



**POPULAR  
MECHANICS**  
MAGAZINE



**MAY  
25 CENTS**

SEE PAGE 706

**TELEVISION ROUNDS THE CORNER**

A D E

THAT WAS A NASTY BLOW-OUT ACCIDENT BACK THERE . . . BLOW-OUTS ARE THE WORST ROAD HAZARD TODAY . . .

DON'T BE SO SURE OF THAT . . . I THINK SKIDS ARE MUCH WORSE THAN BLOW-OUTS



## Why Argue? New Goodrich Tire Protects Against BOTH Skids and Blow-outs

1 MINUTE TO READ THIS MAY SAVE YOUR LIFE

● Skids! Blow-outs!—both are dangerous—both pack dynamite!

Yes, and that's all the more reason why you need this new Goodrich Safety Silvertown. Because here at last is a tire that gives you every great life-saving tire feature you can name—real protection against *both* skids and blow-outs.

### Quickest Non-Skid Stops

'Way up the list of safety features in this new Silvertown is the Life-Saver Tread that acts on wet roads like a battery of windshield wipers—leaves a track so dry you can actually *light a match* on it! And when a pavement is swept *that* dry, no wonder this tire will stop you quicker, safer than you've ever stopped before!

And, adding one safety feature to another, this Silvertown gives you the new, improved Golden Ply. By resisting internal heat, this *exclusive* Golden Ply provides scientific protection against high-speed blow-outs.

Don't take chances with either a skid or a blow-out—especially when you can get this safety *right now* on the liberal Budget Plan available at Goodrich Silvertown Stores and many Goodrich Dealers—and set your own long, easy terms.



Special Offer!  
10¢



YOUR LICENSE PLATE  
ON A KEY CHAIN

See your Goodrich Dealer or Goodrich Silvertown Store and ask them to get you one of these reproductions of your own license plate. Only 10 cents to cover cost of handling.

# The new Goodrich SAFETY Silvertown

SEE JIMMIE LYNCH'S "DEATH DODGERS" AT THE GOODRICH ARENA . . . N. Y. WORLD'S FAIR

# Best Features, Best Ride *Best Buy* of "All Three"

NOW SEE WHAT EACH  
LOW-PRICED CAR GIVES  
FOR YOUR MONEY

1. See the 1940 Quality Chart to discover what each of "All Three" low-priced cars gives you in size, luxury, economy, comfort—in fine-car engineering.
2. Take Plymouth's Luxury Ride... you'll realize what extra quality means to you.



YOU'LL BENEFIT FROM THIS  
"ONE-TWO" COMPARISON

1. SEE THE  
QUALITY CHART
2. TAKE THE  
LUXURY RIDE

OF 22 IMPORTANT FEATURES FOUND IN HIGH-PRICED CARS—

*Plymouth has 21... Car "2" has 11... Car "3" has 8*

CAR VALUE can be measured! In "One-Two" order you can compare size, features, comfort.

You'll find that Plymouth alone, of "All 3" low-priced cars, gives you a majority of the 22 big features found in high-priced cars.

See the 1940 Quality Chart at your Plymouth dealer's. Then take Plymouth's Luxury Ride. Plymouth is easy to buy! Plymouth Division of Chrysler Corporation.

SEE THE NEW LOW-PRICED 1940 PLYMOUTH COMMERCIAL CARS!

COUPES START AT	SEDANS START AT
<b>\$645</b>	<b>\$699</b>

—DELIVERED IN DETROIT, MICH., including all standard equipment. Prices include all federal taxes. Transportation, state, local taxes, if any, are not included.

## PLYMOUTH BUILDS GREAT CARS

# MILD & SWEET

TO THE  
END OF THE  
RUN!

PETER OSBORNE, *Engineer*  
JOHN F. ELLIOTT, *Fireman*  
CRACK CREW OF THE N. Y. CENTRAL'S  
"20th CENTURY LIMITED"



Every pipe of Velvet is scheduled to smoke *right* . . . made from finest Kentucky Burley tobacco in America's most up-to-date tobacco factory. Velvet's the right word for smooth smoking . . . that means *it's mild and cool* . . . "no bite."



# Velvet

*the Right Word  
for Smooth Smoking*

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# Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

May, 1940

Vol. 73, No. 5

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## Navy Fliers Earn Their Wings

FROM the ground it looked easy. That "V" of flying boats roaring over your quarters at the naval air school seemed to be drilling through smooth air like three giant planes welded into one. But now the air seems as turbulent as that terrifying ocean beneath you, and you clutch the stick of your training plane with a tense fist. Orders pour into the gosport helmet faster than you can listen. Pull the nose up! You were heading for the bay. The June Coloroto section, with its eight pages of color photos of "Our Flying Navy," will take you to Pensacola and start you on your way to winning the coveted Wings of the Navy.

## Job Hunting in Test Tubes

FRONTIERS have shifted. Instead of staking out a homestead, young men today pioneer in the research laboratory. A Harvard student developed a new Polaroid glass, now runs a factory making it. Another college boy invented a quick-starting tube for fluorescent lamps. An article next month tells how young men are creating their own jobs today.

## Next Month

WHEN we really need it, engineers will bore four miles into the earth for oil. Already they have drilled down 15,000 feet, where the temperature is 300 degrees Fahrenheit, any water they hit is boiling, and the earth is under a pressure of 6,000 pounds per square inch. They have to pump mud down through the drill pipe at 800 gallons a minute to wash up the chips and debris. In June you'll read about the new tools and technique that are ready to go 20,000 feet down for oil.

## 500 Miles to Go

SOME racing driver will have to average pretty close to 120 miles an hour to win the annual 500-mile classic at Indianapolis on Memorial Day. Next month we're giving you a preview of the speedsters that are being "souped up" for the event. What the drivers want most of all is a car rugged enough to stay away from the pits, for repair stops mean lost laps. Two of this year's racers will be powered by engines salvaged from cars wrecked a year ago.

## Camera vs. Crime

CAUGHT wearing a shirt from which he had washed the blood stains of his victim, a New York murderer was convicted by the camera. The stains were invisible to the human eye, but the camera saw them. More and more it is becoming the prosecutor's star witness. A June story reveals a number of cases in which the camera was the master detective.

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

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Extensive Repairs and Expensive Bills are Eliminated by Pyroil. When you Use Pyroil You Get Continued Better Engine Performance, Longer Useful Engine Life, and Indefinite Postponement of Many Engine Troubles.

This Spring, thousands of owners of cars are thankful for Pyroil. They have escaped big repair bills following the roughness of winter driving. They will say goodbye to engine troubles and repairs throughout all spring and summer, too. For Pyroil gives dependable protection against many operation troubles the year around. It constantly safeguards against *acid-corrosion* attack and damage on metal parts. Against carbon, gum and sludge formations. Against heating, friction, wear—repairs.

It is extremely simple to use Pyroil . . . a product famous the world over for its exceptional accomplishments. You merely add a *few ounces* to the gasoline tank and to the crankcase of your car. It costs only a few cents. It often saves many dollars. Ask at your favorite service station or garage for a trial Pyroil service, today. Manufactured and guaranteed by Pyroil Company, W. V. Kidder, Founder, 55 Pyroil Bldg., LaCrosse, Wisconsin, U. S. A.

**FREE** Interesting Folder, "What Car Manufacturers Have To Say," also Free Booklet, "Questions and Answers about Pyroil." Mail coupon for these.



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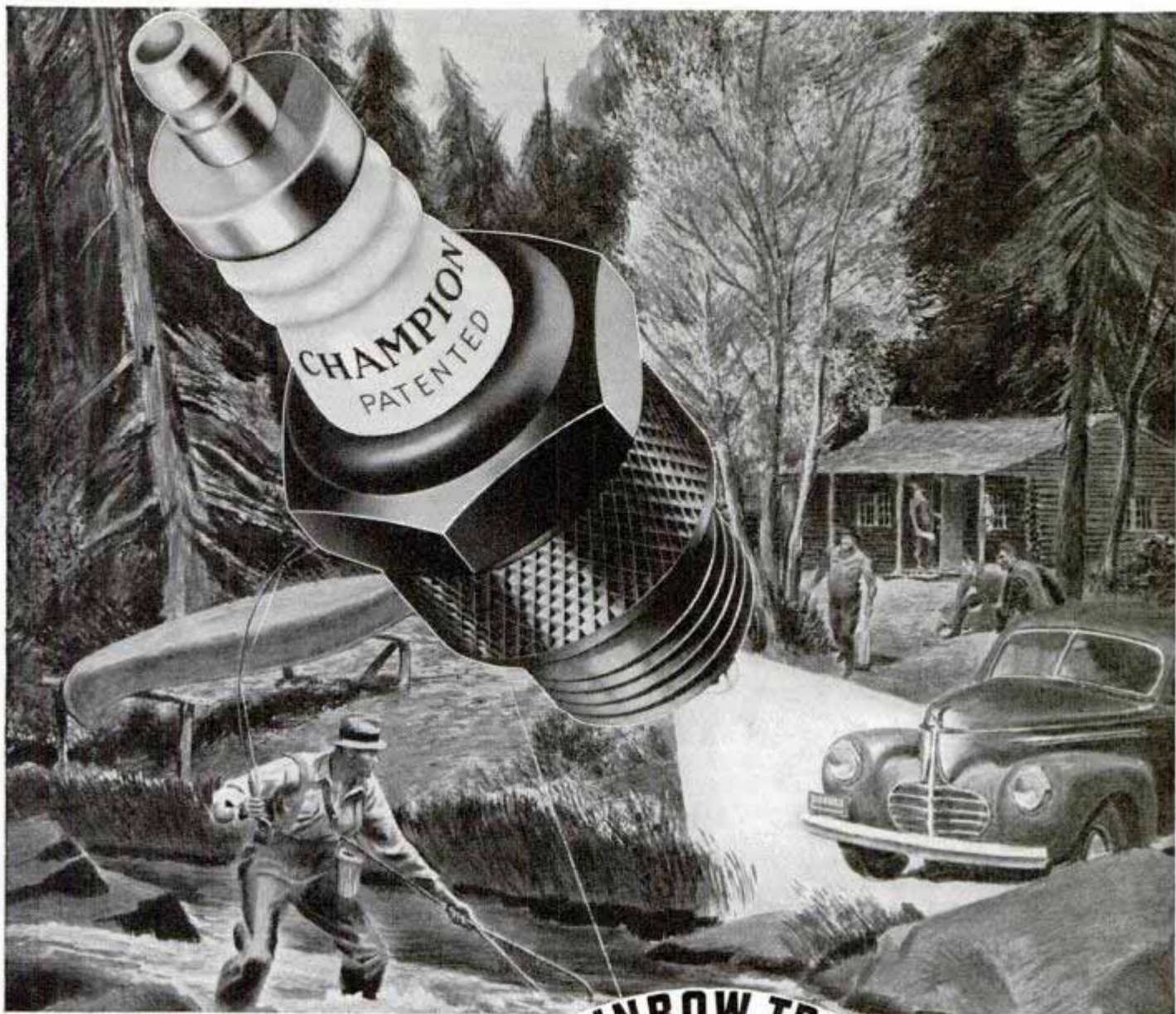
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# PUT YOUR CAR ON THE RAINBOW TRAIL WITH NEW CHAMPION SPARK PLUGS

## MODEL BUILDERS—ATTENTION!

### ACTUAL SIZE V-PLUG



65c

Champion Spark Plugs for model gas engines give the same dependable performance as the regular Champions. Sillment sealed. Sillmanite insulator. Alloy needlepoint electrodes for easy starting. One piece construction.

CHAMPION SPARK PLUG CO.  
900 Upton Ave. • Toledo, Ohio

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	5/32
Weight, Grams	8	3 1/2	2 1/2

YOU CAN chase rainbows—real or otherwise—to your heart's content with a car that's fit and ready to go—and there's nothing like a new set of Champion Spark Plugs to fit your car for any adventure.

Champions are more than ever today's spark plugs for today's high-compression engines, particularly because their exclusive Sillment seal prevents troublesome leakage common to ordinary spark plugs. Since even one "leaker" in a set will cause rough, uneven and wasteful engine operation, you appreciate how important this new development is.

This exclusive feature also makes each spark plug fire with absolute

uniformity in each cylinder by holding it rigidly within its heat range. Thus full, flowing power, speed and acceleration are kept at the maximum, while gas consumption is kept at the minimum.



Studebakers equipped with Champion Spark Plugs won all places in the Sweepstakes Class of the Gilmore-Yosemite Economy Run. Champion-equipped cars won 7 of the 9 divisions.

**"PICK UP AND GO" WITH NEW CHAMPIONS!**

# Movies MAKE YOUR HOBBY A LOT MORE FUN!

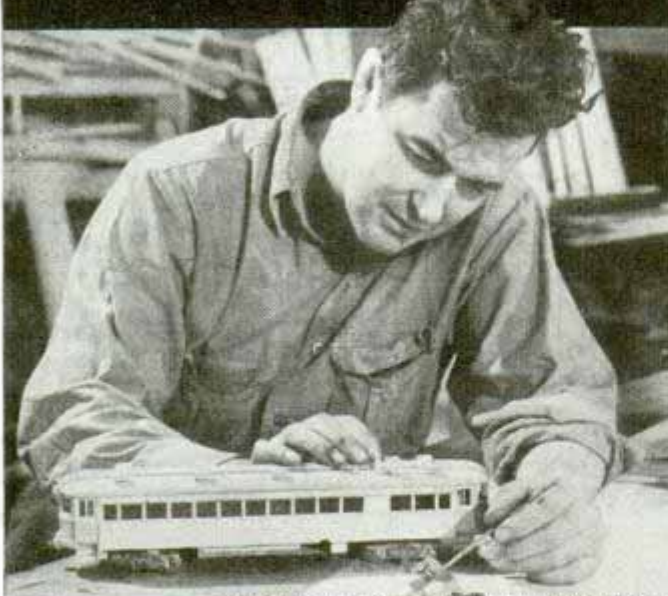


Photo Courtesy of "The Model Railroader Magazine"

**G**ET more fun from your hobby by recording it in Filmo movies. Do you go in for miniature railroading? Model airplanes? Woodworking? Metal working? Gadget making? Whatever your hobby, movies will record your methods, your progress, the performance of your products.

With a Filmo, even unusual movies are easy! Just press a button—*what you see, you get* . . . at snapshot cost! Superb results are certain, for Filmos are precision-made by the makers of Hollywood professional equipment—are basic cameras to which you may add accessories as your skill grows. Mail coupon for movie booklet. Bell & Howell Company, Chicago; New York; Hollywood; London. *Established 1907.*



**PALM-SIZE**  
*Filmo 8*

Makes Movies at Snapshot Cost

only **\$49<sup>50</sup>** EASY TERMS

Other models to \$1155



**FREE Movie Booklet**

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1844 Larchmont Ave., Chicago, Ill.  
Send free, 16-page booklet about making movies at snapshot cost.

Name.....

Address.....

City.....State.....PM 5-40

PRECISION-MADE BY  
**BELL & HOWELL**

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# Are You STILL in the DEPRESSION??

**T**IMES are better. Business is out of the rut—well ahead of a year ago. Millions of men have gone back to work. There's more money in lots of pay envelopes. But what good is that to you, if *your* pay check is still written in depression figures?

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

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

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

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

Since this plan brings results in bad times as well as

**LASALLE EXTENSION UNIVERSITY, Dept. 564-R, Chicago**  
**A CORRESPONDENCE INSTITUTION**

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

- |  |  |
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| <input type="checkbox"/> Higher Accountancy    | <input type="checkbox"/> Modern Foremanship      |
| <input type="checkbox"/> Traffic Management    | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Commercial Law        | <input type="checkbox"/> Business English        |
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| <input type="checkbox"/> Expert Bookkeeping    | <input type="checkbox"/> Modern Salesmanship     |
| <input type="checkbox"/> C. P. A. Coaching     | <input type="checkbox"/> Stenotypy               |

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

Address.....



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

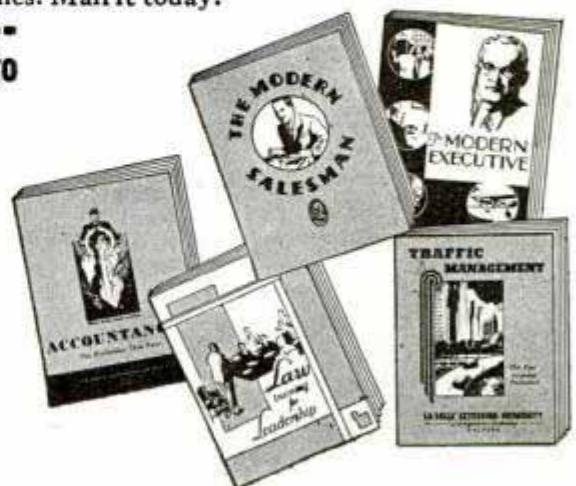
The LaSalle Success-Building Plan is made for men like you—men with courage, ambition, persistence, who need expert guidance to make the most of their efforts. But LaSalle supplies even *more* than that. Not only individualized training and coaching to help you meet today's crying needs . . . but also the very steps you may need to take to fill the job ahead, and force that pay raise *quickly*. Any

synopsis of this plan, which we might include here, could give you only a vague idea of this service. We suggest you mail the coupon for complete details on your own line of work.

## Today's Danger

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

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



This One





# a World of Sport in MOTORCYCLING

**A**dventure, action, thrills are yours when you ride a Harley-Davidson! You visit famous distant places; explore off-the-highway mystery spots; take wonderful vacation trips at little cost. Pal with "regular fellows" on club runs, gypsy tours, rallies — take in hillclimbs, races and other exciting events. See your Harley-Davidson dealer and get the whole story of this great sport.



## HARLEY-DAVIDSON

WORLD'S CHAMPION MOTORCYCLE

**Free**

**Send Coupon NOW**

HARLEY-DAVIDSON MOTOR CO.  
Dept. P. Milwaukee, Wis.  
Send FREE copy of big 24-page "Enthusiast" magazine filled with thrilling motorcycle pictures and stories. Also literature on the new 1940 Harley-Davidsons. Stamp is enclosed for mailing cost.

Name .....

Address .....

Clay tile keeps milk cool .....	740
Fruit jars labeled with crayons.....	746
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Picture molding prevents water blowing under door.....	752
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### IMPORTANT NOTICE

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

# State Has 425,000 Jobless— but Can't Find Skilled Labor

Record's Harrisburg Bureau

HARRISBURG, Jan. 23.—With private industry to train any apprentices during the lean depression years.

425,000 unemployed on its own waiting lists, the State Employment Service disclosed today Pennsylvania is facing the most shortage of skilled labor since World War I.

Other Jobs Open.  
Besides machinists,  
ment

**H**eadlines like this—and the human tragedies behind them—emphasize this fundamental truth:

Today, the TRAINED MAN—the skilled man—gets the highest reward and the best job. The untrained man has little security, small chance for advancement—in fact, he's fortunate to have a *job* of any sort!

I. C. S. students have faced facts—recognized their need for modern training—and set out to get it! They know that former I. C. S. students are today key executives in every business and industrial field. *They know that today's I. C. S. students will be tomorrow's leaders in Business and Industry.*

This coupon, checked and mailed today, will bring you information that's *vital* to your own success!

## INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 5574-J, SCRANTON, PENNA.

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

### TECHNICAL AND INDUSTRIAL COURSES

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

### BUSINESS COURSES

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

### DOMESTIC SCIENCE COURSES

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

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<p>The Wright brothers, long months after they actually had accomplished flight, still were baffled by the problem of how to turn a plane while it was flying. (1904)</p> 	<p>Thousands of schoolboys 14-16 years of age know more today about airplane design than the Wrights knew at Kitty Hawk.</p> 
<p>In 1900 . . . The High School Graduate was a person of distinction. Only one person in 800 had finished high school.</p> 	<p>In 1940 . . . More than a MILLION boys and girls completed high school. Graduates now are commonplace. High school is minimum educational requirement in most lines.</p> 
<p>In 1900 . . . Very few even thought of going to college, unless to enter one of "the learned professions." The number of college graduates in business and industry was so few that they formed practically NO COMPETITION in the average job.</p> 	<p>In 1940 . . . Almost exactly as many are being graduated from college, today, as from high school 40 years ago. Everywhere—in everything you do—in commerce, industry, personal affairs, you are up against the competition of COLLEGE GRADUATES.</p> 

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| <input type="checkbox"/> Diesel Engineering     | <input type="checkbox"/> Salesmanship              | <input type="checkbox"/> Aviation                 |
| <input type="checkbox"/> Drafting and Design    | <input type="checkbox"/> Air Conditioning          | <input type="checkbox"/> Electrical Engineering   |
| <input type="checkbox"/> Liberal Arts           | <input type="checkbox"/> Accounting and Auditing   | <input type="checkbox"/> Electrical Refrigeration |
| <input type="checkbox"/> Private Secretary      | <input type="checkbox"/> Architecture and Building | <input type="checkbox"/> Business Law             |
| <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Automotive Engineering    | <input type="checkbox"/> Retail Merchandising     |

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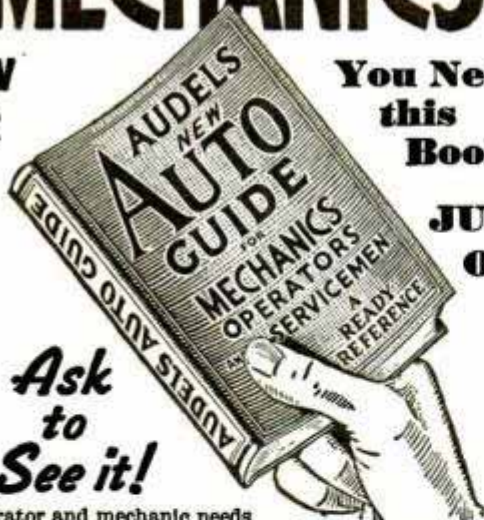
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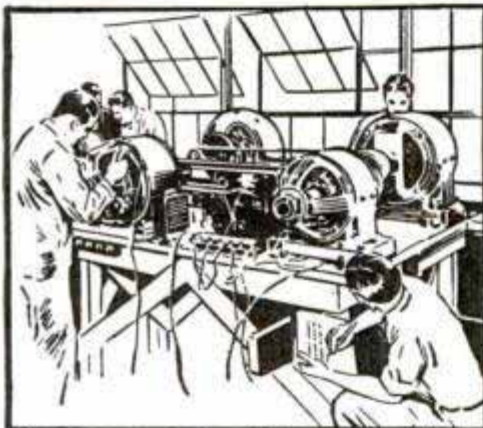
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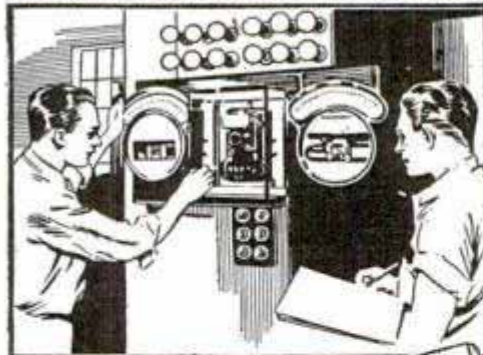
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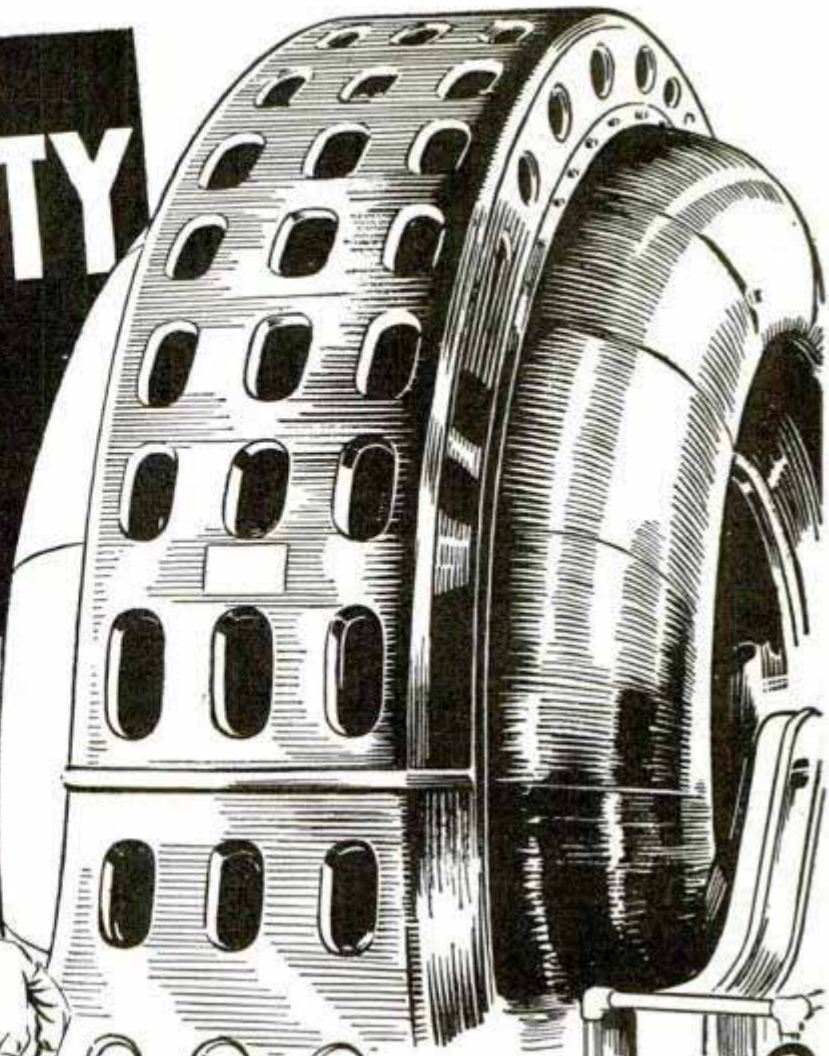
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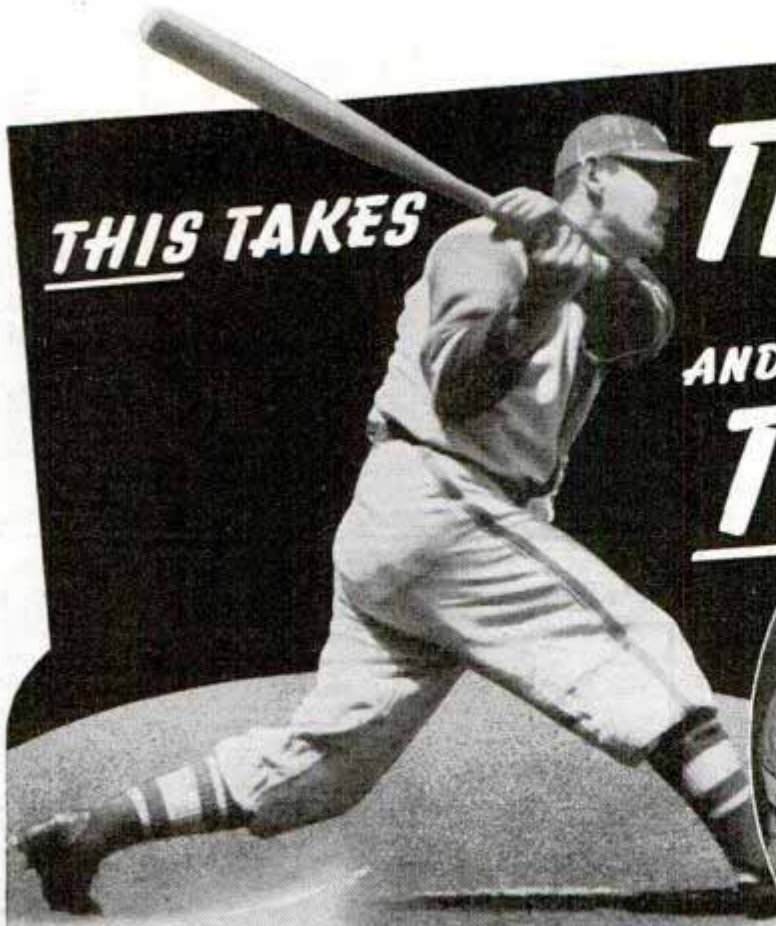


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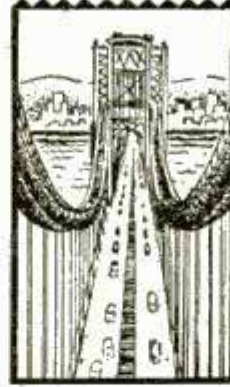
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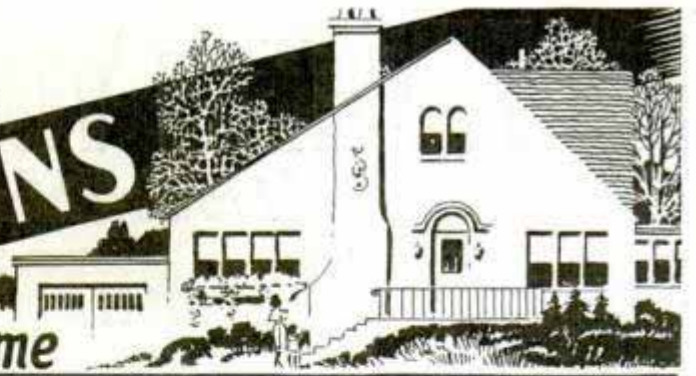
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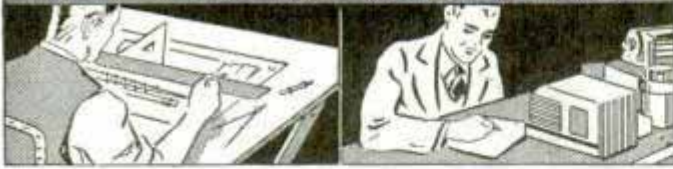
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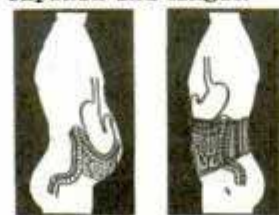
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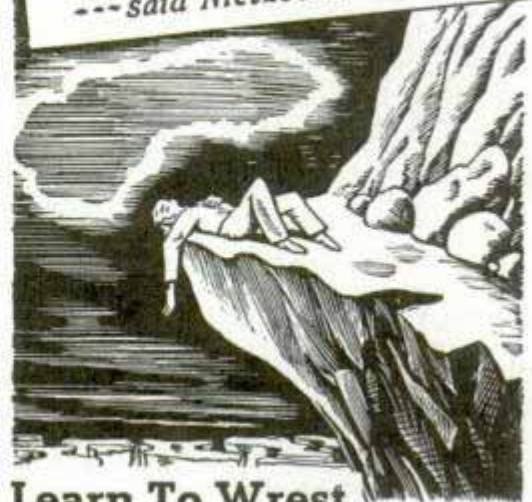


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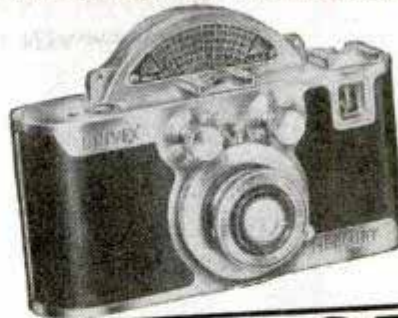


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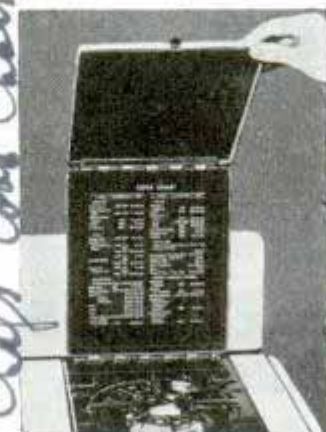
K 46 (Continued from page 20A)

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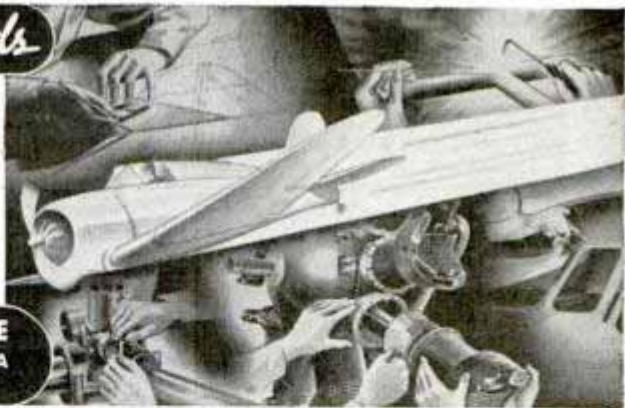
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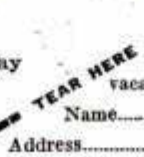
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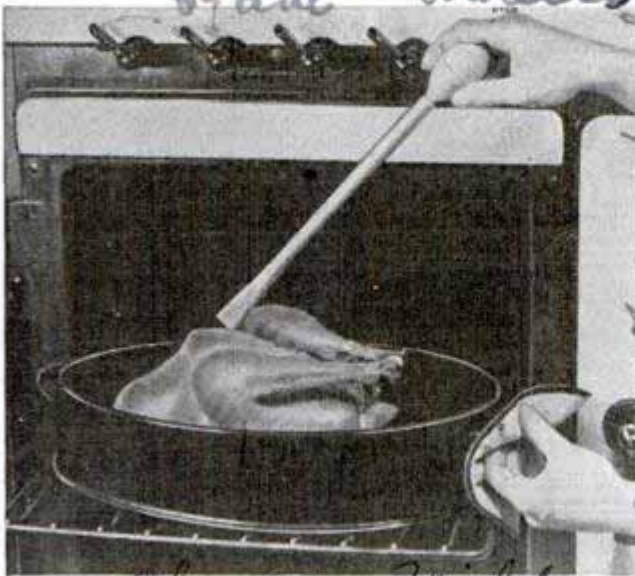
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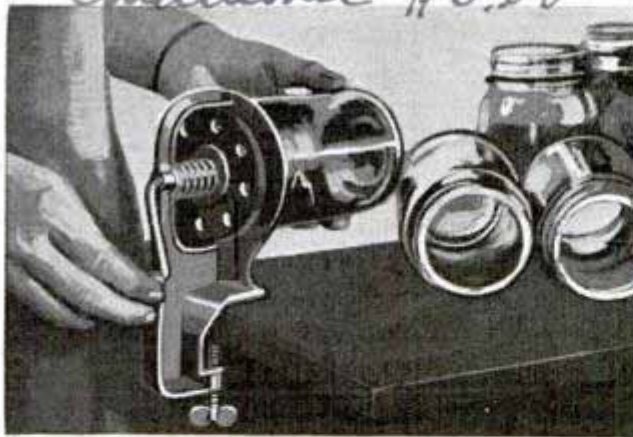
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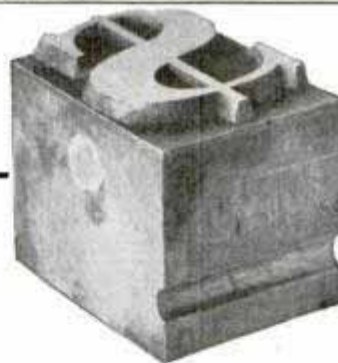
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**MIDGETS!** Racers, roadsters, motorcycles. Build yours with our guaranteed motors, wheels, parts, accessories. Bargain prices. Handbook catalog 90 illustrations, 20c. Midwest, Box 1959, Chicago.

**MOTORS.** Transmissions, axles, heads, gears, bodies, upholstery. In fact we can furnish you with any part, new or used, your auto may need, including 1940 models. Also automobile motors for boats. Write for prices. Trading Post, 2201-2207 Elmwood Ave., Buffalo, New York.

**ALUMINUM** Alloy pistons, automotive, aviation, diesel, industrial, marine, midget, model, motorcycle, outboard. Finished or semi. Judson Mfg. Co., Hedge and Gillingham, Philadelphia, Penna.

**CHANGE** Ford motor into air compressor. Instructions \$1.00. Tuck, 73 Shirley, Pontiac, Mich.

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

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**RECLEAN** Used oil. Complete instructions \$1.00. Hutchison, 2742 Hennepin, Minneapolis, Minn.

**RE-GROOVE** Tires. More and safer mileage. We supply equipment. Unlimited field. Profitable work. Small investment. Particulars. Anchor Tire Groovers, Eleven Washington Avenue, Irvington, New Jersey.

**BARGAINS**—Welders, compressors, battery chargers, car washers. Liberal trial terms. Write Hobart Equipment, Box M-5403, Troy, Ohio.

**GAS-SAVER** \$1. Blueprint 50c. Dept. PM, 561 Paramount Bldg., Los Angeles.

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

**BOOK** Of 100 practical mechanical electrical conversions, \$1.00. Practical Methods, St. Paul, Minn.

**1940 IGNITION** Supercharger. E. G. Sales & Mfg. Co., New York.

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

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**ALL** About trailers, construction, parts, supplies, etc. 64 pages vital information for anyone interested in home trailers. Send 25c. Stepes Co., 2800 14th, Kansas City, Mo.

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

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

**RECONDITIONED** Motorcycles. New—used parts for all makes. Authorized Harley-Davidson dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

**ALLOY** Pistons \$3.00—Harley, Indian, Henderson, Excelsior, Cleveland. Cylinder grinding, rings, bearings, gaskets, chains, sprockets, helmets, goggles, accessories, parts new and used for less. Catalogue and wings pin 10c. Ballak, 1115 Chestnut, St. Louis, Mo.

**MOTOR** Marvel ready! Mead's sensational new Ranger Scooter goes 120 miles per gallon, 30 m.p.h., ride, rent or sell for profit, pleasure. Dealers, agents write for special introductory offer, easy terms, free circular. Hurry! Mead Cycle Company, Dept. O-1, Chicago.

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**BICYCLE** Motor. Push-a-Bike outboard motor, complete with pneumatic tire, ready to attach. Dept. P, Richburn Company, Aurora, Missouri.

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**BUILD** Motorscooter with sturdy Comet parts. Frame, fork, handlebars \$9.95. We supply wheels, engines. Literature drawing 10c. Comet Cycle Co., Madison, Wis.

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**NEW** Speedy motorscooter sensationally easy to build. Steel kit \$3.95. Guaranteed wheels, motors—bargain prices. Catalog, 80 illustrations 20c. Mid-Motors, Box 1959, Chicago.

**BUILD** Sensational motorscooter speedster! Amazing new design makes our prices lowest in America. Fork \$2.95, etc. Rush dime for complete plans, price list. Zipscoot, 3622 North Troy, Chicago.

**BICYCLE** And parts catalogue free. Coupon for identification plate with your name engraved in gold. Fastens to bicycle. Krause Supplies, St. Clair Shores, Mich.

**MOTORSCOOTERS.** Midget cars! Easily built. Complete plans and literature on motors, wheels, tires, attachments for motorizing bicycles, etc. 10c. Honsakers, Masontown, Penna.

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**KNUTH'S** Motorcycle bargains. Lowest prices. Bulletin 10c. Prompt service on repairs, parts, accessories. Harley-Davidson factory dealer. Knuth's, 2491 Fondulac, Milwaukee, Wis.

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**WINDING Data 200 automobile armatures \$1.00**. Sabina Armature Works, Sabina, Ohio.

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**FURNACE Blowers \$22.50**, 13" wheel. Also larger sizes for cooling, air conditioning. 2,500 CFM to 30,000 CFM. \$47.50 to \$265.00. Variable speed control, belts and pulleys included. Reynolds Mfg. Co., Grand Rapids, Mich.

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**KNOW Your plumbing**. 405 page book of valuable data—formulas, drawings, tables, sketches on layouts, estimating, installing, ordinances, joint wiping, etc. Price \$2.00. Johnson Plumbing Supply Company, 3647 South Halsted St., Chicago.

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**75-200 AMPERE Welders** from old generators. Complete plans 35c. Plans show single and dual welder connections. LeJay Manufacturing, 347 LeJay Building, Minneapolis, Minn.

**BARGAINS**, Demonstrator arc welders, gasoline and electric drive. Liberal trial, easy terms. Write Hobart Welder Exchange, Box M-5402, Troy, Ohio.

**POWERFUL Dodge generator welder**. No rewinding. Good cheap reactor. No rewinding connection to auto engine. Plans \$1.00. Clarence Barcus, Farmersburg, Indiana.

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**POWERFUL A.C. welder, kits, plans \$1**. Marvelweld, Box 1156, San Francisco.

**D.C. Arc-welder plans \$1.00 each** (three for \$2.00). Build it yourself without rewinding armature. 25-200 amperes from farm light plant generators. 25-200 amperes from Northeast Dodge automobile generators. 25-600 amperes from d.c. vehicle motors originally storage battery driven. Welders Club, AIB-3432 M-Mart, Chicago. For sale: D.C. vehicle motors, supplies, etc.

**WELDERS**, New and used. Write Lincoln Electric Company, Cleveland, Ohio.

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

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**BARGAINS—Welders, electroplating, motor generators**, guaranteed, liberal terms. Write Hobarts, Box M-5404, Troy, Ohio.

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**SMALL Elect. motors**, with flexible shafts \$3.25 postpaid. McConnell, 1619 Edgewood, Racine, Wis.

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**RELIABLE Motor winding books**, Lessons, connecting diagrams, winding data. Introductory data selection. \$1.00. Motor Data Co., Box 7631, Kansas City, Missouri.

**THREE To ten KVA alternating generators**. Motors, converters, State your needs. Queen City Electric, 519 South California, Chicago.

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**BUILD Your own machine tools**. Castings and blue prints at nominal cost. Send 10c for 2 color 28 page catalog, 34 prints covering 12 metal-working projects, \$1.50. 23 prints covering 6 wood-working projects, \$1.00. Lewis Machine Tool Co., Dept. M-5, 1000 Alhambra Ave., Los Angeles.

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**BUILD** Electric outboard from automobile generator. Smooth—quiet. Uses car battery. Complete plans 10c. LeJay Manufacturing, 547 LeJay Building, Minneapolis, Minn.

**KAYAK** Construction kits. New designs in lightweight canvas kayaks and canoes. Nine to fifteen feet from \$9.95 to \$39.50. Also sold assembled. Mail time for literature. Jamestown Specialty Co., Dept. P540, Titusville, Penna.

**BUILD** A boat by the Welch system. It's inexpensive, interesting and profitable. Everything for building, equipping or repairing boats. Use Welch ready cut parts. Send 10c for catalog showing boats of many types; boat hardware; propellers; marine paints; sails; boat finishing materials and Welch White Cap marine motors. Welch Boat Company, Station K-1, Milwaukee, Wisconsin.

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**BUILD** Your own boat with Bay City prefabricated frames and materials. Save up to 2/3s. Lumber, fittings, engines and equipment. Illustrated catalog 100 boats 9 to 75 feet 10c. Bay City Boats, Inc., 1552 Adams St., Bay City, Mich.

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

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

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**ARCHERY** Kits complete, everything that's needed. Krons-Noble Co., Kenosha, Wis.

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**HOOT** Indian twin spinner—goes deep among the big ones—weedless—legal—\$1.00 postpaid. Hootspinner, 4629 Kingswell Avenue, Los Angeles, Calif.

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**BINOCULARS**, Telescopes cleaned, repaired. New and used glasses for sale. Send glasses for estimate. W. M. Belz, Opticians, 2 E. 44 Street, New York City.

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

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

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**INVESTIGATE** The Highlands of Southwestern Louisiana. Gently rolling, well drained, at low prices on cash rental terms. Descriptive book sent without obligation. Long-Bell Farm Land Corporation, 851 R. A. Long Building, Kansas City, Mo.

**GOVERNMENT** Land—10c acre up. Information all states 25c. Nat. Tax Service Bureau, 1036A Majestic Bldg., Detroit.

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

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**BUILD** And install own attic cooling systems. Profitable. Box 85, Osceola, Ark.

**BUSINESS** Proposition resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write Sprinkle, Plater, 288, Marion, Indiana.

**MAKE** Money—Others do—Collecting reptiles, toads, frogs. Easy! Profitable! Sure! We buy all varieties. Particulars dime. Biological Research Laboratories, Dept. 2B, Little Rock, Arkansas.

**SPARE** Time profits taking magazine subscriptions. Complete details free. New York Circulation Service, 30 Church Street, New York, N. Y.

**UNEMPLOYED?** Need work? Write H. Foster, Mount Ayr, Iowa. (No selling.)

**OPERATE** Rental libraries! Profitable, dignified, steady income. Write for free folder. B&B, 218 West Gold, Albuquerque, New Mexico.

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

**GREAT** Money making opportunities. Write. George Clark, Thorne, North Dakota.

**LIKE** Afternoons free? Work home! 12,000 word surprise literature free! National, Box 1240-U, San Bernardino, California.

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**MEN—Women**, operate "specialty candy factory" home, all or spare time. Opportunity for good steady income. (Our 31st year.) Ragsdale Candies, Drawer 62, East Orange, N. J.

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**BINGO**—Money maker for organizations. 100 card game complete \$1.00. Warwick Press, Conimicut, R. I.

**PHONOGRAPH** Records—Twelve, \$1.00. Paramount, 358-AB East Market, Wilkes-Barre, Pennsylvania.

**PUZZLEKLUB**. Get membership, world's toughest puzzle, 25c. Puzzleklub, 854 Plymouth Bldg., Minneapolis.

**TRICK** Chalk stunts. Catalog 10c. J. Balda, Cartoonist, Oshkosh, Wisconsin.

**SELL** Your game! If you have devised a new game and want to market it, send 3c stamp for particulars. Trend Games, Highland Park, Ill.

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

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**FREE** Guide to all leading magazines. Frank Davis, So. Macon St., Fort Valley, Ga.

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**HUNDREDS** Panning, digging gold! Big placer-deposits untouched. Learn prospecting, panning, sluicing. New, illustrated treatise, with maps showing localities, valuable gold-diggin's information, interesting news-articles covers everything. \$1.00, prepaid. Nugget-News, Box 52, National City, Calif.

**MAGAZINES**. Back numbers (used) all kinds. Unselected 1c each, 3c each selected. Universal, Box 739, Boston, Mass.

**FREE** Catalogue: Little blue books. Renseb, 30 Church, New York City.

**MAGAZINES** Half-price! Catalog 10c. Magazine Exchange, Baseline, San Bernardino, California.

**PHOTOGRAPHS** By McGoldrick. Samples, listings, 35c. Albert McGoldrick, Mansfield, Mass.

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**HOLLYWOOD** Special! Magicians button, new 1940 catalogue and free trick. All for 25c. Magic House of Charles, Box 888, Hollywood, California.

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**COMPLETE** Vaudeville act 25c. Chas. Hyde, 311-n 4th, Reading, Penna.

**MAGICIANS'** Headquarters. 216-page catalog pocket, parlor, professional tricks, 25c. Kanter's, 1309 Walnut, Philadelphia.

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

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

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

**JOIN** Magicians' Fraternity! Free tricks! Monthly magazine, sample 10c. International Magicians, Mt. Morris, Ill.

**LEARN** Ventriloquism, 3c stamp brings particulars. Smith, 801 Bigelow, Peoria, Illinois.

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

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

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

**OLD** Money wanted. Do you know that coin collectors pay up to \$100.00 for certain U. S. cents? And high premiums for all rare coins? We buy all kinds. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. 20, Fort Worth, Texas.

**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.

**COIN** Packet, 100 all different coins, copper, nickel, silver, some over 100 years old, \$2.00, postpaid. Koeppel Coin-Shop, Eighth at Broadway, Los Angeles.

**ILLUSTRATED** Retail coin catalogue 10c. James Randall, 407 South Dearborn, Chicago.

**25** COINS And tokens, 25c. Oddehon, Box 44, Overland, St. Louis, Mo.

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

**GET** Profit and pleasure in collecting old coins. Send 10c for 56 page illustrated coin catalog. You'll be delighted with it. Send for it now. B. Max Mehl, 370 Mehl Building, Fort Worth, Texas. Largest rare coin establishment in U. S. Established 40 years.

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**U. S.** \$1.00, \$2.00, \$3.00, \$4.00, \$5.00, \$10.00, including 35 different U. S. commemoratives—25c. Approvals sent with all orders. Regal Stamp Co., 3505 Aldine St., Philadelphia, Penna.

**MINT** Roumania air mail with approvals 3 cents. Harries, 6606 No. Whipple Street, Chicago.

**80** AIRMAILS \$1. U. S. unused stamps wanted, 85% facevalue. Money return mail. American Trading, 656 West 160th, New York.

**RED** Postmark on 10c Nevin cacheted first day cover from Derry, Pa., June 10th. Send no money. C.O.D. 75c. V. Kestner, Derry, Penna.

**FALKLAND** Islands coronation set on first day cover (worth 75c)—only 20c to approval applicants. Free packet and bargain lists included. W. Torgesen, Teaneck, N. J.

**PENNY** Approvals, Airmails, pictorials, commemoratives. Treasure Stamps, Mount Prospect, Illinois.

**THE** World in a packet. An outstanding value! 100 stamps from 100 different countries, including Abyssinia, Afghanistan, Brunel, Falkland, Samoa and others from Africa, Asia, South America, West Indies, etc. Our pamphlet which tells "How to Make a Stamp Collection Properly," together with our large bargain list of albums, packets, sets, etc. All for only 20c. Queen City Stamp Co., 604 Race St., Room 36, Cincinnati, Ohio.

**"CHACO** Peace" commemorative set including airmails, also 97 different stamps, 10c approvals. Tipre Stamp Co., 976 So. Westmoreland, Los Angeles, Calif.

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

**25** SWEDEN, 25 Norway, 25 Denmark, all 75 different, ten cents with approvals. Pocono Stamp Co., Dept. P, Box 512, Wilkes-Barre, Penna.

**25** FINE U. S. 1861-1908, 10c. Weston, Box 383, Ponca City, Oklahoma.

**20** DIFFERENT U. S. commemoratives, unused selected Pan-American, etc. \$1.00. Steger, 222, Peotone, Ill.

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

**3000** U. S. Bank mixture or 300 commemoratives \$1.00. H. Legz, 45 Ferris, Highland Park, Mich.

**EXPENSIVE** Collection broken, 15 valuable specimens free. Lessler, Barkley, Clifton, N. J.

**CANARY** Island airmail 10c. Ten Hyderabad 10c. Dufort's, 4402 Chateaubriand, Montreal, Canada.

**ELEVEN** Sets for twenty cents. Reed's, Citizen Office, Houtzdale, Penna.

**OUTSTANDING** Bargain! 25 different Newfoundland only 35c with approvals. Douglas, Hawkesbury, Ontario.

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

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**FREE!** Two coronation sets. Postage 3c. Roberts, 312F Shearerblg., Bay City, Michigan.

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**HUNGARY** 46 Different free to approval applicants. Excel, Box 1315, Chicago.

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9 DIFF. North Pole commemoratives 30c. Johns, 1725 Aisquith, Baltimore, Md.

U. S. Only. Lowest prices. Send dime for \$5.00 stamp and catalogue. Adam Bert, Parck Building, Pittsburgh.

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**APPROVALS**, 40000 Varieties available. Large selections, low prices. Write today. Pkeigwin Stamps, Vineland, N. J.

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5000 MIXED: \$1. Collectors wanted: 100 different 10c. Wholesale list 25c. Collectors names 10c. Griest, 515 W. Third, Davenport, Iowa.

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**BECOME** Mailorder stamp dealer. Men, women, young or old. Sparetime at home. Make more money than working hard on job. Free instructions sent that guarantees success. Confidential wholesale pricelist included. Postage 3c. Superior, 276A Palms Station, Los Angeles, California.

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**COLLECTORS**, Dealers, send for gigantic mixture list of bargains, Macrory, 94 Indian Rd., Toronto, Canada.

**WORLD'S** Smallest airmail—Largest diamond and triangle stamps, free stamp magazine, magnifier to study stamps, with large packet of stamps from scarce countries. Big bargain 5c with approvals. Capital Stamp Company, Dept. 2, Little Rock, Ark.

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**WHOLESALE** Dealer's catalog. Illustrated. Postage 5c. Frank's, 4900 Chalgrove, Baltimore, Md.

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UNITED States illustrated looseleaf catalog. \$1.00. Send postage for free United States price list, precancel list. Stanley Gibbons, 38-P Park Row, New York.

**STAMP** Dealers, your ad here will bring wonderful returns. Ask me for proof. F. W. Johnson, Manager, Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

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STAMPS! Coins! Photography! Hobbies from Hawaii! Chinese Hobby Journal, 50c year. Honolulu, Hawaii.

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"CACTUS," 100 different varieties, 10c each. O. Hooks, Box 542, Ranger, Texas.

EXCHANGE Your duplicate stamps, match covers, etc., with collectors everywhere. List, swappers, dime. (Mention hobby. Secretary, Box 2166, Denver, Colo.

FREE Information! Matchbook album. Adams Sales, Dept. 30, State Tower, Syracuse, N. Y.

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ONE 6 1/2 x 8 1/2 Plate sunk enlargement or one 5x7 hand colored enlargement with each roll developed and 8 prints 25c. 36 exposure roll developed and 36-3 1/4 x 4 1/4 enlargements \$1.35. 18 exposure roll 75c. Vidor, 321-P Hennepin, Minneapolis, Minn.

ROLL Developed—2 sets glossy prints and 2 free enlargement coupons 25c; 20 reprints 25c. One day service. Bartow Studio, Topeka, Kansas.

PHOTOGRAPHY For pleasure and profit. Prepare for profitable business or fascinating hobby at home. Common school education sufficient. Write for information and requirements. American School of Photography, 3601 Michigan Avenue, Dept. 3454, Chicago.

PROFESSIONAL. Overnight service. Developed, printed, 2 enlargements, 25c. Fotoservice, 1942-D Marlow, Toledo, Ohio.

ROLL Developed and printed, two enlargements, one in colors—all for 25c coin. Photo Finisher, Station E, Box 42, Columbus, Ohio.

ROLL Developed and 16 prints, 25c. Reprints 16 for 25c. We place quality and service above free premiums. Prove it by trying Golden Gate Photo Service, Box 428, San Francisco.

FREE List and mailing equipment. Rolls 25c up. H. F. H. Co., Jamaica Plain, Mass.

UNIVEX Mercury. 36 big 3 1/2 x 5 enlargements \$1.00, 18-65c. Photoshop, Linton, Indiana.

ROLL Fine grain developed and enlarged. 8 exposures—25c; 16-50c; 36-\$1.00. Ohio Finisher, Station E, Box 42-J, Columbus, Ohio.

BEAUTIFUL Enlargement from each picture on roll 25c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

PROFESSIONAL Service, any 6 or 8 exposure roll, including two 5x7 enlargements 25c. Film Capital Service, Box 504, Rochester, N. Y.

ROLL Developed—16 guaranteed prints, 25c. Beautiful enlargement free. Dick's Photo, A-10, Louisville, Ky.

GUARANTEED. Film developed, 16 prints, 2 enlargements 25c, 20 prints 25c. Quality Photo, Hutchinson, Kansas.

LIFE Photos last a life time. Roll developed, 16 prints, 2 enlargements 25c. Reprints 1 1/2c. Life Photo, Hutchinson, Kansas.

TWO Beautiful prints from each picture on roll 25c. Twenty years of satisfied customers. Quick service. Lens Photos, Dept. J-4, Janesville, Wis.

HIGHEST Class photo finishing in America. Rolls developed and two prints each good negative, plus enlargement coupon 25c. Sixteen reprints, plus enlargement coupon 25c. Kelso, Box 549-B14, Inglewood, California.

CLEVER! Photo stamps reproduced from any photograph \$1.00 per hundred. Original uninjured. U. S. Ultra Stamps, Upper Sandusky, Ohio.

OIL Coloring photographs a fascinating hobby or profitable business. Learn at home by easy simplified method. Previous experience unnecessary. Send for free information and requirements. National Art School, 3601 Michigan Avenue, Dept. 3434, Chicago.

ROLLS Developed, 16 guaranteed prints, 25c, reprints 2c. Photolab, 1806-C Wabash, Chicago.

ROLLS Developed. Two 5x7 and 8 prints, 25c. Reprints 2c. Photolab, 1806-CA Wabash, Chicago.

ROLL Developed, 16 Velox prints 25c. Dividend coupon. 16 Velox reprints 25c. Willard Studios, Box 3535-A, Cleveland, Ohio.

NEW! Patented machine in scientifically equipped plant permits fine development of roll and 8 enlarged prints—only 25c (coin), rolls up to 116. Enlarged Photo Co., Dept. P, Teaneck, New Jersey.

TRIAL Roll developed, 8 glossy prints, 15c. Kase Photo, Box 1047, Omaha, Nebr.

ROLL Developed, 8 enlargements; or 8 prints and 2 enlargements, 25c. Enlarged reprints 4c. Artcraft, Box 3580A, Cleveland, Ohio.

TWO Special enlargements, 8 pictures 25c. Diamond Photo Finishers, Ottawa, Kans.

YOUR Roll film developed and two prints each negative, 25c. Twenty reprints 25c. Send for free mailing envelope, price list. Star Photo Service, Dept. M, 20 W, Jackson, Chicago.

FINER Enlargements, 5x7 3 for 25c; 8x10 3 for 50c. Lee Photos, P.O. Box 2053, Chicago.

MAIL Roll and 25c, receive 16 Velox prints; 20 reprints 25c; two 8x10 glossy enlargements 25c. Seabrook Photos, Franklin, Penna.

DON'T Take chances on valuable films. Roll developed—2 glossy prints each negative and 2 enlargement coupons 25c. 20 reprints 25c. Bartow Studio, Box 272, Topeka, Kansas.

NEW Sensational creation! The 1940 style leader. Exquisitely beautiful deckled Luxtone process photos in classy pocket album. Ordinary prints look shabby in comparison. Send 8 exposure roll with 25c for delightful surprise. Free enlargement coupon, 35mm, 36 exposure miniatures with indescribably beautiful enlarged prints \$1.00. Samples and mailers free. Mailbag Film Service, Dept. 1, Box 5440 A, Chicago.

ROLL Developed—16 guaranteed prints, two coupons on enlargements, 25c. Smart Photo, Winona, Minnesota.

IDEAL Photos beautiful finished with wide border, deckle edged, 25c per roll of 8 and free enlargement. Ideal Photos, Box 2255, Paterson, N. J.

THE Photo Mill. Immediate service; No delay! Eight-exposure roll developed, carefully printed and your choice of two beautiful 5x7 double weight professional enlargements, one tinted enlargement, or eight reprints for 25c coin. Reprints two cents each. Highest quality guaranteed. The Photo Mill, Box 629-12, Minneapolis, Minn.

18 LIFETIME Prints, 2 sparkling Hollywood enlargements each roll 25c. 21 reprints 25c; 100-\$1.00. Finished 3 hours. 25 other bargains. Overnight Studio, Albany, Wis.

THREE Lovely Silktone enlargements and two sets sparkling lifetime prints with roll developed—25c. Trial, 20 reprints 25c; 50-50c. Lifetone Studios, L-39, Des Moines, Iowa.

BETTER Pictures, quicker service! Roll developed and 16 prints 25c, 20 reprints 25c. Hundred reprints \$1.00. Mercury Studios, D-109 N. Dearborn, Chicago.

DOUBLE-QUICK Service! Roll developed 16 Velox prints; or 8 prints, 2 enlargements 25c. Chicago Photo Lab., Box 3A, South Chicago, Illinois.

PROMPT Service! Rolls developed, two Velox prints each negative 25c. Hench Studios, Harrisburg, Penna.

8 ENLARGEMENTS—Films developed plus 8 enlargements, 25c coin—116 or smaller. Enlarge Photo, Box 791, Dept. PMM, Boston, Massachusetts.

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THREE Prints each good negative in roll 25c. Reprints 3c. Fred D. Eastman, Bode, Iowa.

16 PRINTS With roll 25c. 16 reprints 25c. Rex Photo, Ogden, Utah.

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TEN Profitable business plans 25c. postpaid. W. A. Watson, Deenagap, N. C.

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MAKE Your own household flavoring. Sell to stores, bakeries, homes. We furnish concentrated flavoring. Sample free. General Products, 776R, Springfield, Mass.

"WATERLESS Soap." Make it yourself. Build big business. Formula, instructions 25c. Ideal Service, 100 S-5, Park Ridge, Ill.

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TURN Tin cans into money at home—Big profits. 25c easy instructions mailed. H. Chaney, 1130 East 16th St., Jacksonville, Fla.

LEARN To make men's ties, pattern and complete instructions. Selling plan. Send \$1.00. Elite Tie Co., 5834 North East Union Avenue, Portland, Oregon.

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

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MAKE Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Payn, 945 Grand Vista Avenue, Los Angeles, Calif.

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GRIND Lawn mowers—factory method. \$2.00 capital. Mowers, Janesville, Wis.

M. M. Earned \$267, three weeks, raising mushrooms in cellar; Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 65, Chicago.

GET Big mails—Samples galore. Your name listed in Midstates Mail Trade Directory, copy sent you, directory 500,000 articles wholesale, 10c. Eagle, 414-P W. 65th, Chicago.

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1000 BUSINESS Cards postpaid \$1.00. Luke Sharpe, 836 Crocker, Los Angeles, Calif.

COLUMBUS Peanut vendors make money. Free catalog, 5415 Woodland, Philadelphia, Penna.

127 SUCCESSFUL Plans. Start own business; home or office. Particulars free. LeVin Service, 6340-A N. 18th St., Philadelphia, Penna.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Brenner, 257 E. 21st, Philadelphia.

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RECAST Old batteries into new. Latest achievements. Battery Laboratories, St. Paul, Minnesota.

SENSATIONAL New invention. Automatically humidifies gas mixture. Gives rainy-day performance every day. Uses lower test gas, increases mileage. Saves low cost quickly. Salesmen cleaning up. Write Motor Products-H, 413 Tenth, Des Moines, Iowa.

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EARN Dollars with our money-making plans. Pleasant, easy, fun! Two complete plans 35c. Century, 10002 SSan Pedro, Los Angeles.

START Small at home! Clean, dye and pressing shop. Be independent. Big profit. Fioco Co., 2311 Eagle Ave., Alameda, Calif.

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STAMP Brings numerous moneymaking opportunities. Worldwide Service, Box 5450, Metropolitan Station, Los Angeles, California.

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ASPIRINS. Chocolate laxatives, under your name. Burton Laboratories, Cincinnati, Ohio.

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FREE—300 Wonderful business, mailorder and homework moneymaking offers. Lewis Co., 828-D Carpenter, Oak Park, Ill.

YOUR Own business, home, office. Tested plans. Free particulars. Buist Co., 7532 Buist, Philadelphia, Penna.

MAKE Money at home! Grow mushrooms in cellar or shed, with U.S.-patented Am Mushroom Spawn and easy-to-follow Manual of Instructions. Fascinating, profitable. Booklet free—write today. Anglo-American Mushroom Industries, Dept. 39, Toronto, Ont.

START Home factory in own kitchen spare time, making, selling, your own private brand products. 10,000 how-to-do-it ideas. Write, Wolveriner, Established 1928, 3545 St. Clair, Detroit, Michigan.

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LIFETIME Income! 110 powerful moneymaking secrets. Valuable details 10c. Traphagen, Goose Rock, Ky.

CASH Paid for insects. See Sinclair display advertisement on page 23A.

BE Credit collection specialist. New different method. Work from home. Full-time part time. Unlimited opportunities. 70% profit. Complete details—franchise 25c. Modern Collections, 5000-A Cordelia Ave., Baltimore, Md.

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AMAZING? Spare time, business starters, \$1.00 copyrighted edition. Sample 25c. Literature free. Publisher, Box 6346P, Pittsburgh, Penna.

MAKE Your own rubber molds. Sample mold and details 10c. June, 101-M Beech, Holyoke, Mass.

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RAISE Wool rabbits: Angora's for profit. Easy and reasonable care. Wool sales guaranteed, small outlay to start. Maurice B. Sixby, 94 Melrose Street, Buffalo, New York. (See Popular Mechanics, April issue.)

SOAP Making. Learn home. No machinery. Stamp. Posera, AB-4545 Bartlett, Milwaukee.

EARN \$50 Weekly using sawdust. Instructions 25c. Routier, 787-D Chili, Rochester, New York.

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WE Help start you in business, furnishing outfits and instruction, operating "specialty candy factory" home. Men—women, opportunity to earn good steady income, all or spare time. (Our 31st year.) Booklet free. Ragsdale Candies, Drawer 4, East Orange, N. J.

MAKE Beautiful door mats from discarded tires. Kowell, 5372 St. Clair, Detroit, Michigan.

A REAL Future for you with Red Comet fire control products. Low prices. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick, 766 Red Comet Building, Littleton, Colorado.

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FASCINATING Profitable "Fixit" service taught. Houlgate, Station C, Pasadena, California.

BIG Profit in mold making and plaster casting. \$1.50 profit on every dime invested. Foolproof rubber. Tremendous market. Simple interesting work. 24 page instructive catalogue free. Plastic Arts, 711 Neely, Muncie, Indiana.

MANUFACTURE High grade cleaning fluid at home. Good moneymaker. Formula and selling instructions \$1.00. Dunn Specialty Co., 17212 Endora Rd., Cleveland, Ohio.

COLOR Concrete with chemicals. Washing wells. Stucco-rock. Benches. Spin concrete pottery. Cement artistry. Garden ornaments. Cold glaze. Water paints. Marbling. Sample 10c. Hollywood Cement Craft, 8527 Wonderland, Hollywood, Calif.

CLEARANCE Sale—Moneymaking books, courses. Merritt Co., Drawer H, Roseland, N. J.

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**ELITE** Collection of business plans, contains 127 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

**EARN** Extra money at home. Increase your income at home by new, simple Wentworth Tempera Color method. We instruct you and supply you with work. Write today for free booklet. Wentworth Pictorial Co., Ltd., Dept. 3, Hamilton, Ont.

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**ADVERTISERS!** 1,600,000 Mail order circulation. Inch advertisement, \$15.40. "Get results." 20 newspapers, 18 words, \$6.50. Diener-Dorskind, 1474P Broadway, New York.

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**"LUMINOUS Paint"** shines in dark. Easily made. 300 other formulas, plans—all 25c. Ideal Service, 300-P5, Park Ridge, Ill.

**YOUR** Name in 10,000 mailing directories 25c. R-Cook, 920 St. George St., East Liverpool, Ohio.

**MAKE** Color-glazed concrete pottery, gravestones, tiles, floors, walls. Basement waterproofing, etc. Booklet 3c stamp. National Potteries, Minneapolis, Minnesota.

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**SUMMER** Profits. Make soft drinks. Complete course 25c. Decor, Box 327, Wheaton, Ill.

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**RENT** 1000 Money making propositions—for 10c. Particulars free. Smith Book Service, West Palm Beach, Florida.

**LIKE** Afternoons free? Work home! Expect surprise details! \$2,000 month (orders) reported (fulltime—no implication exceptional amount can be duplicated.) National, Box 1240-X, San Bernardino, California.

**FORMULAS.** Opportunity books, wholesale service. Edwards Service, 324 North 18th Street, Quincy, Illinois.

**MONEYMAKERS'** Opportunity Digest Magazine—60 pages of golden opportunities—10c. Lewis Co., 828-S Carpenter, Oak Park, Ill.

**CASH** Paid for insects. See Sinclair display advertisement on page 23A.

**LETTERING** Patterns, free literature. Sample alphabet 5c. Display Letters, Box 28, Ft. Hamilton, Brooklyn, N. Y.

**AGENTS-DEALERS** Dime brings wholesale price sheet, fast easy sellers. Parlor Corporation, Greenwood Lake, New York.

**EXTRAORDINARY** Profitable plan with golden magic. Write. Rotex, 216-P Degraw, Brooklyn, N. Y.

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**"RAISE** Earthworms for profit" new, interesting home business. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

**START** Own telephone repair service in your farm community. Good money maker. We furnish instructions, material at low prices. Ideal sideline—Radio, electric, hardware stores. Inquire about local agency. Farm Telephone, Dept. A, Rogers Park Station, Chicago.

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**AMATEUR** Cartoonists, earn cash at home, copying and duplicating cartoons for advertisers. Ad-Service, Arkyle, Wis.

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**GROW** Plants without soil. Folder free. Gordon Laboratories, 1265-J Broadway, New York.

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**111 ONE-INGREDIENT** Formulas, \$1.00. Service Bureau, Box 454, Edmonton, Canada.

**THAXLY** Formulas, processes, for perfect products. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

**FLY** Spray formula—25c. None better! R. McKinley, Wayne, Penna.

**MAKE** Money, Ten household formulas, 50c. List, Harpold, Kitzmiller, Md.

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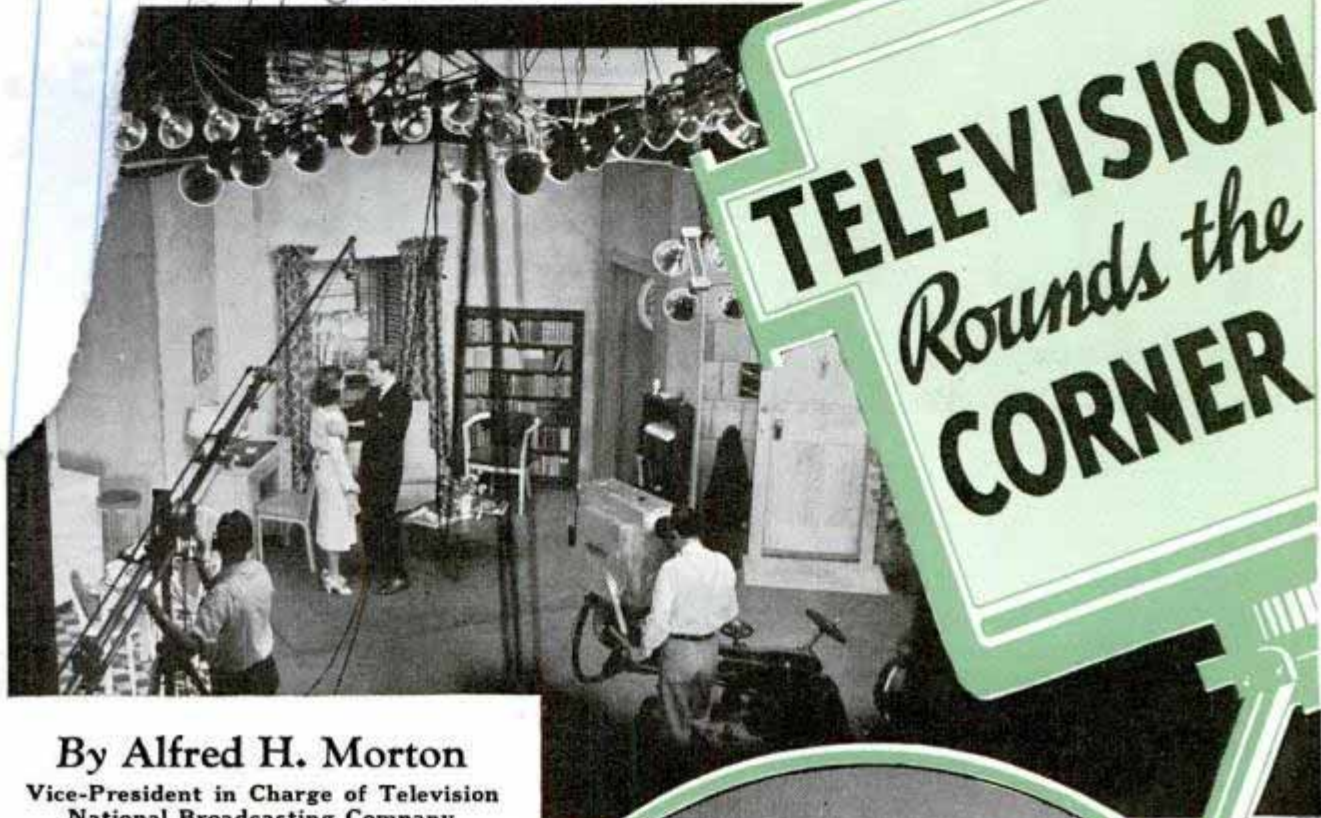
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WRITTEN SO YOU CAN UNDERSTAND IT

MAY, 1940

No. 5

9-1488



## TELEVISION Rounds the CORNER

By Alfred H. Morton

Vice-President in Charge of Television  
National Broadcasting Company

THEIR first glimpse of television leaves Radio City visitors amazed at its advanced stage of development and wondering when it will come to their home towns.

The best efforts of hundreds of scientists and skilled engineers were absorbed by television for more than a decade before it was ready for its historic public debut April 30, 1939. Enormous strides have been made since that day, when the National Broadcasting company's telecast of President Roosevelt and others at the opening of the New York world's fair marked the beginning of the new art in America.



Top, scene in television studio. Note multiplicity of high-powered lamps. Bottom, watching pictures on receiver's screen

MAY, 1940

RCA Bldg. Radio City

641

NBC. Propaganda  
show.



Hundreds of programs have gone out on the air since the debut. Among them have been major league baseball games, intercollegiate football and track contests, tennis matches, swimming meets, variety shows and dramatic presentations. The images have become brighter and more stable and more highly detailed. Greater achievements remain for the future.

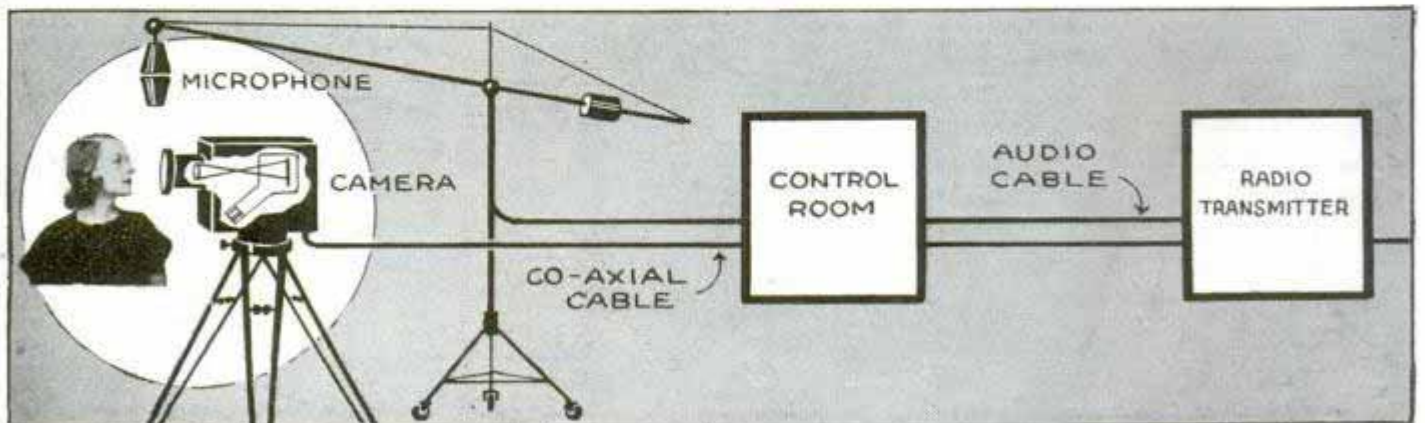
New York and Los Angeles, with their surrounding territories, already have television, and a station serving the region including Schenectady, Albany and Troy, N. Y., is being linked to NBC's New York station by radio relay—thus forming the first television network.

Technical standards already have been adopted by the industry, providing ample margins for further improvement in image quality without the necessity of changing a single transmission standard. This is the

public's assurance against early obsolescence of receivers.

Since television is highly complex, many technical standards are involved in the group. The one most easily understood by the public is that television's images are in 441 horizontal scanning lines and are transmitted at the rate of thirty complete images a second. The images are in black and white.

The television that all of America is destined to receive is entirely electronic. It has no moving mechanical parts. Its two bases are the Iconoscope, a large dipper-shaped vacuum tube which converts a light image into a corresponding pattern of electrical impulses, and the Kinescope, a type of cathode-ray tube, which converts electrical impulses back to light values. These light values in turn, properly distributed over the face of the Kinescope, constitute



Top, mass viewing of television programs. This shows more than 200 students seeing and hearing a lecture demonstration. Bottom, sketch on this and page opposite shows television from start to finish



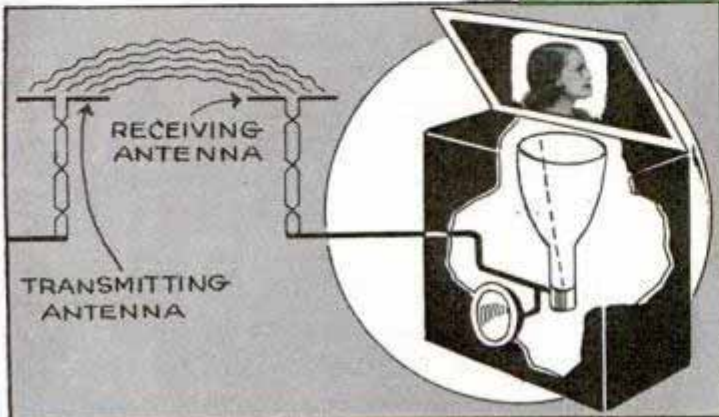
*Rotary Readers*

Left, what television screen showed of picture at right. Center, latest portable television field pickup equipment. Bottom, horn over "eye" of television camera guards it when shooting toward the sun



a synthetic image corresponding to that seen by the camera in the studio or on the field.

In practice several cameras are used for each studio program or pickup in the field. The purpose is to give an interesting variety of "angles" or "shots." Since television means simultaneous transmission of a program, multiple camera pickups enable the program director to vary his shots from moment to moment without going through the equivalent of motion pictures' cutting room. A special television lighting system has been devised to provide a



2/14/48

streets of New York.

Empire State



fluid auxiliary to the camera pick-up. Sound associated with the image is registered and transmitted in the usual way. Both sound and image are tuned in with a single control.

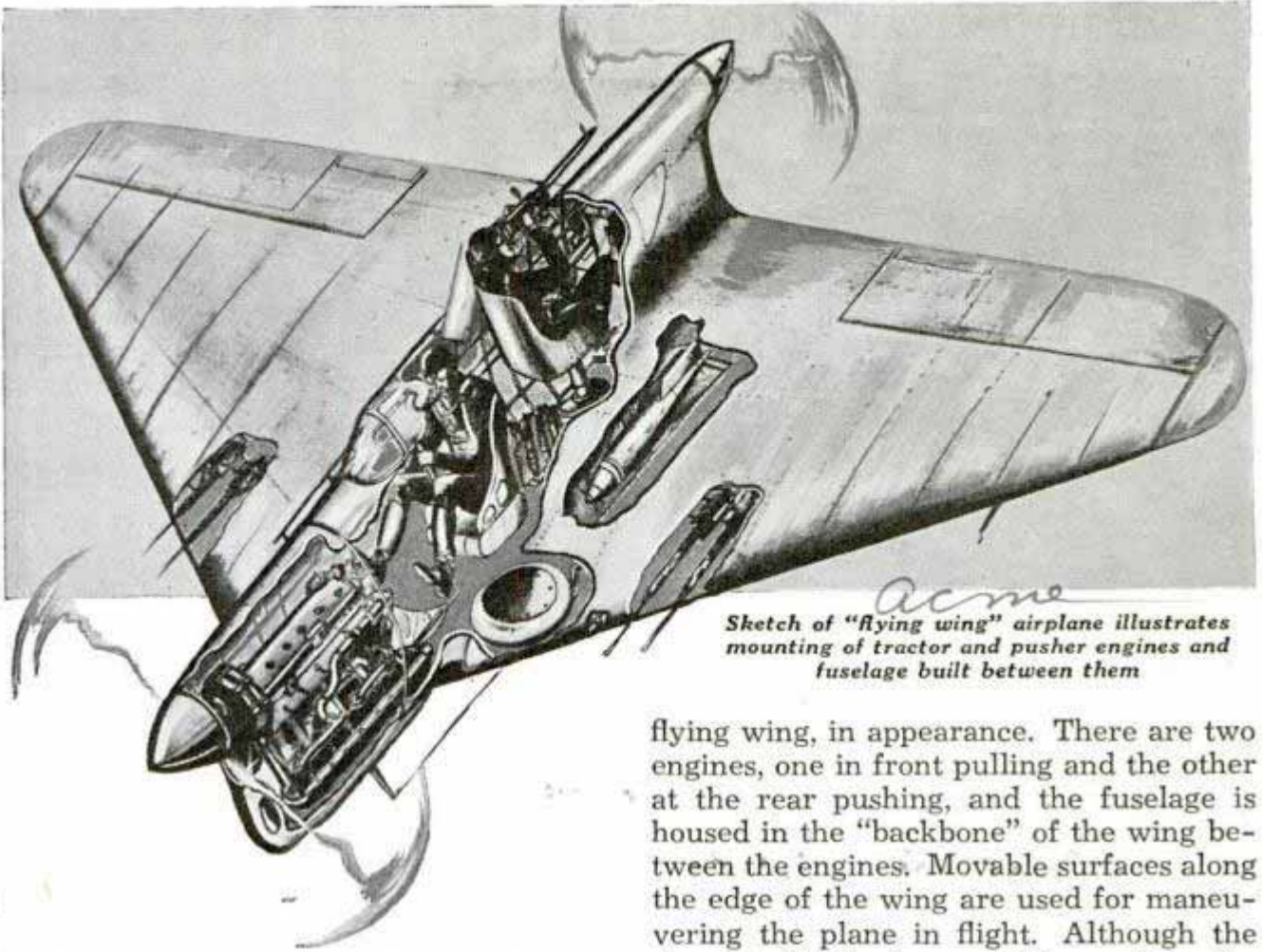
One of television's present limitations is the coverage afforded by a single transmitter. Highly detailed images necessitate the use of an enormous group of extremely short waves in transmission. For instance, the Federal Communications Commission has set aside a band 6,000,000 cycles wide in the ether for the use of each television station. A sound broadcasting station occupies a strip only 10,000 cycles wide, extending, let us say, from 600 kilocycles to 610 kilocycles.

It is a peculiarity of these extremely short waves that reception by home viewers is ordinarily limited by the visual horizon, as seen from the transmitter antenna. In some instances, however, the programs may be received regularly and satisfactorily some distance beyond. The service area of NBC's Station W2XBS is thus roughly a circle with a radius of a little more than fifty-five miles. This, of course, applies to reception from comparatively low-

(Continued to page 144A)

Top, miniature stage being arranged. Center, scene from play appearing on television screen. Bottom, at the control panel in New York television studio

# Wing without a Tail Is Twin-Engine Plane



*Acme*  
Sketch of "flying wing" airplane illustrates mounting of tractor and pusher engines and fuselage built between them

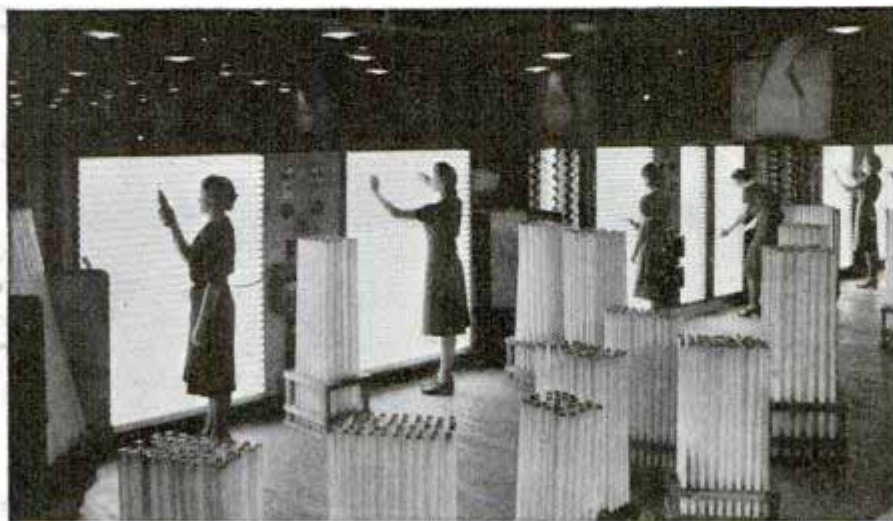
You may wonder what happened to its tail and body when you see a new airplane which is being constructed at the aeronautics department of California State Polytechnic School. It is little more than a

flying wing, in appearance. There are two engines, one in front pulling and the other at the rear pushing, and the fuselage is housed in the "backbone" of the wing between the engines. Movable surfaces along the edge of the wing are used for maneuvering the plane in flight. Although the drawing illustrates a military ship, the first one to be constructed is for civilian use. It can be adapted to mass production and the inventor claims his plane could be produced cheaper than present types.

## Fluorescent Lamps Tested So They Will Work Properly

Before fluorescent lamps can be sold to the public they are passed through a

thorough test at the General Electric plant where racks of lamps constantly are being



Girls testing fluorescent lamps by running induction coils, or only their hands in some instances, over the tubes to make sure they will light

filled, tested and emptied. Lighting the lamps as though by magic, girls run an induction coil, and sometimes only their hands, up and down the luminous tubes. The tests are made so the producer can be sure that the lamps will start normally when put into use.

One of the latest methods of manufacturing Dry Ice is to compress the carbon-dioxide gas distilled from limestone.

*San Luis Obispo*  
*K197*  
*Fluorescent Lamp*  
*Para Cleveland*  
*hela*

# Gas-Engined Model Seaplanes Compete in Pilotless Flights



Model builders line up their miniature seaplanes for competitive flights in which they take off from, and alight on, water under their own power

High point of the year for model seaplane builders is the annual "roundup" when the model fans put their gas-engined ships into flight competition. The models range from thirty ounces to ten pounds in weight, with wing spreads from thirty-five inches to ten feet. They take off from the water and alight without guidance, their gasoline motors of one-thirty-fifth to one-half horsepower being adjusted to keep them up for flights of twenty seconds duration.

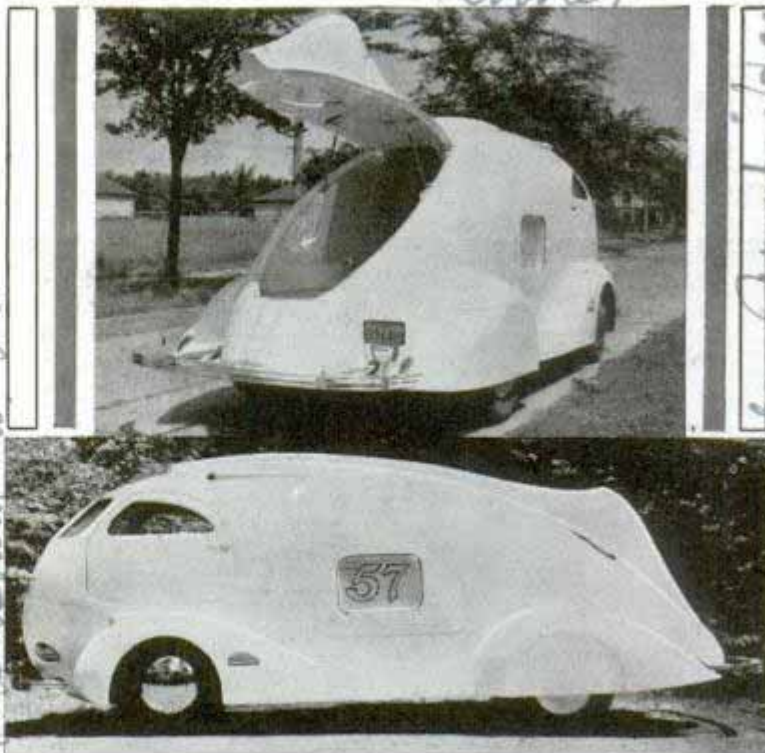
## Speed Arrester for Truck Eases It Down Steep Hill

Fully loaded, a heavy truck recently drove down a six-percent grade in high gear, without the use of its brakes, and yet the driver was able to hold it at any speed he desired between six and thirty-five miles per hour. This was accomplished by using a hydraulic speed arrester, operating on the same principle as the hydraulic clutch, which is coupled to the main shaft between the engine and transmission. It consists of a wheel, or rotor, with fin-shaped spokes revolving inside a

metal housing that contains other spokes opposing those of the rotor. When water is admitted between these opposing fins it holds back the movement of the rotor and, hence, of the transmission. Advancing a control rod mounted on the dashboard turns the water into the speed arrester. The action is smooth and without jerks.

## Modern 'Aero' Auto Has Cab over Engine

Modernistic lines characterize the design of a streamline delivery truck built on a chassis with 132-inch wheelbase and having the cab over the engine. Enhancing the aerodynamic appearance is a fin curving from the top of the cab to the rear lights. A tail gate, raised and lowered by a hydraulic hoist, gives access to the interior.



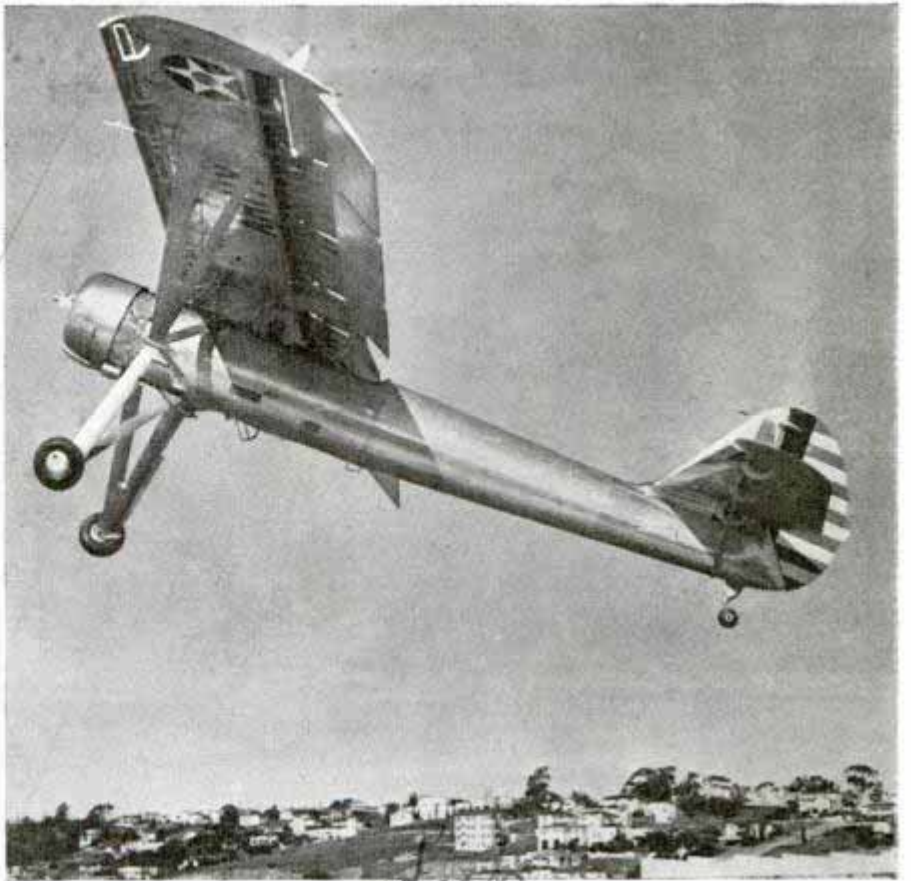
Two views of streamline delivery truck showing how tail gate rises, and when closed forms part of the finlike design

R 210.  
R 132  
at Marine Florida  
K 240  
Hydroclutch  
developed by...  
Casperburg Calif.  
646 Los Angeles Calif.



# 'Dragonfly' Plane Climbs After Fifty-Foot Run

It takes the army's new slow-flying observation plane just fifty feet to get into the air, and it can land and roll to a stop in 100 feet. Nicknamed the "dragonfly" for its appearance, the YO-51 is made highly maneuverable by special flaps and slots, and on test flights it is understood to have landed at only twenty-eight miles an hour. Top speed is under 140 miles an hour. The two-seat monoplane was designed for landing in small areas and for infantry liaison service. Its wingspread is fifty feet, and it is driven by a 420-horsepower engine. Officers of the Ryan company, its builders, say the plane can hover at a standstill in a slight wind.



The "dragonfly" takes off after a run of only fifty feet. Notice the broad wing flaps, virtually retractable wings, which facilitate slow flight

## Parkas and Sheepskin Boots Keep Arctic Pilots Warm

Suspender boots, parkas and muffs seemed perfectly snug in the laboratory at forty-nine degrees below zero, so next winter the U. S. army air corps pilots in Alaska will try them out on sub-zero arctic flights. Designed and tested at Wright Field, Dayton, the standard arctic equip-

ment of the fliers consists of a fleece-lined leather ensemble. Heavily lined suspender boots with slide fasteners from toe half-way to knee are worn in lieu of trousers and provide better ventilation. Like the suits, these boots are of specially treated reversed sheepskin. Over them goes a

three-quarters length jacket. In still colder weather the usual flying cap is discarded for a parka hood. For mechanics, there is a "blizzard cape" completely covering head and shoulders.



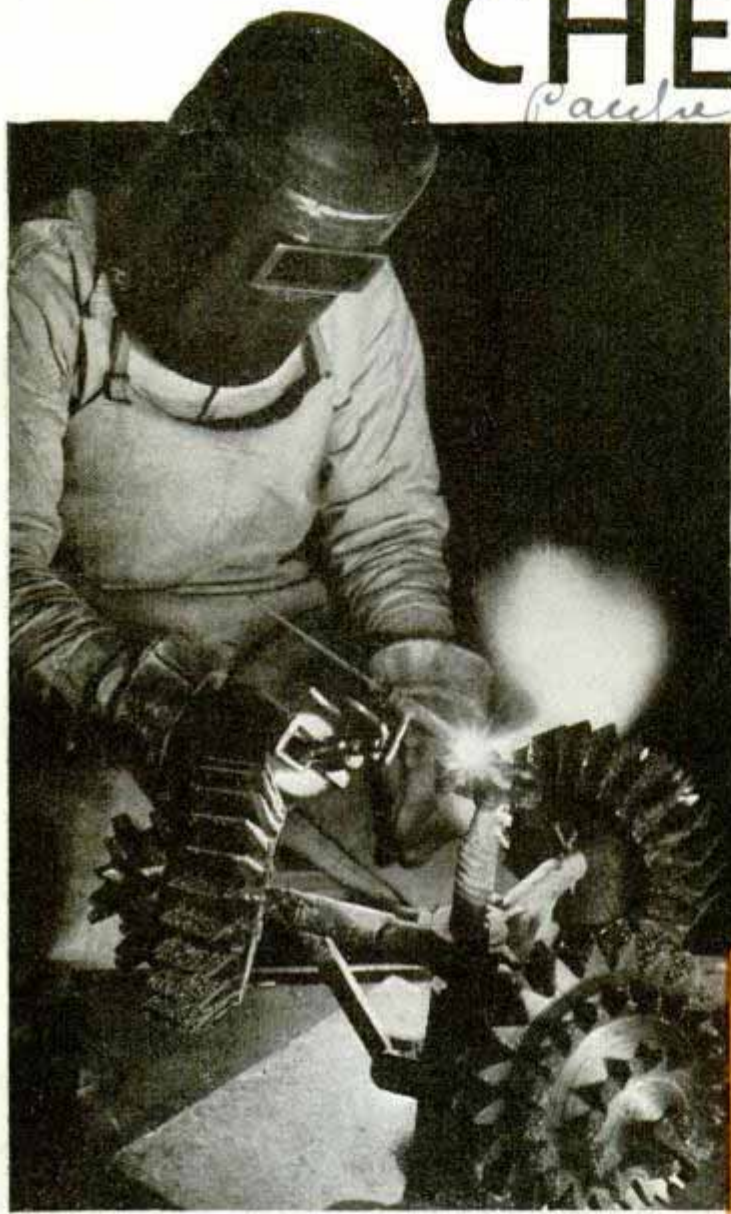
Left, fleece-lined suspender boots worn in lieu of trousers; center, mechanic's "blizzard cape"; right, Alaskan pilot's complete uniform

Ⓞ Last year 3,745,000 boys and girls rode to school in 85,700 school buses, growing use of which is reflected in the fact that 11,546 new school-bus bodies manufactured in 1939 were sixty-two per cent of the national output of bus bodies.

cont. Charles G. Bowers, Dayton Journal

Buss In report  
330 W. 42nd St.

# CHEMISTRY



Geochemists, above, transfer a sample of subsoil from auger to jar for analysis. At left, hard facing the teeth on self-cleaning rock bit cones. The cutaway model of an oil field, below, demonstrates how wells reach oil from deposits separated by a fault



SUPPOSE an expert, by examining a few handfuls of earth from your property, could tell definitely whether or not there is oil under your land.

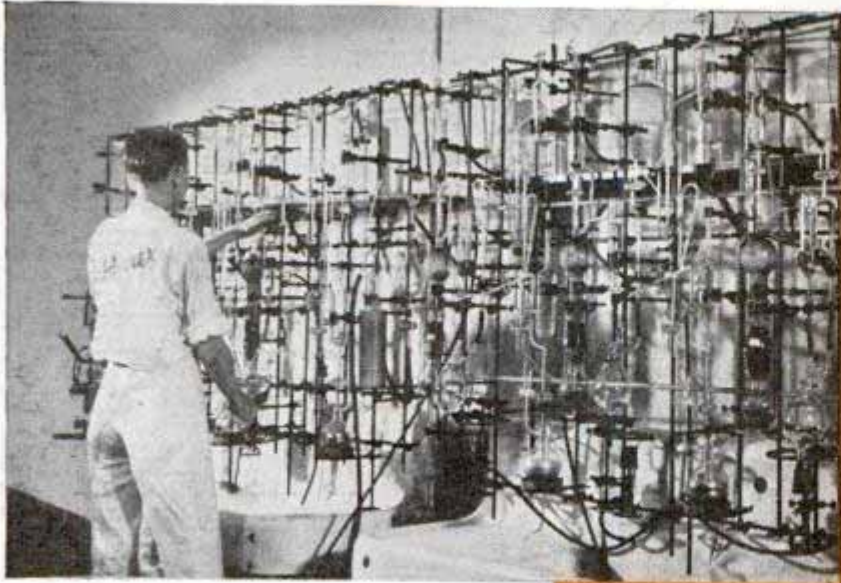
Accurate surface prospecting like that is the goal of a new science called geochemistry. Virtually unheard of a few years ago, chemical analysis of surface soil may revolutionize petroleum exploration and save some of the hundreds of millions of dollars that are wasted each year in fruitless drilling.

Geochemistry is based on the knowledge that light hydrocarbon molecules filter upward through the earth from any buried petroleum deposit. The difficulty has been that this positive evidence of oil below usually exists in such infinitesimal amounts that it couldn't be measured. Another trouble has been that at least some of the oil and gas molecules seem to undergo chemical changes on their upward journey, possibly by oxidation or polymerization, leading to differences

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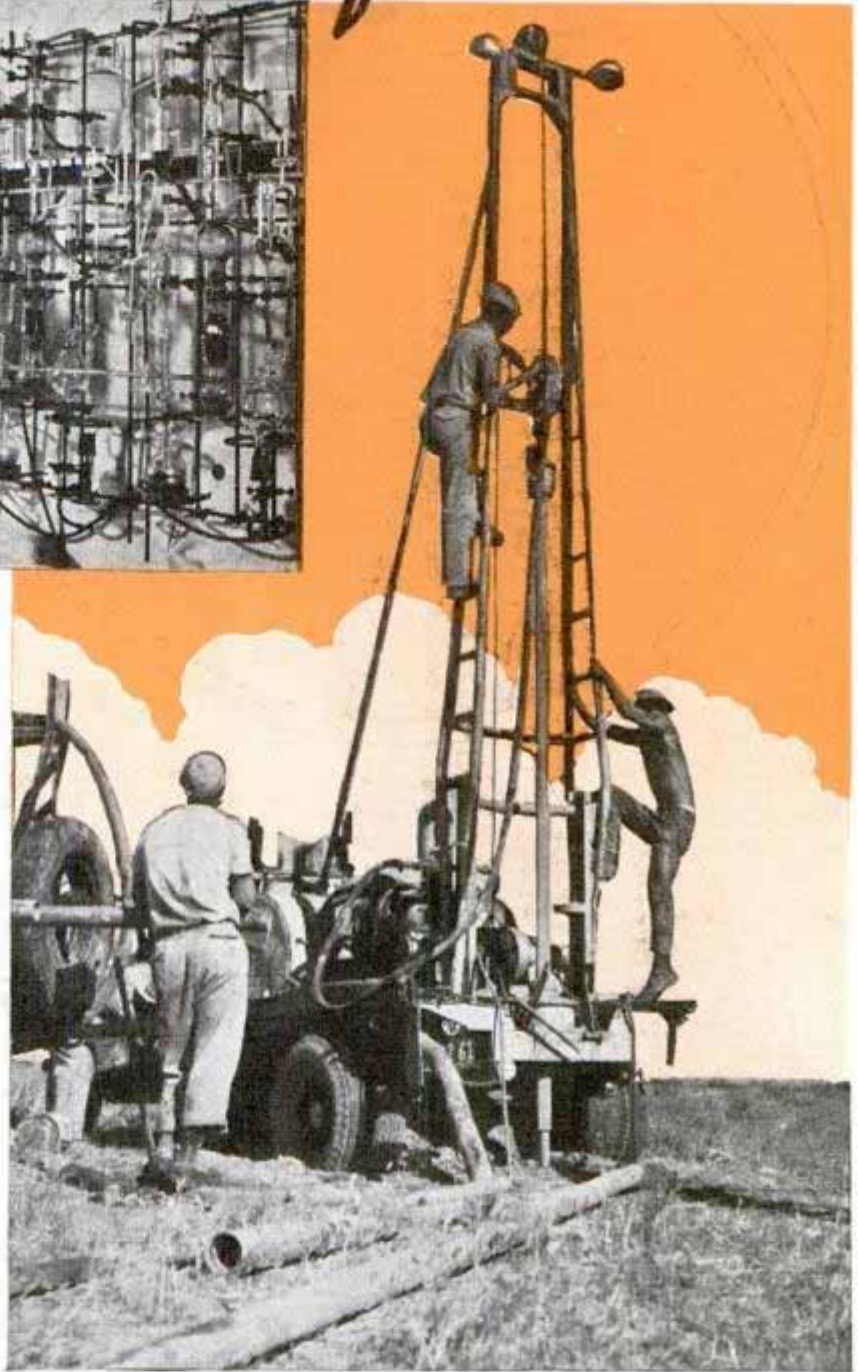
# EXPLORES *for* OIL



of opinion as to which of the hydrocarbons that are found are the true signs of an oil deposit.

The science is still so young that various techniques are being tried out, the usual method being to collect pint samples of uncontaminated earth a few feet below the surface and subject them to a new laboratory process known as low-temperature de-gassing. Each sample is heated and the small amount of gas the sample contains is driven off and collected, after which the gas is put through a series of freezing treatments by which the different constituents of the gas may be separated and measured. Defractionation of this sort allows the weighing of materials found in amounts of only one part per billion.

The strange thing about geochemistry is that no oil is found directly under the soil that contains the hydrocarbons. The geochemist advises drilling into the area at one side. This is because the large amount of material that filters upward from an oil deposit, carrying water and chemicals with it, forms an impervious seal through which gas molecules cannot filter to the surface. The rising gas has to escape around the edges of this seal. Surface indications of



*Low-temperature de-gassing apparatus, top, used to separate and measure gases in earth sample. Portable rig, right, drills "shot hole" hundreds of feet deep in which dynamite is exploded and "echo" waves charted to map rock formations*

oil usually assume the shape of an imperfect halo that outlines the borders of the pool. Oil is found by drilling inside the halo ring and not in the halo itself. In some cases concentric halo rings have been plotted on the surface, indicating deposits of oil at different depths, predictions that subsequent drilling confirmed.

