

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

ESTABLISHED 1872

REG. U.S. PAT. OFF.



**WATER BOMB
FOR FOREST FIRES
PAGE 126**

*Enjoy extra
shaving speed and
convenience with a*
Gillette
One-Piece Razor

TO whisk off tough beard with perfect ease—save time and bother—get a gold-plated Gillette Aristocrat or Gillette Milord *one-piece razor*. These are the finest and most convenient shaving instruments money can buy. There's nothing to take apart or put together. You change blades in a flash. Twist . . . the razor opens. Twist again . . . your blade's locked in shaving position. For cleaning both razor and blade just loosen the holder, rinse and shake. Every man wants a fine razor. Ask to see the superb Gillette Aristocrat and Gillette Milord *one-piece razors*.

**Gillette Safety Razor Company
Boston 6, Mass.**



**Gillette
Aristocrat
One-Piece Razor**

in a beautiful case with ten Gillette Blue Blades . . . **\$3⁷⁹**



**Gillette
Milord
One-Piece Razor**

with handsome case and five Gillette Blue Blades . . . **\$2⁵⁰**



look SHARP! feel SHARP! be SHARP!

use Gillette Blue Blades WITH THE SHARPEST EDGES EVER HONED



Now at less than prewar prices—the tire that outwears prewar tires

B. F. Goodrich Silvertowns in all popular sizes now cost less than before the war. And yet they outwear prewar tires. For several months, issues of this magazine have shown, on this same page, pictures of car owners who have kept actual records of tire mileages. Others are shown above.

Typical example No. 74: 42,375 miles in taxi service! Paul A. Howell, manager of the City Cab Co. of Orlando, Fla., writes:

"We have thirty cabs in operation and several sets of B. F. Goodrich Silvertowns in service. To date we have not had a single tire failure. The mileage record on one set shows 42,375 miles, and we believe this set will go at least

50,000 before recapping. No other tire in our experience has given us better service."

Typical example No. 69: 23,304 miles in hospital service—tires still look new! Orrie Ewart, of Port Huron, Mich., is employed by St. Clair County, and his duties consist of transporting hospital patients. He says: "B.F. Goodrich Silvertowns don't skid on wet roads like others. I've driven the set you see in the picture 23,304 miles since last December, and they appear as if they were newly purchased."

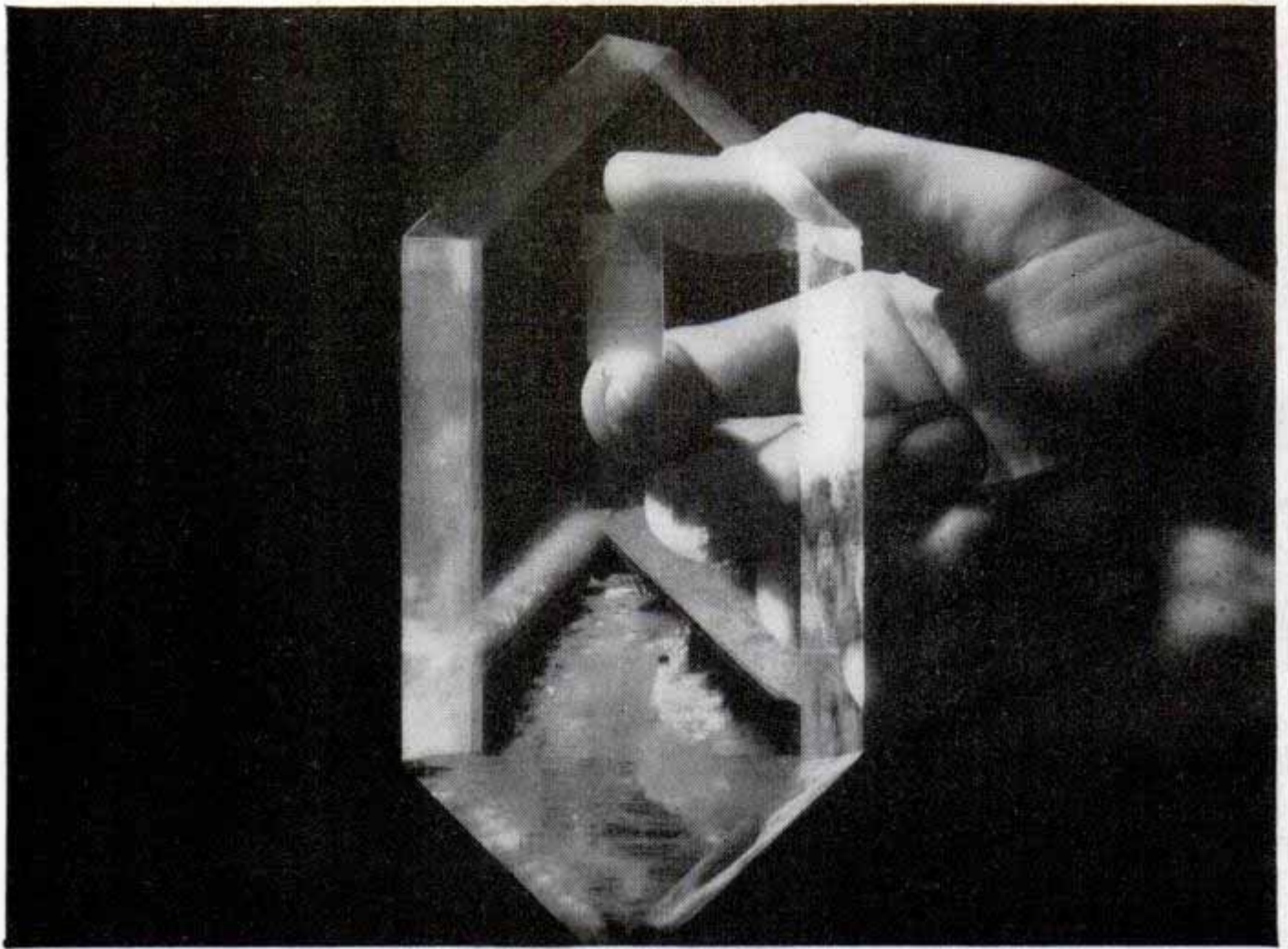
Typical example No. 57: Best tires she ever had in thirty-three years! Says Mrs. Eugene Guest of Lithonia, Georgia: "I purchased three B. F.

Goodrich tires last year. When these tires were put on, the speedometer reading was 21,246. It is now 51,636, and there is a lot of good wear left in them. They are the best tires I have ever had, and I have been driving thirty-three years."

Not only do these tires cost less than before the war, but your B. F. Goodrich dealer will give you a good allowance on your old tires if they're still good enough to be used or recapped.

The B. F. Goodrich Company, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



A CRYSTAL THAT GREW FROM A SEED . . . *The large crystal in the foreground is an EDT (Ethylene Diamine Tartrate) crystal. It started from a seed (a piece of mother crystal) and in three months grew in a slowly cooling solution to the size shown. The small plate is cut from a large crystal, then gold-plated for electrical connection and mounted in vacuum. Cultivated EDT crystals can do the same job as quartz in separating the nearly 500 conversations carried by a coaxial circuit.*

Crystals for Conversations

AT WAR'S END, the Bell System began to build many more Long Distance coaxial circuits. Hundreds of telephone calls can be carried by each of these because of electric wave filters, which guide each conversation along its assigned frequency channel. Key to these filters was their frequency-sensitive plates of quartz.

But there was not enough suitable quartz available to build all the filters needed. Bell Telephone Laboratories scientists met the emergency with cultivated

crystals. Years of research enabled them to write the prescription at once — a crystal which is grown in a laboratory, and which replaces quartz in these filters.

Now Western Electric, manufacturing unit of the Bell System, is growing crystals by the thousands. Many more Long Distance telephone circuits, in urgent demand, can be built, because the scientists of Bell Telephone Laboratories had studied the physics and chemistry of artificial crystals.



BELL TELEPHONE LABORATORIES

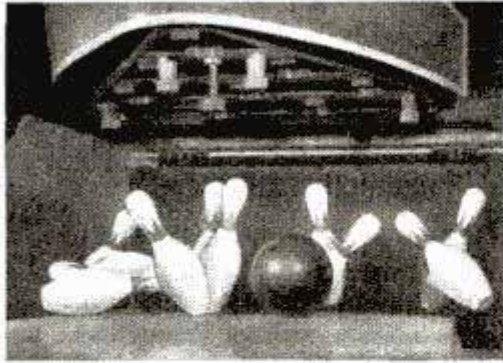
EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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



BOWLING PINS toppled by the country's 18,000,000 fans are clattering across the alleys in full volume again this fall. We asked Joe Wilman, voted 1946's "Bowler of the Year" by sports writers, for a few tips on knocking over strikes and picking up spares. "Control and 'stuff' on the ball are most important," he says. He explains this bowling lingo in a story on page 106.

NEXT MONTH'S ISSUE features a trip underground to the "Colossus of Coal," a mechanized tunnel that pours forth enough fuel in a single day to heat 2000 homes for the winter. Another fast-moving yarn describes the thrills and spills of motorcycle racing—over a course rough enough to shake the confidence of any rider. The latest surveying instruments are given a close inspection in "New Methods for Plotters."

STRAIGHT from Santa's workshop come the detailed plans in next month's Craftsman section. This pre-Christmas feature tells how to build toys, games, gift items and children's furniture. Also, for the man who builds his own machines there's the first installment of a two-part article detailing the construction of a table saw with a tilting arbor. The home workshop can be a dangerous place—and a November feature tells how to operate shop equipment safely.

RECEIVERS, amplifiers and transmitters can be operated with the compact power unit described in next month's Radio section.

Volume 88

OCTOBER 1947

Number 4

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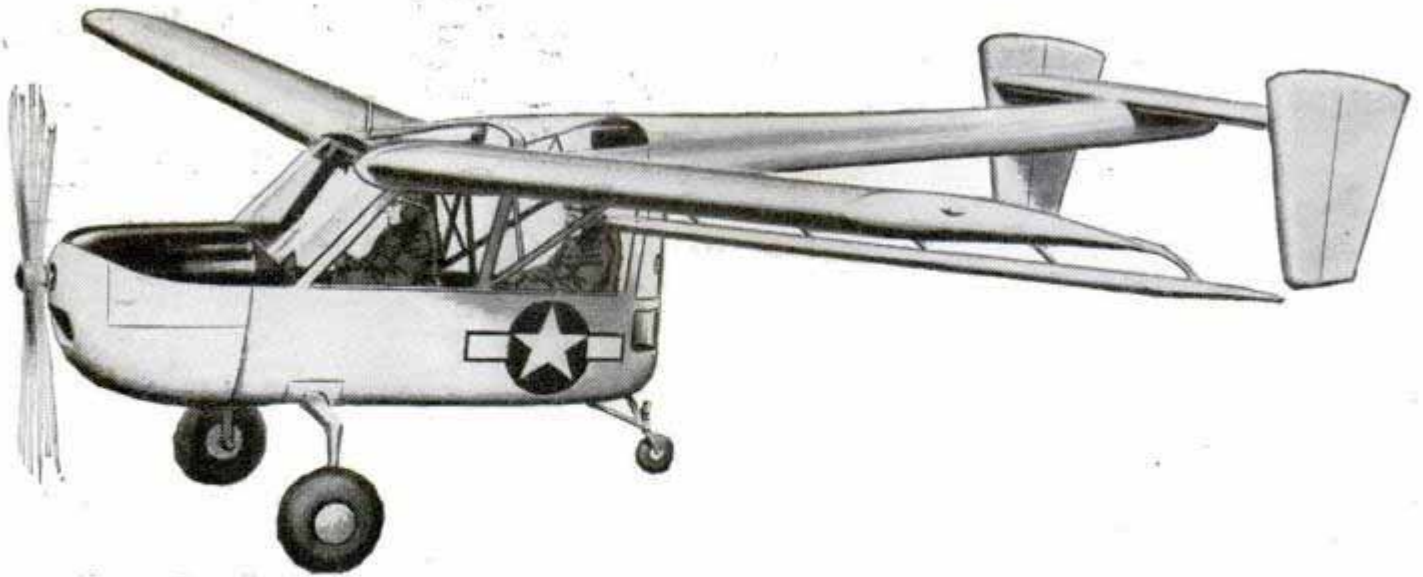
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New "eyes" for the Army Ground Forces

YOU might guess this little aircraft belonged to the Air Forces, but you'd be wrong. It's strictly a Ground Forces gadget — the latest development in liaison and spotting planes.

