electricity and light, 186,000 miles per second, the instrument divides that figure by the time required for the signal's round trip and shows on a dial the plane's exact height above the ground. So

sensitive is the instrument that the indicating needle shows the height of the plane above buildings, fluctuating rapidly as the ship passes over small and then large buildings. The device uses the shortest radio wave ever employed for commercial purposes—only six-tenths of a meter long. On a blind landing in fog, the instrument, also known as the absolute altimeter, shows accurately the distance to within five feet of the ground. The entire equipment weighs twenty-five pounds. By flicking a switch the pilot can read the dial in hundreds of feet, when under 1,000 feet, or in thousands at higher altitudes. An automatic warning light can be set to flash whenever the plane goes below a fixed minimum altitude above the terrain. By signaling when the plane approaches a mountain, the device is expected to put an end to one of the most feared causes of air-transport crashes.

Anti-Aircraft Guns Aimed Automatically

Remarkable accuracy in firing at a target moving through the air at 200 miles per hour two miles away is the result of automatic aiming of anti-aircraft guns. Two instruments, the altitude finder and the director, are used. The first determines how far away is the target and does its own calculating. This range is then converted to an altitude and transmitted electrically to the director, known to the army as the "mechanical brain," which automatically computes all the data for the guns and fuses. Speed of the moving target is determined and guns are aimed by electrical impulses. The gunners simply load and fire as each gun moves slowly, like a robot, to maintain its aim. The effective dispersion range of a bursting shell is a sphere about 100 yards in diameter, so that any shell exploding within fifty yards of the target causes damage. The maximum range, up into the air, of the latest anti-aircraft guns is 9,300 yards.

Chicago Tribune. S. Wood Dept.



Camp Logan
Here is how anti-aircraft guns are trained on an enemy bombing plane by range finder and director. Note circle showing effective shell pattern around the plane, at upper right

202nd Anti Aircraft Artillery

BIRTHPLACE BIG WINDS

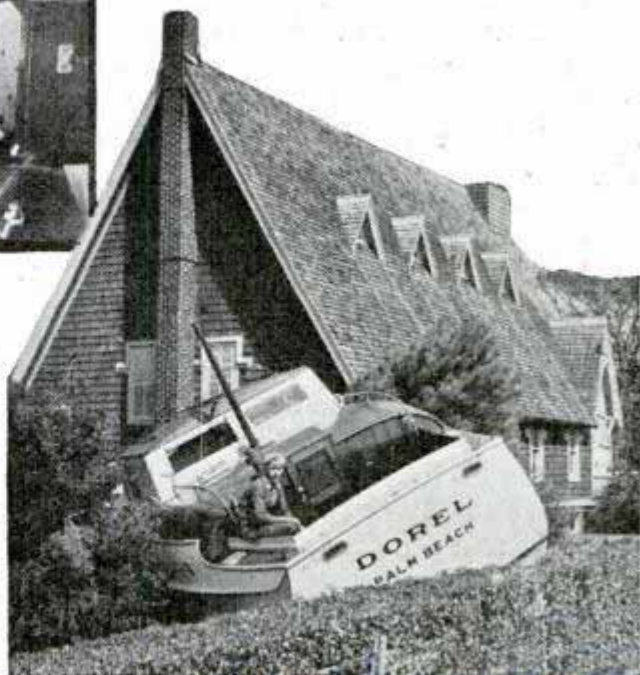
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*Biscayne
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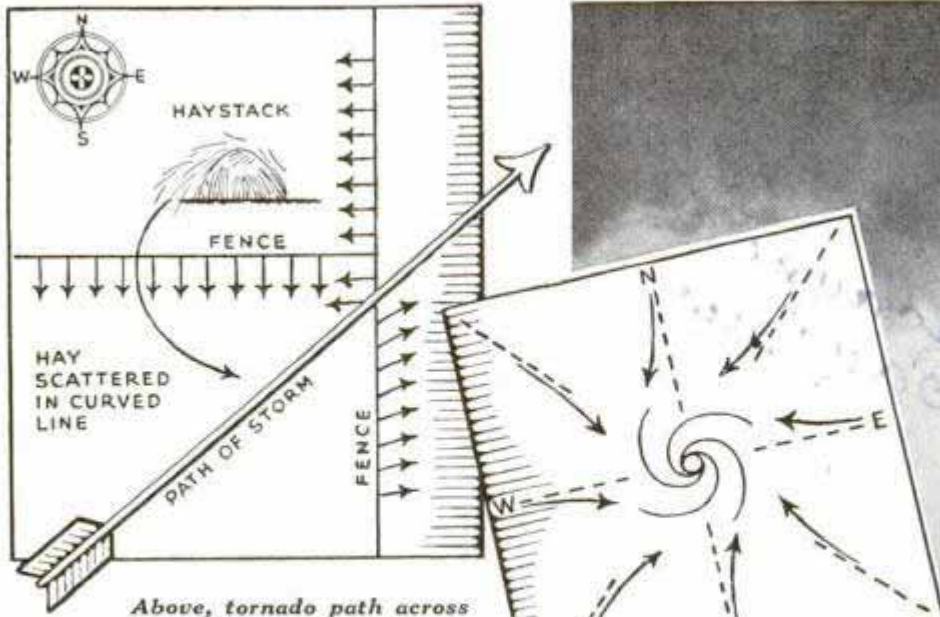
TWO forms of cyclonic storms—the hurricane and the tornado—wreak their destructive fury on the United States each year, exacting an enormous toll in lives and property damage.

Just recently a hurricane roared up the Atlantic and swept across six northeastern states, leaving 500 persons dead and the wreckage of property once worth millions upon millions of dollars. A few days later a tornado twisted through Charleston, S. C., killing more than twenty-five and injuring more than 300 inhabitants in sixty seconds.



Westhampton
Top, thoroughfare strewn with debris in hurricane. Left, radio man maintains only contact between stricken village and outside world. Bottom, power cruiser hurled into churchyard by wind

*Chil Radio man
induced contact*



Above, tornado path across farm, showing directions in which fence posts fell and how hay was scattered in curved line. Right, air currents as tornado funnel begins to form



Above, remarkable view of tornado. Left, police emergency squad with rubber boat in which hurricane-flood victims were rescued



miles or more. The approach of a hurricane is heralded by an ominous stillness. Then follow light breezes which increase to high winds. When the storm breaks in its fury, the wind blows at seventy-five, eighty and even 100 miles per hour. Rain falls in torrents. The wind whirls in a spiral around a center of low pressure and in that center no wind is apparent

The typical hurricane begins in the warm Atlantic belt north of the equator and sweeps across the West Indies to the coast of the United States. Some turn to the northeast and are dissipated in the Atlantic while moving toward Europe, but many strike the eastern coast, usually in Florida, or pass into the Mississippi Valley by way of the Gulf of Mexico. In the beginning the diameter of the storm area is from 100 to 300 miles, but it may increase to 1,000

as the current is upward. This area of low pressure frequently is called the "eye" of the storm.

The tornado is also cyclonic in its movements, but instead of being 100 to 1,000 miles in diameter like the hurricane, it usually has a diameter of gyration of 100 to 300 yards. Its speed of rotation is so terrific that measurement of velocity is virtually impossible. Its direction is nearly

(Continued to page 149A)

Harris County Police

No. 70. Mr. Chas. G. Johnson, Jr.
100 55 Johnson Ave.
Los Angeles Calif

BEHIND *the* SCENES *in* AVIATION



MECHANIC checking the oil supply of one of the big engines of a modern transport plane before a scheduled flight.

809
American Air Lines

810



TRAILING wires, left, on United Air Lines plane used to discharge static as soon as it gathers on ship. Bottom, American Airlines transport ready for night flight. Note truck heating unit supplying warm air to cabin. Engines warm cabin in flight.

810

LITTLE by little, aviation engineers are revolutionizing the art of flying. Today's big transports are vastly improved over those of only a year or two ago although an untrained eye can hardly spot the differences. Scores of slight improvements in power plants, instruments and construction have materially increased efficiency.

Behind the scenes the engineers are working on other improvements. "Within five years we will be wondering how we ever got along without the many improvements in radio alone which are now being developed," one of them remarks. "Within that time passenger transports will be landing on schedule in zero-zero weather. Among other new in-

struments in the control room, the pilot probably will have a height indicator to tell him the exact distance down to the ground. Planes will be carrying heavier loads farther and faster due simply to numerous small improvements which are constantly being made."

Among the things looming for the near future are opposite-turning propellers for two- and four-engined airplanes. Gearing all outboard propellers to rotate inwardly at the top suggests higher speeds and greater stability. Another idea under development is to divert the flow of air used for engine cooling into the exhaust pipes, with the thought that the flow of air will have an extractor effect on the exhaust gases, contributing to engine efficiency. Vari-

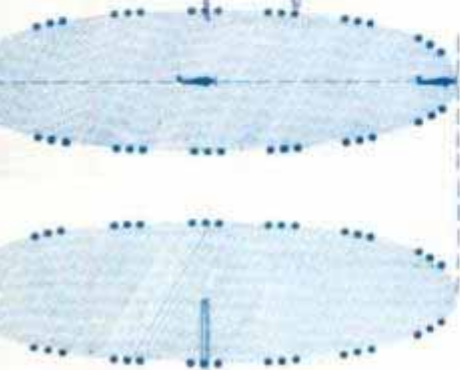


ous ways of putting the exhaust gases and radiator cooling air to work by making them contribute a rearward thrust are also being studied. Greater engine efficiency is being sought in a solid fuel injection system that would eliminate the present types of carburetors.

New ways of controlling airplanes in flight are also receiving attention. Two controls instead of three, provided by coupling aileron and rudder action, seem to have possibilities. A British invention dispenses with the present ailerons completely. In this system a hollow tube crisscrosses from each leading edge of the wing to the opposite trailing edge, permitting the pilot to obtain aileron control by opening or closing the tubes to make use of the difference in pressure existing between the two edges of the wing. Localized boundary layer control at the wing tips is another suggestion for providing aileron action. If present ailerons con-

United Airt Lines
REMOVING transport plane's batteries, top, right. Center, landing flaps on Lockheed transport. Bottom, enclosed loop antenna on underside of fuselage. Diagram shows airways marker radio beacon which enables pilot to check his distance.

Dept. of Commerce





7810 812
TYPICAL night scene at a busy airport. Passengers are boarding the plane before the start of a night transcontinental flight.

tinue to be used, they may be made more effective by arranging some means of sealing the gap between the wing and the aileron surface to prevent leakage of air at that point.

Completely smooth wing and fuselage surfaces would add 273 extra horsepower to present transports, the National Advisory Committee for Aeronautics has determined. Rivet heads, overlapping joints and surface roughness resulting from working tolerances and factory workmanship offer as much as forty-two per cent more drag than perfectly smooth airfoil shapes. Manufacturers are beginning their "cleanup" campaign by using flush-type rivets but high manufacturing costs may prevent them from ever achieving perfect wings in metal construction.

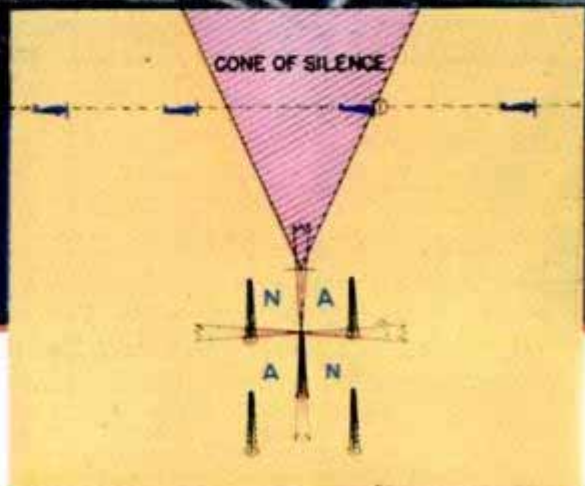
Every detail counts. Even the drag of ordinary rubber boot de-icers along the leading edges of wings has been studied, and de-icer drag has been reduced from an original sixteen per cent to nine by mounting the boot in a flush position instead of lapping it over the leading edge. Engineers are studying the phenol-formaldehyde resin type of plastics as

a possible new material for airplane surfaces that can be molded into smooth and efficient airfoil shapes.

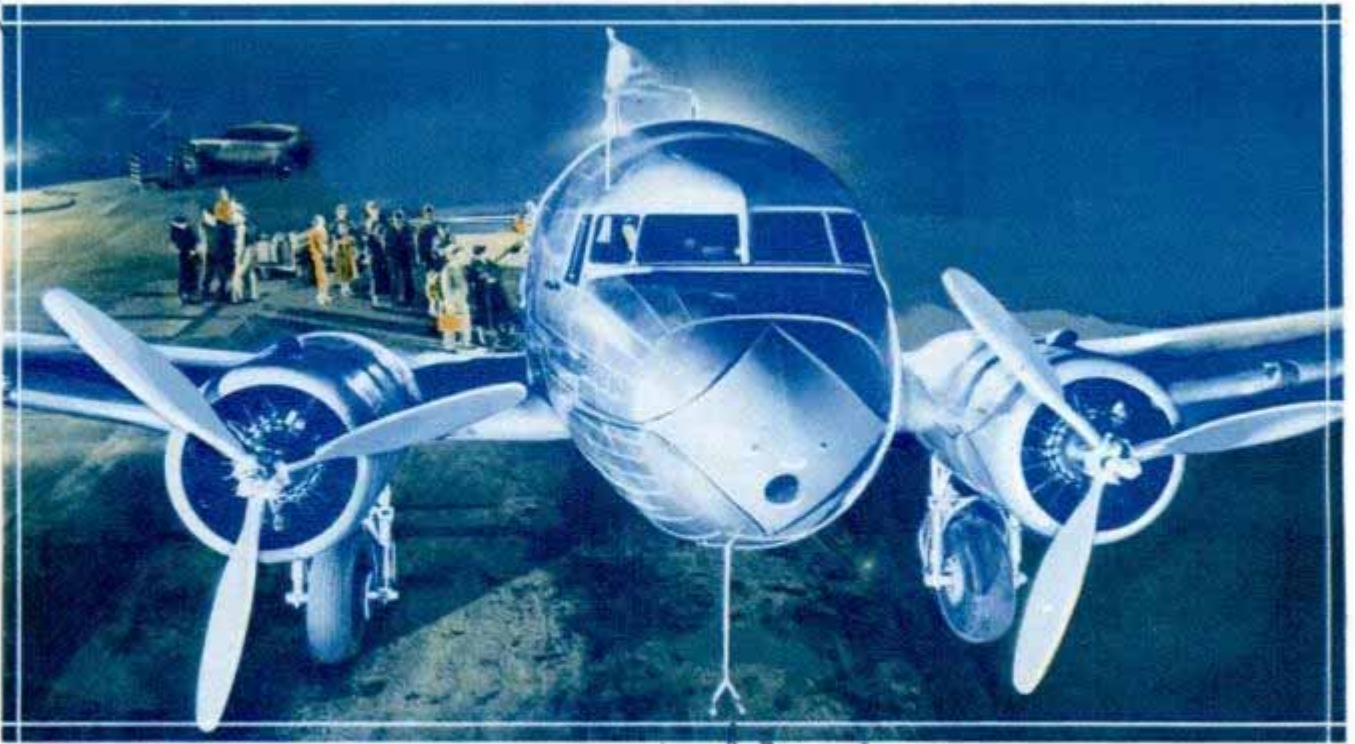
Blind landings made by instruments alone will be normal procedure within a year or two. Thousands of such landings have already been made safely, with short-wave radio signals orienting the pilot toward the field and other signals telling him when to start the "let down" glide in a safe landing attitude with flaps and landing gear extended. The new tricycle landing gear makes instrument landings easier, reducing the bounce of a hard landing, allowing more immediate braking and permitting planes to land across the wind.

Many radio possibilities are being explored. One patent provides "panoramic reception" of several radio compass signals visually and simultaneously on a cathode ray tube indicator. Static is slowly being wiped out although a moving airplane is an almost perfect static-generating machine. Shielded loop antennas have eliminated some of the static. United Air Lines is experimenting with wires with sharpened ends trailed from the tail of the plane to pro-

813
PILOT speaking over two-way radiophone of passenger transport. Below, checking instruments in nose of plane as part of the frequent regular overhauls. Diagram shows "cone of silence" over radio range beam transmitting station which enables pilot to check his position in the air.



8/4



Lockheed
LOADING passengers, above, at start of night flight. Below, left, shielded radio direction-finding loop antenna mounted in glass nose of transport. Right, triple tail surfaces and passenger loading door of four-engine Douglas DC-4.

7810

vide leakage paths along which static charges may be dissipated.

Ultrashort radio waves in which static conditions are less acute are to be adapted to air line use. Beginning next year, much lower wave lengths will be used for plane-to-airport communication over short distances. Ultrashort-wave radio marker beacons will help the pilot with his navigation. Fan beacons that set up walls of short-wave warning signals will mark the edges of mountainous areas in the vicinity of airports. Auto-

matic pilots are being connected directly to the radio beam receivers so the robot actually keeps the plane on its course as well as attending to the mechanical details of flying.

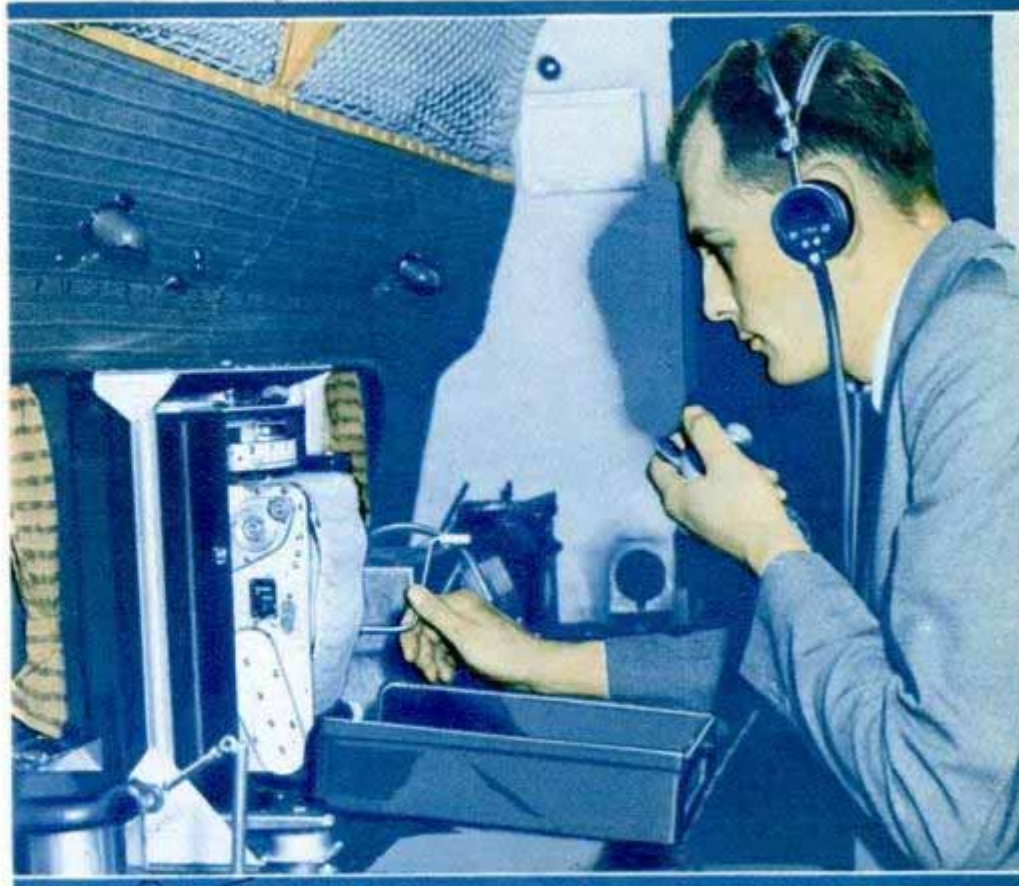
Research is being conducted on various ways of providing a pilot with "fog eyes." What is wanted is an instrument that will measure the distance to the ground. Present altimeters show the height of the plane above sea level but not the ground contours beneath the plane. Short radio waves, infrared rays



and sound waves reflected from the plane to the ground and back again are being studied.

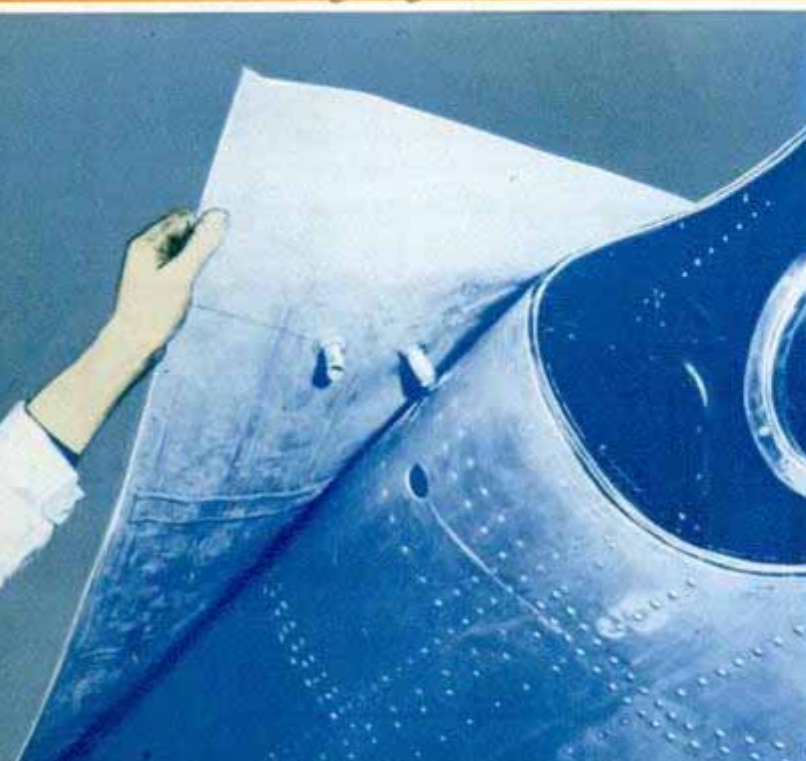
Engines are sturdier even though they are developing more power than a few years ago. Automatic oiling systems have eliminated frequent overhauls and increased engine reliability. The heavy drag of a "windmilling" propeller when an engine goes dead in the air has been reduced almost to nothing by the Hamilton hydromatic full-feathering propellers. By turning a switch the pilot can turn the blades to point directly into the wind. Propeller blades that may be rotated through 120 degrees of a pitch have been developed in France to enable flying boats to maneuver astern on the water.

Designing a transport is such a complex job that no one man can do it all. Specialists in wing construction, tail group design, and landing gear assembly work side by side. The cockpit alone needs the attention of several experts and hundreds of minor details require intensive study. The exact location of the pilot's seat, the angle of the windshield and the shapes of the control knobs are all important.



MEASURING intensity and width of radio range beam, above, while plane is in flight. Below, left, attaching "rubber boot" de-icer to leading edge of wing. Right, hydromatic propeller blades which can be turned to point into wind and reduce windmilling if engine dies.

Different control handles are given different colors and shapes so the pilot invariably can recognize the one he seeks. His seat must be close to the windshield to give him wide angle vision, yet he must be able to slide out of the seat easily without disturbing the controls. In the past, pilots were sometimes confused by lights reflected on the cockpit win-





SPEED is indicated in every line of the nose of this modern transcontinental air liner.

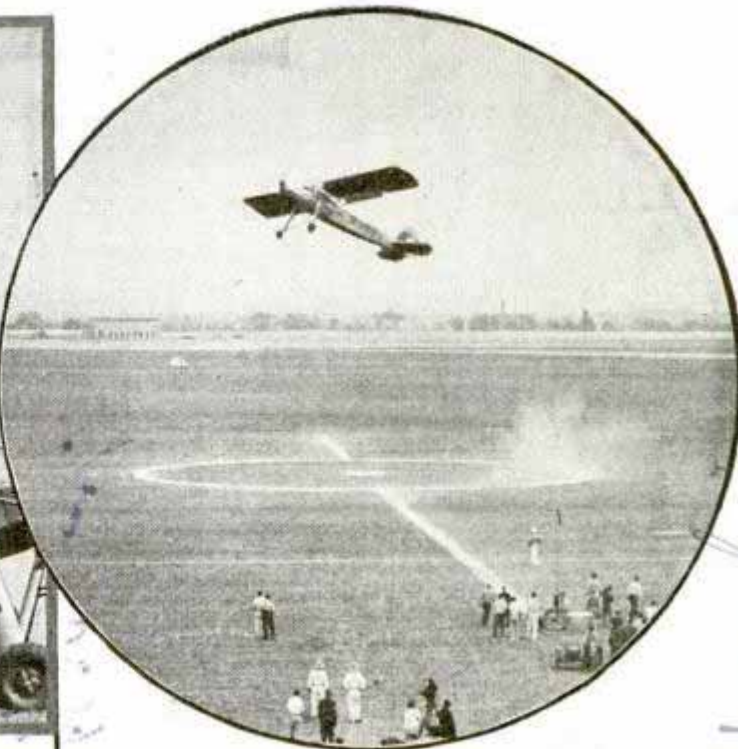
dows. Lights on the ground behind sometimes seemed to be ahead of the plane. Placing the windows at exactly the proper angles prevents such reflections. Pilots in the past also were almost blinded by rain or snow pounding against the windshield while making night landings during storm conditions.

Designers solved that trouble in an adroit way. Instead of trying to keep the moisture out of the cockpit they let it in. Now when a pilot prepares to land

during a storm, he slides open a side window and a windshield window, allowing rain or snow to sweep in one window and out the other. Sitting behind the blast of wind, the pilot can see forward and rarely receives more than a few drops from the controlled storm that invades the cockpit. The windshield is completely waterproof when closed and can take a pressure of one pound per square inch at 200 miles per hour without leaking.

(Continued to page 128A)

Plane Climbs Sky at Forty-Five-Degree Angle

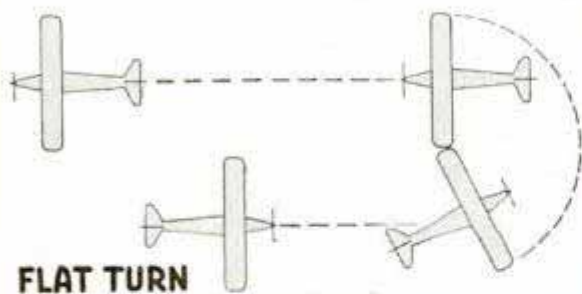


30 M.P.H.
MINIMUM FORWARD CRUISING SPEED



45° CLIMB

TAKE OFF



FLAT TURN

Closeup view of the "grasshopper" plane at top reveals the wing slots and flaps that make it so flexible in maneuvering. Drawings below indicate the little ship can keep aloft at a mere thirty-mile speed, take off with a twenty-three yard run and climb at forty-five degree angle, and execute flat turn with one wing tip as axis. In circle, steepness of climb is shown by dust cloud below

Spectators are not particularly impressed when a long-legged monoplane rolls across the airport runway into position for a takeoff. It boasts no great speed as modern planes go, looks rather like a grasshopper as it toes the mark. Then, with no wind blowing, it roars forward, is off the ground after a run of just twenty-three yards, and in a matter of seconds is climbing steeply, seeming to hang on its propeller as it points upward at an angle of forty-five degrees. Built in Germany, the two-passenger cabin plane is astonishing watchers at air meets in this country. With a load of 2,310 pounds it climbs at 1,141 feet a minute, lands at 23.6 miles an hour and halts within forty-nine yards, and can stay aloft at a speed as low as 30.4 miles an hour. Its ceiling is 20,340 feet, its maximum speed 130 miles an hour. Another startling feat is its ability to make a flat turn, the tip of one wing forming the axis. Wing slots and flaps enhance its maneuverability. The power plant is a 250-horsepower eight-cylinder inverted air-cooled engine. The high wings have a spread of forty-six feet nine inches. Because of its ability to climb, to get up and land in small areas, the ship has proved itself useful in Alpine regions, Brazilian jungles, Iceland and other areas where rough terrain makes air travel hazardous.

North Park Hotel, Chicago
Storch by Gerhard Feeder
Fisher
built by Gerhard Feeder

mission

Library Vacuums and Sprays to Preserve Old Books



Spraying old books on shelves of Athens library

Vacuum cleaner and spray gun are employed to save ancient books and documents in the library at Athens, Greece. The library custodians regularly go over the books and shelves carefully with a vacuum, then follow with an insecticide spray.

News Reporter in Gas Mask Covers U. S. War Games

Newspaper reporters covering the mock war maneuvers around the Fort Knox, Ky.,



Fitting gas mask on reporter covering war maneuvers

gold depository were given gas masks to make the "war" seem more real. The masks, which covered only the face and had a window for vision, were of the type with which the army plans to equip civilians in this country if the United States should be invaded.

H 1064

Self-Propelled Street Marker Cleans as It Sprays Paint

Fully controlled from its handlebars, a self-propelled marker for street traffic lanes first cleans, then sprays and finally brushes the painted line. A three-quarters horsepower motor drives the one-man



Pole extending in front of road marker helps follow guide line. All controls are at the handlebars

machine. A single-lever, motorcycle control feeds the paint, which is sprayed with a gear pump after the exhaust blower cleans the area to be painted. Immediately behind the spray box, a brush finishes the job, leaving a clean, well-defined line. The paint flows automatically during forward motion, and is shut off while the machine is in neutral or reverse.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Col. Benj. A. Brabankin
Chemical Warfare
103

Melvin Blumberg Corp
New Holstein, Wis.

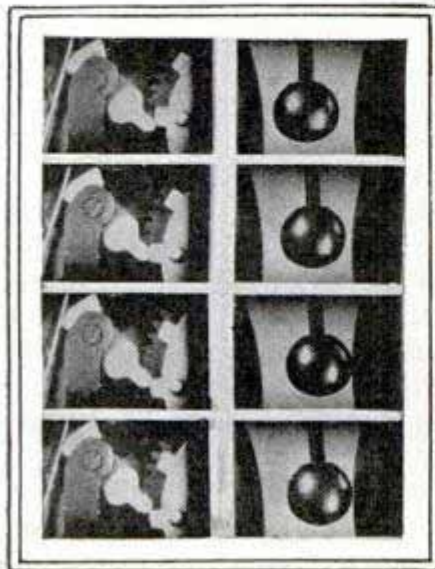
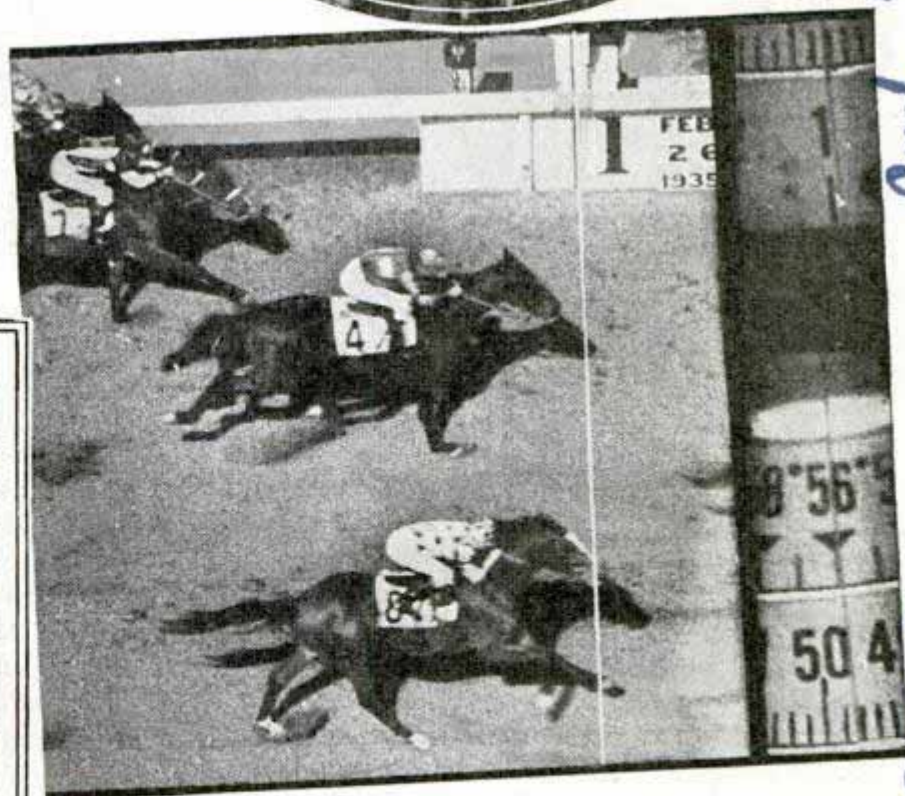
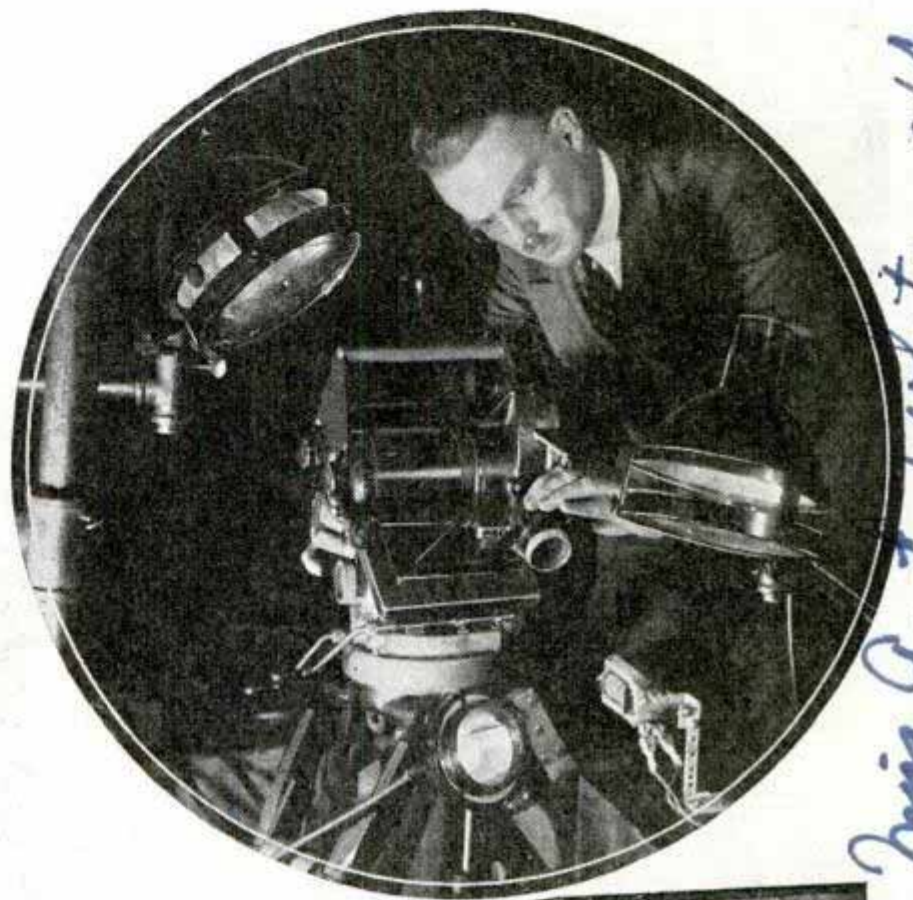
Melvin Blumberg Corp
Chicago

Miss Katherine

Hidden Flaws Bared by HIGH SPEED MOVIES

THE "movie doctor" is not human. It is a machine that in its own line can do more than any human being. It specializes in diagnoses, because with its keen, rapid-seeing eye, it can peer at machines, watch the way they work, and point out just what is the matter with them.

This movie doctor is an exceedingly high-speed motion-picture camera, now used in conjunction with a precision clock. It is really a sort of time microscope. In it is used the ordinary sixteen-millimeter moving-picture film, which takes pictures of the object under examination and at the same time records the time of each frame. While the ordinary motion-picture camera is designed to run at a rate of around sixteen pictures per second, this high-speed camera

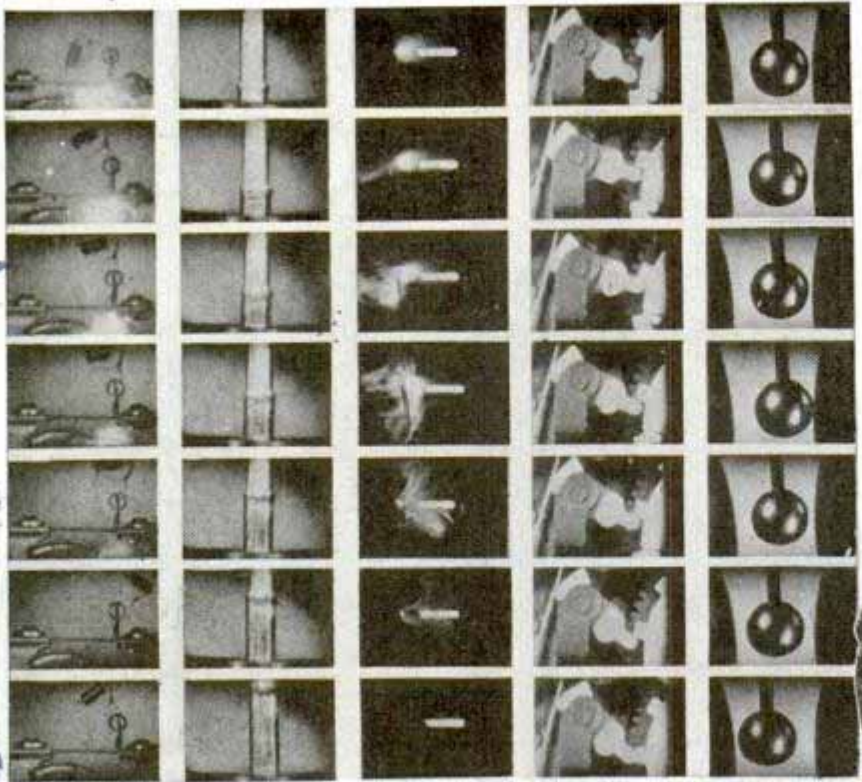


Circle, operating the "movie doctor." Below, finish of race recorded by speed camera. Left, clapper striking gong. Photos were at 2,000 per second

Western Electric 819
High Speed

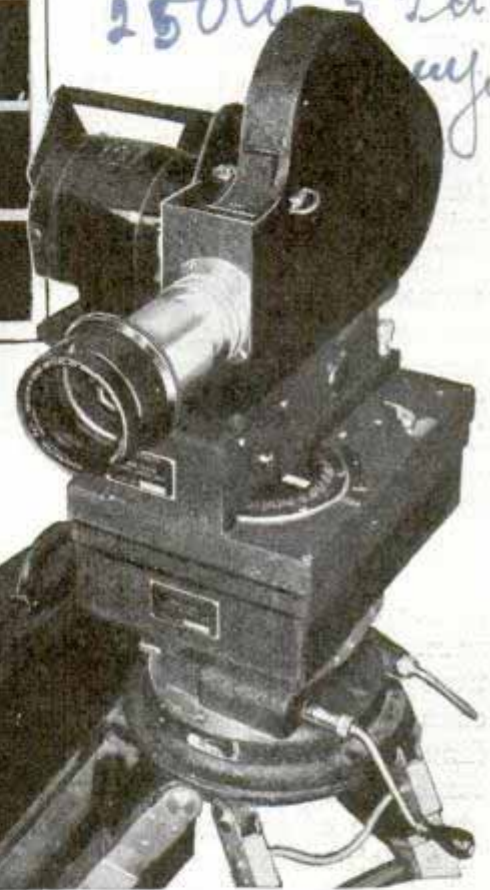
Cont. Miss A. L. White Apr. 13 - 1935

195 Broadway New York

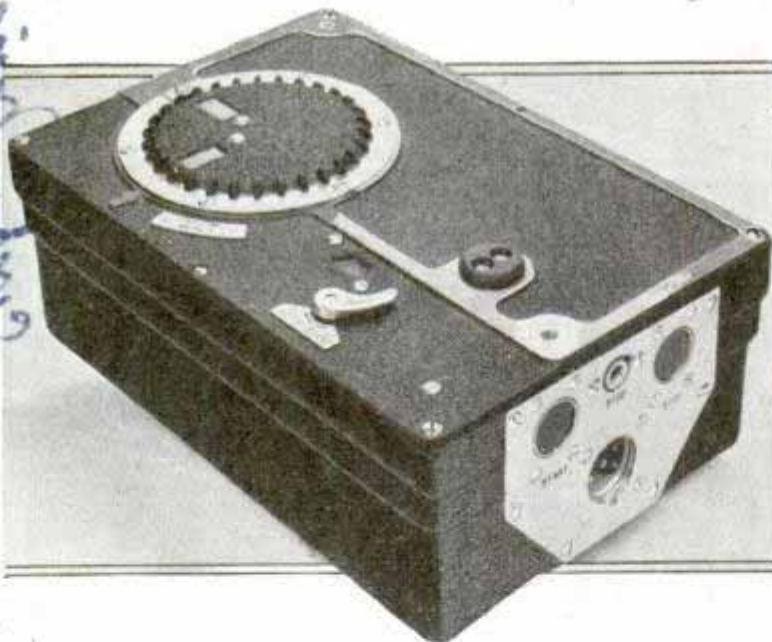


Left, speed photos in strips show (from left to right): blowing of a telephone fuse; formation of a condenser casing (similar to a collapsible toothpaste tube); burning out of straight wire fuse; gear tooth striking pawl, and clapper striking gong

Photos courtesy Bell Laboratories and Electrical Research Products, Inc.



Right, Western Electric high-speed camera. Bottom, precision clock used with camera in the manner demonstrated at right



by which it is possible to read the time to a little closer than $\frac{1}{1000}$ of a second. This result is obtained by means of two dials, one with sixty divisions rotating once per minute, the other with 500 divisions rotating once per

second. With this combination camera and clock, not only panchromatic and super-panchromatic film can be used but also color film. This last is particularly useful for photographing flames and chemical processes, as by its use gases emitted may be identified by their characteristic colors. Photographs can be made in sunlight or by the light of photo-flood or spot lamps, and

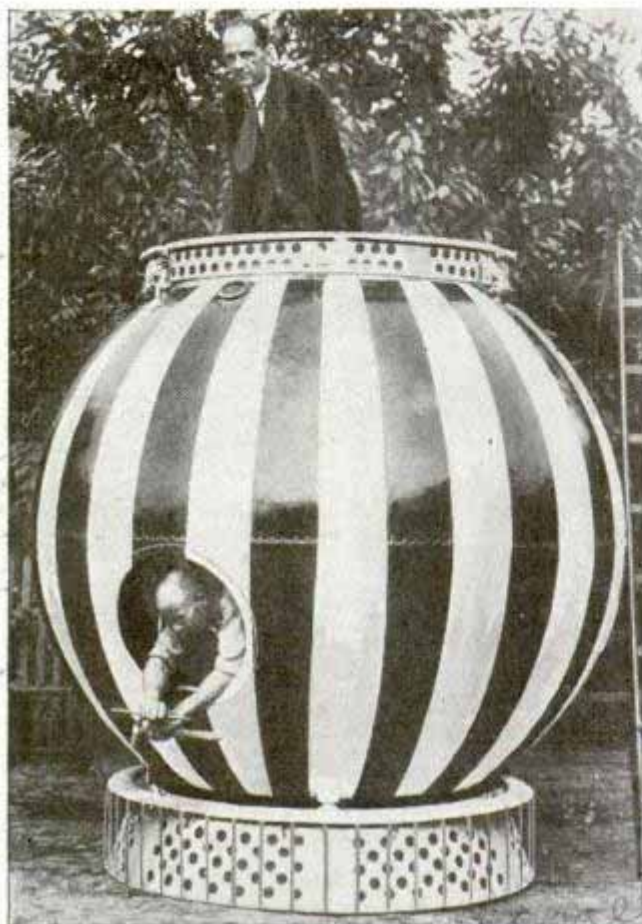
can run at a speed of 2,500 pictures per second, and a specially constructed camera can run as many as 4,000 pictures per second. When the pictures taken at high speed are projected at the normal rate of sixteen pictures per second, the motion appears to be slowed down more than 150 times.

The time of each frame is photographed on one side of the film. The clock used with this camera is a precision timepiece

(Continued to page 126A)

103
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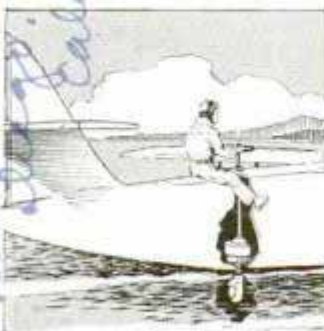
Stratosphere Fliers' Gondola Ready for Trip



Gondola of stratosphere balloon, ready for attachment to the inflated bag

Ready for a journey into the upper air is the ball-shaped gondola which will be attached to the "Star of Poland" stratosphere balloon. Three Polish fliers will make the trip. The gondola is equipped with various instruments for making tests.

Outboard Motor Steers Plane Threading River Narrows



Natives of Dutch New Guinea may gape with good reason when the big flying boat of the American Museum of Natural History noses into a cove of some inland lake, the pilot astride its tail like an aerial cowboy. Sister ship of the U. S. Navy's twin-engined "PBY" patrol bombers, this aerial explor-

er can poke into snug inlets, thread narrow rivers and turn around "on a dime." An outboard motor under the aft hull does the trick. A strong propeller blast against the rudder would steer it afloat, but would also force the ship forward, making tight maneuvers difficult. Instead, the pilot of the "Guba" climbs to the "saddle" on the tail and maneuvers the ship by operating a nine-horsepower outboard motor and rudder below him. The "Guba" is a reconnaissance, supply and photographic plane owned by Richard Archbold, expedition leader. The rim of its bow turret is graduated in degrees for taking azimuth, and shadow bars show direction in relation to the sun. The rear tunnel hatch is the mount for the outboard motor, and is used also for dropping flares and supplies and for mounting a camera. The ship carries radio transmitters and receivers operating from any of eight stations in the cabin; there is a still for distilling sea water; four weeks' food supplies and a gasoline stove, a six-place raft, a collapsible boat and fourteen life jackets.

Bracelet Holds a Powder Puff, Rouge and Mirrors

All the materials for a quick cosmetic "touch-up" are concealed in a bracelet made of plastic in colors to match any



Twist this bracelet band and you find a purseful of "make-up"—mirrors, powder, rouge and puffs

Marlowe Novelty Corp. 347-5th

Vertical handwritten notes on the left margin, including "1084", "P. Kyle, III", and "Dahelito, Corp. 247 Park Ave."

Vertical handwritten notes in the center margin, including "Warsaw" and "Dahelito, Corp. 247 Park Ave."

Handwritten signature or initials at the top right of the page.

costume for sports, street or evening wear. Give the band a turn and it reveals three receptacles holding powder puff, mirror and face powder. Another turn discloses rouge, mirror and another puff. A further turn brings open a lip-rouge container.

Insulating Board Made of Waste from Steel-Pickling Bath

Steel mills used to dump into sewers and polluted streams the evil-smelling waste liquor of the steel-pickling bath. Today, by an inexpensive process, the worn-out pickle liquor is separated into pure water and a residue which is used for insulating material, wallboard, pipe covering or fertilizer. Steel is immersed in the pickling fluid to remove the "scale" or impurities. A Cleveland inventor discovered a way to redeem the worn-out fluid. The valuable residue he obtained from the waste is called ferron. At one stage it is plastic, molding into any shape and setting into a hard, tan-colored porous mass. Ferron resembles wood, is fireproof and termite-resistant, will not warp and can be sawed, cut or machined. One inch of ferron is said to be equal in insulating value to fifteen inches of brick wall.

Launch Tows a Steel House to Lot Across River

This is no rescue scene in floodtime. It is a new, eight-room steel house being towed across the Illinois river at Peoria to a home site on the opposite shore. Prefabricated at a Peoria plant, the forty-one ton house was set afloat on the river, riding evenly on its own buoyancy.



Nothing but its own buoyancy supported this forty-one ton all-steel house as it floated across the Illinois river in tow of a motorboat

"Fire Weather" Sampled from 150-Foot Tower



Weather instruments are stationed at five stages of this 150-foot tower to study "fire weather"

What influence does the weather have on forest fires? Forest research men are trying to answer that question from the steps of a 150-foot steel tower that rises eighty feet above the treetops at Priest River, Ida. The "steps" are platforms stationed at five height levels—on the ground, at thirty-five feet, seventy-five feet, 105 feet and 150 feet. On each platform are instruments recording wind velocity, temperature and relative humidity continuously, and measuring evaporation and radiation.

The annual commercial catch of fishery commodities in the world amounts to about 34,000,000,000 pounds, valued at approximately \$744,000,000.

Dept. of Commerce memo 9/16/3

*man...
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See letter 14 1098
See June 1937-889*

*Les Shanas...
The emergency...
cont.*

*Le Tourneau Co.
Peoria, Ill.*

Science Helps Carve Giant Faces on Mountain



Huge models in studio are used in carving giant faces on Mt. Rushmore in South Dakota's Black Hills. One inch on the models represents one foot on the mountainside. The models aid in making measurements and taking readings



Above, director with telephone sits on side of cliff to guide the workers dangling from steel cables. Note huge face in background



Above, jackhammer driller prepares holes for dynamite in the granite. Blasting then loosens the rock. Right, Lincoln Borglum, son of the Mt. Rushmore sculptor, Gutzon Borglum, holding bundle of small dynamite charges and a bundle of caps and fuses used in blasting

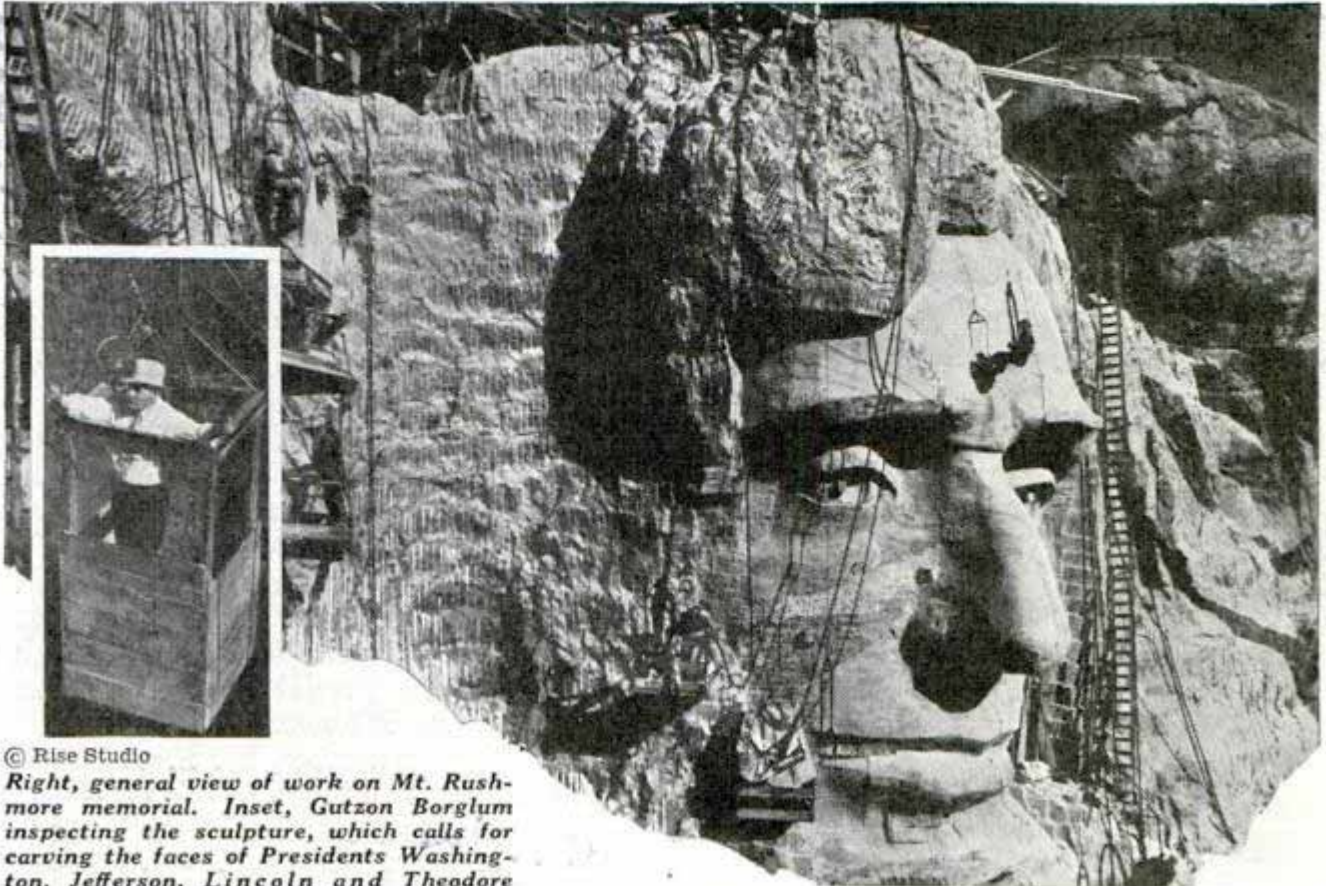


Cont. H. A. Sghaderi. 2. 20. 2. Walton

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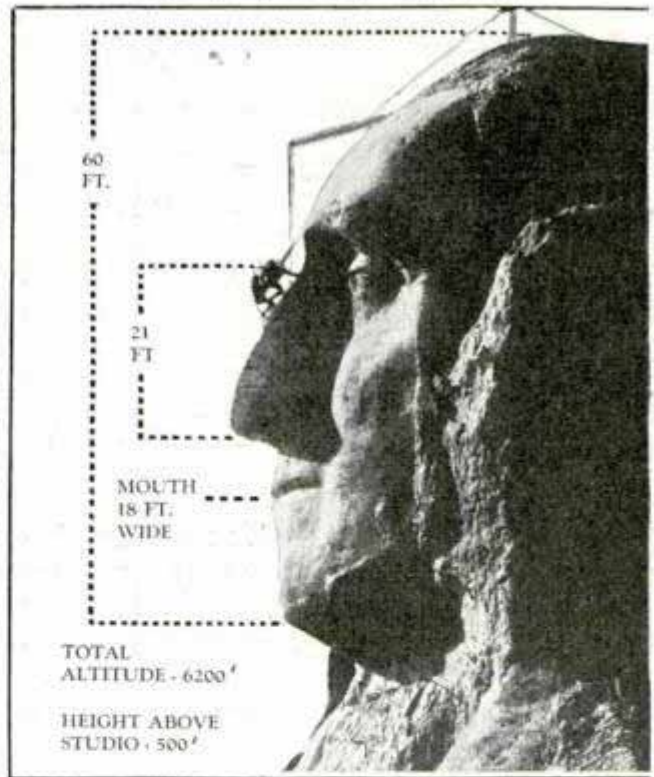
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Models Used in Shaping Mt. Rushmore Group



© Rise Studio

Right, general view of work on Mt. Rushmore memorial. Inset, Gutzon Borglum inspecting the sculpture, which calls for carving the faces of Presidents Washington, Jefferson, Lincoln and Theodore Roosevelt on the mountainside. Workers' tiny figures give an idea of project's size



Left, measuring model in studio helps workers locate same relative spot on mountainside. Multiplying studio readings by twelve gives the correct distances. Right, giant proportions of the memorial are illustrated by measurements of this huge face

The faces of the presidents are carved into the mountain. The scale of the project is shown by the tiny figures of workers. The measurements of the face are 60 feet high, 21 feet wide, and the mouth is 18 feet wide. The total altitude of the mountain is 6200 feet, and the height above the studio is 500 feet.

Static-Proof Radio Compass Is Reliable in All Weather



Compass needle of this direction-finder points "home" to radio station regardless of static

Static troubles of the aircraft pilot are beaten by a radio direction finder just developed. Equipped with a double aerial, it is unaffected by static. When the radio is tuned to a station, the compass needle points to the direction of the station.

Adapter for Use of Color Film Has Ground-Glass Focuser



To make miniature color film available for use in some cameras not previously adapted to it, a special adapter has just been introduced. It consists of a sliding film chamber and ground-glass focusing panel mounted to fit on the back of certain film-pack cameras. The picture is focused on the small glass

panel, then the film chamber is slid down into position and the shutter snapped. The adapter can be removed from the camera when the roll of eight pictures has been only partly exposed. Photomicrography in color and "table-top" work is facilitated by this adapter.

Five-Billion-Dollar Cost of Rust Exceeds War Budgets

Wartime budgets of the nations reach sums staggering the imagination, yet the largest single cost item faced by the United States or any other country is the cost of corrosion. One automotive engineer computes the loss to the world due to corrosion of metals alone at \$5,000,000,000 a year. Each year, he says, one-fourth of all the world's iron returns to the oxides or ores from which it was derived. Although it is theoretically possible to convert iron oxide into pure commercial iron again, it is practically impossible, for most of the rust is scattered and lost.

Frozen Bread Nine Months Old Stays Fresh and Palatable

At a banquet the other day the guests were served bread thirty-two days old. It was perfectly fresh and palatable. The guests could not distinguish the month-old bread from that baked the same day. The secret lay in freezing. Immediately



It takes a hard whack with meat cleaver to break a loaf of frozen bread, but it's tasty when thawed

Dr. W. W. Warren & Co. Inc. 1073

Eastman Kodak Co. Rochester

Chrysler Corp. 341 Nassau Street

10/3/38

1119
1110

after baking, the bread had been frozen so hard that a meat cleaver was required to chop it up. Thawed out, however, it was unchanged in appearance and taste even after nine months in refrigeration. Experiments indicated it would be quite feasible in wartime to store thousands of loaves for months at a time and, if necessary, to ship bread in refrigerated boats to an army abroad.

Exposure Meter for Enlarging Gives Direct Reading

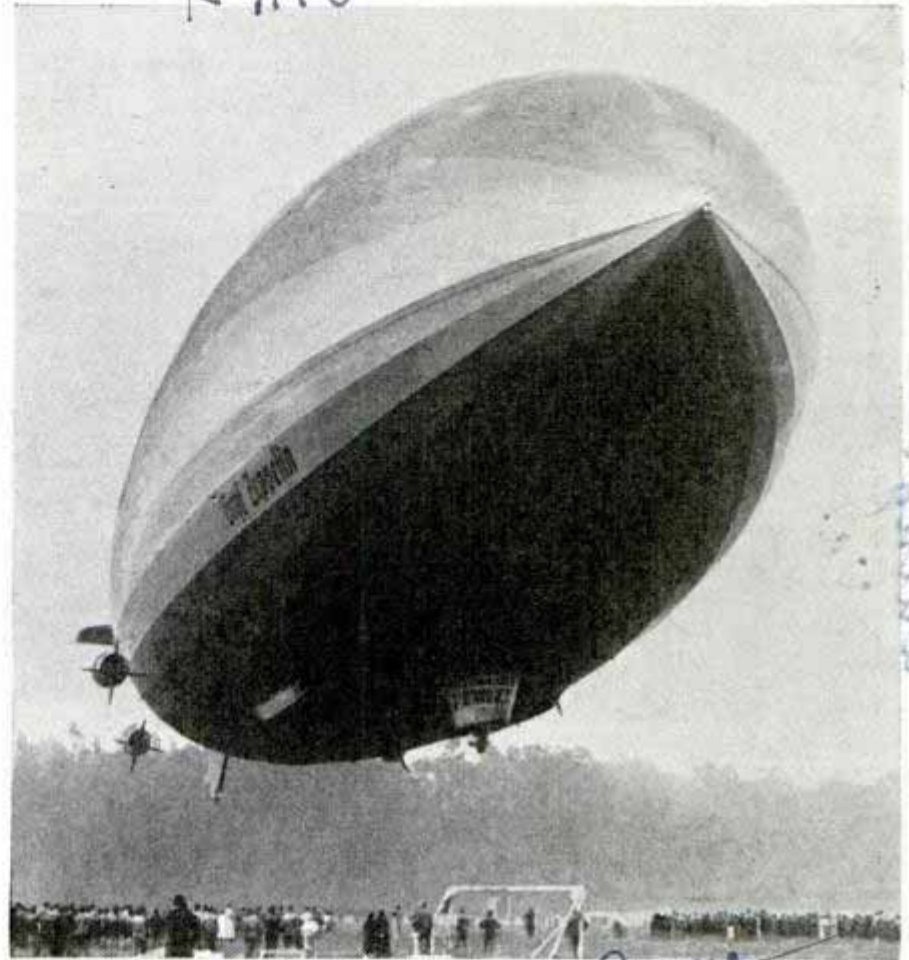
Photographic enlarging is made easier by an exposure meter of the extinction type which has no moving parts, no bulb to burn, no consumption of current. The reading is made directly, without reference to charts or calculations. There is no electric cord to interfere on the enlarging table.



Taking a direct reading with extinction type meter

*Raygram Corp.
425-4th Ave*

Newest Queen of Zeppelins Goes Aloft for Maiden Flight



Up for its first taste of the air, Germany's newest "Graf Zeppelin" rides majestically away from the ground crew, her cells filled with hydrogen

Faith of the Zeppelin builders in their giant dirigibles, despite the tragic loss of the "Hindenburg," was expressed again when the newest of the famous line, the "Graf Zeppelin," was christened recently. The gas bags of the new sky queen were filled with hydrogen on her trial flight, as previous Zeppelins had been. Germany had been unable to obtain a supply of the non-inflammable helium gas from the United States. Helium is more costly and has only ninety-two per cent of the lifting power of hydrogen—the gas itself is twice as heavy as hydrogen—but its use eliminates the risk of explosion and fire that ended the transatlantic career of the "Hindenburg" in 1937.

☐Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

*Amesbury Institute of Reading
9 Rockefeller Plaza, New York*

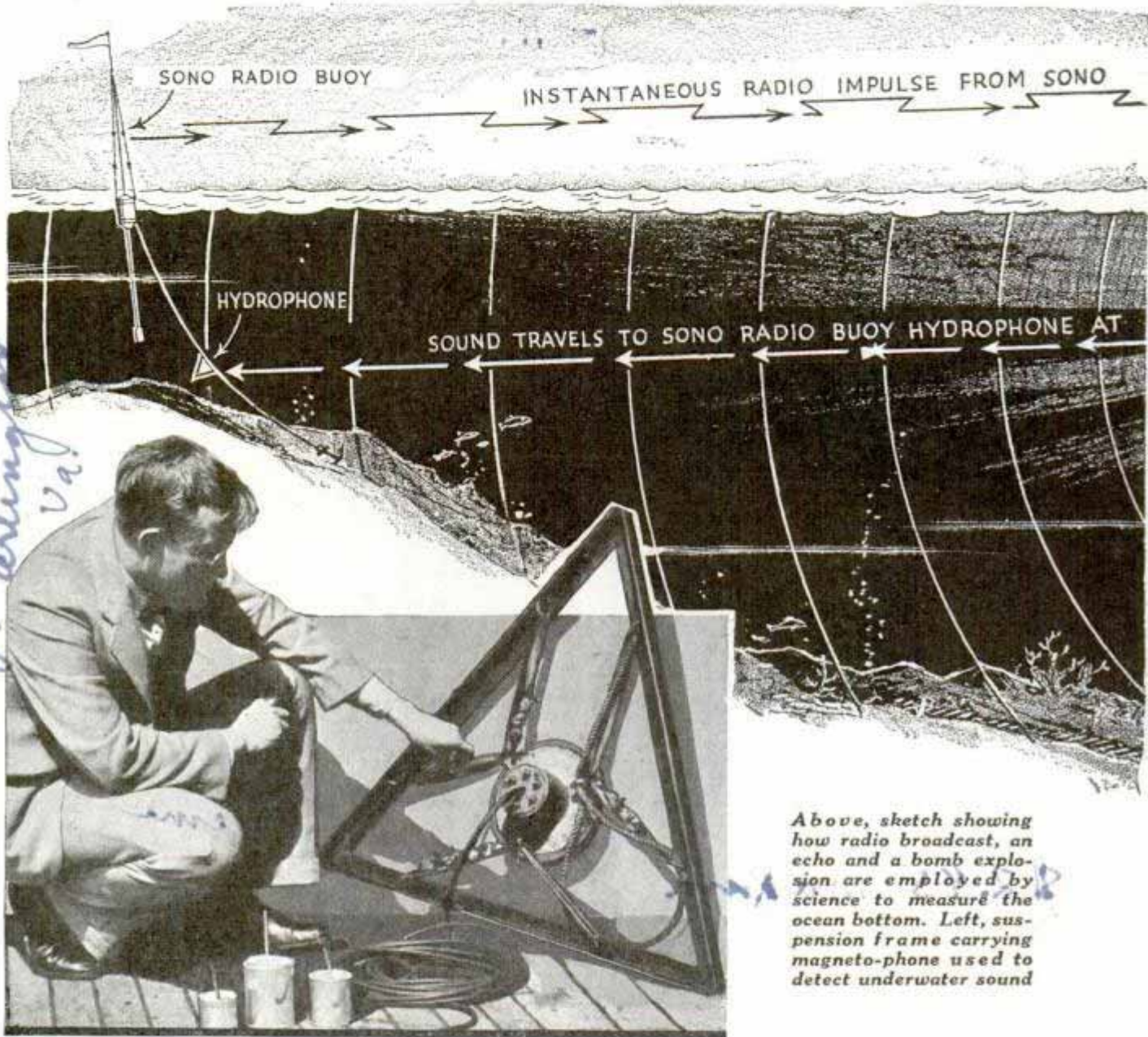
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OCEAN'S DEPTH



Above, sketch showing how radio broadcast, an echo and a bomb explosion are employed by science to measure the ocean bottom. Left, suspension frame carrying magneto-telephone used to detect underwater sound

Cmt. John L. Coontz, 3901-5th St. N.E., Arlington, Va.

IT'S hard to believe that a radio broadcast, an echo and a bomb full of TNT can measure the profile of the ocean's bottom.

These apparently unrelated occurrences actually work together and reveal in a few seconds' time the exact configuration of the mountains and canyons of the sea, many of which are greater than Mt. Everest and dwarf into insignificance the Grand Canyon of the Colorado.

It was accomplished the other day off the coast of New York City, giving promise of being repeated hundreds of times for years to come in stretches of the ocean off the Atlantic, Pacific and Gulf coasts.

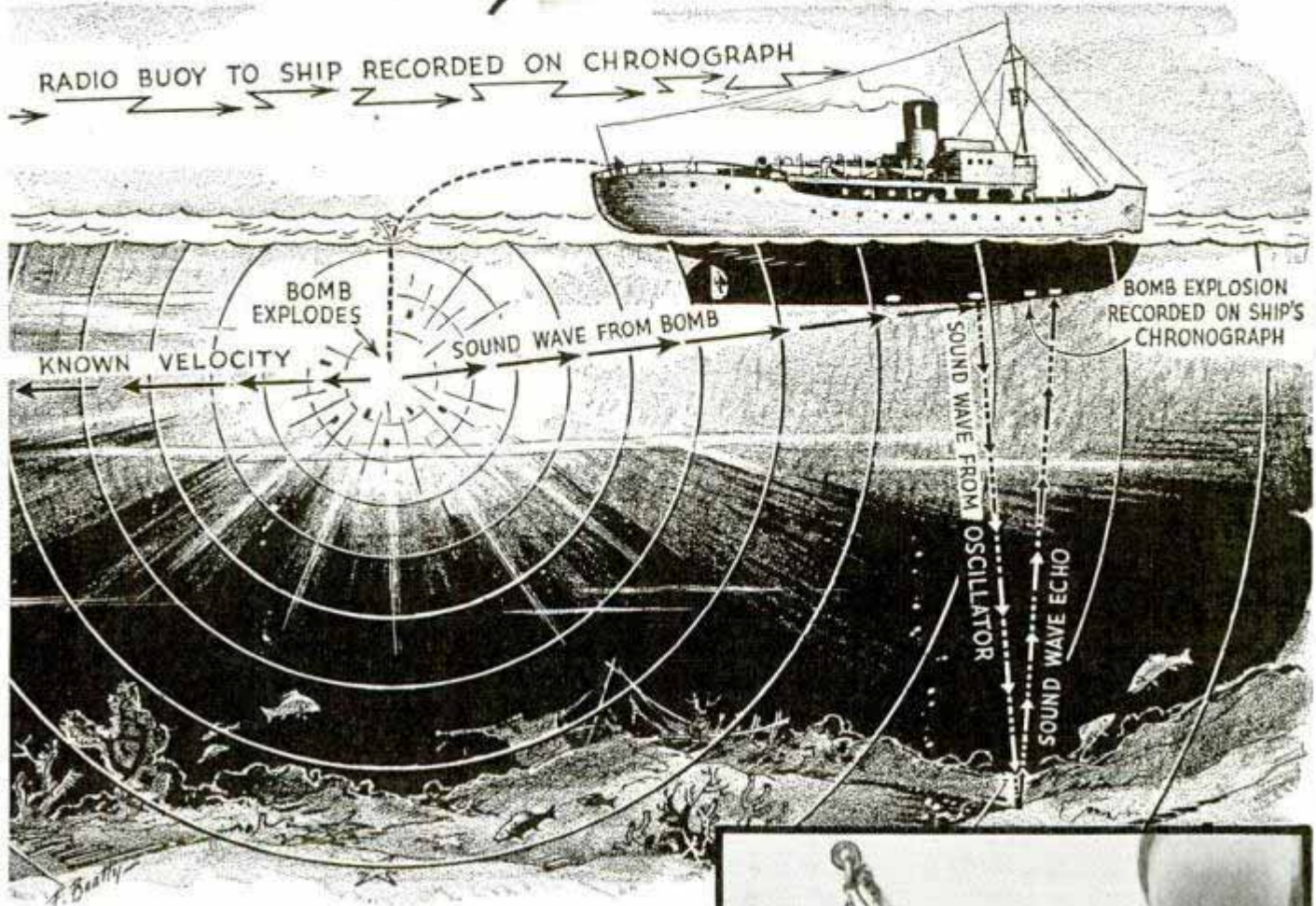
To make the achievement seem even more weird and fantastic, the broadcast was made fifty miles out to sea by a robot sealed in an airtight container inside a buoy bobbing up and down on the waves.

It is all a part of something entirely new in the field of ocean surveying, a science which its inventors, research experts of the U. S. Coast and Geodetic Survey, with headquarters in Washington, refer to as radio acoustic ranging.

Practical importance of the feat scarcely can be exaggerated. It means the quickest and most accurate method the world has ever known of charting the ocean's floor and making it safe for navigation interests.

141036

Measured by RADIO ROBOT



Here's an exact visualization of how the new science works, as explained by Capt. Gilbert T. Rude of the Coast and Geodetic Survey:

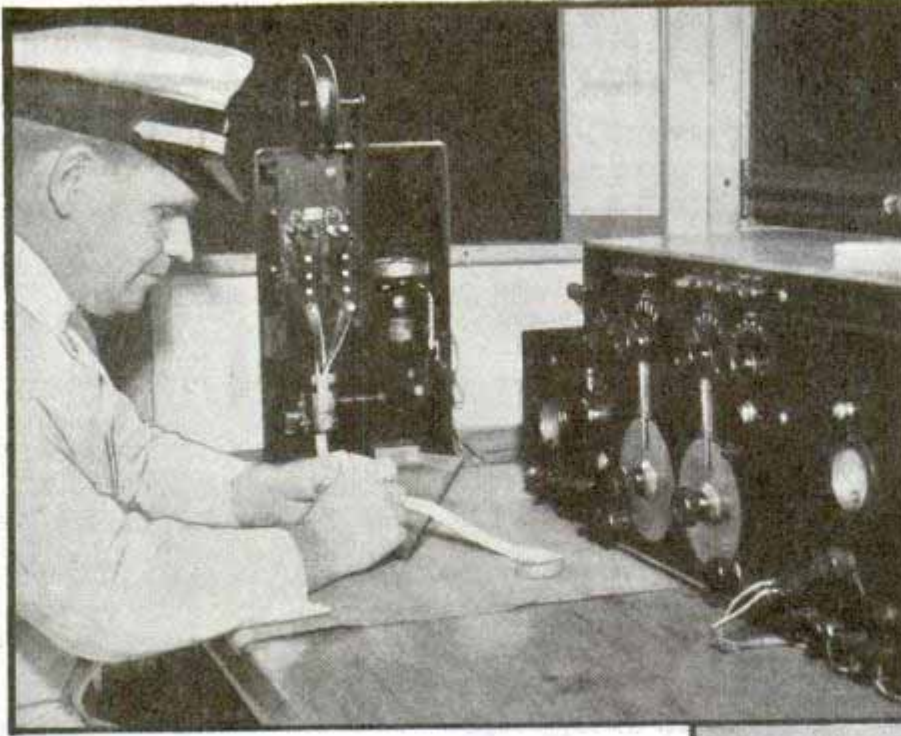
"Scientists have labored under serious handicaps in their efforts to explore the sea's substrata. It has been impossible to send submarines into the treacherous watery depths because the pressure would crush the craft's heavy metal as rapidly, perhaps, as an eggshell crumbles in the hand.

"The old-time procedure has been to make soundings by means of leads attached to heavy piano wire. However, to let out some six miles or more of wire and pull it to the surface again has proved to be a task, sometimes consuming at least an hour's time. Moreover, hundreds of soundings must be taken in laborious fashion in a limited area before scientists may gain anything approximating a genuine idea of the configuration of a large ocean canyon.

"Recently research workers of the Coast



Here the crew is lowering a radio buoy into the ocean. It takes only a few minutes to drop the buoy or to remove it from the water, thus speeding up the survey work



drop a buoy into the water and about the same time to pull it back into the ship. The buoy is lowered with the aid of a lightweight cargo boom with standard gear.

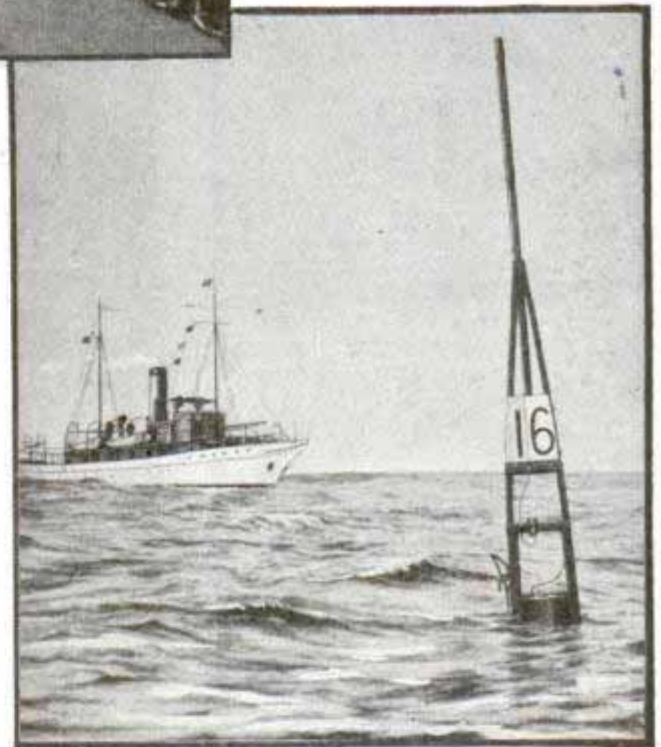
"Survey ships along the Atlantic and Gulf coasts are now using the new equipment regularly, chiefly because, due to generally prevalent conditions of shallow water in these regions, the sound waves would not go all the way ashore, to be measured

and Geodetic Survey developed a science, known as radio acoustic ranging which measures the ocean's floor in a quicker and more efficient way than hitherto was thought possible. It involves the use of a number of ocean-going, movable radio stations of a novel and revolutionary type.

"These stations are known as sono-radio buoys and they have proved their efficiency in working with the fathometer, used on survey ships to plot the ocean depths. The fathometer sends out a series of sharp rapping noises from the ship's bottom, catches the rap echo which resounds from the ocean bottom and by calculation of the time consumed in the emission and return of the sound, reports the exact depth of the water under the ship at the moment.

"It works at high speed, reporting the depths as frequently as four per second, even while the vessel on which it is mounted steams along at full speed.

"How does the sono-radio buoy work with the fathometer? In the first place, every time a survey ship is engaged in the task of measuring a certain section of the ocean's bottom, several new buoys are carried along and anchored at definite points close by the ship. The entire equipment for each buoy weighs 700 pounds. It is 'homemade,' devised and put together right on the survey ship. The buoy section is made from two oil drums. It takes only about five minutes for four men to



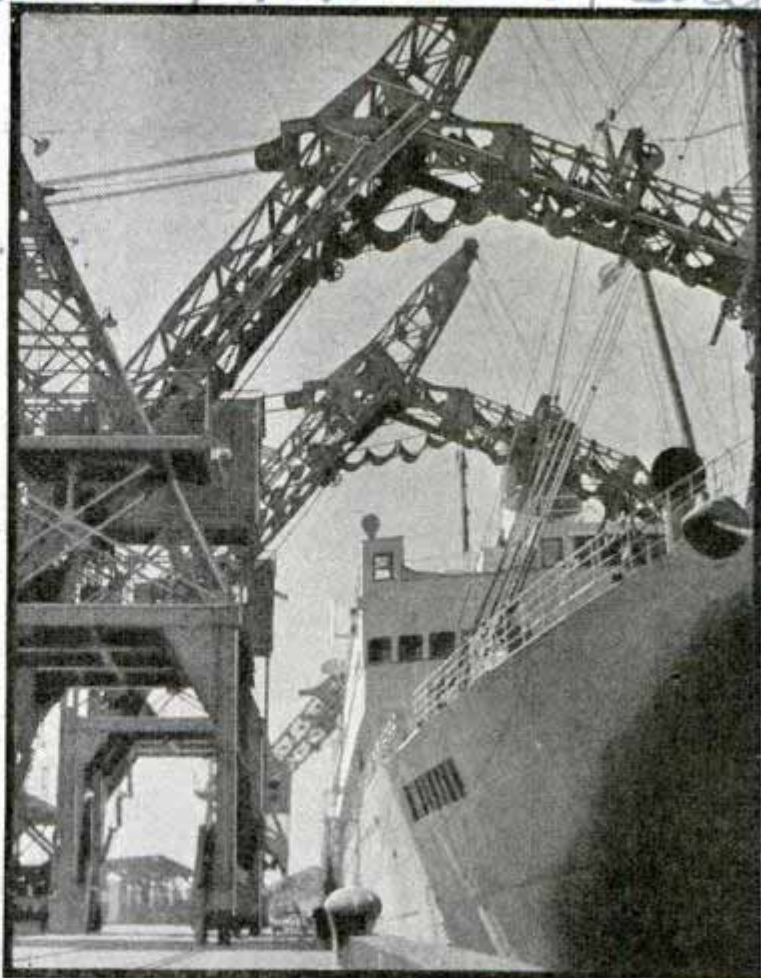
Top, officer measuring travel time of underwater sound from chronograph tape. Bottom, closeup of sono-radio buoy in position for measuring depth

by the shore stations of the Coast and Geodetic Survey. Along the Pacific where the water is considerably deeper for the most part, this difficulty is not encountered. The buoys, however, are being introduced more and more on the west coast and in Alaska. Main reason for this is that the equipment is less expensive than the previous standard procedure of setting up shore stations for such important ocean survey work.

(Continued to page 130A)

1013
**Bananas Ride Cradle
 from Steamship
 to Freight Car**

Cargoes of bananas are unloaded rapidly from fruit-carrying ships by means of large belt conveyors. The conveyors are designed so that a canvas cradle is arranged the entire length of the belt to receive the clusters of bananas. Large cargoes may be unloaded in this manner in a fraction of the time formerly required when stevedores were used in every step of the operation. The conveyors frequently carry the fruit directly from the hold of a ship to the doors of freight cars, into which the bananas are packed by hand.



Mechanical stevedores unloading a great cargo steamer. Clusters of bananas can be seen moving in continuous stream along the belt conveyors which carry them rapidly from hold of fruit ship to the doors of freight cars, there to be packed by hand

1141
Electric 'Eye' Sees Tiny Flaws in Fast-Moving Steel Strip

Pinhole flaws in strips of steel moving through the mill at a pace of 900 feet a minute are detected by a photoelectric "inspector." Not only does the unerring "eye" see through the tiniest hole, but it operates a mechanism automatically throwing out the faulty section of steel. This electric inspector is set up at a Maryland plant of the Bethlehem Steel com-

pany. The steel strip, thirty-six inches wide, passes through a slotted scanner head; light projected upward from bulbs in the lower part of the head passes through any pinholes in the steel and operates photoelectric tubes overhead. These tubes, through an amplifier, actuate a diverter which takes the imperfect portions of the strip out of the production line.

General Electric Co. Schenectady

Hand Truck 'Walks' Piano Up or Down Stairs



One man demonstrates how easy it is to move piano, bench and girl up stairs with "walking" truck

For easy transportation of pianos up or down stairs, a hand truck has been developed. One man, using the truck, can move a piano that formerly required three men. In moving a piano upstairs, the truck literally walks up the steps, balancing first on the front wheels and then on the back wheels, which automatically proceed to the step above when the weight is taken up by the front wheels.

Milking by a Vacuum Process Saves Calcium and Vitamins

By excluding all contact of milk with air from the cow's udder to the bottle, a new vacuum milking process prevents loss of calcium and vitamins. Milk fresh from the cow contains nitrogen and carbon-dioxide gases in solution, and contact with oxygen is said to cause precipitation of calcium salts and loss of vitamins. The vacuum milker operates at one-half an atmosphere

of pressure, delivers the milk from cow to tank under partial vacuum and thence direct to bottles. Nitrogen and carbon dioxide are added to bring the milk up to atmospheric pressure, still excluding oxygen, then the bottles are capped.

H1113

Elastic Cover Protects Book

Made of a material resembling pebbled leather, an adjustable book cover will fit any size volume up to fifteen inches wide. It is held in place by four elastic bands which have at their free ends small metal hooks gripping the edges of the book.



H1114

"Cat Eye" Mirrors on Highway Guide Motorists at Night

Triple "cat eye" reflectors mounted on posts along roadsides are being installed by the Federal Bureau of Public Roads to reduce the accident toll. The three tiny mirrors reflect the headlights and lead the automobile safely around curves.



An engineer of the U. S. Bureau of Public Roads adjusts a "cat eye" on roadside post in Maryland.

Handwritten notes on the left margin:
I had Herbert Muller Hollywood
5126 Hollywood Calif
with Professor Oscar at Chic

Handwritten notes on the top and right margins:
Walden, Jr. E. O.
Walden, Jr. E. O.
near support
The Paris Calif. at 27 H
new gold

Handwritten notes at the bottom:
D. W. Lutzger
1117 12 E

Motor Surfboard Hits a Twenty-Mile Pace

Twenty miles an hour is thrilling speed when you're lying on a surfboard skimming along the surface of a lake. That's what the "skimboard" will do. Invented by a Pennsylvania automobile mechanic, it is part surfboard, part motorboat. Weighing ninety pounds, it "knocks down" into four sections for carrying, and is nine feet long when assembled. A four-horsepower outboard motor supplies the power.



Weds Walk

Top, carrying the "skimboard" from car to shore to be assembled and launched. It knocks down into four pieces, weighing ninety pounds in all. Left, idling on the water and making a turn with the outboard motor churning

Claw. Emil Hansen, Pa. media, Pa.

Plane with the Speed of Sound Is Proposed by Designer

Exhibiting the model of a plane which he claims would have the speed of sound, about 700 miles per hour, Ivan Eremeeff has drawn plans for a "flying fuselage" powered by two 1,500-horsepower engines. Its wings would be reduced to relatively small fins and its two propellers would be mounted one forward and the other in the rear. A top speed of 1,000 miles an hour and a normal speed of 600 to 700 miles an hour are claimed by the designer. His plans call for an over-all length of thirty-six feet and a span of twenty-four feet from fin-tip to fin-tip. Aeronautical engi-

neers assert that, unless he has worked out a totally new principle, such a speed with existing aviation power plants is impossible. A serious limiting factor is the fact that there is a definite ratio between top speed and landing speed; the higher the former is pushed, in general, the higher is the latter. If conventional practice were to bind Eremeeff, the 1,000-mile top speed would mean a landing speed around 150 miles an hour, a practical impossibility. One solution might be that he hopes literally to hang the plane from its forward propeller and land it vertically on its tail.

12 10 90

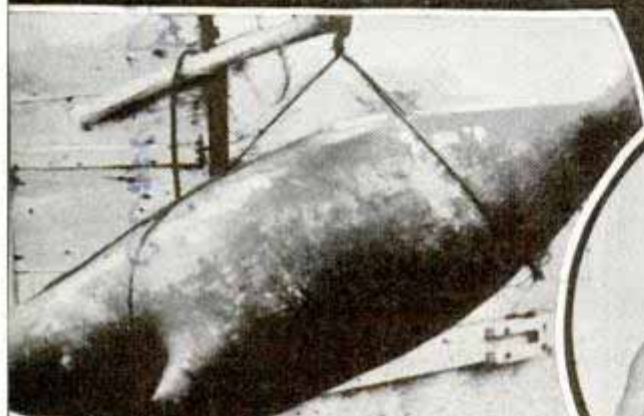
311 Cherry St. Phila.

Science 9/18/38

Don't Pity the

ESKIMOS of the Bering Strait region probably did not invent the pneumatic tire, but they seem to have known about its basic principle and utilized it long before the white man realized its possibilities.

These Eskimos, just emerging from the Stone Age, offer a wonderful opportunity to observe a primitive people in a primitive environment, and to compare their standard of intelligence with that of people of our modern age. Those who cherish illusions that modern man represents the acme of mental development are likely to have their illusions shattered.



Top, Eskimo mechanic inspects outboard motor before starting walrus hunt. Circle, Eskimo girl with baby brother on back. Bottom, scene outside an igloo with inflated skin hanging from pole

Chas. William Albee,
Harry Beardley,
210 W. Harrison, Wheaton, Ill.

H1029

Box 812,
Waurenville, Ill.

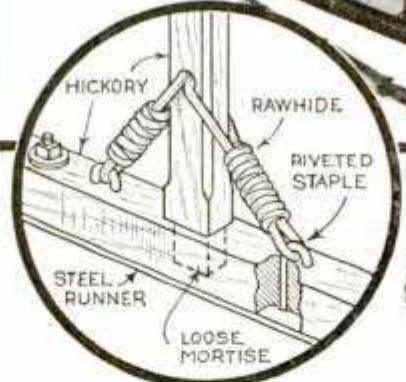
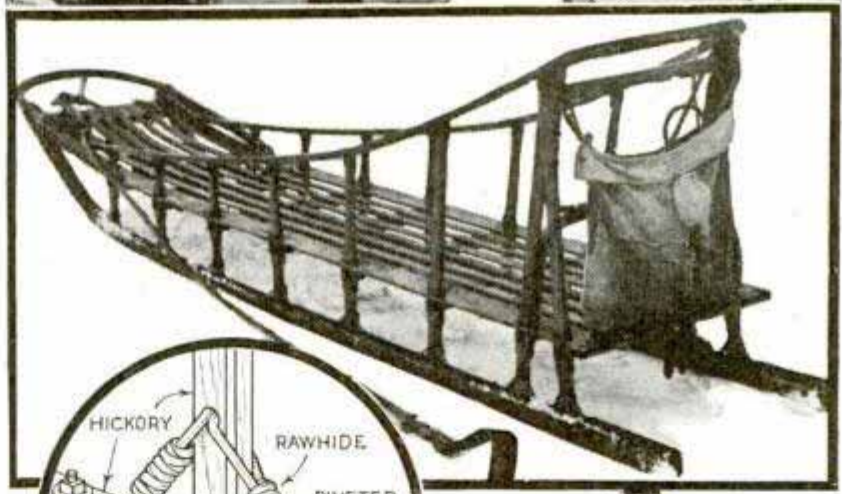
POOR ESKIMO

By
Ruth and Bill Albee
PART II

For instance, many moderns think of straight-line production, precision workmanship, utilization of by-products, and streamline design as characteristics of our modern industrial age. But we found that they were old stuff to the Eskimos at Cape Prince of Wales, Alaska. In their own way, the Eskimos have practiced these principles for countless generations.

As teachers among them, working for the Bureau of Indian Affairs, we were supposed to teach their children how to cope with life. But we found them teaching us. We were amazed at their resourcefulness, efficiency, inventive genius and mechanical skill.

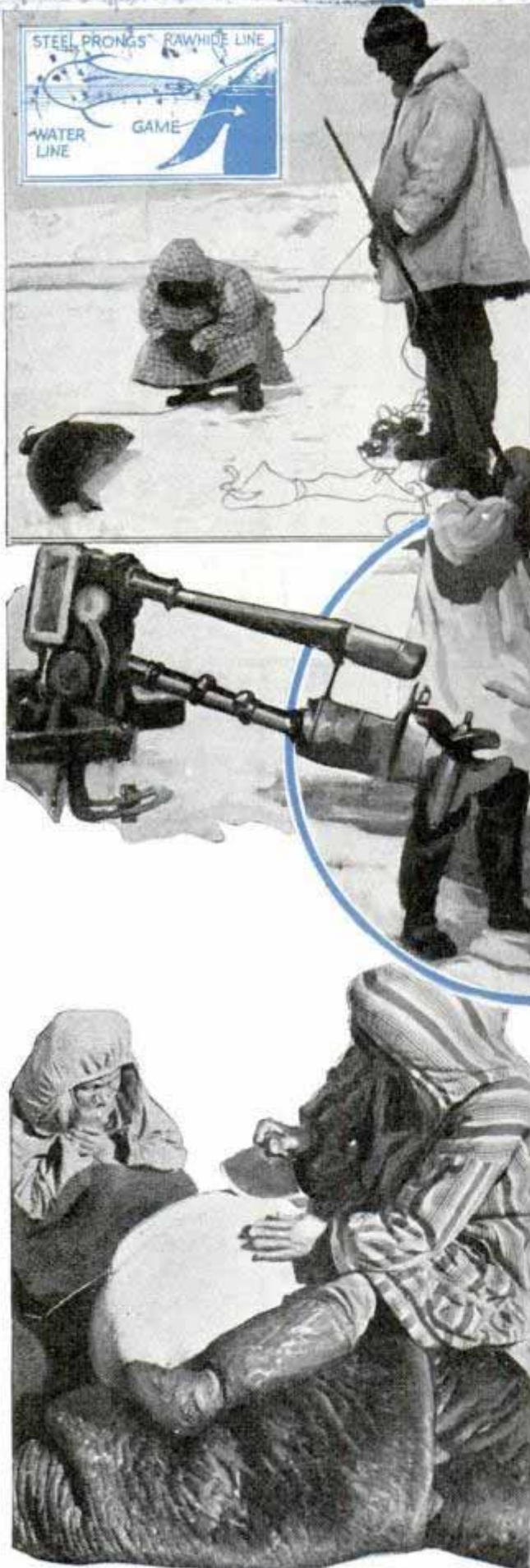
Modern industry can show few better examples of efficiency than that displayed by an Eskimo crew butchering a walrus. Six to ten men, working apparently without leadership or direction, will skin and cut up a 3,000-pound



walrus in less than ten minutes. There will be no lost motion, no interference with one another.

As for utilization of by-products, the Eskimo obtains or manufactures from the hair seal alone some 500 different useful products and articles—ranging from toys

Top, natural born mechanics, these Eskimos are highly interested in movie cameras. Center, dog sled. Circle, flexible joints used in construction of sled. Bottom, sled in use



Top, seal retrieved with "ilhook," illustrated in inset. Bottom, girl learning to split walrus hide. One slip of the knife ruins the whole hide

to medicines—and food is listed as one product. Not even the Chicago packers, who boast of using every part of the pig but the squeal, can do much better.

No one who has ever seen an Eskimo woman split a walrus hide can again think of precision workmanship as being exclusively a machine-age characteristic. The walrus hide is about three-quarters of an inch thick—too thick and too heavy to be used as a covering for a skin boat or oomiak. So the women split the hides into two layers, each approximately three-eighths of an inch thick. In this operation, the women use the traditional "ooloo," a knife with a curved blade, somewhat sim-

ilar to the old-fashioned chopping knife. Holding a curved board between her knees to provide a cutting surface, she guides her ooloo strokes with her free hand and gauges the thickness of the two layers by a delicate sense of touch. It takes from six to eight hours to split a hide approximately twelve feet square. When the job is completed, the two layers will be of uniform thickness throughout. A thin spot might bring disaster to a hunt-

Circle, chopping away rotten ice before launching oomiak. Note wooden shaft housing extension (at left) on outboard motor

ing crew using the oomiak.

But the Eskimo men display even greater skill and precision in their work with rawhide. To explain their work and the Eskimo pneumatic tire, one must first explain that for some uses to which sealskin is put, the entire carcass is removed through a single opening at the neck, leaving the skin in one piece. An Eskimo man, using nothing but a hunting knife and his fingers for a gauge, will cut around the skin from neck to tail in a continuous spiral. Within an hour, he can reduce a seal hide to a rawhide thong from 500 to 800 feet long. These thongs have many uses, such as for making harpoon lines and nets

to catch seals. They are so uniform in width and thickness that the eye can detect no variation.

On feast days the men hold contests demanding even greater skill. Each contestant takes an arm's length of rawhide thong not over three-sixteenths of an inch thick, and splits it with a quick pull of his knife. The man who splits his thong into strips of the most nearly uniform dimensions, wins. Sometimes the judges ponder many hours before the victor is proclaimed.