Geochemists usually find that certain mineral salts may be detected in greater than usual concentrations in a halo pattern

214

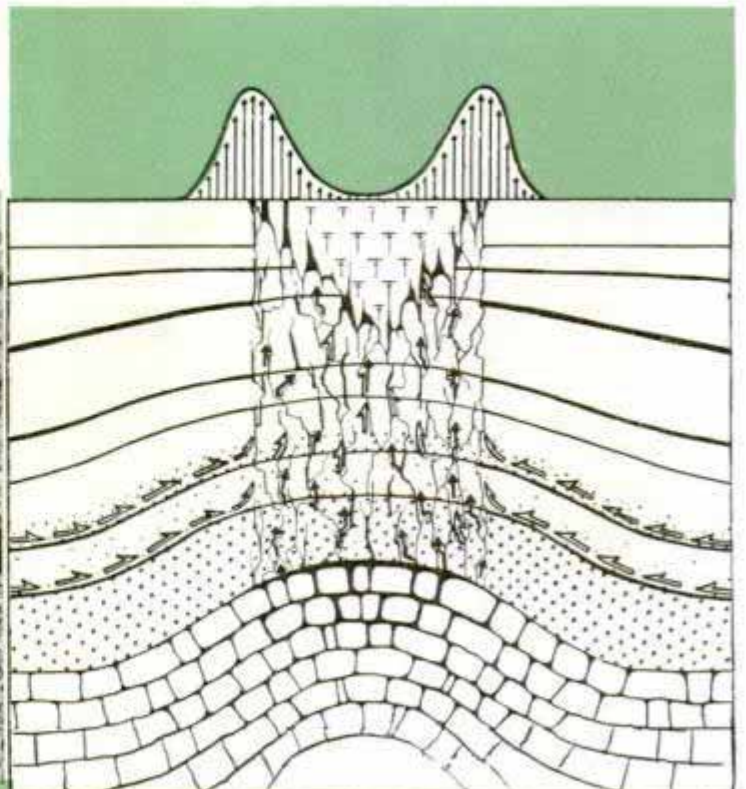


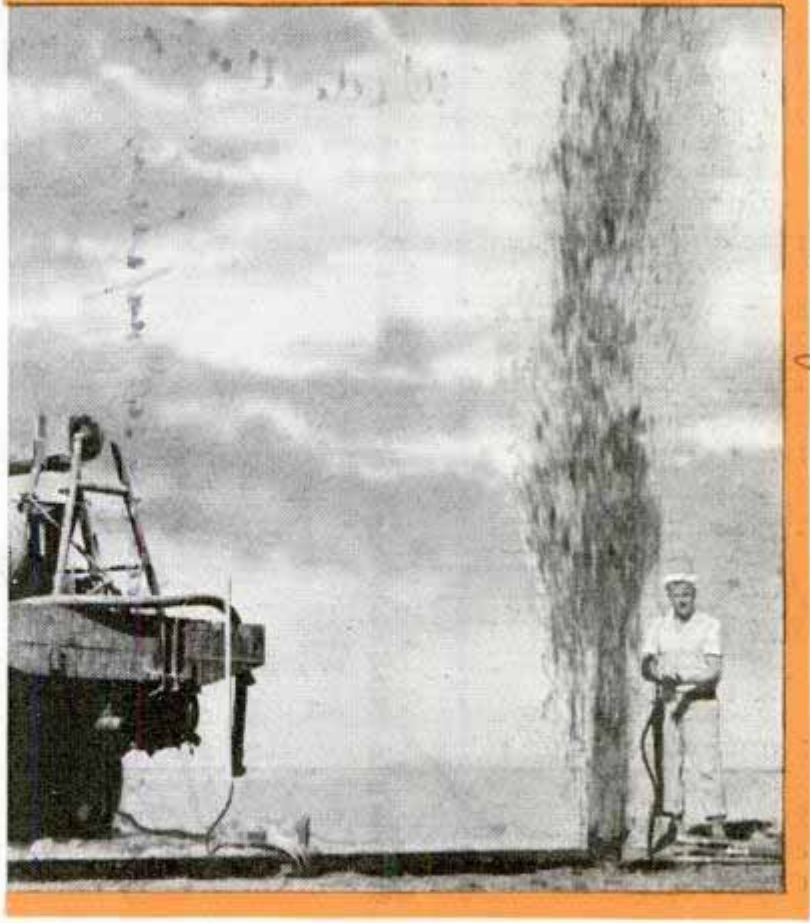
that roughly approximates the hydrocarbon halo in the surface soil, and they use this phenomenon to check their findings.

One of the newest developments in geochemistry is chemical logging, a study of the material that is brought to the surface when an oil well is being drilled. Such analysis detects the depth at which the drill pierces the seal above the pool, permitting a close estimate to be made of the additional depth that must be drilled before oil itself is found.

Gas molecules tend to migrate laterally through a structure as well as vertically, and this fact permits operators to chart the true location of a pool in cases where they have drilled a number of unproductive wells. The concentrations of hydrocarbons brought to the surface by several wells are compared and this evidence points the way toward the deposit from

*Collecting a sample of subsoil, top. At left, location where sample was collected is spotted on map with aid of plane table. Drawing shows a cutaway section of oil field indicating "halo" formation over trapped oil*





which the hydrocarbons escaped, or establishes the fact that no oil exists in the vicinity.

Geochemistry got its start about ten years ago when efforts were made to collect small samples of gas in the surface soil by placing tubes in the ground and analyzing the atmospheres in the tubes after they had remained capped for several days. This was a slow and impractical method. The advanced technique used today was developed about two years ago from the research studies of Dr. E. E. Rosaire, E. McDermott, Dr. L. W. Blau, and others.

So far geochemistry has been used principally to confirm the findings of reflection seismography rather than as a reconnaissance exploration tool. Seismography gives the geologist a picture of underground structures and depths by measuring the time required for small seismic waves created by gunpowder explosions at the surface to be reflected back from subsurface strata. It reveals the presence of traps in which oil may be found. Geochemical studies on the surface then give a good indication as to whether oil actually exists in

(Continued to page 140A)

Upper left, portable laboratory used to map strata that may hold trapped oil pool; right, soil wax is separated from earth sample by solvents, then purified and weighed. Reflected earth waves from explosion, below, help find oil-bearing structures

Houston, Texas  
 2559  
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## Tiny Homebuilt Motorcycle Can Be Carried in Car



If his homemade midget motorcycle runs out of fuel rider can pick it up and thumb ride to gas station

Dubbed by its owner a "hitch hiker's special," a homemade motorcycle is so small that it can be picked up with its rider by a motorist. Twenty-four inches long and eighteen inches high, the midget bike is powered by a one-half horsepower, two-cycle engine with magneto ignition, and can make twenty miles per hour. The tank holds two quarts of gasoline, which the builder says will carry him 200 miles.

## Long-Distance Gas Detector Sends Warning by Wire

Poisonous or explosive gases in the atmosphere, even in minute quantities, are measured by a "long-distance" gas detector, invented by Dr. A. Herman Pfund, of the Johns Hopkins physics department. Operating automatically, it will send an electric signal to a remote-control center to warn of gases in mines, tunnels or factories, or of enemy gas attacks in time of war. It may find applications as an aid to

ventilation, since it will measure the proportion of carbon dioxide in the air. The detector works along the lines of a spectroscope. Atmosphere to be tested is heated by an electric coil, and the gas is measured by a cell which also transmits the information to a galvanometer.

## Variable-Pitch Automobile Fan Helps Cut Fuel Consumption

By helping to maintain the most economical operating temperature in the engine, a variable-pitch fan just developed for trucks and buses is said to achieve a noticeable saving in fuel consumption. The blades are controlled by a thermostat sensitive to engine temperatures, changing their pitch to deliver more cooling air when the motor is above the optimum temperature. When the engine does not require cooling, the blades flatten out, throw no air and use no power.



## Automatic Wrapping Machine Folds Napkin around Bottle

Bottled beverages, dewy wet from the cooler, are wrapped neatly in a napkin for serving, by an automatic machine just devised. Press the bottle on its treadle and the wings of the wrapper swing up and fold the napkin around the bottle.



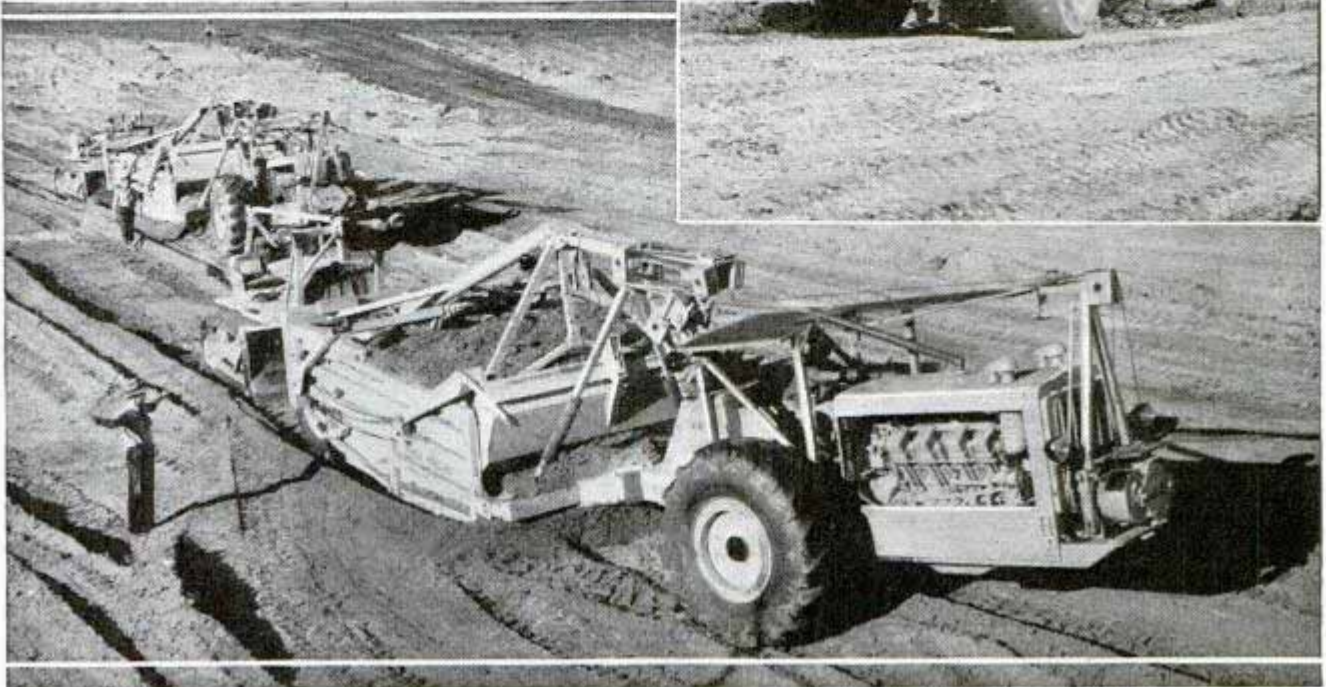
As the bottle is pressed down, the two arms close in and wrap a napkin around it

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*Will by [unclear] Atlanta Ga*  
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*control. Fan. [unclear] 55 W. Green St. Calif.*  
*W.A. Emery*

*Peoria Ill. Journal*

# Monster Dirt Mover Loads and Dumps Itself

Self-loading or loaded by small pusher tractors, these big 160-horsepower earth movers carry sixty-ton cargoes at twenty miles an hour. Independent steering for each wheel provides for sharp maneuvering



Working at truck speeds and carrying sixty-ton loads, huge self-loading and self-spreading dirt movers are doing the heavy work of a number of superhighway and government dam projects. Capable of twenty miles an hour with maximum load, these machines are highly maneuverable despite their size, having independent

*California*  
steering for each wheel and a 160-horsepower Diesel plant that can deliver its full power, when desired, to a single wheel. The low-pressure tires of 102-inch size afford good traction in soft earth. In some cases snatcher and pusher tractors load the big scows. On one job fifteen machines moved 14,000,000 cubic yards of earth.

*R 198*

## Baseball Pitchers' Practice Rack Returns Ball to Thrower

Pitchers are enabled to play a lone hand in practicing control with a robot that "pinch hits" for the catcher in receiving

and returning the ball. Seven feet high and four feet wide, the pitching board has a "strike zone" marked off in the opening



to provide a natural target. After hitting the board, the pitched ball will return a distance of sixty feet by its own momentum without touching the ground. However, an adjustment can be made to return the ball on the ground if the thrower desires to improve his fielding ability. The board is moved on rubber-tired wheels, and the steel supports fold back for storing.

Baseball pitcher pegs ball at target in practice rack to improve control. Ball can be seen near upper left-hand corner of rack on way back to mound

*The Ball Back Corp. 179 Broad St.*

K 18 4  
**Living Plants Used to Form Lincoln Portrait**



Living plants in his back-yard garden were used instead of paint by Frank Oliver, a gardener in San Francisco, Calif., to create a large portrait of Abraham Lincoln. In preparing a preliminary design, Mr. Oliver divided an enlarged picture of Lincoln into equal squares. Guided by this pattern, he arranged 22,000 plants of appropriate shades in metal forms which were spaced throughout fifty-six boxes. The great emancipator's likeness is contained in a garden measuring twenty feet long and ten feet wide.

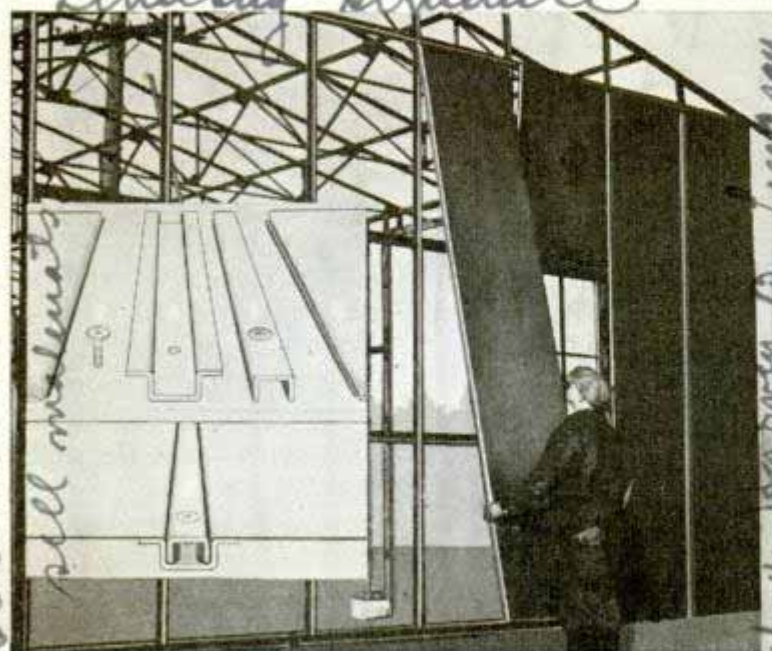


*club.*  
 Above, bird's-eye view of "living portrait" of Abraham Lincoln. Gardener, at right, touching up the picture

K 22 8  
**Simple Sheet-Steel Framing Makes Strong, Light Wall**

Strength is combined with lightness in a new kind of sheet-steel wall construction. Instead of using the sheets simply as cov-

ering for a cross-braced structural framework of steel, they are locked at the edges by lightweight framing members. These members consist of a flanged frame into which the edge of the sheet steel is inserted, and a "tensioner" which locks the panel sheet in the flanged frame. A socket lock screw draws the assembly together and holds it in place. While this type of construction can be applied to almost any structure in which metal sheets and framing are assembled, it is likely to be most widely used in mobile bodies, such as motor trucks, railroad cars and marine superstructures, where light weight and rigidity are important.



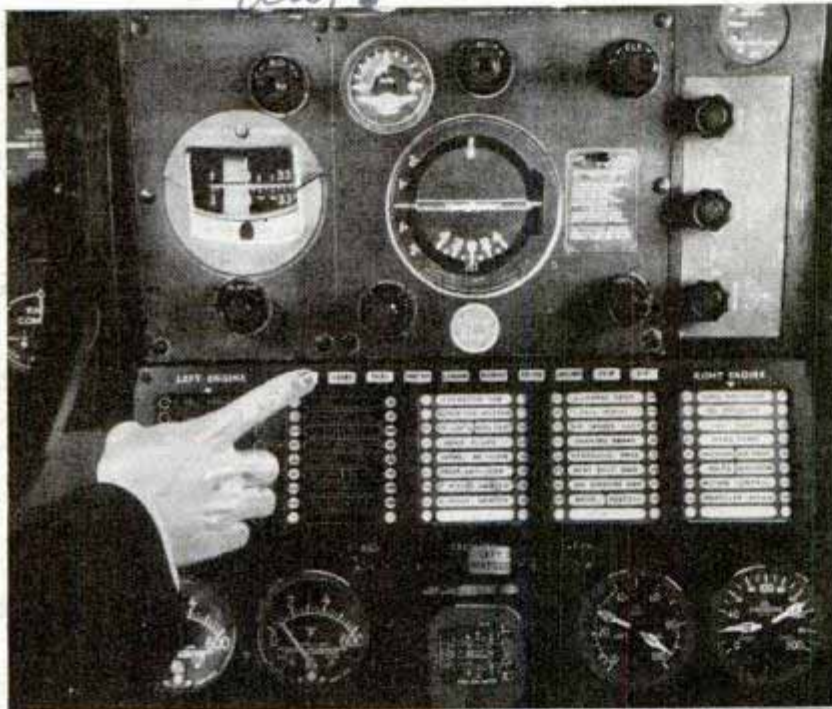
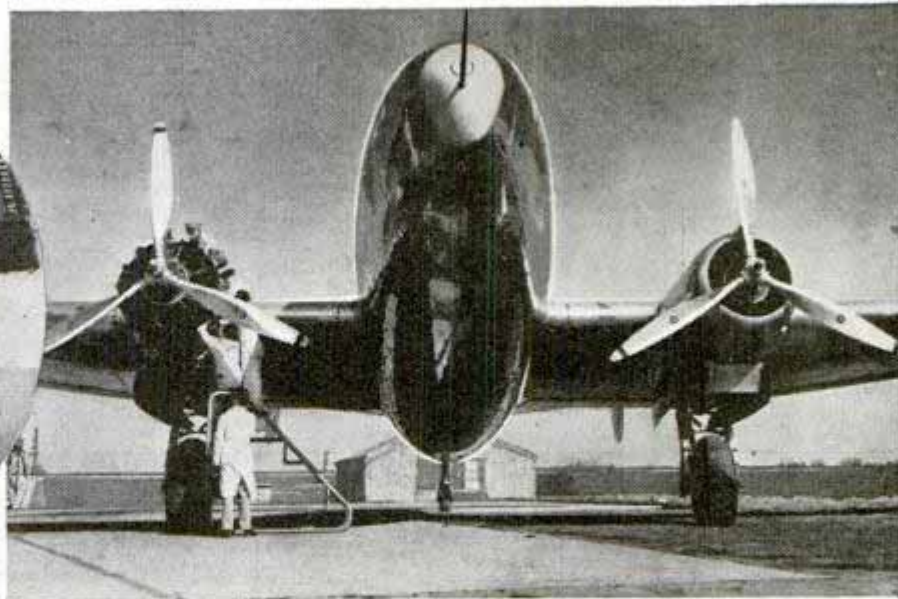
Placing steel panel on building. Inset shows how it is held in channel of flanged frame with the "tensioner" and lock screw

☐ American manufacturers in 1939 built 215,283 tractors valued at \$157,744,209.

*Automotive Industries*

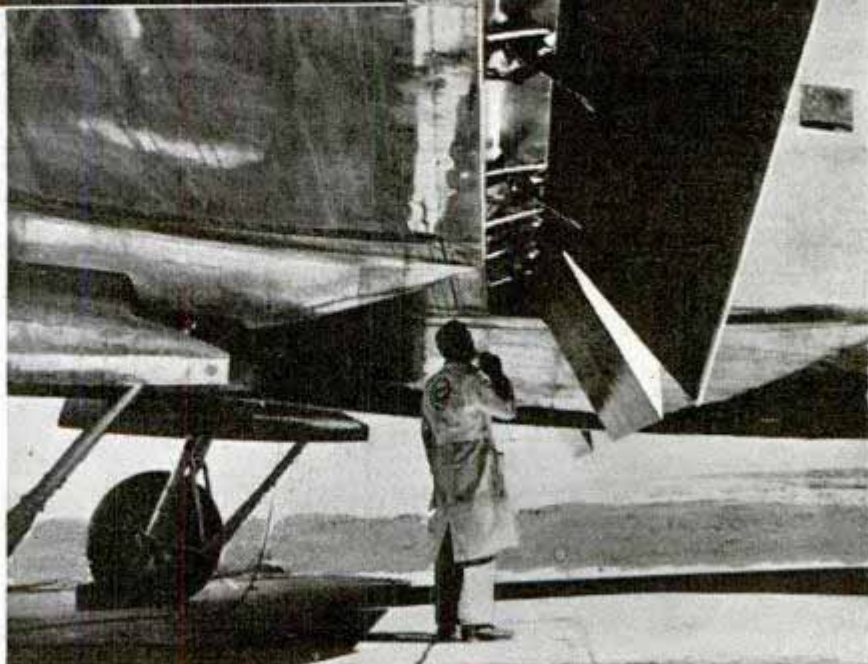


# High-Altitude Liner Has Robot 'Fourth Pilot'



Biggest twin-engine passenger liner to emerge from an American aircraft plant is the thirty-six seat plane completed by Curtiss-Wright at St. Louis. Its two 1,600-horsepower Cyclone engines can drive the plane at top speed of 243 miles an hour or cruising speed of 210 miles, and it has a 13,000-foot ceiling on one engine. The landing gear, seen above at left, is built to withstand the shock of a 38,000-pound load landing at a descending rate of 800 feet per minute

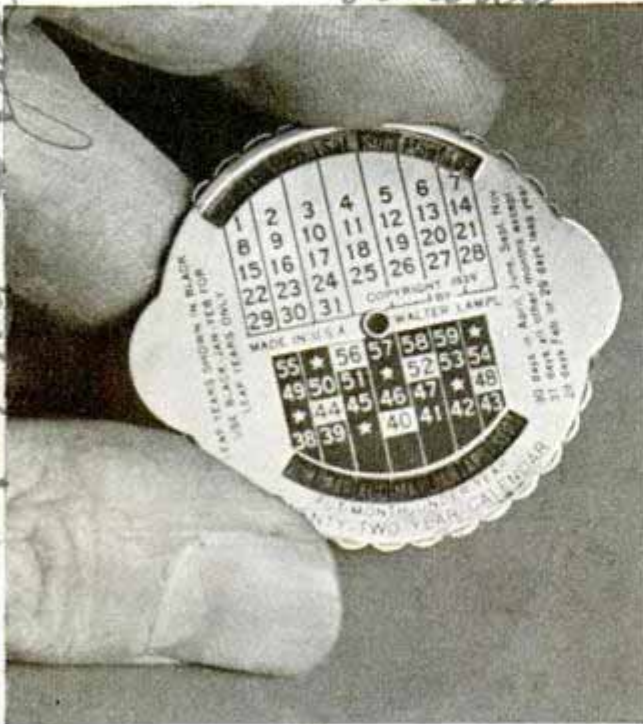
"Telltale" board, above, is nicknamed the "fourth pilot" for it does virtually the work of one man in automatically checking the functioning of about fifty instruments. At right are the wide flaps which add to wing area for extra lift in takeoff or landing, and bend down to act as air brakes. Fuselage is strengthened by new cross-sectional design of two eccentric circles to absorb stresses in supercharging to a "cabin altitude" of 6,000 feet when cruising at 20,000 feet. Seventy-five feet long and 108 feet in wing span, the new transport is convertible into a twenty-berth sleeper capable of long-range flight, its four fuel tanks carrying 1,000 gallons. The fifteen-foot full-feathering Curtiss electric propellers are the largest ever built for commercial air service in the United States



*Corp. 30. Double-roller Play. new 4 all City*

# Twenty-Two Year Calendar Fits in Pocket or Purse

80 cents

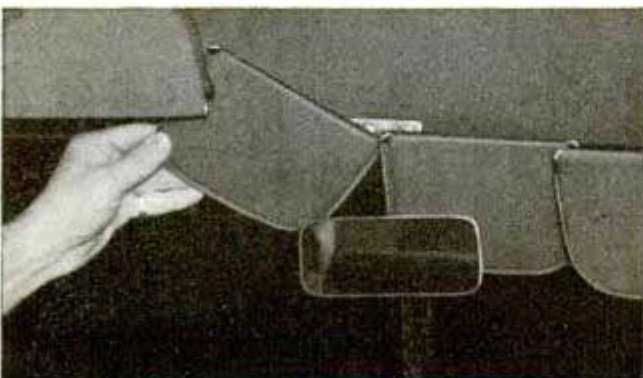


Pocket calendar gives day of week for any date and month within twenty-two years, by turning disk

Any date within a period of twenty-two years is found quickly with a pocket calendar consisting of two metal disks pivoted at the center. Simply turn the disks so the month engraved on the back disk shows beneath the proper year on the front one, and you can read the date and the day of the week at the top. Leap years, for which special instructions are given, are distinguished by black letters printed on a white background, instead of white on black.

## Visors for Center of Windshield Guard Unshaded Area

Protection for the driver against the sun's glare through the center portion of the windshield is given by a double auxiliary visor which is easily installed. Added



Pivoted so it does not block the rear-view mirror, a pair of sun visors shade center part of windshield

to the side visors it makes an unbroken bridge across the top of the windshield. The center visor rotates on a ball and socket around and behind the rear-view mirror and hence does not obstruct it.

K196

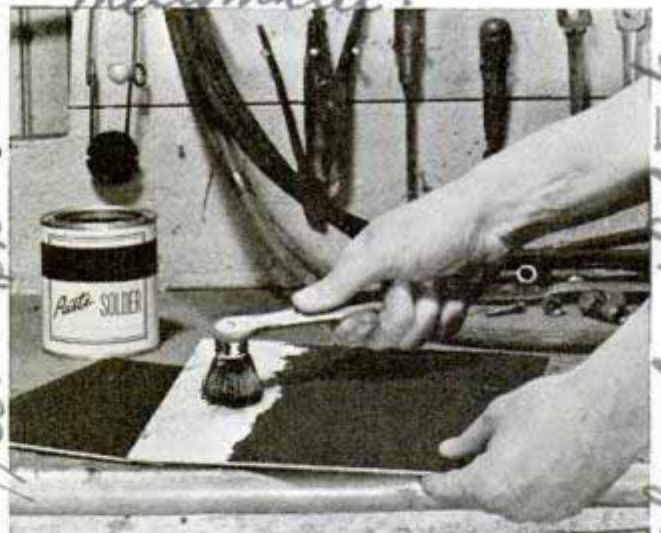
## Heels of Rubber and Leather Have Plywood Core

Rubber heels are now made with a sole-leather insert in order to add dressiness to the advantages in service afforded by rubber. A plywood core built into the heel helped solve the problem of keeping it in place on the shoe. The rubber-leather top lift is being applied to new shoes by some manufacturers and has been found to eliminate much of the buffing which was necessary with the older types.



## Solder Applied with a Brush Cleans Surface of Metal

Solder prepared in paste form so it can be applied quickly with a brush will clean the metal surface without extra treatment.



Solder cleans surface when it is brushed on the metal, and fuses by melting under a 400-degree heat

It saves waste since only the amount needed is brushed on evenly, and it dispenses with melting pot, bar solder, soldering iron and flux. The solder will melt and fuse to the metal when heated to 400 degrees Fahrenheit. It is especially handy on small articles where a soldering iron cannot be operated efficiently.

Sold by: Walter Lawpel, 210 W. 49th St. N.Y.C.

Specialists Inc.

J. J. Lonsdale & Co. 9007 Copeland, Detroit

# The ERA of PLASTICS



Giant "lemonade glasses" containing life-size figures constitute one application of Monsanto Yue-Pak in display field. The glasses are transparent plastic.



*Design Rohde*

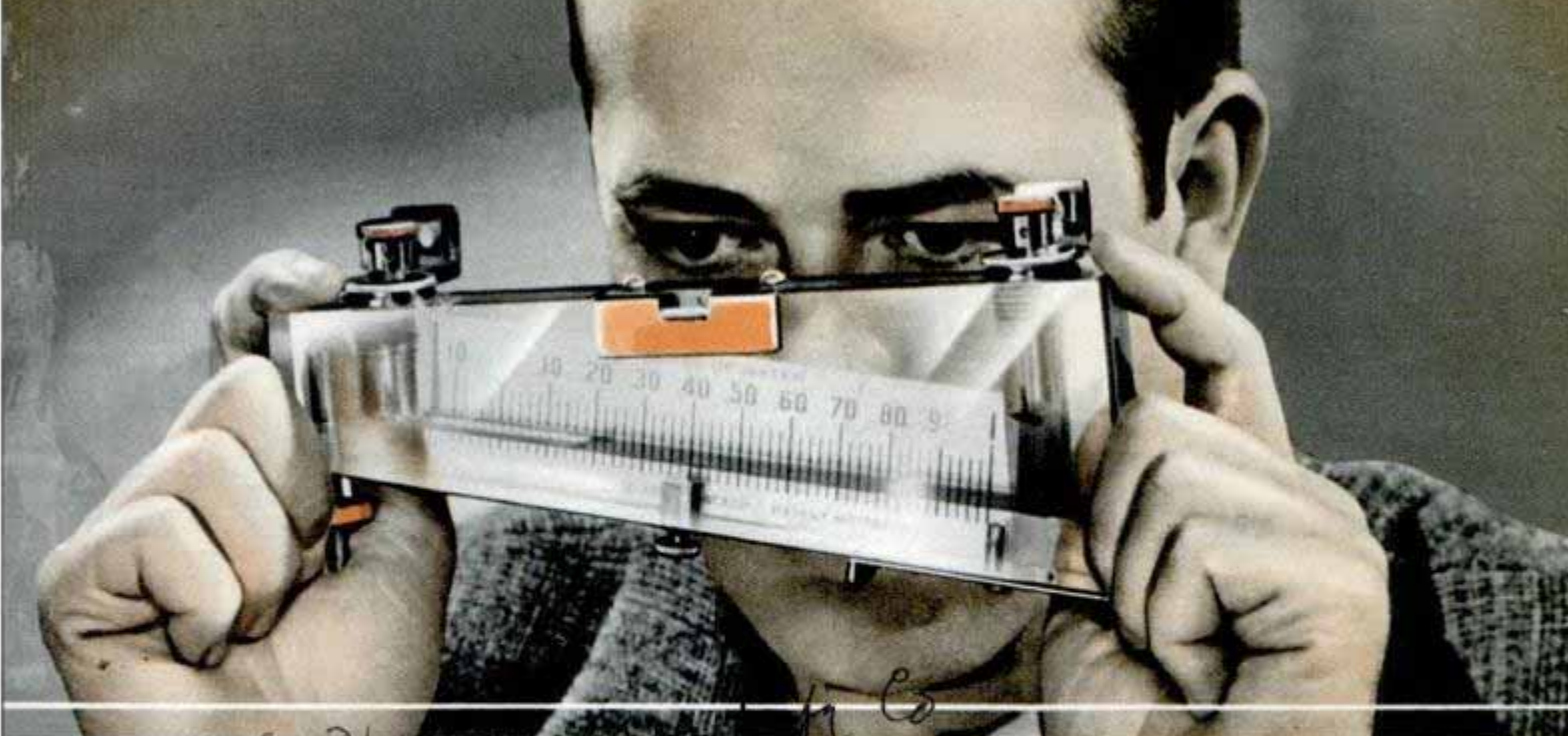
Stretching plastic filler for safety glass (left); chair with plastic seat and back designed by Gilbert Rohde (above); "Princess Plastic" (below) wearing fifteen articles made of plastics. Coal-air-water plastics supplied the young woman's jewelry.



658 21124  
By Julian P. Leggett

**C**LOTHED in plastics from head to foot, the American of tomorrow will live in a plastics house, drive a plastics auto and fly in a plastics airplane.

Fantastic or too far in the future to interest us? Not at all, say far-sighted scientists who point out that already plastic materials, or combinations of materials, either exist or are being developed which hold the promise of fulfilling every point of this prediction — and perhaps more. The average person has become a plastics showcase largely without knowing it, because plastics have been made to simulate bone, horn, ivory, semi-precious stones, wood, metal and a score of common materials. And the uses to which plastics articles are being put number literally thousands and range from airplane parts to false teeth.



*659 7 1/2 W. W. ... Co*  
*56 5 W. W. ... Co*  
 Precision instrument (above) is made partly of plastics. Illuminated fish lure (right) made of Plastacele cellulose acetate plastic. Below, left, chessmen made of plastics. Right, turning chessmen in Catalin Corp. plant with wood-turning tool.

*Gene Parkhurst*  
 From morning to night we use articles made of plastics—combs, buttons, shoelace tips and eyes, toothbrushes and hairbrushes, even to the bristles, fountain pens, pencils, eyeglass frames, tabs for files and loose-leaf books, keys of computing machines and typewriters, slide rules, golf tees, playing cards, radio dials, control knobs and receiver cases, containers for a vast number of face creams and lotions, thermometers, ash trays, lamp shades and reflectors, handles of coffee sets, tableware and carving sets and scores of others.

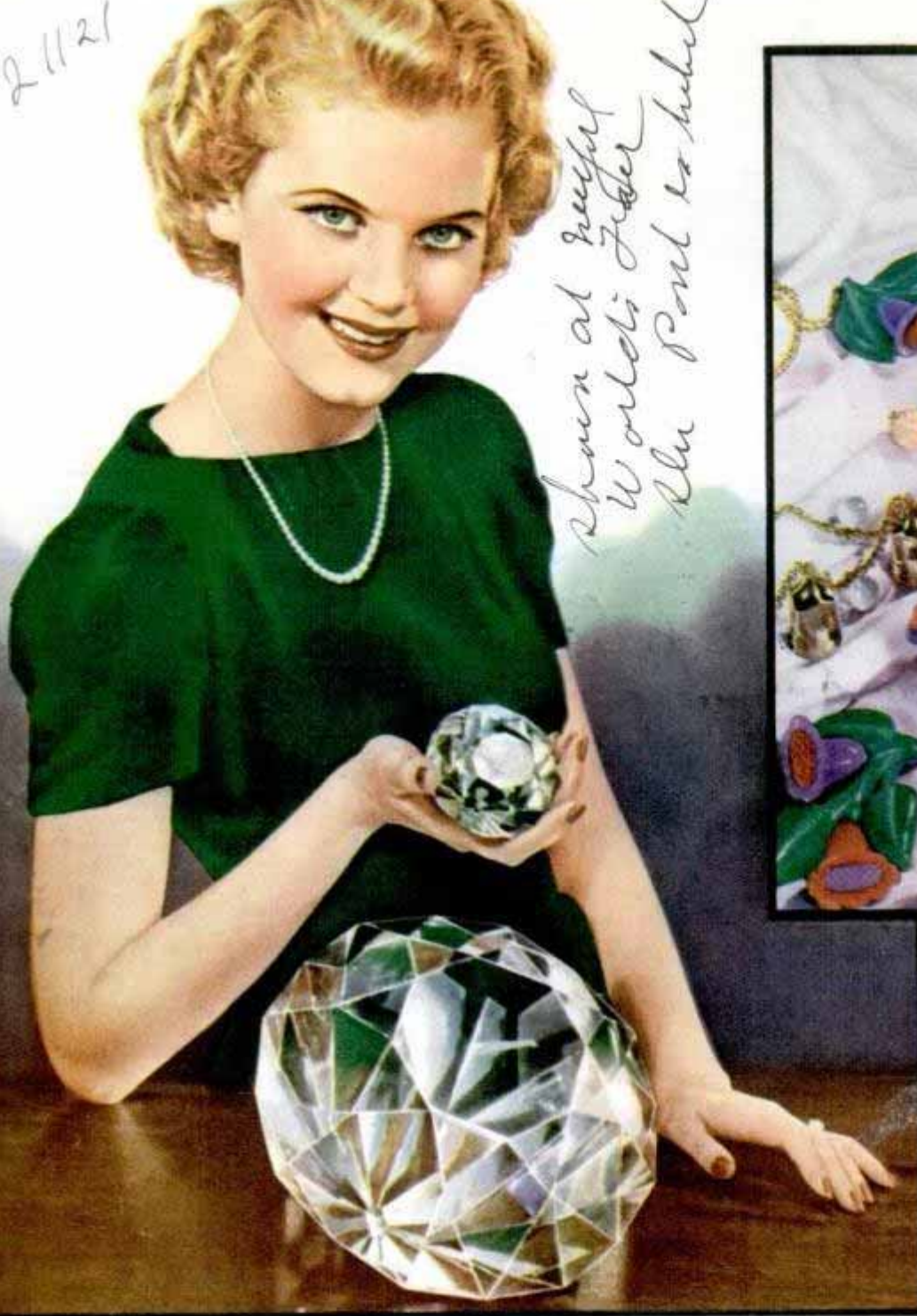
Since plastics appear to be more closely associated with our daily affairs than any other class of industrial materials except food and



*Gene Parkhurst*



21121



Shown at recent World's Fair thru Pont to exhibit



Catalin is the new synthetic plastic

Catalin-made Prystal hand and costume jewelry (above). Sparkling "diamonds" cut from du Pont's Lucite (left). Durable shoe forms, heel covers, solid heels and even shoe eyelets of Monsanto plastics in gay colors or lustrous black.

660



that plastic is most important

clothing, you may well ask, "What are plastics?" One chemist answers: "Plastics are materials that, while being processed, can be pushed into almost any desired shape and then retain that shape." Rubber, glass and pottery might be regarded as the earliest plastics, since they were formed easily into any desired shape during their processing, then retained that shape after cooling. But due to the tremendous growth of newer and more versatile materials, the word now applies almost exclu-



66

*Loreta Young*

*Land Haven*

*Eternally young*

sively to the synthetic products of chemistry which can be cast, molded or pressed into an almost unlimited variety of forms.

Giant referor, more than five feet high, made of Lucite for use in movie (above). Actor in magician's role creates full-grown woman inside the plastic apparatus from which she then emerges. Plastics are used in piano keys and for decorative effects on musical instruments (below).  
 Photo courtesy Monsanto Chemical Co.

*Designer / Klaus Wedau / California*

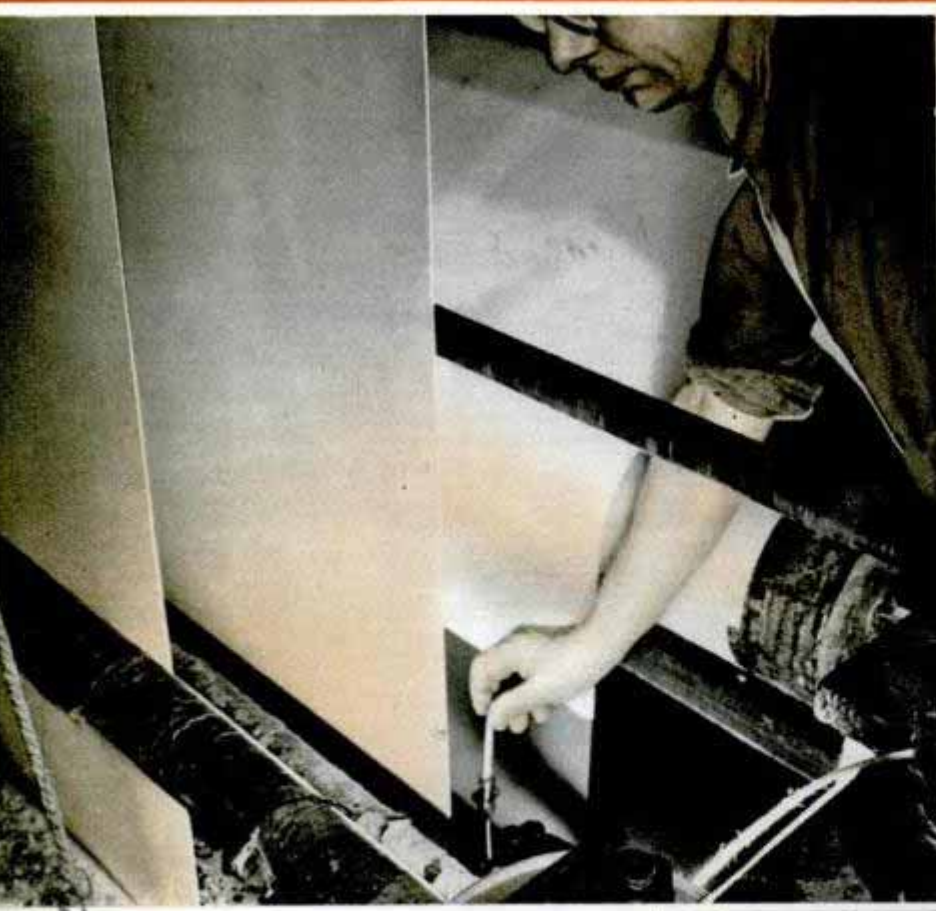
*2/1/21*

Recently a young woman stepped upon a stage in an eastern city. She wore a plastics hat fabricated from cotton cellulose. Coal, water and air plastics contributed her necklace, bracelet, ring, belt buckle, hand bag frame, shoe ornaments, buttons and walking stick. The contents of her hand bag were all made of plastics and so were her eyeglass frames, tinted to match her complexion. No less than fifteen purposes were served by plastics in her costume. With that start, clothing women, as well as men and children, en-





*Met. clarity Resin*  
 tirely in plastics is too near realization to be regarded as an idle dream.  
 That the house, auto and airplane of the future may be constructed for the most part of plastics, combined in some cases with other materials, appears a possibility. Already several plastics have been employed experimentally for these purposes; one in the production of an airplane fuselage and wings with surfaces literally as smooth as glass and affording excellent aerodynamic efficiency; another in tests as a material for lightweight auto bodies and parts which would be more resistant to wear and impact than if they were fabricated from metals. Others may be produced that will serve as substitutes for wood, stone and brick in fashioning exterior walls of buildings. Even now plastics are being used widely as interior walls, ceilings,

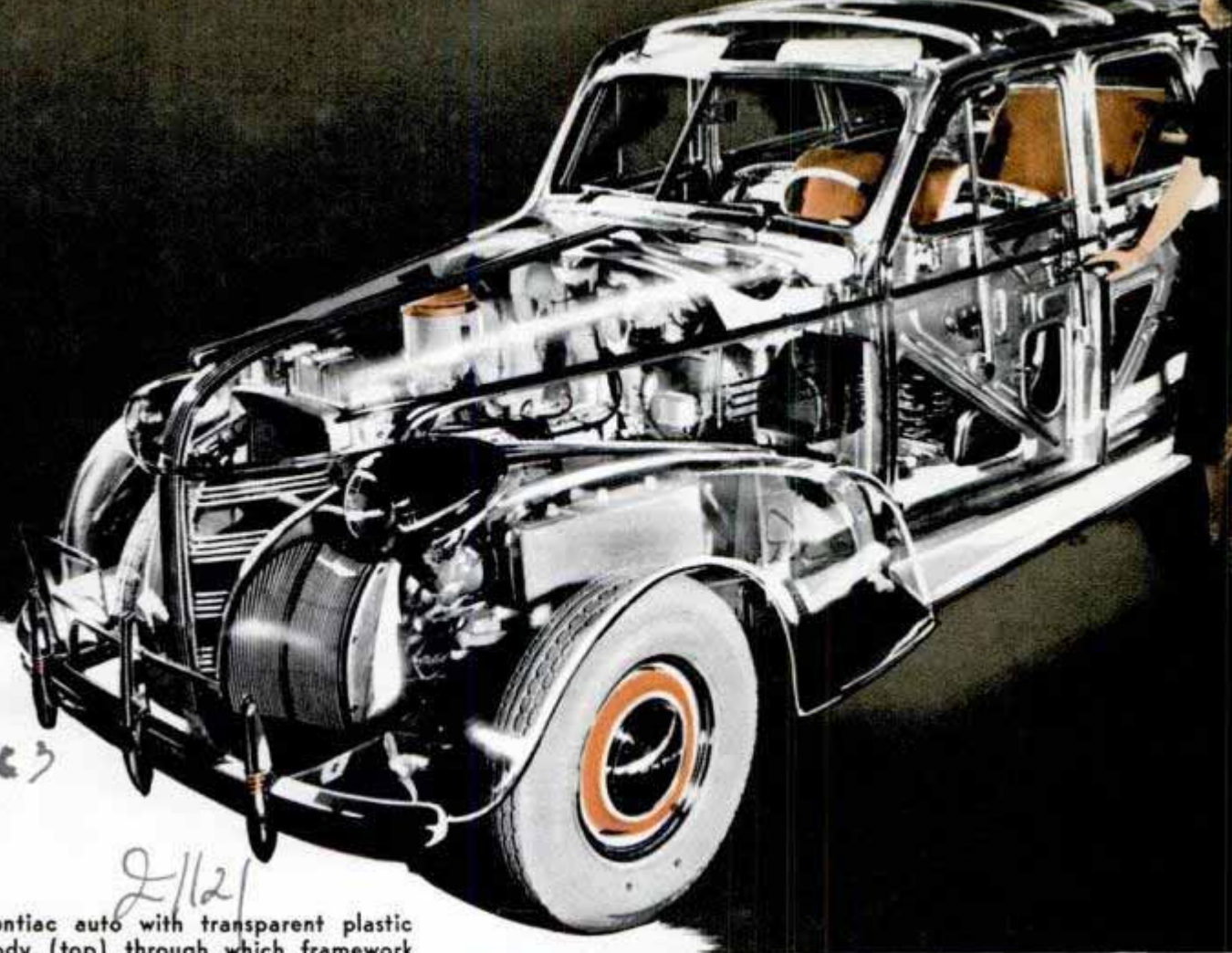


*Acetate*  
 Metal head guard with mask made of plastics (top) designed for tobogganists. Checking specific gravity of synthetic resin (center) in dipping tank at Westinghouse Micarta works. "Clock of Tomorrow" which gives time in all parts of world is fabricated of Marlette, a plastic (bottom).



663

2/121



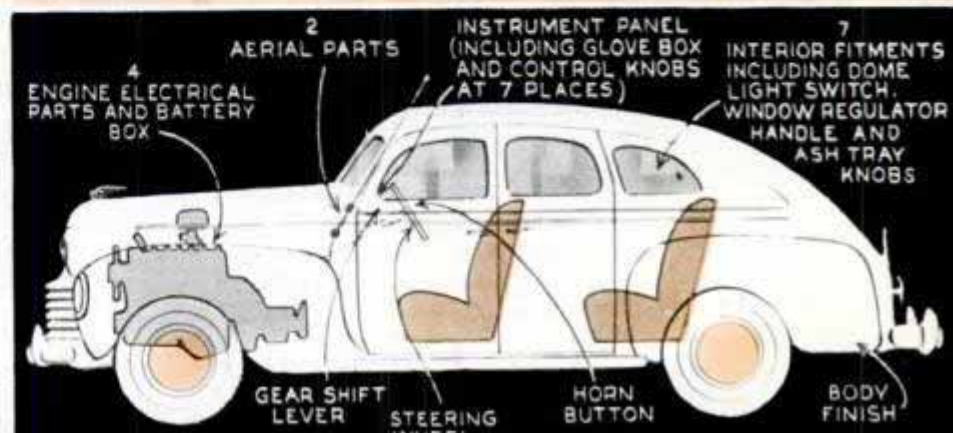
Pontiac auto with transparent plastic body (top) through which framework and mechanism may be viewed easily. Moto-Tool kit for working with Bakelite (center). Drawing of Chrysler with plastics parts indicated (bottom).

floors and decorative trim in homes and offices.

Current plastics production in the United States is estimated at more than 160,000,000 pounds per year, and at least thirteen types of plastics are on the market, with new types being introduced at the rate of about one every twelve months, as contrasted with the pre-1929 rate of about one every twenty years. The automobile industry probably is the largest buyer of plastics today, with women second.

Plastics have become increasingly important in creating beauty appeal in automobiles, as well as replacing materials formerly used and hence, are much more extensively utilized in the 1940 models than heretofore. Approximately forty applications appear in the various lines.

A transparent plastic, such



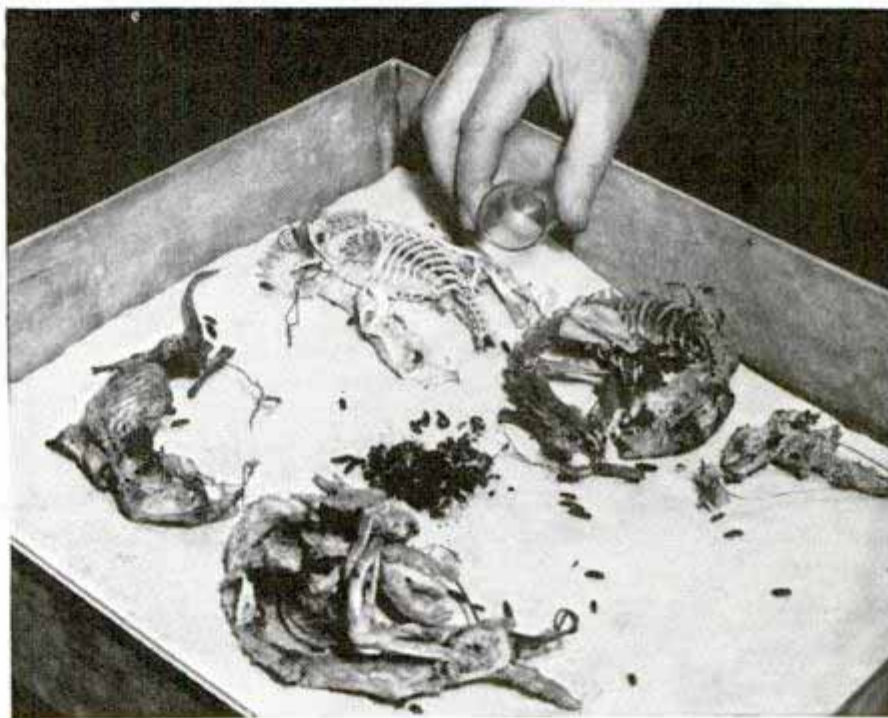
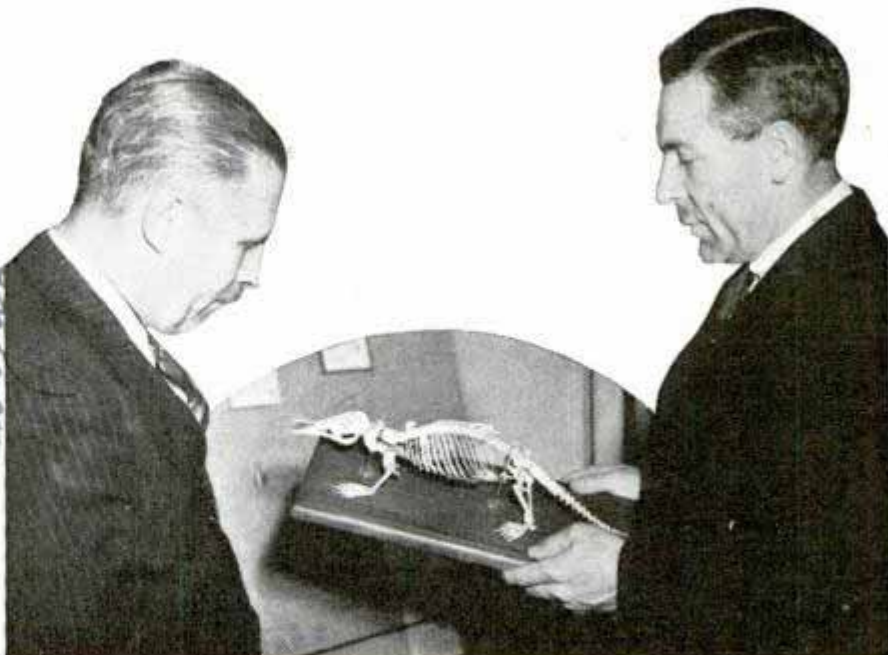


Brooches of Lumarith by Celluloid Corp. (top). Drawing resin from still (below) in Marblette plant. Mottled effects are produced by dipping glass rod into resin of contrasting color, plunging it into kettle resin and swirling it about, leaving trail of oddly shaped veins.

21121  
 as Lucite methyl methacrylate, is used for some accessories in place of glass because it is virtually unbreakable and at the same time crystal clear. Clock dial ring, speedometer light conductor and pointer and reflector buttons also are made of Lucite, in some cars, since it does not cause a glare from the instruments when lighted at night, because it possesses unusual qualities of light diffusion and edge lighting. Other interior uses of plastics include ornamental knobs for window controls, throttle, light switch, cowl vent, gear shift, heater switch, defroster switch, windshield wiper, cigar lighter and ash tray. Door control handle grommets, dome light switch bezel and lens, window reveal inlay, door handles, glove-box lock, radio control buttons, steering wheel, horn button and such under-the-hood parts as distributor heads, spark-plug covers, ignition coil cases and radio insu-  
 (Continued on page 128A)

# Beetles Help Clean Skeleton Bones for Museum

An army of beetles has been mustered into the service of cleaning bones of small animals that are to be mounted, because the beetles do the job better and quicker than humans. Skeletons and skulls of animals are shipped to American Museum of Natural History from points as far distant as Persia and Australia, and invariably there are scraps of dried meat clinging to them which must be removed before mounting. The collection of bones is placed in a metal-lined "arena," where they are attacked by hundreds of beetle cleaners. The insects are of a variety propagated from stock received from Africa and Asia.



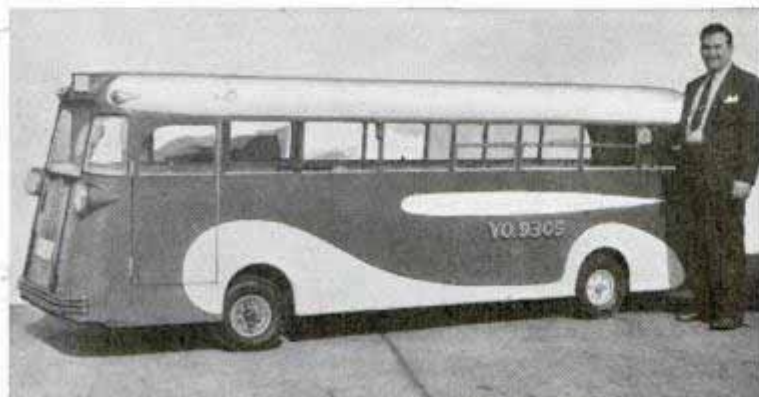
Top, looking over specimen of small mammal, the bones of which have been cleaned by beetles. Bottom, several hundred beetles are placed in steel-lined box with collection of bones that are to be picked clean for mounting

R 203

## Sandwich Stand in Miniature Bus Serves Roadside Diners

A miniature bus which was built for use in motion pictures has been converted into

a sandwich stand. Tables are installed at the rear where hot sandwiches from steam tables, and cold drinks from refrigerators, can be served. Parts from old cars were used for the driving mechanism, and a small engine supplies the power. Wheels are of the airplane type. One man operates the bus and serves the customers.



Undersize bus, made originally for the movies, is fitted to serve as a traveling sandwich shop needing only one man to run it

Jugo's Famous Hot Dogs  
Pies and Bimbale

K 221

## Waterfall in Painting Booth Rids Air of Enamel Fumes



Man-made Niagara carries away fumes and particles of sprayed enamel. Note fog being blown from fender toward water curtain

Painters who spray automobile bodies, fenders and hoods in a modern painting booth can work without masks or hoods for protection, because all the fumes and excess enamel are carried away by a miniature "Niagara." Car parts that are to be sprayed pass on a conveyor between the workman and the man-made cascade. The surplus cloud of enamel emitted by the spray gun is drawn into the water curtain by suction fans, and these particles of enamel are reclaimed later from the water.

K 213

## Hot Ink "Sets" by Cooling and Prints Faster

"Cold setting" printing ink that hardens as soon as it touches the paper promises to speed up presses since the danger of smearing is eliminated. It reverses the ordinary process of printing with a fluid paste which dries comparatively slowly by absorption and

heating after it is on the paper and might be termed "heat setting" in contrast. Instead, the new ink, supplied to the printer in lumps like coal, is melted to liquid form by heating before it is applied to the type, which also is heated. It hardens as a solid deposit immediately on touching the relatively cold surface of the paper. It is possible to print on ordinary newspaper with 133 screen, where fifty to sixty-five screen commonly is used, and still retain sharpness of outline, because there is no spread or penetration due to fiber suction as with liquid inks. Virtually all web presses can be converted readily to this process of printing, the only change being the addition of hot-water connections to shafts and ink fountain.

K 226

## Boat Folds into Trailer for Trips to Water

Readily converted into a trailer for convenience in towing it to the water, a folding outboard-motorboat is handy for the sportsman who frequently hauls his boat over land. The boat is equipped with pneumatic tires and a collapsible trailer hitch. To make it ready for towing, the bow is folded back over the stern and locked in place.



By folding bow over stern this boat is converted quickly into trailer for convenience in towing it to and from the water

Chrysler Corp. Plymouth Blvd. 341 Mac each with cover

for my Huber, class 460 W. 34th Ave. Chicago

Chicago 2251  
Arcar Johnson, 49 Coleo  
Mrs. E. D. Knebel, 1749 Shore

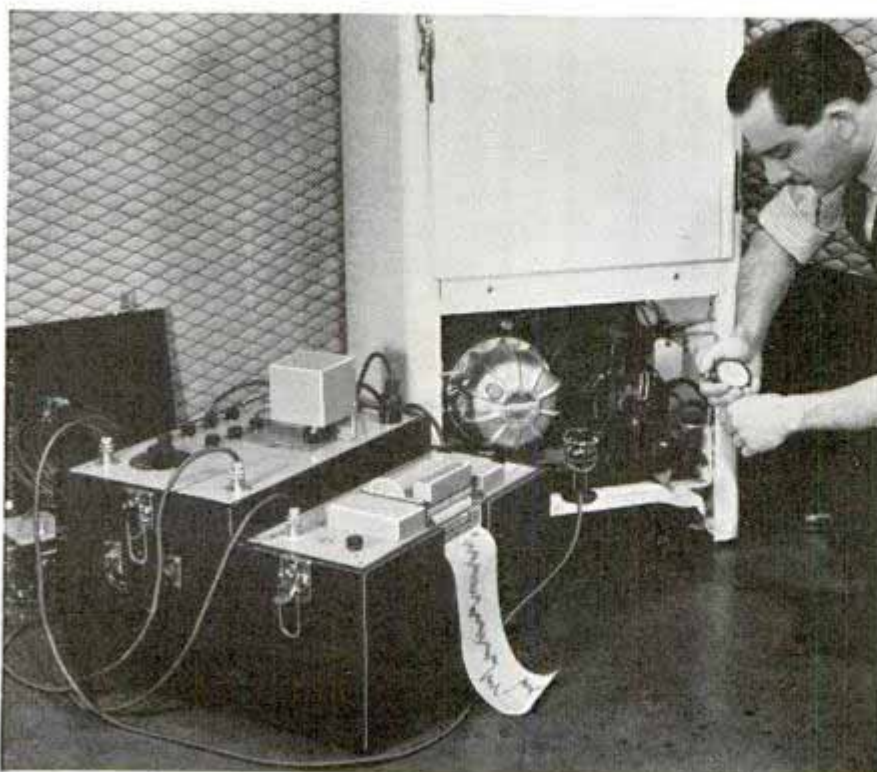
# Midget Orchestra Helps Teach Musical Parts

Music students can learn orchestral parts quickly with the help of a patented miniature orchestra operated in connection with a phonograph. Using a switchboard, the teacher can light up any section of the orchestra and in this way indicate for his students the various parts or instruments of the orchestra that the record is playing. This trains the student to associate individual musical sounds with the proper section of the orchestra.



Music teacher using miniature lighted orchestra to teach students various instrumental parts. As a phonograph record plays the different parts, he pushes a button that lights the corresponding section in the model

# "Stethoscope" Charts Motor Noise and Warns of Failure



Impending breakdown of electrical machinery is foretold by an "industrial stethoscope" used by acoustic engineers to determine the "heartbeat" of motors under actual operating conditions. The varying levels of sound frequency are recorded automatically on a chart, and by noting the eccentric noise peaks it is possible to prevent failure of electrical machines by making timely adjustments or repairs.

Industrial "stethoscope" placed near refrigerator motor records noises on a chart, which tells engineer whether there is danger of breakdown

K9<sup>3</sup> *The* "FLYING EYES"

Ref: Lt. Arthur LaVigne, 40th Div. Aviation, California Natl. Guard  
 115th Photo Section, 40th Div. Aviation, California Natl. Guard



Courtesy 115th Photo Section, 40th Div. Aviation, California Natl. Guard



Top, left, observer, oxygen tube in mouth, looking through bottom of fuselage. Right, looking downward from above observer. Center, firing at sleeve target. Bottom, strapping parachute food container to bomb release mechanism

**P**EERING through the belly windows of the fuselage, the observer saw a colored signal light flashing on the ground. Over the phone he spoke to the pilot. "Circle at 800 feet, pull three flares."

Half a minute later the ground below was illuminated by the light of the three parachute flares and the observer saw long lines of trucks moving toward the front.

A year ago the observer would have returned to his airdrome or sent a radio code message to report this important information, but tonight he snapped on a shielded light and rapidly sketched on paper the size and direction of the enemy movement. He added a few sentences to explain the map, fed the paper into a facsimile machine, and pressed a button.

Instantaneously in the command headquarters miles away a machine began duplicating the map he had drawn. Later the red message light beside him winked on and the observer pulled a new sheet from his facsimile box, containing revised instructions from

K93

Capt. Thomas G. Stinson, Jr. 10078  
Malibu Road,

# of the ARMY

Pacific  
Palmerdes  
Calif.



Courtesy 115th Photo Section, 40th Div. Aviation, California Natl. Guard  
**Observation plane in flight (top) with gunner in rear cockpit facing aft. Sergeant-operator at radio center from which voice and code radio traffic to observation planes is handled (lower circle)**

headquarters based on the activity he had reported.

Observation aviation, the "eyes of the army," can spy so efficiently on an enemy these days that most mass-troop movements and large-scale battle preparations are made at night. The result is that aerial observers are flying by night as well as by day and have learned new tricks that help them to see in the dark. Learning what

the enemy is doing is half their task; getting the information back to headquarters is the other half. The new radio facsimile machine is the latest aid for flying scouts.

Voice or code radio can be drowned out by interference, it is not secret, and it can be misunderstood. Radio facsimile can't be drowned out or garbled, can be made secret, and reproduces anything from handwriting to maps. The military model, con-



they use the shelter of every cloud they can find and watch for enemy fighters in order to avoid them. They fly high or low, rarely in the middle altitudes where they are most vulnerable to anti-aircraft fire. The planes are slower than most military aircraft and a pilot may "hedgehop" even after dark at under 500 feet to take advantage of the terrain. At high altitudes he skids and turns and changes altitude incessantly to avoid being hit, until the observer calls for straight and level flight to permit accurate mosaic photo mapping.



Pilot, photographer, radio operator, gunner, and scout—and an expert in each—these are the qualifications of an observer. Every mission is different. When Major Eldo A. Peterman, commanding the 115th Observation Squadron of the California National Guard, assembles his officers, half a dozen different assignments may be passed out. If the squadron is co-operating with ground forces in summer training, an enemy force may be assumed to have occupied part of the coastline. Captain C. W. Larsen, operations officer, lays out the plans. One plane is assigned to the artil-

(Continued to page 146A)

taining secret improvements, is about the size of a typewriter.

Observation planes are the lone wolves of the Army Air Corps and affiliated National Guard squadrons. They hunt singly, rarely accompanied by protective fighters. In actual warfare they may have to fly through their own and the enemy barrages and the pilot and observer may have the uncanny experience of watching a big shell, at the apex of its trajectory, coast along beside them.

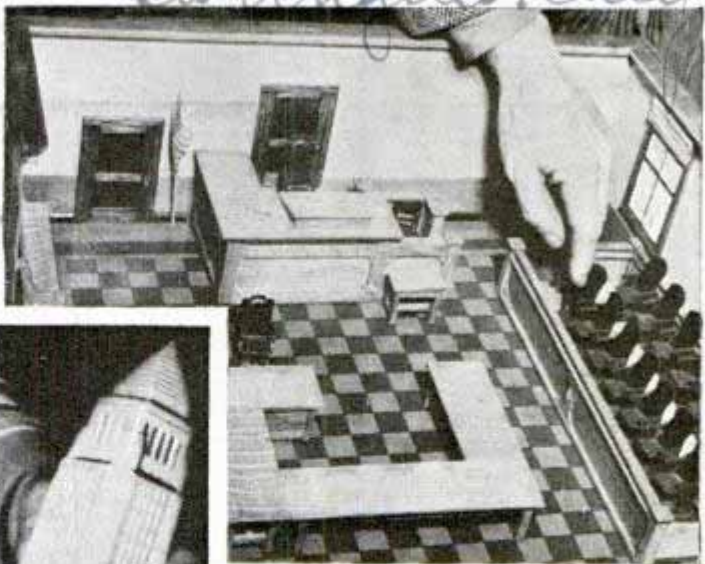
Piercing the enemy lines,



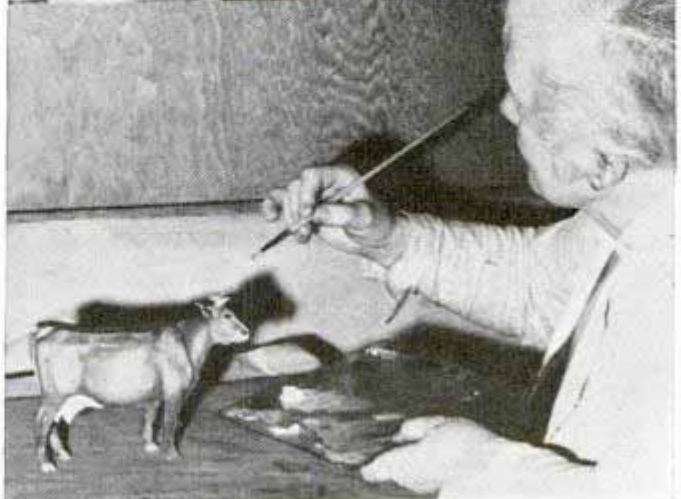
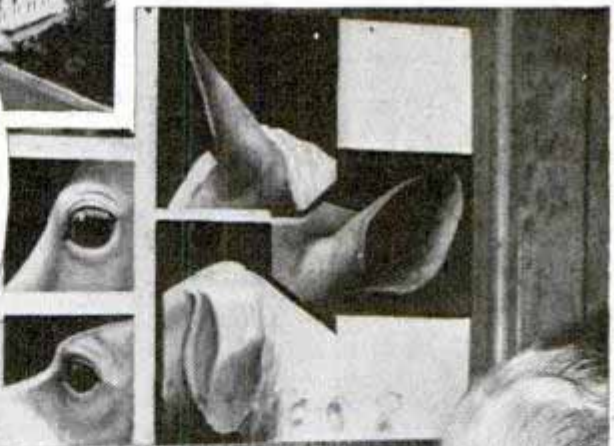
Top, throwing out message tied to streamer that burns colored light at night. Center, laying out message panels so observer aloft may read them. Bottom, plane picking up message with grapple hook from rope supported by uprights held by men on ground



Scale Models Teach School Lessons by Sight



*It's an old story that one picture tells more than a thousand words. Los Angeles city schools put that principle to practice in teaching with models. Hundreds of scale models, which fold up in convenient cases for carrying from one school to the next, have been constructed for use in teaching natural sciences, architecture, civics and a host of other subjects. Above, miniature reproduction of a court room, complete to the gavel on judge's desk, used in teaching municipal government. Left, dismantling model of city hall*



*Pages of reading may be forgotten, but one look at an object is impressed on the student's mind. After a year of experiments, tests indicate that teaching with models has materially reduced learning time for all grades of Los Angeles school children. At top, left, is a model of Los Angeles civic center. In circle, a gigantic model of a tooth, hinged to allow study of enamel, internal structure, and decay. At right, large reproductions of details of animals are used as guides in painting models, such as the cow, which helps teach very young children word meanings*

# Portable File Cabinet Lamp Throws Light on Letters



Lamp on top of filing case gives plenty of light to read letters without first removing them from drawer

Light is shed directly on correspondence where it is needed by a portable lamp designed especially for filing cabinets. One 100-watt bulb, according to the manufacturer, will illuminate the entire width of five standard letter cases, four drawers deep. Even the bottom drawer receives enough light to permit reading of letters in the file.

## Electric Stop Watch Easy to Read Has Dial Like Speedometer

Time is measured in tenths of a second by an electric stop watch that shows the elapsed seconds in numerals, as a speedometer indicates mileage, instead of on a clock dial. It is driven by a synchronous motor, using sixty-cycle alternating cur-



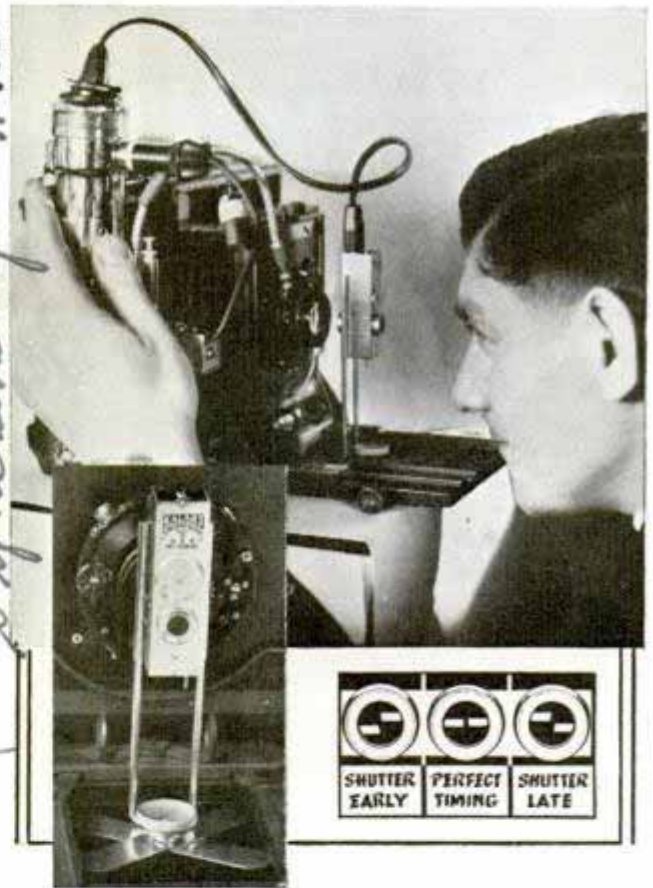
Direct-reading electric stop watch shows time in tenths of a second. Push button starts and stops it

rent at 110 volts. Stopping and starting is controlled by a single push button. The timer gives split-second accuracy and runs 10,000 seconds, or an interval of two hours and forty-six minutes, before returning to zero. It can be used in many industrial and laboratory operations that call for easy-to-read timing and uniform accuracy.

X 224

## Tester for Flash Synchronizers Assures Perfect Timing

Flashlight synchronizers can be set in perfect time with the aid of a visual tester through which the photographer sights his camera shutter as he presses the trigger. No flash bulbs need be used in the test. The test instrument, mounted directly in front of the lens of the camera, is connected to the battery of the synchronizer. A



Position of light slits (lower right) seen through tester indicates timing of shutter and flash

light is placed behind the open back of the camera. When the shutter is released two slits of light are seen through the window of the tester; if the left slit is higher than the right, the shutter is slower than the flash; if the right slit is higher, the shutter is faster. If shutter and flash are timed perfectly the slits are directly in line and a red line appears.

The Light Right Co.  
 1750 N. Springfield Ave.  
 Chicago, Ill.

Synchronizer  
 \$25.00

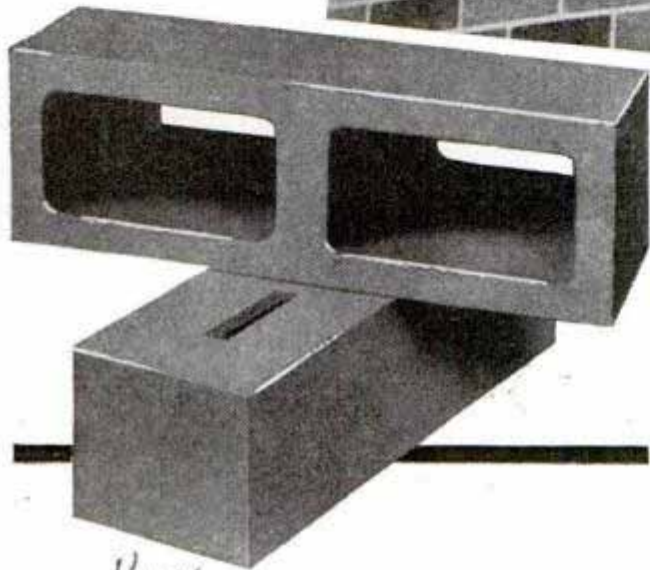
newspaper

Kalash  
 915 Broadway

4669 Lincoln Ave. S.  
Cromwell

# Hollow Wall Tile Equals Two Bricks in Size

Lightness in weight is combined with strong construction in a tile brick which has two inner air cells. Its dimensions are twelve, by three and one-half, by three and three-quarters inches, being proportioned about the same as ordinary brick but having twice the face area. The cellular design provides air insulation and accounts for a reduction to almost half the weight of



*Tile is as easy to lay as brick and it covers twice the area. Note cellular design of samples at left*

brick. There are fewer mortar joints to fill and it is claimed that one tile is handled as easily as a brick, yet it is twice its size. It is produced in a wide variety of colors to take the place of face brick, but is supplied also in a "basic" color.

*Edward Roberts - Cold Junction Company*

Kill

# Streamline Car Ferry for Lake to Be a Floating Palace

Passengers and automobiles, as well as freight cars, will be carried on a palatial \$2,000,000 car ferry being constructed to ply across Lake Michigan between Ludington, Mich., and Manitowoc, Wis., at a speed of eighteen miles an hour when fully loaded. Ten watertight compartments and a reinforced double bottom, for navigating heavy ice fields during winter months, together with two-way radio and repeating beam compass help to make it one of the

most modern and safest ships on the Great Lakes. The cabin deck of the 406-foot streamliner will have a spacious radio-equipped lounge, separate smoking parlors for men and women, and seventy-four staterooms, each with controlled air circulation and furnished with upper and lower beds like those in railroad sleeping cars. Fifty-seven persons can be accommodated in the dining room, which, like the salons, will be illuminated by fluorescent indirect lighting. On the upper deck twelve parlor suites will be fitted with showers. All furniture, wall partitions and the window and door casements are to be of steel, rendering the ship fireproof. A 6,000-horsepower engine will drive twin screws, automatic stokers will do the firing.



*Passengers enjoy all modern conveniences and comforts on this car ferry designed to transport thirty-four freight cars as well as 100 automobiles*

*Designed by Manitowoc Shipbuilding Company, Manitowoc, Wis.*

*operated by Pere Marquette Railway*

21381

# REBUILDING



*Brush is burned when heavy snow makes it safe, top. Below, at left, CCC boy planting seedlings; right, constructing fire-control line in southern pines with double moldboard plow*

**P**AUL BUNYAN was the daddy of all lumberjacks. According to the fable, he invented logging, designed and made the tools for it. He logged off the forests from Maine to Oregon. Farms sprang up on the land he cleared, while the finished lumber built our cities.

Actually, Paul Bunyan was no myth. He was the personification of a mighty industry. His fabulous deeds were those of a generation of lumberjacks, who cleared an empire to build an empire. Paul did ev-

erything on a gigantic scale, but so did the husky young industry he typified.

Paul Bunyan has a new job now. He's putting back the forests he skinned off with his mighty ax, guarding them against their mortal enemies—fire and insect. For decades the U. S. Forest Service battled feebly to preserve our woodland, put back the trees leveled by fire and ax. But it was a losing fight. It needed a Paul Bunyan equal to the magnitude of the job.

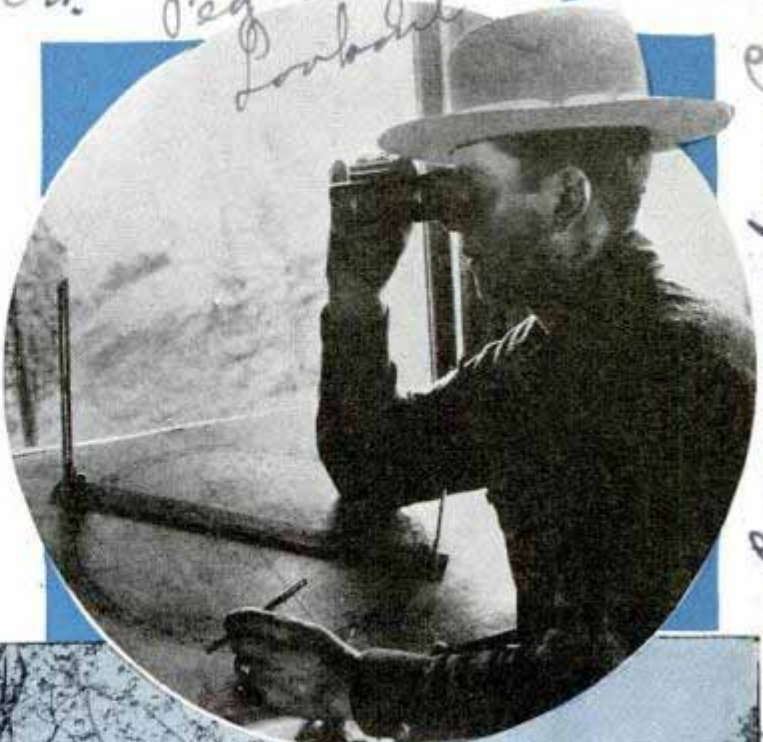
Seven years ago the Civilian Conserva-

*F. A. Selcox, Chief*  
*Washington*

4322 Seema Road, Wash, D.C. 20501

# PAUL BUNYAN'S Empire

tion Corps was organized; and it immediately adopted Paul Bunyan as its patron saint. With an average strength of 270,000 men, it is reforesting the land on a scale to rival the lumberman's operations. Two billion trees have been planted. That's a lot of trees; enough, in one plot, to cover Connecticut and Rhode Island. And though many larger trees spring from seed smaller than grass seed, they cannot be broadcast over the ground. First they must be gathered. The CCC has collected a million and a half bushels of pine cones,



Lookout in Lassen National Forest scans horizon for smoke, top. Center, collecting seed from tulip poplar. Bottom, ranger fights at edge of fire to stop lateral spread

threshed them for their tiny seed. It has gathered a million pounds of nuts and winged seeds of hardwood trees, has dehusked or de-winged them. The seed cannot be planted direct in the denuded forest. Most of the CCC planting has been done on tracts so burnt over, or cut over, that nature's protection has not been available. So the seeds are planted in beds, protected from sun and wind and frost, until they attain the sturdiness of a few inches. Then they are individually pulled, transplanted with



CCC: Robert F. Schner, Curly Conservation Club, Washington D.C.

Enrollment in CCC nearest Army Regulating

2/1981



Fighting a brush fire with shovels, above. Left, Ropes turn trees into skeletons. Below, quick use of portable pumps prevents a holocaust, and cutting a firebreak through woods

The other part of this job is to protect these new forests, and the vast areas of virgin and second-growth woods still remaining. And they are vast, there being in the United States 670 million acres of woodland—an acreage equal to the combined areas of France, Germany, Norway, Sweden, Italy and Spain.

To make these forests accessible to themselves as fire fighters, the CCC has constructed 104,000 miles of truck trails and roads—enough to girdle the earth four times. Forty thousand bridges have been constructed and 72,000 miles of telephone line erected to facilitate fire control.

A few years ago forest fires were discovered by chance, located by



wider spacing, so their roots may develop. After a year they must be pulled again, the roots packed in damp moss for a trip to the final planting place.

Aside from some southern pine planting, which may be done in plowed furrows, the planting crews are usually two-man units. One, armed with grub hoe or mattock, digs the hole. The other places a tree in each hole, packs earth around it. When fires in a single bad year denude an area as large as Arkansas, replanting by this method is a job to keep even a Paul Bunyan busy.



Natl Forest Calif  
POPULAR MECHANICS

21387



guess. Travel to the scene was by foot or horse or canoe; and the few men arriving had only hand tools to fight the blaze. Under these conditions, forest fires were truly of Paul Bunyan proportions. In August, 1910, a strip of woods 120 miles long, twenty to thirty-five miles wide was destroyed in Idaho, seventy-four fire fighters perishing in the flames. In October, 1918, the Cloquet fire in Minnesota wiped out that town of 12,000, threatened



Duluth, destroyed \$30,-000,000 worth of property and timber, snuffed out 400 lives. For sheer fury it rivaled the Battle of the Argonne Forest, then going on 4,000 miles away.

Today CCC camps dot our national forests, making trained crews quickly available, to put out little fires before they become big ones. And they have an imposing array of machines to aid them. Small crews of picked CCC men constantly patrol forest routes by truck, on foot, by canoe, and in airplanes; carrying equipment for putting out small fires, carrying portable radios to report fires they cannot handle. Thousands of observation towers have been erected, from which fires may be located accurately. When a fire is off a trail, horses and mules are transported in huge trucks, nine mules to a truck; the mules then pack the equipment across country from the nearest point on the road.



Top, weeding a bed of seedlings. Center, spraying pines to kill their insect enemies—in this case a needle miner infestation. Seven-ton stripper at bottom clears field of brush to give young trees a chance

Fire fighters are moved  
(Continued to page 114A)

developed by Roger  
Auburn School of Timber Management

## Photoflood with Black Neck Stops Escape of Stray Light

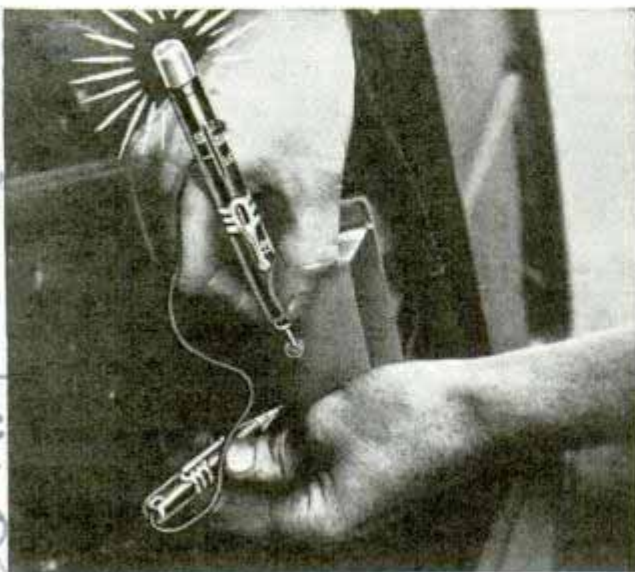


Pointing to black coating on neck of photoflood lamp that keeps light from "backfiring" into camera lens

Self-reflecting photoflood lamps are now produced with black necks to prevent stray light from escaping backward or toward the sides. This was found desirable because amateur and professional photographers sometimes place the lamps very near or just ahead of the camera. The black outer coating extends two inches from the lamp's base to a point where it overlaps the interior reflecting surface.

## "Pocket Pencil" Circuit Tester Also Indicates Voltage

Any electric circuit from six to 600 volts can be tested with a "pocket-pencil" set



Smaller of the two circuit-testing units has a retractable needle for piercing insulation of wire

which is safely insulated and easily carried in vest or overall pocket. When the voltage is unknown the setting is placed at 600 volts and adjusted until its incandescent test lamp burns with normal brilliance. In this way it can be used as a voltmeter. The smaller of the twin units has a needle, retractable like a pencil lead, for piercing wire insulation to make a test.

## Portable Unit to Deodorize Air Works Like a Gas Mask

Cocoon-shell carbon, such as is used in gas masks, is the absorbent element in a portable unit which removes all odors from the air in a room. Self-contained, it plugs



Fan draws the room air through portable unit containing cocoon-shell carbon which removes odors

into any alternating-current outlet of 110-220 volts, and has a fan to draw the air over the carbon elements. It is designed for kitchens, offices, washrooms and other small rooms lacking air-distribution ducts.

Automobile makers use a million dollars worth of diamonds yearly for boring, drilling and finishing auto parts.

K168  
 General Electric Co  
 Park Cleveland Ohio  
 K192  
 W. B. O'Connell Engineering  
 Charles Blvd.  
 114 E. 92nd  
 New York City  
 K167  
 Duncan 408  
 Home Air Charge  
 S.W.



# Superfast Camera 'Freezes' Runners in Action

Strained expressions and complete details of the muscular action of runners, clearer and sharper than ever before seen in a picture, are visible in a photograph made with an exposure of 1/30,000 of a second, whereas the average newspaper camera is limited to 1/1,000 of a second. The picture, taken with a new high-speed photographic process developed at Massachusetts Institute of Technology, was the first attempt to apply it to a public event.

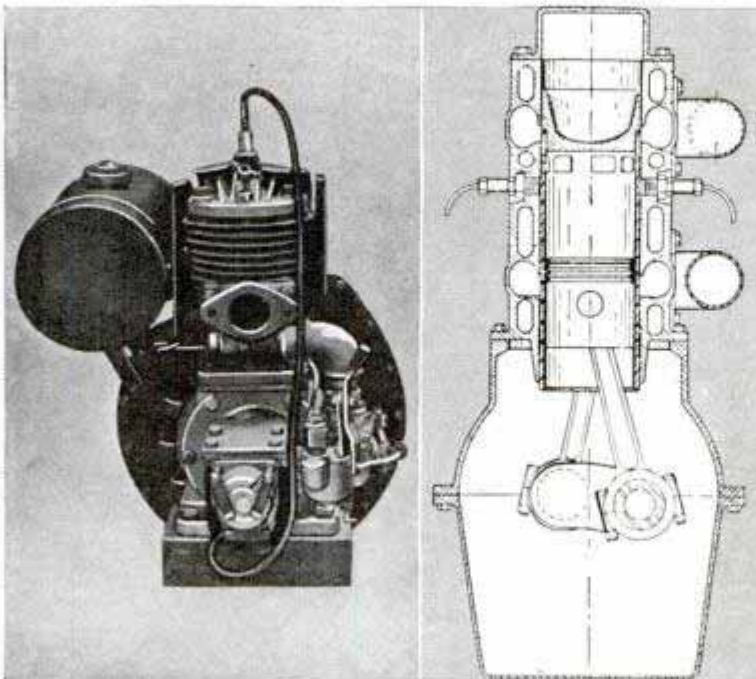
*Cambridge Mass*  
 New high-speed photographic process, used for the first time in recording a news event, caught strained expressions of runners and shows action of their muscles which would be missed by ordinary cameras used by newspaper photographers.



# Diesel's Two-Way Power Stroke Reduces Its Vibration

Exerting both an upward and downward power stroke simultaneously, a Diesel engine developed by a mechanical engineer is

claimed to reduce vibration more than seventy-five per cent by relieving the crankshaft of much of the pounding experienced with most Diesels. The piston operates within a moving sleeve, both being connected to the crankshaft with connecting rods. When the explosion takes place between the two, it drives the sleeve upward and the piston downward, thus producing a dual power impulse, one on an up-stroke and the other on a down-stroke. Using the new construction, two lightweight engines have been designed, both of which have spark plugs for starting because of their lower compression. One of these Diesels weighs fifty pounds and develops five horsepower. The other, weighing about thirty-five pounds, develops two and one-half horsepower and is said to be the world's smallest Diesel.



Sketch of engine, at right, shows how piston rides inside sleeve

*American Diesel Engine Corp*  
 1156 Main St  
 Mansfield

# SECRETS of a CHAMPION



Drastic changes in racing design appear first in miniature. At the left Lou Meyer is studying the scale model of a proposed rear-engine racer; notice the streamline "pants" behind its wheels. Bottom, a pit crew funnels gas into the tank during a half-minute stop

By Lou Meyer

THIS year will be my first opportunity to watch the 500-mile Memorial Day race at Indianapolis, although I've been present at every "500" since 1926. That's because, aside from two times that I was busy in the pits, I've driven a car in every race and you can't watch the race from a driver's seat. This year I'm turning my car over to Bob Bowes, and Rex Mays is going to drive it. I won't compete.

Why? I've raced 5,200 miles on that track and have won three firsts, a second, and a couple of fourth places. Possibly I could win again but I seem to have lost the thrill of it. That's isn't quite the way to put it because there are plenty of thrills in every race, not all of them pleasant. Take last year. I had a lap and a half to go. Just another hundred seconds and I would collect \$10,000 for second place. I stole a fast look at my left rear tire, going down the back straight-away, and when I faced forward again the track wasn't there. The inner guard rail was



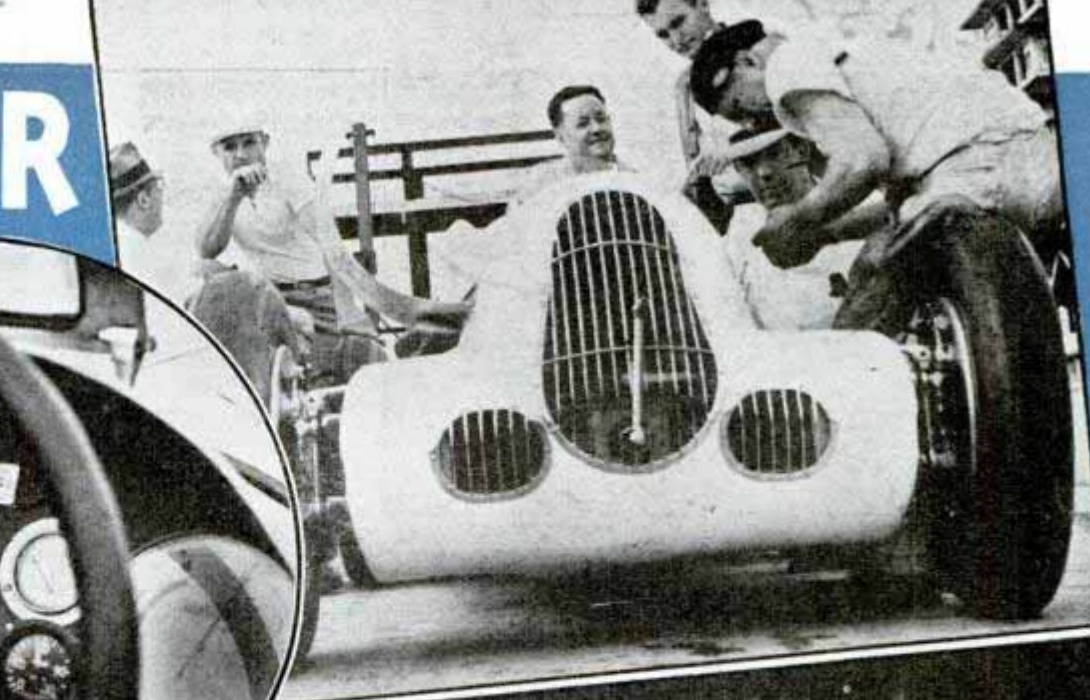
Curb Thomas & Benjamin, Jr. 10755 Holman Ave Los Angeles, Calif

2814 Walnut Park Calif Broadway

# RACER



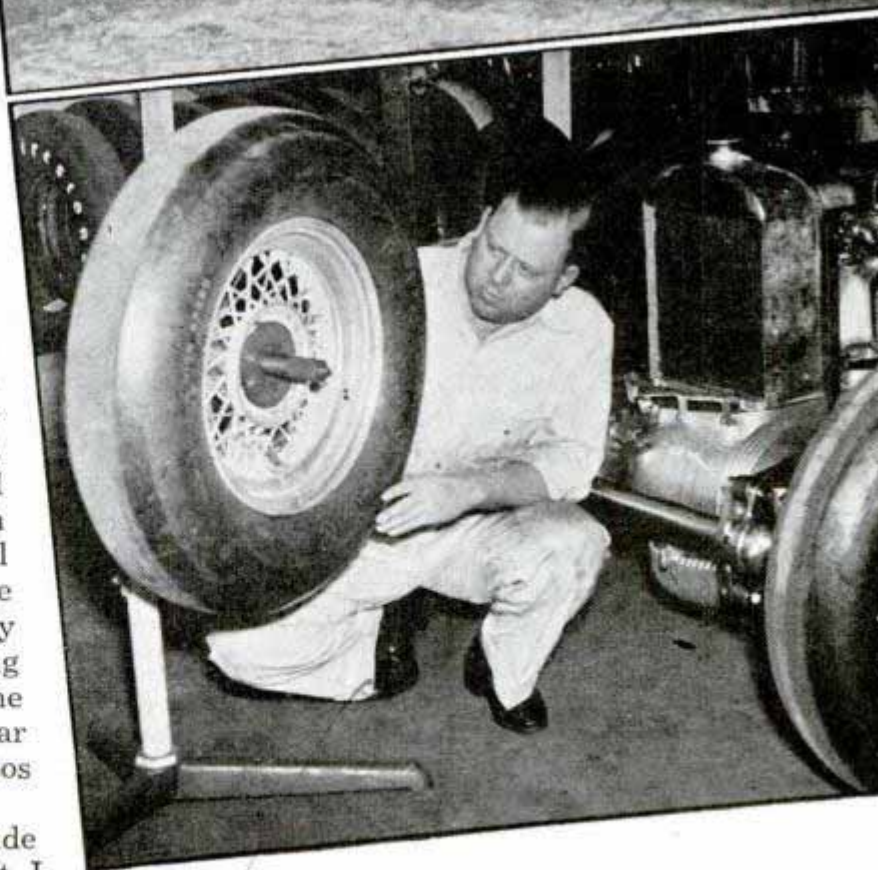
Circle, instrument panel of racing car. Large dial at right gives engine revolutions in thousands per minute. Top, working over Maseratti car in Indianapolis pits



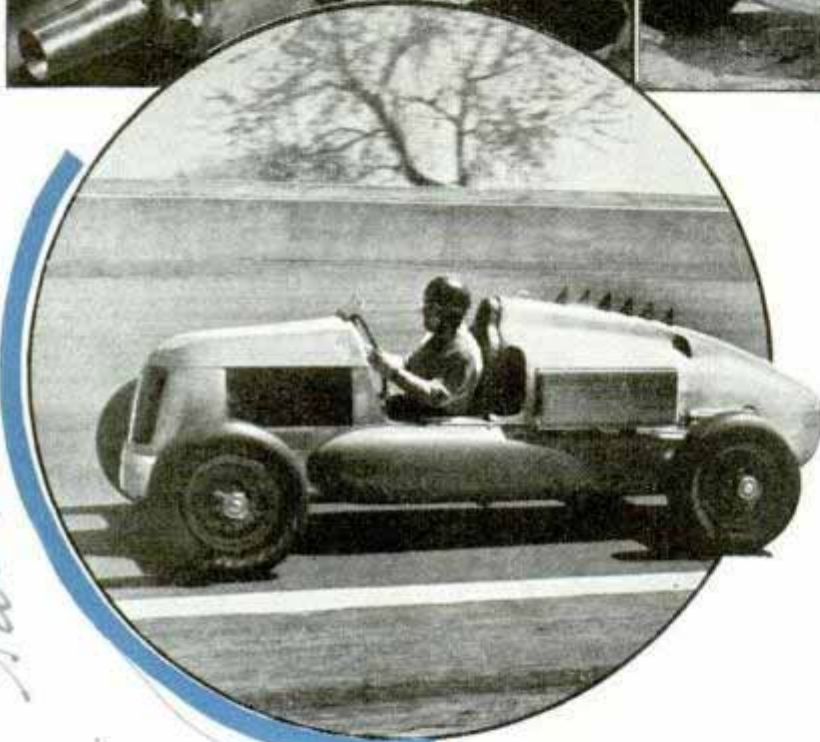
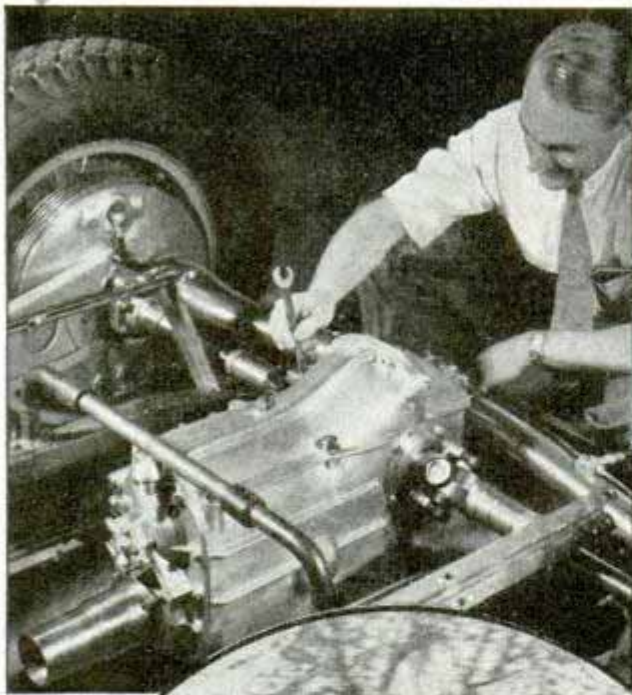
right in front of me and I was doing 120 miles an hour. The car went through the fence and landed in the infield with a bent front axle and damaged body. I'd gone into a slide on the slick track just as I looked around at the tire.

I've been lucky. I wasn't hurt at Altoona in 1929, the time Ray Keech was killed when he hit the steel guard rail and it folded out across the track. Five of us piled into it. I was going 130 miles an hour when I hit. The steel rail sliced the front wheels right off the car yet I wasn't scratched. My only injuries in fifteen years of racing were a broken shoulder and some broken ribs that I got when my car turned over in a practice lap in Los Angeles a long time ago.

You'd think I'd have a lot of inside tips on how to drive to win but I haven't. My idea is that fast competent driving comes natural to some



Center, midget cars piling up after leading driver went into a skid. Bottom, checking tires in preparation for Indianapolis classic



Left, shot of rear-end gear box of racing car. Right, servicing a racing car in the pits. Circle, George Bailey in a rear-engine car

people and not to others. It's all in the feel, and most of the things that a driver learns on a track will be self-taught. A lot of practice isn't going to help, at least it wasn't necessary for me. I think that to enter every race that comes along just for the experience is poor judgment. In my case I rarely drove more than two or three times a year, and since 1933 I raced only in the Indianapolis classic.

In an automobile race the winner gets the big purse. His car is virtually as good as when he started and he has his health. If you lose you get no money and you may find yourself in the hospital and have an expensive wreck on your hands as well. My philosophy has been to race only when

the possible prize money is large enough to offset the odds.

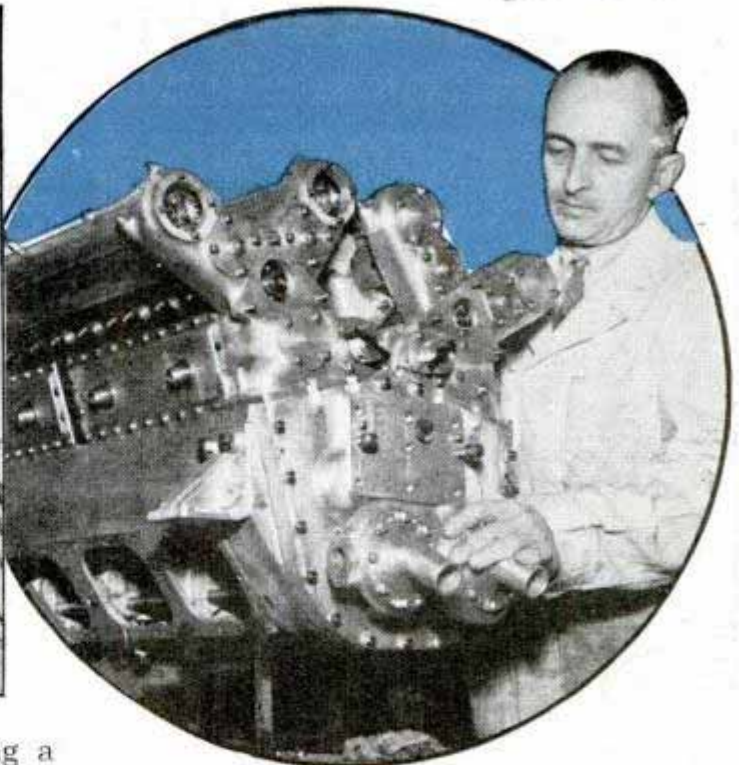
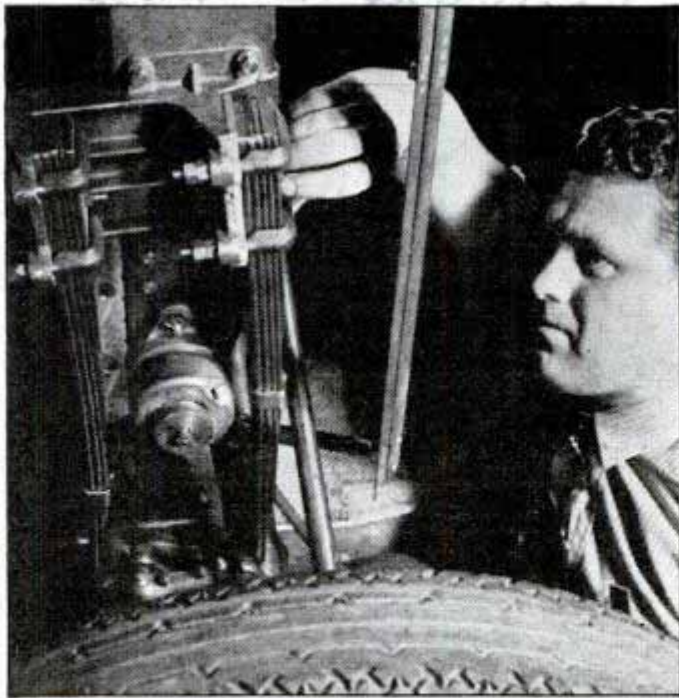
A lot of young drivers make the mistake of racing against the other cars instead of against time. Especially in a long race they should be trying to finish the distance first instead of dueling with other drivers. It doesn't do any good to lead the field through most of a long race and then hit the fence or blow a tire just before the finish.

For such a long race as the "500" it's good strategy to figure out what driving speed the winner will have to average and then get up to that speed and stick on it. Some of the other cars will go by you but the lead

will drop back to you later on if they are forced out with mechanical trouble. The faster you go the more you punish the car, so it's safest to go no faster than necessary. If a car or two are still in front of you toward the end of the race, you are still close enough to go after the lead. This isn't an infallible system, but it is one that works better than any other.

If you are a good driver you will find that mechanical trouble holds you back more than anything else. The three times I didn't have mechanical trouble at Indianapolis I won the race. Once a cotter pin pulled out of the foot throttle assembly and I had to go to the pits; another time a set of gears in a sixteen-cylinder engine

2/252



stripped, and once an oil tank sprung a leak. I've worn out from one to as many as five tires during a race. The most exasperating experience was with a car that had cooling trouble. The water would start to boil in less than twenty-five miles, so every ten laps I had to pull into the pits for water, finally winning fourth place.

The best safety rule I know is to stay out of traffic. That's hard to do on short tracks but whenever I can I like to ride by myself. I'll deliberately slow down to avoid joining a bunch of cars up ahead, and wait long enough for them to string out before overtaking them. You can't tell when a car is apt to skid and you don't

want to be hub cap to hub cap if one does.

If I were a young driver today, anxious to go, I think I'd pick the midgets. There isn't the money in the big cars that there used to be. Real estate is too valuable now to be tied up in the large acreages required for big tracks, especially since half the ground must be reserved for parking. Most drivers of big cars who follow the dirt-track circuits don't average much more than \$50 a week. Even an Indianapolis winner who may gross \$45,000 will have most of it spent almost before he wins it.

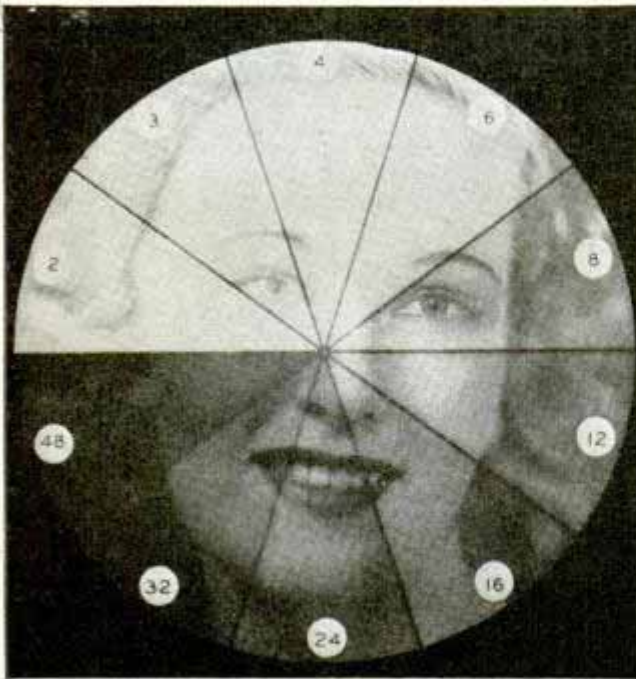
(Continued to page 122A)



Top, left, double spring suspension at front of racing car. Right, sixteen-cylinder engine used in Bob Swanson's car. Bottom, attendants rushing to aid of midget car driver caught beneath wreckage

*U. S. ...*  
*5 ...*

## Photo-Print Density Scale Tells Best Exposure Time



From test print made through density-scale disk, photographer uses best-exposed segment as guide

To determine the proper exposure time and the correct contrast grade of enlarging paper for a projection print, there is a new density scale, a four-inch transparent disk divided into ten numbered sectors. A test print is made with a sixty-second exposure, with the scale covering the sensitized paper. When the print is developed, the exposure time can be read from the best sector. Study of details also shows the proper grade of paper to use.

## Exerciser for Weak or Lazy Eyes Forces Correct Reading

People with eyes that are weak, inefficient or lazy can be trained to read correctly with an eye exerciser, called a

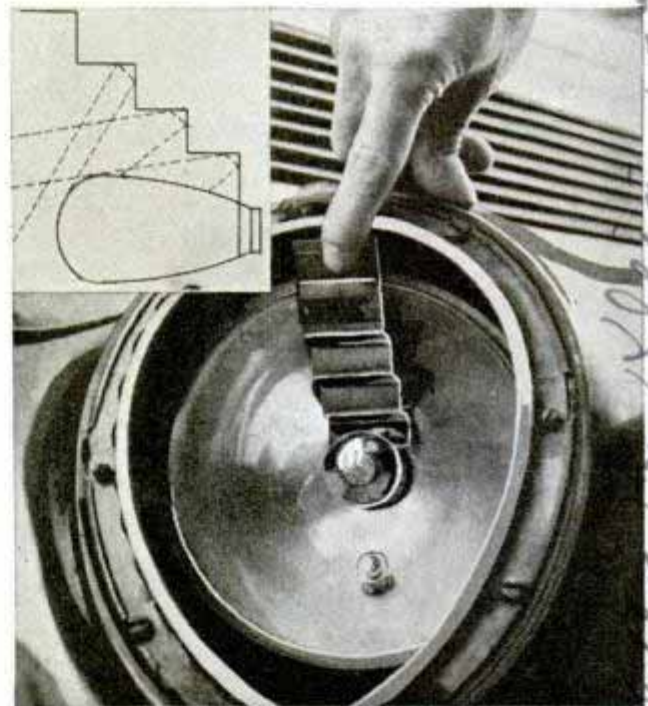


Exerciser shows one-third of the line at a time in order to train inefficient eyes to read correctly

metronoscope, that unrolls reading matter systematically. Eye muscles of the patient are exercised and reconditioned by looking through special lenses, or prisms, at a line of words. Three shutters open and close in close sequence to expose only a third of the line at one time. This forces the subject to read properly, because it is impossible to pause or retrace what has been read. Reading speed can be increased gradually by speeding up the roll.