It's the 125-hp. L-15, built to do the almost unbelievable things required by the Infantry, Artillery and Armored Cavalry.

This plane can cruise at a top speed of 112 mph., and dive safely at 200, yet it can hover at 36 mph. without stalling! On a field where there are no obstacles it can take off or land in less than 250 feet — or take off and clear 50-foot trees in 600 feet.

One of the L-15's most outstanding features is full visibility in all directions. Pilot and observer have a sweeping, all-round view, including straight down and straight aft, made possible by the unique cockpit design and elevated tail spar.

The role of small observation planes in World War II was vitally important to

victory. Spotting enemy installations, they enabled our firepower to strike with deadly accuracy. This new plane will give the Ground Forces still more dependable "eyes."

All through the peacetime Regular Army you'll find new scientific advances being tested and perfected. It's a great career for young men of mechanical skill who want to get ahead. There's good pay while learning; food, clothing, shelter and medical care; travel and splendid educational opportunities. A 3-year enlistment permits you to choose your branch of service from those still open. Ask for full details at your nearest U. S. Army Recruiting Station.

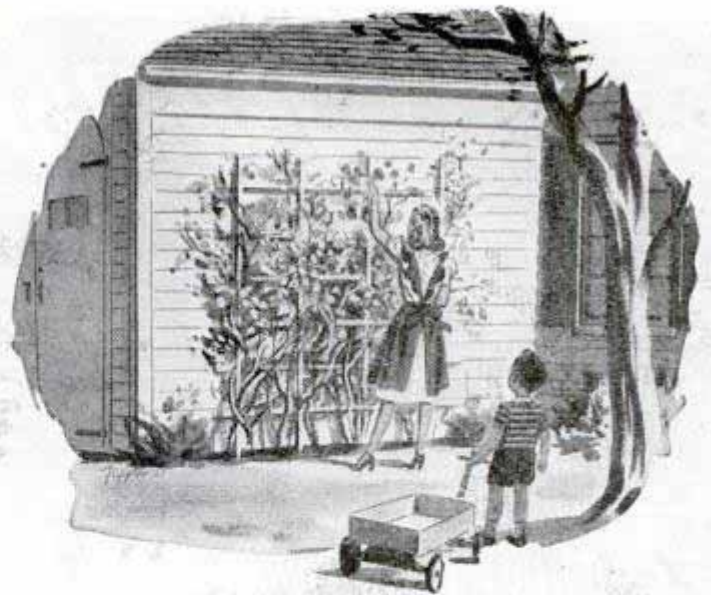
• Listen to "Sound Off," "Voice of the Army," "Proudly We Hail," and "Front and Center" on your radio.

A GOOD JOB FOR YOU
U. S. Army
CHOOSE THIS
FINE PROFESSION NOW!

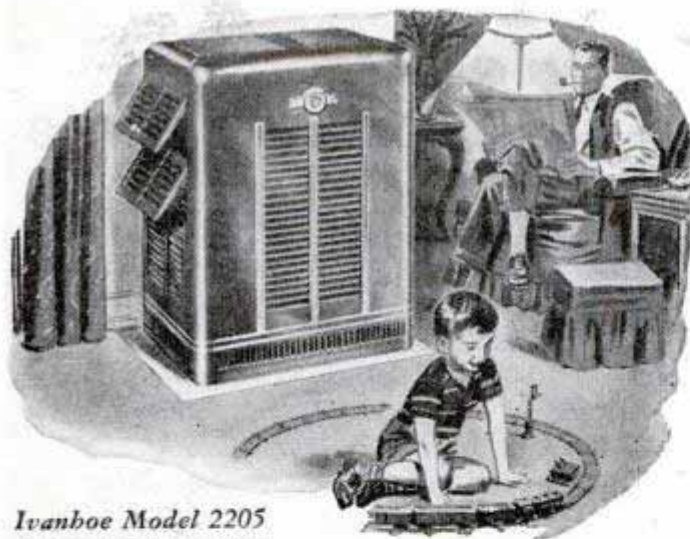
YOUR REGULAR ARMY SERVES THE NATION AND MANKIND IN WAR AND PEACE

*Plant roses where the
woodpile used to be!*

Modernize your home with a Perfection Oil Heater and you'll be able to have a garden where the woodpile was! This is a symbol of the greater comfort and freedom that can be yours with *quality* Perfection heat. You can look to Perfection, as so many others have, for better living!



Switch to Modern, Economical PERFECTION Oil Heat!



*Ivanhoe Model 2205
Space Heater, other
sizes available*

*Firelight Portable
Model 750 for "spot"
heating anywhere*



The Mark of Quality



Uniform Heat—quick radiating and circulating warmth, always there, day or night, when and where you want it.

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Quiet Operation—a silent servant producing the quick, clean comfort of better living.

and—no coal to carry, no fires to build, no ashes to empty, no soot-streaked walls to clean!

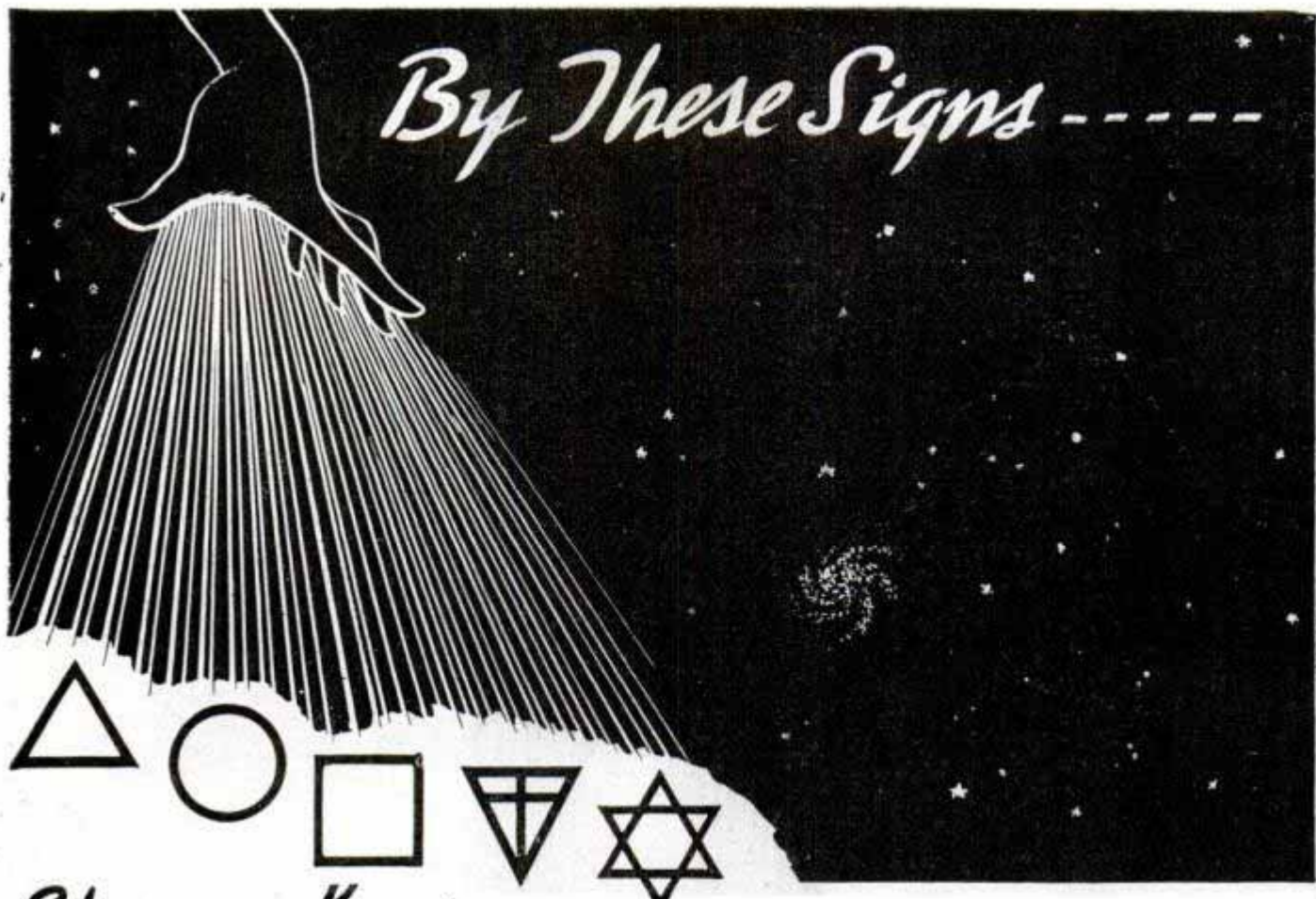
PERFECTION

*Manufacturers of
Oil Cookstoves, Oil Heaters, Oil Water Heaters,
Oil and Gas Air-Conditioning Furnaces*

PERFECTION STOVE COMPANY
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Atlanta • Cleveland • Chicago • Jersey City • Kansas City • Oakland • St. Paul

By These Signs -----



Strange Keys

to the Powers of the Universe

"GOD GEOMETRIZES," said an ancient sage. Within the straight line, curve, and angle—and their combinations—exist the forces of creation. These *secret symbols* contain the mysterious laws of the universe. Upon their right use—or the neglect of them—the success or failure of every *human enterprise* depends.

Have you a desire, *something you wish to accomplish* in life? Put your finger on a dot. In whatever direction you move your finger from the dot, you have made a beginning. Thus a dot is the symbol of *one*—or a beginning. Your desire then is also symbolized by *one*. If you follow the *proper method* or way to accomplish what you want, you have arrived at point *two*. Whenever these two symbols are brought together—the idea and the right way—you produce point *three*—the success of your plan. Success, therefore, is symbolized by the three equal sides of a *triangle*.

In planning your personal affairs—business, domestic, or the welfare of your family—do you use a *Cosmic formula*? Do you determine whether your acts are in accord with Divine truths eternally expressed in symbols? Why does the circle represent completion? Why is it said that a man is on the square? These

symbols are used by astronomers and scientists to prove the physical laws of the universe—why don't you apply them to the problems of your everyday world? Learn what symbols, as powers and forces of nature, you can simply and intelligently use in directing the course of your life.

Let the Rosicrucians (not a religious organization), a world-wide brotherhood of learning, reveal to you *the symbolism of successful living*.

Let this GIFT BOOK Explain

If you want to prepare yourself through understanding for the greater rewards of life, write for the fascinating *free Sealed Book*. It explains how you may receive this age-old wisdom. Use the coupon below.

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THE ROSICRUCIANS, AMORC
San Jose, California, U. S. A.

Please send me the Free, Sealed Book. I am interested in knowing how I may obtain the masterful Rosicrucian teachings.

Name.....

Address.....

.....



THE ROSICRUCIANS, AMORC - SAN JOSE, CALIFORNIA, U. S. A.

**"What's he got
that I haven't got?"**

LOOK at the successful men you know. "What have they got" that you haven't?

Very little, probably. In most ways these men are no brighter or naturally more capable than average. Many of them probably have no more formal education or better natural aptitudes than you.

But that little extra they have is important. They have the special knowledge and ability for which business is glad to pay well—they know the what, why and how of business. They have also the confidence and aggressiveness which come from knowing that they know and can apply their knowledge.