The women cure these whole seal hides with oil to make bags or "pokes" that have many uses. Stuffed to capacity with dried meat soaked in seal oil, and with the opening sewed up airtight with sinew, the poke serves as a container to store food and preserve it for future use. Inflated with air, and attached to a harpoon line, it



serves as a buoy to support and mark the location of seals or walrus harpooned out in the open water.

But perhaps the most interesting use of a seal poke is as a pneumatic roller. Two or three half-inflated pokes, placed under the keel of a loaded oomiak, will enable a crew to pull the boat with ease over a sandy beach. Wooden rollers, or even tightly inflated pokes, are not satisfactory, as



Top, girl stretching sealskin. Center, hair-stuffed handball and "mukluks" (slippers) made from sealskin. Bottom, biting crimps to form toes and heels in mukluks

they dig into the loose sand, and pile it up in front of the roller. But the Eskimo was smart enough to discover long ago that the pneumatic wheel, or roller, overcame irregularities of terrain.

In building a dog sled for use on snow or ice, the problem was to construct a vehicle capable of transporting heavy loads over rough terrain at high speeds. Hence the sled, like the oomiak, must be strong but flexible enough to absorb shocks. Most dog sleds are made from imported hickory. One two-inch by twelve-



inch plank, twelve feet long, will be ripped by hand into more than two hundred linear feet of hickory strips varying from two inches by two inches to one-quarter inch by three inches, all the wood needed for a ten-foot sled, such as the one illustrated. The members, like those of the oomiak frame, are lashed together with taut rawhide thongs, providing strong, resilient joints that will yield

and then pull back into place without breaking. Thin steel bands, bolted to the bottom of the wooden runners, provide the sliding surface.

The Eskimo's innate mechanical sense finds many expressions in his adaptation of modern devices to his needs. Almost any Eskimo can take an outboard motor that a white man would relegate to the junk heap and make it function satisfactorily. We watched one of our Eskimo friends lengthen the shaft of an outboard motor to use on his skin boat.

He carved a "gasket" five inches thick from a piece of hardwood to insert where the bottom housing joins the shaft. In the gasket he drilled holes for bolts, water circulation, and shaft. Then he filed threads on sections of steel rods and thus made bolts to extend through the gasket. Finally he made a new long shaft from a rust-pitted drift pin resurrected from an old bit of wreckage on the beach. Cutting it to length, he filed bearings and keyways by hand, and re-

assembled shaft and housing. The motor functioned perfectly for three years to our knowledge, and is probably still in use.

Everything they can procure, even the

(Continued to page 134A)



Top, girl wearing reindeer-skin parka. Center, Eskimo being tossed from walrus hide to teach surefootedness, so necessary in hunting on the slippery ice floes. Bottom, girls using dog sled to carry water from spring to the igloo

Contour Map Helps Control Fire and Floods

Five years in the making, a detailed topographical relief map of Los Angeles county will soon be ready to aid in flood-control work, fighting forest fires, highway planning and agricultural administration. Spread over a table twenty feet square, the map—built of fiber board and plaster—weighs three tons. Every section is constructed to scale with great accuracy. Quarter-inch fiber board



Forest fire patrol stations and electric power lines are shown on relief map of Los Angeles county, now nearing completion

is cut with a jigsaw along the contour lines and built up to represent the exact shape and elevation of the foothills and mountains. Mount Baldy, highest in the area, appears four feet high on the map. When the thousands of small pieces have been arranged in layers, they appear like terraced mountains; then the plaster-of-paris covering is laid over, sanded smooth and coated with paint and shellac. Streets, roads and boundaries were laid out by miniature surveying from the U. S. geological survey maps. Forest lookout stations are indicated by an electric-light bulb adjustable to correspond to the actual height of the tower, and when lighted shows the actual ground area the lookout can observe. Transmission lines are shown in "T" pins and thread. Colored patches represent the various crop acreages of ranches.

Carbon Black in Rolls and Pellets Is Easier to Handle

Converted into small rolls the size of a pencil or into pellets the size of buckshot, carbon black is handled more easily than when it was compressed and packed into unwieldy bundles for shipment to rubber companies. The "dense black," as the new product is called, is loaded into tank cars for shipment, just as grain is loaded. The

pellets are formed by agitating carbon black, which has been blown into a funnel-shaped tank, until it has assumed the desired shape. The pencil-like rolls are formed from carbon black that has been saturated with water and then pressed through a screen. Carbon black is an important ingredient in rubber manufacture.

Cont. Miss Annice Dyer, Kenna

1019

Cont. J. Leland
Elmer
Calif

made & sold by
Monolite Co. 896
Santa Barbara
Berkeley



Left, moths caught in light-ray bait trap. Below, moths and beetles taken from ten traps in three months

a. c. covered only

LIGHTS turn BATTLE

Boyd Green



made in Berkeley

ELECTRICITY is playing a new role in agriculture. It now becomes a destroyer of insect hordes by developing light rays which lure them to their death.

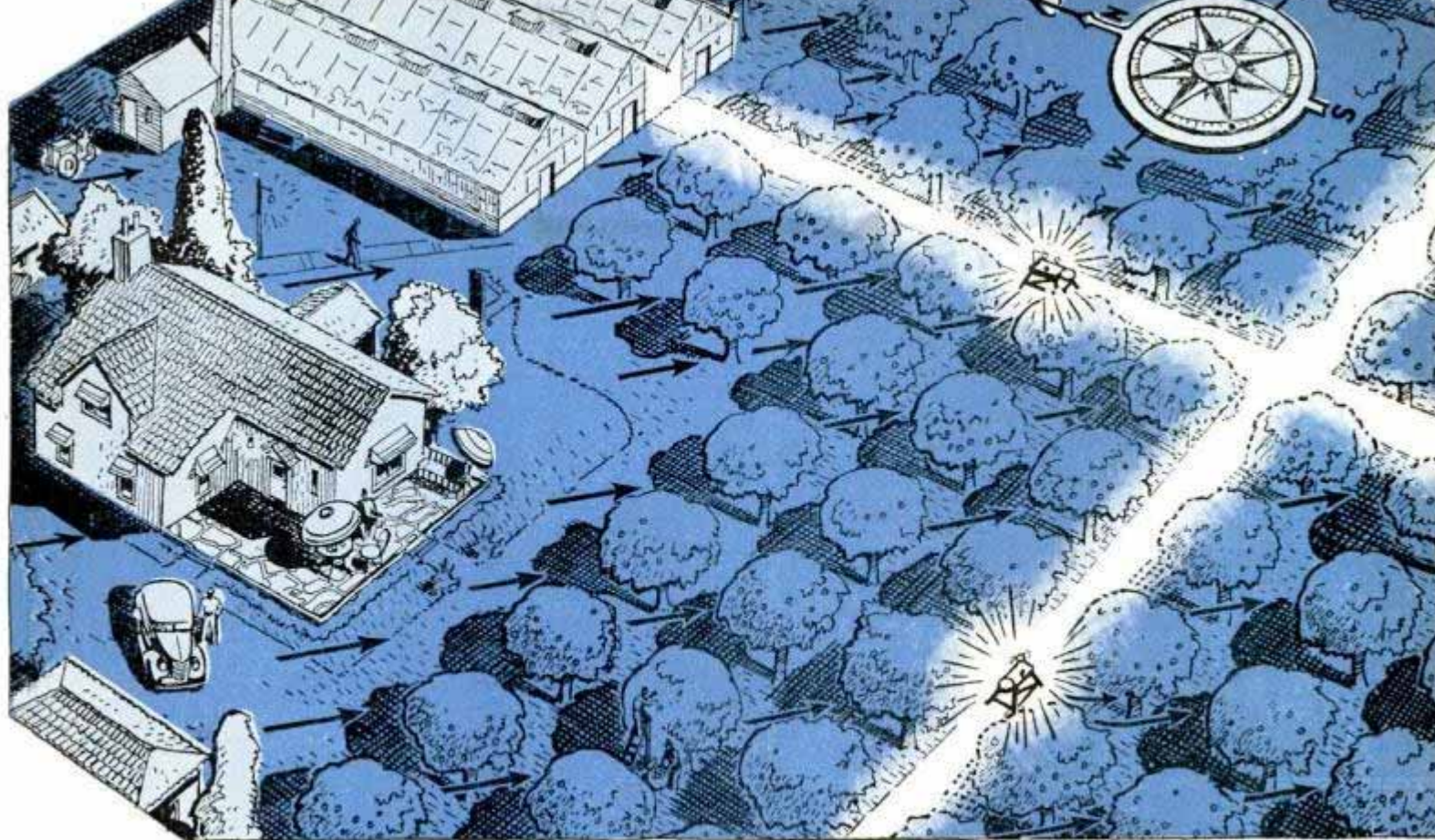
Importance of the development of such death-dealing machines is apparent in a report by the United States Department of Agriculture, that insects cause an annual loss of more than \$2,000,000,000 to American farmers, and at least \$25,000,000 in California alone.

"Development of such instruments," one entomologist says, "will go far toward re-

ducing this costly destruction of crops. It will help put the farmer on a more substantial economic basis, will probably reduce the cost of fruits and vegetables to the consumer and will give the consumer a better grade of fruit and vegetables for his money."

There are two new types of traps which project a bombardment of death light rays. One is a tube which throws off certain colored light rays to attract a definite kind of insect to the source of light where it is electrocuted. The second type is a combination of light and mirrors which throws directed rays and which with the help of a odorous bait lures the insect into an oil bath from which there is no escape.

Several years of experimental work by J. K. Ellsworth, division of entomology and parasitology of the University of California, and Professor W. B. Herms of the same division, proved that insects prefer certain colors and can be lured to their death by colored light rays. The professors developed an insect electrocutor in which a



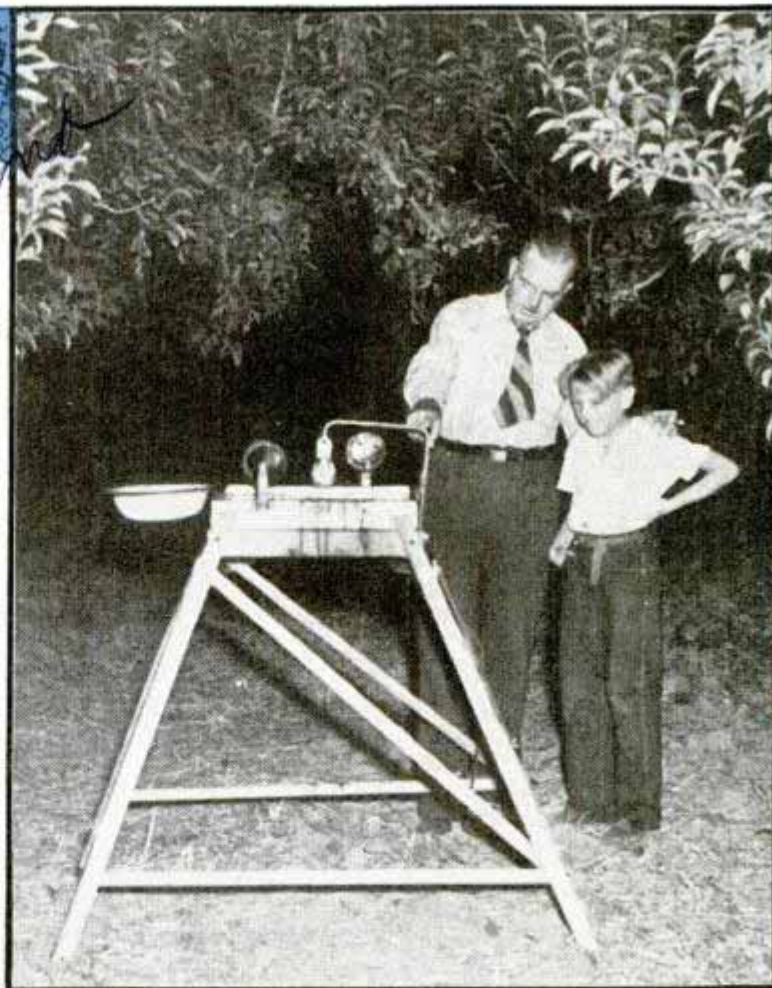
against INSECT ARMIES

Diagram of how light-bait trap works in orchard and how beams cross. Arrows show course of bait if southwest wind is blowing

helical luminescent gaseous discharge tube furnishes the light.

The combination light-bait trap, invented by Boyd Green, California orchardist, was designed on the bases that an insect is immediately excited when it flies through a ray of light and will attempt to find its source, and that insects are attracted by certain odorous baits. The bait draws the insects to the vicinity of the traps where they fly through the light rays and are lured to their death in a pan of oil.

These methods of killing insects are proving more effective on many crops than the method of partial control by the use of poison baits and expensive spray materials. They relieve the farmer of fruit-washing costs made necessary by the increasing vigor with which food and drug administrations and health authorities are



Light-ray bait trap in orchard at night. One light is used to cover an acre where trees are twenty feet apart. Beam is effective up to 800 feet if unobstructed



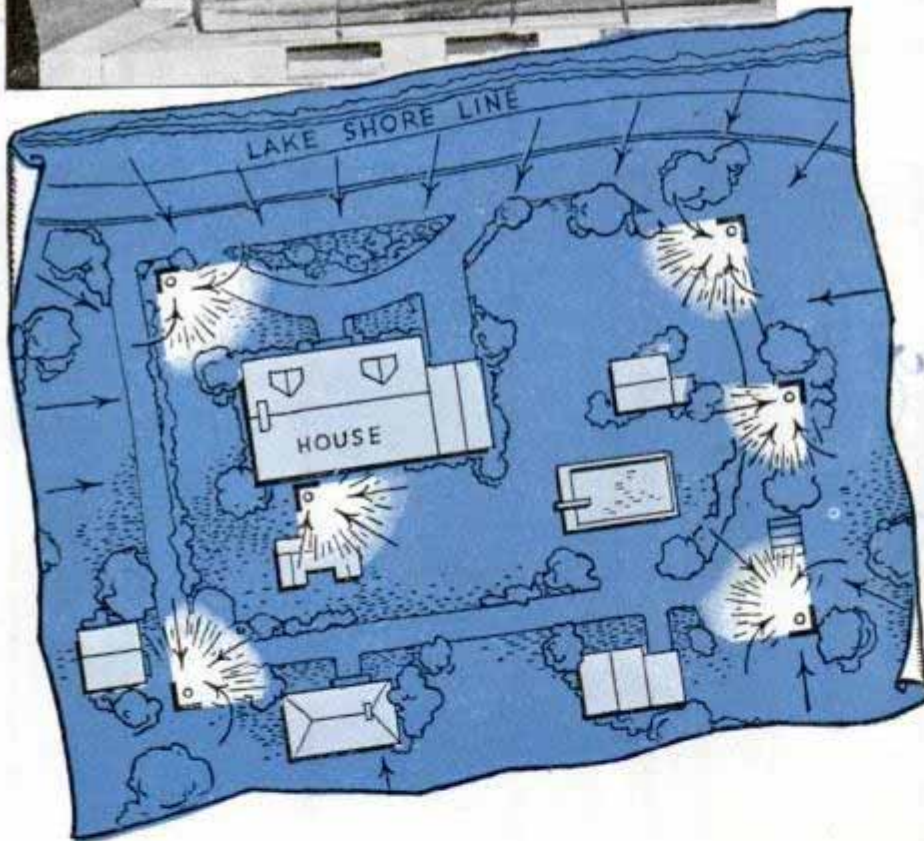
cage of stainless steel, the alternate wires being connected through high-tension porcelain insulation to the terminals of a transformer embedded in compound in its metal container, which supplies enough voltage to electrocute the insects as well as to furnish sufficient current for the luminescent tube. This tube projects the colored rays. It is suspended in the center of the cage so the insects attracted by the light will come in contact with the wires as they fly toward the light. These tubes are designed to burn 50,000 hours, or nightly for approximately ten years.

These electrocutors are used efficiently in the control of grape leaf hopper, artichoke plume moth, pear and apple tree codling moth, tomato insects, mushroom insects, dried-fruit insects and the lima-bean pod borer.

While the trap using light rays and bait is designed primarily to destroy the codling moth which causes thousands of dollars damage to pears and apples annually, it works as efficiently on many other insects which are attracted by light. Such insects attack walnuts, peaches, raisins, dried fruit, corn and tomatoes. Among them are the peach wig borer, hoppers, gnats, leaf-eating beetles, corn moth, and other destructive insect pests.

The trap consists of a large square pan filled with crankcase oil. Above

the pan on a swivel, and in the center, is an electric-light globe. Mounted on two sides of the pan are mirrors specially designed for the trap. These are focused on the globes to throw a beam of light between rows of trees or any other direction desired. The oil also acts as a reflector and



Top, cage in which moths are hatched and used in experiments to discover type of bait each species of moth prefers. Bottom, how light traps may be arranged about grounds of summer resort to attract gnats. Lights are concealed behind baffles to draw only those insects inside area

enforcing government regulations pertaining to dangerous chemical residue on fruits and vegetables resulting from the use of sprays and dusts.

The insect colored-ray electrocutors are eight inches in diameter and eighteen inches in height. They consist of a wire

University of California Entomologists

Ud Calif

Series - Von Lengerke's Automatic
Price - \$12.00 reel case - 1.00

throws a beam of light upward.

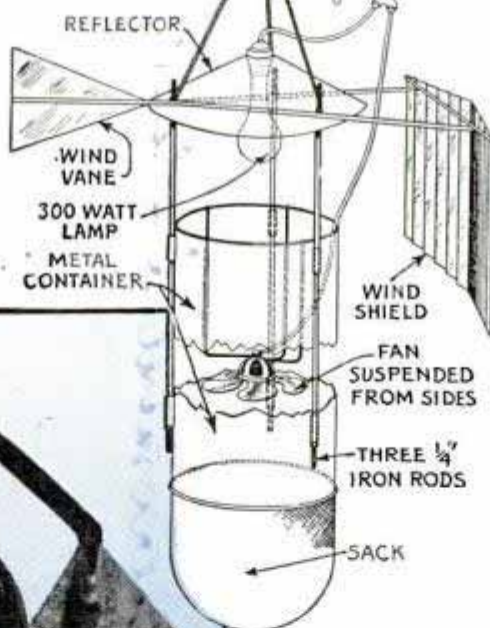
"Mounted on the oil pan is a basin of liquid bait, which is an important part of the trap," Green explains. "Perfume from the bait circulates through the orchard on the air currents. This bait draws the insects toward the traps where the odor is stronger.

"When the lights are turned on at night they reflect into the two mirrors and oil, throwing a beam from each surface which becomes at least ten feet wide, depending on the distance it goes before hitting an obstruction. Each light works efficiently as far as 800 feet."

Insects fly with such speed toward the trap, drawn both by the bait and the light, that they do not pause to fly around the light but hit the oil with a plop. As more in-



Designed by U. S. Entomologist



Above, latest type of electric-ray insect killer being used to rid the dog of fleas. The rays do not harm the animal. The device is called Leray

sects are trapped their weight takes them to the bottom of the pan.

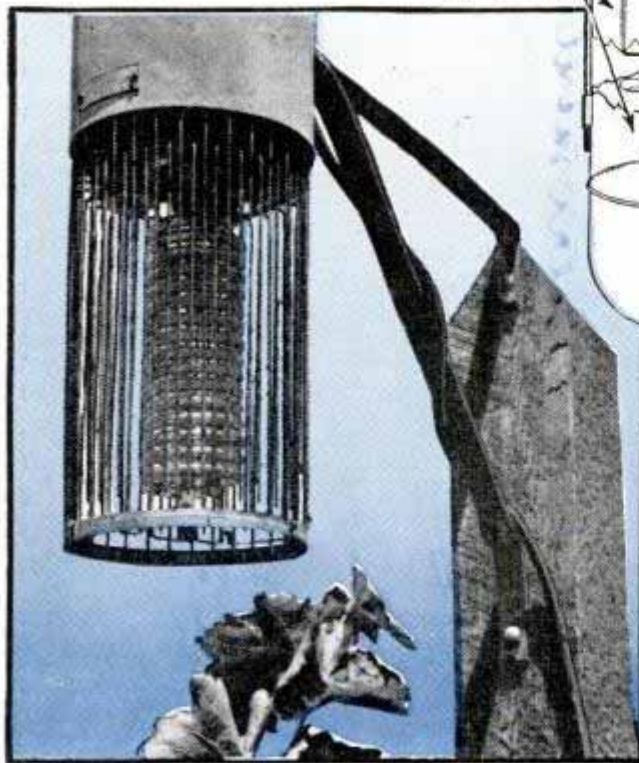
A pale-blue light is used to attract the grape leaf hoppers. Population counts have shown only seventy-eight hoppers per vine in a light-trap protected vineyard with 1,280 per vine in an unprotected area.

A typical six-acre vineyard produced sixty-three tons of which fifty-eight tons were number one and sold at sixteen

dollars a ton or four dollars a ton higher than that from neighboring vineyards which received usual insecticidal treatments. No other method of control was used. The annual operating cost was fifteen dollars. In previous years the cost of treating the vineyard with oil-pyrethrum and cyanogas amounted to as much as \$100.

One pale-blue light to the acre is netting returns to the tomato grower by destroying insects, eliminating costs of insecticides and resulting in better tomatoes.

"Because of the humid, even tempera-



Center, combined light and suction-fan trap for gnats. Bottom, colored-light electrocutor

(Continued to page 118A)

Le Ray Corp. 2-30-30 Park Ave. New York
agent - Albert M. ...

iron streams out six feet behind the shoe. Under the heat and the strain, the car wheels change their shapes. Transverse cracks, starting so fine that a microscope is needed to detect them, also appear and grow until one-third of the wheel may drop off like a chip.

121024

Cherry Crop Saved by Fruit Drier

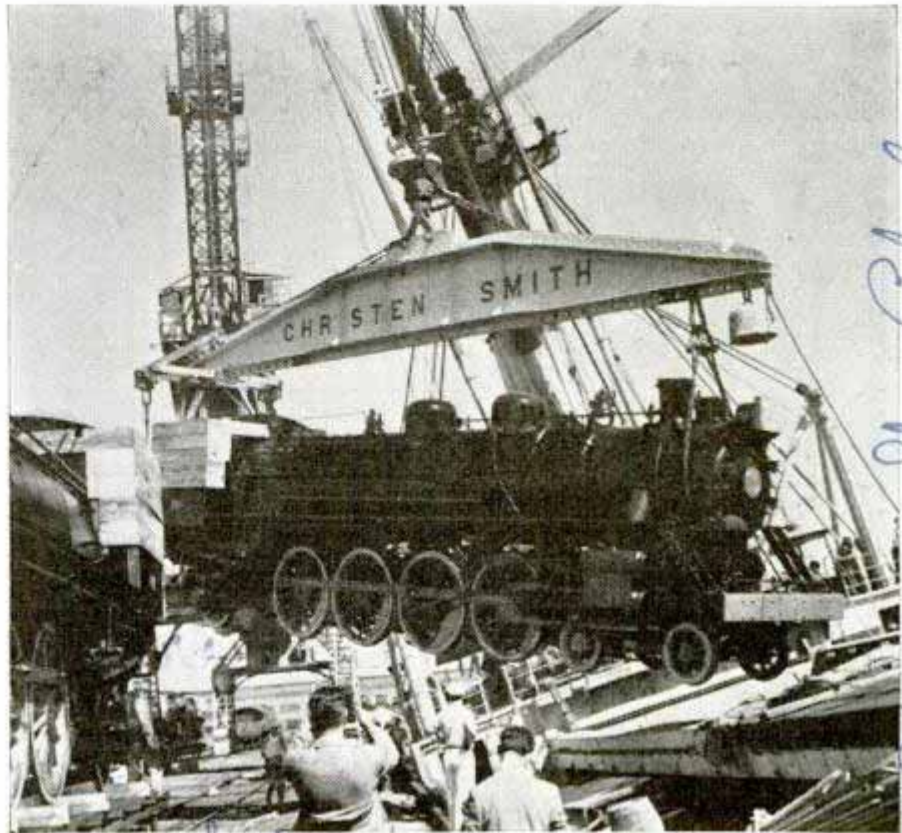
By drying the raindrops from cherries while they are still on the tree, one grower has been able to save a large portion of his crop which might have been lost through cracking of the fruit. This occurs during warm, sunny days immediately following heavy rains. Drying off the fruit was accomplished by means of a truck on which are mounted two airplane propellers driven by gasoline engines. The blowers are operated as the truck is driven back and forth between rows of the cherry trees.



Airplane propellers mounted on rear of truck provide blast to dry off the fruit

Clyde Harris

100-Ton Locomotive Swung from Loading Dock to Ship



Big locomotive being swung aboard ship. Modern hoisting equipment can handle tremendous loads

Swinging a 100-ton locomotive aboard a ship is not too big a job for the loading hoists and cranes of today. At Eddystone, Pa., recently, a locomotive of this size and weight was lifted easily aboard a vessel for shipment to the Chilean state railways. It was one of seven of these big engines manufactured by the Baldwin Locomotive Works on the same order. Work on the locomotives, all of the mountain type, was rushed to completion in less than twenty weeks.

121049

Bushel Basket on Roller Stand for Self-Service Stores

Adaptable for self-service shopping or for display of merchandise, a four-wheeled "buggy" carrying a bushel basket has been put on the market. By dropping the handles it can be converted into a food display stand.

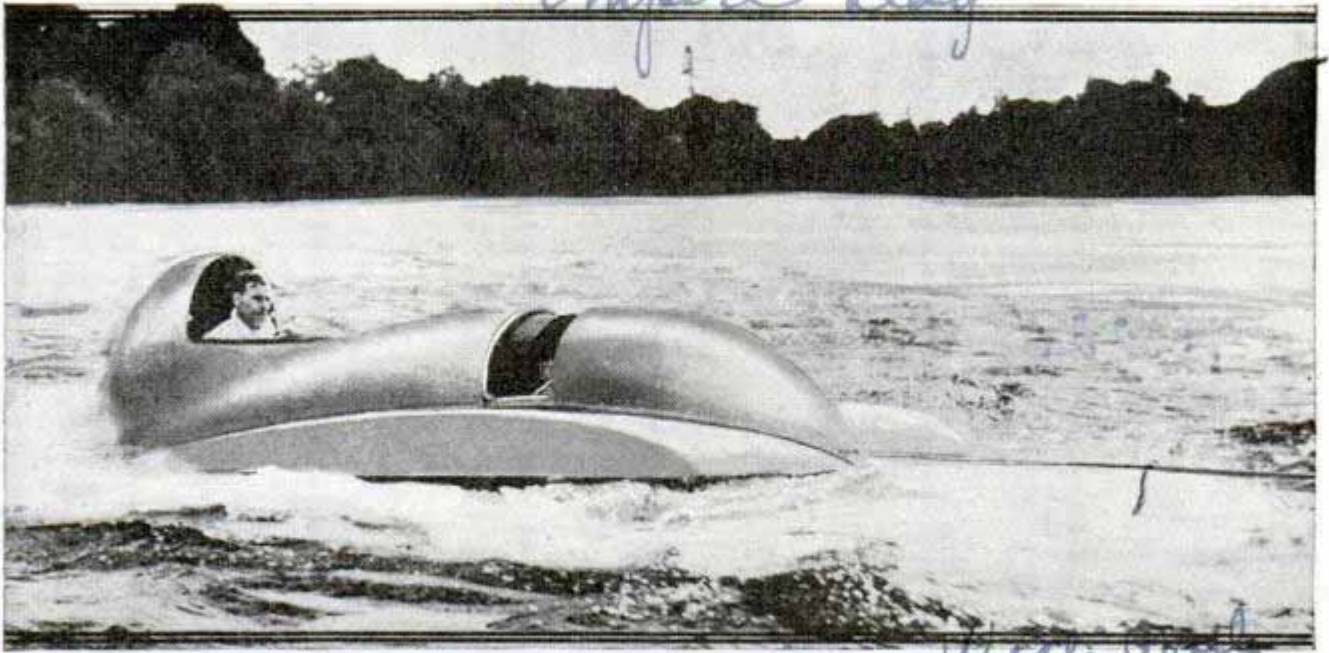


Metwood Mfg Co

123 Broad St. Chula

Rockford Ill

Speedboat Shaped Like Wing of an Airplane

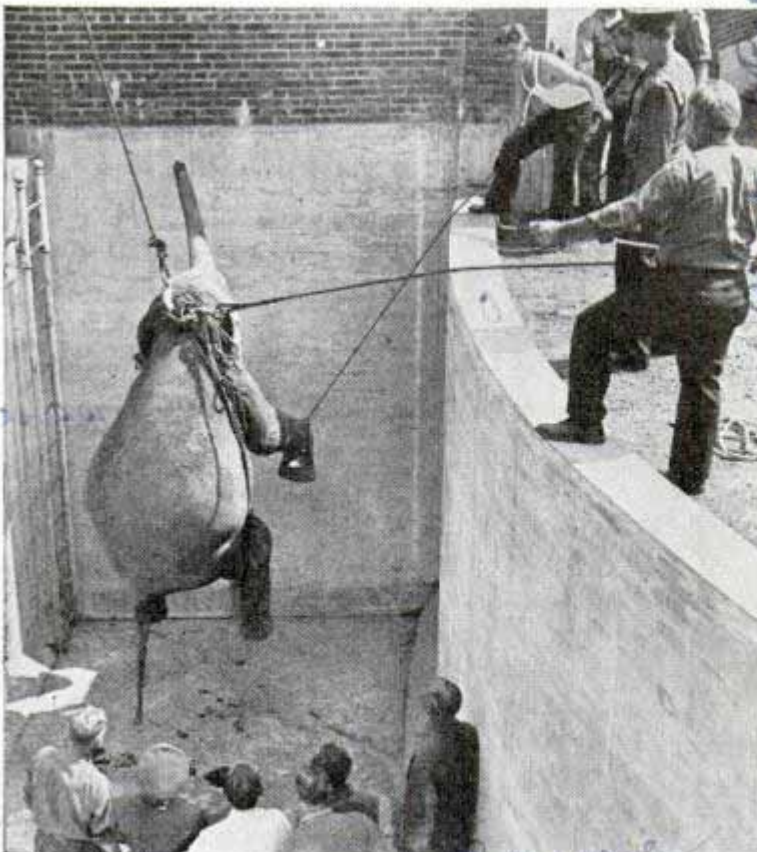


Speedboat being towed out for a test run. Note resemblance of its shape to an airplane wing. It was designed in accordance with ideas of the late "Lawrence of Arabia"

Shaped like an airplane wing, a speedboat designed by an English engineer in accordance with the ideas of the late T. E. Lawrence ("Lawrence of Arabia") has been undergoing tests on Lake Winder-

mere. The craft cost \$40,000. On its design, Lawrence had based plans for shoals of power-driven torpedo gnats which he claimed would be able to wipe out an enemy fleet completely within a week.

Crane Lifts Big Elephant Out of Twenty-Five Foot Moat



Big elephant being hoisted out of twenty-five foot moat

When a 3,000-pound elephant fell into a twenty-five foot cement-lined moat at the Brooklyn zoo recently, an emergency crew with a big crane was called. A sling was improvised and placed about the elephant, which had been unable to stand. Then the crane hoisted the animal out of the moat and back into the yard, from which it had been pushed while playing with another elephant.

Streamline Rods for Rigging Help Win Sailboat Races

Streamline rod rigging was tried out on several sailboats during the recent yachting season and racing skippers are convinced that they add speed by reducing wind resistance. Replacing the conventional steel cable, these streamline rods resemble the struts used on airplanes before internal bracing

121020

Empire Day

W. E. Wood

Edward Spurr

Bradford Guy

121020

Crane

121093

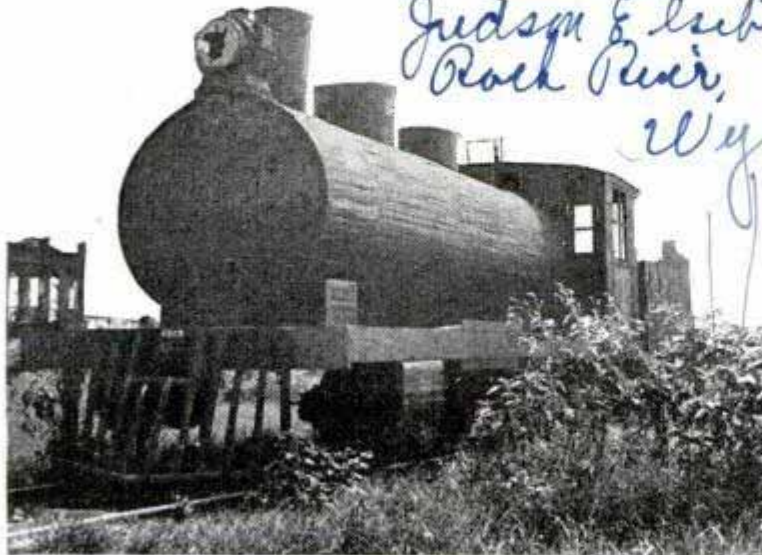
Acme

Lucius Danice

became general. They add perhaps a tenth of a knot to the sailboat's speed, and this may gain a quarter to a half mile in a race lasting several hours. There is less stretching of the rigging than when cables are used, and a single adjustment of the rod rigging may suffice for the entire sailing season. Drag of the streamline rod rigging ranges between one-eighth and one-third that of cable.

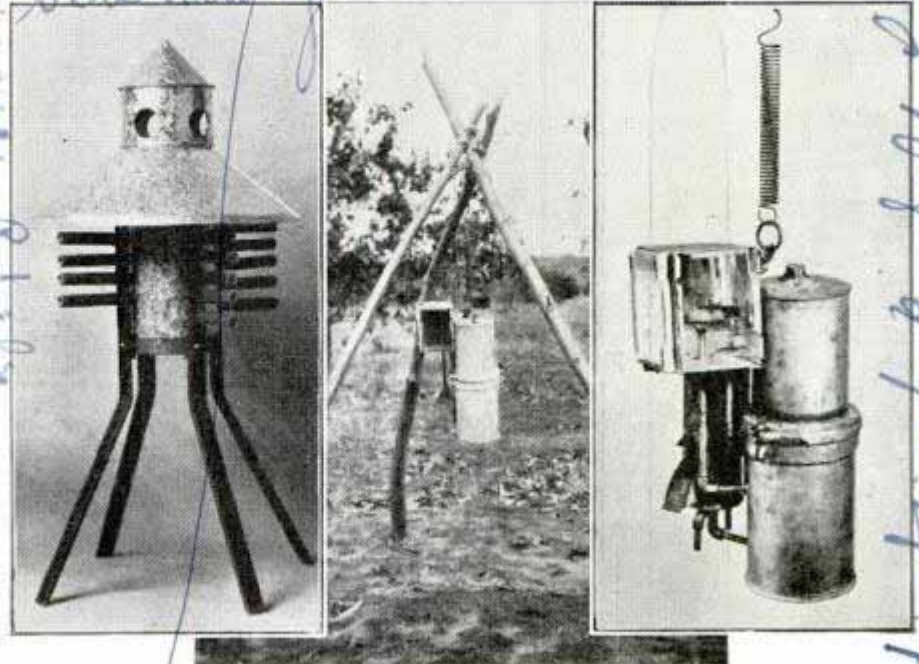
Dummy Locomotive Fools Enemy Aviators

Thousands of dollars have been wasted by Japanese pilots attempting to bomb Chinese locomotives and airplanes on the ground. Many of the bombs destroyed nothing more valuable than wood and reed decoys fashioned like railroad engines and planes. One dummy locomotive, which closely resembled a real engine, was found recently at Kiukiang, ready to fool the enemy pilots.



From the air this dummy locomotive looks like the real thing to enemy aviators, so they waste bombs

Firecracker Guns Rid Farm of Bird and Animal Raiders



Left, "machine gun" that explodes firecrackers at regular intervals to frighten birds. Center and right, carbide lamp sets off bright flashes

Out where coyotes raid the sheep and where deer and other animals and birds make themselves nuisances in the fruit orchards, ranchers protect their crops with automatic flashers and firecracker guns. The old-fashioned scarecrow is of no use against animal pests. Something more frightening is needed. One invention, designed to chase coyotes away from the lambs, is a machine gun that explodes firecrackers at regular intervals. Radiating from its central iron cylinder are barrels housing firecrackers, each with a fuse extending into the cylinder. At the center is a "filler" made like a slow-burning roman candle, which sets off a firecracker every fifteen or twenty minutes as it burns down, and itself flashes a flare periodically. Another type, used often in orchards where deer nibble at the bark and birds attack the fruit, consists of a tank dribbling water on carbide. This generates acetylene gas to keep a pilot light burning, and at the same time fills a combustion chamber with a mixture of air and acetylene gas which is periodically exploded with a bright flash. The action is automatic and requires only a daily filling of carbide and water. The apparatus is hung from a spring and jumps violently after each explosion, adding to the frightening effect.

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 Dummy Locomotive
 Fools Enemy
 Aviators
 Thousands of dollars
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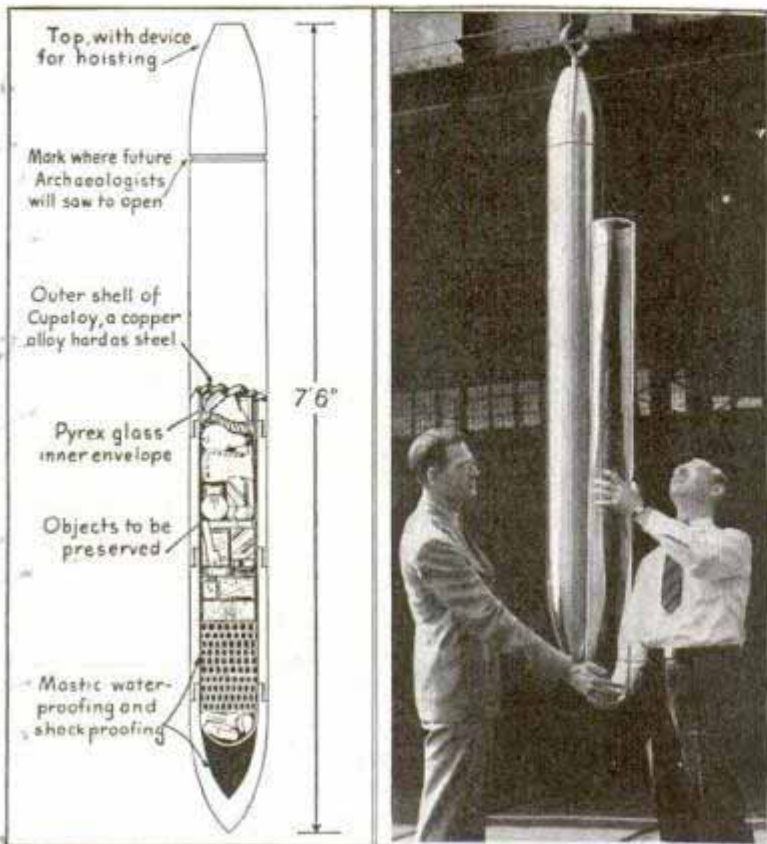
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 847
 Firecracker Guns
 Rid Farm of Bird
 and Animal Raiders
 Left, "machine gun"
 that explodes
 firecrackers at
 regular intervals
 to frighten birds.
 Center and right,
 carbide lamp sets
 off bright flashes

Handwritten notes:
 Judson & Leitch
 Rock River,
 Wyo

Handwritten notes:
 From the air this
 dummy locomotive
 looks like the real
 thing to enemy
 aviators, so they
 waste bombs

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 Patd. \$ 5.00 and

5,000-Year "Time Capsule" to Preserve Modern History



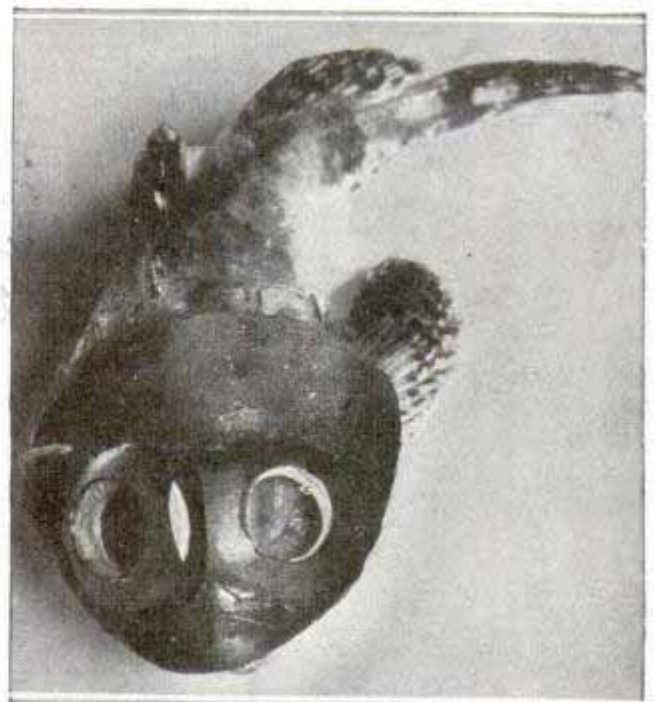
Left, diagram of the "Time Capsule." Right, the capsule and history-preserving inner tube of glass

Constructed of a special material to preserve for 5,000 years a tangible record of life of today, a "time capsule" has been deposited fifty feet in the earth beneath the Westinghouse exhibit building at the New York World's Fair of 1939. The metal envelope, weighing 800 pounds, contains the formula for Cupaloy, the copper alloy of which it is made, as well as items representing a cross-section of this age. These items were placed in a six-foot inner crypt of heat-resistant glass, the air was evacuated and replaced by an inert gas to act as a preservative. After being sealed, the glass tube was wrapped with glass tape and embedded in a waterproof compound before being placed in metal capsule, which was also sealed tightly. The alloy of which the envelope is made is the result of a five-year research by Westinghouse scientists to make copper as hard as steel. It is a heat-treatable material composed of copper, chromium and a small amount of silver. The investigators found that the silver added to copper and chromium helped to strengthen the basic metal. They believe that the completed capsule

will resist the corrosion effect of sea water seeping through the foundation soil of New York during the next 5,000 years. One pointed out that copper is quite resistant to the attack of sea-water seepage because the products of initial corrosion tend to accumulate and protect the underlying metal. Scientists think the presence of chromium in the alloy may increase the protective quality of this film.

Sea Scorpion Tests Vision with Colored Glasses

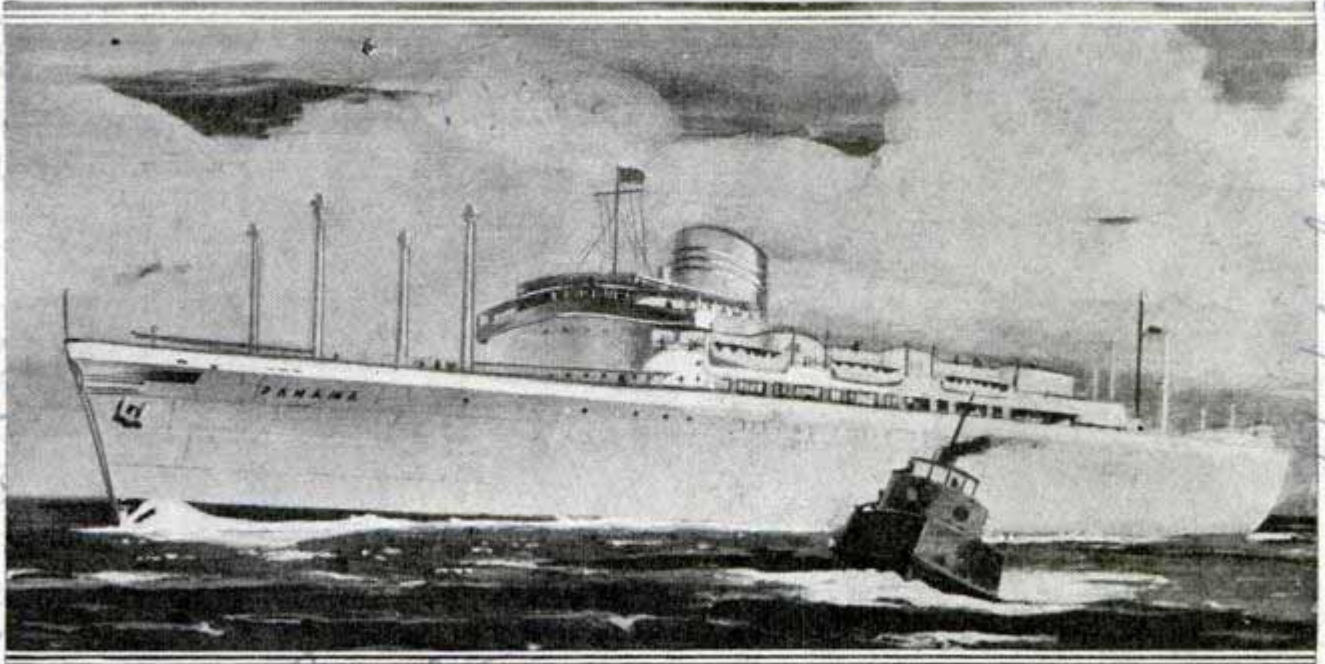
Glasses for fish? The picture is evidence that it's being done. However, it's not to help fish recognize a baited hook, nor is it from any kindness-to-animals motive that the sea scorpion was fitted with glasses. German scientists are studying the vision of animals, their reaction to colors, their lack of perspective and ability to see in darkness. Many fish react to the color of their environs by changing their own skin color. The sea scorpion was fitted with colored goggles to test the impressions made by various colors.



© Weltrundschau
Posing for its picture is a sea scorpion wearing glasses to test its reaction to color

*Prof. Dr. H. H. S. Müller
Hamburg*

Fireproof Liner Embodies Latest Safety Aids



Artist's conception of the "Panama," modern cargo and passenger vessel which is the first of three ships being built for use of the government-operated Panama railroad. The "Panama" has been launched

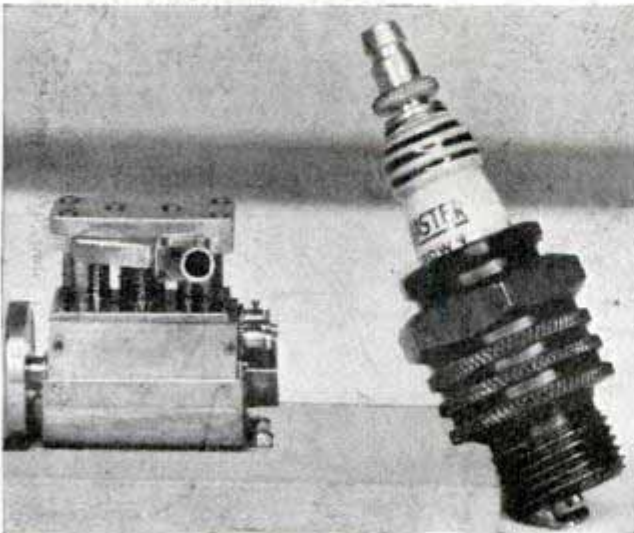
Equipped with the most modern safety appliances, a fireproof passenger and cargo ship has been launched for use of the Panama railroad. The railroad is owned by the United States government and is operated in connection with the maintenance

and operation of the Panama Canal. A painting of the new ship, which will carry 206 first-class passengers and a crew of 130, shows how the craft will look on the high seas. The ship is the first of three being built for the Panama railroad.

Midget Air-Pressure Engine Is Built by a Watchmaker

Operating on two or three pounds of air, a midget three-cylinder engine has been built by a watchmaker. It is complete with counterbalanced crankshaft, two camshafts, pistons, connecting rods, valves,

valve springs, timing gears and other essentials of a four-cycle engine. The cylinder bore is slightly less than five millimeters. Timing gears, made from watch parts, are held to the camshafts and crankshaft by watch screws. The cylinder head is removable. Bearing caps on both main and connecting rods are removable, but it requires watchmaker's instruments.



This photograph gives an idea of the diminutive size of the air-pressure engine a watchmaker built

"Crab" Tricycle Gear on Plane Helps Takeoff in Cross Wind

Tomorrow's airport may have but one long runway on which a "crab-geared" airplane will roll for a takeoff, its wheels headed straight down the lane while its nose points into the cross wind. An English designer is working on such a tricycle landing gear, with wheels that can be turned at an angle to the plane itself so that the thrust of the propeller could compensate for the side winds.

DeLichem Shipbuilding Corp.
 Quincy, Mass.
 10/30/38
 Science Service

H. S. Barnhart
 247

C. J. McGarvey

Army's Quick-Firing Rifle Has Automatic Ejector



New army rifle holds eight cartridges, gas from explosion automatically throwing out empty shell

Its automatic ejector makes the new U. S. army rifle fire five times as fast as the weapons now in use. The thirty-caliber gun holds eight cartridges. The hand-operated bolt of the old type army rifle is eliminated. Instead, the rifle is fired merely by pulling the trigger; gas from the explosion immediately ejects the empty cartridge and throws another in place.

Radio Sends SOS Automatically After Crash of Plane

Radio engineers have developed an automatic transmitter that will broadcast "SOS" continually for as long as three days after an airplane crashes, solving the problem of locating a fallen plane in a wilderness region. The two-tube transmitter is turned on by a pendulum whenever a jolt occurs strong enough to throw the pendulum forward into a position where it

locks. It would be mounted in the tail of the plane, protected by asbestos and other insulation against fire and shock. A signal light informs the pilot if the pendulum is tripped by a hard but safe landing.

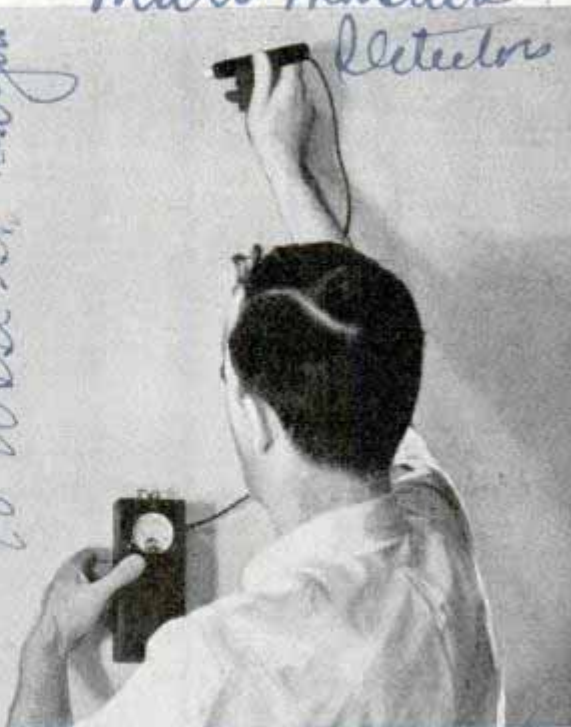
Coiled Electric Appliance Cord

Coiled wire for electric appliances, just being introduced, has a spring-like recoil that keeps it always out of the way. The wire stretches to considerable length without tangling in the electric iron or other appliance.



Meter Shows If Wall Is Dry Before Paint Is Applied

Painters may determine if a newly plastered wall is sufficiently dry to retain paint by using a battery-operated meter now on the market. The device indicates surface and sub-surface moisture of the wall. It also may be used by paperhangers to find whether the wall will retain the paper.



Testing freshly plastered wall with battery-operated meter to determine whether it is thoroughly dry

#1052

Argonauts... of Hull at Chicago

#1094

#1031

R. D. Colby, Beverly Hills, Calif.

Anthony Easton, English scientist

William J. DeLambert, 90 West St. N.Y.C.

Science Service 10/2/38

#1023. Casman Kodak Co
Rochester, N.Y.

Make Your **SNAPSHOTS** TELL *a* **STORY**



A BOY bends over the skeleton of his newest airplane model, fitting into place a slim, feather-light skewer of balsa wood. Light from the table lamp gleams on his curly hair; his eyes are intent and his lips pursed in concentration.

He is completely absorbed in his task—quite oblivious as his father, in the shadows of the basement workshop, focuses a miniature camera and clicks the shutter.

This will be a good picture, no matter who views it. The maker knows it will be good—although he may not know precisely why. The picture will have appeal because it “tells a story.” Not a complicated story, with an involved plot, but a simple one—really just the suggestion of a boy’s dreams, his pride in neat craftsmanship, his hope of building a better and swifter



Light, activity and figures in these story-telling pictures all are directed at center of interest



airplane than any of his friends can build.

Tomorrow, this same camera may go outdoors in search of other stories. Guided by its owner, it may snap a snowball fight, a spill from a sled, or even the tracks of birds and rabbits in fresh snow. And, if each of these subjects is approached from a "story-telling" angle, all will yield good pictures.

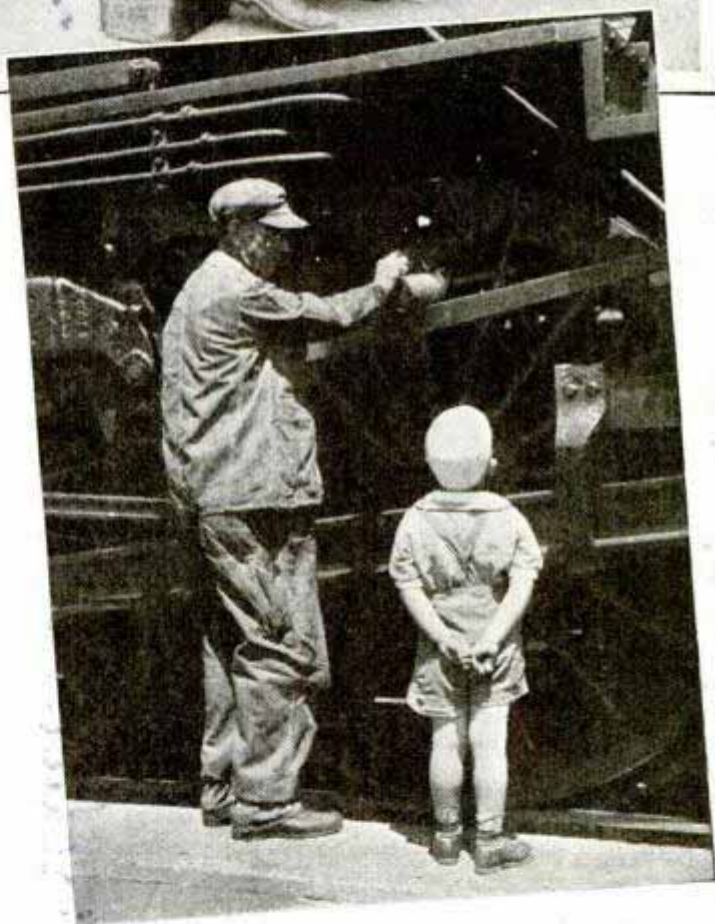
There is no mystery about getting good "story" pictures. It isn't a matter of finding subjects—for almost any detail of everyday life is good subject matter. The secret is in choosing a simple picture idea or theme, then taking your picture in such fashion that the theme is presented clearly.

The snapshot of the boy and his model airplane is a good example. It shows a situation concretely and effectively, and leaves out details that might confuse or obscure the central idea. The test of such a picture is: can you give it an imaginative, general title? In this case, such a title might be "Dreamer" or "Wings,"—and if the title obviously fits, the story is well told.

Telling stories in pictures is easy, and anyone can do it. Some picture-takers seem to know how instinctively, the first time they pick up a camera. Others need practice and experiment, but the more pictures they take, the more rapidly they learn.

When you take a picture, there are several factors that determine the result. One is your distance from the subject. By varying this, you can include just the material that your picture-story requires, and exclude details that are not part of the story. Composition in enlargements can

In the ski scene a story is told without even including the actual persons in the picture. At the left is a good example of a short sequence, the Christmas tree providing a background theme and holding the group together



be improved by washing part of the negative.

Another factor is your viewpoint—high or low, to the left or right. By changing this, you can often bring out important details more clearly. Some stories can be told better with the camera low and tilted up; some, with the camera high and tilted down; others with the camera level. In the picture of the boy and his airplane model, the best viewpoint would probably be obtained with the camera a foot or two higher than the table level, so all the airplane skeleton shows clearly.

A third important factor is the lighting of the subject. As a rule, significant details of the story should be brightly illuminated, while unimportant details can be in shadow. This concentrates the picture interest, and it applies especially to indoor pictures, as remarkable effects can be obtained by changing the position and angle of photoflood lights.

Perhaps the most important point of all in a "story" picture is choosing the right moment. Try to catch subjects when their facial expressions are best "in key" with the story idea. If there is action of any sort, shoot when it is clearly outlined—so that anybody who looks at your snapshots

Sign on door, above, completes a tale that would be just a dog snapshot without it. You can almost hear the Gettysburg yarn being told at right. Scene below hints at boy's longing to be an engineer

can tell at a glance just what is going on.

In brief—keep the essential story simple, tell it clearly, and exclude everything that does not assist the effect you want.

Most story pictures include people doing something. Such action—real or suggested—is essential in these pictures, and the

(Continued to page 136A)

Camera Inside a Football Films View from Air



© RKO-Radio Pictures

Balsa wood container, shaped like football, is shown open to reveal camera

Wonder what the stadium looks like to the football sailing through the air? You'll soon know. For a novel sequence in a football picture filmed in the Rose Bowl by RKO-Radio Pictures, a sixteen-millimeter movie camera was fitted inside a football made of balsa wood. The lens looked out from a window in the end of the imitation ball. As the player forward-passed the football, a release spring started the camera grinding, and a panoramic view of the field and the players was recorded until the ball came to rest in the receiver's arms.

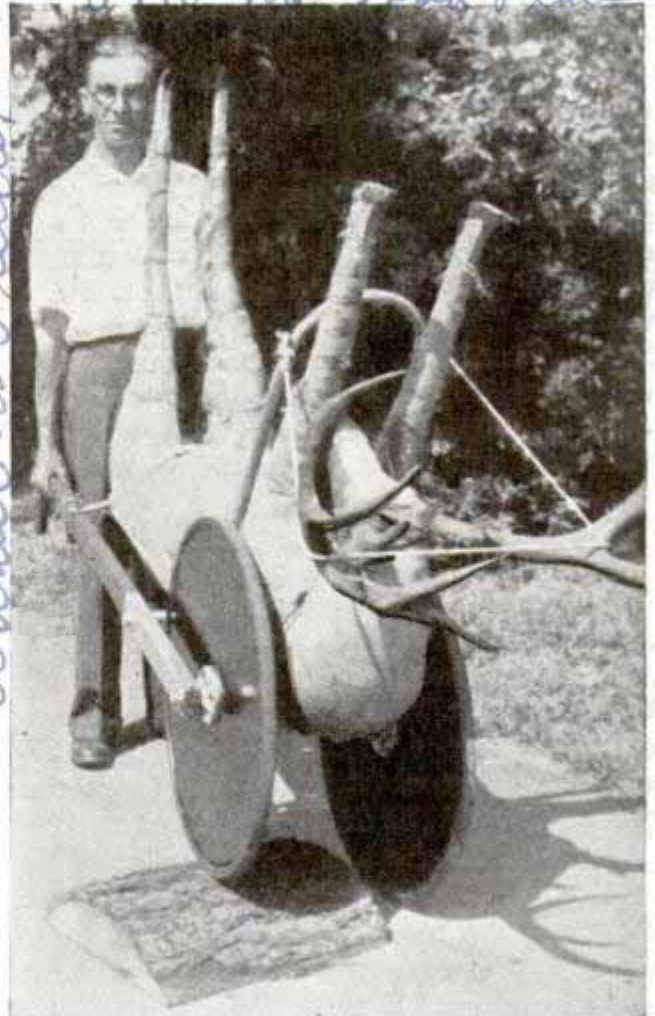
Four-in-One Flight Instrument

Aiming at simplification of the problems of flying and landing by instrument, the Sperry Gyroscope company is developing an airplane dial that combines in one the artificial horizon, directional gyro, turn indicator and altimeter. On this single dial the pilot can read all the information nec-

essary for route flying or landing. It will be adapted to use in connection with any of the ground beam systems by which the pilot is led "blind" down a glide path to the airport runway. The various readings appear in a standard pattern on the luminous screen of a cathode-ray tube.

Two-Wheel Cart for Hunters Hauls Game on Trail

Toting a full-grown buck home over a mountain trail is a backbreaking job for any hunter—but the backbreaking part can be eliminated. An Oregon sportsman has invented a knock-down cart that resembles a wheelbarrow. Dismantled and packed, it is light and easy to carry. When the hunt is over, the game can be loaded between the wheels and pushed over rough trails, for the wheels are independent of each other and the raising or lowering of either handle compensates for uneven surface.



Small, lightweight cart eliminates necessity of hunter packing game long distances

*Designed by Russell Mettley
Camiciamant
RKO Picture*

*5410 N. 3rd Place
Portland*

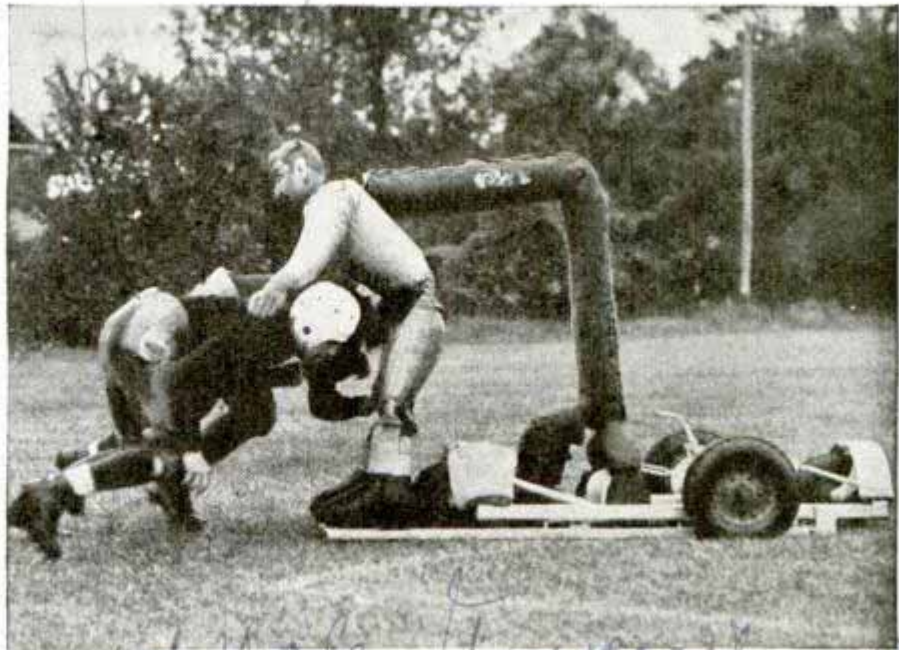
12/11/11

Flight Day

Sperry Gyro. N.Y.

"Go-Back" Dummy Trains Football Tacklers

Football players are trained to tackle properly with the aid of a "go-back" dummy mounted on wheels. The device provides resistance to the tackle, but is not fixed rigidly to the ground, assuring the coach that none of his men will be injured while it is in use. The dummy figure is supported by a padded arm extending vertically and then horizontally.



Right, player tackling the dummy. Note wheels on which the apparatus is mounted

Floating "Flatiron" Wins Title of Speedboat Champion

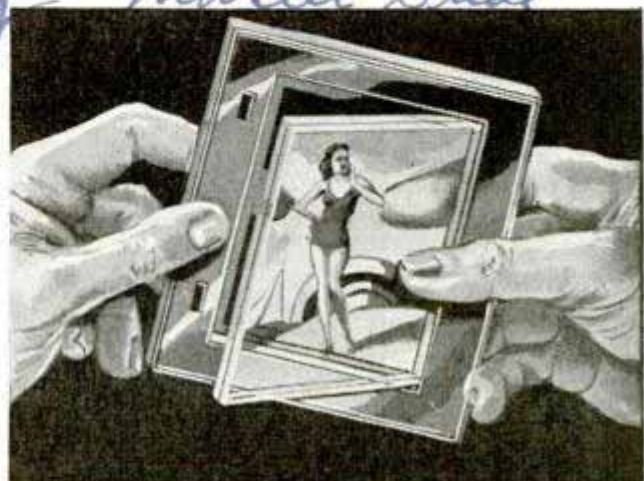


Here is the flatiron-shaped speedboat skimming along the surface in record-breaking Gold Cup races recently.

Resembling an animated flatiron as it skimmed over the Detroit river, the Italian hydroplane "Alagi" roared to a triple triumph in the Gold Cup race of 1938 and established itself as champion speedboat of North America. Piloted by Count Theo Rossi of Turin, the little red-and-black speedster won all three of the thirty-mile heats at better than a mile-a-minute clip.

Snap Frame for Projecting Miniature Film Does Away with Taping

Projection of miniature films on the screen is simplified by the use of a ready-made frame that holds the negative between glass. A spring arrangement holds the glass tight, and in less than a second the picture can be snapped into the frame ready to project. Binding tape is eliminated. The film can be left in the frame permanently or quickly removed to make way for another. Once snapped into the frame, the film cannot slip or twist.

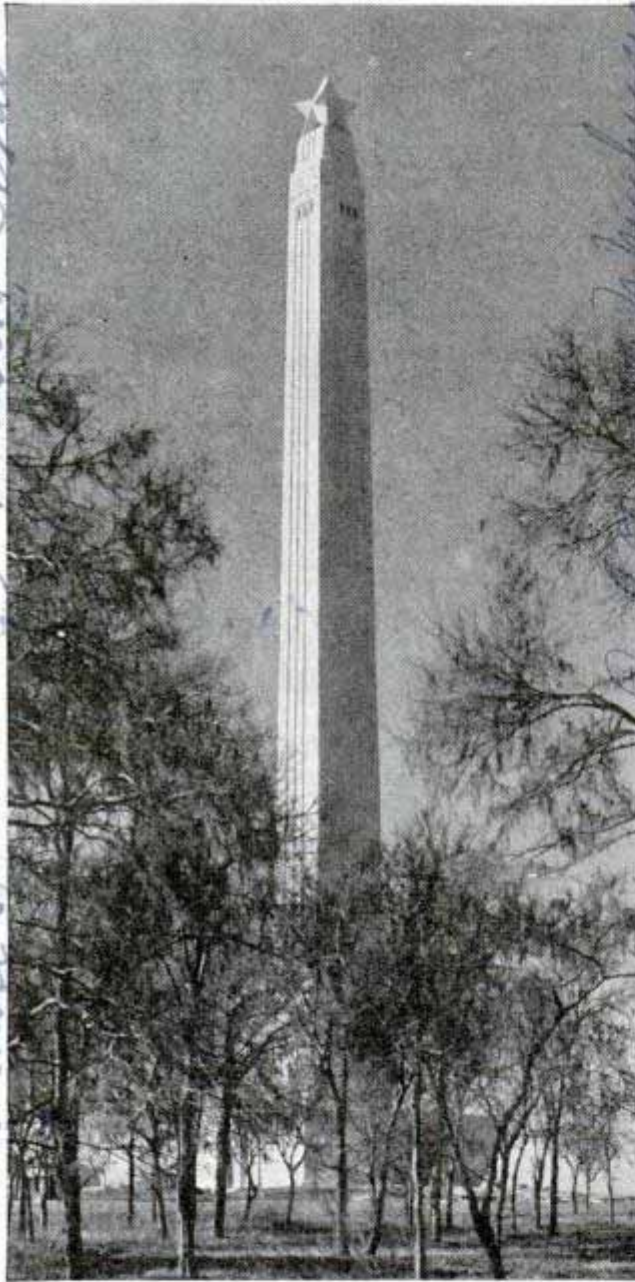


Right, frame into which two glass plates containing negative can be inserted quickly

Handwritten notes:
 at Yale University.
 De Montelera
 Kaiko Photo Products, Brooklyn
 22 West 11th St

H1043

570-Foot Memorial Shaft Marks Freeing of Texas



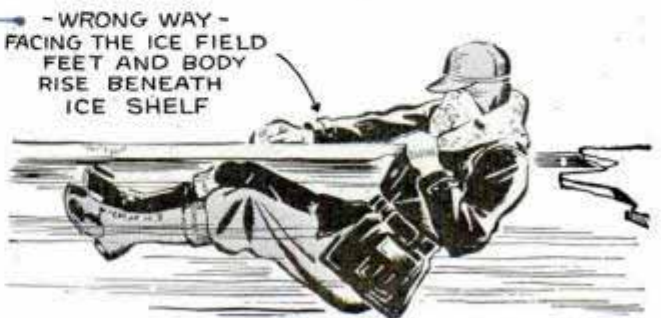
Lofty memorial shaft on historic battlefield.
Note 220-ton star at the apex

Commemorating the successful struggle of General Sam Houston and his 800 men to free Texas from Mexico, a 570-foot shaft rises from the old battlefield of San Jacinto. The memorial is reinforced concrete faced with variegated golden buff Texas limestone. Polished limestone is used for the interior, rough sawn rock for the exterior. A huge star at the shaft's apex is thirty-five feet high, thirty-five feet across and weighs 220 tons. Statues of the state's heroic men and women, historical relics and art will be housed in the base building of the memorial. Fifteen feet loftier than the

Washington monument, the shaft is forty-seven feet square at the base, tapering to thirty feet at the top. Its total weight is 70,300,000 pounds. Eight hundred and fifty steps lead from the base of the shaft to the observation tower at the top.

Take Advice from Indian Guide If You Fall through Ice

Two deer hunters were resting on the shore of a snow-covered lake in northern Wisconsin one November day. It had been a hard, gameless tramp over frozen swamps and around lakes. Homeward around this lake would mean another three and one-half mile trek. A short cut across the ice would save time and effort. They were hungry. The ice looked solid. They started across the clean expanse. A quarter mile from the home shore came an ominous crack, a sudden cry and the leader plunged into the icy water. His warning was too late, and his companion broke through the same soft ice. Searchers followed their trail the next day and read the story of the tragedy in the ice. One man, laden with heavy clothing and gun, apparently had died of shock and gone down instantly, for the ice indicated there was no struggle to get out. The other was frozen solid into the surface ice, after making futile attempts to break off the thin ice with his hunting knife and reach a strong-



Your feet rise under ice shelf and trap you if you climb out forward. Here is right and wrong way

Comd. Jack J. Mc. Cully, Publisher, Chamber of Commerce, Houston, Texas

Com. W. S. Watson, Editor, Popular Mechanics

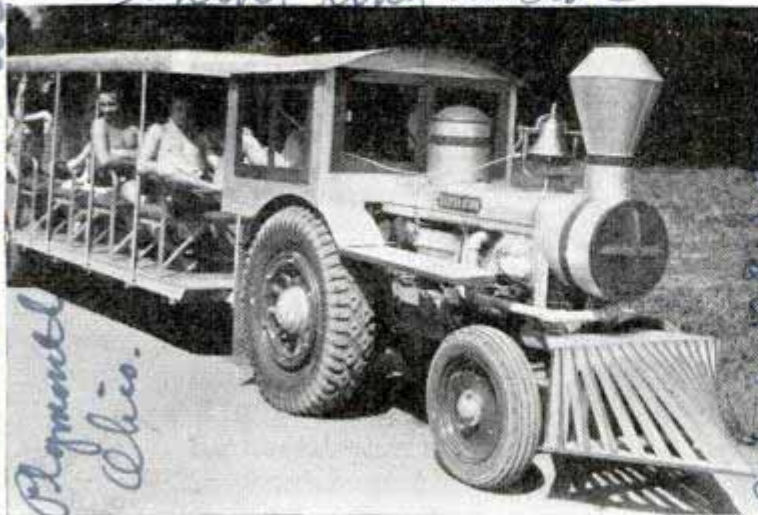
er surface. An Indian guide in the search party, in his comment on the unnecessary tragedy, gave a terse lesson to others who may plunge through treacherous ice in winter sports: "White man don't know how to get out of ice. Indian, he know how. White man grab ice with fingers. Feet go up under ice. It break off. Pretty soon he drown. Indian, he swim on back. His feet go up. He get head on ice. Then get shoulders on ice. If it breaks, Indian do it again and crawl up on back slow like snake. Pretty soon he get on big ice. Run, get warm, make fire. All hunky-dory." Remember that when you face the emergency. If you grasp a pier, the gunwale of a boat or an edge of ice while you face it, your feet tend to rise under the object. With your feet under the ice, you break off more and more, but remain trapped. Instead, swim to the ice edge backstroke, floating on the back, hunch head and shoulders over the edge until the supporting ice is strong enough. Then drag yourself up and get warm, as quickly as possible, with blankets, rubbing, warm drinks and dry clothing.

H 1054

Tractor in Guise of Locomotive Hauls Train of Trailers

Decked out with cowcatcher, "funnel" stack and cab to disguise it as an old-time railway locomotive, a farm tractor hauls passengers on a "scenic ride" through an Ohio summer resort park. The open passenger cars are built on standard tourist-trailer chassis. The small tractor can pull the two loaded cars at fifteen miles an hour.

Silver King tractor



Farm tractor dressed up like an old-time iron horse attracts passengers to ride in open trailers through summer resort park

Rate - Prob. Heath
Plymouth
Ohio

cont. Ernest teifhay
211 2 4

Welder's Non-Fog Eyeshield Gives Wide Vision



Eyeshield for the welder is designed to prevent fogging. Here it is in raised position

Well ventilated to prevent fogging, a new wide vision, close-fitting eyeshield is available for blowtorch work, gas cutting, welding, overhead operations and general maintenance. A light, opaque, noninflammable Bakelite frame carries regulation welding lens of any shade and ventilated cover lens. It fits the face snugly. Fiber side shields provide further protection.

H 1033

Pilot Warned if Wheels Are Not Set to Land

Designed to prevent a pilot from landing when the wheels of his plane are not in position, a new signal automatically thumps the pilot to give warning. It consists of an auxiliary tread attached to the rudder and brake pedals. If the pilot tries to land with the wheels retracted, in flying position, an electrical circuit is closed, setting into operation a small solenoid motor that literally raps the soles of his feet.

Jackson Electro-Tool Co
 March Ave
 West Mt.
 1135
 1135
 Carpenter
 Dayton, Ohio
 and Harold
 W. Howard

W. Howard

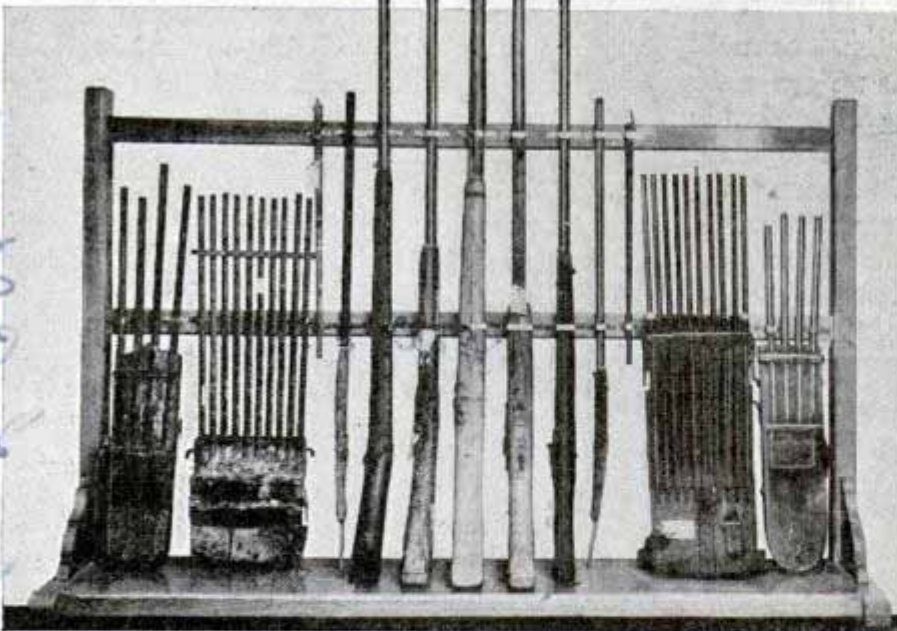
Laurel Shuffler 1048
James Silver
Regional Director
James Silver

TRAILING *the*



Photos courtesy U. S. Bureau of Biological Survey

Federal deputy game wardens banding duck removed from trap in Chesapeake Bay. Left, illegal guns seized by wardens



Smith Island
other stop and a second passenger left the car.

By now the first passenger in his thicket had finished his preparations. The big bundle unrolled into a sleeping bag on which he half reclined. A box at his right leaked dim rays of light as he occasionally snapped a switch. The hour hand on his watch crept round

THE moon was partly hidden and the big sedan slinking along the country road without lights, stayed in the shadow of a row of trees. It coasted to a stop beside a thicket, a passenger with a big bundle jumped out, and the car was on its way again. Fifteen minutes later there was an-

the dial and the night grew colder.

Then, so close at hand that the report startled him, a heavy gun boomed, followed half a minute later by a long fusillade as other guns joined in. The silent watcher turned to his box and picked up a mouthpiece.

Mr. Richards
Office of
Mr. Richards

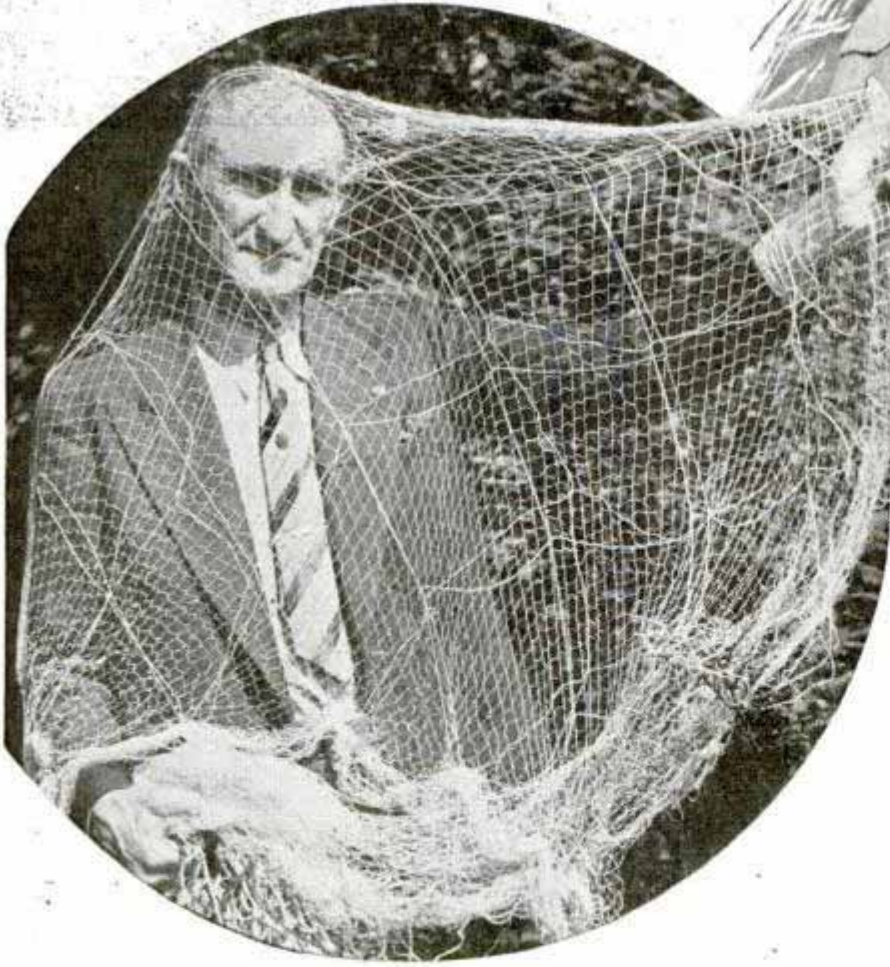
2-27-54
Smith Island

Mr. Thomas S. D. Umson, Jr. 1/10/48.
10655 Hollywood Ave
Los Angeles, Calif

Wild Game POACHERS

"Hello, Biological Survey car. This is Conners. A duck drag is just starting, a quarter of a mile south of me. I'll walk in toward them and you can pick me up as you come along."

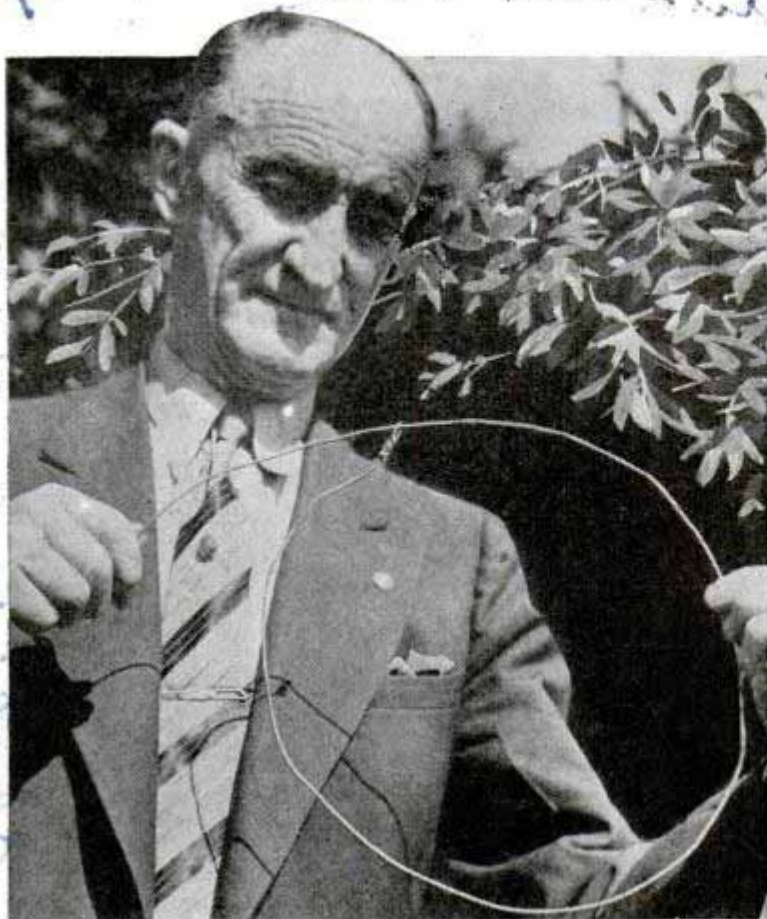
Turning off his short-wave transmitter, the federal game agent jumped up, un-snapping the holster of his revolver as he strode down the road. On this particular raid five duck bootleggers were captured. The blast of shotgun fire that had aroused the game agent had killed nearly 500 ducks which the bootleggers were gathering up just as the agents descended. Ten minutes after the firing the poachers would have been on their way and quick, silent action must be used to catch them. Sometimes pitched battles occur and officers have been killed or wounded in protecting wild game.



Mallards, pintails, widgeon and other ducks bring one dollar or more per bird in large cities and they are wholesaled under cover by rings that operate like bootleg liquor rings. Huge swivel guns and tremendous stationary shotguns mounted on rowboats, that kill from 150 to 500 birds per shot, were once the favorite weapons of the poachers but now automatic shotguns with extended magazines holding from eleven to twenty shells are used because they are easier to hide. Game agents may hold

Reference: W. E. Crouch, Chief, Division of Game Management, Bureau of Biological Survey

Fine linen bird net seized on its way from Europe to America. Top, game agent studying suspected poachers at long range



way of discouraging the poachers.

For a time duck poaching seemed on its way to becoming a big business. Now the activity has been stamped nearly out on the west coast and in the middle west and the federal agents are concentrating on the marshes of the eastern flyway where baited traps made of chicken wire capture forty or fifty birds each per night. Five hundred such traps were confiscated in a three-month period. On one week-end alone more than forty market hunters in Arkansas, Mississippi and Tennessee were rounded up, many being old offenders who sold direct to hotels and restaurants which

(Continued to page 143A)

night-long vigils for weeks without hearing a shot but ultimately they catch the poachers that are destroying the game.

Wild game of every kind, from mocking birds to mountain sheep, is the prey of the poachers. Unchecked, they could easily destroy all the wild life in the country. Moose have been killed illegally in Alaska merely for dog food. Elk have been destroyed in Washington simply for the two teeth per head that are prized as emblems. Game agents of the Biological Survey and the deputies of the fish and game commissions of the different states work hand in hand against the poaching rings. Skins have been shipped as far away as China in efforts to dodge the law and agents have trailed their men clear across the United States in making captures. Stiff fines and jail sentences seem to be the only



Lower photos courtesy U. S. Bureau of Biological Survey

Top, game deputy with heavy wire snare which had been placed in deer runway. Bottom, duck found by game wardens in steel trap. Right, releasing duck which had been trapped

Handwritten notes in blue ink:
 141048
 Clean message
 mark
 Virgin
 James
 Rubin

H 1046
 215 Market St. San Francisco, Calif.
Old Tires Sweep Up Stalks in Sugar-Cane Field

In the sugar-cane fields of Hawaii a new use has been found for old automobile tires. Split in half and given "teeth" by deep notches, the tires are mounted behind a farm tractor in such a way that they are self-rotating when dragged across the field. Thus each pair of tires, driven over the dead leaves and stalks of cane, sweeps this refuse into windrows where it is easily collected for final disposition. One man, operating the two-row "sweeper," can clean up ten acres in a day.



Right, sweeping sugar-cane refuse into windrows with the aid of old tires. This sweeper handles ten acres per day

H 1088
Fish "Planted" by Parachute Cans Dropped from Plane



Lower left, parachute and can of fish being tossed from plane in lake planting test

Thousands of young fish are being "planted" by airplane in experiments to determine whether this method may be used to stock isolated mountain lakes. The fish are placed in tin cans to which parachutes are attached. As the plane speeds over the lake or other body of water at about 1,000 feet, the cans are pushed overboard. The parachute gently lowers the cans to the water. Fish planted in this manner have not been noticeably affected by the plane and parachute ride.

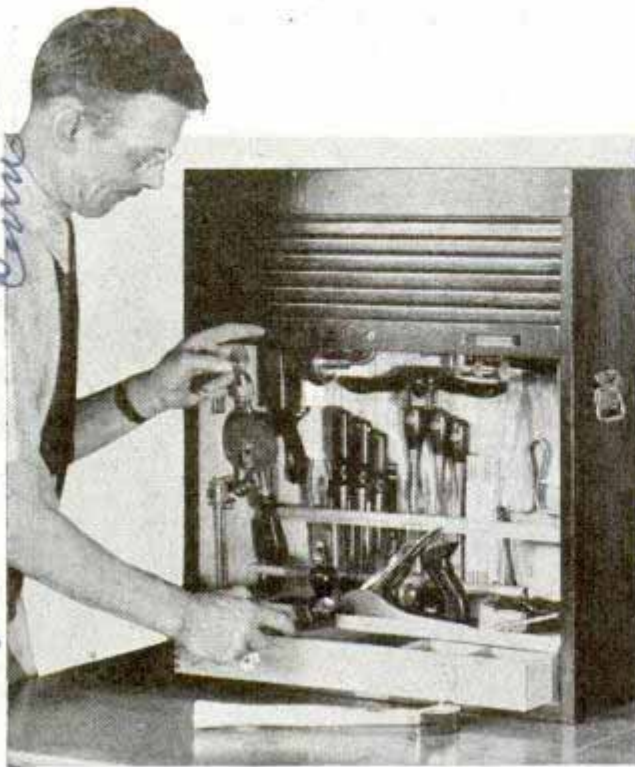
H 1082
Truss Expands Auto Piston to Stop Oil Pumping

Designed to reduce piston slap and oil pumping, a new piston truss pushes against the side of the piston, causing it to expand against the cylinder wall. It is possible to expand the piston as much as .04 inch without breaking it.

A take examine Dept

Piston Truss Co.
 Pacific Idaho

Roll-Up Door of Tool Chest Is Out of Way When Open

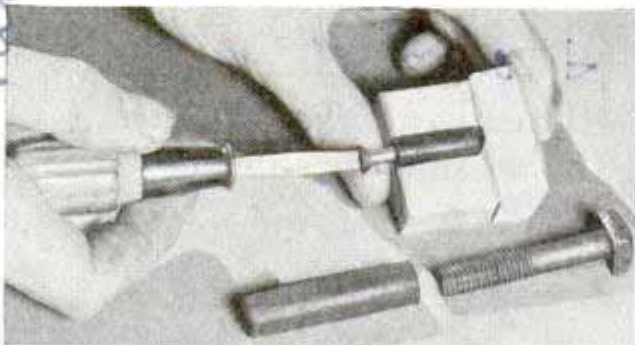


This tool chest has no swinging doors to obstruct the worktable. It is like a roll-top desk

Built with a roll-up front that operates like a roll-top desk, a tool chest with thirty-three woodworking implements is on the market. There are no doors in the way of work when the chest is open, the front sliding easily up and down, and locking.

Rubber-Tube Expansion Shield Anchors Bolt in Masonry

For anchoring bolts or screws firmly in masonry, metal or other construction materials, a rubber expansion shield has been developed. It consists of a rubber tube containing an expanding metal core. As the bolt or screw cuts its own threads in



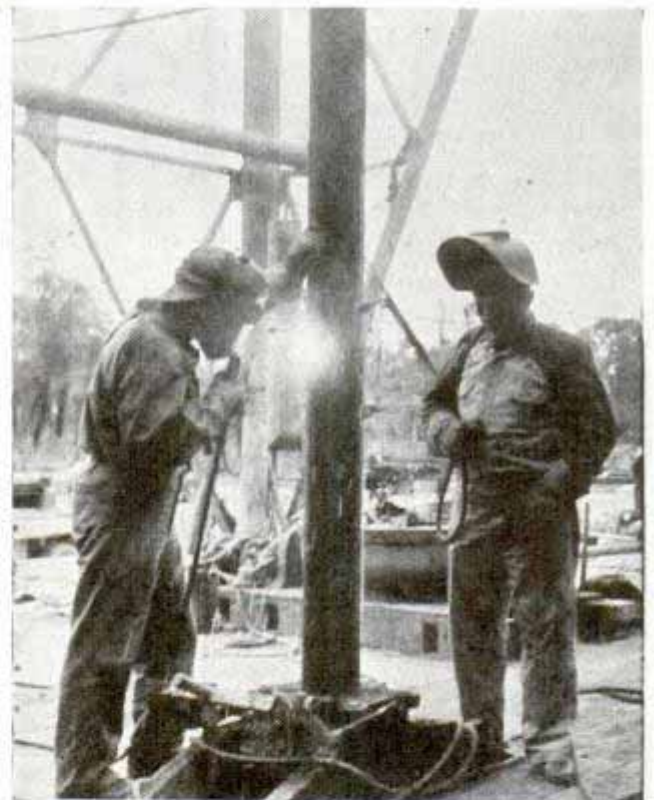
When screw is driven in, rubber tube and metal core expand and grip sides of hole

the metal, it causes both core and rubber to expand, the rubber filling all the space in the hole and gripping the sides firmly. It acts, too, as a seal against gases, water and other liquids.

Bombarding Foe with Noises Latest War Weapon

War may become a battle of sounds, as well as of bullets and bombs. A system for bombarding the ears of the enemy with all the horrible noises of the battlefield has been patented by a French citizen. It consists of playing phonograph records through a loudspeaker network to create a terrific din.

Welded Casing in Deep Oil Well Is Found Practical



Electric arc welders at work on casing as it is sunk in deep oil well

Once considered impractical for deep oil wells, an electric arc-welded casing was used recently in place of threaded couplings, at a considerable saving in labor and first cost of material. The casing, the welds on which were made on the derrick floor as the steel pipe was sunk, was put into a 8,100-foot well in Oklahoma. The finished welds provided joints of extreme-

Stanley Tools, 19.5 Lake H. New Britain

Leland H. Adams 450 Ex 1092 Chicago

maxime wage

41014 11/3

Linnoli Electric Co 13810 East Grand

ly high strength, a fact demonstrated by building up pump pressure to 1,200 pounds and allowing it to stand for forty-five minutes. At the close of the period, the pressure had not diminished, indicating the work was a success.

H 10 30

Torch Removes the Paint from Wood or Canvas

Removal of paint from wood, metal or canvas without burning is claimed for a new air-acetylene torch. The burner works on reeds, fluted columns and flat surfaces. By changing the direction in which the torch is held, the width of the flame may be varied from one-half inch to three inches, so that paint is easily removed from grooves without scorching or injuring adjacent surfaces. The flame is of even, high temperature throughout. Holding the burner at the proper distance from the surface heats the paint evenly to the correct temperature. Boat owners find the burner handy in removing paint from wooden or metal hulls, canvas or wooden decks, cabin roofs or canopies. Paint can be taken off canvas without removing the prime coat or filling, and without melting or loosening the marine glue with which the canvas is fastened to a wooden surface.

Pres. O. Litz 0-6115 Paul Buener

Keyhole Door at Playground Keeps Out Larger Children



Unless the child is small enough to pass through the keyhole, he or she is barred from the playground

Older and larger children are kept out of a Boston, Mass., playground by a keyhole door which admits only those youngsters small enough to pass through the opening in it. The door thus restricts use of the playground to small children, for whom it was planned.

Adhesive Tape of Elastic Cloth Lets Taped Finger Bend

To permit the taped finger or other injured joint to bend naturally without stiffness, an elastic adhesive tape has just been developed. It is made of loosely



woven cloth of a color to render it inconspicuous, and is sold in a neat plastic container which could be carried in a purse.



Using acetylene torch to burn paint off boat. Inset, working on curved surface

Linde Air Product Smith and Nephew

Handwritten notes on the right margin: '5 n Wabach Chicago', 'St. Stephens Church', 'Linsplack', 'England and ...', 'H 10 40', 'E', 'Linsplack', 'Chicago'.