## 'Staircase' on Headlight Reflector Eliminates Glare

Glaring rays from headlights are trapped and directed downward by an auxiliary reflector in the shape of an inverted staircase. It fits above the light bulb and behind the lens. The action is simple. All



Auxiliary reflector above light bulb catches glaring headlamp rays and throws them downward to road

rays shooting upward from the bulb are caught by one of the facets tilted to receive them, whence they are reflected to other surfaces of the reflector which aim the beams squarely in the road.

## Wood-Pulp Waste Is Converted into Alcohol, Oils and Resin

Chemists of the U. S. Forest Products Laboratory have found a way to turn the waste wood-pulp liquors of the paper mills into commercially valuable alcohols, oils and resins. Fifty to sixty per cent of

Eastman / Kodak Co. Rochester N.Y.

K187

Southbridge, Mass  
K148  
Los Angeles, Calif

157 W. ...

madison, Wis

the wood substance heretofore has been wasted, frequently polluting the streams into which it was dumped. The experimenters discovered that by subjecting wood chips or sawdust in water to alkali and hydrogen with a nickel catalyst under high pressures, they could obtain methyl and propyl alcohols, an amber resin that may be used for plastics and lacquers, and various oils, and still recover pulp cellulose for making paper.

X80  
**Ten Thousand Burnt Matches Build and Furnish House**

Evening "home work" of a Montreal modelmaker through five months consisted of building a house from 10,000 burned matches. There isn't a nail or a pin in the one and one-half story structure. Three cans of glue hold it firmly together. The open-air sunroom even has chairs made of matches, and a tiny rug.



Inside the open-air sunroom at right of this house of matches are chairs, also made of matches, and a hand-painted rug

Emory S. Land  
**Vessels Will Be Convertible into Plane Carriers for Navy**



Model of luxurious ocean liner that is designed for ordinary travel or carrying cargo, but can be converted into an airplane carrier if needed

Washington, D.C.  
 Fast, luxurious ocean liners, recently designed for the United States Maritime Commission, are intended primarily to serve peacetime needs, but can be converted into fully equipped airplane carriers within a short time in case of emergency. Planned for operation between San Francisco and the orient, the vessels will carry 1,000 passengers and have a speed of twenty-four knots. With a displacement of over 30,000 tons, and a length of 760 feet, the ships are said to be larger than any ever built in America.

X232  
**Spark-Plug Action Speeded by Adding Ore to Electrodes**

Engine acceleration is speeded up and greater economy of operation is possible, it is claimed, by new spark plugs which contain polonium in their electrodes. This substance, which was discovered by Mme. Curie, emits 4,000 times as many alpha rays a second as an equal amount of radium, and its use in plugs is said to break down the air between the positive and negative electrodes in a manner that helps instant sparking.

as me  
 Russell A. Wade  
 Montreal, Canada

Firestone Tire & Rubber Co.

## Toothbrush Holds Powder Enough to Last a Week



Tooth powder being poured from handle of brush that holds a week's supply. Note cap flipped to side

Tooth powder is carried conveniently in a reservoir built in the handle of a toothbrush which is handy for travelers. At the tip of the handle a cap is flipped open for pouring powder into the hand, and is closed with another flip in the opposite direction. The brush can be removed for replacement, and the handle will hold a week's supply of dentifrice.

## Merry-Go-Round for Tricycle Whirls as It Is Towed

Spinning around and around as it moves forward, a tub-shaped trailer that can be coupled to any tricycle offers a new kind



Trailer for tricycle gives a merry-go-round ride to child in rear, spinning once every thirty feet

of riding amusement for children. The merry-go-round action is not fast enough to make the child dizzy or sick, one turn occurring in a distance of about thirty feet. By pulling a lever the mechanism may be disengaged to stop it from rotating.

## Twin Paint-Pot Hook for Ladders Holds Two Pails in Easy Reach

Two paint buckets containing different colors can be hung on the rung of a ladder within convenient reach of the painter, with a patented double hook having a peculiar twist. With this hanger it is not necessary to reach through the rungs or around the sides in dipping a brush, since both pails are suspended at the right of the worker.



## Suction Pulls Grass into Mower and Away from Obstructions

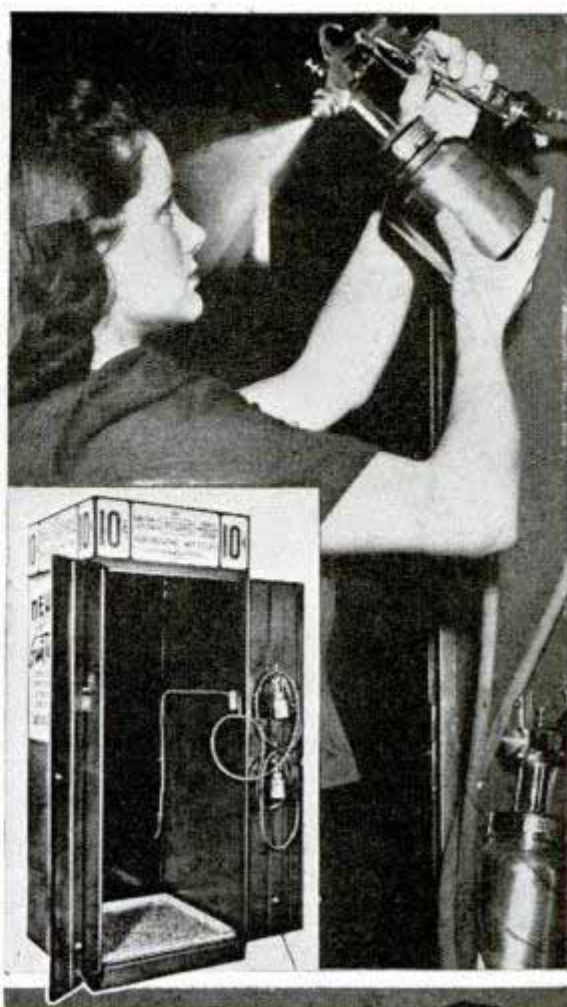
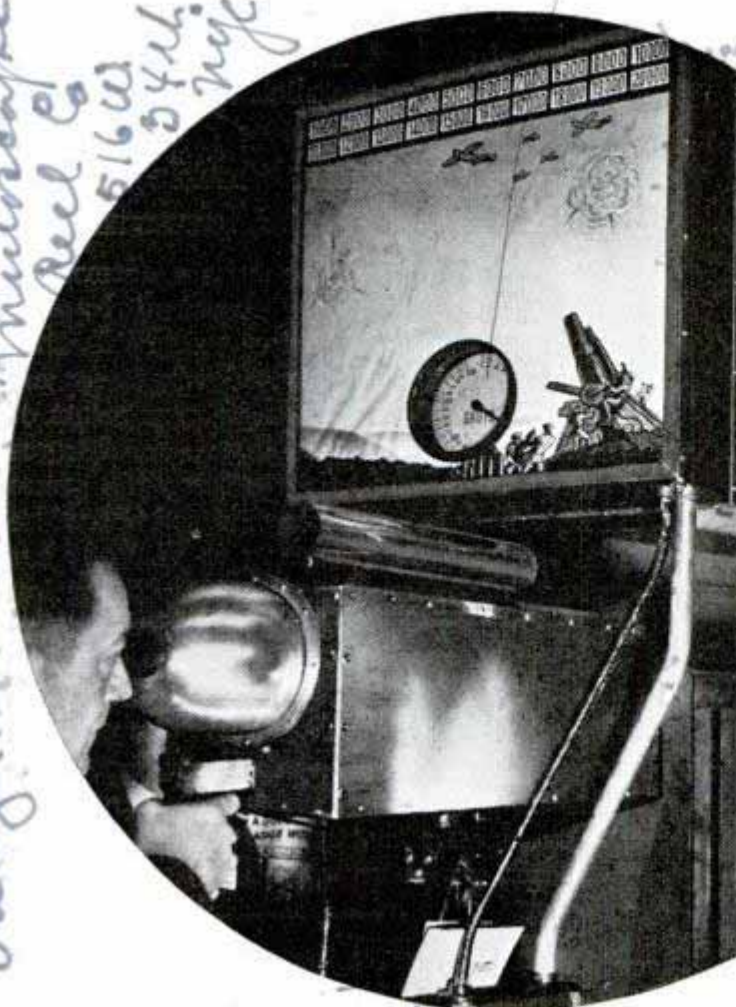


Air suction helps this electric lawnmower draw grass into its cutters when trimming lawn near obstacles

Trimming grass that grows near shrubbery, walks and buildings is accomplished easily with an electric mower that creates suction to draw the grass away from obstructions and into the cutters. A rubber bumper prevents marring of objects on the lawn, and any small stones in the way are deflected by the bowl-shaped head.



# Coin in Slot Buys Coat of Sunburn Protection



Among things that can be purchased from new coin machines is sunburn protection. The patron is admitted to a locker, as shown at top of page, right, where she can spray her face and arms, or entire body, with a non-irritating oil lotion which not only guards the skin from sun's rays but also repels flies and insects. To its left is an airplane shooting gallery that fires electric "bullets" at planes flashed on a screen; a direct hit brings down the ship in a blaze of flashing lights, scores being registered on a board above the machine. Another newcomer in the field, center, consists of a microphone that may be attached to a coin-operated phonograph, enabling you to sing or speak through the music machine, either with or without a record accompaniment. Bottom, left, a slot machine where golf balls are putted into a cup and then drop into scoring area

*Target machine - International  
Mutoscope  
Reel Co  
516 W  
34th  
N.Y.C.*

*Jean  
slon*

*Phono niche*

*Lotus spray - Watling - Sun  
T.M. - International  
To see Mutoscope  
to see Mutoscope  
to see Mutoscope*

## Portable Cool-Light Printer Duplicates Line Drawings



Nine minutes' exposure of sensitized stencil in printer prepares it for reproducing line drawings

Line drawings can be reproduced in quantities from a dozen to hundreds with a portable photochemical printer announced recently. It uses a cool light of low wattage, brilliant and unvarying in intensity. A sensitizing solution is brushed on the mimeograph stencil sheet, allowed to dry, then the sheet and the tracing to be reproduced are placed in the printer for nine minutes. Development with a damp sponge finishes preparation of the stencil.

## Upholstered Chair for Invalids Rolls on Scooter Chassis

Greater comfort could be provided for invalids by using an upholstered wheel chair instead of the common type. To dem-



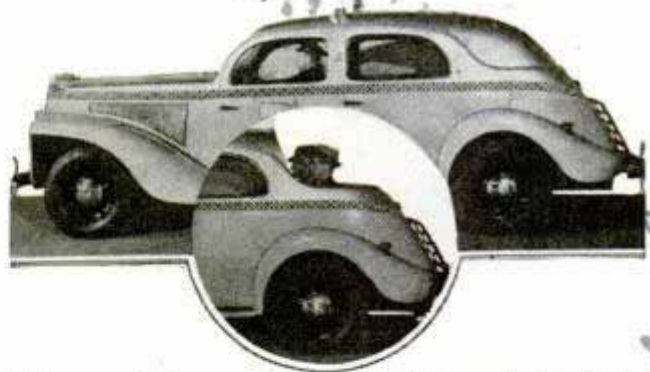
Invalids would enjoy more comfort if wheel chairs were upholstered like the one illustrated above

onstrate how simple it would be to build it, one furniture dealer mounted an ordinary easy chair on a three-wheel scooter chassis. If desired, he explained, an electric motor can be installed to power it.

## Bombing Plane May 'Hide in Sun' with Aid of Optical Instrument

Developed to help scientists determine how much sunlight is absorbed by the earth's atmosphere, a tiny optical instrument is being investigated by army air corps officers for possible use by pilots of bombing planes. With some slight changes it may enable the pilot to keep his plane directly between the sun and the object he is attacking, thus making it difficult for ground defenses to learn the exact position of the ship. Worn as an eyepiece, the apparatus has been used in a plane that soars to a point between a ground observer and the sun, both pilot and observer making observations of the sun's radiation. Any difference between the two observations would be caused by the intervening amount of air and water vapor.

## Taxicab with Disappearing Top Allows Rider to Sit in Open



At request of passengers, cab driver rolls back the roof over the rear seat and it disappears in body

Passengers in the newest taxicabs can ride in the open air. A turn lever at the driver's right rolls the top from over the rear seat, and it disappears into the body. Several safety provisions are also featured in the 1940 cab. A telltale light on the instrument panel warns the driver if a rear door is not tightly closed; an attachment prevents the car from rolling backward downhill if the motor stalls; a buzzer warns pedestrians behind the cab when its gearshift is in reverse, and a sponge-rubber head bumper protects passengers if a sudden stop jolts them from the rear seat.

# Murals for Liner Carved by Hand in Linoleum

Hand-carved murals that will decorate the new United States Lines ship "America" are cut in linoleum before being installed on the walls. The artist and designer, Pierre Bourdelle, uses tools of his own design, and to make the linoleum more pliable, a portable heating lamp is focused on the work. All of the decorations are carved from commercial brown battleship linoleum, six millimeters thick and supplied in rolls two yards wide, such as might cover the floor of an office. Rough chalk sketches are prepared as a guide. Most of the designs are in



Left, one of the finished murals made by carving a beautiful scene in ordinary linoleum. Right, top, artist sits right on the linoleum as he cuts out a figure; bottom, this design calls for raised relief

low relief, but where the murals call for raised reliefs the individual figures are carved out and then glued on the face of the mural. An assistant smooths out the grooves and lines, and gives the surface a thorough scrubbing, after which two coats

of special white lacquer are applied with a spray gun. Color effects are worked out with metal leaf of gold, silver, copper, aluminum and palladium. The panel is rubbed with stain, pumice and rottenstone, then polished with auto finishing wax.

## Infrared Meter Tells Temperatures of Objects at Remote Distances

Temperatures can be read at a distance with a remote thermometer that measures wave lengths of invisible infrared radiations. When a reading is made, reference to a conversion chart that compares it with

readings of boiling and freezing points will tell the object's temperature. The new instrument is used with a small telescope and measures temperatures from 100 degrees below zero centigrade to boiling point.

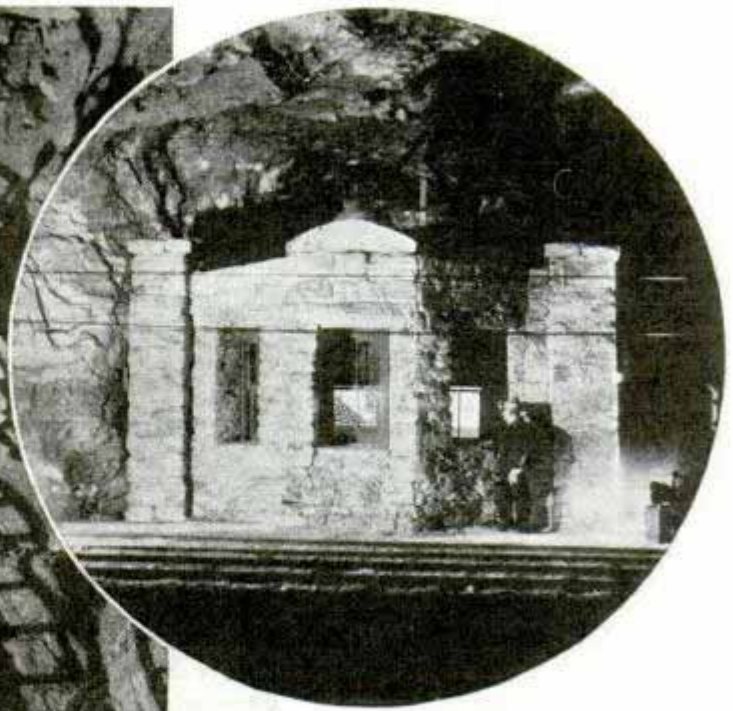
Science Service. 2/10/40

Dr. John Strong  
California Institute of Technology

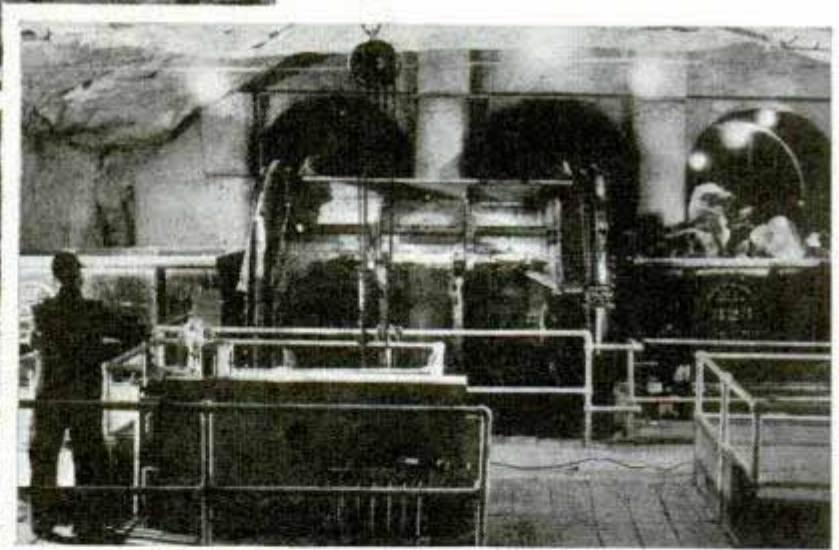
Camp John Wayne... California Institute of Technology

# Miners Hew Vast Caverns from Veins of Salt

Cmt. John Winters & Fleming.  
 27 & 3  
 May Fair Photo  
 Made in St. Paul, N.C.



Salt miners didn't have far to go for building material for the mine office, above; 1,137 feet beneath the city of Detroit, Mich., it is built entirely of rock-salt blocks. Below, an operator throws a lever dumping a carload of salt, which then pours down a chute into a giant crusher



Scenes at left are deep underground at Avery Island, La., where mining since Revolutionary War times has hollowed vast caves in the thickest salt veins ever discovered. Drills have sunk 2,200 feet without reaching bottom of solid rock salt. At top, powder men hundreds of feet below ground work from ladders high above floor. Bottom, sixty-foot "pillar of salt" supports roof of mine. Evaporation from subterranean salt springs left this deposit

Courtesy International Salt Co.

*Photo of NY*

# STEAM *versus* DIESEL

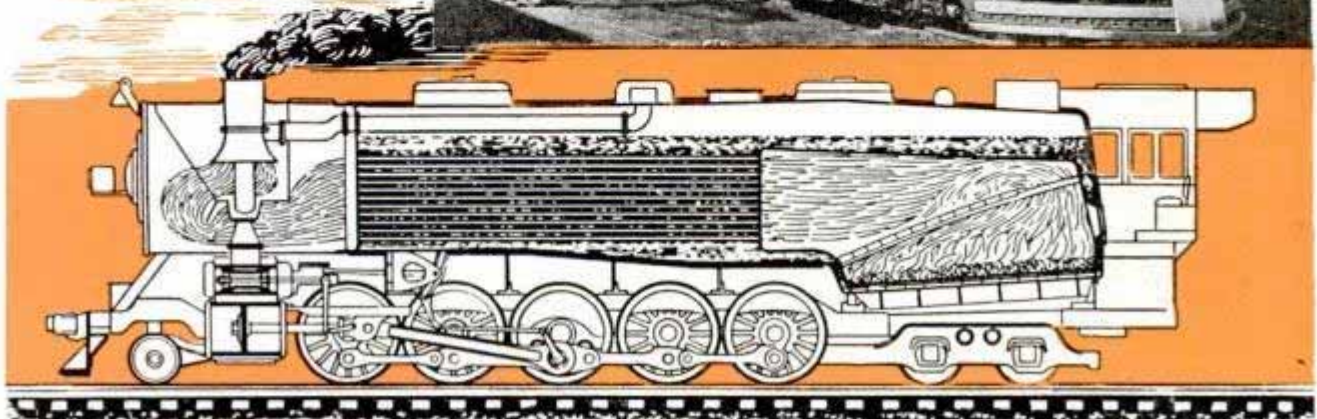
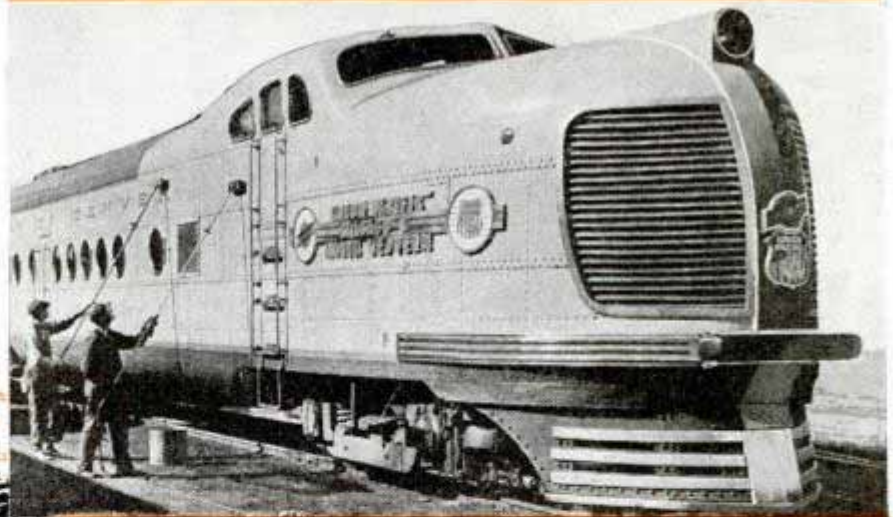
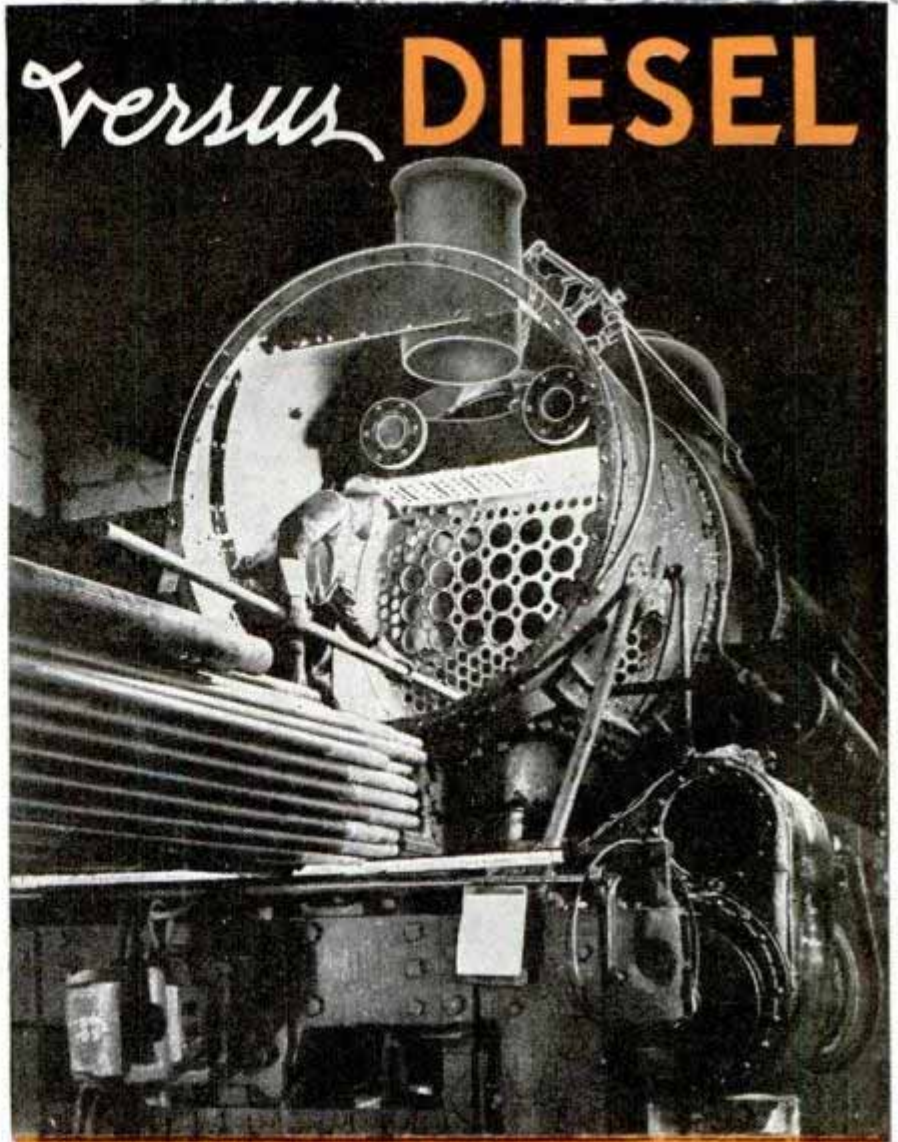
By  
Roderick M. Grant

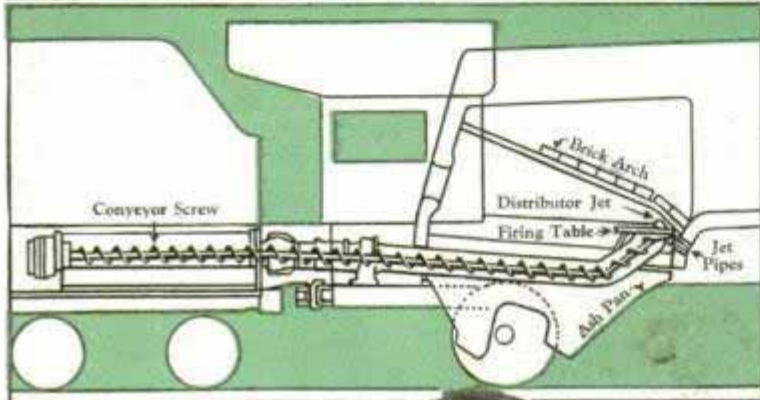
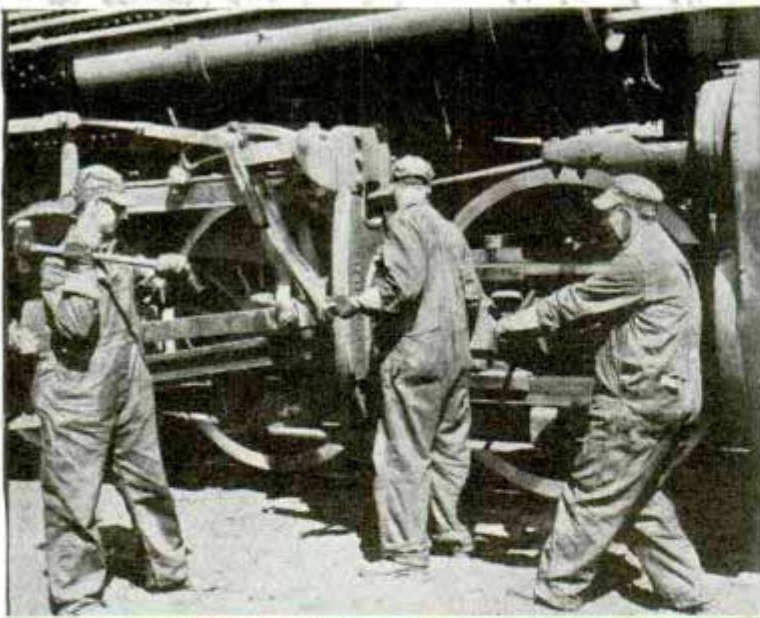
WITH more than a hundred birthdays behind it, the old iron horse is still springing surprises on the folks who thought it was ready for the museum. Feeling the spur of competition from that handsome "baby" of the automobile, the Diesel-electric streamliner, the steam locomotive has simply lengthened its stride and matched speed with more speed.

Over the fastest 1,000-mile railroad route in the world there's a daily duel between steam and Diesel. Every summer afternoon at four o'clock a husky iron horse hauls the "Columbine" out of the Chicago terminal of the North Western and Union Pacific lines, Denver-bound. A couple of hours later the smartly tailored "City of Denver" with 3,600 Diesel-

*Top, inserting seamless steel tubes in tube sheet of locomotive boiler. Right, the "City of Denver" has its face washed in Denver yard. Below, section of a modern freight locomotive*

Top photo and drawing courtesy US Steel News





Top, courtesy  
US Steel News

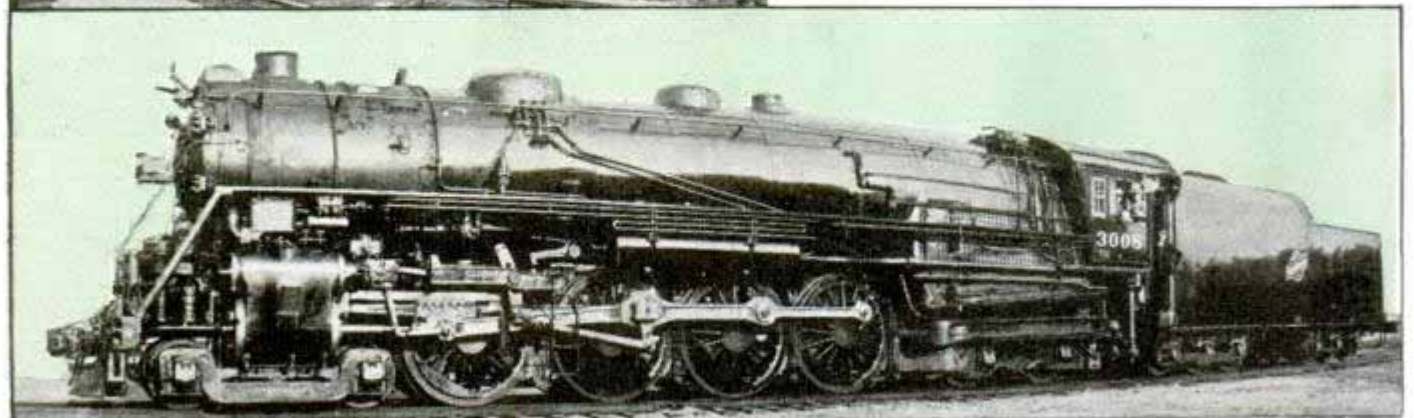


electric horsepower in its stream-  
line nose starts on the same trail.

A year ago the steam train chugged up hill to Denver, 1,048 miles, in a lazy thirty-two hours and a quarter. Today the same train sprints the distance overnight in just over seventeen hours—its time cut almost in half, and only an hour slower than the streamliner.

Not long ago a single steam locomotive pulled a standard train 2,227 miles from Los Angeles to Chicago in forty-nine hours—the longest continuous run ever made by a steam engine in regular service. With ordinary servicing that engine could have turned around and repeated the trip.

What's got into the old horse? W. C. Dickerman, president of the American Locomotive company, says a modern steam engine has 136 per cent greater power than a locomotive of the same weight and driving axles twenty-five years ago. Tougher steel alloys and welding permit higher boiler pressure. The new steam streamliners of the North Western that whisk the "Columbine" from Chicago to Omaha in twenty minutes slower time than the Diesels, carry 300 pounds steam pressure and enough fuel and water to eliminate three servicing stops. Roller bearings and sealed lubrication let the engineer forget his oilcan for a thousand miles. Except for the fact that a different type of fuel is burned west of Omaha, the same 412,000-pound iron horse could

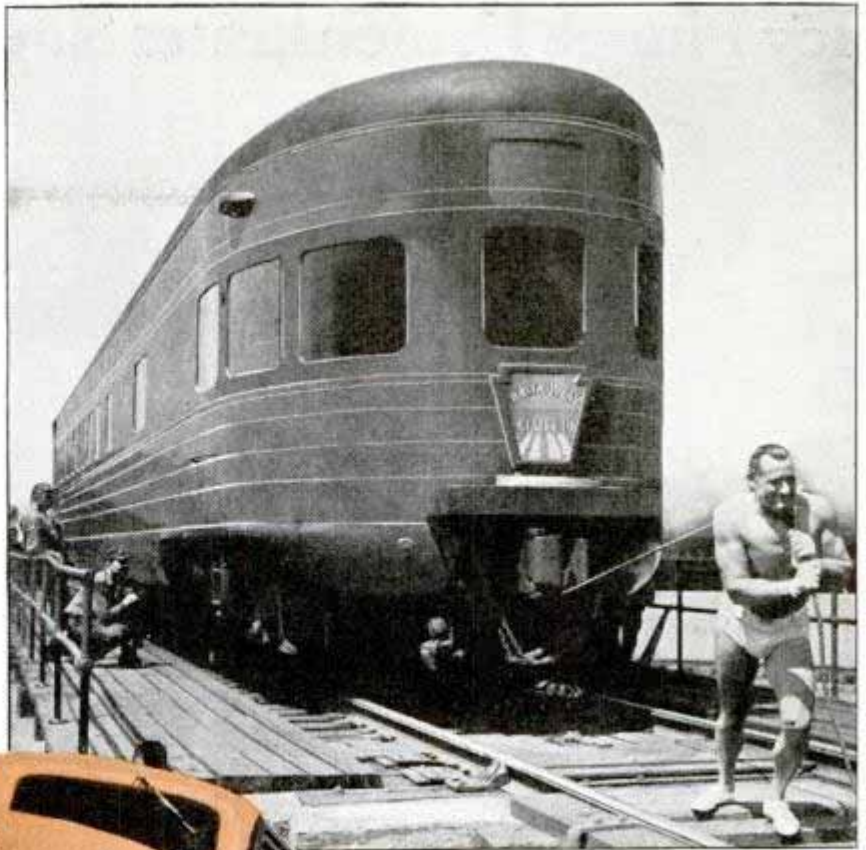


Top to bottom: repair crew works on "iron horse"; new stoker feeds coal from front of firebox; North Western-Union Pacific "Columbine" on Chicago-Denver run; dual passenger-freight locomotive of North Western

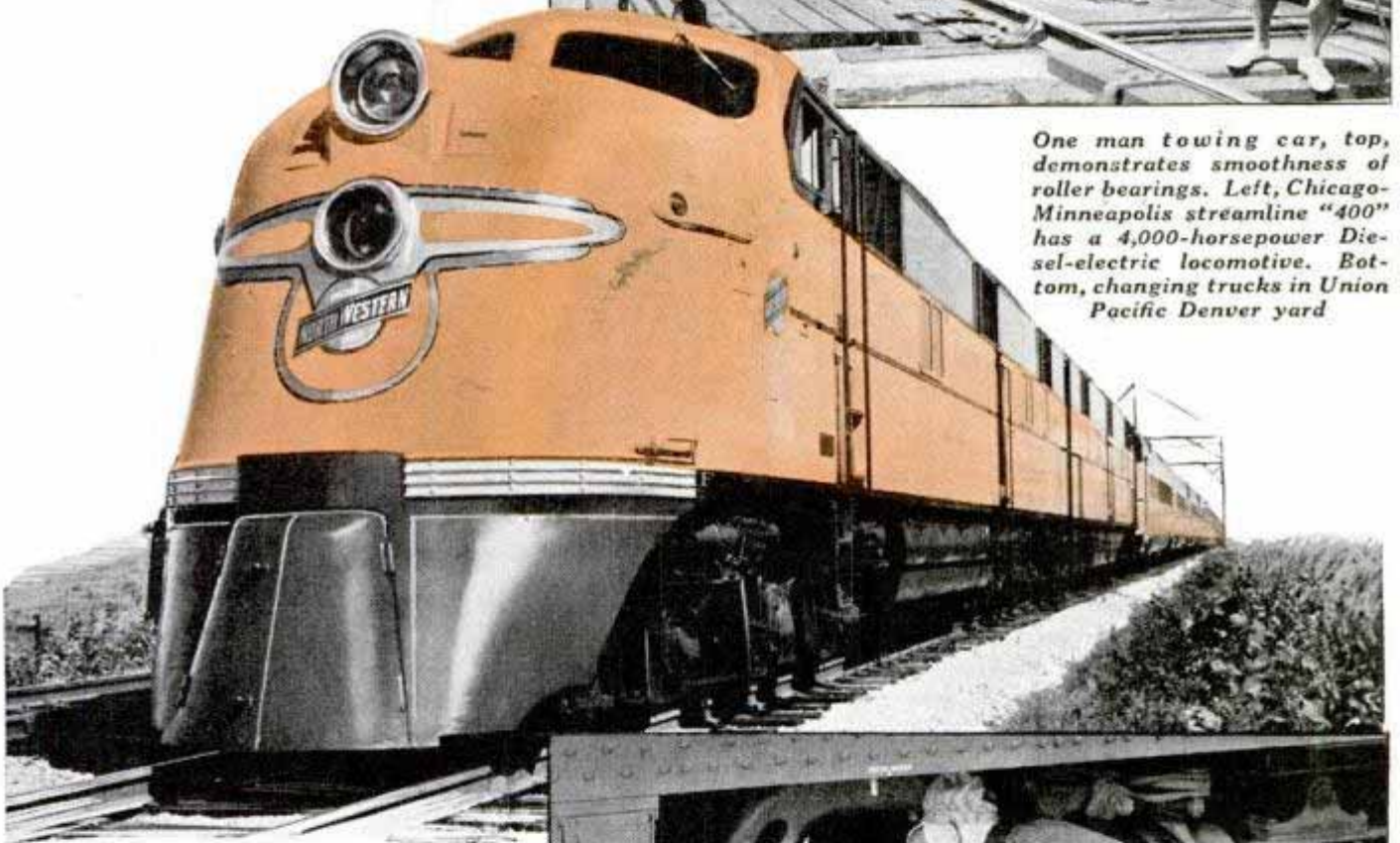
stay in harness all the way from Chicago to Denver.

You hear a lot about the Diesel's fuel economy. The "City of Denver," for example, burns around 1,153 gallons of fuel oil between Chicago and Omaha at five and one-half cents a gallon—a fuel cost of \$63 for the thirteen-car, 3,600-horsepower train. Well, the new steam locomotive hauls thirteen heavier steel cars the same distance on thirty-eight tons of \$1.75 coal, a fuel cost of \$66.50. Not much difference, after all!

Ask a railroad man whether he prefers steam or Diesel



*One man towing car, top, demonstrates smoothness of roller bearings. Left, Chicago-Minneapolis streamline "400" has a 4,000-horsepower Diesel-electric locomotive. Bottom, changing trucks in Union Pacific Denver yard*



and you seldom get two answers alike. It's like asking whether he prefers gravy or maple sirup. It depends on what you're using it for. You can buy a modern steam locomotive for around \$175,000. A Diesel-electric costs nearer a half million. Each will deliver about 4,000 to 5,000 horsepower at the rail, haul

(Continued to page 118A)



R103 Robert A. Stearns  
**Icy Plunge Demonstrates Safe Rescue Method**



*Acme*



*Not many people would deliberately chop a hole in the ice and plunge in for a mid-winter dip, but that's what one Washington, D. C., citizen did. It wasn't for a lark, but to demonstrate what to do for the luckless victim of thin ice. At upper left he is shown plying an ax on the Potomac in preparation for his cold plunge; at right, the demonstration of proper rescue methods begins. The first rescuer attaches a can buoy to a rope around his waist and throws the buoy to the ice victim to sustain him as he struggles*

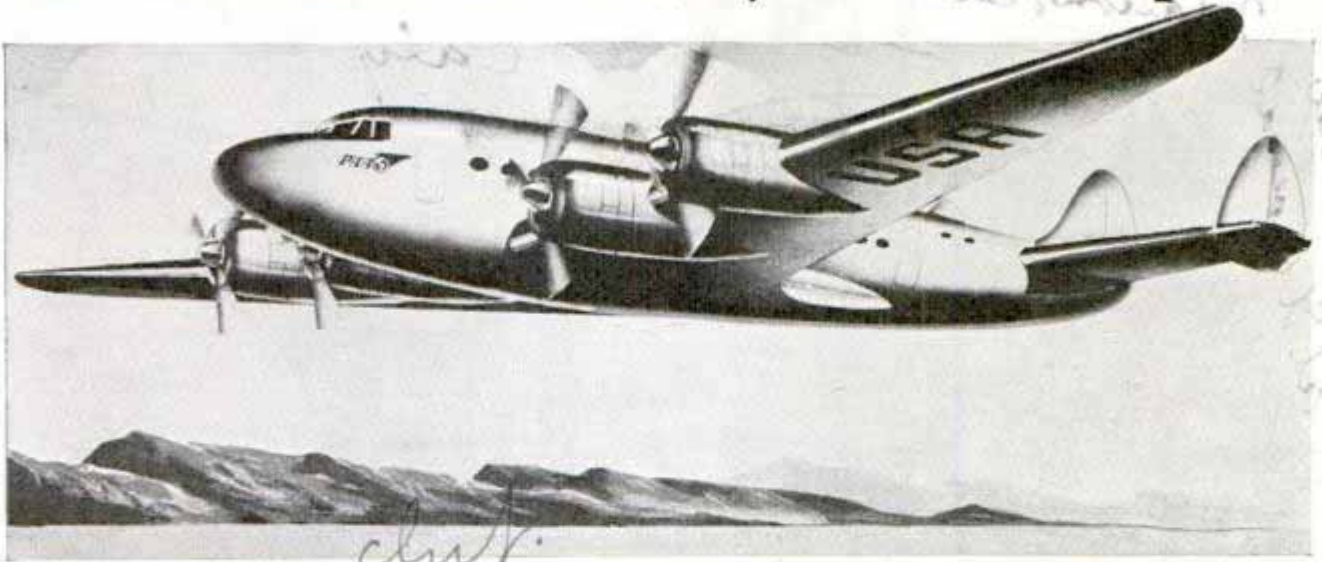


*Once in the icy water, the "victim" had no desire to stay and it was up to the Washington police to get him out without going through the ice themselves. While other police watched and cameras recorded the safety demonstration, the police followed the can buoy with a ladder pushed to the edge of the hole. The volunteer victim grasped this and was pulled forward to firm ice where he started climbing out. The ladder was used to avoid adding weight. Next the police formed a human chain, crept out and dragged the victim to safe and solid ice*





# 300-Mile Air Liner Will Fly in Substratosphere



*clut.*  
Drawing of Pan American Airways' substratosphere plane, pulled by four 1,200-horsepower engines, that will make flight between Miami and Buenos Aires in two days instead of four days required at present

Plans have been completed for a new substratosphere transport plane which is designed to operate at a speed of 300 miles per hour and is expected to reduce from five days to two the scheduled flying time between Miami and Buenos Aires. Pan American Airways have ordered three of

*Our bank Calif*  
the ships to be built by Lockheed Aircraft corporation. Each plane will have four 1,200-horsepower Cyclone engines, and will carry thirty passengers in super-charged cabins for a distance of 1,500 miles. The three new airplanes probably will go into service during 1942.

## Locomotive Is Run by Remote Switch Like Toy Train

*K 169*  
Operated by remote control from a point alongside the track, a new fifty-ton electric locomotive starts, stops or backs up ac-

*Used by Raymond City Power with Wright-Co*  
cording to the will of the operator. It is an industrial engine, powered by a storage battery that drives a General Electric traction motor on each of its two axles. The locomotive is used for spotting bottom-dumping coal cars over a conveyor belt, where the coal is emptied for delivery into the plant of a large light and power company, three or four trains of about nine cars each being handled daily. The operator stands on the ground where he can see that each car is spotted properly before unloading. Control is managed through 600 feet of cable with seven separate conductors. This cable unwinds and rewinds on a reel as the locomotive moves, and if it attempts to travel beyond the length of the cable a pull-out plug stops it automatically.



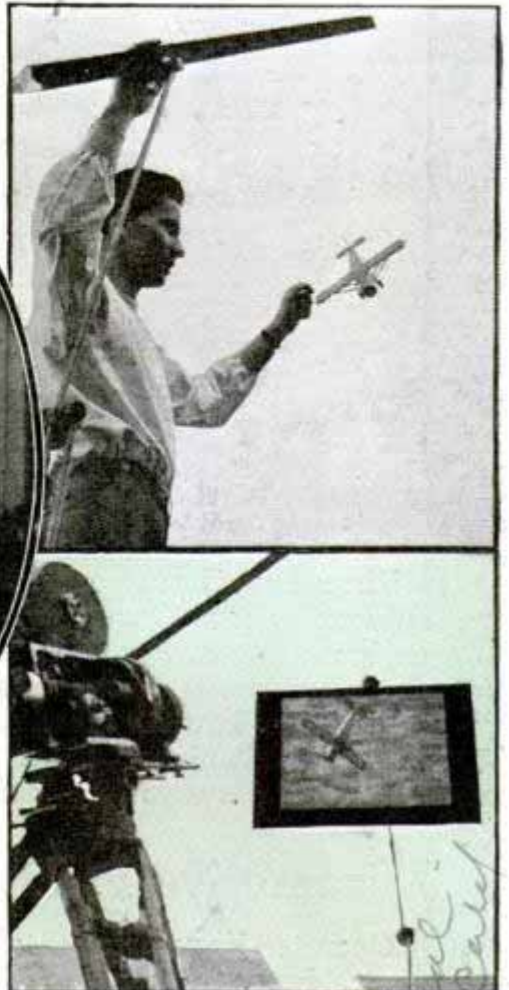
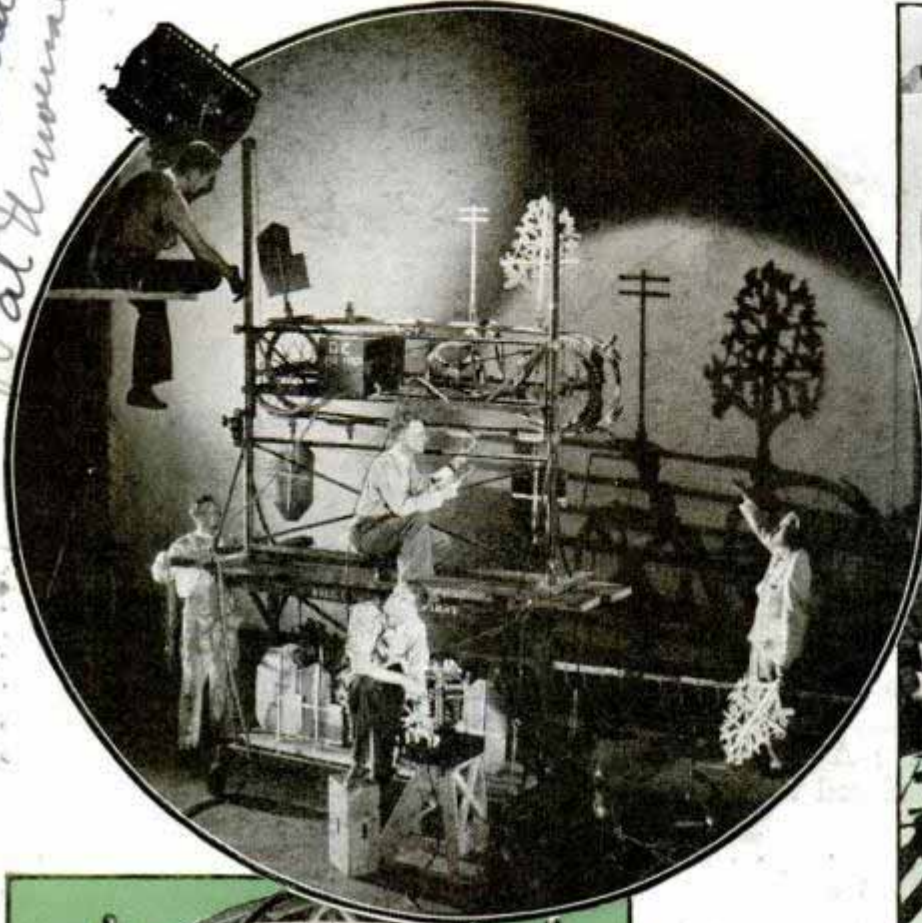
Man at switch beside track controls electric locomotive through long cable. Extra set of controls permits operation within cab

Seventy-seven new airports were added during 1939 to bring the United States total last January 1 to 2,451, including 171 sea-plane bases and anchorages.

# INVENTIONS

800  
 18618  
 Malibu Road  
 D. 800  
 Mr. Thomas G. Sullivan, Jr.  
 Pauley Palisades  
 City

Directed by John Fulton  
 Special Effects Director  
 at Universal



Wm. Zeltner  
 Wm. Zeltner  
 Wm. Zeltner

First national  
 Burbank, Calif.  
 Wm. Zeltner  
 Wm. Zeltner

Top, traveling shadowgraph machine simulates effect of motion on screen. Bottom, "atom chamber" in Buck Rogers film. Right, arranging miniature plane for shots that make it appear full size

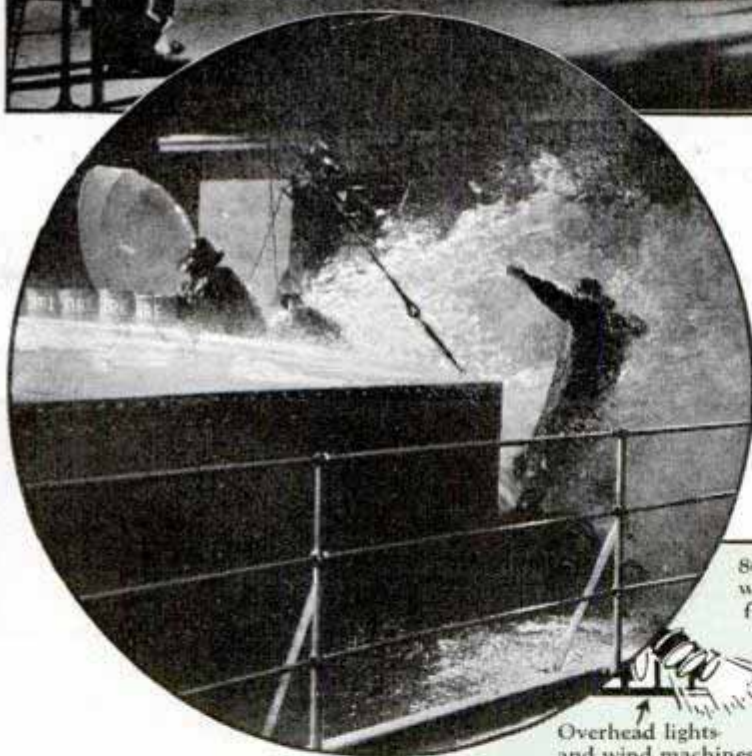
PICKING up his telephone, the motion-picture director dialed James A. Gibbons in the shop department.

"Jim," he said, "we have a story that calls for a submarine to be rammed and sunk at sea. Naturally the navy won't let us use a real sub, so see what you can do."

Gibbons got busy with pencil and paper and a couple of days later Warner Brothers went into the shipbuilding business, assembling a submarine that would cruise on the surface, submerge, fire torpedoes and maneuver like a real war vessel. It was twenty-six feet long, scaled one inch to the foot, and instead of a crew it carried electric motors that filled and emptied the ballast tanks, turned the propellers, and discharged two-foot aluminum torpedoes. Cables trailing out of sight in the water led to a control panel that enabled one man to maneuver the miniature boat. In the motion picture the craft was so realistic that navy officers almost wondered whether the studio had gotten its hands on a full-sized submarine.

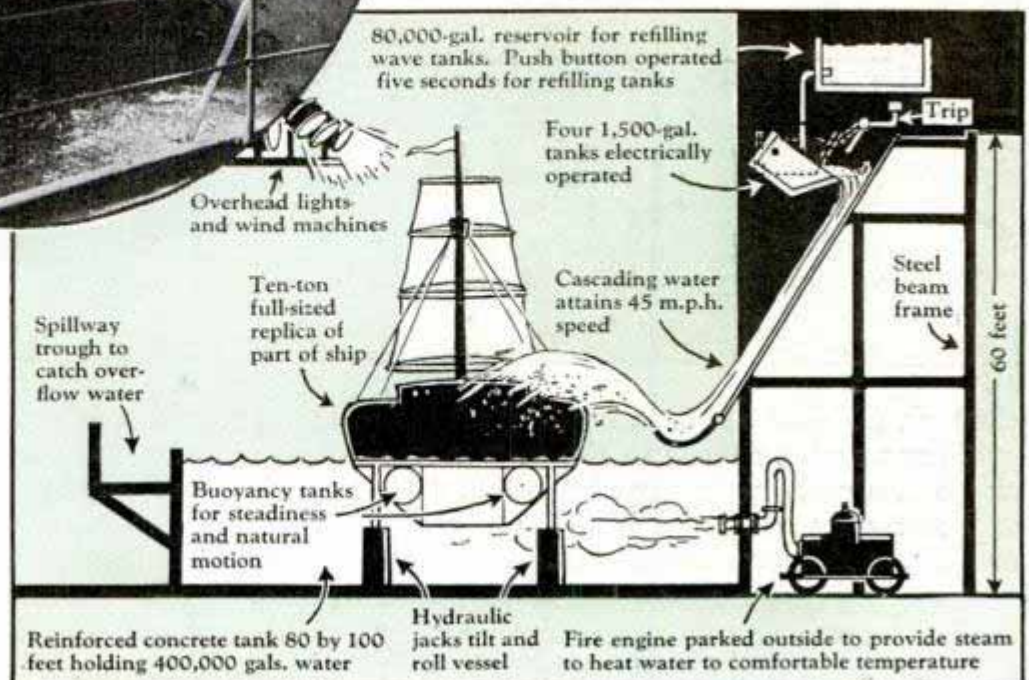
Crabbe

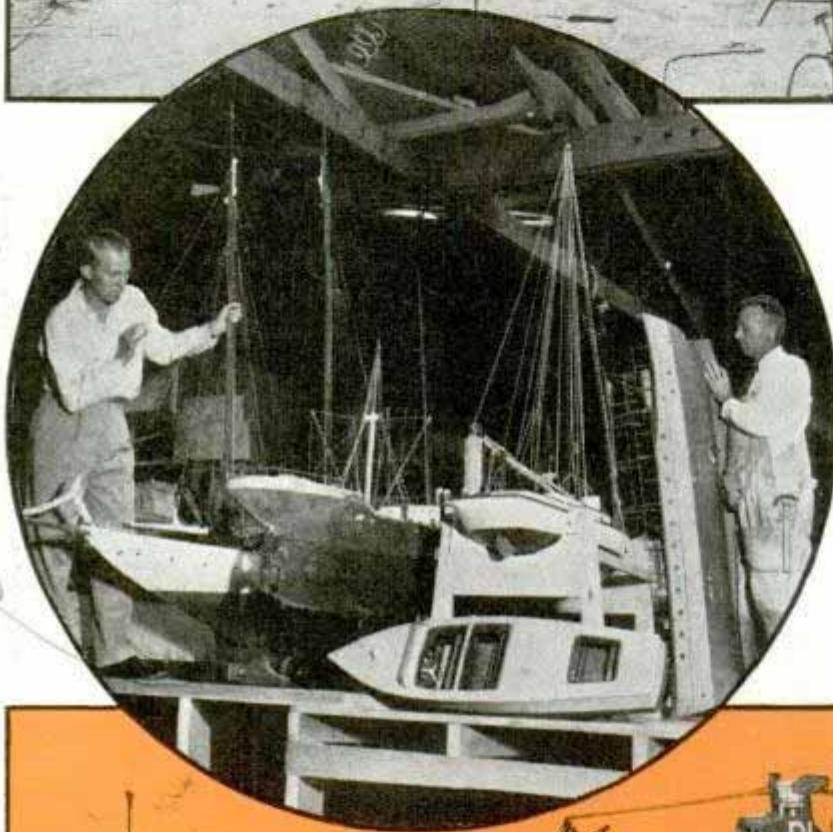
# MADE *to* ORDER



How soon could you invent an arrangement that would permit an actor who had never used a bow and arrow to unerringly smash a light globe thirty feet away? How long would you need to devise an octopus that you couldn't tell from the real thing on the screen and that would perform the way you wanted? What would you use for "breakaway" glass for a store window

Top, filming actors in front of screen on which movie of clouds at sea is projected. Circle, storm-at-sea scene on Universal stage. Right, diagram showing how storm effects are produced in studio tank



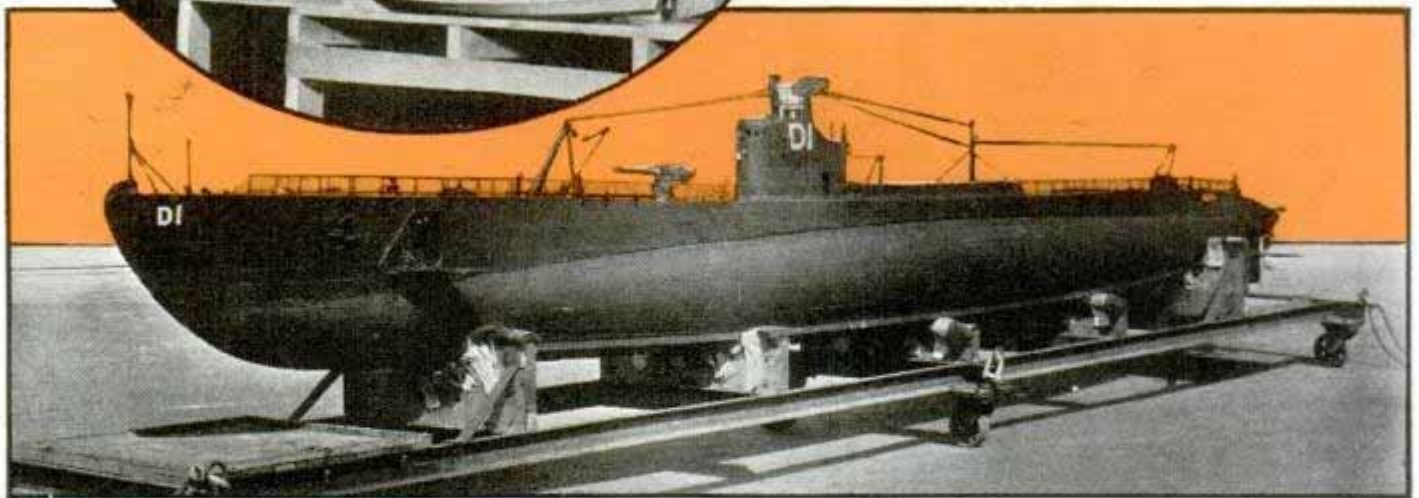


something brand new. The invention may never have been thought of before and may never be needed again but it must be ready on schedule. It takes a rare combination of technical background and inventive genius to hold down such a job.

If you haven't found a way yet to help the actor smash the light globe with an arrow Gibbons will explain how it was done. He simply attached the arrow with tiny hooks to a wire so thin that it was invisible on the screen. The wire was stretched directly to the bulb and when the actor released the arrow it flew along this track to its target.

The animated octopus took considerable thought and the inventors solved their problem by using a rubber octopus filled with compressed air, manufactured so that the ten-

*Top, section of "space ship" used in Buck Rogers movie. Circle, scale models of boats used in screening full-size effects on miniature stage set. Their use eliminates attempts to film dangerous storms at sea. Below, twenty-six foot submarine built by Warner technicians. It submerges, cruises and fires torpedoes*



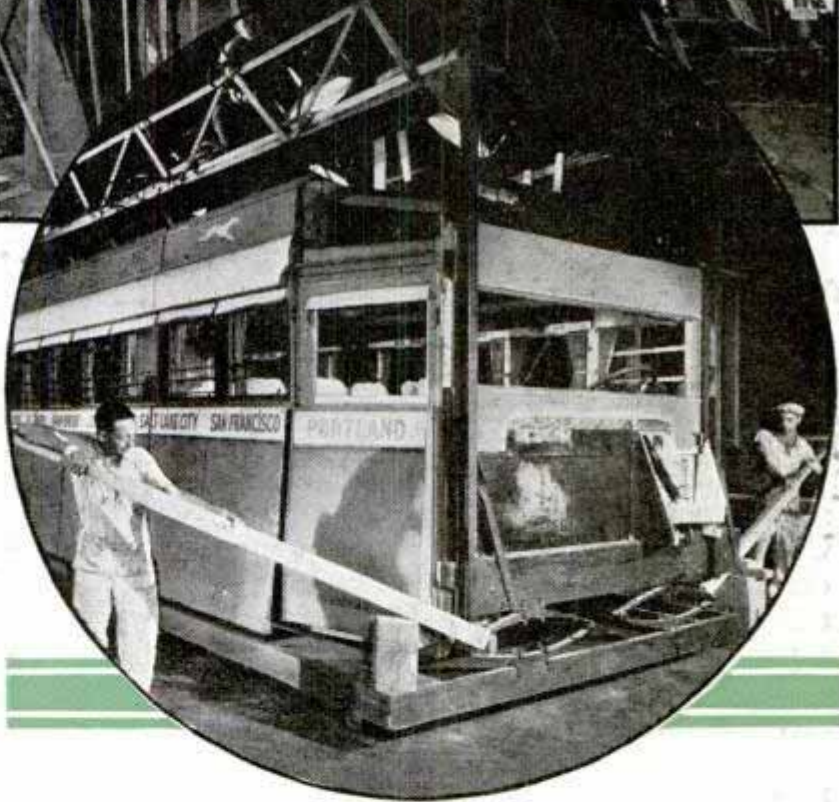
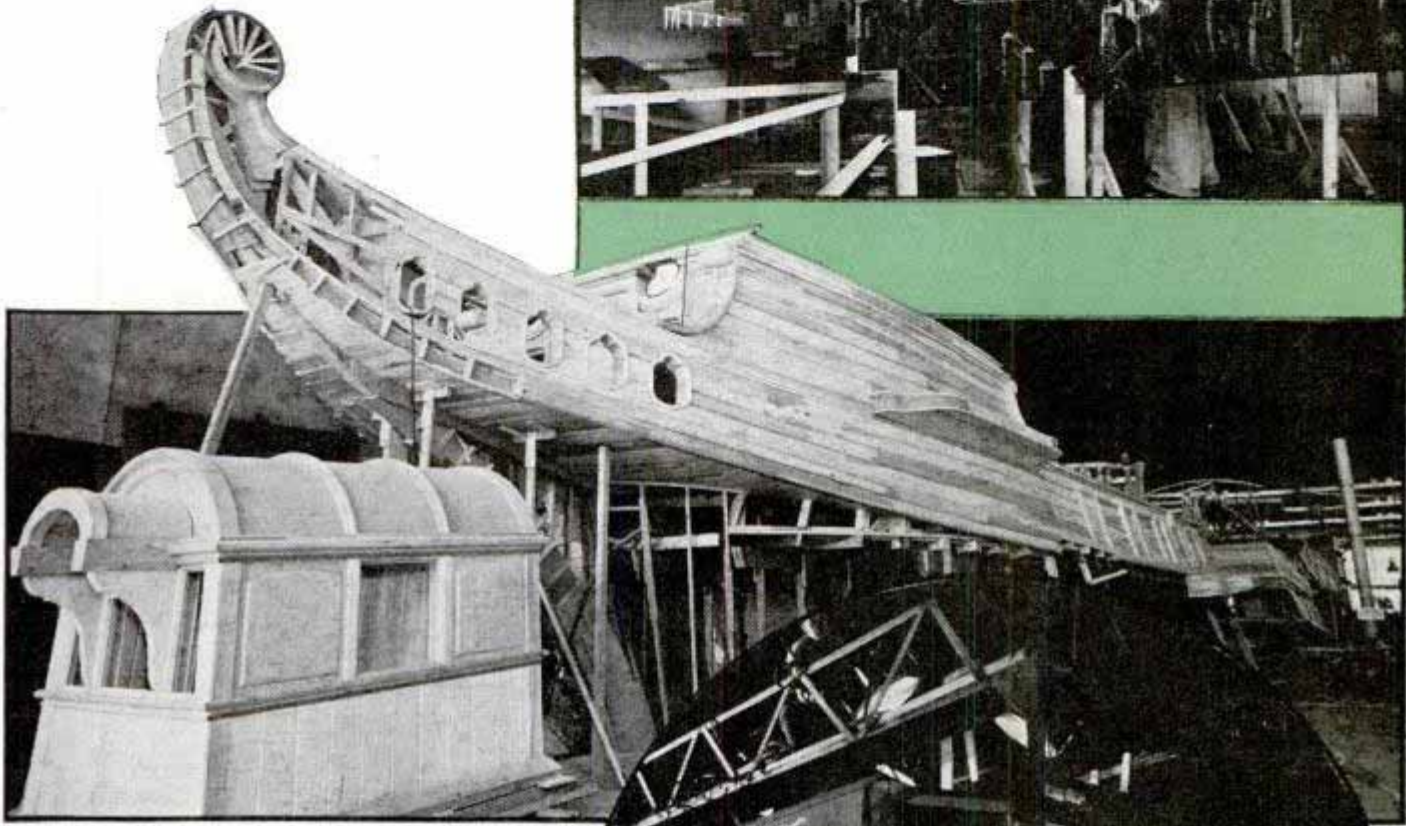
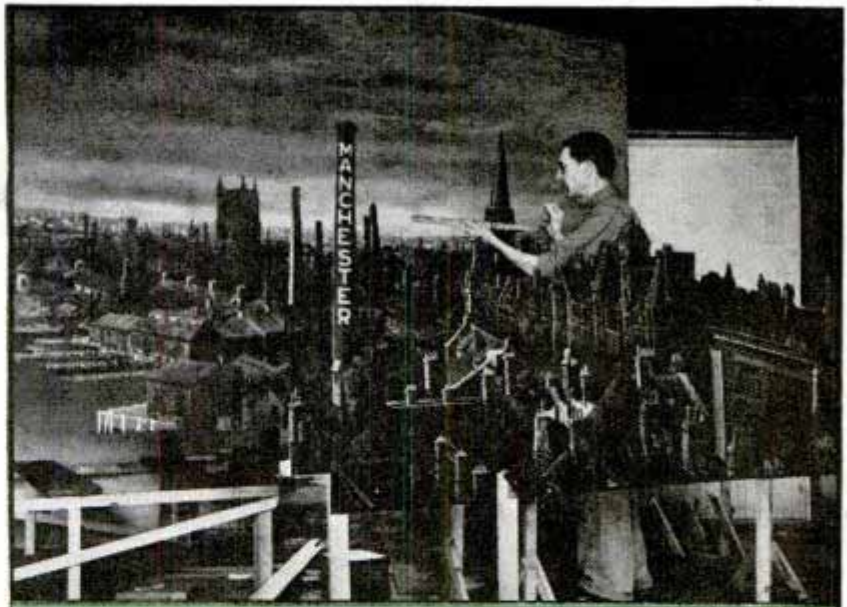
through which a car is to be driven? Put problems such as these to the men in the shops of a motion-picture studio and they will not only have the answers but the completed instruments or materials ready when the director needs them. A dozen times a week or more these master minds of the movies are called upon to invent

tacles would writhe and squirm as the air pressure was varied. To get the "break-away" glass for the store front Gibbons discarded the sugar-candy mixture from which harmless movie glass is usually made. It wasn't strong enough for the big pane required, and Gibbons finally found a transparent phenolic resin solution that

John Fulton

2800

Right, building miniature city for long-distance skyline shots. Below, English man-o'-war being built at Warner Bros. It measures 130 feet and is built in twelve sections. Circle, stage hands rocking wheel-less bus in which movie scenes are being filmed



was just the thing, poured out in flat sheets and allowed to dry. It shatters easily and its dull edges are safe to actors.

Most movie goers know that because of the impossibility of filming storms at sea such sequences are usually made right in the studio. What they don't know is the tremendous amount of engineering skill required to mount the movie ship on its jacks and rollers and to set up the water chutes that dump tons of water on deck at exactly the right times. Such a storm can be turned on and off at will but it is a real hurricane while it lasts and the actors in front of the camera take severe beatings.

Technicians at Universal occasionally have a chance to let their imaginations run

riot. Pictures that portray the future give them a chance to create all sorts of weird effects but their futuristic machinery usually has to have some sound scientific basis or must follow some scientific theory. In

(Continued to page 126A)

*Handwritten notes:* ... by John ... ... of ...

# Radio 'Weather Prophet' Sounds Storm Alarm



Above, control panels in operations office; left, watching neon tube that warns of storm



away as 100 miles the electromagnetic disturbances that accompany a storm; a tiny current travels over 150 feet of wire, passes through a photoelectric amplifier and activates relays that ring the chimes and light the neon tube. Distance of the storm can be judged from the rapidity of the bells.

## Engine Analyzer Aids Tune-Up by De-Gumming Sticking Valves

Both analysis of engine troubles and correction of some of them are accomplished by a portable analyzer and tune-up instrument. With a system of switches,



Analyzer reports condition of engine and electrical system, and also frees sticking valves with solvent

One hundred miles to the southwest, a storm moves toward New York City. Chimes ring faintly in the Manhattan operations office of the Consolidated Edison company, and light flickers in a neon tube. As the disturbance comes nearer the city, the neon coil burns brighter and the chimes ring an insistent alarm. Operators watching the panel call the generating plants, notify them that a storm is on its way and additional generators must be warmed up. These huge generators need as much as two hours to warm up for action, and the automatic radio "weather prophet," only one of its kind, gives them ample warning. Its four tubes, similar to those in a standard radio set, pick up from as far

Done by Richard G. Lombard, radio operator  
 41st and West Ave. New York

K 141

K 171

Chicago

one half of the cylinders can be cut out while the engine is running, to permit valves to be de-gummed with a special solvent. Heat of the spark is measured by a coil calorimeter that is combined with a dual-range voltmeter, coil efficiency being indicated as "good," "fair" or "poor." An observation window for each plug permits the engine to be tested under actual firing conditions. In addition, all of the customary tests, such as compression, vacuum and fuel pump pressure, can be made, and the dual-range voltmeter checks cables, resistance in the starting, lighting and ignition systems. A new method of checking fuel lines also is incorporated.

*K190*  
**Ease of Driving the New Cars Tested for Energy Gauges**

Everyone knows that the new 1940 automobiles are easier to drive than those of 1929, but automotive engineers can be exact and tell you that the difference is seventy-three per cent. This isn't guesswork,



Gauges installed on steering wheel and other driving levers record amount of energy expended by motorist

but is based on actual measurements made with gauges attached to the steering wheel, shift lever, clutch, brake pedal, and other controls. On a 200-mile trip over General Motors proving ground, it was found that the driver of a 1940 car uses 7,533 less foot-pounds of energy than he did in 1929, according to records which are still available. This is equivalent to the effort required to lift nearly four tons, a foot-pound representing the force necessary to raise a one-pound weight one foot. The greatest energy saving is in the steering, which requires 3,740 foot-pounds less effort.

MAY, 1940

**Polaroid Movie Attachment Fades Pictures In or Out**

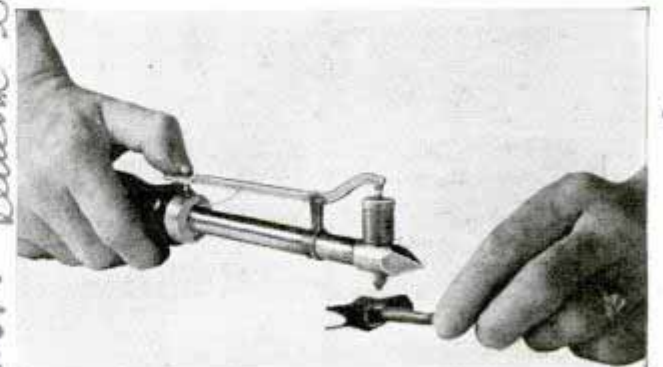


Pushing up lever of Polaroid attachment fades out movie scene, pressing down fades in next scene

Equipped with Polaroid lenses, an attachment for sixteen and eight millimeter movie cameras enables the amateur to produce fade-ins, fade-outs and lap dissolves with professional effects. It fits over the lens and is operated by pressing a small lever up or down.

*K173*  
**Soldering Iron with Drip Feeder Operated by Thumb Lever**

One drop of melted solder at a time is released by an electric soldering iron which is controlled by a thumb lever extending from the handle to the tip. This saves time and simplifies many jobs where the mechanic must keep parts together and at the same time hold both the iron and solder. The size of the solder drop can be regulated by an adjustment on the lever.



Drop of solder is released from reservoir above tip of electric iron by pressing lever with thumb

701

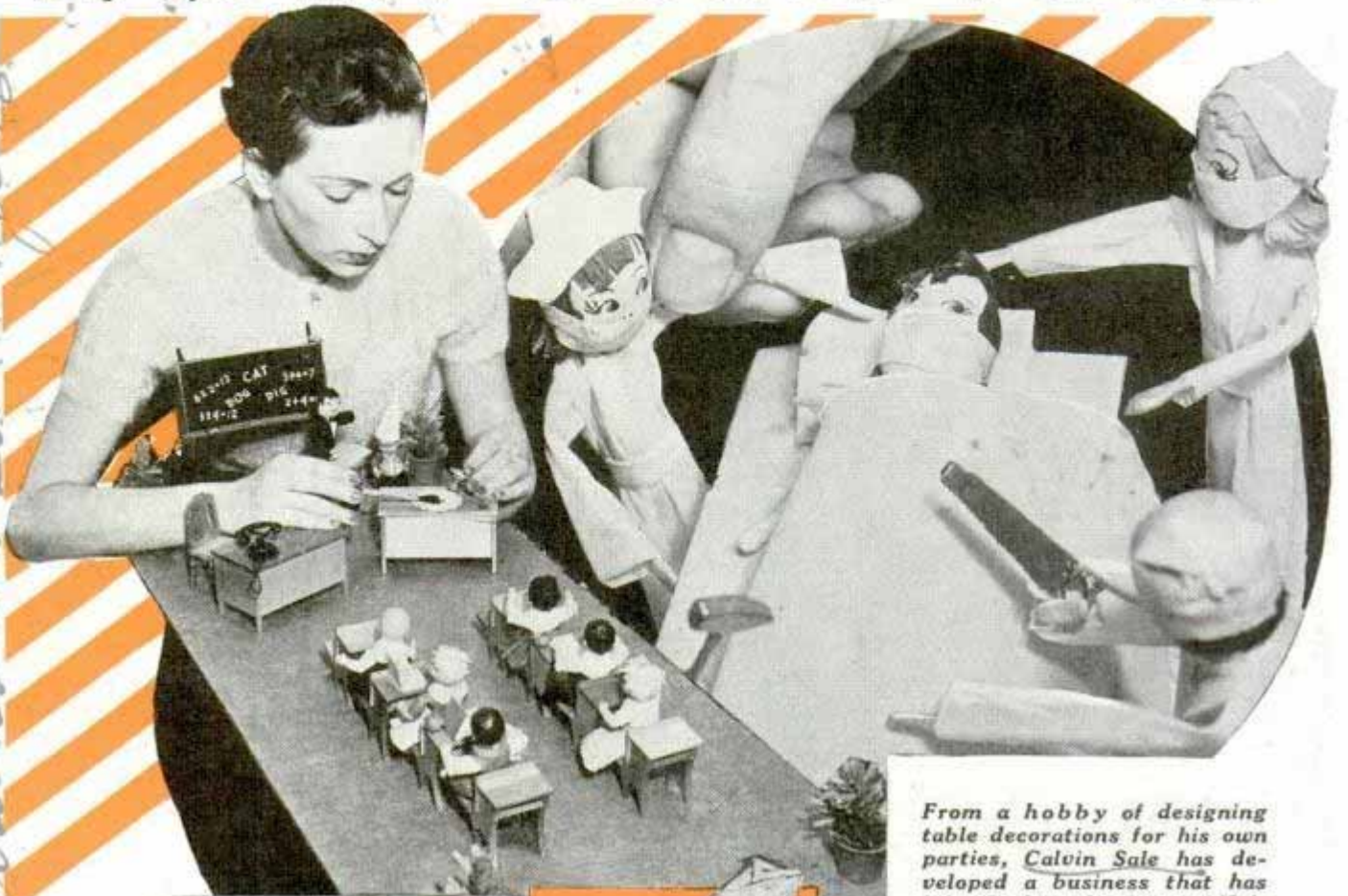
*Pontiac Motor Div.*

*Dual Remote Control Co. 3179 E. Warren Ave*

*Wayne... D. Cooper... Faded... Wayne...*

# PAPER SCULPTURE

Mrs. D. De Witt Miller, 457 D  
 Granada Ave Los Angeles



From a hobby of designing table decorations for his own parties, Calvin Sale has developed a business that has brought him the name of Hollywood's "sculptor in paper." Above, closeup of hospital operating scene which he built for surprise birthday party of an eminent surgeon. Left, schoolroom of paper and wood designed for graduation party. Sale has turned out an endless variety of paper figures, buildings, boats, furniture, giant cocktail shakers and scenes from fairyland tales

625 Alhambra  
 Los Angeles

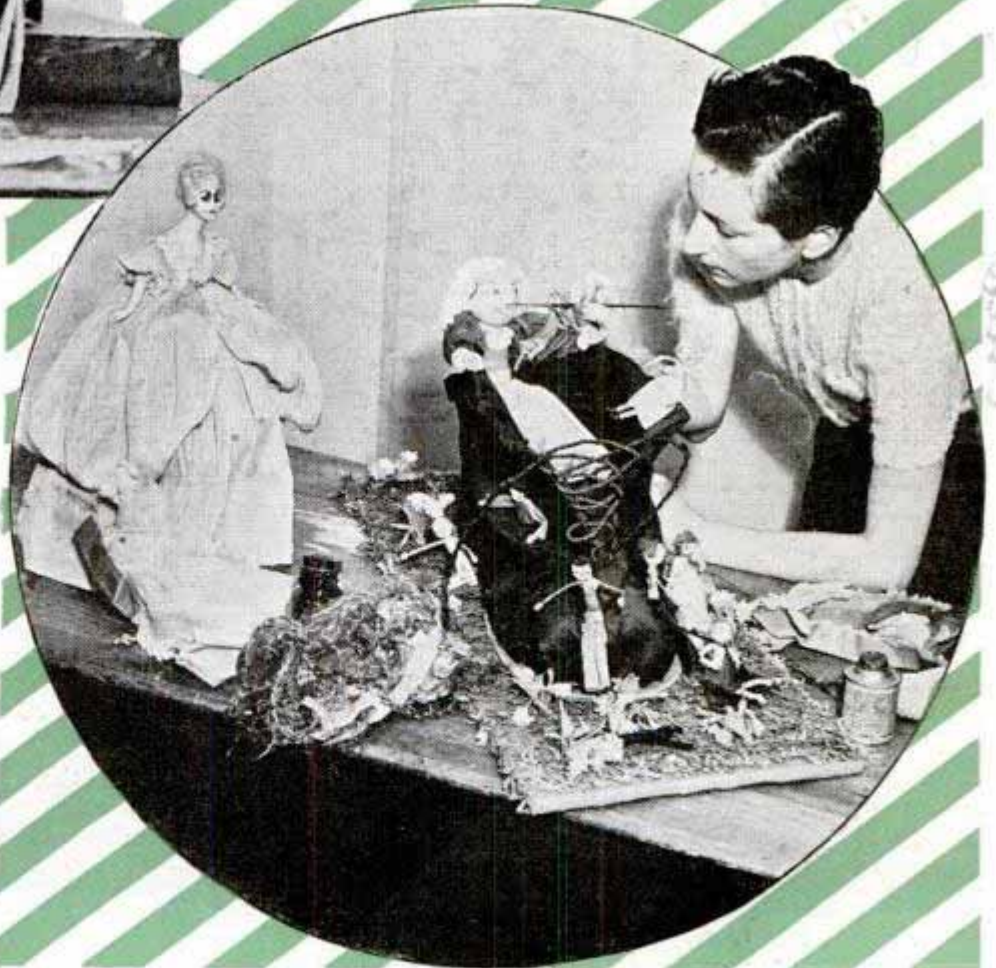
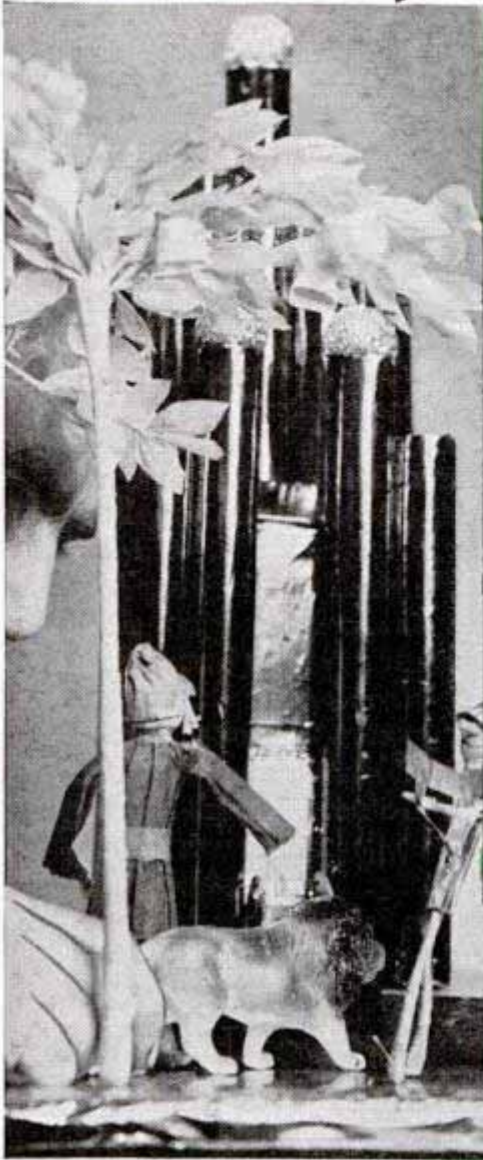


Left, reproduction in paper of painting "Ring, Grandfather, Ring," showing messenger giving news that American independence had been declared. Right, gigantic cornucopia built for a convention. Outside of paper, Sale finds pipe cleaners the most useful material because they supply legs, arms and necks

American legs

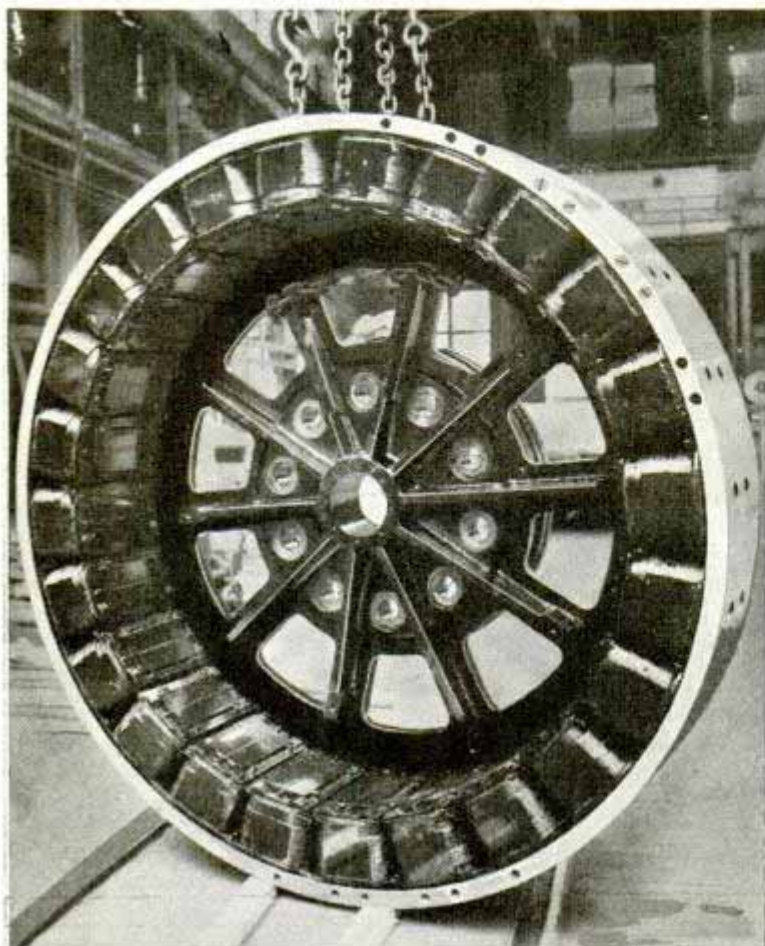


K100  
*Grows into a* **BUSINESS**



Special decorative pieces, such as the one (above) suggested by movie, "The Wizard of Oz," are in demand. Right, for a hosiery shower, Sale built this huge slipper of paper. Gifts for the shower were put inside the slipper. Below, making up figures for scene from Mother Goose rhyme, "The Old Woman Who Lived in a Shoe." Large figure in background was used in decorative piece for an eighteenth century costume ball, its head being molded of wax. Sale stores settings not bought outright and he has more than 300 stacked on shelves, under counters and in every odd corner of his shop

# Electric Coupling Cuts Vibration in Diesel Ship



Outer half of electric coupling is turned by inside armature, like electric motor, without transmitting engine vibration

Vibration in Diesel ships, caused by the pounding of pistons, is smoothed out by electric couplings made by Westinghouse which consist of two rotating parts separated by a quarter inch of air space. The inner part, or armature, is connected to the engine shaft, and the outer part, or field, is connected to the gears which turn the propeller, eliminating the usual solid or flexible mechanical connections which transmit the pulsations of the engines to the driving mechanism. Both the armature and field rotate when the coupling is energized electrically, and by opening the circuit to the coupling the engine is disengaged instantly from the gearing, thus permitting it to serve also as a clutch. In one new ship, powered by four Diesels, one can be shut down without stopping the others, as each is connected to the gears through a separate coupling. For maneuvering, two engines can be operated forward and two in reverse.

## Super-Warplane for U. S. Carries Four Tons of Bombs

Tested recently for the United States army air corps, a new all-metal plane, built by Consolidated Aircraft corporation, can travel faster than 300 miles per hour pulled by four twin-row radial engines of 1,200 horsepower each, and can carry four tons of bombs. With a cruising range of about 3,000 miles, it is manned by a crew of six to nine, depending upon its mission.

Larger than any other "flying fortress," and weighing 40,000 pounds gross, the new plane has a wing span of 110 feet, its fuselage is sixty-four feet long, and the overall height is nineteen feet. There are hatches and windows in the nose, tail, turtledeck, back and bottom. The rear wheels of the tricycle landing gear retract into the wings, the front wheel into the fuselage.



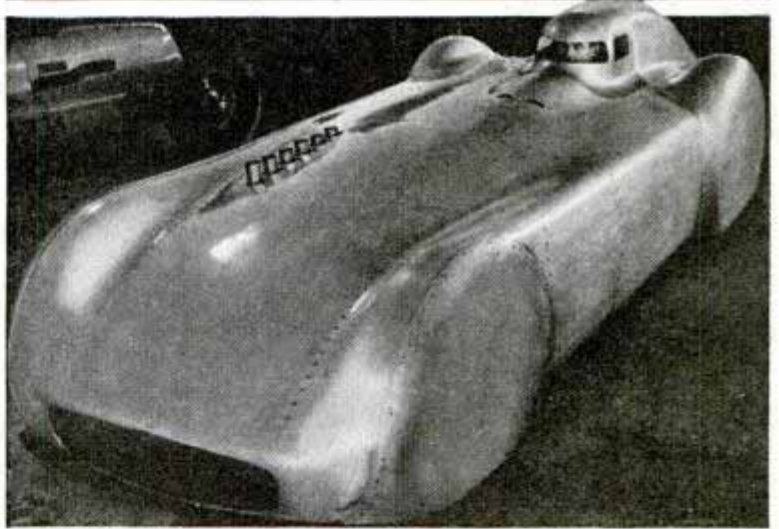
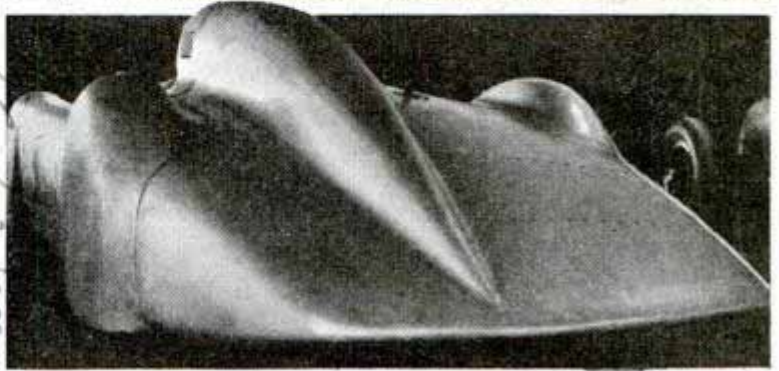
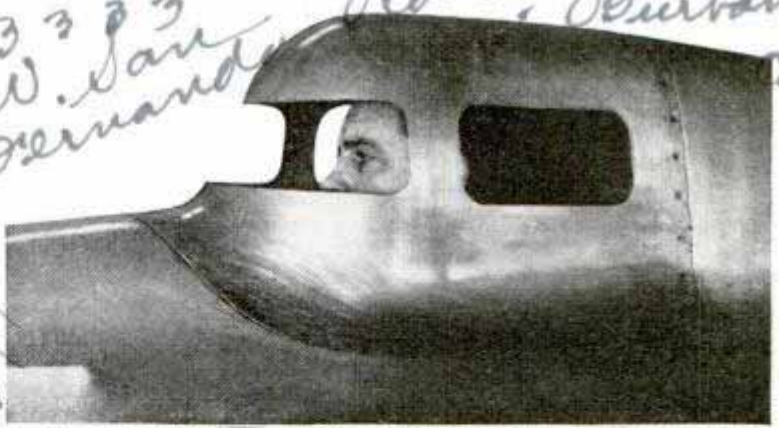
Bomber for United States army has a carrying capacity of four tons of bombs, and a total of 4,800 horsepower makes it capable of speeding more than 300 miles an hour and permits cruising range of 3,000 miles

*San Diego*

*Pratt and Whitney*

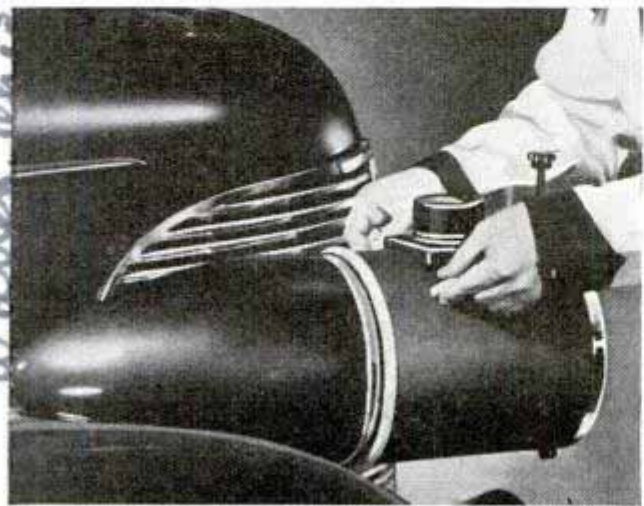
# 500-Horsepower Racer to Seek Hour Record

An attempt to travel 200 miles in sixty minutes is to be made by Joe Thorne, sportsman racing-car owner and driver, who has built a streamline speeder for the purpose. The record will be sought on a circular course twelve miles in circumference at Bonneville salt flats in Utah. The present record for the hour's run is held by Ab Jenkins, who drove 172 miles. Designed for a top speed of 225 miles per hour, Thorne's 500-horsepower auto, covered with duralumin, has a six-cylinder supercharged engine of 366 cubic inches displacement, which turns at 5,000 revolutions per minute and is fitted with overhead valves operated by two camshafts. Twelve gallons of oil and 100 gallons of fuel will be loaded into the car at the start. After entering the cockpit and closing the cowling, the driver will communicate with the outside world by means of a radio transmitter. Semielliptic cross suspension springs are used at both front and rear, and special tires have been constructed for the race—twenty by six in front and twenty-two by eight at the rear. The wheelbase is 125 inches.



Top, driver in cockpit of racer designed to break hour speed record. Center and bottom are rear and front views of streamlining

# Portable Tester for Auto Headlights Operated by Hand



This hand-operated headlight tester can be brought to automobiles for checking efficiency of lamps

Light in weight and easy to handle, a drum-shaped headlight tester can be used anywhere since it is operated by hand with its open end placed against the lamp that is being examined. By turning a knob on the instrument, the highest reading of the sensitive light cell is registered, the condition of the headlight being indicated on the dial as "good," "fair," or "poor." It is claimed that the light cell's sensitiveness will last indefinitely.

Walnut shells, once considered waste, are now ground into fine flour and impregnated with chemical poisons to form insecticides and fungicides.

Packard Electric Div. General Motors Corp.

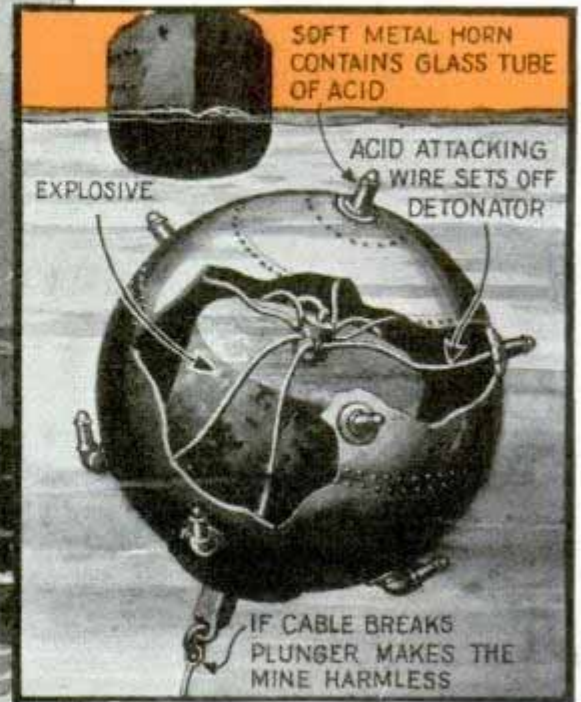
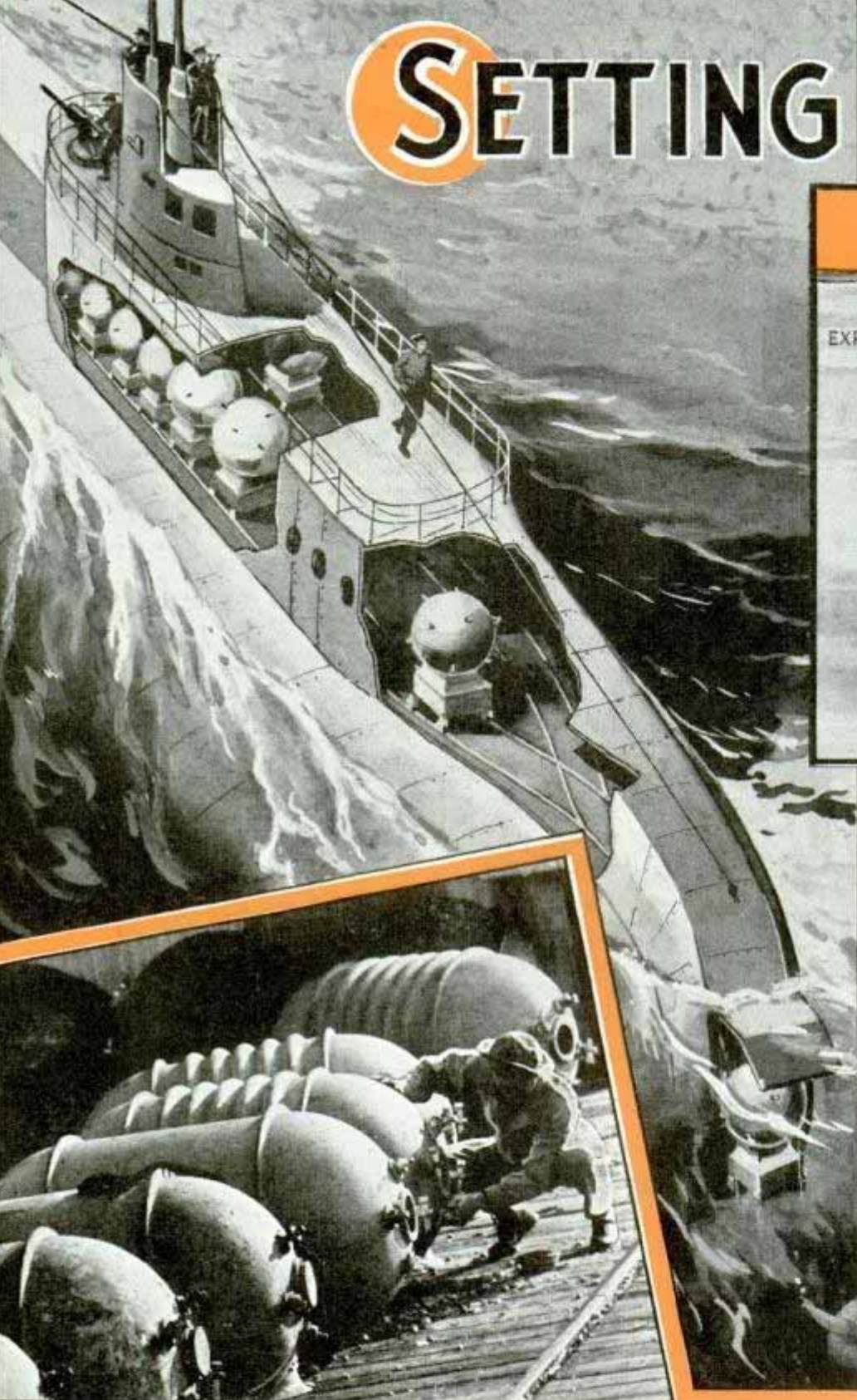
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*Road, Burbank*  
*Calif*

*See page 193 of 64*

*K 166*

*Science Service*  
*2/14/40*

# SETTING TRAPS



*Left, drawing of an ocean-going submarine equipped to lay mines. Cutaway view shows how mines are handled. Below, assembling mines for tests off U. S. coast. Right, drawing of "floating" mine. If approaching ship touches one of the horns the mine explodes*

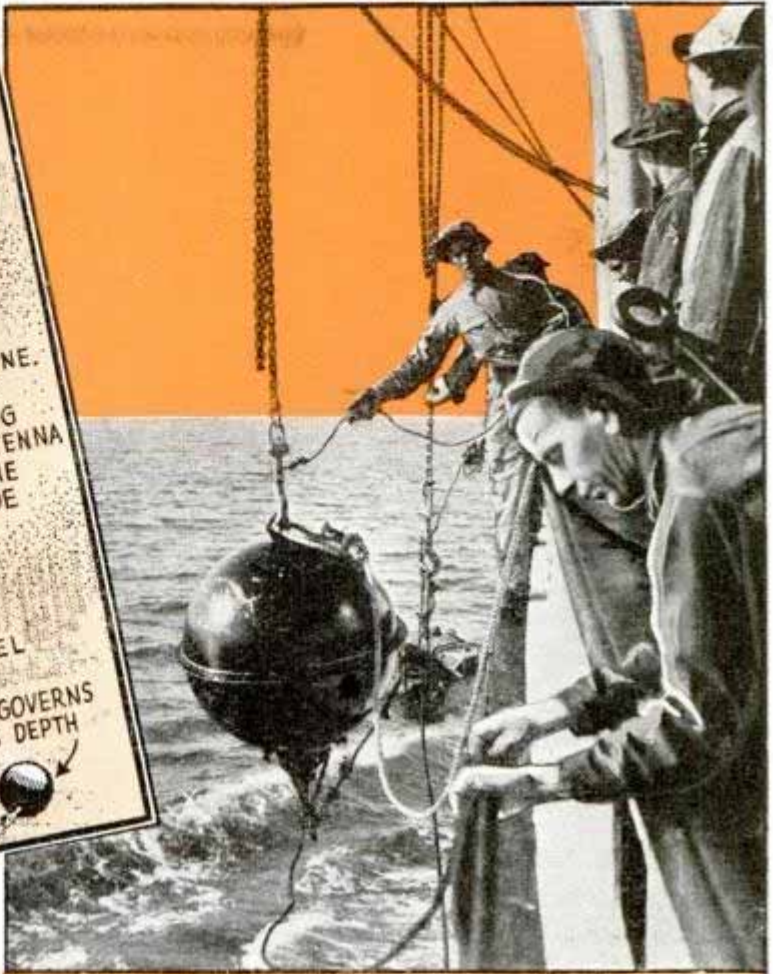
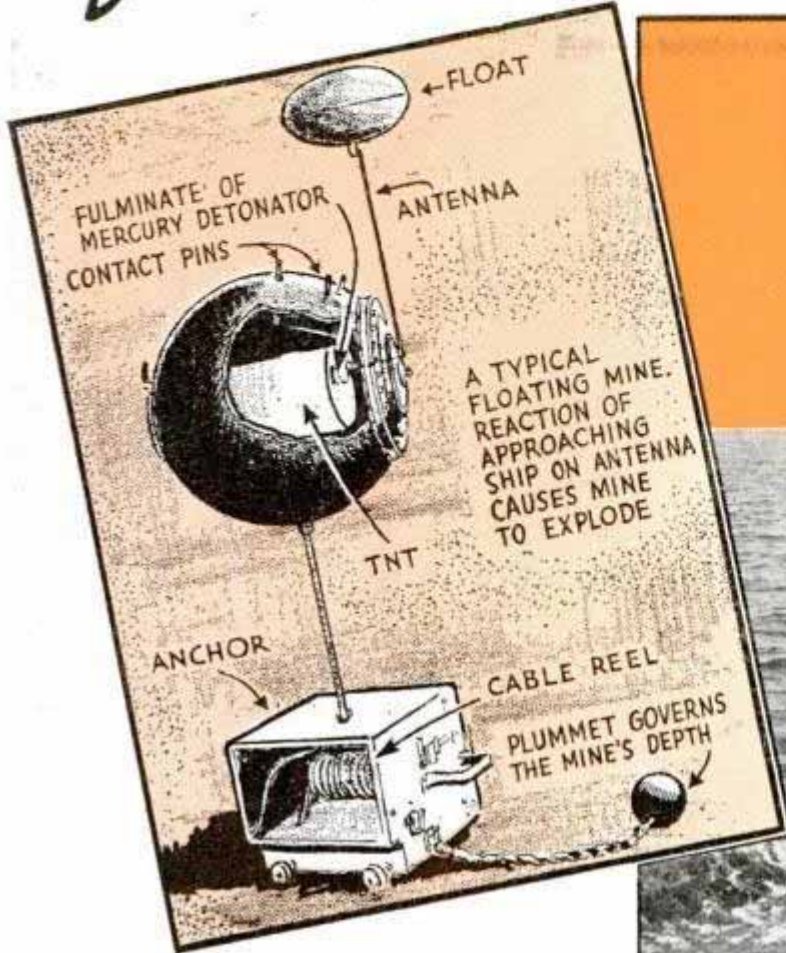


This, British authorities believe, is the way Germany sows deadly mines in sea lanes. Fully as important as the ability of the seaplane to launch parachute-supported mines is the mine itself, which some experts say is a magnetic type designed so that a steel-hulled ship entering its electromagnetic field causes a relay to unleash the explosive, with terrible

WHILE sirens shriek, searchlights comb the night sky with bright fingers of light and anti-aircraft guns bark lustily at tiny moving objects high above, a trimotored seaplane flies low, and slowly, off the English coast. Unnoticed in the din of the air-raid alarm, it drops one fluttering shape after another which floats to the water's surface and sinks—and thus is recorded the successful planting of mines from the air, a new terror in the war at sea.

effects to the unsuspecting vessel and all aboard it. The mine is believed to require only two or three midget tubes, of the type used in your radio, with their filaments set so low that batteries much smaller than those in portable receivers produce radiations for long periods. Electromagnetic poles arranged transversely to each other would insure a sufficient area of distribution of energy to induce reactions with ships coming from any direction.

# for ENEMY SHIPS

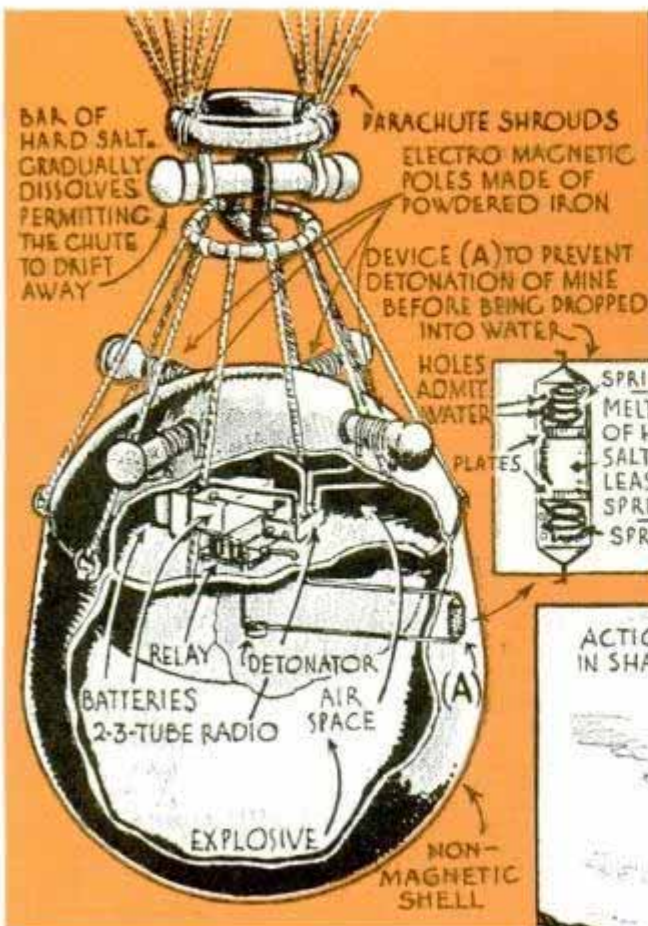


For protection of the crew planting the mine, military experts say, a small bar of hard salt interposed between two small plates prevents the "trigger" of the mine from becoming set until the water has dissolved the salt.