You may add that extra—may get that same profitable knowledge and ability—that same confidence and aggressiveness—if you are willing to pay the price in earnest, necessary study. For LaSalle has spent 38 years developing, testing and proving, with over a million student members, spare-time success training in certain specialized business fields. What scores of thousands of men and women—many just like you—have done, you should be able to do.

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How much do you want success—more money, a promotion or a new job, prestige and responsibility? If you really want it, you will use the coupon below to find out what LaSalle training can do for you. It costs only a postage stamp, but a coupon like it has been the starting point to real success for scores of thousands—and can be for you.



LA SALLE Extension University
A Correspondence Institution

Dept. 1064-R • 417 S. Dearborn • Chicago 5, Ill.

I want to know how LaSalle can help me win success in the field I have checked below. Please send me your free 48-page booklet about that field and your success training in it.

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| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Effective Speaking |
| <input type="checkbox"/> C.P.A. Coaching | <input type="checkbox"/> Business Management |
| <input type="checkbox"/> Business English | <input type="checkbox"/> Industrial Management |
| <input type="checkbox"/> Law: LL.B. degree | <input type="checkbox"/> Traffic Management |
| <input type="checkbox"/> Foremanship | <input type="checkbox"/> Stenotypy (Machine Shorthand) |

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

Position.....

Address.....

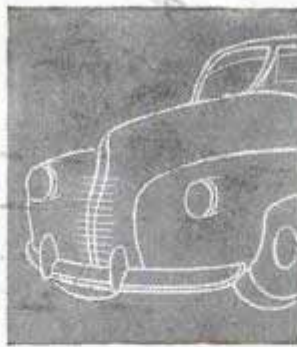
City, **This One**



WKEU-C7B-CHHZ

LA SALLE EXTENSION UNIVERSITY
A Correspondence Institution

So little Pyroil gives so much Protection



A pint of Pyroil in the crankcase — and a few ounces in the gas tank will add miles to your car. Pyroil gives oil the property of clinging to cylinder walls—thus preventing excess wear and corrosion. Pyroil prevents the accumulation of sludge, gum and other contamination in the crankcase and on cylinder walls. A little PYROIL does so much. Be sure to ask your gas station attendant to add PYROIL.

PYROIL FOR AIRCRAFT ENGINES

Use Aircraft Pyroil B for lubricating oil, Aircraft Pyroil A for gasoline.

Manufactured and Guaranteed by Pyroil Company, 72 Pyroil Bldg., La Crosse, Wisconsin.

Canadian Distributors:
Central Purchasing Agency, Ltd.
Toronto, Ontario



PYROIL COMPANY

72 Pyroil Bldg., La Crosse, Wisconsin

I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

Name _____

Address _____

City or Town _____

State _____



Jerry, the talking dog, is entertaining hospitalized veterans, by courtesy of the PYROIL Company. Picture of Jerry, sent on request.

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DON'T read another word of this advertisement unless you're interested in a better job, a larger salary, greater responsibility! I. C. S. messages are not addressed to the idly curious — they're for the man who is curious with a purpose.

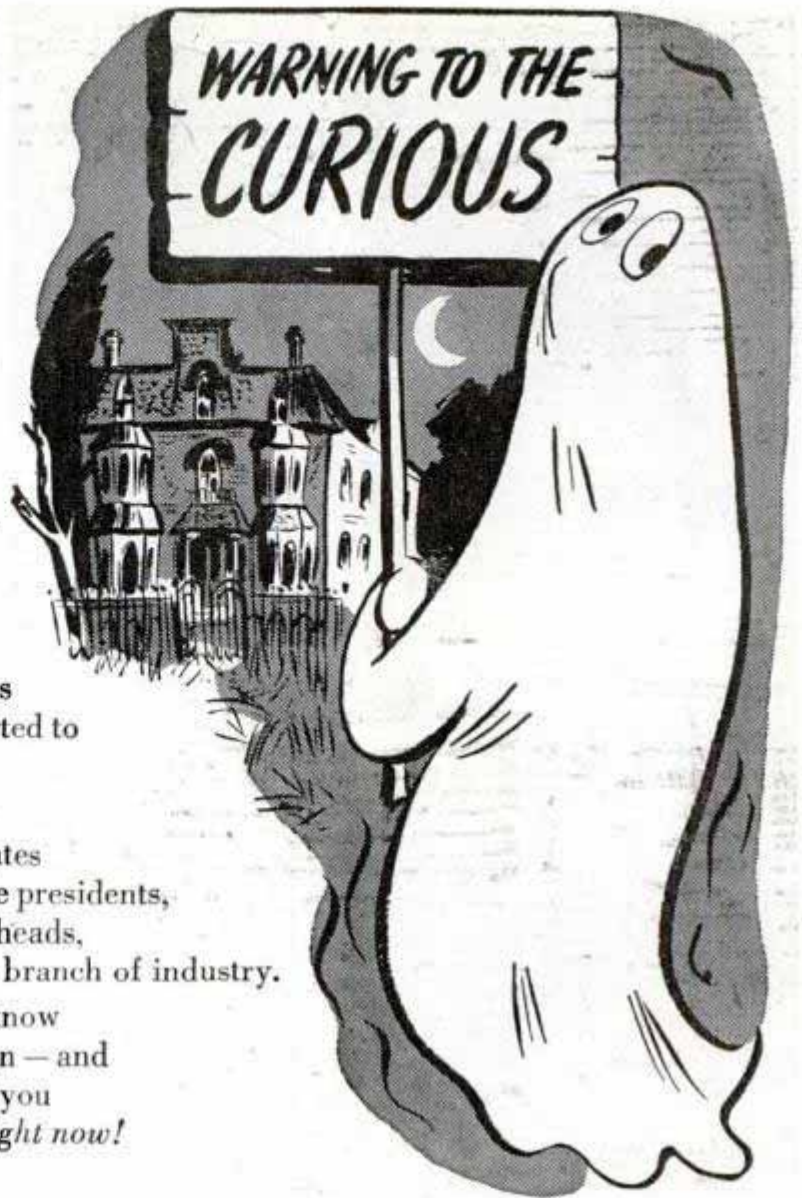
If you want to know how to start achieving advancement and success, we have important information for you.

We want to tell you that I. C. S. Courses covering more than 400 commercial and technical subjects are available for spare-time study at surprisingly low cost.

We want you to know that pay increases and job betterments are consistently reported to us by I. C. S. students in a volume as high as 600 and more letters a month.

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If you're truly curious, you'll want to know the details of what I. C. S. did for these men — and what it can do for you. The coupon brings you this full information. Mark and mail it *right now!*



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- Chemistry, Industrial
- Chemistry, Mfg. Iron & Steel
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- Architectural Drafting
- Bridge and Building Foreman
- Building Estimating
- Civil Engineering
- Coal Mining
- Contracting and Building
- Highway Engineering
- Lumber Dealer
- Reading Structural Blueprints
- Sanitary Engineering
- Structural Drafting

Structural Engineering

- Surveying and Mapping

Communications Courses

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- Practical Telephony
- Radio, General
- Radio Operating
- Radio Servicing
- Telegraph Engineering

Electrical Courses

- Electrical Drafting
- Electrical Engineering
- Electric Light and Power
- Lighting Technician
- Practical Electrician

Internal Combustion Engines Courses

- Auto Technician
- Diesel-Electric
- Diesel Engines
- Gas Engines
- Aviation

Mechanical Courses

- Aeronautical Engineer's, Jr.
- Aircraft Drafting
- Flight Engineer
- Forging
- Foundry Work
- Heat Treatment of Metals

Industrial Engineering

- Industrial Metallurgy
- Machine Shop
- Mechanical Drafting
- Mechanical Engineering
- Mold-Loft Work
- Patternmaking—Wood, Metal
- Reading Shop Blueprints
- Sheet-Metal Drafting
- Sheet-Metal Worker
- Ship Drafting
- Ship Fitting
- Tool Designing
- Toolmaking
- Welding—Gas and Electric

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- Car Inspector
- Diesel Locomotive
- Locomotive Engineer
- Locomotive Fireman
- Railroad Section Foreman

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- Boilermaking
- Combustion Engineering
- Engine Running
- Marine Engineering
- Steam Electric
- Steam Engines

Textile Courses

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- Rayon Weaving
- Textile Designing
- Woolen Manufacturing

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- Bookkeeping
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- Cost Accounting
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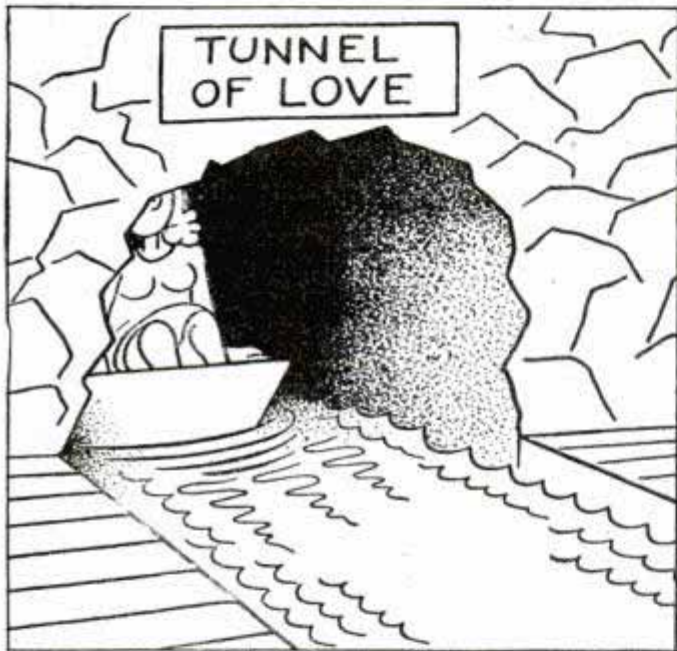
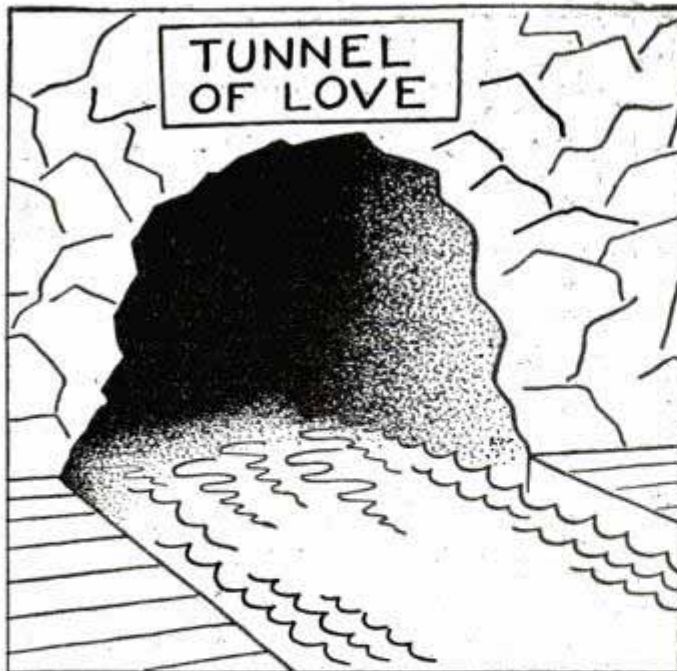
Name _____ Home Address _____

City _____ State _____

Age _____ Present Position _____ Working Hours _____ A.M. to _____ P.M.