Rose Glasses on Chickens Reduce Fighting

Lifeguards



Here is a chicken fitted with rose-colored glasses which reduce fighting in flock

There was murder going on in a New Jersey penitentiary yard. The prison chickens were killing each other. One after another, the young White Leghorns would fight among themselves to the death. Nothing was effective in preventing the quarrels until the warden tried putting rose-colored glasses on the birds. That stopped the fighting instantly. The Leghorns, the only fighters in the poultry lot, now are all equipped with aluminum-framed spectacles, with center pieces extending in front of the bill.

Synthetic Fiber Better Than Silk in Strength and Elasticity

Finer, stronger and more elastic than natural silk or rayon, a new synthetic fiber has been developed by du Pont chemists. It is lustrous in appearance and can be drawn out to one-seventh the diameter of a real silk fiber. Because of its remarkable elasticity and recovery after being

stretched, the new fiber is expected to find use in stockings, gloves, sweaters and underwear. Larger filaments can be made into tough bristles, strings for musical instruments, fishline leaders, mohair and horsehair substitutes.

Rubber Guard on Trolley Wire Makes Mining Safer

Developed especially to protect the miner, a rubber guard for trolley wire has been introduced. It is made of cloth inserted sheet rubber which is cured in a permanent "U" shape. Placed on the trolley wire, it provides complete protection because the material flexes or bends in either direction. The feeder pole of mine vehicles slips through the guard easily. The exposed trolley wire has long been a danger to workmen. Even when the greatest care is taken to prevent body contact with the wire, there is always the possibility of serious injury or death occurring to a miner due to his touching the high-voltage cable with tools he may be carrying. Trolley guards of wood are subject to breakage and rapid deterioration.



Top, rubber guard protects miner's head. Below, trolley passes through guard easily.

1067
Illinois Laboratory
428 Meryck Boos
Synbrook, N.Y.
Western Hamina
101

deceased
1097
Devere & Evans
W. J. Woodrich Co
Apron White
North Caldwell, N.J.
101
101

E. I. du Pont de Nemours & Co.

A 1012 ... Montebello Calif

Reclaiming Ghost Gold Mines Is Profitable



Left, leaving the mine. Right, worker protected by dust mask. Bottom, at work in mine



Large quantities of gold have been taken recently from "ghost" mines reclaimed in the western part of the United States. At first reopened to provide a meager living for the workers, the once deserted mines have been found highly productive, yielding a nice profit. One of these mines is the famous old Tom Reed mine at Oatman, Ariz., where a newly discovered vein of gold is being worked. Latest methods of mining are being employed to speed up production and to safeguard the lives of the miners.

10 1069

Electric Coin Sorter Tests and Rejects Spurious Money

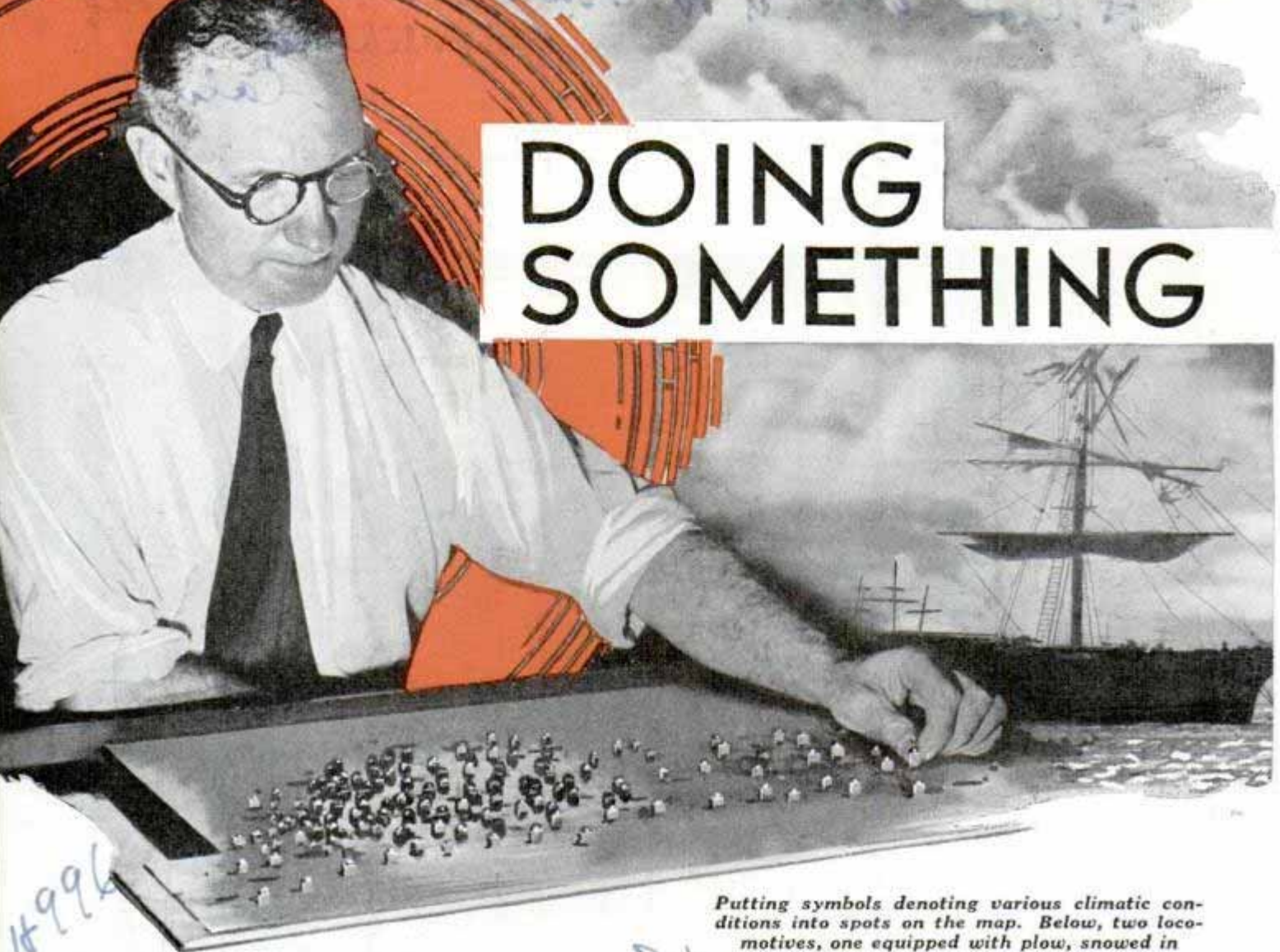
In a bank at Sydney, Australia, is a coin machine that does virtually everything except spend the money. Electrically driven, it sorts and counts, tests and bags the coins at the rate of \$5,000 worth an hour. Coins dumped into a tray are brushed into a hopper from which they are rapidly sorted into several receptacles, according to

their denomination, and each is tested for its worth as it passes to the bag. Registers show the total in each bag as it is filled. It takes one-fifteenth of a second to test and sort each coin. The bank has another coin machine which counts and wraps \$2,500 worth of pennies a day, a task that formerly required five men.

*Inv. R. J. Little
c/o Metal Products Ltd.*

80. Teaching ... Sydney, Australia

DOING SOMETHING

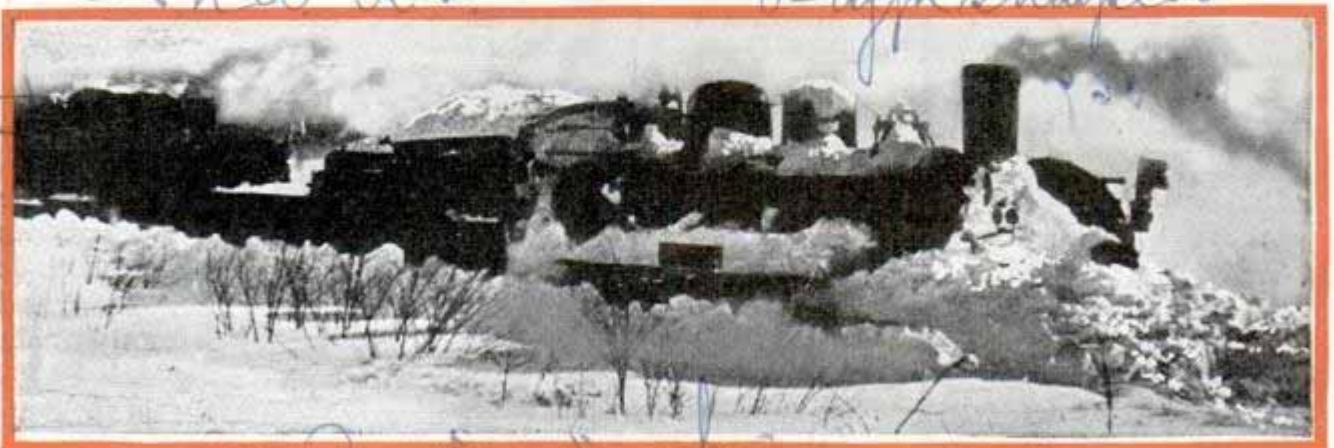


Putting symbols denoting various climatic conditions into spots on the map. Below, two locomotives, one equipped with plow, snowed in

MARK TWAIN said that everybody talks about the weather but nobody does anything about it. But back in 1931, a young meteorologist named Irving Krick decided he could do something about it. Backed by a research grant from the Rockefeller Foundation, he set out to improve methods of weather forecasting so they could be used commercially.

Despite the nation-wide service of the U. S. Weather Bureau, businessmen were not taking full advantage of it, largely because they didn't know how to apply the

forecasts in terms of their own individual needs. But since wartime, experts at the Geophysical Institute at Bergen, Norway, had been working on an "air-mass analysis" system, and here Krick went to learn details of the scheme. Then he traveled around the world visiting foreign weather observatories and gathering the best European ideas. In his laboratory at California Institute of Technology, he assembled his information and evolved a weather-forecasting system that was adopted by every major air line in the United States.



#996

Irving Krick
 meteorology Dept

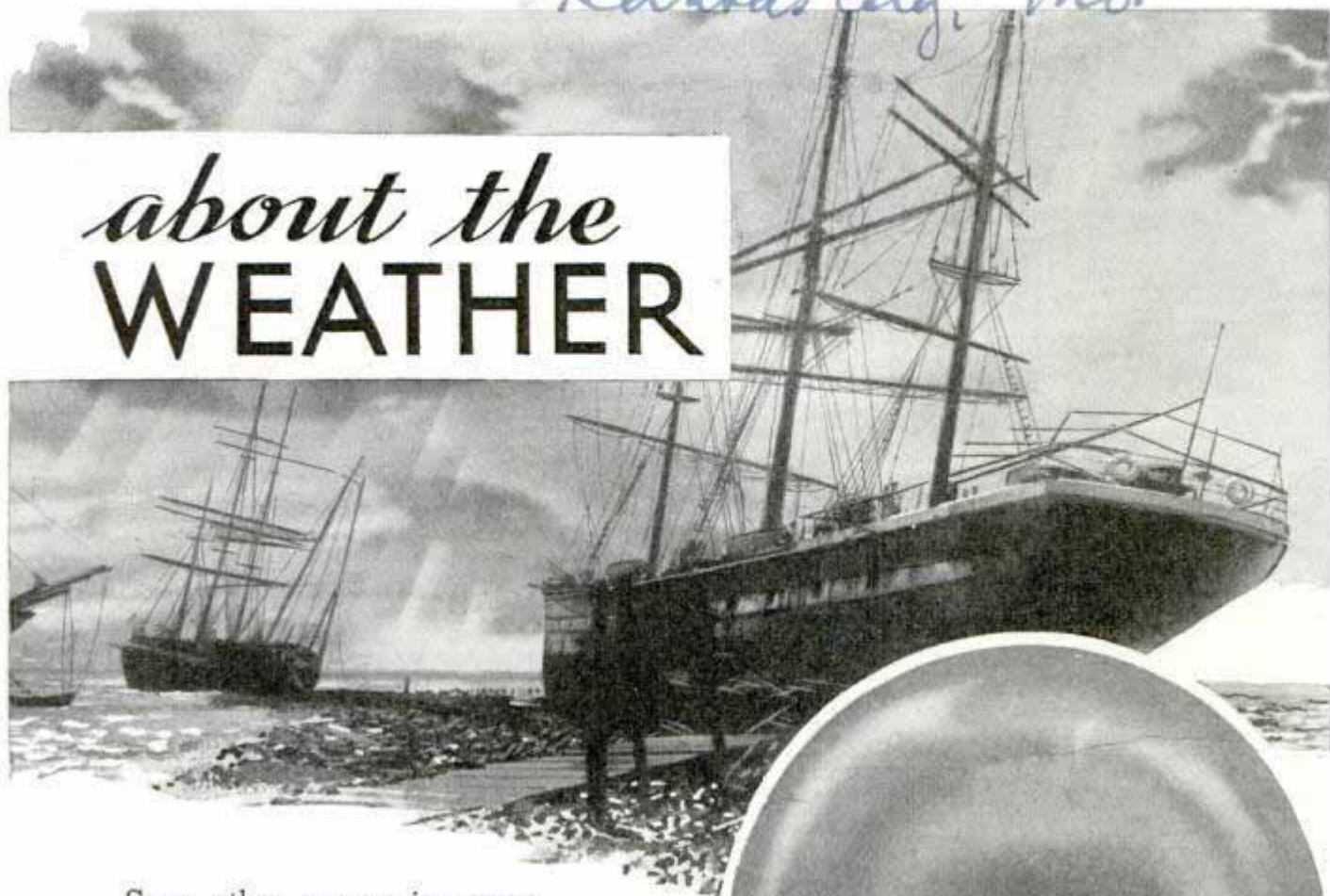
Barometer

D-type snowplow

Hydro...
 ...

Capt. James M. Sweeney
481 W. 60th Terrace
Kansas City, Mo. H 9916

about the WEATHER

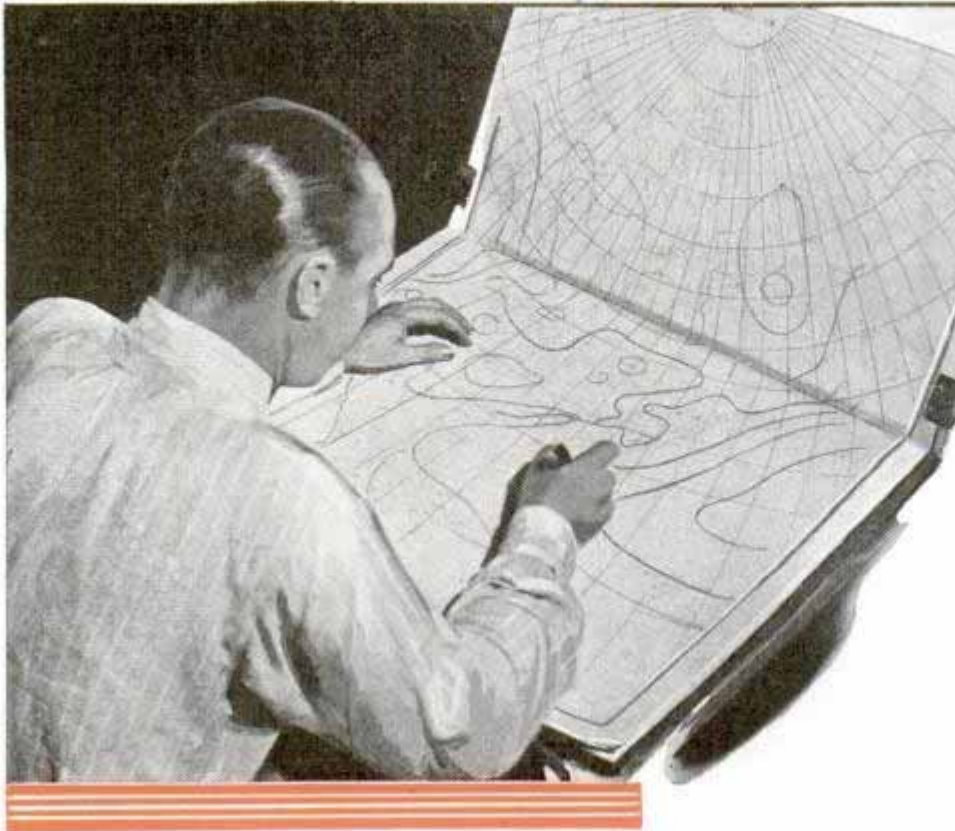


Soon other companies were wanting to know if Krick could tell them what the weather was going to be next week. Among them were the large movie studios. When it costs \$50,000 a day to set up for shooting, a run of bad weather that keeps high-salaried actors and crews idle can quickly run a picture into the red. So Krick began to issue special forecasts covering two or three days ahead. At



Top, ships blown aground by hurricane. Right, balloon and automatic radio transmitter. Left, closeup of the transmitter which flashes reports on weather conditions aloft

H 9916



first, some conservative movie executives were skeptical, but after they had ignored warnings a few times they realized that the predictions were running up a much higher batting average than their own guesses.

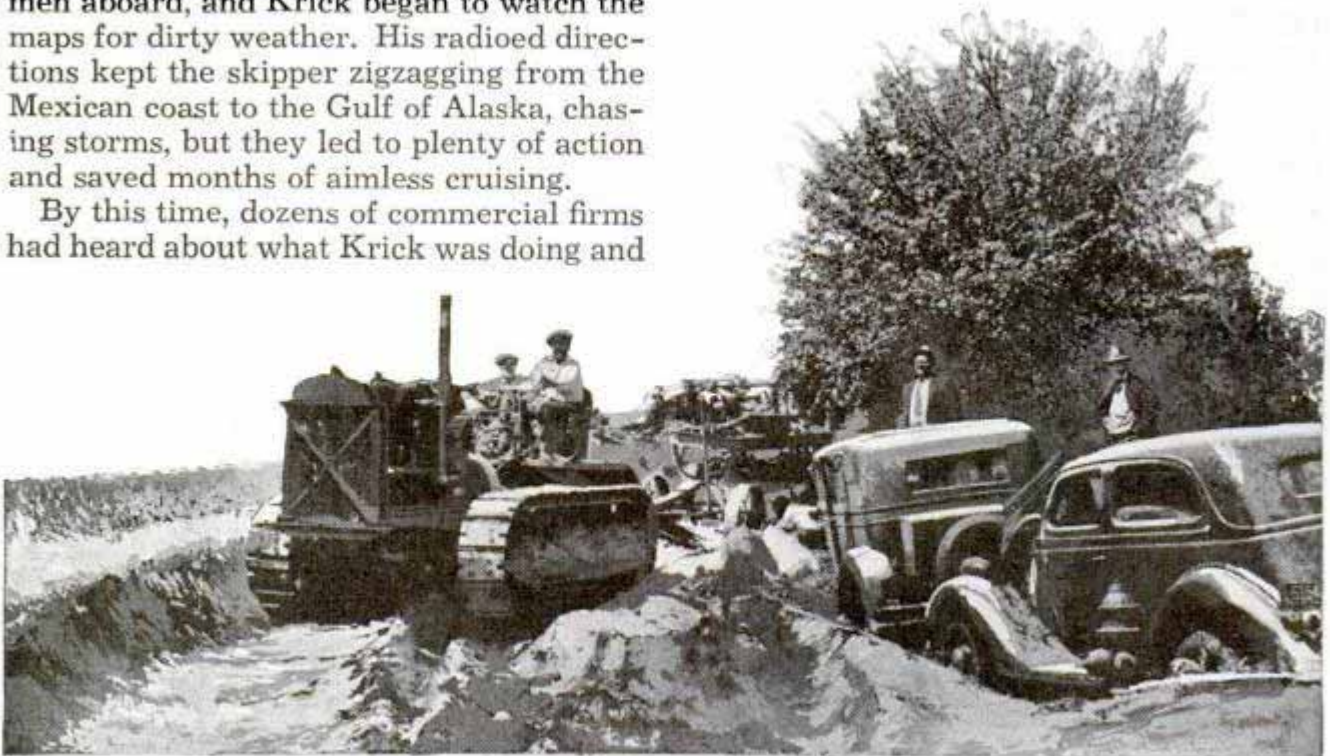
For the picture, "Captains Courageous," Metro-Goldwyn-Mayer needed storm shots. A studio ship set sail with cameramen aboard, and Krick began to watch the maps for dirty weather. His radioed directions kept the skipper zigzagging from the Mexican coast to the Gulf of Alaska, chasing storms, but they led to plenty of action and saved months of aimless cruising.

By this time, dozens of commercial firms had heard about what Krick was doing and

they wanted the same service. Ordinary forecasts didn't tell them what they needed most to know: specific information as to exactly when the fog would lift at Point Loma, or how long the thermometer was going to stay above ninety degrees. Krick saw at once that he would have to learn each client's particular needs and fit the service to them.

A big soft-drink manufacturer asked how the service could help him, so Krick and his assistants carefully studied the effects of weather on the cash register. Correlating soft-drink sales with temperature changes, they determined exactly how much a given jump in the mercury would mean in thousands of bottles sold. Now the manufacturer knows in advance how many cases to ship to each territory when a hot spell is due.

Selling radiator anti-freeze compound is



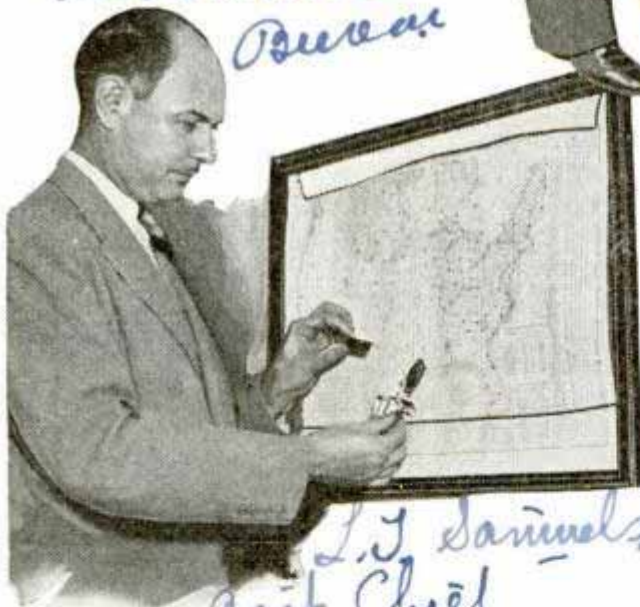
Top, making weather map at U. S. Weather Bureau. Bottom, snow-fighting equipment which was called out in midsummer to cope with drifts of hail that stalled traffic

Omaha May 1936

another temperature problem. A large chemical company gets warning of an impending cold snap far enough ahead to start shipments moving in that direction, so dealers will be well supplied when the freeze comes.

During the season when wheat from Texas to Minnesota begins to ripen and move to market, the grain market is a nervous, skittish affair, sensitive to every minor weather fluctuation. One big firm of speculators asked for regular warnings of hot spells five to seven days ahead, so as to anticipate market moves. Last summer, a rust scare boomed the grain market. Many

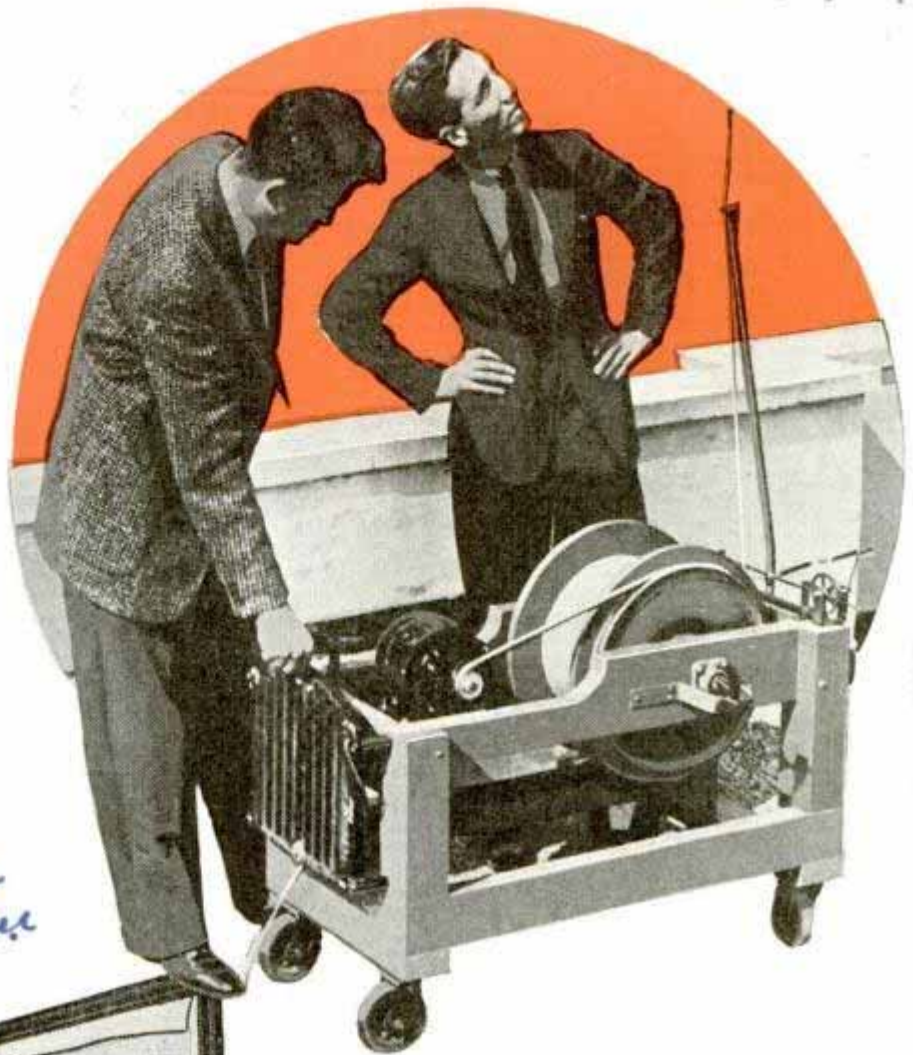
U.S. Weather Bureau



*L.J. Daniels
Asst. Chief
Aerological Div.*

experts kept advising people to buy wheat with the idea that it was going still higher. Unlike Krick, they didn't realize that long-run weather conditions were more favorable to a big crop, and that the rust scare was just a flurry. When wheat subsequently dropped fifteen cents a bushel, many speculators were wiped out—but those who had acted on Krick's warning saved their money.

In some industries, weather factors vary so that different service is needed from



Above, motor-driven spool which controls balloon transmitter. Left, weather official holding meteorograph sent high in air to record data on violent tropical storms

month to month. In winter, orange growers need to know about minimum temperature so they can be ready to light their smudge pots when the thermometer drops to the danger level. In summer, maximum temperature and humidity are most important in governing the ripening of fruits, spraying and pest control.

Department stores find weather important in their operations. They consult the forecasts before scheduling a big sale and hiring additional help.

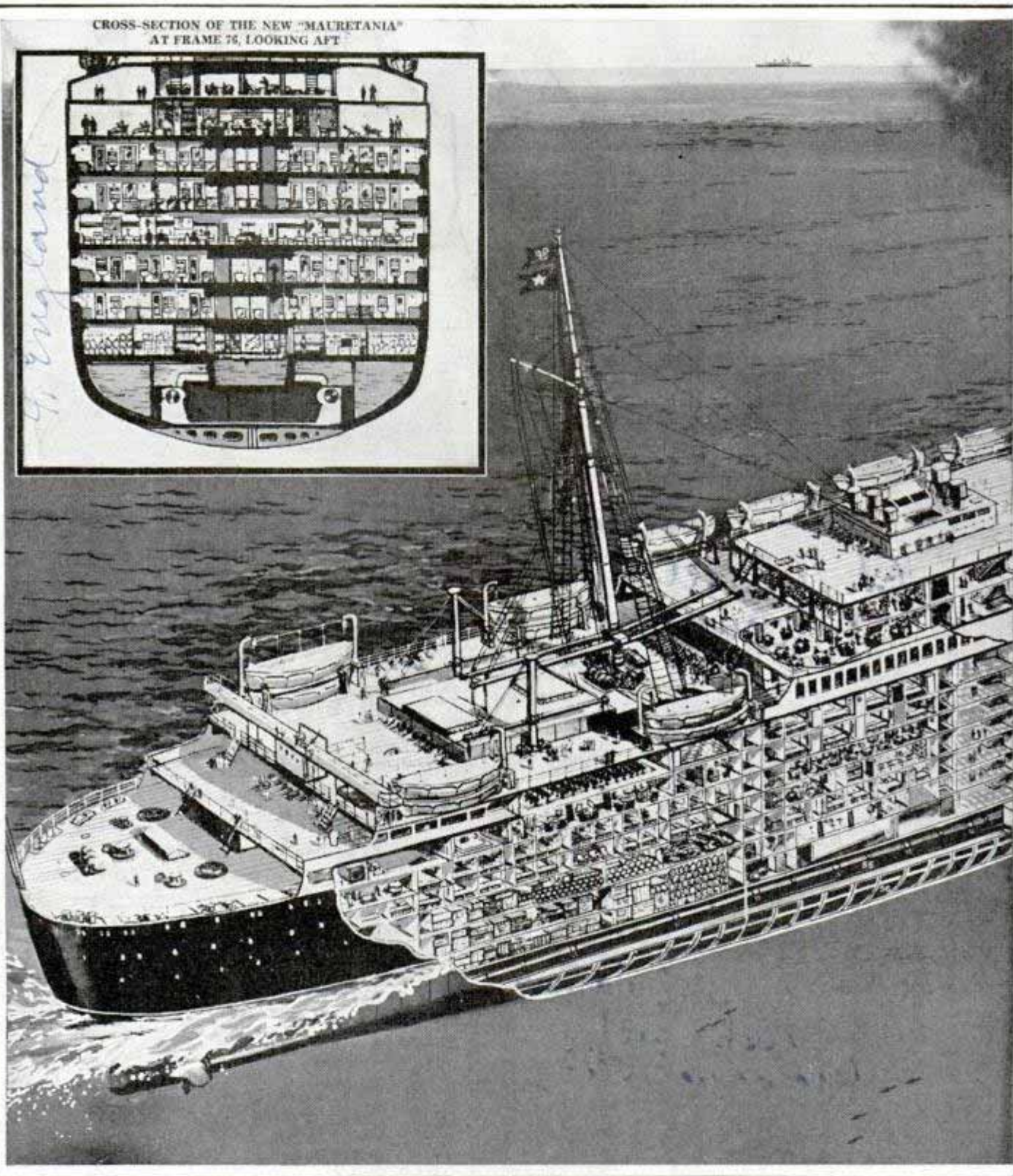
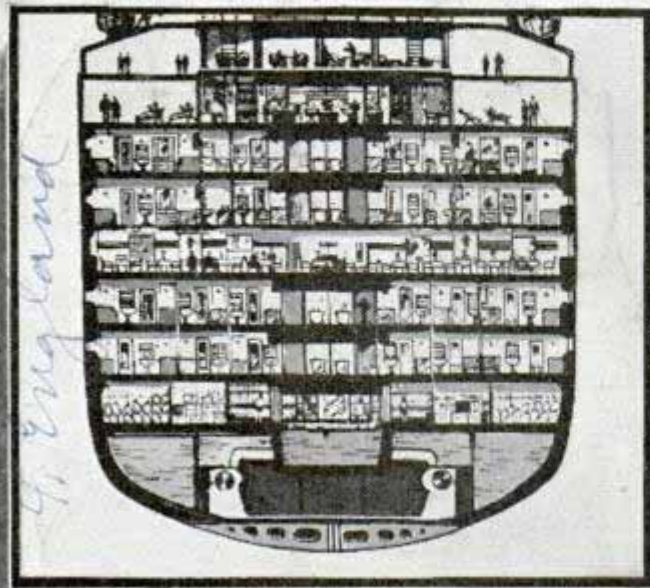
It's pretty hard to say exactly how much rain will fall at any given time, but air-mass analysis makes possible a close estimate of the probabilities. Recently a county fair asked for a special report advising how much rain insurance to carry. Krick's report not only foretold a favorable season, but also gave valuable clues as to how much popcorn, hot dogs, and pink lemonade would be wanted.

(Continued to page 120A)

"Mauretania"—Britain's New Ocean Queen

London: Electrotype Agency, Ltd. 23-24, Fleet St. London, E.C. 4. 1914

CROSS-SECTION OF THE NEW "MAURETANIA"
AT FRAME 76, LOOKING AFT

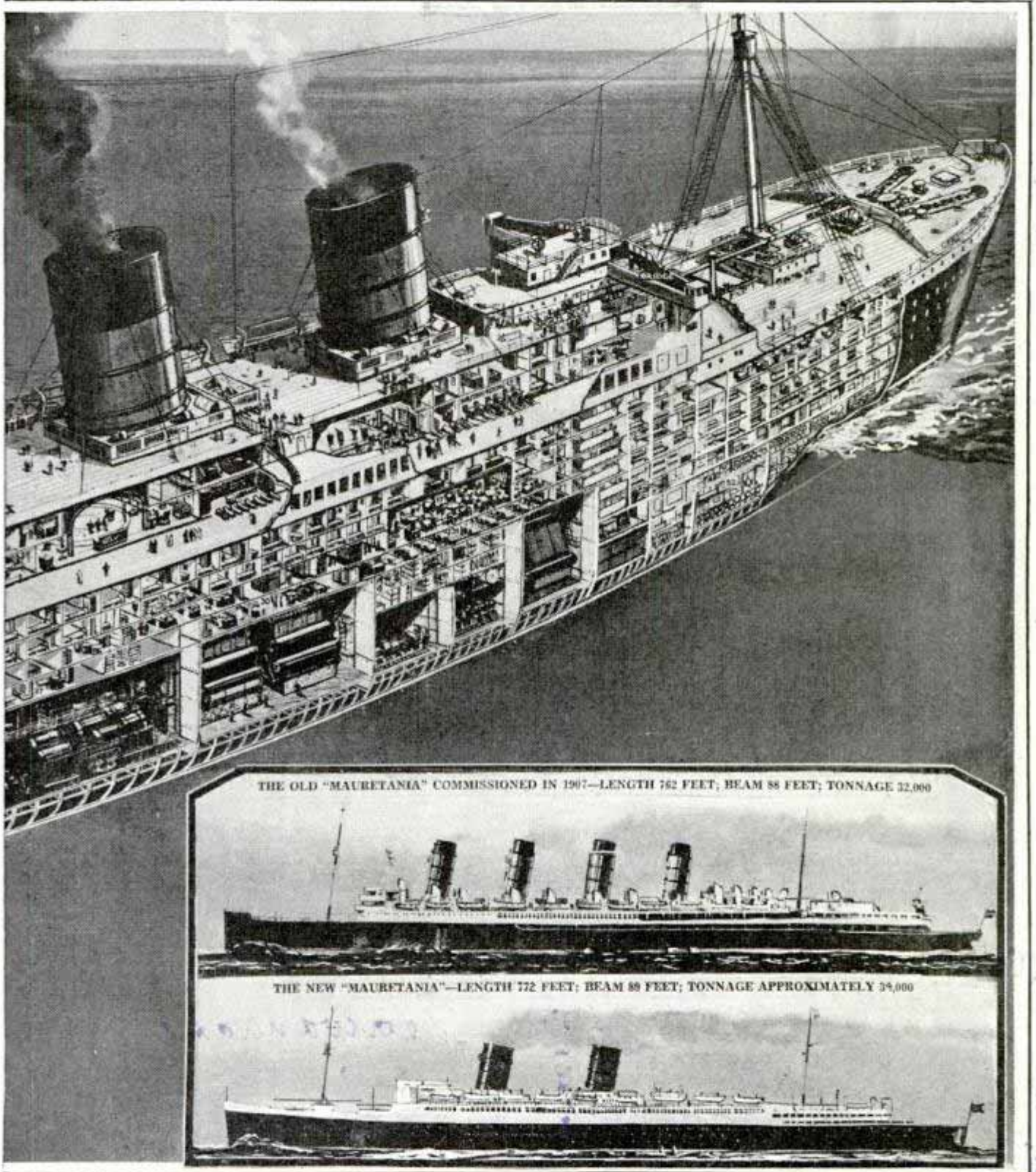


Designed to have more deck and cargo space than the old ship whose name she bears, the new "Mauretania" has been launched, the latest addition to England's fleet of ocean liners. Owing to efficiency of super-heated steam and modern boilers, which take up less than half the space that

would have been occupied by boilers had she been built in the days of the old "Mauretania," the new liner has but six boilers with super-heaters, in two stokeholds, to give her a speed of about twenty-two knots. Another feature is the provision of fans to supply air to the boiler and

H 999

Ventilators Removed to Give More Deck Space



THE OLD "MAURETANIA" COMMISSIONED IN 1907—LENGTH 762 FEET; BEAM 88 FEET; TONNAGE 32,000

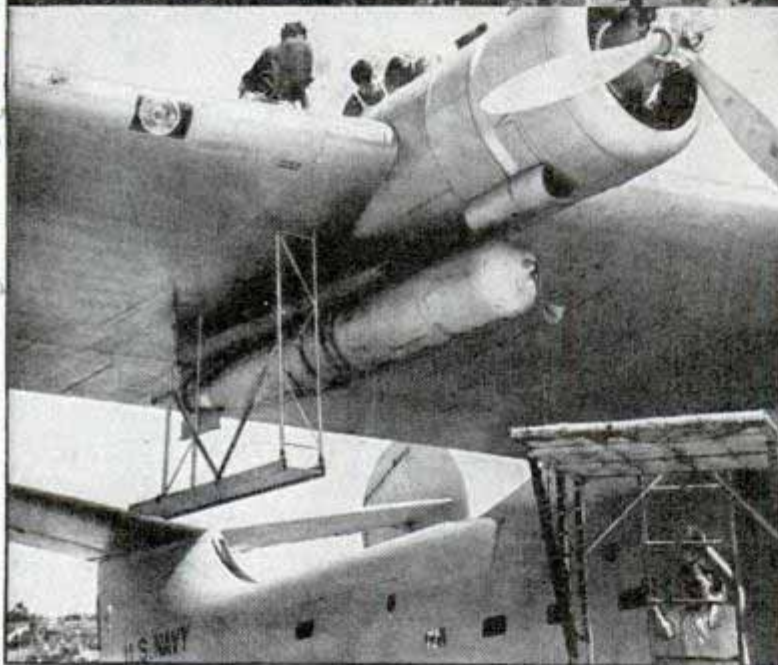
THE NEW "MAURETANIA"—LENGTH 772 FEET; BEAM 89 FEET; TONNAGE APPROXIMATELY 34,000

Artist's sketch showing cross-sectional view of Britain's latest sea queen, the new "Mauretania." Note absence of ventilators, giving passengers a vast area of deck space

engine rooms and to ventilate the ship, thus dispensing with the great array of huge ventilators which obstructed the deck space in the old "Mauretania." The new ship is remarkable for her amount of open deck. Because of the reduction in space

taken by the boilers and the fact that oil, which is stored in the sides and bottom, is used for fuel, the liner has an increased capacity for cargo. The old ship had four funnels, the new only two. In size, the two ships are approximately the same.

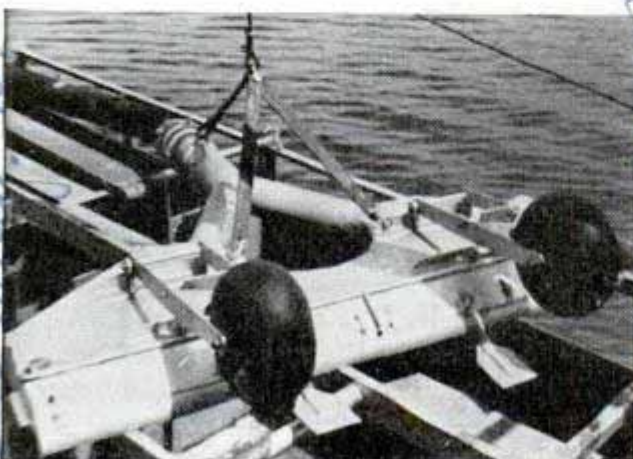
Million-Dollar 'Flying Arsenal' Joins the Navy



Top, the "flying arsenal" on test flight; below, one of the 2,000-pound torpedoes in its sling under a starboard engine

Under the giant wings and in the broad belly of the navy's newest air dreadnaught rides a tremendous cargo of bombs and torpedoes. In its test flights the million-dollar ship, which has been dubbed the "flying arsenal," lifted 49,000 pounds of explosives; under each wing was slung a 2,000-pound torpedo, the pair to be released simultaneously while swooping down at low altitude. Its speed unofficially rated at four miles a minute, the flying boat is powered by four 1,050-horsepower engines and has a range of about 4,000 miles.

Diesel Boat Sucks Up Oysters Like a Vacuum Cleaner



Oyster suction head has airplane wheels

Resembling the vacuum cleaner in operation, a Diesel-powered dredge sucks up oysters by a patented process that speeds up harvesting. The boat is equipped with suction heads to which is attached eight-inch flexible pipe composed of alternate sections of steel and rubber. A centrifugal dredging pump, driven by auxiliary Diesel engines, provides the suction. It is the work of but a few minutes, by manipulation of controls in the pilot house, to hoist one of the suction units, which are fitted with two airplane wheels, over the side, connect it to the suction pump and lower

Consolidated Aircraft Corp
141007
San Diego Calif

Oyster Boat
141025
San Francisco

Seawanhaka

the suction head to the oyster bed. Then, while the boat cruises at three knots, the suction heads pick up enough oysters to expel a steady stream of them onto a moving steel screen. Here water washes all mud and small refuse to the deck below, while the oysters travel with the screen and are discharged into large bins. Ordinarily oysters are harvested by means of power boats which drag chain mesh bags over the beds, each bag having a mouth formed by steel rake jaws which break the oysters loose from the bottom. The bag is hoisted aboard and emptied into bins when full. An additional duty of the boats is to drag what looks like an overgrown floor mop over the beds to pick up starfish and drills, the oyster's worst natural enemies.

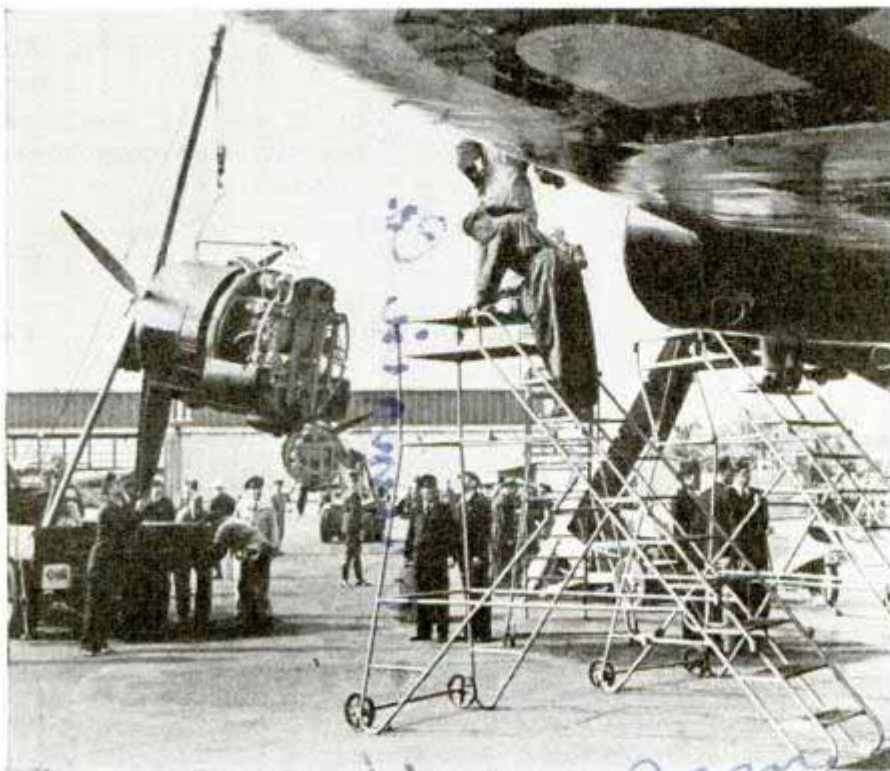
"Big Ears" Listen for Airplanes in Mimic War Raid over Britain



These are sentinels who will spread alarm if warplanes approach England. Sensitive "ears" amplify sound of motors and tell path of approach

Soldiers with big ears stood guard over the British Isles during recent air maneuvers which were featured by a mock invasion by enemy planes. The "ears" were highly sensitive listening devices which the Royal Engineers pointed into the air, picking up the hum of approaching aircraft and relaying the information to the defending air force.

Changing Engines of Plane Takes Just Twenty Minutes

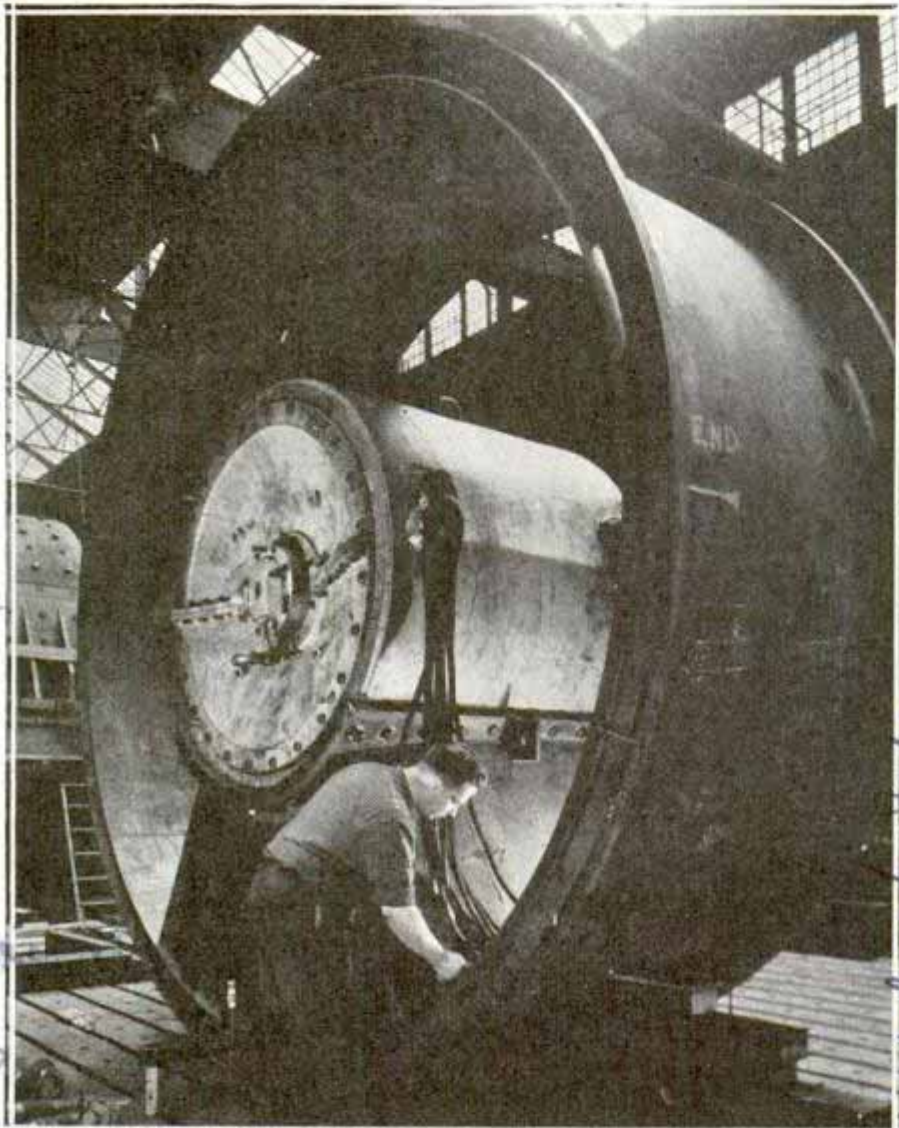


In about the time it takes to change tires on your automobile, mechanics at the Berlin airport can remove an engine from one of the giant Lufthansa transport planes and install a new one. The airport crews have developed a fast routine, making the change of motors in just twenty minutes.

When a Lufthansa air transport needs a new engine, mechanics wheel up portable ladders, tractors with tackle lower the old engine and hoist the new one into place in twenty minutes

12978.

400-Mile-an-Hour Hurricane Stirred Up by Ten-Ton Motor



When this ten-ton, 2,000-horsepower electric motor is harnessed to its huge propeller it will fan 400-mile winds through a steel tunnel

Outdoing the violence of nature's wildest typhoons, a 2,000-horsepower motor will soon stir up 400-mile-an-hour winds in the experimental tunnel at Massachusetts Institute of Technology. While its propeller thrusts air through the tube at twice the velocity of a West Indies hurricane, aeronautical engineers can study performance of model aircraft, skin friction, turbulence and flow separation, factors important in designing fans, windmills, turbines, pumps and airships. The Westinghouse motor can run at four speeds, from 443 to 1,180 revolutions per minute. The test tunnel, six by ten feet in cross-section, will be equipped to reproduce barometric pressures up to an altitude of 35,000 feet, pressures varying from one-fourth of an atmosphere to four times sea-level atmosphere. The chamber is made of steel plates three-eighths to five-eighths inch thick, but even this is insufficient to risk maximum air-pressure testing, so the tunnel will be filled with water and the water put under

air pressure, the water reducing the punching power of the man-made tornado. The motor weighs ten tons and because temperatures up to 200 degrees Fahrenheit will develop in the tunnel it must be air conditioned to seventy-five degrees. This will be done by a separate blower driven by a forty-horsepower motor.

Utility Vise Adapted to Precise Drilling

Mounted on a swivel base which permits quick, easy adjustments, a utility vise makes itself useful at the drill press, shaper or small milling machine and as a welding jig. It is large enough to handle work up to four and three-quarters inches thick or as thin as tissue paper. Adjustable to any angle, it is handy for holding odd-shaped pieces which require precision drilling. Made of steel and cast iron, the vise has a two-piece face; the bottom is machined to receive the upper part, the vise proper, and the one-by-two inch flat steel jaws are machined to fit the secondary base so that the guide slides hold them rigid.



Cambridge Mass

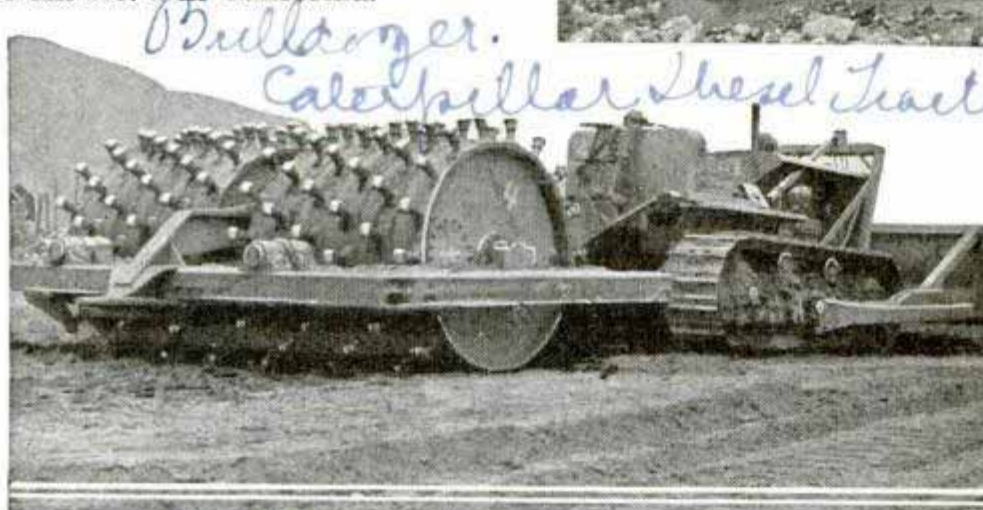
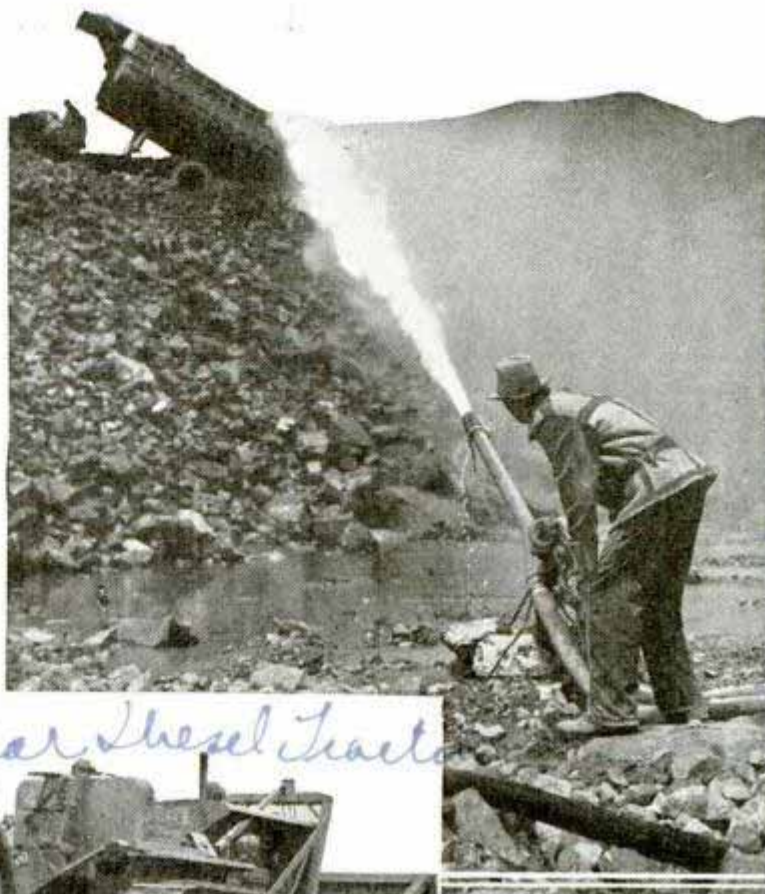
Murdock

Shenquin Co

Shenquin Co
Murdock

Big Earth Dams Built Faster with Water 'Guns'

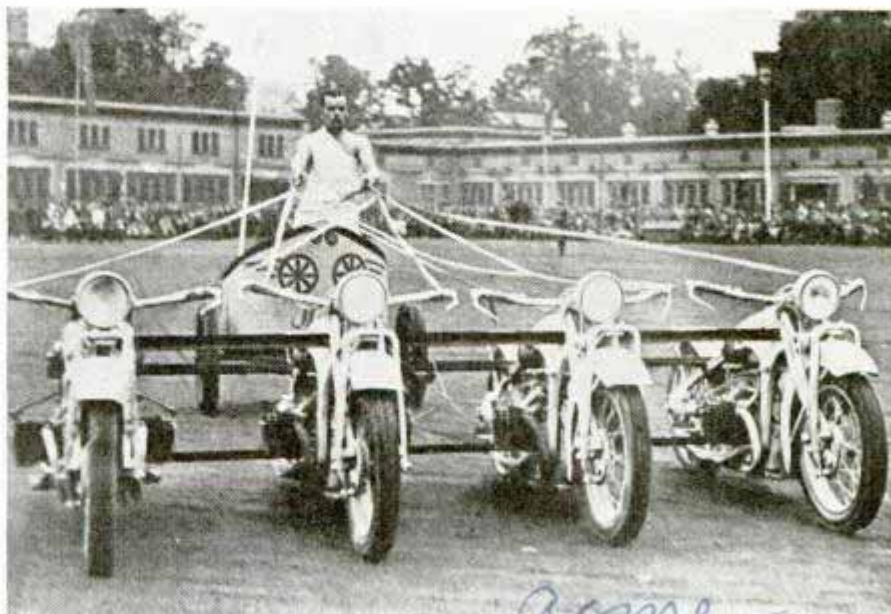
Placer gold-mining methods, calling for use of powerful water "guns," are being used in the building of great earthen dams. The streams of water are directed from the big nozzles to saturate freshly dumped earth and small rock with water under high pressure. As a result the small particles of rock and crushed stone are bound to the earth, making the entire mass pack more solidly. On some dams, the top is tamped by a big "sheepshank" roller propelled by tractor. One of the spike-studded rollers is seen below at work on the huge San Gabriel Dam No. 2 in California.



Top, hydraulic "gun" at work on dam. Left, giant roller being used to tamp top of the dam

Chariot of 1938 Ben Hur Drawn by Four Motorcycles

For the Ben Hur of the motor age, no four-horse team would do. Instead, the charioteer—stunting in a sports festival sponsored by a Potsdam regiment in Germany—rides on a rubber-tired chariot drawn by four motorcycles. "Reins" in the driver's hands lead to the handlebars of all four "bikes," which are harnessed together by three horizontal bars. The harness recalls certain farm tractors which are controlled by reins.



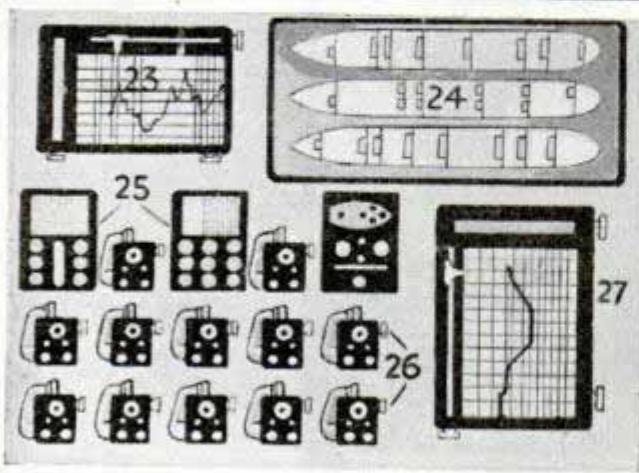
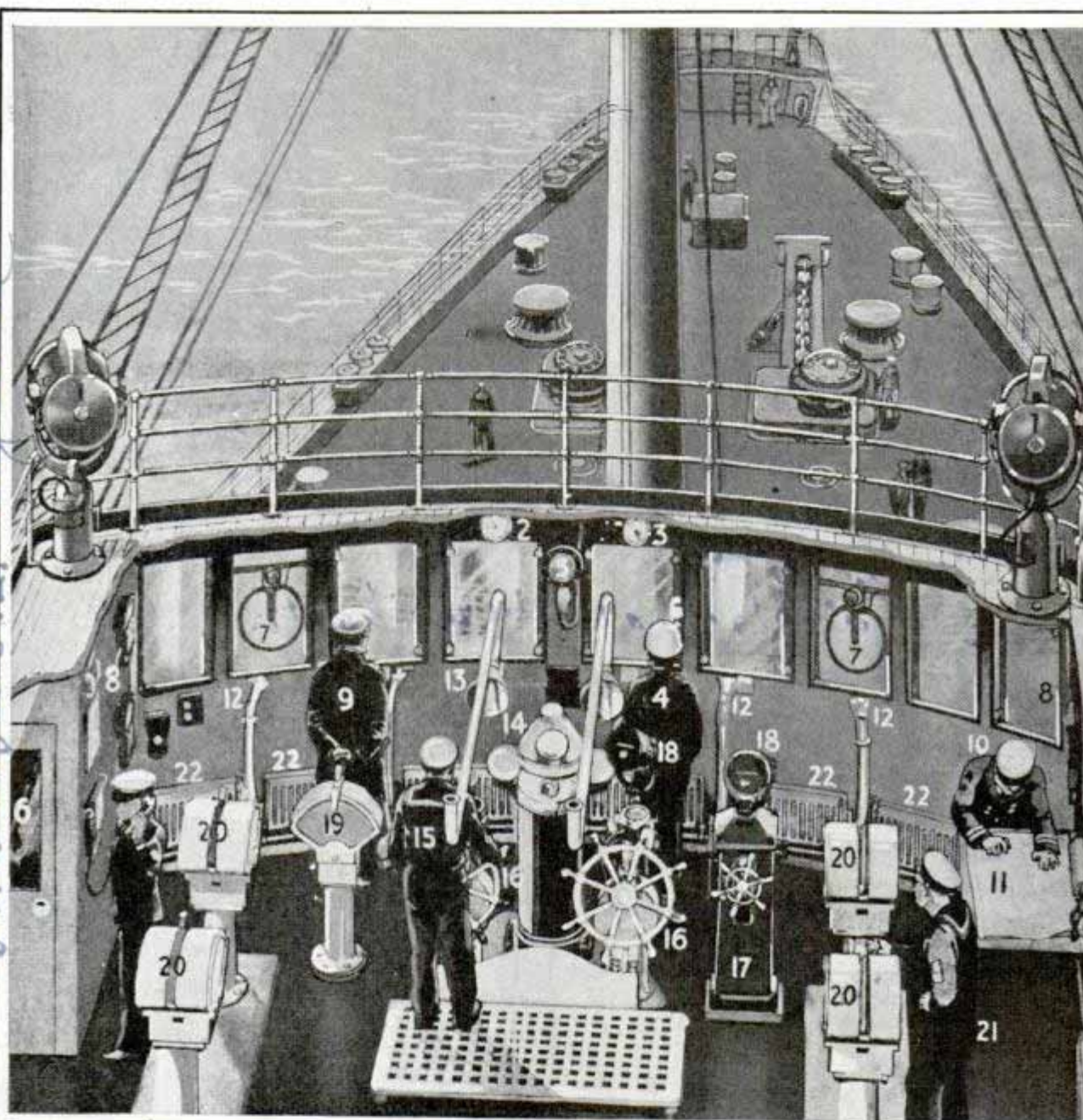
Charioteer in German sports festival drives four motorcycles with reins

Berlin

8/13/38

The Bridge—'Brain' of a Modern Ocean Liner

Admiral's Pass. Ld. 9 3rd long Acce. 10/16



- 1. 18-inch searchlights
 - 2. New York time
 - 3. Greenwich time
 - 4. Junior officer
 - 5. Gyro instruments
 - 6. Sound-proof cabinet
 - 7. Clear view screens
 - 8. Revolution indicators
 - 9. Senior officer of the watch
 - 10. Officer of the watch
 - 11. Folding chart table with screened lamp
 - 12. Voice pipes
 - 13. Voice pipes for orders to helmsman
 - 14. Magnetic compass
 - 15. Quartermaster at wheel
 - 16. Duplicated steering wheels in case of failure
 - 17. "Iron Mike" gyro pilot
 - 18. Steering repeaters
 - 19. Steering telegraph to docking bridge (aft)
 - 20. Engine telegraphs
 - 21. Seaman on telegraph
 - 22. Wheel house heating radiators
- INSET (at Left)
- 23. Chart of depths of seabed being recorded
 - 24. Watertight doors indicator
 - 25. Fire indicators
 - 26. Loud-speaking telephones to every part of ship
 - 27. Course recorder operated electrically from gyro

Few of the thousands of passengers who cross the Atlantic or the Pacific ever see the bridge, that point from which the mighty liner on which they ride is controlled. And even if they were permitted to visit the control room they would be

H 1016
 unlikely to know what was going on unless an officer explained the function of the various instruments and controls. A visit to the control room of one big liner reveals that atop the bridge are two eighteen-inch searchlights, used for many purposes, one of which may be a dramatic rescue at sea. Inside the room are the officers of the watch at their posts, the quartermaster at the wheel and the seaman at the telegraphs, ready to transmit orders to the engineers far below. There are two clocks, one with New York time and the other with Greenwich time; duplicate steering wheels in case either fails; the "Iron Mike" gyro pilot which is capable of keeping the ship on course without human aid; revolution indicators; magnetic compass, and a host of other instruments.

H 954
Landlubbers Hoist Their Sails and Go Yachting on Bikes

Boats are nice, but not necessary for a sailing trip. Right in Miami, Fla., a city of yachtsmen, two youths who had bicycles but no boats hoisted their sails over the bikes and let the trade winds haul them down the drive.



Two dry-land sailors roll merrily along a Miami street on their two-wheeled "yachts"

H 1018
Focuser and View Finder Combined on Camera



Using focuser-view finder on camera equipped with harness and metal supports

Helping to make better pictures is the purpose of two reflex focusers for Contax lenses. Each incorporates a mirror, coupled with the shutter through a single cable release, which is automatically lifted away just before exposure and returns of itself. The reflex principle permits focusing and viewing the subject simultaneously. The focusing eyepiece incorporates a five-times magnifier. One of the focusers is for closeups only. Since it extends the lens about three inches forward of its normal position, it is usable only for large-scale reproduction at close working distances. The other focuser is for normal distances and permits accurate and rapid focusing and composition at all distances. Another new development in the photographic field is a harness for use with practically all still and movie cameras. Two metal uprights are braced across the abdomen and suspended comfortably by adjustable neck straps, and carry a tilting head to which the camera is attached with a standard tripod screw. The camera is held continually in position before the eye so that both hands are always free to arrange the subject material or to carry on the usual activities.

485-5th Ave New York
 122 S. Michigan Chicago
 Carl Davis, Inc. Los Angeles
 728 S. Hill

141063

Self-Heating Gas Flatiron Carries Its Own Tank



Pressure gas tank attached to iron makes it independent of electric source or stove

In camp or at home, away from gas stove and electric line, the housewife can do her ironing with a self-heating iron. Using gas under pressure, it has its own small tank attached, and its chromium-plated base heats evenly.

Theory of Exploding Stars Traces Their Growth

Stars grow old, Prof. George Gamow of George Washington University suggests, by gradually burning up their hydrogen and getting hotter and brighter. A source of nuclear energy within the star causes this first stage in the star's evolution. Next is a progressive contraction in which the star's radiation comes from gravitational energy alone. However, at the point between the two stages, the star's mass must redistribute itself, during which period gravitational energy is liberated which shows up, suggests the professor, as a short-time additional brightness. It is this brightness which may well be the cause of

the bright flareup of the so-called "new" stars. What happens after contraction sets in depends on its mass. For small stars, less than three and two-tenths times as large as the sun, the contraction leads to the type known as white dwarfs which have a degenerated electron gas inside and very small energy production. For larger stars, the contraction creates a central neutron core inside the star which represents a practically unlimited source of energy. The growth of such a neutron core will bring about an increase in the amount of energy liberated and probably make the star's atmosphere expand. In this state it may enter the star class known as the giants. Finally the explosion of such giant stars will lead to extremely bright novae, or exploding stars, which might be identified as the super-novae, Prof. Gamow concludes in his theory of star evolution.

141087

Auto Wheel Runs Generator for AC or DC Power

Attached to the rear end of an automobile, a new portable power unit is driven by the car's rear wheel. It consists of a generator mounted on a steel rack which is bolted to the bumper, and a welded steel driving pulley which is attached quickly to the wheel. The 110-volt AC generator is a combination unit which also provides a source of direct current at six, twelve,



Wheel of car jacked up to operate generator that powers stationary machinery

eighteen or thirty-two volts. The generator is available in various models up to 2,000-watt size. On 300 and 500-watt sizes, the direct-current capacity is about half the capacity of the alternating current winding. All terminals are brought to the

Kato Engineering Co.
530 Franklin St.

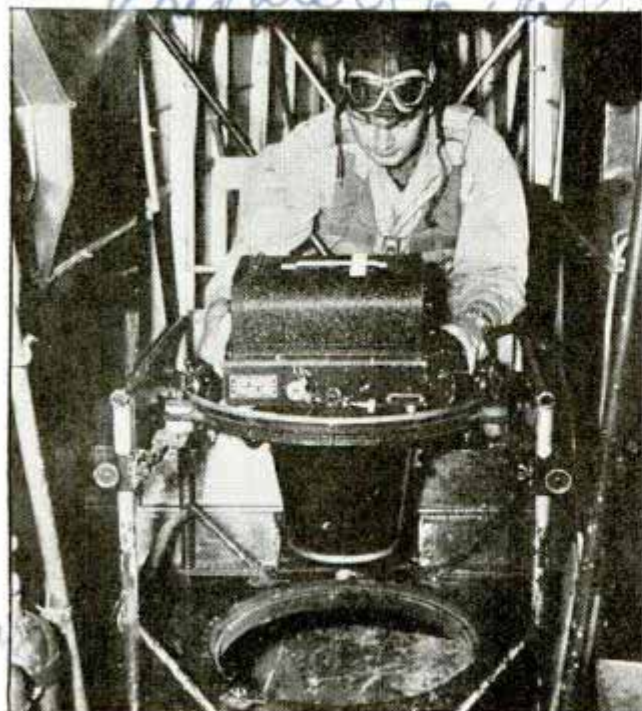
The Coleman Lamp & Stove Co.
1100
Salem, Oregon
9/20/38

outside of the generator, thus permitting use of a field rheostat for close control. Multi-wire cable is furnished to conduct power into the auto or to stationary motorized apparatus near by. The generator may be operated while the car is moving or stationary, the rear wheel being jacked up for stationary operation. The unit has a wide range of usefulness in public-address equipment, floodlights, moving pictures and all sorts of motorized outdoor machinery, being especially adapted to providing power for traveling exhibits, movies and farm apparatus.

1096

Army "Eye" Maps Terrain in Mock War

High above Kentucky's blue grass hills rides an aerial camera-man in a U. S. Air Corps photographic plane, mapping the field of battle while troops maneuver in sham war below. The area surrounding the Fort Knox gold depository was mapped as a part of the recent war games there, the photographer "shooting" through a circular window in the floor of his plane.



Aerial photographer sights his camera over Fort Knox, Ky., as sham war is waged below him

Concrete Poured from Bridge Rolling Along Sixty-Foot Canal



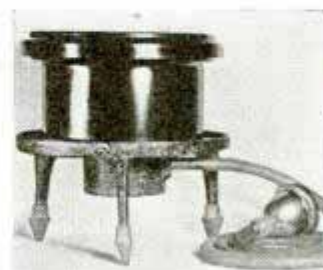
Rolling cement across bridge that moves along the canal on wheels at either end

To solve the problem of getting concrete across the sixty-foot canal of the Colorado river aqueduct, a rolling bridge was designed. Both sides of the canal were to be fenced with six-foot wire supported by steel posts set in concrete. The bridge made it possible to carry on operations on both sides of the canal at the same time. Concrete was poured directly from the end of the bridge into the holes and then the span was moved forward by a hand crank. In all, 152 miles of fences were constructed to inclose all open sections of the 392-mile aqueduct including canals and reservoirs. Two hundred and fifteen gates were included in the fence.

1098

Agitator for Developing Tank Vibrated by Running Water

Running water operates an agitator devised to speed up the finishing of negatives in a daylight developing tank. When attached to

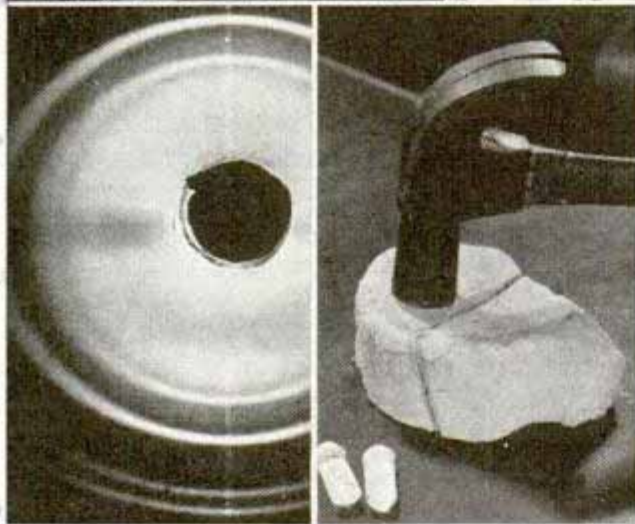


any faucet, the water causes a small turbine to set up a vibratory motion, the degree of agitation regulated by adjusting the faucet handle. Rubber feet prevent any spilling of solution.

Canaday Sound Apparatus Co.

for Pittsburgh Steel Co. 1570 Garden City Pittsburgh Pa. made by Esarlinghouse Bros. 2418 E. 16th, Los Angeles, Calif. Road Cleveland Ohio

12 1044
**Long-Sought Boric Crystal
 Discovered in a Tin Can**



Scientist "cooks" new crystal in a tin can. Below, X-ray diffraction picture and blow showing hardness

For years scientists have hunted for some method of transforming boric oxide from a glass to a crystal. At last a chemist in the Westinghouse Research Laboratories has found the secret—in a tin can! The chemist, Leon McCulloch, was working with boric acid fused in loosely covered quart tin cans in an electric oven, heated between 225 and 250 degrees centigrade. He wanted a liquid mixture for insulating electric coils. But his mixture turned milky, then pasty, finally becoming hard as stone. He weighed it. The specific gravity of the crystal was a third greater than a similar lump of boric-oxide glass, and it was so hard that it took several blows of a hammer to shatter it. An X-ray

picture brought out sharp diffraction lines and proved the substance was the crystal for which science had been looking. In the heating process, boric acid—fundamentally the same acid used for eye washes and antiseptics—changed to the crystalline state much as sugar syrup crystallizes into fudge. Boric-oxide glass has a high resistance to heat shock and so is useful in chemical and industrial processes. The new crystal has a definite, controllable melting point and should prove valuable in commercial glass manufacture.

12 1068
**Forty-Five Mile Speed Attained
 by Model Racing Car**

Forty-five miles an hour on a fourteen-inch wheelbase is the top performance of a tiny racing automobile built in spare time by a California youth. It weighs seven pounds, and travels about two miles on its tank capacity of two ounces of gasoline. Under the hood is a one-cylinder engine of one-fifth horsepower. Built chiefly of pressed steel, with tubular steel axles, the car has wheels of wood mounted with rubber ash-tray tires.



One-fifth horsepower motor gives this model racing car plenty of speed. Its tires came from ash trays

Acma
 Ralph Richard
 Hawthorne, Calif

Research Engineer and Chemist
 Westinghouse Research Laboratories
 East Pittsburgh, Pa.
 12 1044

120-Mile Iron Horse Hauls Fintail Streamliner

Under the streamline jacket of the "iron horse" just added to the Milwaukee Railroad's "stables" is an engine packed with more than enough power to haul a loaded nine-car passenger train at a speed of two miles a minute. It may never be called on to do that, but the power is there, and those seven-foot drive wheels must pound the rails around 100 miles an hour to keep the "Hiawatha" on its schedule of 410 miles in 390 minutes between Chi-



Eighty-four inch driving wheels of this powerful steam streamliner pull nine cars at 120 miles an hour. Notice longitudinal steel ribs of train

ago and St. Paul. Replacing equipment that was new when the streamliners began service in 1935, the latest train in the fleet is new from the wheels up. The steel cars are ribbed longitudinally with semicircular bars, and structural strength is added to the slant-roofed rear observation car—slanted to reduce wind drag—by a vertical and four horizontal fins, the latter serving

also as sunshades for the rear windows. New trucks have been developed, with automobile-type hydraulic shock absorbers, coil springs and stabilizers to absorb sideway. Rubber mountings throughout trucks, couplers and buffer plates quiet vibration. A novelty in the tavern car is a station indicator; after each stop the name of the next station is illuminated.

#1062

Hobbyist Strings Bottle Caps into Many Useful Articles



Out of the ash can comes the material for a Miami modelmaker. His hobby is fashioning household articles out of old bottle caps. Small tables, flower stands for the porch, and baskets are some of his creations, made by stringing the metal caps on old wire coat hangers. One of the largest articles built of this strange material was a model airplane requiring 2,200 bottle caps.

Scientists have estimated that if all the ice in the polar regions melted it would raise the ocean level at least 100 feet, perhaps more than 200.

Bottle caps are strange material for the modelmaker. More than 2,000 were strung together to make this airplane; hundreds more made baskets

John Hanley
 Smithsonian
 1937

14 10 42

Mr. Wallace St. Morris
5902 Magnolia Ave.
Chicago

OFF the "PLATTER"



Top, control room where engineer manipulates "mixing panel" which blends volume and intensity of sound. Bottom, examining wax record under microscope

It is a big business, this offspring of radio. Every broadcasting station in the United States, without exception, uses these "platters." Many of the smaller stations depend on them for a majority of the time they are on the air each day.

As an illustration of platter adaptability, hour-long programs, such as the Ford hour, have been put on records from the actual chain broadcast, then duplicate platters have been shipped to small stations throughout the country for playing at such later time as local Ford dealers might wish.

Along about dinner time in the evening you hear your radio say: "Well, here it is 5:45 again, and Orphan Annie time." No matter whether in Maine or California, the Orphan Annie doings greet their listeners at that time. But those words were spoken, as well as the rest of the program, four or five weeks before you hear them, put on platters and shipped to the stations well in advance of schedule. Each of the country's four time belts gets its Orphan Annie, then, at 5:45. The only other way, and not a whit

more satisfactory, would be for the Orphan Annie actors to repeat each broadcast four times a night.

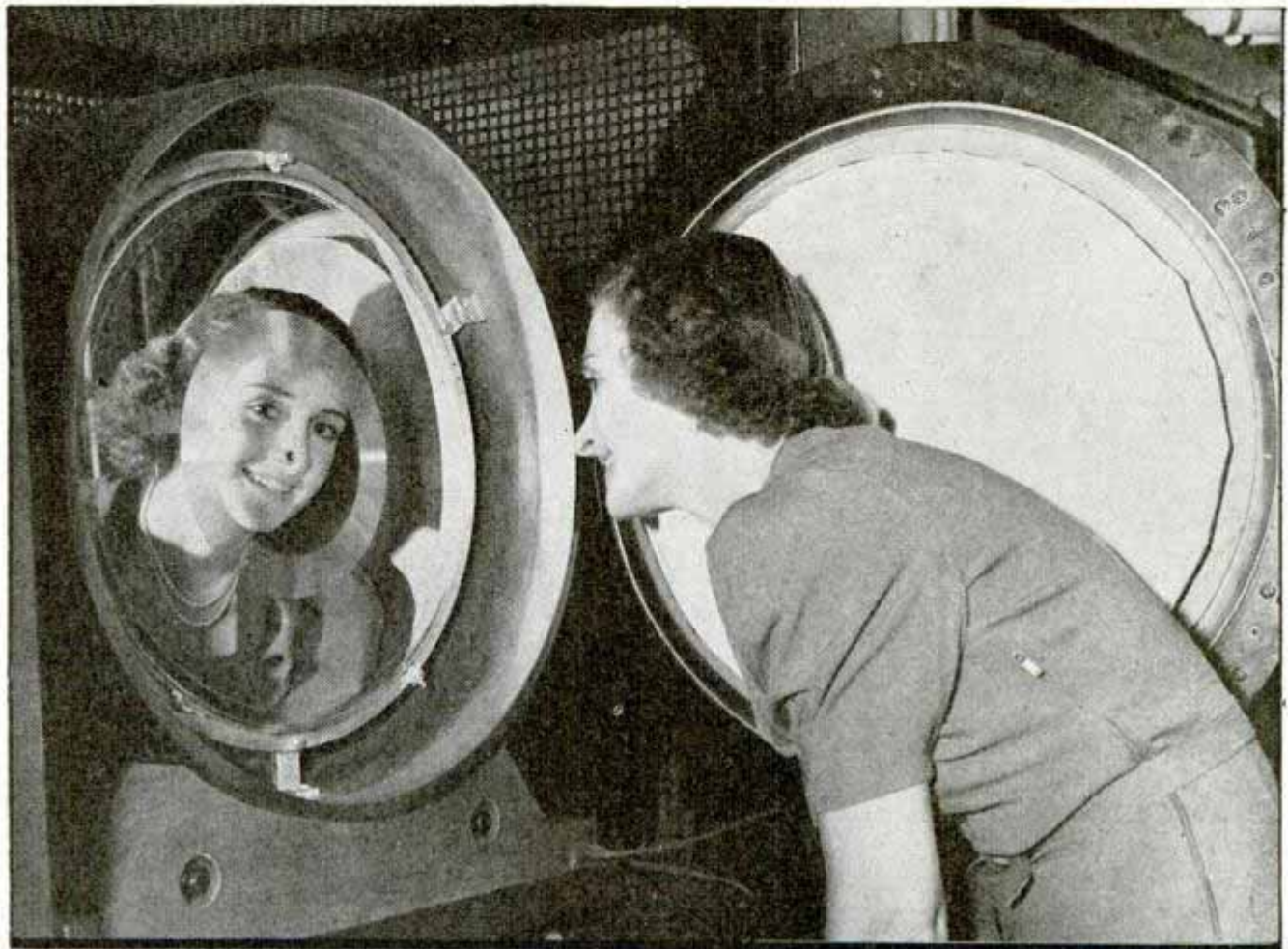
There is advertising psychology behind all this. Stations and certain types of products have their peak hours of listeners. The youngsters are at home by 5:45, and the sponsors of Orphan Annie know it. The same reasoning applies to other prod-

WHEN a voice from your radio says: "This is an electrical transcription," don't turn to another station, for what you are about to hear is one of the wonders of modern broadcasting. Last year the customers of one of the leading makers of electrical transcriptions for broadcasting purposes paid \$30,000,000 for the records and station time.

World Broadcasting System
7/11/54

H 1042

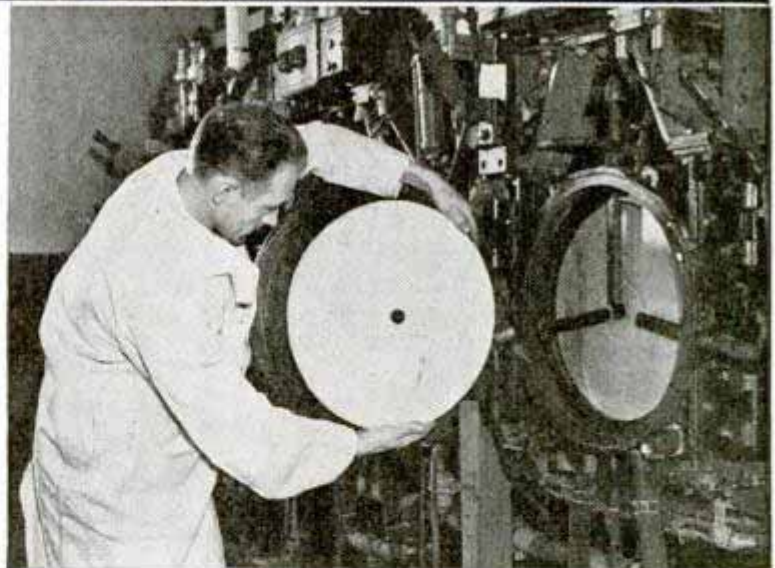
and into YOUR HOME



ucts sold via the air waves. Eight o'clock at night in New York may be a splendid time to sell something via radio, but that is five in the afternoon in California. And eight o'clock in California may be four o'clock during New York's daylight saving summer months. The platters supply the answer.

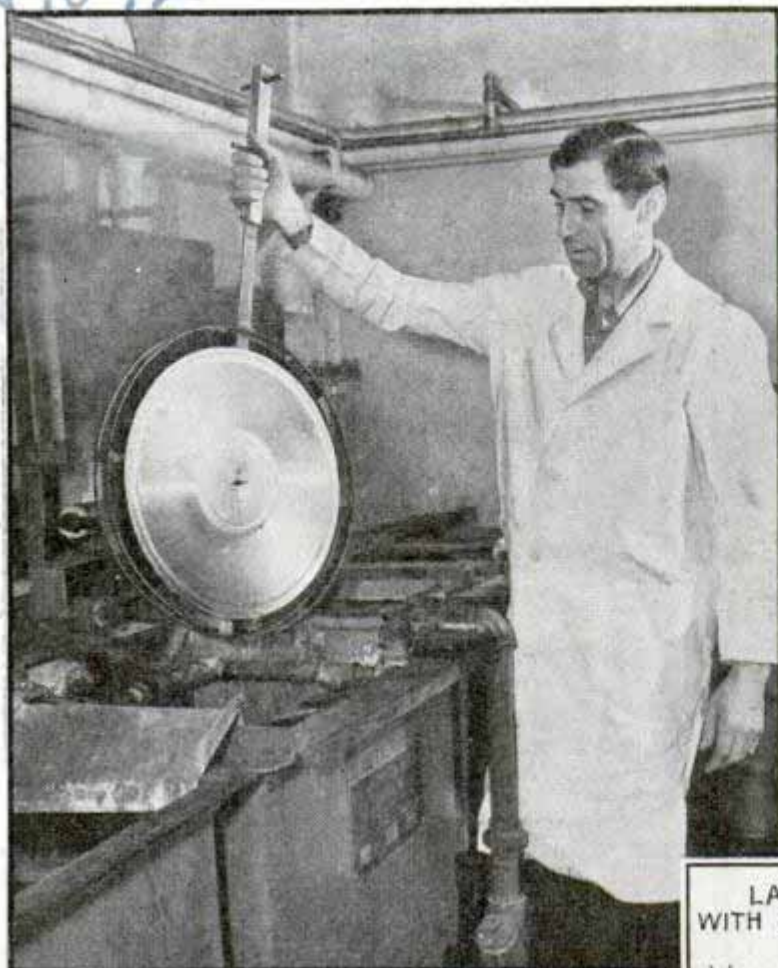
A regular broadcasting studio is interesting, but the plant of a modern electrical transcription company is even more so, for, in addition to the fittings of a broadcasting studio, there is an elaborate and intricate mechanical equipment devoted to the making of the original records, and of the platters after the original has been cut.

In the studio itself, where the actors, musicians and others perform, you will find the walls and ceiling broken up into a considerable number of flat surfaces, no one of which is parallel to another. Knobbed



Original record goes into vacuum-sealed chamber at top to be coated with gold. Bottom, placing record in machine where it is coated with copper

projections are found in spots on the ceiling. All this is to eliminate echo and "backslap" of music and voices. A delicate microphone hangs from the ceiling—so keen in its sensitiveness that an ordinary conversation half a dozen feet away



can be picked up and recorded in all its distinctness. Gone are the days when the singer or speaker had to park his vocal organs almost in contact with the old-time "mike."

Transcription studio atmosphere is pretty much the same as in a broadcasting studio. The only essential difference is that the product of the former goes on a record, while that of the latter goes directly onto the air. The only things missing from a transcription studio are seats for an audience. In this respect the business is somewhat similar to the motion-picture studios; the product of both is intended for later consumption.

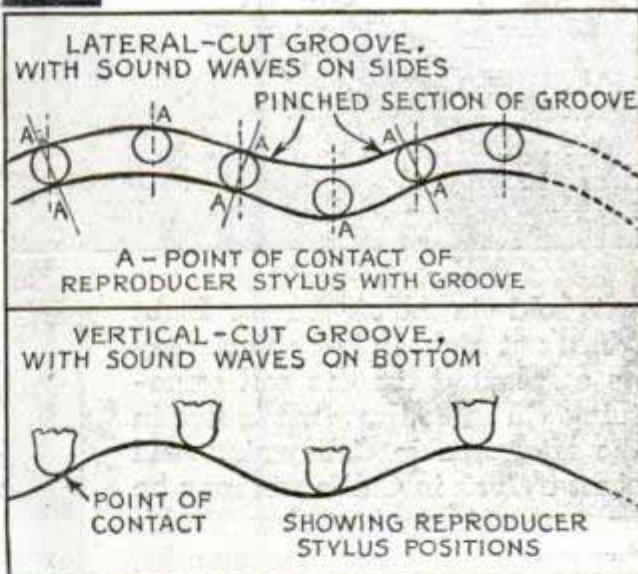
However, at the transcription plants, as at broadcasting studios, you will find musicians rehearsing in various studios, and even overflowing into the halls. Actors sit waiting and watching the clock, for this business maintains a strict schedule. A platter runs fifteen minutes on the air, but there is an average of eighteen hours of writing, rehearsing, casting and producing for each quarter hour of entertainment.

Imagine a program being recorded. In a studio the action is taking place—the mu-

sic, sketch, talk or whatever is to be put on wax. As it proceeds, an engineer, seated at a "mixing panel," and watching through a glass window the activity in the studio as he listens, manipulates the knobs on his panel, so proper volume and intensity of sound are obtained.

In an adjoining room—the recording room—a stylus is cutting its continuous circular path around a blank record, the music having been passed on to that room via wire from the control room. The program finished, the record goes into a vacuum-sealed chamber. Here, for twenty minutes, it is bombarded with tiny gold particles, so that it comes out with a millionth-of-an-inch gold plating on every little groove and hollow.

Next the record, with its beau-



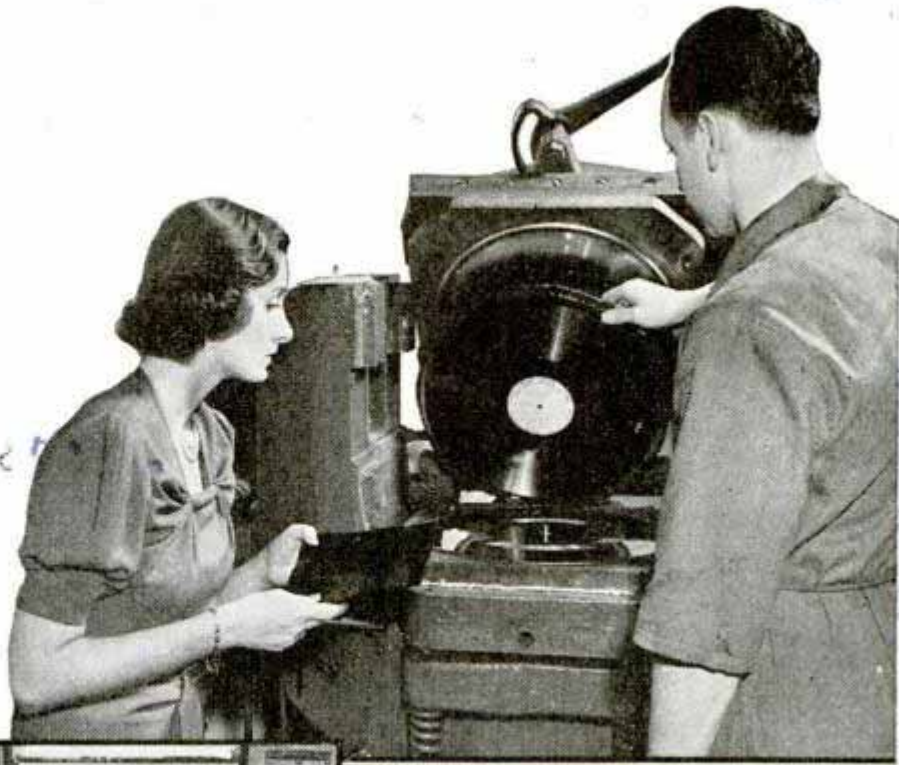
Dunking a disk in a chromium bath. Diagrams show difference in lateral-cut and vertical-cut grooves

tiful gold film, goes into a solution of copper sulphate. When it comes out it has a layer of copper on top of the gold. Another machine adds a thick layer of copper to the surface. Now, obviously, we have a negative impression of the original record, impressed on the gold, to which the copper plate is attached. The wax is then stripped off, being no longer needed, and the copper-and-gold disk is trimmed down to size. Next it goes into a chromium bath. Out of this it comes chromium-plated, goes into a drying oven, gets a final smoothing and

alining—and we have a master record from which any number of platters may be made.

Why the gold film? Because gold insures purity of the original sound, and freedom from any possibility of scratchiness. Experience and experiment have proved it the best material for the purpose, and superior to graphite, which once was the accepted finish.

Vertical, or "hill-and-dale," recording is conceded superior to lateral recording, and by far the



Pair of turntables enables radio station to present an endless program, one record picking up where the other leaves off. Top, hydraulic press which turns out records, using the master record as a die

greater portion of transcriptions is made by the former method. One excellence of this system lies in the fact that a vertically cut groove permits a lightweight reproducer to be used, with a very small moving part that easily and accurately follows the extremely complex waves impressed on the record. This results in low-record wear, which in turn keeps mechanical noises to a minimum.

Phonograph records are made by the lateral recording method, the sound waves being cut on the sides of the groove. When played, the needle bounces from side to

side of the groove. As a result, after about twenty playings the sound waves begin to wear from the impact of the needle, and the record loses its original sharpness and purity of tone. However, with a vertically cut transcription, the sound waves lie at the bottom of the groove, and such a record can be played from 1,800 to 2,000 times before it shows any diminution in tonal quality.

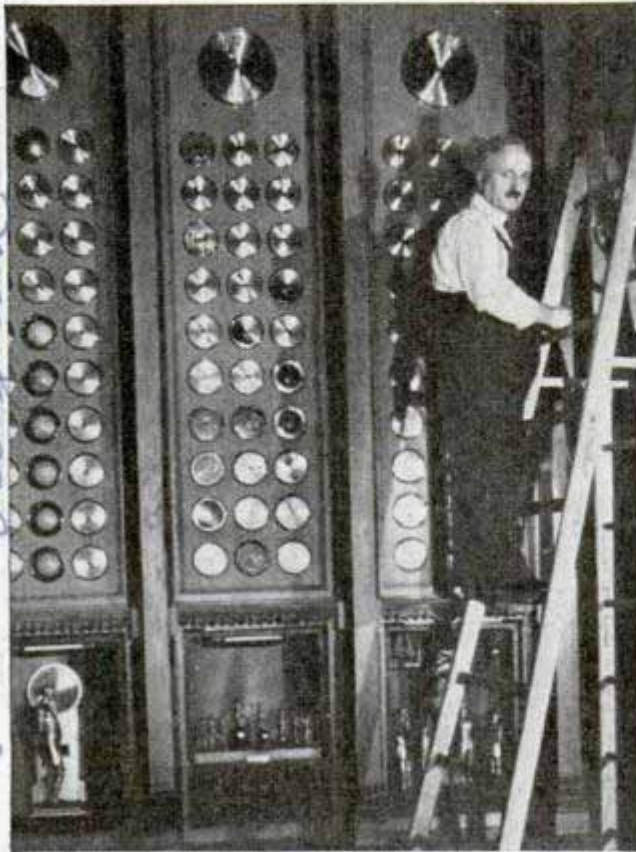
The electrical transcription makers have had to lick many problems in order to turn out their present product which often defies detection from an original broadcast. The tonal range of the human ear had to be considered, and every step taken to fulfill its

exactions. The normal ear has a range from twenty to 16,000 cycles per second. At the lower end are the slow vibrations, such as cannon fire. At the upper end the jingle of keys or the higher notes of an oboe will reach 16,000 cycles. Your telephone will transmit within the forty to 3,500-cycle range. Lateral-cut transcriptions reproduce within the forty to 6,500-cycle range. Vertically recorded transcriptions extend the limit to 8,500 cycles, and are equal in trueness to network programs put on the air at the point of origination.