A number of mines of 200 to 300 pounds weight can be carried easily in large seaplanes. How the mines could be released from a plane is purely speculative, but some military authorities believe that it might be accomplished by an adaptation of the aft gunner's hatch, which ordinarily is susceptible to the release of parachutes bearing supplies for relief purposes. Refinements of technique conceivably could include cylinders in which the 'chutes may be packed and swung over to a point above the open hatch before the heavy mine is manipulated into position by movement on rollers along a miniature railway to the hatch. Once the mine is



Left, drawing of mine with antenna. Right, planting forty-inch mine. Bottom, exploding mine with rifle fire from mine sweeper



WINCHES CONTROL THE CARRIAGES AND PARACHUTE CYLINDER TRANSFERS

RAILS FOLD BACK WHEN HATCH IS COVERED

released, it is pointed out, the weight would drag the parachute from its cylinder and the opening would follow as the plane continued. Experts say that separation of the 'chute from the mine, after contact with the water's surface, might be accomplished by attaching the shrouds to a shackle through which is passed a bar of hard salt and from this hangs the mine, so that the dissolving of the salt frees the parachute, permitting it to drift away.

During the World War, experiments with parachute mines were conducted, but with so little success that there is no record of adoption of the idea. In one test, the 'chute was carried away by the wind and the mine was lost.

More familiar to military expert and civilian is the so-called "floating" mine, which is a metal case containing 200 to 400 pounds of high explosive, a detonating device and sufficient air space to make it buoyant. Usually round or pear-shaped, it has a number of spikes or long horns on its upper surface. Each horn is a soft metal casing containing a glass bottle of acid, which, when broken by contact with a ship's hull, permits the acid to run into the

body of the mine and explode a fulminate of mercury detonator by completing an electric circuit. The detonator flashes a primer of black powder or dry gun cotton which explodes the main charge—the complete operation being almost instantaneous.

Laid mostly by surface ships, these mines are mounted on small trucks or "sinkers" that run on rails fixed to the deck. They are tipped over the stern at regular intervals as the ship steams along, and float for a short time until the heavy truck fills with water. At the same time a large lead plummet sinks and trips a catch on the truck when it touches bottom. This tripping of the catch results in an automatic measurement of the depth of the water, less the distance the mine is designed to float below the surface. The cable by which the mine is fastened to the truck is

(Continued to page 123A)

K8

PARACHUTE PACKED IN A CYLINDER. IN FALLING IT IS DISENGAGED BY A RIPCORD

COMPOUND CARRIAGES FOR MOVING MINES TO HATCH. WHEN OPENINGS COINCIDE, THE MINE DROPS

MINES ON CASTERS IN RACK

COLLAPSIBLE BOAT

PARACHUTE OPENS WITH SUFFICIENT CLEARANCE FROM PLANE WITH THE AID OF A PILOT CHUTE

CONCEPTION OF A PATROL PLANE FLYING AT A LOW ALTITUDE, THE ENGINE THROTTLED DOWN TO ABOUT 90 M.P.H. LAYING PARACHUTE MINES

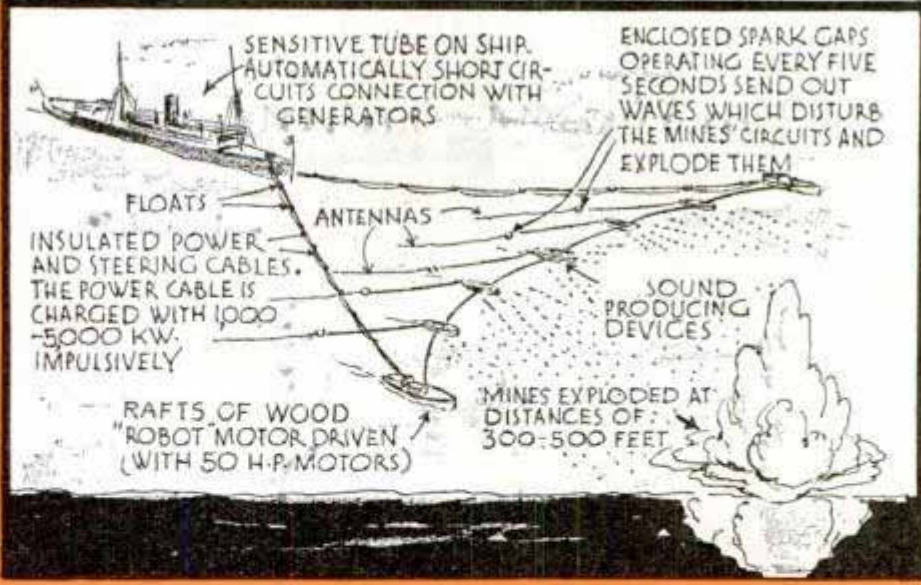
NAVIGATOR PLOTS POSITION OF MINE FIELDS

BOMBARDIER DETERMINES GENERAL PLACING OF MINES

FLIGHT ENGINEER

PILOT AND CO-PILOT

RADIO OPERATOR  
GUNNER

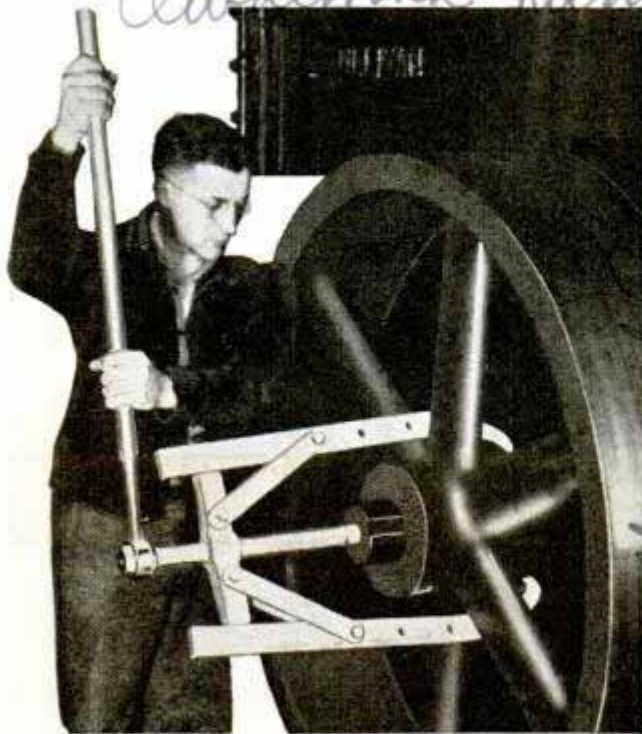


A SYSTEM DEvised BY WM. DUBILIER TO DETONATE ENEMY MAGNETIC MINES

Artist's idea of mine-laying plane, prepared with cooperation of naval experts. Note how mines are handled. Upper right, one proposal for combating magnetic mines, with crewless boats or rafts operating by remote control from the "mother ship"

R 107. Quatonna Tool Co

# Man Exerts Forty-Ton Tug with Safety Wheel-Puller



Removing heavy wheel from shaft with puller that multiplies force applied by man up to 80,000 pounds

Requiring only one person to operate it, a handy gripping tool is designed to remove heavy wheels, gears, pulleys and sleeves with safety. Six sizes are available, exerting a pulling power of 13,000 to 80,000 pounds. The pullers are used by automobile, truck and tractor repairmen, as well as in industrial plants.

the boat is in motion. Changes in speed due to various sail trims or tacks are noted instantly. Unaffected by rolling, pitching or heeling of the boat, the meter is said to have an accuracy within two per cent.

K 156

# Supersensitive Exposure Meter Is Sighted Like a Camera

So sensitive that it will measure the light of a match 100 feet distant, a photometric exposure meter for photographers is operated by "fountain pen" type batteries. It is sighted like a camera at waist level, bringing into view on its angle image finder the scene to be photographed. Pressure on a button lights a tiny red cross at the center of the finder, then a knob is turned causing the red lines to fade. At the point of their disappearance the exposure reading is taken. The meter has a wide range, being calibrated for film emulsion speeds from one-tenth to 800 Weston, "f" stops from 1.5 to 32, and shutter speeds from 1/1200 to 100 seconds. An adjustment is made to compensate for varying battery power. Scientifically accurate, this meter can be used for movie or still pictures.

K 175

# Portable Speedometer for Sailboat Shows Water Speed in Miles



Sailing speed in miles per hour is given on the dial of a handy speedometer designed for use on small open cockpit sailboats. The instrument can be removed from the boat simply by lifting it out of a permanently installed well. Although the small bronze arm that projects into the water is strong enough to resist breaking or bending, it does not create a drag when



Sighting object in view finder, photographer turns knob of exposure meter until red cross vanishes

Speedmaster Co  
Michigan City Ind

W. S. Doherty, Wood, San Francisco, Cal.

Merchandise Co. The



no answer. 5/7/40

# Watertight Pontoon Cells Make Cruiser Safe

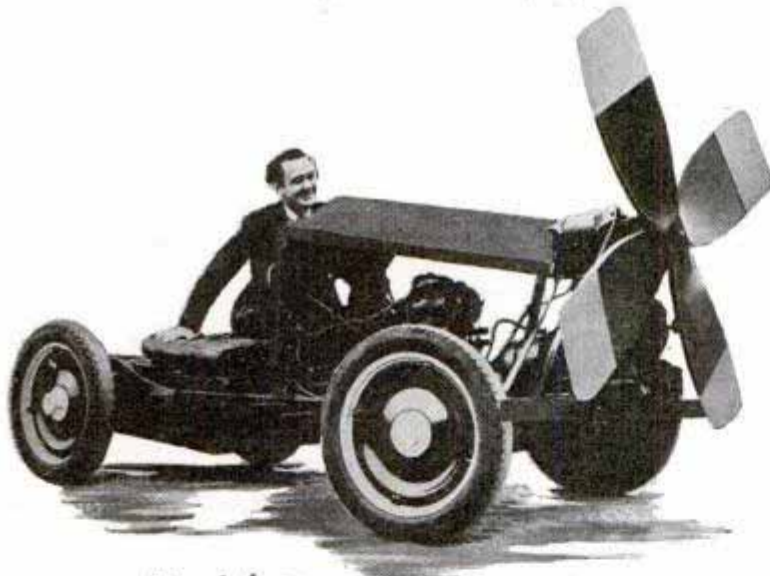
Tried out in waters at Oakland, Calif., a cruiser floating on a pair of pontoons is said to be virtually unsinkable. Each pontoon is divided into watertight compartments, and it is claimed that the boat will remain afloat even if half of the compartments become flooded. The inventors say that the pontoon cruiser, which is capable of thirty miles an hour, could serve as a submarine chaser in wartime. Her broad decks, in peacetime, are used by fishermen.



*Watertight cells built into the two pontoons will retain enough air to keep the cruiser afloat even if half of their compartments become flooded*

K 83

# Electric Auto Has Own Windmill to Charge Its Batteries



Wind power helps to run an electric auto which the maker calls a "windmobile." Twelve batteries, supplying power to drive the electric motor, are charged by a propeller mounted at the front. This is accomplished by parking the car so the slightest breeze will spin the propeller, which in turn operates the generator. The inventor claims it costs a quarter of a cent to run the car a mile and it can travel fifty miles an hour.

*Windmill mounted in front of electric auto converts even slight breezes into power to charge its twelve batteries*

K 163

# Neon Lamp Operating Like a Stroboscope Finds the Speed of Motor

Revolutions per minute of any alternating-current motor can be determined with a simple lamp that is equipped with neon bulbs and operates like a stroboscope. It is designed for use with 115-volt circuits and is provided with a switch to check 220 and 440-volt circuits. The slip speed of the motor is found by directing the light on the end of the motor shaft and counting the number of revolutions a minute. Then by subtracting the slip revolutions per minute from the synchronous speed you can obtain an accurate count of the motor's revolutions per minute.



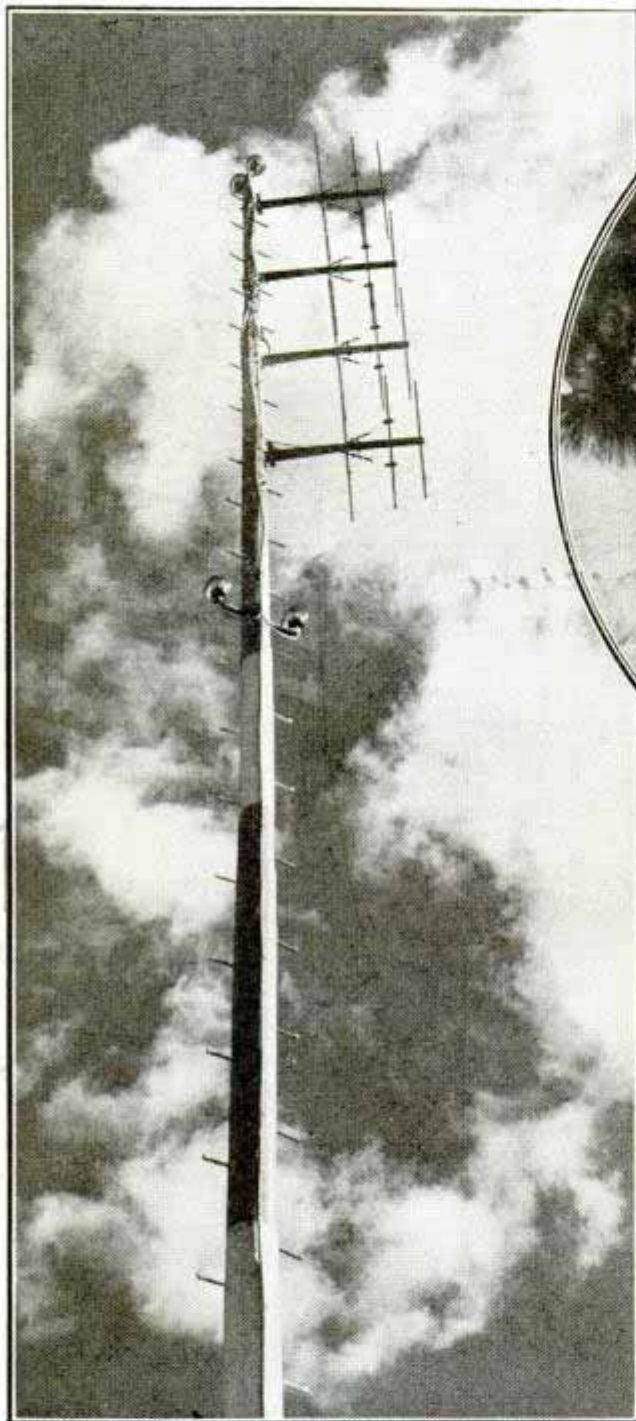
*Counting revolutions of shaft under neon stroboscope gives slip speed for computing revolutions of motor*

*Release Electric & Engineering Co  
1288 Commercial Road  
711*

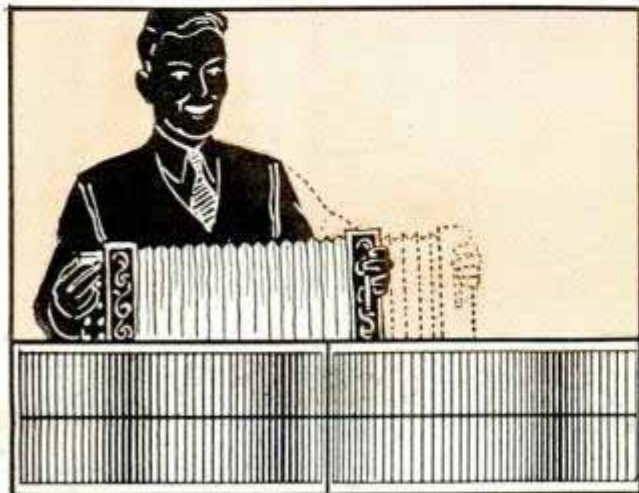
*Mr. J. Thomas  
St. Augustine, Florida  
Street address  
not known*

# "WOBBLING" RADIO WAVE

*Sam Curtis*  
*Mrs. Louis Ackerman*



Left, directional antenna of relay FM station atop Yankee Network studios in Boston. Right, demonstrating receiving set, panel of which is shown below. Top band is for FM reception. Bottom of page, FM wave pattern, 100 per cent modulation, compared to accordion. Variations in wave pattern denote changes in sound imposed on carrier wave



**C**LEAR as a bell, with every musical note and every spoken word coming from your loud speaker with the same fine quality as they entered the microphone at the broadcasting studio, and free from static, even in violent thunderstorms—

That's the kind of radio reception you've always said you wanted and now there are good indications that you are going to get it. This promise of "perfect" radio is held out by a fast-developing system called frequency modulation—FM for short—which has gained a substantial foothold in the eastern United States and apparently is challenging the giant networks and their

# Conquers STATIC

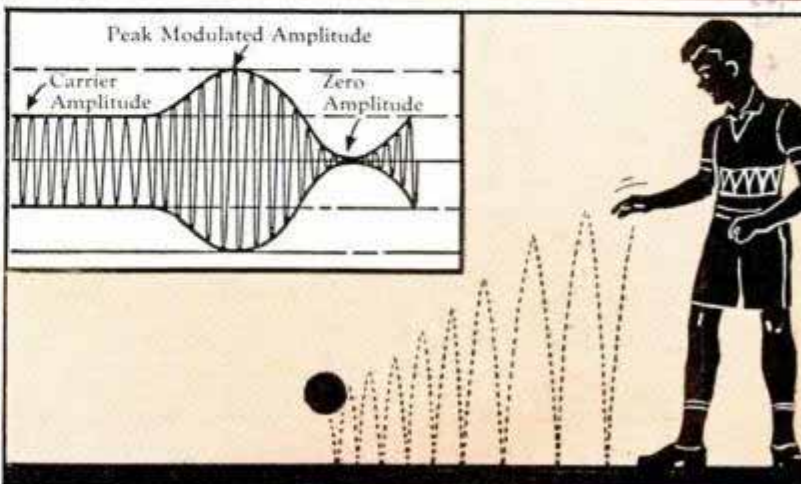
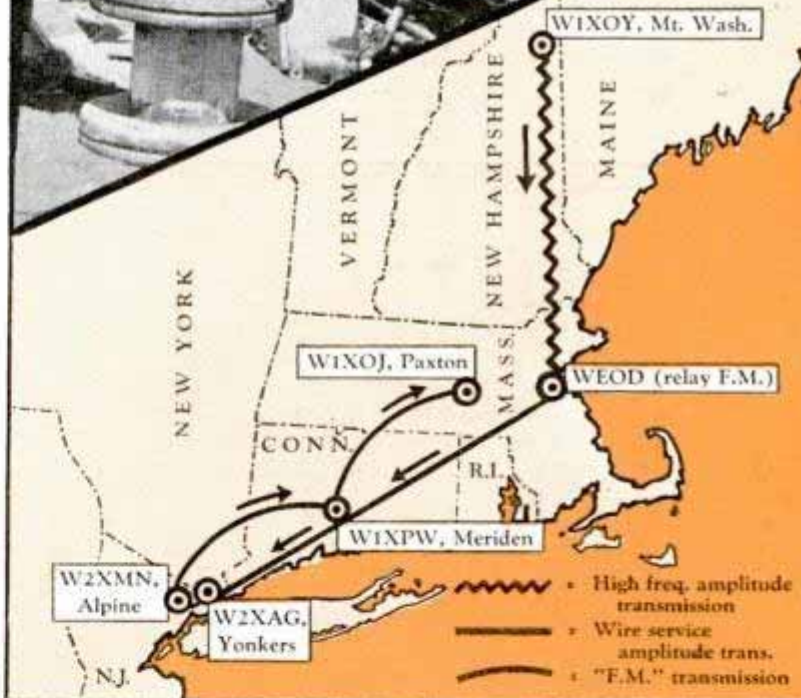
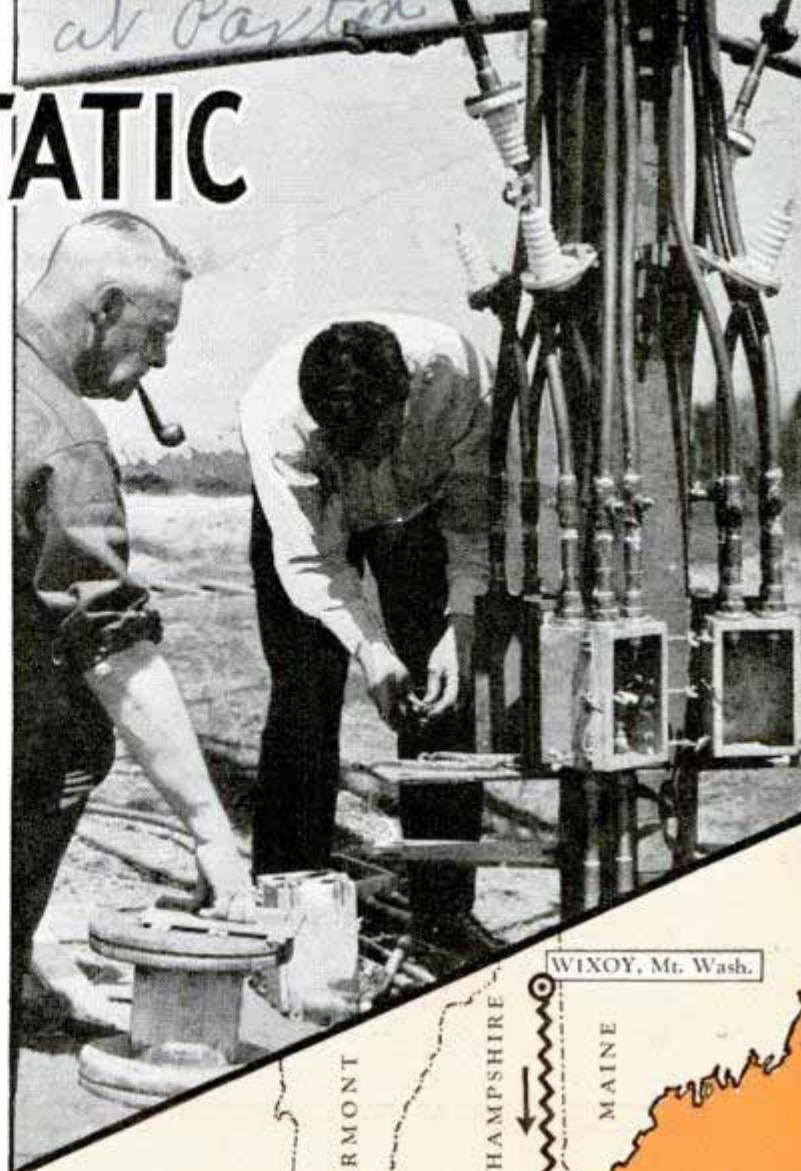
conventional amplitude modulation system.

Of course a sudden change from the old to this new system would cost a lot of money; station operators would have to replace between \$75,000,000 and \$100,000,000 worth of transmitting equipment and you listeners would have to replace present receivers—there are about 40,000,000 in operation—or purchase some kind of adapter units that might work in connection with your old sets. Because of this cost, there is little likelihood of wholesale scrapping of equipment. Instead, the change will be gradual. As old sets wear out, they will be replaced with those designed for the new system. Nine manufacturers are licensed to build FM receivers, one type of which is designed for the new system and another for both the old and the new. Between 5,000 and 10,000 FM sets are reported in operation, mostly in the northeastern part of the country.

Already several stations in the New York-New England area, most conspicuous of which is WIXOJ of the Yankee Network, are broadcasting experimentally and others have applied for FM licenses. Together these stations will offer static-free radio to about 20,000,000 potential listeners in New England and parts of New York state and New Jersey. Considerably more than a score of authorizations, including one at Milwaukee, Wis., have been issued by the Federal Communications Commission and another score of applications for frequency modulation licenses is being considered. Of particular significance is the fact that the large networks have applied for permission to operate FM stations.

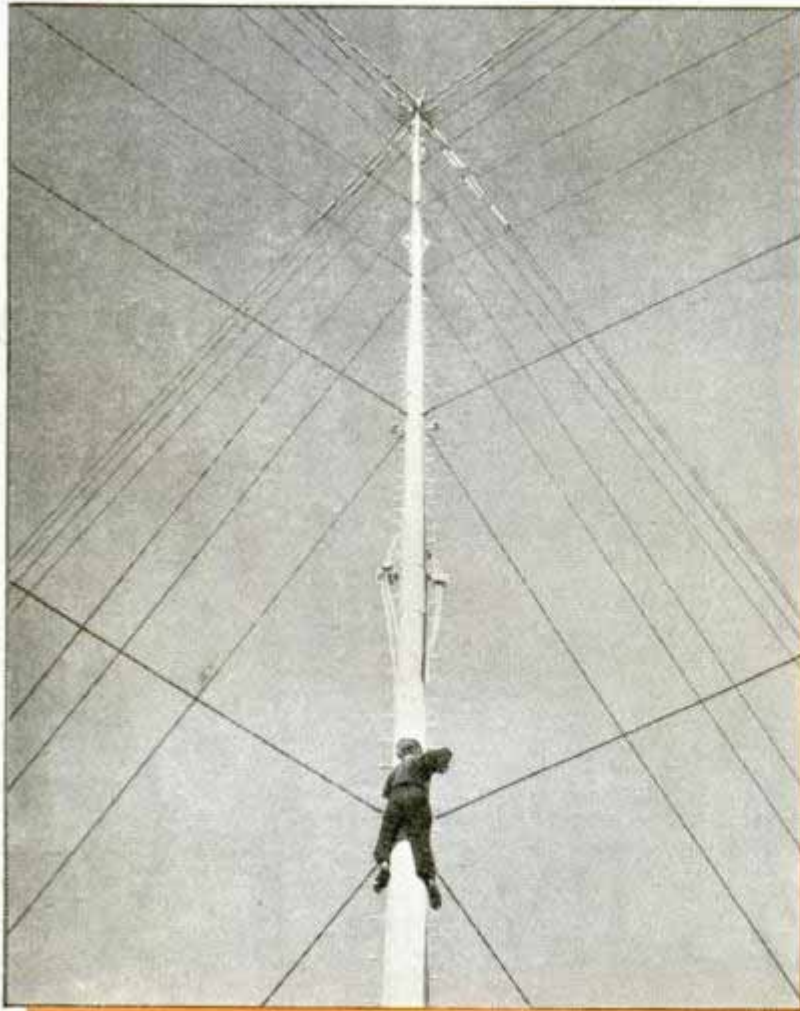
Imagine, if you can, this sort of reception from your radio: outside the thunder may be crashing and the lightning flashing, street cars may be

*Top, Yankee Network technicians assembling base of top section of FM antenna mast. Center, map of FM network. Bottom, amplitude modulation wave pattern, 100 per cent modulated, compared to bouncing ball. The harder the ball is thrown, the higher it bounces*



*21 Brookline Ave.*

R 10 1



Just to show the possibilities of FM radio, General Electric engineers ran an antenna into their laboratory, tuned in a program and listened to crystal-clear music and speech while their giant lightning-making machines hurled powerful bolts of electricity back and forth. Not a click nor a thud came from the radio, thus demonstrating the ability of FM to eliminate interference from man-made static.

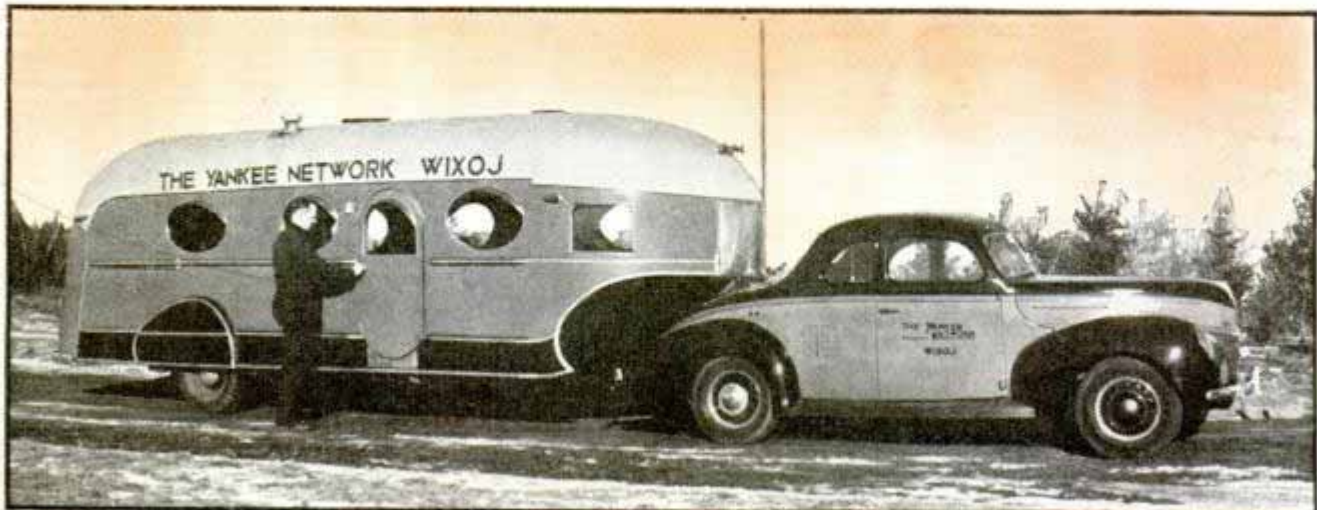
Exact differences between the old and new systems are hard to explain and hard to understand, even for radio technicians. The issue seems to lie in the basic principles of broadcasting. High-frequency alternating current is used as the power in radio broadcasts. In order to introduce sound waves on the radiating waves of radio, some characteristic must be modulated, or varied, as in the old system the voltage strength is altered.

rumbling past, telephone near the set may ring and someone may start the electric vacuum sweeper—yet an orchestral rendition comes pouring into the room with virtually precise fidelity, every tone liquid-clear and well-rounded. There is no static, even during the lightning storm, no distortion; reception is perfect to the ordinary ear. If you close your eyes, the orchestra sounds like it is in the room with you.

Known as the amplitude modulation system, present broadcasting has operated on the principle of varying the radiated power, first weak and then strong, with each sound impulse entering the microphone. It is something like a boy playing with a rubber ball; the harder he bounces it on the ground, the higher the ball goes in the air.

The old system has always been haunted by distortion and static; the first caused by

Sam Curtis



Top, closeup of antenna mast showing feed lines coming down from turnstile antenna arms, with vertical antenna on top for emergencies. Bottom, demonstration unit on the road. FM signals are brought in by receivers housed in the trailer

the necessity for operating on narrow wave bands in the long wave lengths so that the 800 stations now licensed may have a place in the 550-1600-kilocycle band assigned to standard broadcasting. If an amplitude modulation station moves down into the ultra-short wave band to avoid distortion and to obtain high fidelity, it runs into static because amplitude modulation has approximately the same characteristics as lightning and other natural electrical disturbances and also noises coming from man's various electrical appliances. An effort to defeat static in the ultra-short wave field has been made by boosting the signal strength to a point many times that of the static and then confining the signal to as narrow a band as possible, thus giving the static less chance to interfere.

Frequency modulation calls for the amplitude, that is, the voltage strength or height of the radiating waves, to remain constant, and sound is imposed on the waves by wobbling their frequency over a wave band that may be 150,000 cycles wide. A sound wave of 5,000 cycles (vibrations per second) will be converted into a frequency wobble of 5,000 times per second in the radiating wave; thus the wave band widens or contracts to accommodate whatever the volume of the sound, somewhat in the manner of an accordion.

Because its wave band stretches, FM requires more room in the spectrum and each station is allotted 200,000 cycles, as compared to 5,000 cycles for an amplitude modulation transmitter. But in the short-wave field where it operates, there is more space than in the standard broadcast band, so this is no disadvantage.

The short waves of the FM are adjacent to the television band, which has the drawback of having a range or coverage no greater than to the horizon—twenty-five to thirty miles—except in a few cases. FM signals have an ap-

(Continued to page 132A)

MAY, 1940

## Radium Bomb for Cancer Swings from Ceiling Turret



Treating cancer patient with radium in swinging bomb. Note reflection of photographer and assistant in polished surface

Radium treatment of cancer is facilitated by a heavy bomblike container that swings from a turret in the ceiling. When a patient is ready to receive an application and the instrument is in position to administer it, the radium is forced to the bottom of the bomb by oil pressure, which is generated by a motor in another room. A buzzer warns the technician when treatment time has elapsed. The bomb contains four grams of radium worth about \$100,000.

## Microscope with Electric-Field Lens Enlarges Object 90,000 Times

Another "super-microscope," capable of enlarging objects up to 90,000 times, has been developed by a German scientist, and uses an electric field for its lens. An original enlargement of about 5,000 times can be magnified still further until the objects being viewed are separated by one fifty-millionth part of a millimeter so each object can be observed distinctly from the others. The microscope is said to be particularly valuable in differential diagnosis.

Dr. H. Muhl.  
Tests made by Robert  
715

Miss Ann Barth

Genor & McCarty  
Los Angeles Calif.  
1407 1/2 St. Hope H.

Image Tube 2/6/40

Coertner

## Clock Shows Billion Years of History in Four Minutes



Geologic clock unfolds in illuminated pictures one billion years of the earth's periodic ages within four minutes' time

A geologic clock, made from auto parts, trout reel, tire pump, tape and other spare material, illustrates in four minutes the evolution of the earth in the sequence of its ages from the period of the oldest rocks to the present time, totaling a billion years of history. Pressing a plunger sets it in operation. The dial, which shows in lights and pictures what has happened since the earth became a planet, is divided into twelve "hours," like the face of a clock. It is pointed out that if a billion years of geologic time were represented as twelve hours, hardly more than one second would have elapsed since the end of the glacial period some 25,000 years ago.

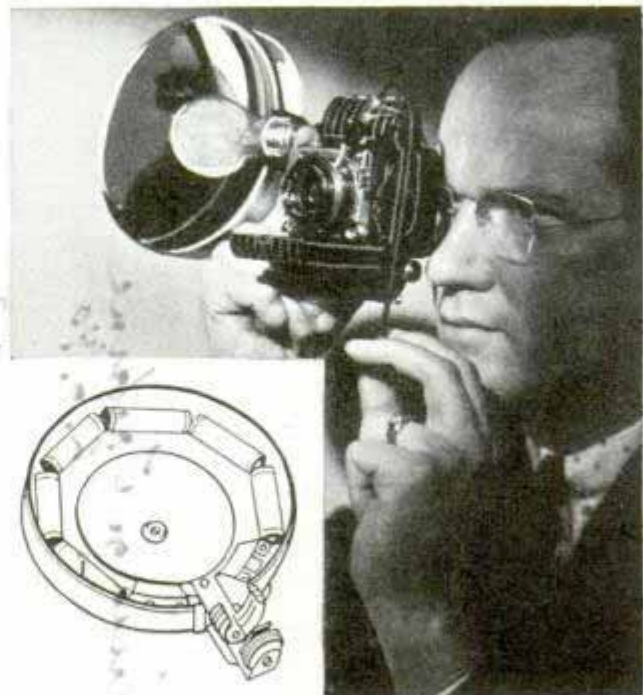
## Featherweight Metal Crutches Withstand Heavy Strain

Failing in his attempts to obtain crutches that would withstand heavy use, an electrician, aided by an automobile mechanic, developed a method of constructing them from duralumin tubing, which is so light that a fifty-inch crutch weighs only fifteen ounces, yet it is strong and durable. Successful welding of the tube joints made the invention possible. Unless subjected to severe accidental stresses, it is claimed by the inventors that the crutches are virtually indestructible. Their lightness makes

them less tiring to carry than others which ordinarily weigh two or three times as much, and the metal piece under the arms remains cool, reducing discomfort in warm weather. To make them slipproof on snow or ice, a pointed screw can be installed at the tip.

## Batteries Stored in Reflector Fire Flash Synchronizer

Six tiny batteries to fire the flash bulb are packed conveniently, end to end, in a circle inside the reflector of a synchronizer just offered to camera fans. Thus no projecting battery case is needed and the entire synchronizing outfit is light in weight. The synchronizer is easily adjusted by an amateur, attaching like a cable release, and may be applied to almost any camera. When it is installed on the camera the plunger is arranged so that it barely trips the shutter, precluding any jarring of the camera or pounding of the shutter release. There is an additional socket in the back of the reflector for extensions to side lights, and an ejector discards the used bulb at the flick of a finger. The bulb socket slides to center bulbs of various sizes in the reflector.

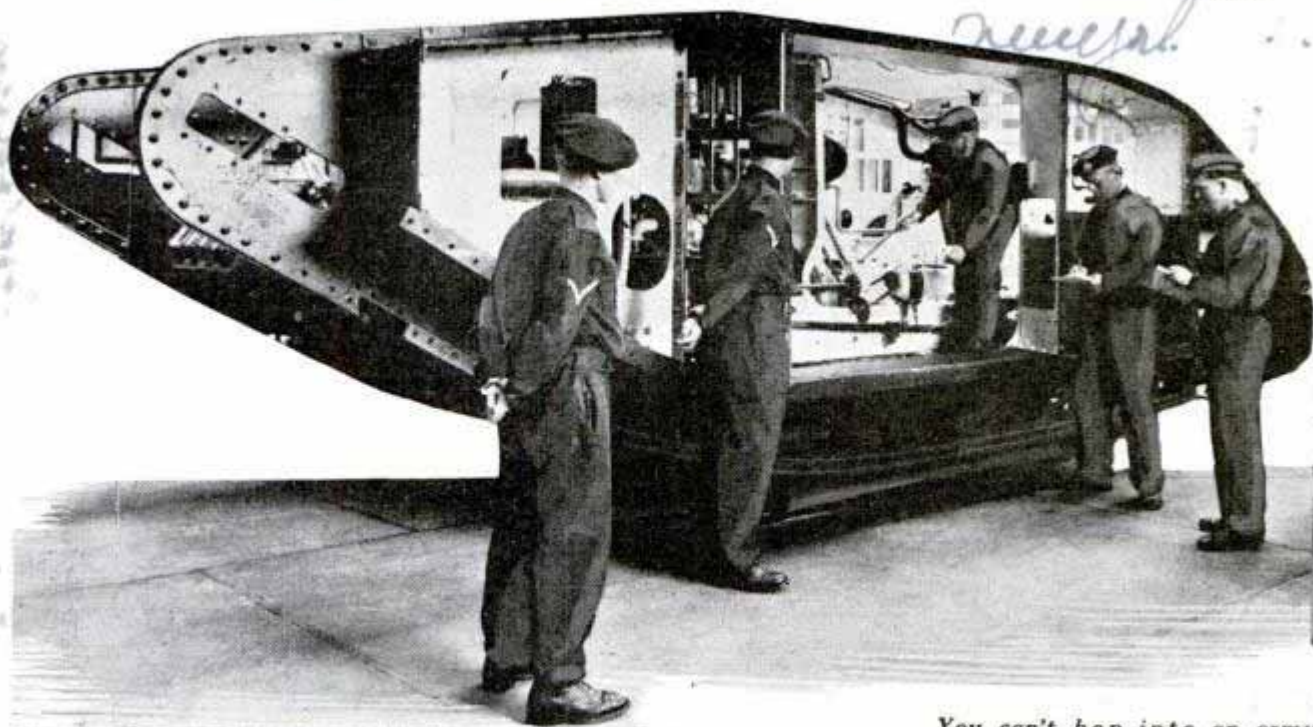


Inside the reflector of flashlight synchronizer, "four-tan pen" batteries are arranged as in inset

Featherweight Metal Crutches

Products, Inc. 220 7th Ave. New York, N.Y. Merchandise

*R. 511 271 Madison Ave*  
**Rookies Trained for War at "Tank College"**



*Handling tanks in traffic is no simple feat and "road sense" is one of the fundamental courses at the tank school. Above, an instructor illustrates the lesson with models on a miniature street layout*



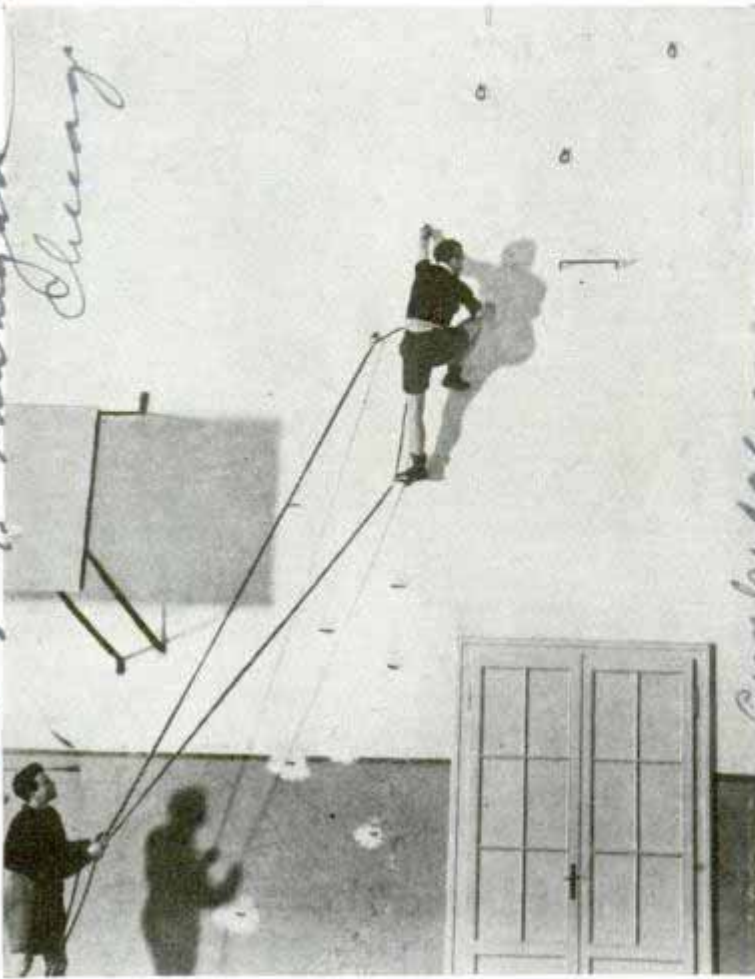
*You can't hop into an army tank and drive away any more than you can fly an airplane on your first visit to the cockpit. The men who make up Britain's efficient tank corps are put through an intensive course of twenty-four weeks at an advanced "tank college" somewhere in England. Above, "rookies" take notes as an instructor points out features of a "sectionalized" tank*



*Above, a soldier tries out the controls under guidance of veteran of Royal Tank Regiment. At left, medium tanks tackle rough and muddy ground during exercises. Before they are ready for active service the tank crews must know their machines thoroughly from tread to cannon, be able to drive the tank in every kind of terrain, operate the radio and guns, repair the rolling fortress in emergencies and understand tactics of cooperating with infantry*

## Mountaineers Scale Walls Before Trying High Cliffs

K165



Student learns tricks of mountain climbing by crawling about side of wall before attempting to tackle a real mountain

Students at a mountain-climbing school in Italy crawl catlike on the walls of the gymnasium as part of their training for a hazardous sport. To simulate natural conditions of a sheer rock or cliff, round nails like those used by mountain climbers are set in the wall at fair distances apart, together with small ledges of iron that protrude about half an inch.

## Charcoal Recovers Gold Trapped in Claylike Ore

Gold may be where you find it, but until recently there has been no profitable commercial way to extract it from saprolite, a claylike gold-bearing ore found in southern states. Using charcoal as a key, an inventor has patented a process of causing the gold to float so it may be recovered. The ore in pulp form is treated with cyanide, and then with charcoal which has been heated to about 1,832 de-

grees Fahrenheit. When this is subjected to a froth flotation process, the charcoal containing the gold floats off the surface while the clay sinks. This method requires only two pounds of charcoal per ton of ore, and saprolite that assays at only 65/1,000 of an ounce per ton is said to yield as much as 98.9 per cent of its gold.

## Light Screen Aids Reader by Reducing Lamp Glare

Where the glaring rays of an electric lamp reflected from a white page are intense enough to render the black print virtually invisible, the insertion of a new Polaroid film between the light source and the page will restore three-quarters of the possible maximum black-and-white contrast, it has been demonstrated by engineers of Polaroid corporation. As the light passes through the film its vibrations become so shaped that glare is reduced greatly. Even under favorable lighting conditions, a modern lamp provided twenty per cent greater contrast with the screen than without it. It is claimed that a new kind of light-conditioned lamp, equipped with the Polaroid film, attains a contrast of ninety-four per cent, only six per cent short of perfect reading conditions.



Holding Polaroid screen between glaring lamp and book, at left, restores visibility. Lamp fitted with screen is shown at right

Italian Journal of Inventions & Discoveries  
B 3 3 7. New York

K138

New York & Co.  
New York, N.Y. 10019

American Cyanamid  
K135  
Polaroid Corporation  
Polaroid, New York

30 main Cambridge  
Dr. Martin Sarafay  
Cambridge, Mass

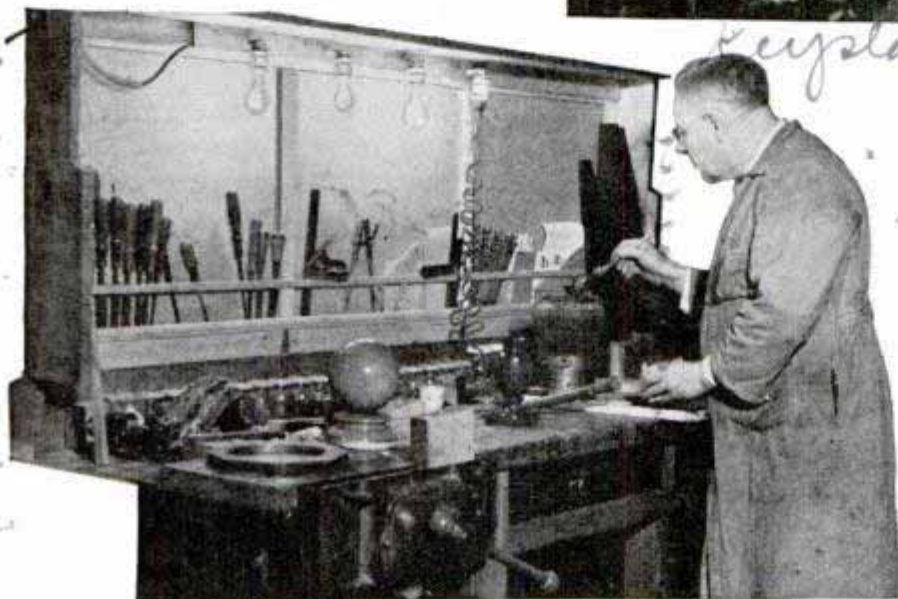
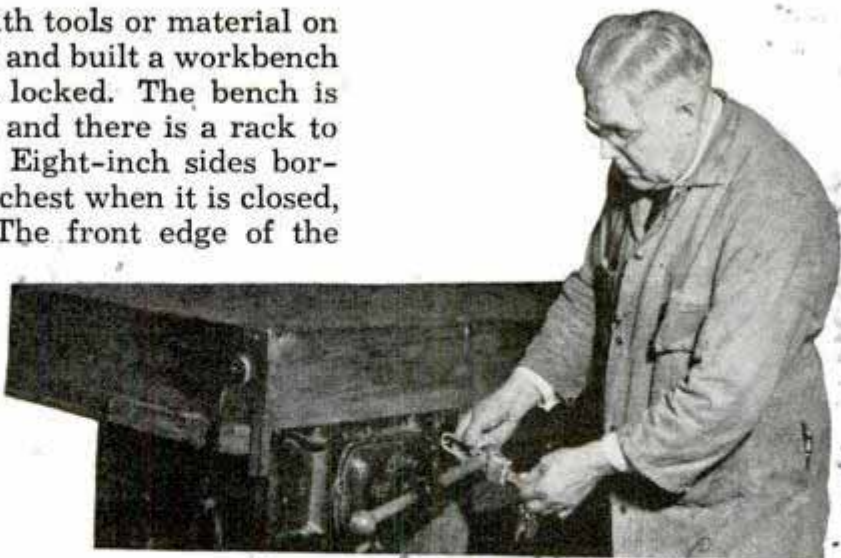
718  
Cornel Crawford  
New York, N.Y.



X134 Hand. Coano. 200. New York City

# Workbench with Hinged Cover Locks Tools

To prevent any tampering with tools or material on his bench, a craftsman designed and built a workbench with a hinged top that can be locked. The bench is wired for lights and a gluepot, and there is a rack to hold the tools firmly in place. Eight-inch sides bordering the cover form a sort of chest when it is closed, with everything safe inside. The front edge of the cover drops into the vise and conceals the drawer. Now draw the vise up tight against the cover, snap a padlock over the handle, and neither the bench nor the drawer can be opened.



Keystone View Co

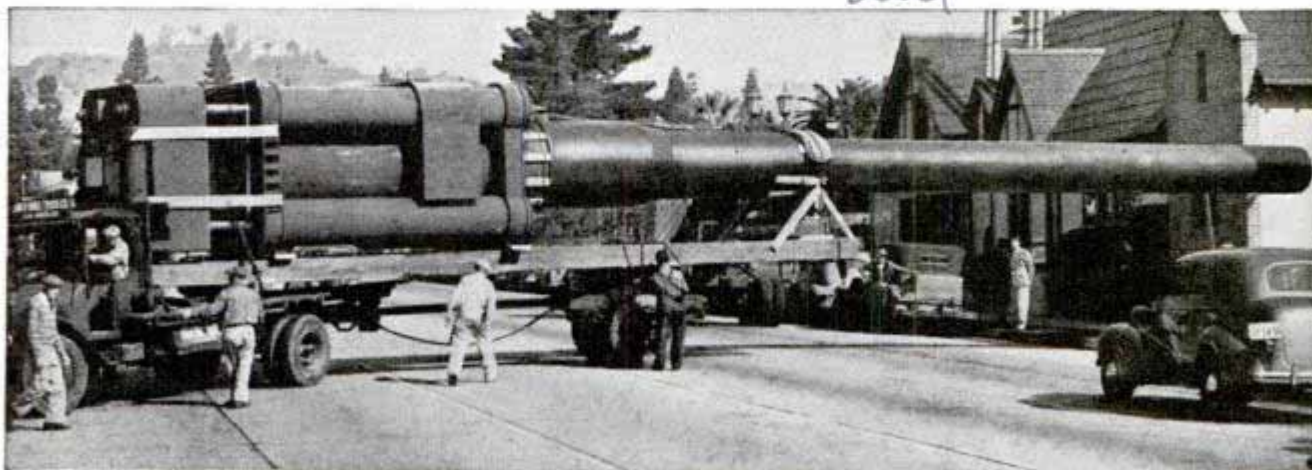
Above, to unlock workbench craftsman removes padlock and opens vise, releasing front part of cover which is raised and lowered on hinges and forms a locking chest to inclose tools and material. Opened, as at left, the cover is wired for lights and serves as a rack to hold tools

# "Big Bertha" of Wood Is Shaped Like World War Gun

One of the biggest guns ever made was transported through the streets of Hollywood recently on its way to be used in a new movie. Fashioned of wood, the gun is shaped like Germany's seventy-five mile

cannon which shelled Paris during the World War. It weighs 6,500 pounds and is 100 feet long. The realistic model will make its appearance in Charlie Chaplin's film, "The Dictator," which is now in production.

dnt



Formidable in appearance, but made of wood for use in movies, this copy of Germany's seventy-five mile gun, 100 feet long and weighing 6,500 pounds, gave warlike aspect to Hollywood streets on trip to studio

Lucas, 1466 N. La Brea Ave.

*8000 ft. Ave. High*  
**Sled Pushed by Propeller Rides on Skate Runners**



*all in one*  
 Light engine and air propeller push "aerosled," made with skate runners by school children in Russia

School children in Russia have constructed a sled they call "aeroskates," which consists of three skate blades mounted under a T-shaped frame and driven by an air propeller and engine at the rear. There is a footrest for the young rider, who steers the sled with handle bars that turn the front runner.

*4-88*  
**Shut-Off Valve Built in Pipe Joint Saves Closing Entire System**

You do not need to shut off pressure of water, gas or oil in the entire system to disconnect a section of pipe if it is fitted with a joint now on the market which has

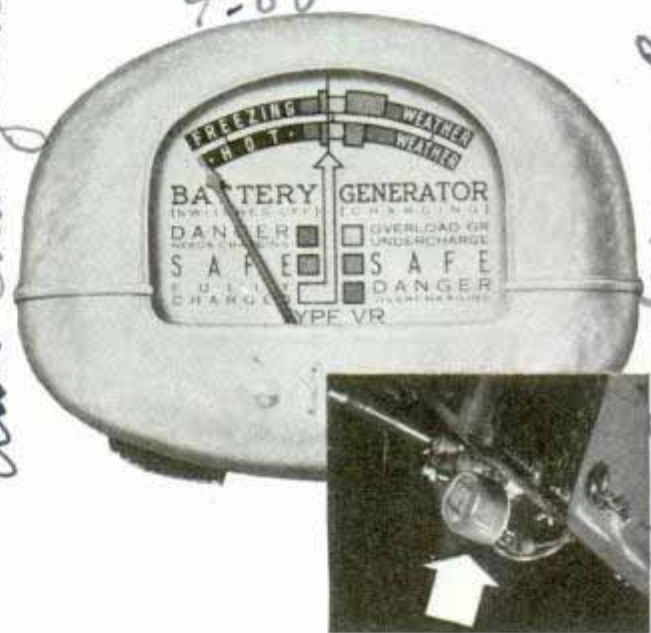


Pipe joint with built-in shut-off valve closes line against leakage if pipes are to be disconnected

its own shut-off valve. The connection threads inside the joint are combined with a seat valve, and when this is screwed down it automatically closes the line before the connection is broken. The pipe may be left disconnected without additional plugging and without danger of leakage, and flow can be started immediately when the connection has been restored.

*K18.*  
**Battery Trouble Seen at a Glance on Dashboard Indicator**

Advance warning of conditions which might result in failure or ruin of your automobile battery or generator is given by an electrical indicator that is installed on the instrument panel. While the generator is charging, a needle on the dial tells you immediately when electrical disorders develop, such as overcharge and undercharge, and keeps you constantly informed



Constant battery checker mounted on instrument board, as shown, warns driver in time to fix trouble

of variations in performance of the generator, in the electrical load over the entire system, or in the battery charge. At rest, a glance at the dial reveals the state of your battery. This avoids unnecessary inspections and enables the motorist to have faults in electrical equipment corrected before a complete breakdown.

ⓂA natural yellow sapphire worth \$125 a carat differs from a white sapphire worth \$5 only in the 92/100 per cent of iron oxide which colors it, the trace of iron thus being worth about \$29,600,000 per pound.

*U. S. Clock & Watch Co. 154 2*  
*Memphis, Tenn. In America*  
*Quis Charge Meter*

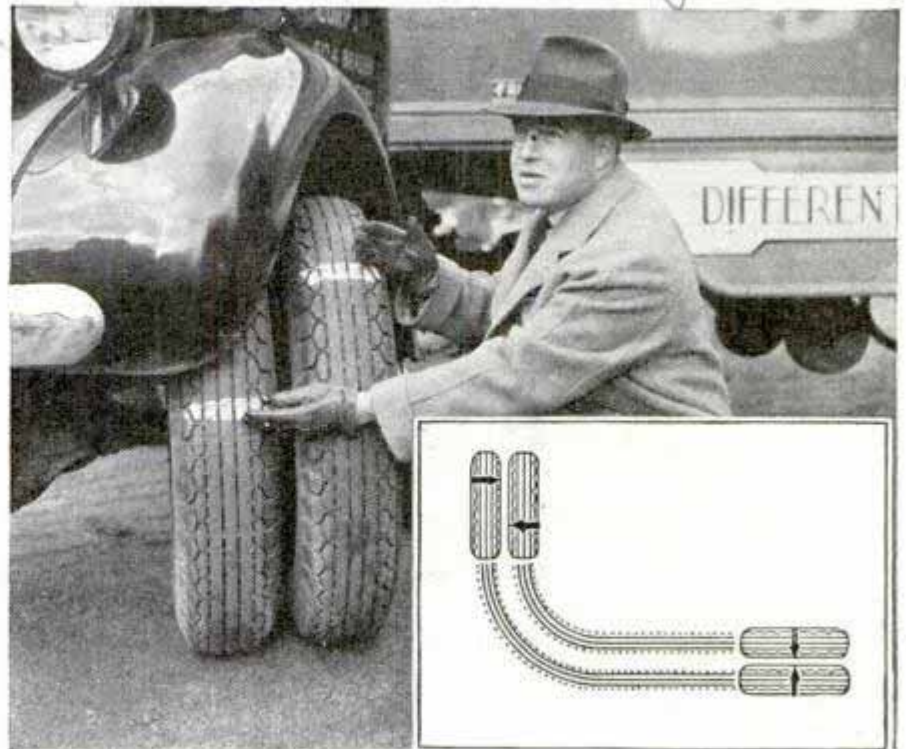
*The Anderson Co. Seattle, Wash.*

*Quis Chapter*

K113 Differentiated wheel cars  
22 E. 40th Street

# Eight-Wheel Car Is Goal of Experimenters

Results obtained in service operations of trucks and in laboratory tests with passenger vehicles indicate that the day may come when automobiles will be equipped with eight wheels, four at the front and four at the rear. Dual wheels have been used on trucks with some success but the real answer seems to be the differential dual wheel, according to a number of automotive engineers. Instead of being bolted together, differential dual wheels are arranged so that each wheel of a pair turns independently of the other; the inner wheel can roll more slowly than the outside wheel, as is necessary for efficient and safe operation on curves and turns. When a stop becomes necessary an automatic clutch is brought into action by application of the brakes, causing both tires to exert full braking effect. The dual wheels, under this arrangement, are mounted independently on the same axle but linked by the clutch; thus slipping and sliding, drag and abnormal tire wear are sharply reduced, if not entirely eliminated. A fuel saving results, according to truck operators who have used the differential duals. Better traction, because the tires are kept rolling, and better braking, because rolling tires give a better grip on the road than do sliding tires, are claimed. For the automobile, differential dual wheels would offer a number of advantages: increased safety from blow-outs because the other tires would carry the load until the vehicle could be stopped;



Illustrating how one wheel of dual set travels greater distance than the other in taking curve, as in drawing (inset)

better braking power because both braking surfaces and road-gripping area would be increased greatly by having eight wheels instead of four; reduction in tendency to skid because the extra four wheels would increase the road traction; easier steering; more opportunity to improve front-wheel suspension—all at very little, if any, increase in costs. While the user would buy eight tires, instead of four, the tires would be smaller and less expensive because the differential dual system permits reduction in tire sizes. Too, doubling the area of rubber in contact with the road would reduce the load on each tire to half that of a four-wheel vehicle, thus saving wear on tires. So far the differential duals have been employed commercially only on trucks, but results have been so spectacular that engineers are working out a system for the automobile.

K61

## Gas-Burner Radiant Uses Less Fuel and Shortens the Cooking Time



Faster cooking and a saving of fuel are accomplished by a gas-burner radiant just offered. Intended for home hot-water heaters, restaurant coffee urns, steam tables, dishwashing machines and similar applications, it has a four-inch burner with two rows of flames directed against an inner and an outer radiant ring. These rings form a radiant combustion chamber which makes for complete combustion. It is said to develop 300 to 500 degrees Fahrenheit more than a burner without radiant rings.

General Combustion  
549 W. Randolph Chicago

45-9...  
Los Angeles, Calif

# The DOODLEBUG Comes

THAT lowliest of gadgets, the "doodlebug," has grown up. Suddenly it has become a thing of incalculable economic importance, not to mention a weapon of modern warfare—and with the rise of the doodlebug there has come into being a new profession, that of the "radio detective."

What is a doodlebug? Originally it was a gadget composed of radio tubes, loop aerials, earphones, and microphones, with which people claimed to be able to locate

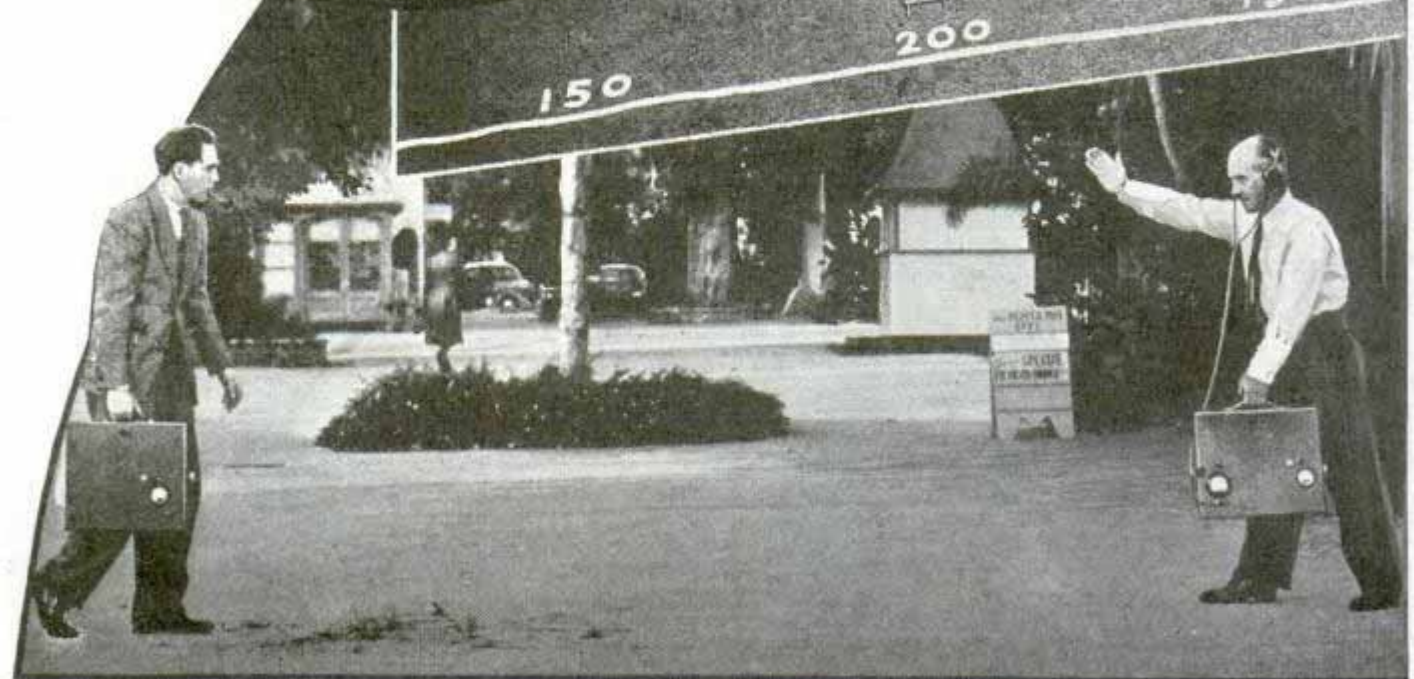
buried treasure. It was a sort of allegedly scientific miracle worker, its practical value somewhere near zero.

But it is a different story today. For the doodlebug has matured into a full-fledged scientific instrument which has already saved lives, discovered fortunes, solved mysteries, caught criminals, saved thousands of dollars.

Let's see some of the strange jobs the radio detective and his doodlebug are called



Left, inside of doodlebug. Right, number indicating maximum sound in microphone tells where to dig for leak. As man at left, below, nears buried pipe, earphones and dial at right detect it



# of AGE

on to perform. His phone jangles; an oil company executive is calling:

"We've got a leaking gasoline pipe line. Casing-head gas is escaping somewhere. We've got to spot the leak before the gasoline catches fire and blows things sky high."

Quickly the radio detective, in this case Roger J. Adams of Los Angeles, Calif., was at the site with a "leak detector," an offshoot of the doodlebug. It consists of a super-sensitive crystal pickup microphone at-



Top, invention evolved from the doodlebug keeps sewer explorer in touch with men above ground. Bottom, left, checking for buried metal beneath shell of Hollywood Bowl. Right, watching dial for indication that buried metal is near by

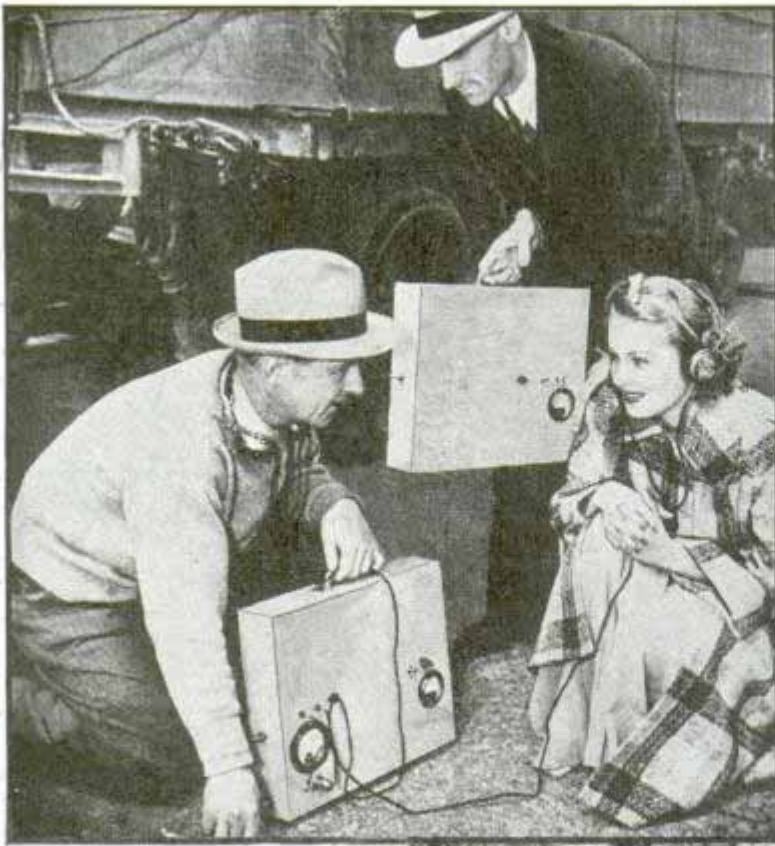
1500 Crystal Street, Los Angeles, Calif. 15/1/40

New address } Roger J. Adams  
 } 2511 Mission St.

Roger J. Adams

3201

Richard  
Trache



tached by a long cable to an amplifying outfit. The detector is so sensitive that it makes the ticking of a watch thirty feet away sound like a riveter's gun. Sounds traveling through the earth are magnified 10,000 times.

Adams placed the leak detector on the ground over the suspected pipe line, clamped on earphones. He heard nothing but a passing automobile four blocks away. He moved the detector again and again. At last he heard a faint rushing sound.



Farther on, the sound was louder; a few feet on it reached a maximum.

"Dig here," Adams ordered.

Concrete breakers thundered. Shovels swung. Suddenly somebody yelled:

"Look out! She's spouting!"

From the hole a stream of gasoline was shooting high into the air.

The leak was quickly repaired. Had it not been for the doodlebug, miles of pavement might have been torn up—and all that time the dread threat of explosion would have remained.

Another job for the doodlebug

Detector at top saved ditch digger from striking high-voltage conduits under street. Center, plotting size and direction of ore vein. Below, hunting machinery buried in California flood

2/327  
 followed the southern California flood of March, 1938. Hundreds of thousands of dollars worth of automobiles and machinery were buried by flood-borne silt and debris. Most of the valuable metal objects were recovered with the aid of the doodlebug. For this work a doodlebug is used which works on the principle of electromagnetic fields. Poor electrical conductors, such as non-metallic rocks, have practically no electromagnetic fields. But all metals are surrounded by such fields. Two special radio sets whose fields of sensitivity can be adjusted in relation to each other are used. When such fields cross the electromagnetic field of a metallic object they are distorted and the distortion is recorded both on a dial and through earphones. This apparatus, in criminal investigations, has located the bodies of murder victims by metal objects in their pockets, discovered poachers' lobster pots, and found illegal pipe-line connections.

Recently a number of doodlebugs have been ordered by European countries, supposedly to hunt buried heavy-caliber shells and locate ore veins. Such instruments could play a vital role in warfare by locating enemy land mines. One European country is thought to be using doodlebugs to chart all mineral resources near the surface, and to be conducting a nationwide search for buried treasure. Several hundred thousand dollars worth of buried treasure has been recovered by doodlebug operators in the United States.

Newest of the doodlebug family is the instrument used for ascertaining the location of pipe lines. Recently it was necessary to dig a trench along a street in a Hollywood movie studio. The street was crossed by a number of high-tension power lines. Should the ditchdigger strike one of these lines, the operator would be electrocuted instantly. The ditch had to be dug at once. There was not time to search out each conduit. The pipe-line finder was called in, and all the conduits were located within two hours. The ditch was then dug with perfect safety.

The doodlebug is found useful also in locating leaks in city water mains. Many water and gas companies have a radio detective as a regular part of the staff. It was in connection with a leaking water main that another movie studio called for the doodlebug. The call came in:

(Continued to page 137A)

X 20  
**Four-Millionth-Inch Metal Coat  
 Doubles Speed of Lens**



*White Water*  
 Metal fluorides evaporated in jar coat lens surface

By coating lenses with a film of metallic fluorides only four-millionths of an inch thick, Dr. C. Hawley Cartwright of Massachusetts Institute of Technology has found it possible to double the speed of the lens. The process, done in a glass jar under high vacuum, consists of evaporating the metallic fluorides, which condense on the lens.

X 125  
**Automatic Projector Rotates  
 to Show Sixteen Slides**

*Select Slide Co.*  
 Built especially for window display and advertising purposes, an inexpensive photo projector carries sixteen glass slides on a rotating drum. Slides are changed automatically, or a manual turn of the drum will bring any picture into projection.



Small projector rotates to show sixteen photo slides

*Spiderly + Sauske*

*Cambridge Mass  
 St. James  
 86 Church*

## Police Wear Electric Signs to Be Seen Easily in Dark

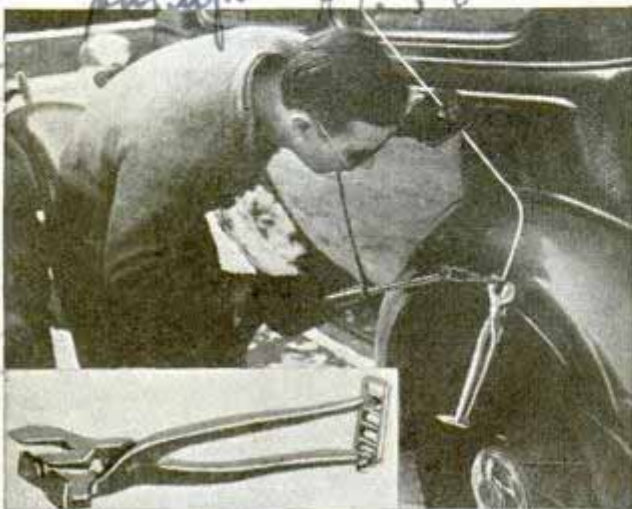


Illuminated sign on helmet makes policeman visible in blackout. He carries traffic lights in his hands

Long white coats help make traffic policemen in England easily visible in the blackout, and mounted on their helmets are illuminated signs bearing the word "police," which can be flashed on and off by a switch carried in the pocket. The officer also grasps red and green "stop-and-go" lamps in his hands.

## Clamp Holds Pliers on Fender as Welder Seals Cracks

Doing the work of a welder's assistant, pliers, held on the work by a clamp that



Pliers and clamp hold fender in place for welding

slips over the ends of the handles, enable one man to do a job that would require two persons using ordinary tools. In welding a cracked automobile fender, small tank or piece of sheet metal, the material is gripped firmly by the pliers and the clamp applied to hold them fast. This keeps the crack in alignment and leaves both hands of the welder free.

## Light Plant for Farm or Camp Has Automatic Starter

Starting automatically whenever a light switch in the house is turned on, a compact lighting plant for the isolated farm or camp provides a convenient power source. It is unnecessary to throw any master switch. When a room lamp is turned on, it operates a relay for the gasoline engine starter



Turning on any lamp in house operates relay for gasoline engine starter and sets generator in motion

which is turned by a six-volt automobile battery, setting the generator in operation. The plant shuts down immediately when the last light is turned off. Available for alternating-current circuits of one kilowatt or more, it operates at a cost of three and one-half cents a kilowatt-hour.

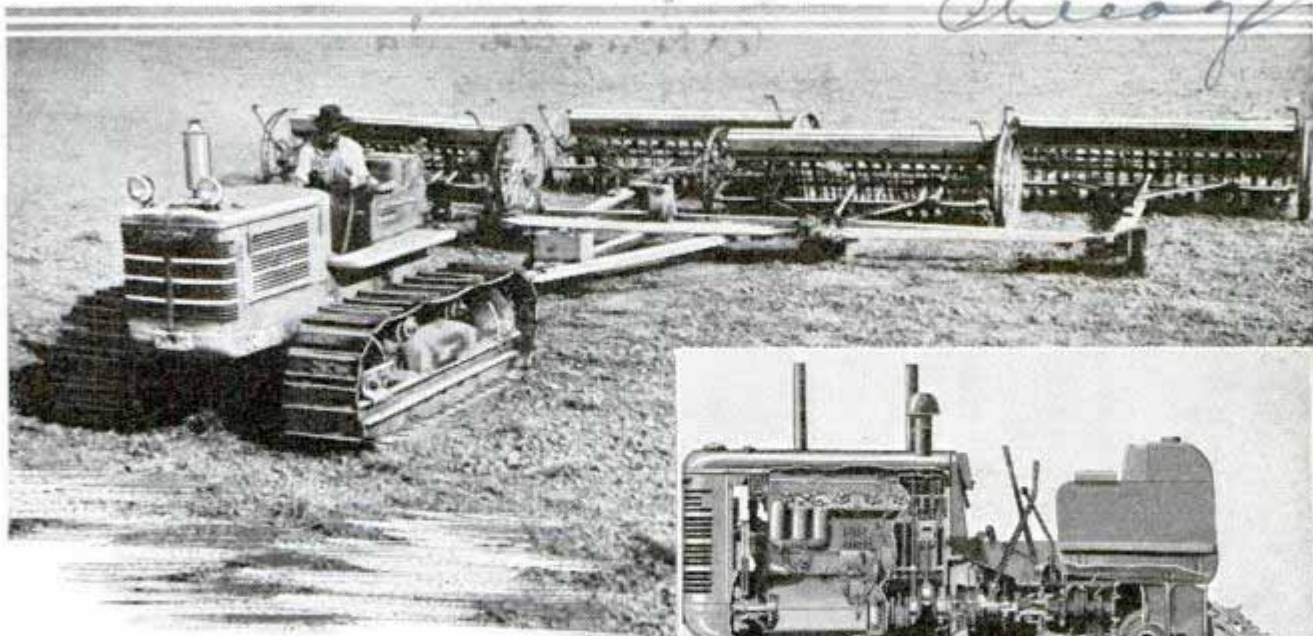
Of the two billion barrels of oil produced annually around the world, the United States produces 1,250,000,000 barrels, or sixty-two per cent, in its six and one-half per cent share of the earth's surface.

Wilkes-Dave Welding Co. Wilkes-Barre, Pa. K 118 K 60 K 102

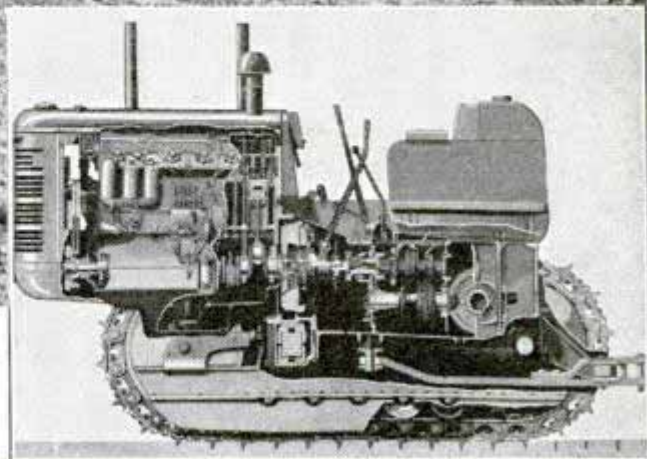
Electric Co. 1417 S. Los Angeles, Los Angeles, Calif. Kaelin



*K-120*  
*International Harvester*  
*Chicago*  
**Gas-Diesel Tractor Plants a Forty-Foot Strip**



*Above, Diesel tractor which starts on gasoline pulls drills planting strip forty feet wide in one trip across field. Right, sectional drawing of six-cylinder tractor*



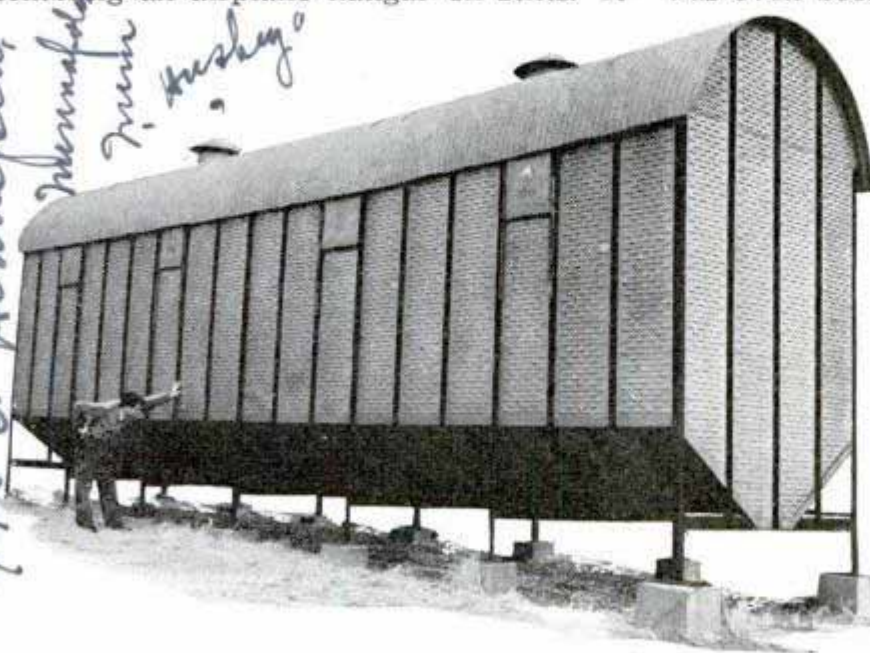
Diesel engines delivering thirty to seventy horsepower at the drawbar power a line of farm tractors just introduced, but each model starts on gasoline and then shifts to full Diesel operation after a minute. Suited to farms of various sizes, these tractors have five or six forward speeds

and one or two reverse. The 53.5 drawbar-horsepower model can pull four drills planting a forty-foot strip, drag three double-disk harrows tilling seven acres an hour, and can haul a twenty-foot combine over rough land, besides attending to various other heavy farm jobs.

*K-126*  
**Corncrib "Hangar" of Slotted Steel Holds 1,000 Bushels**

On the state experimental farm at Ames, Ia., there is a steel corncrib somewhat resembling an airplane hangar on stilts. It

was scientifically designed to store the crop safe from humidity and from rats, and it has even been arranged for fumigation to rid the corn of insects. Holding 1,000 bushels, the crib cost about \$215; agricultural authorities suggest that small farmers could build a similar 500-bushel crib for about \$100. There is a door at one end, and removable hopper-bottom slats. The sides are of perforated steel slats, and there are ventilators also in the bottom and in the roof to combat moisture. The crib is built eighteen inches above ground to assure air circulation and to keep out rats.

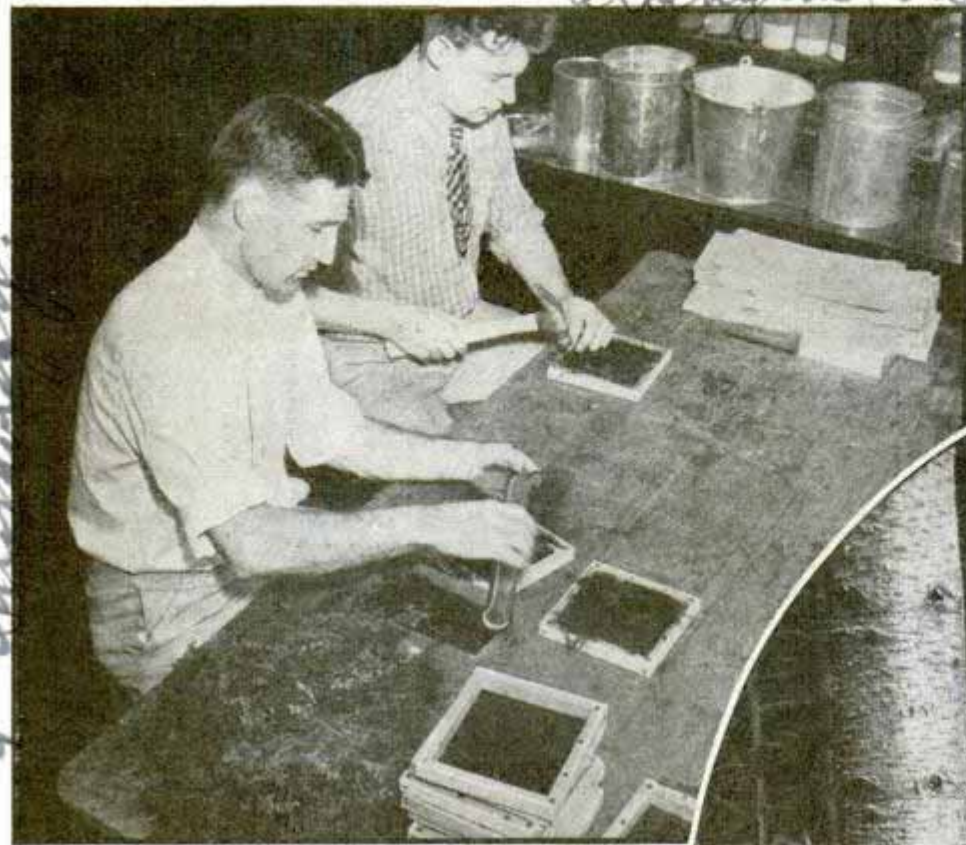


*Steel cornerib holding 1,000 bushels is perforated for ventilation*

*Amstar-Corn & Co.*  
*940 E. Hennepin*  
*Minneapolis*  
*Chicago*

*Dept of Agriculture*  
*Washington DC*  
 727

# DAVID and GOLIATH



Cocoons in which parasites are about to hatch are placed in wooden boxes with screen tops, packed in moist moss (left) and taken to fly-infested spruce forests (below) where parasites emerge, find cocoons around base of trees, lay eggs in them and so wage man's fight against the sawfly



**F**ACE to face with destruction of spruce forests worth \$500,000,000 to its pulp, paper and cellulose industries, the state of Maine has begun to fight bug with bug. Against the European spruce sawfly it has pitted a parasite wasp imported from Europe to attack a victim twenty times its size.

Unusually hardy, the sawfly exists as far north as the Arctic circle. First found in Canada in 1930, the pest has devastated thousands of square miles of Canadian spruce forests and is menacing Maine, which embraces half the spruce in the United States.

After many experiments, the Maine Department of Forestry decided to combat the fly with the microscopic parasite, *Microplectron Fuscipennis*. This insect David attacks its Goliath in the cocoon, depositing twenty to thirty eggs in each fly larva. Hatching, the parasite larvae feed on the sawfly larvae; in Canada, where the parasites are well established, they sometimes destroy an average of fifty per cent of the cocoons, representing millions of sawflies per acre.

The spruce fly literally saws a slit in the spills of the spruce leaves. Eggs laid in this slit hatch as larvae which feed on the

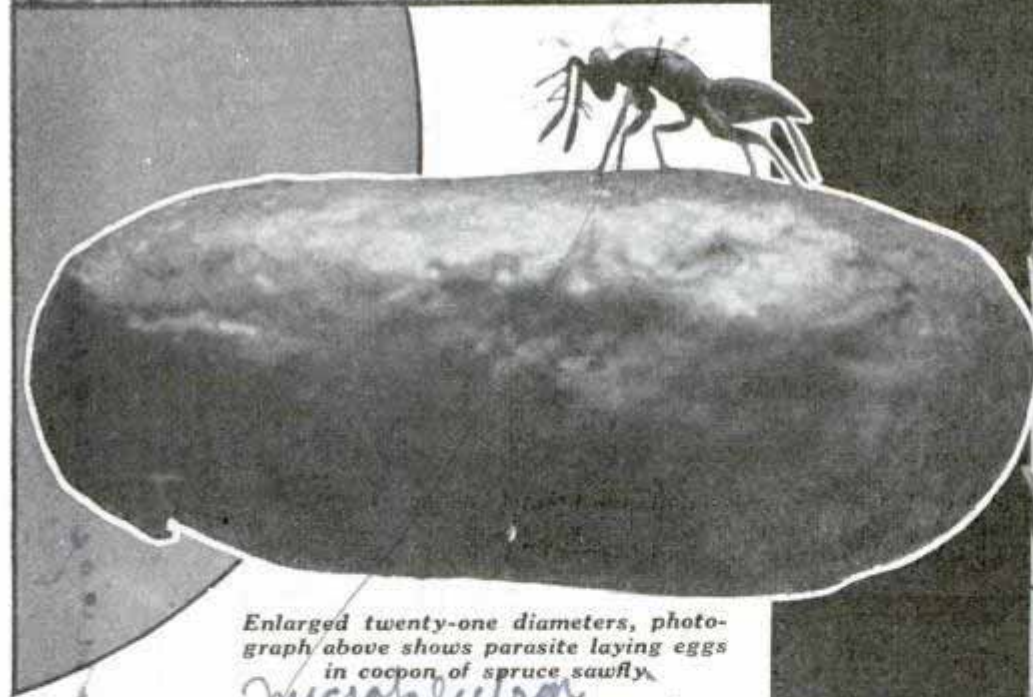
foliage, causing eventual death of the tree. The larvae then wrap themselves in cocoons in the "duff" at the base of the tree, and in this stage are susceptible to attack by the parasites.

To fight the sawfly, 30,000,000 parasites were bred and released in Maine. CCC boys dug around the trees to gather cocoons. At the University of Maine these cocoons were poured into a chute, live co-

U. of Maine. Coops. with Dept. of Agriculture Bureau

802 S. Esplanade Road  
Arlington Va

# of the INSECT WORLD

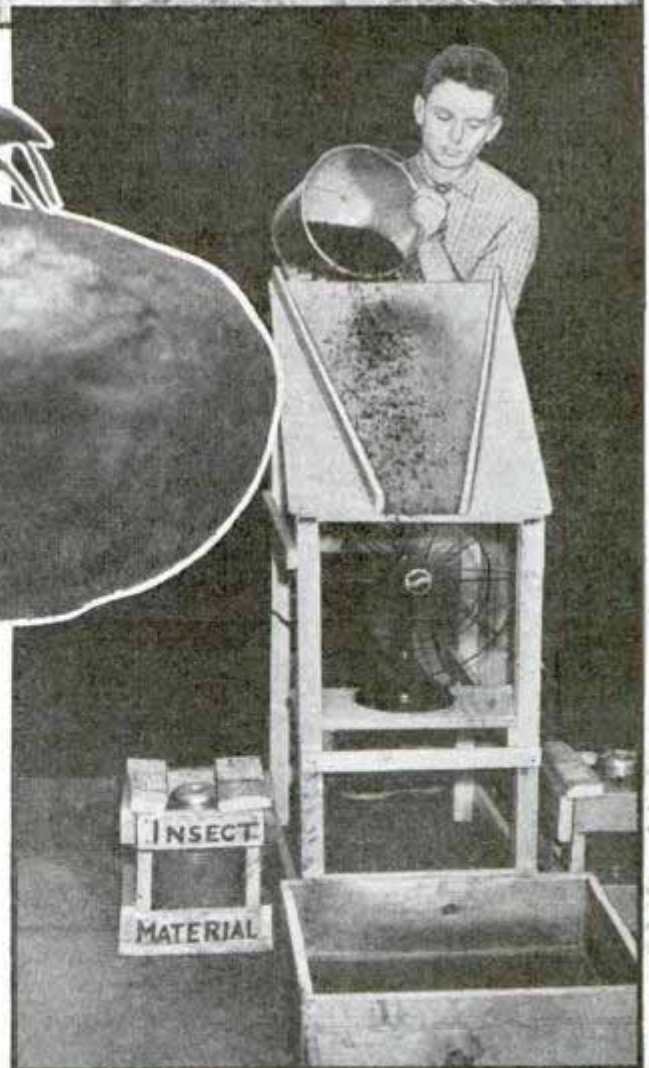


Enlarged twenty-one diameters, photograph above shows parasite laying eggs in cocoon of spruce sawfly.

*Microgaster  
truscipennis*

Cocoons falling into a box while dead ones, being lighter, were blown clear by a fan. Students placed the live cocoons in glass vials, introduced parasites, closed the vials with cotton stoppers.

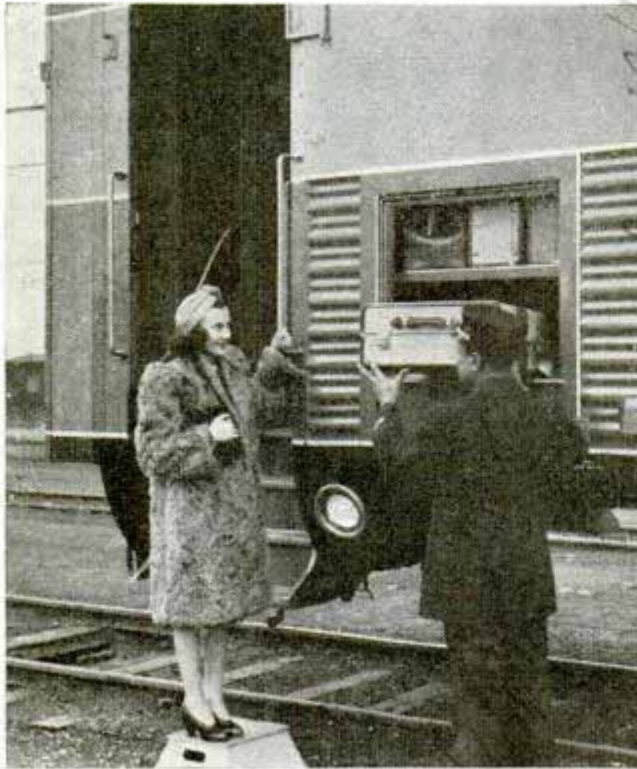
Cocoons about to produce parasites are put in boxes with a screen top. Packed in moss to keep them moist, the boxes are placed in fly-infested spruce woods. The parasites emerge, find cocoons, lay their eggs in them, kill the fly larvae and hatch successively larger generations of parasites.



Top, CCC boys collect cocoons around bases of spruce trees. At right, below, sorting cocoons: live ones drop into box, lighter dead ones are blown away

The Pullman Co. 79 E. Adams, Chicago

## Elevators Handle Luggage on New Streamline Train



Porter removes bags from outer door of luggage elevator as passenger alights from train

Luggage elevators to handle the baggage of passengers boarding or leaving the car are innovations on the Pullman cars just put in service on the Southern Pacific's "Daylight" streamliners between Los Angeles and San Francisco. When the train reaches a station the porter places the bags on the elevator from the car aisle, presses a button and the baggage is lowered, to be removed from a door on the outside of the car. Then bags being placed aboard are raised by pressing a reverse button. This procedure eliminates delays to passengers.

## Sharp Point Given to Pencil Lead by Abrasive Grinder



Sharp points can be put on pencils quickly with an abrasive sharpener that will grind the lead of a mechanical pencil, or of a wood one, although it is not designed to cut away the wood portion. Along the top of the pointer there is a slot faced on both sides by an abrasive cloth. By twirling the

pencil slightly as it is drawn over the groove, a fine point is obtained. You can give the pencil a chisel edge by gently forcing it between the abrasive surfaces.

## Stencils Print Fine Wood Finish on Low-Cost Furniture

Photography is now used to make stencils for printing the finest wood finishes on low-cost furniture, and the result is so realistic that the layman cannot tell the difference. In the process, a photographic negative showing the intricate grain pattern of some rare wood is laid on a special sheet of sensitized gelatin with a fine celluloid backing, and then exposed to light. Hot water develops the print by dissolving the gelatin in proportion to the depth of high lights and shadows. While the gelatin is still soft, a strip of fine silk is pressed into it until firmly embedded. When this dries, the celluloid falls away from the design, leaving a stencil on the silk. Using a special press, paint is pressed through the stencil onto the low-cost board.

## Crossbow Used for Hunting Deer Has Auto Spring for Bow



Shoemakers' twine, a billiard ball and an automobile spring went into this homemade crossbow

Using a twenty-inch automobile spring for a bow, a Harvard student has fashioned a powerful crossbow for hunting deer. The stock, copied after that of a shotgun, is of black walnut, and the cocking device was made from a billiard ball. Forty strands of shoemakers' twine form the bowstring.

Ralph W. Pope, Canton, Mass.

Sharpener

George J. Smith, Jr.

Cambridge, Mass.

Chicago  
K 98  
K 26  
K 56  
Require of state machine

*R 10 3 cmv, from 002ack, 11/10/41  
Thayer av.  
Los Angeles, Calif*

# Weighing Snowdrifts to Gauge Summer Crops



*Winter snows in the sierras (above) are a key to summer crops in California valleys; from the moisture packed in cold storage in the mountains engineers can compute the expected runoff for lowland rivers in rainless summer months. Upper left, two members of "Snow Patrol" assemble equipment for measuring mountain snow*



*Above, the jointed aluminum tube is thrust deep into the snow to take a sample. In sub-zero cold and blinding blizzard 150 hardy woodsmen of "Snow Patrol" range over hills and 14,000-foot peaks*



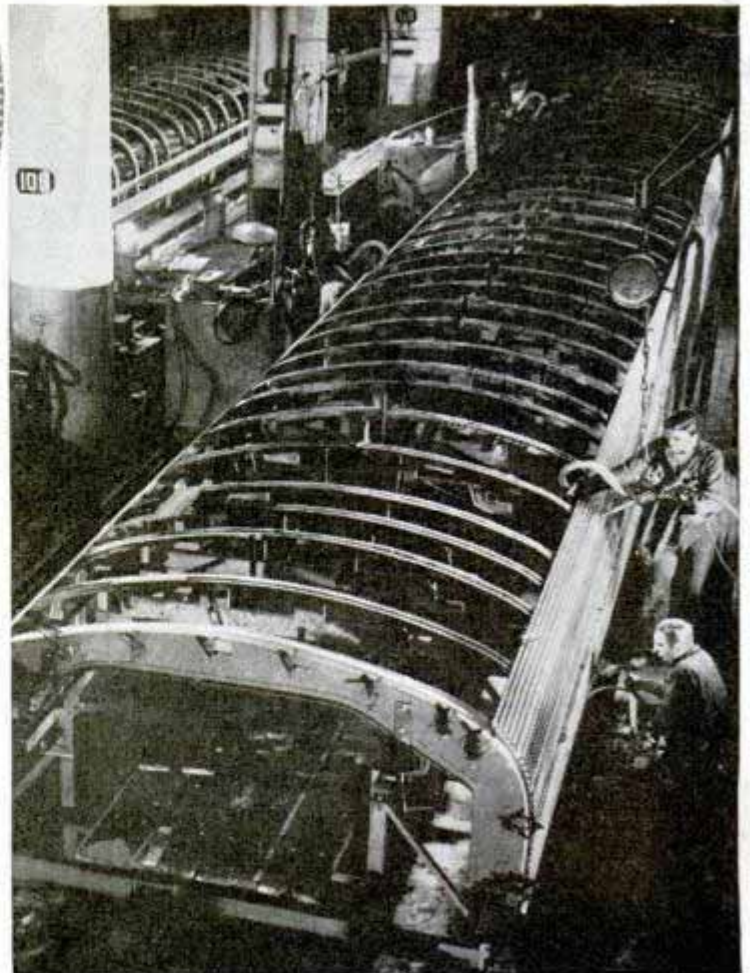
*At left and above, the tube filled with snow is weighed on a specially calibrated scale with a simple bent-rod hanger. The reading is immediately recorded, and from hundreds of records taken over the mountains an accurate estimate is made of the flow that will be available for irrigation next summer. The apparatus is easy to carry and simple to operate*



# Tailor-Made



Top, measuring sleeve-bearing linings for electric motors; alloys strengthen parts like these. Left, turbine blades of stainless steel. Below, building stainless-steel streamline train



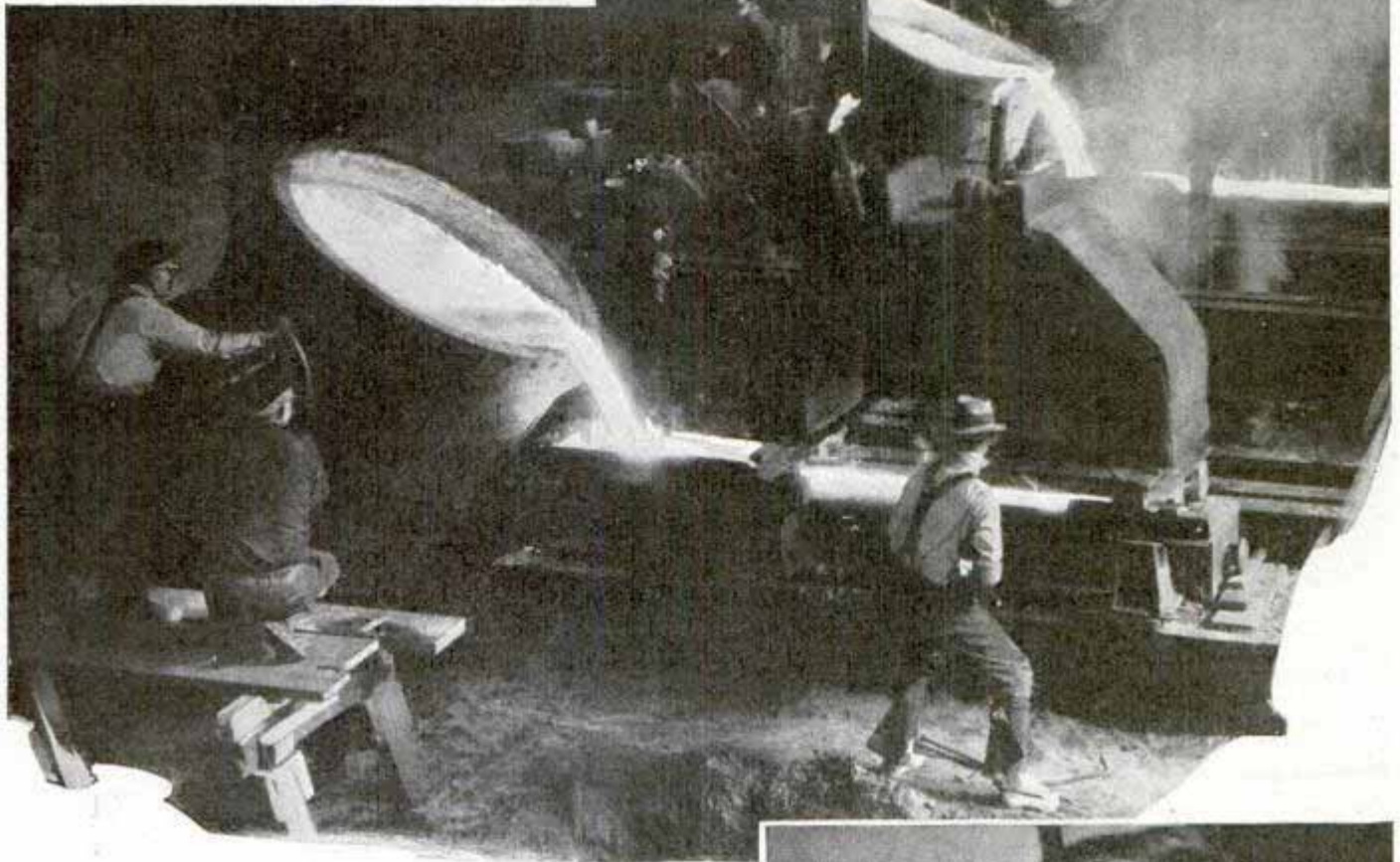
By W. E. Ruder

General Electric Research Laboratory

*Schenectady, NY*  
**I**T IS no longer possible to build an efficient machine from just iron, steel, copper, or brass, or any of the common alloys. For almost every part there is now a tailor-made alloy which will do the work of that particular part much better than any of these materials.

Man has progressed successively through the stone age, the bronze age and

# Metals



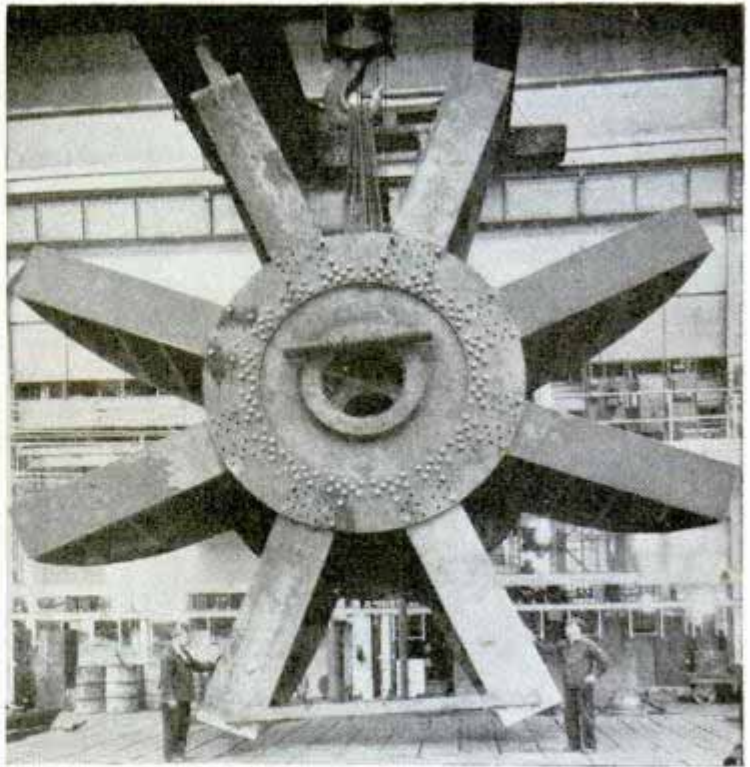
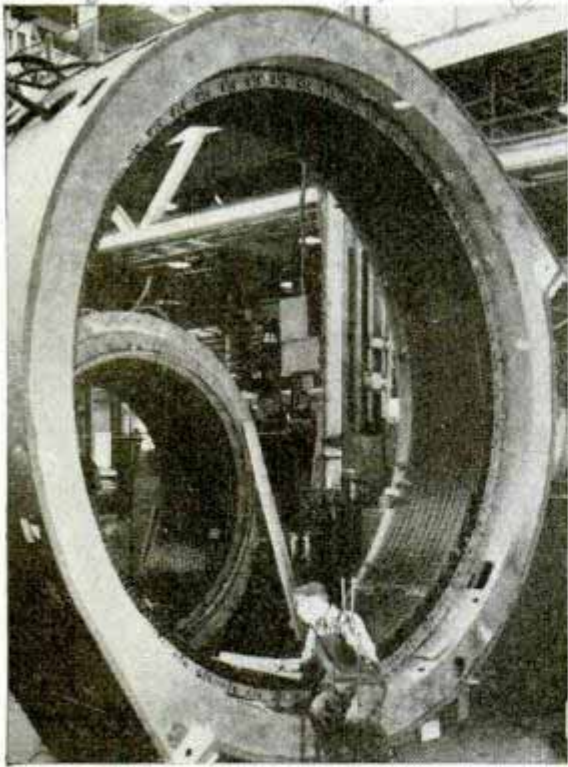
the iron age, and now he is well started on the "alloy age." Up to thirty years ago universities looked upon metallurgy mostly as the art of winning metals from their ores, so they put the emphasis on mining and ore reduction. Since then, the emphasis has been increasingly on the use and properties of metals. This change of attitude is associated with the birth of the science of physical metallurgy which started when the microscope began to reveal that metals had a variety of structures, that they were really crystalline, and that the small quantities of, frequently incidental, foreign materials played a major role in the physical characteristics. Then came the X-ray, which made it possible to determine the type of crystallization characteristic of each metal and gave some clue as to how metals reacted under stress.

Pure iron exists in two crystal forms; one stable at temperatures up to full red heat, the other stable at higher temperatures. These forms have entirely different properties. The change from one to the other which occurs sharply at definite temperatures, depending upon the composition, constitutes the underlying reason



*Qualities of a metal are determined largely by what is mixed with it in foundry stage of production, top. Below, measuring with a pyrometer the temperature in an electric furnace used for production of sintered alnico*

g 1404 Electric



Alloys are used in nearly all big pieces of machinery. Laminations of huge synchronous electric motor above, left, are made of silicon steel. Right, ninety-two ton bearing bracket of water-wheel generator for Dnieper river hydroelectric plant. Below, hydraulic press for stamping aircraft parts from duralumin

why steel can be hardened, and give such wide variety of properties. With this knowledge, metallurgists began to understand what happened to iron when we added other elements to it.