Special tuition rates to members of the Armed Forces
Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada

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FARM

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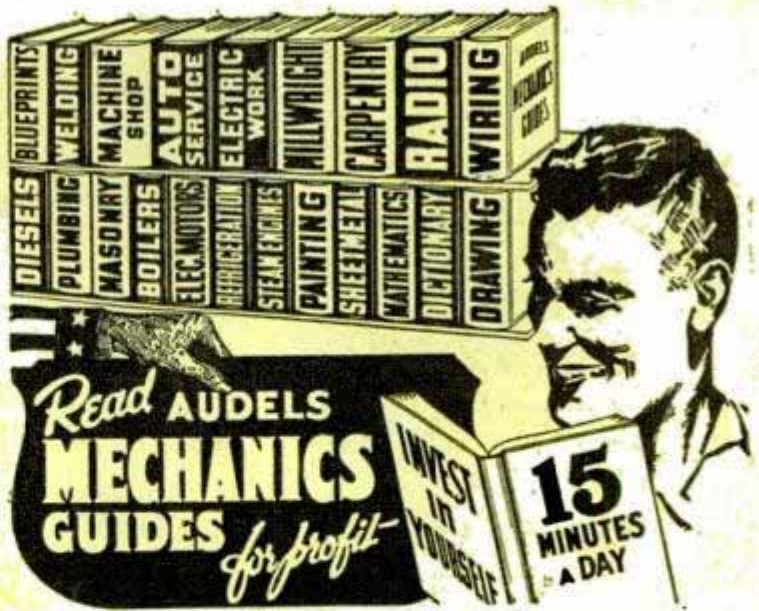
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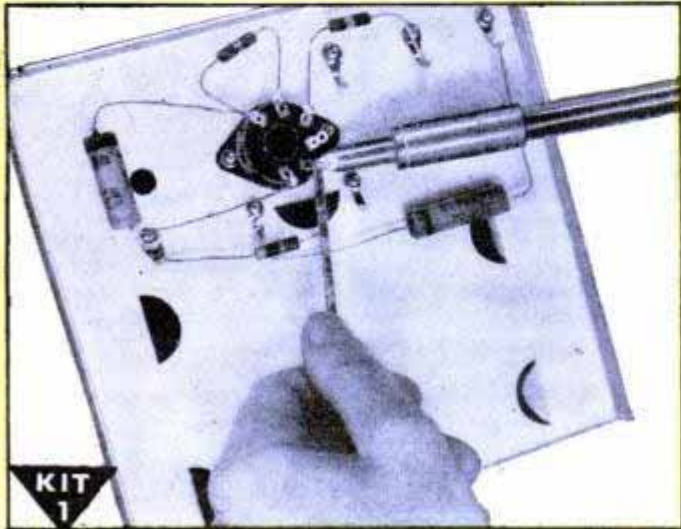
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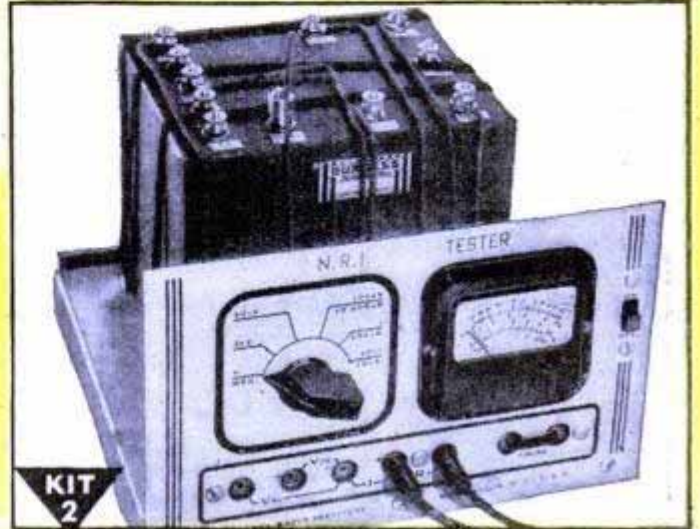
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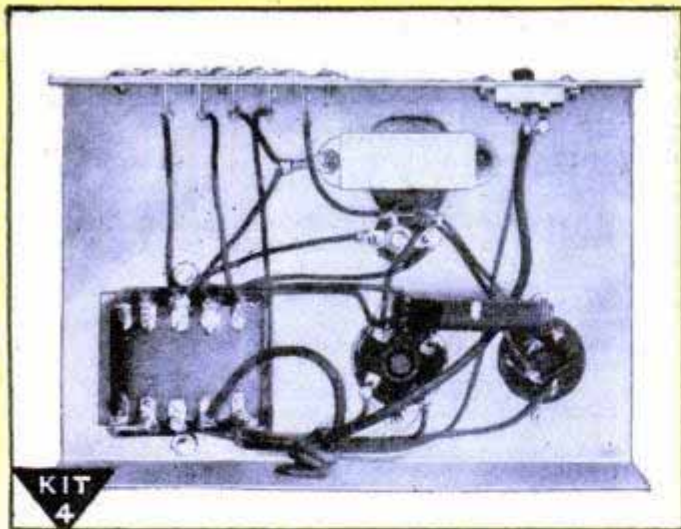
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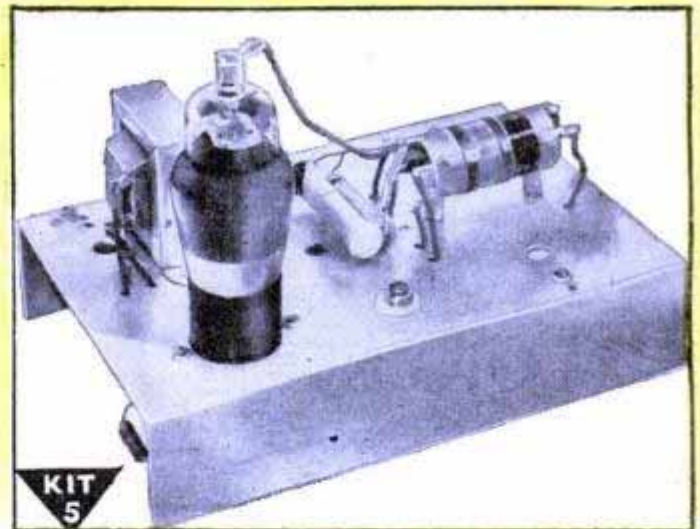
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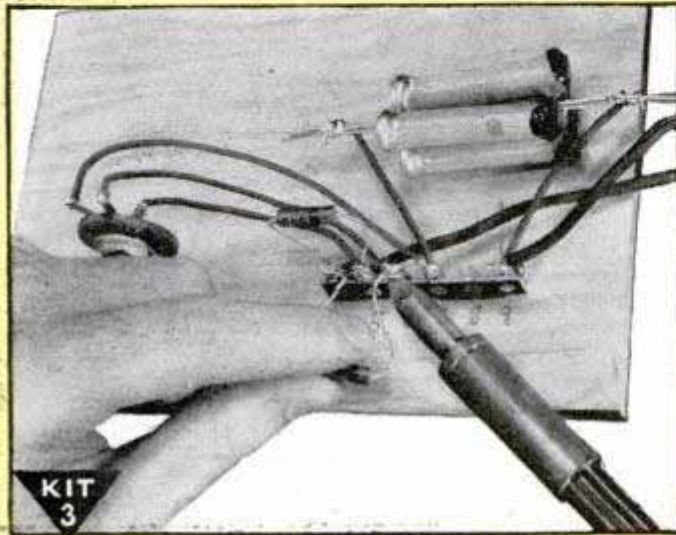
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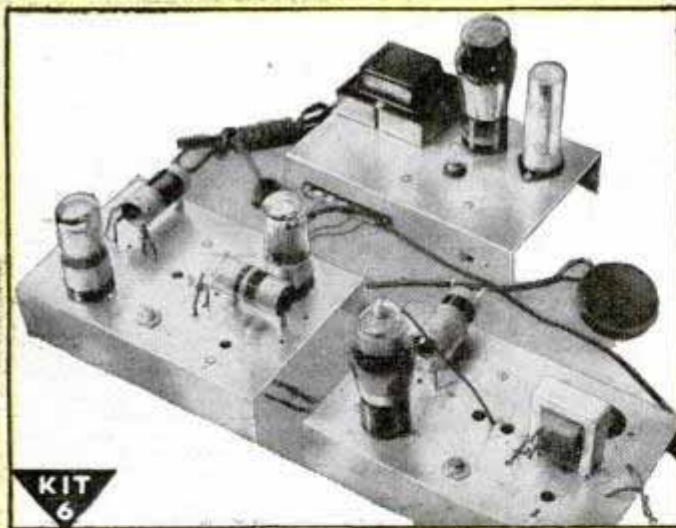
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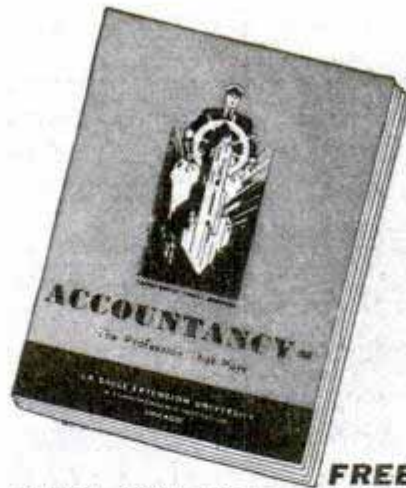
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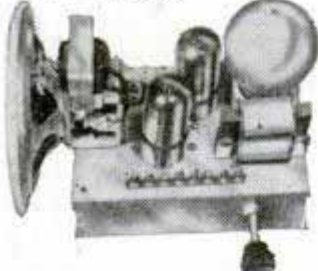