(Continued to page 132A)

*Telephone Laboratories
for Western Electric
46 West Street
New York*

'Wonder Clock' Hands Turn Once in 26,000 Years



Belgian clockmaker installing the clock with ninety-three faces in a New York museum

(Pictorial Feature)

One master movement controls ninety-three different dials on the "Wonder Clock" built by a Belgian clockmaker. It was brought to this country recently for exhibition at the Museum of Science and Industry in New York. The various faces show the time divisions of the world, the location and movements of the earth, sun, moon, planets and stars, high and low tides at the principal ports and other phenomena—all synchronized by the single movement. Some of the clock hands cannot be seen moving—the slowest indicator rotates but once in 26,000 years, while the fastest revolves around its dial in one-hundredth of a second. The clockmaker, Lodewyk Zimmer of Lierre, Belgium, took three years to build the mechanism.

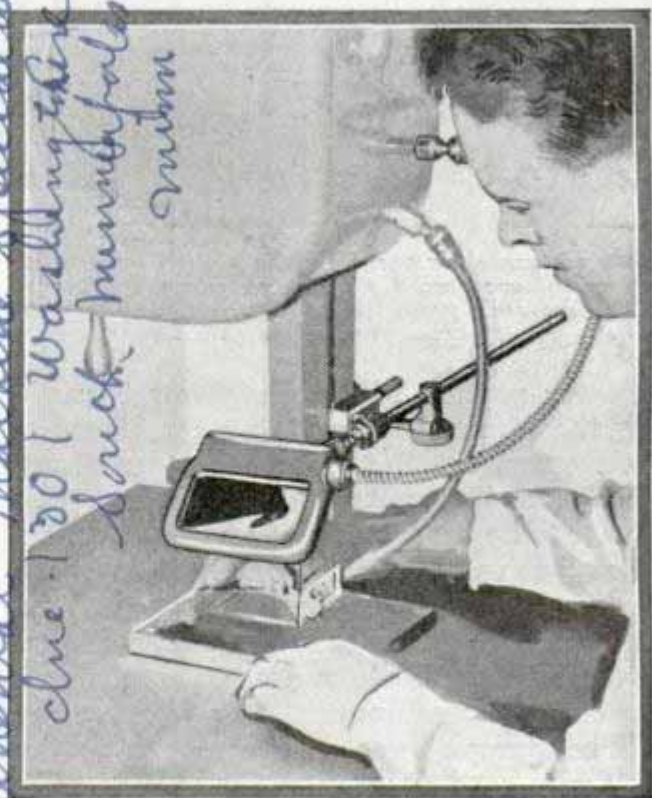
Built by Lodewyk Zimmer of Lierre, Belgium

tion at any moment. Even in dense fog or rainstorms the device, operated by radio waves, reveals the position of the ship and enables airport men to guide the pilot in safely by radio telephone. Any of ten wave lengths can be selected remotely for the signals. As the pilot talks, the spot of green light moves to the correct position on the circular screen of a cathode-ray tube, and compass markings around the edge of the screen enable the dispatcher to give the pilot his exact bearings.

7d 1005

Magnifying Glass Has Light to Illuminate Work

Additional illumination on close work is provided by an electric lamp built into a magnifying glass now on the market. The lamp plugs into the standard socket. The lens is of ample size, two by three and three-fourths inches, permitting vision with both eyes without strain. The lamp is ball jointed and clamps to the guide post. Adjustment of the glass is quickly made with a double-lock clamp. The fifteen-watt lamp is inclosed in the same fixture as the two-power glass. Illumination is even and covers the entire field of view. The outfit is especially useful in connection with precision-work machines.



Using the new magnifying glass which has fifteen-watt electric lamp

Moving Light on Glass Screen Shows Position of Plane

Watching a tiny speck of green light moving across a frosted glass screen, airline dispatchers can follow the path of an approaching plane and tell its exact posi-

7d 1066

*controllable machine specialties
due 1201 Washington
Street
New York*

Vast Relief Map Matches Earth's Curvature



Mapmaker finds a place for a tiny segment of United States in the huge relief map, so accurately made that it conforms to curvature of earth's surface. It is built on steel frame sixty-three by forty-five feet

It will be more than a year before the huge relief map of the United States, begun at Wellesley, Mass., in 1923, is completed. The task calls for the utmost

precision, for it will reproduce in exact proportion the curvature of the earth. The states are being laid out in sections on a steel frame sixty-three by forty-five feet.

Auto Engine Drives Mower Built of Old Machine Parts



Grain mower built of odd parts is driven by automobile engine

Needing a mowing machine, a Utah farmer-blacksmith collected odd parts around the farm and built himself one. Its motor came from an old passenger automobile, its transmission from a truck; the front wheels belonged to a manure spreader, the upright guide shaft is an artillery caisson axle. The frame is of oak. The finished power mower cuts four times as much hay in a day as a team-drawn machine.

The average per capita consumption of water for all purposes in the United States is more than 100 gallons a day.

Built by Neville Jensen, Brigham

Smithsonian Institution

Adham Press. Ltd. 93 Long acre, London W.C.2

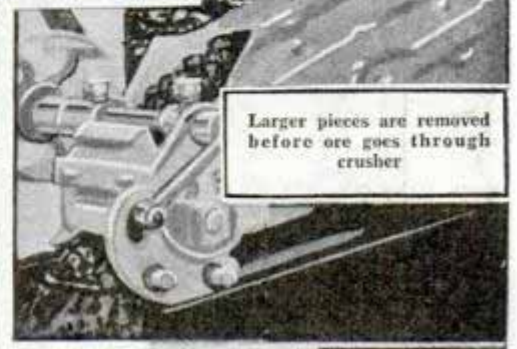


The EPIC STORY of RADIUM

Hundreds of tons of pitchblende ore mined daily must be concentrated to about two tons for removal of silver, uranium and radium



Larger pieces are removed before ore goes through crusher

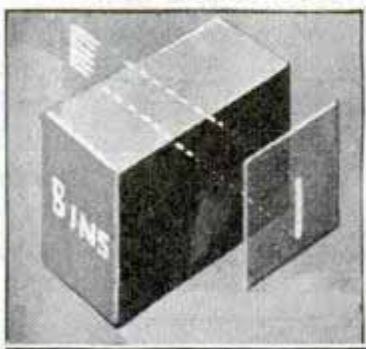


RADIUM was discovered by Madame Marie Curie, who with her husband found the secret four years after being assigned the task in 1892. Gilbert La Bine found vast fields of pitchblende, from which radium is extracted, in Canada in 1930, thus assuring the world of a steady supply of the deadly life saver at considerably lower cost than had been possible before. There radium is mined in the largest quantities known. More than 12,000 tons of pitchblende ore have to be blasted and put through various processes before a full ounce of radium can be obtained. On these pages is the story of radium, from the mines near Eldorado, Canada, through the refineries 1,500 miles away.

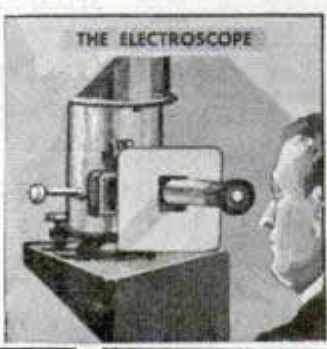


Packing pitchblende concentrates into 120-pound packages for easy transportation. Mask protects worker from dust

AMAZING FACTS ABOUT RADIUM



Eight-inch battleship armor cannot stop radium rays from recording on photographic plate



The electroscopes detects a millionth part of a milligram of radium. Only a twelve-inch lead screen upsets its sensitivity

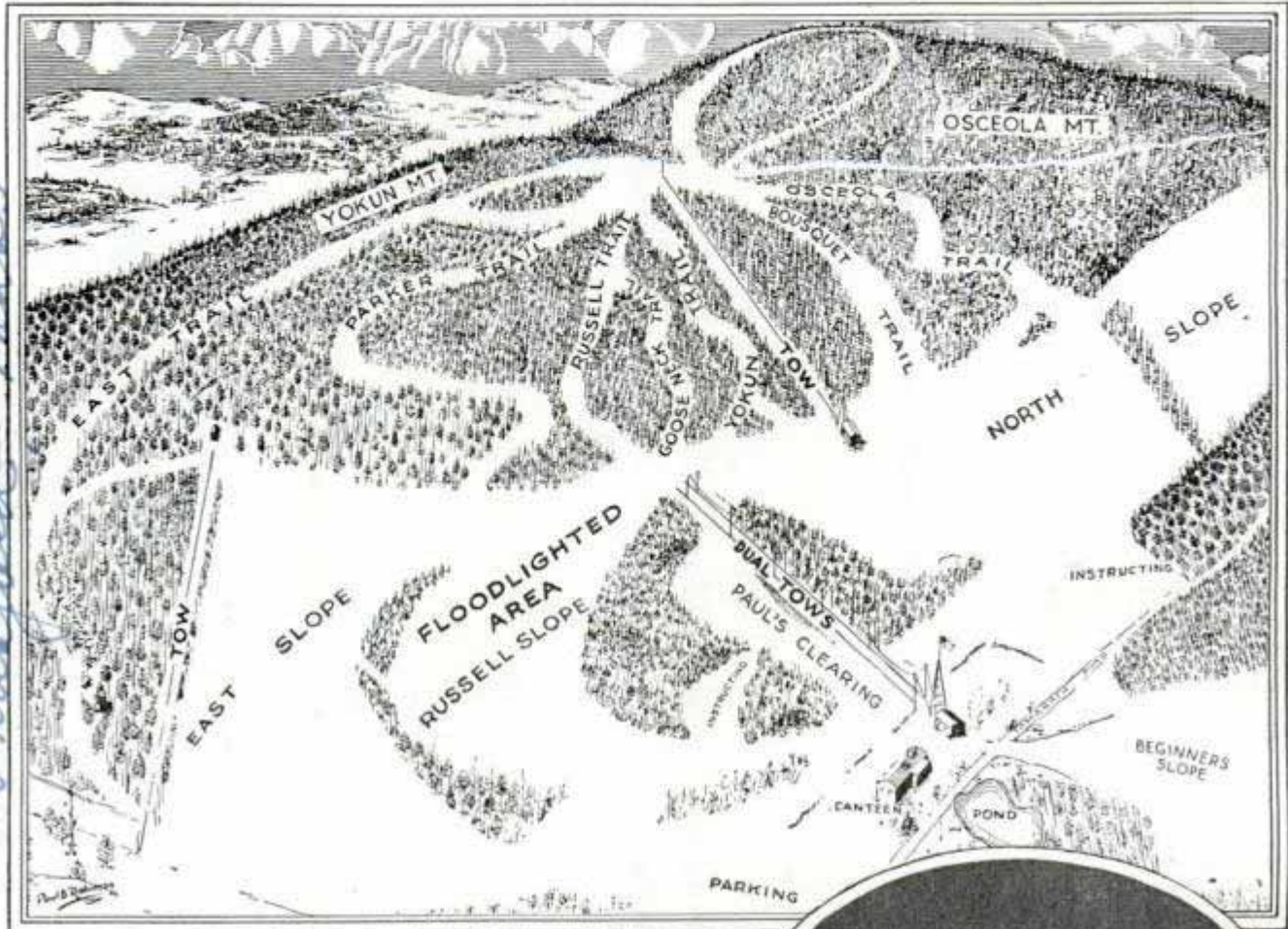


Radium is stored in a safe with ten-inch lead walls



12688.

Mountainside Is Cleared for Floodlit Ski Slope



Bousquet's
 Drawing shows trails and clearings that form skiers' paradise in Berkshire Hills. Snow scooter at left can slide to any part of mountain after reaching top by tow line. Above, night view of floodlit ski center



In the heart of the Berkshire Hills near Pittsfield, Mass., ski trails and wide, open slopes have been cut from a wooded mountainside for a winter sports haven. Two to three thousand skiers come by snow train or automobile on winter week ends, ride to the top of the slope by one of the several tow ropes and then ski through the

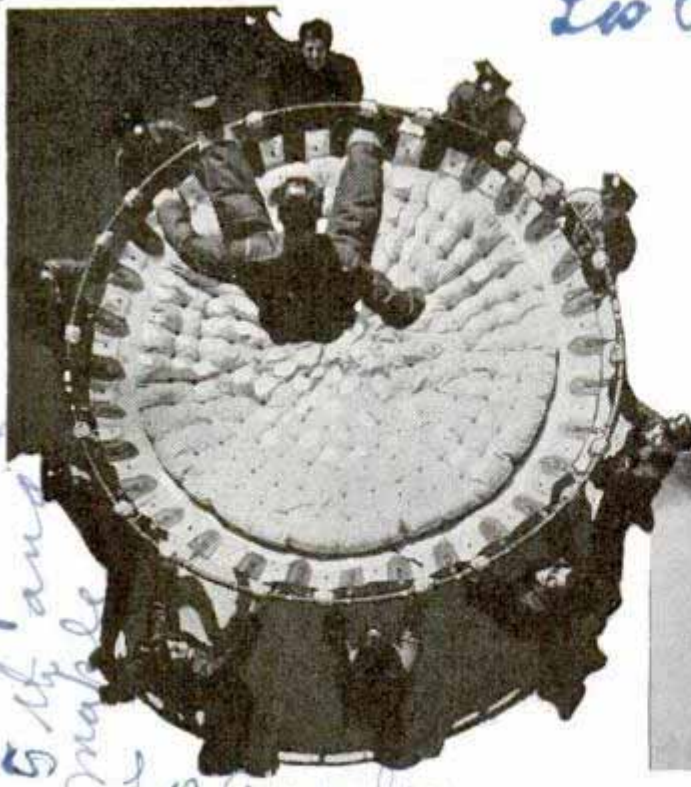
woods on winding, slanting paths or race down the cleared hillsides. There are 200 acres of open slopes, one broad area being floodlighted at night by mercury vapor lamps. In clearing trails and slopes, windbreaks were left to prevent wind sweeping away the snow. The tow ropes, with a total capacity of 7,200 rides per hour, are

Emt. Russell Bousquet, Tamarack Road, Pittsfield Mass

1949
 10555 Holman Ave
 Los Angeles

HEROES

423
 Capt. Johnson, Fire Dept. Reserve Co. 1
 5th and Maple
 Los Angeles
 Reference:



Left, fireman jumping from fourth story into safety net during drill. Below, chief ordering his men away from sheet-metal store front as it buckles. Bottom of page, rescue squad, protected by breathing apparatus, descending into hold of ship with water line to fight fire in cargo



PUTTING out fires is only a secondary job of the fire department. Saving lives comes first.

Men in every engine company are detailed to search the rooms of a burning building as soon as they respond to the alarm. A forgotten invalid in a bedroom or people trapped on an upper story may shift the generalship of fighting the fire.

In the downtown section of Los Angeles specially trained rescue squads answer each alarm with the other fire fighters. The squads have their own ambulances and rescue trucks loaded with lifesaving gear and gas masks. If every one is safely out of a building they turn to with the other firemen, dragging in water lines or running upstairs to get the ventilators open.



But when there is rescue work to be done they leave the fire fighting to the others.

Occasionally they get caught themselves and have to be rescued. Lowering incapacitated people from an upper story with the aid of a safety bag and a long rope may take so long that their exit is cut off and they have to jump. Part of their training includes the proper way to fall into a safety net that is held up by other firemen on the street.

At some fires the rescue men take over the toughest assignments in getting close to the flames while their mates stand in

of the FIRE LINES



*Top, rescue squad member dressed in gas-protective helmet.
Below, firemen fleeing from exploding gasoline tank*

the street trying to protect them with cooling streams of water. Strong ammonia fumes are frequently an accompanying hazard to fires in the business areas of large cities because quantities of ammonia are piped to many buildings and are used in refrigerating plants. When such a line breaks, unprotected firemen are often helpless because they can't see or breathe in the fumes, and the gas can cause serious burns to moist parts of the body.

When an ammonia line broke in a big ice-cream plant that was in flames the firemen were driven out to the sidewalks

by the fumes. About all they could do was wet down adjoining buildings to keep the fire from spreading. But the rescue squad got the fire out in fifteen minutes. Two of the men dressed in what amounted to dry-land deep-sea diving suits, outfits that completely covered them and inside of which they could live for two hours without replenishing the self-contained oxygen tanks. With this protection they took a water line right into the building and got the fire out.

The rubberized canvas suit completely covers the fireman. The breathing appa-



ratus, which straps on his back, weighs thirty-eight pounds. A gauge at his right shoulder tells him the pressure of the oxygen remaining in the tank so that he can escape to safety in time. Small reservoirs below the goggles of his mask contain distilled water and when the goggles fog up from his breathing he can clear the panes by shaking his head, washing the goggles off with the water.

With this outfit a fireman has complete protection against ammonia fumes and poisonous gases. He can enter gas-filled tanks, descend into the holds of ships filled with poisonous fumes, and even dive and remain under water.

Modern fire-fighting technique is to get in close to the flames before turning on the water. That way a few gallons of water may be more effective than thousands of gallons poured into a building from a distance. Fighting the flames at close quarters is sometimes pretty dangerous. Visi-

bility may be only a few feet or a few inches inside a burning building. Firemen, blinded by the thick smoke, have walked into open elevator shafts and have fallen down where staircases have burned away. If necessary, firemen stay at their posts until the floor gets soft under their feet or they can tell that a wall or ceiling is ready to collapse. Falling timbers and flying glass account for most injuries. Panes of thick skylight glass, broken loose by the heat in spite of their chicken-wire netting, have struck firemen on lower floors and injured them severely.

A big two-and-a-half inch fire hose can be a fireman's best friend inside a burning building but he must never let the hose get away from him. With plenty of water

at his finger tips he can wet down the floor as he goes in, both to keep the flames from burning the hose up behind him and to keep open a path along which he can escape. In close quarters the fumes and hot gases from the fire are suffocating and in an emergency he and his mates can place their faces down close to the water



Lowering hose down ship ventilator; demonstrating ladder rescue, and asbestos-clad fireman demonstrating use of the safety suit

stream to breathe air that has been cooled by the water. Many firemen have saved their lives that way.

It takes two men, one at the nozzle and another right behind him, to keep one of the big water lines under control. The hose is alive with energy and if one man tried to open up the water valve without the help of a companion, the kicking, writhing hose would throw him. Once the line breaks loose it is a dangerous, thrashing weapon and its thirty-seven-pound nozzle can kill a man easily. The safest thing to do, if one fireman has to let go of the nozzle, is for the other to hang on and take the bumps until he can get the water shut down. Once a line has gone on a rampage it can't be picked up until one or two men lie down on the squirming line some distance back and crawl along it until they have worked their way back up to the nozzle.



Demonstrating rescue by a ladder (left) and by breeches buoy (upper right) from dummy building

A new aid for getting in close to a fire is a combination fog and stream nozzle. With this a fireman can walk right into a hot spot behind a cool and protecting curtain of fog that sprays out in front of him like an umbrella held at the tip. With a flick of his wrist he can turn off the curtain and open up the line, hitting the fire with the usual powerful stream. If the heat becomes too intense he twists the valve again and turns on the fog curtain for a short respite.

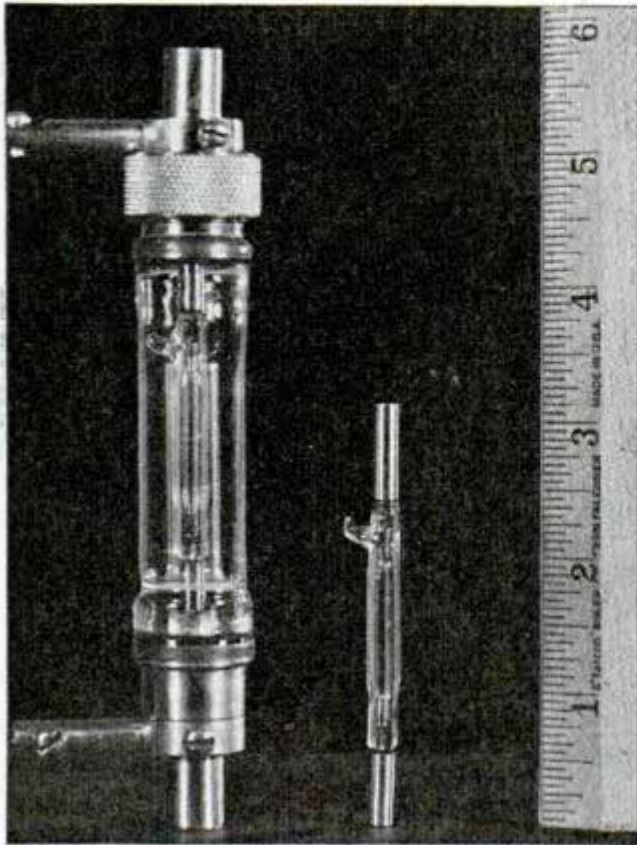
One of the first things that young firemen are taught is that a big fire must be ventilated to get it under control. That is, skylights must be opened up or upper windows broken so that the intensely hot air and gases that are mushrooming under the roof can escape. Otherwise the fire may spread upward faster than it can be fought. But ventilating a fire can be dangerous work because the hot air and gas mixture may explode as soon as it reaches enough oxygen in the open air to become inflammable. Another thing the firemen learn is

(Continued to page 124A)



Fireman in protective suit, armed with electric lantern and wrench for shutting off ammonia and gas lines in a burning building

Water-Cooled 'Midget Sun' Gives Brilliant Light



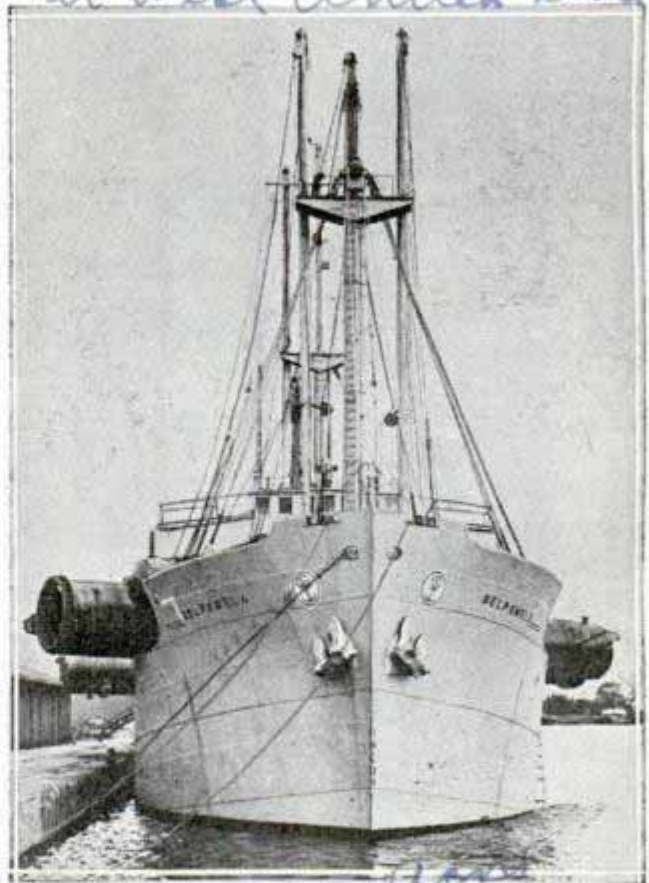
Tiny mercury lamp, center, compared in size to old-style lamp with far less brilliancy

Designed to give light with a brilliancy equivalent to about one-fifth that of the sun's surface, a new midget mercury lamp is expected to revolutionize lighting practice in many fields of light projection. Results of numerous laboratory tests indicate that the lamp can be used to great advantage in photoengraving work, blueprinting, photo-enlarging, in searchlights and for therapeutic application. The lamp consists of a quartz tube about the size of your little finger. Confined within a tiny bore inside the tube is a globule of mercury and a trace of argon gas. Each end of the tube is furnished with a brass ferrule which provides proper electrical contact. In producing so brilliant a light, the midget "sun" develops such high pressure and heat as to destroy itself unless the lamp is properly water-cooled. By developing an ingenious water-cooling jacket, permitting three quarts of water per minute to flow past the lamp, General Electric engineers at Nela Park, Cleveland, O., found a practical way to carry off the excess heat without affecting the light output. The cylindrical glass

portion of the water jacket is about the size of a shotgun shell. Rated at 1,000 watts, the lamp has an arc as its light source which is approximately twelve times as brilliant as the incandescent filament of a 1,000-watt standard projection lamp. When the water jacket is made of quartz instead of hard glass, the unit emits a wealth of ultraviolet radiation. Special glass that screens out dangerous ultraviolet rays not found in sunlight at earth levels may be used instead of quartz. The lamp is said to produce about three times as much light for the electrical energy it consumes as does the average incandescent filament type of comparable wattage.

Cargo Wider Than Freighter Sails from London to Orient

It was an unwieldy cargo that stevedores had to load at London on the S. S. "Belpamela." A shipment of oil towers 105 feet long and weighing 100 tons was destined for the Persian Gulf. Too big to be stowed away in the hold, the towers straddled the deck and overlapped about eighteen feet on each side of the ship.



Too big to stow away in hold, 105-foot oil towers ride deck of freighter and overlap both sides

Incandescent Lamp Co see Feb 1940. 198

at West India dock

1890-7

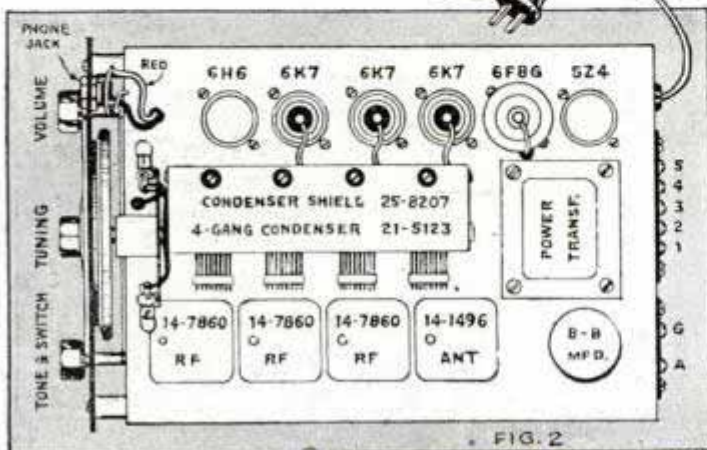
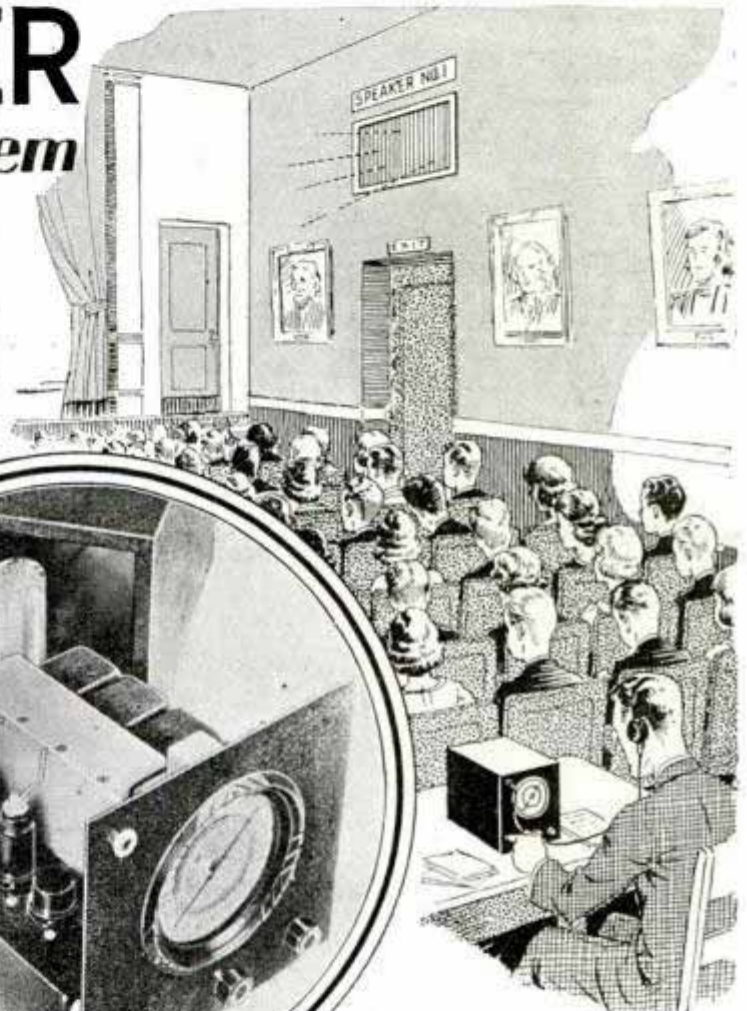
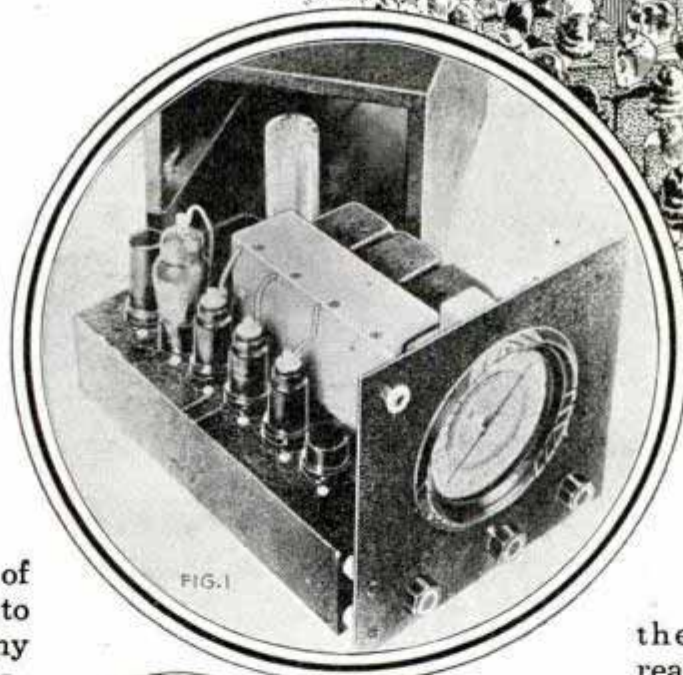
RADIO



T.R.F. TUNER for school P.A. system

EDUCATIONAL programs from distant stations can be tuned in with this compact self-contained unit and amplified for large audiences by means of your present school public-address system.

Assembled easily from a kit of parts and diagrams, either as a classroom project or by members of the school radio club, it adds completeness to any good sound-distribution installation. Operating directly from a 110-volt 60-cycle line, the radio tuner supplies undistorted reproduction of broadcast programs to the input stage of any power amplifier system. Photo Fig. 1 shows



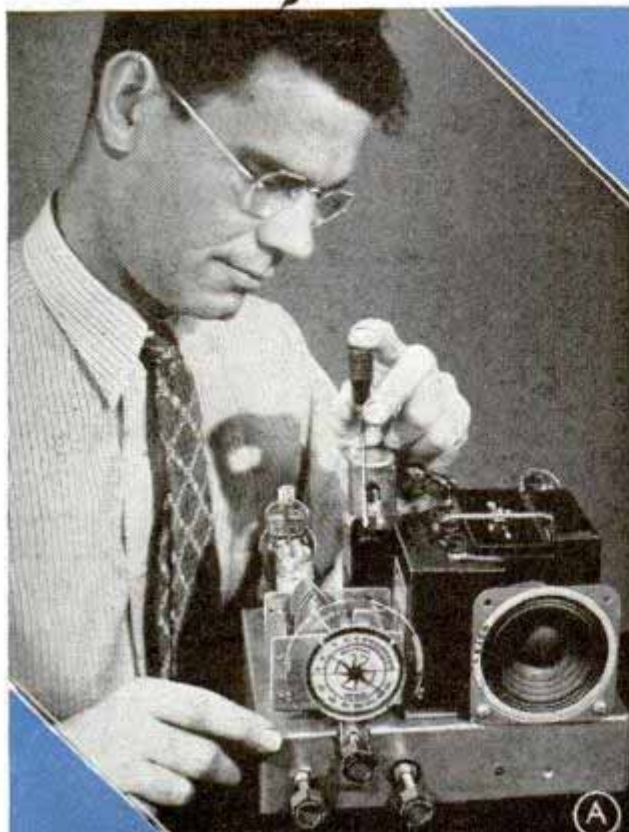
the completed chassis ready for the steel cabinet. Layout diagram Fig. 2 clearly illustrates the compact arrangement of parts on the chassis base.

Covering the full broadcast band, the tuner consists of four tuned circuits employing Meissner iron-core shielded r.f. transformers and a 4-gang tuning condenser. Special features include a convenient separate output channel that may be used for headphone monitoring purposes, frequency calibrated 4-in. airplane-type dial, high-gain coils, full automatic volume control and manual audio-gain and tone controls.

*Meissner mfg Co
not connected*

Economy BATTERY-OPERATED

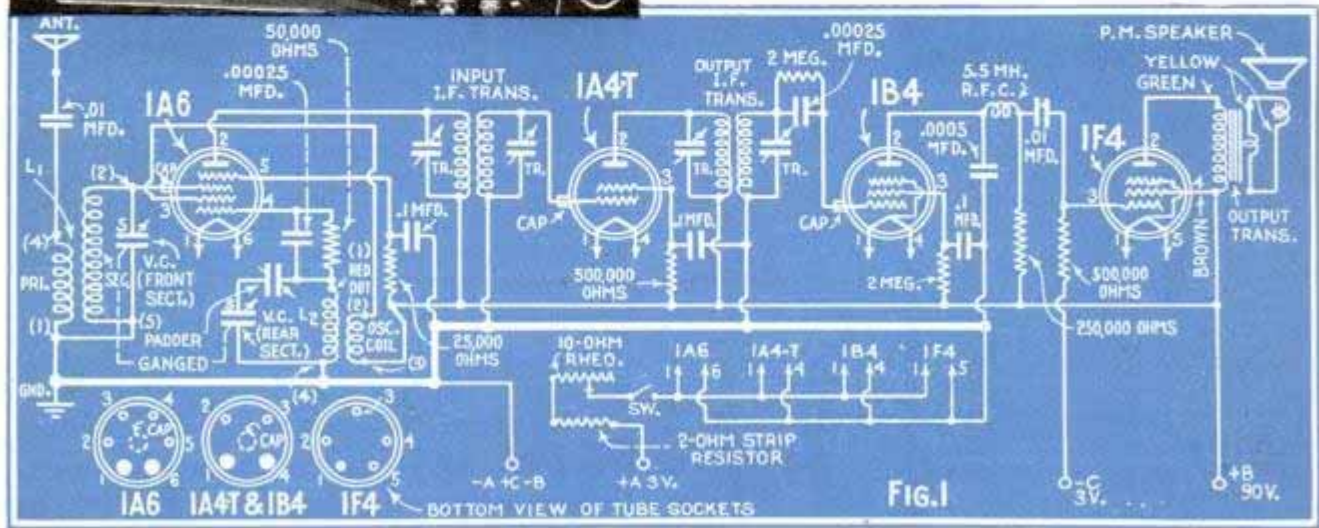
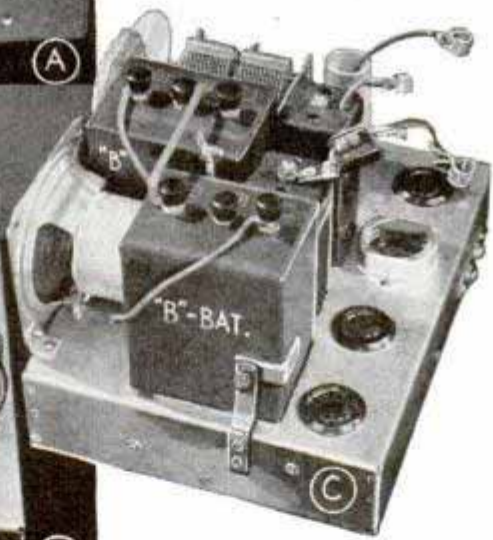
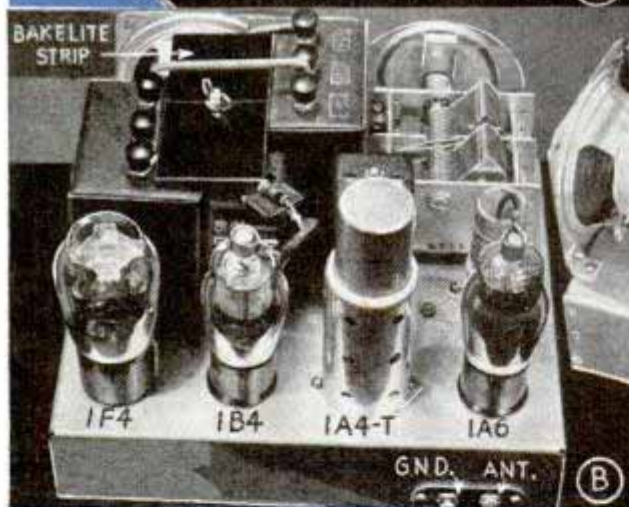
By J. T. Wilcox



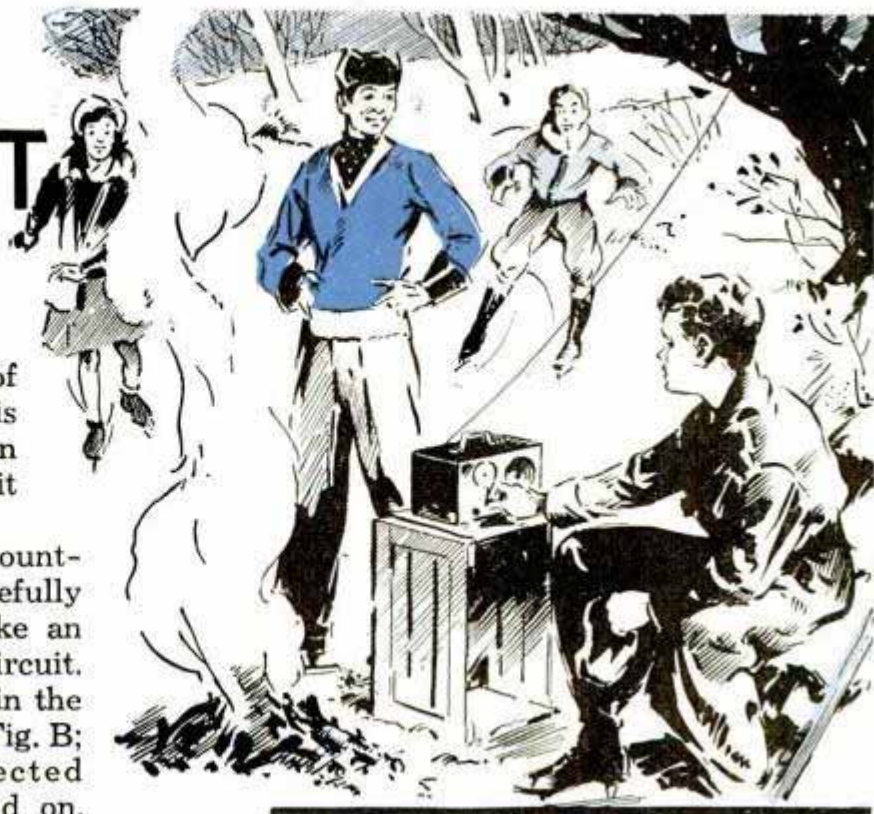
PORTABLE battery-operated radio receivers have always been popular as they are independent of any form of line supply. Many so-called portable battery sets in the past were hardly portable in the strict sense of the word, as they were much too heavy and bulky. The model to be described weighs only ten pounds complete with batteries and is capable of performance above average for portables.

Some recently developed low-drain tubes are used in the conventional super-het circuit with a few modifications. An unusually low battery drain of 7 m.a. for the B-battery, and 300 m.a. for the A-battery, makes economical operation possible. The circuit is sensitive and selective, easy to build and the parts are not expensive.

Fig. 1 shows the schematic circuit diagram, and the simplified wiring diagram appears in Fig. 2. The metal base, detailed in Fig. 3, is an underside view and all holes are clearly indicated. Photos A, B, C, D and E show various views of the completed re-



Portable BROADCAST RECEIVER



ceiver. This arrangement of parts is not critical, but it is hardly likely that any deviation from the original will make it smaller.

After all parts have been mounted on the chassis base and carefully wired, it is advisable to make an initial test of the filament circuit. All tubes should be inserted in the sockets as indicated in photo Fig. B; the A-battery is then connected and filament switch turned on. These tube filaments normally operate with a dull red glow. They are easily damaged if the incorrect battery voltage is accidentally applied. When the filament circuit is correct, the "C" and "B" batteries may be connected.

To line up the set, the trimmer condensers in the I.F. transformers should be aligned by means of an oscillator to insure maximum efficiency. If an oscillator is not available, any local radio serviceman can

(Continued to page 146A)

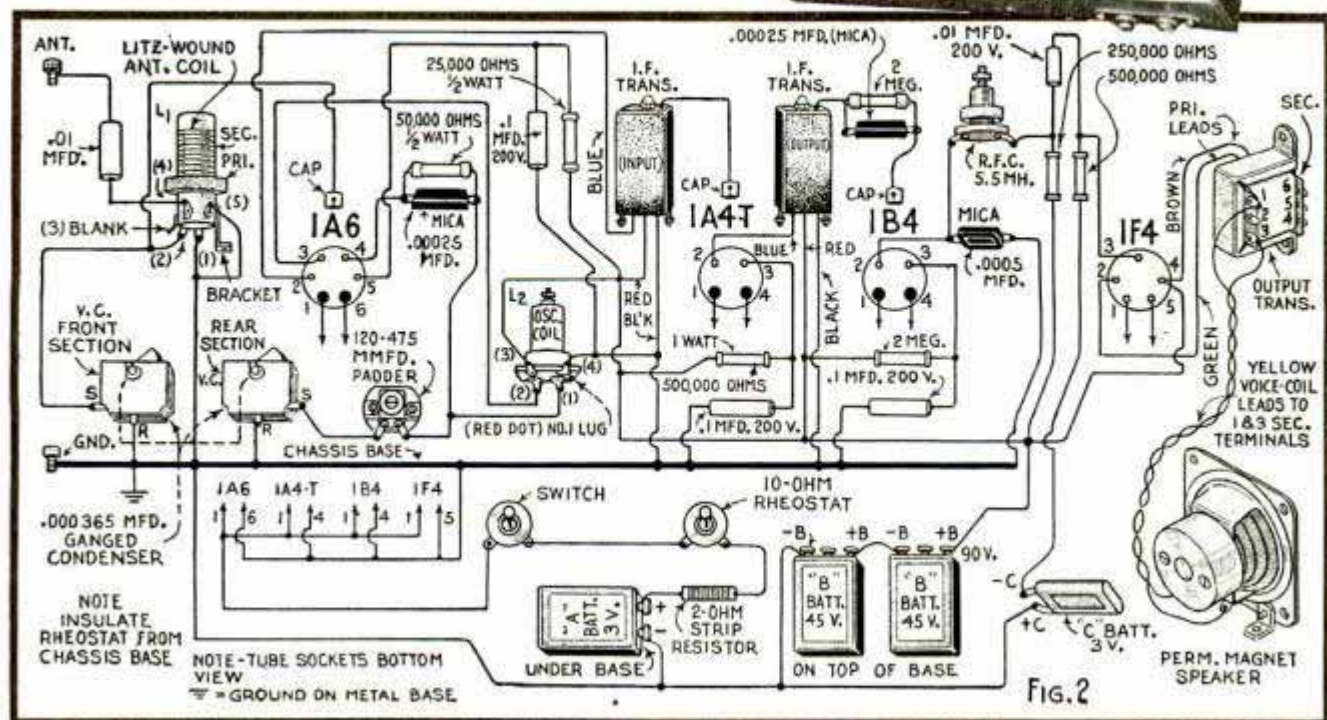
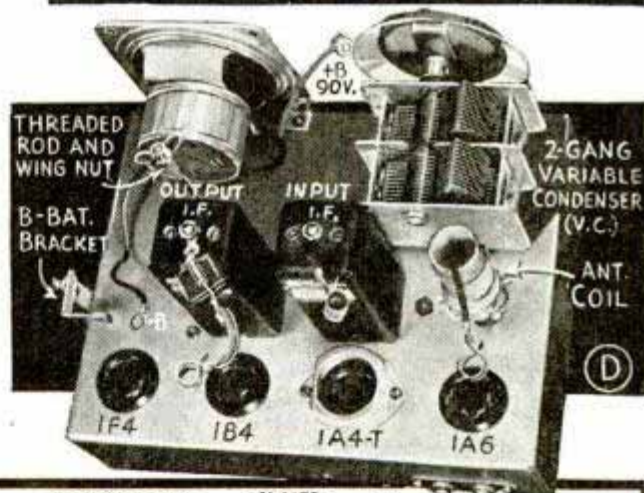
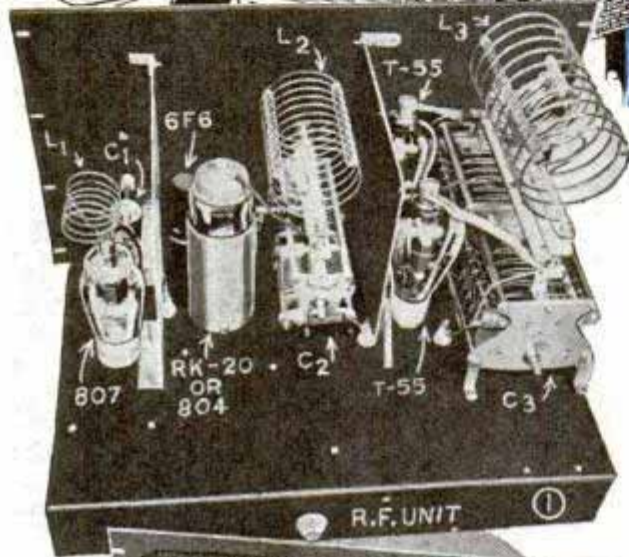


FIG. 2

Compact Ten and Twenty-Meter Transmitter

By R. E. Davy—W9GKU

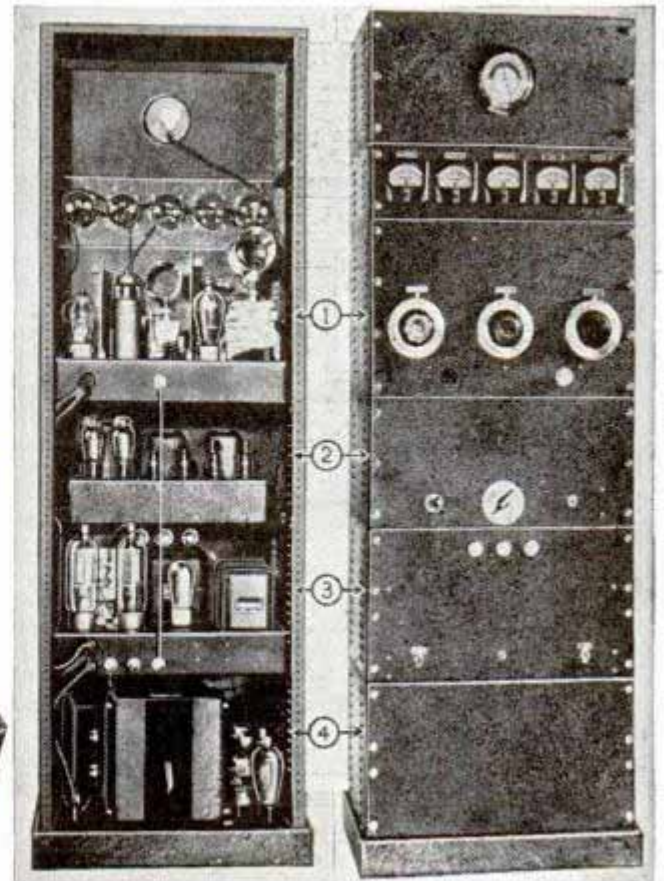
F. L. Brittin—W9DCX



COMPLETE in every detail, this self-contained transmitter for the advanced amateur is designed to meet conditions where medium high power is desired and space is at a premium. Although only 58½ in. high and of standard width and depth, the power input is conservatively rated at 400 watts. An additional top panel is provided in the Bud sectional relay rack for extra equipment such as an antenna network or cathode-ray oscilloscope.

Photos 1, 2, 3 and 4 show rear views of the various units and the same numbers identify their respective positions in the front and rear photos of the rack assembly; a complete circuit diagram appears in Fig. 5. The r.f. unit panel is 12¼ in. high and the chassis base is 17 by 13 by 3 in. All panels are 19 in. wide and provided with type "A" notching for rack mounting. The chassis bases are supported directly on the panels with the exception of the high-voltage power supply. This is as-

(Continued to page 116A)

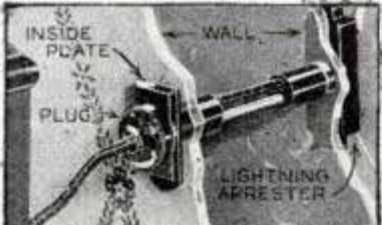


*Delmar Product Plus
Chesholm-Ryder Falls NY*

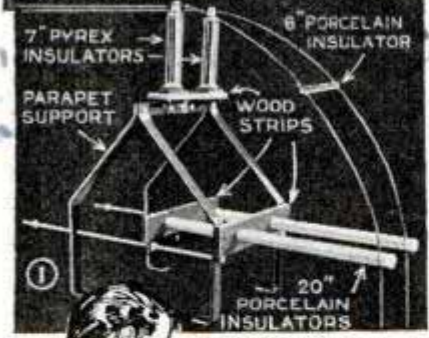
Hints for RADIO EXPERIMENTERS



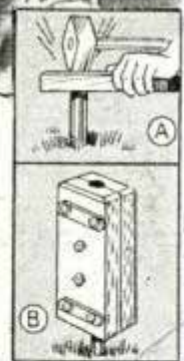
Vertical receiving antenna requires no overhead wires; post and insulator assembly shown in A and B; RCA cable carries underground lead-in



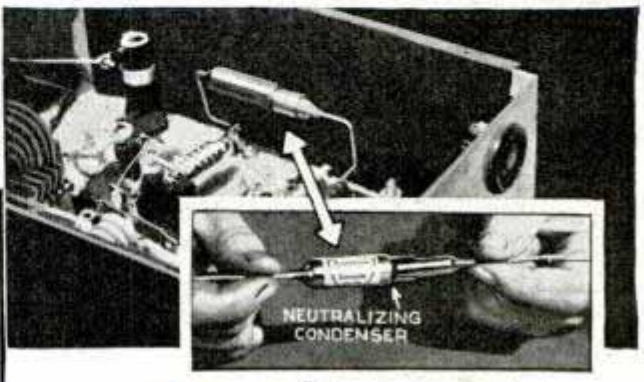
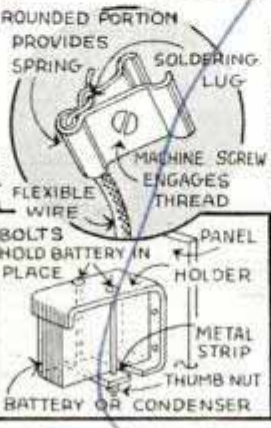
Left, compact antenna-receiver connector now available for running antenna and ground leads through building walls to inside plug and socket arrangement



Figs. 1 and 2 show assembly and installation details of a method employed by an amateur for bringing "Zepp" transmitting feeders over the parapet of an apartment building. Wood strips are added to a Premax parapet mast support and drilled to take two 20-in. Johnson porcelain insulators which extend out over the edge of the building; these and two stand-off insulators mounted above, support the No. 12 enameled copper wires at the desired spacing



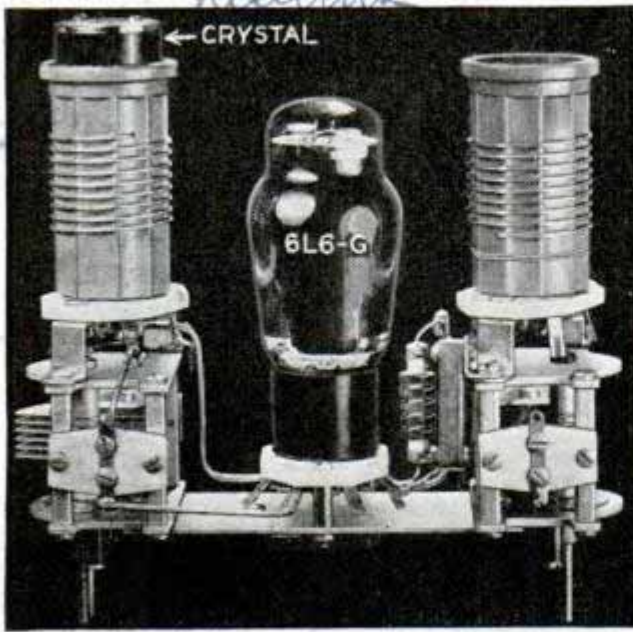
Below, handy wire clip made from spring brass; also, a panel-mounting clamp for holding small units in portable equipment. Right, variable concentric-tube neutralizing condensers mount directly on their own bus-bar leads; capacity 1 mmfd. to 20 mmfd.



*Premax Product Plus
Chesholm-Ryder Falls NY*

*Walt G. Newell
Covinch Wale G. Church
No. 0 7. Oakland
California*

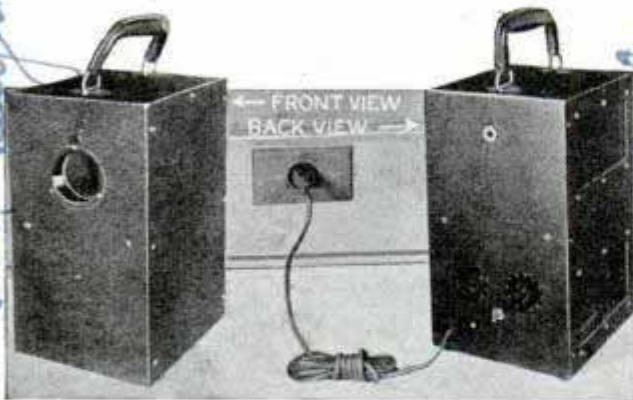
Crystal Oscillator-Doubler Foundation Unit



Beginners can assemble this foundation unit in a few minutes; it provides a low-power transmitter capable of up to 25 watts output on two bands with a single crystal. The entire unit is self-supporting and fastens directly to a panel by means of four mounting screws. A specially designed Hammarlund crystal socket fits into the top of the cathode coil form; both can be changed in a single operation.

Electric-Eye Burglar Alarm

No wiring is required to install this burglar alarm; it is merely plugged into an outlet and faced in the direction of a lamp.



An invisible path between the lamp and unit is then fully protected from trespassers. The alarm, controlled by a secret dial combination, continues to ring if power line is cut or pulled out of socket

Push-Button Tube Tester

Equipped with automatic push buttons, this compact unit speeds up tube checking. It makes the standard R.M.A. official tests of electronic conductance, shorts, open circuits and leakage. A roller tube chart lists all tubes.



Sound Tracks Indented in Film



Used with an amplifier-speaker combination, an electromechanical device records 28 fine sound tracks on any type of developed or undeveloped 16 mm. film. No processing is required; records and plays back for dictation.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build the PM Economy Nine Superheterodyne Receiver. An excellent 9-tube a.c. super for high-quality broadcast-band reception; has 10-watt output, fine tone, full automatic volume control and phonograph pick-up jacks. Also—An Inexpensive Photo-Cell Relay, for controlling lights and bells.

Handwritten notes in blue ink:
 Hammarlund
 424 W. 33rd
 Chicago
 4019 W. Lake
 miles per hour
 \$ 5.50.00 C.F.
 37 W. 54th Street
 Tele-Touch Industries, Inc.

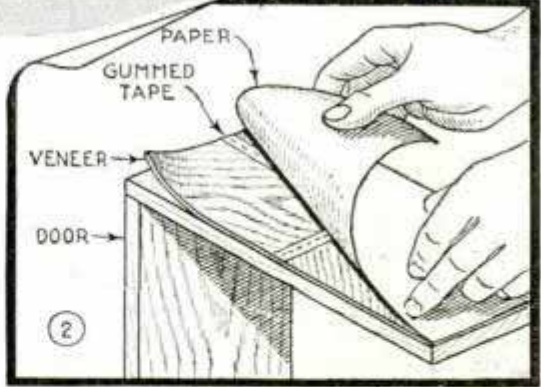
453 Weston Ave
Aurora, Ill.



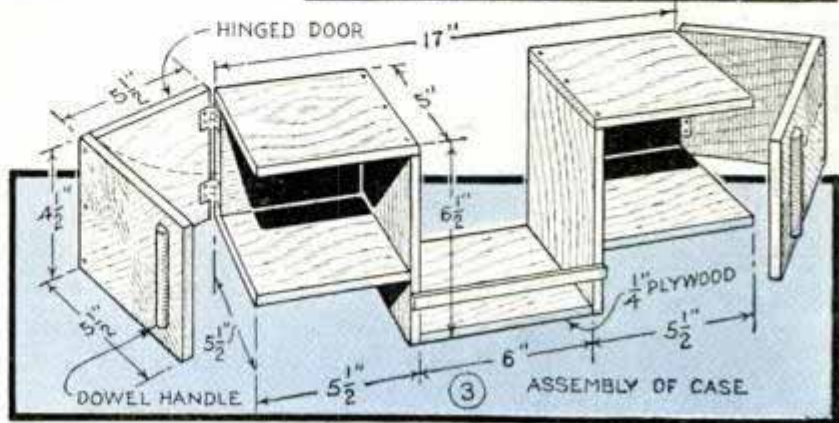
"Pin-up" VANITIES

By
Wayne C. Leckey

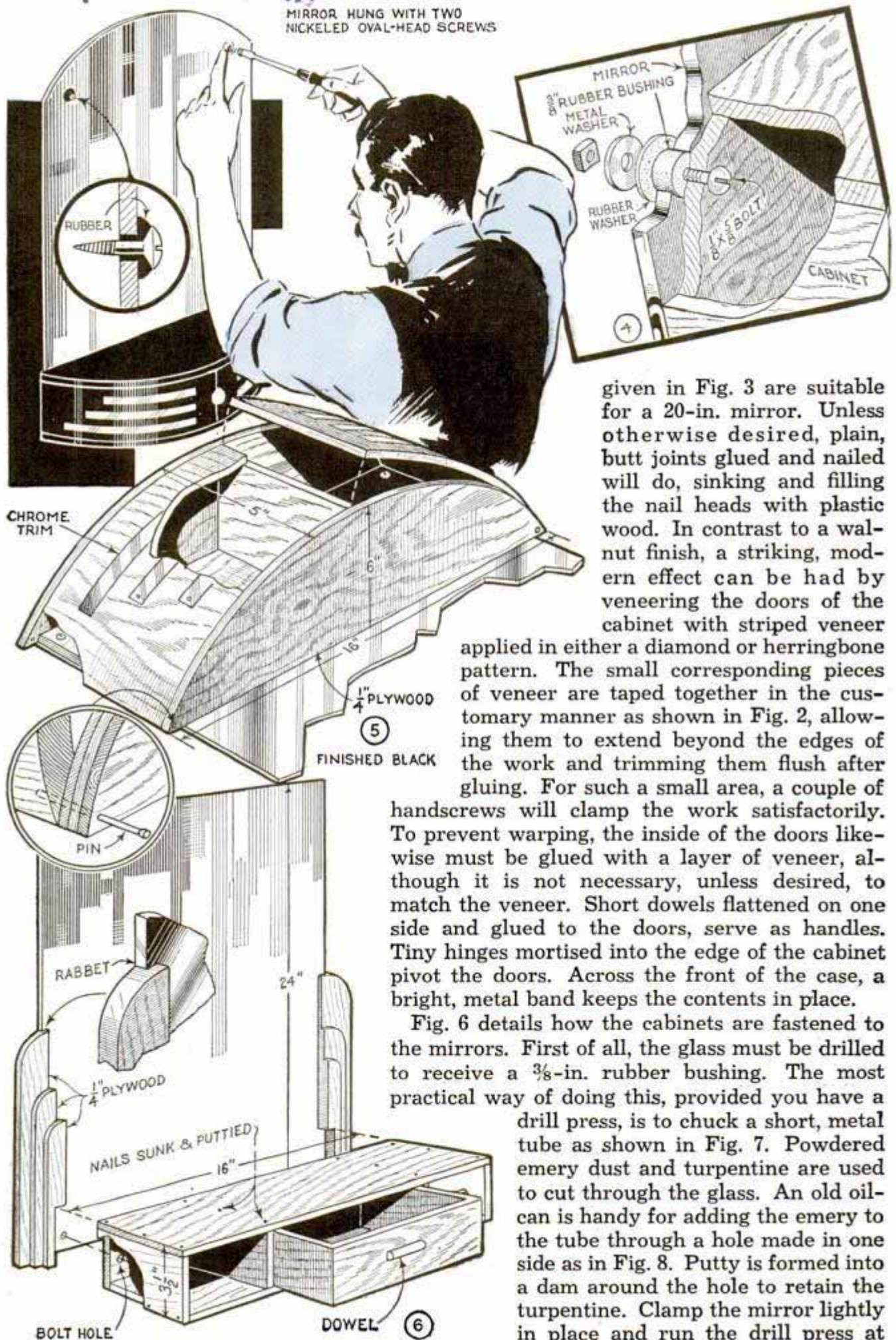
FOR your guests, or for last-minute make-up, these little vanities are a pleasing addition to a hallway or dressing room, and they are very attractive when finished in painted or natural woods and backed with a crystal or blue-glass mirror. Essentially, the vanities are little cabinets attached to the bottoms of plate-glass mirrors and are hung on walls where desired. The designs presented suggest the use of both circular and rectangular mirrors, which can be purchased with plain or beveled edges at any large department store. While the beveled type gives the neatest job, you can use special shapes cut to suit, possibly from old glass on hand. For the sake of lightness, 1/4-in. plywood is perhaps the best material to use for the cabinets. You can use common fir plywood, and paint it, or you can select fancy, veneer-faced plywood which will finish beautifully. Where the edges of the stock are exposed, the plies of the wood should be concealed by painting a contrasting color, giving a pleasing two-tone finish.



For the design shown in Fig. 1, first get a circular mirror of the size you wish. From this, the size of the cabinet is determined. The dimensions



For the design shown in Fig. 1, first get a circular mirror of the size you wish. From this, the size of the cabinet is determined. The dimensions



given in Fig. 3 are suitable for a 20-in. mirror. Unless otherwise desired, plain, butt joints glued and nailed will do, sinking and filling the nail heads with plastic wood. In contrast to a walnut finish, a striking, modern effect can be had by veneering the doors of the cabinet with striped veneer

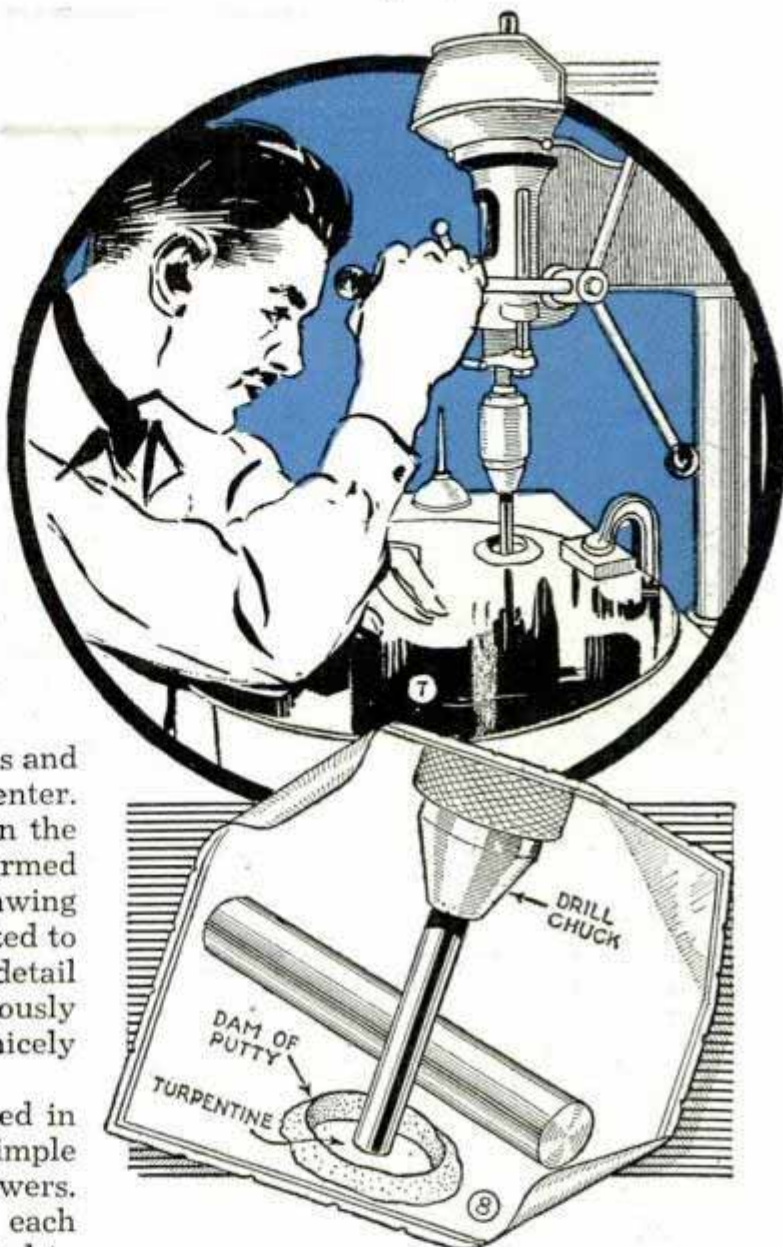
applied in either a diamond or herringbone pattern. The small corresponding pieces of veneer are taped together in the customary manner as shown in Fig. 2, allowing them to extend beyond the edges of the work and trimming them flush after gluing. For such a small area, a couple of handscrews will clamp the work satisfactorily. To prevent warping, the inside of the doors likewise must be glued with a layer of veneer, although it is not necessary, unless desired, to match the veneer. Short dowels flattened on one side and glued to the doors, serve as handles. Tiny hinges mortised into the edge of the cabinet pivot the doors. Across the front of the case, a bright, metal band keeps the contents in place.

Fig. 6 details how the cabinets are fastened to the mirrors. First of all, the glass must be drilled to receive a $\frac{3}{8}$ -in. rubber bushing. The most practical way of doing this, provided you have a drill press, is to chuck a short, metal tube as shown in Fig. 7. Powdered emery dust and turpentine are used to cut through the glass. An old oil-can is handy for adding the emery to the tube through a hole made in one side as in Fig. 8. Putty is formed into a dam around the hole to retain the turpentine. Clamp the mirror lightly in place and run the drill press at

slow speed. By raising the chuck occasionally, you can keep plenty of emery under the rotating edge of the tube. Allow the tube to grind through gradually and do not press too heavily. Small bolts inserted through the back of the case and the center of the bushing are drawn up securely with a nut and washer on the back of the glass. For attaching the completed vanity to the wall, rubber grommets are likewise fitted under the screw heads as shown in Fig. 4.

The case shown in Fig. 4 is equally as simple to make. Finished a dead black, you can use soft plywood for this, trimming the doors with narrow strips of chrome metal fastened with tiny pins and providing a suitable pull at the center. The curved doors, cut to fit between the top and bottom of the cabinet, are formed to the proper contour by band-sawing from thick, solid stock and are pivoted to swing outward as shown in the detail given in Fig. 4. Finished as previously suggested, this case will contrast nicely with a crystal mirror.

A plain, rectangular mirror is used in the design shown in Fig. 5. Here a simple boxlike case is fitted with small drawers. Receding plywood pieces flanking each side of the glass are glued and nailed to the side of the cabinet which in turn is fastened to the mirror in the manner previously described. Flattened dowels, painted black, are likewise used for drawer



handles. Round black plastic with the ends rounded and polished is also very attractive. Small machine screws hold the plastic handles in place.

Signs with Lettering in Relief Easy for Anyone to Carve



You can carve decorative signs like the one shown by removing waste wood to bring out the design or lettering in relief. Magazines and catalogues provide a number of designs that can be enlarged and traced on the wood if you are unable to draw them. After the design has been transferred to the work, outline it with a sharp knife or carving tool, and then work away the surface of the wood to bring out the design in relief as indicated in the photo. Paint or finish the sign as desired.

—Clifford B. Paul, Moline, Ill.

T-Square Has Clamp on Head to Fasten on Drawing Board

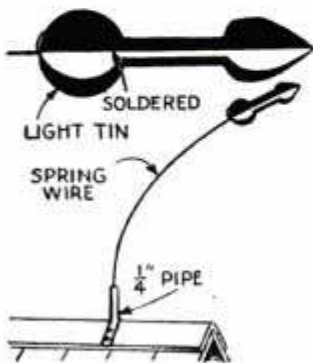


When many lines must be drawn from a given plane with a triangle, it is a convenience to anchor the T-square firmly in place. One method of accomplishing this is to attach a large paper clip to the square. The bottom jaw is cut off to permit mounting the clip near the inside edge of the T-square head so that the top jaw projects under the board. When the clamp is squeezed, the square may be moved freely. When released, it will hold firmly in any position.

—S. J. Gancher, Richmond Hill, N. Y.

Novel Weather Vane

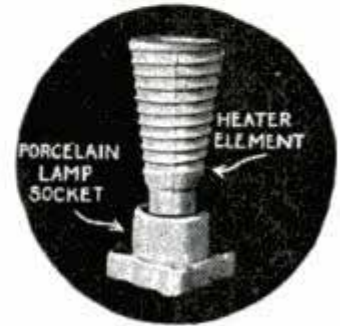
A Wisconsin tinsmith is responsible for this novel weather vane, which points in the opposite direction from which the wind is blowing. At the same time, the degrees that the wind flexes the standard give a rough indication of the velocity of the air current. The vane is a double arrow, cut from light tin and soldered to a length of medium-gauge spring wire. The lower



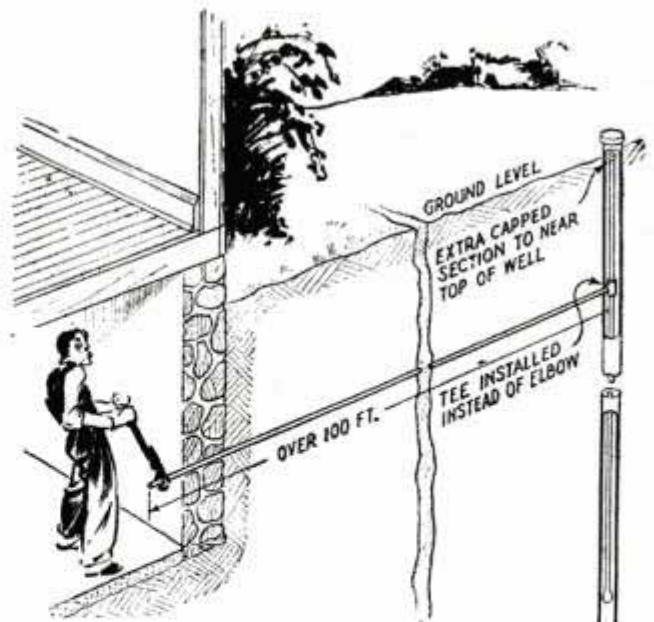
end of the wire is anchored permanently in a length of $\frac{1}{4}$ -in. pipe, which is split at one end and spread to fit over the roof gable. The tin arrows are painted in contrasting colors to make the vane easy to see.

Heater Element Serves as Crucible

An excellent crucible for melting small quantities of solder, lead or brass may be had by removing the resistance wire from an old heater element and then screwing it into a porcelain lamp socket of the type shown. The bolt and nut at the bottom of the form are retained to fill the hole in the base. In case the heat applied is so intense that the brass shell on the element or socket is melted, the space can be filled with plaster of paris or asbestos cement. It is best to use a metal plate or some other protecting layer between the crucible and the bench top.



Installing Suction Line in Well

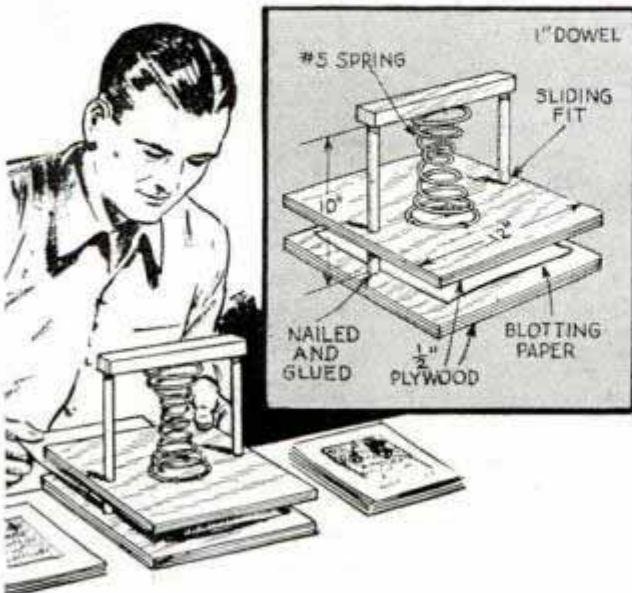


The difficult job of installing a suction pipe in a 6 to 10-in. artesian well where there is a horizontal run into the basement of a building is simplified by the following method: Instead of the usual elbow where the pipe makes its 90° turn, install a tee and add a capped section of pipe of suffi-

cient length to reach the top of the well. It is now easy to hold this combination at the proper level where the horizontal pipe can be threaded into the facing tee. Two other mechanical advantages add to the idea. First, this extra section of pipe acts as an air chamber and helps any power or hand pump to work, and should it be necessary to remove the well pipe for examination, it can be done without digging up a straight horizontal run.—Walter U. Akerman, Dover, N. H.

Photo Press Is Made of Wood and Coil Spring

Here's a simple yet efficient press that is just the thing for drying enlargements and pressing papers. A compressed spring, stapled to a plywood panel, keeps the two panels firmly together. To use it, raise the sliding panel enough to permit the insertion of the work. The panel must slide freely on the dowels.



Bookcase Folds for Transportation without Taking Books from Shelves



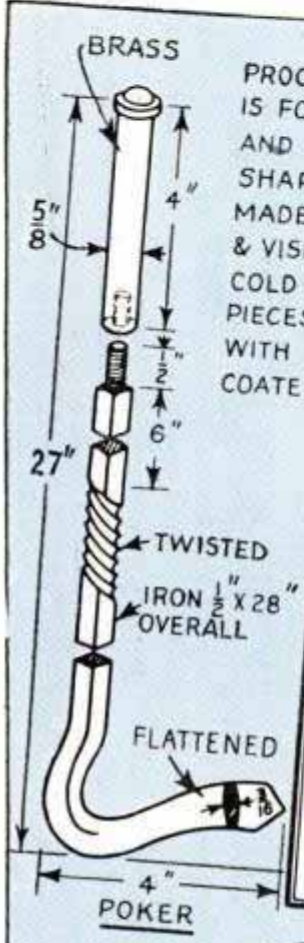
Just tip case over on one side and fold top half against the bottom half

Students, teachers, engineers and others who take up quarters temporarily in rooms and may move from place to place frequently will find this folding bookcase just the thing. Also, it is ideal for those who live in furnished apartments and for vacations in a summer cottage. When you want to transport the case, just tip it over on one side, leaving the books on the shelves, and swing the top around against the bottom and lock them together. The two frames, which are hinged together, are made of $\frac{3}{4}$ -in. stock and are identical. The backs of the frames are covered with $\frac{1}{4}$ -in. plywood, and the shelves are cut from $\frac{1}{2}$ -in. plywood. A hasp and padlock will keep the frames from opening when folded, and two handles can be attached to one side of each frame for carrying the case like a suitcase.—Lester Lehnerr, Madison, Wis.

Protecting Lantern Mantles

You can move a gasoline lantern from place to place in a car without breaking the fragile mantles if they are impregnated with paraffin. Just melt a small amount of paraffin in a tin can, and hold it under the mantles, immersing them completely. The wax coating applied in this way hardens and stiffens the mantles. In relighting the lantern, the paraffin will melt readily when a match is applied.

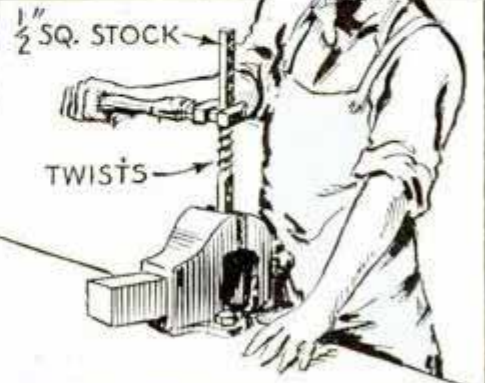
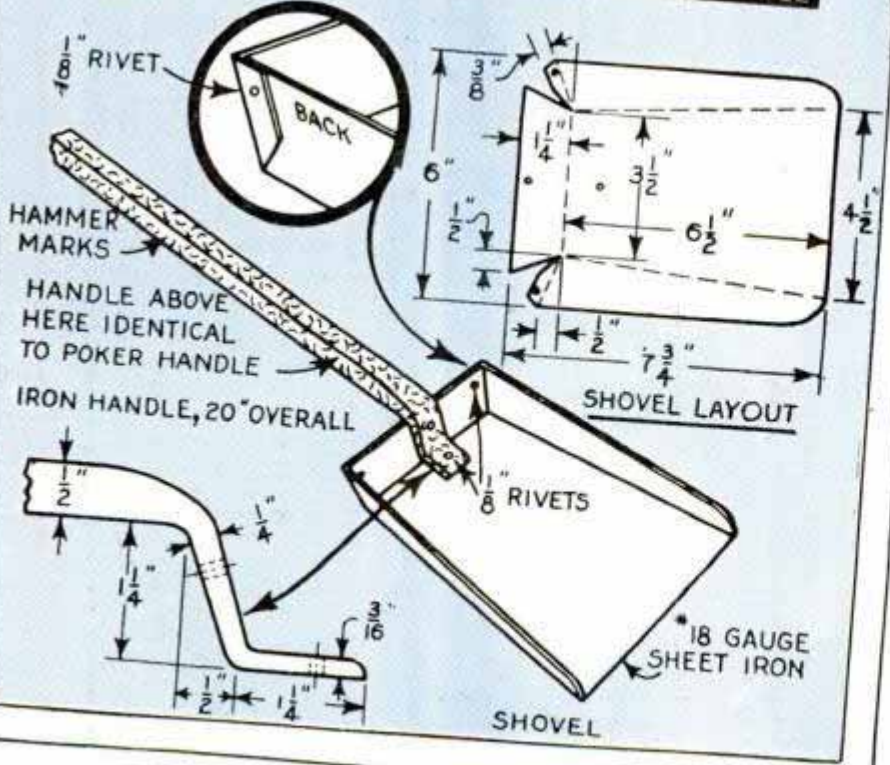
in Wrought Iron



PROCEDURE: THE IRON IS FORMED BY HEATING AND HAMMERING TO SHAPE - TWISTS ARE MADE WITH WRENCH & VISE. BRASS IS BENT COLD OR MACHINED. ALL PIECES ARE POLISHED WITH EMERY CLOTH & COATED WITH LACQUER

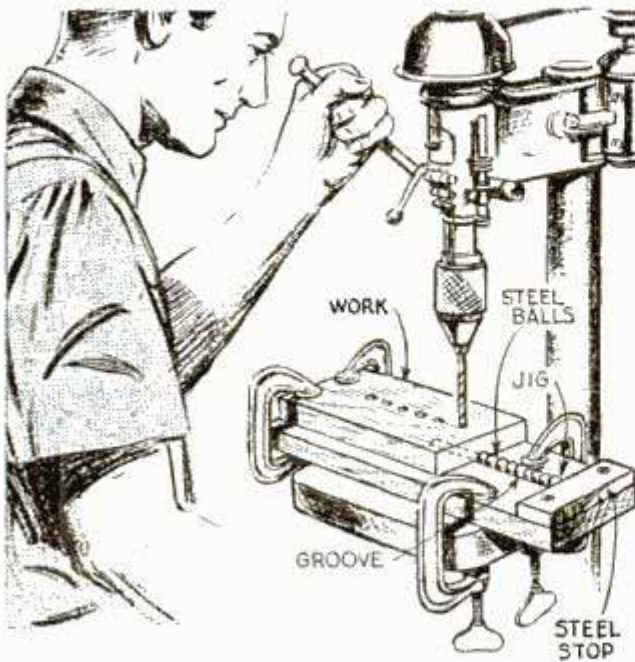
- MATERIAL LIST**
- 6 FT OF $\frac{1}{2}$ " X $\frac{1}{2}$ " - WROUGHT IRON
 - 2 FT-3IN OF $\frac{3}{32}$ " X $\frac{3}{8}$ " - WROUGHT IRON
 - 5 FT OF $\frac{1}{8}$ " X $\frac{1}{8}$ " - WROUGHT IRON
 - 1 PIECE - $\frac{1}{4}$ " X $1\frac{1}{4}$ " X $2\frac{1}{4}$ " - IRON
 - 1 PIECE - 18 GAUGE $10\frac{1}{2}$ " X $15\frac{1}{2}$ " - IRON
 - 1 PIECE - 18 GAUGE 6 " X $7\frac{3}{4}$ " - IRON
 - 1 PIECE - $\frac{1}{16}$ " X 2 " X APPROX. 37" - BRASS
 - 1 PIECE - $\frac{3}{4}$ " X 9 " X 14 " - HARDWOOD
 - 1 PIECE - $\frac{7}{8}$ " DIAM. X 20 " - BRASS ROD
 - 1 PIECE - $\frac{1}{2}$ " X $\frac{1}{2}$ " X APPROX. 19" - BRASS

THE SHOVEL IS FORMED ON A BLOCK



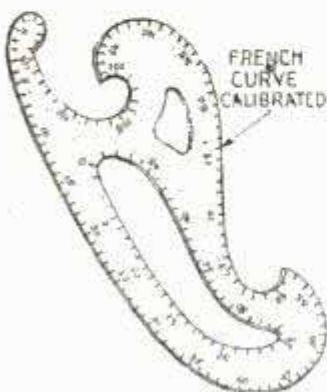
THE HEATED IRON IS HELD IN A VISE WHILE BEING TWISTED WITH WRENCH

Accurately Spaced Holes Drilled with Aid of Steel Balls



This jig will be found a timesaver when a number of equally spaced holes are to be drilled. The body of the jig is a piece of hardwood with one or two V-grooves cut in the upper surface to hold steel balls, which are used to space the holes. A stop screwed to the piece keeps the balls from rolling off at one end, while the work keeps them from rolling off at the other end. In use the jig is clamped to the drill-press table, and the work to be drilled is laid on top of it and clamped in position as indicated. After drilling the first hole, the work is loosened and moved to locate the next hole, after which balls are placed in the groove between the stop and the edge of the work. The remaining holes can be spaced by adding balls and butting the work against them.

Graduated French Curve



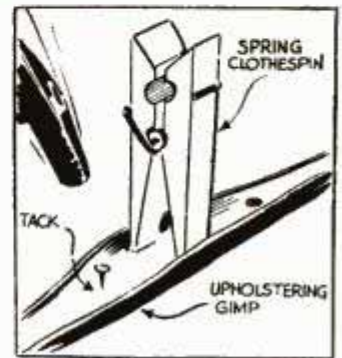
When duplicate curves of similar section are required, you will find it convenient to have the working edges of the French curve suitably graduated. The graduations are laid out with

dividers and then scratched on the surface of the celluloid with a sharp scribe. These lines can be filled with thick paint, the surplus of which is carefully wiped from the surface. An alternate method is to frost the front and back of the curve with fine sandpaper. The calibrations can then be marked on the surface with a lead pencil.

—S. J. Gancher, Richmond Hill, N. Y.

Upholstery Gimp Is Held Open by Spring Clothespin

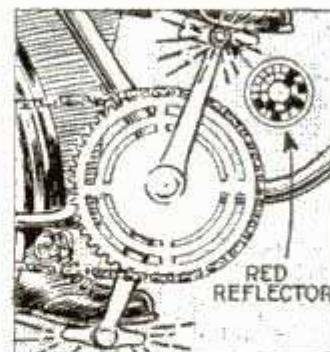
To avoid striking his fingers while tacking leather upholstery gimp, one craftsman obtained a common spring-type clothespin to spread the gimp apart. The open end of the pin was



pressed together and inserted vertically between the gimp, after which it was released as shown, thus expanding the rolled edges to insert tacks. The pin is compressed and moved along the gimp as the tacking progresses.

Reflectors on Bicycle Pedals

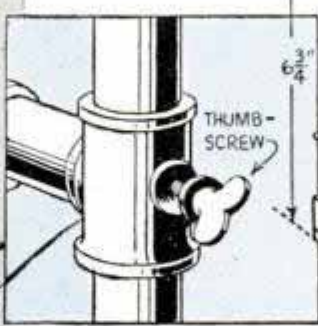
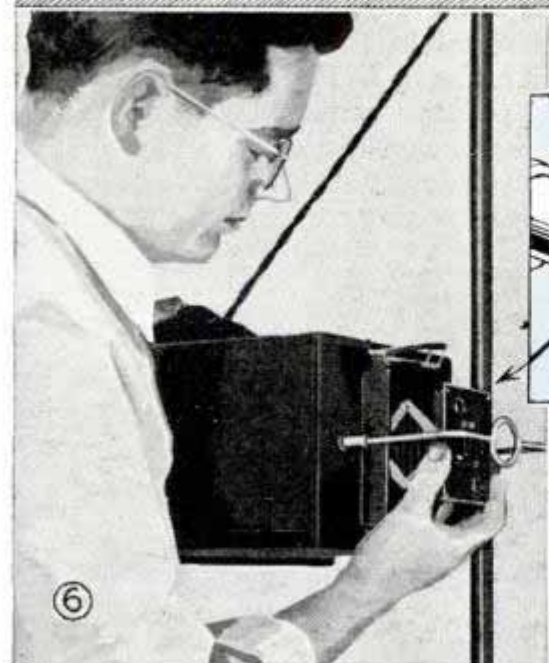
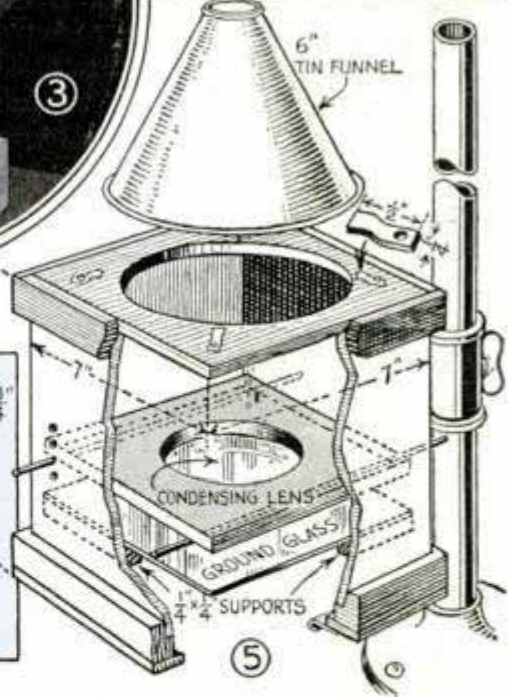
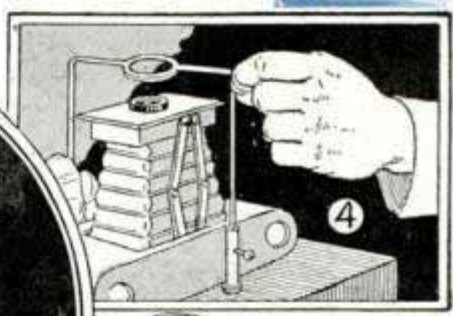
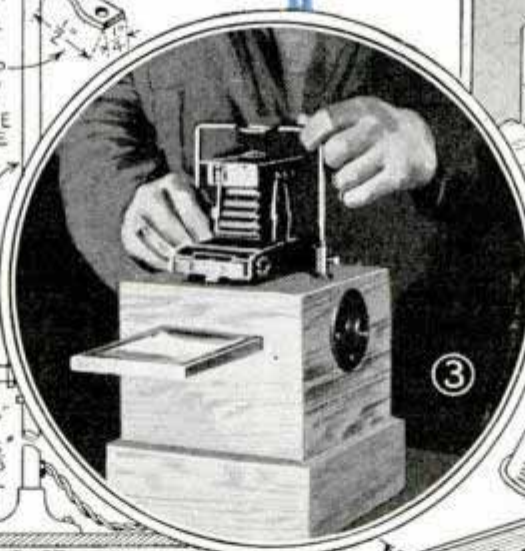
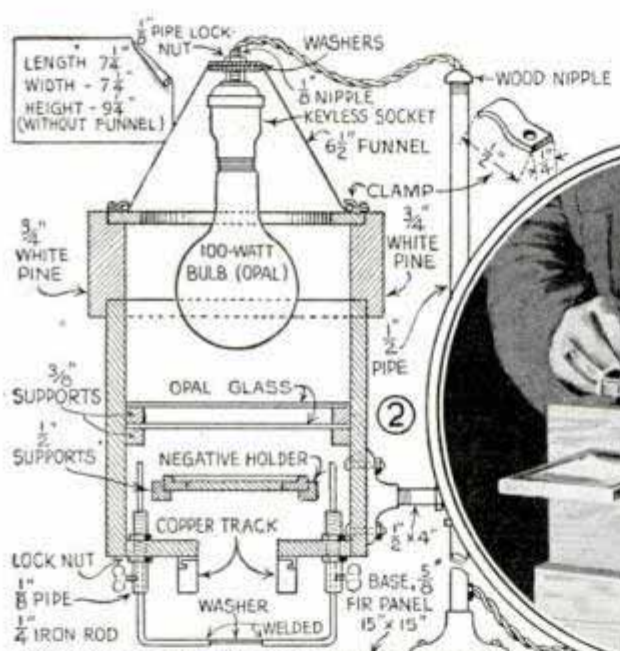
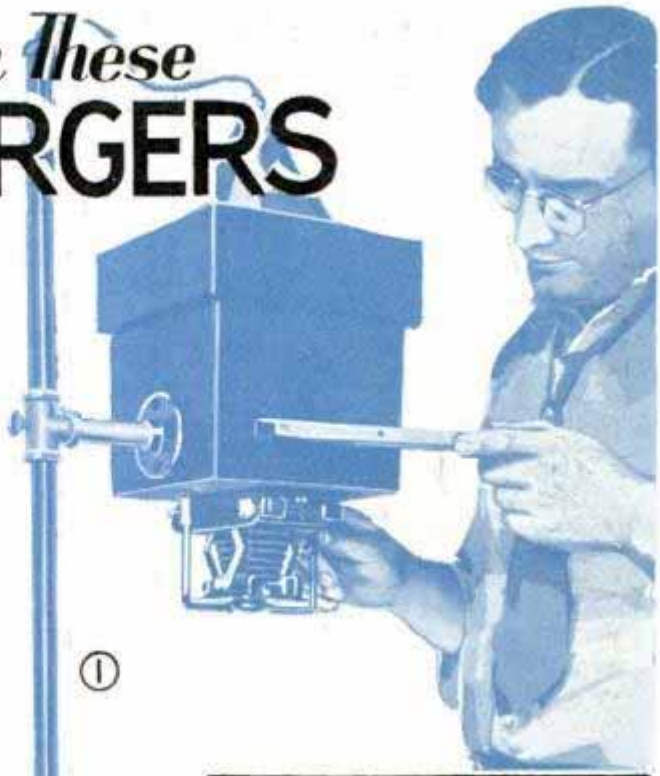
Most bicycles have red reflectors on the fender to reflect the lights of a car approaching from the rear and warn the driver, but few riders take the precaution of warning a motorist who might approach them from the side. This can be done quite easily, however, by attaching red-glass reflectors to the ends of the pedals. The type backed by metal are easily soldered to the pedals, and are noticeable because they rotate with the pedals.



☐ Dried adhesive on gummed-paper tape can be softened so that it will stick by adding a few drops of glycerin to the water used for moistening.