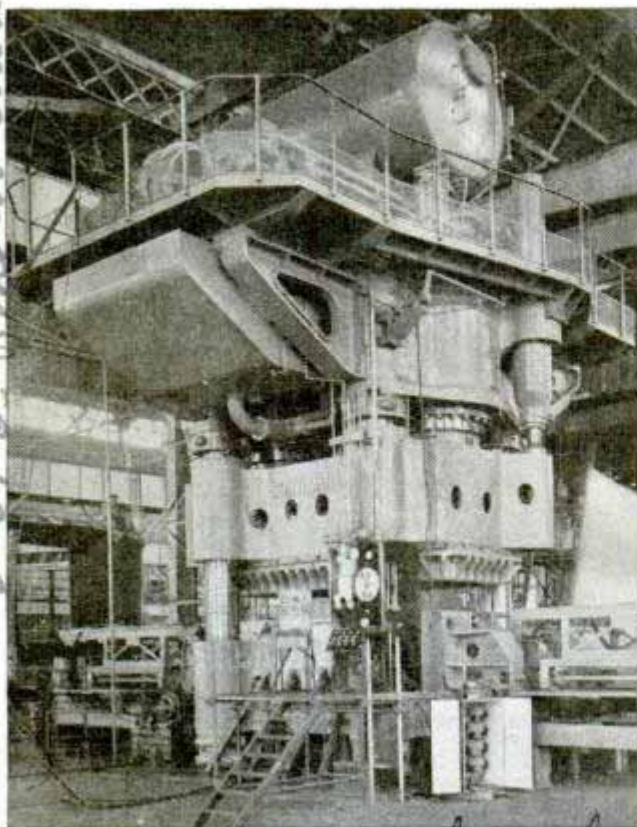
The economic importance of a metal lies in what it will do. Take tungsten, for example. Little more than 200,000 pounds of it is used in a year for all purposes, yet the

drawn tungsten filament of incandescent lamps saves this country close to \$2,000,000,000 a year, the additional cost we would pay for the same amount of illumination from the old carbon filament.

Let us consider four of the more industrially important developments in metallurgical science during the past thirty years: silicon-iron, important to the electrical industry; stainless steel; tool steels, and the age-hardening principle which has already revolutionized the ferrous and non-ferrous alloy fields.

In no field is the relationship between metallurgy and electricity closer than in that of magnetism. Research in metallurgical composition, grain-size control, and crystal orientation has reduced losses in the magnetic circuit to less than half what they were thirty years ago, and the possibilities are not exhausted. The average-sized distribution transformer contains 125 pounds of steel and dissipates about 600 kilowatt-hours of energy per year with modern steels. With the steel originally used, this would have been three times that amount, and when we consider the thousands of distribution transformers in use, the savings stagger the imagination. One of the great Boulder dam transformers contains fifty tons of steel, and the yearly savings due to silicon-iron in one of these machines is over a million kilowatt-hours.

throughout hydraulic press





21404 K13 General Schenck

Some ninety varieties of stainless steel are being made, each for some definite type of application. They are, in general, divided into two classes—straight chrome-iron alloys and the so-called 18-8 type. To the first belong the cutlery steels. Modifications of this alloy find application as motor-valve steels, high-temperature resistant steels, and turbine blades. The alloy most commonly referred to as "stainless" is the 18-8 type, containing approximately eighteen per cent nickel and eight per cent chromium. From this alloy kitchenware, tableware, and architectural and automobile trim are made. Because abnormal strengths can be developed in this alloy and it resists corrosive attack, it is finding increasing use in lightweight high-speed trains and in airplane construction.

It has been estimated that introduction of high-speed tool steel into industry reduced six days of work to five. The newest thing in tool steel is the use of cemented carbides, of which Carboloy is an example.

The age-hardening principle is considered one of the most important because of its wide-spread application. In duralumin it made possible production of an alloy, essentially aluminum, with the strength of mild steel. Copper can be hardened by this principle so that it, too, has the strength ordinarily associated with steel while retaining electrical conductivity and other desirable properties. One interesting application of this principle has been the production of magnet steels.

Alnico, for example, is not a steel but an alloy generally consisting of nickel, aluminum, iron and cobalt. Properly heat treated, it has many times the magnetic strength of quenched carbon steel. Its high strength has made it possible to consider permanent magnets in the construction of very efficient small generators and motors, in control apparatus, and most of all in radio loud speakers. While the ordinary horseshoe alnico magnet will lift sixty to eighty times its weight, specially designed magnets can lift 4,000 times their weight.

There is a constant competitive battle between materials—not only between different metals, but between metals and the rapidly developing plastics. Where appearance, weather resistance, and cost are of primary consideration, plastics will replace many cheaper sheet metals, but where, in addition, strength and tempera-

(Continued to page 139A)

MAY, 1940

see Feb 1940 sheet

## Tube Shows Killing Power of Ultraviolet Lamp



Holding tube that measures output of germicidal lamp

The ability of an ultraviolet lamp to kill germs is indicated by a phototube made of a special ultraviolet transmitting glass, replacing a more expensive tube in a quartz bulb. Among its applications are the measurement of ultraviolet output of low-pressure mercury germicidal lamps and mercury vapor detection. It responds very slightly to visible radiation, but has a maximum response in the invisible spectrum.

## Tiny Adding Machine Is Accurate and Handy for Small Business

Intended primarily as an educational toy for young folks, a miniature adding machine is accurate and rapid enough to be useful in small business houses where it will handle footings up to 9,999. Sliding ratchets do the adding.



Toy adding machine is accurate and useful for office

Walverne Supply 735

Vertical handwritten notes on the right margin, including "K 69" and "Western Supply Co."

## Cashier's Chair Holds 'Safe' to Guard Surplus Cash



Cashier slipping money through slot in "safe" that protects surplus currency against possible robbery

Hidden beneath the cushion of a cashier's chair a locking strong box guards surplus cash against robbery. There is a slot for slipping in bills and a hole for coins, two keys being required to unlock it. If the cashier suspects a holdup, she can stuff money away quickly, and even if the bandit discovers it, lack of tools and time to open the "safe" would keep him from reaching the money. Attachments for anchoring the chair to the floor are available.

## Stove Holds Day's Supply of Wood and Heats Two or Three Rooms



Needing to be filled only once or twice a day, similar to a base burner, a wood-burning stove, developed by the Connecticut forest and park association, in cooperation with Prof. Lauren E. Seeley, Yale heating expert, is capable of heating

two or three rooms. Two and one-quarter cubic feet of wood, or more than fifty pounds, can be placed in the heater, and as it burns at the bottom of the stove a fresh supply drops automatically from the reservoir. In the burning process there is a partial distillation of the wood into gas and charcoal, each product being burned in a different space. Besides the air that is directed into the combustion chamber, a separate air supply is allowed to mix with the highly heated gases, which then are conducted through small passageways, called combustion ports, where they are burned separately from the wood. For fuel, small trimmings are recommended in preference to larger chunks commonly used in wood stoves, thus creating a market for cordwood waste and encouraging woodlot owners to remove inferior growth from their forests. Sawmill waste as well as chipped or "hogged" wood resulting from logging operations can be burned also.

## Hub and Grease Cap Remover Applies Powerful Leverage

Hub and grease caps of automobiles are removed easily with a handy tool, now available, which is designed to take the



Tool applies leverage for easy removal of grease cap, and hub cap is lifted by inserting other end under rim

place of makeshift devices. One end of the instrument fits between the hub cap and wheel, and the other takes a firm grip on the grease cup to provide strong leverage. The tool also may be used as a hammer.

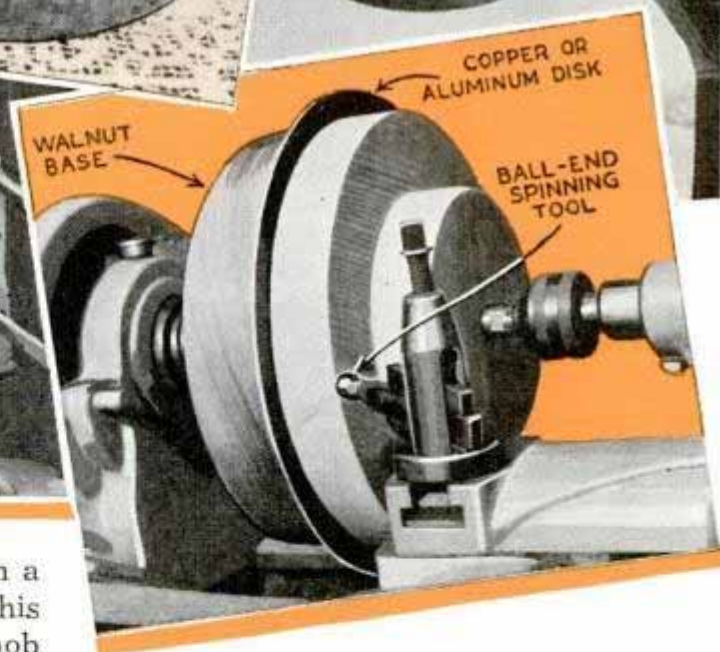
Send stamped, addressed envelope to our Bureau of Information for name of maker of any device described in this magazine.



The

# CRAFTSMAN

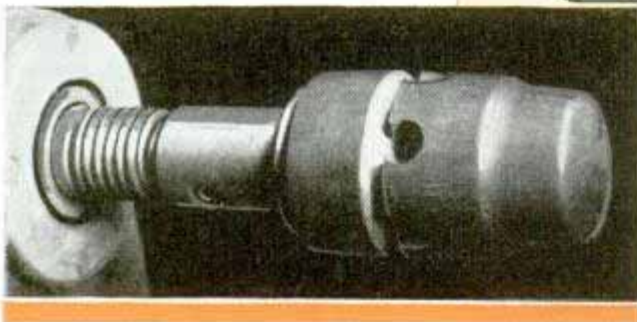
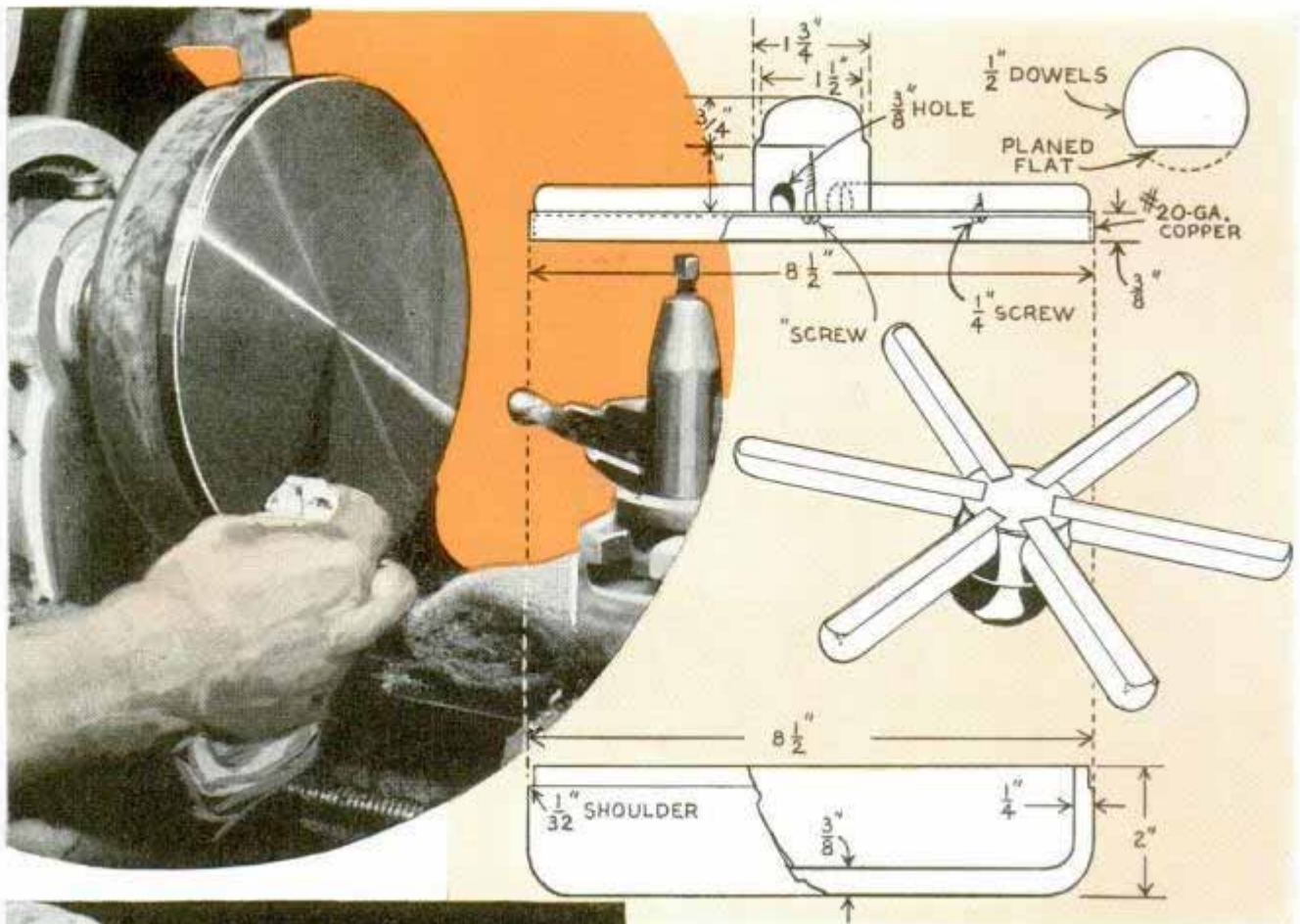
## Turned NUT BOWL has a spun lid



**D**OWELS radiating from the knob on a spun-copper or aluminum lid give this nut bowl a wagon-wheel motif. The knob is turned to simulate a hub and has holes drilled equidistantly around its periphery near the flat end to take dowels, which are flattened slightly to fit snugly on the lid. Both dowels and knob are attached by means of screws driven up through the underside of the lid, holes being drilled in the latter to take the body of the screw, and pilot holes being drilled in the hub and dowels so that these pieces will not

split when the screws are driven up snugly.

You can spin the lid from a 10-in. disk of No. 20-ga. copper or aluminum, which is mounted between the walnut base and a white-pine backup block of the same diameter. The base is mounted on a small faceplate with a center screw. A second backup block of smaller size is set against the larger one with the grain of both running at right angles. These are screwed



together and turned previous to being assembled with the disk and walnut base, so they are already centered for the dead-center contact. If possible, use a ball-bearing dead center. Otherwise lubricate well and turn up tightly so that the copper will be kept in place. To spin the cover, a 1/2-in. ball bearing welded to the end of a mild-steel bar was used. This was set in the tool post and the projecting edge of the copper was greased with hard oil. When turned to a position about halfway between the original and the finished position, the waste was cut off to provide copper for a turnover of 3/8 in. Then the edge is spun down sharply against the walnut. A maple dowel, rounded at the end and well greased, can be used if no spinning tools are available. Slow speed and plenty of grease are important. After spinning the cover, the base is placed on the faceplate and the inside turned and sanded, leaving

a raised portion in the center, to prevent showing the screw hole occasioned by mounting the base on the faceplate.

The outer surface of the bowl at the upper edge should be turned down to provide a shoulder for the cover to rest against. Turn the wood to a depth equal to the thickness of the cover so that the two surfaces will be flush when it is in position.

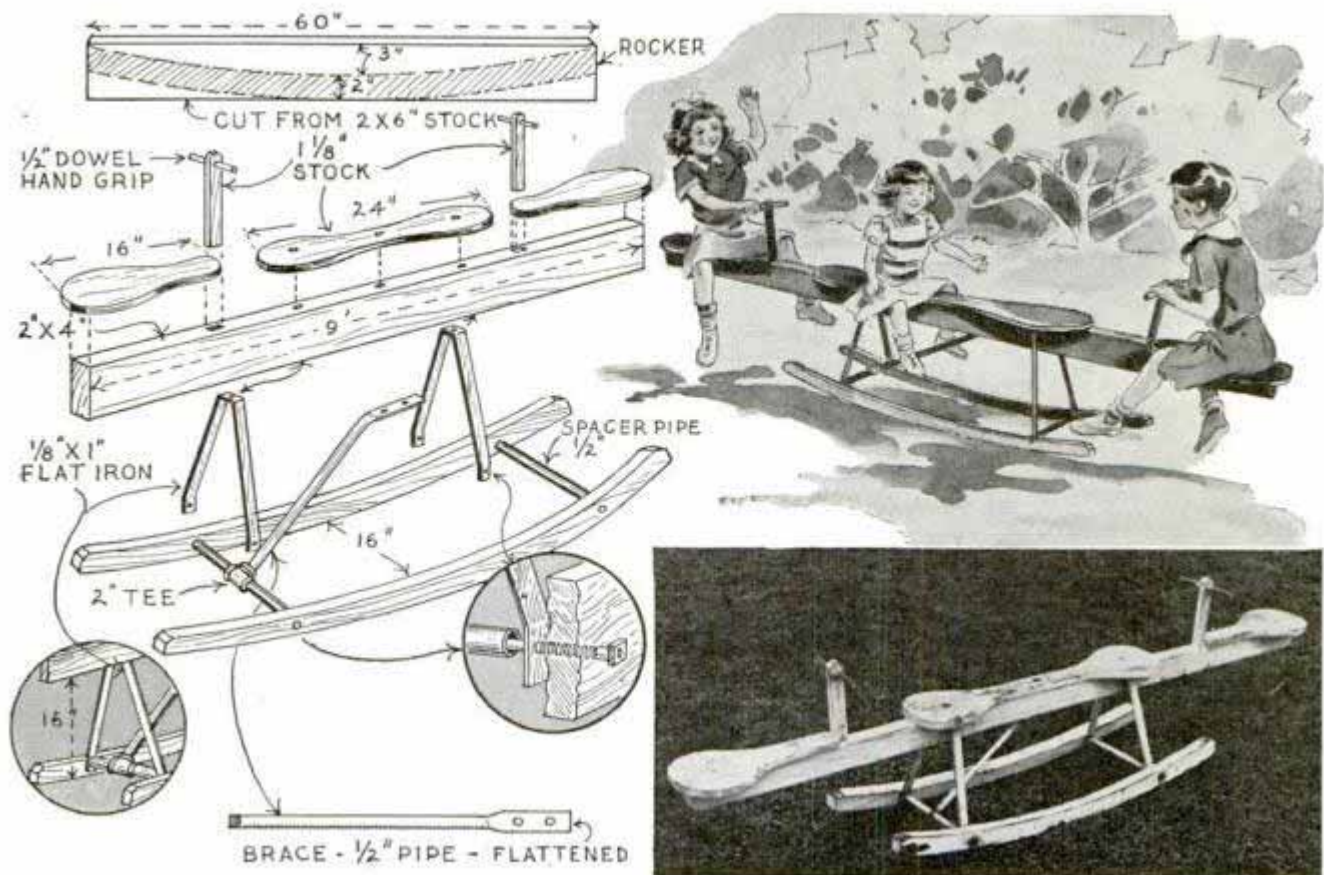
## Sparrows Can't Take Possession of This Birdhouse

If you want to keep sparrows out of a birdhouse until the birds you want to nest in make their appearance, just pivot covers over the openings to the compartments. Wood screws will do for the pivots, and they should be located so the



wind will not blow the covers over the openings. A fishing pole is handy to move the covers while standing on the ground.

# Seesaw Set on Rockers Is Safe for Little Tots



Mounted on rockers, this seesaw accommodates four and is safe for small children because the ends do not rise far above the ground. As the seesaw will be exposed to all kinds of weather, it is best to make it of

hardwood, although white pine can be used. It should have at least two coats of paint, and special care should be given the rockers to see that they are made as nearly waterproof as possible.

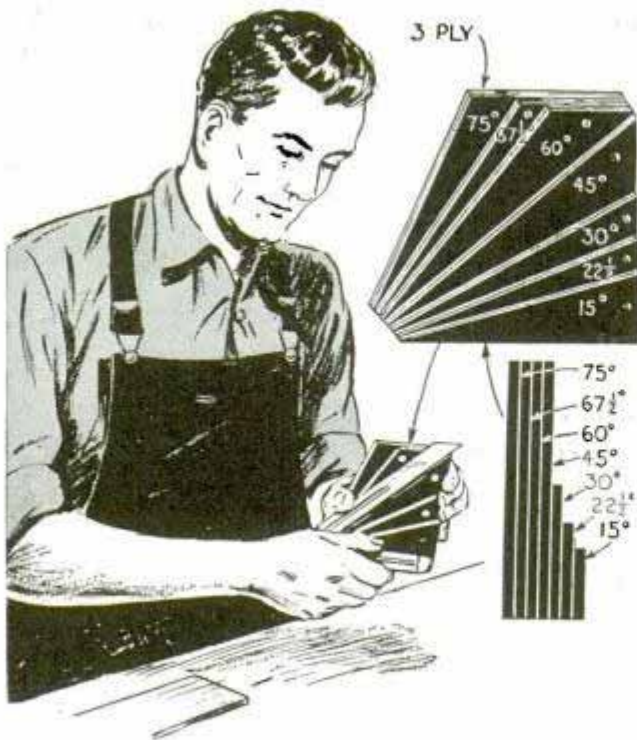
## Give Your Flowers an Early Start in Window-Box Hotbed

A window box will serve as a miniature hotbed for starting flowers early if you cover it with a piece of glass to keep out cold air. Nail wood strips around the upper edges of the box to provide a lip to keep the wind from dislodging the glass. Then fill the box with stones, manure and soil as indicated. The stones provide drainage and the manure generates heat as it deteriorates and warms the soil above it. Ventilation for the box can be provided on warm days by raising the glass slightly with a cork set on a wood strip nailed inside the box. It is a good idea to provide some means of fastening the glass when it is raised so that the wind cannot get under the edge and blow it off.

☛ A tablespoonful of powdered borax added to the final rinse water is a simple, harmless and effective whitener for dainty curtains and linens.



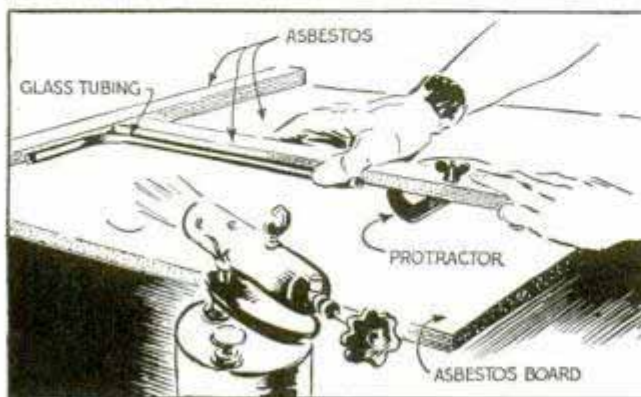
## Gauge to Adjust Sliding T-Bevel at Different Angles



This simple gauge will save a lot of time in setting a sliding T-bevel to the commonly used angles. It is made from blocks of plywood squared on two sides, the third side of each one being sawed accurately at a different angle as indicated. After the blocks have been screwed together accurately, the tool is set by holding the handle against the bottom of the blocks and bringing the blade down on the desired angle.

## Forming "Table" Helps to Shape Glass Tubing

While making a rather complicated set-up of glass tubing for use in my chemical laboratory I used the former shown as an aid in bending the tubing. It consists of a sheet of thick asbestos board, which has a strip of the asbestos fastened near one edge. Another strip with a protractor attached to



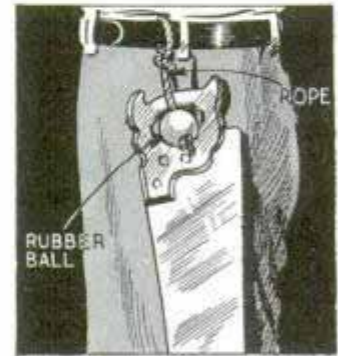
it is adjustable to get the desired angle. In use the protractor is held against a line drawn on the sheet parallel with the strip fastened to the edge, and a blowtorch flame is directed against the tubing, which is then bent to the angle formed by the intersection of the two asbestos strips.

—George Vias, Chicago.

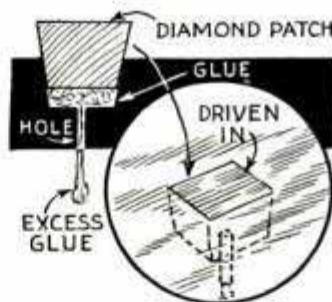
## Handsaw Carried on Trouser Belt by Means of Rope and Ball

The difficulty of carrying a saw up a ladder or among the branches of a tree, when working in an orchard, may be avoided by using this holder to suspend it from your trouser belt.

A piece of small rope is inserted through the ball and tied to the belt. The ball is compressed to slip it through the handhold of the saw handle.



## Diamond Patches in Table Tops Installed Easily



When putting diamond patches in table tops, I always make the openings deep and taper the sides of the patches so that they can be driven in tightly. Before driving them, small holes are drilled through the bottoms of the openings so that excess glue will pass out and not compress under the patches.

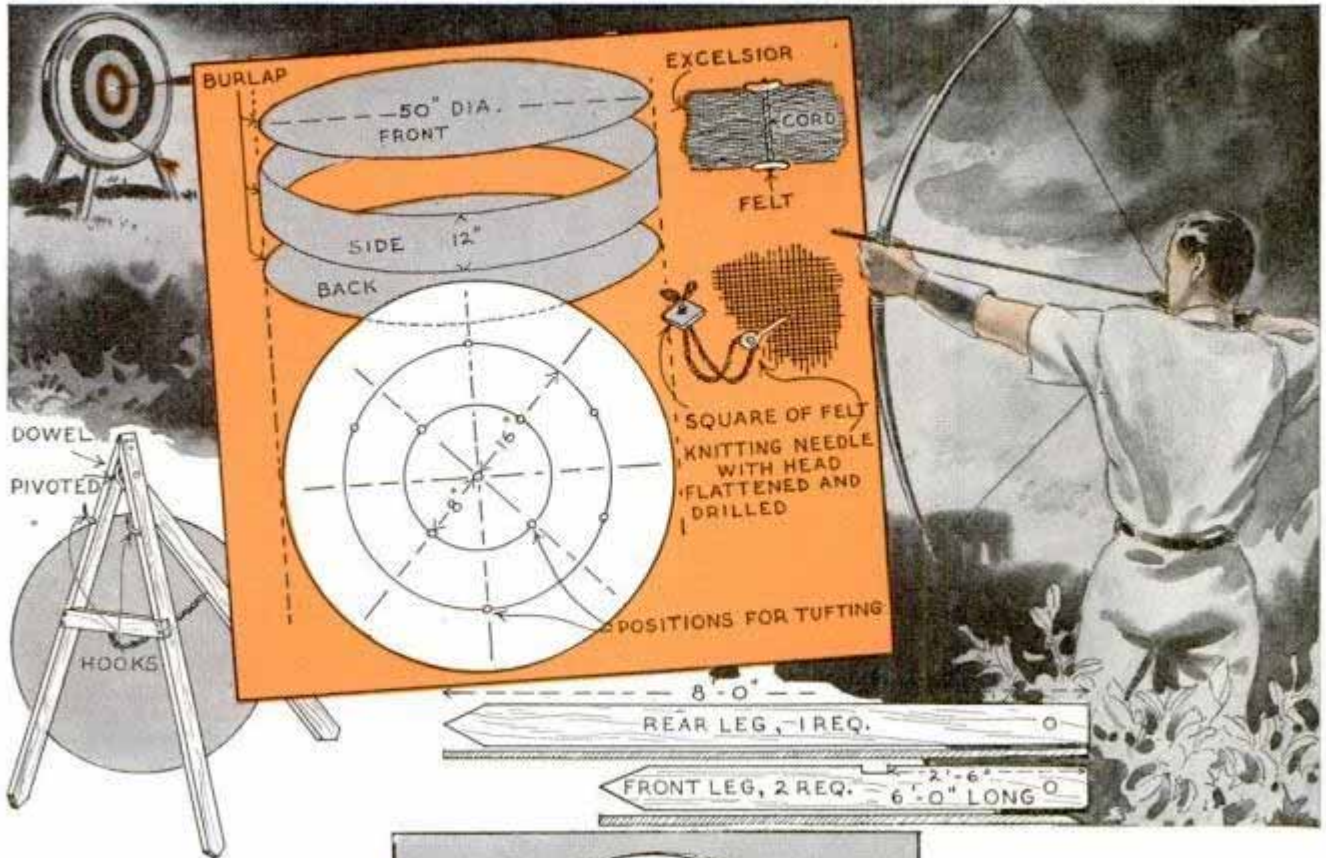
—A. Guenther, Hamilton, Ont., Can.

## Wedge under Trigger of Ratrap to Move It While Set

If you dislike to handle a mouse or rattrap after it has been set, slip a wedge under the trigger so it cannot trip. A spring-type clothespin is a good wedge.



# Make Your Own Archery Target and Tripod

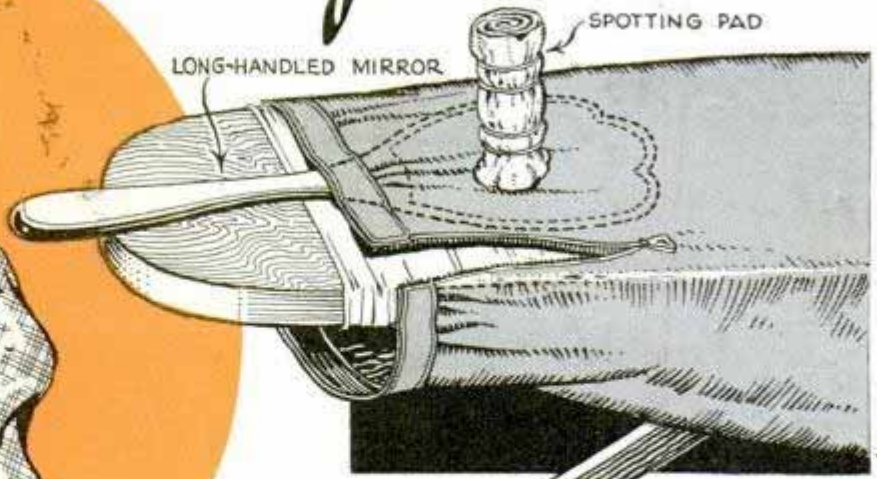


Archery targets varying from 24 in. in diameter to the standard tournament size of 48 in. in diameter are easy to make. First get enough burlap to cut two disks 50 in. in diameter and a strip 12 in. wide for the side. Lay out the circles with chalk and after cutting the pieces out, sew the bottom onto the side. Then pack excelsior or hay into the bag and sew on the top, leaving a good size hole to add more stuffing. Pack tightly, by walking on it, etc., after which you add as much stuffing as possible and sew on the top. The next step is tufting the target, which prevents it from bulging out, and holds the stuffing in place. To tuft the target get a long knitting needle, cut off the head, flatten it and drill a hole for an eye. Tie a piece of felt or leather to the end of a cord, run the needle through the target and draw up firmly, as the bag must be tight to hold the arrows. The target face is oilcloth, sign cloth or muslin. The center of the gold ring is  $9\frac{3}{4}$  in. in diameter and the other rings are  $4\frac{1}{4}$  in. wide. The

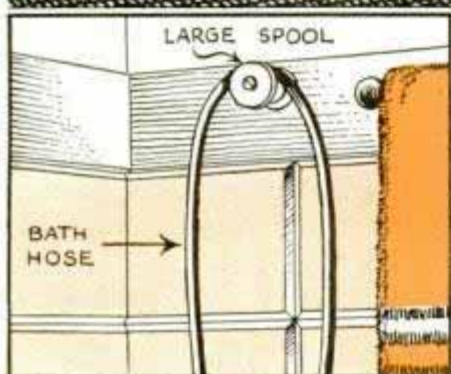
colors painted on are, beginning at the center: gold, red, blue, black and white. The values are, beginning at the center: 9, 7, 5, 3 and 1. When the face is dry it is whipped onto the burlap backstop. The target tripod is made of 1 by 2-in. wood. A crosspiece is nailed across the front legs, about  $2\frac{1}{2}$  ft. from the top, and the rear leg is pivoted at the top as shown. Hooks on the front legs near the top are made of large nails by cutting off the heads and filing to a sharp point. Also, a small chain connects the crosspiece and the rear leg. The target should be hooked on so that the center of the gold is at least 4 ft. above the ground. When the face has become worn another can be substituted or whipped over the old face. Keep the target inside when not in use. If it gets wet, drying takes considerable time, and repeated wettings will soon cause it to rot. Besides this, the sun tends to fade the painted rings on the face, causing them to become dingy and not easily distinguished.

—William C. Maxwell, Jr., Anniston, Ala.

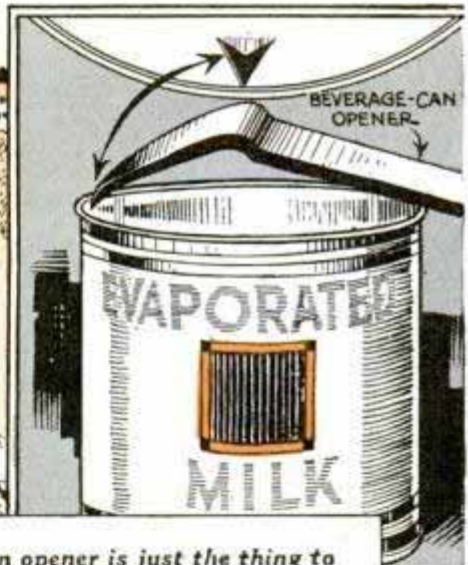
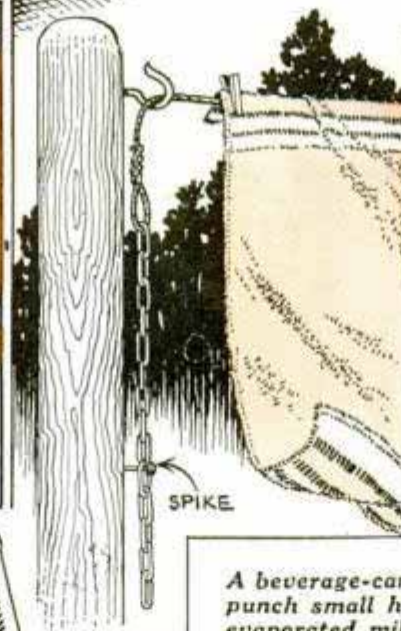
# Solving HOME



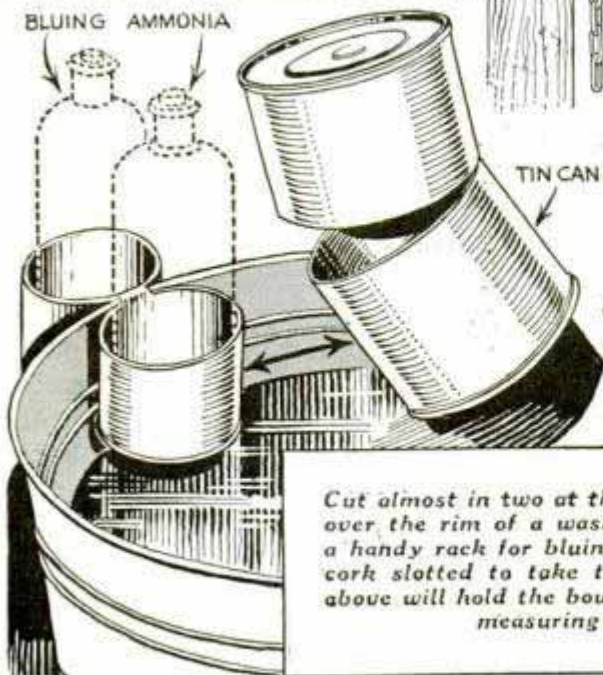
A small mirror is a good substitute in the home for a dry-cleaner's glass-top spotting table on which garments are placed to remove stains. When the glass face of the mirror is located under the spotted portion of the cloth, it keeps the cleaning fluid in contact with the fabric for a longer time so that the substance that caused the stain is dissolved and removed from the cloth quickly.



Hang a bath hose over a large spool instead of a nail, so that it won't kink and break.



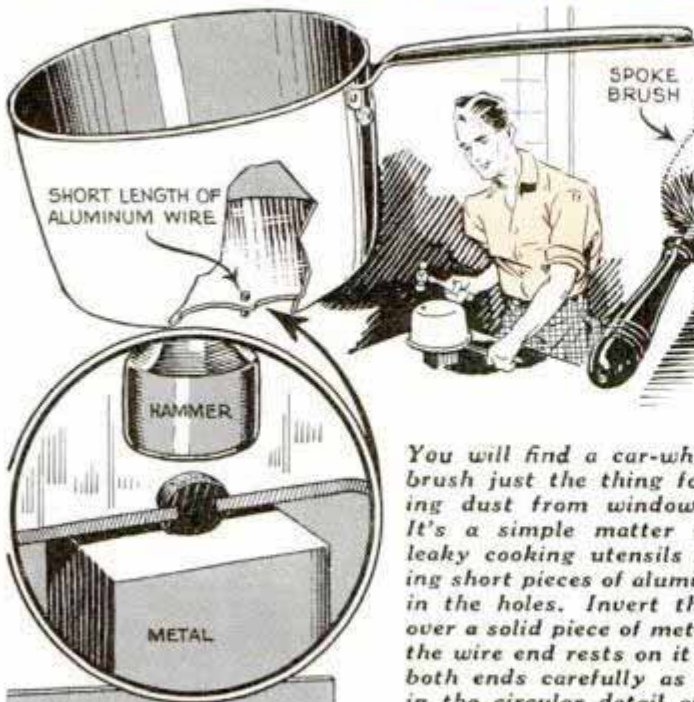
A beverage-can opener is just the thing to punch small holes in the top of a can of evaporated milk. You can tighten a rope clothesline easily by attaching a length of chain to one end so that a link can be slipped over a nail driven in the post.



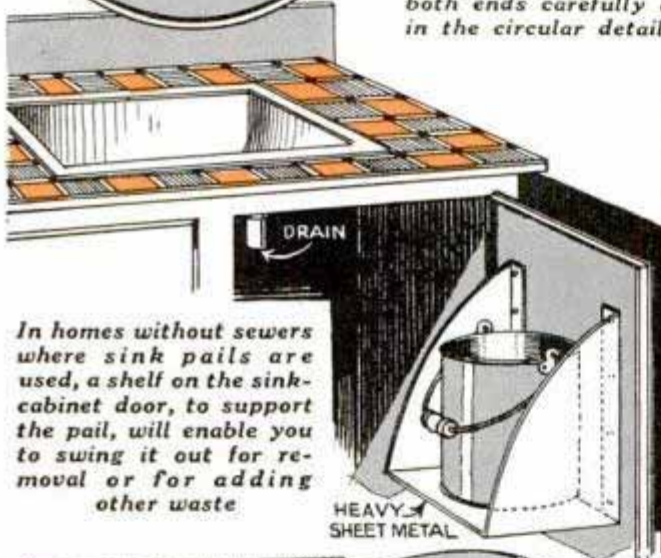
Cut almost in two at the center and folded to fit over the rim of a wash tub, a tin can provides a handy rack for bluing, ammonia, soap, etc. A cork slotted to take the handle of a spoon as above will hold the bowl of the spoon level when measuring out medicine.



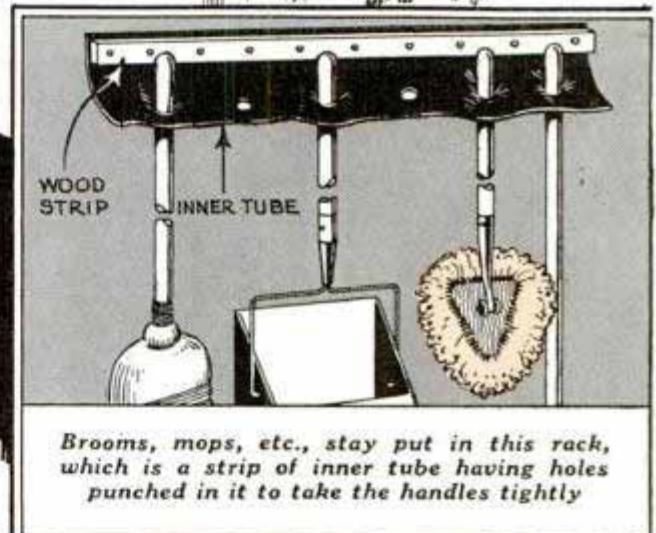
# PROBLEMS



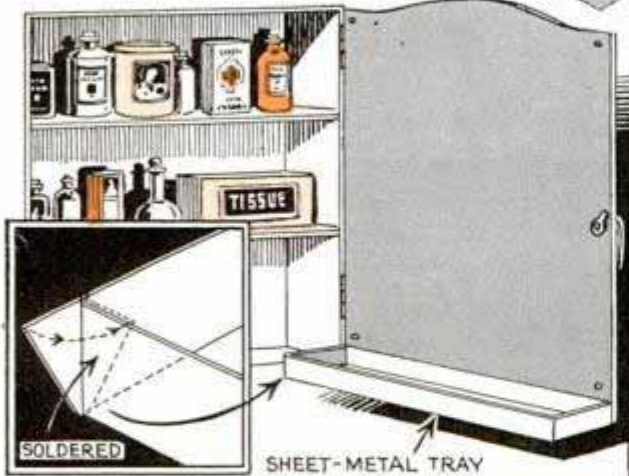
You will find a car-wheel spoke brush just the thing for removing dust from window screens. It's a simple matter to repair leaky cooking utensils by riveting short pieces of aluminum wire in the holes. Invert the utensil over a solid piece of metal so that the wire end rests on it and peen both ends carefully as indicated in the circular detail at the left



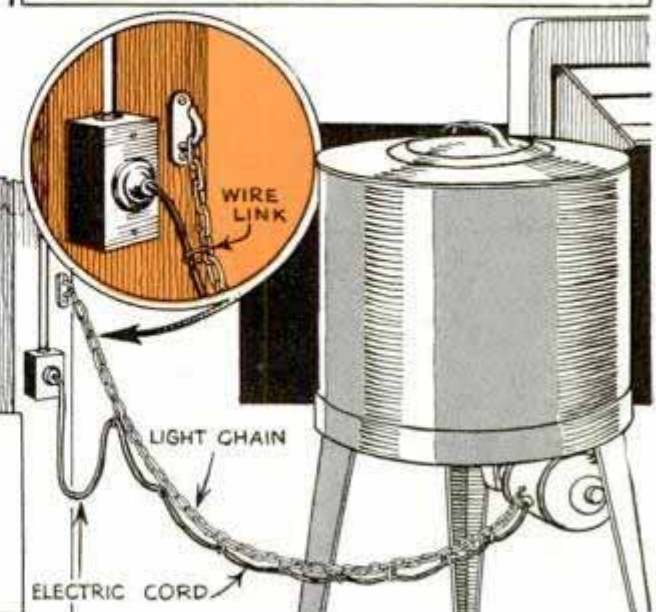
In homes without sewers where sink pails are used, a shelf on the sink-cabinet door, to support the pail, will enable you to swing it out for removal or for adding other waste



Brooms, mops, etc., stay put in this rack, which is a strip of inner tube having holes punched in it to take the handles tightly



Above, the bottom shelf of a bathroom cabinet is a tray, attached to the door to swing out for easy removal of most-used articles. Right, chain on electric cord prevents pulling it out of the wall socket when washing machine is moved



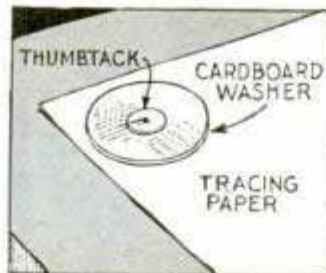
## Notched Stopper Controls Flow of Water in Lavatory



The next time you want water to flow slowly into a lavatory, sink or laundry tub, and do not wish to maintain the water level high enough to run out of the overflow, cut a piece out of the stopper or water plug. It is best to cut out a small section first and then enlarge the opening until it passes the desired amount of water.

## Washer under Thumbtack Head Prevents Tearing Paper

When using thin tracing paper on a drawing board, clip a large cardboard washer under the head of each thumbtack. This provides a larger bearing surface on the paper so that the head of the tack is less likely to tear the paper.



## Sweeper Handle Is Held Upright by Coil Springs

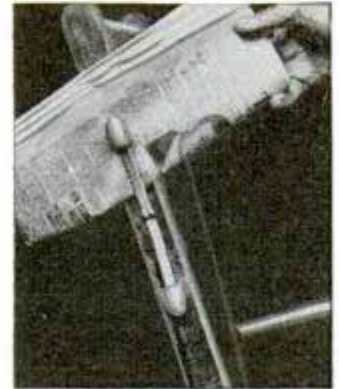


To keep the handle of a carpet sweeper in a vertical position when it is released so that you won't have to stoop to pick it up, use a couple of coil

springs as indicated. If the top of the sweeper is metal, you can solder them in place. If it is wood, small staples can be used to attach them. The other ends of the springs are soldered to the handle. Be sure to attach the springs so that they keep the handle from falling to either side. When you use the sweeper, the springs stretch so that the handle can be held at a good working angle.

## Newspaper Rack for the Lawn or Porch Chair

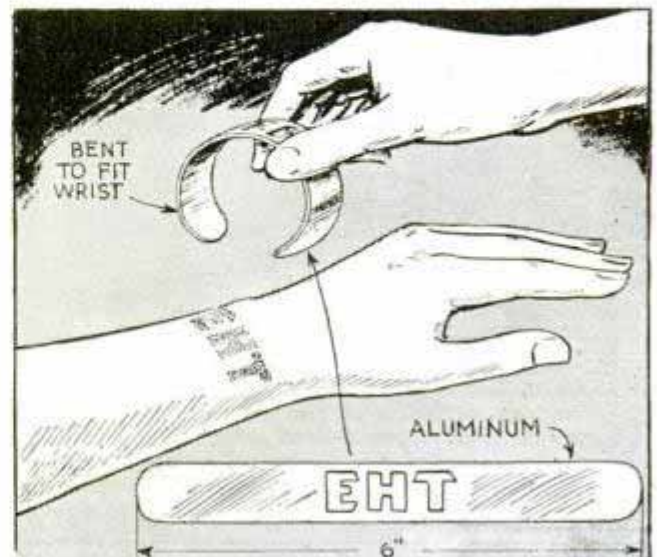
Because lawn and porch chairs are moved to various places about the home, there usually is no place to put a newspaper or other small article to keep it from blowing away when leaving the chair temporarily.



To provide a place or holder, just screw a spring-type shoetree to the chair, and you can slip the paper under the ball ends. File a nick in each edge of the spring and drive the screws in them, bringing the heads down tightly.

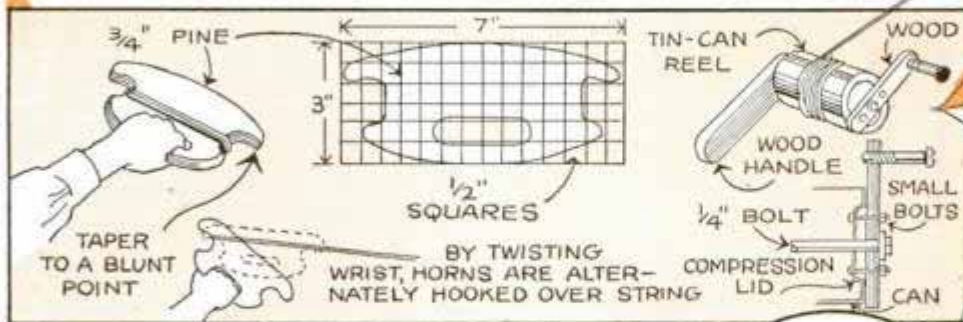
## Sun-Tan Bracelets 'Brand' Initials on Your Wrist

Placed around your wrist, these bracelets will sun-tan initials on your skin in a short time. The bracelets are strips of aluminum with your initials cut in them with a jewelers' saw.

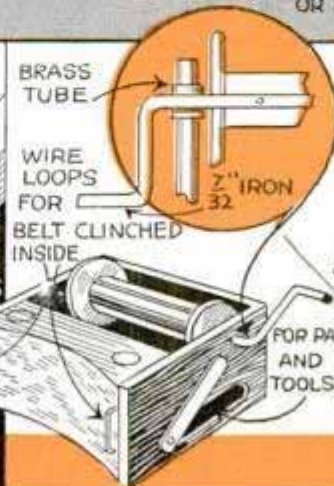
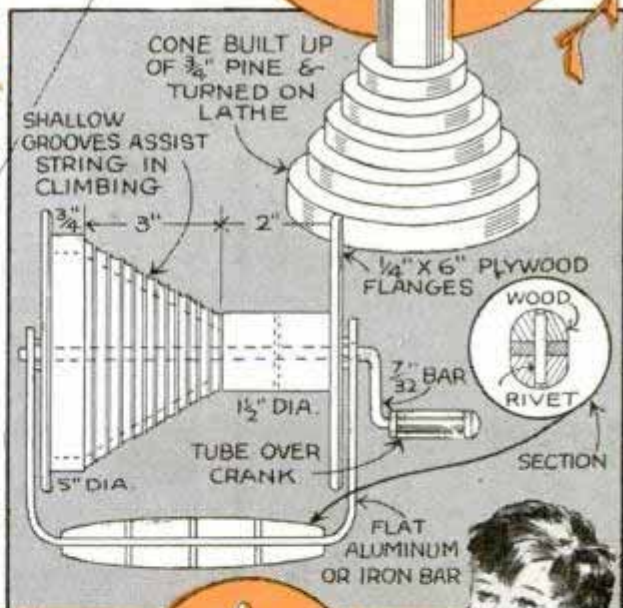
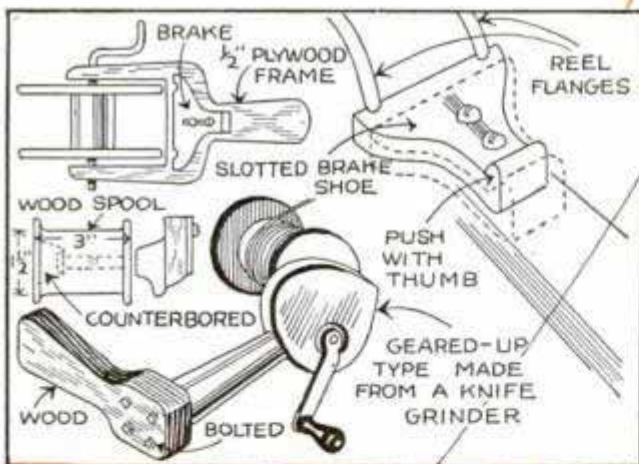
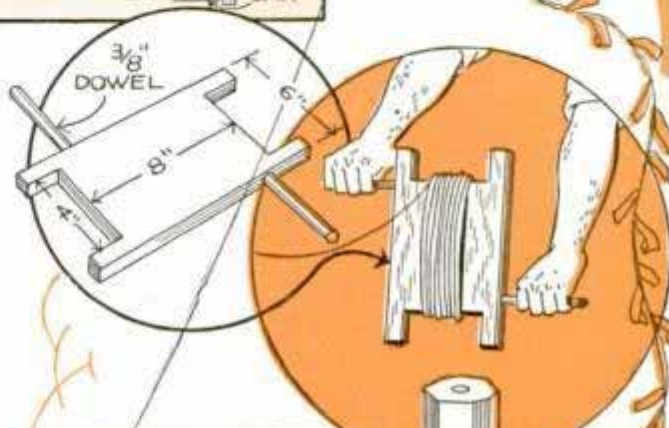


# FAST-WINDING REELS

*give new thrills to kite flying*



ANYONE can make the flat horn-type string winder shown above, which works by a simple twisting motion of the hand. Another one, which is quickly improvised, is the two-handle affair at the right; it is merely a piece of pine recessed at both ends and drilled for dowels. Below, are shown several other types that are more elaborate and have been designed especially for speed, even winding and ease of handling.



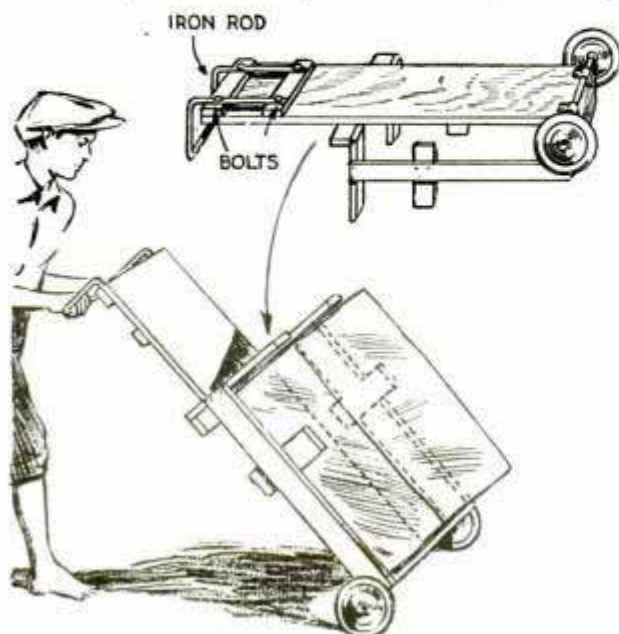
## Talcum Prevents Smudge of Copy When Tracing Drawings



When it is necessary to make a carbon tracing of a detailed drawing, the movement of the hand back and forth over the original is apt to cause smudging of the copy from the carbon. To avoid this and permit the carbon to produce sharp lines where desired, sprinkle a little talcum on a powder puff and brush this over the under sheet before beginning the work.

## Handy Cart to Haul Ice Cakes Short Distances

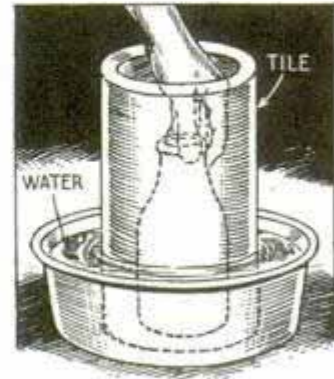
If you live on a farm and put up your own ice, or if you live in town near an icehouse, this cart is just the thing to carry



ice to your home for the refrigerator. The wheels and axle are taken from a child's worn-out wagon or baby carriage, and are fastened to a wide board fitted with a handle. This is an iron rod bent to the shape shown and bolted to the cart.

## Clay Tile Keeps Milk Cool

Finding that milk delivered at her door sometimes got too warm before she was able to put it in the refrigerator, one housewife set an unglazed clay tile in a pan of water and told the milkman to set the bottle inside the tile when he delivered it. The tile absorbed some of the water, which, in evaporating, cooled the milk.



## Split Keg Provides Bird Feeder



Sawed in half through the center lengthwise, a small keg makes an ideal feeder for birds. Before sawing the keg, nail the hoops to each stave and also nail the ends to keep the assembly

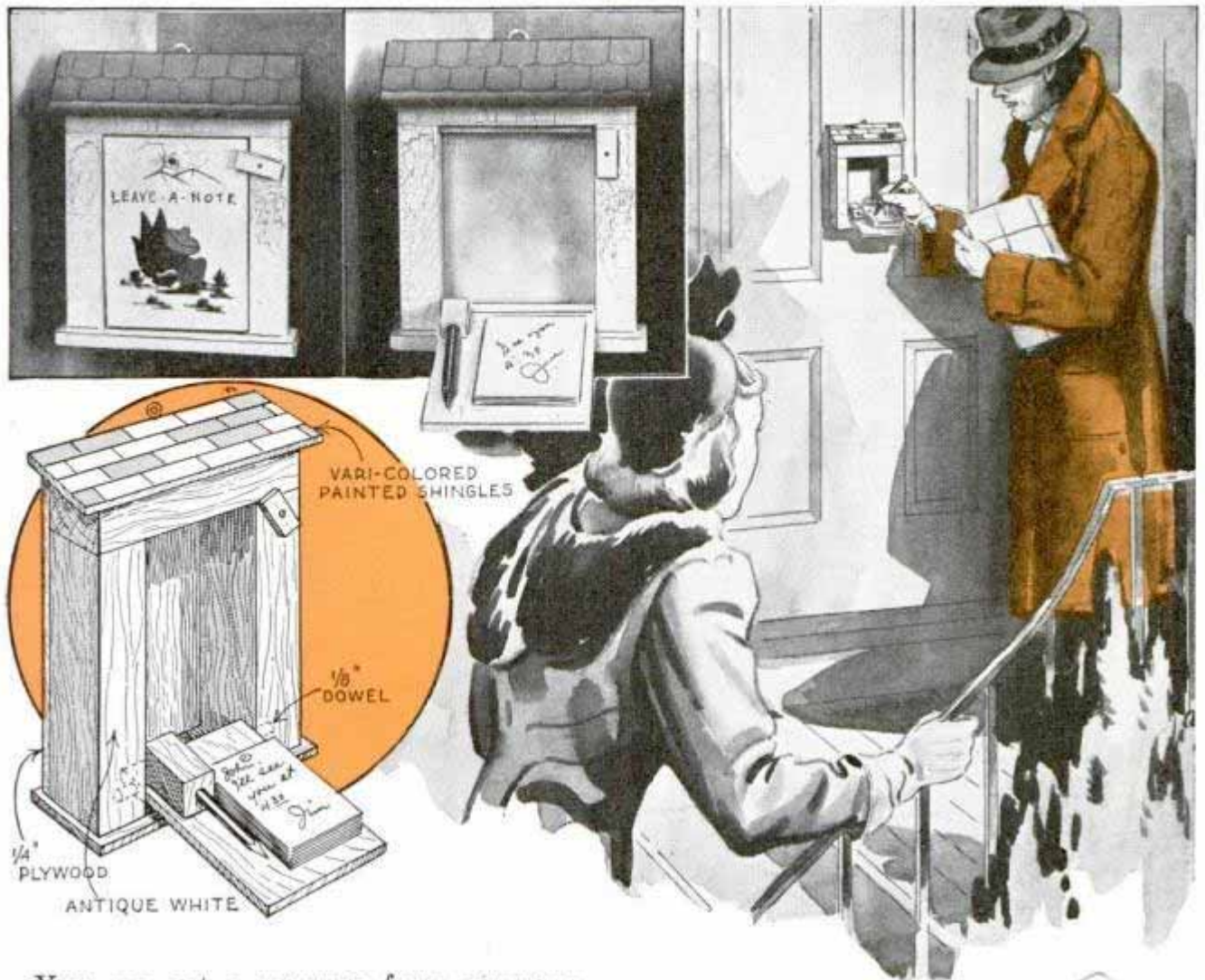
from falling apart. Small dowels or skewer sticks are set in holes equally spaced around the edges of each half of the keg to hold them apart. A hardwood pole 6 ft. long supports the keg at a convenient height for placing food and water inside it.

## Fruit Jars Labeled with Crayons

To avoid the work of making labels to indicate the contents of fruit jars, simply write the name of the contents on the jar with a wax crayon. This must be done while the jar is still warm. Various colors of crayons may be used to further classify the jars.



# Callers Leave Note in Box While You Are Out



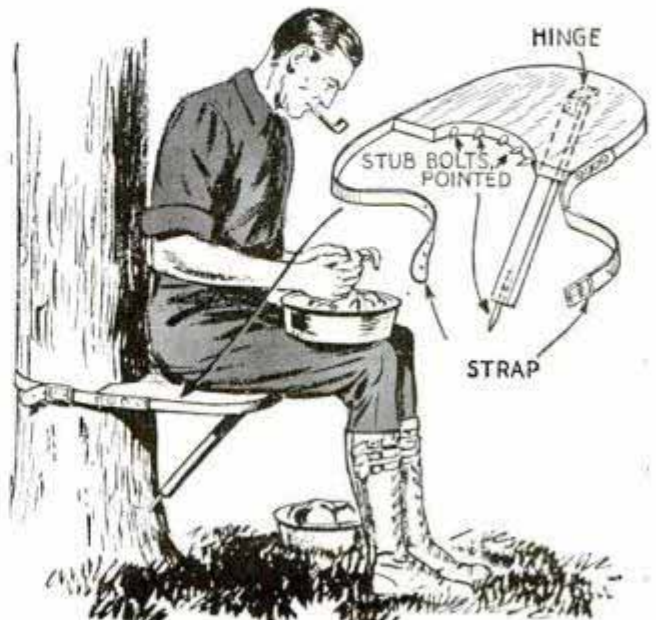
You can get a message from someone who calls at your home while you are out by making it convenient for a note to be left. A tiny cabinet with pad and pencil inside, is attached to the outside surface of

the door. The cabinet door is pivoted with two small dowels at the bottom, and a small turnbutton holds it in a closed position to protect the pad from the weather.

## Camper's Portable Seat Strapped Quickly to a Tree Trunk

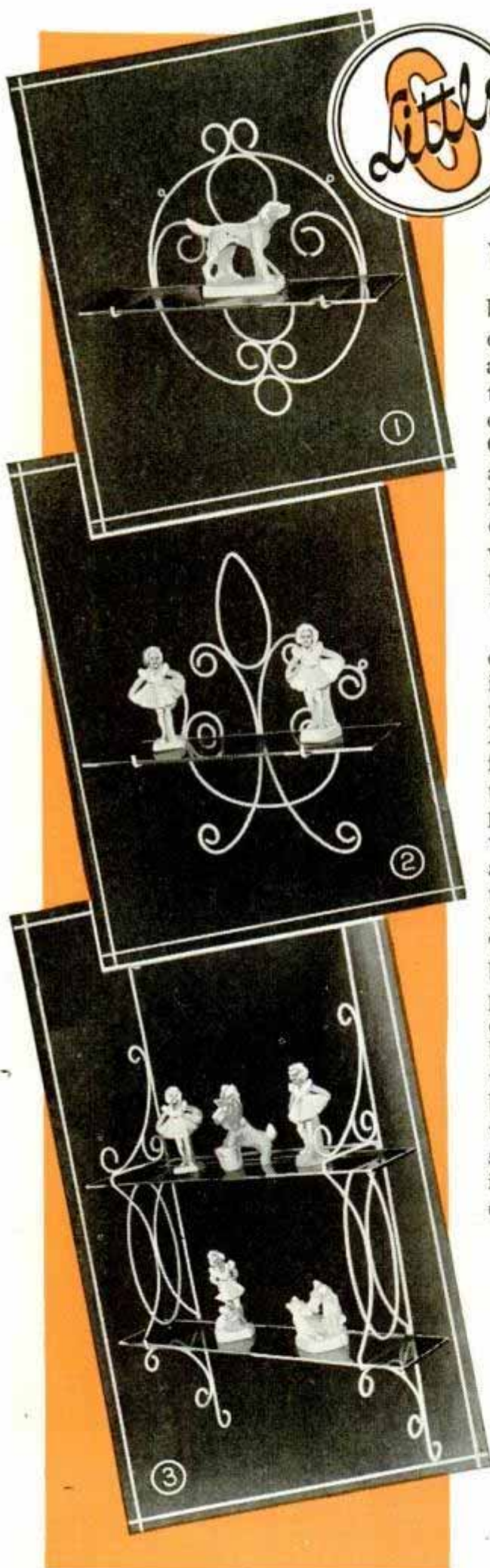
Attached to the trunk of a tree by means of two straps and a buckle, this seat takes little space in your camp equipment. The seat is tilted to any angle by means of a brace, which has a pointed bolt in the lower end to engage the tree. The rear edge of the seat is curved to fit against the tree in such a way that pointed bolts penetrate the bark. The bolts should be a snug, drive fit in both the seat and brace so that they will not fall out when the seat is packed. If the seat is cut from hardwood, there will be less tendency of the bolts splitting out. Facing the edge with thin, flat iron and drilling the bolt holes through it is a further improvement.

—Everett Hanson, Argyle, Wis.



# SHELVES

By  
WAYNE C. LECKEY



WHITE-ENAMELED wire and blue glass are combined in these dainty bric-a-brac shelves for the home. However, the color combinations can be varied and the shelves are equally attractive if finished in pastel tints of green, blue or pink and fitted with clear, white, black or other colored glass. Only a few ordinary hand tools are needed, and you'll find it surprisingly easy to shape No. 9 galvanized wire to produce any of the designs shown in Figs. 1 to 7 inclusive. While wire was used in all of these, the two-shelf types, Figs. 3 and 7, can be made of  $\frac{1}{16}$  by  $\frac{1}{2}$ -in. flat iron, joined with small rivets.

Begin by making a full-size paper pattern, enlarging the drawings on paper marked off in 1-in. squares. In making the two-shelf types, Figs. 13 and 21, an assembly board, Fig. 9, to which your paper pattern can be fastened with thumbtacks, will aid in keeping the work straight and flat while soldering the parts together. The assembly board is fitted with a narrow strip along the rear edge, against which all parts must make contact so that a perfectly straight edge will be had when finally joining the remaining upright. The exact length to cut each part before bending it, can be determined easily by simply forming a length of wire solder directly over the curved outline of the pattern. When bending the wire, clamp a small adjustable wrench in a vise as shown in Fig. 18. Then, by feeding the wire between the jaws of the wrench a little at a time with a repeated, slight, sideward pull, and frequently checking it with the pattern, you'll find the job comparatively simple.

Parts such as the ovals, Fig. 13, which are soldered to the outer surface of the sides, and the circular parts required in Figs. 12 and 15, can be formed more easily if the wire is bent around wooden forms such as shown in Figs. 10 and 16. Fig. 22 shows the method of splicing these parts together by first temporarily spot-soldering the wire at the lap and then sawing through both at an angle. The beveled ends of the wire are tinned with the iron and soldered together, after which the splice is smoothed up with a file.



*in*  

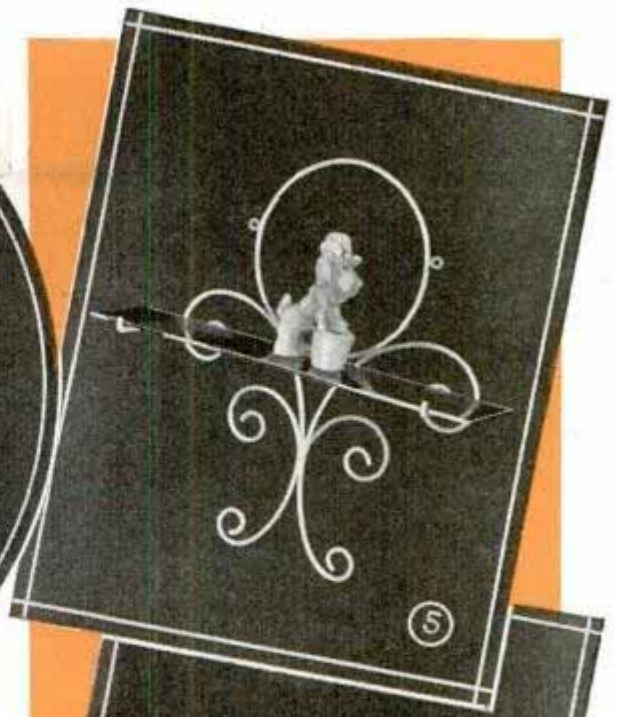

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*metal and glass*  


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Before soldering the parts together at each point of contact, small netting staples will be found handy for temporarily holding the wire over the outlines of the patterns as in Fig. 9. A freshly cut potato or an ice cube, when placed on a previously soldered joint, will keep the wire relatively cool, so that when applying the iron to a near-by part, the heat will not loosen the adjacent joint. Fig. 8 shows how the side frames of the two-shelf brackets are joined together with stretchers, angle-bent at the ends, and soldered to the back edge at the shelf. In Figs. 14, 20 and 23, you will notice that the extending supports for the glass shelf are an integral part of the assembly, whereas, in Figs. 11 and 19, L-shaped supports bent as indicated in the insert detail of Fig. 17, are simply soldered to the frames at points indicated in each respective drawing. Small screw eyes cut off within  $\frac{1}{8}$  in. from the eye and soldered to the wire provide a means of hanging the shelves. It is important that these be soldered well, especially on the two-shelf types. Flow a generous amount of solder around the base of the eye.

Now for finishing the frames. Go over all the joints and smooth them with a fine file. If you have used flux paste in soldering, carefully wipe the work clean. A specially prepared metal surfacer, obtainable





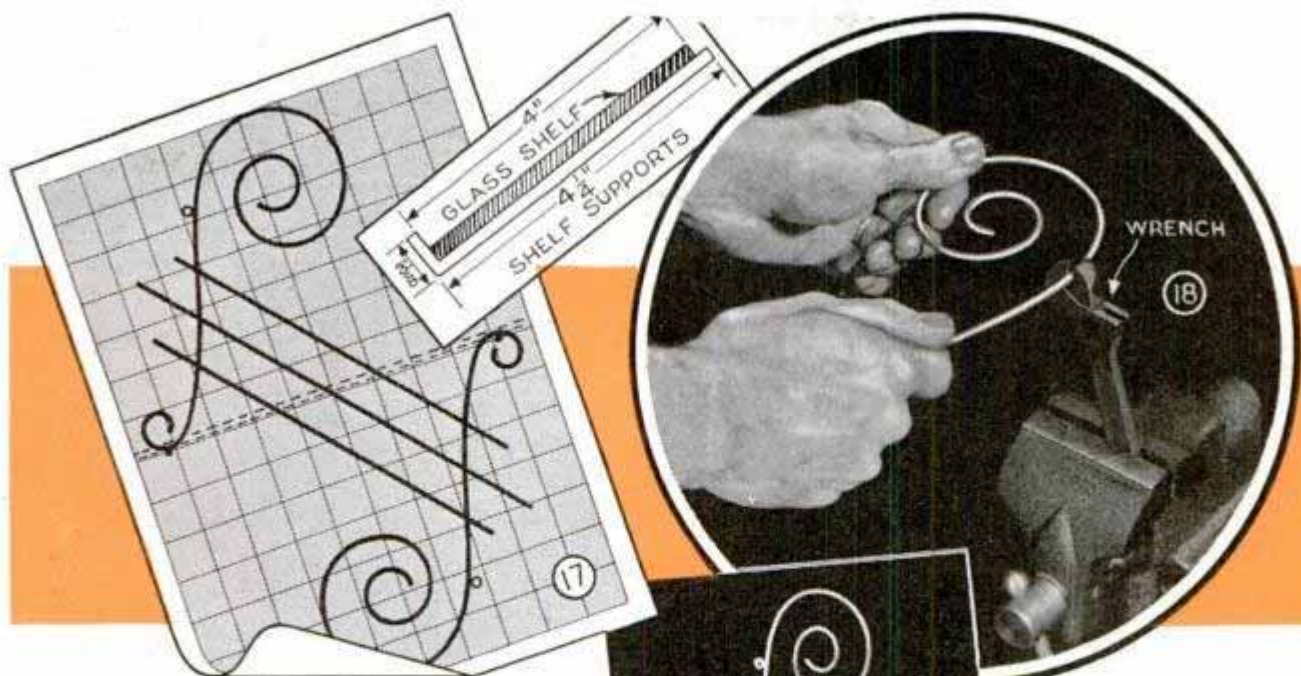
ALL PATTERNS ENLARGED FULL SIZE ON 1" SQUARES



from your local paint store, should be applied to the wire first. This will prevent chipping of succeeding paint coats. This can be applied with brush or spray, being careful to cover all parts. Allow to dry thoroughly. Follow this with two separate coats of high-grade semi-gloss enamel of the preferred color, allowing each to dry thoroughly before applying the next. The popular antique-white effect can be acquired by applying a light coat of burnt umber glaze over a coat of bone-white enamel and then, while still wet, wiping off the glaze in a haphazard manner to leave

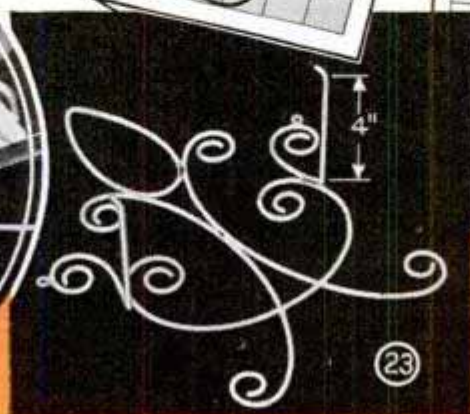
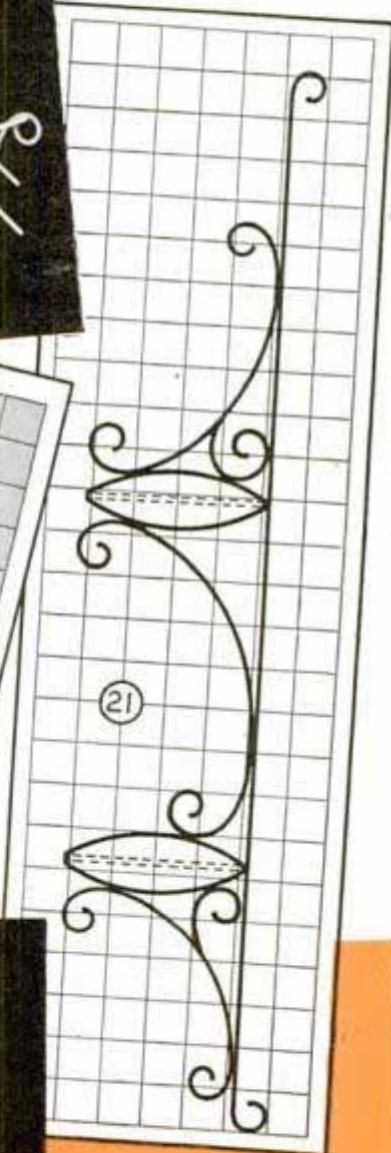
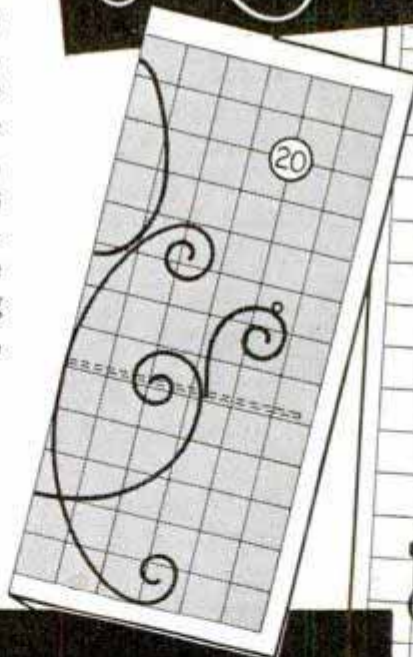
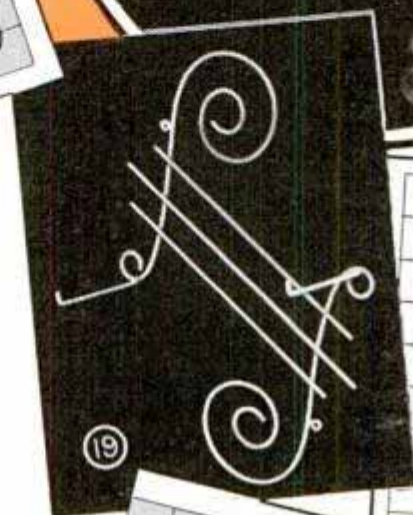




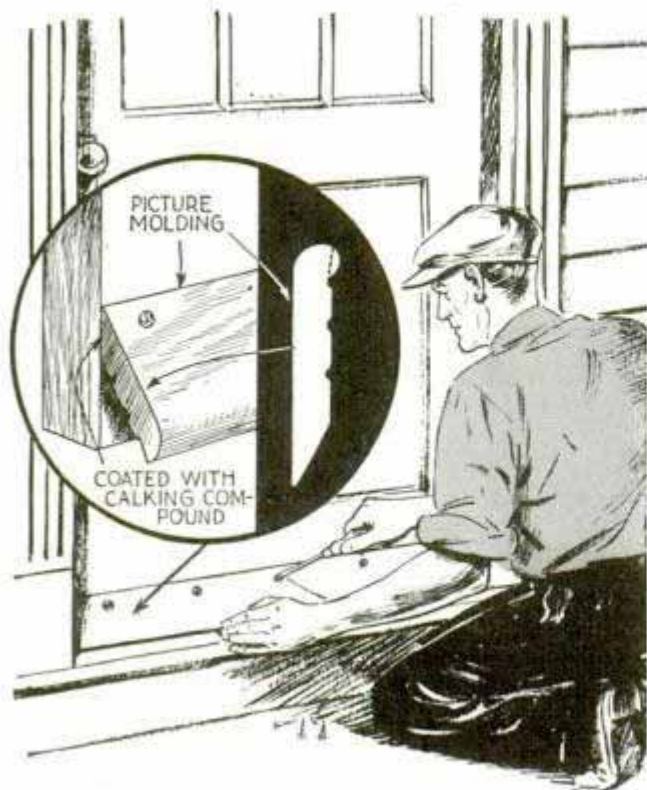


some traces of the glaze in the corners.

Glass in various colors is available to use for shelves. Highly polished sheet plastic is also appropriate. In the five-and-ten-cent stores you will find glass shelves with nicely rounded edges. If desired, plain hard-pressed board can be used and painted a contrasting color. The designs given are dimensioned to support shelves 4 in. wide. For the two-shelf brackets, the glass should measure 18 in. long, while a 13-in. length will do for the smaller, single-shelf designs. Where shelves are cut from glass on hand, it is essential that the sharp, exposed edges be removed. This can be done by rubbing the edges with a small hand stone, dipped occasionally in turpentine.



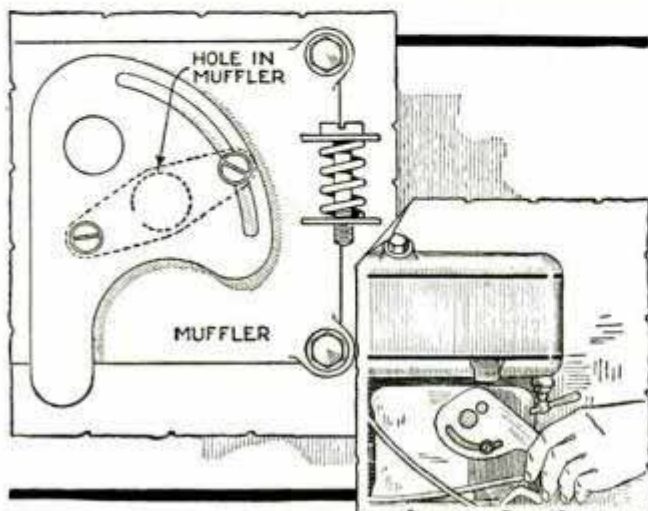
## Molding Near Bottom of the Door Avoids Water Blowing under It



If the wind blows water under a door when it rains, a strip of picture molding of the type shown, screwed to the door as indicated, will help prevent this trouble. It is best to saw off part of the beaded edge as indicated by the dotted lines in the end view of the molding. Water will not pass between the molding and door if the edge is coated with calking compound before screwing the molding in place.

## Muffler Cutout for Outboard

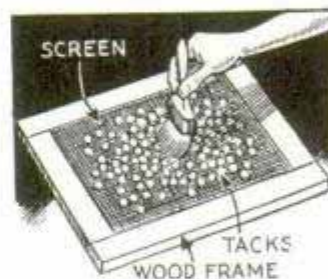
It's not much of a job to install a muffler cutout on your outboard motor. Most motors of this type have a small opening in the muffler covered by a screw-on plate. All you have to do is remove the plate and



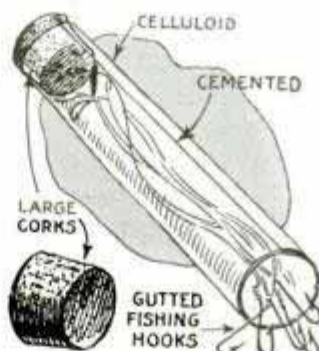
then cut a piece of aluminum or brass to the shape shown and pivot it over the opening so that the latter can be covered or uncovered.

## Painting a Number of Tack Heads at One Time

A workman who needed a number of tacks having the heads painted a certain color did the job quickly with the aid of a piece of screen wire. This was nailed to a small wood frame and the tacks emptied onto it. A little shaking quickly caused the tack points to penetrate the screen mesh so that the heads were exposed as indicated. A few strokes of a brush applied the paint in a jiffy.



## Fishhook Holder Is Waterproof

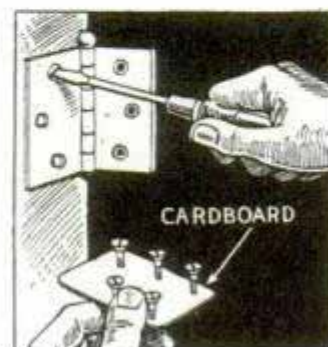


A piece of clear sheet celluloid rolled to form a cylinder and cemented together with acetone provides a handy holder for gutted fishhooks. Such a holder, when plugged at the

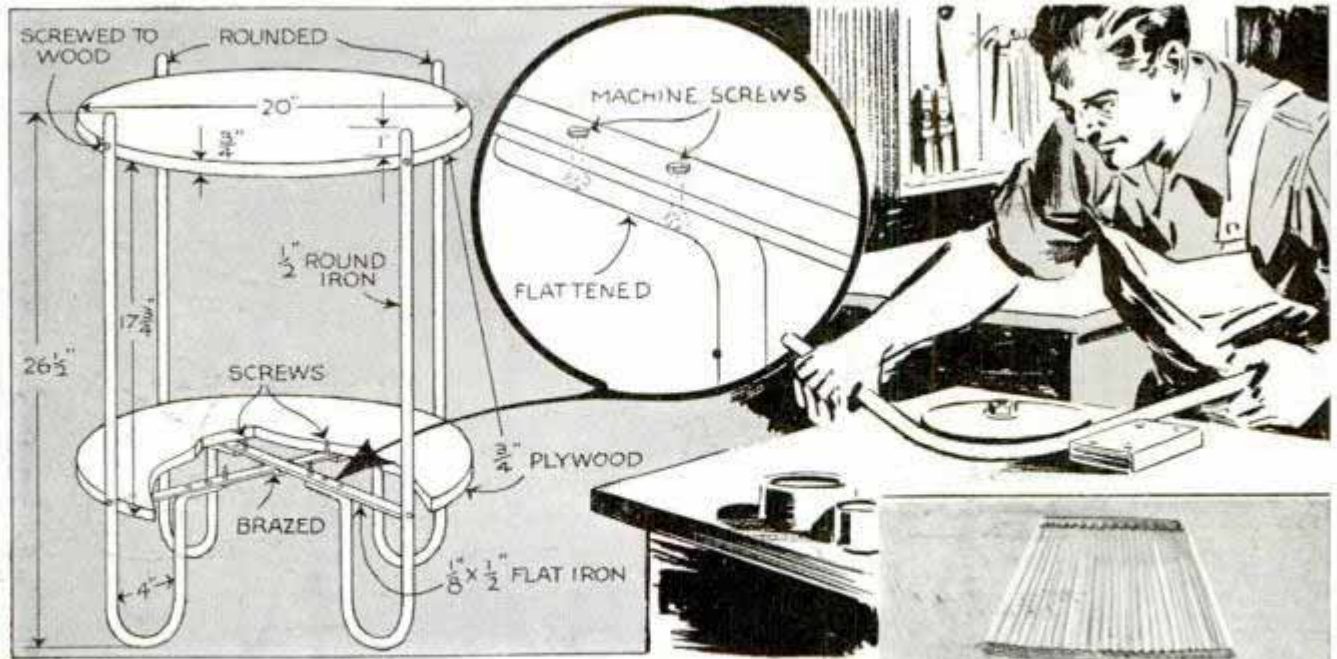
ends with corks, is waterproof, will not sink if dropped into the water, and is transparent so that you can see the hooks.

## Hinge Screws Kept in Cardboard to Prevent Loss

When you remove wood screws from hinges and other places, drive them into a piece of thin cardboard so that they cannot roll around and become lost. If the screws are put away temporarily, the cardboard can be labeled to identify them.—Opie Read, Jr., Chicago.



# This Chairside Table Has Painted Iron Legs



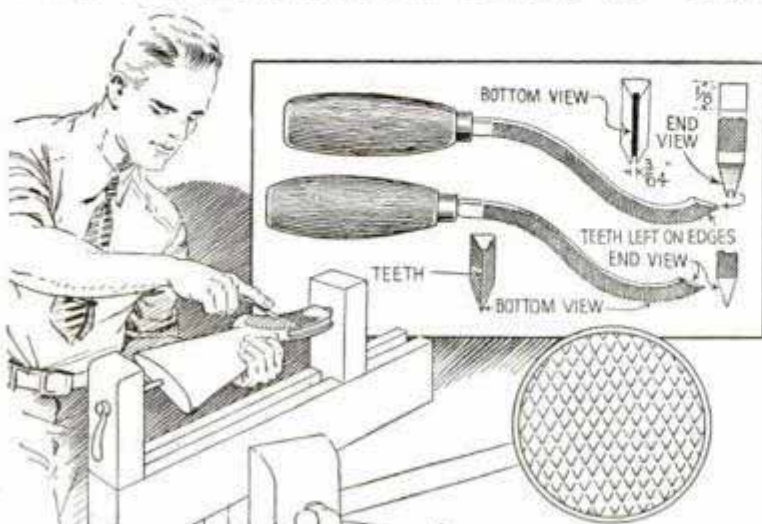
Combining wood and metal, this table is an easy piece to build. Cut out the top and shelf with a keyhole saw if a band saw is not available. For the legs, you use  $\frac{1}{2}$ -in. round iron rod. Each leg has a loop bent at the lower end and the short return portions are bent at right angles and drilled for riveting to flat-iron cross-pieces. These assure rigidity, but they may be eliminated if you wish to screw the return portions of the legs directly to the shelf. Holes are drilled and counterbored in the legs to take oval or flat-head screws, which are driven edgewise into the shelf and top. You can construct the table without any brazing or welding although some may prefer this method. The upper ends of the legs are ground round. Paint the legs white and the shelf and top a pastel shade to go with the color scheme of the room.—E. M. Love, Monterey Park, Calif.



## Gun-Checking Tools Shaped from Three-Cornered Files

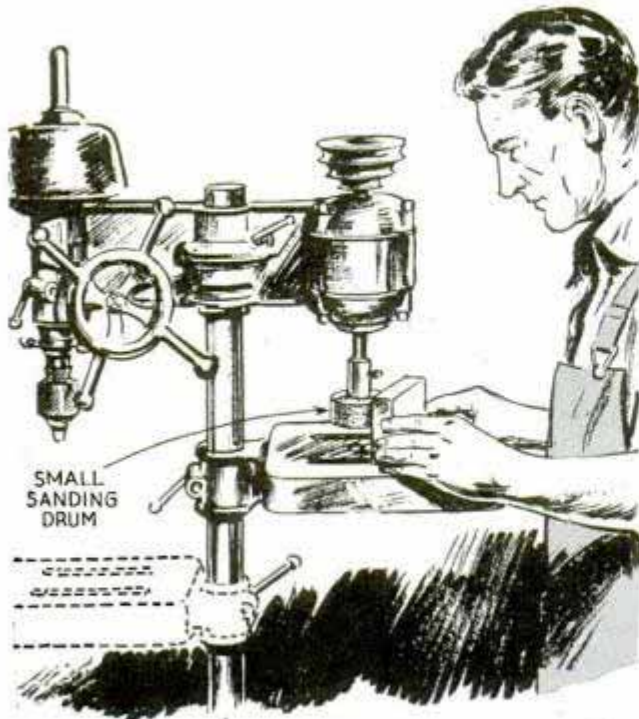
If you have a gunstock that you would like to decorate, a couple of tools for the job can be made inexpensively from two files.

You will have to draw the temper from the files before working on them and then reharden them after the work has been done. The spacing or double-edge tool is made from a square file about 5 in. long. The details show how the end of the tool is shaped. The tool for deepening grooves made by the double-edge tool and giving the checkering a pointed effect is made from a three-cornered file.



☛ Tomatoes can be peeled in a jiffy if held on a fork in a flame and turned to loosen the skins.

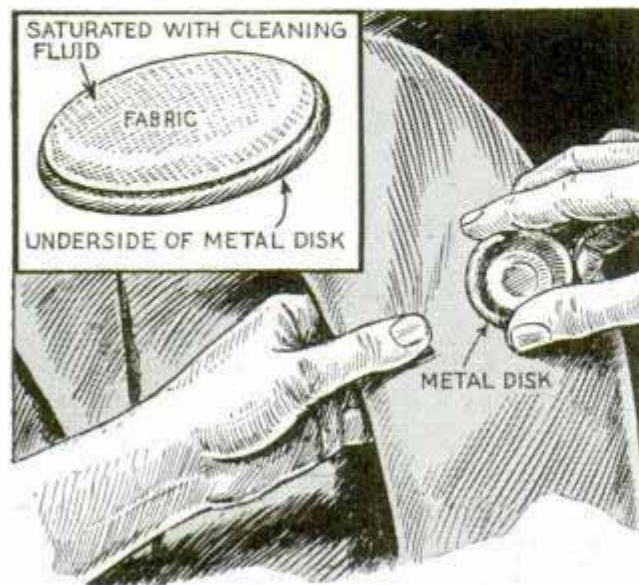
## Drill-Press Motor Has Attachment on Lower End for Sanding



If you have a floor-type drill press on which the armature shaft extends from the lower end of the motor, sanding and other work can be done with it by making the proper attachments to fit the end of the shaft. The drill-press table can be raised and swung around under the motor to support the work.

## Caster Cup Serves as Applicator When Using Cleaning Fluid

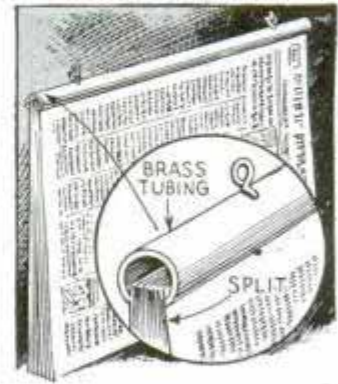
Fabric-covered caster cups of the type used under furniture legs are handy as applicators for cleaning fluids in removing spots from garments. Just dampen the fab-



ric of the cup with the fluid and then use it to rub the spot to be cleaned. The cups can be obtained in ten-cent stores.

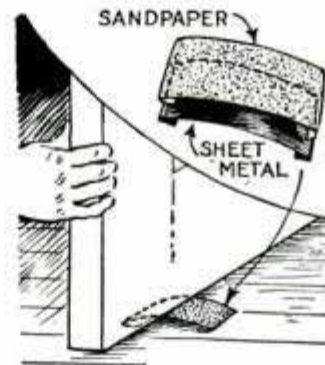
## Binder for Your Printed Papers from Brass Tubing

Having a number of papers he wanted to file in pads, one man slit brass tubes on one side, pried the slit open and inserted the papers. Wire eyes were then soldered to the tubes so that they could be hung up.



## Door Is Sanded to Avoid Dragging without Removing It

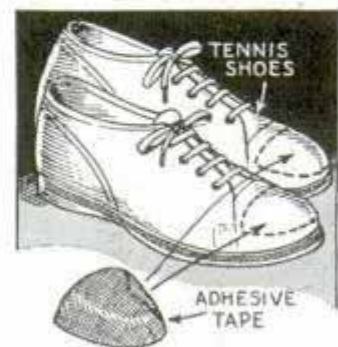
When a door needs a slight dressing on the bottom to avoid dragging, one carpenter does the job by simply swinging the door back and forth across this sheet-metal sanding block. This makes it unnecessary to remove the door. The metal is bent slightly convex and the sandpaper is folded over it so that the spring tension of the metal forces it against the wood.



over it so that the spring tension of the metal forces it against the wood.

## Toes of Tennis Shoes Reinforced with Adhesive Tape

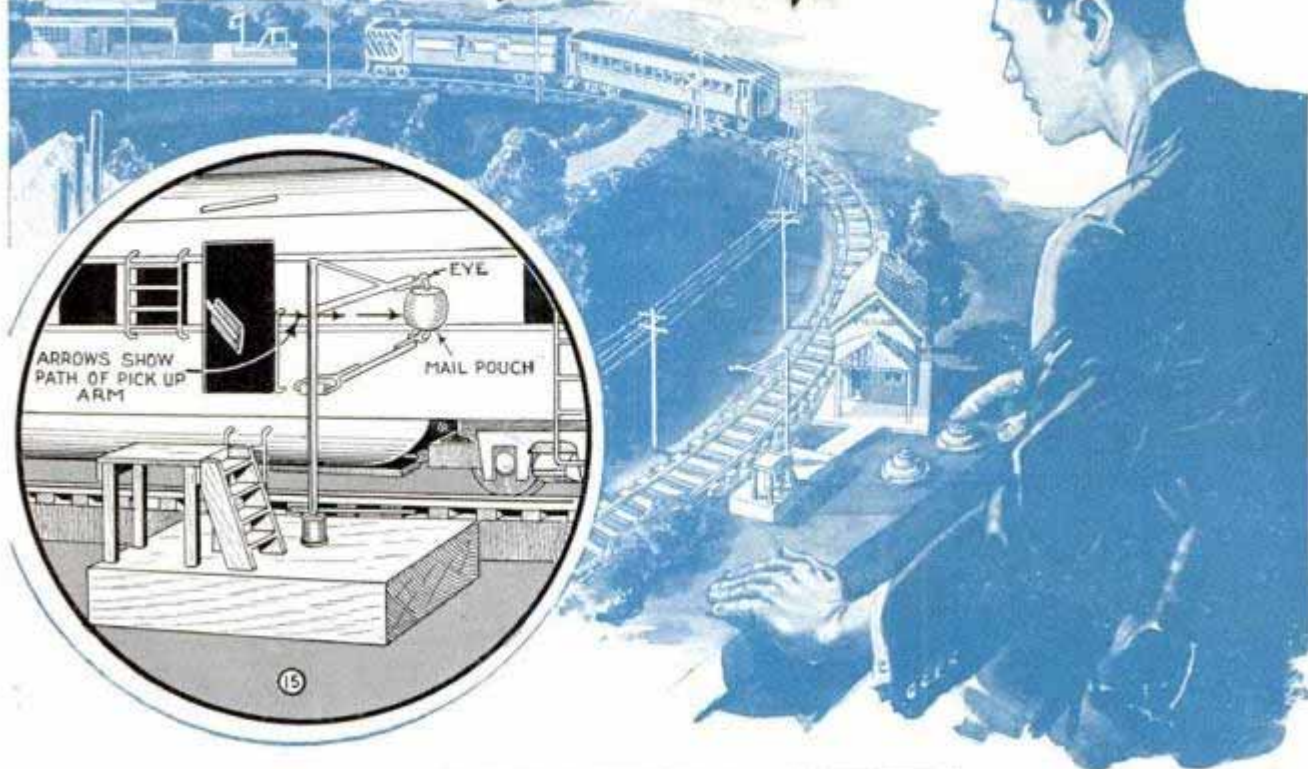
Toes of tennis shoes will not wear through quickly if you line them on the inside with adhesive tape. This acts as a reinforcement where your toenails rub against the shoes.



☐ Squeaks in a floor often can be eliminated by simply working fine graphite into the joints between the boards.

# Non-Stop MAIL EXPRESS

*has automatic pickup and delivery*

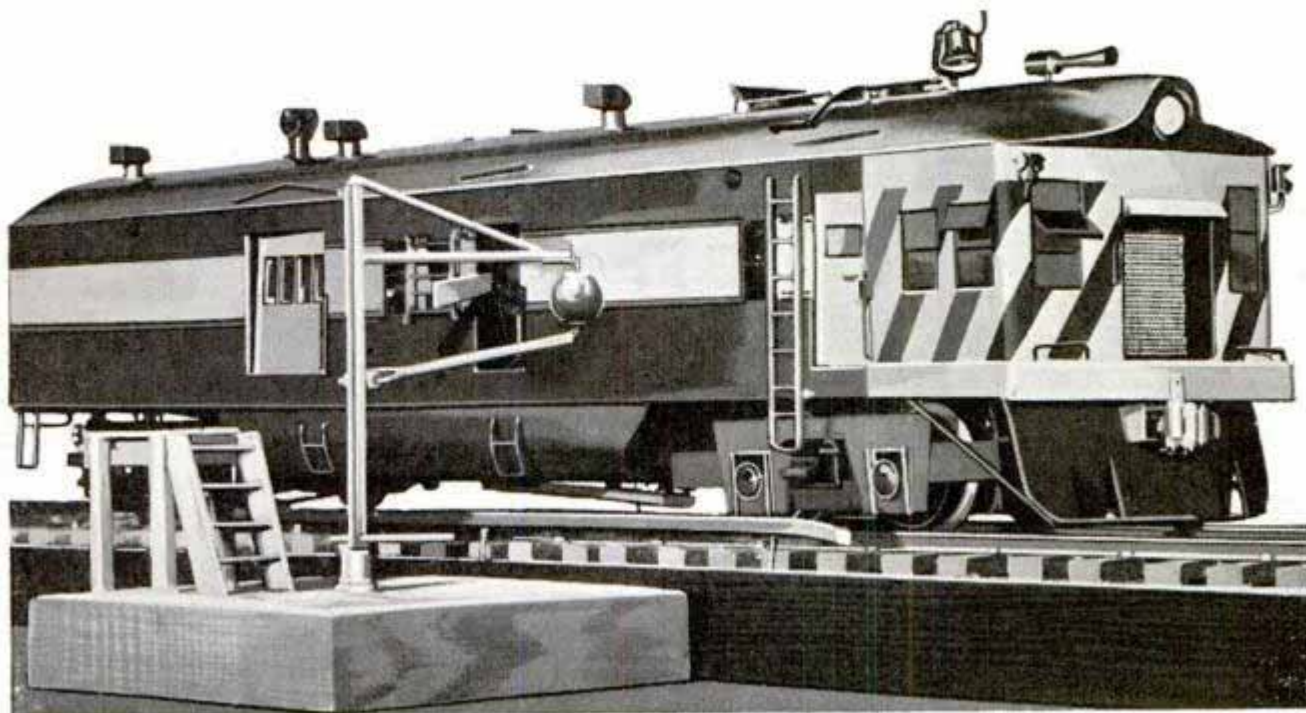


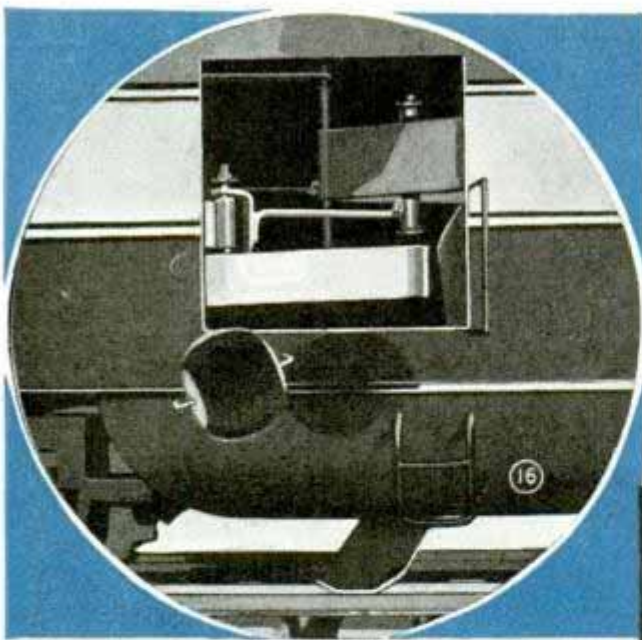
By ALEXANDER MAXWELL

## PART II—The pickup and ejector, mail-pouch chute and platform mail crane

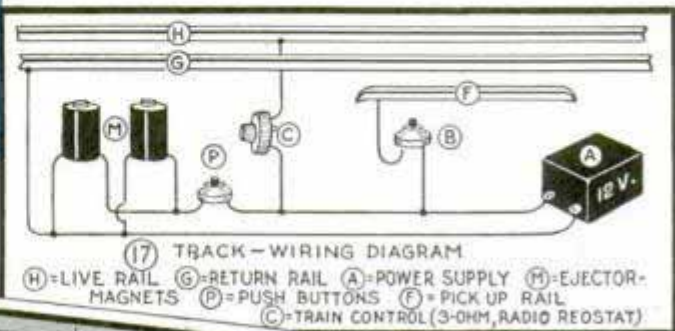
**Y**OUR mail car with its removable top has been completed virtually except the electrical pickup, ejector, chute and mail crane. Colors to paint the outside of the car were given in Fig. 12 of the last installment, but if you desire, the painting job can be left until last to avoid acciden-

tally scratching the finish while installing the interior "machinery." Before working on the interior, it is a good policy to remove the motor unit. The delicate fittings such as ladders, sun visors, etc., should be left until the last to avoid bending or breaking them.

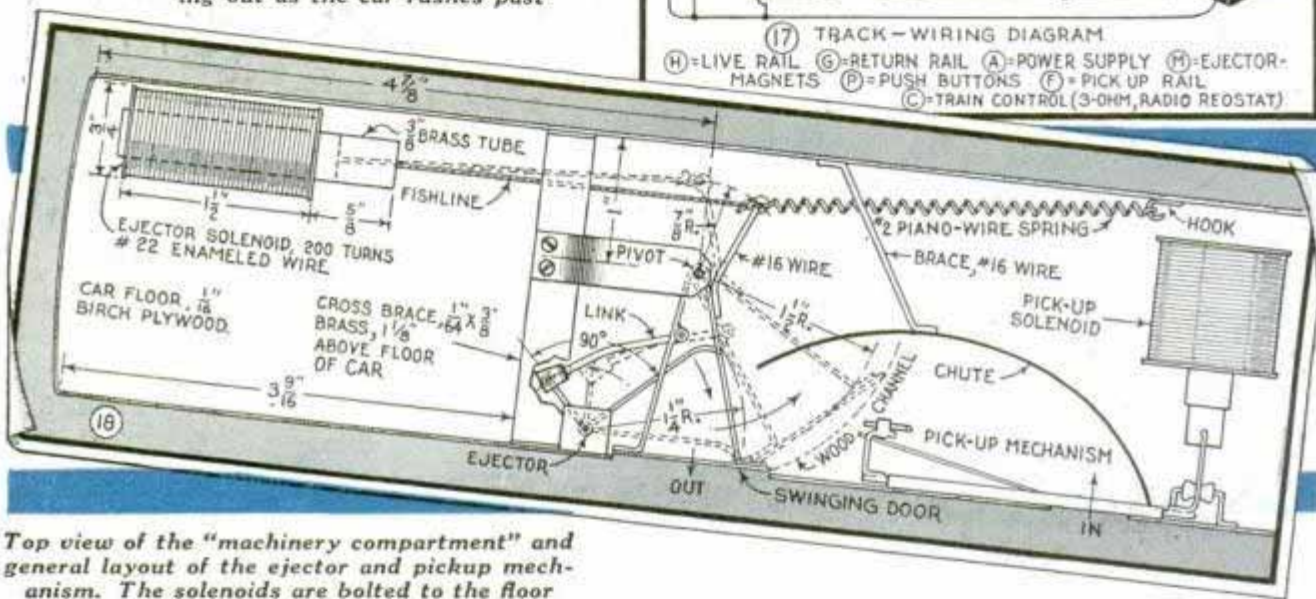




The tiny mail pouch comes bounding out as the car rushes past



(17) TRACK-WIRING DIAGRAM  
 (H)=LIVE RAIL (G)=RETURN RAIL (A)=POWER SUPPLY (M)=EJECTOR-MAGNETS (P)=PUSH BUTTONS (F)=PICK UP RAIL (C)=TRAIN CONTROL (3-OHM, RADIO REOSTAT)



Top view of the "machinery compartment" and general layout of the ejector and pickup mechanism. The solenoids are bolted to the floor

The four stationary car doors are made of thin sheet metal. Enough material can be obtained from a 2½ by 3½-in. film-pack case to make all of them. Your local photo finisher will give you one. Windowpanes in the doors are simulated with black, gray and white paint. The door at the rear end, Fig. 14 of Part I, is left black. Fasten the doors in place with celluloid cement. No doors are required for the right-hand "post-office" and "express" openings as these are part of the pickup and ejector system.

In addition to the electric motor, the pickup and ejector system take up most of the space inside of the car. There are two solenoids — electromagnets, which, when energized cause an iron plunger to move in a central tube. Both solenoids are bolted firmly to the car floor, which is thin

plywood. The ejector should be installed first, as the exact location of the pickup and the chute is dependent on the space occupied by the ejector mechanism. As shown in Fig. 17, the latter, which opens the swinging door and pushes out the mail pouch as in Fig. 16, is held in position by means of a coil spring made of No. 2 steel piano wire. When current energizes the rear solenoid, the plunger is drawn toward the center of the coil, pulling the fishline with it, which works the lever system. In a split second the current is turned off, the

plunger is released and the spring pulls the door shut. The pull of a solenoid is quick and violent. Therefore, the eye should be sweated securely into the plunger, Fig. 20, and the strongest and most flexible fishline available should be used. The pull begins just as the plunger enters the coil and drops off as it passes the center. To get the snappiest action, the plunger should lie at rest with one end just inside the coil. The pivot for the swinging door, Figs. 18 and 20, is sunk into a hole bored through the floor and underbody, and the upper end is braced by a bar soldered crosswise in the car. All of the bushings are loose fits so that the entire assembly is free to move without binding. The door must be slightly smaller than the opening.