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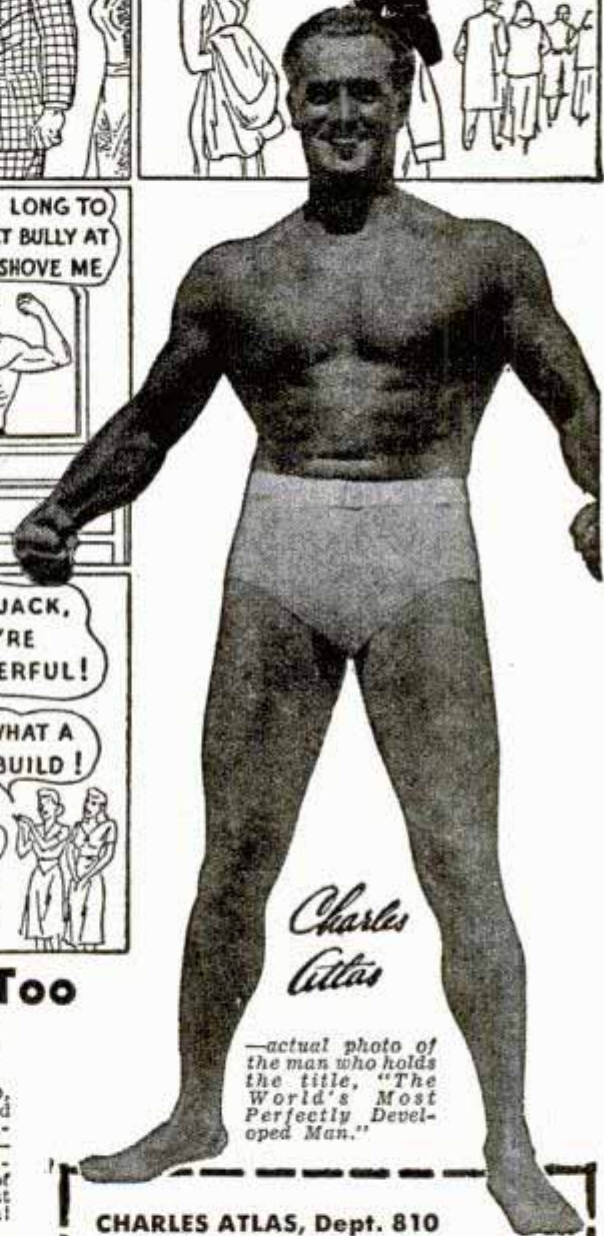
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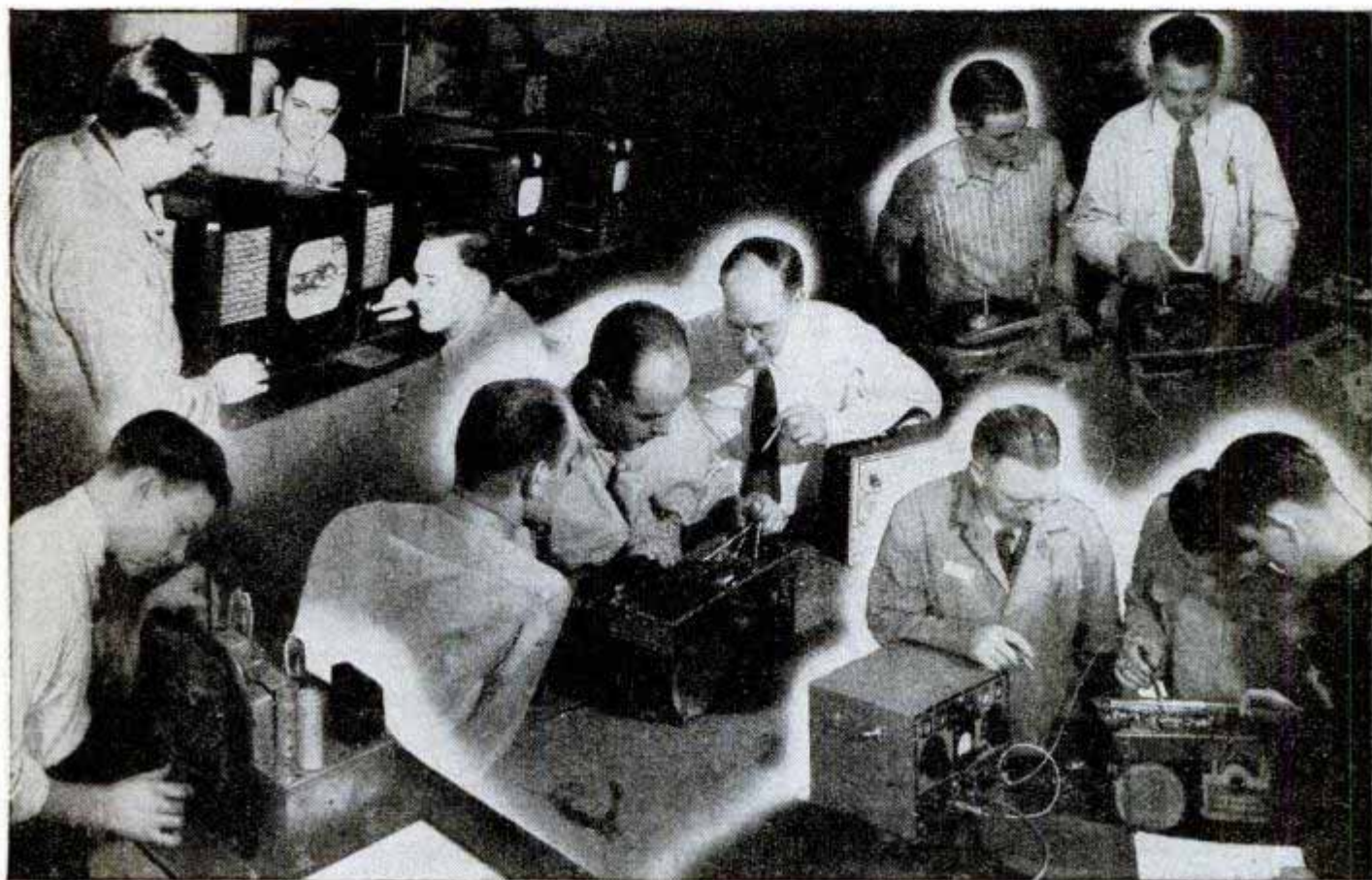
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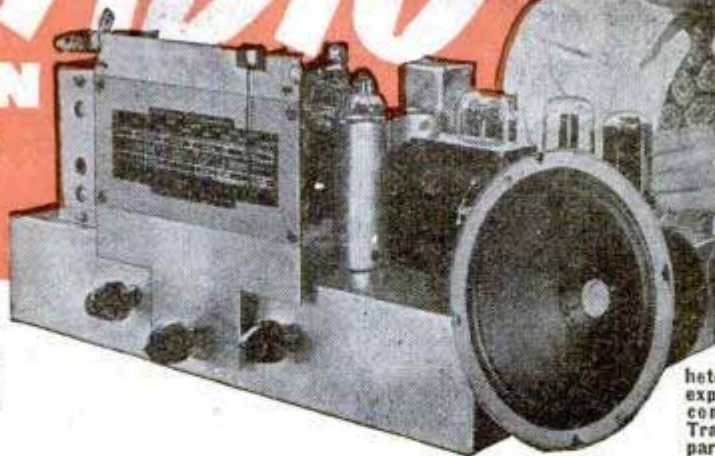
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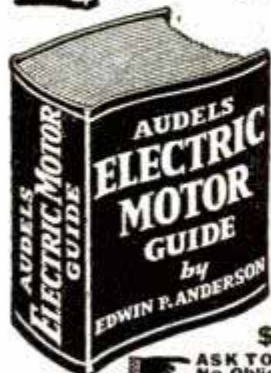
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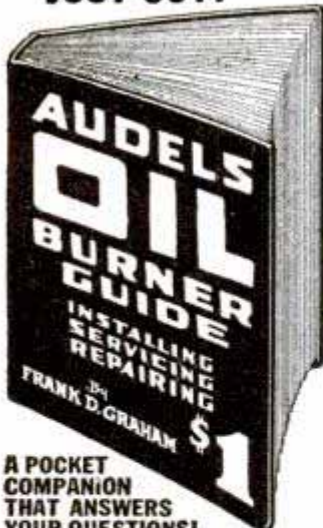
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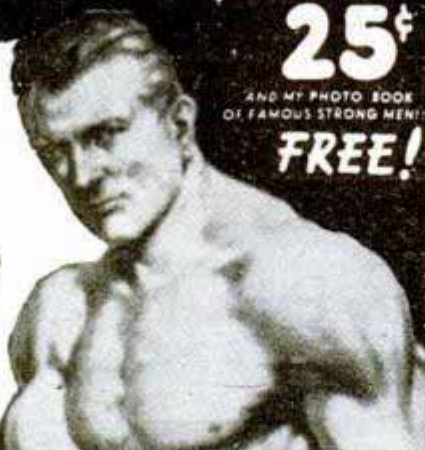
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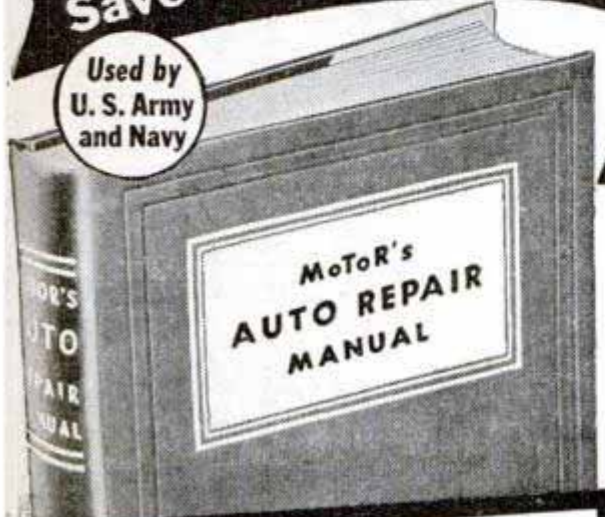
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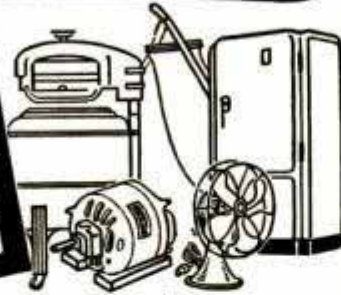
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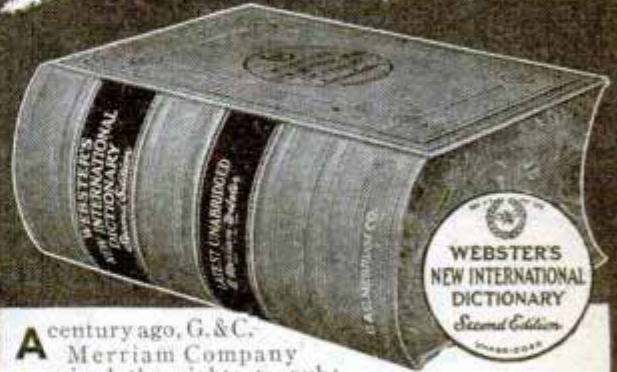
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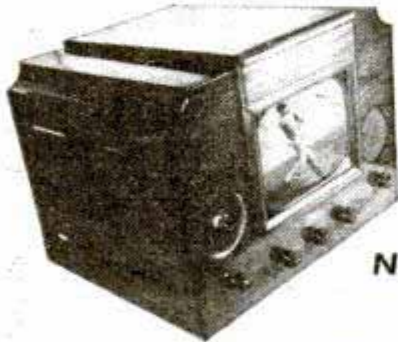
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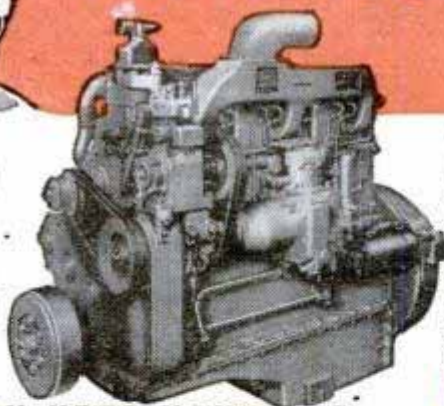


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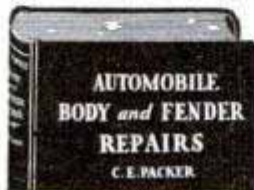
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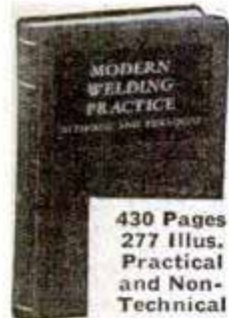
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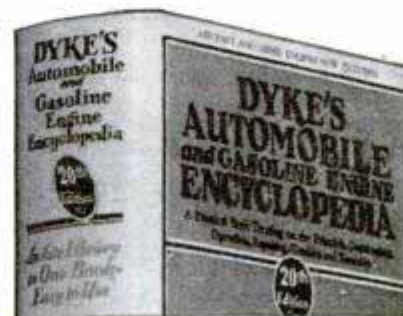


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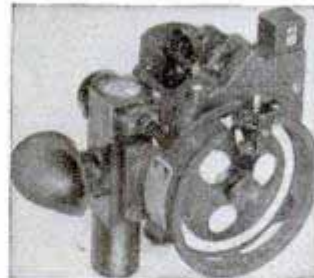
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RADIO And television catalog—free! Money saving prices on radios, hard-to-get parts, record changers, wire and disc recorders, amplifier systems, tubes, books, amateur and test equipment. Write today! Radionic Equipment Co., Dept. 2010, 170 Nassau Street, New York 7, N. Y.

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U. S. SIGNAL Corps featherweight earphones \$1.00. Radio service men and experimenters send stamp for our giant radio catalogue. Save dollars. United Radio Co., (100-V) Newark 1, N. J.

BROADCAST Through your radio with the "Tiny-Tone" Little Mike. Complete instructions included. 50c postpaid. Money back guarantee. Tiny-Tone, 1216 Park Row Building, New York 7, N. Y.

TELEVISION Opportunity knocks now. See Marlowe Ad under Profitable Occupations.

RADIOMEN, Servicemen, beginners—make more money, easily. \$250 weekly possible. We show you. Information free. Merit, 216-32A 132nd Avenue, Springfield Gardens 13, New York, N. Y.

MAKE Simple, tubeless, batteryless, distance-getting crystal radios. Crystal and illustrated instructions 25c postpaid. Allen, 427-P, Clinton, Missouri.