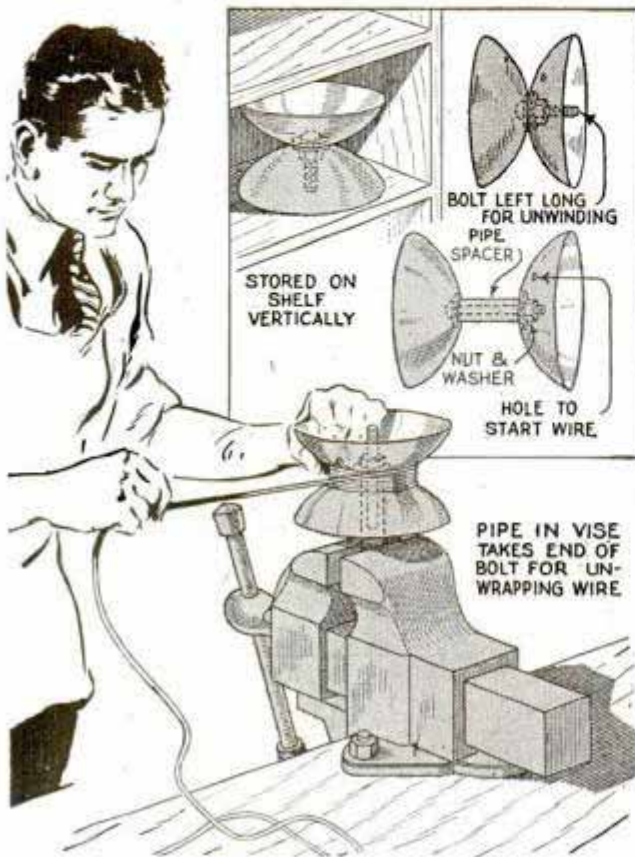
Use Your Camera with These "JIFFY" ENLARGERS

Most enlargers are complete units, including lens and bellows, but these are really only lamp houses. The camera that takes the picture supplies the lens and bellows units for making the enlargement. As you see, there are two types, one using an opal glass for diffusion, Figs. 1 and 2, the other a condensing lens, Fig. 5. Both types of lamp houses are supported on a column of 1/2-in. iron pipe. The sliding arm consists of a pipe tee, with the threads reamed out to fit over the column, a 4-in. nipple and a floor flange. The vertical column is turned into a flange which is screwed to the easel or baseboard. The lower part of the lamp house is built of wood and the reflector is made from a funnel, or, can be purchased ready made



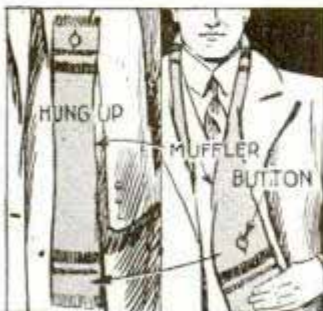
Of course, dimensions of the various parts may have to be altered to suit the camera used. In addition to the clamp for holding the camera back tightly against the light box, some types of folding cameras will require the ring support shown in Figs. 3, 4 and 6 and detailed in Fig. 2. This serves to hold the lens at exactly the position required. A negative holder can be made by hinging two pieces of plate glass with tape and then masking to the required area

Surplus Wire Wound on Spools from Headlight Reflectors



Neat, useful spools for storing odd lengths of magnet wire or single and double cord can be made if some old auto headlamp reflectors are at hand. Bolt them together as shown, leaving the end of the bolt projecting for a short distance at one end. Then, by clamping a piece of pipe vertically in the vise, the bolt end can be inserted into it and the spool will rotate while removing the wire. These spools can be made to take any amount of wire by inserting various lengths of spacers.

Muffler Buttoned to Overcoat



Instead of sticking your muffer in the pocket or in one of the sleeves when you take off your overcoat, why not button it to the coat so that it always will be in place when

needed? Near one end of the muffer make a buttonhole, put the muffer around your neck and then sew a button to the inside

of the overcoat in a position corresponding with the buttonhole in the muffer. Then, when you take off your coat, you can forget all about the muffer because it is buttoned in place and cannot get lost.

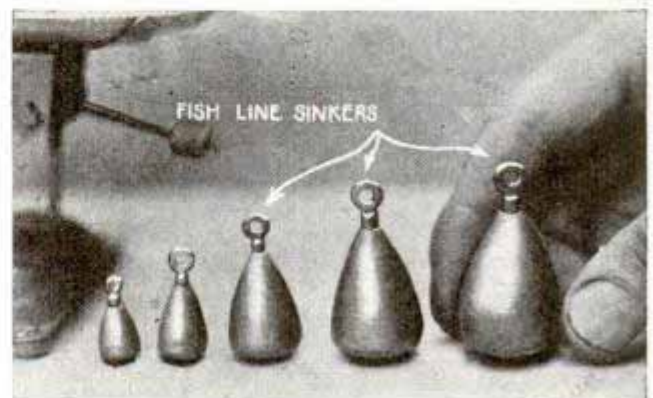
Metal Cam on Tinner's Shears Deflects Long Strips

Usually a long cut with tinner's shears in a piece of heavy sheet metal is hindered by interference of the waste stock, which does not bend or curl out of the way as the cut proceeds. To deflect the waste stock, attach a piece of metal under the end of the pivot bolt as shown in the photo. Be sure that the angular edge of the metal faces the direction that the cut is being made.

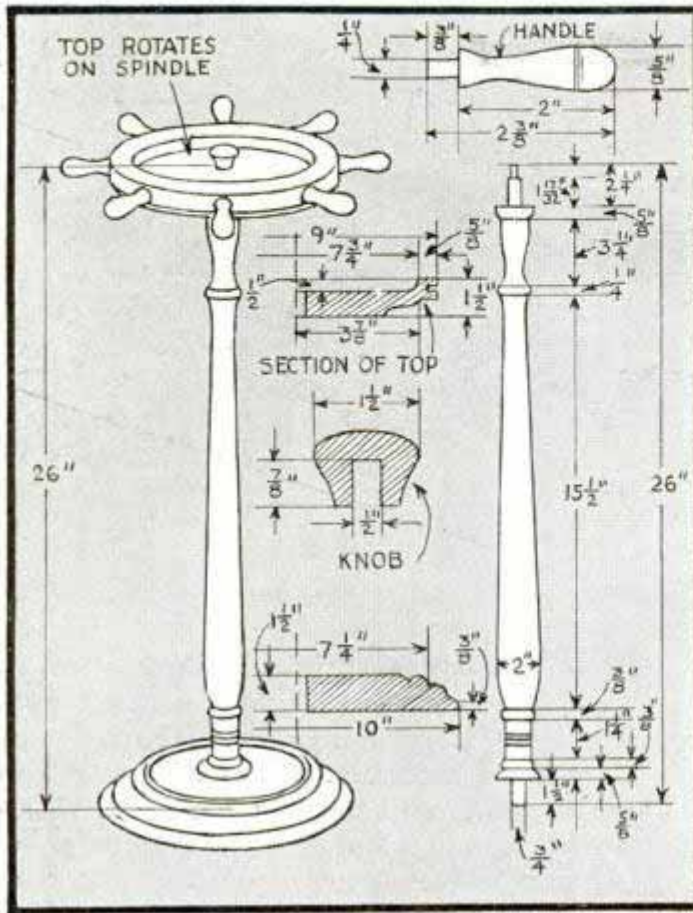


Fishline Sinkers Provide Weights for Small Chemical Scales

Photographers and others who mix chemicals from the same formula frequently, will find that ordinary fishline sinkers provide good weights for their balance scales. To make up a set of the weights, weigh each chemical in the formula carefully by the usual method and then take one of the sinkers and whittle it down until it just balances the chemical. Mark the name of the chemical on the sinker and then do the same thing with each chemical in the formula. The next time you make up the formula all you have to do is put the required weight on the scale and pour in the chemical until it is balanced. This saves reading the formula each time or taking care in weighing it.



Ship's Wheel Top on Smoking Stand Rotates



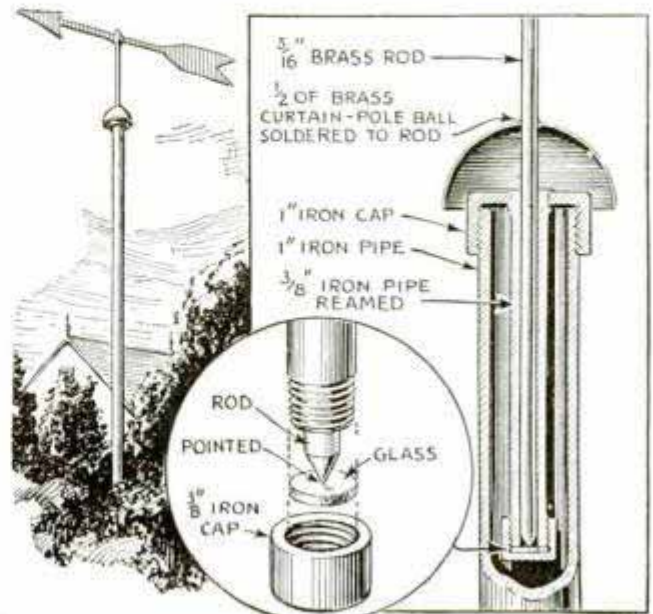
Pivoted so that it rotates for convenience in reaching articles, the helm-like top of this smoking stand gives it an unusual appearance. The entire assembly is a simple turning job, the top being deeply recessed and holes drilled in the edge to take the

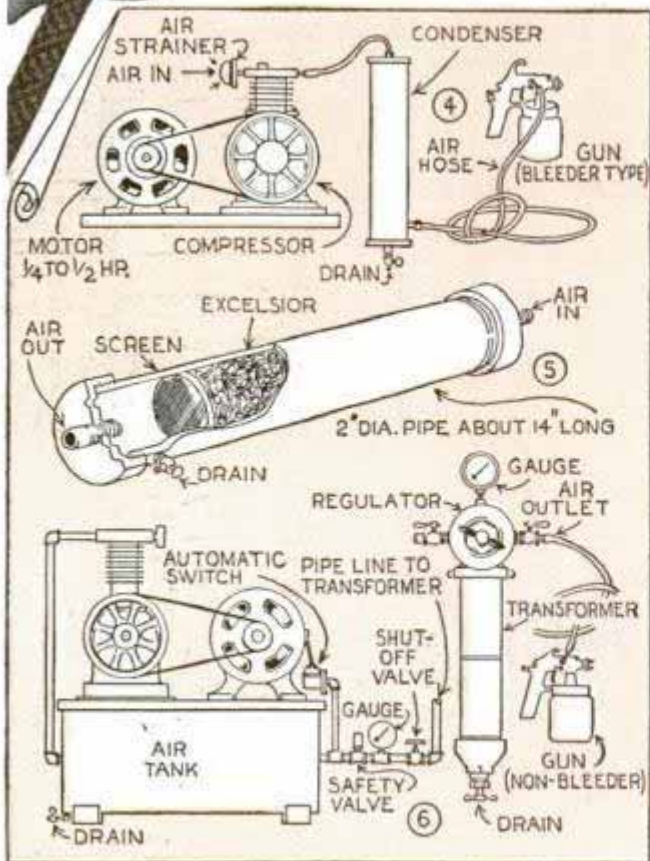
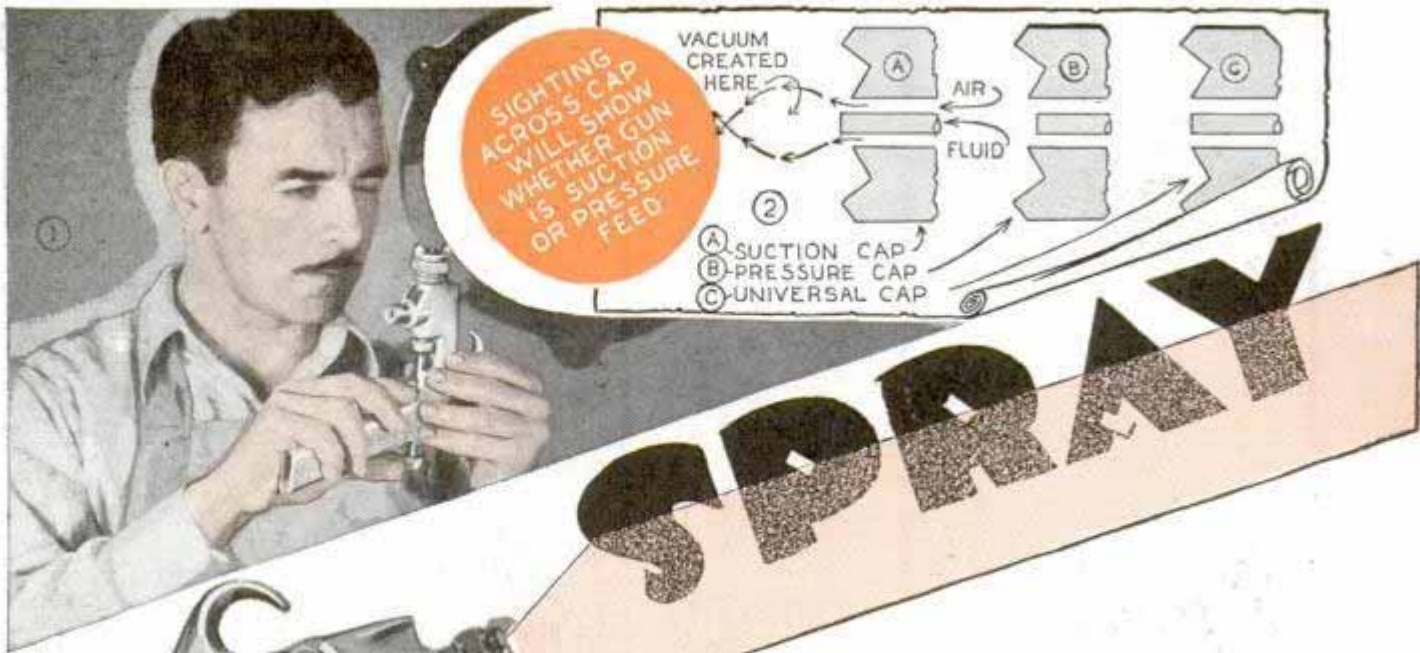
eight handles. Two tenons are turned on the upper end of the standard, one on which to pivot the top, and a smaller one on the end to take a knob, which prevents the top from coming off and also serves as a finger grip for lifting the smoking stand.

Rainproof Mounting for Weather Vane Has Glass Bearing

Here's a mounting for a weather vane that reduces friction to a minimum so that the vane turns freely. The standard is pipe with a cap at the top, which is drilled in the center and a smaller pipe soldered into the hole. This pipe is reamed to take a brass rod, which carries the vane. The pointed end of the brass rod rests on a glass disk inside a cap on the lower end of the small pipe. One half a brass curtain-pole ball is soldered to the rod as shown, to keep water from entering the assembly. —Fred T. Oakes, Croton on Hudson, N. Y.

☐ Inexpensive acidproof paint used to repair storage batteries, makes a good lining for tanks or trays in which chemicals or photographic solutions are to be used.





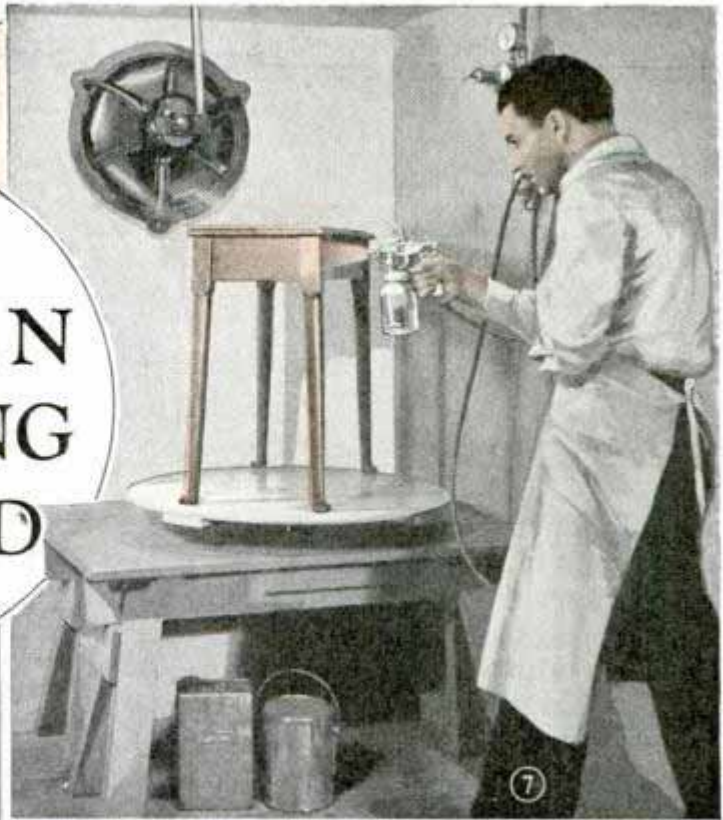
FINISHING becomes the easiest part of the job when done with a spray gun. Not only is spraying many times faster than hand brushing, but it also gives superior work and permits the use of fast-drying lacquers and synthetic enamels.

Many different arrangements are used in spray finishing. The simplest practical setup is the portable unit shown in Fig. 4. The condenser, Fig. 5, can be made from 2-in. pipe and can be arranged to drain from either the bottom or end. The condenser smooths out pulsations in the air supply, and also extracts the water and oil which form when the air is compressed. A more elaborate setup where the unit is to be stationary is shown in Fig. 6. In this arrangement, air is first pumped into a storage tank. An automatic switch on the tank turns off the motor when the pressure reaches 100 lbs., and turns it on again when the pressure drops to 80 lbs. Since the full 80 lbs. pressure is seldom needed, the main air line must be piped to a transformer. The transformer consists of two parts. The upper part is a regulator, which can be adjusted to deliver any required air pressure; the bottom part is a condenser as already described.

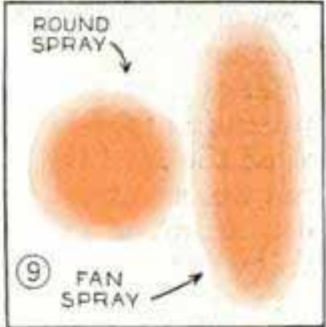
The spray gun for the portable installation shown in Fig. 4 must be of the bleeder type. The unit shown in Fig. 6 takes a non-bleeder gun. A bleeder gun is constructed to pass air at all times and must be used when air is taken direct from the compressor or where the compressing unit



THE MODERN FINISHING METHOD



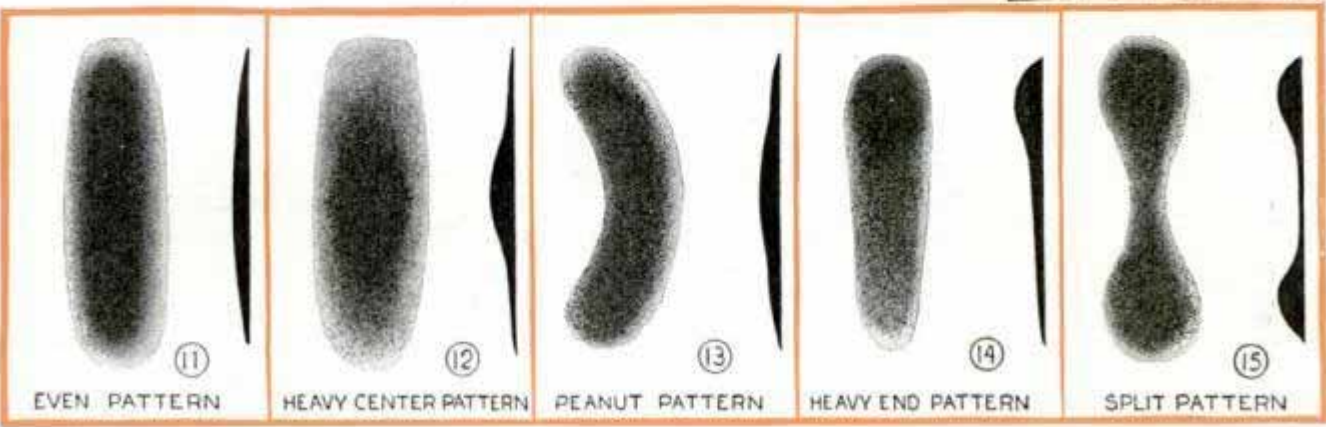
A TYPICAL HOMESHOP INSTALLATION



does not have some form of pressure control. A non-bleeder gun can be made a bleeder type by tying back the trigger, as shown in Fig. 10, to pass air but not pulled so far as to pass fluid. Two or three other features of gun construction must be considered. Most important of these is whether the gun shall be suction or pressure feed. In the suction feed, the fluid is pulled to the nozzle of the gun by the vacuum created by the air; in the pressure feed, air is introduced into the paint cup to force the fluid to the nozzle. Pressure feed is useful and necessary for heavy fluids; suction feed is practical for average fluids and is simpler and less expensive.



Most guns can be used with either pressure or suction feed.



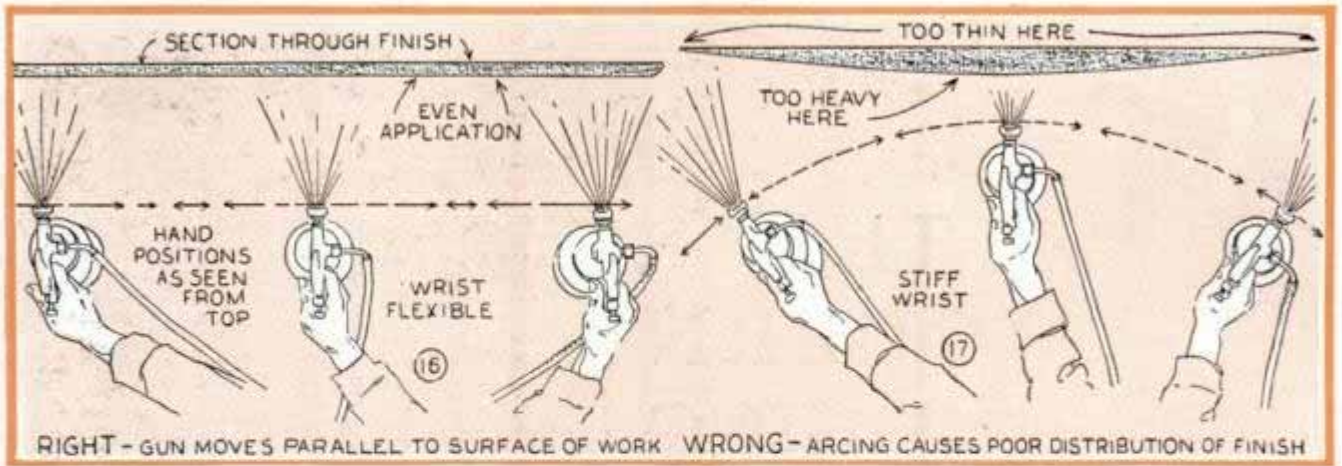
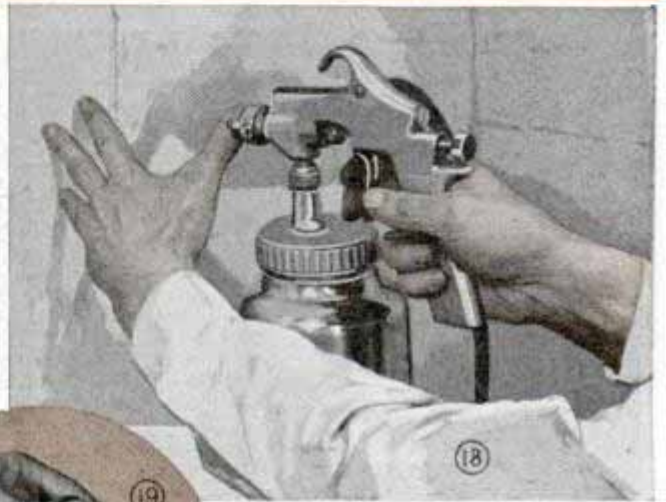


Fig. 3 shows a gun arranged for suction feed. By fitting a pressure feed cup and a different cap, the gun can be used with pressure feed. Many workers neglect the second feature—changing the cap—but it is of considerable importance. If you sight across the nozzle of a suction-feed gun, as shown in Fig. 1, you will notice that the fluid tip projects about $\frac{1}{32}$ in. beyond the air cap. This arrangement, as shown at A, Fig. 2, creates the vacuum necessary to draw the fluid to the nozzle. B shows the pressure cap, which extends beyond the fluid tip. This cap will not work with suction feed. The cap shown at A (suction feed) will work with pressure feed but gives poorer atomization of the fluid. The cap shown at C is a universal design used for either suction or pressure feed, but less effective with either than a true



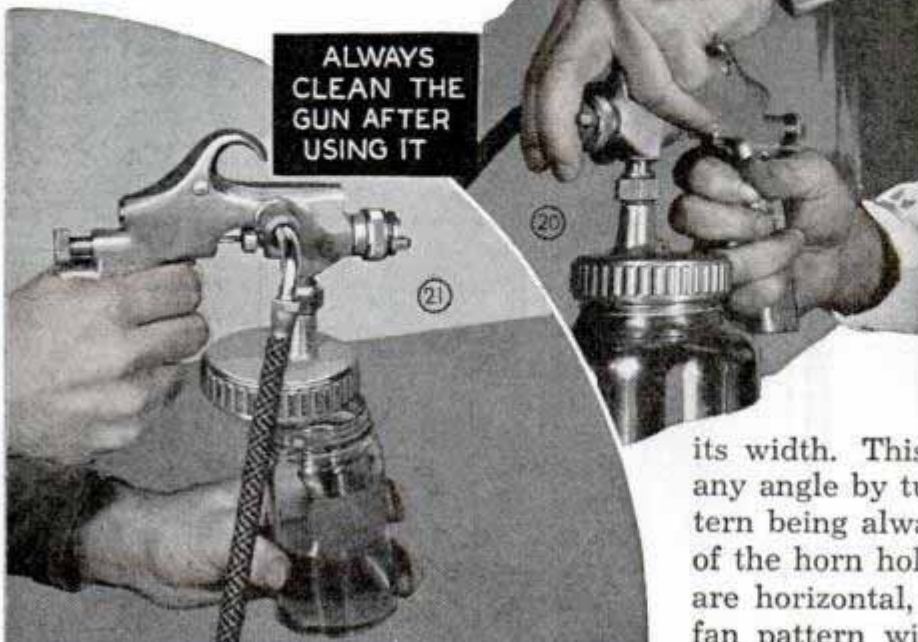
8" IS A GOOD WORKING DISTANCE



suction or pressure cap.

The air cap of an external-mix gun has three holes in it. The central hole passes the air which breaks up or atomizes the fluid. The two outer or horn holes pass air which forms the atomized fluid into a definite pattern. When air passes through the center hole only, the pattern is round, as shown in Fig. 9; when air passes through all three holes, the pattern is the familiar fan spray. The longer dimension of the fan spray, Fig. 9, is called, somewhat incorrectly,

its width. This pattern can be moved to any angle by turning the air cap, the pattern being always opposite to the position of the horn holes. Thus, if the horn holes are horizontal, the long dimension of the fan pattern will be vertical. This is the

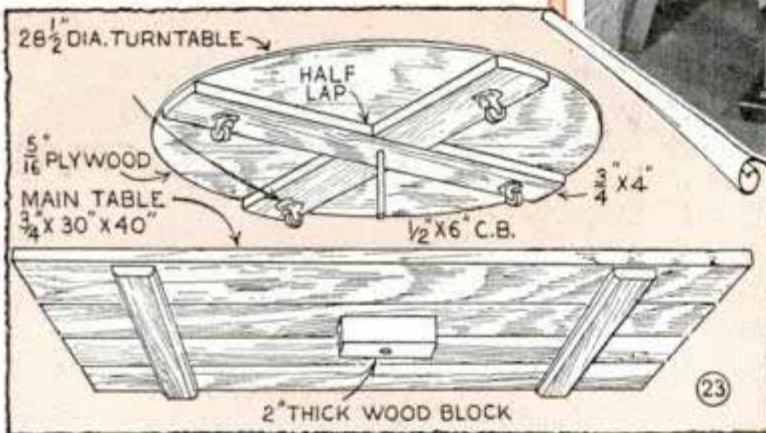


ALWAYS CLEAN THE GUN AFTER USING IT

adjustment usually used. Most guns make a fan pattern only, but better quality guns make both fan and round patterns. When the gun is of the internal-mix type, that is, the air and paint are mixed inside the cap, the air cap is slotted to give the same fan spray. Between external and internal mix guns, external mix is the most prevalent and practical.

The first operation in spray finishing calls for the making of a pattern. Hold the nozzle of the gun about 6 in. away from a sheet of cardboard or paper, as shown in Fig. 8, and pull the trigger. The resulting pattern shows whether the gun is prop-

Right, work suspended on strings for finishing. Below, construction of a simple turntable



erly adjusted to go ahead with the work. Fig. 11 shows the perfect pattern—a long oval, with the paint evenly distributed and finely atomized at the edges. The heavy-center pattern, Fig. 12, is

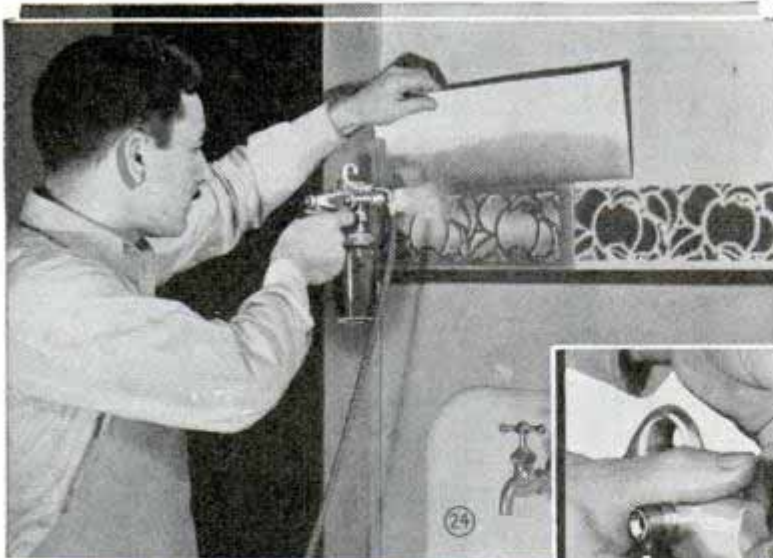
SPRAYING RECOMMENDATIONS *

- SHELLAC** Use 3-lb. cut. Can be used either suction or pressure feed.
- VARNISH** Use spraying varnish at can consistency. Thin brushing varnish 25%. Hold nozzle 8 to 10 in. from work.
- LACQUER** Reduce 25 to 150%, depending upon type. Hold nozzle 6 to 8 in. from work. Apply full wet coats.
- SYNTHETICS** Spray mist coat, first coat. While still tacky, apply full wet coat. Average synthetic works best pressure feed, but can be thinned as required for suction feed.
- PAINT** Oil paints and enamels should be thinned as required. Hold nozzle 8 to 10 in. from work.

*With maintained air pressure between 22-28 lbs.

COMMON FAULTS

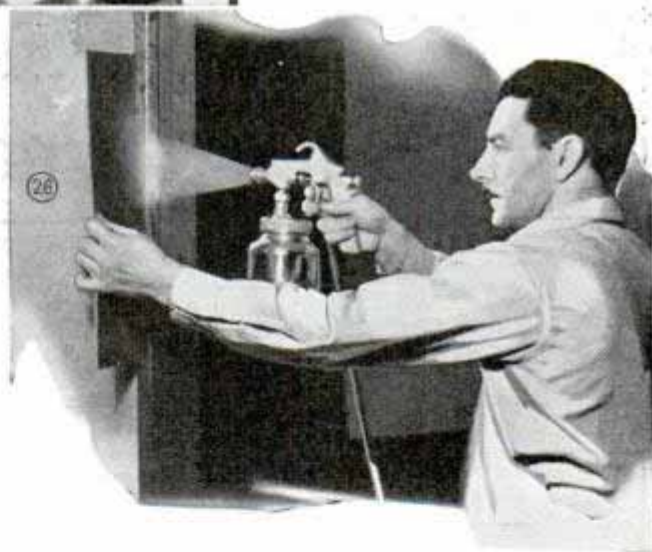
- DRY SPRAY** The sandy, "orange peel" effect encountered when spraying lacquer and synthetics is usually caused by holding nozzle too far from work so that only a dry dust is deposited on the work. Correct by working closer, increasing fluid or reducing air.
- PINHOLES** Caused by holding gun too close to work, or, excessive air pressure, or, heavy fluid; also can be caused by work improperly filled.
- BLUSHING** Blushing is a whitish cast on lacquer caused by absorption of moisture. Seldom encountered except during summer. Correct by adding retarder to lacquer.
- SAGS** Sags or curtains are caused by too much material on work. Correct by working gun faster or decreasing fluid.



STENCILING IS DONE WITH ROUND SPRAY

poorly atomized, caused by insufficient pressure. The peanut pattern shown in Fig. 13 gives good distribution, but is poorly shaped. It is caused by the clogging of one of the horn holes. The pattern shown in Fig. 14 is usually caused by a dirty gun, resulting in a partial clogging of the fluid tip. The split pattern, Fig. 15, results when too much air pressure is used, and is corrected by reducing pressure or increasing the flow of material. Of the various patterns, the one shown in Fig. 12 will give most trouble to the home-shop owner. This fault is one of equipment—there is not enough pressure to break up the paint which is being sprayed. To some extent, this can be corrected by cutting down the amount of fluid delivered to the nozzle (your gun should have an adjustment for this), but the only true remedy is to install a larger compressor or use a smaller gun.

After obtaining a good pattern, you are all set to spray. The very first rule to remember is always to keep your gun at right angles to the surface being finished, Fig. 16. This requires a flexible wrist, and demands a little attention until the right movement becomes automatic. Fig. 17 shows the common fault of the beginner. Arcing in this manner causes poor distribution of the finishing material. Learn how to "trigger" your gun. The start and finish of a stroke on a flat-wall surface must be feathered off. If you are working on a flat surface which can be covered with one stroke, start the fluid before you hit



Cardboard strips can be used for a large percentage of spraying jobs where masking is necessary

strainer or cloth, Fig. 19. Always clean the gun after using it. This operation is very simple, and is done by simply placing the fluid tube in a jar of thinner and pulling the trigger, as shown in Fig. 21. Some workers also alternate this by holding two fingers lightly over the nozzle, as shown in Fig. 20. When the trigger is pulled, the thinner surges violently in the cup and exerts a powerful cleaning action.

While spray finishing can be done anywhere in the shop, it is best to reserve and equip a certain space for the work. Fig. 7

the work, and stop it immediately after running beyond the work. Overlap your strokes about one-half, that is, the edge of the second stroke should come to about the center of the first stroke. Keep the gun in motion.

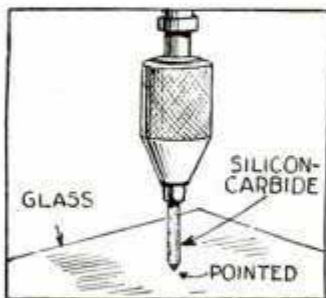
A second point to be considered is the distance from the gun to the work. This varies with different materials and guns, but 8 in. is a good general average. Spraying distances for certain materials can be checked readily by spanning the fingers from the gun nozzle to the work, as shown in Fig. 18.

Cleanliness is of prime importance in spray finishing. Strain any doubtful material through a tea

shows a typical installation. Fig. 22 shows a simpler arrangement. A turntable on which work can be placed and rotated is a worth-while item, and can be made easily as shown in Fig. 23. An exhaust fan is a nice feature, but not strictly necessary in the home shop where only one piece at a time is finished. Most workers get along nicely by opening two windows of the basement, thus creating a cross current which quickly carries away fumes caused by the spraying of the finishing material. Notice that on the portable outfit shown in Fig. 22, the motor, compressor and condenser are combined in one unit. The set-up shown in Fig. 7 is a larger stationary installation using a transformer, the top of which can be seen behind the worker.

Portable equipment has a nice feature in that it can be moved to any location. Thus, if you want to stencil a border on the kitchen wall, Fig. 24, it's no trick to pick up the equipment and carry it upstairs. The stenciling operation shown here is done with the usual paper or metal stencils, holding a strip of cardboard against the wall to catch any overspray. Stencils should be worked with a round spray. If your gun does not have this adjustment, a round spray can be made by blocking off the horn holes with friction tape, as shown in Fig. 25. Fig. 26 shows how a strip of cardboard is used to catch overspray when finishing woodwork. Similar methods can be used to protect windows and other surfaces. Where clean separation is required, as in two-tone color work, masking tape should be used to cover areas which are not to be painted.

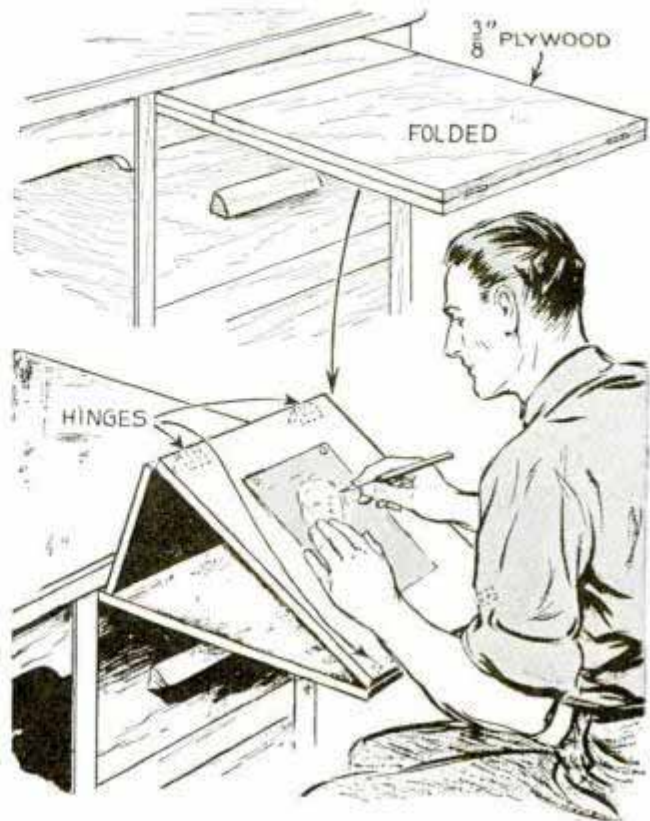
Glass Drilled with Silicon-Carbide



I have found that a pointed piece of silicon-carbide is superior to a steel drill for making holes in glass. When chucked in a drill press or hand drill, the silicon-carbide will penetrate the glass faster than a drill without the chances of chipping it. The pointed end of the carbide should be dipped in water occasionally.

—Nicholas Biebel, Buffalo, N. Y.

Desk Slide Instantly Converts into Drawing Board



Office workers who occasionally need a sketching board will find this combined desk slide and drawing board worth-while. It is made from $\frac{3}{8}$ -in. material, doubled to fit in the slide slot of the desk. Three pieces are hinged together so that, when the slide is pulled out, one section drops down to support the outer section at any angle.

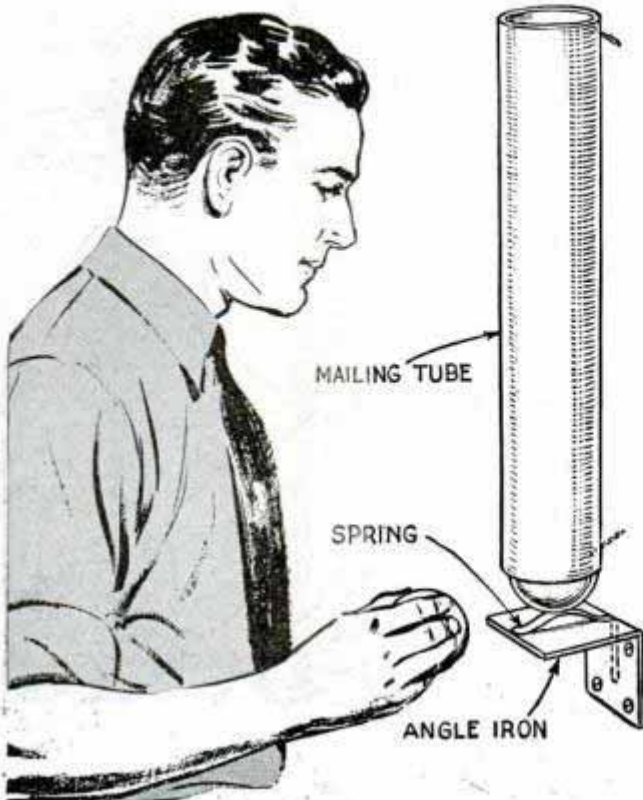
Saw Vise Serves as Depth Gauge

Fastened to a hand-saw blade to limit the depth of the cut, a small saw vise serves nicely as an emergency depth gauge. Remove the vise from its bench clamp and place the jaws on the saw blade,



making the distance from tips of teeth to the jaws equal to the depth of the cuts you wish to make. Start the cuts with the point of the saw where you can see the line easily and finish with the portion of the blade under the jaws.

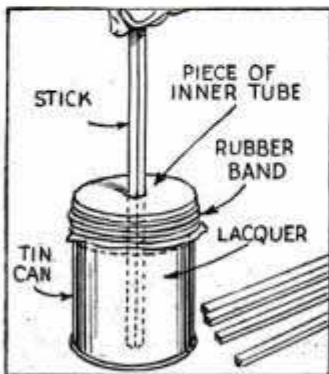
Table-Tennis Balls Dispensed One at a Time



A neat holder for several table-tennis balls can be made from a 2-in. cardboard mailing tube, which is mounted on the wall near your tennis table. Just below the bottom end of the tube, screw a short piece of angle iron to the wall to serve as a shelf. Directly under the end of the tube fasten a curved spring to the shelf, letting one end extend down between the shelf and the wall to hold it in place. The spring keeps the balls from coming out. To remove them, grasp the bottom ball with the fingers and press down against the spring.

—Donald C. Stiles, Springfield, Mass.

Paint-Dipping Can Has Wiper

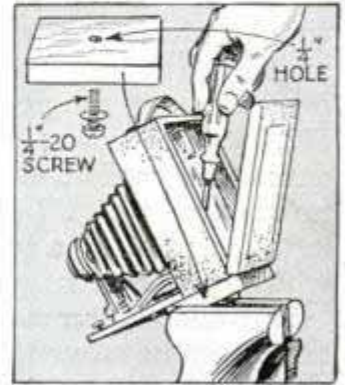


One craftsman who made up several hundred small wood novelties with handles that had to be painted near the ends, rigged up the dipping can shown. This consisted of an ordinary paint can with a piece of inner tube stretched over the top and held by a rubber band. A

small opening was made in the center of the rubber so that the handles could be inserted into the can. When they were withdrawn the rubber tended to wipe off the surplus paint.

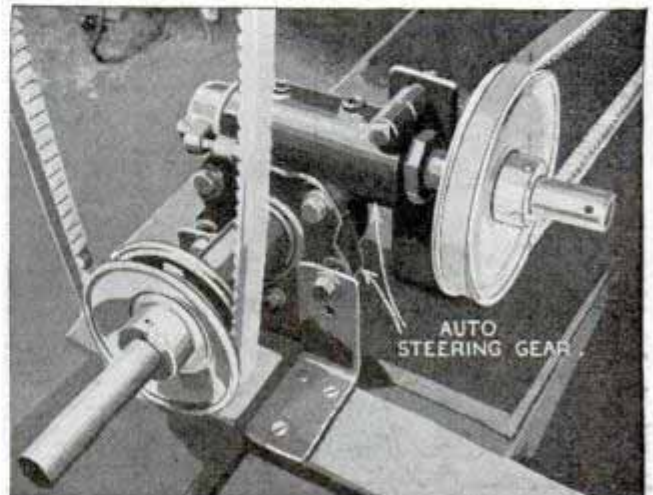
Jig to Hold Camera in Vise Facilitates Repair Work

When repairing the bellows of your camera, or when working on other parts of it, you will find this simple jig for clamping the camera rigidly in a vise a great help. The jig is nothing more than a small wood block drilled in the center to take a standard 1/4-20 machine screw for attaching the camera to the block. The block can be clamped in the vise at any angle.



Auto Steering-Gear Mechanism Serves as Reduction Gears

For operating models, small machines around the home and other light work, the steering-gear mechanism from an old car will serve nicely as reduction gears. Also, it can be used to step up the speed by belting the motor to a pulley slipped onto the stub shaft where the steering-wheel shaft entered the housing. Many of these gears have a reduction as low as 17 to 1. If it is used to step up the speed, care must be taken, of course, to keep the gears properly lubricated.



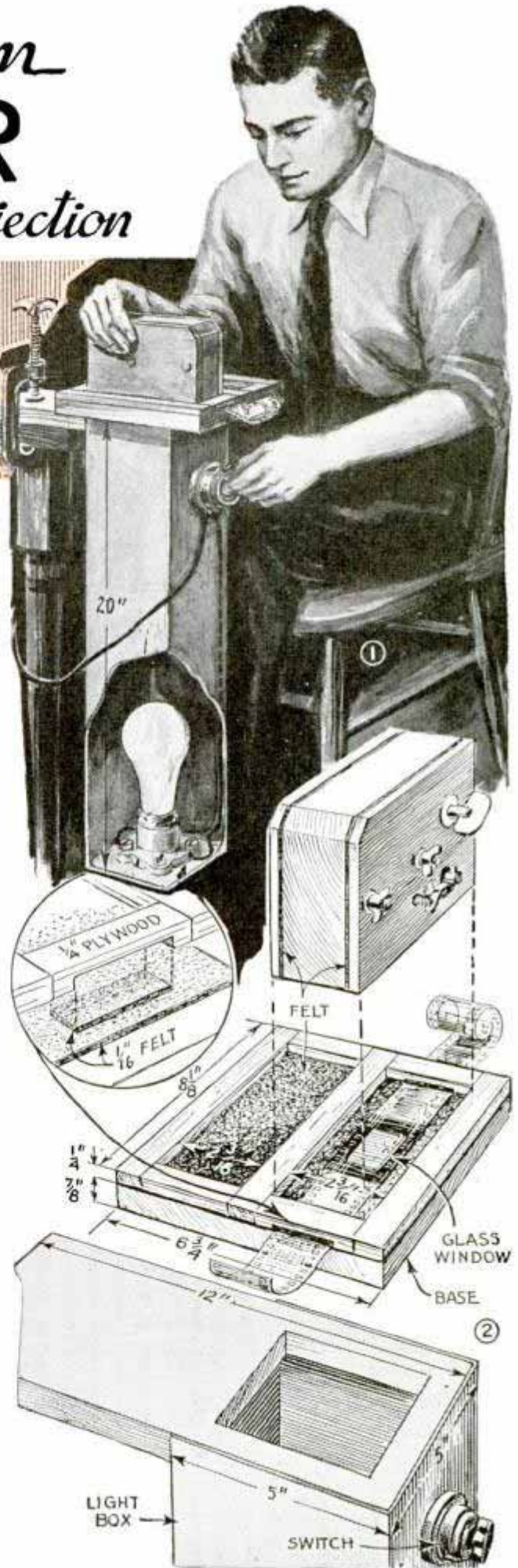
Miniature film PRINTER makes positives for projection

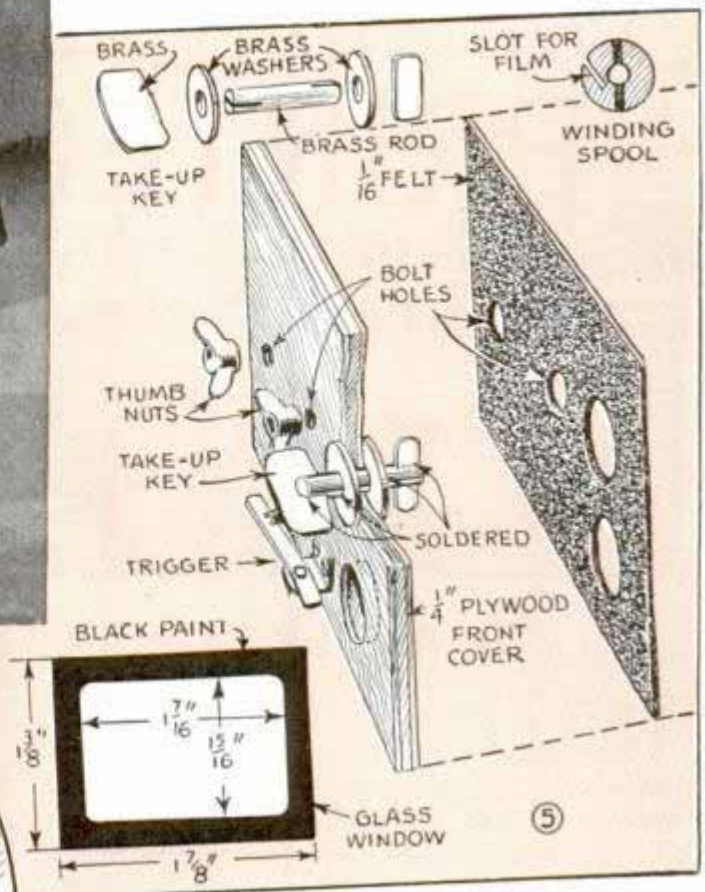
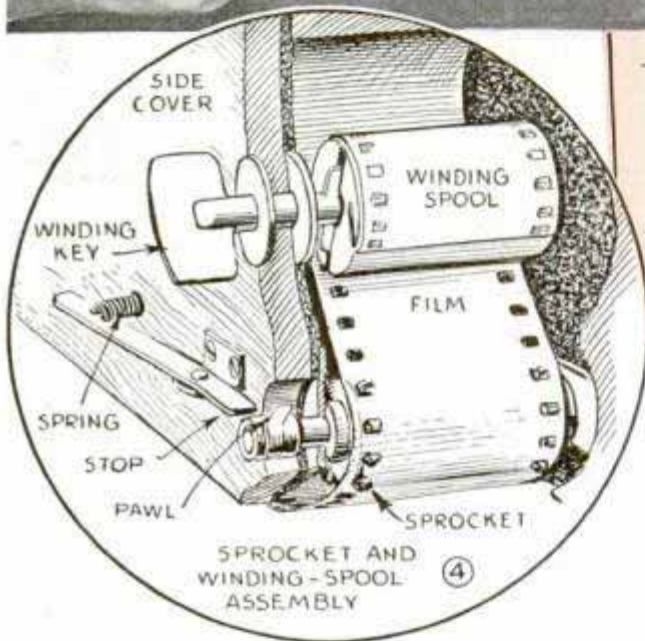
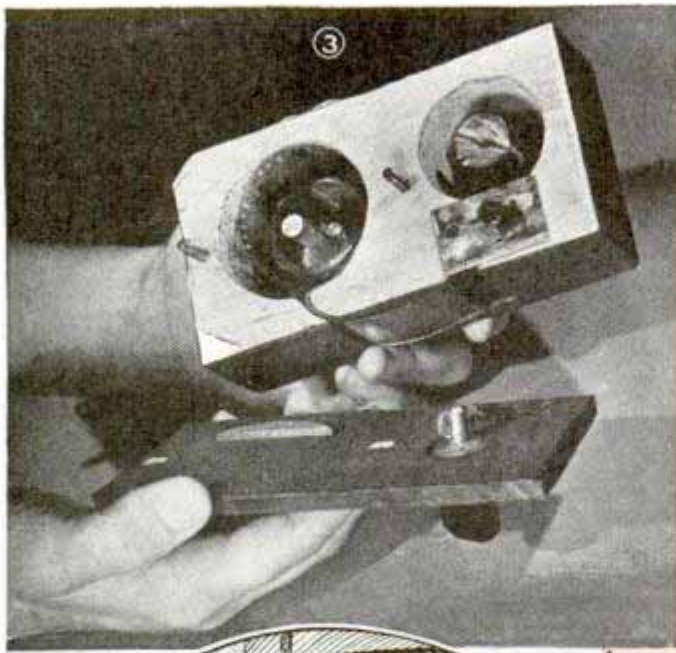


By R. E. BEST

YOUR choice miniature films can be shown to best advantage by projecting them on a screen like the old-fashioned lantern slides. Instead of having a large number of these films printed commercially, which would be expensive, you easily can construct a printer like that in Fig. 1, and make them yourself at a cost which is comparatively negligible. Thirty-five millimeter positive film can be purchased in 100-ft. rolls for about two cents per foot and you can print seven pictures of the standard miniature size to the foot. It is necessary to print a number of pictures at a time and then develop the whole strip at once. Of course, the film must be protected from the light during intervals between exposures, and there also must be a device to move the film the proper distance after each exposure. This should be the distance measured by nine perforations in the film.

Figs. 2 to 6 inclusive show the lightproof magazine and the arrangement for winding the film accurately. If you have access to a lathe you will find no difficulty in making a film-spacing sprocket to the dimensions given in Fig. 6. Sprocket teeth can be cut either with a milling attachment, or by turning the cutting tool sideways in the tool post and moving the carriage back and forth by hand. If no lathe is available a sprocket can be built up by hand which will be sufficiently accurate for this work. First make two disks of $\frac{1}{16}$ -in. brass or steel and carefully file in the teeth to the dimensions given in Fig. 6.



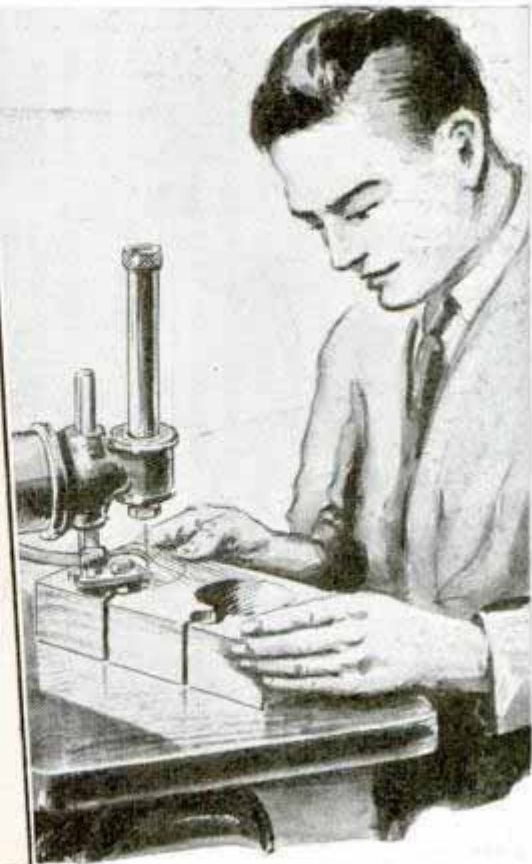
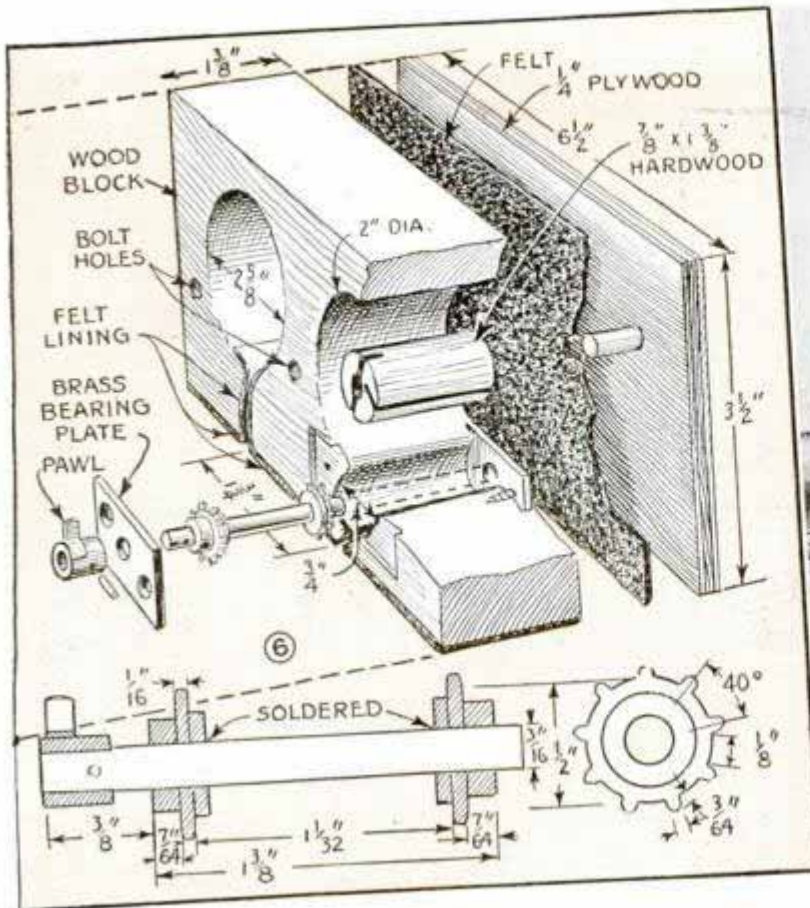


The two sprockets thus made are spaced and soldered to a $\frac{3}{16}$ -in. brass rod as shown. Solder a washer $\frac{7}{64}$ in. thick at each end making the sprocket $1\frac{3}{8}$ in. over all. Solder or pin a short piece of tubing to the shaft and to this solder a piece of No. 20-ga. sheet brass to serve as a stop or pawl to engage the trigger at the end of each revolution, as in Figs. 4 and 6.

Next, construct the film magazine of soft pine to the dimensions shown in Fig. 6. The 2 and $2\frac{5}{8}$ -in. openings in the magazine are for the unexposed and exposed portions of the film respectively. The sprocket fits into a $\frac{3}{4}$ -in. hole as indicated. Channels for passage of the film must be cut wide enough to permit it to move between strips of soft felt and narrow enough to be lightproof. Fasten a $\frac{1}{4}$ -in. plywood cover over the back with screws, using a piece

of felt for a lightproof gasket as shown. Insert and glue in place a length of $\frac{1}{4}$ -in. dowel in each magazine to hold the film supply and the take-up spool, and fit the sprocket into brass bearing plates which are fastened in place with small screws, Fig. 6. Note that the sprocket shaft must project far enough so that the pawl will strike the trigger at the end of each revolution, Fig. 4. Glue a piece of felt to the front of the block so that when the cover is fastened with bolts and wing nuts it will be light-tight.

The winding spool is center drilled and slotted along the side to engage the end of the film as shown in Fig. 5. The key for turning the winding spool consists of a $\frac{1}{4}$ -in. brass shaft, two brass washers and two cross pieces soldered into slots at each end of the shaft, one to engage the end of the winding spool and one by which the whole thing is turned. The cover is fitted with a spring-actuated trigger to engage the pawl on the sprocket shaft after each revolution and release it for the purpose of letting the film move into its new position. Strips of felt should now be glued onto the bottom and in each of the film channels so that it will be impossible for



light to penetrate to the film magazines.

Next, you make a base as in Fig. 2, having two compartments $\frac{1}{4}$ in. deep into which the film magazine will fit. Line the rear compartment with felt so that when the magazine is placed there between exposures the entire film will be protected from the light. The front compartment has a glass window, Figs. 2 and 5, fitted in flush with the surface in such position that the light coming through it and the negative will strike the positive film. Paint the margins of the glass so that the unpainted portion is a rectangle with curved corners $1\frac{5}{16}$ by $1\frac{7}{16}$ in. in size. The light for exposing the film should be a ten-watt lamp placed in the bottom of a box 5 by 5 by 20 in. and fitted with a convenient switch, Figs. 1 and 2. Make the top 5 by 5 by 12 in. so that it can be clamped to the top of a table. Cut an opening 4 in. square over the light.

Now, to operate the printer, load the film magazine and place it in the rear compartment of the base. Place the latter over the light box and fit a negative strip over the glass window as shown in Fig. 2. Turn off all lights (except a ruby light) and move the magazine over to the front compartment of the base. Snap on the white light

and expose from two to fifteen seconds, depending on the density, release the trigger and turn the film into position for the next exposure, then return the magazine to the rear compartment of the base, after which you can turn on the room lights and arrange a new negative for printing. There are several inexpensive projectors on the market which will handle 35mm. film.

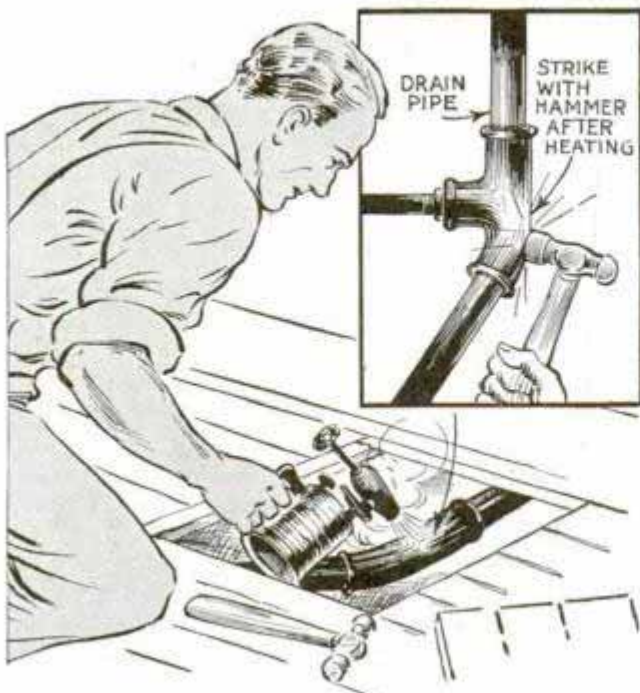
Electric Heater Used as Flash Gun

I find that an electric heater having a chrome reflector provides an ideal photoflash lamp. These heaters are reasonable in price and the large reflectors throw light over a wide area. A feed-through tumbler switch is a convenience, and two or three bulbs may be fired at once by using double or triple sockets.

—Arthur Trauffer, Davenport, Ia.



Clogged Drain Pipe Cleaned with Heat of Blowtorch



In early types of plumbing, several lines are often run into a common discharge with the result that the main line clogs at the junction. When a plumber cannot be found, the householder can often clear the lines by an old trick of the trade. Direct the flame of a blowtorch back and forth along the underside of the pipe until it becomes hot. Then follow the flame by striking the pipe sharply with a hammer. Do this at all sides of the junction. The heat will swell and even steam the clogged mass while the hammer blows will loosen it.

Scoops Made from Shoehorns

When bent as indicated, shoehorns make excellent scoops for handling photographic chemicals. Shoehorns being inexpensive, several scoops can be made and one used for each chemical. One of the features of

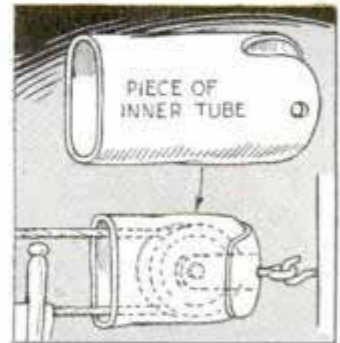


the scoop is that when weighing powders, they may be added slowly to the scale pan by simply pushing them with the thumb.

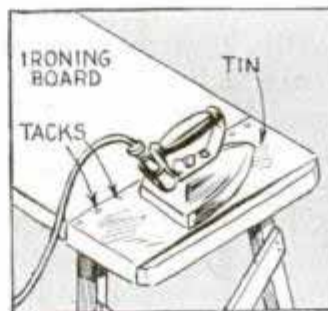
—Daniel Reynolds, Pontiac, Mich.

Clothesline Pulley Shielded from Snow and Ice

Pulleys supporting "traveling" clotheslines are often prevented from operating by accumulations of snow or ice which freezes within the housing. If lengths of inner tube are cut and fitted over the pulleys as shown, they will act as effective shields to prevent such difficulties.



Sheet Metal on Ironing Board Reduces Arm Strain



Instead of lifting the iron on and off the holder each time I set it down, I use a piece of smooth, bright sheet metal nailed flush with the ironing-board surface as a holder.

In this way I merely slide the iron off and on the metal, which also tends to help the iron retain its heat better than the regular type of holder.

—Mrs. N. C. Jensen, Chicago.

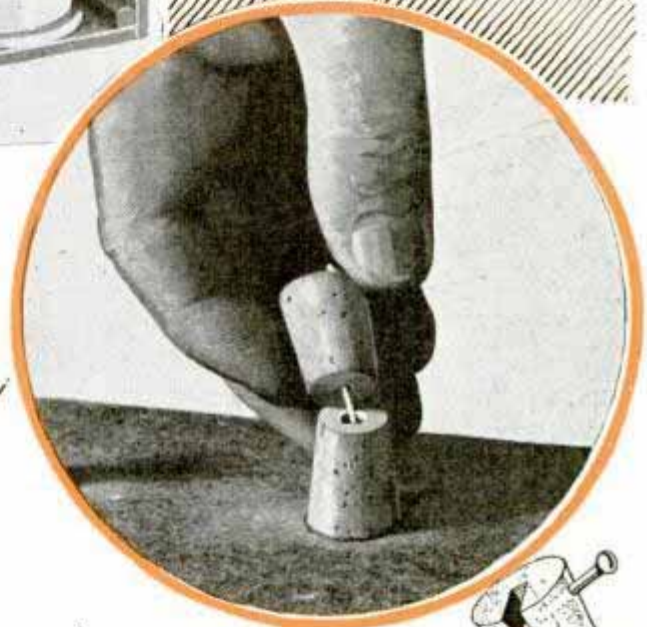
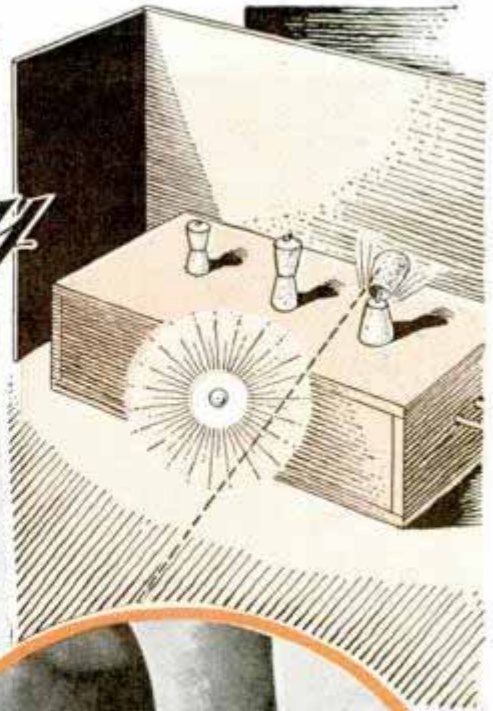
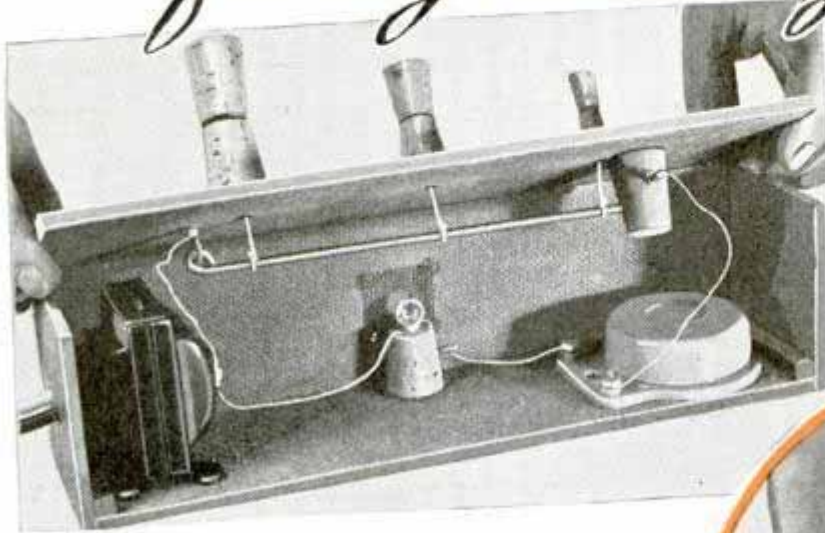
Tape Aids in Drilling Small Parts

When you have to drill a hole transversely through round wood stock, wrap the part tightly with tape before starting the hole. The tape tends to strengthen the wood so that there is less possibility of the drill splitting it.

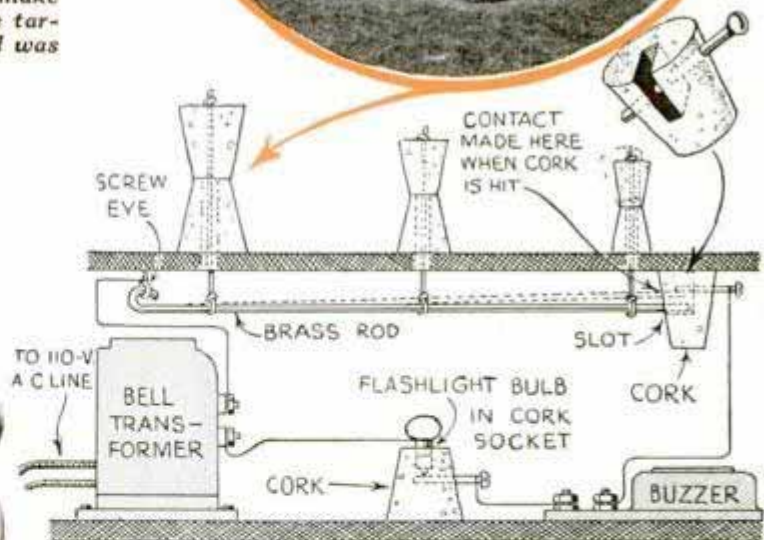
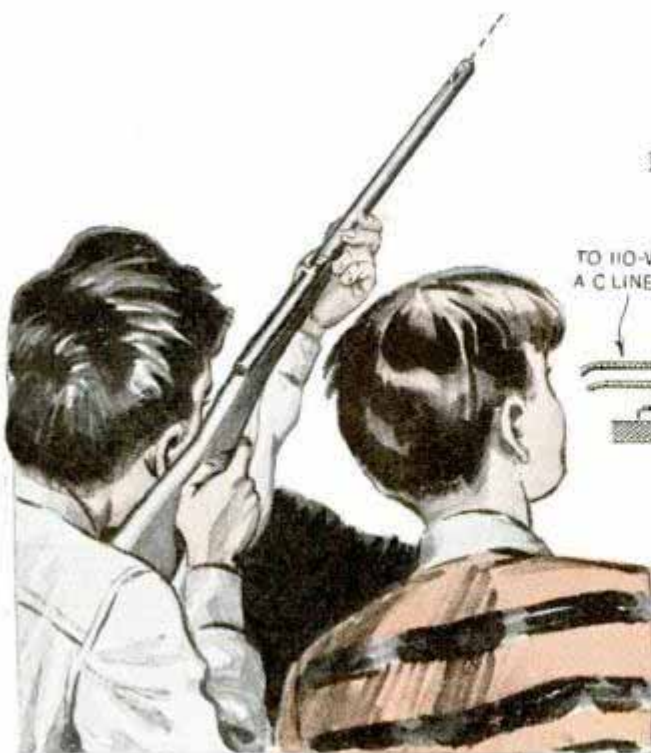


—Fred Cornelius, El Paso, Tex.

Electric TARGET for toy artillery

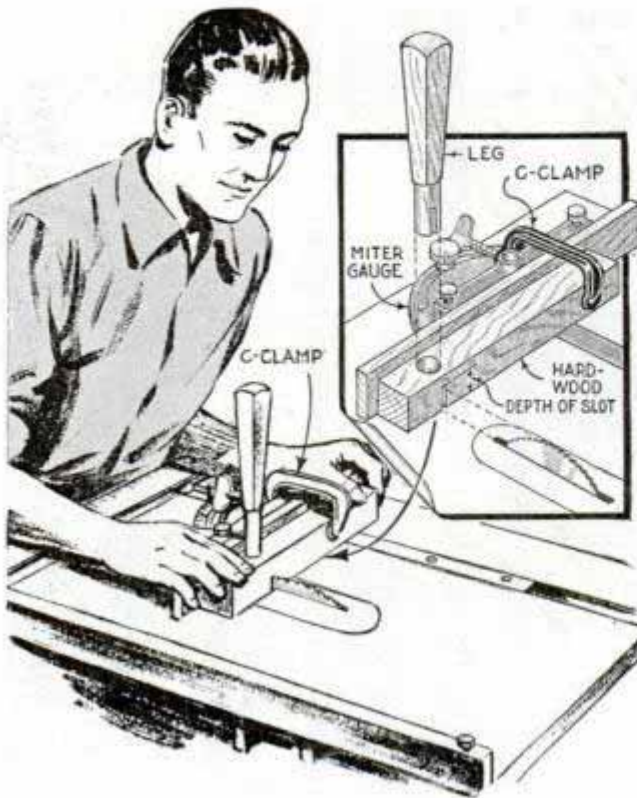


Intended for use with a pop gun or pistol, this electrically operated target sounds a buzzer and flashes a light when hit, and then automatically resets itself. If desired, it can be used as an air-rifle target by substituting rubber bottle stoppers for the regular corks. A heavy canvas back-stop will catch the lead pellets for repeated use. A peculiar feature of the target is that although the largest cork is naturally the easiest to hit, due to a leverage principle in the mechanism it is the most difficult with which to make a score. The small cork, on the other hand, is very sensitive. A direct hit is necessary in order to make the buzzer sound and the light flicker. The target case is 11 in. long and 3 in. square, and was made from $\frac{1}{4}$ -in. hard-pressed wood



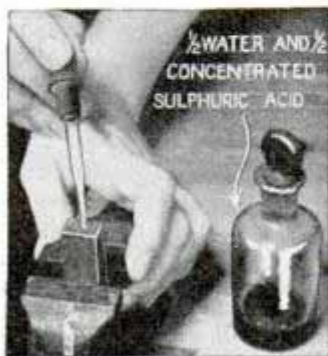
An ordinary toy or bell transformer, electric buzzer and flashlight bulb complete the electrical equipment, which is wired as indicated above. The circuit is momentarily closed when one of the three corks is hit, and, as the buzzer and light are wired in series, the light flickers instead of throwing a steady beam through a screen-covered window in the front of the case. The weight of the brass rod returns the corks to their positions after each hit

Simple Jig Aids in Slotting Legs for Pegged Construction



When constructing colonial furniture having "pegged" joinery, slotting of the members to receive snug-fitting wedges can be done quickly and accurately with this jig. A hardwood block, bored to take the tenon of duplicate pieces snugly, is clamped to the miter gauge of the saw in a position to allow the blade to be at exact center with the hole. The work to be slotted is inserted upright in the jig and passed over the saw. The height of the blade above the table determines the depth of the slot.

Removing Broken Taps and Drills



parts of water and concentrated sulphuric acid is helpful. Mix the solution by dropping the acid slowly into the water. Then

The home mechanic who has the problem of removing a broken tap or drill from a piece of work where the hole can be re-tapped oversize, will find that a solution consisting of equal

apply it directly to the broken tap or drill. While the solution will not consume the broken member entirely, it will reduce its diameter so that the piece can be removed. The solution also acts on the metal around the hole so that the latter is bound to be enlarged slightly.

—J. P. Driscoll, Buffalo, N. Y.

Tape Roll Improved with Washer

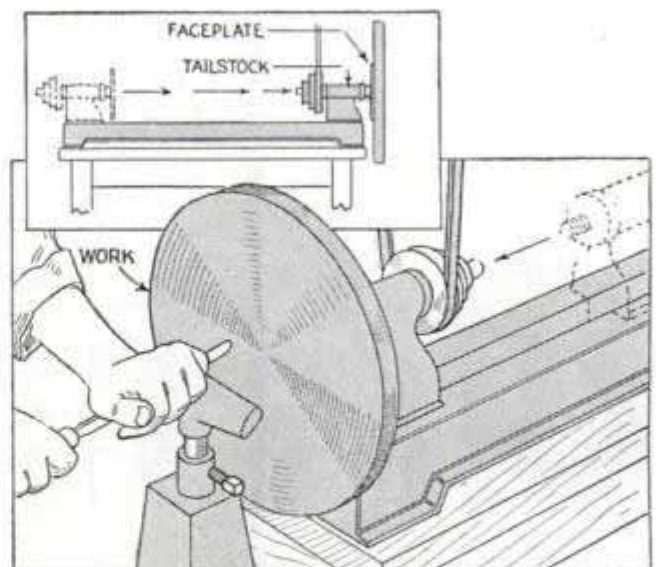
The annoying job of lifting the end from a roll of tape to tear off a piece is simplified by slipping a small metal washer under the end of the tape as indicated.



The washer will stay in place, and the uncovered portion is easy to lift with the fingernail.—Frank Bentley, Clinton, Iowa.

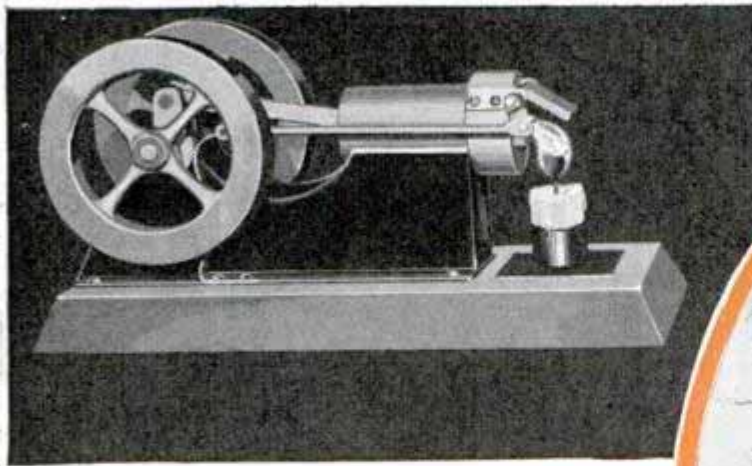
Turning Large Disk in Small Lathe

When I had a large disk to turn and the swing of my lathe was too small to accommodate it, I slid off the tailstock and moved the headstock to the extreme right end of the bed as indicated. This allowed the faceplate to hang over the end of the lathe bed so that I had plenty of room to handle the



disk. An improvised post set on top of the bench top took care of the support for the turning tool. Of course, it was necessary to shift the motor to line up with the lathe pulley.—R. Rapenport, Columbus, Ohio.

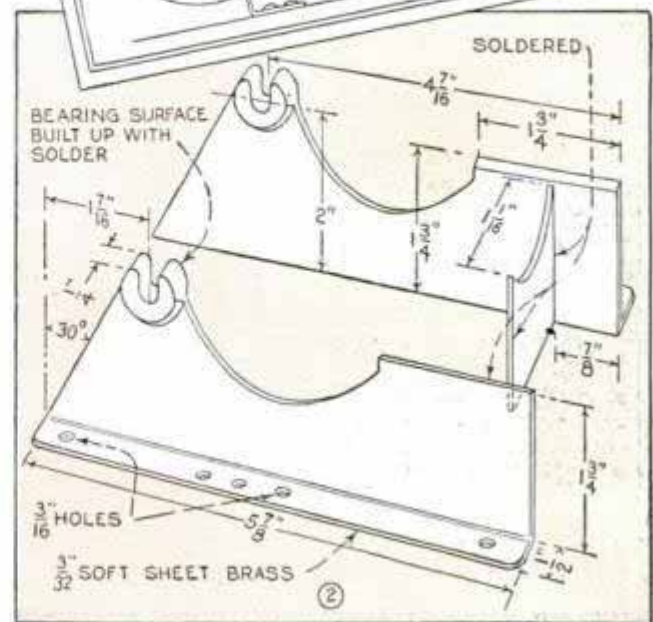
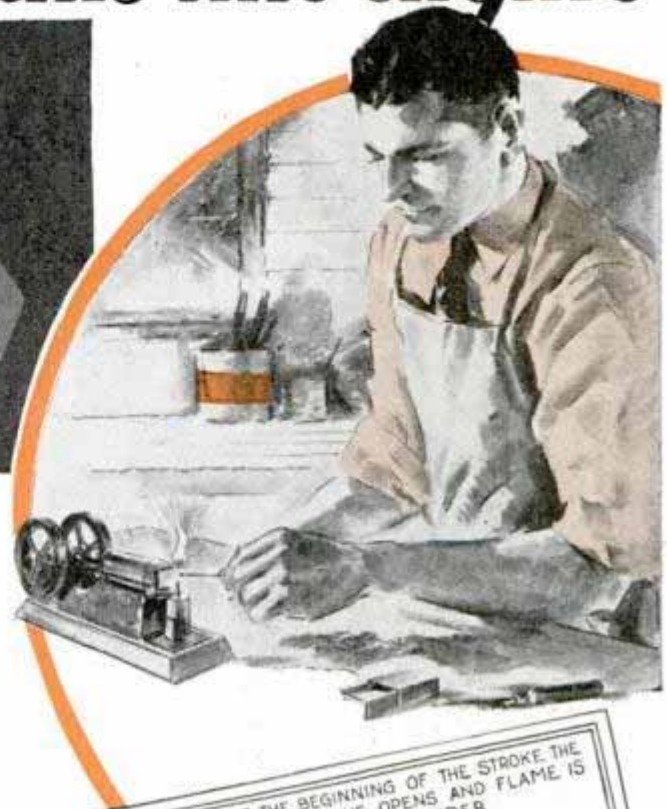
A CANDLE *runs this engine*

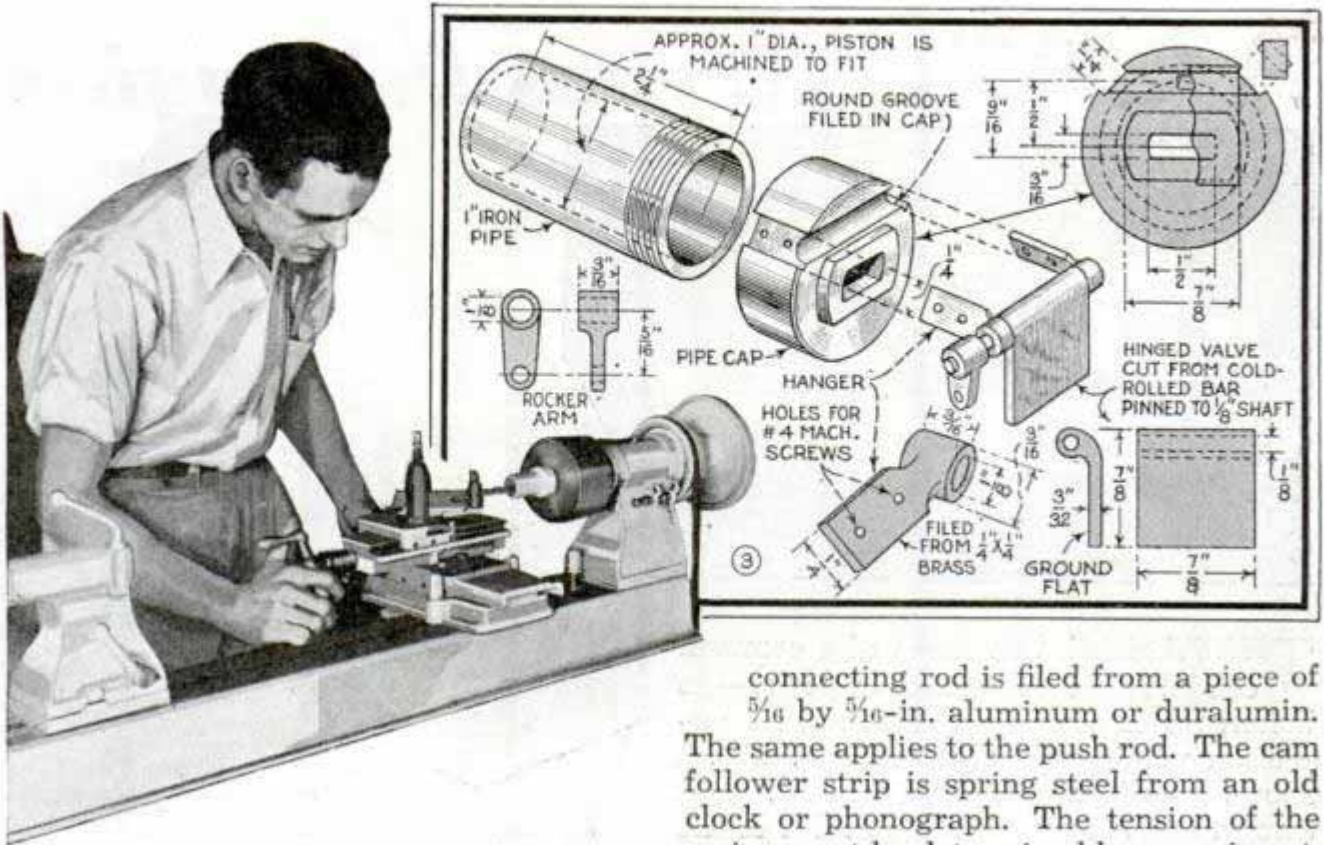


THAT'S right! The flame of a common candle is the sole source of power—no boiler, no displacement chamber, no explosion within the cylinder itself. Fig. 1 shows how it works. You will see right away that it is essentially a model of the heavy-duty, horizontal-type gasoline engine, except for the hinged valve mounted on the cylinder head. This trap-door affair fits tightly over an opening in the cylinder when closed, and is actuated by a cam on the crankshaft. The lighted candle is set with its flame adjacent to the opening. As the piston moves in one direction, the valve opens and the flame is sucked into the cylinder. At the end of the stroke the valve closes. The moment the flame is cut off a vacuum is produced in the cylinder, and the piston is drawn inward on a power stroke. When the piston reverses its direction, the cycle is repeated.

Fig. 2 details the base which is simply a matter of bending, filing and soldering sheet metal. The cylinder, Fig. 3, is a more fussy job. A 1-in. pipe nipple and cap form the body. The inside surface of the pipe must be machined smooth and bored to a diameter uniform throughout the length. Later the piston is turned to fit the bore diameter. The contact surfaces of the valve mechanism should be surface ground and then finished up on a surface plate. Soot which accumulates on the meeting surfaces tends to seal the valve. As you will see from Fig. 3 the pipe-cap cylinder head requires just a simple shoulder cut in the lathe and then some careful hand filing.

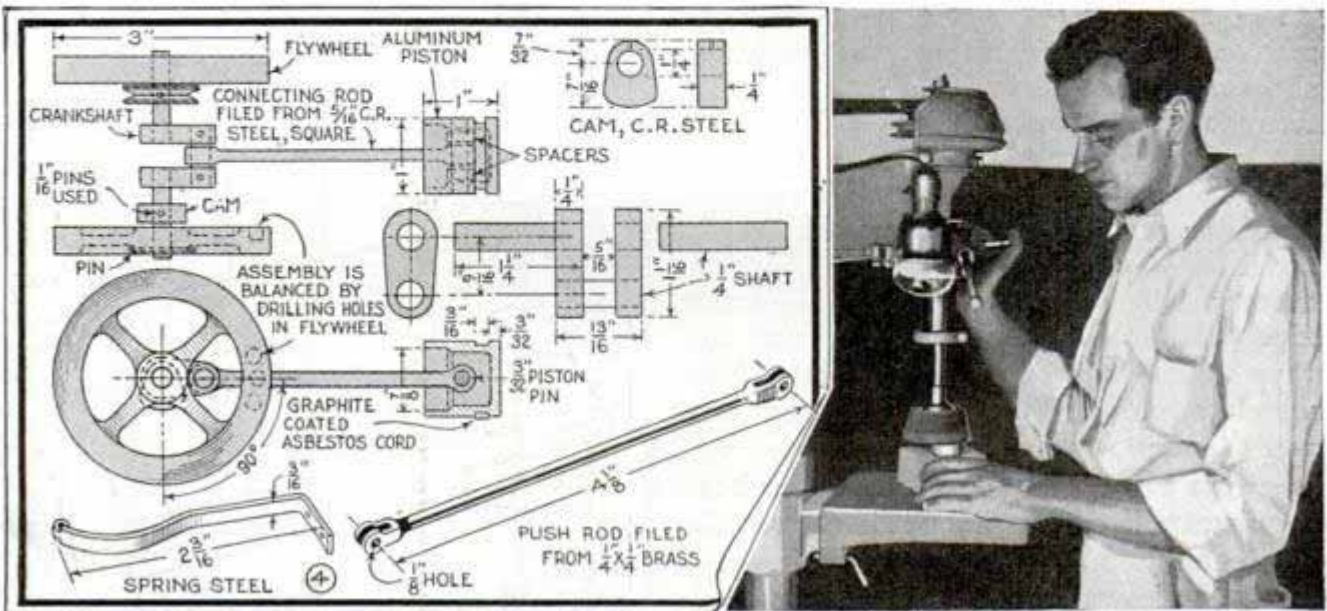
Fig. 4 shows the crankshaft, flywheels



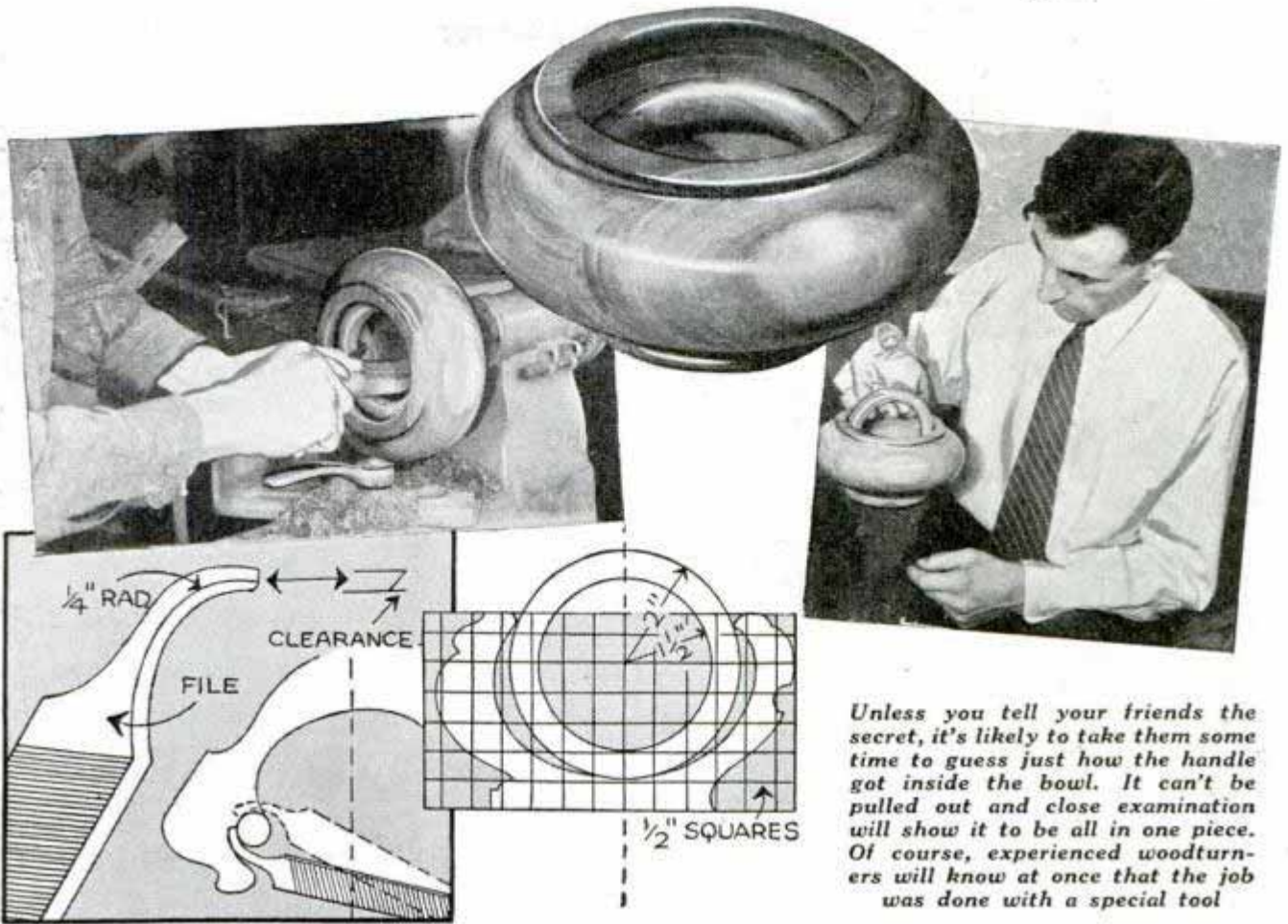


and miscellaneous parts that finish up the assembly. The crankpin is pressed into the crank throws, making the crankshaft and connecting rod a unit assembly. The flywheels can be cast of gray iron, brass, or type metal. The cam must be mounted on the shaft with its center line at 90 degrees to the center line of the crank. The piston is made from a piece of aluminum rod approximately 1 in. in diameter. The ring slot is wound with asbestos cord coated with graphite. Spacing sleeves center the connecting-rod end on the piston pin. The

connecting rod is filed from a piece of $\frac{5}{16}$ by $\frac{5}{16}$ -in. aluminum or duralumin. The same applies to the push rod. The cam follower strip is spring steel from an old clock or phonograph. The tension of the spring must be determined by experiment. It should be sufficient to close the valve quickly when the engine is running at full speed. The cylinder is lubricated by coating the piston with white vaseline each time it is taken out to clean the cylinder. If the engine is operated considerably, the cylinder must be cleaned frequently. When soot accumulation reaches a certain stage it will interfere with efficient operation. Note in Fig. 2 that there are no caps over the main bearings. This is done purposely so that the whole crank assembly can be removed easily for cleaning.



This Turned Bowl Has a Novel Ring Handle



Unless you tell your friends the secret, it's likely to take them some time to guess just how the handle got inside the bowl. It can't be pulled out and close examination will show it to be all in one piece. Of course, experienced woodturners will know at once that the job was done with a special tool

You won't lose or break the handle on this turned bowl because the handle is a loose ring turned out of the waste wood in the recess. The general design of the bowl proper can be most any that suits your fancy but the contour of the inside recess must be approximately the same as that indicated in the cross-sectional view shown on $\frac{1}{2}$ -in. squares. The ring handle is turned with a tool made from an old file.