The pickup mechanism works as follows: The mail pouch, which is suspended be-

tween the arms of the mail crane on the platform as in Fig. 15, is released from the crane by the pickup arm in the car, Fig. 19, when the arm is raised to a horizontal position by the solenoid that controls it. A chute guides the pouch so that it reaches a position at rest in front of the closed swinging door from which it will be pushed out later. The pickup mechanism is detailed in Figs. 18, 22 and 23. As the contact shoe (Figs. 4, 8 of Part I, and Fig. 16 of this installment) engages the pickup rail, the solenoid pulls in the plunger. The attached fishline passes over a pulley and up to a lever arm which pulls down the parallel

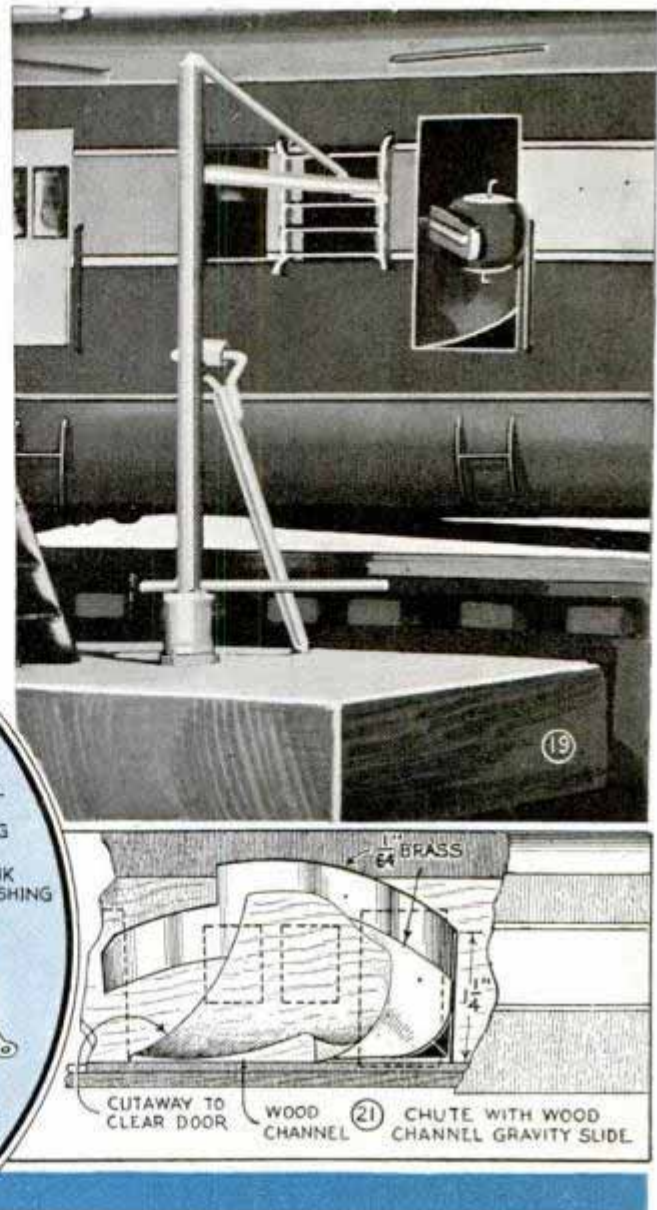
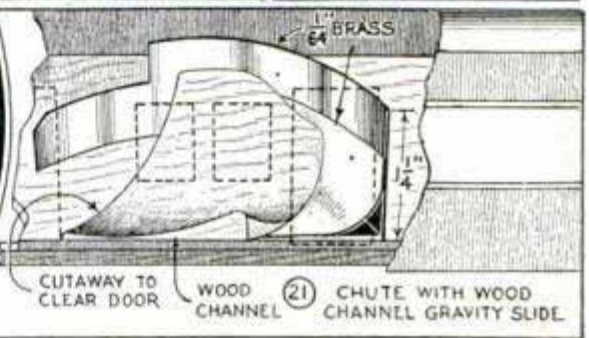
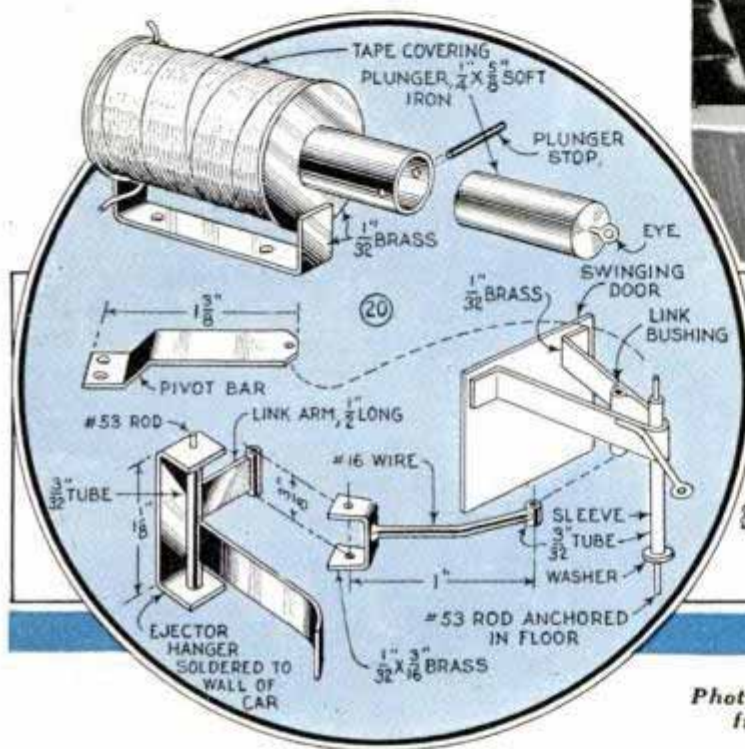


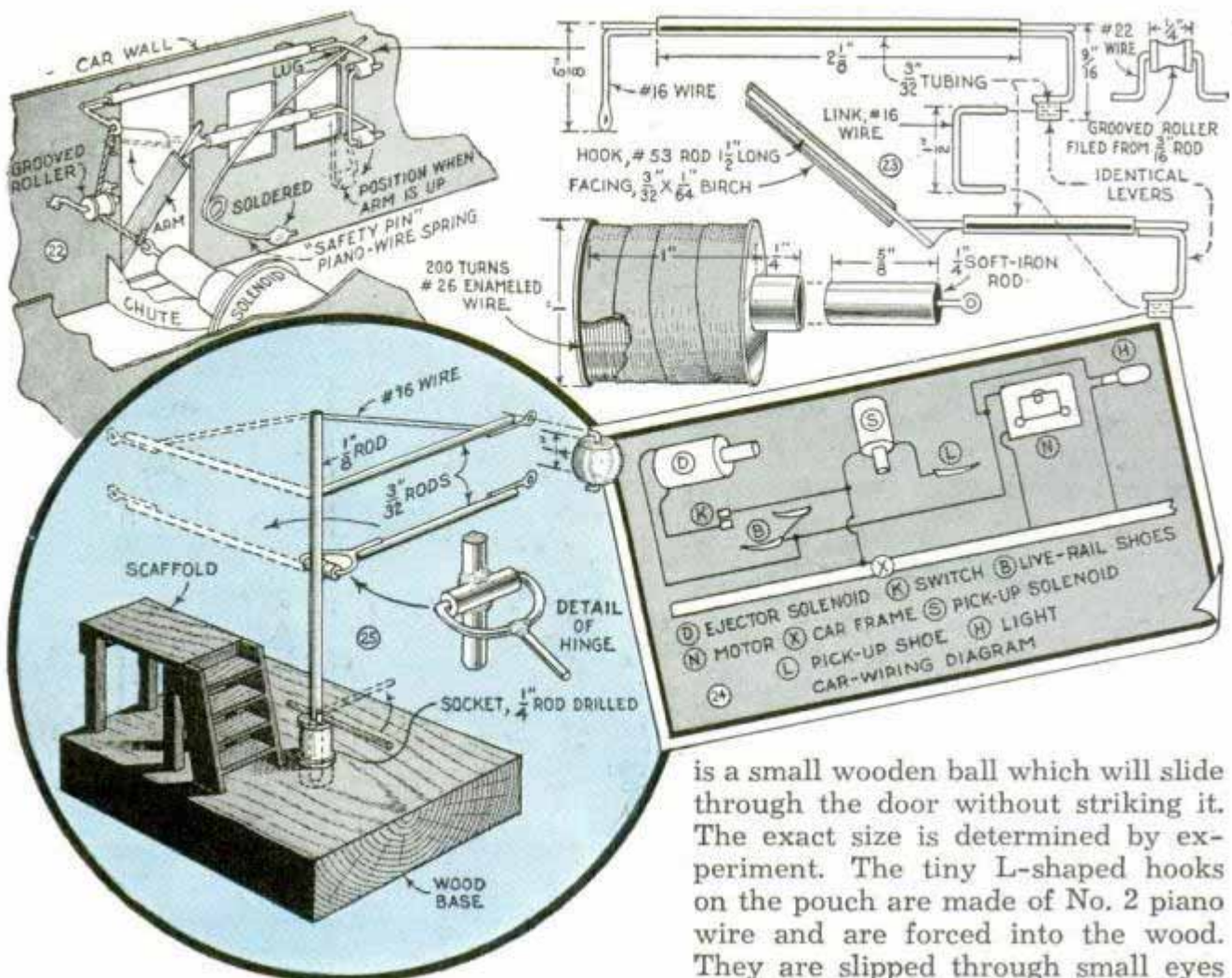
Photo above shows the mail pouch being snapped from the crane and whisked inside of the car



linkage, holding the levers tight against the car wall, out of the path of the pouch, and also raising the pickup arm to the horizontal position. The moment current supplied to the solenoid is cut off, the "safety-pin" spring snaps the assembly back to normal position. This is a length of piano wire, bent as shown in Fig. 22. The quickness of the return is dependent on the strong leverage action of the spring. It is adjusted so that the solenoid is just able to pull it down. A wire lug, soldered crosswise on the upper lever arm, holds the spring in position. See Fig. 22. To increase or decrease the spring pressure as may be necessary for best action, unsolder its lower end from the car wall and then resolder it after moving the required distance. The entire spring must be free to move, touching the lug only. The pickup arm is a flat

birch paddle cemented to a length of drill rod. See Fig. 23. The wooden paddle absorbs the shock of impact and keeps the pouch from rebounding when struck. The angle at which the arm projects forward from the car is determined by experiment. Besides changing the angle as may be necessary, the speed of the car may have to be varied for best results.

The mail-pouch chute consists of a sheet-brass deflector and a carved wooden gravity slide or trough, which is detailed in Fig. 21. These two pieces are both shaped by the "cut-and-try" method so that the pouch will roll against the ejector arm behind the swinging door. Part of the deflector can be seen in Fig. 19. The general idea of the shape and function of the chute is made clear in Fig. 1 of Part I, although this illustration does not show the gravity



slide, which is wedged between the deflector and the car wall.

All wiring details are given in Figs. 17 and 24. If you already have a rather complete control board for your system, the addition of two push buttons will accommodate the new controls. With these push buttons you operate either the pickup or ejector mechanisms as desired. After all parts have been installed and the wiring has been completed, nut and bolt heads should be given an application of celluloid cement to keep them from loosening from vibration. Also be sure to inspect and oil the mechanism periodically. Non-gumming oil should be used.

Construction of the mail crane comes last. No dimensions can be given as it must be built to fit your layout and car. However, the general arrangement is given in Fig. 25. The crane is made of drill rod, painted white, and set in a socket so that it can be swung out when needed and back against the scaffold at other times. The upper arm is rigid while the lower one is hinged to keep a constant tension on the pouch. It drops down the moment the pouch is released as in Fig. 19. The pouch

is a small wooden ball which will slide through the door without striking it. The exact size is determined by experiment. The tiny L-shaped hooks on the pouch are made of No. 2 piano wire and are forced into the wood. They are slipped through small eyes cut from fishhooks, which are soldered to the arms of the crane. A piece of plush or bath toweling laid on the platform will keep the pouch from bouncing when it is ejected from the car, or a picket fence may be built around the edge of the platform to retain it.

### Electric Shaver Is Kept Clean by Dipping in Alcohol

Your electric shaver will stay in good condition indefinitely if the clipper portion is dipped in alcohol about twice a week to keep it from gumming. Just insert it in the liquid to a depth of 1/4 or 1/2 in. while it is running. Leave it in the alcohol for a minute, then remove and shake it dry. Follow this with a few drops of fine oil while the razor is still running.

—Edward Wisnewsky, Racine, Wis.





# Two-Piece Flower Vase Leads a Double Life



Turned of hardwood, this two-piece "vase" to accommodate artificial flowers will stand on a table or it can be pulled apart quickly and the matched halves can be hung on each side of a picture, window or doorway. You can glue two blocks to a paper separator and then do the turning, after which the pieces can be pulled apart. Or, you can turn the vase from a single block and then saw it in two exactly along the centerline, although this method may not result in a good fit because the saw cut reduces the diameter. A snug fitting dowel holds the two pieces together. Mark for

drilling the dowel hole by placing a small ball or shot between the two halves at the right location. After the edges are aligned, press the pieces together firmly, which leaves a dent for drilling. A number of small holes about  $1\frac{1}{2}$  in. deep are drilled in the top to take flower stems and a small wire loop is provided at the top of each half for hanging. Each loop must be flush with the flat surface. Finishing is done with lacquer or enamel.

## Fisherman Keeps His Plugs Handy on Rack Inside Boat

When fishing from a boat, one sportsman arranges his favorite plugs and lures in a slotted rack screwed to the side of the boat. In this position, any of the lures can be selected with one hand at a glance, without laying down the rod and going through the tackle box with both hands. The rack is simply a wood block with slots in one edge. The other edge is shaped to the curvature of the boat to make a neat fit where it is attached. Notice that the ends of the rack are cut at a bevel so that screws can be driven into them at an angle for fastening it in place. If hardwood is used for making the rack, it will be less likely to split or break off if unusual pressure is accidentally put on it.

—G. E. Hendrickson, Argyle, Wis.



## Level in Plumb Board Saves Time When Fitting Door Jambs



To save time, and to leave one hand free for driving wedges between a door jamb and the frame when checking the jamb vertically, one carpenter set a spirit level in the side of his plumb board. Before mounting it with screws, it was adjusted for accuracy by checking with a level held against the straight edge of the board.

## Shrubs Shaped by Rubber Bands

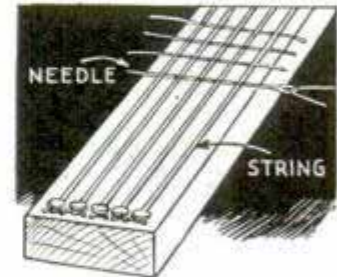
The shrubs in the photo were made to grow to the shape shown by wrapping them with rubber bands cut from an old inner tube. The bands were about  $\frac{1}{2}$  in. wide



and were just tight enough to hold the branches in position. The elasticity of the rubber allows movement of the shrubs in the wind without chafing the bark, and does not bind the branches enough to interfere with the flow of sap.

## Easy Method of Making Ratlines for Ship Models

Elaborate ratlines for small ship models can be made easily by the following method: Fasten a number of lines securely to a wood block, getting them as



close to each other as possible. Next take a small needle and thread and pierce each cord successively. Then draw the thread through, cut it off, and repeat the procedure. Leave plenty of extra thread so that none of the ends will be too short when the lines are spread for mounting.

—Robert Hegeman, Waukon, Ia.

## Index Tabs Made with Typewriter



Desiring to index my phonograph album, I did the job neatly by making the figures with a typewriter. They were typed on a strip of gummed-paper tape, punched out with a punch used to put holes in loose-leaf note

books and stuck to the pages of the album. Corresponding figures were stuck in the front of the album and the titles of the records were written beside them for quick reference.—D. Henningfeld, Madison, Wis.

### EVERYBODY IS AN INVENTOR

Nearly everybody has discovered some kink or shortcut to happily solve one of those seemingly trivial problems encountered in every home or in a person's work, hobby and play. But the solution may have saved time, money and energy. We pay readers for such ideas. Just submit a sketch or photo and a brief description to our Homecraft Editor. If acceptable for publication, we will send you a check promptly and if we cannot use it, the material will be returned

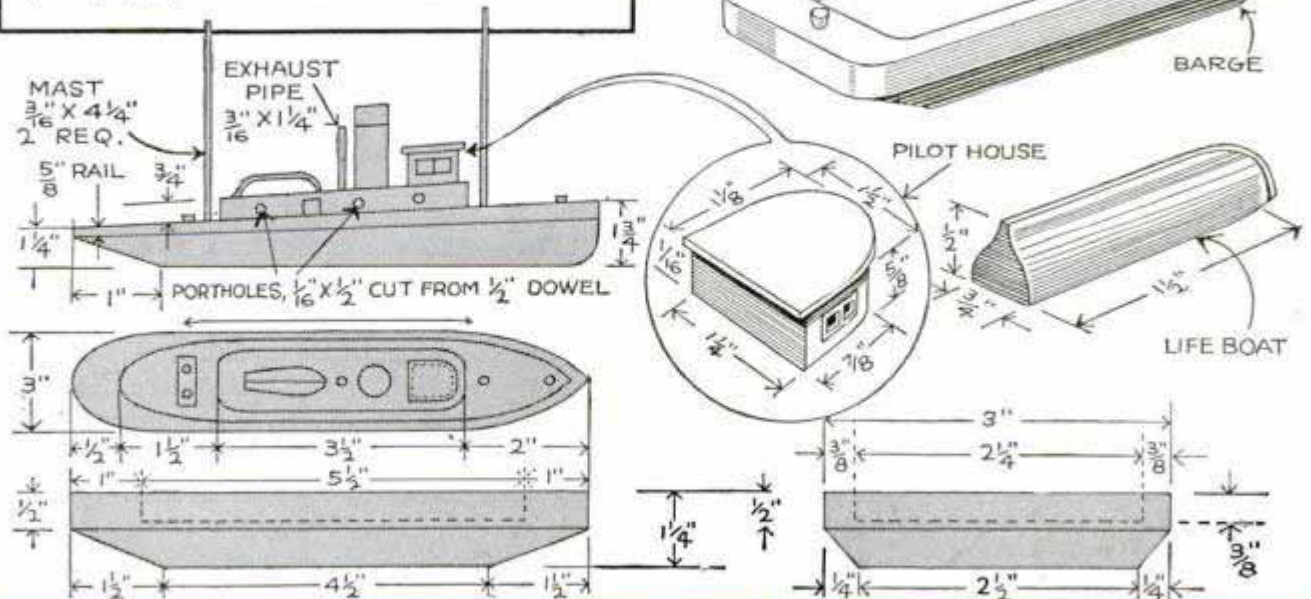
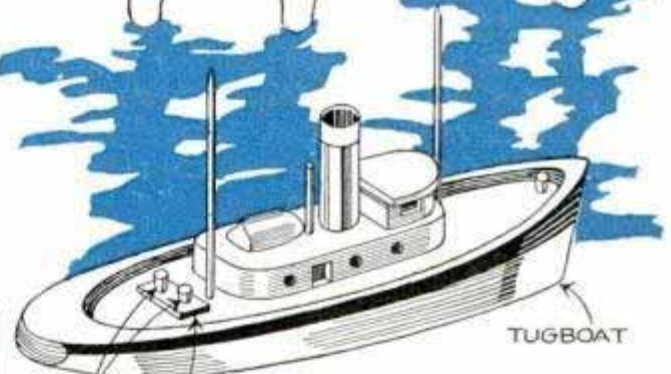
# Hours of fun with this TUGBOAT and BARGE



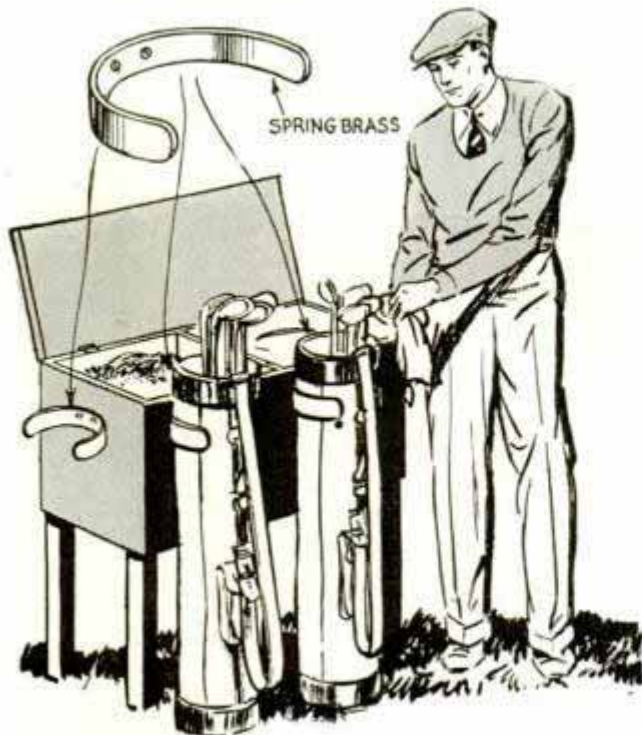
This realistic tugboat with its freight barge in tow will help satisfy that sea-going urge that crops out in most small boys. The hull is shaped from a piece of pine  $1\frac{1}{8}$  by 3 by  $7\frac{1}{2}$  in., and the cabin and pilothouse are separate parts glued and bradded to the deck. Every ship must have its lifeboat, of course, and no tugboat skipper would be satisfied without a freight barge. Both are shaped to the dimensions given, and the lifeboat is inverted on the pilothouse. Bitts are provided on the barge and tug for a tow rope, and the assembly is painted according to the color chart

## COLOR CHART

TUGBOAT—Hull and rail, green; bottom of hull, black; cabin, pilot house, bitts, yellow; deck, lifeboat, masts, varnish; stack, exhaust pipe, black and red; portholes, doors, black; glued strips of black leather form window outline; skylight, yellow.  
BARGE—Hull, green; bottom of hull, black; bitts, yellow. After painting, apply spar varnish all over both boats.



## Spring Clips Support Golf Bag Leaned Against Tee Box



Screwed to the sand boxes at the tees of a golf course, these spring clips prevent the players' bags from falling down when leaned against the boxes. The clips are made from spring brass and are attached to the boxes with screws.

## Dust Mask for Scraping Boat

When scraping paint from a boat or other places where the work is above the head, this simple mask will keep dust and paint particles from getting in the eyes, nose and throat. The mask is nothing more than a piece of muslin or other cloth sewed sack fashion to fit closely over the head

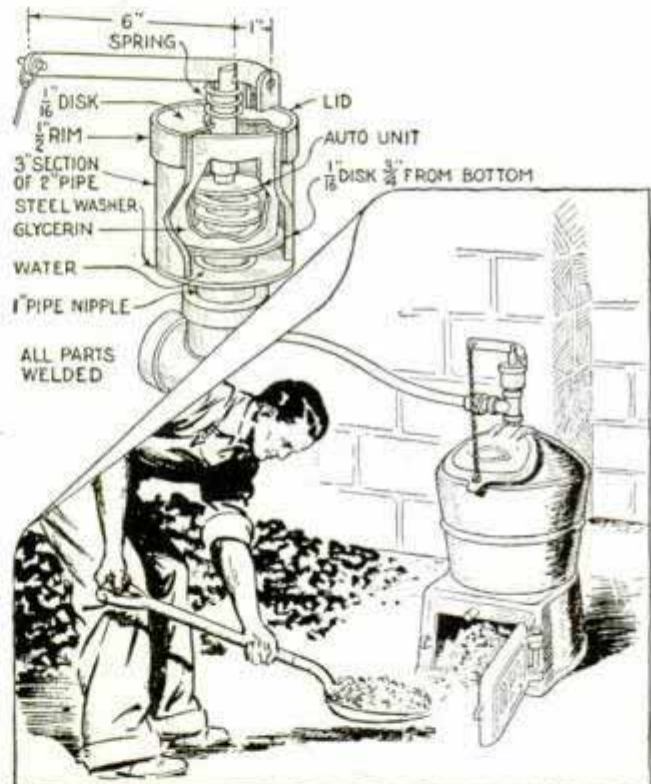


and shoulders. A celluloid window sewed over an opening in front of the face provides clear vision.

—J. I. Madigan, Rockville Center, N. Y.

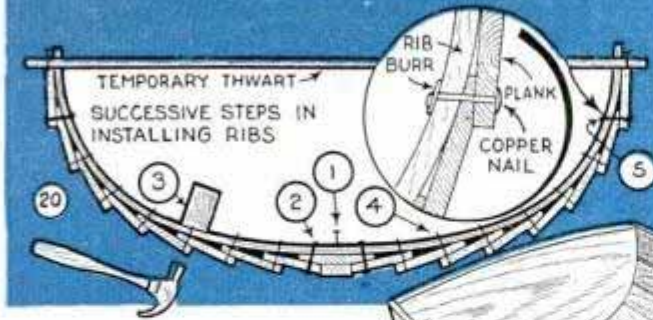
## Homemade Thermostat Controls Drafts on Water Heater

If the water for your home is heated by a coal-burning heater, you can make a thermostat for controlling the drafts. The main part of the unit is a poppet-type thermostat used in car cooling systems. The housing of the assembly is a 3-in. length of 2-in. pipe divided about  $\frac{3}{4}$  in. from the bottom by a metal disk welded into place. A large steel washer to which a 1-in. pipe nipple is welded forms the bottom, which is welded in place. A cap or lid is made by welding a disk to a  $\frac{1}{2}$ -in. rim. A  $\frac{1}{2}$ -in. hole drilled in the center of



the cap takes a connecting link, which joins the thermostat element to the operating arm. The housing now has two compartments, the lower one for hot water and the upper one for the element. Two machine screws through the outer housing and top of the support posts anchor the element in the housing. A bracket to pivot the operating arm is welded to the rim of the lid. A chain connects the operating arm to the heater lid. The upper compartment containing the thermostat element is filled with glycerin for greater sensitivity.

# "ZEPHYR" - a Sailing Dinghy



By  
**CHAS. H. McALARY**

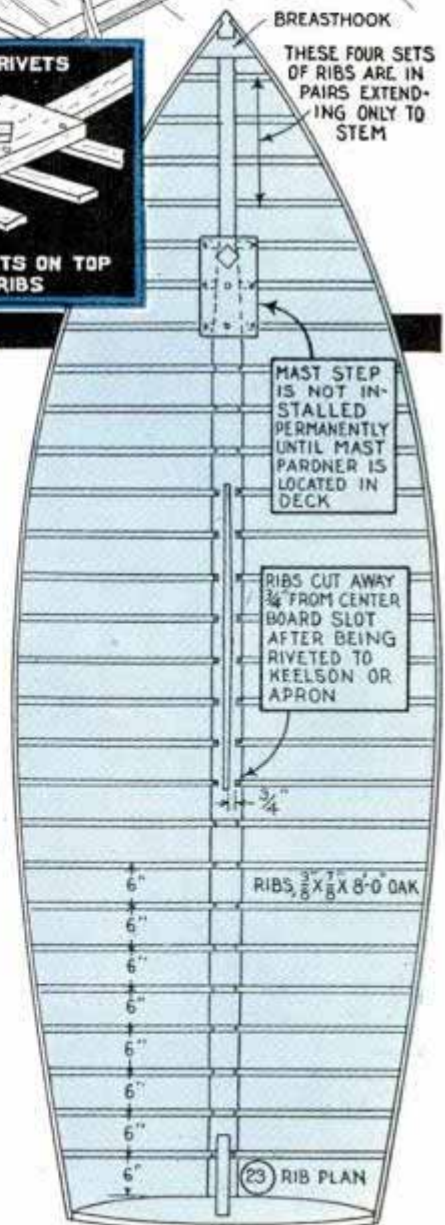
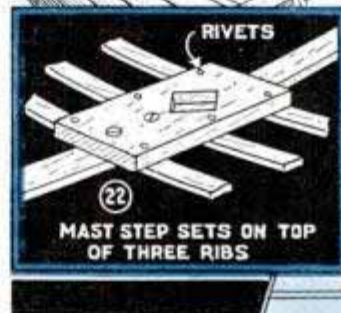
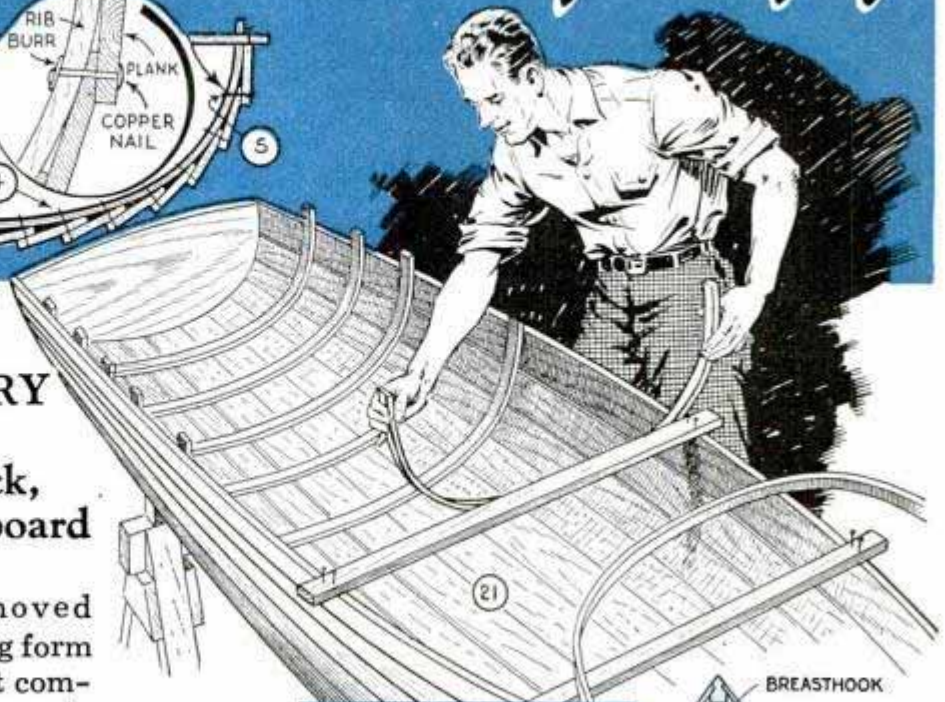
## Part II — Ribs, deck, cockpit and centerboard

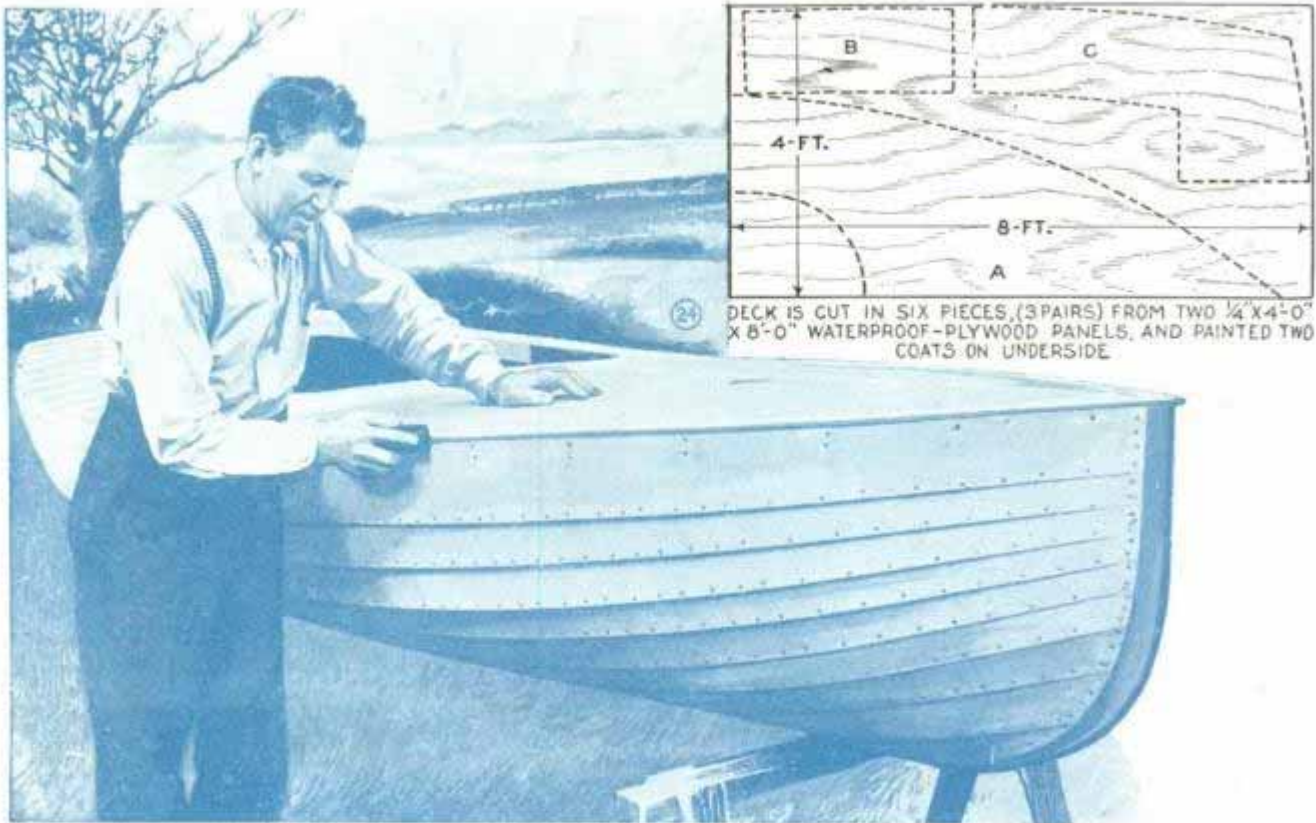
WITH the hull removed from the assembling form and the inside of the boat completely painted, you are ready to install the oak ribs which are bent to shape. Block up the hull on a pair of sawhorses and nail two or three temporary thwarts or cleats across the gunwales, as in Figs. 20 and 21. Small finishing nails driven part way into the sheer strakes will be sufficient to hold these, as the ribs, when installed, exert little outward pressure.

Before the ribs can be bent, they must be steamed for about 20 min. This can be done in a long, narrow tank, or in an iron pipe, capped at the lower end and nearly full of water. The pipe is supported at an angle, with the lower end resting in a fire pit dug in the ground. The  $\frac{3}{8}$  by  $\frac{7}{8}$ -in. oak ribs, when thoroughly steamed, will become flexible. In selecting the stock for these, see that the grain runs straight.

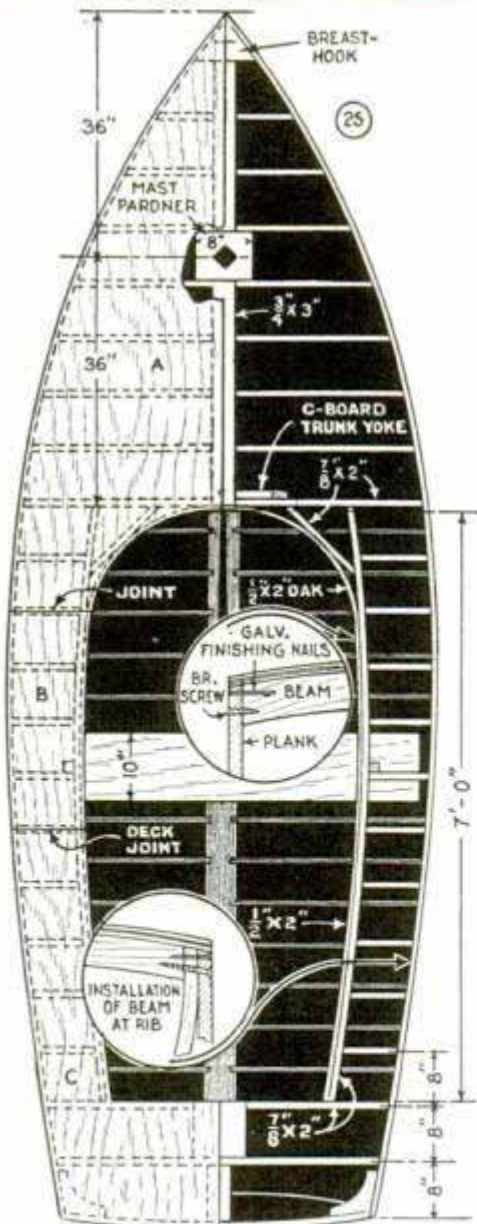
The procedure for fitting each rib is shown in Fig. 20. Step No. 1 consists of bending the rib and fastening it to the keelson with one galvanized nail. The second step is to rivet the garboard planks and keelson to the rib. Third, a copper nail is driven through planks and into the rib about midway between the keelson and the sheer strake, on each side, holding a scrap block against the rib on the inside to provide a solid backing which prevents splintering the rib when the nail comes through. Holes for the nails already have been drilled in the planks as explained in Part I. The fourth step is to drive the remaining nails in the rib, one through the lap of each plank. Step No. 5 is clinching the nails. This is done by placing a burr or washer over the protruding end of each nail, holding a weight against the head and hammering the nail point down flat as indicated in the circular inset of Fig. 20.

The plan view of the boat, Fig. 23, shows the spacing of





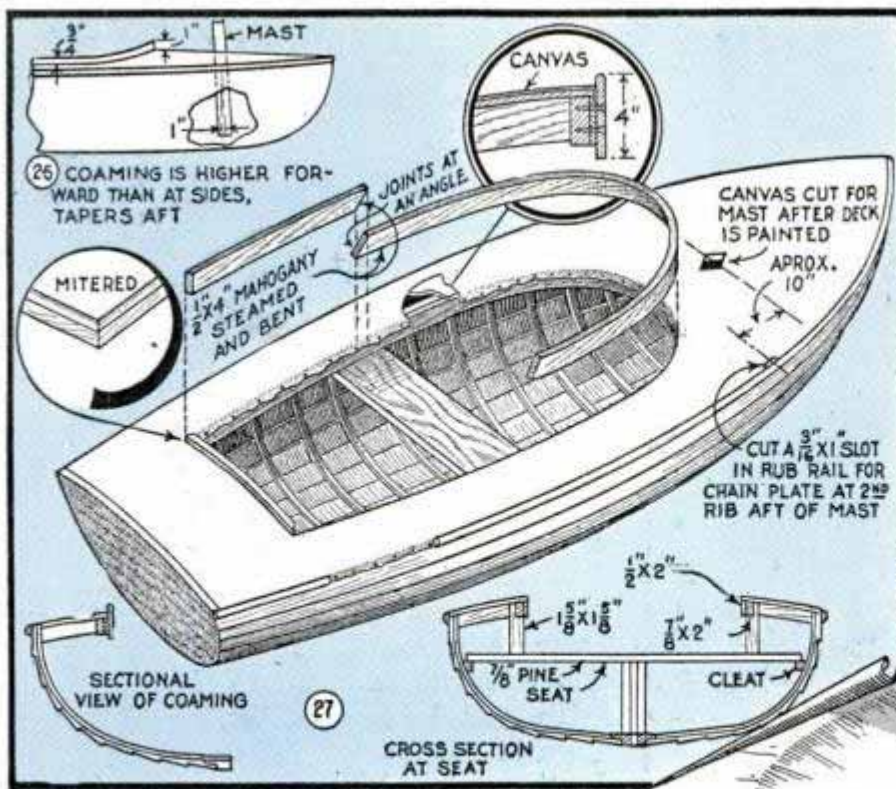
24 DECK IS CUT IN SIX PIECES, (3 PAIRS) FROM TWO  $\frac{1}{4}$ " X 4'-0" X 8'-0" WATERPROOF-PLYWOOD PANELS, AND PAINTED TWO COATS ON UNDERSIDE



the ribs. Note that they are spaced 6 in., center to center, beginning at the inside edge of the transom. The four ribs along the stem and knee, however, are divided into pairs, the lower ends being butted against the stem and knee. Eight ribs amidships, over the centerboard slot, are riveted to the keelson, like the others, and later cut away for the centerboard slot. There should be at least a  $\frac{3}{4}$ -in. space between the ends of the cut-off ribs and the edge of the centerboard slot, to later admit the centerboard trunk. In this plan, the mast step is shown, but it is better to locate it permanently after the mast pardner is installed in the deck, as it is easier to move the step fore or aft, to make an adjustment, than the mast pardner, especially after the deck is laid. The step arrangement, given in Fig. 22, can be made to set on the ribs, or rabbeted to straddle them.

The curved deck beams just ahead of the cockpit have a crown of  $2\frac{1}{2}$  in. and are bandsawed from  $\frac{7}{8}$ -in. pine. Toward the stem and transom this curve is gradually flattened out. You will notice from Fig. 25 that the beams are spaced 8 in. apart at centers, while the ribs are only 6 in. apart. Therefore a beam and rib will meet at the gunwale only occasionally, and when this occurs, they are fastened as shown in the lower circular detail of Fig. 25. In this case, a galvanized finishing nail and a bronze screw are used at each joint, the nail head being covered later with the rub rail. The seat is supported at the ends by cleats fitted across three ribs. Short uprights to brace the edge of the cockpit, are screwed to the top of the seat as shown in Fig. 27. The center of the seat is supported by the end of the centerboard trunk.

Referring to the deck plan, Fig. 25, you will note a

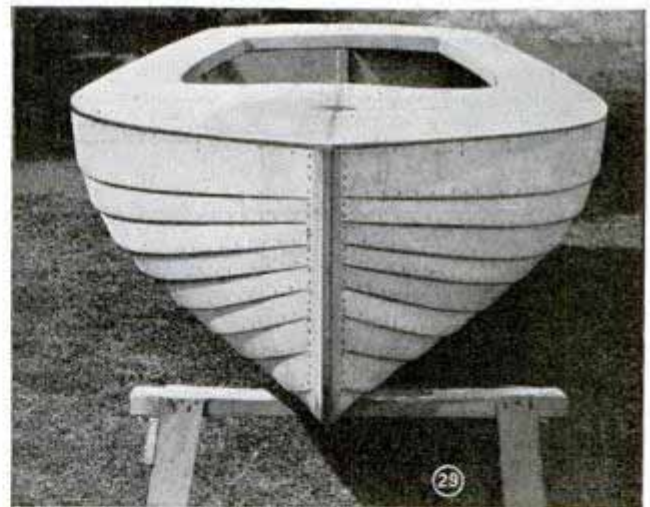


STRETCHING THE CANVAS

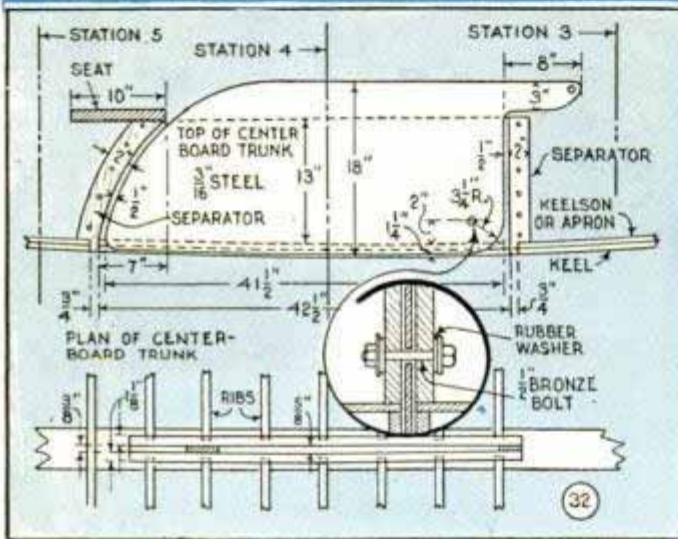
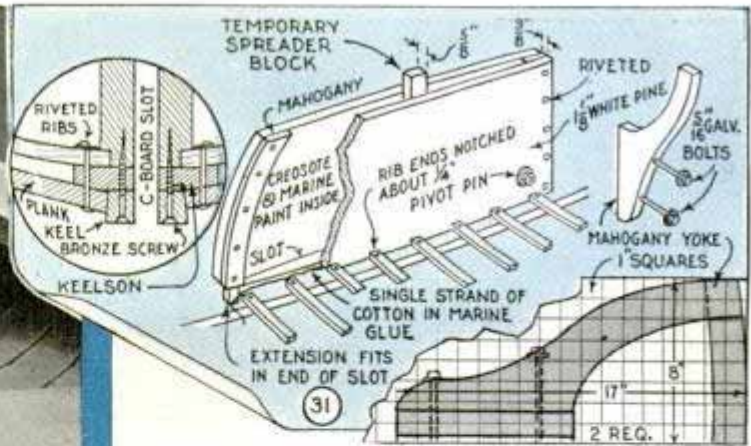
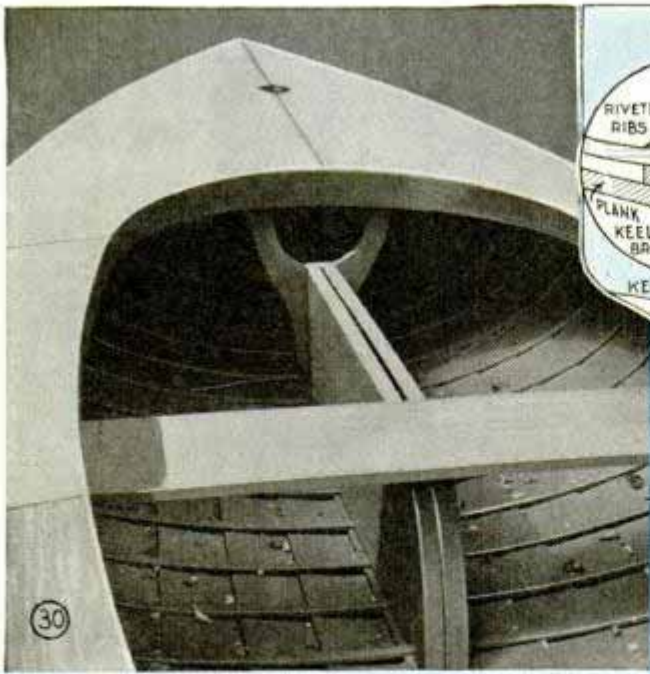
double frame on each side of the cockpit. The outer one is of  $\frac{7}{8}$ -in. pine, while the inner one, forward of the seat, is  $\frac{1}{2}$ -in. oak, steamed and bent. Aft of the seat, the  $\frac{1}{2}$ -in. piece is merely a filler and can be of pine. A breasthook is installed at the stem, and knees are fitted at the transom, also shown in Fig. 25. The mast partner is permanently located between two deck beams, approximately midway between the stem and forward end of the cockpit.

The plywood deck panels A, B and C, Fig. 25, are three separate pieces on each side, with the joints centered on the beams and on battens recessed in the beams along the centerline of the deck. The plywood, which should be the waterproof kind, is brought to the outer edge of the planking and the inner edge of the cockpit. The six pieces are bandsawed from two 4 by 8-ft. panels of  $\frac{1}{4}$ -in. plywood. In cutting, allow about  $\frac{1}{8}$  in. for planing flush, Fig. 24. The detail of Fig. 24 shows how the plywood sheets are laid out for cutting. Paint the beams and the underside of the plywood pieces before nailing them to the deck with galvanized finishing nails.

While it would be somewhat more convenient to fit the centerboard trunk before installing the beams, it can be done afterward. In either case, be sure that the lower edges of the side boards follow the same curve as the keelson and fit perfectly, as most sailboats develop leaks at this point. Make a template of plywood to lay out the



curve, and then fit it to the keelson. The sides of the trunk must be notched in about  $\frac{1}{4}$  in. for the ends of the ribs. The notching helps to prevent the ribs from coming loose if the bottom should receive a severe bump. In the side, sectional view, Fig. 32, note that the ends of the separators fit down into the ends of the centerboard slot. This special feature of the "Zephyr" makes a watertight joint. Location of the centerboard pivot bolt is also given in Fig. 32. The bolt, which should be of bronze, is made watertight by means of rubber washers placed under steel washers. A  $\frac{3}{16}$ -in.

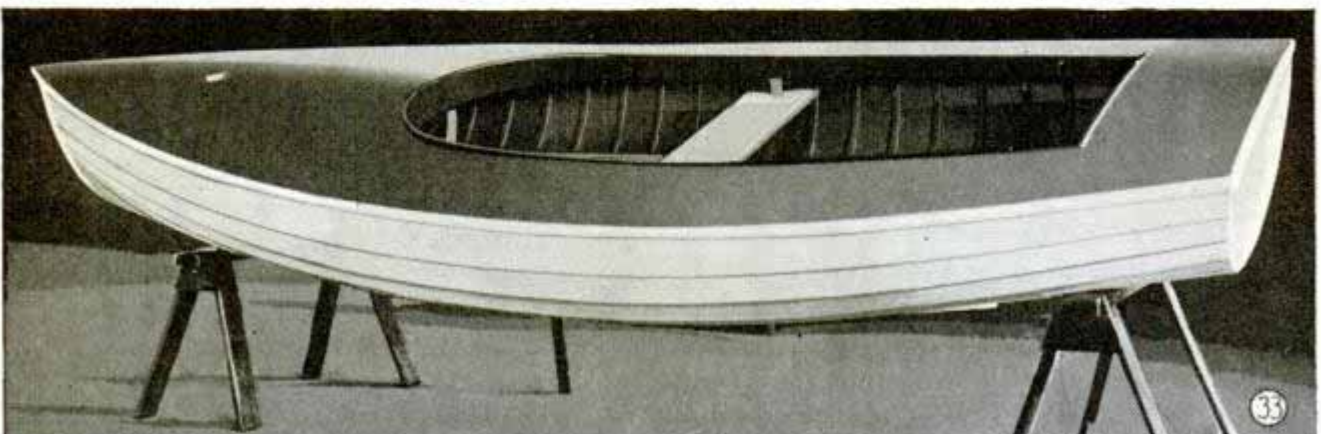


centerboard is specified here. However, for beginners, the additional weight provided by a  $\frac{3}{8}$ -in. centerboard helps to prevent capsizing. If the latter size is used, the width of the well will have to be increased accordingly. Fig. 31 shows how the centerboard trunk is fitted to the keelson. A single strand of cotton candle wicking is laid in marine glue, around the slot, and a spreader block is left in the trunk until it is

screwed to the keel assembly. Before being put together, the inside of the trunk is painted with creosote and marine paint. The cross-section detail, through the slot, shows how securely the trunk is fastened to the keel unit with long, bronze screws, while Fig. 30 shows how rigidly it is braced at the top by the seat and yoke. Details of the mahogany yoke are given in Fig. 31. The centerboard should be galvanized heavily especially if the boat is to be sailed in salt water.

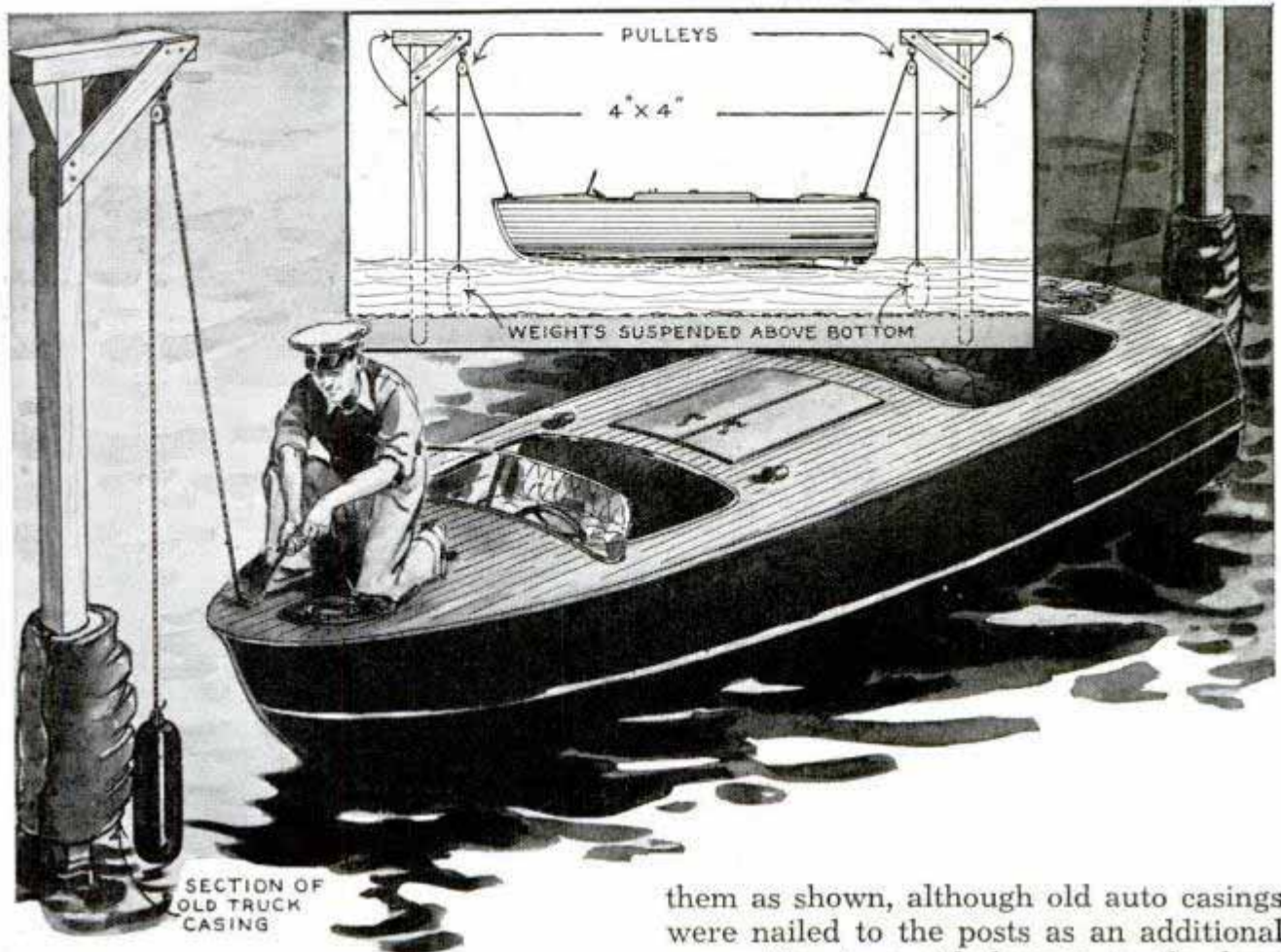
After the plywood has been given two or three coats of paint, and this has dried thoroughly, you cover the entire deck, including the cockpit, with a piece of No. 10 duck canvas, measuring 6 by 15 ft. Stretch the canvas over the deck, copper-tacking it along the gunwales and the transom, after which the edge of the canvas is covered by a rub rail. Next, block up the hull and walk on the canvas over the cockpit as in Fig. 28, which removes the slack before tacking to the edge of the cockpit. Fig. 29 shows the canvas after being applied.

A neat, low coaming is shown in Figs. 26 and 27. This is fastened with oval-head, bronze screws. The coaming projects about 1 in. above the deck in front and tapers down to about  $\frac{1}{2}$  in. aft, Fig. 33.





# Counterweights Keep Small Boat in "Stall"



One small-boat owner, who found his craft frequently endangered by rough water caused by storms and strong tides, provided a "stall" in which the boat was held by means of counterweights. Two 4 by 4-in. posts were sunk into the sandy bottom so that there would be plenty of clearance when the boat was located between

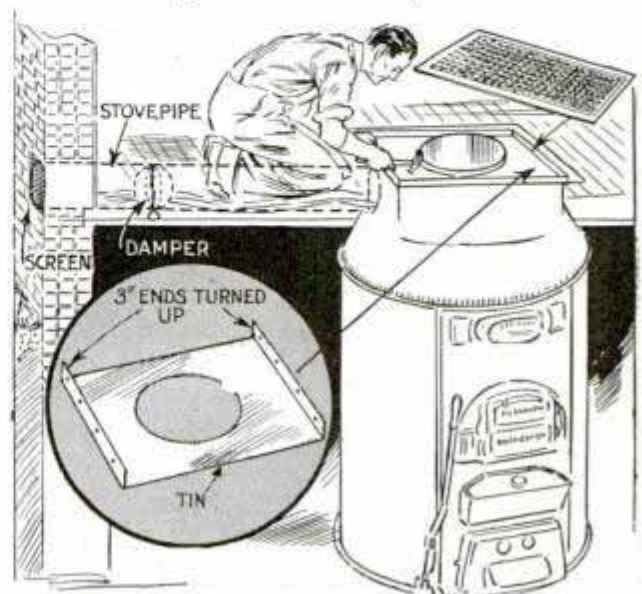
them as shown, although old auto casings were nailed to the posts as an additional precaution to avoid damage to the boat should it batter against them. Weighted ropes running through pulleys attached to cross beams at the top of the posts hold the boat in position and yet allow some movement. The weights, which must be proportional to the size of the boat, are suspended above the bottom.

—John J. Southard, Tuscaloosa, Ala.

## Cold Air from Outdoors Improves Operation of Furnace

After installing a pipeless furnace in our home, we found that the air immediately above the floors was cold and damp because it did not circulate back to the furnace properly. To overcome this, we blocked off the cold-air return part of the register with tin, and then ran a pipe from the furnace through an outside wall as indicated. Now we have an abundant supply of fresh, warm air being delivered into the house, and all drafts and cold air on the floors have been eliminated, as incoming fresh air causes the stale air to escape through the natural exits of the house, such as windows and doors.

—Amos C. Bontell, Lenox, Mass.



## Notched Spade Removes Flooring without Undue Damage



Removal of single flooring or sheathing without damaging it excessively can be done with an old spade having a notch in the end. The notch should be of a size to straddle the joists so that the prying action is imparted to the floor board on both sides of the timber.

## Abrasive Sticks Clean Erasers

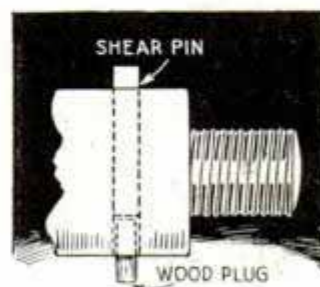
Artists and others who have to clean their erasers frequently will find bird-cage perch refills just the thing for the purpose. The abrasive is coarse, and the sticks are easy to handle by gripping them between the fingers as indicated. The refills are of



the type used to slip over bird-cage perches so that the bird can keep its toenails in condition, and can be purchased at any store dealing in bird supplies.

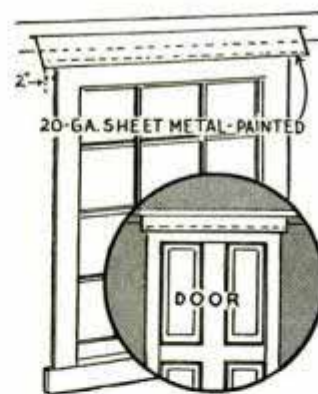
## Safe Substitute for Shear Pin in Boat Propeller

Instead of substituting a nail or piece of wire for a broken shear pin in a boat propeller, until repairs can be made, try the following method: Push the remaining part of the pin so that one end projects slightly through the propeller hub. Then drive in a wooden plug against the pin so that the plug projects slightly on the opposite side of the hub. This repair is better than a nail or wire because it will break if the propeller strikes a rock or other obstruction under water, whereas a nail or wire is not likely to shear off.



—V. O. Marquez, Montreal, P. Q., Can.

## Metal Drip Cap over Door Casing Prevents Entrance of Water



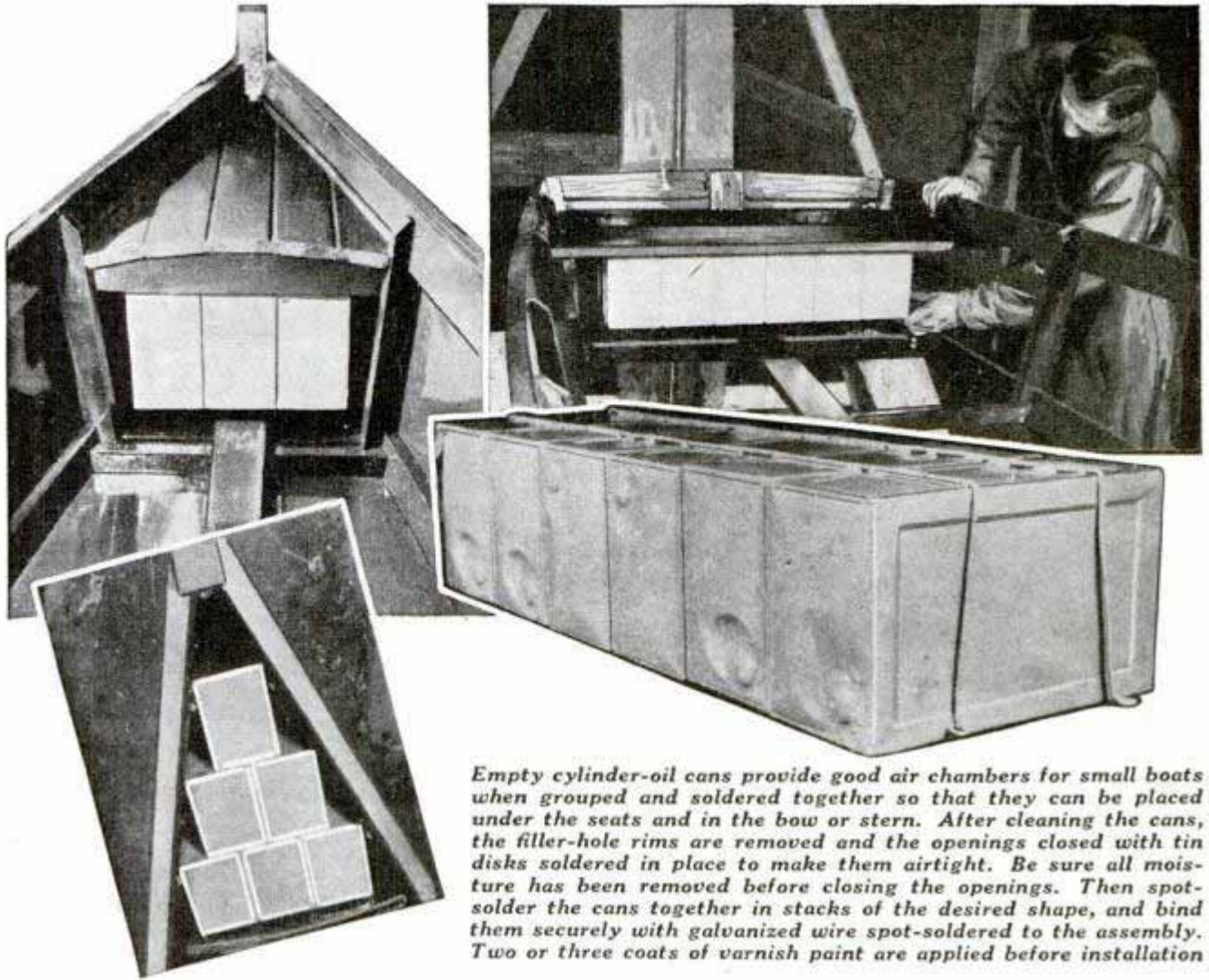
During my 30 years of carpentering, I have found many door and window casings rotted by water which worked over the wood cap at the top of the casing. To prevent this, I install a metal drip cap that

projects down and over the casing about 2 in. from the wall. The cap is a strip of sheet metal painted and then set in a groove cut through the siding and part way into the weatherboarding. All cracks where the cap is installed should be put-tied carefully and painted.

—Claud Burriss, Joplin, Mo.

☞ Lace curtains may be dried evenly without stretchers by putting them back on the rods while wet and slipping a pole through the lower hem to weight them down.

# Lightweight Air Chambers in Small Boats



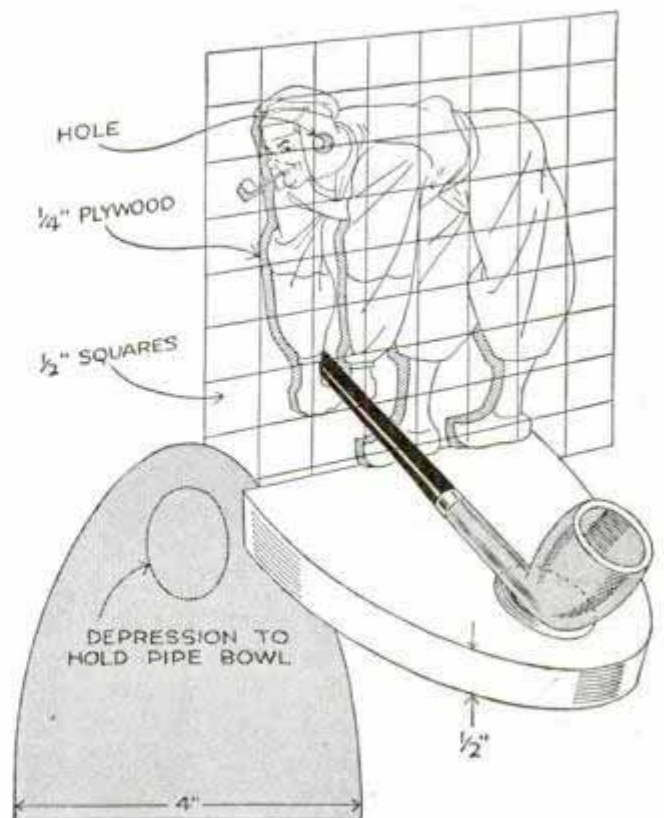
Empty cylinder-oil cans provide good air chambers for small boats when grouped and soldered together so that they can be placed under the seats and in the bow or stern. After cleaning the cans, the filler-hole rims are removed and the openings closed with tin disks soldered in place to make them airtight. Be sure all moisture has been removed before closing the openings. Then spot-solder the cans together in stacks of the desired shape, and bind them securely with galvanized wire spot-soldered to the assembly. Two or three coats of varnish paint are applied before installation.

## Jigsawed Dutch Boy Holds Your Pipe with Both Hands

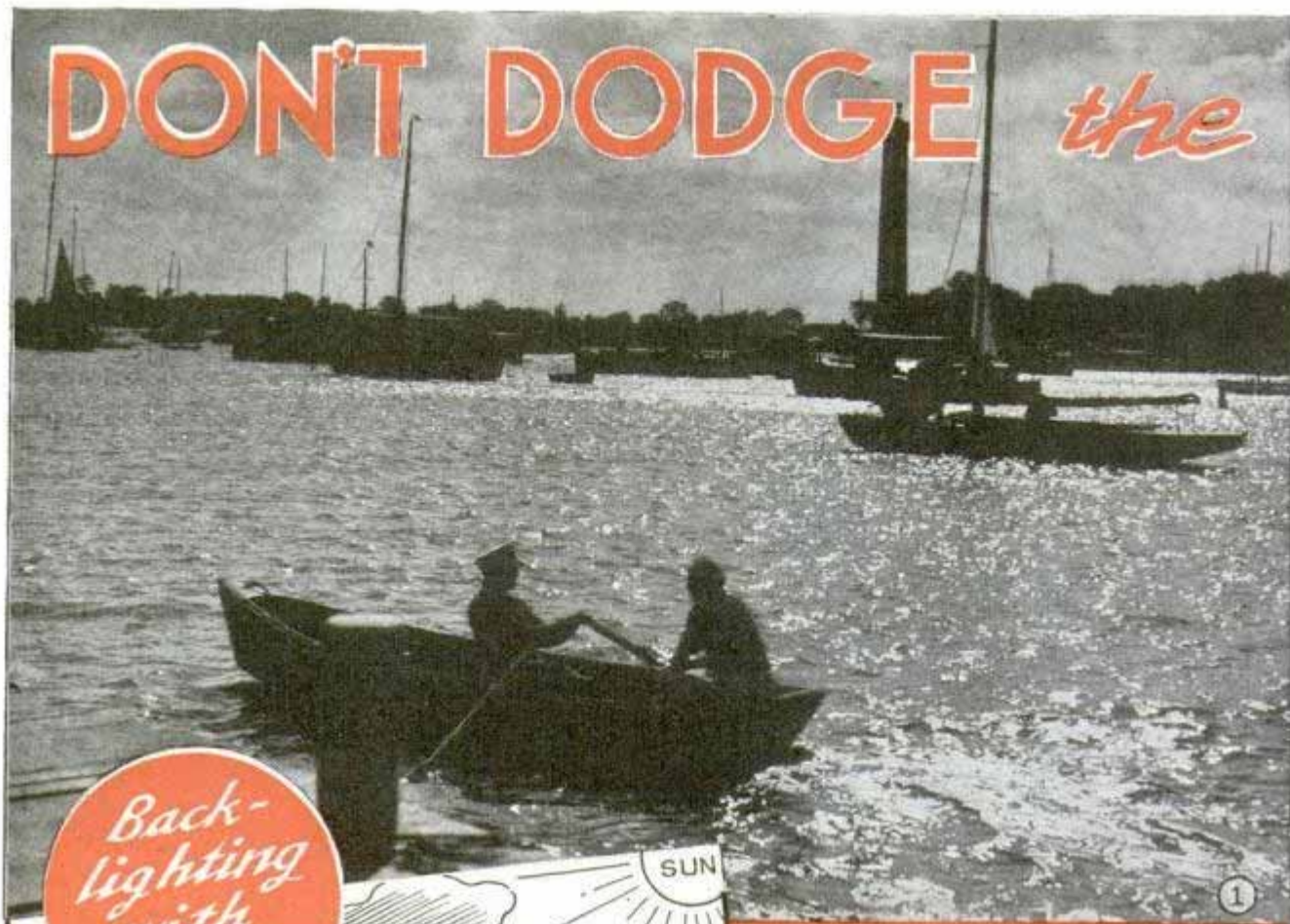
This holder will provide a novel decoration to your smoking set. The figure is scrollsawed from  $\frac{1}{4}$ -in. plywood and the base is of  $\frac{1}{2}$ -in. solid stock. Tenons extending down from the feet fit snugly in holes in the base to support the figure, which is sanded and painted in appropriate colors. Note that a small oval depression is made near the end of the base to take the pipe bowl so that it will not tip.

### Flushing Sink Drain with Lye

If you are in the habit of using lye to keep your sink drain from clogging, always use potash lye instead of the soda type. Potash lye forms a soft soap when it comes in contact with grease, while the soda type forms a hard soap that is almost impossible to remove. After using the potash lye, flush the drain with liberal quantities of hot water to be sure all of the soft soap is washed away.



# DON'T DODGE *the*



*Back-lighting with details*

①



LENS HOOD

②

IN "BACK-LIGHTING" SUN IS AHEAD OF CAMERA



③

IN "FRONT-LIGHTING" SUN IS BEHIND THE CAMERA

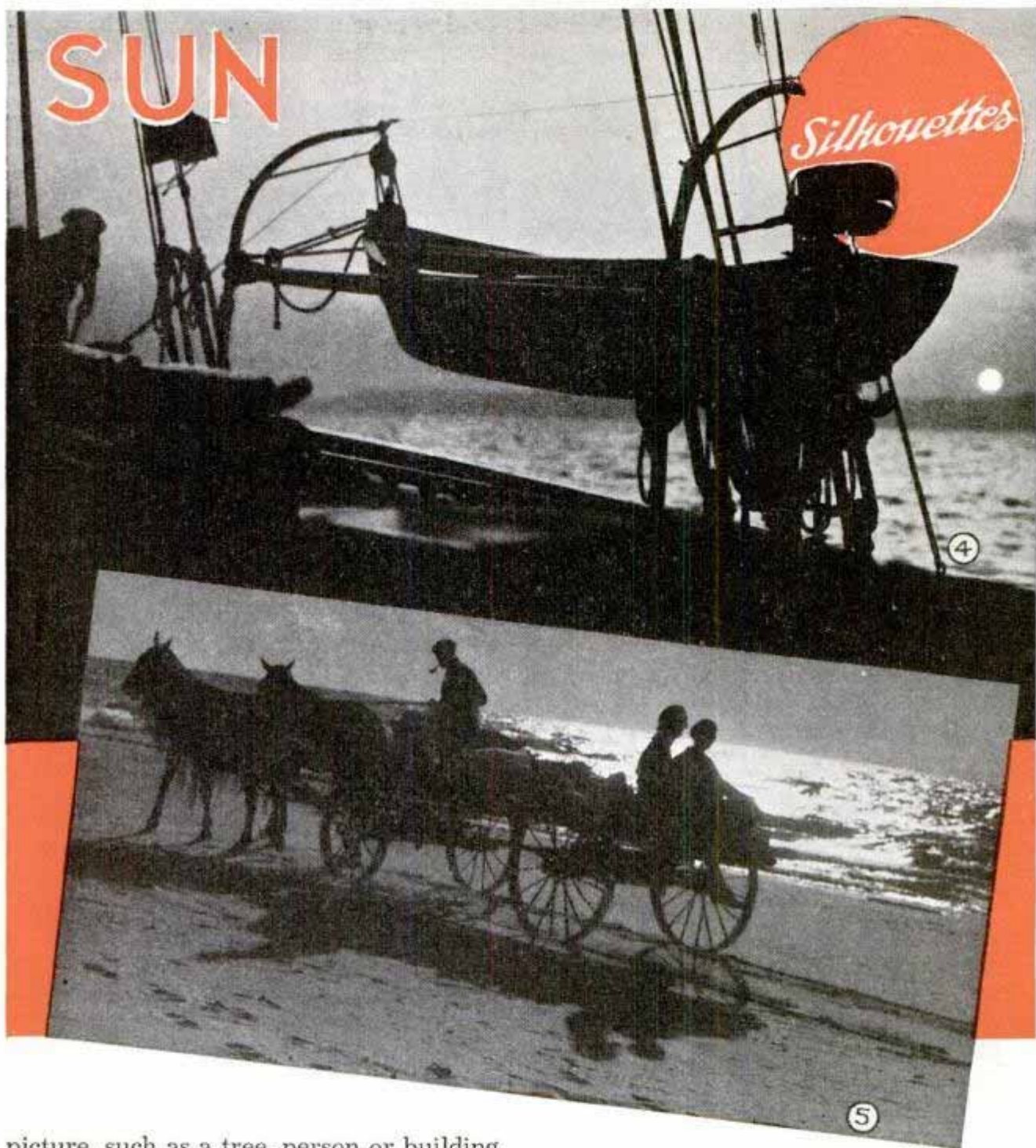
By

THOMAS P. LAKE

**B**ACK-LIGHTED photos such as the one shown above give interesting effects and striking contrasts, but are possible only when you disregard the old rule of always taking a picture with the sun behind you as in Fig. 3. In back-lighting you face the sun as illustrated in Fig. 2 and occasionally shoot right at it when partly obscured by haze or clouds, as at sunrise or sunset. To become proficient in shooting back-lighted photos one must regard light as a tool to

obtain certain desired effects, starting from the fact that back-lighting causes near objects to be comparatively dark in the print, as the side of the object that appears in the photo is in shadow.

It must be remembered, however, that it is necessary to keep the direct rays of the sun from striking the camera lens as this will produce circles or streaks on the negative, ruining the photo. And, even though the sun's rays do not strike the lens itself, they may reflect from a bright spot on the metal surrounding the lens and produce similar results. These streaks and circles are called "lens flare." To avoid it you use a lens hood or shade even if this is only your hand or hat, or you keep the camera in the shadow cast by some object in the

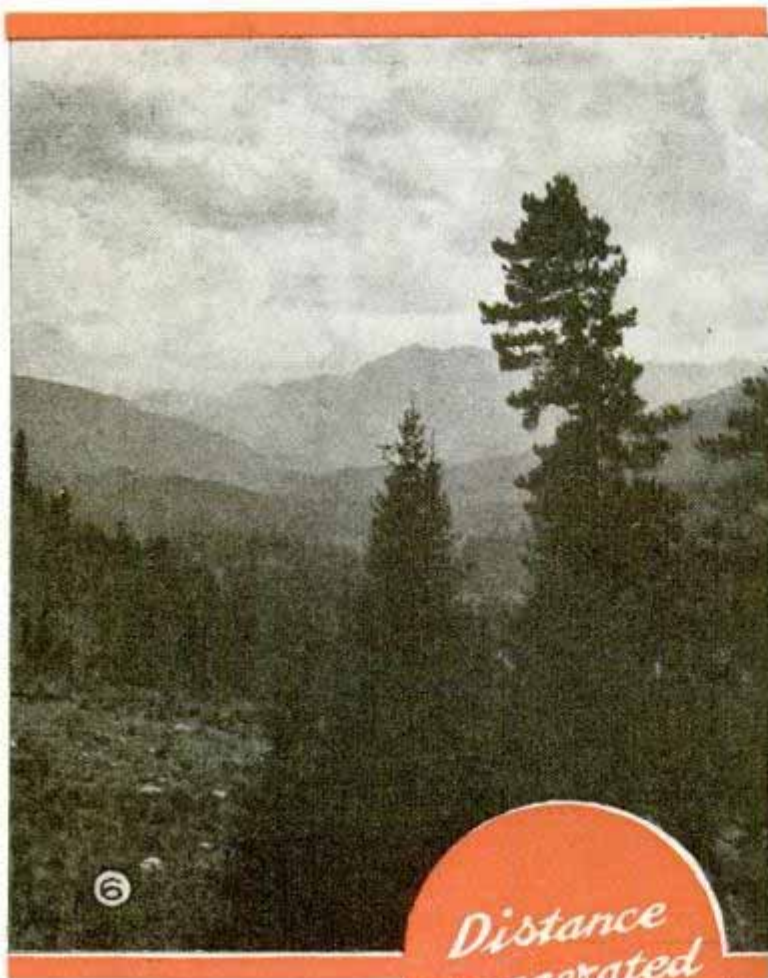


picture, such as a tree, person or building.

The easiest type of back-lighted photo to start with is the silhouette, examples of which are shown in Figs. 4 and 5. Such a silhouette is obtained by selecting a subject that will present a pleasing outline when sharply contrasted with a bright sky or with the bright surface of water. This type of picture is often made more effective by a low viewpoint of the camera, as this reduces the amount of foreground detail that might detract from the main objects. An exposure suitable for objects in direct sunlight will under-expose the shaded objects of a scene and they will be reproduced dark or almost black in the print. In case there are numerous small details such as leaves, which are separate from each

other to the eye, these easily may become a disturbingly dominating factor in a silhouette. While this may be desired at certain times, care must be exercised to avoid unexpected and unwanted effects. In making silhouettes of people, it is well to repeat the professional model's important rule to "tuck the tummy in" as silhouettes have a way of disclosing faults in posture and therefore require careful posing.

After one becomes adept in making simple silhouettes, the next step is to get more detailed back-lighted photos, as the one shown in Fig. 1. In regard to landscape scenes such as Fig. 6, a number of factors should be kept in mind. If a prominent



6  
Back-lighting helps to separate the trees in the foreground from the background and also increases the haze effect in the distance

*Distance exaggerated*

tree is to be photographed, and it is so located against a background consisting of other trees, back-lighting will separate it from the background besides emphasizing or exaggerating the distance between it and the background. After the camera is located in a position that the tree receives sunlight from the back, the side of the tree toward the camera is lighted only from the blue sky, which is a much weaker source than direct sunlight. The picture should

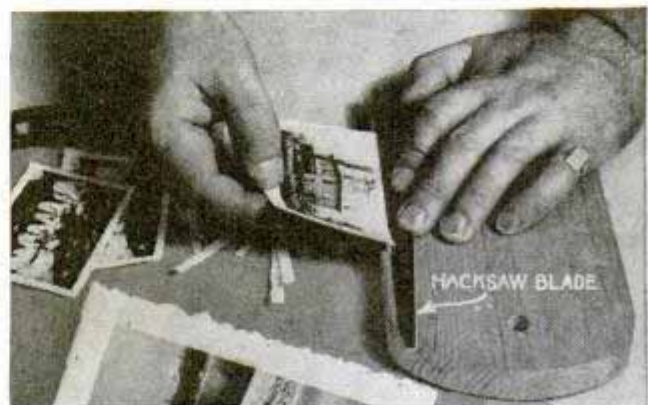
have a longer exposure than normal so that various tones and shadows of the tree will be differentiated and considerable detail will be brought out. As illustrated in Fig. 6, the background in such a scene is lighter in tone than the main object. This is because the separate reflections of the background trees produce a general effect of greater illumination, and the tops of the trees have received some sunlight as well. Also, there is a haze in the extreme distance which is often more noticeable in back-lighted than in front-lighted photos and has the effect of emphasizing distance. Such exaggeration of distance reaches its maximum when the steps of distance are abrupt, as for example if there are a number of hills or valleys.

When clouds form an important part of a back-lighted picture, a compromise in the exposure required by the different parts of the picture must be made. Detail in near objects is secured only by lengthening the exposure as these objects present their shadowed sides to the camera. If full exposure is given to these under-light-

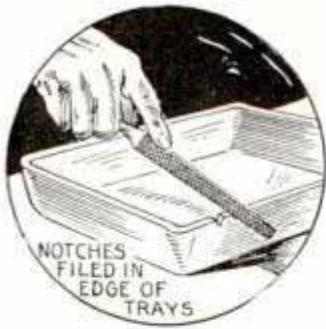
ed portions, the sky and cloud portion of the picture will receive entirely too much exposure and as a result will suffer from burnt-out detail. It is therefore necessary to choose a happy medium between the two. You will find that this is an easy matter if you are working with photoelectric light meter. A well-judged exposure will give satisfactory detail in the foreground objects and at the same time will preserve the bold contrast of clouds and sky.

## Snapshots Given Attractive Deckle Edges with Saw Blade

Attractive deckle edges that add to the appearance of snapshots can be made without expensive or elaborate equipment. Just hold a hacksaw blade near the edge of the paper and pull the print up sharply, tearing it against the saw teeth. Make sure that the blade is clean and hold it down tightly against the print. When making prints to be deckled, allow a fairly wide margin around the edge so there will be plenty of room for the saw to get a "bite."



## Identifying Trays in the Dark

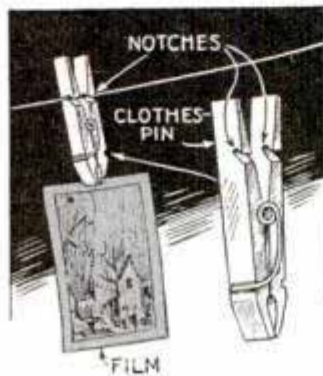


Hard-rubber trays containing different solutions are easy to identify in the dark if a different number of small notches are filed in the edge of each one. Glass and enam-

eled trays can be marked for the same purpose with small pieces of adhesive tape.

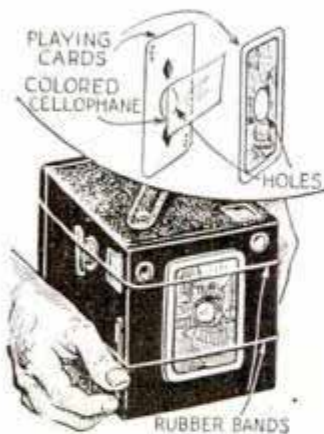
## Notches in Clothespin Film Clips Hook Over Drying Line

Films being dried in these clothespin film clips are easy to remove from the line for inspection. With a fine saw cut notches in each pin in the position and at the angle indicated.



## Box Camera and Cellophane Filter Produce Striking Pictures

Box-camera owners can produce striking pictures of landscapes, clouds, marine and other scenes if they use a set of homemade filters. For each filter, take two playing

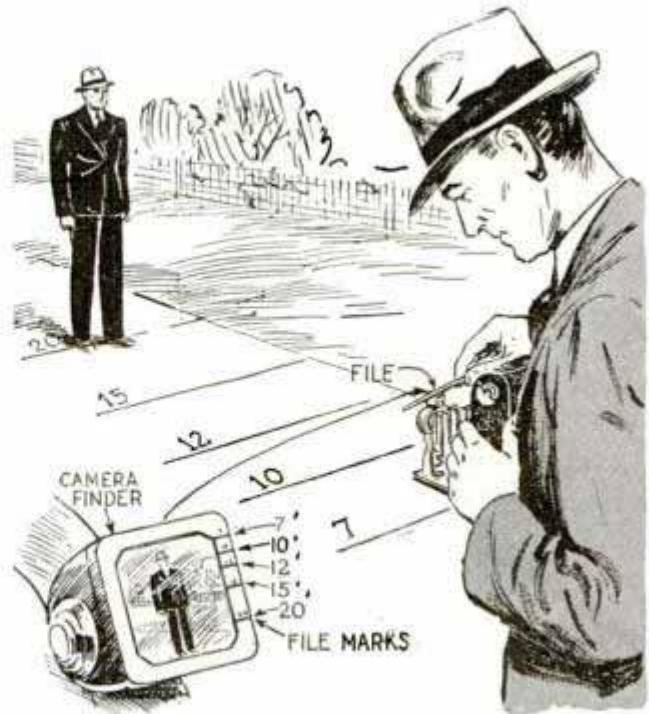


cards and cut a hole in the center of each a little larger than the hole in the front of the camera. Apply rubber cement to one side of each card and press them together with a sheet of colored Cellophane between. The filter can be held on the

camera by rubber bands. Yellow, in various shades, is the most common color for filters, but novel effects often can be secured with other colors. Determine by experiment how much to increase exposure for each filter and mark them accordingly.

—Arthur C. Nelson, Minneapolis, Minn.

## View Finder on Folding Camera Serves as a Distance Gauge



Distance from the camera to persons of average height, when taking snapshots of them standing, can be shown approximately by a number of file marks on the edge of the reflecting view finder of a folding camera. Place the camera on a tripod and mark off on the ground in front of it the different distances shown on the focusing scale. Have an assistant of average height stand on the first mark and note how high his image appears in the view finder. Then mark this point on the finder with a small scratch. Do the same with the next mark and so on for all the distances. When taking a snapshot, first see how high the subject appears in the finder and set the footage scale accordingly.

—Sigmund Sameth, Norman, Okla.

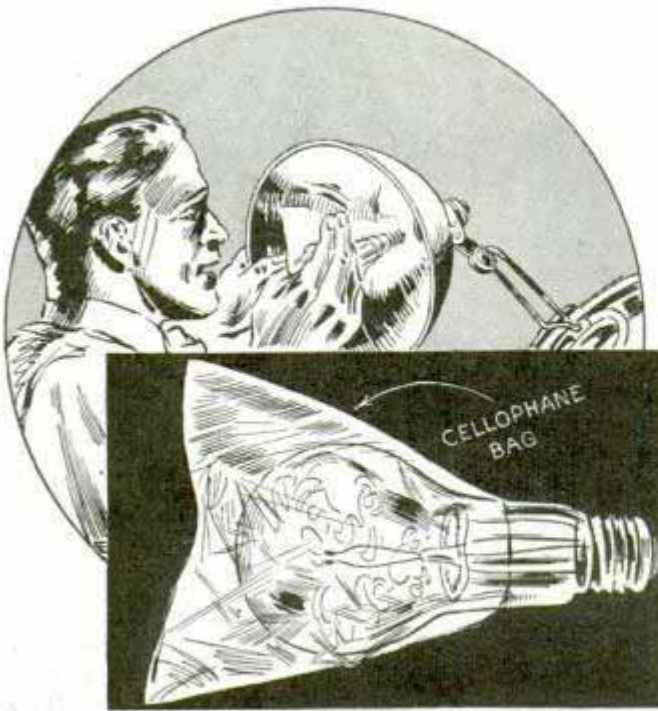
## Tiny Suction-Cup Thermometer Fits in Developing Tray

Stuck in one corner of the tray and left there during the developing process, a small dial-type thermometer with a suction cup on the



back gives a constant check on the temperature of the solution. Be sure to seal the instrument with rubber cement applied liberally so that liquid will not seep inside.

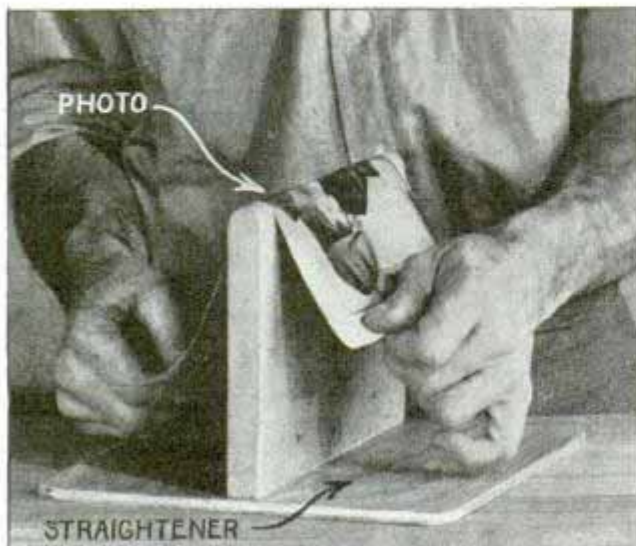
## 'Cellophane' Jacket on Flash Bulb Assures Added Safety



Although the shattering of a photoflash bulb has been overcome by a protective lacquer coating, some photographers use a Cellophane bag over the bulb as an added precaution in the event of an occasional breakage while flashing it. To save time on jobs where a number of bulbs are needed, photographers of the National Safety Council "bag" the bulbs beforehand, all ready for use.

## Upright Block Straightens Prints Better than Edge of Table

Those in the habit of straightening prints by stretching them over the edge of a table will find this straightener handier as well as more efficient. A piece of board with



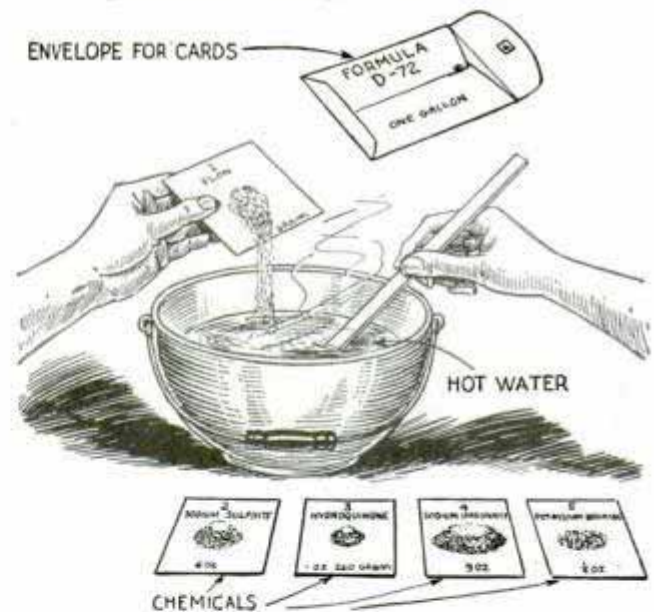
the top edge rounded and waxed is screwed to a plywood base as shown. Prints should be straightened before they are completely dry to prevent the emulsion from cracking, especially in case of glossy papers.

## Film-Holder Slide Is Handy Place to Write Exposure Data

Written on the film-holder slide with a soft wax crayon, exposure data are always available when the negative is developed. The marks can be rubbed off easily with a soft cloth. This, incidentally, waxes the slide and makes it slip in and out easier.—William Swallow, Brooklyn, N. Y.



## Numbered Cards for Chemicals Speed Mixing of Solutions



Two advantages are claimed for this system of mixing developer formulas: All chemicals can be mixed with hot water before it has time to cool, and it is unnecessary to search through a book for a formula when you are ready to mix it. Cut squares of cardboard and write the name and quantity of one chemical on each card. Number them in the order the chemicals are to be mixed. Weigh out each chemical on its proper card, then prepare the hot water and mix the solution as usual.

—Arthur Trauffer, Davenport, Iowa.



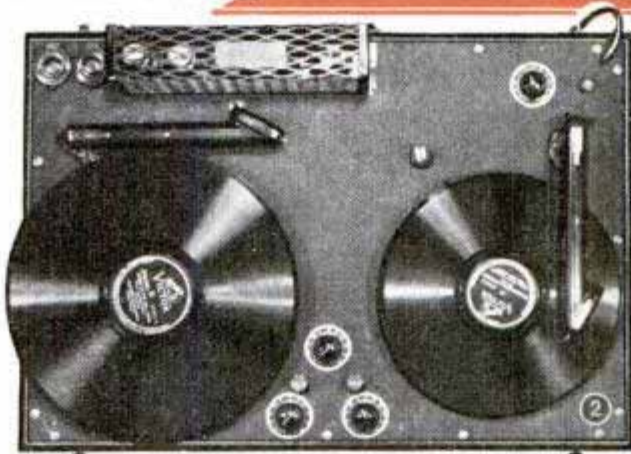


# Radio

## ADDING SOUND to Home Movies

ALTHOUGH practically any kind of record player and audio amplifier can be used to add thrilling sound effects and suitable musical backgrounds for home movies, there are certain refinements that have been worked out carefully by various amateur cine clubs with the aid of radio amateurs also interested in home movies.

The portable dual-turntable unit illustrated in photos 1, 2



and 3 is the direct result of such cooperation between the Minneapolis Cine Club and radio amateur W9CSY, a member of the same group. Several varieties of this instrument are now available, and can be operated by anyone

who can tune a radio receiver. There is a separate volume control for each pickup and the microphone which permit fading music, sound effects, or speech and dissolving between records without interaction. With some models equipped with a third pickup, it is possible to play two sound effects from the same record. Each pickup has a guide light and push-button switch for instantaneous cut-off of music or sound for split-second synchronization.

The 13-watt audio amplifier in the model shown employs 1 6F8G, 1 6J7G, 2 6V6G's and 1 type-80 rectifier. A separate permanent-magnet dynamic speaker is set up near the screen before the audience, and the dual turntable is mounted beside the projector. The entire assembly, photo 3, weighs only 45 pounds. A 50-ft. speaker cable is wound on brackets which hold the turntable plates in position for carrying.



# SIX-TUBE RECEIVER *for*

By M. N. BEITMAN

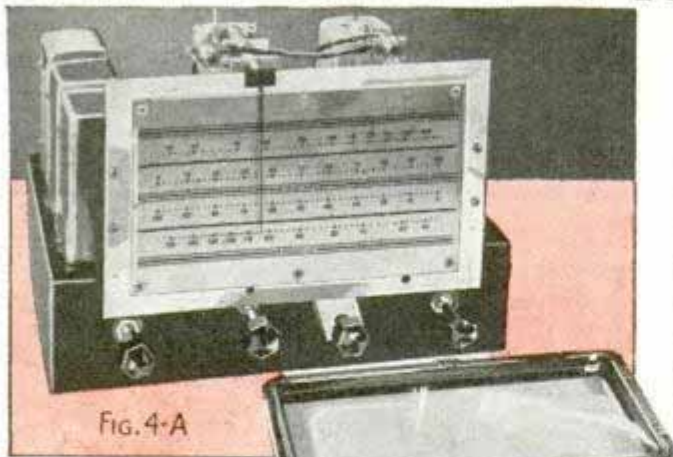


Fig. 4-A

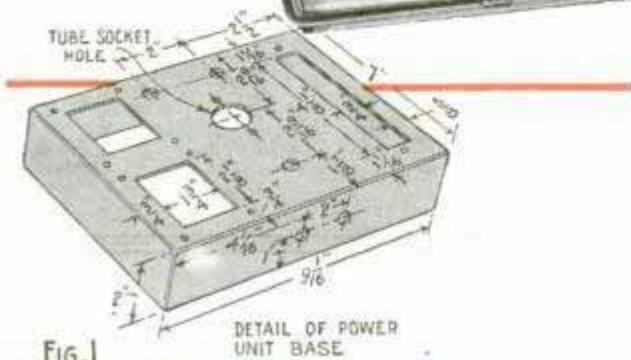


Fig. 1

DETAIL OF POWER UNIT BASE

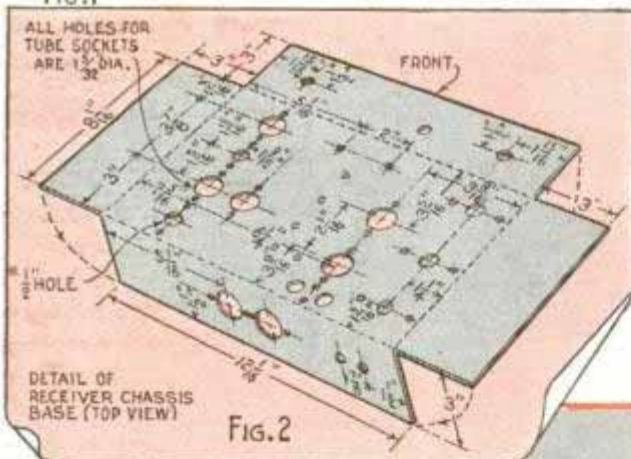


Fig. 2

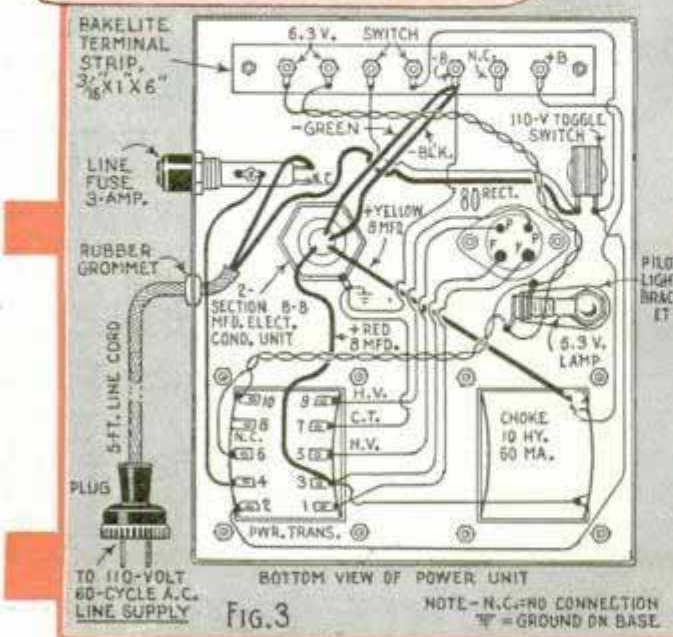


Fig. 3

BOTTOM VIEW OF POWER UNIT

NOTE - N.C. = NO CONNECTION  
 ⏏ = GROUND ON BASE

DESIGNED for progressing radio classes and advanced experimenters, this six-tube, three-band superheterodyne is complete and up to date in every detail. Originating as a four-tube t.r.f. receiver, described in the December, 1939, issue, all of the original materials are used, and additional parts are mounted in the blank positions provided in the chassis base employed for the previous set. The original chassis base details are given for those who did not build the four-tube set, and the same separate power-supply unit is again employed without alterations of any kind.

Builders of the previous receiver will note that all of the same parts remain in place, and many are wired in the same manner. However, a few of the connections must be changed, therefore the builder should remove all wiring in order to avoid confusion. Once this larger version of the December, 1939, progressive receiver is wired and properly aligned, excellent reception may be obtained on all frequencies from 530 kc. to 18 megacycles.

The only additional drilling in the chassis base will be for mounting the three extra terminal strips, and this is easily done with a small hand drill. After all parts have been mounted on the receiver base as shown in the various photos, and simplified wiring diagram Fig. 4, connections can be made in a systematic manner, beginning with the antenna end. Unusual care has been taken to show clearly all connections to the three-section band switch and all other parts, in the simplified wiring dia-

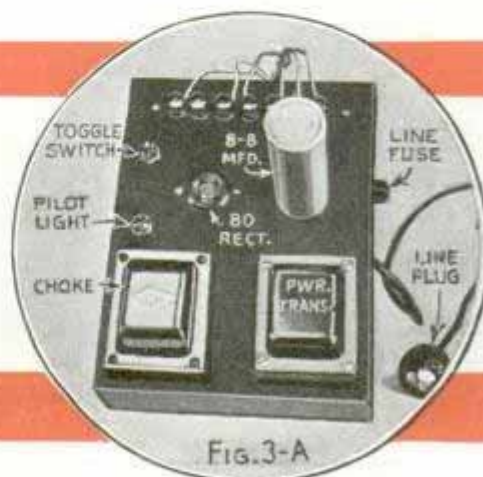


Fig. 3-A

# Students and Experimenters

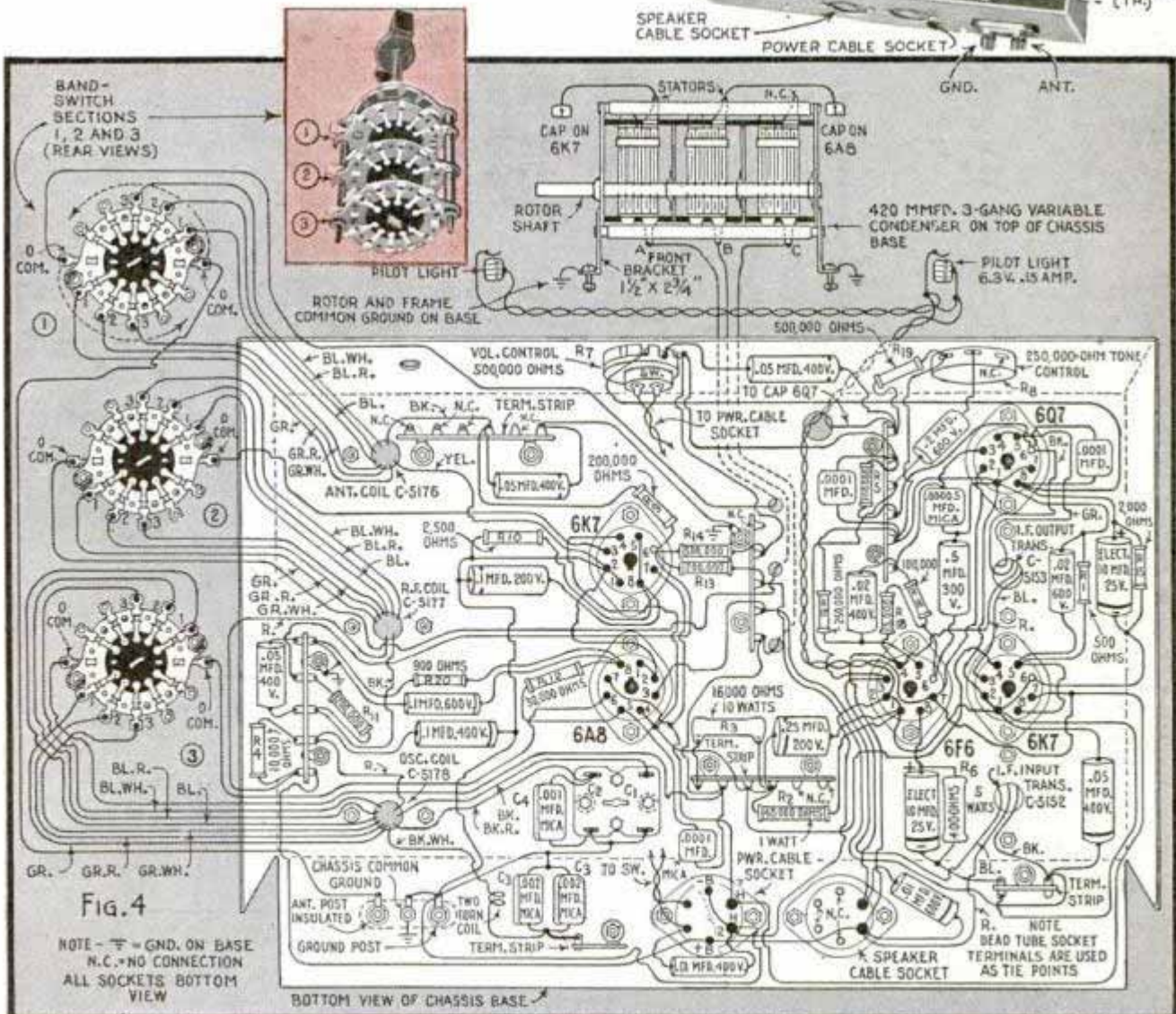
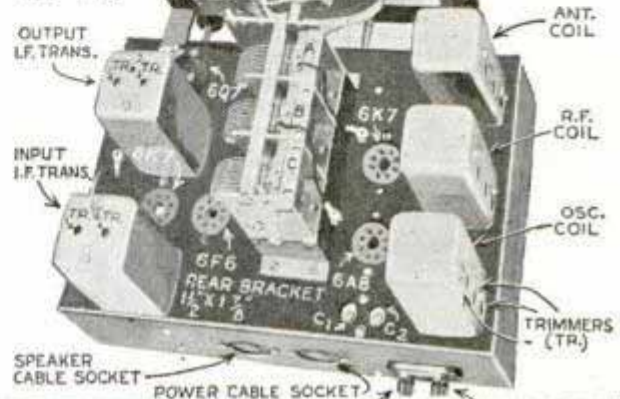


gram Fig. 4. The same type of wiring diagram is also given for the power unit in Fig. 3; schematic circuit diagrams for both units appear at the end of this article. The Yaxley type 1335-L three-section switch is a five-position variety, with three positions used. Make all leads to these switch sections short and direct, also keep the leads to each coil together and well apart from each coil unit.

This set is quite sensitive and because of very small losses on the broadcast band may oscillate slightly on the upper end of the band. A long antenna is recommended to prevent this and will give even better results on the short waves. For best results the receiver should be aligned with a signal

(Continued to page 116A)

FIG 4-B



*Alfred Radio Corp. 8 25 W Jackson*

# Audio Oscillator for Group Code Practice



**T**HIS inexpensive audio-frequency oscillator provides a choice of four tones, any of which are made audible through a built-in loud speaker or through headphones. With a code-practice set of this description large groups can "sit in" and there are no long waits for headphones.