RADIO Technician and radio service courses. Training for federal licenses. American Radio Institute, 101 W. 63 St., New York City. Approved under G. I. Bill of Rights.

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TOP Profit. No investment. Handle superior quality photo stamps. Amazing portrait photographs in gummed back stamp form. Steady business. Free samples and particulars. American Photo Stamp Co., 103 East 125th Street, Dept. 509, New York 35, N. Y.

START Home manufacturing business making Cleaning Compounds, Soaps, Insecticides, Cosmetics, Polishes, Food Flavors. No machinery. Literature free. Kemix, Park Ridge, Ill.

DISTRIBUTORS, All territories, new simplified bookkeeping system, includes preparation income and estimated tax returns. \$16.25 profit each sale. Repeats. Leads furnished. Permanent. National Accounting Service, Dept. M-10, Lynbrook, New York.

MAKE Profits in mail order business. Astounding plans describing method sent free. Jimton Service, Lock Box 1373, Mobile 8, Alabama.

SIGNS Made easily. Instructions and ten sets modern alphabets, numerals, patterns. Sizes up to eight inches. All for \$1.00. Co-operative Business, 7 West Madison, Chicago, (2).

STUFFED Toys. Make and sell sawdust stuffed toys. Spare or full time. Instructions and five patterns, postpaid, \$1.00. Sawdust, Dept. 113, Lock Box 586, Old San Diego Station, San Diego 10, California.

WANT To sell your brains? Publish and sell your own knowledge for money. Publisher tells how. Free details. Write today. Royal Publishers, Auburn 3, Alabama.

TREMENDOUS Profits selling real estate. Authoritative new manual shows how to start full or part time business of your own. Complete only \$2.00. Details free. Schultz House, 3116 Seminary, Chicago 13.

GOLD, Silver plating at home. New, amazing outfit. Does marvelous work and so simple. Just plug into electric socket and in a jiffy you begin to plate. Not a toy. No experience needed. Everything furnished. Absolutely guaranteed. Make money plating for others. Write immediately for full details. Louric Mfg. Co., 1809-W Callowhill Street, Philadelphia 30, Penna.

OPPORTUNITY Knocks for those sending for our successful business enterprises. Manning, 3259 Decatur, New York 67, N. Y.

MAIL Order businesses, franchises, distributorships, bought and sold. Write for free bulletin of exclusive opportunities. Turnipseed, Inc., Box 681, St. Louis, Mo.

BUYERS Wanted for plaster novelties. Painted—unpainted. Retail—wholesale. Write today for free information. Bing Products, 88-X5A Broad, Boston 10, Mass.

REMNANTS—Amazing values. Housewives buy on sight. Good profit. Write B & M Textiles, 415 East 26th Street, Paterson 4, N. J.

NEW Invention. Opportunity exclusive selling rights. Ingram, 6774 Taft, Detroit 8, Michigan.

FOR Best prices on silver plated and gold plated earscrews, write The Marcraft Co., Skokie, Illinois.

START Home business in spare time. No experience needed. Unusual opportunity. Literature free. Bailey Service, 1710 Portland Avenue, Nashville, Tennessee.

HOME Moneymakers. Business information directory \$1.00. Reimer, N-1119 Chestnut, Saginaw, Michigan.

GROW, Sell plants, flowers. Details—Geranium seed 10c. Bowers, Loyaltown, Penna.

MAKE Liquid marble, flexible molds, statuary, art goods, novelties, artificial marble flooring. Literature free. Kemico, Park Ridge 50, Ill.

OPERATE America's most popular low priced precision penny vending machine. Big profits. Be independent. Write for bulletin and prices. Stock shipments. Fielding Mfg. Co., Desk 1047PM, Jackson, Michigan.

MAILORDER Beginners! Save money by getting started right! Our new booklet may save you dollars. Only 10c, postpaid. Mail Order Mecca, 30 West Washington Street, Chicago 2, Illinois.

RAISE Fishworms, everything revealed; extensive method, \$5.00. Details, free. Stoner's, Chattanooga 6, Tenn.

DOLLARS Daily! Cleared \$1,900 in two months by mail! Write immediately! Loeb, A-10, Silverton, Cincinnati 13.

MAKE Own products, keep all profits! 500 formulas, rush 25c. Wilde, Z-10, Rossmoyne, Ohio.

RUBBER Molds, liquid rubber, statuary plaster, kits for beginners. Complete "Plastercraft" course free on request. Blue Rapids Supply, Blue Rapids, Kansas.

ONE Minute portable studios. No negatives. Photos cost about 1½c each. Ideal for pleasure or profit. Complete camera \$60.00. Glossick Mfg. Co., 544B Monson Street, East Peoria, Illinois.

GOODYEAR—Has natural Malaya liquid rubber, for mold making, fast drying, air-curing, quart \$3.00, gal. \$10.50, trial pints, \$1.50. Write for full particulars. Goodyear, Lake Geneva, Wis.

OPERATE Profitable mail order business. Write Gallagher Publications, Box 691C, Kingsport, Tenn.

\$100.00 WEEKLY In local or mail order business. Exclusive set up free. J. Molus, 2146 N. Campbell Ave., Chicago 47, Illinois.

PLASTER Paris gets hard as stone. Just mix in "ROC," amazing new chemical—air bubbles come to surface, disappear. Finished casts hard, ring like a bell. Enough for 2,000 casts only \$1.00 postpaid. Money back guarantee. So-Lo Works, Dept. A-200, Loveland, Ohio.

INSIDE Secrets, quick cash folder free. Jenkins Enterprises, 4831 Hatfield St., Pittsburgh 1, Penna.

USE Your home as magazine subscription station. Represent all magazines. Liberal commissions—we supply everything. Big Christmas business ahead. Catalog, full details, free. McGregor Magazine Agency, Dept. PM-9, Mount Morris, Ill.

COMPOSITION Flooring—Made in most colors. Lifelong, soundproof, resilient. Flexible molds. Cast novelties, plaques, statuary. Big money—your own business. Catalog free. Write Bing Products, 88-A3E Broad Street, Boston 10, Mass.

OPERATE Profitable home mail order business on \$5 capital. Details free. Notte, 2718 West Cambridge, Philadelphia 30, Penna.

COLOR Concrete with chemicals. Formulas, instruction. Sample 10c. Hollywood Cementcraft, 8527-A Wonderland, Hollywood 46, Calif.

OPERATE Profitable home business. Levine's, 15-X Boulevard Station, New York 59, N. Y.

ATTENTION, Agents or gift and novelty shops. Make 100% profit, buy direct from manufacturer beautiful line fish-scale and shell costume jewelry and novelties. \$2.00 brings 3 samples returnable. Free illustrated folder on request. Wonderland Studio, P.O. Box 709-P, St. Petersburg, Fla.

REBUILT Champion-A.C. spark plugs, 11c each. Finished, boxed like new! Guaranteed. Big profits selling dealers. Exclusive territory. Standard Parts, 3033 Main, Kansas City, Mo.

SEND \$1.00 For quart earthworm stock. Complete instructions. Earthworm Farms, Lamoni, Iowa.

AT Home—Your own manufacturing business; making popular \$1.00 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. B-600, Loveland, Ohio.

PROFITABLE Mail order business. Write Beiers, 837-A Hoffer, Bethlehem, Penna.

MOLD Easily-sold articles from plastic, plasters, compositions. Free circular describes designs, methods, opportunities. Digest, 2917B Michigan, Kansas City, Mo.

PLASTICIZE—Lasting beauty-protection for autos. Used like polish, entirely new. Opp. exclusive distributors earn \$15,000 annually. Plasticize, 2254 N.W. 62nd St., Miami, Fla.

METALLIZE Baby shoes. Excellent profits. New system insures success. Free details. "Treasures Forever" Metallizers, 89 Henry Ave., Lynn, Mass.

300% PROFIT Selling fast repeat item by mail, local. Dade Products, Box 1720H, Cleveland, Ohio.

NUPLAMOLD Molds are permanent, will not shrink or deteriorate. Made to order. Own your own business, start spare time. Make big money duplicating hundreds of decorative ornaments or industrial items. Start now—Get our price list. Write the Shop Technician, 314 Westport Road, Kansas City, Mo.

DO IT with sea shells. Beautiful jewelry, novelties. Big profit spare time. Free lesson. Werts (P.), 1429 56th Avenue, Oakland 3, Calif.

UNPAINTED Plaques, statues. Variety of designs, free list. ArBo Products, A 195 E. 7th St., St. Paul, Minn.

EXCLUSIVE Distributorships available. New sensational home labor saving device ready October first: Wonderful money making opportunity. Write Sherwood Products, Erie, Penna.

BABY Shoes bronzing supplies, lowest prices, onyx and plasticide mountings, special hardening solutions. Box 2095, Wichita, Kansas.

MAKE 90c profit, every \$1.00. Operate profitable mail order business. Lane, 548-B 61st St., West New York, New Jersey.

SECURITY, Happiness, Independence. Selling by mail. Free details. W. Young, Box 1477, Portland 7, Ore.

AGENT Or exclusive distributor for cigarette lighter mfg. MacGregor, Tahoe Valley 16, Calif.

START Your own mail order business, anywhere on small capital. Interesting, fascinating, profitable. Details free. Artz, 1060A Harding Drive, Toledo 9, Ohio.

OPERATE Profitable mail order business. Splendid opportunity. For details write, E. C. Oliver, P.O. Box 1030, Newburgh, N. Y.

YOU Too can start profitable home business with \$5.00 capital. Details free. B. E. Leveque, 823 Howard Street, San Antonio 1, Texas.

MEN—Women—"Everybody likes candy." Learn to manufacture professionally at home. (Our 37th year). Ragsdale Candies, Dept. 4, East Orange, N. J.

DOES \$1,500 Yearly in spare time by mail interest you? Free details. Lawson, Box 1302-P10, Detroit 31.

PERFUME Manufacturing business. Little capital. Big profits. Particulars free. Bob Celaya, Brownsville, Texas.

MEN, \$100-\$250 weekly possible installing, maintaining fluorescent lighting. Rebuild fixtures for 100% profit. Make beautiful lights (including ballast and lamps) for 50c each and less. Free sample materials. Write Willis Service, 101 York St., Brooklyn 1, N. Y.

LOOK Mail order service business everybody wants. No manufactured stock to carry. Operate from home for many extra dollars. Complete detailed instructions 25c. Particulars free. Brady, 323 S. Mulberry, Albuquerque, N. M.

HOME "How to Sell by Mail" business. Complete instructions 25c. Martin, 2454-OM Wilson, Chicago 25, Illinois.

NEWEST Idea in finishes. Flok-Kraft Synthetic Plush sprayed on all shapes, surfaces. Beautiful soft texture covers mended radios, furniture, figurines, lamps. Profitable, entertaining. Supplies, equipment, free instructions. Coast Ind., 1509 W. Manchester, Los Angeles 44.

LIQUID Rubber for making flexible molds. Sample bottle 25c. Plaster hardener, quart \$2.00. Free literature. Chaney, 1130 East 16th Street, Jacksonville 6, Fla.

MAKE Flexible molds! Few cents each! Cast plaques, novelties, bookends! Free sample! H. Tooker, Hamilton 44, Ohio.

QUIT Wasting dollars trying to start a mail order business. Get and read the truth and save losses. Send quarter for ideal free booklet of facts not promises. Send for "How to Build Your Own Mail Order Business" and get "in right" for profits. Douglas Service, 3231-M 40 Ave., S. W. Seattle 6, Washington.

SAWDUST. Turn it into cash. Six methods. Instructions 25c. Charles, 12-AV, Norwood, Ohio.

LEARN Piano tuning, repairing, at home. Tremendous field! Piano parts, tools furnished. Established 1935. Empire School of Piano Tuning, 606-B East University Ave., Champaign, Ill.

FACTORY Representatives. Gas-electric lawn mowers, 1948 models. Lowest priced. Rotacut, M-2006, Excelsior Springs, Mo.