The shank is bent as shown, the end ground to a bevel and the edge sharpened. When the cut has been run in deep enough to form half the ring, the bevel on the end of the file is ground in the reverse direction and the cut completed by running the tool in from the opposite side. If you're careful, it's an easy trick to turn out the ring with a perfect circular section.

—Edwin M. Love, Monterey Park, Calif.

Soap Aids When Applying Color to Glossy Photographs

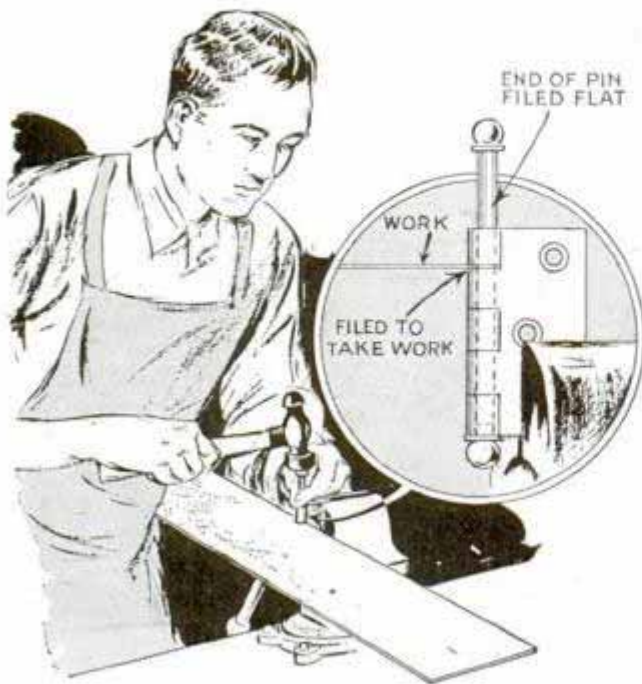
If you have trouble in making water color stick to glossy or greasy surfaces, rub each brush full of color on a bar of soap before applying. With this method you can apply color to brass or steel, as the soap dissolves the grease and makes the color take if most of the grease is wiped off first with a damp cloth.

—C. W. Woodson, East Aurora, N. Y.

☐ The lens of a vertical enlarger should be protected against dust, as this may be the cause of dull enlargements.



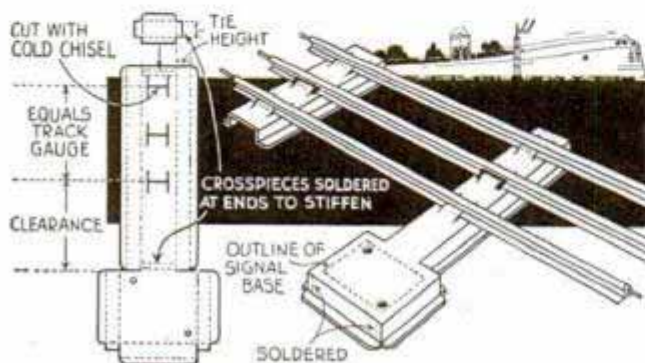
Punch for Light Sheet Metal from Door Hinge



Altered as indicated, a door hinge of the removable-pin type provides a handy jig for punching holes in light sheet metal. A joint in the barrel of the hinge is filed down sufficiently to permit the insertion of the material, and the end of the pin is filed flat so that a neat hole will result when struck sharply with a hammer.

Signals of Model Railroad Supported on Tie

When it is impossible to screw model-railroad signals to the track base, which may be a rug or hardwood floor, this simple metal sub-base can be substituted for one of the ties in the track. Tin cut from a can will be found stiff enough when the sides have been bent as shown. Two holes in the end of the base projecting from the rails permit the signals to be attached with

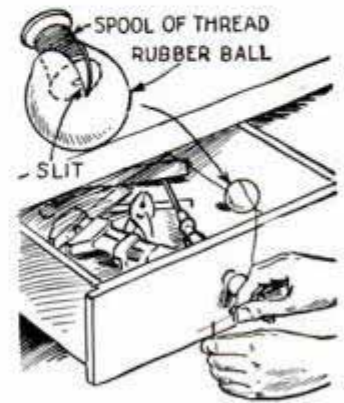


small stove bolts or machine screws. A wooden sub-base of proper thickness may be used instead of the metal, but the latter will match the factory-made equipment better.

—John L. Story, Oklahoma City, Okla.

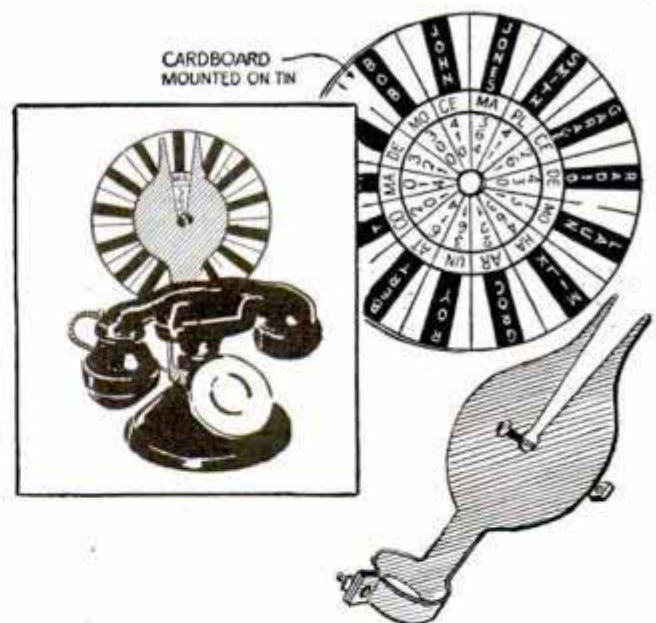
Rubber Ball Holds Thread Spool

When a spool of heavy thread is kept in the shop drawer for various uses about the place, it often becomes entangled with tools and is more or less a nuisance in every way. If a hollow rubber ball is cut



open at one side, and the spool slipped inside, this will serve as a safe container, and the thread may be dispensed by pulling through the closed slot of the rubber.

Dial Carrying Phone Numbers Permits Rapid Selection

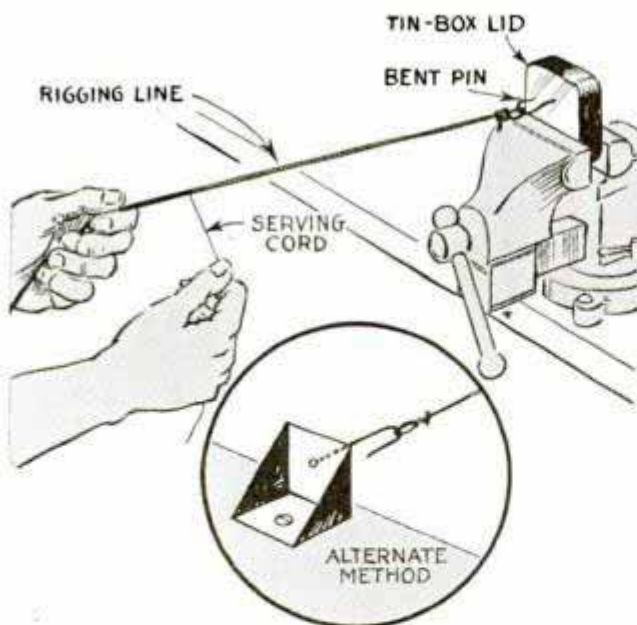


Make up this dial, write on it the telephone numbers that you use the most frequently, attach it to your telephone and it will take only a second to find the desired number when you want to call. The dial is sheet metal and is pivoted to a sheet-metal bracket, which is in turn clamped to the telephone as indicated. A paper dial

carrying the names and telephone numbers is fastened to the metal with a small stove bolt. When you turn the dial to the opening in the support, nothing but the name and telephone number of the desired person shows.

Easy Method to Serve Rigging on Fine Ship Models

The finished appearance of a ship model can be improved greatly if the rigging is served in accordance with the practice on real ships. Two quick and easy methods of doing this without expensive apparatus are shown in the drawing. In the upper detail a tin-box lid is punctured in the center to take a large pin, which is bent to form a hook to hold the rigging. Tie the rigging line to the hook, then tie the serving cord to the rigging line, pull the latter tight with the left hand, and at the same time, twist it in a counter-clockwise direction. While doing this, the left hand guides the serving cord into position. Each twist will add from 5 to 10 turns to the work. At the finish of each twist, a slight relaxation of the tautness caused by the left hand will permit the hook to spin of its own accord, thus unwinding the rigging line to its normal condition ready for the



next twist. The circular detail shows another way of anchoring a hook. In this case the corner is cut from a square can, which is used instead of the lid, and is screwed to the bench top.

—A. L. Delin, Montclair, N. J.

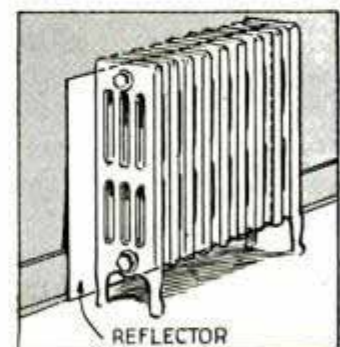
Tank Supply Pipe Supported by Auto Casing



Attachment and removal of a tank supply pipe at a windmill may be simplified if the bail is discarded and the pipe supported with a section of auto casing, cut as indicated. A hole through the sides of the casing takes the pipe, which should be a tight fit to prevent turning or twisting. The elasticity of the rubber allows the pipe to be pushed down easily for removal from the pump spout.

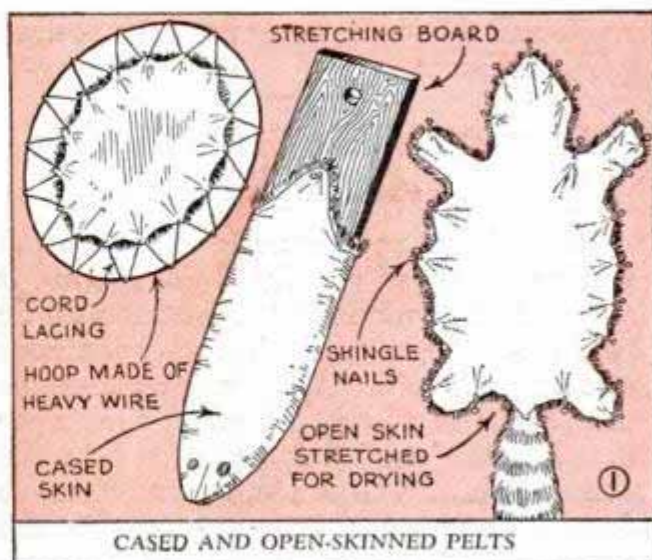
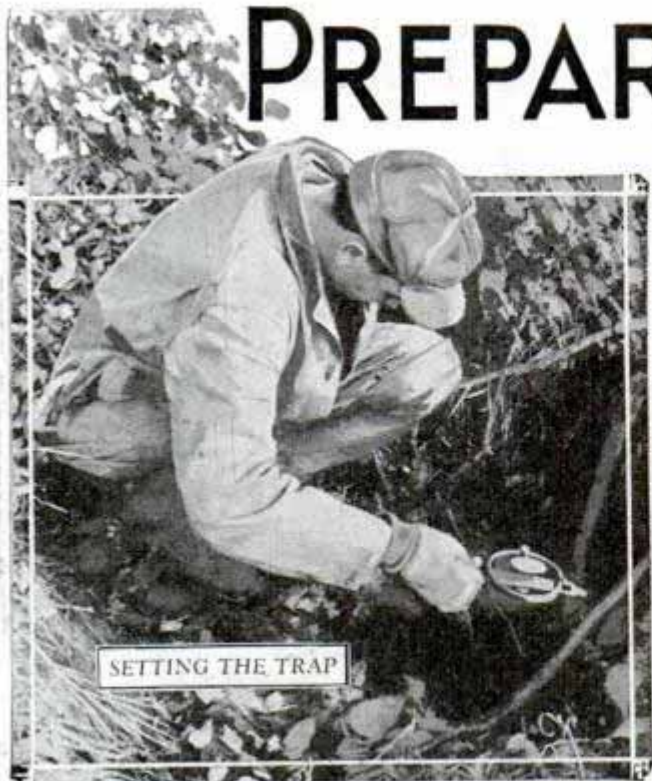
Radiator Improved by Reflector

If your radiator or oil stove does not provide enough heat for a room, place a sheet of shiny tin, or a piece of paper coated with aluminum paint behind it. This will act as a reflector, and prevent the heat from being absorbed into the adjacent wall.



—Arthur P. Goldman, New York.

PREPARING YOUR



CASED AND OPEN-SKINNED PELTS

By ROYCE M. ROATH

WHILE the top figure in a raw-fur price list is the coveted prize of every trapper, fur buyers and graders know that a considerable portion of each season's catch of otherwise prime pelts must be devalued simply because of carelessness in the initial steps of skinning and curing each individual pelt to make it bring the highest market price. Care in preparing the skin begins at the time the animal is taken from the trap and continues until the pelt is packed for shipment. Many trappers with long trap lines skin each animal as soon as it is removed from the trap. Others prefer to wash and brush the fur before skinning, hence carry the catch to the fur loft where the animals are skinned and the pelts scraped and stretched all in one operation.

In many localities, weed and bramble patches are the habitat of certain fur bearers that obtain their food on dry land. In the fall burrs and seed pods get into the fur of these animals and should be combed out before skinning them. A discarded hairbrush, Fig. 4, can be used to

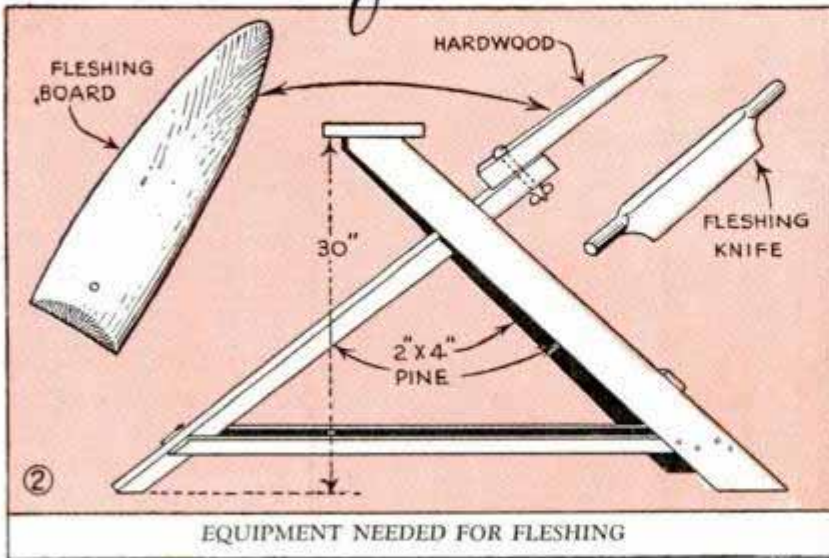
advantage, as it straightens the fur and leaves it sleek and shiny. Animals trapped along creeks and river banks saturate their fur with mud and sand when trying to escape. These pelts are most readily cleaned by washing in lukewarm water. Dry thoroughly and brush the fur before skinning.

The "cased" and "open" methods of removing the pelt from the carcass are accepted by fur buyers as standard with certain fur bearers. See Fig. 1. Like pulling your glove off wrong side out is a good description of the cased method. First, lay the animal on its back and with a sharp knife, Fig. 5, cut around the paw pads of the hind feet and slit down the back of the hind legs to the vent. This is the opening cut, Fig. 6. Now, suspend the carcass by

means of a skinning gambrel at a convenient working height and carefully work the pelt down over the carcass, cutting the tissues loose with your knife where necessary, Fig. 7. Cut the pelt loose at the base of the tail on muskrat, opossum, and beaver. On others the tail bone should be skinned out. A neat job can be done

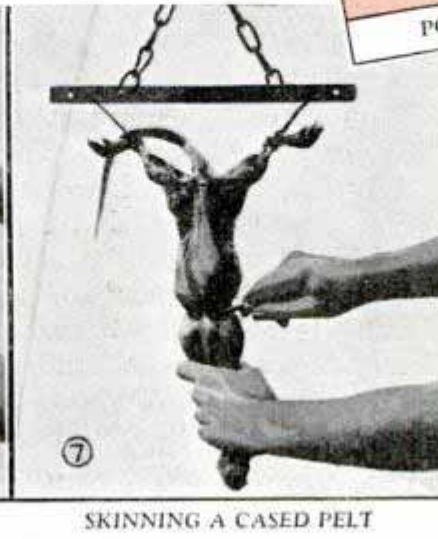
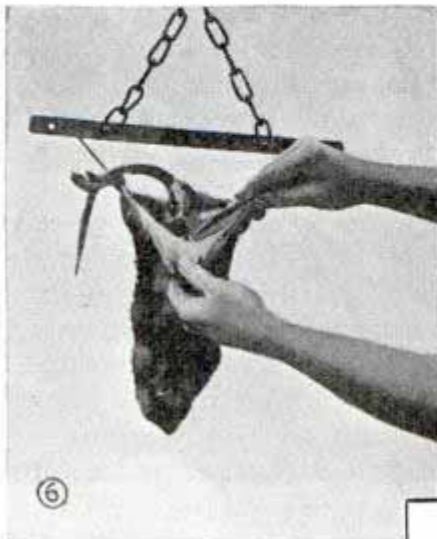


FURS *for* MARKET

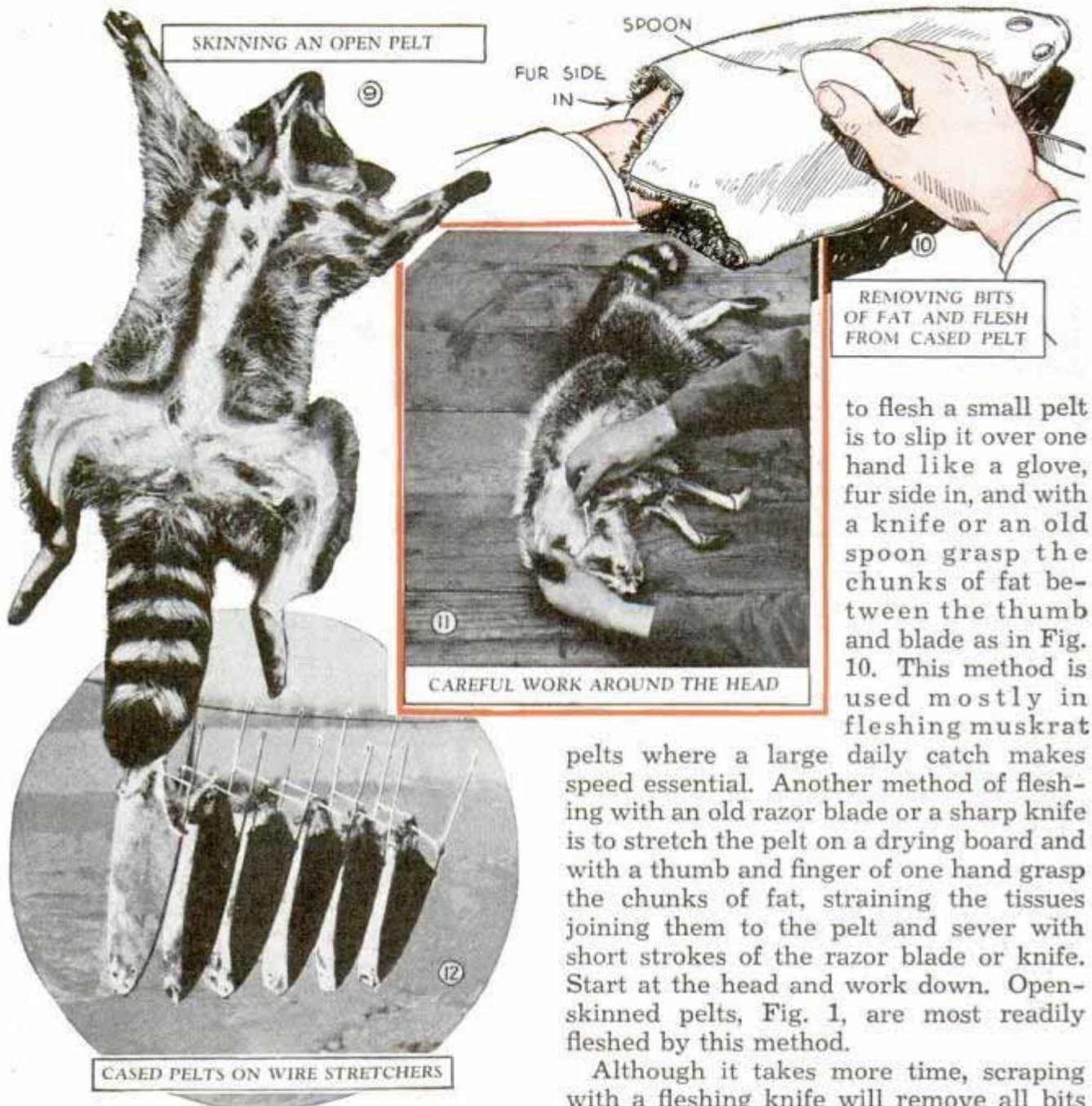


by inserting an umbrella rib or a short length of stiff wire on the underside between the skin and tailbone to serve as a guide for the point of the knife. Skin out the front legs with a direct pull as in Fig. 8. Use care in skinning out the head, working very close to the skull and cutting loose the eyes and ears, Fig. 11. The pelt is very thin at this point and tears easily so don't try to hasten the job by a vigorous pull. Skin with your knife to the tip of the nose.

Remove pelts by the cased method on the following animals: Muskrat, mink, skunk, opossum, ermine, fox, wolf, lynx, civet cat, coyote, marten, fisher, otter, lynx cat, and wolverine. Raccoon, badger, wild cat, beaver, and bear are open skinned.



SKINNING A CASED PELT



REMOVING BITS
OF FAT AND FLESH
FROM CASED PELT

CAREFUL WORK AROUND THE HEAD

CASED PELTS ON WIRE STRETCHERS

Skinning by the latter method, you slit down the back of the hind legs to the vent and cut the pelt open from the point of the chin to the end of the tail down the center of the belly as in Fig. 9. Cut around the paw pads and slit down the inside of the front legs. Then carefully skin the pelt from the carcass. Skin beaver as cleanly as possible as the pelt is very difficult to flesh.

Fleshing the pelt after skinning is always necessary as it is practically impossible to remove the pelt without some of the fat and flesh clinging to it. If this is not removed it may cause spoilage or improper curing of the skin, resulting in the hair falling out. One of the quickest ways

to flesh a small pelt is to slip it over one hand like a glove, fur side in, and with a knife or an old spoon grasp the chunks of fat between the thumb and blade as in Fig. 10. This method is used mostly in fleshing muskrat

pelts where a large daily catch makes speed essential. Another method of fleshing with an old razor blade or a sharp knife is to stretch the pelt on a drying board and with a thumb and finger of one hand grasp the chunks of fat, straining the tissues joining them to the pelt and sever with short strokes of the razor blade or knife. Start at the head and work down. Open-skinned pelts, Fig. 1, are most readily fleshed by this method.

Although it takes more time, scraping with a fleshing knife will remove all bits of fat and flesh without the danger of cutting holes in the pelt. Equipment used in this method is shown in Figs. 2 and 3. The fleshing boards are made up in various sizes, the fur bearers in your locality governing the dimensions and contour of the boards. They should be made from 2-in. stock to permit rounding the side against which the scraping is done. The working face is planed and the ridges sanded smooth. Make the hardwood fleshing knife, Fig. 2, sufficiently large to grasp firmly in both hands, and plane it to a sharp edge.

To use, pull or drape the pelt on the fleshing board, skin side out, working only against the rounded portion and turning the pelt as you scrape from the head down. Scraping too hard will loosen the hair

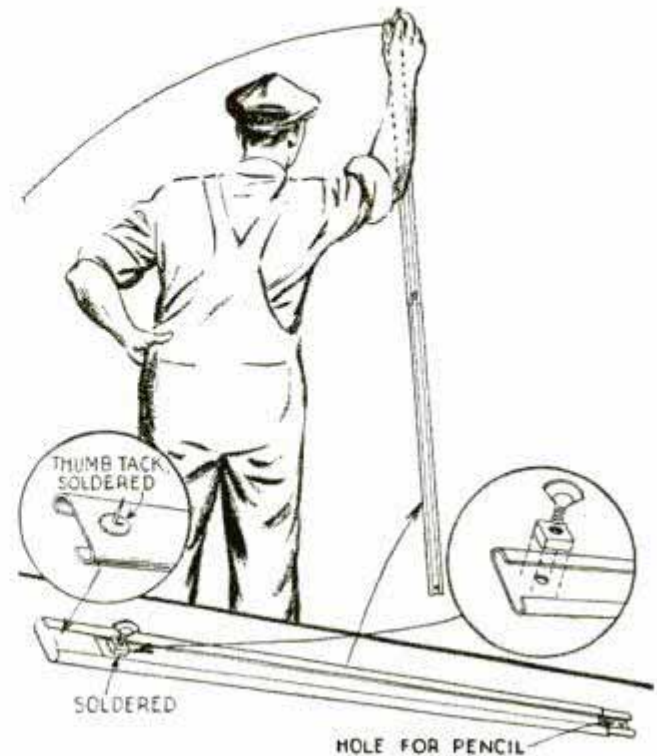
roots. Use just enough pressure to work the excess fat from the skin. Clean, dry sawdust sprinkled on the pelt absorbs much of the oil squeezed from the fat while scraping. Continue the scraping until all bits of fat and flesh have been removed, then wash the skin with a non-caustic soap and lukewarm water.

When the water has dried from the fur the skin should be stretched immediately. Spring-steel wire stretchers for the smaller cased pelts, Fig. 12, are generally recommended. They have a tension to properly stretch all sizes of pelts for which they are intended, and allow circulation of air for better curing. When making your own stretching boards for cased pelts, a smooth symmetrical shape is the thing. Irregular or overstretching will thin the pelt, loosening the hair roots and causing the hair to fall out. Proportion the pelt-drying boards to just take up the slack in all directions leaving the skin free of wrinkles. Several sizes will be needed.

In stretching, drape the pelt on the board with the belly on one side and the back on the other, centering the front feet openings an equal distance from each side. Tack the skin at the butt end after pulling up the slack. The following list of pelts should be stretched and dried skin side out: Muskrat, skunk, opossum, mink, civet cat, otter, ringtail cat, and weasel. To prevent sticking, which makes it almost impossible to remove the skin from the stretcher, the following should be placed first on the board skin side out and allowed to dry a few days. Reverse the pelt when it ceases to be tacky and finish curing fur side out. Wolf, coyote, fox, lynx, marten, fisher, and wolverine are preferred by the fur trade in this manner.

Stretch an open-skinned pelt by tacking to the side of a building, Fig. 1, or, if there is danger from rodents, make a panel of boards and hang it from the rafters. Get a square effect on raccoon and badger. Tack fur side in for better curing. Lace beaver skins on the inside of a wire hoop, fastening first at four points equidistant around the hoop. Gradually stretch between these points by lacing cord through the edge of the pelt and around the hoop with a sacking needle as in the upper detail in Fig. 1. Hang pelts in a cool, dry place for curing.

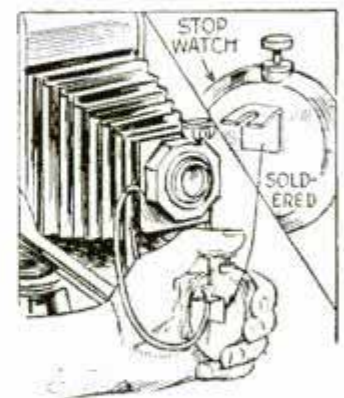
Beam Compass from Curtain Rod Scribes Long Arcs



In swinging curves of a large radius, you will find a flat, telescoping curtain rod handy as a traverse compass. A flat-head thumb tack is soldered to the outer end of one member to serve as an axis, while the inner sliding rod is drilled at the extreme end to take the point of a pencil. Adjustment is made with a thumb nut soldered over a hole, which is drilled near the end of the inner rod.

Camera Shutter and Stop Watch Operate Simultaneously

Desiring to operate my camera shutter simultaneously with a stop watch, I used the arrangement indicated in the drawing. This is nothing more than a small bracket soldered to the back of the watch to take the end of the shutter release cable so that both the cable-release and the starting knob on the watch can be operated with the thumb of one hand.



—Armand Thyot, Cohoes, N. Y.

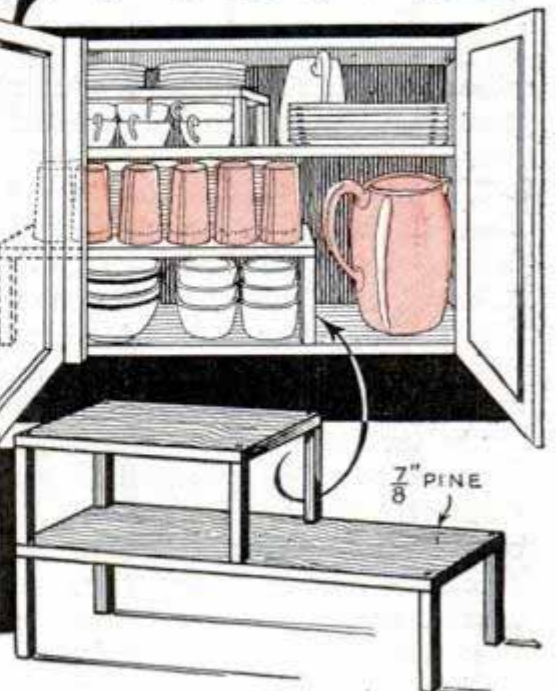
Solving HOME



SQUARES OF TIRE PATCH OR INNER TUBE

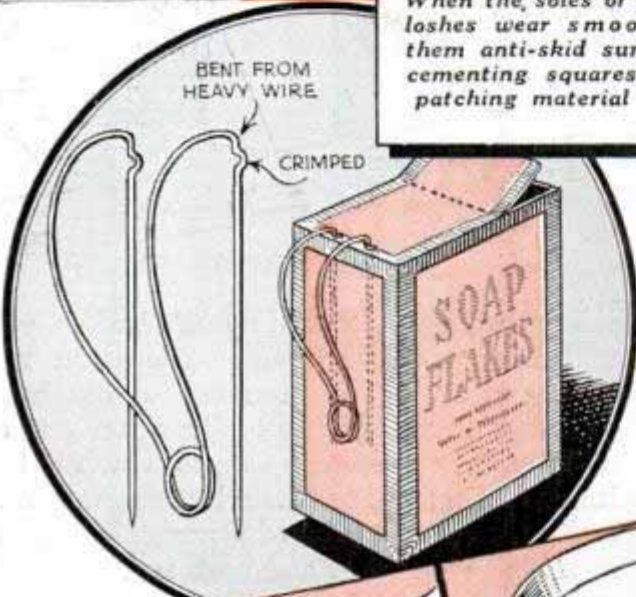
RUBBER CEMENT

When the soles of your galoshes wear smooth, give them anti-skid surfaces by cementing squares of tire-patching material to them



7/8" PINE

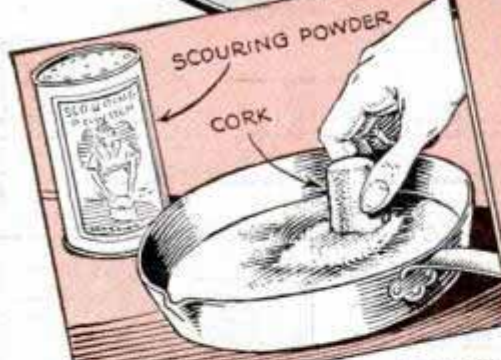
The pyramid shelf above is intended for small articles and will save space in your cupboard, while the wire handle at the left quickly converts your soap-flake box into a pitcher-like dispenser



BENT FROM HEAVY WIRE

CRIMPED

SOAP FLAKES



SCOURING POWDER

CORK

You can polish small surfaces on cooking utensils quickly when a cork is used as a scouring pad



REFRIGERATOR WATER BOTTLE

HEAVY WIRE

PAPER DRINKING CUPS

SOLDERED

WRAPPED WITH CORD

Store your frying fat in paper cups that you can throw away when empty

Why do without a handle on a refrigerator water bottle? You can make this one easily



NOTCHES



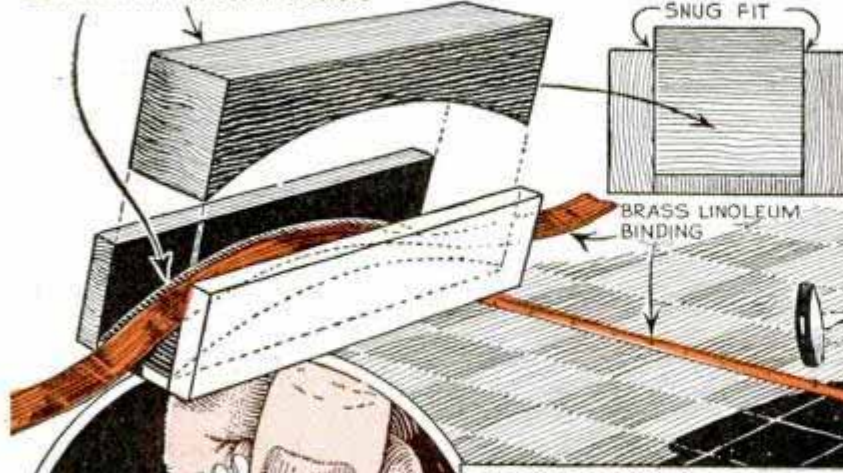
1" ROPE

A pail will hang on a pitcher pump if a couple of notches are filed in the spout as at the left. You can carry a heavy flowerpot easily with a rope handle like the one at the right

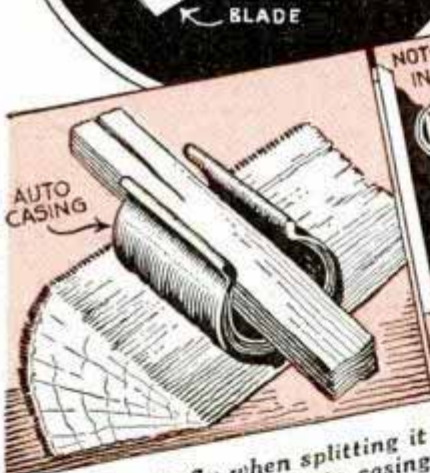
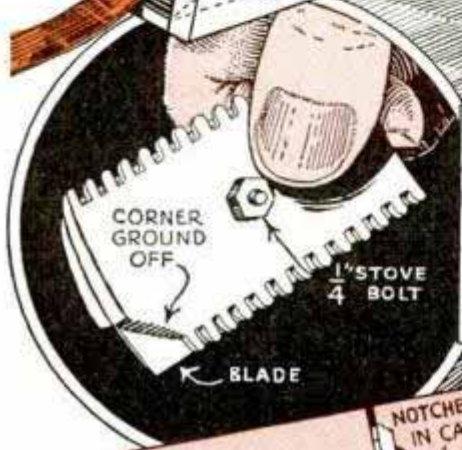


PROBLEMS

CUT FROM PINE 2"x4" STOCK



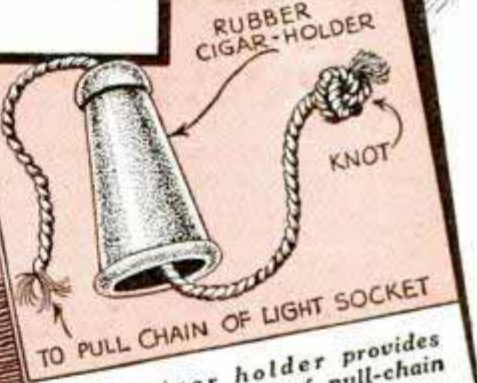
After tacking down one end of linoleum binding, you can stretch it taut with the holder above. Left, grind off one corner of a razor guard, clamp a blade in it and you have a handy cutting tool



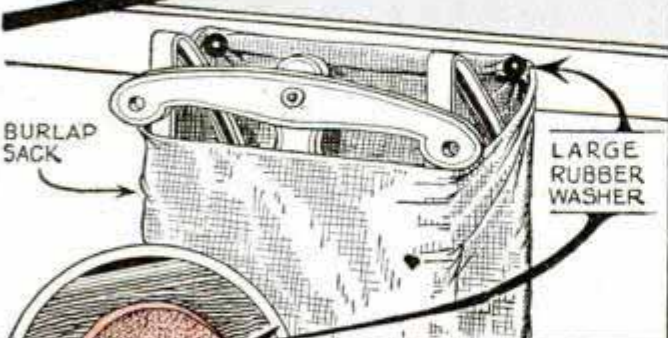
Kindling can't fly when splitting it if placed in a piece of auto casing tacked to the chopping block



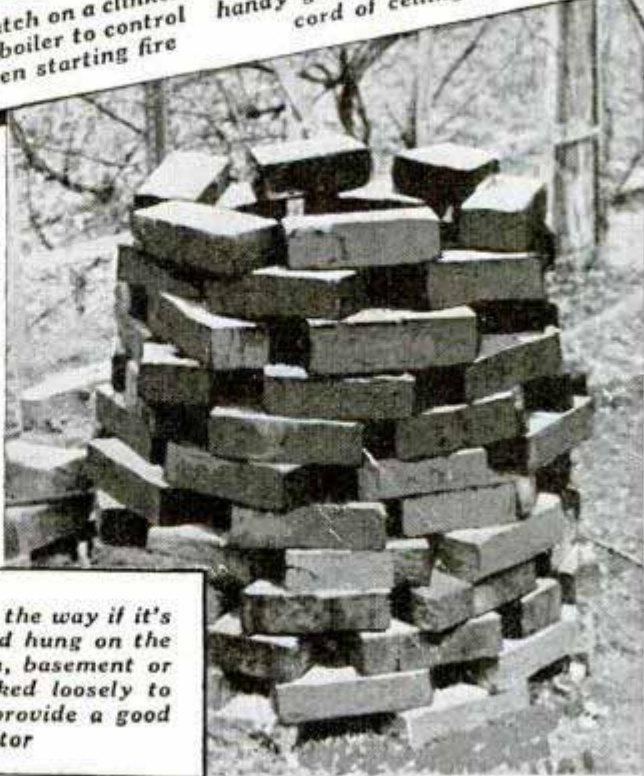
Notches filed in catch on a clinker door of a heating boiler to control draft closely when starting fire



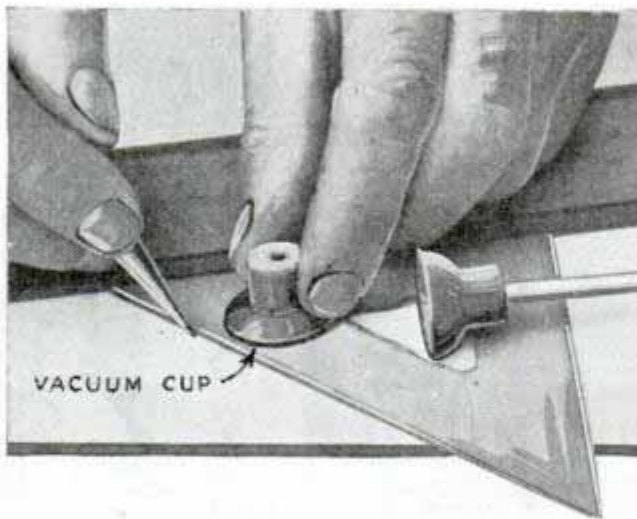
Rubber cigar holder provides handy grip on end of pull-chain cord of ceiling lamps



The child's sled won't be in the way if it's slipped in a burlap sack and hung on the wall of a closet, store room, basement or garage. Right, bricks stacked loosely to form a circular enclosure, provide a good outdoor incinerator



Vacuum Cup Serves as Handle for Celluloid Triangle



The home draftsman and student will find that one of the small soft rubber vacuum cups serves nicely as a handle on a

celluloid triangle. The cup is held comfortably with the fingers and can be used on a protractor or other drawing-board device as well as a triangle.

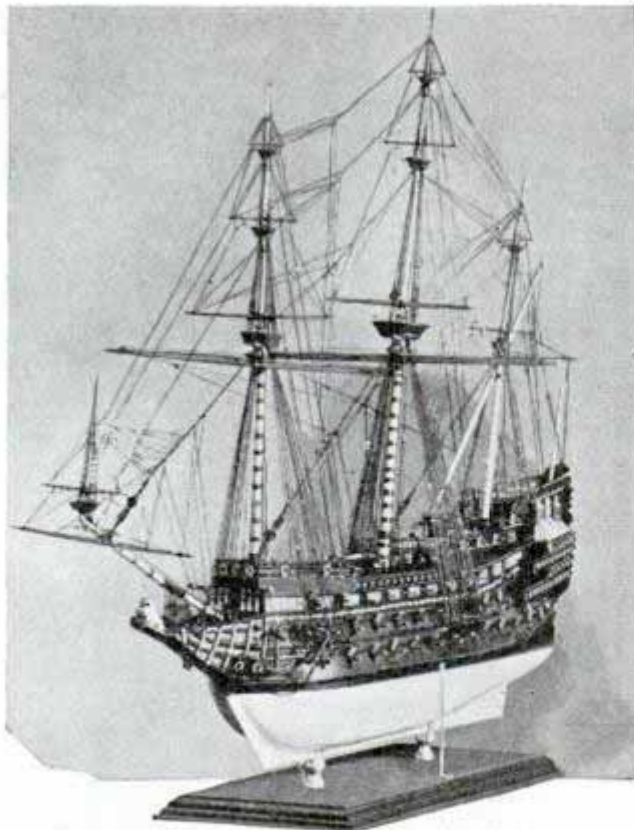
Rubber Feet on Framed Photo

When framed photos are kept on tables and other pieces of furniture, there is possibility of marring the highly polished surfaces unless the frames of the photos are provided with non-scratching feet. To do this easily, just insert a couple of rubber-headed tacks in the lower edge of each frame as indicated.



A Masterpiece in Ship Models

Do you want a model of one of the most outstanding warships in history? If so, build the "Sovereign of the Seas." Complete information on the construction of this ornately decorated, and highly picturesque model, 34 in. long and 26 in. high over all, is given in our blueprints 828 to 835 incl., priced at \$1.50 per set. Descriptive text in bound book, \$1.00 additional.



PLANS ON

OTHER WORTH-WHILE MODELS

"Flying Cloud" Clipper Ship—709-714A: No collection is complete without a clipper. Complete with full-size lift templates—\$1.25.

"Half Moon"—717-718A: Model of boat used by Dutch Seaman, Henry Hudson—\$1.00.

"Sea Bee"—965 to 968: 32 in. speed boat for circular race courses. Powered by midget gas engine—\$1.00.

Viking Ship Model—888: Used by Norsemen in early explorations. 14-in. hull—25c.

"Santa Maria"—759: Simplified design of Columbus' flagship. About 18 in. long—25c.

"U.S.S. Pensacola"—863 and 864: Midget design of 10,000-ton treaty cruiser—50c.

Prairie Schooner—728: Model is quaint reminder of covered-wagon days. Wagon without top, 8 3/4 in. long—25c.

Model Colonial Cannon—735: Perfect 10-in. miniature of guns used during days of 1776. Turned brass and wood—25c.

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



Motorized HAND PLANE *gives smooth finish*

By R. G. BULLARD

JUST the thing for edging long boards, fitting doors and jointing smaller pieces of stock at the bench, this electric hand plane is made from a discarded vacuum-cleaner motor, a piece of hardwood, some sheet aluminum and a few small bolts. If you've ever had the rather disagreeable task of fitting a door with the ordinary hand plane you will appreciate this tool, as the high-speed cutter whisks away the waste wood down to the dimension line in a fraction of the time and besides, it leaves a glass-smooth surface. Or, if you need a jointer just turn the machine upside down and clamp the handle in the bench vise as in

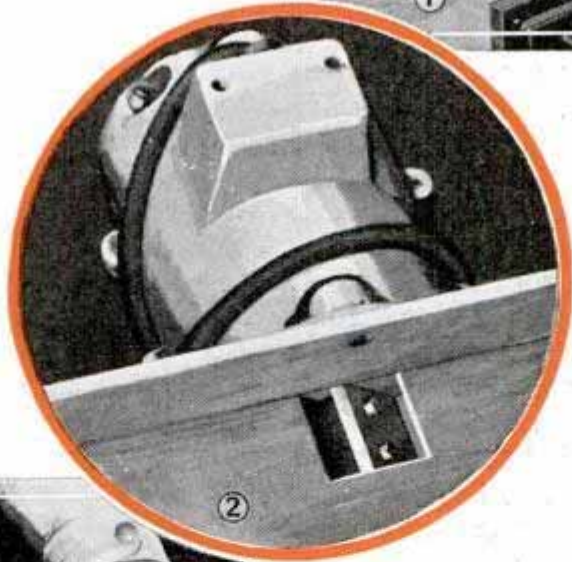
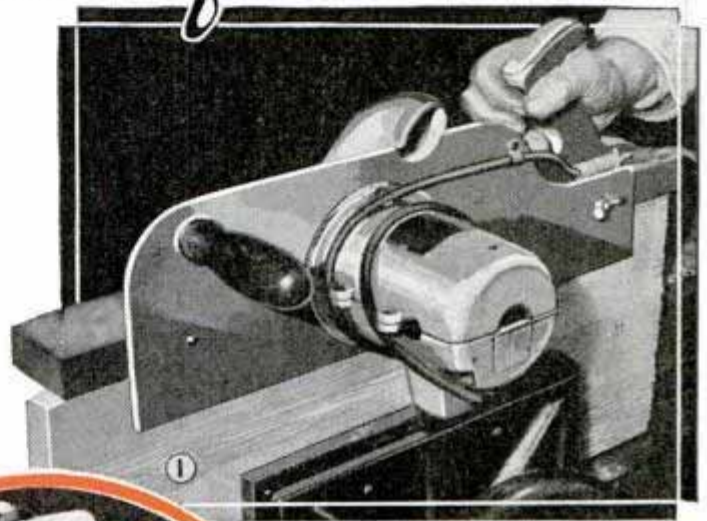
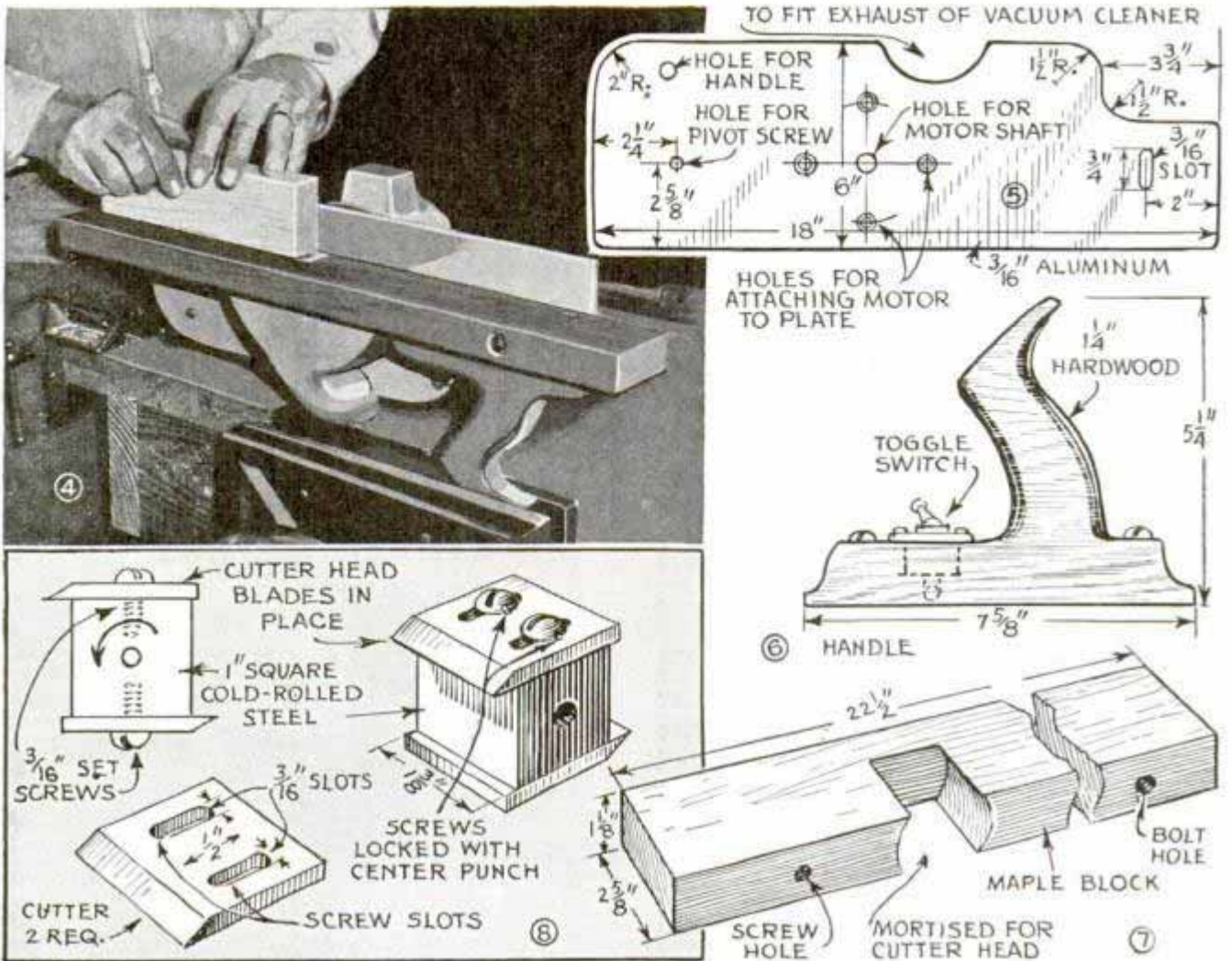


Fig. 4. In this position it's especially handy for squaring up small pieces of stock.

Figs. 1, 2, and 3 tell practically the whole story of the assembly. Of course, the arrangement of the parts shown is that suited to the characteristics of one particular motor. This

means that if another motor of somewhat different design is used minor changes in details of the assembly may be necessary. Now, referring to Figs. 5 to 8 inclusive, you'll get a good idea of how the parts are made. The guide, Fig. 5, is bolted to the motor and then to the base, Fig. 7. A slotted bolt hole, Fig. 5, provides a means of adjusting the depth of cut. You will notice from Figs. 1 and 3 that the fan housing





has been cut and fitted to the plane in such a way that it forms a combination knife guard and dust chute. The fan housings of most vacuum cleaners can be adapted in the manner shown by a bit of careful work with the hack saw and a file.

The cutter head is shown in Fig. 8. It is of the square two-knife type and is drilled to fit over the motor shaft. Perfect running balance is of the utmost importance as the head must operate without vibration at high speed. This means that the hole for the motor shaft has to be exactly centered and the cutting edges of the

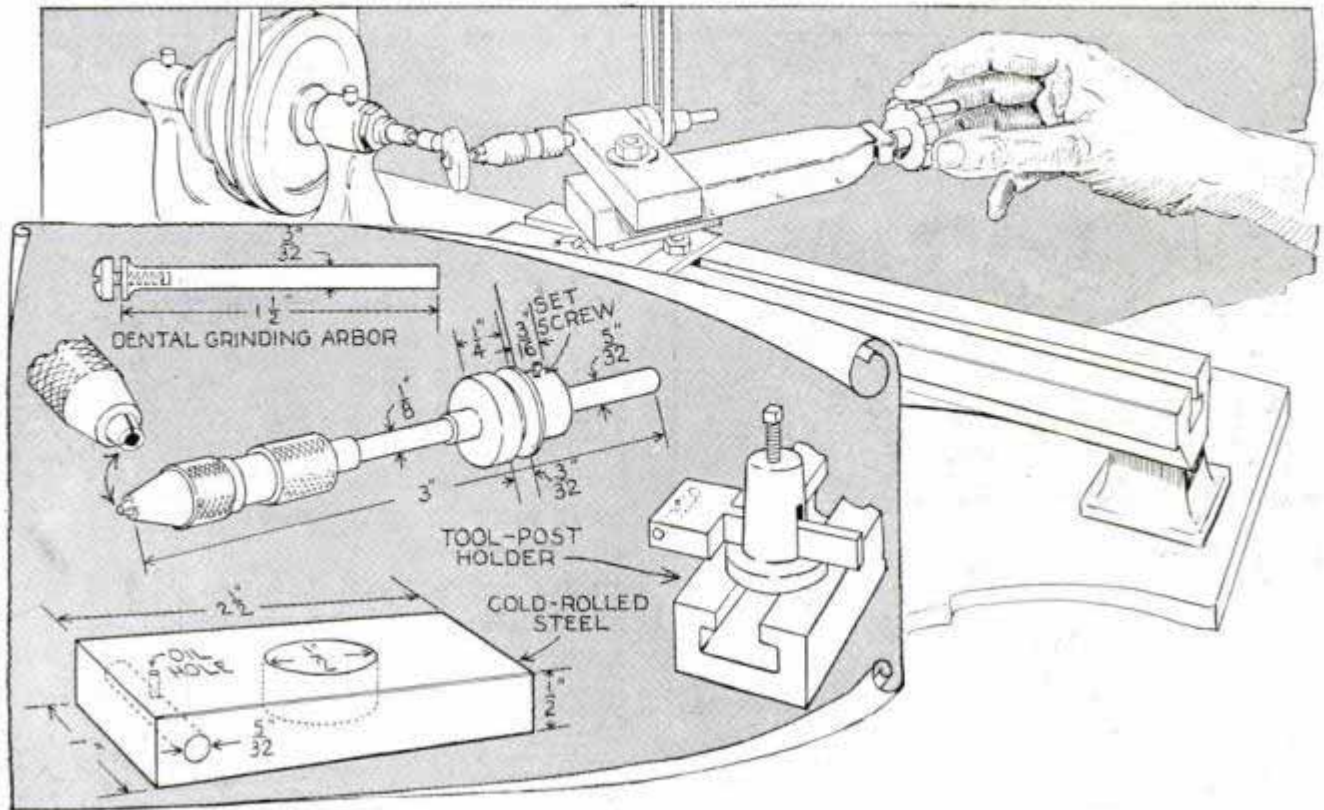
knives must describe the same arc. One way to test the head for static balance is to mount it on a short length of shafting with the ends projecting equally. Then fasten two razor blades to a block of wood, level them, and place the head with the ends of the shaft resting on the edges of the blades. If the head is even slightly heavy on one side it will immediately roll until this side is down. To correct this tendency you remove metal on the heavy side of the head with a file until the head will roll on the razor-blade edges without coming to rest at any one point.

Lightweight Metal Doubletree Can Be Assembled Easily

The main leaf of an old car spring is used for the back of this metal doubletree and is braced with a piece of flat iron welded between the spring eyes. These form natural connections for the singletrees, and squares of heavy iron welded to the top and bottom of the doubletree take the tongue pin.



Tool-Post Grinder for Modelmaker's Lathe

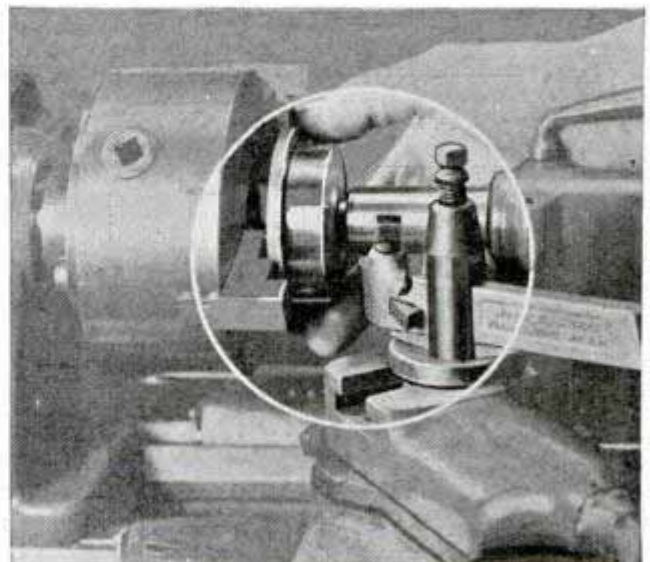


After experimenting with several types of electric tool-post grinders, I developed a belt-driven one that has proved ideal for use on small modelmaking lathes. When held in a bench vise, it is also handy for use with small drills and tools, and has saved much filing when making small model parts. It is possible to do internal grinding in holes as small as $\frac{1}{4}$ in. in diameter. As the grinder is designed to use abrasive wheels of the type employed in dental laboratories and those made for small hand electric grinders, a large variety is available. The shaft was made from a pin vise, the metal handle of which was turned to the dimensions given. It will be necessary to ream the jaws of the vise slightly with a small drill to take the dental grinding arbors, which are $\frac{3}{32}$ in. in diameter. Bearings for the grinder shaft can be ground from cold-rolled steel to fit in the lathe tool post as shown, or they can be of a rectangular shape to bolt on the compound rest or clamp in a bench vise. Be sure to provide an oil hole in the bearing. A V-pulley can be turned for the grinder shaft. A sewing machine motor is fastened to the ceiling above the lathe and belted to the grinder shaft.

—C. K. Fankhauser, Bedford, Ohio.

Thin Disks Chucked in Lathe with Aid of Drill Pad

Thin disks, which are to be faced and must project slightly beyond the chuck jaws, are chucked easily if a drill pad is placed in the tailstock. The disk is held securely against the face of the pad and the whole moved up to the chuck with the tailstock hand wheel. When in exactly the right position, the chuck jaws are tightened down on the work, which will then run absolutely true.



Lever-Action Tool Peels Logs with Little Effort



When peeling the bark from a number of logs for the framework of a machine shed, one farmer saved several hours of tedious labor with this tool. It consists of a length of tire-iron bent to form the handle, and a second piece of scrap metal, which was bent and sharpened to serve as the blade. In use, the bark strips are started with an ax or hatchet, after which the blade of the tool is placed in the position indicated and driven along the log by forcing the handle prongs into the wood and pushing forward.

Extra Pocket on Plumber's Kit Holds Small Tools



To avoid opening a kit for only one or two small tools, and to keep these items separate from the larger ones, a plumber made an extra pocket from a section of inner tube and attached it to one side of his tool

bag. The ends of the tube section were cut as shown to insert through slits in the side of the large bag. A slit along the upper side of the tube gives access to the contents.

Printer's Mitten Always Open for Handling Castings

Printers who employ a casting box for casting mats in their shop, will find the mitten shown useful for handling hot ladles or castings as it may be put on or removed in



an instant without the use of the other hand. The top of the mitten is stitched to a wire loop to hold it open, and the loop is provided with a hook for suspending it from the operator's belt.

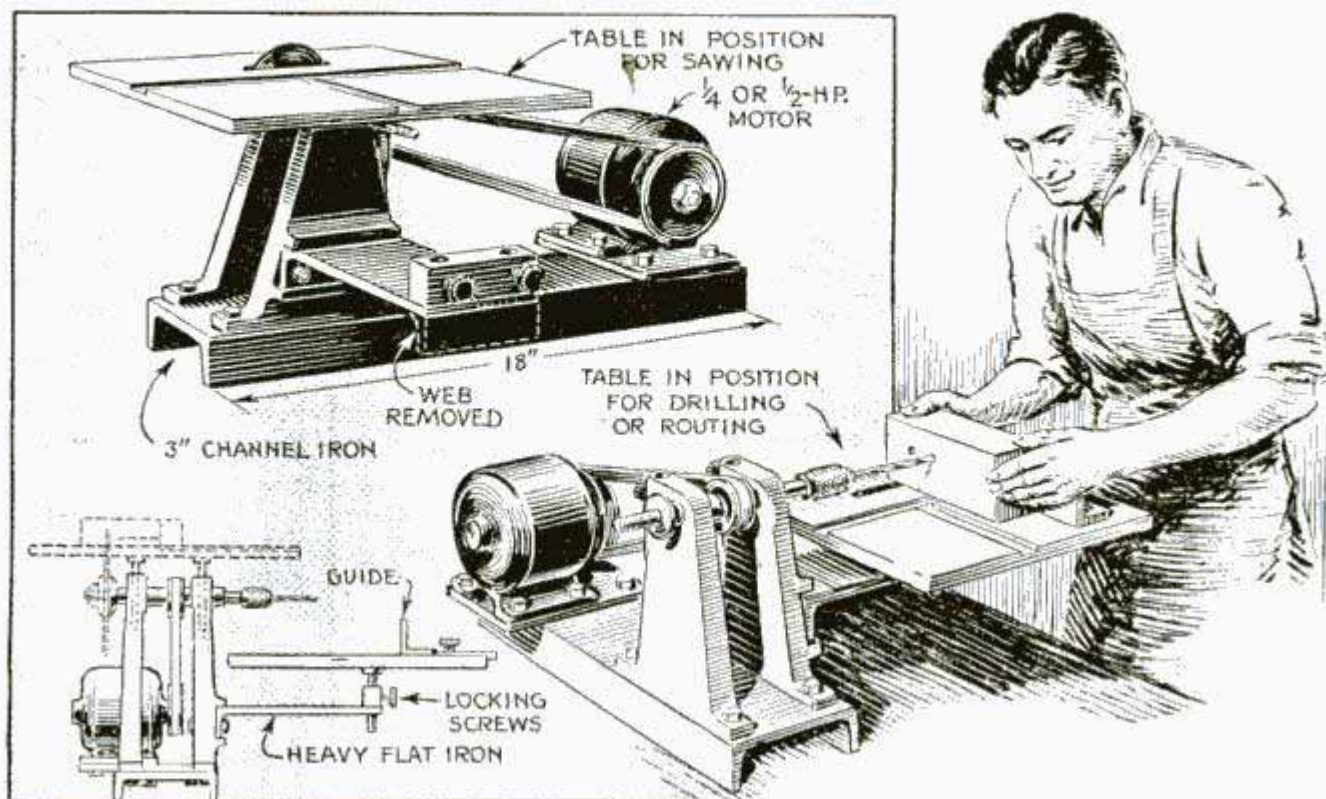
Barbed-Wire Hoop Keeps Stock from Overturning Small Tank

When a small tank or tub is employed to water livestock, one farmer wraps a strand of barbed wire around it just under the



rim. While it does not prevent the safe conveyance of the tub, the barbs project sufficiently to prevent the animals from upsetting the tub with their noses.

Saw Table Converted for Drilling and Routing



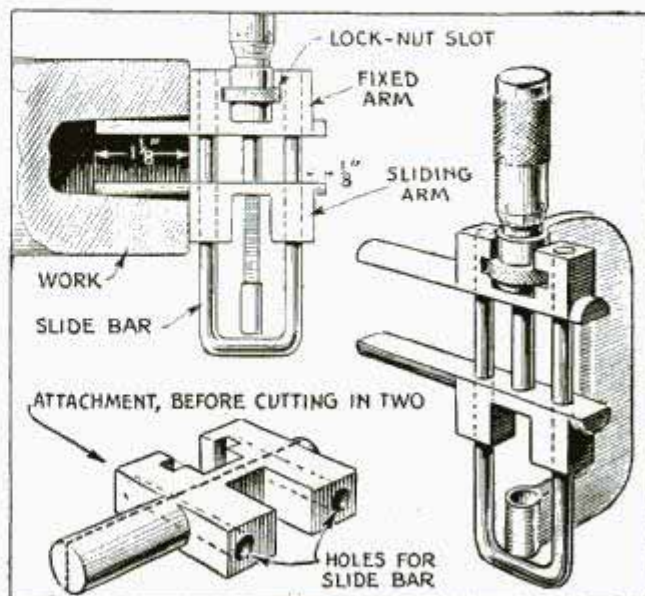
Having a small circular saw of the type that has a removable table and one end of the mandrel threaded to take a chuck for drilling, one craftsman converted the saw so that the table could be used as a drilling or routing table. To provide a support for the table when the latter is used for drilling or routing, a short length of heavy channel iron was bolted to one side of the base and leveled parallel with the table.

One web of the iron was cut off after which a piece of steel was bolted to the outer end and drilled to take the table slides. Locking screws were provided to hold the table in the desired position. The miter gauge can be used to feed the work into the drill. If both the saw base and a motor are mounted on a length of channel iron, the assembly can be moved easily wherever desired.—M. B. Birge, Hinsdale, Ill.

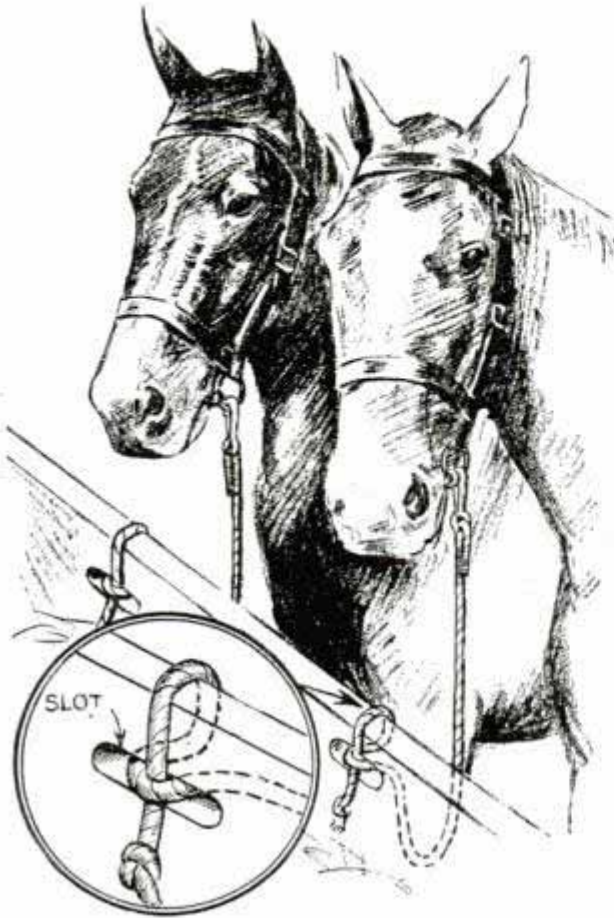
This Micrometer Attachment Measures Internal Tapers

Handy for quickly measuring the taper per inch of internally tapered work, this micrometer attachment is made from a steel block. The block is turned at one end for a distance of $1\frac{1}{8}$ in., and $\frac{1}{8}$ in. at the other end. Then the piece is slotted at one side to fit closely over the lock nut, and at the other side to straddle the anvil. A hole for the micrometer spindle and two holes for the U-shaped slide bar complete the work before sawing the piece in two. In use, the $1\frac{1}{8}$ -in. projections are inserted into the tapered opening and the reading is noted, after which the $\frac{1}{8}$ -in. projections are similarly inserted. The difference in the readings is the taper per inch.

—H. Moore, Leeds, England.

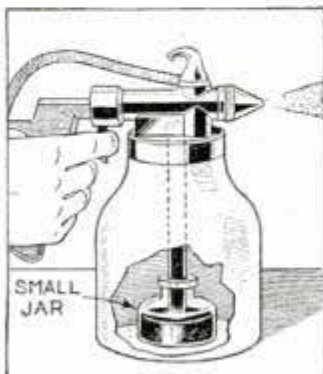


Double-Loop Halter Tie Is Better Than Knot in Rope



When a horse is tied to the manger hurriedly, there is a possibility that the knot employed may become so tight from the animal's pulling that it will be difficult, if not impossible, to loosen. If a long slot is sawed in the manger to receive the looped halter rope, and the end (knotted) is dropped through this, as shown, the tie will hold against all ordinary pulling, yet may be loosened and released instantly.

Small Containers Save Paint



in the bottom of a regular spray gun container with a pint or quart capacity, screw-

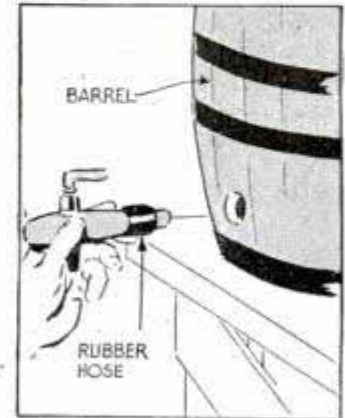
In our business we have occasion to spray small objects with various colors of lacquer. To eliminate wasted time and material, we keep our lacquer in 2 to 4-oz. jars and insert one of these

ing the container in place. When we have finished spraying, we insert a small jar of lacquer thinner and clean the gun.

—Richard Pedersen, Chicago.

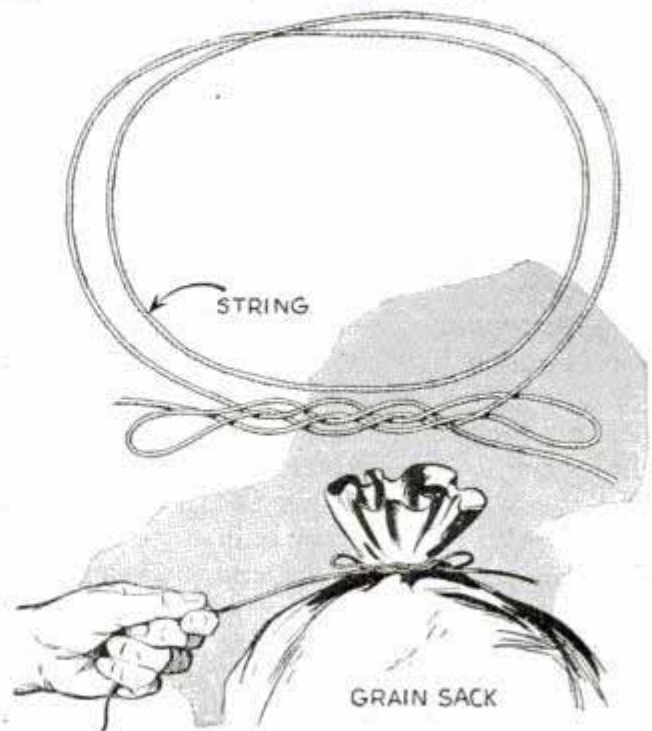
Wood Spigot Secured in Barrel with Rubber Washer

To avoid driving a spigot forcibly into a barrel for dispensing vinegar and other liquids, one merchant recommends the use of a short piece of radiator hose, which is slipped over the spigot as shown. The rubber seals the spigot snugly in place with a single tap of a hammer, and prevents it from being dislodged.

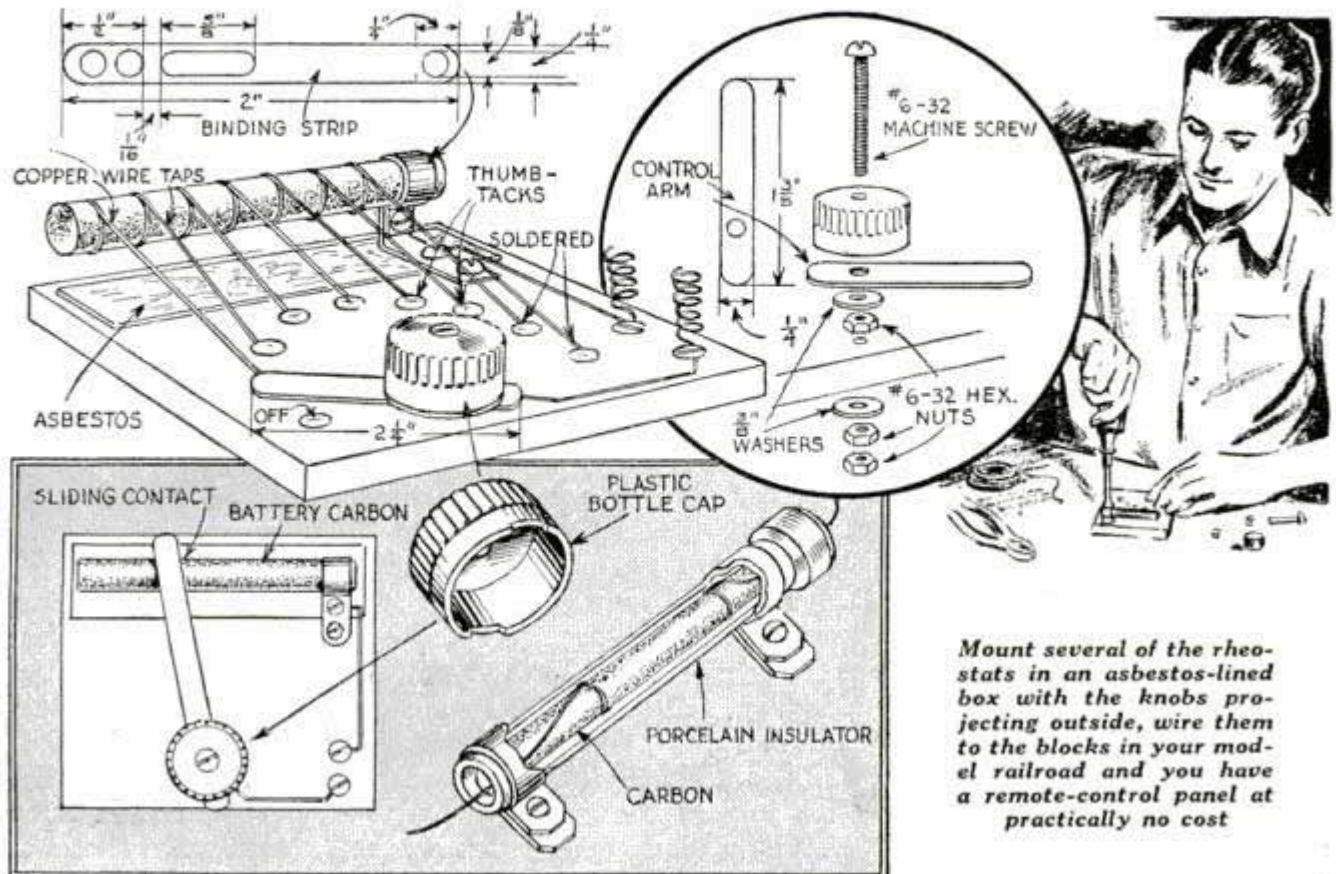


Simple Knot for Grain Sacks Is Opened Easily

Here's a knot that will hold grain sacks closed in handling, yet is easily and instantly untied by pulling on a projecting end of the string. In making the tie, the two ends of the string are doubled back on each other, the string is wrapped twice around the sack, and the loop ends are given three interlocking turns.



Carbon Rheostats for Low-Amperage Current



Mount several of the rheostats in an asbestos-lined box with the knobs projecting outside, wire them to the blocks in your model railroad and you have a remote-control panel at practically no cost

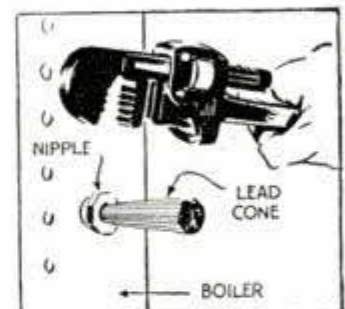
Model-railroad fans who would like a separate control for each block, but feel that the cost of such an installation is prohibitive, will find these rheostats just the thing. Also, they are handy for the electrical experimenter and for other uses where the current handled is of very low amperage. Of the two types shown, the one in the lower detail is simpler, and gives steadier control, but it has the disadvantage of wearing quickly if it is used where the control must be adjusted frequently. The carbons for both rheostats are taken from flashlight cells. In the lower one, the carbon is mounted on an asbestos-covered base by means of a bracket at one end. A sliding brass or copper contact brushes the carbon, and is controlled by a knob assembled as shown in the circular detail, the knob being a plastic bottle cap. The carbon in the rheostat in the upper detail is mounted in the same way, but it has several copper-wire taps leading to thumb-tacks or screws, which the control arm contacts as adjustment is made. This method avoids wear on the carbon, but control is likely to be a little jumpy unless care is taken to locate the tacks so that the arm

contacts one the instant it breaks contact with the preceding one. If the carbons are used as permanently set resistors, it's a good idea to inclose them in a porcelain tube, as they are likely to heat.

—Earle T. Orchard, North Attleboro, Mass.

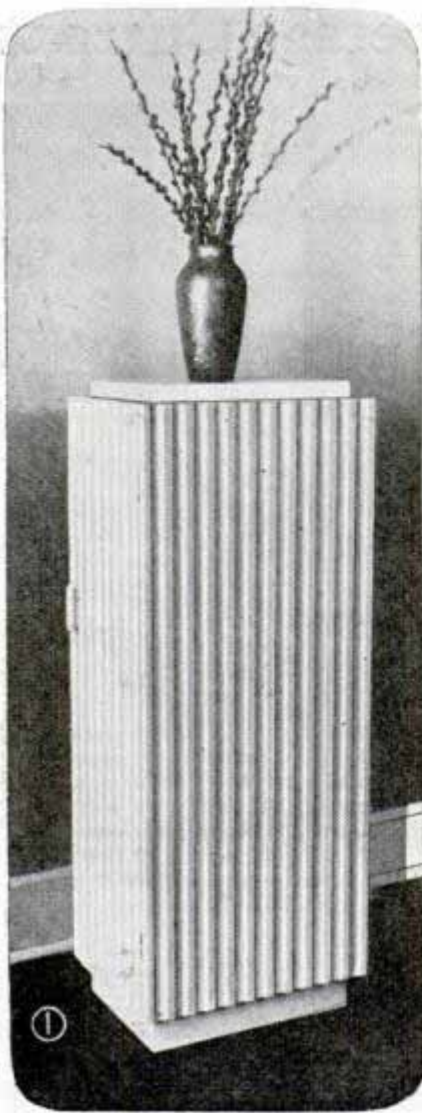
Bushings Removed from Boiler with Lead Cone

Crushing of small sleeves, nipples and bushings when they are being removed with a heavy wrench, is avoided by one plumber who uses a lead cone. This is driven into the sleeves before the wrench is applied. The cone tends to keep a bushing or nipple from being crushed by the wrench when pressure is applied.

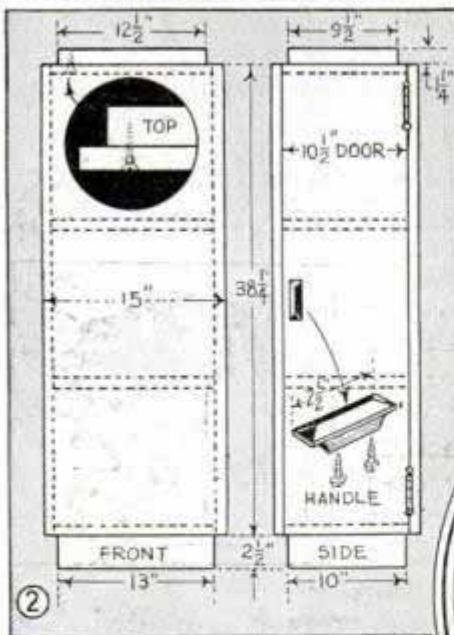


☞ To clean an empty oilcan so that it can be used for other purposes, rub the inside with a handful of sawdust.

You Can Build These



SIMPLIFIED by straight lines of modern styling, any one of these graceful pier cabinets will lend a modern touch to a bare wall or vacant corner. For a finish of bone white, any close-grained stock, hard or soft, that will take a smooth coat of enamel can be used. The cabinet in Fig. 1 is of simple design and when open, affords commodious space for numerous magazines, books, etc. Made in pairs, this cabinet offers a delightful decorative treatment at either side of a doorway or bay. The construction should be apparent readily from the cut-away drawing in Fig. 6, with full dimensions being given in Fig. 2. Simple rectangular frames fitted at top and bottom of the assembly are first made with butt joints held by corrugated nails, after which the three sides are fitted. If you use corrugated fasteners in joining the frames, keep them back from the edge of the top frame so that the top piece will hide them. The corner joints of the side pieces can be tongued-and-grooved or simply butted. The side pieces including the door, the back being left plain, are fluted before assembling them permanently. This job can be accomplished easily on a circular saw with a molding head which has been fitted with a rounded knife ground from a blank. Or, you can do the job by using a standard cutter as shown at Fig. 3. This latter method requires more time in making the repeated cuts although a $\frac{3}{4}$ -in. dado saw can be used first to remove the waste. For sake of simplicity, the fluted effect can be simulated by tacking standard half-round molding to a carcass of $\frac{1}{2}$ -in. plywood, Fig. 4. While this method produces a reeded effect, the same general appearance will result when heavily enameled. The mitered base is counterbored to take wood screws with which it is attached to the bottom frame. Cleats to support



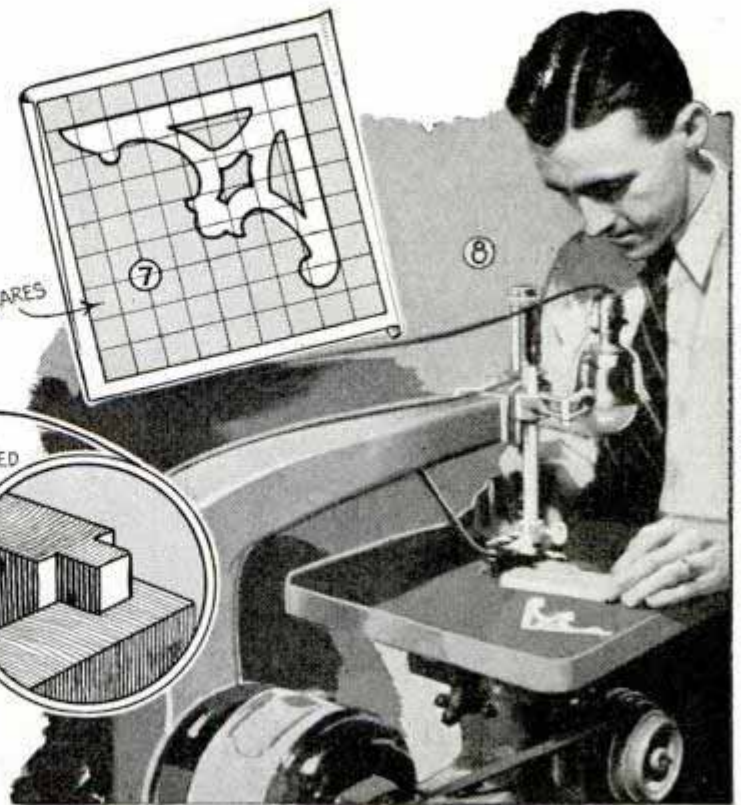
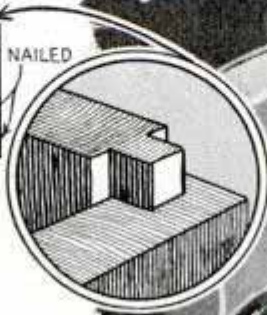
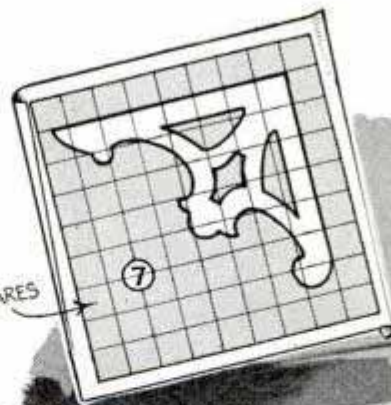
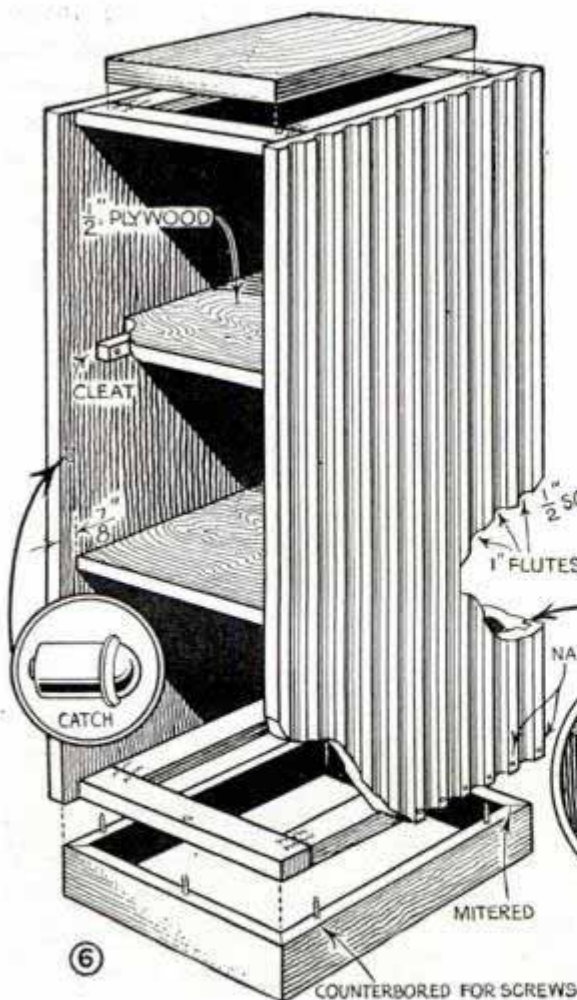
Side of cabinet opens to expose shelves on which books and magazines can be stored out of sight



PIER CABINETS

shelves of $\frac{1}{2}$ -in. plywood are fitted to the inside of the cabinet as shown. The lower frame can be covered with a piece of $\frac{1}{4}$ -in. plywood. The door is hung with two narrow butt hinges and held closed with a bullet-type friction catch.

Equally as effective for a bare corner in the living room is the cabinet shown at Fig. 5. Fully detailed in Fig. 10, the upper assembly is formed mainly from standard $\frac{3}{4}$ -in. dowels capped with 1-in. square members at the ends. The two center shelves, after being stacked and band-sawed along with the top one, are next bored, both at once, for the seven dowels. The top of the lower cabinet is cut slightly larger from $\frac{3}{4}$ -in. stock with the edge being shaped, if desired, as shown at Fig. 12. The best method of assembling the upper part, after the square-end members have been bored for the dowels, Fig. 9, is first to fit the pieces together without glue and mark the position of the square ends on the lower and upper shelves. Then remove the end from the dowels and glue these in their respective positions just



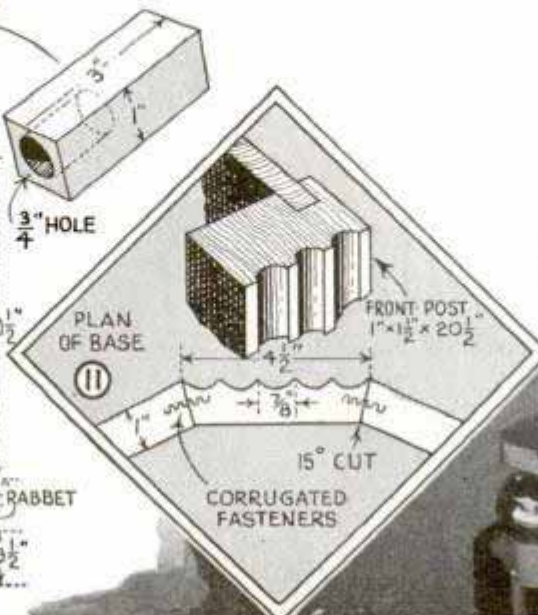
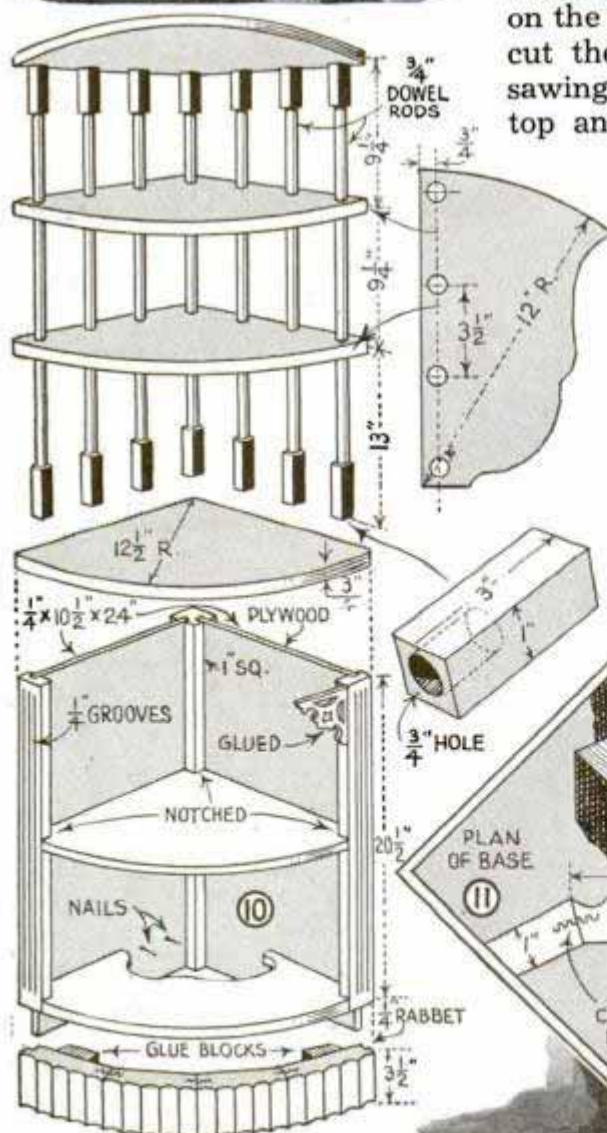


marked. When dry, they can be nailed from the top. It is then a simple task to coat the dowel end with glue and insert it in the holes. The center shelves are spaced as shown and held by nailing through the edge as at Fig. 13. Plywood sides for the lower structure are fitted to grooves run in the front and rear posts, after which the shelves are notched and nailed in place. Two jigsawed fretworks, Figs. 7 and 8, are bradded and glued to the front corners, which, when finished in walnut, will add a bit of contrast to the rest of the cabinet. The base, which can be left plain if desired, is easily formed from four angle-cut segments glued together as in Fig. 11. The ends are rabbeted to fit the plywood sides and are held with screws and glue blocks. If you flute the base, the grain of the segments should run vertical.

A distinctly novel design is shown in Fig. 14. It provides space for the installation of a small radio chassis and speaker at the top with dial mountings being made on the side of the cabinet. With the exception of the shelves and stepped-cut corners, the construction is of plywood. The sides are of 1/2-in. material, rabbeted at the back edge for a 1/4-in. back. The front facing is of 1/4-in. plywood. Fig. 15 details the layout of the corner pieces from a 2 by 6-in. block. The angle cuts are made on the circular saw set at 45° as in Fig. 15. It is best to cut the entire front facing from a single piece, jigsawing the speaker grille similar to that shown at the top and covering with a scrap of gold bronze cloth.

The location of the shelves is primarily dependent upon the size of the radio at hand which will govern the position of the remaining shelves. Provide air vents in the top compartment by drilling several large holes through the plywood back.

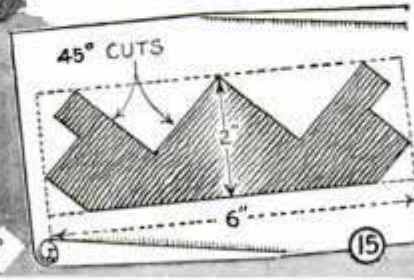
These pieces have been especially designed for an enamel finish and if you have used close-grained woods such as birch or





Large dowels blocked at both ends emphasize height and at the same time provide a novel means of supporting the shelves as shown at the right. The middle shelves are slipped over the dowels and held with small brads

STEPPED CORNER CUT WITH TABLE AT 45°

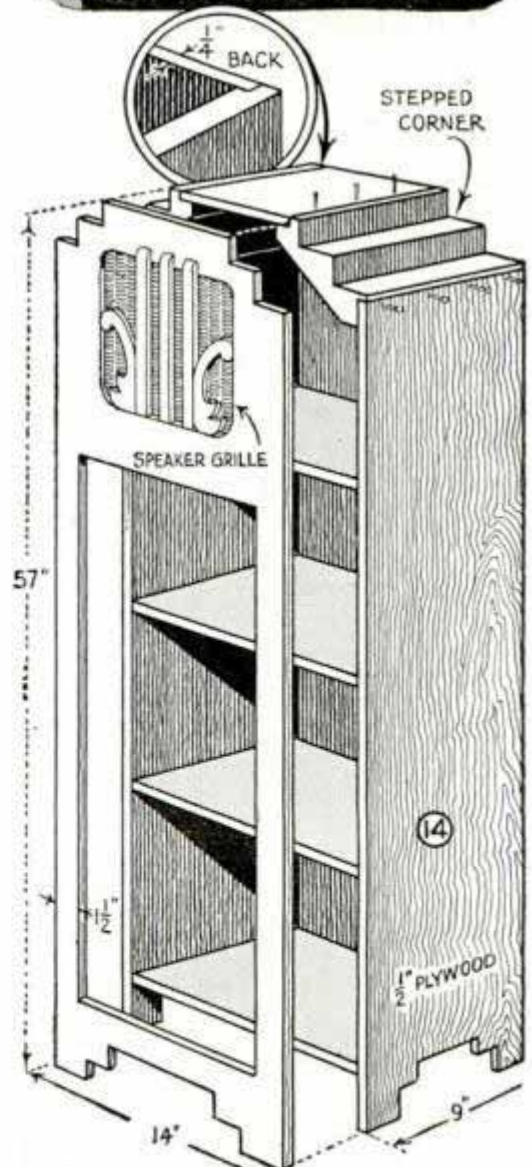


popular this is an easy job. A thorough sanding is the important thing, for enamel will not hide tool marks and rough end grain, even though several coats are applied. For sanding tool marks out of the flutes a piece of sandpaper wrapped around a short length of dowel of approximately the same radius as the fluting cutter is just the thing. Use successively finer grades of paper on both the flat and curved surfaces, being especially careful with exposed end grain. This must be perfectly smooth otherwise you will have trouble building up a level coating of enamel. After all parts have been sanded, apply a coat of enamel undercoater and let it dry thoroughly. If the undercoater absorbs on the end grain, fill the surface with a bit of paste, white lead applied and rubbed in with a piece of cloth or simply with your finger. Be sure to give this white-lead filler plenty of time to dry. Then sand all surfaces lightly with No. 6-0 paper. Then, for a first-class job, apply a second coat of undercoater, being careful to brush the coating out uniformly. After this is dry, sand again lightly with the same grade of paper. Then lay on the first coat of enamel to a uniform thickness with as little brushing as possible. When dry, sand lightly with No. 7-0 paper, and apply the second coat. When laying on both the first and second coats you have to be careful with the vertical surfaces, for if you get the enamel film a bit too heavy it will sag or run in places. This results in an unsightly blemish very difficult to remedy. When the second coat is dry, sand smooth and polish with wax.