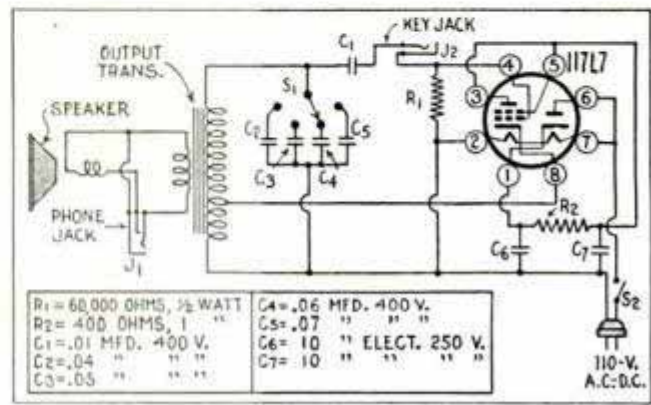
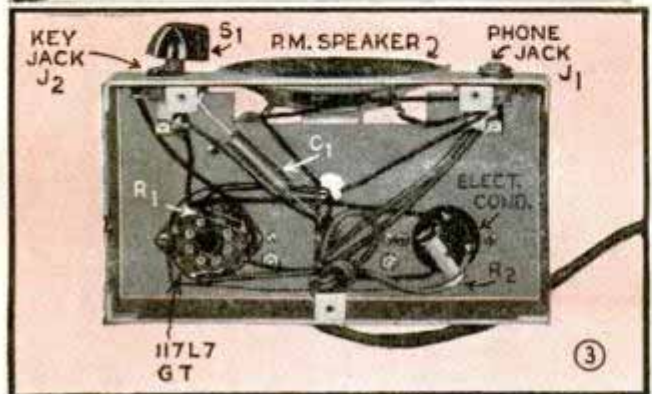
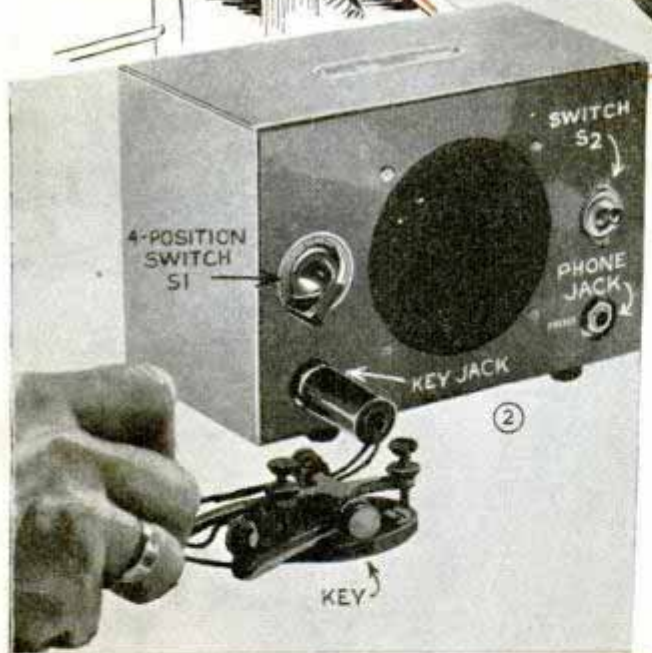
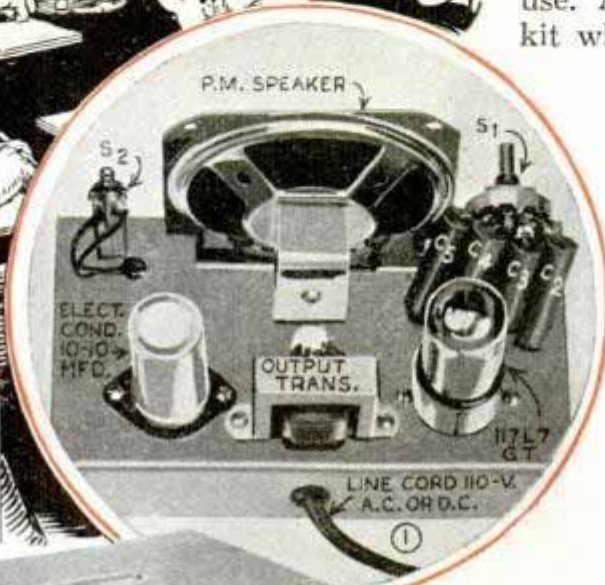
Operating on 105 to 125 volts, 25 to 50-cycle a.c. or d.c. line supply, it is always ready for instant use. All parts are available in a kit which includes the drilled metal base and cabinet.

The new type 117L7-GT tube operates on the full-line voltage, thus doing away with the usual line-cord resistor.

Photos 1, 2 and 3 show various views of the completed unit, and it will be noted that only a handful of radio parts is required. The fixed condenser and resistor values are all given in the circuit diagram below.

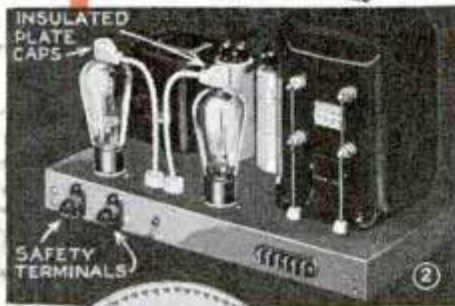
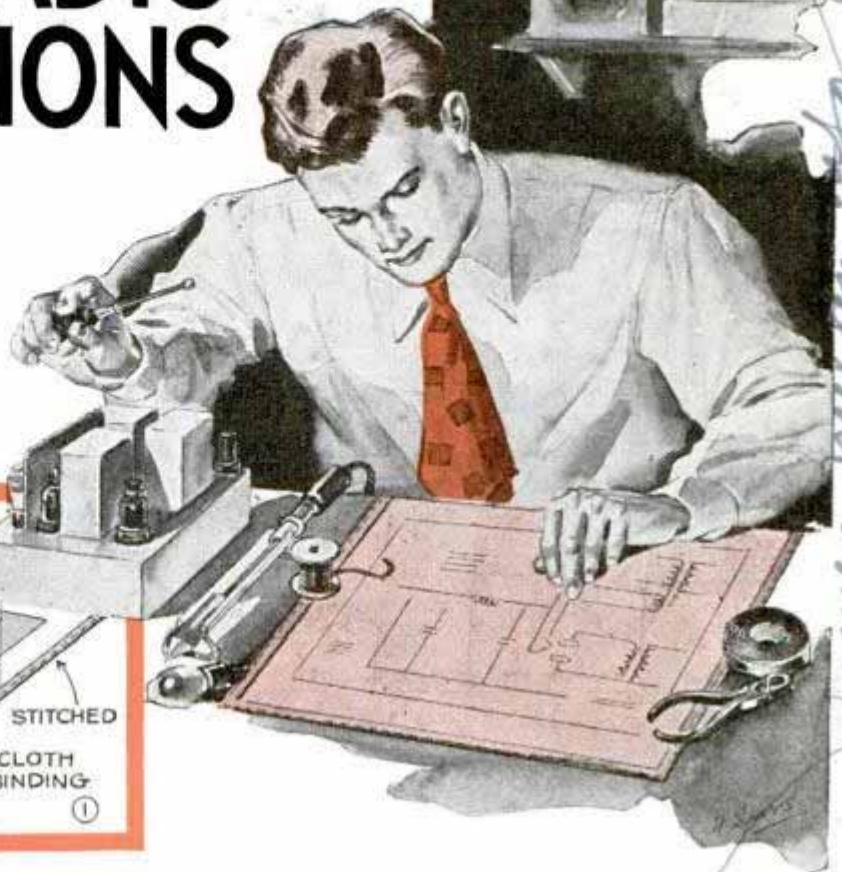
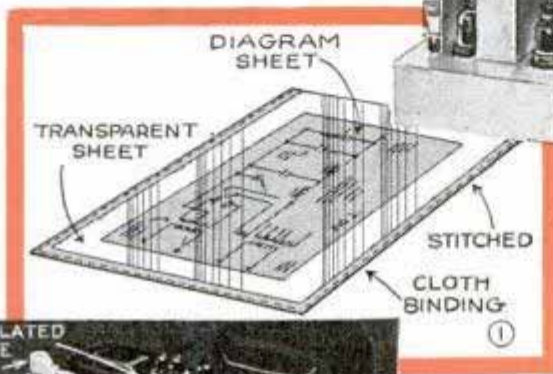
All condensers are Cornell-Dubilier types; other parts include a 4-inch permanent-magnet speaker with Guthman output transformer type CH-10; 4-position switch (S<sub>1</sub>); s.p.s.t. toggle switch (S<sub>2</sub>); insulated closed-circuit jack (J<sub>1</sub>); insulated open-circuit jack (J<sub>2</sub>), and an octal-type wafer socket.

For code practice, connect a key to a phone plug by means of a short length of 2-wire lamp cord and insert in key jack. Turn toggle switch "on" and allow one minute for tube to warm up. Operating key produces audible tones from speaker. Tone pitch may be varied in four steps by adjusting pointer knob on (S<sub>1</sub>).

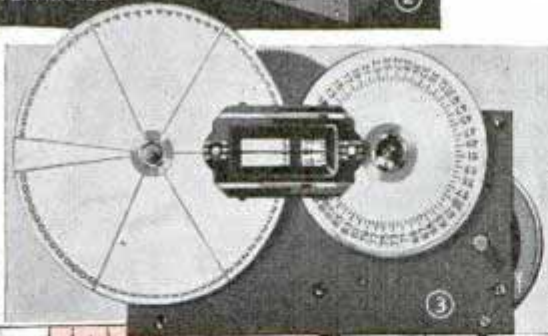


# Practical RADIO SUGGESTIONS

**Fig. 1, Cellophane envelope protects wiring diagrams from stains or tears on workbench. A piece of the transparent material of suitable size to cover the average radio blueprint, wiring diagram or data sheet, is stitched to a piece of card-board on three sides, with a cloth or leather binding to form an envelope in which the diagram is easily inserted. For double-duty use extend the Cellophane to both sides**



**Fig. 2, Isolantite plate caps and Bakelite safety terminals prevent radio workers from coming in contact with high voltage in power supply units. The 2-piece chassis safety terminals employ insulated bushings which extend through the base, and all metal parts are enclosed in Bakelite. Tapered plug and socket provide efficient pressure contact.**

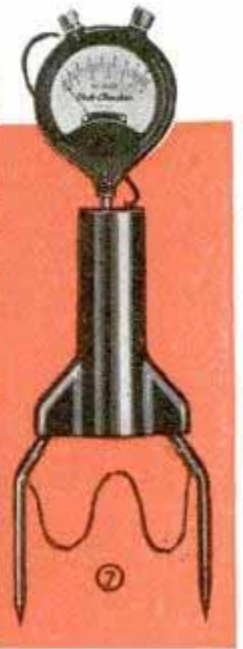
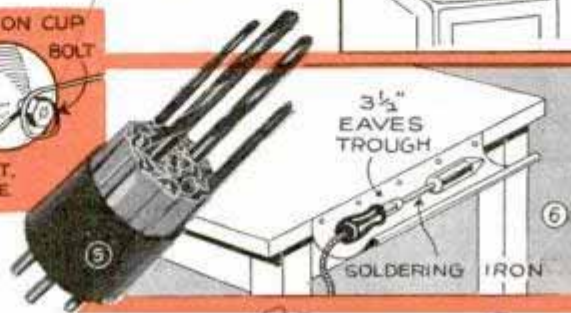


**Fig. 3 shows a precision tuning dial having a ratio of approximately 72 to 1 in 360 degrees of condenser rotation**

Several small rubber suction cups may be used as shown in Fig. 4 and sketch at lower left, to permit erection of a temporary indoor antenna without marring walls or woodwork with nails; cups are easily removed when not required. Photo Fig. 5 shows a twist drill holder made from an old tube base and a narrow strip of tightly wound corrugated cardboard. Corresponding holes to take the socket prongs will keep the holder in place on a shelf



**Fig. 6 illustrates a simple holder for soldering iron on bench; Fig. 7, combination prod adjustable for any storage battery and voltage checker, tests battery under proper load**



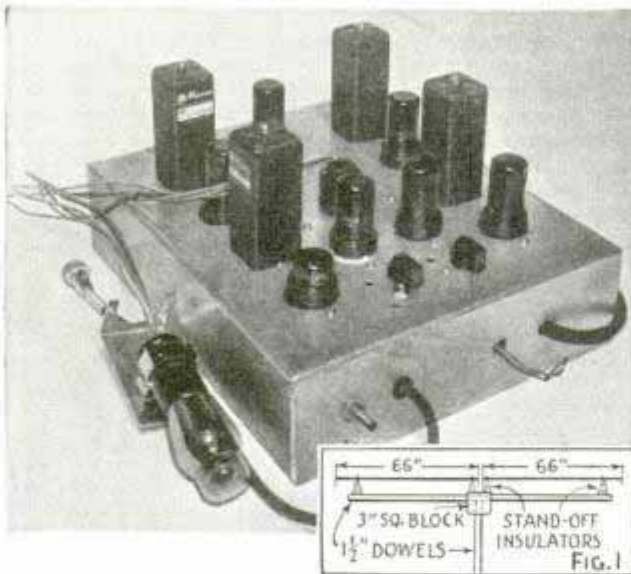
*570 Lexington Ave*  
**Phonograph-Radio Combination  
 in Portable Case**



Easily portable, this phono-radio combination has a record turntable powered by a silent hand-wound spring motor. Batteries are used to reproduce sound through the audio system of the radio receiver which is a 4-tube super with P.M. speaker.

**Frequency-Modulation Receiver**

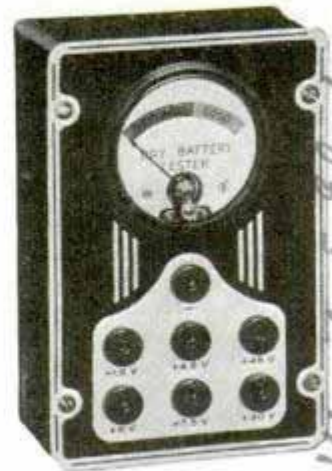
Built to receive the new frequency-modulation broadcasts now available to listeners in several states, this experimental chassis assembly, and the suggested



dipole antenna Fig. 1, were designed for the New York Sun by Mr. J. R. Day of Columbia University.

**Dry-Cell Battery Tester**

To test portable-type A and B-batteries under actual operating conditions, small test instruments of the type shown include built-in resistors to supply the proper load. Pin-jacks are labeled for standard voltages.



**Radio Interference Locator**

This portable battery-operated r.f. and a.f. amplifier is equipped with a directional loop antenna, "fish pole" antenna, output meter, phone jacks and loud speaker, for locating sources of man-made static.



Blueprints covering radio construction articles in this and past issues are available for 25 cents each. Original material lists, with names of manufacturers and dealers, can be obtained from our Radio Department upon receipt of postage.

**NEXT MONTH—How to Build a Portable Battery-Operated Vacation Receiver.** One combination dry A and B-battery operates this compact portable set for more than 200 hours. It is a full super with permanent-magnet speaker, built-in antenna, and excellent range and volume. Also—**How to Improve Tone of Console Sets**

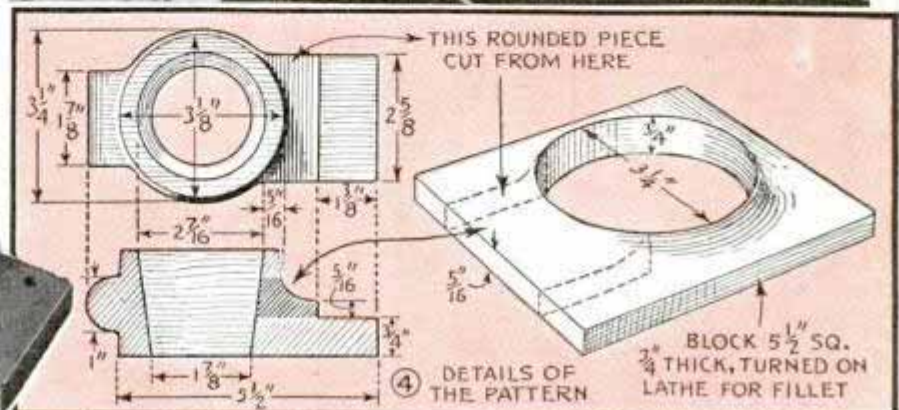
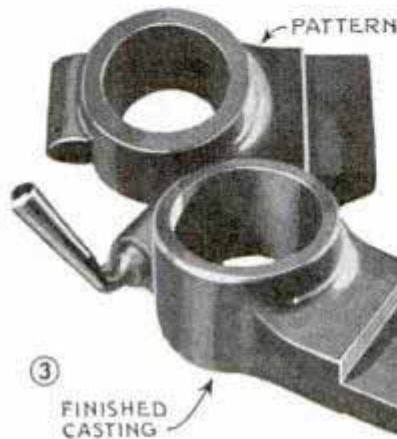
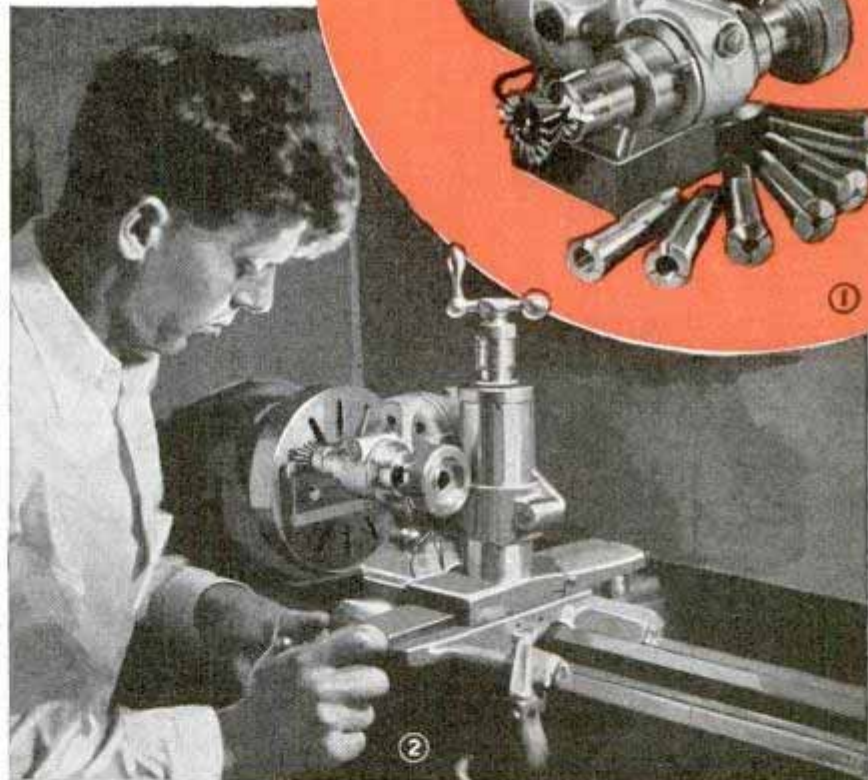
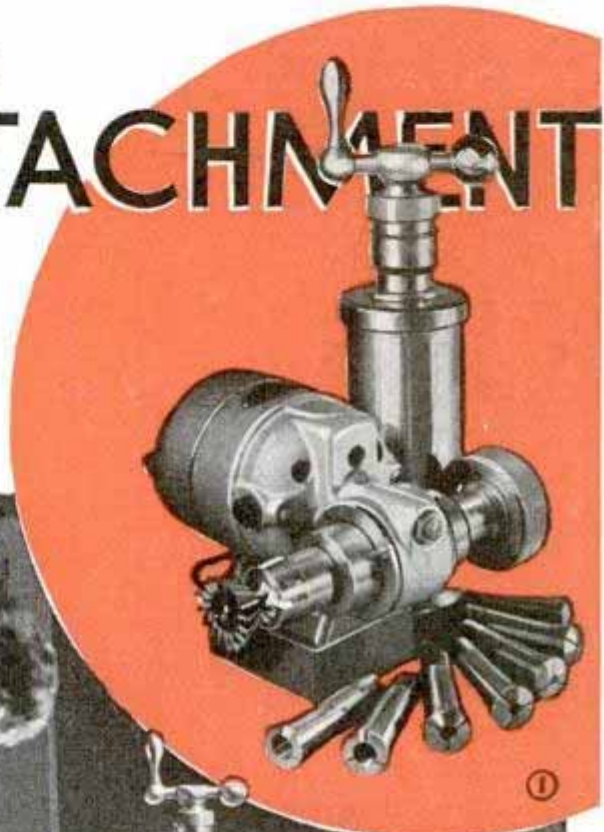


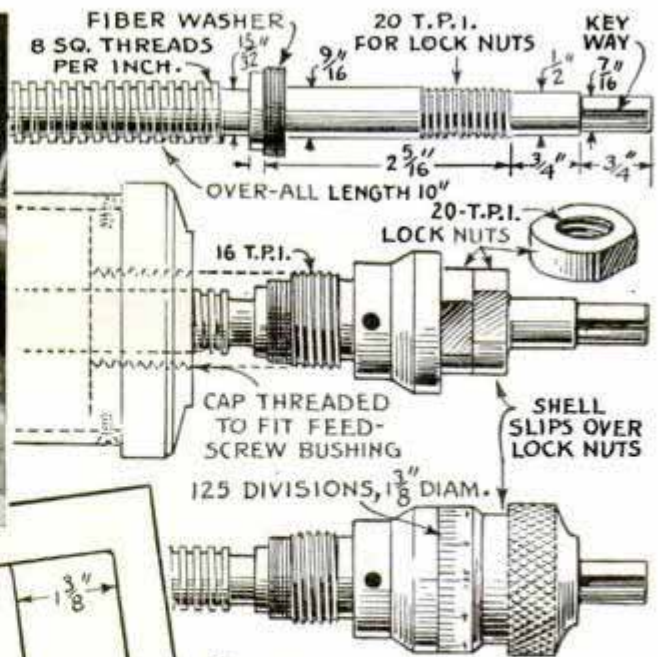
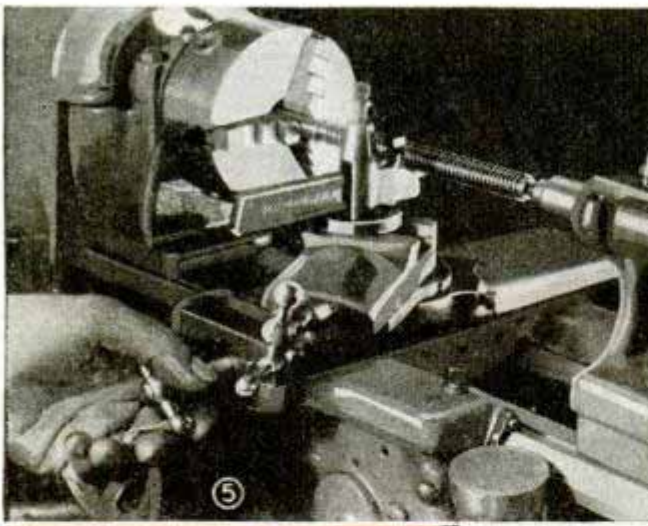
# SHOP NOTES

## *Motor-driven* MILLING ATTACHMENT *fits 9-in. lathe*

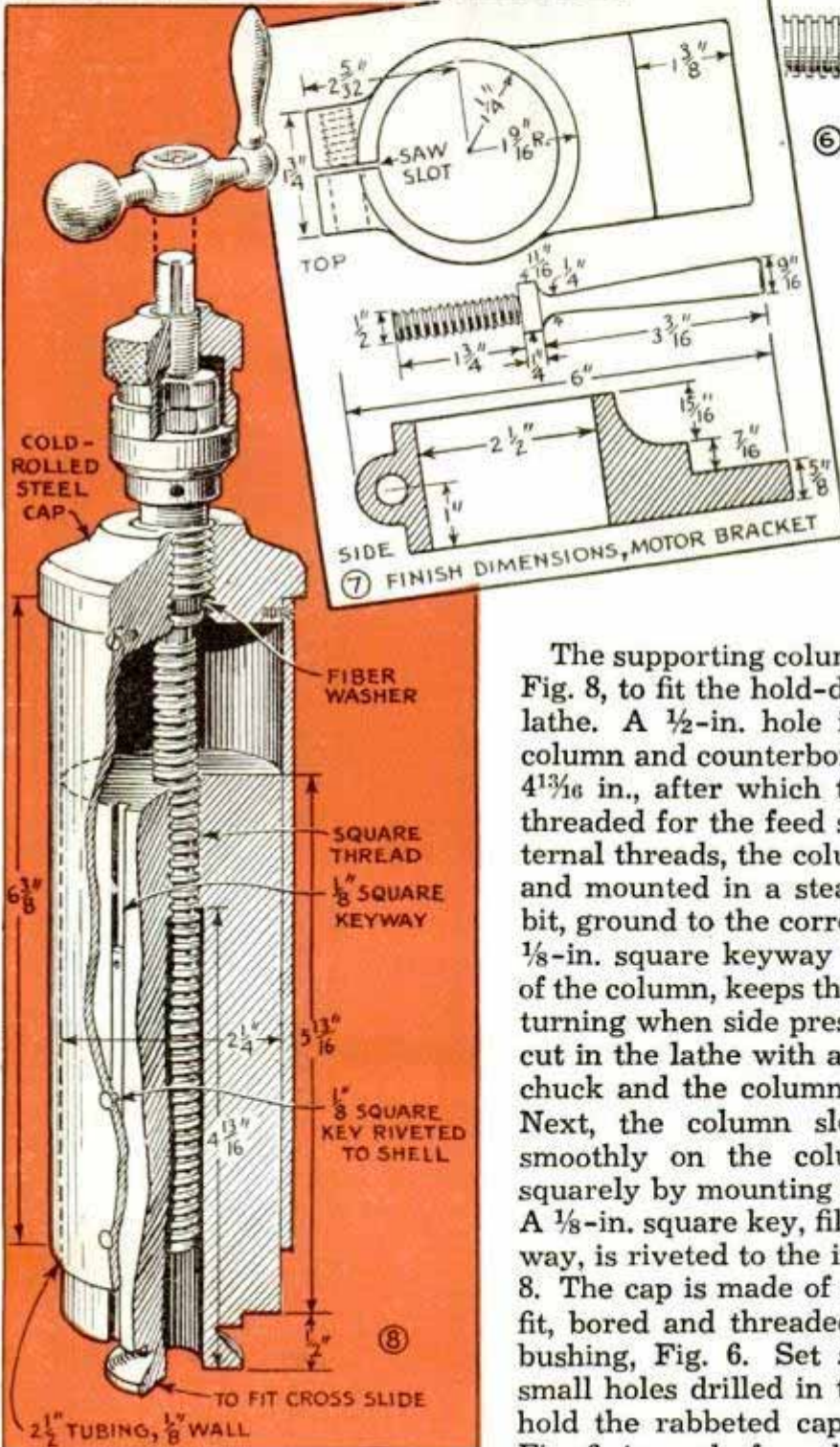
Starting with a worm-and-gear motor, you make all parts and have a motor support cast

HERE'S a milling attachment that can be built on the lathe itself from odd pieces of steel and one iron casting in addition to a worm-and-gear drive motor. The completed unit with a number of collets is shown in Fig. 1, and its arrangement on the lathe is shown in Fig. 2. You begin on the collet attachment which is built into the motor, and makes use of regular lathe collets. The bearings and worm gear of the motor are rebuilt to take the collet spindle. The shaft hole in the worm gear is bored





⑥ DETAILS OF FEED SCREW



⑦ FINISH DIMENSIONS, MOTOR BRACKET

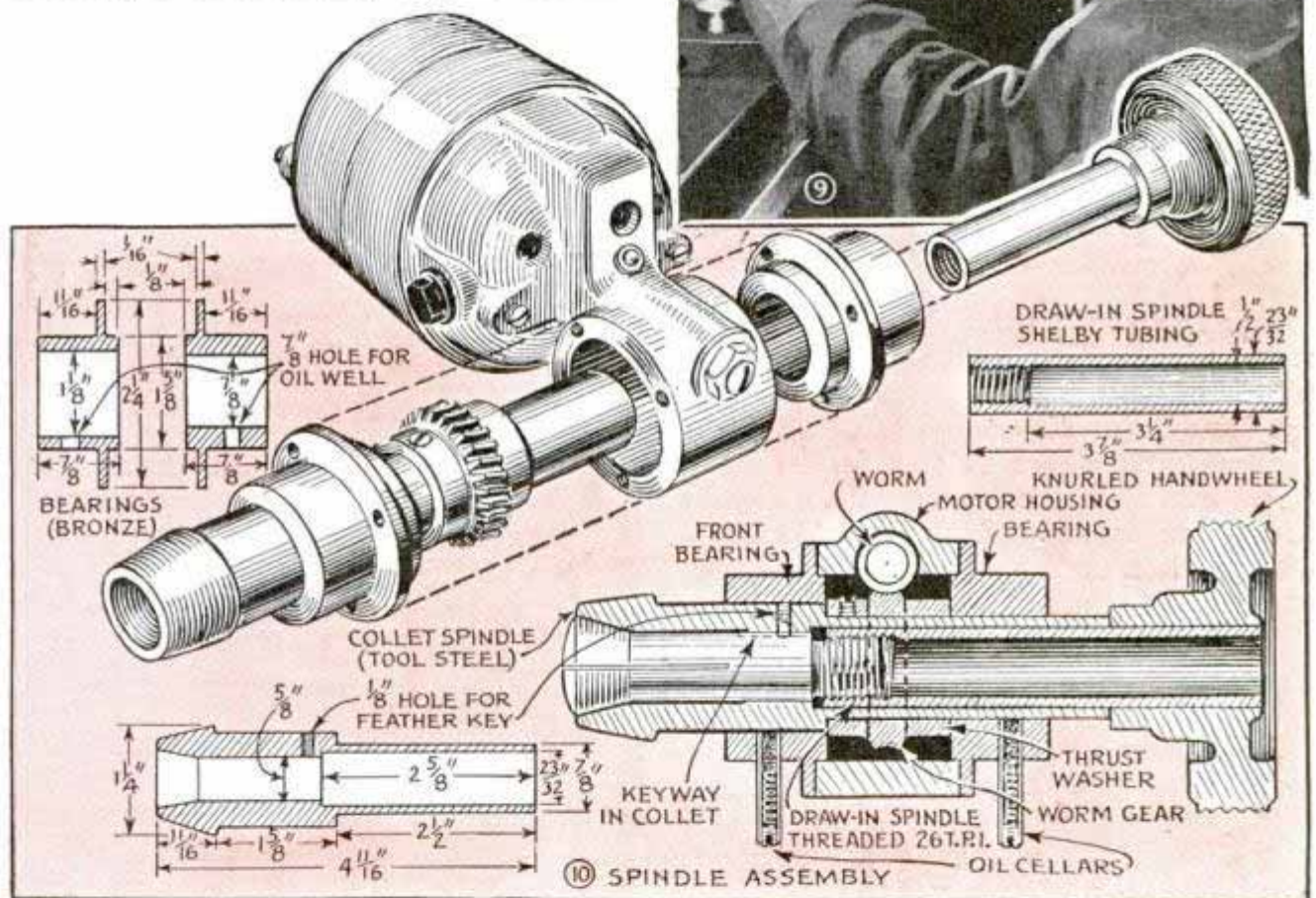
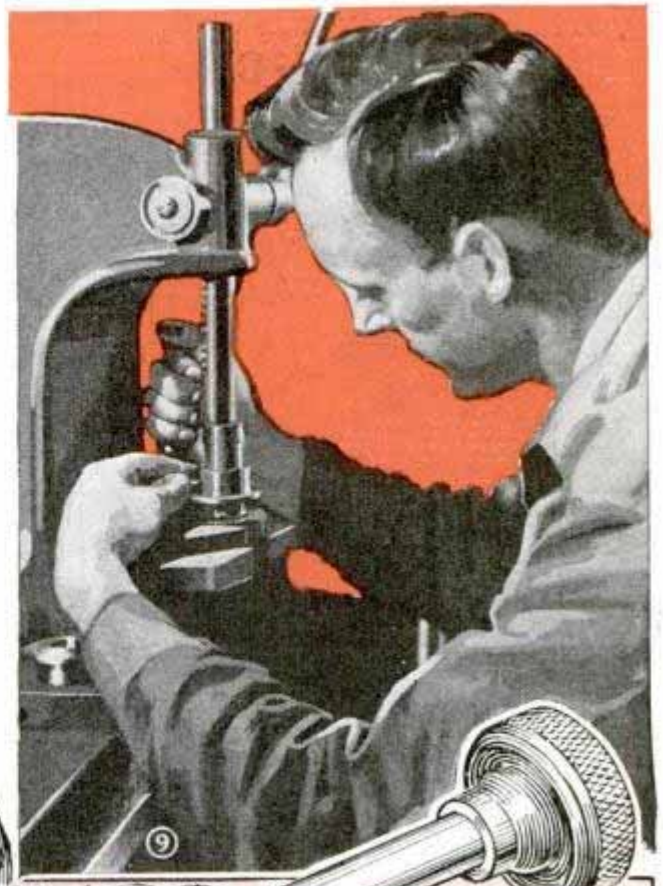
out to fit the collet spindle and after slipping the front bearing in place, is forced on in an arbor press, Fig. 9. All these parts are shown in Fig. 10. The knurled hand-wheel which tightens the collet in the spindle should be turned to a 2½-in. diameter and drilled for a force fit on the draw-in spindle.

The supporting column is turned next at the base, Fig. 8, to fit the hold-down in the cross slide of the lathe. A ½-in. hole is drilled clear through the column and counterbored to 5/8 in. for a distance of 4 13/16 in., after which the ½-in. hole at the top is threaded for the feed screw. For cutting these internal threads, the column is reversed in the chuck and mounted in a steadyrest. An ordinary cutter bit, ground to the correct shape, is used for this. A 1/8-in. square keyway which is cut the full length of the column, keeps the rest of the attachment from turning when side pressure is applied. This can be cut in the lathe with a woodruff cutter held in the chuck and the column fastened to the cross slide. Next, the column sleeve is machined to slide smoothly on the column, truing up both ends squarely by mounting in the chuck and steadyrest. A 1/8-in. square key, filed to slide freely in the keyway, is riveted to the inside of the sleeve as in Fig. 8. The cap is made of mild steel, turned to a press fit, bored and threaded to receive the feed-screw bushing, Fig. 6. Set screws, which are fitted in small holes drilled in the upper end of the sleeve, hold the rabbeted cap in place. The feed screw, Fig. 6, is made from blue-machine steel and it is



threaded as in Fig. 5, with a right-hand thread—eight square threads per inch. The micrometer dial, also shown in Fig. 6, is turned from mild steel and then bored and reamed to fit snugly on the feed screw. It is placed on a mandrel between centers, and with the aid of a dividing attachment it is graduated into 125 divisions, each division being cut with a sharp pointed cutter bit, laid on its side, and moved along the work by the lathe carriage. The depth of cut is regulated by the cross-slide feed screw. The ball crank, Fig. 8, which is bored and reamed to fit the feed screw, and then drilled to receive the riveted handle, completes the column.

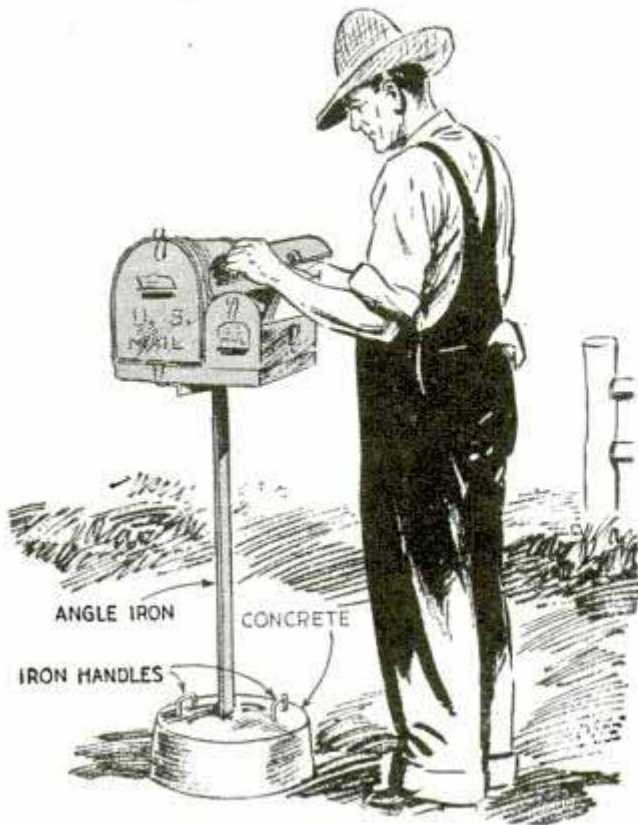
The motor support, Fig. 3, which is made from a gray-iron casting, requires a wood-



en pattern which is made by gluing several parts together and shaped as in Fig. 4. As the hole for the column sleeve is large and is given plenty of draft, it requires no core. In machining the casting to the dimensions in Fig. 7, it is chucked bottomside out, in a four-jaw chuck and faced smooth. Then it is reversed in the chuck and the hole bored out to a sliding fit on the column sleeve, after which the top edge is trued up squarely and slightly chamfered. The flat area to fit the motor base can be cut by machine or filed smooth by hand. The cast-

ing is drilled and threaded for the clamp screw and split in the back with a hack saw as shown in Fig. 7. The clamp screw, Fig. 7, is turned to fit the hole in the bracket and is threaded. After being heated to a bright red, it is bent easily to the angle shown in Fig. 3. Only a slight turn of the handle is required to clamp the bracket firmly to the column in the desired position. Holes to fit those already in the motor base are drilled and the motor is mounted in place. The attachment is then ready for mounting in the lathe cross slide.

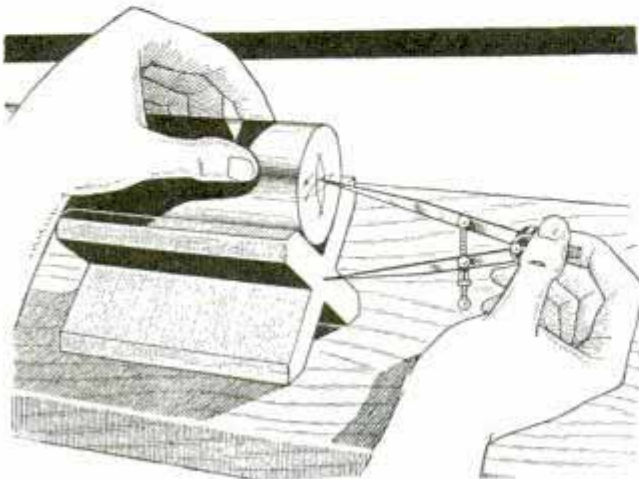
## Portable Mailbox Is Supported by Concrete Base



Cast in an old washtub with the bottom removed, the base of this mailbox has plenty of weight to withstand winds, yet the handles permit easy shifting when the road maintainer comes along. An L-shaped angle iron with the lower end embedded in the concrete supports the box. The handles are iron rods bent to wide U-shapes and set in the concrete.

## Using V-Block to Center Work

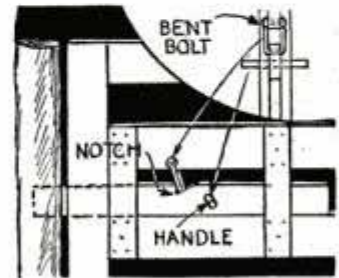
A quick method of locating the center of round work is to use a small V-block and a pair of dividers. A tiny hole in the end of the block takes one leg of the dividers, which are set a trifle larger than one half



the diameter of the stock. In use, an arc is struck on the end of the work, which is then given a quarter turn and another arc struck, continuing this operation until you have the pattern shown on the end of the work.—E. E. Stanton, Huntington, Mass.

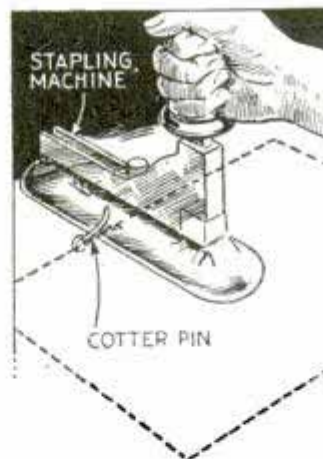
## Lock for Sliding-Bolt Gate Latch Prevents Cattle Opening It

Gate latches of the type shown are often opened by cattle that slide back the latches by pressing against the handles with their noses. To avoid this, a farmer provided his latches with locks like the one shown. It is simply a short length of  $\frac{1}{4}$ -in. iron rod bent to a U-shape and pivoted to one of the gate boards so that it will drop into a notch cut in the latch.



—Norman Wyatt, Lexington, Mo.

## Office Stapler Has Depth Stop as Aid in Inserting Paper



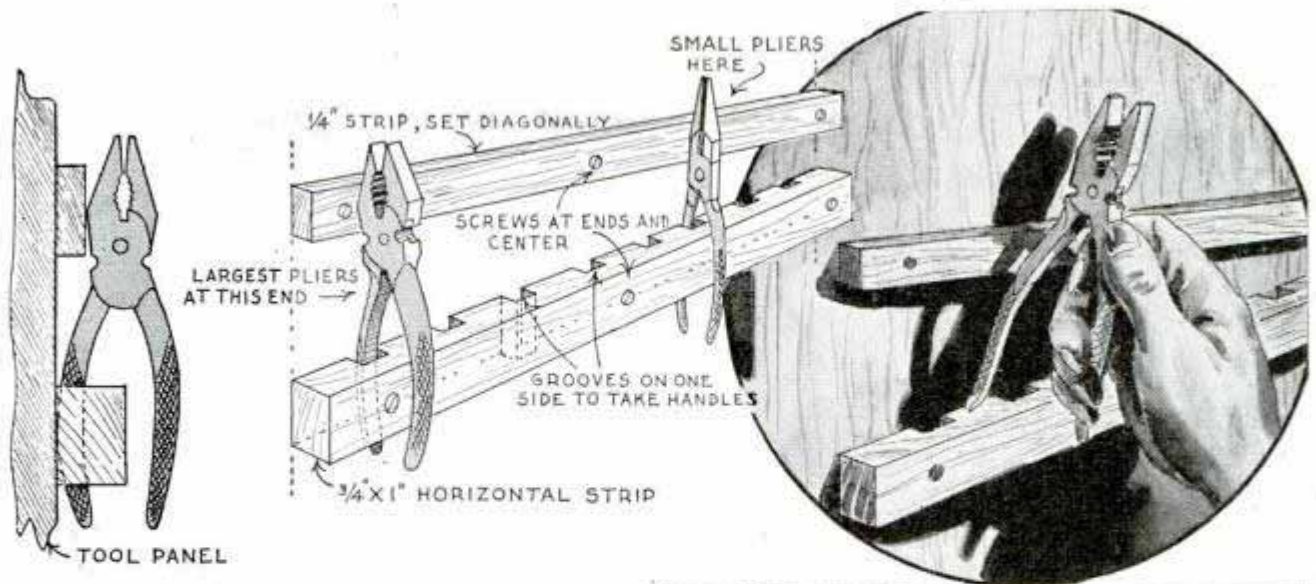
Inexpensive office staplers that are not provided with stops to gauge the depth to which papers may be inserted, can be provided with them by using small cotter pins. These are bent as indicated and are slipped over the bases.

## Oil-Coated Lids on Ink Cans Are Not Likely to Stick

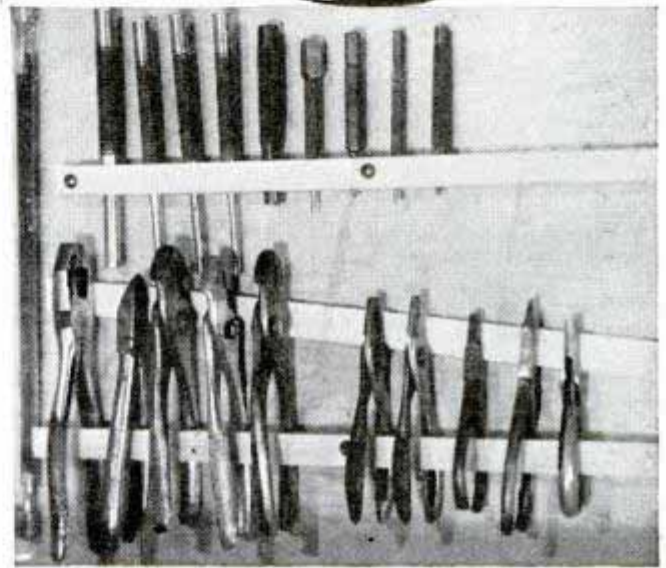
To prevent ink collecting on the can lids and causing them to stick, one printer coats the lids with oil or glycerin. This is applied with a felt pad kept on the ink shelf.



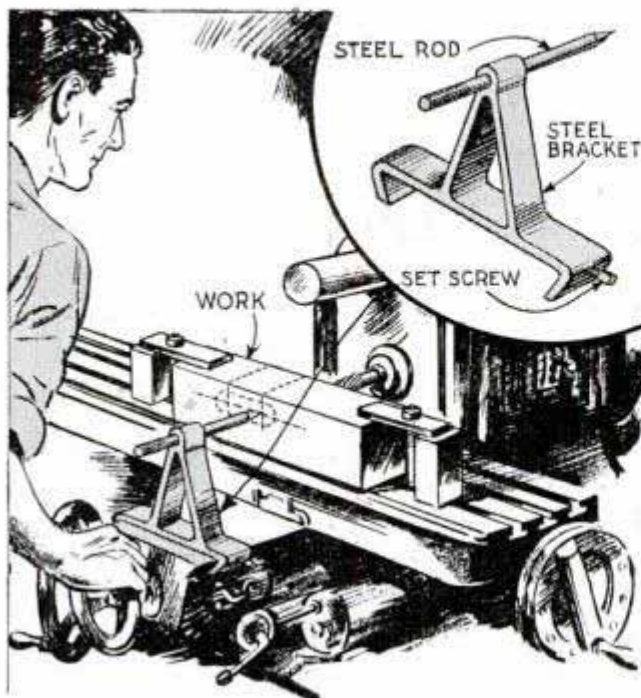
# Pliers Held in This Rack Are Easy to Remove



Here is an improvement over the usual rack for pliers that has holes or notches in which the handles tend to bind or are held so loosely that the pliers spread apart at various angles. This rack has one strip notched to accommodate a handle of each pair of pliers and is screwed onto the cabinet back horizontally. A second strip at an angle serves as a headrest for the pliers, which are arranged progressively from the largest to the smallest. The notches of the lower strip should be just deep enough so that the heads of the pliers will wedge firmly against the upper strip, which keeps them erect and prevents them from slipping down in the notches as shown.



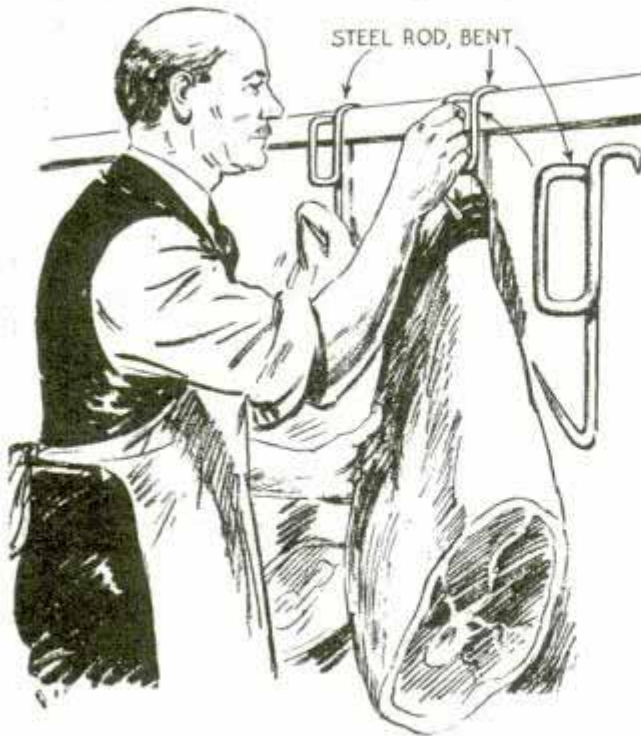
## Guide for Milling When Layout Lines Are Not in View



When you have a job on a horizontal milling machine where the layout lines cannot be seen from a convenient position with reference to the table controls, this guide will simplify the problem of following the layout lines with the cutter. The pointer of the guide is in true alignment with the center of the milling-machine spindle. Thus when the table is manipulated so that the end of the pointer follows the guide lines on the front side of the work, the cutter is in the same position on the opposite side where the lines cannot be seen. The guide consists of a steel-rod pointer 10 in. long, held snugly in a bracket, which is shaped to fit on the ways of the milling machine where it is held firmly by a set screw located as indicated in the detail.

—Peter F. Rossmann, Kenmore, N. Y.

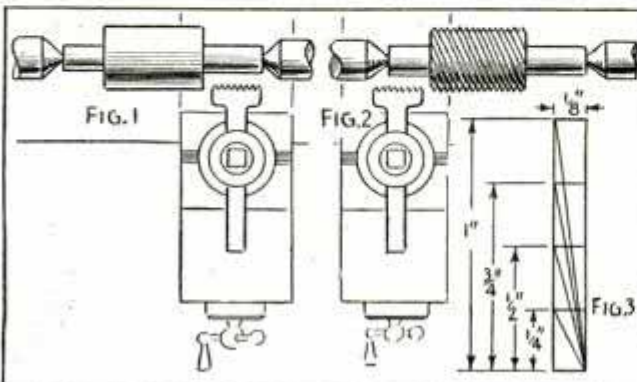
## Meat Hook Has Loop for Hand to Avoid Pinching Fingers



Often pinching his fingers when hanging up heavy pieces of meat on his refrigerator racks, a butcher made a number of hooks like the one shown. It is bent from a length of steel rod and has a loop for the hand so that there is no possibility of the fingers coming in contact with the rack.

## Multiple Threads Cut Accurately without Indexing Equipment

Anyone can cut multiple threads without special equipment at a considerable saving in time. Assuming that a multiple thread of 32 pitch having a 4-lead is desired, set the lathe to cut a 4-thread and use a 32-pitch thread-chasing tool set at the proper helical angle, Fig. 1. Start the tool clear of the work, taking the first cut as though you were cutting a 4-thread. Let the tool complete its cut, clearing the work as in Fig. 2. If the lead screw is 8 or

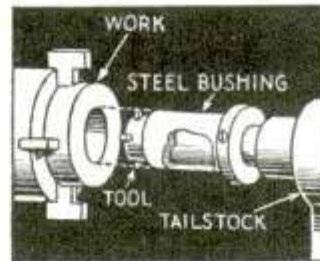


a multiple of the thread being cut, the half nut can be disengaged and the carriage run back for each succeeding cut. It is important that the tool be set at the proper angle otherwise the heel will drag and ruin the job. The tool angle must be set according to the diameter of the work. It is a simple matter to compute this as shown in Fig. 3. Draw two vertical lines a distance equal to one half the lead. In this case your lead is  $\frac{1}{4}$  in., therefore the vertical lines would be  $\frac{1}{8}$  in. apart. A diagonal line intersecting each line  $\frac{1}{2}$  in. apart will give the proper angle for cutting a 32-pitch 4-lead thread on  $\frac{1}{2}$ -in. stock.

—C. A. Mowrey, Elmira, N. Y.

## Heavy-Duty Boring Tool Held in Tailstock of Drill Press

When I have a boring job to do where a pilot or guide on the end of the boring tool cannot be used, I use the tool shown, which can be held in the tailstock of a lathe or in



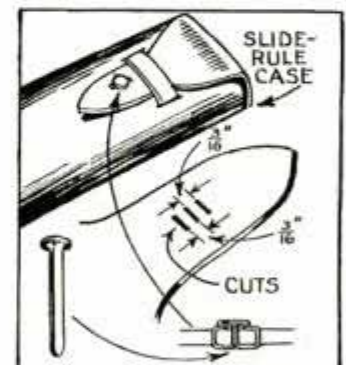
the spindle of a drill press. The tool-bite holder is turned to fit the lathe or drill-press spindle, and a steel bushing is turned to fit snugly over the holder as indicated.

The shoulder at the end of the bushing is just slightly smaller than the hole to be bored so that the bushing follows the tool into the work to act as a guide.

—W. P. Davies, Topeka, Kan.

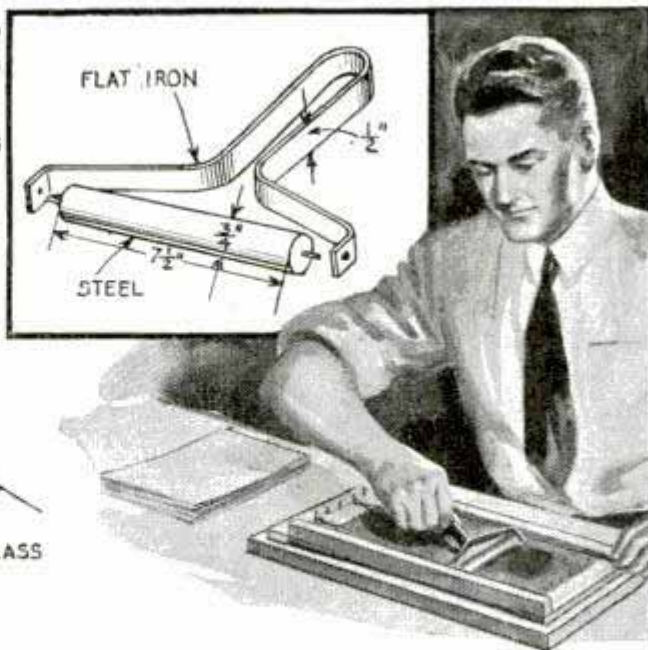
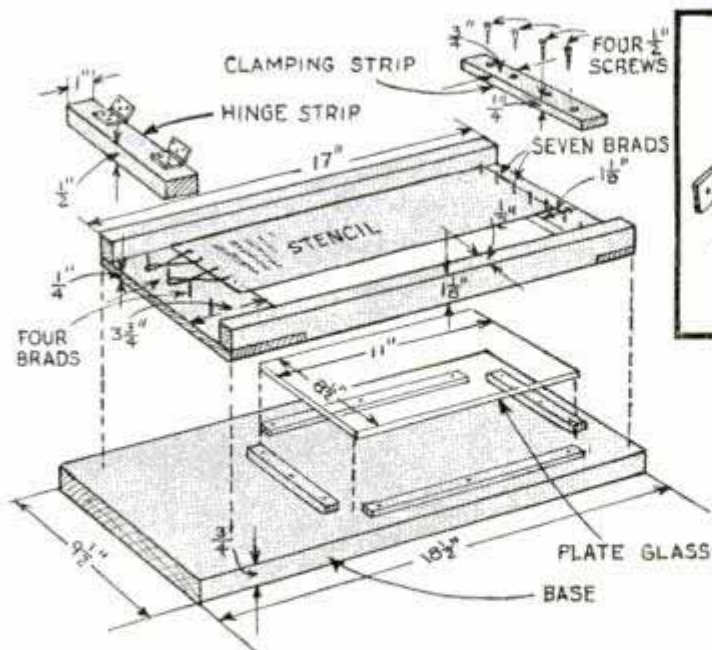
## Keeping Flap of Slide-Rule Case Closed with Staple

Men who carry slide rules in their pockets, and are bothered by the flaps of the cases opening, will find that staple paper clips of the type shown will keep them closed. To use one of the



clips, make three slits in the flap as indicated and insert the clip as shown. The clip head prevents the flap from slipping out of the guide strip when closed.

# Simple Duplicator Uses Mimeograph Stencil



Owners of shops and stores who occasionally have small printing jobs can do the work at small cost on this homemade duplicator. It consists of a base having a frame hinged to it at one end, a mimeograph stencil and an ink pad. A piece of  $\frac{1}{4}$ -in. plate glass laid on the base and held by cleats assures a true, flat printing surface or impression plate for the paper. The pad, made from canton flannel, and the stencil are stretched in the frame and

pressed over brads at one end where a clamping strip holds them. At the other end, rubber bands run through the stencil and slipped over brads keep the assembly taut. In use, the paper is placed on the glass, the frame lowered and a roller, made as indicated, is run over the pad to force ink through the stencil. With a little practice, you will be able to put just the right pressure on the roller.

—O. E. Freeberg, Moline, Ill.

## Weeds under Electric Fence Cut with Mowing Machine

As it is necessary to prevent weeds from growing up against the wire of an electric fence because they are likely to short-circuit it when wet, a Wisconsin farmer drives the stakes or posts that support the wire into the ground at an angle. Then the weeds can be cut with a mowing machine instead of a scythe. In following this method, be sure that the posts lean sufficiently for the mower sickle to slide along on the ground under the wire without striking them. If the fence has been built near the ground for swine and other small animals, it may be necessary to remove the swath board from the end of the sickle bar. If this is done, the sickle can slip under very low stakes.

☞ Chickens can't scratch their crushed oyster shell over the lot and waste it if you keep it in a shallow box or frame covered with 1-in. mesh wire.



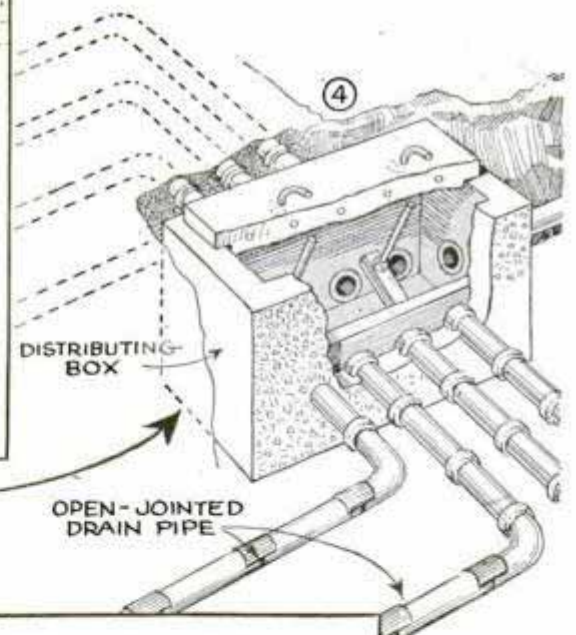
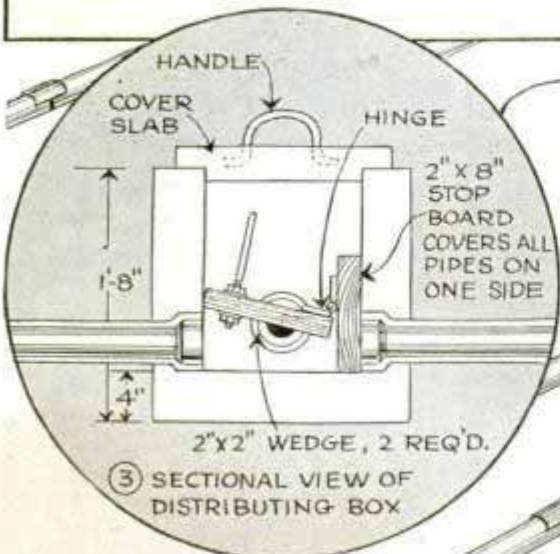
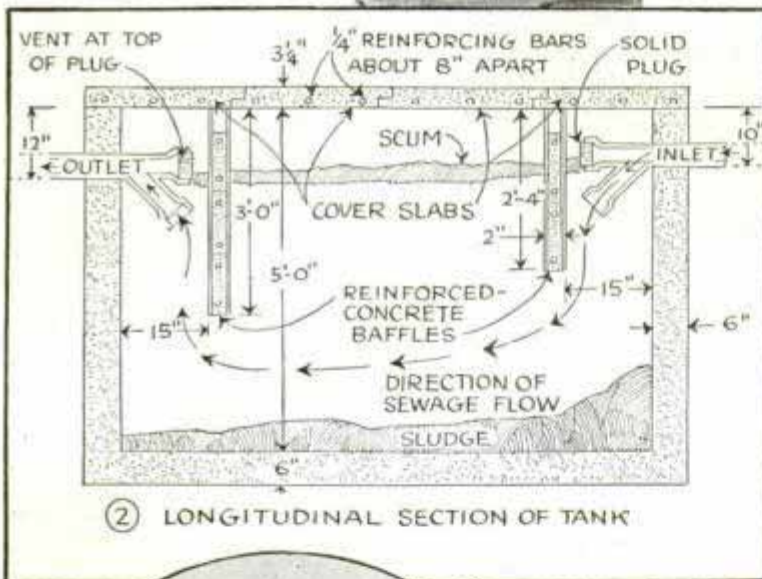
# Rural SEWAGE DISPOSAL

By C. A. CROWLEY



**P**ROPER disposal of sewage and waste matter is just as essential to the summer home or farm as it is in the city. By the use of a simple septic tank and proper disposal of the effluent or outflow from the tank, the possibility of pollution of the water supply can be practically eliminated.

The septic tank should be reasonably close to the house, say 5 to 20 ft., depending on conditions, so that sewer lines can be short and straight. In this way it is unnecessary to interpose a grease trap between the kitchen and the septic tank. It should not be located in close proximity to wells, springs or cisterns. A distance of at least 50 ft. is advised. Any gases formed in the septic tank will escape through the vents in the plumbing system of the house. It is required that all plumbing outlets be equipped with vents above the house level.

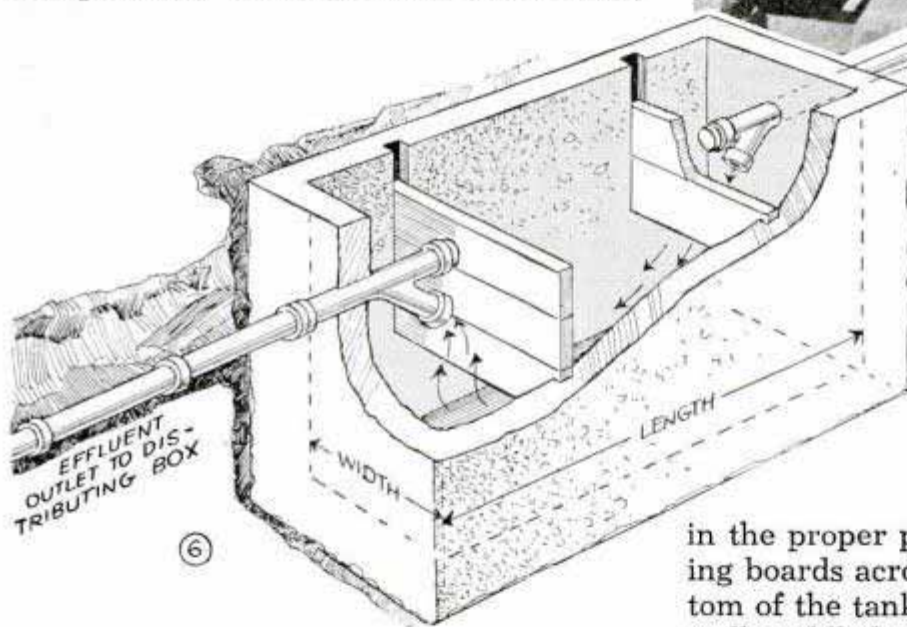


SIZE FOR SEPTIC TANK				
No. of Persons	Inside Dimensions in Feet			Gallons Capacity
	Length	Width	Depth	
7 or less	6	3	5	540
8 to 10	7	3	5	630
11 to 14	8	3	5	720
15 to 21	9	4	5	1080
22 to 24	10	4	5	1200

Two "purifying fields" located on opposite sides of a distributing box, permit one to be rested while the other is in use. Thus over-irrigation of the soil is avoided. Use of a stop board or valve in the distributing box makes it easy to direct the sewage to either field

# MADE SAFE

These are the usual restrictions imposed by health ordinances and by good practice in plumbing. On the assumption that the plumbing in the house will be adequate, there is no need for any further concern on this score. The tank must be built large enough if it is to be safe, and this means that a capacity of not less than 50 gals. per person must be provided. In addition, no tank should be built smaller than 500 gals. or thereabouts, as very small tanks are found to be inefficient and have no overload capacity. It is best to build a tank larger than present needs, to provide for future or unexpected requirements. You can purchase a ready-made metal tank,



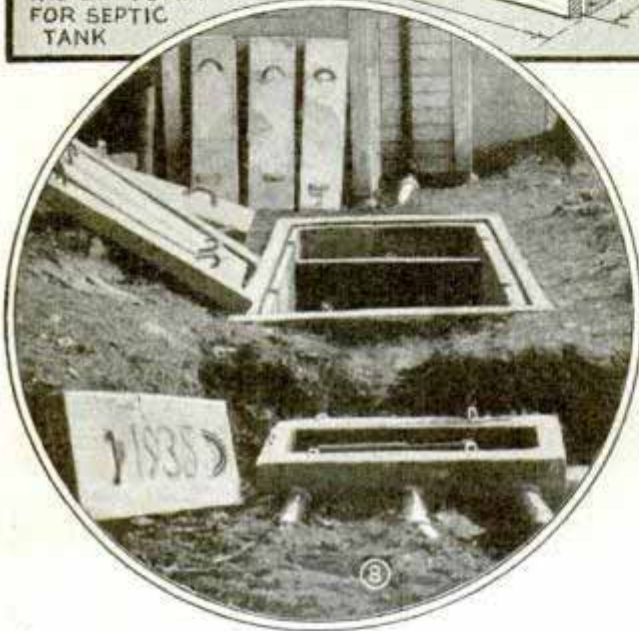
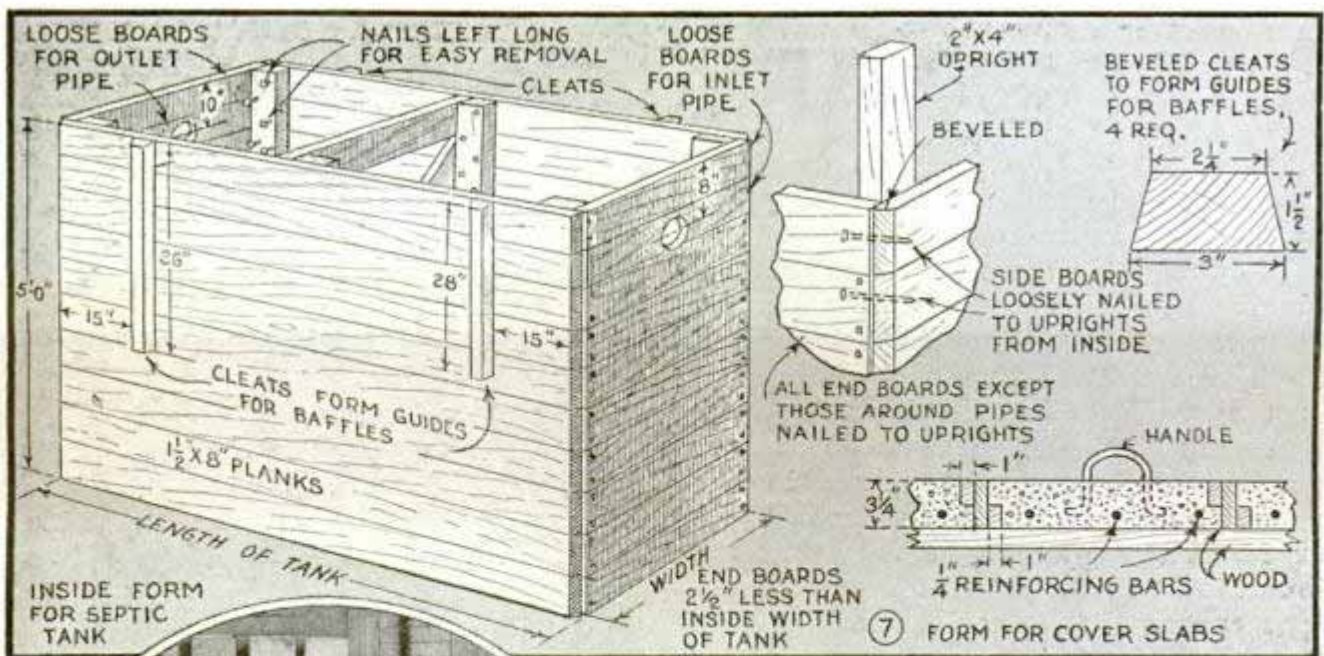
coated to make it resistant to corrosion, or you can build a concrete tank. In case of a concrete tank it should be cast in one piece as shown in Fig. 6, so that there are no construction joints in sides or bottom. Construction details are given in Figs. 2, 3, 4 and 5. The size of the required tank can be found from the table in Fig. 4. Fig. 2 indicates the appearance of the tank in operation.

Beginning construction, the first consideration is the forms. If the ground is firm and does not cave, no outside forms will be required and the excavation, Fig. 1, should be made the exact outside dimensions of the tank. If the soil caves, outside forms will be required, and the excavation must be made large enough to accommodate

RAW SEWAGE LINE  
BELL-AND-SPIGOT  
PIPE WITH CEMENTED  
JOINTS

these. Inside forms should be constructed as shown in Fig. 7. Note the cleats on the outside of this form to provide channels for the baffles, Figs. 2 and 6, and note also the provision that is made for inlet and outlet pipes.

It will be necessary to suspend the inside forms in the proper position by nailing supporting boards across the top, Fig. 5. The bottom of the tank is then poured first, and is well puddled and tamped for solidity. The concrete should be mixed  $4\frac{1}{4}$  gals. of water per sack of cement, if moist aggregates are used. With dry sand and aggregate, this quantity of water can be increased somewhat, but no more than  $5\frac{1}{2}$  gals. of water should be used under any circumstances. If the sand and aggregate are very wet, reduce the amount of water to  $3\frac{3}{4}$  gals. per sack of cement. About 2 cu. ft. of sand and 3 cu. ft. of gravel or crushed rock, graded up to 1 in., should be used to each sack of cement. This amount of aggregate should be tried in the first batch and adjusted if necessary by using more or less aggregate in succeeding batches. Do not vary the amount of mixing water. The concrete should be mixed thoroughly until each particle of gravel is covered with a mortar of sand and cement. The final mix



should place readily, but require some tamping to settle properly. Avoid mixes that are too sloppy or too dry.

As soon as the floor is poured, start pouring the walls. Pour about 6 to 8 in. at a time, puddling and tamping well until thoroughly compacted, and then pour the next layer. Continue in this manner until the forms are filled. The inlet and outlet pipes are cast in place. In summer the forms can be removed after about a day, but if the weather is cold it will be better to wait somewhat longer. It is not well to leave the forms too long, as they may swell, making removal difficult.

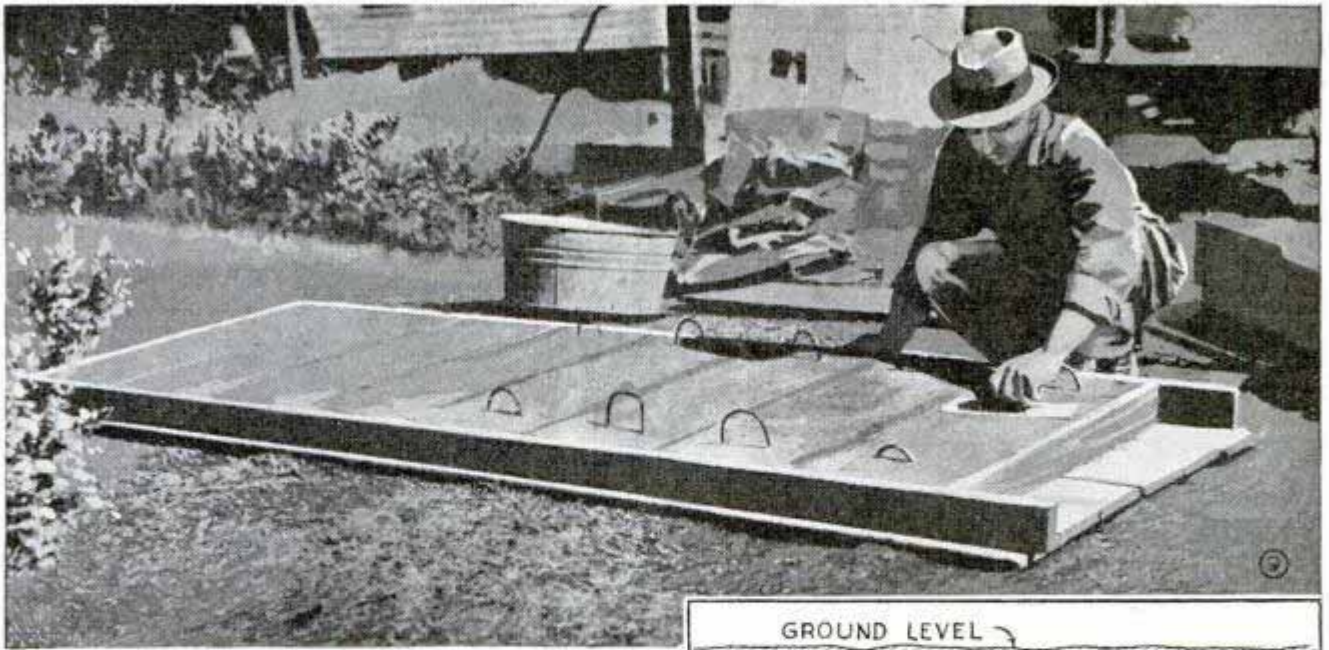
The cover slabs and the baffles are cast in molds as in Figs. 7, 8 and 9. They should be made in sections light enough to be handled easily when necessary. About 1 in. of concrete is poured in the molds, the reinforcing rods or bars are then put in place, and the form is filled. Handles should be provided in the lids.

The line connecting the septic tank to the house should be constructed of 4-in. bell-and-spigot tile pipe. The joints must be cemented tightly so that there will be no danger of seepage. The straight end of the inlet pipe, Fig. 2, should be plugged so that all sewage will enter below the surface of the liquid. The plug can be removed should it be necessary to clean out the sewer pipe.

The liquid, or effluent, which leaves the septic tank is not purified completely. The action of the septic tank is carried on by a species of bacteria called "anaerobic," which means that they thrive in the absence of air. These bacteria liquefy the solids in the sewage and the effluent is relatively clear and partly purified. It is then fed underneath a purifying field where the process of purification is completed. In this case the action is carried on by bacteria that are called "aerobic," that is, those that require oxygen for living. The organic matter in the sewage is fully oxidized here and all harmful substances are eliminated completely.

The effluent is carried to a distributing box, Figs. 3, 4 and 11, by means of a sealed tile pipe. From this distributing box, a number of open-jointed tile pipes are run underneath the purifying field. The length of open tile that will be required will depend on the quantity of sewage and also on the nature of the soil. If the latter is light and porous, or sandy, as little as 30 ft. of drains per person will serve. On the other hand, a clay soil may require as much as 100 ft. of pipe for each person. Another necessary precaution is to provide dupli-

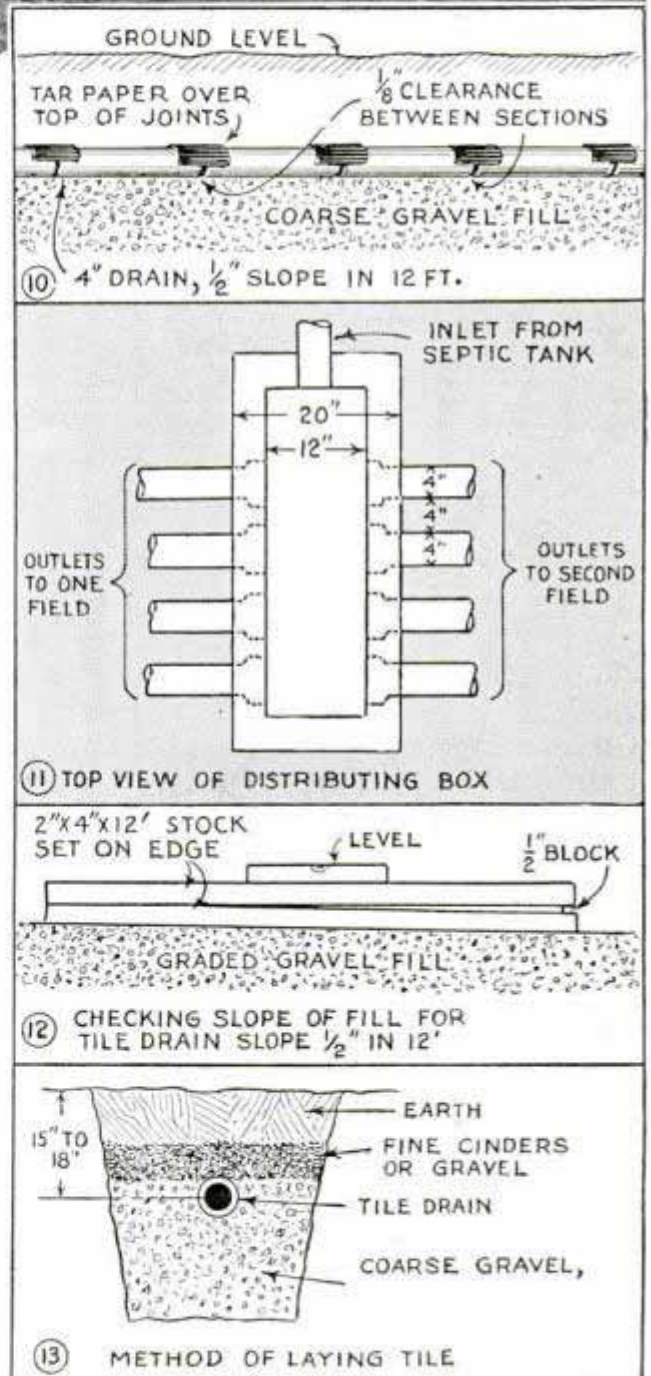




cate facilities so that one area can be allowed to rest while the other is being used. In this way you will avoid overworking the soil and especially over-irrigating, since the sewage is principally composed of water. If the distributing box is constructed as shown in Figs. 3 and 11, it is a very simple matter to divert the flow to either of two fields. A stop block in the box covers the tile openings to one field and is held by hinged wedges.

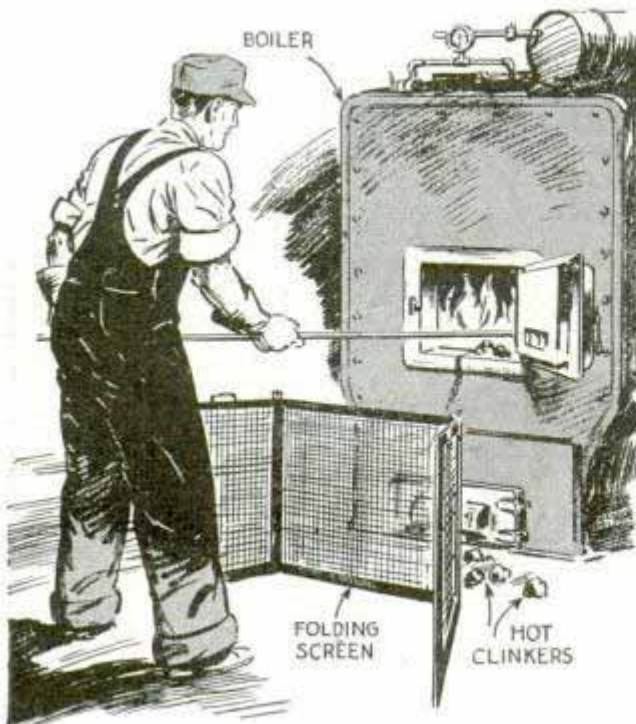
The drain tiles preferably should be laid in a substantially level field, about 15 to 18 in. underground—just deep enough to plow over. Dig trenches about 2 to 2½ ft. deep and fill them to the required depth with gravel or crushed rock, as shown in Figs. 10 and 13. This must be graded carefully to give a pitch of ½ in. in 12 ft. Two 12-ft., 2 by 4-in. planks, a ½-in. block, and a level will serve to check the slope, as shown in Fig. 12. The tile that is used for the system is ordinary open-jointed drain tile. The tiles are laid on top of the gravel, with about ⅛ in. between succeeding sections, and a piece of tar paper is laid over the top of each joint, as shown in Figs. 4 and 10. Then gravel is placed loosely over the pipe, followed by a layer of fine cinders, and finally the topsoil is replaced.

The tank should be allowed to cure for about two weeks before being placed in use. After this, it will take a few days for the tank to fill and set up ideal operating conditions. In operation, a thick scum will form over the top of the liquid in the septic tank, as indicated in Fig. 2. As this is the best protection for the anaerobic bacteria, it should not be disturbed.



*Tile trenches in "purifying field" should be 24 to 30 in. deep and should be filled with coarse gravel or crushed rock as indicated above*

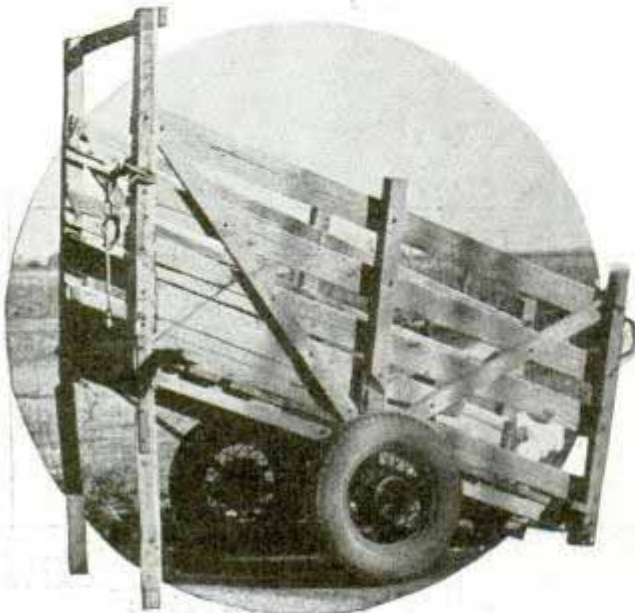
## Screen Protects Workman's Feet When Cleaning Boiler



To assure protection of his feet and legs when pulling clinkers from the firepot of a large boiler, one workman uses a folding fireplace screen as shown. If any of the large, red-hot clinkers accidentally drop on the floor and burst, the screen keeps them from striking his legs.

## Portable Stock-Loading Chute Mounted on Rubber Tires

Intended for use by several farmers, this loading chute is mounted on the rear-axle assembly of an old car so that it can be towed like a trailer from farm to farm as needed. The hinged supporting legs at the



front of the chute fold up against the body for moving, and they are adjustable to support the chute at a height to suit any truck with which it is used.

## Hacksaw Blade Used in Scroll Saw

When you are out of heavy metal-cutting blades for a scroll saw and a supply is not immediately available, it is a simple matter to cut down a hacksaw blade to fit. Just file down the ends of the blade so that they will fit the chucks.



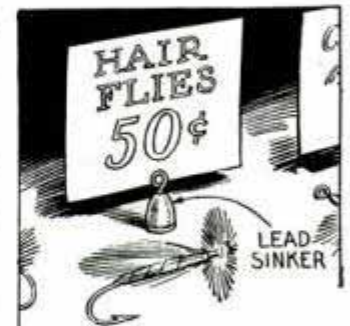
## Canceling Stamp from Hose



A rubber stamp for canceling printing on labels or shipping containers is made easily from a short piece of corrugated hose. This is slit along one side so that it can be spread and slipped over an old stamp block or a piece of wood cut especially for the purpose.

## Fishline Sinkers Hold Price Tags

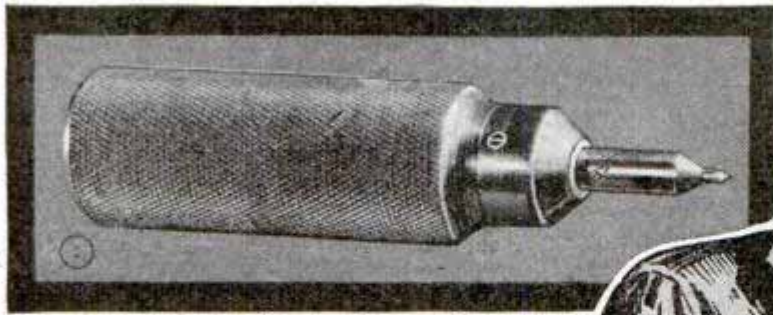
While putting a display of fishing tackle in his show window, a Wisconsin merchant found that lead sinkers cut in half provided appropriate holders for price tags. Large sinkers were used, and the loops of wire imbedded in each end of them served to hold the cardboard tags upright.



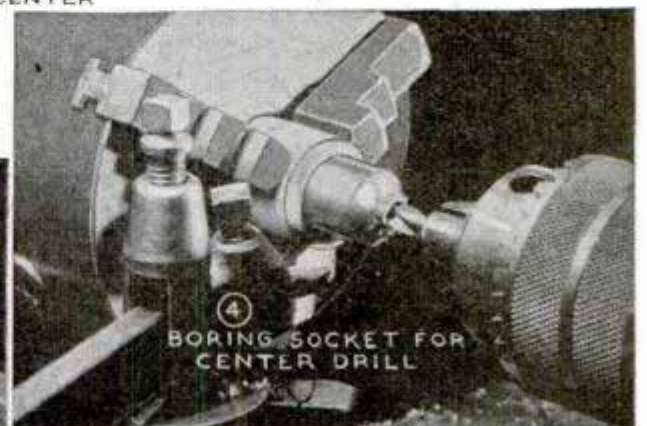
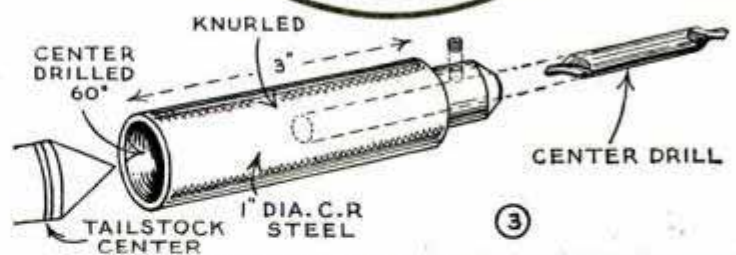
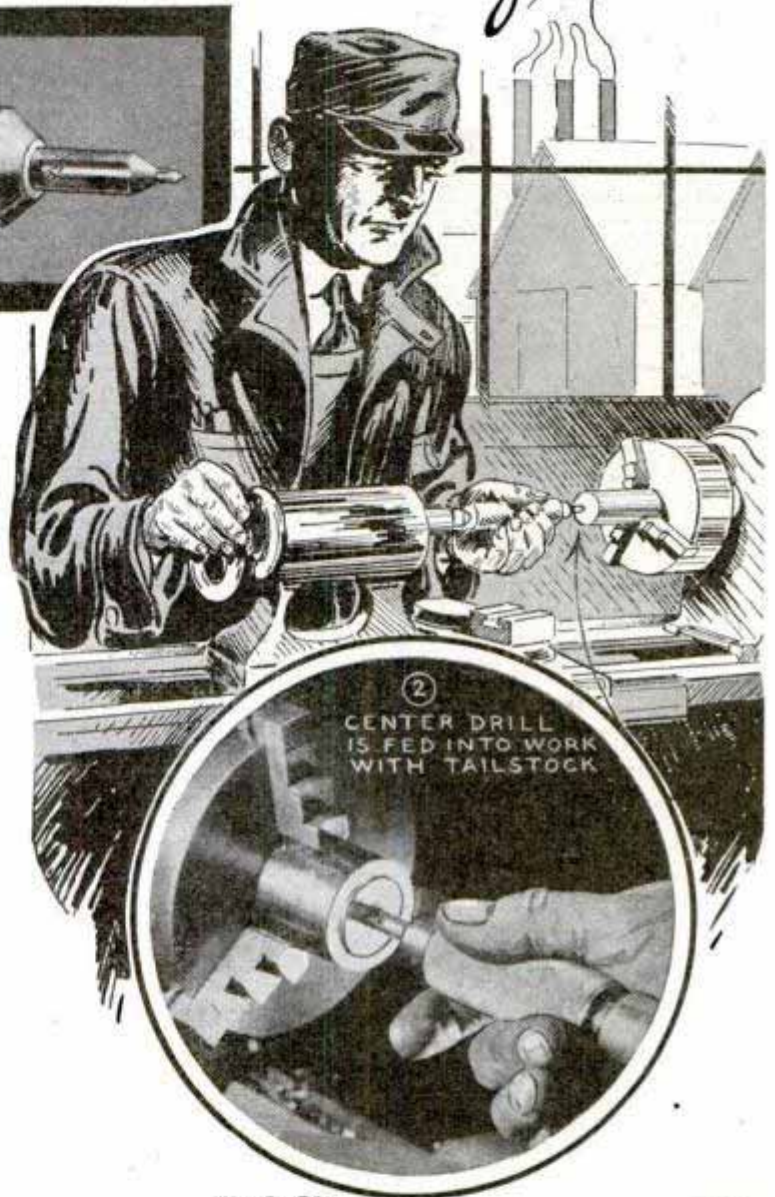
☐ Bronze welding rod is better than rawhide for pins in metal belt lacing as it does not swell and stick.

# Floating CENTER CHUCK

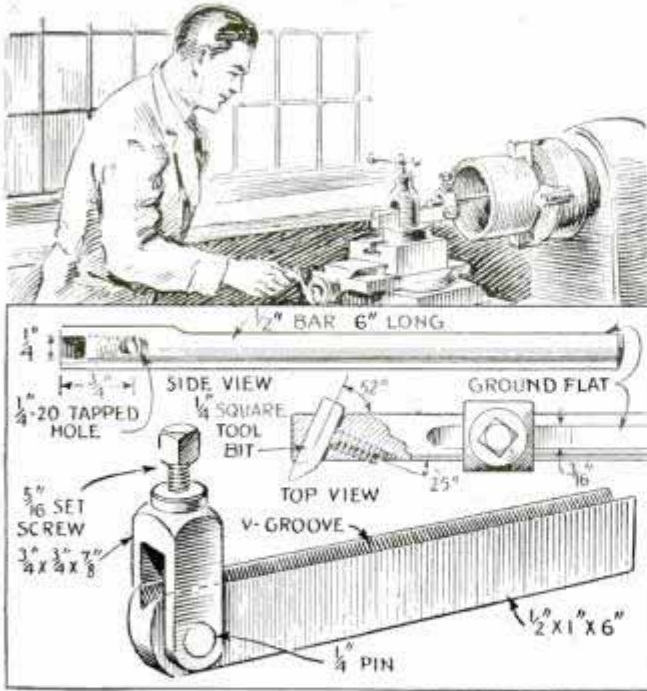
*saves time in the shop*



WHEN using a center drill in a lathe, this floating chuck will save the time usually lost in putting a tailstock chuck in place and clamping the drill in it. With the floating chuck, you just rest it against the tailstock center, with your hand guiding the drill into the work as the tailstock spindle is moved forward, after which the chuck is steadied with the hand, Fig. 2, to prevent turning as it is fed into the work. Fig. 1 shows the completed chuck, which is made from cold-rolled steel turned to the shape given in Fig. 3. After turning the stock, it is knurled to afford a good grip for the hand, and then the large end is bored out at a 60° angle to fit over the tailstock center, Fig. 5. Next the stock is reversed in the lathe chuck and the small end is drilled out to take the center drill as in Fig. 4. A small hole should be drilled and tapped near this end of the work to take a set screw, which is turned down to hold the center drill in place. When using the chuck, care must be taken, of course, not to force the center drill into the work so fast that it causes the chuck to spin in the hand, which might be injured.



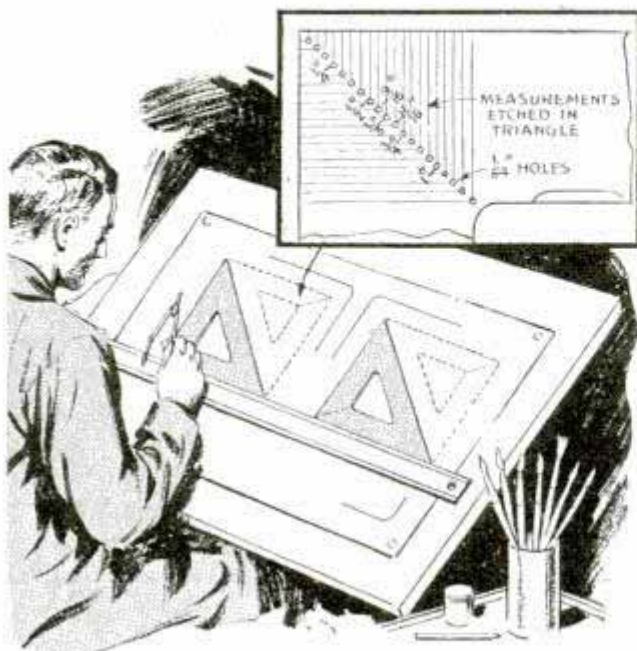
## Boring Bar Fits in Small Openings without Set Screw Interfering



For boring out small openings where the tool-locking set screw of a regular bar would interfere, try a boring bar of the type shown. A set screw is used to lock the cutting tool in place and is flush with the surface of the boring bar. The bar is flattened on top for the tool-holder screw to bear against, and it rests in a V-groove of the holder as shown.

## Radius Gauge Etched on Triangle Saves Artist's Time

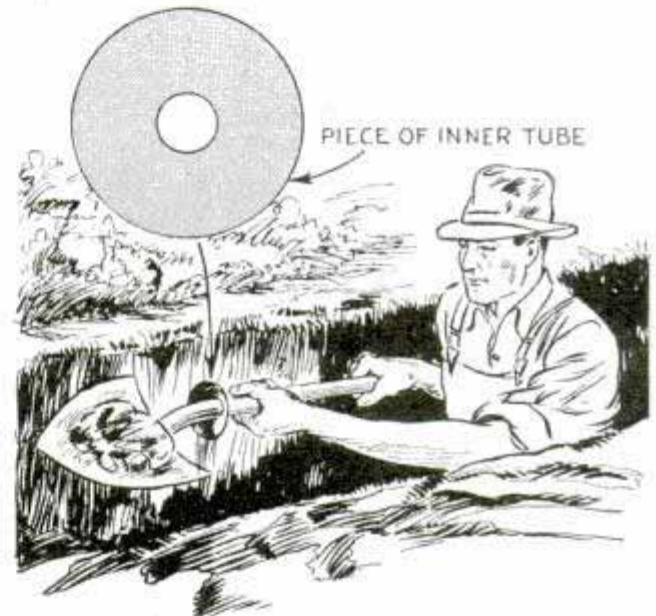
This gauge on a triangle will enable you to locate instantly a compass point to make round corners and similar work. After



drawing the lines on the square as indicated, using a soft lead pencil, drill tiny holes where each pair meet. Then erase the lines and etch or scratch in the measurements. In use, the triangle is lined up with the vertical lines on your work, and the leg of the compass is pushed into the hole representing the desired radius to prick the paper. Then the compass is removed and the leg set in the prick to scribe the desired arc.—Otto K. Korth, Fairmont, Minn.

## Rubber Shield on Shovel Handle Deflects Water

When using a shovel where water and mud are likely to run down the handle, try a rubber shield similar to the one shown. It is a disk cut from an old inner tube with



a hole made in the center to slip tightly over the shovel handle. Cut this hole small so it has to be stretched to go over the handle, and the disk will take a cup shape.

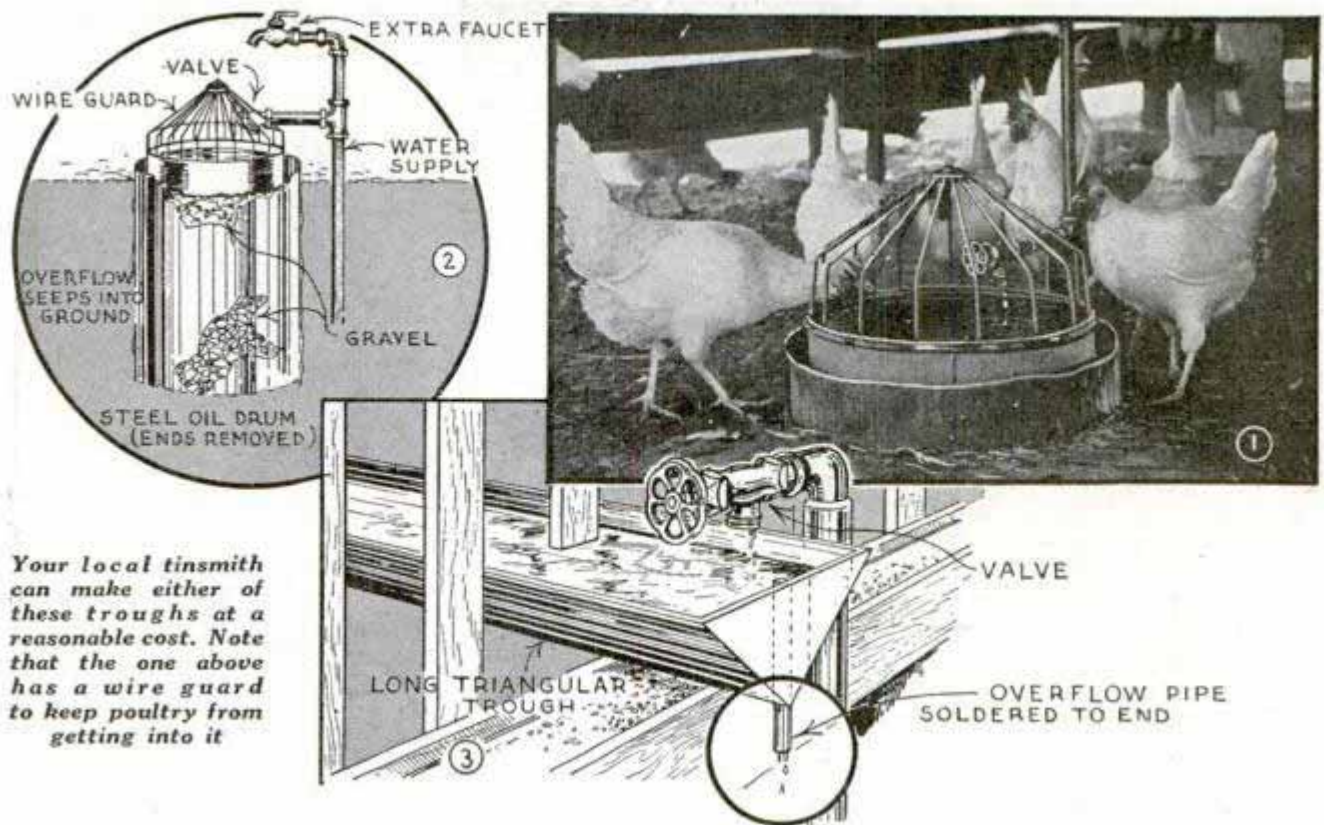
## Neat Stencils for Spray Painting

When cutting stencils for spray painting, I used silk thread to hold the centers of some letters instead of leaving a connecting tie in the stencil to hold them in place. The thread leaves no mark on the finished work and the finished job is much neater. The thread can be anchored with rubber cement or with collodion.



—J. Philip La Point, Ottumwa, Ia.

# Dripping Faucet Keeps Poultry Water Fresh



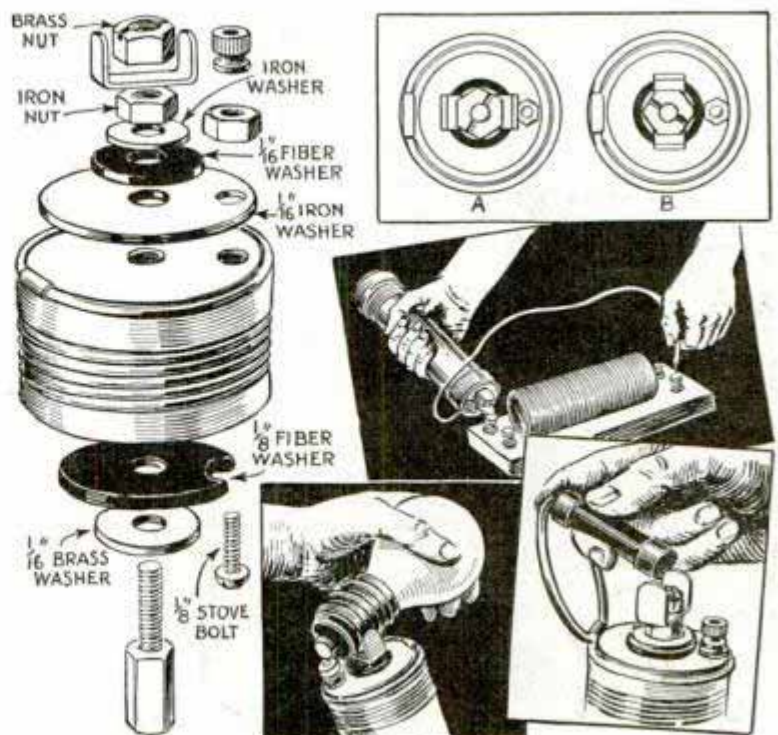
Your local tinsmith can make either of these troughs at a reasonable cost. Note that the one above has a wire guard to keep poultry from getting into it

A constant supply of fresh water for poultry is provided by either of the watering troughs shown above. Water from a pipe drips into them, and displaces stale water, which flows away. Figs. 1 and 2 show a good method of disposing of this waste water to avoid wet, muddy ground around an outside trough. An oil drum

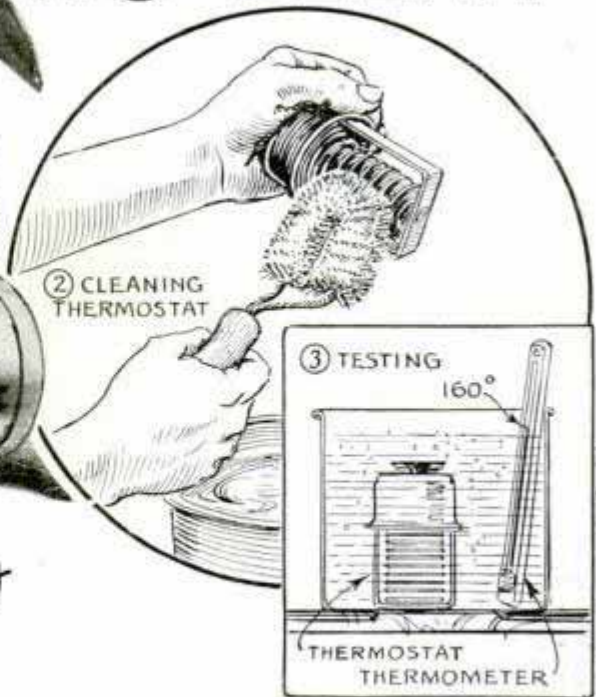
with the ends removed is sunk into the ground so that it projects about 3 in. It is filled with coarse gravel and the trough is set in it. Waste water runs into the drum and slowly seeps into the ground. The trough in Fig. 3 is for an inside battery. It is made of sheet metal and has an overflow, which projects almost to the top at one end.

## Flashlight Serves as a Good Pocket Electric-Circuit Tester

I find this simple tester, made from a flashlight, handy for testing fuses, lamps, magnet coils, control circuits and other circuits that do not have too much resistance. The bottom cap of the flashlight is altered as indicated. While not shown, the screw that passes through the cap to hold the assembly together should be insulated from the cap and iron washer with a short piece of rubber tubing. The various tests are shown in the right-hand details. In the upper details, A and B, the U-shaped piece of yoke is turned to contact the binding post when using the flashlight for its regular purpose. Tests are made with the switch in "on" position.—Henry E. Holtschneider, Cumberland, Md.



# "SPRING-CLEAN"



① Back Flushing

② CLEANING THERMOSTAT

③ TESTING

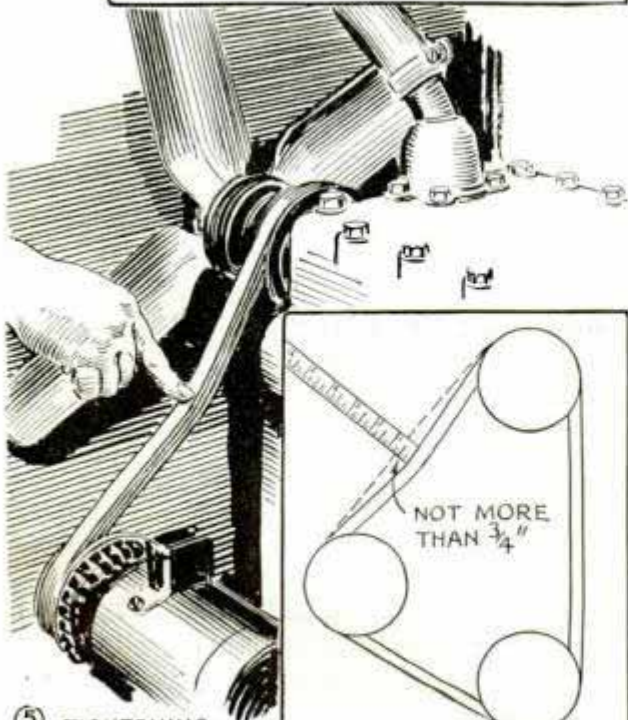
160°

THERMOSTAT THERMOMETER

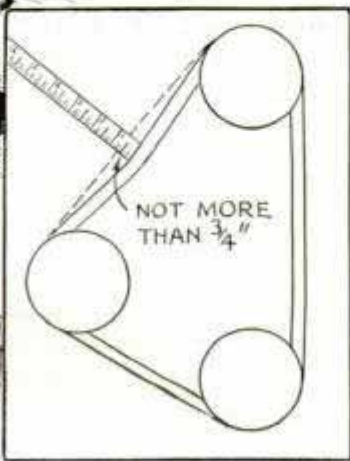
FLAP OF INNER LINING CAN CAUSE STOPPAGE



④ DETERIORATION OF WATER HOSE



⑤ TIGHTENING FAN BELT



NOT MORE THAN 3/4"

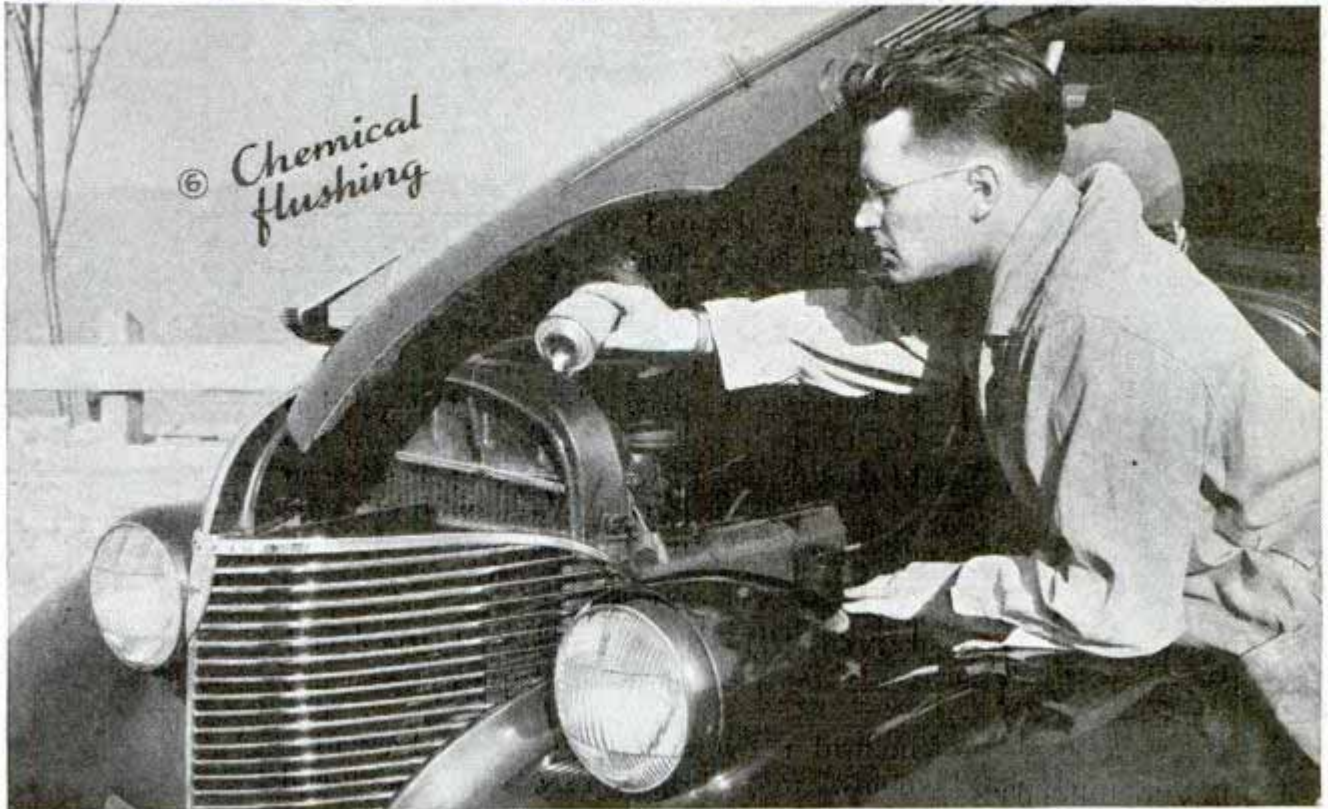
By JAMES WARD

NO MOTORIST would deliberately insulate his motor and radiator during the hot summer months, yet, in a way, that is exactly what happens, slowly, when the cooling system is not cleaned at regular intervals. Corrosion—rust, lime, and grease—slowly builds up on the radiator tubes and motor water jackets, retards heat dissipation and causes the motor to overheat. This can be avoided if you will take a little time each spring and fall to clean and flush the system.