GET Hundreds of money-making deals, business ideas, plans and manufacturing formulas. Amazing folio free. Austin Mail Service, 5538 Lexington St., Chicago 44, Ill.

OWN A mail-order paper products business. Sell envelopes, tags, bags, boxes, by mail, wholesale. Tremendous demand. Steady profits. No capital necessary. Write Omaha Envelope Service, Dept. 219, 4721 California, Omaha 3, Nebraska.

CONSULT—Mitchell Engineering, 6430 Evans, Chicago 37, Ill. Electrical; mechanical; product design; patent engineers.

NEW Help for bona fide mail order beginners! To get going right contact Pes, 10226X 11th SW, Seattle.

\$6,000 YEARLY Possible operating branch office in cities of 5,000 and up population. Write for full details, proof. "D. Hunt," President, Box 308, Burlington, Calif.

UPHOLSTERING—Start your own shop. Beginners kit, complete instructions \$12.95. Wynn and Graff, 5114 Charlotte, Nashville, Tenn.

START Home business making statuettes, plaques, artificial marble flooring, liquid marble, flexible molds, metalizing baby shoes. Amazing profits. Folder free. Creative, 236-L, Winnetka, Illinois.

UNPAINTED Bookends, plaques, statues, figurines. List. Haverty Products, 1219 8th Ave., Altoona, Penna.

WORKERS—Apply Reflect-O-Lite to signs, readable 500 ft. at nite. Sample with instructions \$2.00. Reflect-O-Lite Signs, P.O. Box 18, Mentor, Ohio.

GET Money by mail—Keep all or half. Samples 10c. "Faucher," P.O. Box 381, Fall River, Mass.

"22 REASONS For Mail Order Failure" and "So, You Want to Sell by Mail?" Both regularly 50c, now 20c. Basura, 425 East Garvey, El Monte, Calif.

MOBIL "Popcorn Candy Business" 100% profit. Complete course \$1.00. "La-Plant," Menominee, Michigan.

FREE—Magazines, publishers offers. 5c stamp. Ritz, 939-P Fteley, Bronx 61.

FELLOW Workers, no bosses. National opportunity to become independent with business of your own. Details free. P. Padney, 307 York St., Jersey City 2, N. J.

BABY Shoes preserved. Formulas, instructions \$1.00. Novelty Bronzing, Box 56, Hyde Park 38, Mass.

METAL Awnings built cheaply from standard materials. Complete bldg. plans \$1.00. Information only 10c, refundable. Lohme, 825 Lima, Burbank, Calif.

ABALONE Pearl sea shell rings, sterling silver, ladies \$6.75 and \$12.00 dozen. Joseph Fleischman, 1535 Broadway, Tampa, Florida.

HANDYMAN—Earn up to \$30.00 daily in America's most uncrowded mechanical field. Write Stafford, 708-A Rawlings, Carbondale, Ill.

RE-NEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 701 Land Bank, Kansas City, Missouri.

CO-PUBLISH For profit, details 3c stamp. "RBCO," 542P Fifth Ave., New York 19.

BRONZED Baby shoe mountings and supplies. All metal bronze bookends, picture frames, ash trays, etc. Onyx ash trays, desk sets, plaques. Hardening solution. 30 amp. plating rectifiers with powerstat control, \$85.00. Geared motors for agitation, \$15.00. Lead lined tanks. Write for list. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

PLASTIC Novelties—Cast statuary, costume jewelry, bookends, colored pottery, liquid plastic, liquid marble. Flexible molds, composition flooring, tile roofing, waterproofing, plastic homes. Particulars free. Marbleizing Service, Edwardsville, Illinois.

MAIL Order beginner? Write Dunlop, 915X 30th South, Seattle 44, Wash.

OPERATE Vending machine route. 10 new Atlas Ace or Silver King ball gum machines and 14,750 balls bubble gum \$147.50. Sell gum, machines paid for. Subsequent orders of gum \$12.50 per case of 3500 balls. Only one offer to customer. T. O. Thomas Co., 1572 Jeff., Paducah, Ky.

TOYS. Make, sell, sawdust filled. Spare, full time. Instructions, five patterns, postpaid \$1.00. Sawdust, Dept. A, Box 586, Old San Diego Station, San Diego 10, California.

RUBBER Molds. Make your own. "Air-cure," mold making liquid. Free model. Directions. Quart \$2.95. Plasticwood, "Plaster Hardener," quart \$2.50. Luster-glaze, quart \$2.50. Rubbercoat, 3873A, California Street, San Diego 1, California.

OPERATE Profitable mail order business. Splendid opportunity. For details write Clara S. Coleman, 29 Lippitt Street, Providence 6, Rhode Island.

\$10,000 YEARLY With topnotch sellers. Catalog sent free. Salesman's Service, 1412A Chase, Chicago 26, Ill.

HALLOWEEN Cats! Inflate 12 inches high, noisemakers attached. Balloon novelty sensation! \$5.90 gross. Retail to 20c. Merchants move these fast. Sell profitable balloon specialties. Ellswood Balloon Headquarters, La Junta, Colorado.

GENUINE Natural latex for rubber molds. Only two coats necessary for a thick mold. Make money reproducing hundreds of objects. Write, Major Chemical Co., 131 Inman Street, Cambridge 39, Mass.

BIG Money selling "Bobby-Jo" baby shoes. Everything furnished. Tested successful mail plan free. No-Co-Ro, Oakland, 6-M, Calif.

NEW Low prices on Super X Molding Latex. Liquid sample 25c. Literature and sample free. W. Wooley, 115-A Donald, Peoria, Ill.

SPECIAL Rubber for making molds. Literature and sample free. Universal, Box 1076-A, Peoria, Ill.

HOME Workers wanted to hand-spin Angora wool. Either sex. House of Angora, M10, Springfield, Illinois.

FREE Literature describing many money making plans. Albert Pearson, Box 1182, Milwaukee, Wisconsin.

SALT Peanuts in the shell! Year round business. Start in kitchen grow to factory. Instructions include buying, salting, selling. \$1.00. E. H. Pease, Grover Hill, Ohio.

\$46 FROM Square foot plywood. Jigsaw necessary. Write Woodarts, X-38, Bridgewater, Mass.

LEARN To metalize baby shoes! Complete instructions \$1.00. Don Brady, 1618 Gage St., Topeka, Kan.

EXCEPTIONAL. Permanent weekly income for man or woman to own and operate route of new small coin machines made especially to sell "Hershey's" world famous 5c chocolate bars. Machines cost \$26.50. You can start with ten or more. Amazing earnings. Be first. Send money order for sample. Full particulars free. Address "Star," 635 South Kenmore Ave., Los Angeles 5, Calif.

DOUBLE Your money back, if not delighted with "Opportunities Preferred"—Big, 8½x11 magazine, handsomely printed on slick paper. Money-making ideas and opportunities galore. One man got \$5,000 ideal! Dollar brings nine big numbers. B. W. Coates, Publisher, 33 Vassar, Dorchester 24, Mass.

MAKE Big money building ship in bottle. See page 74.

MANUFACTURE Paints, your garage a factory, no equipment, capital necessary. Industrial Chemist, 525 Donnelly, Kansas City 32, Mo.

METAL-COTE—Metalizes "baby shoes," plaster casts, etc. old silver, copper, gun metal. Pint \$1.95, gallon \$8.00. Plastic Products, 3151-NE Southport, Chicago.

PLASTIC—Liquid glass, china glazes plaster, protects wood etc. Pint \$1.00, gallon \$4.00. Plastic Products, 3151-NE Southport, Chicago.

RUBBER—Airflex, makes molds overnight "A coat or two will do." Pint \$1.50, quart \$2.50, gallon \$7.00. Plastic Products, 3151-NE Southport, Chicago.

ATTENTION Ambitious men. Get into business for yourselves, using our proven and dependable methods. Free details. Stratton Business Service, Chicago Stock Exchange Building, Chicago 3.

ELEVEN Formulas, also diagram of electroplating outfit for \$1.00, (coin). Emery, 482-40th Street, Oakland 9, California.

MAKE—Sell new amazing auto paint you simply wipe on. Complete formula \$1.00. Ideal Service, Park Ridge 8, Ill.

DISTRIBUTORS Wanted for nationally advertised, guaranteed, high-quality brushless, Wipe-on Auto Paint and 1-coat Auto Spray Paint. Protected territory. No price competition, full profit margin. Easily make \$200 per week selling to jobbers and dealers. Requires \$500 to handle stock. Address Gold Seal Brands, 673 So. Coronado, Los Angeles 5, Calif.

READ "Advance"—The Voice of Mail Order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. American Mail Trade Association, 313 East 21st Street, Suite 45, New York 10, N. Y.

NEW Auto thief alarm protects car, tires and accessories. Amazing invention blasts loud alarm instant thief tampers with any part of car or truck. Write for descriptive circular and prices. Joyce Distributing Co., 30 W. Washington St., Room 940, Chicago 2, Illinois.

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BUILD Your own independent, fascinating and very profitable business at home, spare or full time. \$75.00 and upwards weekly easily possible making beautiful, brilliant, sparkling novelties, religious figures and popular sports souvenirs. Fast sellers through you, salesmen, stores. Quickly learned and few dollars starts you making real money. Successful manufacturer can tell you how and furnish everything. Start small, grow big. Write for full information and "Amazing story of my success" at once. Inghram Company, 2845 Sixth Street, Detroit 1, Michigan.

"PLANNED And profitable" mail order selling. New work book of ideas and instructions for beginners, aspirants, established dealers. Send quarter for copy of "Mail Order Business Monitor" magazine and details. Free subscription offer. P. Kaufman Agency, 2629 78th Ave., Chicago 35, Illinois.

MAILING List! 10,000 women mailorder buyers, \$45.00, 5000, \$25.00, 1000, \$6.00. Guaranteed accurate. Try them! Woods Remnants, Bedford, Penna.

FREE Sample copy national mail order publication. Other opportunities. Write Post-Age, 909 E. 20th, Indianapolis 2, Ind.

PROFITABLE Home sparetime business, making wallets, belts, other fast-selling leather novelties. Simple to make. Tools not necessary. Amazing opportunity. Send for free catalog. Gold Leathercraft, 632 Desplaines, Forest Park, Ill.

LEARN To metallize baby's first shoes at home. Big profits in spare time. Secrets, free gift. Send card. Schoettle, Friendship, Ohio.

MERCHANDISE At half the standard advertised price and catalog 10c, none free. Ken Solomon Company, 813 Broadway, New York 3, N. Y.

MOTHPROOFING And cleaning business pays well. I'll show you how to start on amazingly small capital. Write today for details on eight practical plans. Howard Robinson, Ph.G., Box A, South Ohio Street, Sedalia, Missouri.

GET Into a billion-dollar industry, unlimited possibilities, large demand, small capital. Details free. Beecroft, 15 Park Row, New York 7, New York.

START Your own electroplating business, highly paid, uncrowded field. Learn at home. G.I. approved. Send postcard for free electroplating booklet and proof. Plater-Hyde, Room 521, 432 "F" Street, San Diego 1, California.

IF You'd like your own, high income but easily learned office business, write for free details today. Cole Associates, Syracuse 2, N. Y.

PROFITABLE Letter shop operation. Details free. Wollard, Box 268-E, Newark, Ohio.

UP To \$1500 yearly selling by mail in spare time interest you? New ideas and plans every month. Details free. Idea of Month Club, Box 118-A, Baltimore 18, Md.

SWAP! Successfully! Instruction book 25c. "Swappers," 2836-PB Slevin, Louisville 12, Kentucky.

BECOME A finance man. Particulars free. George Lenhoff, Lincoln 8, Nebr.

METALLIZE Baby shoes, new ideas, particulars free. Krall, Box 8087, Pittsburgh 16, Penna.

50 GOLDEN Opportunities for profitable mail order operation. Free literature. Star Publications, Dept. S, 207 Investment Bldg., Pittsburgh 22, Penna.