☐ Photographers and others who often use several extension electric cords at the same time will find that they can distinguish them easily if pieces of colored paper are glued to the wires at 2-ft. intervals.

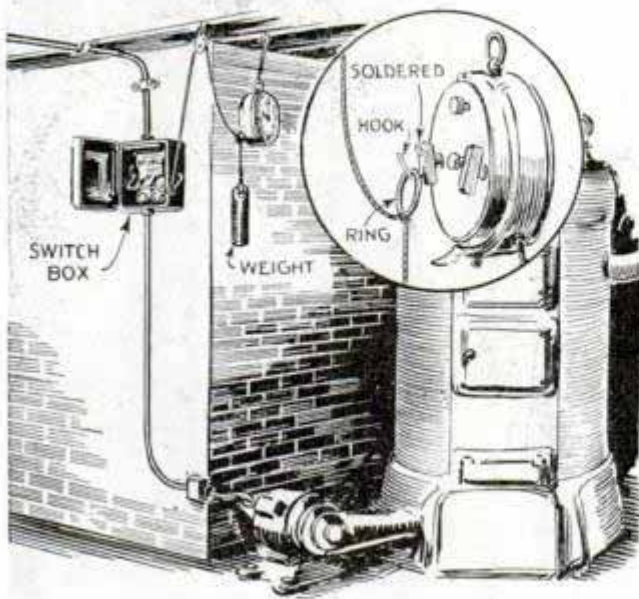


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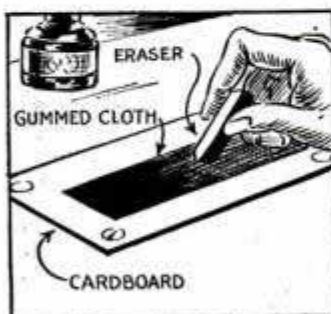
14

Boiler Plant Started in Morning by an Alarm Clock



When I operated a boiler in a manufacturing plant, it was often necessary that I be down at three o'clock in the morning to start the oil burners. As this was rather unpleasant on cold mornings, I devised the time switch shown to do the job for me. As all oil burners have a wall box throw switch to shut off the power when the burner is not in use, the clock was installed so that it pulled the switch and closed the circuit at a given time. As shown, a small rope weighted at one end is tied to the handle of the switch and run over a pulley to the clock, where a ring in the chain attaches it to a hook soldered to the alarm winding key. At night, the switch is pulled and the alarm set. When it goes off the key turns, allowing the ring to slip off the hook.—W. C. Strodl, Arlington, N. J.

Cleaner for Eraser



strip of cardboard or thin wood, which serves as a base. This is tacked in a convenient place where it is within an easy

Mechanics, draftsmen, artists, typists and others who often require a clean eraser, will find this cleaner just the thing. It is nothing more than a strip of gummed cloth stuck to a

reach. To clean the eraser, just draw it back and forth over the rough surface of the gummed cloth.

—M. Grossman, New York, N. Y.

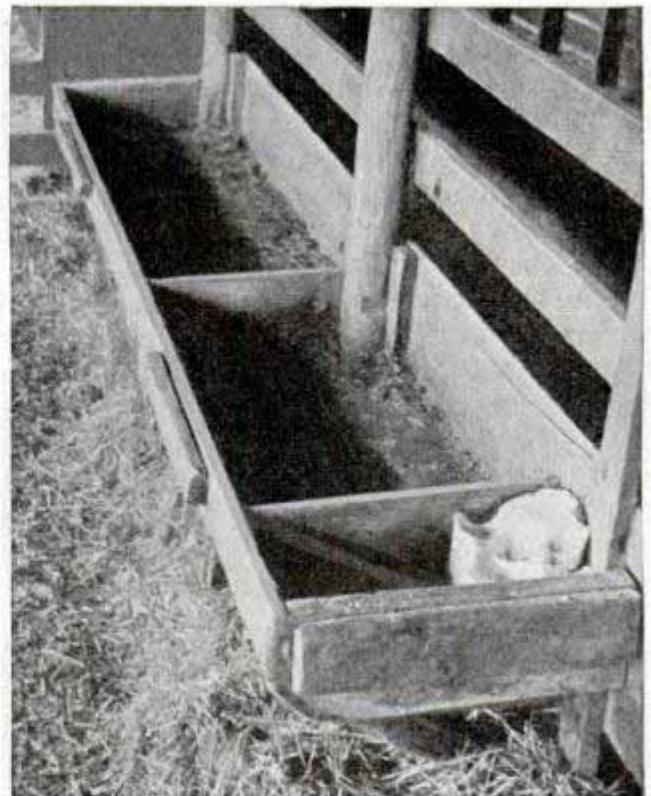
Tile Ventilator for a Cave

A good ventilator for your cave is assembled easily from a clay or concrete tile. Set it bell end down in the roof of the cave, and then make a cone-shaped cap from a piece of heavy, galvanized sheet metal. Attach this to a sheet-metal band by means of three or four metal strips and clamp the band around the top of the tile.

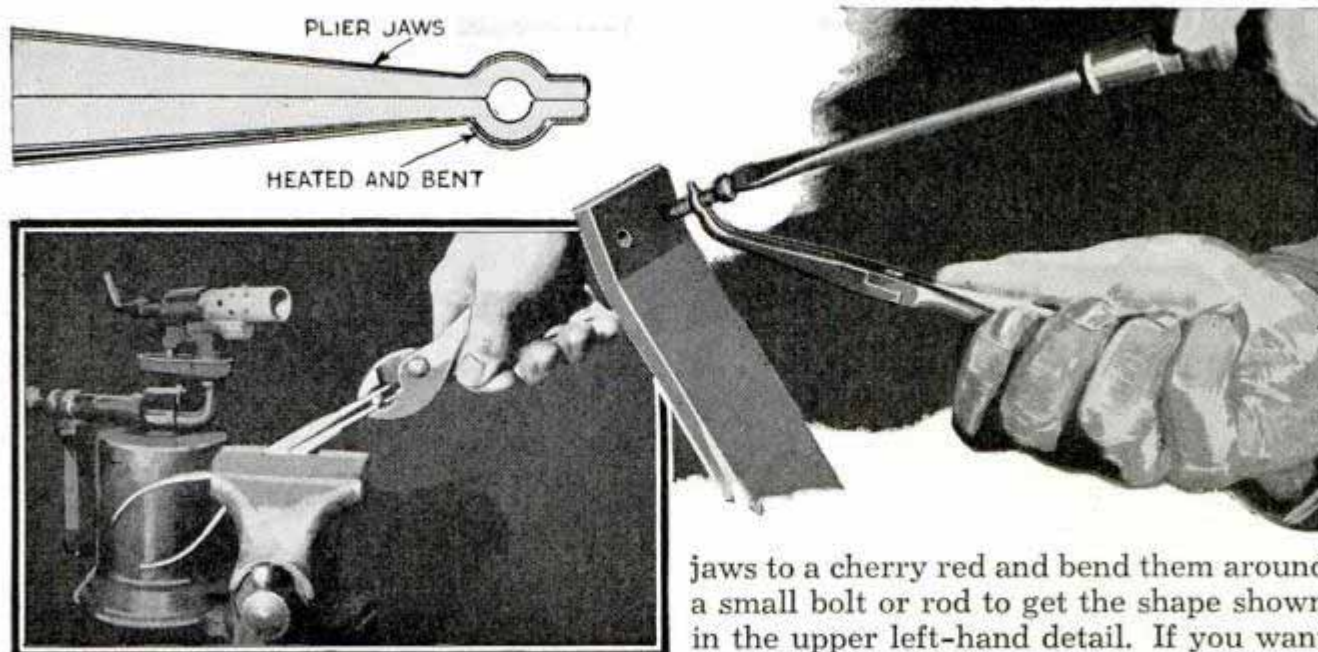


Rounded Bottom on Feed Trough Increases Sanitation

These feed troughs or mangers, used on the University of Nebraska Experimental Farm, are worth copying because there are very few corners to accumulate small particles. The bottoms are of smooth, galvanized iron nailed to curved end pieces and patterns, which are sawed from 2 by 8-in. pieces.



Long-Nose Pliers Are Altered to Hold Screws



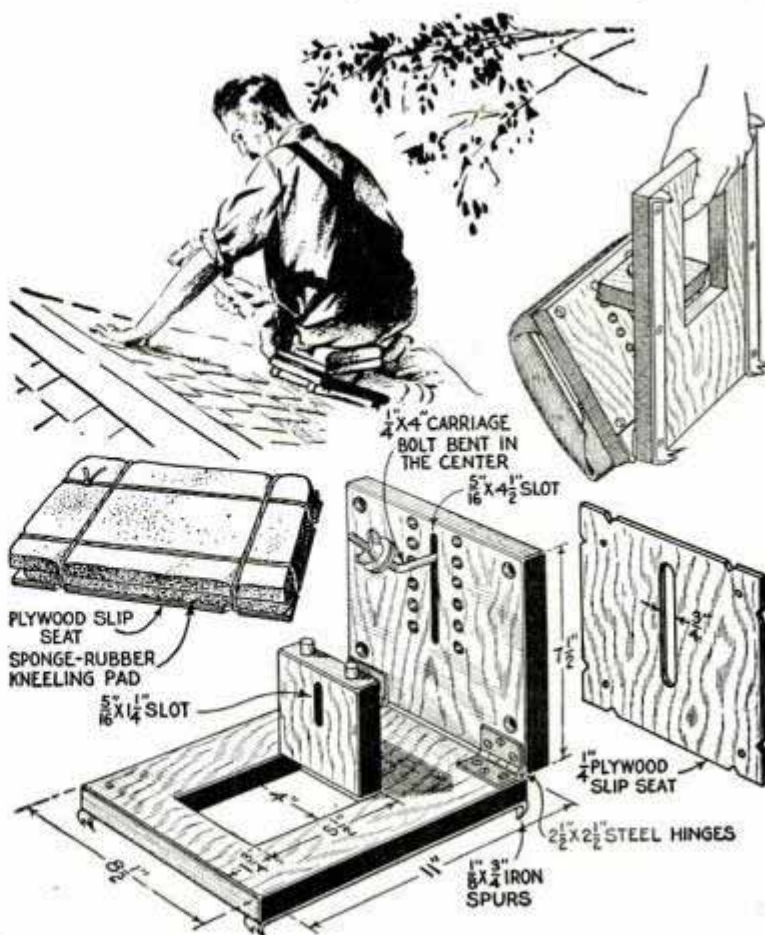
Bent to the shape indicated, you can use a pair of long-nose pliers for holding nails, screws, etc., while starting them. Also, they are handy for holding small work while grinding and similar jobs. Heat the

jaws to a cherry red and bend them around a small bolt or rod to get the shape shown in the upper left-hand detail. If you want to bend them at right angles afterward, grip them in a vise and bend them with a pair of heavy pliers. After shaping them, reharden by heating to a cherry red and then plunging into cylinder oil.

—M. W. Mutschler, Lincoln, Nebr.

Shingler's Seat Is Adjustable to Pitch of Almost Any Roof

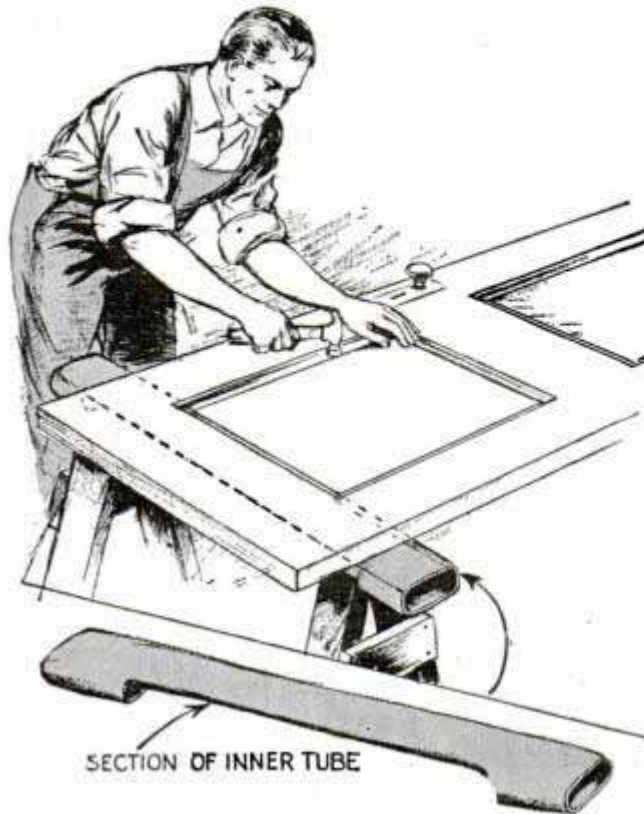
Compact and comfortable, this shingler's seat is upholstered for comfort and is easy to adjust. Small metal spurs on the underside "bite" into the roof and prevent slipping. If used when applying composition shingles, pads of rubber should be substituted for the spurs. The seat consists of two wood blocks hinged together with a hinged spacer block between them to permit adjustment by means of a carriage bolt. Two pieces of sponge rubber provide the cushion, and they are lashed to a removable plywood slip seat.



Restoring Faded Blueprints

Blueprints that have been rushed through the washing process to get them on the job quickly, often fade on contact with strong light. If this happens, store them in a dark place a few hours and their original color will return.

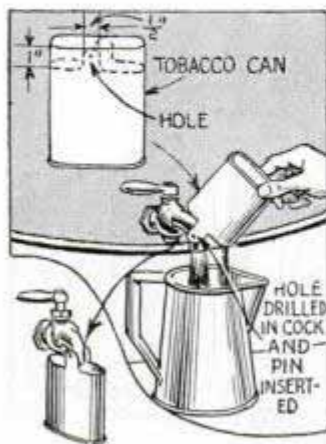
Pad for Repairman's Sawhorse from Inner Tube



A carpenter, who frequently had to repair varnished or painted doors, windows, etc., eliminated the possibility of scratching them by carrying a removable pad for each sawhorse used on the job. The pads were made from sections of inner tube cut to the shape indicated to fit securely over the top of the horses.

—G. E. Hendrickson, Argyle, Wis.

Drip Catcher on Barrel Cock Prevents Waste



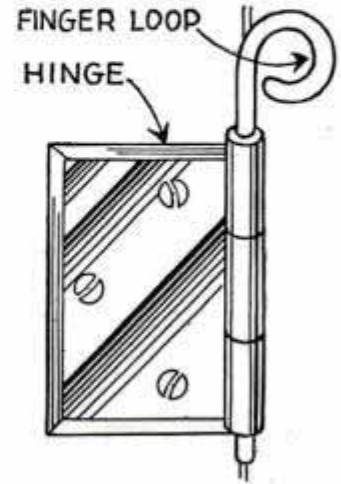
Farmers and others who keep gasoline, lubricating and fuel oil stored in barrels will find that this simple drip catcher not only tends to save oil, but also prevents the floor or ground underneath the barrels from getting oily. The catcher is nothing more than a tobacco can with the top cut away to provide two ears in the center which are

pivoted to the barrel cock so that the catcher can be swung upwards, as shown, to empty the drippings.

—A. H. Waychoff, Tempe, Ariz.

Special Hinge Pin Aids Carpenter

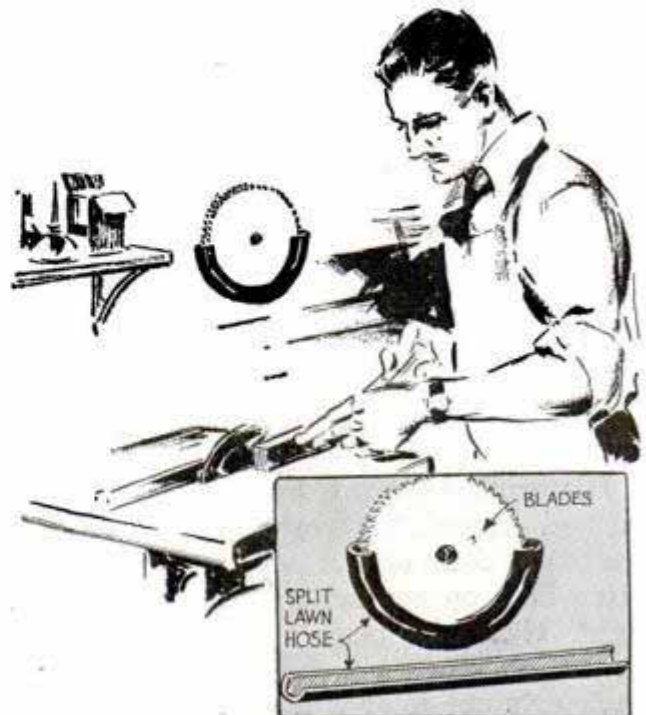
When hanging doors, carpenters are sometimes inconvenienced by removing and replacing the hinge pins, which may often fit so snugly that a tool must be used to loosen them. To avoid this, one carpenter suggests a set of special pins. These are made to fit the standard door hinge and are provided with a finger loop by which they may be lifted.



These are made to fit the standard door hinge and are provided with a finger loop by which they may be lifted.

Holder for Bench-Saw Blades from Split Lawn Hose

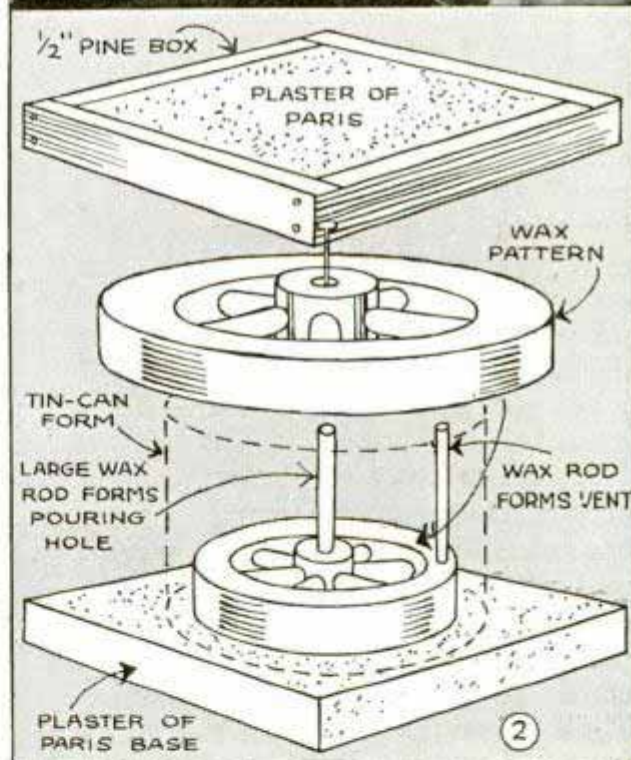
Several blades of your bench saw may be kept conveniently at hand in this holder, which is simply a split length of discarded lawn or garden hose, nailed to the wall as shown. The rubber will protect the teeth from damage and also allow easy selection of any blade.



Making UNIT CASTINGS *in the home shop*

INTRICATE castings of small objects such as wheels, model parts, statues and busts can be made by this method, which employs a pattern of modeling wax. The process is such that usually it is not necessary to part the pattern. One variation of this general method makes it possible for you to purchase inexpensive novelty china statuettes and then duplicate them in every detail with soft metals such as brass, aluminum, bronze, type metal, pewter or lead. Examples are shown in Fig. 3.

Now to get into the process. The one method which is most widely applicable uses an original pattern made of wax. As an example, take the wheel shown in the center detail of Fig. 2. Making this pattern of modeling wax is really very easy as the wax can be softened and molded into most any shape, and then trimmed to the exact size wanted, as in Fig. 4. The finished pattern should be mounted on a plaster-of-paris base made as shown in the upper detail, Fig. 2. Then a form such as a tin can with the ends knocked out, is placed around it as in the lower detail. To provide for pouring the metal, rods of wax



CASTINGS MADE WITHOUT PARTING

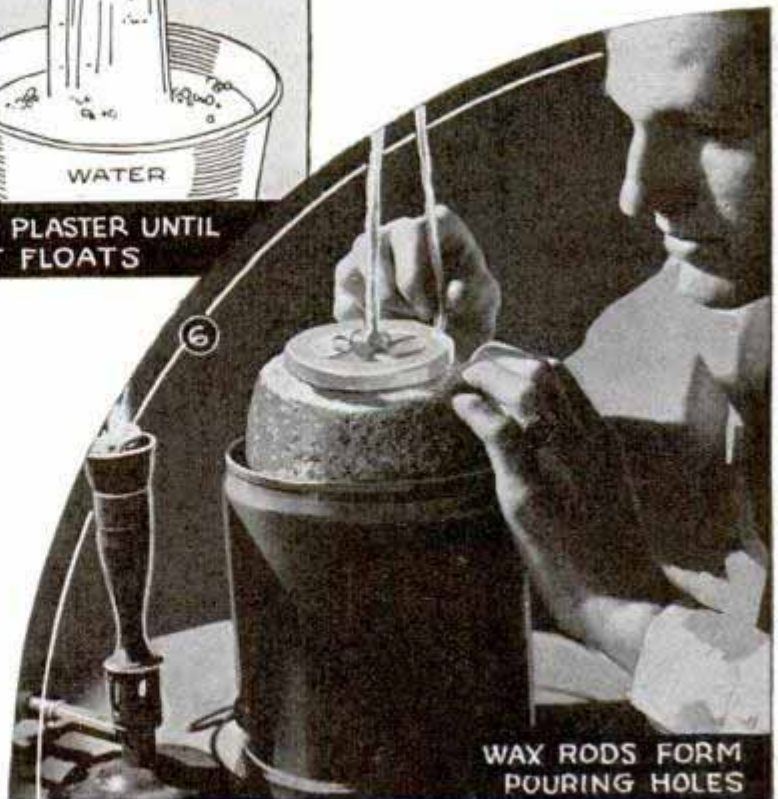


are softened and stuck on the highest part of the model, Figs. 2 and 6. These should extend higher than the metal form and one should be large enough to provide a passage for pouring the molten metal; the others serve only to let air out of the form. The wax pattern must be fastened down so that it can not move when the plaster is poured over it.

A thin mixture of plaster of paris is made by taking enough cold water in a large pail to fill the form, and slowly dropping in plaster of paris until some of the latter comes to the surface and floats, Fig. 5. Then the mixture is stirred well and poured into the form, as shown in Fig. 9. When the plaster is dry, the wax pattern is melted out as shown in Fig. 8, by standing the mold over a gas flame, with the vents down, and with a pan provided to catch the melted wax. Care must be taken that the wax does not catch fire. The mouth of the pouring hole should be enlarged so that it is funnel shaped.



ADD PLASTER UNTIL IT FLOATS

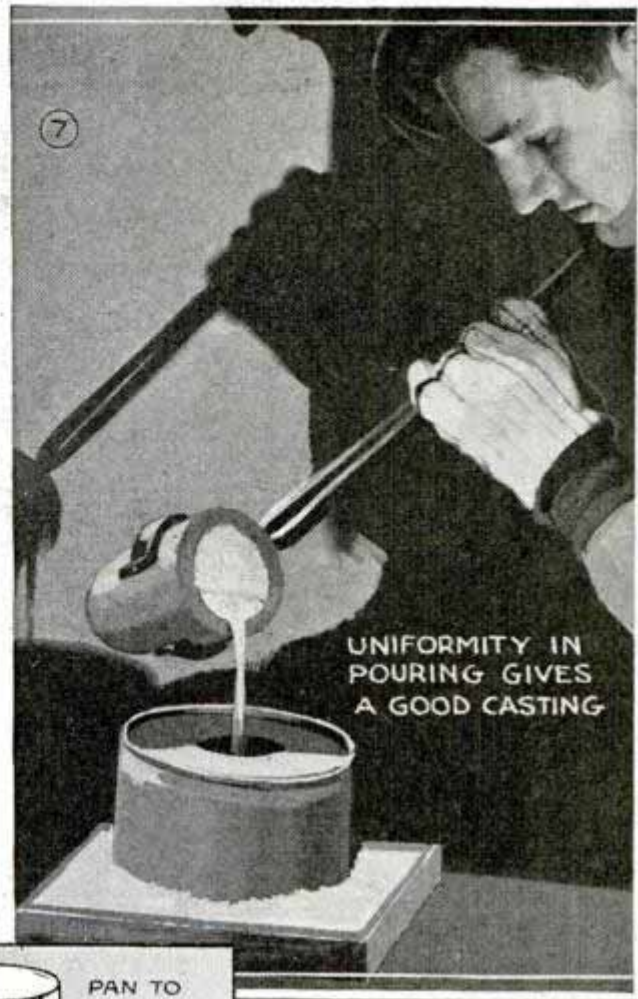


The mold must be thoroughly heated to drive out the last trace of moisture. The metal should be melted down in a crucible placed in a forge or a gas furnace. Lead, type metal, pewter, etc., may be melted in an iron pot in a forge, Fig. 16. The crucible should be handled with tongs similar to those shown in Fig. 8, and the metal poured as in Fig. 7. All pouring of molten metal should be done over dry sand. Excess metal must not be allowed to "freeze" in the crucible. After the metal has solidified in the mold, the form is removed and the plaster broken away by plunging the hot mold into a tank of cold water. With large molds, the plaster should be broken off. The pouring riser and vent prints on the casting may be sawed away and the surface dressed with a file or grinder.

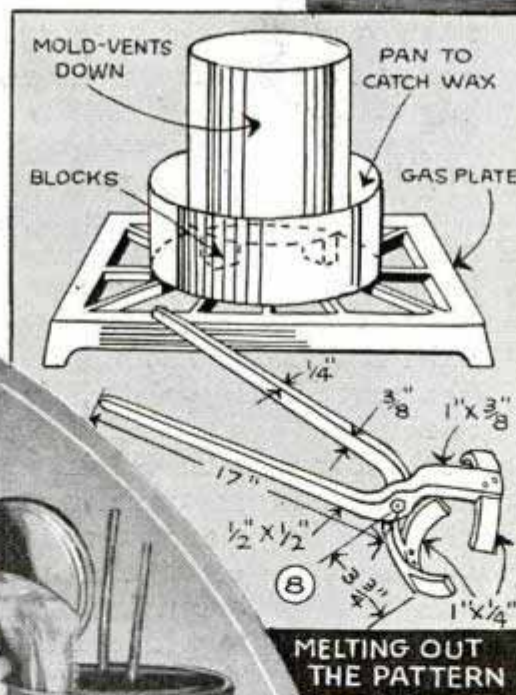
Another method must be used where there is already a model to work from and where a single duplicate of any article is needed, or when a broken casting must be replaced. The broken

parts can be fastened together temporarily and used as a model for a new casting. Also duplicates of antique or unusual parts can be made from the original without in any way injuring it. The model is first set in position on a flat board, as shown in Fig. 10. In order to keep it in this position and to return it to the same place, spotting pins or small brads with their heads cut off can be driven into the base and pressed down into the model. The model next should be covered with two or three layers of wet newspaper, and then a layer of modeling clay, at least $\frac{1}{4}$ in. thick as in Fig. 11. The outside of this should be coated with paraffin oil or grease. A wood flask, spotted with pins, Fig. 12, is placed around the model to retain the plaster. The inside of the flask should be greased thoroughly. The plaster mold can be in one piece if the draft or taper of the model runs all in one direction from the base as in Fig. 14. If not, the mold will have to be parted approximately along the center line of the model by imbedding a light length of piano wire in the clay along the desired line and drawing it out when the plaster has partly set.

When the plaster has set, the mold is removed



UNIFORMITY IN POURING GIVES A GOOD CASTING



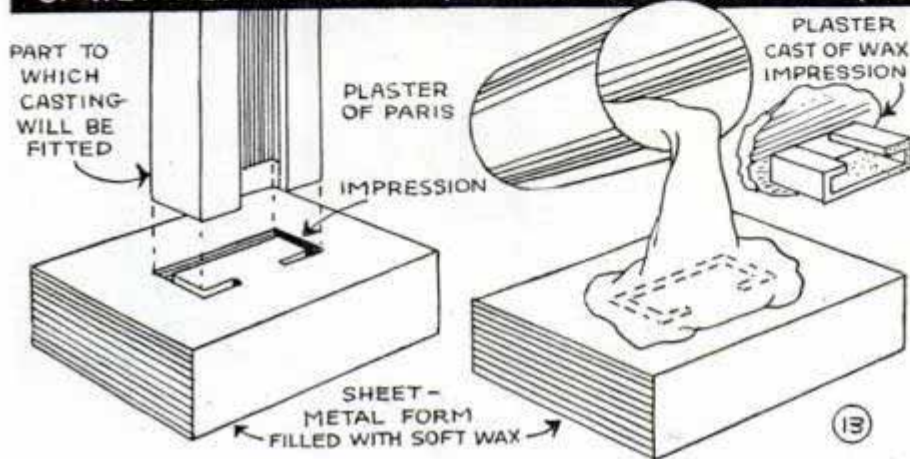
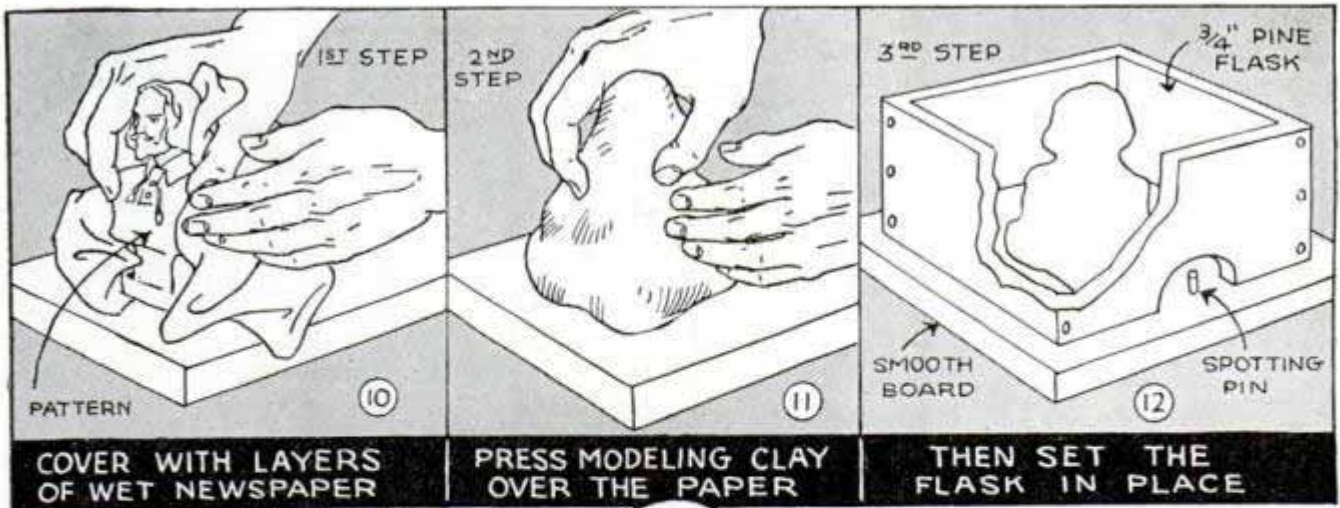
MELTING OUT THE PATTERN

carefully from the clay. All the clay and the wet newspaper are now removed from the model and plaster mold. A pouring hole is drilled through the mold at the top, using a knife and working from the inside. The mold is then set back in position around the model as shown in Fig. 15. Both the model and the plaster mold should be coated with oil. Small vent holes must be drilled any point where the air is

likely to be trapped. Next, soak cabinetmaker's white glue in sufficient cold water for fifteen minutes to swell the glue completely. Excess water is then poured off and the swollen glue is placed in a water-jacketed glue pot or a double boiler, and melted. When melted, it is poured into the mold



PLASTER IS POURED OVER THE WAX



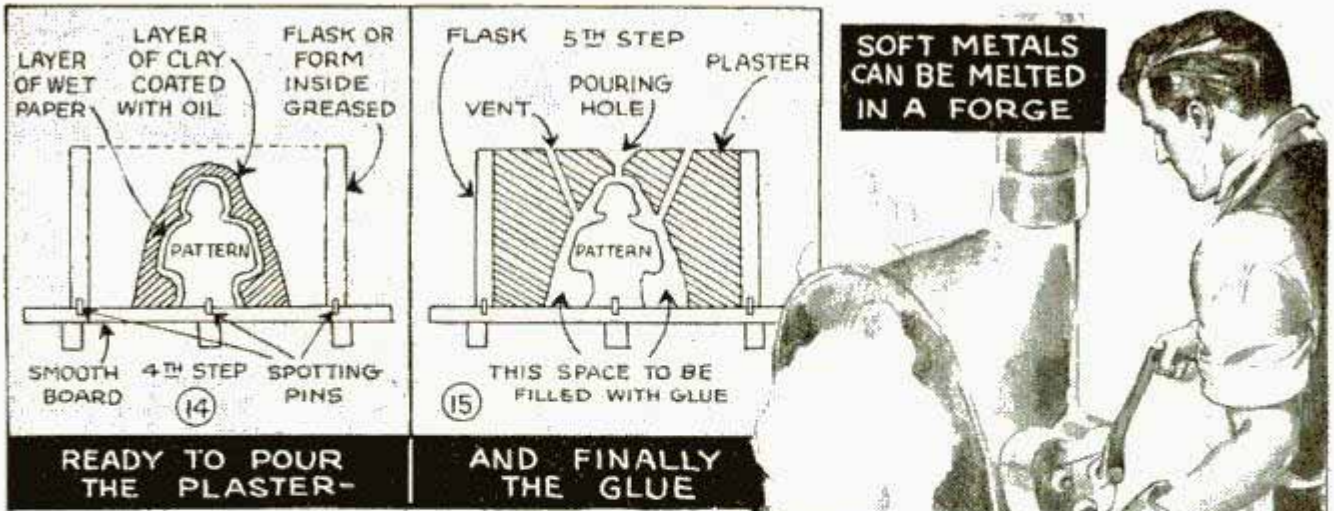
until the space between the model and the plaster is filled. Give this plenty of time to set. The plaster case is then removed and the glue mold carefully split and skinned off. The model is no longer needed. Now cut a pouring hole at the top of the glue mold, as was done with the plaster case, and put the glue mold and the plaster case together and in place on the board. Vents should be provided if necessary. If the mold is in two parts it must be clamped together. Melt modeling wax and fill the glue mold. When the wax has set, you have a wax duplicate of the original model, and the casting is made from the wax pattern as previously described.

Frequently it is desired to make a casting, one side of which shall accurately fit a contoured surface, which may be cast, stamped, or formed in some other way. Fig. 13 shows one way of doing this. This method is particularly useful when it is required to cast a mounting bracket or ornament to fit a formed section, beam, or machine part exactly. A wax impression of the contour which is to be matched is made first and then a plaster cast of this impression which gives a positive dupli-

cate of the original part. Working from this, a wax model of the desired casting can be made.

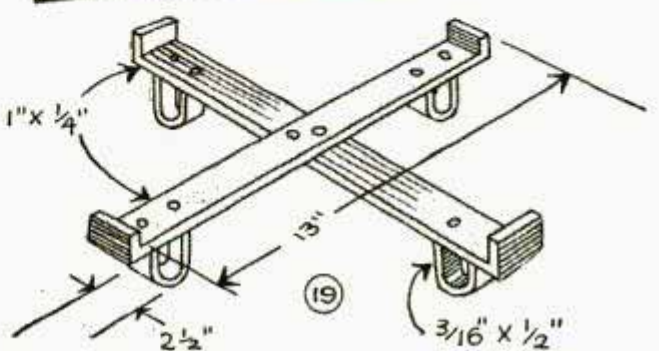
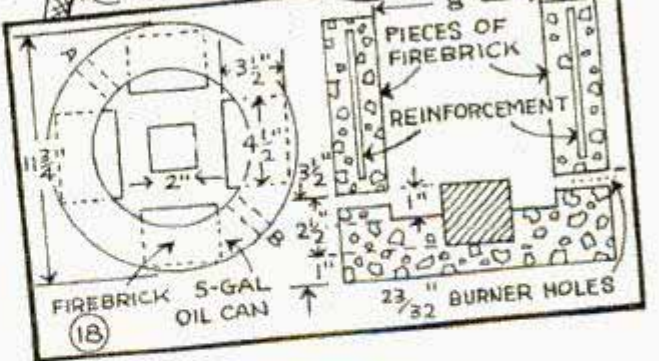
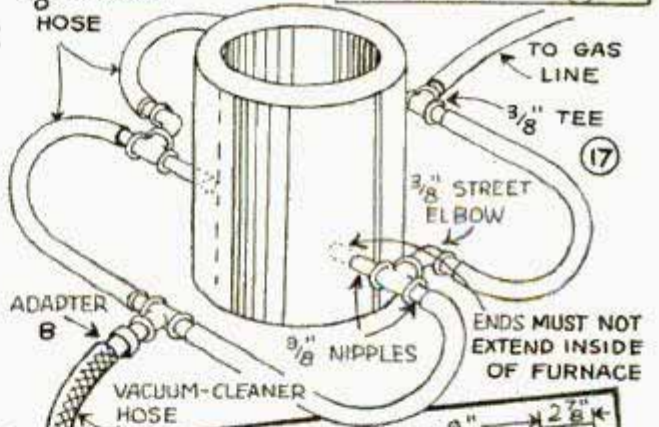
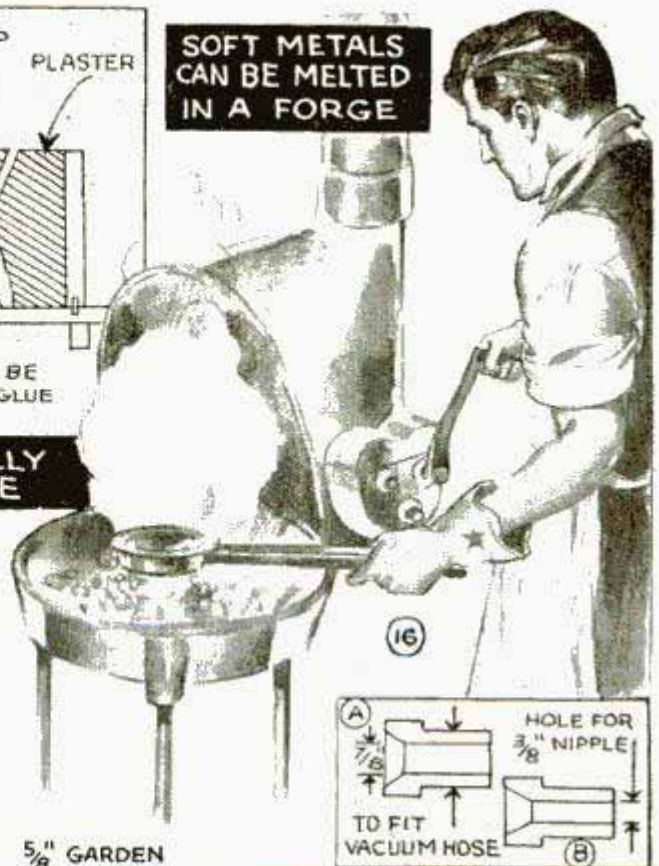
A small blast furnace which will melt a 10 or 15-lb. charge of brass, aluminum, or any other metal melting under 2000° F. can be built from a 5-gal. oil can with the top cut away, Figs. 17 and 18. Two holes are drilled

and reamed for $\frac{3}{8}$ -in. pipe nipples in opposite sides, $3\frac{5}{16}$ in. from the bottom. The heat-resistant lining is built up from ganister, a mixture of equal parts of fire clay and pulverized firebrick, moistened with water and worked up to the consistency of heavy plaster. Scraps of firebrick are added as filler and to increase the strength. The bottom of the can is covered with 1 in. of ganister, which is packed down by ramming with a stick. Four pieces of firebrick, each $4\frac{1}{2}$ in. long and $3\frac{1}{2}$ in. wide, are pressed down into the ganister, and another piece is placed in the center to support the crucible, Fig. 18. The space between these bricks is packed with ganister to within 1 in. of the top of the bricks. Two pieces of $\frac{3}{8}$ -in. gas pipe are inserted through the burner holes to form openings for the burner pipes. A smooth sheet-metal form 8 in. in diameter and free from dents is now set in the can, centered and propped in place. The space between the outside can and the center form is now filled with ganister and pieces of firebrick. When the wall has set sufficiently to support its own weight, which will be in about 12 hours, the center form and the $\frac{3}{8}$ -in.



pipes should be removed and the furnace left to dry in the air for about three days. The burner assembly shown in Fig. 17 is built from $\frac{3}{8}$ -in. pipe and fittings; connections to the gas and air supplies are made with $\frac{5}{8}$ -in. garden hose, or better with pipe fittings and unions. The air can be supplied with a vacuum cleaner as shown, the adapters A and B being turned from hardwood. After testing the pipes for leaks, the final drying of the furnace is accomplished by operating it without an air blast for half an hour or more. The furnace is always lighted and adjusted according to the following sequence: (1) drop a piece of burning paper inside the furnace; (2) turn on the gas; (3) start the air blast and adjust gas flow to the minimum which will give good combustion. This is indicated by long tongues of almost colorless blue flame, forming an intense, whirling flame in the furnace. In shutting off the furnace, always turn off the air first, then the gas. Cracks that form in the refractory lining are filled with a putty made of fire clay and water. To melt a charge, start the furnace and insert the crucible of metal with tongs. Borax is added to dissolve any dross that forms. This should be skimmed off before pouring. To inspect the charge, lift the asbestos cover with tongs and observe the contents through colored goggles. The best crucibles to use are graphite. A stand for the furnace is shown in Fig. 19.

Back in Fig. 1 is shown an inexpensive gas furnace which is now on the market. In general construction it is similar to the furnace just described, but is fitted with a special mixing burner and an electric blower. It is supplied in several sizes, all suitable for home shop use.



Kansas City Specialty Co City

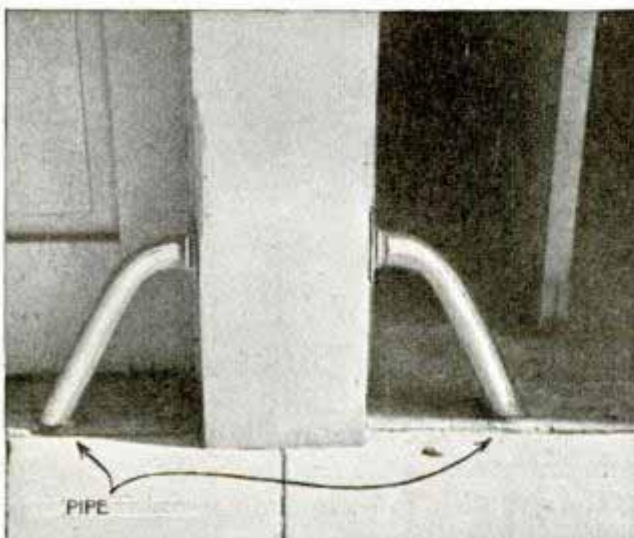
accessories, leaving the regular battery to operate the starter only. The extra battery can be installed in the electrical circuit of the car as shown by the wiring diagram. Note that an electrical cutout is used between each battery and the generator. Also note that the output wire from the generator leads to both cutouts.

Shrinking Brake Shoes to Fit Lining

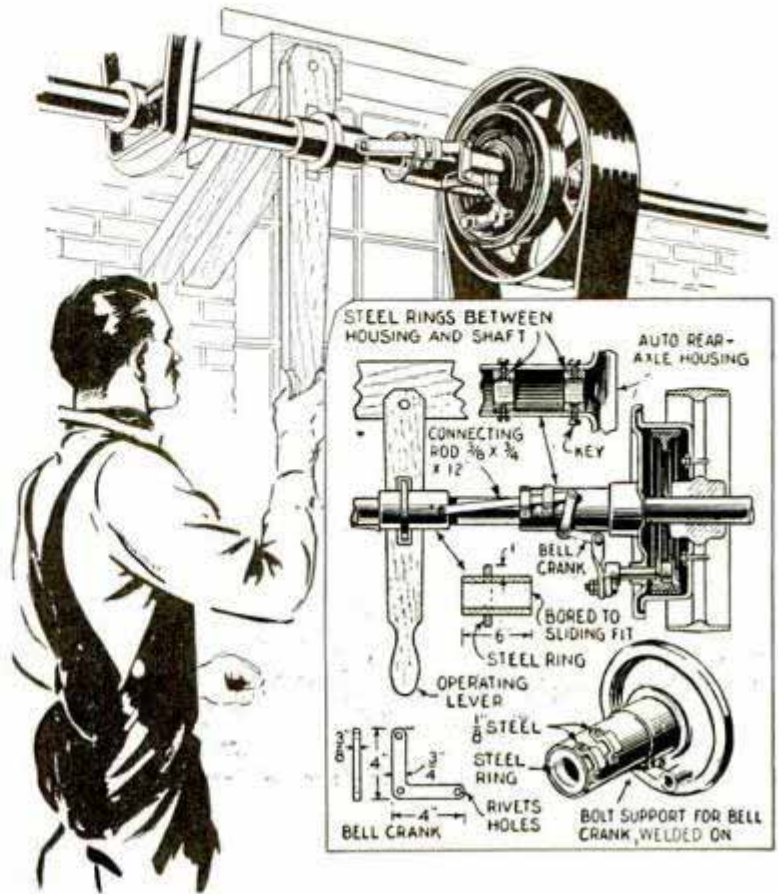
When you purchase brake lining with the holes already punched in it, don't be discouraged if they lack a little of lining up with those in the brake shoe. Just lay the shoes on the ice in your refrigerator for about 30 min. This will shrink the metal enough so that you can now lay the lining on, get the rivets in and do a neat job.

Guards on Garage Door Save Fenders

After scraping the fenders of his car on the garage-door frame, one motorist installed these guards. Two lengths of 1½-in. pipe were bent to the shape indicated. A floor flange was fitted to the end of each one and this was screwed to the frame while the other end of the pipe was set in a hole in the concrete sill. The hole was later filled with cement.



Clutch to Control Countershaft Assembled from Old Auto Brake



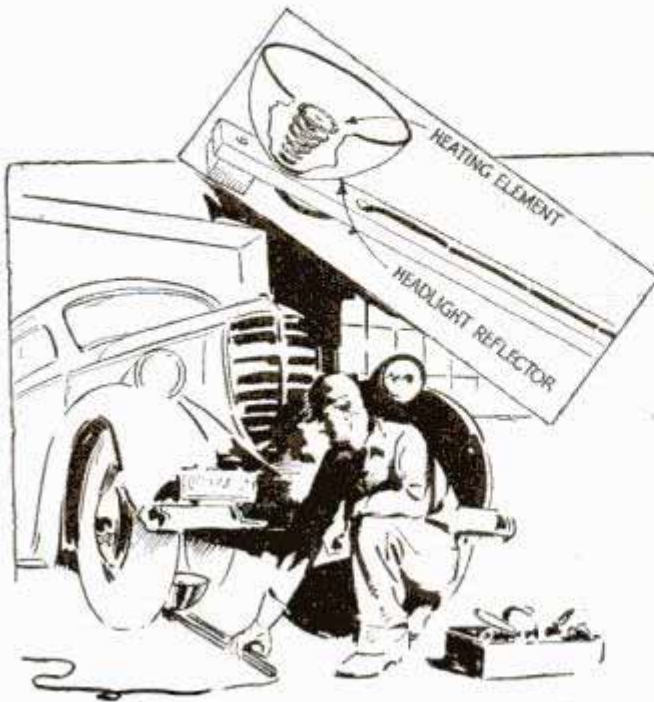
Owners of small garages who operate several tools from a countershaft, and drive the latter with a gas engine or electric motor that should be started under a light load, can rig up a clutch on the shaft by using a drum and shoe assembly from an old car brake. The drum is bolted centrally to a loose pulley on the shaft, after which a portion of the rear-axle housing carrying the brake shoes is sawed off, and steel rings are turned to center it on the shaft. These are brazed inside the housing and are locked to the shaft with keys or set screws.

The housing carries a linkage, which actuates the brake shoes as indicated. The linkage is in turn operated by a sliding sleeve, which has a steel ring welded to it to turn in a slot cut in the lever used to control the clutch. The control lever may be made of either wood or metal and is pivoted to the wall behind the shaft. The entire assembly, except the pulley, drum and lever turn with the shaft.

—W. C. Wilhite, Edelstein, Ill.

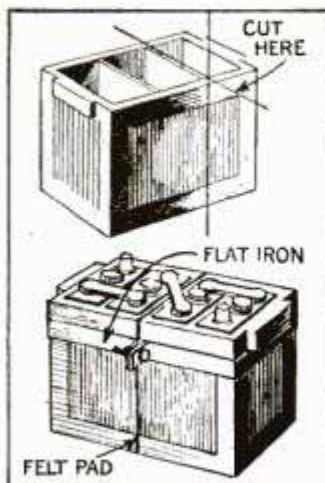
☐ The crown of an aluminum piston can be polished with a typewriter eraser, after the carbon has been removed with a strip of solder.

Heater and Headlight Reflector Thaw Frozen Brakes Quickly



To discourage the use of a blowtorch flame for thawing frozen brakes in the garage, this simple tool was assembled to do the job electrically. It consists of a headlight reflector with an electric-heater cone in the center and a lath handle. The electric connection is made by means of wires attached along the lath. A block nailed under the reflector end of the lath elevates the heater to the height suitable for reaching the brakes on most cars.

Mechanic Carries 8-Volt Battery in Tow Car to Start Motors



Receiving many calls during winter to start cold motors, a mechanic in one garage made an 8-volt battery to handle the jobs. This type of battery was desired because a starter, in cranking a cold, stiff motor, usually lowered the volt-

age of a three-cell battery so that there was insufficient current at the plugs to produce a hot spark. The 8-volt battery

was made by cutting a dead cell from each of two old ones and connecting the four good cells together as indicated.

—C. E. Packer, Chicago.

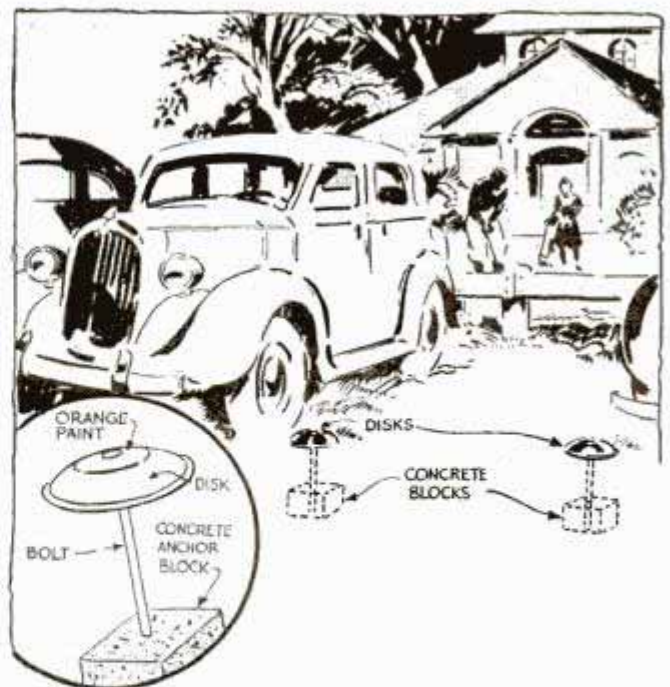
Too Much Oil in Air Cleaner Causes Carburetor Trouble

Oil-bath type of carburetor air cleaners often cause uneven motor idling after the oil has been renewed in the tank. This is caused by too much oil being put in the cleaner tank. If the oil touches the steel wool in the upper part of the cleaner, some air to the carburetor is cut off and a rich mixture and choking of the engine result. Choking also results in vibration of the engine which causes the carburetor to overflow, with a waste of gasoline. The proper amount of oil in the air cleaner will prevent this trouble.

—Emil J. Novak, Omaha, Nebr.

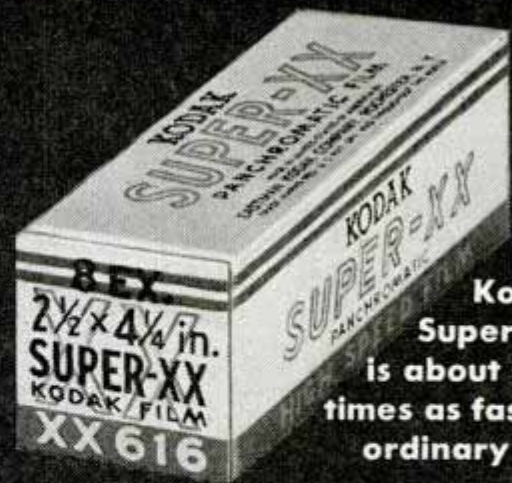
Car Spaces in Parking Lot Marked by Disks on Ground

A Nebraska country club uses markers flat on the ground to designate spaces for parking cars. The markers are disks taken from an old farm disk harrow and are held



in place, convex side up, by means of long bolts extending into concrete blocks buried in the ground. A little orange paint on the disks makes them easy to see.

EASTMAN'S NEW HIGH SPEED FILM



Kodak
Super-XX
is about four
times as fast as
ordinary film

MAKES NIGHT SNAPSHOTS EVERYBODY'S HOBBY

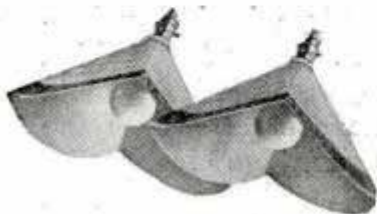


ALL YOU NEED

Your present camera loaded with
the new Kodak Super-XX Film

plus

two or three inexpensive
Photoflood lamps in
Kodak Handy Reflectors



NIGHTTIME SNAPSHOTS are sure shots, now. You use any camera that takes the new high speed film, even an inexpensive Brownie—Kodak Super-XX is now available in all standard amateur sizes. You get snaps that have the spontaneous, delightfully lifelike quality of outdoor pictures. And the shooting itself is almost as simple. With Kodak Super-XX, you use two or three inexpensive Photoflood lamps in Kodak Handy Reflectors.

FREE BOOKLET . . . Condensed course in indoor snapshotting. Detailed, easy-to-understand instructions, interesting photographs, clear-cut diagrams show you how to arrange your lights and place your subjects—how to make your very first batch of indoor snapshots as good as any you'd take outdoors. Get a copy at your dealer's . . . Eastman Kodak Company, Rochester, N. Y.

Pie Has Its Face 'Washed' with a Spray Gun

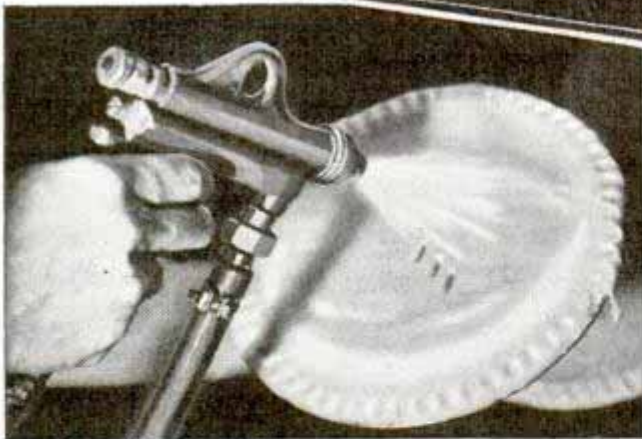
Big city bakeries turn out good pies, and they bake them by the hundred thousand, but they don't bake them like your grandmother did. Imagine your grandmother hovering over the oven with a spray gun in her hand, firing an atomized mixture of egg white and water over the top crust of a delicious coconut pie! That's what the pie factories do today. The air-gun process is called "washing," and it is done to produce that golden-



Top, putting open "lattice" tops on fruit pies; left, pouring custard into shells and "washing" with air gun to brown crust



brown crust. It is just one of the machine-age methods introduced to turn out pies in quantity without losing the homemade flavor. One company in New York City bakes 100,000 pies every day, and sells them all. Pies unsold at the bakery shops the first day are picked up the next and sold to farmers to fatten hogs. The custard filling is poured into the pastry shells in a manner reminiscent of the steel mill. Kettles full of custard are shoved into the ovens on long poles and the liquid filler is ladled into one crust after another. This eliminates the sloppiness of filling each shell outside the oven and then moving it in. Americans, champion pie-eaters of the world, consume 450,000,000 pies a year.



Cartridge Starter for Airplanes Saves Half the Weight

Weighing less than half as much as a conventional electric self-starter, a cartridge starter for airplane motors has been installed in a fleet of army pursuit ships. The idea of kicking over an internal combustion motor by exploding a cartridge is not new, but its application to small air-

planes to save weight is a fresh development. The pilot loads the cartridge, which resembles a twelve-gauge shotgun shell, into a breech in the cockpit, closes the breech and fires the cartridge electrically. Gas generated by the explosion moves a piston geared to turn over the engine.

New York Pie Bakery & Pastry Co. 15th St. N.Y.C.

Science Service 9/30/35

*..she couldn't
say No to that
VELVET
aroma*

Velvet
—the *MILDNESS*
of fine old
Kentucky Burley
aged in wood
—the *FLAVOR*
of pure maple
sugar for extra
good taste

*Velvet packs easy in a pipe
Rolls smooth in a cigarette
Better tobacco
for both*

*Better smoking
tobacco*

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Put this **POWER HOUSE** in your car!



A NEW BATTERY

that lasts **68% longer!**

● If you drive a '35-'36-'37 or '38 car, you need a more powerful battery than required by earlier models. You need extra power for its high-compression motor—extra power for multiple lights, twin horns, radio, defrosters and the other electrical accessories that add so much pleasure and safety to your driving.

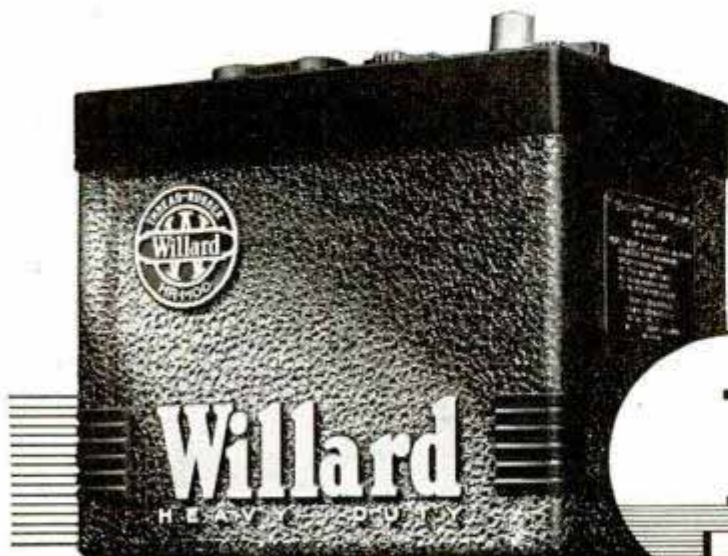
This new Willard "H-R" Battery was built after nine years' study of how people drive and how their batteries perform. It is designed for the present-day car—designed for present-day driving.

It will deliver dependable power to every part of your car just as the substation near you delivers power to every part of your home—when you need it—and where you need it.

THE RECORDS OF 78,000 BATTERIES, DRIVEN OVER ONE BILLION MILES, PROVE THAT THE NEW "H-R" WILL KEEP ON DELIVERING THIS DEPENDABLE POWER 68% LONGER THAN THE AVERAGE OF COMPETING BATTERIES.

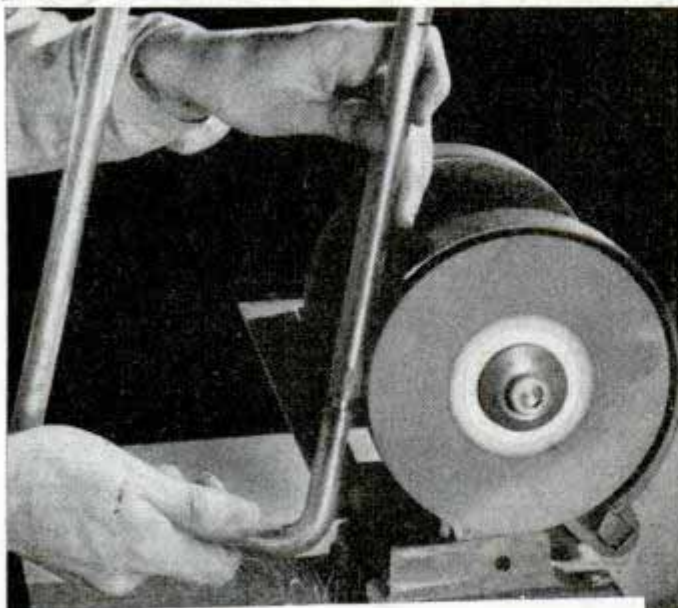
Expensive? No,—the "H-R" costs no more to buy than any good battery, and its extra months of life make it cost *less* to own. You'll be safer, and you'll save, if you replace your present battery with a Willard "H-R" now.

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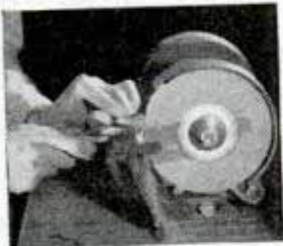
SHORT CUTS FOR THE CRAFTSMAN... NO. 2



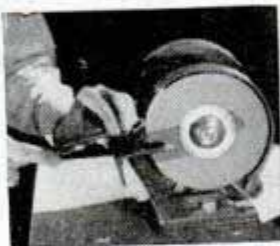
How to smooth a WELD

You can make a welded joint as smooth as can be, simply by doing these two things. Remove excess metal with an Aloxite Brand Aluminum Oxide Grinding Wheel. Then finish it off by smoothing with a Carborundum-made slip stone or Aloxite Brand Aluminum Oxide Cloth.

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CARBORUNDUM

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ABRASIVE PRODUCTS



Lights Battle Insect Armies

(Continued from page 843)

ture and abundant food supply, mushroom houses frequently became badly infested with insects, particularly fungus gnats, house flies, mites and springtails," Dr. Herms explains. "Midnight-blue lights are allowed to burn twenty-four hours every day and are regarded as necessary for raising mushrooms."

Dark-blue light traps are now installed in dried-fruit warehouses to kill the dried-fruit moths. The manager of the 4,500-acre El Solyo Ranch, Tracy, Calif., where traps are used extensively, reports during the main flying season each of his warehouse traps average 1,000 moths a night.

The lima-bean pod borer caused a loss to beans (warehouse figures) in Ventura, Orange, and San Diego counties in California of over \$317,000 in 1935. The use of a high-intensity pale-blue light strongly attracts the female moths and is now keeping such loss to a minimum.

The artichoke plume moth reacts to a midnight-blue light. Acreage protected with such a light showed only a worminess of one and eight-tenths per cent, while a check plot without light protection showed a twenty-nine and four-tenths per cent increase in worminess.

Records of the inventor of the combination light and oil trap reveal that during a 246-hour period ten traps caught 6,696 codling moths in a pear orchard. Entomologists estimate that at least half of these, or 3,348, were female moths that had not deposited their eggs. Each female codling moth will average about 300 eggs. At least 1,004,400 potential eggs which probably would have become moths were destroyed.

"Sixty traps in this orchard cost only ten dollars to operate every night for three months," said the inventor. The cost varies, depending on the power rate."

The light-oil traps caused a general reduction of worminess in a sixty-acre pear orchard from about twenty per cent to about eight per cent. Saving in fruit paid for a major portion of the installation.

A cornfield protected by one of these traps did not produce one ear of wormy corn last year, proving it is very effective on the corn moth.

Entomologists working on the problem are conducting further experiments with

these two types of electrically lighted traps to determine the color preferences of other insects, and the effect of the directed light rays and bait.

"Thus in the near future," one entomologist says, "plagues of grasshoppers, chinch bugs, army worms, moths and beetles, and other insects may be controlled at much less cost and with greater effectiveness with light traps than they are now partly controlled with poison baits and expensive spray materials."

Entomologists have gone a step further in their use of lights which they have invented for protecting crops and have adopted them so a plain globe can be used where protection against annoying insects in general is desired.

Although some work has been done with the color reactions of mosquitoes, most species react fairly well to white light of intensities to which other annoying night-flying insects react, hence white light is generally used. Ordinarily the light used in the trap is of higher intensity than the sources of illumination.


An entirely new field for light traps has emerged in that the electrocuted insects are extensively used as food for fishes, frogs and birds on game farms.

Another electric-ray insect killer which employs the penetrating sections of an infrared ray generated by a specially designed light bulb and filament, has just been introduced. The bulb, housed in a cone-shaped container of spun steel, sheds a brilliant "spot" of light which spells sure and sudden death for fleas, ants, bedbugs, moth larvae, plant insects, animal lice and other crawling pests. Held easily in the hand by means of its non-heat-conducting handle, the device solves the insect problem without recourse to poison sprays, unpleasant powders or oily insecticides which leave stains and odors.

The light can be turned on a flea-ridden dog or cat, and without harming the animal in the least, relieve him of his unwelcome guests in an unbelievably short time. Canaries, whose delicate feathers and skins have made the application of liquid or powder insecticides impossible to use, have undergone this treatment without the slightest irritation.

Gardeners find the device efficient in dispatching flower and plant pests, including Japanese beetles and meal worms.

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If you were to follow a Delco battery through its various steps of manufacture in one of the Delco-Remy battery plants, you would finally come to the mammoth charging floor. Here, thousands of batteries will be receiving a 48-hour charge before being shipped. From the charging floor, each Delco battery must pass through a final inspection test to determine that it is fully charged and functioning properly. Each cell of each battery is tested separately, as any imperfections in material or workmanship will show in a lowered voltage in the defective cell. Even a minute variation in cell voltage is sufficient to prevent the battery from being passed. This is the final factory test to assure the uniform high quality of Delco batteries.



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Delco-Remy
 ANDERSON, INDIANA

World's Largest Manufacturer of Automotive Electrical Equipment

Doing Something about Weather

(Continued from page 869)

U. S. Army engineers and private contractors consult Krick's service when planning time to pour concrete on big construction jobs. Last winter, an explosion in the shops of one California highway maintenance division blew up snowplow equipment. From day to day, road foremen anxiously scanned special wire predictions on snowfall, so that if a heavy storm came they could hire private equipment and have it ready to keep the mountain passes open. The Los Angeles County Flood Control regularly uses Krick's data in operating its big network of dams, reservoirs, and flood channels. When to store water, when to empty reservoirs to make room for an impending heavy rain, when to hire extra men and have them ready with truckloads of sandbags to reinforce weakened levees are a few of the problems the forecasts help the flood control to solve.

There's no secret about Krick's methods, for the air-mass analysis technique has been heralded throughout the scientific world. He has simply pioneered in interpreting the forces that make the weather, so that industry can make use of them. For rule-of-thumb predictions he has substituted quantitative measurement of the gigantic air masses that stream above the continents, forming boundaries of conflict where storms are born. Sampling these masses at many points, observers find out where the hot and cold masses are located and which way they are moving. In over the teletype of the Department of Commerce network pour reports from all parts of the country—from air fields, from ships at sea, from Weather Bureau stations.

All these observations, transformed into colored crayon marks on Krick's maps, show the movement of the gigantic air masses as they sweep across the country, and form the basis of his predictions. The more reports, the more accurate the forecast.

New methods have enabled the weatherman to make forecasts which are about eighty-five per cent correct, according to Dr. Willis R. Gregg, chief of the United States Weather Bureau. And by going to the stratosphere, the weatherman hopes to extend his forecasting period from two days to five or six days in advance.

The airplane and the radio-meteorograph have added a third dimension to the weatherman's observations, Gregg adds, as previously, only surface conditions were observable. There are approximately thirty stations in the country where airplanes or radio-meteorographs are sent to high altitudes for recording upper layers of atmosphere, and seventy additional stations are to be added as rapidly as personnel can be trained for the work.

If you can imagine a combined meteorological observatory and radio broadcasting station combined in one small mechanism weighing between one and two pounds, you have a good idea of the newest radio-meteorograph. Attached to a small hydrogen-inflated rubber balloon, it ascends to heights of from ten to fifteen miles and radios back to the earth temperature, humidity, and air pressure at various levels.

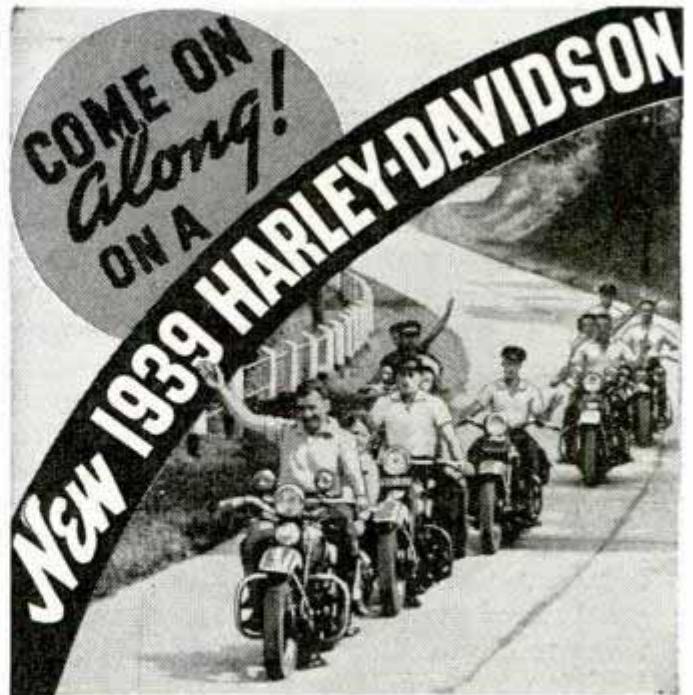
The radio-meteorograph has been placed in regular service by the United States Weather Bureau at Nashville; Fargo, N. Dak.; Omaha; Oklahoma City; Oakland, Calif.; and Sault Ste. Marie, Mich. These stations have been selected at strategic locations so that daily reports will typify upper-air conditions in the United States.

A new epoch in weather service soon may be established, Gregg believes. "When we are able," he says, "to get twice daily recordings from these instruments at stations well distributed over the world, including soundings on ships and including also reports from isolated regions and mountain summits transmitted by radio, we will be in a position to give much more precise predictions covering longer periods in advance."

No longer is the weather observer content with general forecasting. He has gone in for specialization, and every activity affected by weather demands is receiving detailed and intensive meteorological reports. More than fifty distinct services now are being offered and these probably touch directly the immediate needs of more of the people than do all the other federal agencies combined, with the possible exception of the post-office department.

Although aviation largely is responsible for this new trend, its first use was in connection with the protection of citrus and other fruits from frost.

(Continued to page 122A)



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Name.....

Address.....

(Continued from page 121A)

"Several years ago," explains Doctor Gregg, "when it was found that the ordinary generalized type of forecast did not meet the needs of the fruit growers, a special service was set up so frequent observations could be made from a close network of stations in and near the fruit districts, and short-period, specific forecasts issued in the evening for the following morning.

"This enabled orchardists to take protective measures by lighting fires in the groves, thus keeping temperatures above the danger point. The value of this service was shown during a cold wave that hit southern California last winter. On the strength of the predictions, approximately three million dollars of oil was burned in the citrus groves, but as a result, almost one hundred million dollars' worth of fruit and trees were saved."

Likewise, sailings of vessels engaged in ocean and lake traffic are largely determined by storm warnings. Ships are held in port when hurricanes are predicted and in one recent instance, cargoes and vessels thus detained amounted to \$35,000,000. Of course, it is not known that all of these would have been lost had they ventured out, but the probabilities are that many would have been wrecked or damaged.

In the construction of high buildings as well as dams and bridges, it is always necessary to compromise between over-design and under-design. In all of these cases it would be possible to construct in such a way as to assure absolute safety, short of an earthquake, but such action would result in tremendous economic waste. On the other hand, under-design means definite hazard to safety of life and property. Hence the desirability of climatic statistics that will serve as a guide in reaching the compromise, which usually includes a fairly liberal factor of safety to provide against extreme conditions.

Forecasts fail at times and result in large losses. A major objective of the bureau is to reduce these failures to a minimum by furthering a broad program of research. One notable project now being undertaken in cooperation with the Massachusetts Institute of Technology is a study of conditions that give rise to the formations of immense domes of polar air over Alaska, these eventually developing into cold

waves that move southward through Canada into the United States. This investigation includes a study of the upper-air data and outgoing radiation as measured at Fairbanks, Alaska, Fort Smith, Canada, and at points along our northern border. When this study is completed it is believed the conclusions reached will result in greater accuracy of cold-wave forecasts.

If you look at a weather map you will see the lines indicating wide areas of cold and warm air that resemble vast lakes. These "lakes" remain intact from a few days to more than a week. Their "banks" are sharply held in line by the differences in weight between the cold and the warm air. These lakes of air are reservoirs that feed the "low" area, which means storms. These great cyclonic whirls are fed from one side by warm air and from the other by cold air. How long this feeding may continue, that is, how long a storm will last is contingent upon the supplies of warm and cold air in the reservoirs.

Eventually every storm is surrounded by cold air and cut off from the warm reservoir. The low then is unlikely to last much longer. By charting the air lakes on the weather maps, the forecaster can see when a storm area is about to lose its source.

Last year, the entire weather bureau consisting of 1,344 primary and secondary reporting stations covering the entire United States from Alaska to Porto Rico, and from Maine to Hawaii cost \$3,810,724 to operate. Figured out on a basis of population, the per capita cost for maintaining the far-flung weather bureau during the fiscal year of 1936 for each citizen was less than the price of a three-cent stamp.

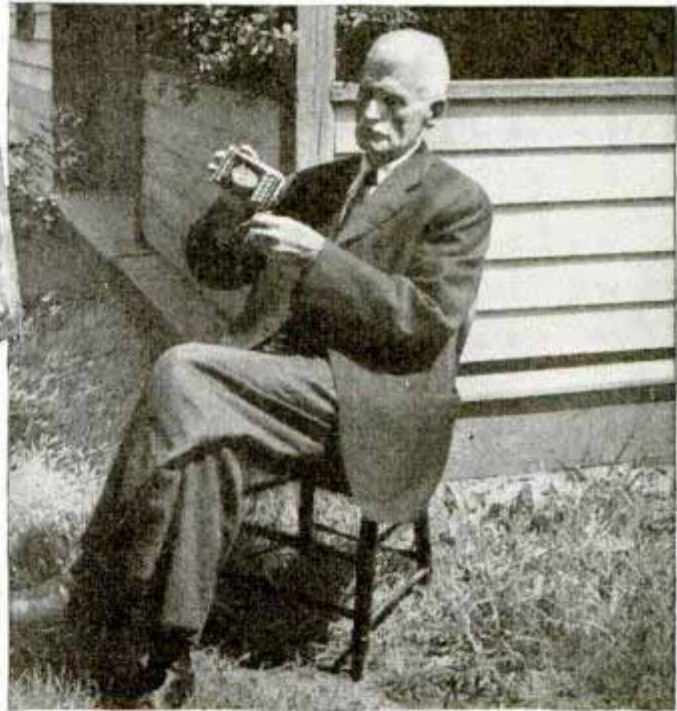
"It's easy to get your money back," reminds A. M. Hamrick, veteran observer. "If you should heed just one cold-wave warning and drain your motorcar radiator to preclude freezing and bursting, you have saved enough to take care of your share of the cost for the rest of your life."

Our Bureau of Information keeps on file the names and addresses of makers of, and dealers in, all devices described in the pages of Popular Mechanics Magazine. We are glad to furnish this information to our readers upon request, accompanied by stamped, self-addressed envelope.

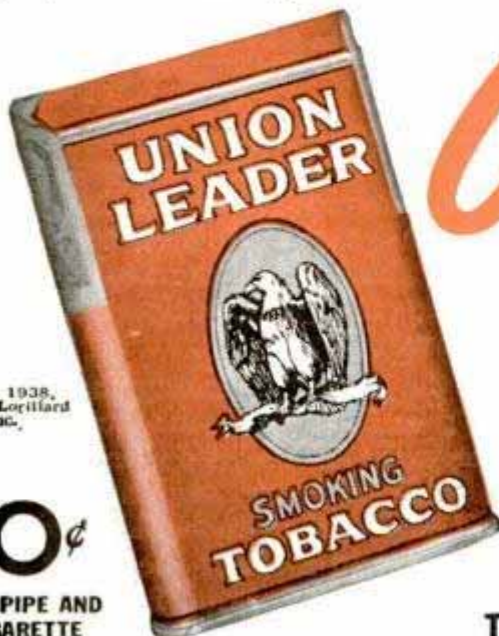
Old friends are true friends



IN 1884 . . . "This picture is out of the family album, which is fittin' in connection with Union Leader. Because it was my old Dad who told me, when Union Leader was introduced at the turn of the century, 'Son, come what may, you'll never find a finer tobacco than Union Leader!'"



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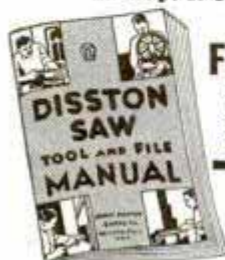
Very little money buys a dependable blade . . . a KEYSTONE Circular Saw—made by DISSTON! Expert sawmakers designed these saws specially for fine craftsmanship, at low cost, in your home workshop.

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6" (1/2" hole) \$1.70 8" (1/2", 5/8", 3/4" hole) \$2.00
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Heroes of the Fire Lines

(Continued from page 895)

never to stand in front of a door while preparing to open it in a burning house. There may be enough hot air under pressure on the other side to slam the door against them and knock them over if they are in the way. Standing alongside the door and reaching over to the knob is the safe way to do it.

Gasoline fires are dangerous even after they have been put out because severe flashbacks sometimes occur. The best thing



Fireman entering smoke-filled building to battle the flames at close quarters

to do, after a gasoline fire has been extinguished with carbon-dioxide gas, is to keep pouring on more gas from the extinguisher. Otherwise the thin inert gas blanket may dissipate before the material has cooled down to a safe temperature and a flashback will occur.

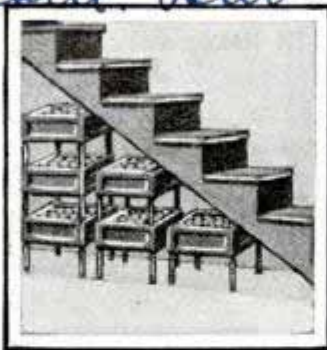
Besides the ammonia safety suits and breathing gear that the rescue trucks carry, firemen and rescue squad members are supplied with ordinary gas masks that protect against carbon-monoxide, smoke, phosgene gas, and most of the gases and fumes that are encountered in industrial

fires. A different type of portable breathing apparatus is also carried on the truck, consisting of a big oxygen tank and other gear that may be electrically or manually operated, attached to several 100-foot lengths of oilproof air lines that fire fighters equipped with small breathing masks may trail behind them as they enter gas-filled enclosures. One of the rescue companies in Los Angeles has a complete asbestos suit for use when valves have to be shut down in an oil fire. The rescue trucks carry complete sets of first-aid supplies, acetylene torches, life belts and safety belts for lowering people down to safety, and grappling and drag hooks for recovering bodies lost in lakes and reservoirs. Resuscitation aids and suction apparatus for bringing life back to people who have been overcome by water or smoke are part of the rescue squad's equipment, as is an "iron lung" respirator for infants and an oxygen tent used for emergency heart attack and pneumonia cases.

Aside from their work at the scenes of fires the rescue squads answer all sorts of other emergency calls and when an alarm rings for a rescue company the members never know whether they are to answer a fire alarm, be called in to save the life of a new-born baby, or be dispatched to the scene of a cave-in where someone has been buried under tons of dirt.

Mushroom Bed for Your Cellar Is Built of Rustproof Steel

Home growers of mushrooms can plant their crops in basement corners and under cellar stairs, using mushroom beds that are available in knockdown, kit form. Built of rustproof, light steel, these beds come in sections which can be installed in tiers, and may be erected in an evening. They are doubly insulated to hold heat and moisture.



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GENERAL ELECTRIC
MAZDA PHOTO LAMPS

High Speed Movies

(Continued from page 820)

bright, self-luminous objects can be photographed without the use of additional lighting.

One of the first uses for the high-speed photographic timer was in sports events, where it proved its usefulness in revealing the exact time of runners. In this work, it is usually not necessary to have the exceedingly high-speed camera. While the machine used operates on the same principle, together with the time device, for horse races, for instance, it is gauged to take from 128 to 150 pictures per second, which is sufficient speed for photographing the action. These cameras at this speed have been found to be excellent for determining the results in closely contested races.

The value of this mechanical diagnostician, at its very high speeds, goes far beyond the realm of sports, and has made itself felt in connection with some of the most common of our modern inventions. The diagnoses of this high-speed camera are being sought in industry for analysis of manufacturing processes and the solution of problems concerning the design and performance of machinery.

The smoothness of operation of an automobile may be the result of examinations conducted in the factory by means of high-speed photography, for the automobile companies use this camera to study vibrations and the rates of combustion of fuels in motors.

In aeronautics, too, this device is used to investigate air flow around structures and as a guide in the design and performance of propellers.

The extent to which the high-speed camera is finding application to problems concerning telephone apparatus is indicated by the fact that about two thousand films have been made of various telephone operations. One group of frames taken by high-speed photography shows the action of the impulse wheel, pawl and snubbing spring in a telephone dial. One high-speed photograph disclosed the cause of a peculiar acoustical effect. This series of frames showing the action of the clapper striking one gong of an experimental ringer, revealed more strokes of the clapper per cycle than were desired.

101032
 In testing firearms, probably no other mechanism can so accurately follow and record shots and the speed of bullets; consequently the high-speed camera is frequently used in ballistic studies.

This camera, together with lighting equipment and the timing apparatus, can be moved about easily, so that it can be used in a wide variety of studies, and its use is growing in demand in industry. By the use of high-speed photography with a precision timer, not only can mechanical movements too rapid to be seen by the eye be analyzed, but these photographic records give definite space-time relationships between moving parts of the machinery. Such photographs may reveal why machines do not function exactly as designed, when parts bounce, bend or break, and where moving parts create currents in liquids or gases. The device is especially useful in studies of transient movements such as contact chatter.

This movie doctor examined a severe case of chattering in part of the mechanism of a motion-picture projector, and the resulting photograph revealed the cause of the trouble.

Sewing-machine companies and shoe companies have found uses for high-speed photography, and companies using high-speed machinery for manufacture of fragile materials such as paper, thread, and transparent cellulose, are dependent upon this device, for when there is a breakdown or any failure in such machinery, often, after the failure, it is impossible to discover just where the fault lay. A photograph of the machinery by means of a high-speed camera, even at a time when everything is operating smoothly, may often reveal some hidden flaw which must be corrected in order to avoid future failures.

One of the most recent applications of high-speed photography is in the field of biology and medicine, where it is used to study nervous and muscular reactions under controlled conditions.

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Name
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Behind the Scenes in Aviation

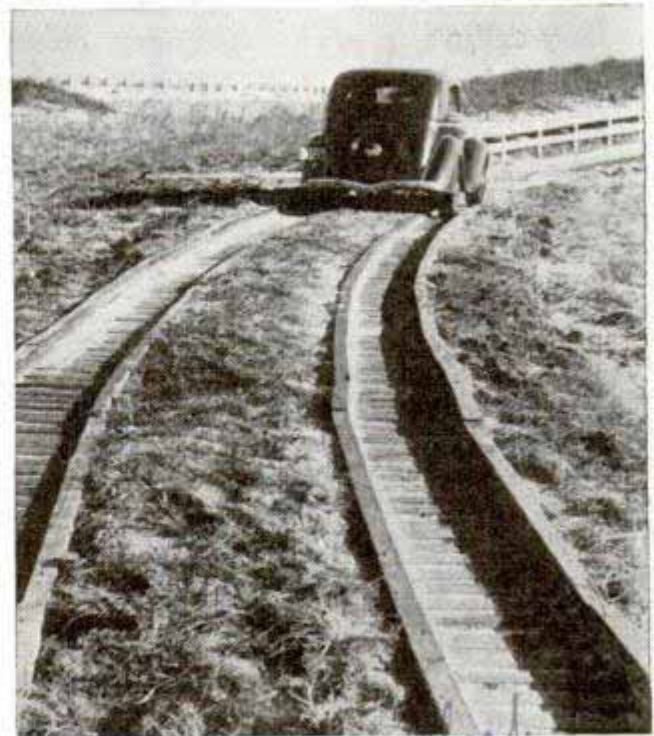
(Continued from Coloroto Section)

Dumping fuel in flight no longer is the hazard it was. Improved vents dump the fuel free from the body of the plane and prevent any chance of the fuel igniting from collision with tail surfaces. The flame front in a combustible mixture of gasoline and air travels only forty miles per hour, hence even if the cloud of dumped fuel happens to catch fire from a static spark the plane remains safe because it is traveling too fast for the exploding flame front to catch up.

More than 1,000,000 passengers per year are carried on domestic air lines and the number of accidents in relation to the number of miles flown is decreasing steadily, yet the aviation engineers are never satisfied. They are constantly trying to make the big transports safer and more efficient than ever.

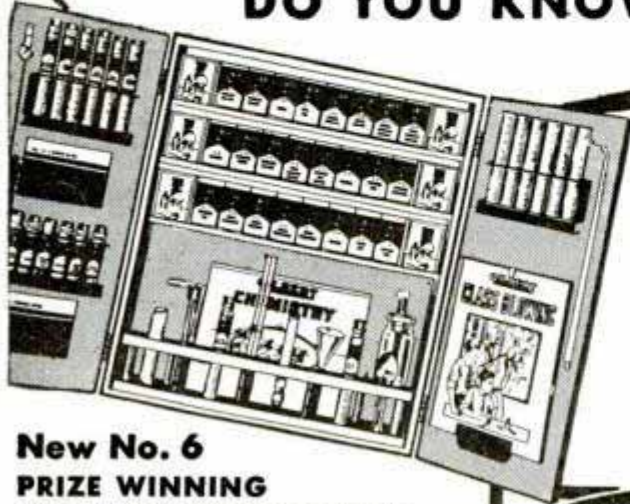
Wooden Track for Automobiles Bridges Hatteras Dunes

Motorists visiting the Cape Hatteras region can drive on a dry land bridge. Sands are constantly shifting there, and motoring would be impossible without some hard base for traction, so a track of wooden ruts has been laid over the sand to help automobiles climb a small dune. Sand on either side has been anchored by planting grass.



A tourist negotiates one of the shifting sand dunes of the Cape Hatteras region on a wooden track

Boys! HOW MANY OF THESE CHEMICAL SECRETS DO YOU KNOW?



Do you know the secret of writing messages in magic ink, of making a chemical weather flag, changing the colors of flowers, making your own paints, sparklers, soda water? All these and many other thrills can be yours with a Gilbert Chemistry Set—the set that has been developed in the Gilbert Hall of Science. Also—the new, Gilbert Microscope reveals to you Nature's innermost secrets.

\$200.00 Annual Awards—To the boy doing what, in the opinion of Mr. A. C. Gilbert, is the most important research in Chemistry, Microscopy or Electricity in 1939, \$100.00 in cash will be awarded. To the ten boys doing the next most important research, \$10.00 each will be awarded. Mail coupon below for free 20-page book giving full details.

New No. 6 PRIZE WINNING CHEMISTRY LABORATORY

Big blue wooden cabinet forms Laboratory over 2 ft. long with 5 feet of test tube racks and shelf room. 63 chemicals and pieces of apparatus, including glass blowing equipment, 2 books by noted Yale professors describing over 400 exciting experiments. Price \$5.00. Other Gilbert Chemistry Sets \$1.00 to \$15.00. See them at your nearest toy store.

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20 pages crammed with color pictures of new Gilbert Chemistry Sets and latest developments of Gilbert Hall of Science. Mail coupon or 1¢ post card.

THE A. C. GILBERT CO., Gilbert Hall of Science, Room 107, New Haven, Conn.

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Swings 10 inches

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BLUE STAR PRODUCTS, 612 Wood Ave., Fairfield, Iowa

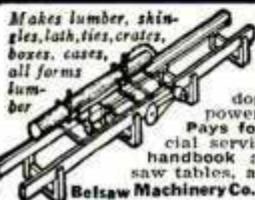
EARN MONEY MAKE COLOR GLAZED CONCRETE PRODUCTS



MAKE Color-glazed concrete pottery without molds or costly tools. Use only sand, cement, cheap materials. Glazed tiles, walls, gravestones, etc. **MEN (only):** Write for **FREE** colorplate, details of this new money-making business.

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Makes lumber, shingles, lath, ties, crates, boxes, cases, all forms lumber

TURN TREES INTO MONEY WITH A BELSAW

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Belsaw Machinery Co., 8110-T Davidson Bldg., Kansas City, Mo.

See THE BRAND NEW CORONA Zephyr

CASE AND MACHINE WEIGH ONLY 9 pounds

A real typewriter—and, at \$29.75, a sensation! Steel case, standard 84 character keyboard, backspacer, etc.—yet tucks away in desk drawer or traveling bag. You have to see it to believe it... so see it!



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 Desk 12,723 E. Washington St., Syracuse, N.Y. I'm thinking of buying a Corona Zephyr. Please mail free booklet.

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

14 1036

Ocean's Depth Measured by Radio Robot

(Continued from page 830)

"The entire buoy with complete units set up, is quite cheap to make. It costs around \$150."

There are other reasons, Captain Rude goes on to explain, why the buoys are of vast importance to Uncle Sam's "ocean surveyors." The fathometer gives the depth, a special type of bomb shows the position of the depth, and the buoy is a means of charting the position of the ship.

Usually at least three sono-radio buoys are used. The scientists really are measuring the distance of the ship away from the buoys by means of the velocity of sound in sea water. The scientists know this velocity is roughly a mile a second.

Exactly how is the first buoy placed with respect to the survey vessel, assuming that the ocean surveyors are working on the profile of a section of ocean bottom off Long Island? Such a survey, which incidentally is now being conducted by the Coast and Geodetic Survey, extends from the coast line out 150 miles beyond the thousand-fathom curve. In planning this survey it was first necessary to lay down control stations consisting of sono-radio buoys, placed about five miles apart, running directly off shore about fifty miles, thence southward about fifty miles and back again to the coast line.

The precise location of these movable control stations depends on where the ship is working at any particular stage of its survey work. With the buoys set up in desired position the ship then runs parallel lines of sounding and when a certain position is desired, a bomb containing a small amount of TNT is dropped over the side about every fifteen minutes. This bomb sinks to a depth of about 100 feet and as it explodes, the sound is received by an instrument located in the bottom of the survey vessel. The time of the explosion is recorded on a chronograph tape on the ship. The sound wave also penetrates to each of three sono-radio buoys where it is received into a hydrophone attached to each buoy. The sound is amplified and it energizes a small radio apparatus inside the buoy which automatically sends a radio signal back to the ship which is also recorded on the same chronograph.

Be Wise - Alkalize

Alka-Seltzer

An Alka-Seltzer Tablet in a glass of water makes a sparkling pleasant-tasting solution. Drink it and it gives quick relief from Headaches, Sour Stomach, Distress after meals and other common ailments. It also helps overcome excess acid condition so often associated with these troubles.

WHEN YOU GO OUT TO HAVE YOUR FUN, KEEP ALKA-SELTZER HANDY. TO CHASE AN UPSET STOMACH OR A HEADACHE IT'S A DANDY.

A MERRY CHRISTMAS TO YOU ALL. GOOD HEALTH AND JOY AND PEACE. WITH ALKA-SELTZER AT YOUR CALL, MAY ALL YOUR TROUBLES CEASE.

Alkalize with Alka-Seltzer AT ALL DRUGGISTS

30¢ & 60¢ PKGS.
OR BY THE GLASS AT DRUG STORE
SODA FOUNTAINS

TUNE IN
THE NATIONAL
BARN DANCE
SATURDAY NIGHT
NBC - NETWORK

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.**

Since the radio is virtually instantaneous for such short distances, the elapsed time between the receipt of the explosion of the bomb at the buoy is indicated on the chronograph tape and is scaled to within one hundredth of a second. The distance, therefore, to each of the three buoys is readily determined. The three arcs represented by these distances furnish on the survey scientist's work sheet the exact position of the ship for charting purposes. This method, furthermore, permits working in the most adverse weather conditions such as fog, storm and darkness.

151097
Model Ship Built in a Light Bulb Has Its Own Tiny Lamp

Four months in bed, ill, launched a modelmaker in the unusual hobby of building ship models inside electric-light bulbs. He finished the first job, a sailing ship, while still in bed and after recuperating kept up the work. His latest achievement is a two-funnel steamship erected inside a bulb and equipped with its own electric light—a tiny bulb in a big one.

Alfred Harris who built the steamship in a light bulb.