Overheating often results in serious trouble and costly repairs, yet the condition develops so slowly that few motorists realize that the cooling system was at fault. Burned valves, scored pistons, bearings and cylinder walls; warped and cracked motor blocks and cylinder heads, especially aluminum heads, are all penalties of overheating motors. Also, excessive heat causes all moving parts to expand far more than normally with the result that clearances between them are reduced to a point where wear is increased considerably, lubrication is insufficient and the parts fail or break.

Chemical flushing or cleaning, Fig. 6, is the favorite method of cleaning a cooling system, and if done at regular intervals, is usually sufficient. There are a number of good compounds on the market for this

# the COOLING SYSTEM



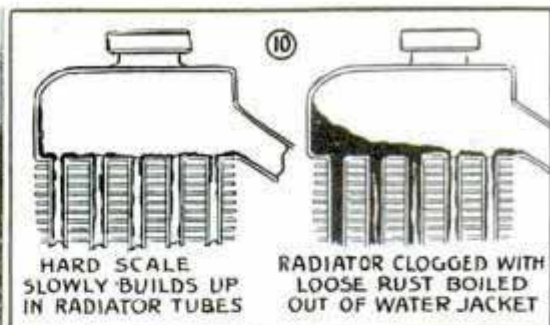
*Thoroughly cleaning and flushing the cooling system periodically with a high-grade compound is good insurance against corroded and clogged water passages, which may cause unexpected overheating troubles and costly repairs*

purpose. Care should be taken in selecting one, and only the best should be used. Many cleaners are alkalis, like washing soda, or solvents like kerosene. They cut grease and remove loose rust, but have no effect on rust itself and do not remove hard rust scale in the radiator core, Fig. 10. Acid cleaners have no solvent action on grease, but do act on the rust scale. Therefore, as many cooling systems are coated in places with a thin film of grease admitted through the pump bearing, it is necessary to use a cleaner that can remove both grease and rust scale. If your car has aluminum cylinder heads, be sure that the chemicals in the cleaning compound used are not harmful to them. Most manufacturers print this information on the containers.

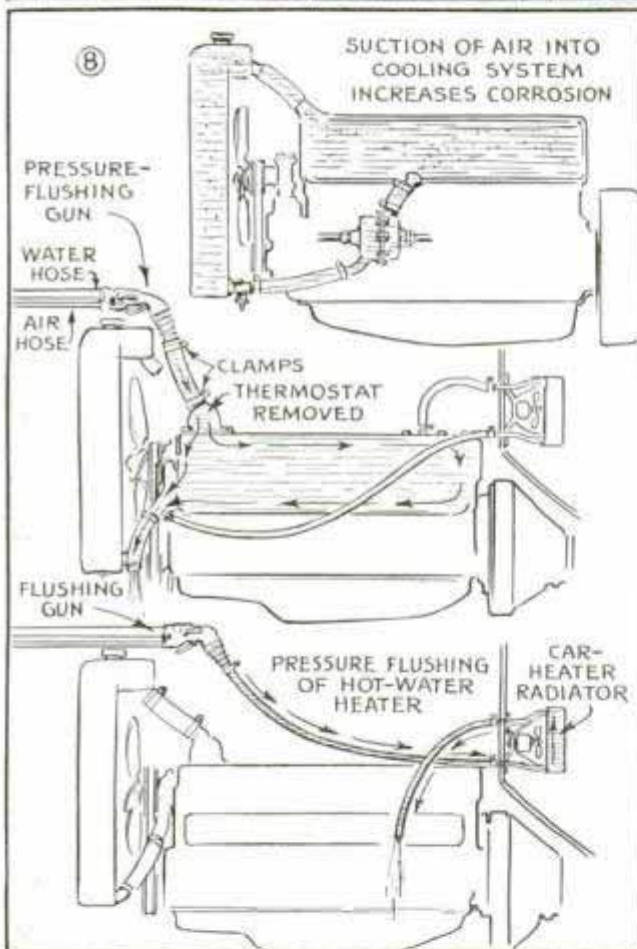
It is best to have your garageman clean your radiator, but if you would rather do it yourself, follow the directions on the can of compound. Then flush out the system with water under pressure. This is necessary, after the chemicals have loosened the corrosion, to remove the particles. If left in the system, they will clog small passages. Here again, the garageman can do a better job because he has the equipment, such as a flushing gun, Fig. 8. This combines air

pressure with water and sends it through the system in spurts that tend to dislodge the loose particles. However, a garden hose is better than just pouring water through the system. To do the flushing, remove all hose connections and flush the radiator from the bottom, Fig. 1. Always flush a radiator or motor block in the direction opposite to that in which the water normally flows. If the flushing is done in the same direction, the corrosion particles that have been carried into small passages by circulation of the cooling water will only be wedged tighter into them. Run copious amounts of water through the system to assure that all of the cleaning compound has been removed. Next flush out the motor block, inserting the hose at the cylinder-head connection. Then disconnect the heater hose, Fig. 7, and flush it.

Before replacing the radiator and heater hose, examine them carefully to see that the inner lining has not rotted, Fig. 4. If there are any indications of decay, it is best to replace them. Otherwise, the lining may loosen and restrict the flow of water. Examine the thermostat and clean it thoroughly as in Fig. 2. A gummy thermostat cannot operate efficiently, and may cause



overheating. After cleaning, test it to see if it opens correctly. Determine the temperature at which it should open, and then place it in water heated to this temperature as determined by a thermometer, Fig. 3. Remember that many elusive overheating troubles are caused by a thermostat that is not working correctly. Now connect



the hose and fill the radiator. Use gasket shellac on the metal parts over which the hose are slipped. This seals them tightly against leaks and the admittance of air to the cooling system. The importance of this will be mentioned later. Always add a can of rust inhibitor to the refilled radiator. This costs only a few cents and is very effective in preventing corrosion. Usually the inhibitor does not have to be added to an anti-freeze during fall or winter as most anti-freeze solutions contain rust inhibitors. However, always be sure, and if this is not the case, add some to the radiator when putting in the anti-freeze. This is one way to avoid trouble during spring and summer.

After filling the radiator, check the fan belt. If it is too loose, it will slip and cause overheating. If it is too tight, it will wear the pump bearings rapidly. The slack in the belt should be  $\frac{1}{2}$  to  $\frac{3}{4}$  in., Fig. 5. While you are at it, check the pump packing. If the pump sucks air into the cooling system, or if air can enter the hose connections, the water becomes full of bubbles and foams, which results in overflow loss and overheating. Also, oxygen in the air mixes with the cooling water in the system and greatly increases rusting of the metal parts. Insects and dirt between the fins of the radiator will block the passage of air through it so that heat is not dissipated rapidly. A stream of water directed through the radiator from the rear as in Fig. 9 will usually clean it. Also, avoid installing emblems and license plates on the radiator grill where they interfere with air passage.





## Inexpensive Battery Filler



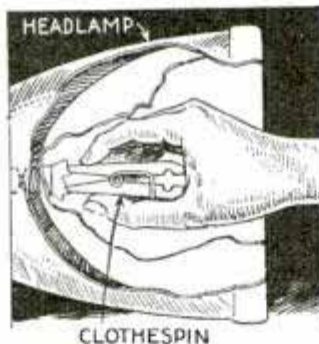
This handy distilled-water container for filling storage batteries is made easily from a bottle, a rubber stopper and a length of small rubber tubing. The stopper is drilled lengthwise to take the tube

tightly, and one side at the upper end is cut away as indicated. This permits the user to close the tube with the thumb to stop the flow of water as desired.

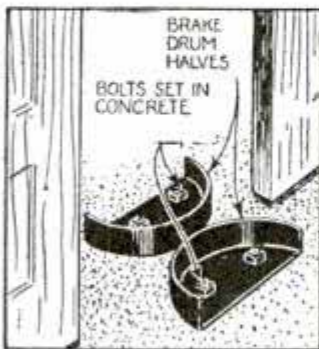
—Ivan J. Stretten, Detroit, Mich.

## Broken Headlamp Bulb Removed with a Clothespin

Instead of trying to remove a broken headlamp bulb with your fingers, which may be injured on the glass, use a spring-type clothespin. Just compress the handles of the pin and insert them into the bulb socket. The clothespin spring will cause the handles to bear firmly against the socket so that it can be screwed out without touching the fingers.



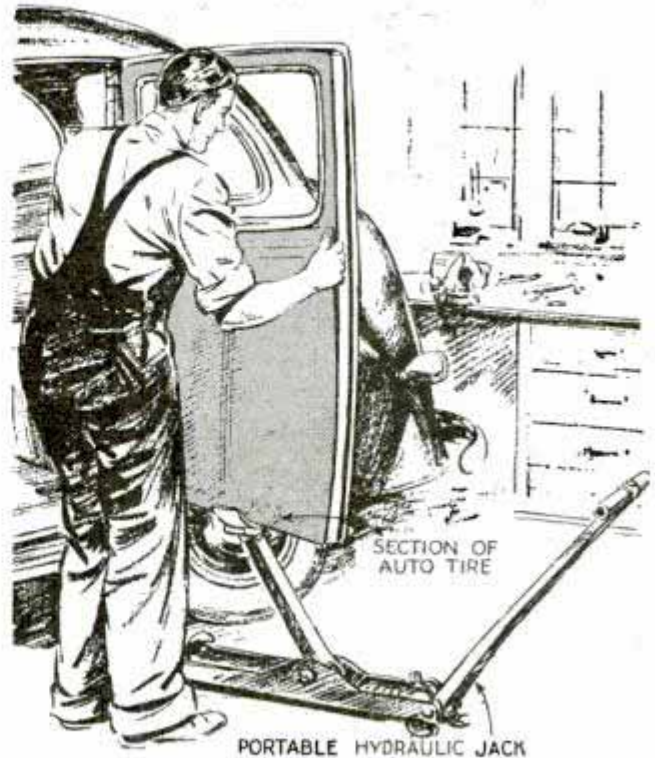
## Sliding Doors of Garage Guided by Brake Drums



Fastened to a stub post driven deeply into the ground, or to bolts imbedded in concrete, a large brake drum cut in half and arranged as shown provides a good guide for sliding doors. The

curved surfaces of the drum facing each other prevent any possibility of the door edge catching on them as it is slid into place.—Dale R. Van Horn, Lincoln, Nebr.

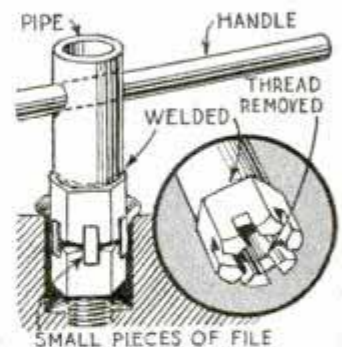
## Jack Steadies Car Door to Work on Window or Lock



The difficulty of holding a car door open and in a firm position for work on the lock or window mechanism was overcome by one garageman who used a hydraulic jack as shown. It was moved into position under the door, and a section of old automobile casing was placed under the door to prevent damage, after which the jack was snugged up under it to hold it firmly while the work was being done.

## Castellated Nuts Removed Easily with This Wrench

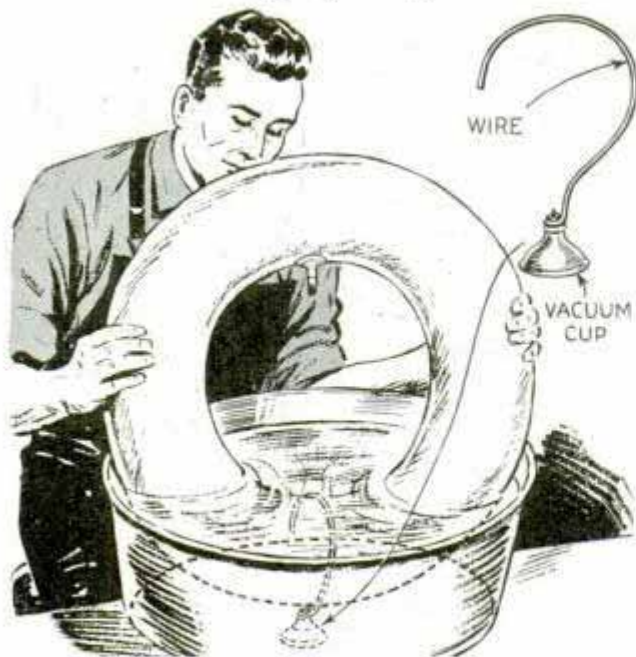
When castellated nuts are countersunk or located where you cannot reach them with the usual type of wrench, try the one shown. It consists of a castellated nut welded to a short length of



pipe which has a rod inserted into holes at the top to serve as a handle. The threads of the nut are reamed out and small pieces of a file are driven tightly between the castellations so that they will extend into those of the nut to be loosened when the wrench is pressed down on top of it.

—Chas. Gincel, Stewartville, N. J.

## Inner Tube Held in Tub of Water for Testing by Large Hook



In the home garage, an inner tube can be tested for leaks in a tub of water by the

aid of a large wire hook attached to a vacuum cup. The cup grips the tub bottom and the tube is rotated under the hook as indicated.

## Car Exhaust Fumes Carried to Rear of Trailer

Finding that fumes from the car exhaust entered his trailer through windows and ventilators while on the road, one motorist carried the exhaust out at the back of the trailer. To do this, a pipe was installed underneath the trailer and connected to the tail pipe of the car exhaust pipe, the connection being made with a length of flexible tubing. This should be of a length to allow the car to turn without pulling it off, yet not drag on the ground. Wire hooks fastened near the ends of the tubing to engage wire eyes near the ends of the two pipes held it in place and permitted quick detachment when the car was used without the trailer.

# Plenty of Fun at a Safe Speed



*This small car, having a 58-in. wheelbase and 28-in. tread, is very easy to operate and may be powered by a 1/2 to 3/4-hp. gas engine of the washing-machine type. It is equipped with effective brakes and pneumatic tires. Plans show three alternate methods of body construction. Easy to build. Our blueprints Nos. 906 to 909 incl. give you all the information necessary. This set will be sent postpaid on receipt of \$1.00.*

### MORE PLANS ON SPRING PROJECTS

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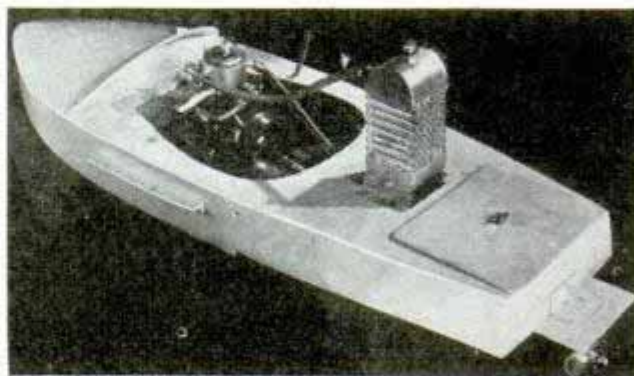
**DUTCH WINDMILL AND WATER WHEEL—911:** Mill, 40 in. high. Small water wheel. 25c.

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Address Plan Service, Popular Mechanics Magazine, 200 E. Ontario St., Chicago

# WHY MR. MURPHY DIDN'T GIVE HIS RADIO AWAY



Mr. Murphy drives into a service station plenty mad. "Do you know anything about radios?" he yells. "I put some new tubes in this job this morning and it's still no good. For two cents I'd tear it out and give it to you!"



Fred, the service man, takes a look inside the car. "I'm no radio expert," he says, "but this is an Authorized Certified Re-Wiring Service station, and I can see from here that those wires leadin' to the radio are 'shot.' I'll re-wire it with Packard cable."

"Boy, listen to her now!" beams Mr. Murphy. "Guess I'll keep this radio after all!" Fred says, "Good accessory wiring is just as important as the other wiring on a car. And if you want this car to run as sweet as that radio, stop in tomorrow and let me give her an Authorized Certified Re-Wiring check-up!"



## The Chances Are 4 to 1 That Your Car Needs PACKARD'S AUTHORIZED CERTIFIED RE-WIRING SERVICE

### SPECIAL TO DEALERS

See your Packard jobber for information on how to become a Packard Certified Re-Wiring Service station. Take advantage of the demand for better electrical service. Packard Electric Division, General Motors Corporation, Warren, Ohio.

Worn-out or undersize cables and faulty connections cause hard starting, reduced gasoline mileage, loss of power and inefficient headlights. Take your car to a Packard Authorized Certified Re-Wiring Service station—identified by the blue-and-gold Certified Re-Wiring sign or by the mechanic's Certified Re-

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**Packard**  
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THE STANDARD WIRING EQUIPMENT OF THE AUTOMOTIVE INDUSTRY

# Rebuilding Paul Bunyan's Empire

(Continued from page 677)

by air when possible. Seventy landing fields have been carved out in mountain areas, and many lakes are large enough to land seaplanes. Experiments are being carried out in dropping fire fighters by parachute. The airplane finds its busiest role in transporting equipment. Burlap parachutes have been used to drop tools and supplies to men on the fire lines, 112 tons being supplied by air for one large fire last summer. Even eggs and portable

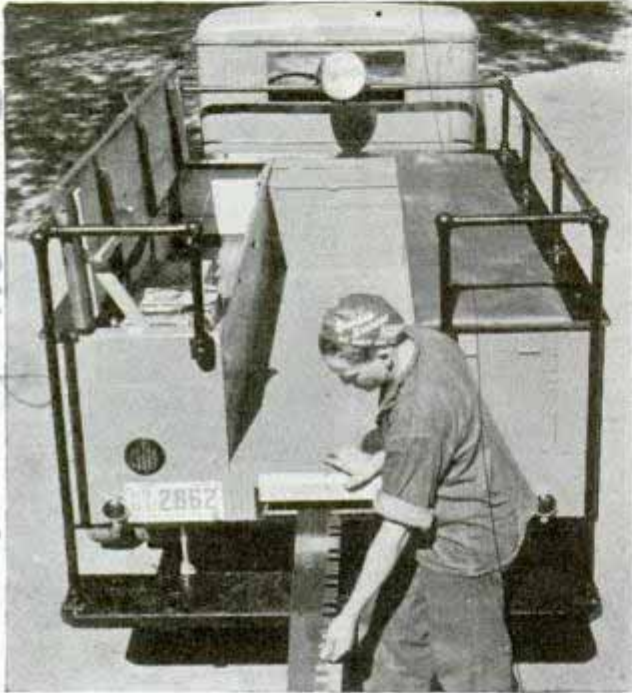
six pounds, powered with an outboard motor, propelled by man power, it marches with ease through pine needles and the litter of a forest floor, its hammers revolving at 800 revolutions a minute to produce a trench eleven and one-half inches wide, as fast as men can tow it. It can hammer its way through roots an inch in diameter, and can be operated in brush up to two feet in height. Light enough to be packed on a mule or manhandled, this machine can construct in a minute as much fire line as a man using hand tools could dig in a day—truly a mechanical Paul Bunyan.

Much of the fire fighting is done by the CCC before fires ever start. Areas frequented by campers are constantly patrolled. Permanent firebreaks are constructed by felling all trees in a wide, continuous lane, clearing out all combustible material. One firebreak in California is 600 miles long, most of it cut through virgin timber, up and down hills and along the crest of ridges. Whenever possible, firebreaks are combined with roads and trails, trees, brush, and weeds being cleared for some distance on either side of the road, to prevent fire from being started by discarded cigarettes of motorists, as well as to form a wide cleared area that will either halt the flames or permit safe back-firing.

Thousands of square miles of forest have been cleared of dead and felled trees, slash, and other highly inflammable material. Woodland streams have been dammed at strategic points, to form water storage basins for fire-fighting tanks and pumps. In Michigan, Wisconsin, and Minnesota, the CCC has developed motorized well-drilling units, for the quick provision of water near potential fire zones.

Next to fire, the forest's greatest enemies are insects. Tiny bark beetles have played havoc over large areas of the northwest, while the gypsy moth has been a serious tree menace in New England. To fight the bark beetle, CCC men destroy egg clusters, fell and burn infested trees. In gypsy moth areas, barriers are created by thinning out undergrowth, felling all of the particular species of trees favored by the moth, in wide belts.

And all of this on the gigantic scale in which Paul Bunyan loved to work.



Fire-protection truck developed for CCC squads in Yosemite National Park is loaded with pack pumps

pumps were dropped without damage. Experiments are also being made in dropping chemicals, explosives, or water on fires.

For fighting fire in chaparral or other dense brush, the standard tractor trail-builder, used in road construction, has been found ideal. Capable of working on steep slopes, this rig has a blade mounted at an angle to push back the edge of a brush fire, separating it from new fuel.

The "Brushbuster," a similar machine, has a "V" blade used for clearing firebreaks where the debris is not too heavy. A double moldboard tractor plow is used for constructing control lines, having a Roman-nosed point to lift the plow over rocks and roots which it cannot dislodge.

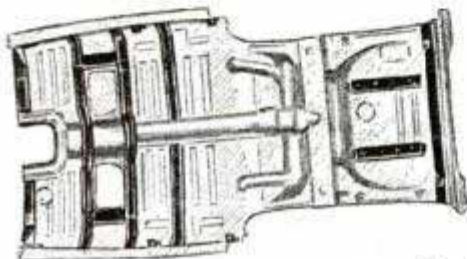
Because speed in constructing fire-control lines is so important, a light inexpensive device called the Bosworth Trencher has been developed. Weighing only ninety-

Bender Amatem Camp 7 54  
 Marine des woodlyn  
 1936 Barrow Alaska  
 see Nav. 1439

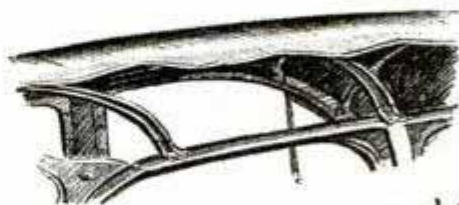
one made by Austen  
 Western Road Machinery Co  
 1936 Barrow Alaska

# NEW STRENGTH in the 1940 BODY BY FISHER

A casual observation will show that the 1940 Body by Fisher is longer and wider than its predecessors. And a structural analysis will reveal that it is also stronger and more solid. This increased strength is the result of several basic engineering advances, which are here demonstrated as they apply to the Body by Fisher on the new Buick Super.



**New Engineering at Vital Strain Points**—Considerable strengthening of the floor area also adds to the greater shockproof, weaveproof ruggedness of the new Body by Fisher. Sturdy steel channel braces, welded into place, reinforce the floor. And new steel brackets bolted to the outside of the chassis frame now extend to the rocker panels along the floor's outer limits. Likewise extended are the cowl bracing and rear wheel housing area reinforcements.



**Turret Top — Higher Crowned**—Increased arching of the solid steel Turret Top, three sturdier roof bows, and stronger roof rails not only provide greater protection overhead—but actually help stiffen the entire body. The explanation is simple. In Unisteel construction every steel member becomes an integral part of the whole structure with no open seams anywhere. Thus the strengthening of any one part makes all of the body more rigid throughout.



**New Double Steel Paneling**—This new Body by Fisher provides an improved wall construction that makes use of new double steel paneling. The solid steel inner panel is fused to the outer one as an integral part of the body construction, giving an all-over reinforcement instead of the occasional reinforcement provided by conventional channel bracing.



"Best buy's Buick" is popular advice this year. And a prime reason certainly is its striking new Body by Fisher. See how easy on the eyes it makes this Buick 4-door Super sedan here—inside as well as out—with clearer, stronger Hi-Test Safety Plate Glass not only in the windshield, but in all door windows and Ventipanes, too.



BODY BY

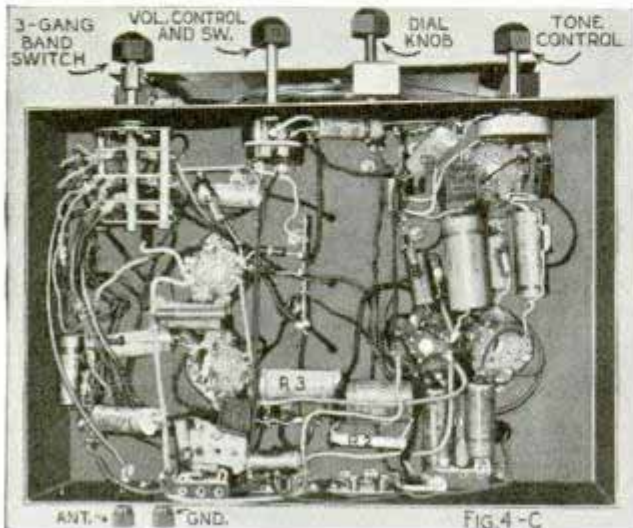
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# Six-Tube for Students and Experimenters

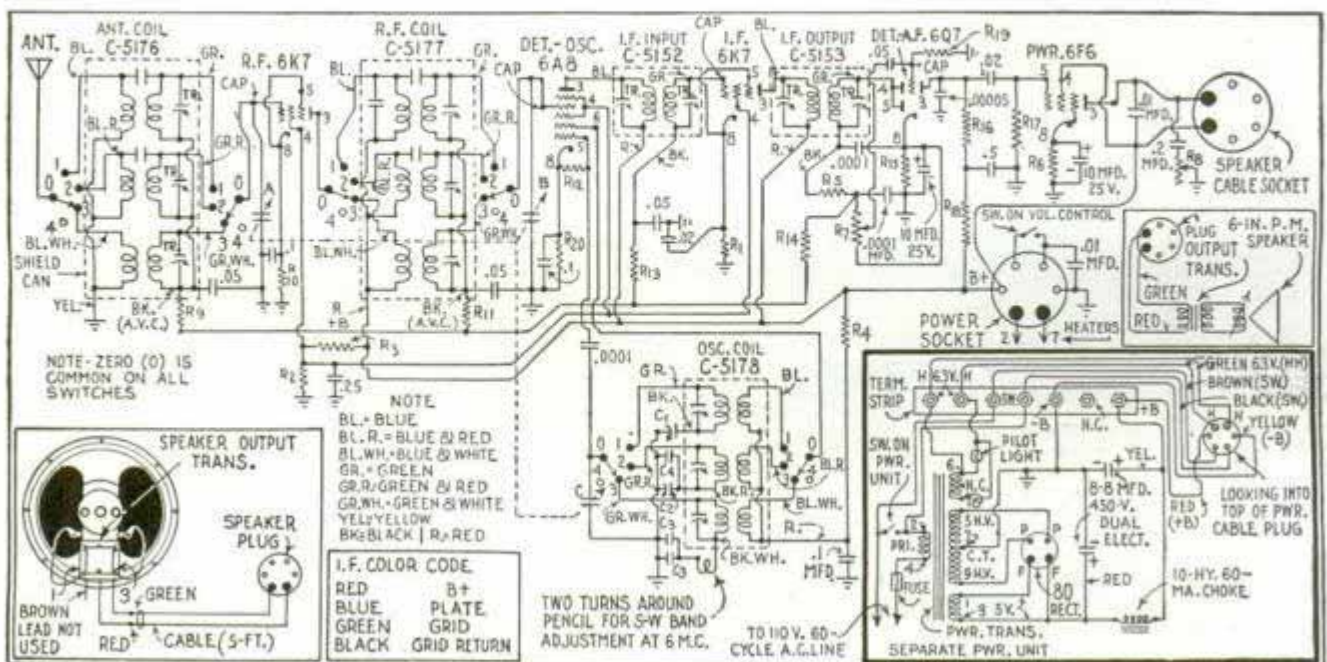
(Continued from page 777)

generator especially for the short-wave bands. However, if an oscillator of this description is not available, a fairly good alignment may be made for the broadcast band as follows: for this band, set the band-selector switch on the No. 1 position by turning the switch to the left; the other



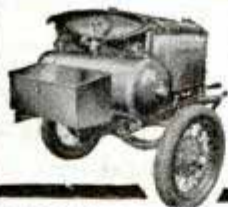
two positions are for the short-wave bands. Advancing the volume control to maximum, tune in a local station at about 1,400 kc. The station may sound weak and distorted, but listen to it until you hear its call letters announced and determine its operating frequency. While listening, turn the trimmers (Tr.) in the tops of the I.F. transformers with a small screwdriver, for better results. If the volume increases to an uncomfortable level, reduce the setting of the volume control.

After determining the frequency of the incoming station, turn the dial so that the pointer is exactly on this frequency. In doing this you may lose the station completely; to bring it back turn the upper trimmer setscrew in the side of the oscillator coil can, and do not change the dial setting. With the broadcast station coming in correctly, adjust the R.F. and antenna coil top trimmers in sides of cans for maximum response; center and bottom trimmers are for bands Nos. 2 and 3. Now turn the dial to receive a station between 600 and 700 kc. While moving the dial pointer back and forth quickly across this point, turn the setscrew of the (C<sub>1</sub>) broadcast-band section of the 200-mmfd. dual padder condenser for maximum response. You may now readjust the I.F. trimmers slightly for still better results. Finally check back to the 1,400 kc. end and make slight readjustments if necessary. To align the receiver on all bands with a signal generator, follow the instructions supplied with the set of Gen-ral coils specified. A detailed material list can be obtained from Popular Mechanics radio department without charge. Dual padder condenser section (C<sub>2</sub>) is also 200 mmfd. and is used for the No. 2 middle band. The two-turn coil is used for the No. 3 short-wave band instead of an adjustable padder; it is adjusted for maximum response by stretching or compressing the turns. Blueprint number for this article is R-278.



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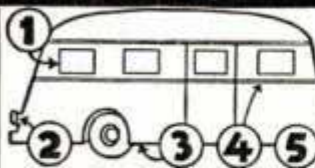
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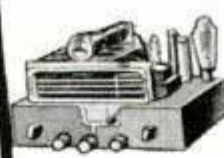
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## Steam versus Diesel

(Continued from page 693)

a passenger train at better than 100 miles an hour and if it weren't for dumping ash-pans and other servicing, the steam engine could make as long runs as its young rival.

Diesels, of course, are famed for their stamina. In the switchyards they work night and day, without rest, available ninety-four per cent of the time. The streamliners ramble along a mile a minute forty hours at a time. If trouble develops in the submarine-like engine room of the "City of Denver" the engineer can cut out one of the four 900-horsepower units and race at undiminished speed while fireman or electrician replaces a cylinder head, repairs a piston or a generator part. If a driving rod on an iron horse breaks—and that's pretty rare in these days of tough metals—the engine must wait for a tow.

One locomotive on a southern line some years ago earned the reputation of a "killer." The railroad had bought a fleet of new engines, all apparently identical. One day a driving rod snapped and the flying steel killed a track worker beside the right of way; anywhere else along the road the accident would have been harmless. The locomotive was repaired and put back in service. A couple of months later the rod broke again, on the same side, flew through a station window and killed the agent. No one was ever able to explain why this locomotive, seemingly identical with a score of others, became a "killer." Railroad men hunted for cover when it came along. It didn't happen a third time; but the strange coincidence proved that no two engines, as no two automobiles, are alike.

If you have ever driven an automobile or watched a streetcar motorman, you could learn to drive a Diesel-electric. It takes a steam-engine driver about three hours to "break in" on a Diesel streamliner. The controls are simple, and there are automatic safety devices that stop the train if you ignore a red light, warning lights that tell of engines overheating, and so on. The thing to learn is how to stop. Jam on the brakes and you slide the wheels flat, an expensive business. A million pounds of train at ninety miles an hour is covering ground plenty fast, and it takes a half mile to stop at the best. Remember when you want to halt that a half



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Regular use of HEAVY BODY 3-IN-ONE Oil will add to the life of small electric motors. It lubricates and cleans, prevents rust and tarnish. Shop equipment needs it. At Hardware, Drug, Grocery, 10¢ Stores. Try it!

Ask for

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## 3-IN-ONE Oil



mile flits past you every twenty seconds.

These Diesel luxury trains were almost "fully grown" at birth. The latest on the line boast new luxuries, new comfort from trucks that absorb sideways, safer brakes. But probably the most important advances have been in the engine room. Instead of 900-horsepower units the new Diesels come in thousand-horsepower banks. A new air blower can be repaired in two hours compared with the twenty-six-hour job servicing the old type. And the bugaboo of the Diesel locomotive in its infancy, cracked cylinder heads, has been "licked." In the early Diesel a cylinder head would break every few days. Redesigned heads have been in thousand-mile daily service for months without a crack.

Another innovation which adds to the flexibility of the Diesel is the two-headed engine introduced on the North Western's new "400" train to Minneapolis. Built in two units, it has a cab at each end. At the end of every run a switch engine hauls the cars to the yards, but the Diesel-electric locomotive just switches over to the next track in the station, couples up to the standard steel cars of the "North Western Limited" and heads back for Chicago overnight, making it a thousand miles a day.

One recent safety move was the installation of laminated glass five-eighths-inch thick in the cab of the "City of Denver." In the early days of that train a pheasant crashed through the windshield one day and the fireman was dangerously cut. More strange but less disastrous was an encounter with an eagle. Streaking across Colorado, the engineer saw an eagle flop ponderously from a telegraph pole and swoop across the track. He knew it must have been struck. Next day a track walker found the bird, with a five-foot wing spread, dead beside the rails. And that morning, when the "City of Denver" pulled into Chicago, they found a fish, apparently dropped by the eagle, inside the headlight.

Steam train and Diesel go through similar servicing routine at each end of the line. The streamliners are placed over pits where mechanics service the trucks as garagemen grease your car. Ordinarily there is a six-hour period for inspection, but one day when washouts in Nebraska delayed its arrival in Denver, the streamliner was vacuumed, polished and inspected in fifty

(Continued to page 120A)



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has spring in handle for greater speed in driving or withdrawing screws. Bores holes with ease, when used with extra Chuck and Drill Points. Price of Driver, \$1.25.

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**MAW!**  
**GIT TH'**  
**SANI-FLUSH-HE**  
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If you prefer, ask your service station to do the job for you. Insist on Sani-Flush. It cannot injure motor or fittings. You'll find Sani-Flush in most bathrooms for cleaning toilets. See directions on the can. Sold by grocery, drug, hardware, and 5-and-10c stores. 10c and 25c sizes. The Hygienic Products Company, Canton, Ohio.

**Sani-Flush** **Safe NOT CAUSTIC**  
**CLEANS OUT RADIATORS**

**Easy GARDEN RAISER**  
**CUTS WORK IN HALF**

You know it's important to keep your garden well cultivated—so moisture and air can get in, and weeds stay out. But oh, what a job—with a hoe—all day long.

Now, the **EASY** Garden Raiser makes all this hard work much easier; one man with his **EASY** will beat 10 men with hoes. That's how fast it is. 80,000 sold at \$8—now \$5.95 direct-to-you. Order your **EASY** today—or write for complete information.

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**AMERICAN GARDEN EQUIPMENT CO., Dept. 7, Milwaukee, Wis.**

(Continued from page 119A)

minutes, then turned back toward Chicago. Extra speed means extra wear and tear. Window glass lasts only a year on the streamliners. By that time wind and dust and sand have pockmarked the outer panes and they must be replaced. Paint, too, is sandblasted by a year's travel and in one of those six-hour intervals at Denver the streamliner's old enamel is ground off and new coats applied. Tread wear on the wheels is watched daily. In the "pioneer" days of Diesels the engineers frequently slid the wheels flat with emergency stops and the tread often lasted only 10,000 miles—ten days between Denver and Chicago. Now, with molybdenum hardening the steel and with more experienced engineers, tread wear is greatly reduced.

Nobody knows the life of a Diesel-electric locomotive. Steam-engine builders put the economic life of the iron horse at fifteen years, beyond which maintenance counts heavily; but there are plenty of old horses still in service at double that age.

Does it ever occur to you, as you race along the steel straightaway and the dial in the observation car reads ninety-five miles an hour, how long it takes a locomotive to step up to that speed? The Association of American Railroads conducted tests with a 5,000-horsepower steam locomotive pulling a sixteen-car train. It reached fifty miles an hour from a standing start in .93 mile; it took 4.41 miles to accelerate from fifty to eighty miles an hour, then covered twenty-nine miles stepping up from eighty to 100 miles an hour!

Ten and twenty years from now, will it be Diesel-electric or steam that rules the rails? Even the men closest to the problem can't say. Diesels are winning in the switchyards, where they plug along twenty-four hours a day without complaint. They're stealing the show in fast passenger service because they can "take it," and because they are luring folks back to the ticket office. They're favored, too, because they eliminate smoke and costly coal-shed operation and ash removal. Diesels have not broken into long-haul freight business, but a heavy-duty Diesel-electric freight locomotive is on trial.

Locomotive builders believe it will be a long time before speeds above 100 miles an hour are demanded—and when they are, the old iron horse will still keep the pace.

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## MAKE BIG MONEY!

### RIDE, RENT, OR SELL!



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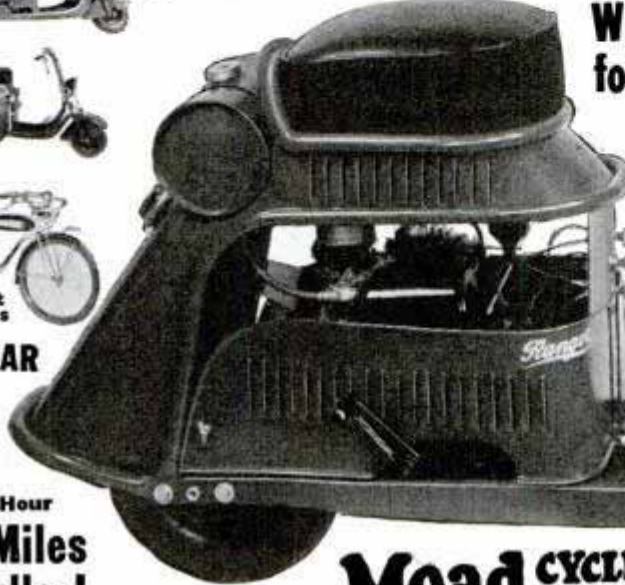
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Miles Per Hour  
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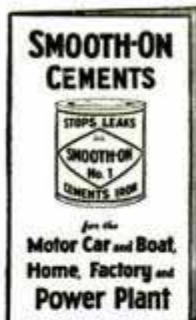


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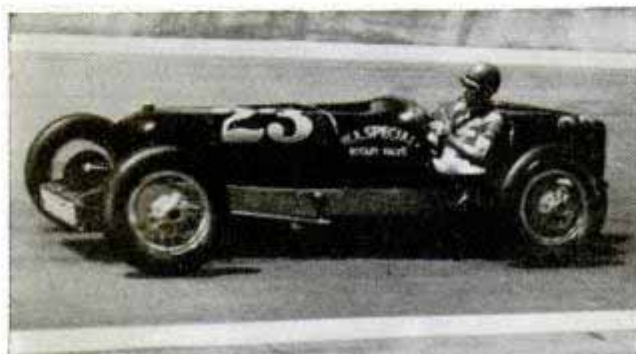


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## Secrets of a Champion Racer

(Continued from page 683)

In the last few years I've always owned the car I drove. I built my last one in 1937. It has an eight-cylinder in-line engine, supercharged, and can do 200 miles per hour. I've had it up to 164 miles per hour at Indianapolis. It cost \$20,000 and has been driven less than 1,000 miles. I burned out a piston the first time I raced it and went through the fence the second time. I believe it is better for a driver to drive for a car owner, these days, instead of owning his car. A driver gets thirty-five to forty per cent of any prizes he wins. The



Action shot of driver wheeling his speedster around Indianapolis track at fast pace

owner gets the rest, out of which he has to pay ten per cent of the prize to the pit crew as well as salaries, and take care of all other expenses.

Midget racing has really revived interest in automobile racing and while a driver can't earn the amounts that the big-time winners at Indianapolis have collected in the past, midget racing is less dangerous and you have a good chance to keep going. Every track has a hospital fund into which all the drivers contribute and from which expenses for injuries incurred in racing are paid. It's a big help to the drivers who get hurt.

The midgets are real racing machines and the public likes them. The little motors develop 100 horsepower and the cars have been clocked at 120 miles per hour on straightaway tests. When you put a dozen of the snarling little bumblebees on a short track and open them up it looks like a free-for-all.

Racing is a thrilling sport and good drivers have earned comfortable livings at it, but what kind of future is in it? You can't race forever and some day younger drivers will start to go by you. Well, the sport is

frequently a steppingstone into some branch of the automotive industry. Veterans such as Pete de Paolo, Harry Hartz, Barney Oldfield, and Ralph de Palma all went on to interesting jobs when they retired from the tracks. The petroleum companies, the tire concerns, and the automotive factories have lots of ex-drivers on their payrolls. I'm opening up a motor reconditioning plant on the Pacific coast. There's a future in racing, though it's like any other profession. It depends on you.

## Setting Traps for Enemy Ships

(Continued from page 708)

automatically shortened to this length. By this time the heavy truck is sinking but the mine is trying to float, and thus causes the cable to unwind from its reel until it reaches the point set by the trip catch, locking the cable and dragging the mine to its predetermined depth, anchored to the sea bed by the truck or "sinker."

Submarines also lay mines, employing an interior launching structure. While a surface mine-layer can carry 200 to 400 mines, the submarine has a capacity of about forty, all of which can be planted without the craft coming to the surface.

To the conventional mine may be added an antenna maintained vertically by a float of special design. Thirty-five feet below the surface the mine, at the end of the antenna, can hardly be seen from an airplane and becomes less visible when painted a dull green or if it becomes covered with sea weed. The specific value of the antenna is its sensitivity to an approaching ship's metal hull, thus setting off the explosive.

When a mine field laid by the enemy is discovered, usually by the sinking of a ship, a flotilla of sweepers is sent out to clear it. Two main types of mine sweepers are used by the British navy. The first is an 800-ton craft which has relatively high speed and heavy gun armament and can be used to sweep ahead of warships. The second is a converted fishing boat—trawler—which can be used for sweeping inshore. For work in even more sheltered places there is the motor mine sweeper, similar to small motor fishing vessels. Of the two types of sweep, the commoner has a float and a "kite" which strains a wire away at a wide angle from the side of the sweeper,

(Continued to page 125A)

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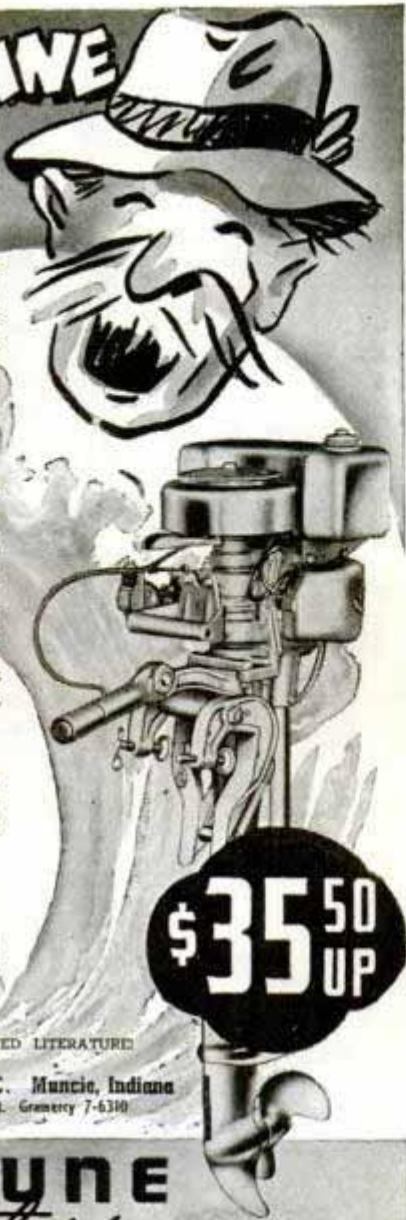
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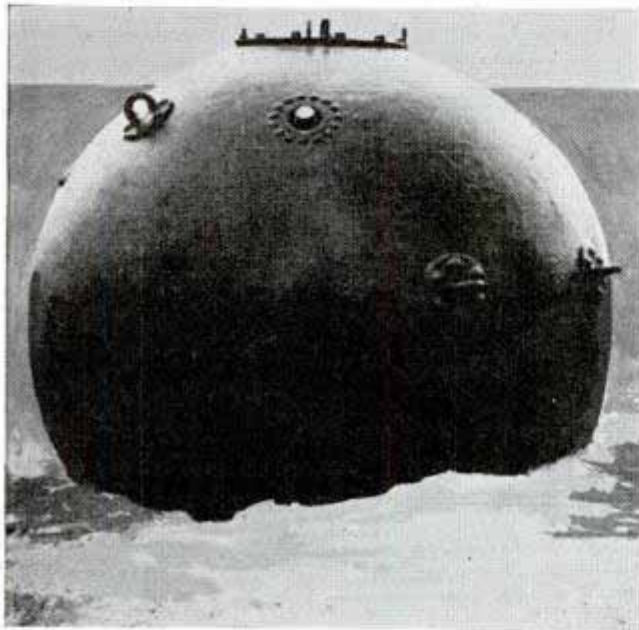
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enabling the craft to work up and down the edge of a mine field like a reaping machine. The mine cables are cut by the sweep wire which has a rough saw edge. As the mines bob to the surface they are destroyed by rifle fire. The second sweep is a wire slung between two ships.

For combating the magnetic mine, the British are said to have considered dragging large sheets of magnetic metal with a wooden vessel through suspected areas, thus causing the mines to explode with no damage except to the sheets. Another pro-



Deadly mine washed up on the French coast after it had broken loose from its moorings

posal calls for use of a wooden-hulled "mother" ship, ahead of which on either side would be crewless, lightweight, motor-equipped rafts or boats deriving their power and steering abilities from cables running from the ship. Between these rafts would be spread another cable to which would be affixed electromagnets and sound makers, in case the mines were found sensitive to noise waves, and a number of spark gaps with antennas. Subjecting the ship's generator, which would be connected to the magnets and the spark gaps, to flashlike overloadings would create an intense electrical barrage that would explode the mines on sea bottom some thirty-five to fifty feet below.

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## Inventions Made to Order

(Continued from page 699)

the Buck Rogers pictures that are cast 500 years in the future the actors use space ships, "de-gravity" belts, light-ray guns, atomic transportation over radio channels, and similar devices that may or may not actually be created in the future. Jack Otterson, art director, and Albert Richards, superintendent of construction, have to make the inventions work today.

It isn't as hard as it might seem. When an actor straps on a de-gravity belt and goes sailing through space he is actually hoisted along through the air by means of fine piano wire that doesn't register on the screen. The effect of the light-ray gun that shoots a spark thirty or forty feet through the air is obtained by double exposure, first setting up the electrodes of a high-tension coil on the stage and filming the spark, then refilming the same scene without the apparatus and the spark but with the actors going through their parts.

Pictures of the space ship in flight are made in miniature. The perfect television instruments that showed distant scenes with high fidelity were made to work by careful double printing, first filming the televised scene and then printing it in the viewing frame of the television box.

One typical problem at Universal was to create the boiling lava pit used in "Son of Frankenstein." Imposing as it appeared in the film, the lava pit was not difficult to construct. Technicians built up the side of the pit with hemp fiber and plaster of paris. They used thin mud for the lava. Submerged steam and compressed-air jets made it bubble and boil with all the naturalness of the real thing.

The men behind the scenes in the studios have a lot of tricks they use to help keep down the cost of pictures, and lately they have been cleaning up the little details that make for perfection on the screen. For instance, process backgrounds have been employed for years but their use has not always been satisfactory because an audience is apt to have an uneasy feeling that there is something wrong with the picture. In this kind of shot a motion picture is thrown on a screen and the actors perform in front of it. If a picture of a London street scene is projected as a background behind the actors the effect as seen

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by the camera is that the actors actually are in London. This is cheaper than sending the cast abroad or building an English set in the studio but it wasn't satisfactory until the technicians learned to light the actors in the same key and from the same direction as the background was lighted.

Lewis W. Physioc, technical director of the Techniprocess Special Effects Corporation, has worked out some developments that have materially increased the scope of background projections. Physioc can make an actor appear to mingle with the action on the screen or can actually show him in the background itself. One of his stunts is to have an actor in front of the screen shake hands with a character on the screen. The effect fools even the skeptical trick men of other studios and Physioc achieves it simply by shooting the scene with a lens that has the right focal length to reduce the actor's size to correspond with the actors on the background screen.

One of Physioc's most interesting processes is to put actors both in the foreground and background of a projection shot. He may start out with nothing except a motion picture of a bare swimming pool yet his finished picture is apt to show people in the foreground talking back and forth with a girl who rests on a diving board at the far side of the pool.

To achieve this he points the camera at the screen on which the picture of the swimming pool is projected. In front of the screen he places the group of actors who are to appear in the foreground. Then, to the left of the camera and far enough away so that her size is diminished to the proper perspective, he places the girl on a diving board, against a black background. The next step is to place a semi-transparent mirror at a forty-five-degree angle in front of the camera lens. This mirror reflects some light and transmits some light, allowing the camera to record both the scene in front of it and the scene at the left. The real diving board at the left is matched up with the diving board that the camera sees on the screen, blending the two scenes together perfectly.

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# The Era of Plastics

(Continued from Coloroto Section)

lators also are made from the many plastics suitable for those purposes.

A recently developed plastic is sandwiched between two layers of plate glass to produce the high-test laminated safety glass being used in 1940 cars. The plastic, when struck, will give instead of remaining rigid, introducing a new degree of safety for windshields and side windows.

Acrylic resins, such as Acryloid, Crystalite and Plexiglas, are employed by the airplane industry in sheet form for landing-light covers, cockpit enclosures, windshields and windows and gun turrets, because of their light weight, weather resistance and clarity—an important factor from the standpoint of visibility. Recently these resins have entered into the making of lenses, dentures, highway reflectors, signs and displays. Methyl methacrylate, probably the closest approach to organic glass, has optical properties that make it suitable for spectacle lenses, camera lenses, magnifying glasses and protective goggles. The material has been found useful for making dentures that may be colored to simulate the color of the mouth tissues. In the sign industry, designers obtain novel effects by heating and shaping sheets or bars and then lighting from one edge. The light entering one edge will leave the opposite side almost undiminished, even though the material be bent or sandblasted. Surfaces of letters in a sign stand out in glowing relief when they have been sandblasted. Lucite, a du Pont product, serves the purposes of both acrylic resin plastics and methyl methacrylate.

In the chemical plastics field, cellulose nitrate plastics are the oldest. The Celluloid collar, easily cleaned by washing, was a familiar sight around the turn of the century, but before Celluloid came Parkesine, a material formed from nitrocellulose and camphor, the essential ingredients of Celluloid. It was invented in 1855 by Alexander Parkes. However, scientists recognize John Wesley Hyatt, who developed Celluloid, as the real inventor of cellulose nitrate plastic—therefore “the father of the plastics industry.”

Today cellulose nitrate plastics, in a more highly developed form, find favor because of their toughness, water resistance and clarity, which permit many beautiful color

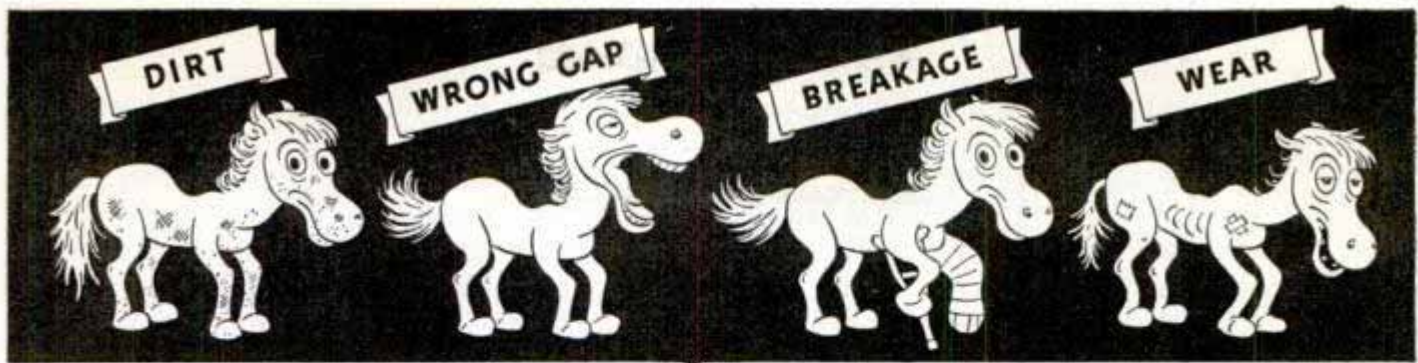
effects, and they are the bases for fountain pens, toothbrush handles, unbreakable watch crystals, scuffless shoe heels, piano keys, drawing instruments, clock dials, bathroom fixtures, eyeshades, golf club parts, and toys. In this family are Pyralin, Amerith, Monsanto cellulose nitrate and, of course, Celluloid.

Also in the cellulose family are the acetate plastics, which have cellulose, produced from cotton linters, as their common base. Like the cellulose nitrates, they are thermoplastic—softened by application of heat and hardened by cooling. Rugged, durable articles can be molded or formed with relatively thin sections and thus are almost ideal for use in the automobile in the form of steering wheels, control knobs, radio grilles, horn buttons and compartment doors. Among the unusual applications of these plastics, which are known as Tenite, Plastacele cellulose acetate plastic, Lumarith, Bakelite cellulose acetate and Monsanto cellulose acetate, are: storm enclosures with cellulose acetate windows which can be attached to door screens without removing the screen; hotbed frames, storm sash and solarium enclosures with acetate film in place of glass, and molded duck pins that outlast wood in bowling. Lamp shades, watch crystals, fountain pens, mechanical pencils, combs, toilet articles, costume jewelry and many other articles also are produced from these plastics. Cellulose acetate butyrate, Tenite II, is used in the same manner for manufacturing transparent sheeting, lacquers and coating solutions, including airplane dopes, and it can be employed in the manufacture of auto taillight lenses, emblems, thermometer casings, fishing reel ends and handles, ferrules for rods, artificial bait and fly boxes.

Next to the plastics made from coal, air and water, perhaps those appealing most to the imagination are the caseins, which are made from milk and processed in a large range of opaque and translucent colors, as well as with many mottled effects. They can be sawed, ground, cut, turned and carved without difficulty and a fine lasting polish can be applied. Research is under way for utilization of proteins from sources other than milk, such as soybeans

(Continued to page 130A)

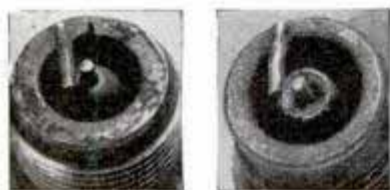
Unusual plastics  
Carbide, Carbon  
2/12/41



# ONLY FOUR THINGS CAN HAPPEN TO ANY SPARK PLUG and AC has the Cure for them all

## DIRT

The most common cause of spark plug trouble. If the deposit is black, it's carbon or soot. If it's red, white,



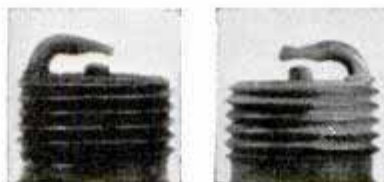
fused, or blistered, it's oxide—a residue of combustion.

### The Cure

is a thorough cleaning (5c a plug) in the special machine developed by AC engineers. You will find this machine in service at more than 70,000 Registered AC Cleaning Stations. There's one near you. (Cleaning and regapping are needed every 4,000 miles.)

## WRONG GAP

Wear causes this condition. Sometimes, gaps widen too



quickly. This indicates that the plug in use cools too slowly, or is of the wrong type.

### The Cure

For normal wear—gap adjustment with the special AC tools used by Registered AC Cleaning Stations. Accuracy is assured by the special round wire gauge, which correctly measures concave gaps. The cure for abnormal wear is a new plug of correct type and temperature range. Better make it an AC.

## BREAKAGE

Breakage of the upper insulator is always the result of a blow, as when a wrench slips. A broken lower insulator results from an attempt to adjust the gap by bending the center wire; or from use of a plug which cools too slowly, or is of the wrong type.

The Cure is a new plug.



For More  
Than 31 Years  
The Quality  
Spark Plug

Standard equipment on America's finest cars, trucks, buses, tractors, and engines, AC's assure you of best engine performance.

## WEAR

It is reasonable to expect about 10,000 miles of economical service from any standard make of plug.



### The Cure

A new plug, or a set of new plugs. You'll be sure of full satisfaction if those new plugs are AC Quality Spark Plugs.





Have Plugs  
**CLEANED**  
by the  
AC METHOD



Cleaning Includes  
**REGAPPING**  
to the  
Engineers' Standards



The Cost is only  
**5c EACH**  
the biggest nickel's worth  
you ever got

Replace worn plugs with New AC's for Better Performance

21124  
and corn. Buttons, buckles, beads, game counters, novelties and trimming accessories are made from these plastics.

Phenolic resins, which depend for their origin upon synthetic substances made from coal or other organic raw materials, may be cast or molded. The cast resins offer unusual ranges in translucency, transparency and opacity, and a wide variety of shades and hues, both in plain colors and in mottled effects, can be achieved through the addition of dyes and pigments. Fine costume jewelry is manufactured by machining cast resins into intricate forms, and polishing; chessmen are carved from rods of the material, and articles such as lamp bases, tableware handles, book ends, clock cases, desk sets, brush backs, fixtures for interior lighting and advertising signs, are produced. Two of the plastics in this family are Catalin and Prystal, the former cast from pure liquid resins and the latter a water-clear material that has the sparkle of a perfect gem and is furnished in a large selection of delicately transparent pastel shades. Catalin is being used to replace costly semi-precious stones, duplicating the appearance of coral, rose quartz, amber, jade, jet, tortoise shell, onyx and ivory.

Bakelite is almost a household word, so widely has it been used. It is a molded phenolic resin. Cured phenolic resins develop great strength and hardness; resist heat, water, acids and mild alkalis and organic solvents; electrical properties are good; and they will shrink around metal inserts after molding and hold them tightly. Automotive parts, electrical insulation, camera cases, telephone equipment, housings and a large number of other applications are possible in this field, which is made up of plastics bearing the names of Durez, Durite, Indur, Resinox and Textolite, in addition to Bakelite. Micarta, which is closely akin to these plastics, is a dense, laminated material formed by action of heat and tremendous pressure on a number of layers of paper, or cloth impregnated with synthetic resin. Pressures varying from 1,500 to 6,000 pounds per square inch are employed. In the case of simple white sheets, such as those from which table tops and bathroom wall panels are made, this pressure totals 7,500,000 pounds, equal to that exerted by the flatirons of 2,500,000 housewives. Bearings made of Micarta can be lubricated with water, instead of oil.

Urea resins, introduced commercially in this country in 1929, and known as Beetle, Plaskon and Bakelite Urea, are employed in moldable powder form and as a water-soluble resin to treat paper, cloth and wood veneer for laminating; to manufacture baking enamels and surface coatings; to treat textiles to render them crushproof, water repellent and more serviceable. Vinyl acetals are used in manufacturing the interlayer for safety glass.

Vinyl ester resins include: polyvinyl acetate, which is widely used as an adhesive in food cartons and drinking cups and for laminating Cellophane cellulose film and cellulose acetate; polyvinyl chloride which has excellent water and chemical resistance and which is used to impregnate silk for use in raincoats, tobacco pouches and the like; and vinyl chloride vinyl acetate copolymer, which is a thermoplastic resin of great versatility, combining the best properties of the other two into a single material. It is useful as a material for direct sound recordings, and sheets of it are going into many fields, such as the manufacture of drawing instruments, radio dials, cosmetics containers and storage batteries.

Calendered sheets of Vinylite plasticized resins, with many of the advantages of leather and rubber, have been developed. The new materials are flexible to the point of withstanding folding and repeated flexing; therefore may be used in manufacturing men's belts, wristwatch straps, garters and similar articles.

When commercial Polystyrene was introduced in this country a short time ago, the plastics industry acquired a material with excellent electrical properties, crystal clarity, low specific gravity and other advantages. A great improvement in the packaging of mineral acids resulted from using Polystyrene molded closures which are highly resistant to high acid concentrations. The material also has good resistance to alkalis and hydrofluoric acid and therefore can be employed in the form of containers, substituting for glass which is attacked by both chemicals.

With plastics invading one field after another, we seem to be emerging into what might be called "The Plastics Age."

☐ Send stamped, addressed envelope to our Bureau of Information for name of maker of any device described in this magazine.

# "ABOVE THE THUNDER WE HEARD THE ROAR OF DEATH!"



A true experience of MRS. J. A. HARMON, Uvalde, Texas



"LIGHTNING STREAKED across the sky ahead of us, as the car in which my baby and I were riding stalled on a desolate grade. Unable to start the motor, I let the car roll back into the center of a dry river bed.

"THE NEAREST RANCH WAS MILES AWAY. Helpless in the storm, we prepared for the long wait until morning. Then an ominous roar rose over the peals of thunder. I knew the sound. A mountainous torrent unleashed by a cloudburst, was hurtling toward us. I acted quickly.



"WITH THE BABY IN MY ARMS, and, aided by my flashlight, I scrambled through the boulders of the river bed to safety. Without that flashlight—and its dependable batteries—we would have perished. Thank you a thousand times for 'Eveready' fresh DATED batteries. They do not fail!

(Signed) Mrs. J. A. Harmon"

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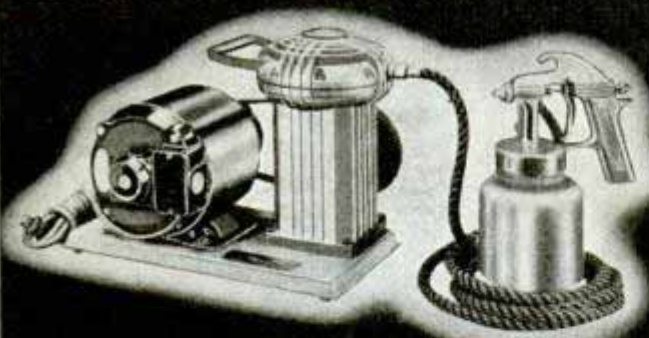
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Please send me your booklet describing the Roche "DS" Outfit and other low-cost paint sprays.

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

# "Wobbling" Radio Wave

(Continued from page 715)

proximate range of 150 miles, the loftier the transmitting antenna the greater the distance the signals reach. Fans eager for long-distance reception are in the minority, however, so this is unimportant in contrast to the almost universal desire for static-free high-quality reception.

One hope that FM holds out to station operators is that it no longer may be necessary to use telephone wires for carrying chain programs from one city to another for rebroadcast. Tests indicate that FM programs can be transmitted by radio from one station to another and then rebroadcast by the second station without appreciable loss of quality. In January of this year—just exactly seventeen years after the first amplitude modulation network program went on the air—FM was used in a relay connecting five stations in five states. The broadcast originated at W2XAG, Yonkers, N. Y., operated by C. R. Runyon, and was flashed to W2XMN, key transmitter operated by Prof. Edwin H. Armstrong, inventor of the frequency modulation system, at Alpine, N. J. From the lofty antenna of the Armstrong station, the music and words were relayed in turn to W1XPW, Meriden, Conn., W1XOJ, Paxton, Mass., and W1XOY at Mount Washington. The last station broadcast by ordinary methods to a receiving outpost of the Yankee Network at Winchester, Mass., from where it was sent by telephone wire to the network's headquarters in Boston and thence relayed by wire back to Yonkers. The test was regarded as highly successful, Boston observers reporting unusually fine tonal quality and operators at Mount Washington describing the program as being received as clearly as if sent from next door. No wires were used in the broadcast from Yonkers to Mount Washington. The Yankee Network, the head of which is John Shepard III, has pioneered in FM radio, cooperating closely with Professor Armstrong in developing the system.

In the future, even for FM, lie many other possibilities. Professor Armstrong says: "When and if there is a television chain it will be done with frequency modulation." The technical principles are the same in frequency modulation as in tele-

(Continued to page 134A)

21 Brooklyn av

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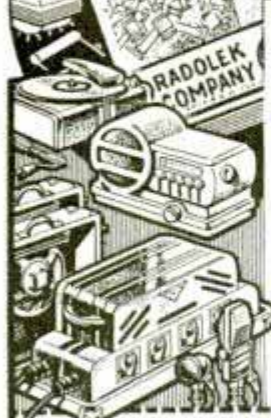
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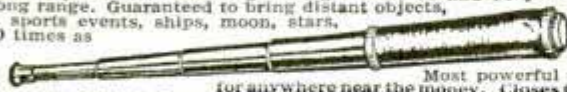
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vision. Thus, television may ride the wings of FM signals from one station to another instead of being carried on a highly expensive cable or other means.

FM signals sometime may be employed for operating a 100-words-a-minute radio typewriter, being broadcast simultaneously on the same channel with a static-free program without interference. This could be accomplished by multiplexing an FM channel, with a wave length of about seven meters, thus adding two channels instead of one to the familiar broadcasting service. Facsimile or radiophotos or stereophonic sound might be transmitted at the same time with a regular program. Stereophonic sound means that what is happening on an orchestra platform or a dramatic stage can be projected into your home with sound perspective, enabling you to follow an actor—by the sounds—as he walks across the stage, or to distinguish whether the drums are on one side of the orchestra and some particular instrument on the other.

While experts agree that FM radio is technically practical and that it really works, no one ventures to predict just how long the transition period—from amplitude modulation to FM—will require. For some listeners FM is already here; for the great majority, it may not be available for one, two or perhaps five years.

## Wing Slot Ends Peril of Spins and Makes Flying Safer

Spins and dives that have been responsible for a large percentage of airplane accidents may be eliminated by a simple method discovered by Dr. E. A. Stalker, head of the department of aeronautical engineering at the University of Michigan. "Dead air" accumulating on top of the wing has long been recognized as the cause of the loss of lift which precipitated fatal falls. To get rid of this dead air Dr. Stalker devised a slot running lengthwise along the top of the wing; the dead air is sucked into this slot and then blown out through short slots in the wing tip. The result is that a plane which formerly had to land at eighty miles an hour can land at forty, and since wings no longer need be large for safe landing and takeoff, smaller wings will permit considerable increase in speed of flight.

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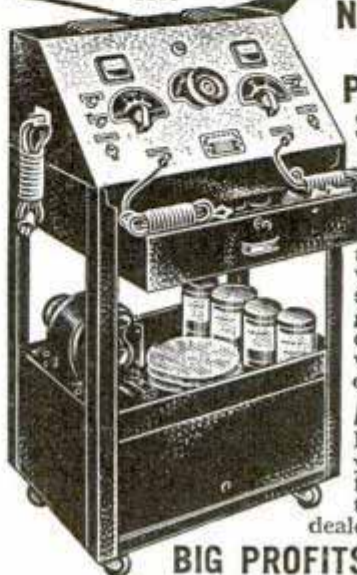
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**NATIONAL POTTERIES COMPANY**  
Dept. 6, 13 W. 26th St. Minneapolis, Minn.



When writing please mention Popular Mechanics

71027  
**The Doodlebug Comes of Age**

(Continued from page 725)

"Our new forest is sinking. It'll be a swamp in another hour unless you find the water leak."

The water company sent a radio detective who found there was nothing crazy about the call. An artificial forest just completed for a picture was being flooded by water rising through the floor. Within a half hour the doodlebug has spotted a leak in the main, and the forest was saved.

Most romantic of the doodlebug's jobs is the present attempt to find the long lost treasure of Maximilian and Carlotta. Supposedly smuggled out of Mexico just before Maximilian's death, it is a legend in southern California that the gold and jewels were finally buried at the mouth of Cahuenga Pass. The scientific doodlebug has indicated a spot at the mouth of the Pass, and as a final touch, the cache is believed to be under the parking lot of the Hollywood Bowl. It may lie under the stage of the Bowl itself. Could it be that world famous singers and orchestra leaders have stood—unknowingly—above the solution to one of the greatest treasure mysteries of all time?

One of the doodlebug's most thrilling exploits was in the exploration of the main sewer of a large city. It was vitally necessary to examine the sewer tunnel. However, because of poisonous gases, the only method of inspection was for a man wearing a mask and carrying oxygen to float down the sewer in a boat, checking the walls and taking flashlight pictures. How was he to communicate with the surface? How were the helpers above ground to know everything was all right? It obviously was a job for the scientific doodlebug. One set was carried above the sewer tunnel, another in the boat. Through the long hours when one of the nameless heroes of the public services risked life in touring the noxious tunnel, the doodlebug kept him constantly in touch with the world above.

Yes, the doodlebug family has come of age. And it bids fair to become one of science's most trusted instruments.

☐ Send stamped, addressed envelope to our Bureau of Information for name of maker of any device described in this magazine.



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This year, choose a 4-CYLINDER motor . . . and then, fisherman, *you've got something!* Something really *special*, that will add new thrills, new pleasure and satisfaction to every mile you travel on the water! Your motor will be an *Evinrude*, because only Evinrude builds "fours" . . . *incomparably the smoothest motors on the water!*

And in Evinrude's new Zephyr you can have all the advantages of 4-cylinder construction compacted into a motor of popular size and price. It's "*smooth as an eight . . . light as a twin*" . . . snaps into action like pulling a trigger . . . speeds effortlessly and endlessly at top gait, or drifts softly at a slow trolling glide at a twist of the throttle. Co-Pilot Steering, Propeller Protection Clutch . . . Evinrude's exclusive trouble-proof centrifugal pump cooling . . . all the features experienced fishermen want are yours in the new Zephyr!



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FOR AS LITTLE AS  
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**EXTRA PROFIT**  
**MONTHLY**  
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**ARC**  
**WELDER**

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**60% Extra Capacity** over old style 25-Volt Welders... necessary for welding with the new coated rods. Automatic reactance lets you handle light welder work without losing the arc. Users don't understand how they got along with old style welders after trying this new Hobart.

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 Order this Model 45 FOREDOM Flexible Shaft Workshop today. Enclose check or M. O. for \$14.95; or, if you prefer, we'll ship C. O. D. Try it for 10 days. If not completely satisfied, return the set and we'll refund your money at once.

**FREE CATALOG**

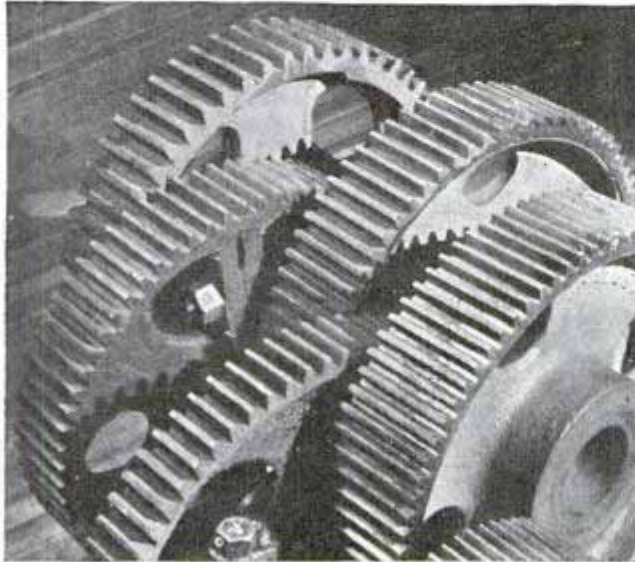
Write at once for our Free Illustrated Catalog showing complete line of Flexible Shaft Tools and quality accessories. Dealers: Write for our offer. **FOREDOM ELECTRIC COMPANY, Dept. 140, 27 PARK PLACE, NEW YORK, N. Y.**

2 (40) 4  
**Tailor-Made Metals**

(Continued from page 735)

ture resistance are of primary consideration, metals will continue to hold their own.

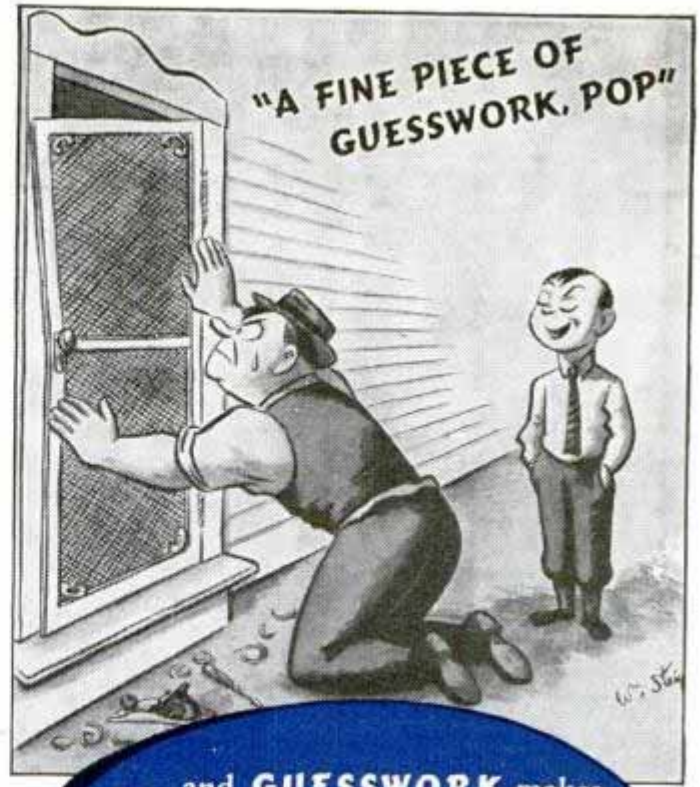
One of the important lines of recent development in metallurgy has been in applications requiring high temperatures. By the use of better steels, allowing higher-temperature operation, the fuel consumption per kilowatt-hour of turbines has been



Forged, heat-treated gears for streetcars and locomotives made at General Electric gear plant  
*Lynn, Mass.*

reduced in ten years from two pounds to one pound and as soon as we find metals which will stand only 150 degrees Fahrenheit higher temperature, it will be possible to reduce this to one-half pound per kilowatt-hour. All metals lose strength rapidly with increasing temperature. A metal which has a strength of 100,000 pounds per square inch at room temperature will stand only one-tenth of this at dull red heat. A metal which will break at 100,000 pounds at dull red heat will break at less than one-third of this value if the load is allowed to remain on for a year. With relatively light loads metals creep, elongate when subjected to stress over a period of time. Engineers feel that to be safe the metal should not elongate more than one-tenth of a percent in ten years' service. Research is constantly being carried out on the causes and prevention of this phenomenon.

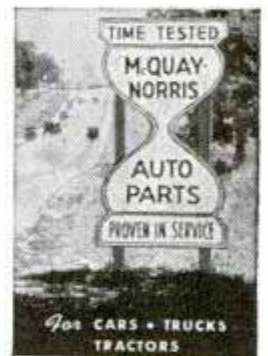
Metallurgy has been called the motorcycle squad leading the parade of mechanical progress. The most accomplished engineer, the cleverest designer, and the most forward looking manufacturer can go only as far as available materials will allow him.



... and **GUESSWORK** makes bungled motor repair jobs, too. Take no chances. Get piston rings that are specifically *Engineered* for your particular model of car.

*Insist on*  
**McQUAY-NORRIS**  
ALTINIZED  
*Engineered Set*  
**PISTON RINGS**

**T**HESE RINGS eliminate guesswork because each set is *specially designed* for each make and model of car and *precision installed* according to blueprint instructions. And only McQuay-Norris Engineered Set Piston Rings are *Altinized* to lengthen life and reduce wear. That's why these rings will stop oil waste and prevent blow-by in your car.



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**HEARTS ENTWINED** once again! Sue has said "yes" to Bud and his pipe since he switched to Sir Walter Raleigh, that milder burley blend of gr-r-and aroma!

**New!**  
**CELLOPHANE  
TAPE** around lid

seals flavor in . . .  
brings you tobacco  
100% factory-fresh!



**UNION  
MADE**

**IT SMOKES AS SWEET AS IT SMELLS**

**TUNE IN—Sir Walter Raleigh "Dog House." Every Tuesday night, coast-to-coast, NBC Red Network.**

## Chemistry Explores for Oil

(Continued from page 651)

the trap. The method has been successfully used to indicate oil before the first well was sunk in a new field, and has also outlined the true borders of known fields which in the past had to be found by expensive hit-or-miss drilling. In its present stage geochemistry is not infallible and geochemists are not able to determine the depth at which oil will be found or whether it exists in commercial quantities. On the other hand, they can distinguish between oil and gas deposits and can predict the gravity of a new pool quite closely.

It is estimated that seismographic exploration made possible successful production in thirty-three per cent of the wells drilled, and it is the expectation of the geochemist that with the new method fifty per cent or more of new drilling will be productive. The experts believe that with further improvements geochemistry will make possible the discovery of all unknown petroleum reserves that yet remain in the earth.

Fuels and lubricants are the most important products of petroleum but petroleum is the raw material on which dozens of other new industries are being founded. Hydrocarbon derivatives are finding many new fields of usefulness. Synthetic rubbers, which in certain respects are superior to the natural product, are being manufactured from petroleum. Sulphur, sulphuric acid, and glycerin are other by-products. Hydrocarbon chemistry is producing explosives, dyes, pharmaceuticals, perfumes, flavoring compounds, and other materials.

Olefin gases recovered in petroleum cracking are used as an agent for ripening fruit and for increasing the rate of plant growth. Tomatoes, grapefruit, and other agricultural products are brought to full maturity in a shorter growing season. Butene gases have a similar effect with walnuts, peaches, apples and cherries when the tree is enclosed in a gastight net and small amounts of butene are released under the net for several hours.

Many other derivatives, regarded as chemical curiosities when they were first isolated, are finding commercial value. Amyl mercaptan is used as an odorant in natural gas to warn of leaks, and ethylene

(Continued to page 142A)



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**—BUT IT LOOKS AND FLIES LIKE A GAS MODEL!**



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It's easy to use—the acid-flux is sealed inside of the solder itself, and all you do is apply heat.

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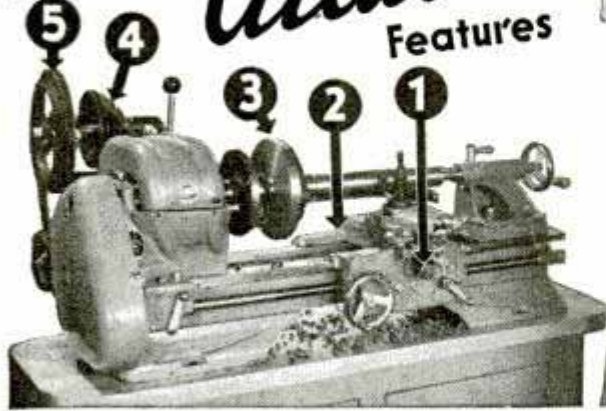
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oxide, not harmful to humans, makes a good fumigant for tobacco and cereals. Glycols are used as anti-freeze and cooling fluids. Ethylene and propene make very satisfactory anesthetics.

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Petroleum is the raw material for new resin fibers whose crease-resistant qualities are the basis of many of the new "wrinkleproof" fabrics. Fishnets made of such synthetic fiber have passed hard tests for durability. Phenols derived from refinery gases often excel present coal-tar products in the germicide, fungicide and disinfectant fields.

With the importance of petroleum increasing year by year, one of the baffling puzzles confronting the hydrocarbon chemist is the fact that no one has succeeded in manufacturing petroleum from the simple hydrogen and carbon molecules of which it is composed. Without advertising their research, some of the most brilliant men in the petroleum industry are working on that problem now and it is conceivable that eventually they may be able to manufacture hydrocarbons at will turning petroleum production into an exact science and guaranteeing the world as much petroleum as it needs for all time.

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Send stamped, addressed envelope to our Bureau of Information for name of maker of any device described in this magazine.





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The KINGFISHER



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Write for free particulars, how you can rent a brand new machine, the same type now used in many barber shops and scalp clinics, for a small rental fee per month, without any obligation to buy. The Crosley XERVAC operates on the principle of alternate vacuum and pressure, known to be effective for forcing fresh, stimulating blood into the deep-rooted blood vessels. Very compact, easy to use. Now that you can rent one you can get its benefits on easiest of terms. Write today for details of this new home rental plan.

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21488

## Television Rounds the Corner

(Continued from page 644)



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NEW TECH RAZOR  
AND GET  
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SLICKEST  
SHAVES MEN  
EVER HAD

GENE SARAZEN,  
Golf Champion

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SINCE I GOT NEXT TO THE TECH  
AND GILLETTE BLUE BLADES



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- 2 NON-SKID TREAD PROTECTS FACE**
- 3 CLEANS QUICKLY -- NEVER CLOGS**
- 4 SOLID BAR GUARD ASSURES COMFORT**

TECH RAZOR AND FIVE GILLETTE BLUE BLADES  
**49¢**

power transmitters. Just what the situation will be when considerable power, say twenty-five kilowatts, is transmitted from the antenna no one can say for certain.

The type of receivers being marketed in New York and Los Angeles centers about the central Kinescope. At present three sizes of images are available, corresponding to five-inch, nine-inch and twelve-inch Kinescopes. The image of the largest of these affords an image approximately eight inches by eleven inches. The image is traced on a translucent screen on the under side of the large, or "open," end of this funnel-shaped tube. In the case of the smaller tubes, the image is viewed directly. Present designs of twelve-inch Kinescopes, however, are too long to permit construction of a receiver of pleasing dimensions without introducing the reflected images. The tube is, therefore, placed upright and telecasts are seen as reflected in a mirror.

Controls for brightness, contrast and horizontal and vertical synchronization are provided in the receivers.

Prices of home receivers are quite high, compared to those for sound receiving sets, but a reduction is planned. Now the price of a set incorporating a twelve-inch Kinescope is \$600. This instrument includes an all-wave radio receiver. An attachment for a late model radio to receive television sound is available at \$199.50.

Before a greatly accelerated public demand for receivers can be expected, numerous transmitting stations must be scattered over the United States. At present NBC is maintaining a minimum program schedule of ten hours weekly in the New York City area. The Don Lee Broadcasting System is also sending out programs in Los Angeles over Station W6XAO and the General Electric company is just going on the air in the Schenectady area.

Programs in television can be of almost infinite variety. Practically everything that is now transmitted by radio can also, with necessary adaptations, of course, be converted into television stuff. In addition, a thousand and one subjects, excluded from radio, will come into their own with television solidly on its way. Art, for instance, has never found a place in radio. Most interest, of course, will center on television's

21480  
entertainment fare. With sound reduced to its proper relationship to sight, the nature of radio entertainment will undoubtedly change radically with television. But the larger categories of radio entertainment will probably remain—drama, sports, variety, music, educational programs.

Television's coverage of news events has undoubtedly held more interest, where the transmissions have been of their best quality, than any other single category of program. The President delivering his address at the fair, the visit of King George VI and Queen Elizabeth and the parade of the Army's "Iron Horses" down Fifth Avenue were only three of the many programs.

Television's problem is to find some way of linking stations in various cities into a network. It is highly probable that the first extensive linking will take place along the North Atlantic seaboard. The General Electric station at Schenectady is the first link in such a chain. Others will probably stem from Chicago and Los Angeles.

Radio had the long lines of the telephone network at its service when it decided to embark on a nationwide service. But telephone lines will not serve television, at least for the present. The wide band of frequencies necessary for transmitting a satisfactory television signal make the use of telephone lines inadvisable for intercity connecting links.

Several years ago, Bell Laboratories engineers installed a coaxial cable link between New York and Philadelphia, but the cost of this purely experimental venture was about \$5,000 a mile.

Tubular in shape, the coaxial cable can transmit more than 200 telephone messages simultaneously, but only a single television program. There, in a nutshell, is the problem of networking television.

A new method, however, is coming over the horizon. An automatic radio relay has been announced by Radio Corporation of America. This is a small gadget which is capable of transmitting television programs on a radio beam from point to point without the attention of a single person. It is believed that these relays, spaced at intervals of perhaps twenty miles, will materially reduce the cost of erecting a nationwide television network. The radio relay is the method used in linking NBC's New York station with the Schenectady outlet.

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(LIQUID)



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*UniveX Home Movies*

**The "Flying Eyes" of the Army**

*(Continued from page 670)*

lery for fire-control spotting, two others go out to get a high-altitude mosaic of the occupied area, a fourth is sent to observe enemy fleet activity, and others are assigned on "pin-point" missions to photograph particular places. The planes are the modern O-47A observation type and carry a pilot, observer, and rear gunner and are armed with a fixed machine gun forward and a gun on a flexible mount in the rear cockpit. Electrically operated oblique and vertical cameras are mounted inside the fuselage instead of being pointed



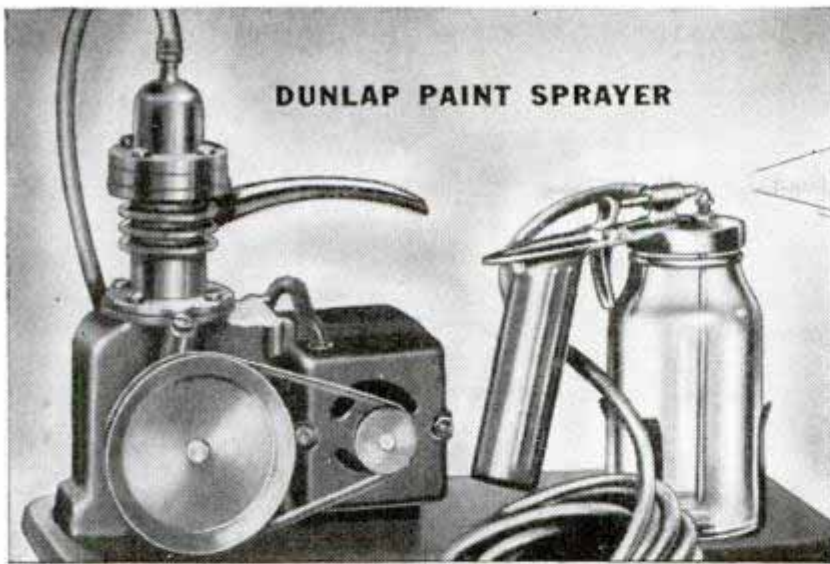
*Ground troops, surprised by low-flying observation plane, practice firing at it*

over the side. A roll of film may be 125 feet long and cost as much as thirty dollars.

While the high-altitude photo planes are still out, their cameras automatically snapping eight by ten negatives that will reveal every bush from 20,000 feet, a low-flying plane roars over the clump of trees that conceals the squadron's mobile darkroom. A can of film attached to a parachute floats down and one of the ground men recovers it. Fifteen minutes later pictures that show the enemy's defense around its landing beach will be ready for inspection.

All through the year Major Peterman keeps his officers employed on training problems. One week they may have to work out the means of locating an enemy

*(Continued to page 149A)*



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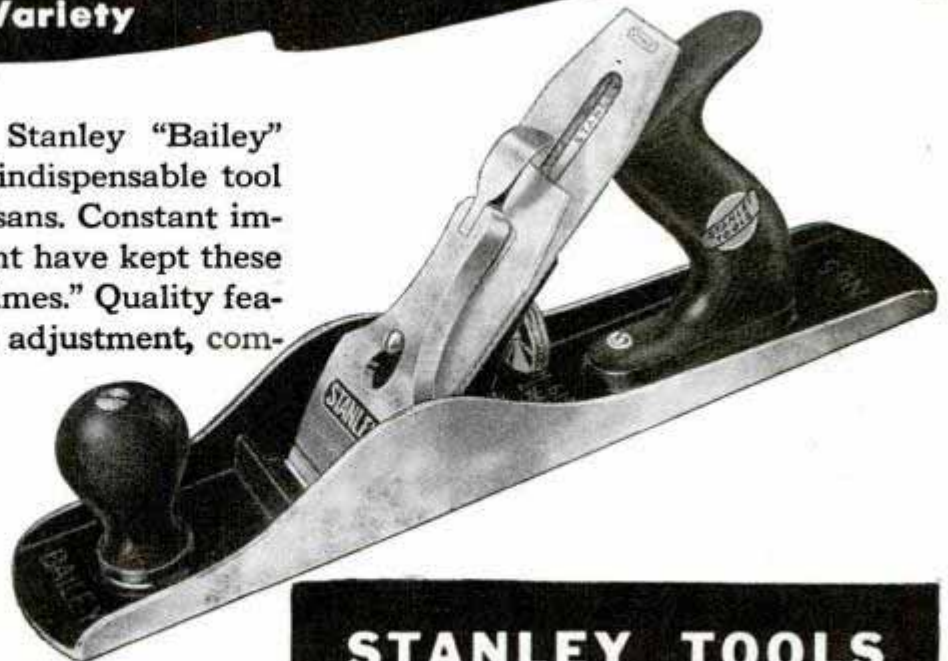
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*meets all  
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airdrome and keeping it under surveillance until it has been destroyed. Another time they may be given the problem of locating an aircraft carrier, known to be offshore, on a moonlit night. With only a few planes the task seems hopeless but by laying down on a chart the points at which the carrier-based airplanes were seen only a few hours before and allowing for their range and speed, a narrow area inside of which the carrier has to be is determined by the officers, after which a single plane can be sent out with every expectation that it will sight the carrier.

Modern wars are fought with photographs. It is possible, by photographing the same area day after day, to learn the size and trace the movements of an army even though the men and equipment remain successfully concealed during daylight hours. Electrically timed flash pictures reveal a square mile of ground after dark. Troop commanders who think that they can move their troops under the cover of fog are foiled by infrared film that picks up ground details through the haze.

An army prepares for its advance by photographing the ground in front of it. The background for every kind of activity is prepared by advance photography and even a bombing raid is preceded by observation planes that photo-map the target area. Enlargements from the negatives reveal or suggest the most likely hiding places for anti-aircraft batteries. Pilots who have the duty of destroying this defense can study their targets ahead of time.

In wartime every observation flight is a separate adventure. An enemy will do everything in its power to keep its secrets from being revealed. Pursuit planes are always on the prowl for the camera plane. Rifle fire and machine-gun fire from the ground is a threat when the planes fly low.

The versatile observation squadrons work with the infantry as well as with the other forces of the army. A message and streamer dropped to the ground tell the infantry the position of the enemy. The troops reply or ask questions by means of panel signals laid on the ground, long strips of cloth arranged in code. To pick up longer messages the pilot flies low over a pair of uprights, a hook dangling from the plane picking up a rope to which the message is attached.

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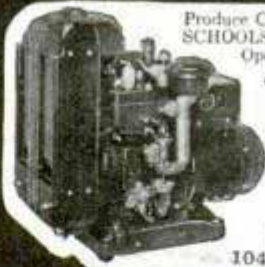
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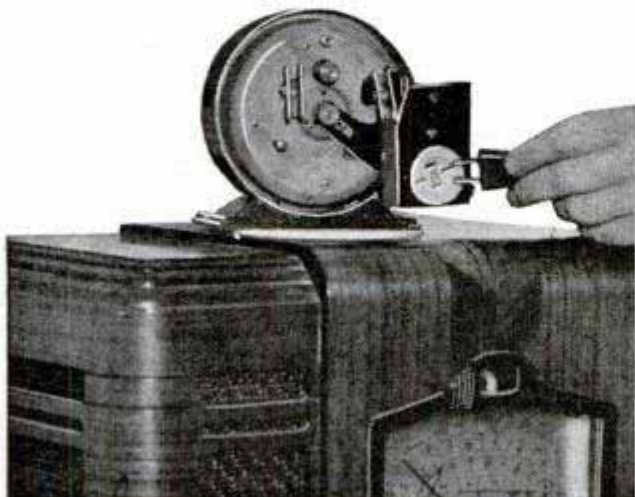


Ice cubes for beverage uses can be obtained from the ice refrigerator by means of a cuber which has a grid on its underside and a tank for warm water on top. The water supplies heat and weight. Placed on top of the ice block, the grid will cut sixteen cubes in less than five minutes. A chipper then dislodges the cubes.

*R151*

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*One copper drop to slush*

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Apply with brush      Solder with match

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**YOU can easily assemble Mead's amazing, portable KI-YAKS inexpensively at home in a few evenings from our patented, numbered, cut-to-fit construction KITS and save nearly HALF — or sell to others at big profits. Strong, Seaworthy, Portable — easily carried anywhere on top of your auto. Thousands of "Men" assembled from our KITS using EXCLUSIVE new construction principle. No experience needed. Just use simple hand tools. 5 Different Ki-Yak Kits!**

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You can use new models **BENJAMIN AIR RIFLE WITH LEVER HAND PUMP** anywhere, for practice firing or just plinking around the house or camping, fishing, hunting, etc., at lowest cost. Shooting force is adjustable depending on **AIR PRESSURE** — amazing maximum power and accuracy — will penetrate to 1". Hair trigger firing without lunge or recoil. Single Shot BB \$7.50. Repeater BB \$9.00. Rifled Cal. 22 or .177 Single Shot \$8.50. Ask your dealer all about them or write for complete specifications — targets and blueprints FREE if requested. We also make a complete line of **BENJAMIN AIR PISTOLS** for target and small game. **WRITE TODAY.** BENJAMIN AIR RIFLE CO., 895 MARION ST., ST. LOUIS, MO. U. S. A.



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Thrilling, Exciting and Fun Galore. Racing Clubs all over the country. Less than 24 inches long. These Little Speed Demons have turned over 62 m.p.h. This is America's Fastest Growing and Most Interesting Hobby. Complete line. Catalog 5c. **MINICARS, 652 Neil, Columbus, Ohio**

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**4000 BARGAINS**



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No. R191. For general and particular writing. The stylo point has eight grooves which act as an ink flow regulator. Writing pressure does not spread the point.

5 BIG FEATURES HELP INCITE QUICK SALES.

- Pearl Color
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Sample 33c Dozen \$3.45

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**COOK and HEAT Without Coal or Wood**

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**OVER 40,000 SOLD**

Beats any cheap burner ever gotten out for low cost, perfect performance. Burns cheap oil a new way, no clogging up. Quick intense heat by Simple Turn of Valve. **GUARANTEED.**

**30 DAYS' TRIAL** Prove its efficiency, convenience and economical operation.

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**From Any Electric Light Socket**

Millions need **SPEED KING**—the amazing disc that you drop into any pan, pail or basin of water and plug into any 110-volt socket. **CHEAP and FAST**, Small in size.

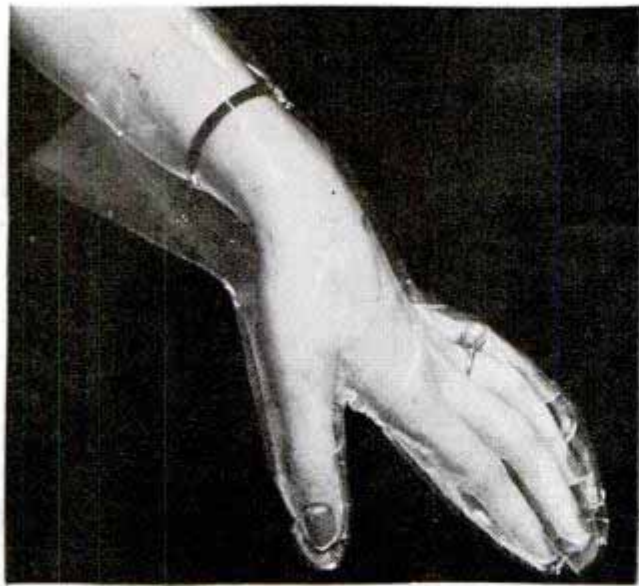
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Write quick—for my **SAMPLE OFFER—FREE!** Get an actual sample **SPEED KING** for making demonstrations. You can make plenty of cash as my agent. **HURRY! Send no money!** —Just your name, **L. B. Patterson, Pres. NU-WAY CO., Des Moines, Iowa**, Dept. 165, Walnut Bldg.



**60-SECOND Demonstration**

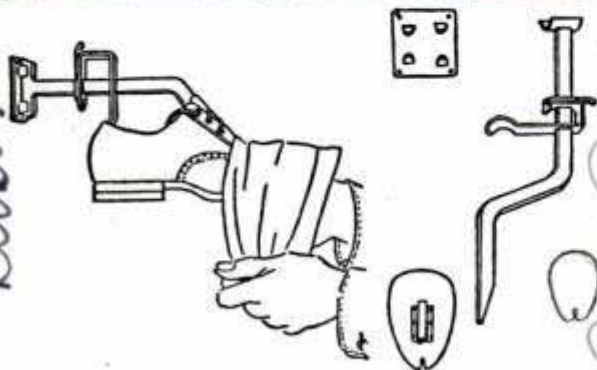
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**ELECTRIC  
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MASONITE—TRANSITE**  
And other materials  
up to 1 1/4 inch thick

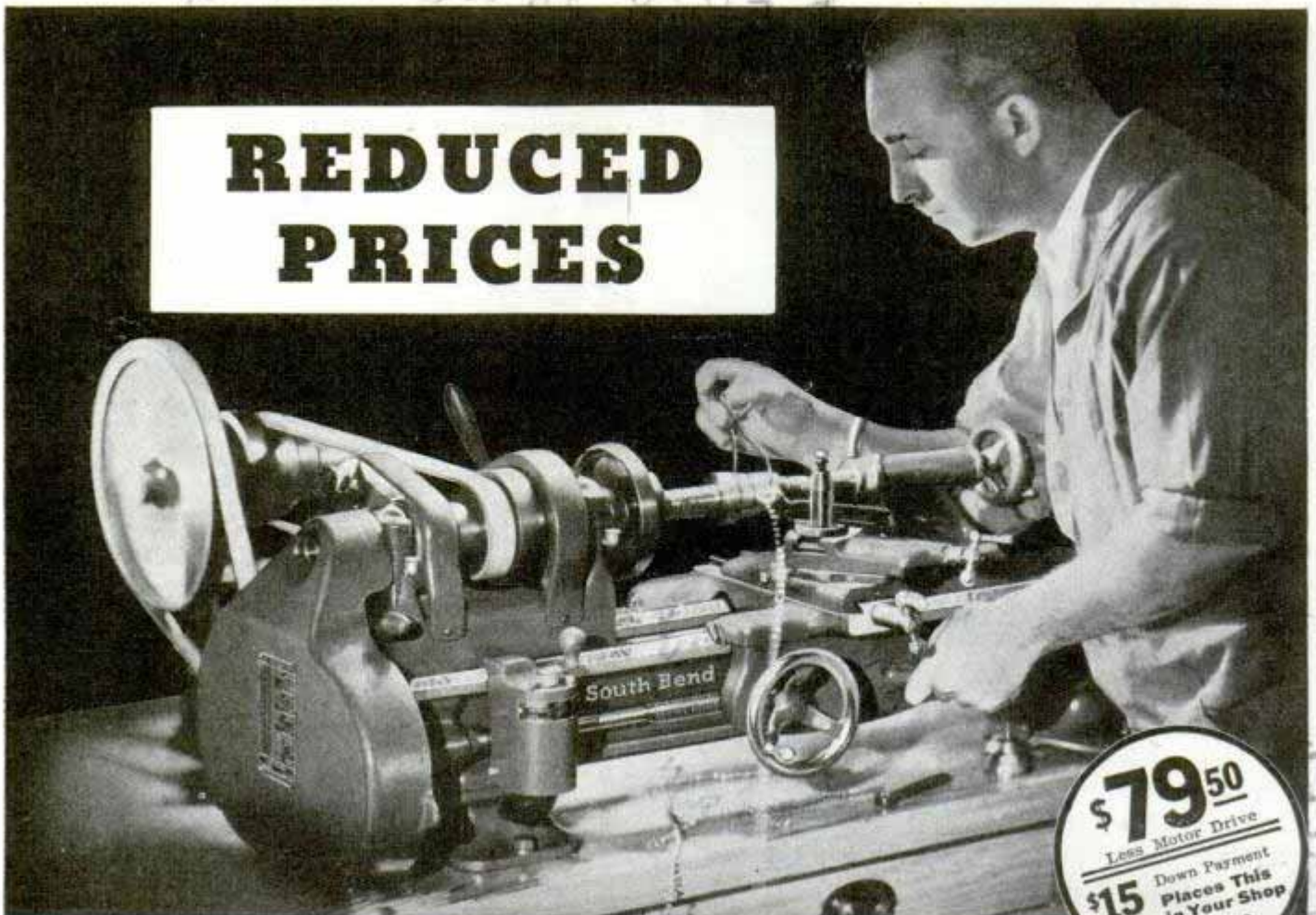
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No. 415-YC, 9 1/4" Swing by 3' Bed Workshop Model C Bench Lathe with Motor Drive as shown. Shipping weight 320 lbs. **\$109<sup>50</sup>**

**\$79<sup>50</sup>**  
Less Motor Drive  
**\$15** Down Payment  
Places This Lathe in Your Shop  
Balance \$6 Monthly

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*Precision* **LATHES**  
LATHE BUILDERS SINCE 1906



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wakes up famous after long-distance snooze

*Long years of slumber  
in oaken casks works miracle of  
mellowness in BRIGGS Tobacco*

**D**OWNRIGHT laziness achieves fame and fortune for Briggs. Heedless of time, the best of each season's tobacco crop is tucked away by Briggs in fragrant oaken casks.

And while it dreams the slow seasons 'round, each golden leaf soaks up mellowness. All harshness and tongue-bite disappear. Only when Father Time has given his benediction does Briggs find its way into those mellow-hued tins that pipe smokers prize so much.

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*Extra Long for Extra Flavor*

OUT IN SANTA BARBARA, West Coast girls play a lot of polo. Peggy McManus, shown about to mount one of her ponies, is a daring horsewoman... often breaks and trains her own horses. She has carried off many cups and ribbons at various horse shows and rodeos.



**PEGGY SAYS SPEED'S SWELL IN A HORSE**

SPEED'S THE THING IN A HORSE, BUT I LIKE MY CIGARETTES SLOW-BURNING, THAT MEANS CAMELS, THE CIGARETTE THAT GIVES ME THE EXTRAS!



...but the cigarette for her is slower-burning Camels because that means

*Extra Mildness*

*Extra Coolness*

*Extra Flavor*

PEGGY McMANUS (above) studied ranch management. She's a swell dancer, swims, sails...is a crack rifle shot...handles her 16-gauge automatic shotgun like an expert. She picks Camels as the "all-'round" cigarette. "They're milder, cooler, and more fragrant," Peggy says. "By burning more slowly, Camels give me extra smokes. Penny for penny, Camels are certainly the best cigarette buy."

In recent laboratory tests, CAMELS burned 25% slower than the average of the 15 other of the largest-selling brands tested—slower than *any* of them. That means, on the average, a smoking *plus* equal to



**5  
EXTRA  
SMOKES  
PER  
PACK!**

NORTH, SOUTH, EAST, WEST — people feel the same way about Camel cigarettes as Peggy does. Camels went to the Antarctic with Admiral Byrd and the U. S. Antarctic expedition. Camel is Joe DiMaggio's cigarette. People like a cigarette that burns slowly. And they find the real *extras* in Camels—an extra amount of mildness, coolness, and flavor. For Camels are slower-burning. Some brands burn fast. Some burn more slowly. But it is a settled fact that Camels burn slower than any other brand tested (see left). Thus Camels give extra smoking... a *plus* equal, on the average, to five extra smokes per pack.

**MORE PLEASURE PER PUFF  
... MORE PUFFS PER PACK!**

**Camels** — *the cigarette of Long-Burning Costlier Tobaccos*