Twin-funneled steamship model built in the narrow confines of an ordinary electric light bulb

Treet Topics

YOU'LL NEVER MISS THE DIME ~



SO WHY MISS THE COMFORT



UMMM... NOT A SCRAPER

AND WHY MISS THE MISSES...



WHEN YOU CAN DO THIS:-

TREET BLADES!

YESSIR 4 FOR 10¢



-AND TREET YOURSELF TO A PACK OF PERFECT SHAVES!



4 FOR 10¢

Treet SINGLE EDGE BLADES

FOR GEM AND EVER-READY RAZORS

Treet Safety Razor Corporation, Newark, New Jersey

1042

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BY REMOTE CONTROL

*Uncoupling!
Loading!
Unloading!*



BUT THAT'S NOT ALL . . .
YOU CAN MAKE YOUR LOCOMOTIVE
WHISTLE, REVERSE AND SWITCH
BY REMOTE CONTROL.

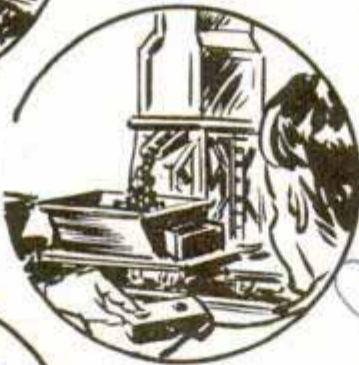


UNCOUPLING

Electro-magnetic couplers
on the cars are operated
BY REMOTE CONTROL.

LOADING

Car can be loaded
from coal elevator BY
REMOTE CONTROL.



UNLOADING

Car tilts, unloading con-
tents alongside track
BY REMOTE CONTROL.

Read all about these thrilling new operating
features in the new Lionel 52-page, full
color catalog. Send for your copy at once.

Insert on **LIONEL**
FOR ALL THE THRILLS OF RAILROADING

The Lionel Corporation Dept. 11
15 East 26th Street, New York, N. Y.
Enclosed is 10 cents for a copy of the new 1938, 52-page,
full color Lionel Catalog. Send it to:
Name _____
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folded blade \$1.00 - Custom release \$2.00

Off the "Platter"

(Continued from page 885)

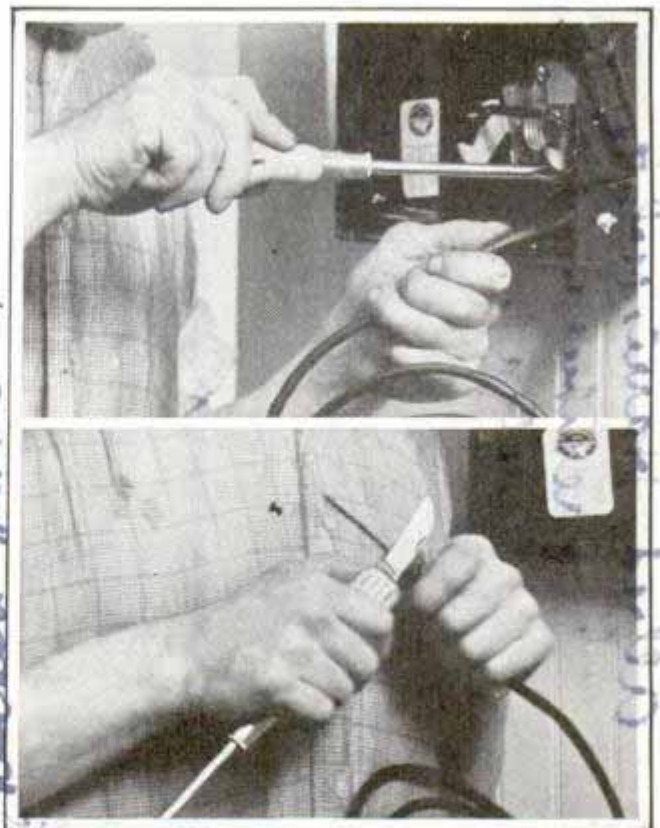
The commercial radio set of today re-
produces vibrations up to approximately
8,000 cycles per second without loss of true
tone. The transcription makers, whose
records capture and reproduce up to 8,500
cycles, are keeping up with the reproduc-
ing instrument in your home. As sets are
improved, transcriptions will likewise keep
step. Experimental work has already
proved that it can be done.

As a component part of the radio indus-
try, the transcription makers have proved
that they are abreast of the procession. It
all adds up to the fact that the listener who
hears such a record on his radio is ready
to credit it with being fully the equal of a
"flesh" broadcast from a conventional
studio.

17914

Screwdriver Has a Jackknife Folded into Its Handle

Really two tools in one, a screwdriver
with six-inch blade has a jackknife folded
into its handle. One model has a composi-
tion handle from which the knife is
released by pressing a button. House-
holders, electricians, motorists and shop
workers find it a handy combination.



The combination tool in use as a screwdriver, top,
and as a knife, bottom

Stanley Tools

FLEXIBLE...

transparent, waterproof

● Holds permanently on china, glass, wood, metal, leather, paper, fabrics. Not affected by heat, cold, moisture. Dries quickly. Ideal for model making, as well as for mending.



DUCO CEMENT

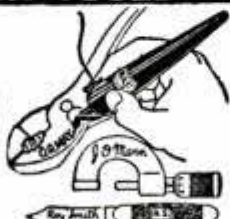
BURN YOUR NAME ON TOOLS

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.

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\$1.50

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TEST-O-LITE

Handiest electrical tester made; quickly locates trouble in electric circuits, fuses, cut-outs, motors, radios, etc. Has 1,001 uses for electricians or home. Tests any voltage, 110 to 550; tells A.C. from D.C. Exceeds ordinary clumsy test bulb. Fountain-pen size; with pocket clip. Lifetime guarantee.

L. S. BRACH MFG. CORP.
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Now Till Christmas Men and Women. Make easy money selling GENUINE LEATHER TIES

4-in-Hands and Bows, for Men and Boys. Beautiful patterns and colors. Won't wrinkle. LOOK LIKE SILK. Wear indefinitely. Cleaned with a damp cloth. Big profits; repeat orders. No sales ability needed. Big leader in necktie sales. Send 50 cents for sample kit. Information free.

Century Tie Co., Mrs. 2345-P W. Grand Blvd. Detroit, Mich. (Originators of Leather Ties)

WIND ELECTRIC PLANT

Build Your Own—We Show You How!

Easily made from old auto generator. Dime brings complete plans and 1938 catalog. 100 other generator changes to 6, 12, 32, 110 volt plants, motors, welders, elec. fence, etc. LeJay Mfg., 447 LeJay Bldg., Minneapolis, Minn.

World's Best Line of TRAILER AXLES, HITCHES and PARTS

New \$3.00 House Trailer Blue Prints Free With Axle Assembly.

WRITE FOR FREE LITERATURE

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White Seal BASS SENDS THIS Candid Midget \$19.50

Has sharp-cutting F:4.5 Huge Meyer Anastigmat lens. Vario shutter speeds to 1/100th. Time and Bulb. \$19.50. Address Dept. P. Send for Free Bass Brochure No. 236

BASS CAMERA CO.

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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.

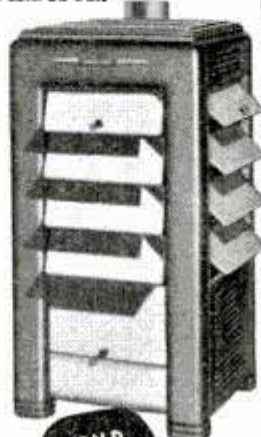
Don't wait! Just send name and address for details about VACU-MATIC and our FREE TRIAL OFFER. Write Today! AGENTS WANTED

VACU-MATIC CO., 7617-398 W. State St., Wauwatosa, Wis.

GET MORE HEAT

in the "Living Zone" (diagram shows improved method)

Dotted lines indicate how circulated heat rises to the ceiling, then sinks lower in the room. Arrows represent radiant heat being directed into the "living zone" and down to the floor by Comfort Control Shutters of the SUPERFEX HEAT-DIRECTOR.



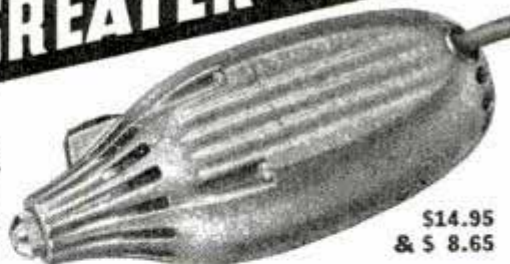
SEND FOR FREE BOOKLET

Because the SUPERFEX is the only Oil Burning Heater equipped with adjustable Comfort Control Shutters, it produces greater comfort in the "living zone"—utilizing both circulated and radiant heat. It operates hour after hour without attention. Dial regulates heat volume. Burns wide variety of inexpensive fuel oils available everywhere. Easy to own on monthly payment plan. Choice of sizes for shops and homes. Beautiful porcelain enamel finish. Radiant Heaters, too. See them at your dealer's.

PERFECTION STOVE COMPANY
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Duro HAND GRINDERS FOR GREATER VALUE

- POWER
- SPEED
- PRECISION



\$14.95 & \$ 8.65

ONE WELL KNOWN TOOL AND DIE MANUFACTURER WRITES—"Enclosed herewith find check for \$45.15 covering cost of three No. 3049 Hand Grinders plus postage.

"After thoroughly testing the one we purchased for trial purposes, my men have told me that it is the finest Grinder they have ever used, and we have tried them all. That it has plenty of power and speed and that it really stands up under hard work without stalling or getting hot.

"My foreman told me that if he could not replace it, he would not sell it for \$100.00."

Our Standard Duty Grinder is the same value in its price field. Write for special circular on the Duro Hand Grinders and Accessories—or let us send either model on 10-day money back trial.

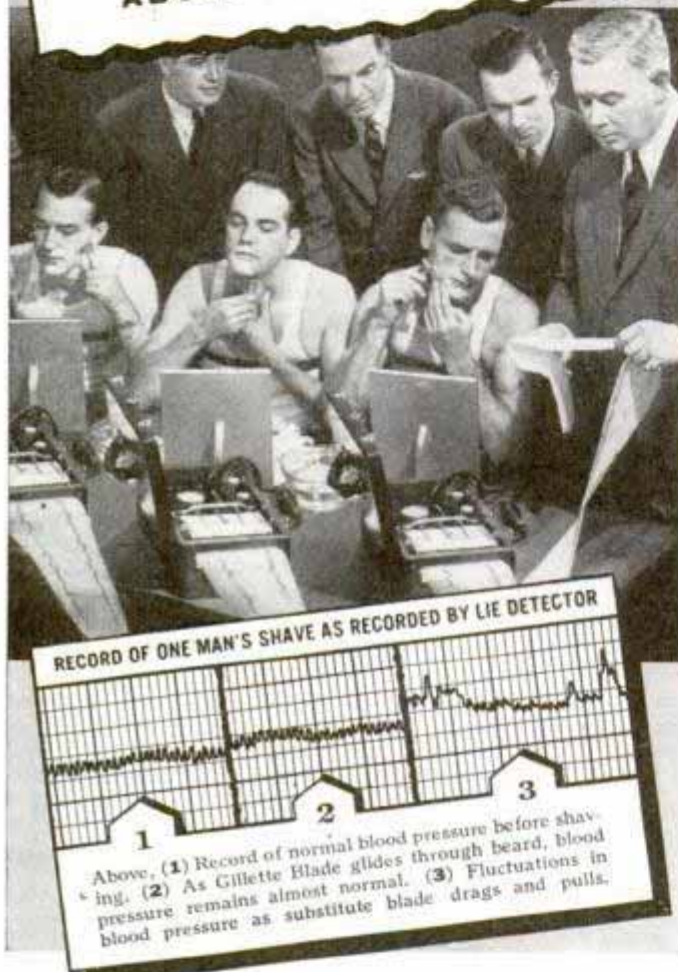
SEND FOR NEW 1939 DURO WOOD WORKING CATALOG... Featuring America's Finest & most Complete line

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2657 NORTH KILDARE AVE. DEPARTMENT B2
CHICAGO, ILLINOIS

A 1029

LIE DETECTOR "TELLS ALL"

REVEALS STARTLING FACTS
ABOUT RAZOR BLADES!



TO BARE the facts about razor blade quality, Gillette retained Dr. William M. Marston, eminent psychologist and originator of the famous Lie Detector. Strapped to the Lie Detector... the same instrument used by police... these men shave one side of the face with a Gillette Blade, the other with a blade of different make—while their involuntary emotional reactions are recorded. Dr. Marston proves the Gillette Blade is far superior in every respect to substitute blades tested. You get shaves that are: 1. Easier. 2. Faster. 3. Free from irritating disturbances that can upset you for hours. Read the graph above. Weigh the evidence. Try a Gillette Blade yourself—and learn what a big difference it makes when you shave with a blade that's precision-made to fit your Gillette Razor exactly.

MORE SHAVING COMFORT FOR YOUR MONEY

"MILLION-DOLLAR"
SHAVES FOR LESS THAN
A PENNY A DAY

Gillette Blades

PRECISION-MADE TO FIT YOUR GILLETTE RAZOR EXACTLY

Don't Pity the Poor Eskimo

(Continued from page 838)

common nail, is put to many uses by the Eskimos. One day we watched one of them rebuild a rifle in our workshop. It was an old rifle and several of the working parts had worn loose. So he made new parts from nails, heating, hammering, and filing them to shape. When finished, the old rifle worked splendidly.

Nowhere does the Eskimo display greater skill than in his ivory carving, an art handed down for countless generations. Ivory is about as hard as brass. The Eskimo now uses a hack saw to rough-shape his ivory, rasps and files for the finer details, small chisels made from saw files to work out finer lines and crevasses, bow drills for holes, and emery paper and crocus cloth for the finishing touches. Finally he rubs it well with jewelers' rouge. The high polish secured by the rouge distinguishes real Eskimo work from the Japanese carvings that constitute most of the ivory offered for sale to Alaskan tourists.

Among Eskimo implements of comparatively recent origin, perhaps the most ingenious is the ilhook, or retriever. Before introduction of the rifle, seals were harpooned and pulled ashore by the harpoon line. But with a rifle an Eskimo might kill a seal or a duck far out in the water, and then be unable to retrieve it, without launching a boat. So he invented the ilhook, consisting of a streamlined, bullet-nosed, driftwood float carved to approximately the size and shape of a 200-watt electric-light bulb. Curved metal barbs protrude from the float, and a long rawhide line is securely fastened to it. In use, the float is whirled around the head rapidly and let fly out past the seal, carrying the line with it. If the line does not fall directly across the object to be retrieved, the hunter moves along the shore line until the float is in such position that it can be pulled directly across the quarry. Thereupon the metal barbs snag the object, and hold it while it is dragged ashore.

One instance of the Eskimos' innate mechanical sense impressed us deeply. Two educated Eskimos who had visited "the States" told us that the greatest fear they experienced was not from automobiles or trains, but from swaying trees. They could never quite overcome the fear that a tree,

swaying in a stiff wind, would blow over on them!

The huge topheavy mass of branches, balanced on the small trunk, had no visible means of support. They had never seen trees growing in their native land, and while they knew that trees had roots, it didn't seem possible to them that there could be enough roots to anchor such an apparently illogical structure. To some, this concept might indicate a lack of intelligence on the part of the Eskimos. But their error was not one of logic. It was due to lack of information.

Here is where the white man enjoys perhaps his greatest advantage. He can avail himself of knowledge accumulated through the research of millions of experimenters, and the experience of millions of fellow craftsmen. Newspapers, magazines, radio, and motion pictures rapidly collect and disseminate new ideas and foster their adaptation to new uses, providing a constant source of inspiration. Perhaps it is this constant stimulus and this easy access to accumulated knowledge rather than any fancied superior intelligence that makes the white man seem to excel in mechanics and invention.

The Eskimos, in common with other peoples cut off from the rest of the world by physical barriers, have until recently enjoyed no such advantages of easy communication of ideas. They have had only their own traditions and experience, plus their native understanding of fundamental principles, to guide them.

From what we have seen of these Stone Age people, we believe that they display as much intelligence in analyzing and solving problems as do those who live thousands of miles and hundreds of years removed from them in the age of the machine.

Wood Veneer with Felt Backing Adapted to Curved Surfaces

Thin wood veneer mounted on a felt base is a sound-absorbent, flexible material for interiors, such as the inside panels of automobile doors. The veneers are available in a variety of handsome, polished woods. One especial advantage of this material is its adaptability to curved surfaces. It is waterproof, resists termites and vermin, will not support combustion and insulates against both heat and sound.

HEAT GUN

assures complete
WINTER LUBRICATION



With a Black & Decker HEAT GUN on the job, stiff, frozen oil and grease offer no handicap to the modern service station.

For complete motor protection HEAT GUN's powerful blast of concentrated heat (450°F) quickly thaws and blows out every bit of old grease, oil and sludge from transmission, differential or crankcase. It works wonders in limbering up spring shackles and other troublesome parts.

And for thawing out radiators, pumps, hose connections, sleeted windshields; or drying plugs, distributor heads and ignition wires, the Black & Decker HEAT GUN has no equal as an aid to safer, trouble-free winter motoring.

Sold through leading jobbers. Get full details today. The Black & Decker Mfg. Co., 612 Penna. Ave., Towson, Md.

BLACK & DECKER

BLACK & DECKER

World's Largest Manufacturer of
PORTABLE ELECTRIC TOOLS

"HO" GAUGE MEN

Attention!



NEW Gilbert American Flyer scale model is here!

The A. C. Gilbert Company, manufacturers of Gilbert American Flyer trains, present a new "HO" gauge two-rail train line. Built to scale from actual railroad blueprints. All rolling stock is die-cast, with bakelite wheels. All couplings are automatic. Locomotive is 4-6-4 N. Y. C. Hudson type, with remote-control reverse motor. 25-to-1 reduction gear gives tremendous pulling power. Locomotive and tender weight, 3 lbs.; freight cars and caboose, $\frac{1}{2}$ lb. each.

AND LOOK AT THE LOW PRICES!

Complete train, consisting of locomotive, tender, 3 freight cars, caboose and 16 sections of curved track (a complete 24-inch radius circle) . . . \$19.50

Train — in kit form, completely machined, to be assembled and painted . . . \$15

Locomotive and tender complete . . . \$12.50

Same—kit form, to be assembled and painted . . . \$10

Freight cars and caboose (each) complete . . . \$2

Same—kit form, to be assembled and painted. \$1.75

Write today for free catalog illustrating and describing these remarkable new trains, as well as newly designed "O" gauge Gilbert American Flyer trains and equipment.



BIG NEWS FOR "O" GAUGE MEN

Gilbert American Flyer now offers a brand-new "O" gauge six-wheel switcher. An exact scale model. Remote control. Automatic couplers. Slope-back die-cast tender with rear headlight. Read full description in free catalog. Price, \$12.50.

GILBERT

American Flyer Trains

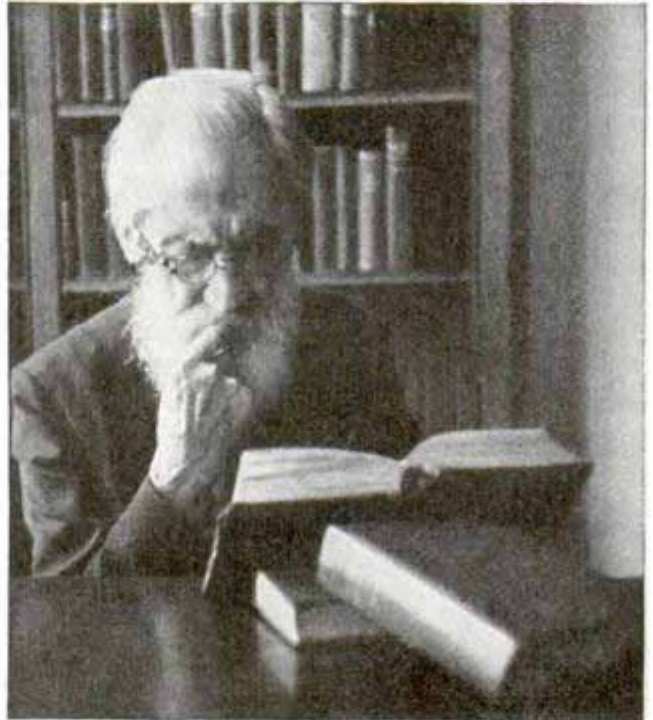
MADE BY THE A. C. GILBERT COMPANY
505 Erector Square New Haven, Connecticut

Make Your Snapshots Tell a Story

(Continued from page 853)

subjects should be absorbed in it, apparently unaware of the camera. But it is not imperative that people be included in all story pictures. A snapshot of a gnarled, twisted tree, perched atop a windy hill tells a story of a lifelong battle with the elements—and no human figure is needed.

It is a good idea to have a title in mind before you shoot a picture. The title helps make your story idea definite—it gives you



Strong light on beard, spectacles, frown, forefinger on lip give "story" quality to this library scene

a foundation or reference point to work from. Consider the twisted tree. Choose the title "Windswept" and you will automatically seek a picture angle that best shows the stretched, blown branches and the hurrying clouds beyond.

Indeed, there is no more fascinating camera pastime than choosing provocative story titles and then searching out picture subjects to illustrate them. For a snowball fight, consider the titles "Direct Hit," "Look Out Below!" and "No Quarter!" Take a general title such as "Steel," "Ripples," or "Skill," and you can find literally hundreds of pictures to fit. For "Steel," think of the gaunt frames of new buildings, railway tracks gleaming in the sunset, loading cranes and hooks, cables and chains. "Ripples" suggest snowdrifts, dunes, or the moods of wind and water,

(Continued to page 139A)



ARCADE Low Cost POWER TOOLS

Compare These Prices

Drill Press, 15" high, \$5.30; Disc Sander, 8 1/4", \$5.00; Jig Saw, 10" throat, \$5.30; Belt Sander, 4"x4" drums, \$8.00; Lathe, 8" Swing, 30" between centers, \$9.50; Band Saw, 10", \$18.00; Bench Saw, 6" blade, \$11.00; Bench Saw, 8" blade, \$25.00. Prices west of Rockies slightly higher. Also other Bench Tools, Model Makers and Accessories at very attractive prices... all quality built for long service and accurate workmanship. If dealer cannot supply, order direct. Write for

FREE CATALOG Arcade Mfg. Co., 1219 Shawnee St. Freeport, Illinois

30¢ BUYS CLASS & CLUB PIN!

SMART, up-to-the-minute designs. Pins in 2 colors with any 3 or 4 letters and year. Handsome Sterling silver rings. Oldest, largest maker; famous for quality for 44 years. Clean cut work distinguishes Bastian Pins and Rings anywhere. Write for new catalog today!

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Dept. 70 Rochester, N.Y.

1.40

BUILD THE CUTTY SARK

2 FT. MODEL OF THE FAMOUS CLIPPER SHIP



Complete kit makes perfect building easy
2.50 plus 15¢ postage

Everything... including CARVED WOOD HULLS, Printed Balsas Decks, Cast-Metal Life-boats, Anchors, Bitts, Steering Wheel, Chains, Mast, Spars, Rigging, Cement, Colored Lacquer—Full-Size Plans and Instructions.

Send for Catalog all latest new models—10¢ IDEAL AIRPLANE & SUPPLY COMPANY, INC. 20 West 19th Street, New York

OTTAWA LOG SAW



\$39 BIG BOOK FREE PUTS THIS OTTAWA

GREATEST OFFER EVER MADE
To work for you
MAKE MONEY! Wood is valuable. Saw 15 to 20 cords a day. Does more than 10 men. Ottawa easily operated by man or boy. Falls trees—saws limbs. Use 4-hp. engine for other work. Write for **FREE** book. OTTAWA MFG. CO., 1427 Wood St., Ottawa, Ks.

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Letterheads, Circulars, billheads, cards. Printing pays BIG. Easy, interesting, educational. **PRINTING PRESS BARGAINS** \$12. Types and Supplies, lowest prices. Send stamp for catalog. PEIFFER Co., 16-C, 6 Columbia St., Newark, N. J.

New Adding Machine Fits Vest Pocket!..

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, very fast. Sells to offices, stores, homes—wherever figures are used. Write quick for **FREE** AGENTS sample offer and Money-Making Plan. **VE-PO-AD, Dept. 152, 303 W. Monroe St., Chicago**



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Saves Dry-Cleaning Bills

SELLS LIKE WILD. Never anything like it. Secret chemically treated. Used like a brush. No smelly liquids—no messy powders—no soiled hands. Keeps suits, dresses, spic and span. Also cleans hats, drapes, upholstered furniture, etc. Long lasting. Low priced. Everybody a prospect. Agents wanted everywhere. **Hustlers cleaning up big money.**

SAMPLE OFFER Samples sent on trial to first person in each locality who writes. No obligation. Get details. Be first—send in your name **TODA!**
KRISTEE CO., Dept. 682, Akron, Ohio



WITH P.W. I'LL PUT THAT ON TO STAY



RESULTS ARE AMAZING

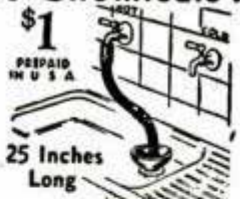
Now if you have a broken chair—loose caster—crack or nick in woodwork, floor, plaster or tile—loose drawer pull—do a quick, expert job of repairing with wood in cans—**PLASTIC WOOD**—that handles like soft putty and hardens into wood—wood you can carve, paint and drive nails and screws into. Paint, hdwe. & 10¢ stores sell **PLASTIC WOOD** in 10¢ & 25¢ tubes and 35¢ cans.



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Cleans Drains without Chemicals!

Revolutionary invention, using water pressure from the faucet. Opens clogged drains. Flashes them out and leaves drain free of stoppage. Clean and sanitary, easy to use. Full instructions packed with each "Drain Flusher." Fully guaranteed. Thousands in use in homes, apartments, hotels and factories. If you are having drain trouble in your kitchen sink, washbowl, laundry tubs, etc., and want a sure cure for this condition, send your order today for a "DRAIN FLUSHER." \$1.00 postpaid, or sent C.O.D. plus a few cents extra charge.



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The 1939 Ranger

at new reduced prices



Now ready for Christmas! Get your Ranger now, while these special prices last. All the latest improvements, among many styles shown in 1939 catalog. You can have **2-speed gear-shift, front-wheel brakes, spring forks**—and genuine Mead quality besides!

NOW you can ride a genuine Mead bicycle 30 days without "buying for keeps." Return it at our expense if not satisfied. Write quick for **FREE** Catalog, marvelous new prices, special offers. **SAVE 1/3** buying direct from **MEAD!**

Tires—Save on lamps, wheels, tires, equipment. Drop us a postal.

Mead CYCLE COMPANY
DEPT. L-118 CHICAGO

FREE!

Great new Color Catalog sent **FREE**. Hurry!

NOW! Anyone without experience can do a thousand and one REPAIR JOBS!

WELDING BRAZING SOLDERING

QUICKLY PERFECTLY EASILY

with the

NEWLY INVENTED

3 IN 1 Electric TORCH



COMPLETE WITH POWER UNIT—WORKS OFF 110 VOLT AC OR DC LIGHT CIRCUIT

Here at last is a portable machine that does real welding, brazing and soldering, yet is priced within the reach of all. The 3 in 1 comes to you complete with goggles, carbons, various types of welding rod and all accessories needed to do various repair jobs. It is all ready to plug in a light socket—nothing extra to buy. Simple instructions make it possible for you to do first class work easily without any previous experience or mechanical skill. The 3 in 1 instantly creates a terrific flame by just touching the carbons together.



REPAIRS FENDERS, AUTO BODIES, TANKS, BICYCLES, RADIOS, ETC.

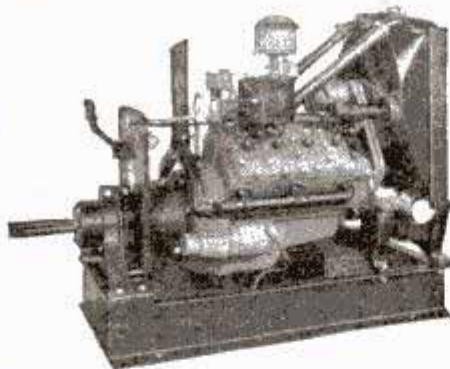
The 3 in 1 is ideal for auto body repairs and fender weld jobs—steam fitters, plumbers, sheet metal shops, engineers, maintenance men and janitors will find it indispensable. By following simple instructions, heavy work such as bumpers, tanks and industrial repairs can be done. Ideal for the countless jobs around a home or farm. **WORKS ON ALUMINUM, BRASS, COPPER, IRON, STEEL AND OTHER METALS.**

AGENTS! You will find quick easy sales waiting for you in repair shops, garages, factories, sheet metal, radio and bicycle repair shops, and many other places. Write at once for free particulars and learn how you can get your own 3 in 1 Electric Torch absolutely free for demonstration purposes by helping to introduce it to others.

ELECTRO-TORCH CO. 2613-BM MICHIGAN AVE., CHICAGO, ILL.

CAN YOU BEAT THESE POWER COSTS?

Save up to **\$293⁸⁰** Per Month on power costs



with a KRW FORD V8 Unit

50 H. P. with KRW V8 Unit using natural gas (1125 BTU) @ 30c per 1000 cu. ft. \$ 46.80 per month
 50 H. P. with KRW V8 Unit using gasoline @ 10c per gal. (no tax) \$ 140.40 per month

Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3c per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks out of actual savings!

KRW V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc. New KRW "GUARDIAN" automatically stops engine in case of cooling or lubrication failure.

Write for new bulletin just off the press—packed with useful information, engineering data, etc. You can buy through your local Ford Dealer and benefit by local service and low-cost Ford engine replacement feature.

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 Builders of Shop Equipment for Ford Dealers Since 1916
 West Coast Branch: 722 Mateo St., Los Angeles.
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When writing please mention Popular Mechanics

Spindle SHAPER \$3

less cutters (C.O.D. or outside U.S. \$3.25) Postpaid

Make tongue and groove joints; shape moldings, picture frames, plaques, etc. Limitless projects can be given a professional finish with this shaper. It has 8" x 53 1/2" steel table; stands 55 1/2" high. Uses standard 3/16" hole cutters. (Cutters 55c each). Oilless bearings. Your fractional H.P. motor runs it.

FREE CATALOG describing \$150 prize contest (1st prize, \$25; 2nd, \$15; 3rd, \$10; 46 other cash and merchandise prizes). Cat. illustr. complete power tool line; Jig Saw, \$1.50; Circ. Saw with oilless bearings, \$3; Drill Press, \$2.50; completely equipped Lathes, \$2 & \$4.90; Sander, \$1; etc. Order today or send card for Catalog.

\$150 PRIZE CONTEST

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BIG NEWS FOR MODELBUILDERS & HOMECRAFTSMEN

In the values and prices featured in the great new C-D Handbook Catalog—now ready! Bargains galore. Thousands of items—including 135 world-famous C-D flying model airplanes; also other makes, 10c up. Also C, CD, OO and HO gage model RR equipment, and toy trains at 20c up. Gas model airplanes, and all well known gas engines; hand tools, power machinery, ship kits—and all necessary supplies. Microscopes, etc. Nothing ever like it, before. Edition limited, act quick! Rush name, address and **10c**

Cleveland Model & Supply Co. Inc., 4508-894 Lorain Ave., Cleveland, Ohio

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WILD ELEPHANTS CAN'T TEAR IT APART

There is a flood of quick profits waiting for those first to introduce this amazing new liquid that joins all kinds of materials as if one piece. Men and women make big incomes in direct sales. Also, counter carried so you can sell in quantities to dealers and let them sell for you. **WAGON JOBBERS, CARD MEN, SPECIALTY MEN**—here's a real opportunity to add a real product to your line. **THRIFTEE-FIX** will mend almost everything imaginable without heat, soldering irons or acids. Agents cleaning up. Big repeat business—enormous profits. Write TODAY for sample proof and particulars.

INDIANA LABORATORIES
 Dept. T-1258 Elkhart, Ind.

Over 1000 Uses

(Continued from page 136A)

while with such a title as "Skill" you can illustrate hundreds of occupations—the shopworker filing a saw, the jeweler at his bench, the carpenter doing a delicate bit of fitting.

This method of choosing titles and then illustrating them is an unailing technique for finding picture subjects. Pick a good title—take a picture that fits it—and you



Here's a "direct hit"—splattering snow, screwed-up face, a snowball ready to throw. It's all told

will have a snapshot that interests everyone who views it.

There are three general classes of picture stories, and you should try them all, for each has a special application—depending on your choice of subject. The classes are:

A single picture, which suggests a complete story by presenting one aspect of it.

Series pictures—each picture covering one point of a longer story. The boy and his airplane would make an excellent series. One picture could show him examining a friend's airplane model; another would picture him poring over plans or blueprints; others would detail the progress of his construction job, and a final picture or group would cover the initial flight. Series pictures are especially good when a story needs to be told, step by step.

Sequence pictures—or movie scenes in snapshot form. It is different from a series in that the background or setting does not change. One might make a good sequence of a fisherman landing a fish, or a baby exploring a new crib. In these pictures, one concentrates on changes of expression, and slight variations of action, rather than

(Continued to page 140A)

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BRING YOU
THIS 188 PAGE
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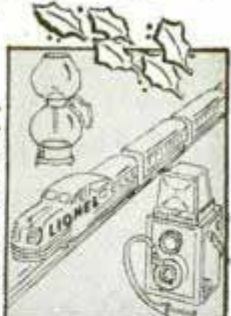
Cover to cover it's brand new. New 1939 Lafayette Radios, 60 new models . . . every one a streamlined beauty and all priced within easy reach. Complete list of nationally advertised radio parts and equip-



ment. Sensational new television kit, plus the biggest selection of build-them-yourself radio kits. New photography section solid-packed with real values. 188 pages of standout buys! Send for your **FREE** copy. It's today's buying—and saving—guide.

Special Xmas Catalog

Be sure to send for our special **FREE** Christmas catalog—out now in time for thrifty Christmas shopping. This year give practical gifts. Largest selection of gifts anywhere—electric trains, cameras, modern appliances, electric shavers, radios . . . Shop at home in comfort with this greater-value gift catalog—save time and money. Check both catalogs on coupon and mail.



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100 SIXTH AVENUE • 401 W. JACKSON BLVD. • 265 PEACHTREE STREET
BOSTON, MASS. • BRONX, N. Y. • NEWARK, N. J. • JAMAICA, L. I.

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100 Sixth Avenue, New York, N. Y.

Rush **FREE** 1939 Gift Catalog No. 75-7M8
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BE YOUR SANTA

PASTE COUPON ON PENNY POSTCARD

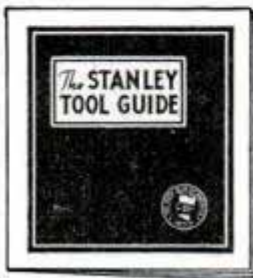
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FOR YOUR HOME WORKSHOP

Stanley Plan Book giving step-by-step instructions for building 16 useful articles. • Stanley Tool Guide shows how to use and care for all common wood-working tools. • "How To Work With Tools and Wood" is a 185 page book showing how to use tools, how to select materials, plan your work and finish it. More than 150 illustrations.

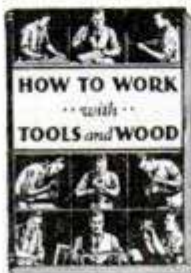


STANLEY PLAN BOOK
16 complete plans 10¢ per Copy.



STANLEY TOOL GUIDE 32 big pages of information 25¢ per copy.

STANLEY BOOK "How To Work With Tools and Wood" 185 pages \$1.00 per copy.



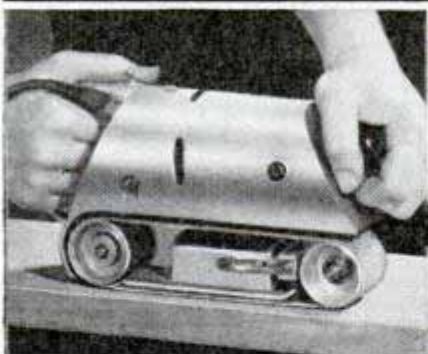
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STANLEY TOOLS

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in **HOURS LESS TIME!**



Use it for . . .
SANDING
GRINDING
SHARPENING
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REMOVING PAINTS,
VARNISHES

New Guild PORTABLE ELECTRIC Sander

Just what you have been waiting for—a portable, high-precision power sander at a price you can afford. It saves time and toil on all your sanding jobs. Equals the quality of work done by sanders costing twice as much.

Straight-stroke, continuous sandpaper belt works with the grain—leaves no cross-grain marks or swirls. Handles wide variety of outside and inside curved surfaces . . . and all plain surfaces.

OUR TRIAL OFFER

will let you see for yourself the many jobs you can actually do with this tool. Write for details today.

Works on wood, metal, bone, compositions, plastics. Weighs only 9 lbs. Plugs into nearest light socket. Anyone can use it. Fully guaranteed.

Syracuse Guild Tool Company
1700-12C No. Selina St.
Syracuse, N. Y.

(Continued from page 139A)

broad shifts, and the camera viewpoint remains the same in all the shots.

"Series" and "sequence" pictures are of rather recent origin. Indeed, they were rarely seen until the development of the modern miniature cameras, built especially for rapid adjustment and quick capturing of action stories. Now, however, owners of larger cameras are adopting the miniature technique, and finding it useful for many subjects although, of course, most of the large cameras cannot rival the miniature's lens speed and simplified focusing or film-winding control.

To take sequence pictures, the amateur must learn to handle his camera quickly and efficiently. All the adjustments should become second nature to him. This calls for taking many pictures, but the results are well worth the effort. Often an especially good sequence opportunity will require that pictures be taken as rapidly as one can wind the film and snap the shutter. It is generally advisable to take more than are required, so the sequence will be of adequate length even if some of the snaps do not fit in properly.

Many clever story ideas can be worked out in series form, and there is more opportunity for humor. Stories that cannot be told at all in one snapshot can be made screamingly funny with a half-dozen snaps arranged in series. Imagine a small boy with a huge snowball on top of a hill. In one picture, show him losing his balance, and starting to roll downhill with the ball. You would pose this action, of course. At several points down the hill, picture the boy and the ball, apparently rolling—and at the bottom, get a final picture, with the boy sitting tousled and bewildered, and the ball now bigger than he is.

Creating such story sequences greatly enhances the enjoyment you get from your camera—and it costs no more than ordinary snapshooting, because when you carefully work out a picture-story, you make every film count.

If you have had difficulty making your pictures as interesting as you would like, try the "story" approach. Make each picture "say something" to those who view it. Take one snapshot when the subject is suited to single-picture treatment, and whenever you want to detail a story more fully, try a series.

Relieve Heartburn Fast This Amazing Way

YES—TUMS a remarkable discovery brings amazing quick relief from indigestion, heartburn, sour stomach, gas, and burning caused by excess acid. For **TUMS** work on the true basic principle. Act unbelievably fast to neutralize excess acid conditions. Acid pains are relieved almost at once. **TUMS** are guaranteed to contain no soda. Are not laxative. Contain no harmful drugs. Over 2 billion **TUMS** already used—proving their amazing benefit. Try **TUMS** today. Only 10c for 12 **TUMS** at all druggists. Most economical relief. Chew like candy mints. Get a handy 10c roll today.

You never know when or where



TUMS are anti-acid—not laxative. When you need a laxative get—*Nature's Remedy* NR—TABLETS—NR. This all vegetable laxative brings such gentle, dependable relief for conditions due to constipation.

BIG MONEY BUILDING MEAD'S New Portable **OUTBOARD BOAT**



IN A FEW DAYS AT HOME! Build this light, 50 lb. tough, durable, seaworthy, portable **Outboard Ki-Yak!** Take it anywhere by hand or car. Safe, leakproof, trouble-free. More speed per horsepower, more miles per gallon. MEAD'S perfected aluminum-ribbed, cut-to-fit Construction Kit guarantees successful assembly, quickly, easily, economically. New 60 lb. OK-4 uses our, sail, motors 10 h.p. or less. Also 3 "CK" paddle-sail models from 20 lbs. to 40 lbs. Rush dime for details. 50 Gift, Paddle Offer!

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Latest type heating stoves, window assemblies, couplers. Everything for the trailer. 40 page illustrated catalog, 10c. **MARVEL TRAILER PARTS CO.** 19020 Celestine Ave., Detroit, Mich.

The APPRECIATED GIFT

A Gerstner Tool Chest for Christmas or any other occasion. Machinists and Toolmakers may choose from Free Catalog. **GERSTNER TOOL CHESTS** 433 Columbia St. Dayton, Ohio

BUILD THESE PROJECTS

For garden or lawn. Easy to build. Easy to sell. Detailed Blueprints Model B-25 Dutch Windmill 50c; Model OM-60 Old Mill, 85c. Lawn Figure Patterns—Sunbonnet Girl, Dutch Boy, Tulip Girl, Holland Pair, 35c each, all 4—\$1.00. Catalog illustrating many models, send 10c, today.

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YOUR OWN MOVIES! 10¢ A DAY!

NATIONALLY ADVERTISED 8MM and 16MM Movie cameras, projectors. For home, business, church, school, club. **MONEY BACK 10 DAY TRIAL.** Payments as low as 10¢ A DAY. Satisfied customers throughout the world. FREE details. WRITE TODAY. Don Elder's Home Movies, Dept. A-12, 739 Baystate St., Boston, Mass.

AGENTS 300% Profit SIGN LETTERS

For Store Fronts and Office Windows. Anyone can put them on. Free Samples. Liberal Offer to general agents. **METALLIC LETTER CO., 438 N. Clark St., Chicago**

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TURN SCRAP INTO MONEY

AUTOPOWER tells you how in plain, easy, simple and illustrated instructions that anyone can follow. Change auto generators into useful, practical A C and D C generators and motors with voltage from 2 to 1,000 volts, for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. **INSTRUCTIONS FOR BUILDING AND A C WELDER THAT ACTUALLY WORKS UP TO A 3/16" ROD. ALSO COMPLETE PLANS FOR WIND AND WATER POWER PLANTS.** Send for your copy of "AUTOPOWER." Already used and endorsed by thousands. Only \$1.00 postpaid. **S. W. DUNCAN, Publisher.** 410 S. Hoyne Ave., Chicago



"STALLING ALL CARS! DON'T USE ANTI-FREEZE TILL YOU CLEAN OUT WITH **SANI-FLUSH!**"



OLD MAN WINTER has two strikes on you, if you put anti-freeze in a dirty radiator. Rust and scale choke the cooling system. Your motor overheats. You waste anti-freeze. You waste power. And you risk costly engine repairs. **SANI-FLUSH** makes it easy and inexpensive to keep radiators clean.

Just pour 10c worth of **SANI-FLUSH** in the radiator. (25c for the largest trucks and tractors.) Follow directions printed on the can. Run the motor. Drain. Flush. Refill with water and anti-freeze. Then you're all set for the winter. The delicate veins that circulate water are free and open. Motors run efficiently. **SANI-FLUSH** can't injure motor or fittings. You'll find **SANI-FLUSH** in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

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Safe NOT CAUSTIC

KEEPS RADIATORS CLEAN

(pocket size) **"DUMATIC"** (any tobacco) **Cigarette Roller**
Send Dime for sample & particulars.
A & M Sales, Box 128, Sta. V, Cincinnati, Ohio

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Amazing
New Feature
in 1938
**LIONEL
TRAINS**



Stop your train in front of coal elevator. Then touch a lever. By remote control, coal pours down through chute into waiting car—fills it to the brim. This year's Lionel Trains can be uncoupled and unloaded by remote control. Catalog contains all details, plus color pictures of the greatest fleet of model trains in all train history.

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Enclosed is 10 cents for a copy of the new 1938 52-page, full color Lionel Catalog. Send it to:
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VELVET SPRAYED FROM A GUN

Pulverized fabric (plush, cotton or wool) may now be applied to any article made of paper, cardboard, leather, cloth, plaster objects, wood, or metal, with our newly developed hand spray outfit No. 26, which includes 1 binder gun—1 fabric gun, binder and pulverized fabric for covering 15 square feet for only \$1.95 plus postage. Shipping weight 3 lbs. 10c brings attractive samples and literature.

MAGIC, SCREEN PROCESS PRINTING

Print your own Greeting Cards, favors, novelties, signs, pennants, etc., up to 200 per hour on your own kitchen table from your own designs, in snappy brilliant colors. Pulverized fabrics and tinsels can be applied while printing color is still wet. Anyone that can handle a lead pencil can make the plates, in a few minutes time. Hundreds are cleaning up in this new fascinating industry. NOT a rubber stamp or linoleum block method. Printing as sharp and accurate as regular printing. Set No. 210 includes 1 silk screen and frame—1 adjustable back bar, side support, printing base, magic film, hinges, flexible printer, pencil knife, 1 can red, 1 can green ink, and instructions for only \$3.45 plus postage. Shipping weight 7 lbs. Attractive samples 10c.

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BUY ONE OF THESE

\$1.50
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**"BIG LITE"
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POWERAY (above) New 6-volt electric lantern with powerful 700 ft. spot beam. 80-100 hours light. 4 1/2 in. reflector. Unbreakable lens.

POWERLITE (at side) America's finest electric lantern. 6-volt, 2 reflectors—front, shoots 800 ft. beam; top, gives wide floodlight. 80-100 hours light. Unbreakable lens. At sport, hardware and electrical dealers or write direct to Delta Electric Co., Marion, Ind. Dept. 300

MEGOW'S GAS-POWERED MODEL AIRPLANE

The Cardinal

\$3.95

plus 20c post.



World's champion Bassett's new 48" gas-powered crack-up proof sensation! Finished prop., many ready-made parts, rubber wheels.

Also the famous **QUAKER FLASH, FLYING QUAKER** and others. Also rubber-powered Giant Fliers with motor-hum device \$1.00 up.

SHIPS . . . carved hulls, many ready-made parts, complete plans and materials. XEBEC (Rob. Crusoe); HISPANIOLA (Treasure Island), ARABELLA (Capt. Blood) and others, \$2.00 (15c postage).

HO-GAUGE MODEL RAILROADS. Most realistic freight cars. 50c. Send 5c postage for 100-page illustrated catalog Model Kits, ready-made parts and supplies.



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Our Fall CARNIVAL OF CAMERAS offers you hundreds of outstanding values in new, used and reconditioned cameras, equipment, lenses, and supplies. Prices are non-competitive. Liberal trade-in allowance; money back guarantee; 10-day FREE trial.

New "CARNIVAL OF CAMERAS" catalog ready! Send 10c to cover postage and handling. 18 E. 42nd St. Dept. G6

136 W. 32nd St. New York, N. Y.



HOLD-E-ZEE AUTOMATIC GRIP SCREWDRIVERS

Hold, start and set-up screws in unhandy places. Gripper instantly released by spring action, sliding up out of way when not in use. Finest materials throughout, chrome vanadium blades; many have transparent, insulating, unbreakable handles. (Illustrated.)



No more expensive than ordinary screw drivers. Models for recess-head screws. Handiest ever. At auto-supply, hardware or electrical stores.

UPSON BROS., INC.

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Send 25c for this Big Book Today

Over 100 pages! Beautifully Printed and Illustrated! Trailer Suggestions and Ideas galore! Catalog shows America's greatest line of Trailer Parts and Equipment at lowest prices. Everything from wheels to top. Rush 25c today. Satisfaction positive! guaranteed! TRAILER SUPPLY CO. Box 439-A WAUSAU, WIS.



BUILD IT YOURSELF

The Jim Dandy Cabin Cruiser

The Trailer that has everything. Classy! Roomy. Easy to build in any size with my simplified Plans and Instructions—Price \$1.00. Rush dollar bill today to JIM DANDY Box 125-A WAUSAU, WIS.

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Only \$3.99

6 Books FREE

25 UNITS genuine salvage commercial apparatus with fine experimental manual! BUILD radio circuits. 110-volt AC motor, eaves-dropping phone, thief detector, powerful arc light, ultra-violet rays, arc furnace, scores more! Used world-wide! Learn at home! SEND ONLY \$3.99 for Special DeLux Kit and 6 FREE Fine Electrical Radio books. Books alone worth \$3.00! Sent C.O.D. if desired. Stamp brings Bargain Catalog! ELECTRICAL SALVAGE CO., Box 524-P12, Lincoln, Nebr.



NEW BRUSH PLATING OUTFIT For AUTO PARTS

Connects to a battery with no tanks necessary. Plates on iron, steel, brass, copper, etc. Almost as simple as painting. Hundreds of car owners waiting for this low-cost plating. Improves appearance and value of the car.

Your opportunity to make good income plating auto parts, bathroom fixtures, reflectors, mirrors, etc.

FREE PROOF

Write quick—big season here. Get FREE PROOF and particulars that put you in a paying business of your own.

GUNMETAL COMPANY

AVENUE M

DECATUR, ILL.

Trailing the Wild Game Poachers

(Continued from page 860)

served wild-duck dinners in special dining rooms. One Texas night-club operator was recently arrested in a case that required a year to complete and that involved persons from coast to coast. In season or out, the night-club operator was always able to supply illegal dinners of duck, quail or plover.

Beaver, after years of conservation, are beginning to come back and lately the traffic in illegal beaver skins has started to increase. Hundreds of pelts bought from scattered trappers in Idaho were smuggled by a fur wholesaler into Nevada and from there to New York, where agents found the shipment and started backtracking. Skins taken on the Colorado river have been captured in Philadelphia. Recently a game agent inspecting furs in a San Francisco wholesale house found five beaver skins that had no state tags certifying they had been taken legally. They had been sent to the fur house from Los Angeles, where further tracing revealed they originally came from South Dakota. It took a month to get the entire story and make the arrests.

One of the most unique smuggling rings the federal game agents have come across was put out of business early in 1938. There is a twenty-dollar bounty on wolf and coyote pelts in Alaska but no such bounty in Canada. Trappers decided there would be good money in sledding Canadian pelts into Alaska to collect the bounty and to smuggle American goods across the Canadian border on the way back to avoid the high tariffs. It had become a well-organized business by the time the agents put a stop to it by flying on a surprise visit to the depot on American soil where the smugglers gathered.

Like wild ducks, venison is widely sought by market hunters. In one very complicated case a burglar stole airplane machine-gun ammunition from a naval training station and sold some of it to a poacher who didn't know that every fifth round of the military ammunition was an incendiary bullet. On a subsequent deer hunt, one of the incendiary loads happened to strike a tree, starting a forest fire. The fire was observed from a forest service lookout

(Continued to page 144A)

*A Remington Portable
—the Gift Your Whole Family Shares*

**It's easy to do
your Christmas Shopping**

Just drop in on your nearest Remington dealer for five pleasant demonstration minutes. Or simply 'phone him and he comes to your home *at your convenience*. Or—clip the coupon and get the information by mail. You shop in your own home.

AND WHAT A GIFT IT IS! Your whole family is bound closer together by something each can use. Even those in far away places will be nearer because you'll write more often.

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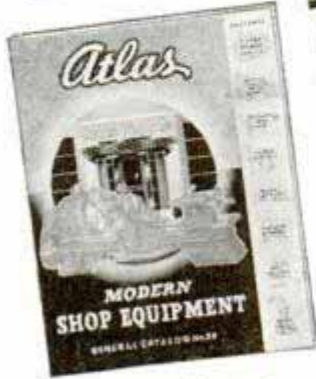


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(Continued from page 143A)

tower and the fire fighters, in putting out the fire, found the dead deer, traced it to the poacher, and through him the burglar who had rifled the naval armory was caught.

Deer poachers in game refuges depend on stealth and silence. Occasionally a warden, patrolling a refuge, finds poachers are using a device adopted from the Indians. A heavy wire noose with a free-running slipknot, greased with mutton tallow for quick action, is hung in a deer runway with the end of the wire fastened to a tree. The greased loop is a deadly weapon because the deer, head down as it makes its way along the path, plunges its head and neck through the loop. Its subsequent struggles draw the wire tighter, choking it to death. The best weapon of the game wardens against this type of crime is eternal vigilance. When such a trap is found one of the agents stakes himself out and waits for the poacher. Instead of making an immediate arrest the agent waits until the man starts skinning the deer or carrying it away.

"Spotlighting" is just as effective as the snare in trapping deer and just as illegal. The deer doesn't have a chance and two or three poachers can obtain a truckload of venison in an hour or so. This type of poaching is done after dark, with a rifle equipped with a silencer and with a powerful flashlight fastened to the gun so its beam is trained along the barrel. The beam of the spotlight not only reveals the feeding deer but transfixes it with its glare so the animal appears paralyzed, allowing the poacher to pick it off at will.

Big horn mountain sheep have an attraction for some hunters who feel they ought to add a head to their collection simply because the species is rare. Some western states have short open seasons for the sheep while others do not. Patrols discourage most of the sheep hunters. What the wardens hate to hear more than anything else is news of a big mining strike in the sheep country, with an inflow of miners from all parts of the west. Some of the miners, wanting fresh meat in camp, often hide near one of the lonely water holes and pick off the sheep as they come down to water. The Boulder dam and Parker dam areas were districts that required special vigilance during the time the dams

were being built, due to the influx of people.

In some parts of Europe song birds are practically extinct because of the practice of netting them either for the market or for use as caged pets. Mocking birds, finches, larks, robins, quail, dove, pheasants and other protected species are likewise taken illegally in many parts of the United States, mostly with nets or horse-hair snares. Some of the nets, made of fine linen thread with half-inch meshes and thirty feet long, imported from southern Europe, are worth several hundred dollars. Possession of such nets alone is against the law. Hung between bushes in a baited area, the fine nets catch and hold any birds that fly into them. Coarser "jungle" nets are made of soft twine and are supported on stakes placed loosely in the ground. When large birds or rabbits run into the nets the stakes collapse and the nets fall over them.

Immigrants from some countries are apt to bring with them age-old customs in taking game, most of which are illegal here. One importation that the wardens occasionally find is "moochie," a gum-like glue that comes from the Malay jungles and which natives spread over the limbs of trees. Once trapped on the sticky surface, a bird can't release both feet at once to spring into the air and remains a prisoner until the native picks him off.

The work of the Biological Survey is not restricted to catching poachers or preventing taking wild game out of season, over the limit, or in restricted areas. The agents are charged with conducting many kinds of conservation work. One of their problems is to keep protected game from becoming a nuisance. Quail or ducks are apt to flock to cultivated fields and destroy a crop. Permits are sometimes issued to destroy the game or birds if they become too much of a pest, but first the agents try all sorts of ways to scare the game away, shooting tracer bullets through the air or igniting explosive bombs to get them out of the territory.

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.

Everything in RADIO

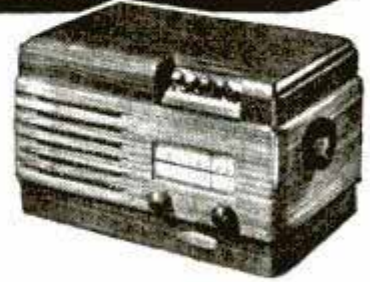
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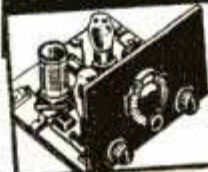
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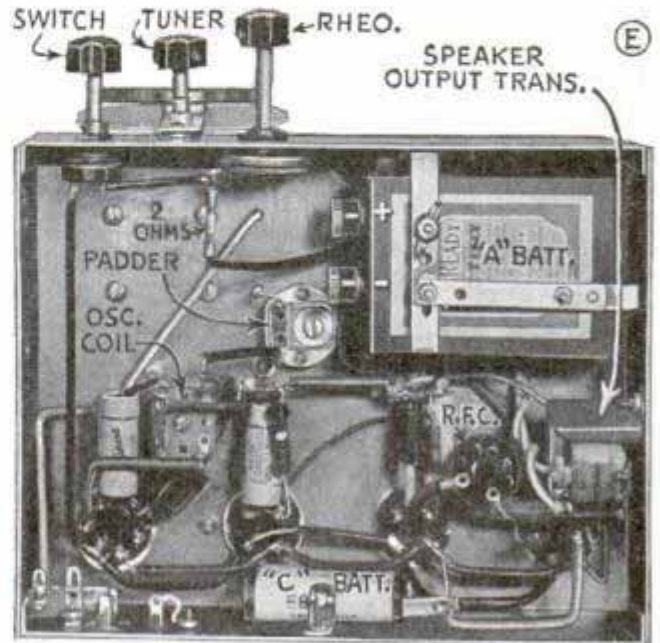
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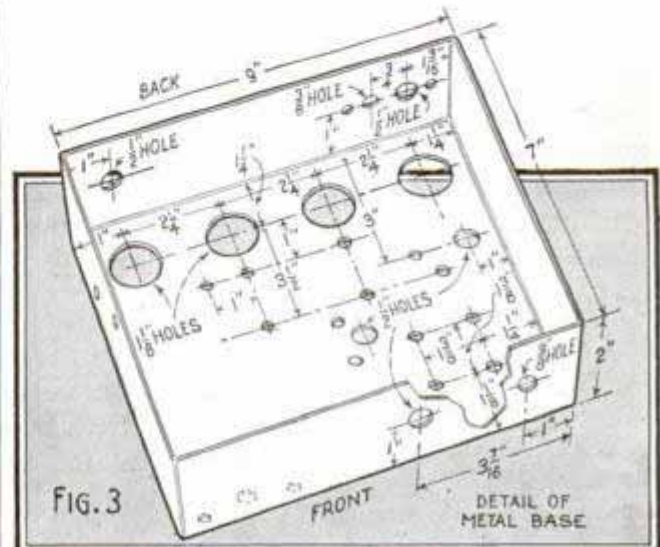
(Continued from page 899)

do it for you at a very reasonable charge. The tuning condenser dial should be turned to 1,400 kc., and, with the oscillator generating the same signal, both trimmers on the tuning condenser sections should be



adjusted for maximum signal. Adjustment of the oscillator padder condenser for loudest signal (with tuning dial and oscillator set for 600 kc.) completes alinement.

A material list of the original parts used in the model can be obtained from Popular Mechanics radio department without charge. The blueprint number is R-260. A 25-ft. length of flexible cloth-covered antenna wire is required, and a ground should be used if possible. A carrying case has not been detailed as most builders prefer to design their own to meet individual requirements.



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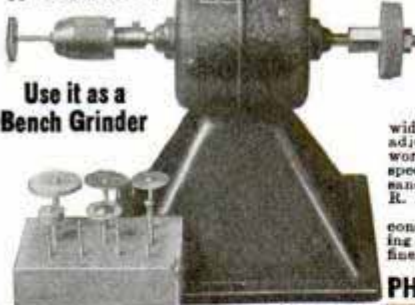
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Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. Q, Chicago, Ill.
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Birthplace of the Big Winds

(Continued from page 808)

always toward the northeast. The Mississippi and Ohio river valleys are the most prolific breeders of this type of windstorm.

On one day, February 9, 1884, there were sixty tornadoes in the United States, the majority being in Missouri, Illinois, Kentucky, Tennessee and Mississippi, with others in Georgia, the two Carolinas and Virginia. The aggregate loss of lives that day was 800, and 10,000 homes were destroyed.

For thirty years scientists have reserved the word cyclone for the ordinary widespread movements of air on a revolving system, while tornado applies only to the highly localized storm marked by a distinctly visible cone, or funnel, which drops down to the surface and picks up objects on land or water at sea, forming a waterspout.

A mass of warm, moist air at and near the surface, and an opposing mass of cold air above it forms the combination which may produce a tornado. The warm air



Train derailed by recent hurricane. Note rail twisted from its ties

seeks to rise above the cold and heavier air, and sooner or later finds a place to break through. The ascending air sets up a rotary motion, counterclockwise in the northern hemisphere. At the start this movement may cover a very large area, but as the movement continues the pressure in the center of the funnel-shaped mass grows less, and the outer air is pushed into this space. The gentle rotary motion may be only twenty or thirty feet a second a thousand yards from the center of the whirlpool, but as the outer particles are pushed inward their speed becomes enormous in relation to the constantly smaller path they travel.

Col. John P. Finley, U.S.A., retired, who is director of the National Storm and Avia-

(Continued to page 150A)

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(Continued from page 149A)

tion Insurance Bureau, a research organization at Ann Arbor, Mich., recently charted a typical tornado cross-section. His drawing showed the funnel path was only eighty rods wide. The region of destructive winds to the right, or southeast of the funnel path, however, was one-half mile wide, while the corresponding belt of destruction northwest of the funnel was only fifty rods wide.

The rotary motion of the funnel can be seen plainly after it has passed by studying the debris left behind. Trees, fences and other objects on the right of the storm will be blown down to the east, those nearer the funnel will lie to the northeast, some in the funnel path, on the left side, will fall pointing westward, and to the north and west of the storm, objects will be blown over to the west and south.

Destructive windstorms have always played an important part in history, so much so that in olden times dates were reckoned from them. The expression "the year of the big wind" was brought to the United States by Irish immigrants who dated their birth from in or near the year of the great storm of January 6-7, 1839.

Louisville was the first important town hit by a destructive storm in the United States. Twenty-five people were killed there on August 27, 1854, in a tornado.

Tornadoes hit seven states on the afternoon and evening of March 15, 1938, including Arkansas, Alabama, Illinois, Louisiana, Missouri, Mississippi and Tennessee.

The recent hurricane in the New England states was a high-power sea-blast. Other hurricanes have visited the northeastern seaboard in past years, but never anything like this one.

A lazy high-pressure area, moving too slowly off to sea, was the indirect cause of New England's woes, the meteorologists explained. Ordinarily, when a tropical storm center moving northward fails to make land below the Virginia Capes, it will veer off to the northeast and blow itself out at sea. But this one found itself stymied behind that loitering "high," and was forced to move straight northward and then toward the northwest—with terrible results.

The storm center traveled at a motorcar speed, weather bureau scientists say, about fifty-three miles an hour.

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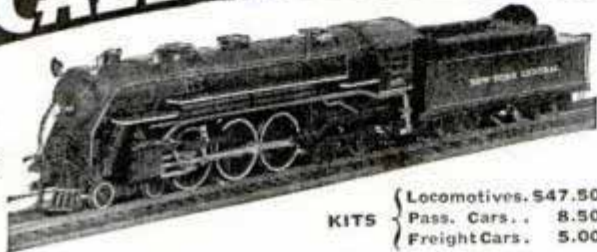


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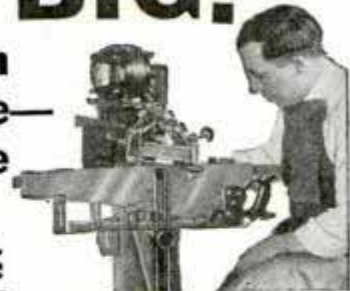
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Good-bye to the "Wobble-Stick"

(Continued from page 803)

ing the accelerator to the floor, causes the conventional high gear to cut in when desired, giving the car unusual pickup for climbing or passing.

The Studebaker overdrive, which has solenoid control, cuts in around thirty miles per hour, but the conventional high gear may be cut in by pressing the accelerator beyond the wide open throttle position. This actuates the solenoid control, which literally cuts off the engine for one-

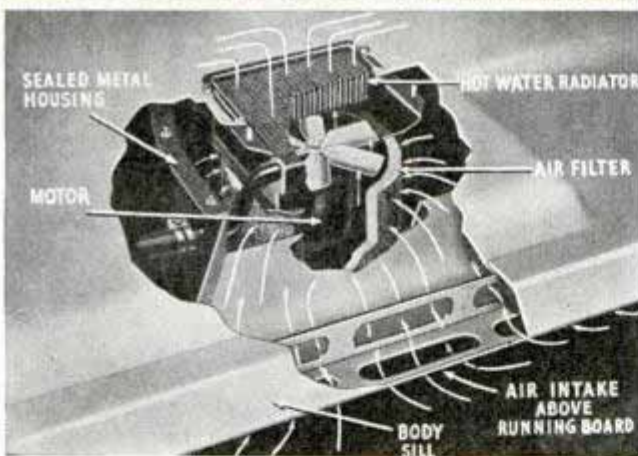
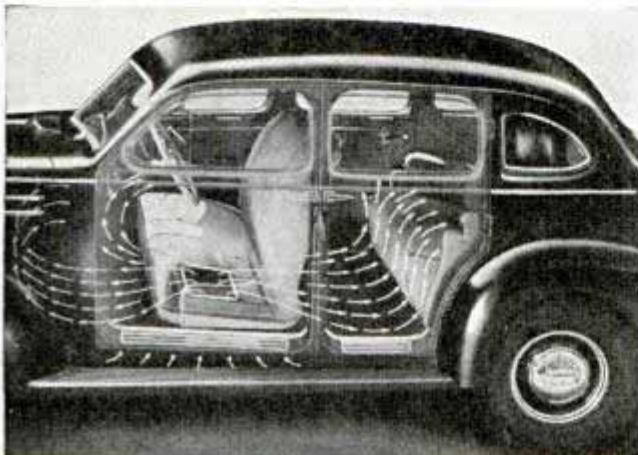


Diagram of Studebaker winter conditioning unit and manner in which air enters car

fiftieth of a second and causes conventional high gear to take hold for quick pickup or for more power to climb a hill. This feature eliminates the formerly objectional slowing down when the driver desires to get out of overdrive.

Comfort surpassing that ever offered before is claimed by several auto makers this year. The new Plymouth has front independent suspension on coil springs of Amola steel. These springs are said to give a twenty-per-cent softer ride. Chevrolet's riding system involves new short and long

(Continued to page 154A)

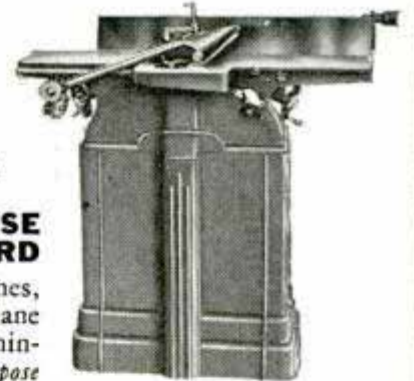
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(Continued from page 153A)

arm type Knee-Action embodied in a suspension system in which front and rear are scientifically balanced. There are double-acting end-to-end discharge hydraulic shock absorbers front and rear and a new ride stabilizer which prevents undue rolling and swaying on curves. Rear springs are thinner, with tapered ends, and their geometry is changed to give a smoother, softer ride.

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side the frame. The fundamental accomplishment is a control of axle weight that prevents periodic axle "hopping," so annoying to passengers and driver. Through the use of rubber bushings at all points, the suspension requires no lubrication.

Packard, too, takes a step in the direction of rear-end suspension by presenting a fifth shock-absorber system, to stop crosswise shocks. The rear springs have rubber and special alloy inserts between the leaves to achieve easy, controlled spring resilience.

Among the engineering achievements for 1939 is Pontiac's new ride system, in which

(Continued to page 157A)

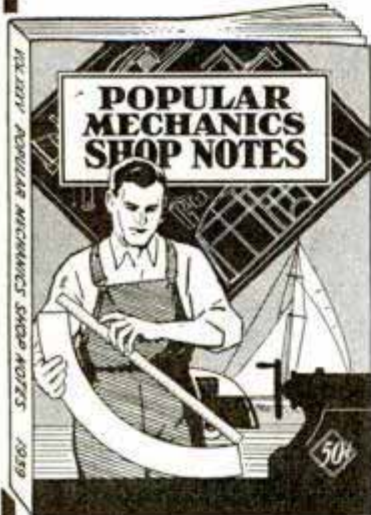
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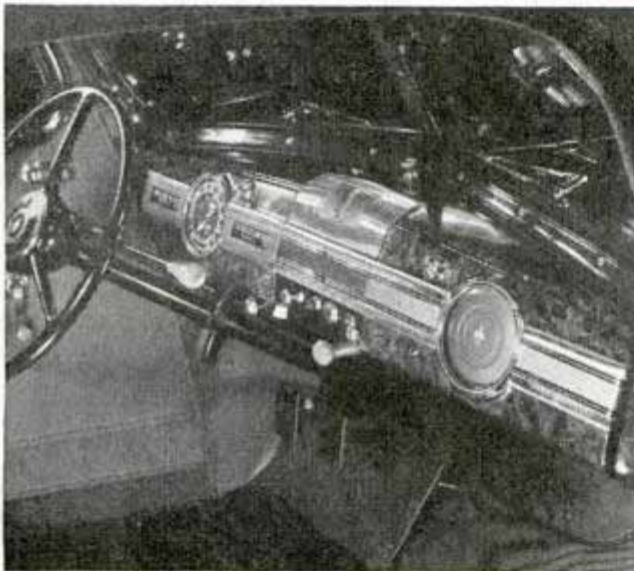
SPORS CO., 10-38 Main St., LeCenter, Minn.

When writing please mention Popular Mechanics

(Continued from page 154A)

Duflex rear springs give one passenger as easy a ride as six passengers and also reduce bouncing and pitching when the car is traveling over bumps. To the conventional leaf spring, and directly below it, has been added a second but shorter auxiliary or helper spring. For light loads the car rides almost entirely on the main or upper unit which affords comfortable motion. As the passenger load increases, this upper spring comes progressively more and more into contact with the helper spring, thus building up maximum resistance to deflection. Front and rear springs have nearly the same oscillation rate, which means that pitching and kick are reduced.

Of considerable importance to the driver is the general movement to increase his range of vision. In cars with Fisher bodies,



Driving compartment of Packard Six. Note Handshift beneath steering wheel

higher windowpanes and windshields, narrower body pillars and smaller corner radii add twenty-seven per cent to the glass, or visibility, area. For example, the Buick has twenty-six per cent more glass area in the 1939 windshield than in that of last year. This trend marks the manufacturers' effort to eliminate "blind spots" which have figured in many accidents. Frequently an automobile coming from one side or the other is momentarily obscured from the driver's vision by a pillar on his own car. Chrysler and other makers offer similar wide-vision windshields.

New beauty has been built into the 1939 automobiles, but the makers have con-

(Continued to page 158A)



BETTER PICTURES A FASTER WAY

JUST turn the knurled edge of this new, quick-setting calculator once with your thumb or forefinger. It's an improvement on the G-E exposure meter that makes possible *complete exposure data*—faster, more easily. Now, too, you read light values more easily on the simplified scale. These new features have been added to the G-E exposure meter for faster, smoother operation.

The new calculator has larger numerals, is faster to use, and has an extended film-speed range that covers the fastest films. Combined in the instrument with the improved calculator are other such popular General Electric features as sensitivity, sharp directional effect, and accuracy. They're *all* yours with the G-E meter. They're additional assurances of better pictures.

Your photo dealer has the improved G-E exposure meter. If you want better pictures, ask to see it today. Or write for GED-678A, which shows the new G-E meter and explains how to use it under all light conditions. General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC



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H1143

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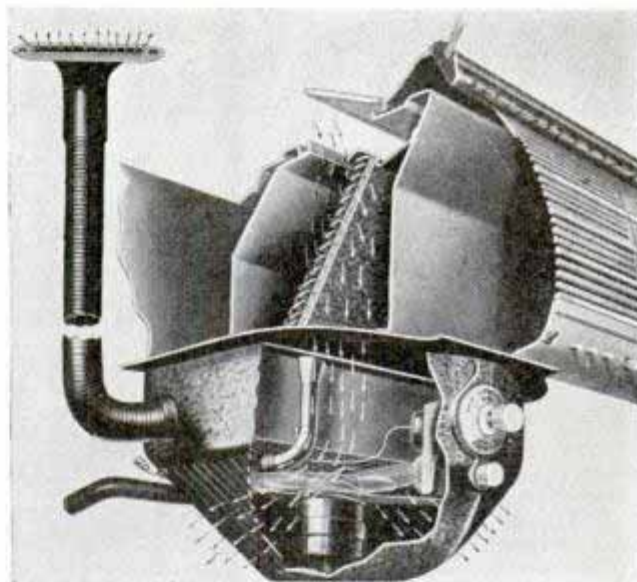
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(Continued from page 157A)

flicting ideas about the way tomorrow's car will appear. General Motors moves toward the knife-edge front and elimination of the familiar radiator grille, reaching the extreme point in Buick, which has a "butterfly" grille starting rather low on the front. This grille is part of the "catwalk" cooling system adopted from European racing cars. With this construction, the grille is set in rakish contour in the catwalk section of the front end, resulting in better streamlining, a narrower hood for better vision and introduction of air to the radiator at greater pressure to increase cooling efficiency.

Buick takes a step toward elimination of running boards. In the models "40" and "60," Buick offers stream boards which are not so wide as the regular running boards



Cutaway view of Nash conditioning unit which has "Weather Eye" control dial

and which are surmounted with stainless steel moldings extending their entire length. Graham eliminates the running boards from its curb-height body, but the full-width boards may be obtained at added cost. The Cadillac "61" offers running boards as optional equipment, replacing them with the strips of stainless steel below the doors. Running boards are narrower on the Chrysler and some other cars, indicating that new models of the near future may be entirely free of step boards.

The Chrysler line has variations of the rounded nose design set off by horizontal vents protected by chrome bars. Headlamps are built into the front fenders. Rear

(Continued to page 161A)

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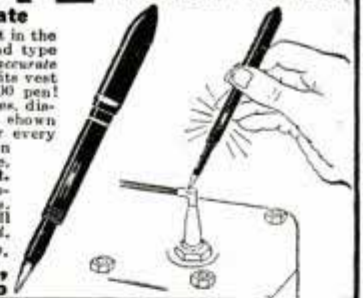
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Between the ages of 13 and 25, final growth takes place. This is often accompanied by disturbances throughout the body. The skin may become over-sensitive. Waste poisons from the intestines often get into the blood, then ugly pimples may break out.

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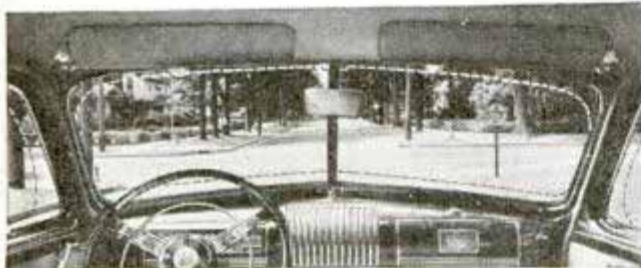
N-LARG-O MFG. CO., Dept. R-2353, Cincinnati, Ohio.

(Continued from page 158A)

end lines are characterized by a sweeping curve. The trunk has entirely disappeared from all Chryslers, in favor of a concealed luggage compartment, another trend in the industry. Studebaker and Nash offer new ideas of design, both with considerable appeal to the eye. The Graham retains its "Spirit of Motion" lines of 1938, giving the appearance of traveling at high speed even while it is motionless. Packard clings to its traditional styling.

Chrysler introduces a new safety speedometer, the indicator of which is illuminated when instrument lights are on. From a standstill to thirty miles per hour, the legal speed in most city driving, the light shows green. From thirty to fifty, it is amber and at fifty, it changes to a brilliant red. Thus the driver is constantly reminded of the speed at which he is traveling, and warned when he approaches a dangerous pace.

Constant-speed electric windshield wipers are another Chrysler feature. Entirely



Dotted line shows area of 1938 windshield, which was much smaller than that of 1939

independent of engine action, the wipers are thus free of the vagaries of the vacuum type.

First to offer a direction signal as standard equipment is Buick. This device enables the driver to indicate to motorists in the rear that he is about to turn. The indicator lamp, located in the center of the luggage compartment door, is clearly visible from the rear at all angles. When the driver wishes to indicate a turn, he flips a switch mounted on the steering-post shift lever, without removing his hand from the wheel. This illuminates a modified arrow in the left or right end of the indicator lamp, depending upon the direction in which he expects to go. The lamp is the flashing type. Very close to the switch and visible through a small lens in the shift lever is a small green pilot light which

(Continued to page 162A)

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HEARD
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like it"



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Ortho-technic Model

Built on new principles in hearing aid design—scientifically adjusted after Audiometric tests—Western Electric's new Audiphone enables you to hear clearly in group conversation, greatly widens your hearing circle. It has greater power; longer battery life; air or bone conduction; no "cut-off" in any position. *Try it!*

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Groceries, markets, restaurants, taverns, do the retailing for you. WE HELP START YOU IN BUSINESS.

Great quantities of Chips are eaten daily. Profit large—unusually so. You can start this money-making business on a "next to nothing" outlay of cash. Write for Potato Chip Booklet.

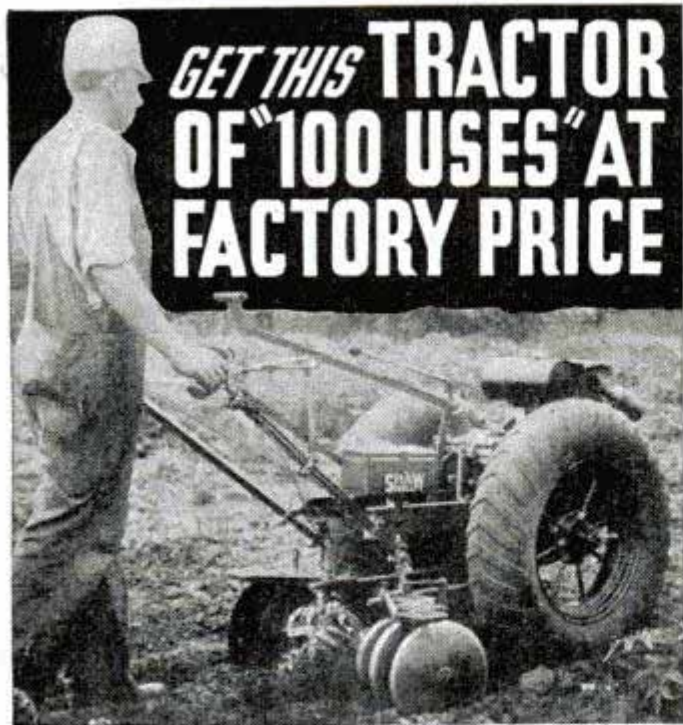


LONG-EAKINS COMPANY
1228-S High St., Springfield, Ohio



4119

(Continued from page 161A)



GET THIS TRACTOR OF "100 USES" AT FACTORY PRICE

DOES WORK OF MANY MEN OR 2 HORSES!

Here's untiring speed and power—that gets field and belt work done on time! Smallest size does work of many men—saving wages. Larger sizes do work of 2 horses or mules—quicker, cheaper, more efficiently—saving costly animal keep. Runs all day for 33c. Greatest time, labor and money-saver made!

"Tractor of 100 Uses"—Does all field, road, belt work. Plows, discs, harrows, furrows, seeds, cultivates, harvests, mows, rakes, cuts tall weeds, hauls. Runs washing machines, feed grinders, corn shellers, light plants, saws, concrete mixers, water pumps, lathes, other belt machinery. Does deep mold-board plowing, other heavy work. **Amazing money-maker** for farms, truck gardens, nurseries, orchards, suburban homes, golf courses, parks, etc.

SHAW GARDEN TRACTOR

New 1938 Model Has 3 Speeds Forward, and Reverse. Special to Order, 6 Speeds Forward—runs from 1/4 mile to 15 miles per hour. New Power Turn enables Shaw to turn in its tracks with no lifting or pushing. Reverse Gear makes it easy to work among rocks, roots, in close quarters. Tool Attachments for different uses. Convenient Jiffy Hitches. Improved Tool Control gives tools a wider range of movement . . . increases tractor's usefulness. Briggs & Stratton air-cooled, 4-cycle engine. 4 Models, 2 to 5 H. P., Walking and Riding Types.

Available With Air or Steel Tires. Air tires save 25% fuel. Enable Shaw to do more work in a day. Provide better traction. **LOW FACTORY PRICE!!** Mail Coupon for details of price and terms today!

10-DAY TRIAL FREE BOOK!

OFFER! Use on your own work for 10 days. Know how Shaw makes you much more money—with less work and trouble! Mail Coupon for details 10-DAY TRIAL OFFER today! Explains everything about Shaw. Tells what enthusiastic owners say. Shows photos of tractors in use. Gives LOW Factory Prices on 4 different size models—with different attachments. Mail Coupon today!



AGENTS—wanted. Liberal proposition. Mail Coupon for full information.

FREE BOOK COUPON

THE SHAW MFG. CO. (Address Nearest Office)

4512 Front St., Galesburg, Kans.; 5812-G Magnolia Street, Chicago, Ill.; 130-G West 42 St., New York, N. Y.; 608-G No. Fourth St., Columbus, Ohio.

Send me FREE information at once about the Shaw "Du-All" Garden Tractor as checked below:

- FREE Book and Low Factory Prices
- 10-Day Trial Offer
- Liberal Agent's Proposition

Name.....
 Address.....
 Town..... State.....

When writing please mention Popular Mechanics

flashes in unison with the flashing signal, when the switch is on.

Another feature is an inside lock which prevents sneak thieves from forcing open the front ventilator windows.

New efforts to make the interior of the automobile more comfortable are evident. Studebaker introduces a ventilating filtering and heating system. Positioned beneath the front floor pan, the unit draws outside air from above the running board at the left. This air is filtered, passed through the core of an efficient heater, and discharged beneath the front seat where suitable apertures distribute it between front and rear compartments to provide equal comfort to all occupants. In warm weather the hot-water supply can be shut off and the unit used to draw in fresh, cool, filtered air. Windows may be kept tightly closed, important during rain or dust storms.

Nash offers the "Weather Eye"—a device which automatically brings living-room comfort to automobile interiors during the cold months of the year. Brought in through the cowl ventilator, fresh, outside air enters the winter conditioning unit under its own pressure. Moisture is removed by "rain shedders" and the air is carried through the filter where it is cleaned of dust and soot, past the motor-driven fan, which can be used to maintain circulation when the car is moving slowly or standing still, through the heating element and into the car. A thermostat dial enables the driver to "tune in" the car comfort level desired, from "cold" through "medium" to "hot" or at intermediate points. Once the dial is set, the weather eye automatically keeps the car at this level.

A "sunshine" top, the roof panel of which slides back to provide vision upward and to let in the sun's rays, is an optional feature on certain models of Buick, LaSalle and Cadillac. The sliding roof, operated from the inside, is drip and rainproof.

Hupp enters the market with two Junior models, fitted with bodies quite similar to those on the discontinued Cord.

With the Mercury "8," Ford enters the medium-price field. The Mercury will have hydraulic brakes, an engine with more power than the Ford and other improvements. Use of hydraulic brakes on the Mercury is indicative of Ford's swing away from the mechanical brake.

GRAB HOLD OF THOSE JOBS WITH "HORSEHIDE HANDS"

THEY'LL STAY SOFT... BECAUSE THEY'RE
WOLVERINE FULL GRAIN HORSEHIDE



Style No. 569

THE thick, soft Wolverine Horsehide in these handsome work gloves will give you months of extra wear—and an exclusive tanning process makes it impossible to harden their leather! Sewed with 4-cord work-shoe thread that you just can't rip! Made by the makers of Wolverine Shell Horsehide work shoes. If your dealer can't supply you send us 75c and your dealer's name—we'll mail your gloves post-paid. Ask for No. 569. Sizes 8 to 12.

Wolverine Shoe & Tanning Corp., Dept. W50, Rockford, Mich.

DEALERS: Offer your Customers genuine Wolverine Full Grain Horsehide Work Gloves. Fast selling—nationally advertised. Write for catalog and tested sales plan for new dealers.

WOLVERINE HORSEHIDE WORK GLOVES

GROW PLANTS WITHOUT SOIL

Startling New
Development

Complete Directions for Small and Large Scale Growing

technique which everyone is talking about. Three methods described—Water Culture, Sand Culture, Sub-Irrigation. Explains all operations. Tells how to make containers and nutrient solutions from raw materials at small cost—how to grow flowers, vegetables and fruits without soil. A fine hobby and a money-saving investment for city dwellers. A source of new business for gardeners, nurserymen, etc. Only book of its kind. Order today "Soilless Growth of Plants." Sent postpaid for \$2.75.

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SAVE ME!

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Don't live with crippled furniture, chipped veneers, splintered mouldings. It's fun "doing them over" with Rogers! Made only from cod fish skins. Stays put longer because it's stronger. 10¢ and up in tube, bottle or can at hardware stores, or send 10¢ for full size bottle and set of project plans.

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New Catalog FREE! Also bargains. Straight, square axles for Fords, Chevrolets, etc. \$4. Drop axles, \$7 up. Undercarriage with axle, hubs, bearings, wheels, springs and fittings, \$19.50. BRAKES: Cable-controlled, \$15. Booster and car control, \$19.95. Electric brakes—prices on request.

SHAMROCK TRAILER PARTS, 12321 Turner, DETROIT, MICH.



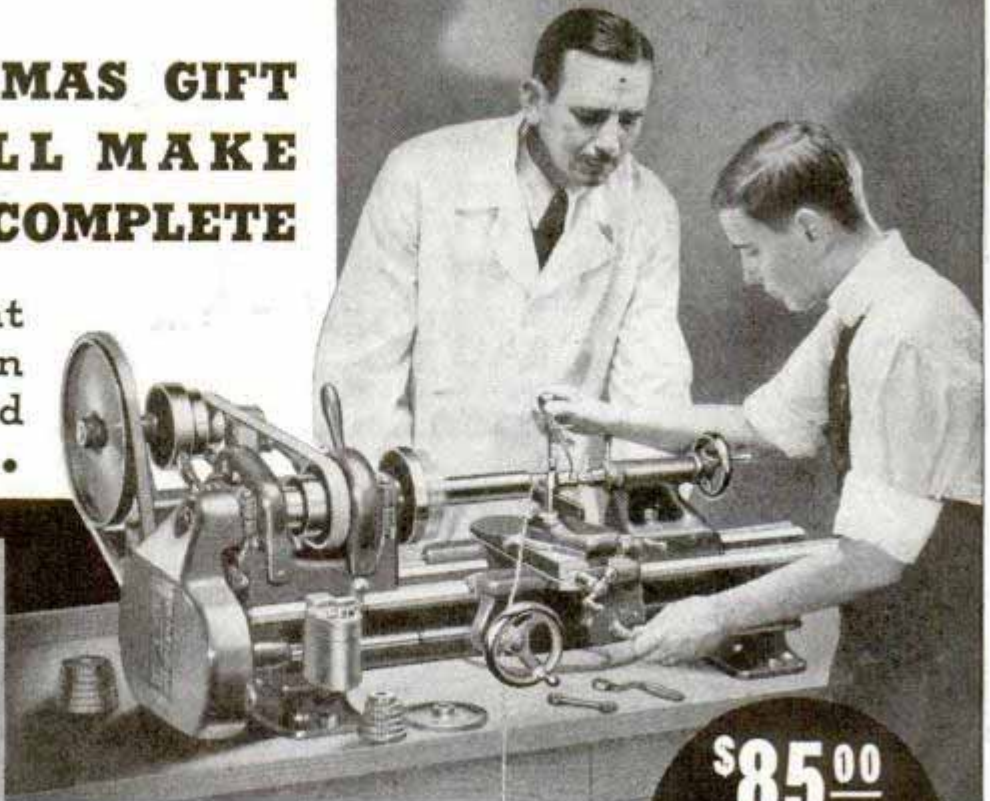
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Cup unlocks—SNAPS OPEN by pressing a button on your dash. **STOPS THIEVES—PROTECTS YOUR CAR—IMPROVES ITS APPEARANCE.** A money maker—every garage and filling station a potential dealer. Write immediately for exclusive distributorship proposition.

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THE IDEAL CHRISTMAS GIFT FOR FATHER
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No. 415-YA, 9 1/4" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Drive, 1/4 H.P. Reversing Motor, Switch, Belts, and Adjustable Belt Tension Countershaft. **\$117.00**
Wt. 320 lbs
(\$15 down—\$7 mo. for 18 mo.)

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THE SOUTH BEND BACK-GEARED, SCREW CUTTING METAL WORKING PRECISION LATHE

A Universal Lathe of Highest Quality and Accuracy for doing Model Work—Home Workshop Projects—Tool and Instrument Repair—Gunsmithing—Engineering Jobs—Inventive Work—Auto Repair—Electrical and Radio Service—Laboratory Work—General Shop Repair—and Metal Working Operations of All Kinds.

Send Coupon FOR THESE BOOKS

"How to Run a Lathe"—128 pages, 350 illustrations on lathe operation and valuable shop hints.

Catalog No. 46-A—illustrates, describes and prices 9" lathes in 3', 3 1/2', 4' and 4 1/2' bed lengths and 8 drives.

"The Home Workshop"—32 pages showing interesting shop views, equipment and shop instruction.



THE South Bend 9-inch Workshop Lathe is a gift to please any man or boy mechanically inclined. Besides a tool which will perform practically every metal working job in the shop, the 9" Workshop Lathe is a fine, precision machine. Accuracy—speed—and durability are designed and built into the 9" Lathe with all the skill and experience our 32 years of building fine lathes can produce.

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Used by well-known manufacturers in this country and abroad. The exacting requirements to which the 9" Lathe is held in doing tool and die work, production operations, etc., is proof of its accuracy and quality.

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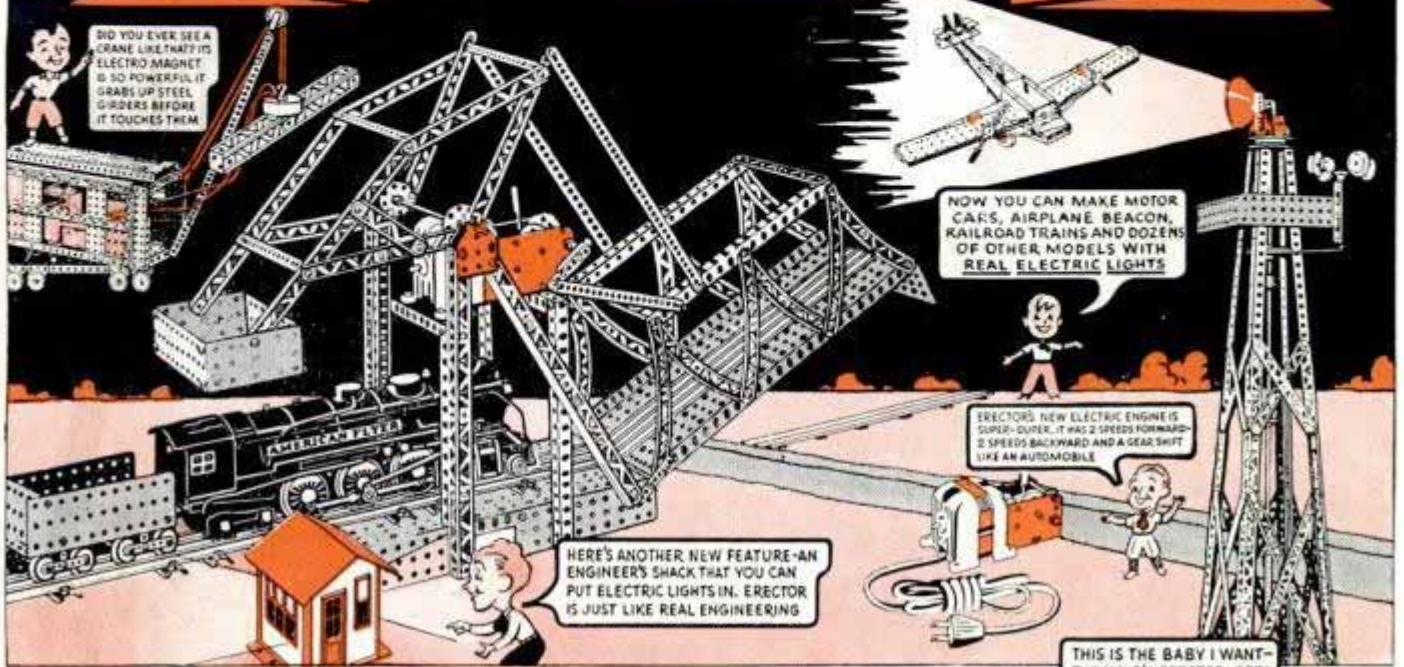


HELLO BOYS—the sensational new ERECTORS ARE ALL LIT UP!

WOW! ERECTOR'S GONE ALL-ELECTRIC—Electric lights—4 speed Electric engine—Electro magnet



DEVELOPED AT THE GILBERT HALL OF SCIENCE



BOYS! Leading toy stores are showing a sensational new kind of Erector this year. An Erector that makes model-building more fun than the movies—more exciting than a football game. Because Erector has gone ALL-ELECTRIC.

Now, for the first time, you can build a revolving airplane beacon with real electric searchlight—construct electrically lighted railroad trains, Ferris wheel, airplanes, motor cars,—erect electric bridges that open and close—make mighty cranes that grab up steel girders by electro-magnetic power.

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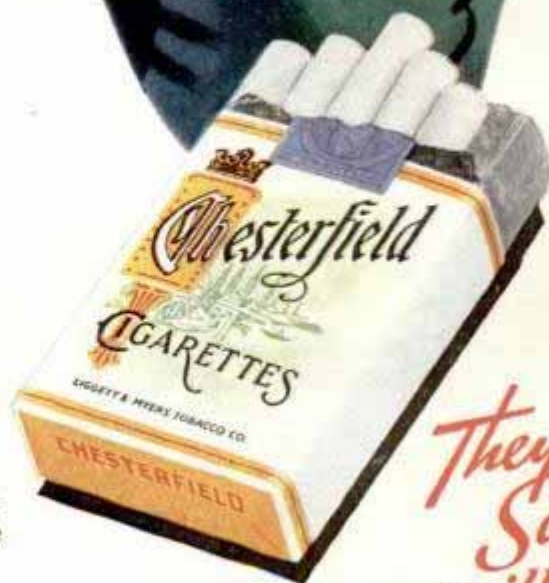


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