FLASH. 3 Classic novelties. Large profits. Gold mine for agents, salesmen. Hurry. 25c coin, not stamps. Martin, PM 57 Hart, New Britain, Connecticut.

CAPITAL Raising made easy; millions available; send for Financing Your Business; large 250 page volume; complete details, only \$2.00. Seminole Publishing Company, Room 9, 317 W. Forsyth St., Jacksonville, Florida.

\$5 COMMISSION On booked distant moving jobs you recommend. United, 243 West 60th Street, New York, N. Y.

POPCORN Machines. Potato chip outfits. Long Eakins Co., 4760 Hi St., Springfield, Ohio.

BE Your own boss! Let us show you how to make big money right at home! Free details! Kiktavi, 8620 South Ruthelen, Los Angeles 44, California.

START Profitable mail order business on \$5. Write Duncan, Ortega Station, Jacksonville, Florida.

HOW To make profits in mail order 25c. Mail Order Monitor, 356 South Broadway, Suite 706-PM, Los Angeles 13, Calif.

GET It for them wholesale. Be community buyer nationally-known merchandise; radios, refrigerators, washers, sweepers, typewriters, etc. Savings up to 50%. This pleasant, easy work can earn up to \$5000 year. Get details today. Kraft, Aurora 8, Missouri.

WHITE Liquid rubber for making flexible molds! Quick drying! Safe! For home, classroom, or industry! Quart \$2.00. Gallon \$5.95. Full instructions! Beginner's booklet on molding and plaster casting 25c. Free with order! Plastercraft Supply Company, 1406 East 43rd Street, Cleveland 3, Ohio.

INVESTIGATE Mail order or home business. 140 new ideas. Write Marshall, Box 655, Centralia 13, Washington.

WHOLESALE Lists, business plans, home profits. Free. Holm Sales, Box 12A, Oaklandon, Indiana.

AMAZE Others. Add faster than adding machine. Free details. Math Institute, Box 633, Mobile 4, Ala.

LEARN Import—Export! Represent manufacturers! Study at home. Uncrowded fields, unlimited opportunities. ITP trains you in a few weeks. Five years free information service. Folder free! International Trade, 246-P Fifth Ave., New York 1.

OPPORTUNITY Mail 6 months 25c. Roth, 1455B Cornelia, Chicago 13, Ill.

MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordan Publishers, Box 23, Pawtucket, R. I.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Odd, Successful Enterprises" free! Some offer occasional "day off." Work home. Expect something odd! Pacific, Oceanside, Calif.

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\$40 WEEKLY, Spare time, your own home business. Many plans. Literature free. Carroll Service Company, 521-A North Pine St., Little Rock, Ark.

FREE Water and our concentrates, makes flavors, lotions, shampoos. 72 products, labels, bottles furnished. Qualco, E-20030 Russell, Detroit.

TWO Amazing new typing opportunities. Earn up to several dollars hour, right at home. New, exclusive, different. Write Schroder, 221 E. Bush, Covington, Ky.

TATTOOING And engraving pays big profits. Experience unnecessary. Literature free. William Moore, 412M South Green, Chicago 7, Illinois.

SELL Books by mail. Large profits! Free! Literature. Cline-Porter, Box 6346 PB, Pittsburgh 12, Penna.

BABY Shoes metallized the durable method. Complete instructions \$1.00. St. Albans Plating Industries, 135-17 135 Ave., So. Ozone, L. I., New York.

BIG Profits and your own business casting latest 1947 metal toy autos, airplanes, ashtrays, savings banks, etc. Enormous wholesale and chain store demand keeps manufacturers busy. Spare or full time. No experience or special place needed. For full information write Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

COLORGLAZED Concrete pottery made without molds. New, low cost, patented method. Cemetery products, novelties, tiles, floors, etc. Basement leaksealing. Other money-making projects. Booklet, details free. Men only. National Pottery Company, Grand Rapids, Minnesota.

UNPAINTED Plaques, bookends, ash trays. List. Bava, 3855 E. Canfield, Detroit 7, Michigan.

COIN Machines earn big money! Machines are now available at \$11.75 that can earn as high as \$7 weekly profit. Place machines in stores, hotels, filling stations, etc., and your income starts immediately. Routes can be operated in spare or full time with no experience needed. We'll tell you how and send you a catalogue describing our nut, candy, gum, and postage vendors, also scales, amusement games, etc. Write immediately to Parkway Machine Corp., Dept. P, 623 W. North Ave., Baltimore 17, Md.

CO-PUBLISH And advertise in The Central Mail Advertiser. Sample copy for stamp. Low rates. Large circulation. Bagby Printing Co., Georgetown, Ohio.

HOW To set up and run a mirror shop! Resilver mirrors. For price write—John Sprinkle V60, Marion, Indiana.

GOT \$24,500 Using "schemes" from "Schemer" magazine, Alliance, Ohio. 49th year. \$1.00. Three samples 25c.

RAISING Canaries pays good profits. Valuable bird book—"Its Care, Breeding and Training." Price \$1.00. American Canary, 2839 N. Halsted, Chicago.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

MAKE Strange plastic—1c pound. Makes durable, attractive floors, walls. Build with waste. Save half. Bays Laboratory, Oklahoma City 9.

INCORPORATE Your business. Delaware laws. Many advantages, free details. Tax Research Bureau, Inc., Delaware Trust Building, Wilmington, Delaware.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

BIG Mail income. Free particulars. Murray's, 196 Circle, Forestville, Conn.

PARATOL—Amazing new rubber latex moulding compound for perfect detail castings of all kinds tested and approved in long service. No worries—easy to apply, quick drying, maximum strength and long life. Why pay more—buy direct! Quarts—\$1.60, 1 gal.—\$4.90, 5 gals. \$4.45 gal. 4 oz. samples on request. Send 25c to cover mailing and handling charges. Full instructions sent with each order. Testworth Laboratories, Inc., Manufacturers of coating and adhesive products of all kinds. 407 S. Dearborn Street, Chicago 5, Illinois.

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AGENTS For fast selling products in demand everywhere! Big money! Send dime for sample, wholesale prices, full particulars, and 10c refund certificate. Copper Hill Sales Service, Copper Hill, Va.

WELDING Outfit—New portable model makes welding easy as A-B-C! Anyone can operate it and save expensive repair bills; or cash in on welding repair work. Sells on sight. Pays you \$8.00 on every sale. Comes complete in fibre carrying case with instructions and accessories for all types of welding on all metals. Indispensable to maintenance shops, factories, garages, farmers, home owners, mechanics, etc. A real money maker. Sells at the sensational low price of only \$19.95; costs you only \$13.95. Write for full details and tested selling plans or start earning at once; send \$13.95 check or money order; save c.o.d. and shipping charges. Universal Equipment Co., 24 West 25th St., New York 10, N. Y.

FREE Nylons given your customers if Kendex hosiery runs or snags within guarantee period! Sensational written guarantee amazes everybody. Three magic words: "Guaranteed Against Everything" enough to make sales. Earn wonderful income writing orders. We deliver and collect. Spare or full time. No money or experience needed. Liberal advance cash profit plus big cash bonus. Your names and address brings you complete free money-making sales outfit prepaid. Write today; start earnings next week! Kendex Co., Dept. 107, Babylon, N. Y.

A NATURAL! Big money, selling new line one piece, lace plastic tablecloths! Sizes to 54x108. Also women's aprons; novel, embroidered cotton pillow cases. Free, "interesting" details. Royalty, Box 748-K, Passaic, N. J.

REMNANTS—Amazing values. Housewives buy on sight. Good profit. Write B & M Textiles, 415 East 26th Street, Paterson 4, N. J.

EXCLUSIVE Territories now available for agents to sell beautiful aluminum ware, prewar silverware and sensational pressure cookers. Big profits on guaranteed merchandise. No investment necessary. Write for catalogue. Continental Products Corp., Dept. P, Box 210, Providence, R. I.

28% TO 75% Profit selling Reflex spark plugs (guaranteed) to garages, service stations, fleets along with other lines steady repeat business. Free catalogue. Reflex Spark Plug Co., 10902 Madison Ave., Cleveland 2, Ohio.

LEATHER Goods and advertising specialties. Fast selling items. Big profits, low prices. Everyone is buying now. Send for particulars. Star Craft, 5023a Broadway, Chicago 40, Ill.

\$1.00 INVESTED Brings \$29.00. Nothing else to buy. In great demand. Write for details. Kohen, 508 W. 45th, Chicago 9.

SHOW Quality greeting cards also. Reese, 915Y 30th South, Seattle 44.

AMAZING Daily profits. Big repeat business. Sell top-quality, lowest-priced men's dress, work hosiery, full, part-time. Experience unnecessary. Take orders. We deliver. Outfit free. Write Colt Shoe Company, 242-D9 Purchase, Boston 10, Mass.

AGENTS—Big line including food products. Fast selling premium and bargain deals. Low prices. Send card for big outfit offer with gift. Ho-Ro-Co, 2725 Dodier, St. Louis 7, Mo.

AMAZING New Glow in the dark house numbers, switch plates, decals, pictures, religious articles, etc. Factory representative wanted. Wonderful opportunity. Free samples. Madison Mills, 303 Fourth Avenue, New York, N. Y.

SELL 10 Boxes of personalized Xmas cards, and we'll pay you \$8.50. Also 7 other beautiful assortments, 50 and 25 for \$1.00 with name. Free samples. Ed-Brite Co., Dept. C, Mount Vernon, N. Y.

SCHOOL Seniors—Earn 40% commission selling classmates America's most beautiful graduation name cards. Largest selection. Outsells all others. Send for free sample kit. Printcraft, 1425 E. Elm St., Scranton 5, Penna.

PROFITS TO 100%, selling Xmas and everyday greeting card assortments. Details and assortment on approval. Glorian, (Dept. 10) 515 East 45th St., Brooklyn 3, N. Y.

WHITE Shirts, pajamas. Sell direct from manufacturer. Free sales kit. Jarod Mfg. Corp., Rockville Centre 4, New York.

MAKE UP to \$50 a week in spare time selling greatly in demand oil burners for kitchen stoves. Oil Burner Supply, Box 327, Cambridge, Mass.

AMAZING Daily profits, steady repeat business selling Colt's 216 shoe styles. Featuring Whippets — miracle post-war super-flexible, super-durable quality shoes at \$6.95. Exclusive features make selling easy. Experience unnecessary. Free outfit. Colt Shoes, 601-D9 Atlantic, Boston 10, Mass.

SELL Delicious candies, nuts, gum. Immediate delivery. Write Casterline, 2031-R Sunnyside, Chicago 25, Illinois.

CHRISTMAS Cards — Earn big money selling personals, boxed assortments. Samples. Lincoln Press, X220 Hartwell, Fall River, Mass.

SCHOOL Seniors! Your postal will bring our wonder, Kwick-Sell Cardalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235(L), Pittsburgh 30, Pennsylvania.

DISTRIBUTORS. Fast selling item. 100% profit. Repeats. Details free. Morrison's, Box 9312-N, Station S, Los Angeles 5, Calif.

DISTRIBUTORS. Unusual \$2.98 photograph product. Fine profits. Repeats. Morrison's, Box 9312-N, Station S., Los Angeles 5, Calif.

NO Money or experience needed. Spare or full time. Steady income writing orders guaranteed men's hose. Variety 20 styles. We deliver and collect. Liberal advance profit. 33% cash bonus. Write today for complete free sales outfit. Kentcraft, Dept. SM, 44 Court St., Brooklyn 2, N. Y.

SCHOOL Seniors: Sell classmates superb Craftcards for super profits. Write Craftcards, Box 235(AK), Pittsburgh 30, Pennsylvania.

\$50 UP. Spare time. Magic money making opportunity. Sell beautiful personalized Xmas cards, 25 and 50 for \$1. Costs nothing to try. Samples free. Victory Studios, Mt. Vernon, N. Y.

AGENTS-DISTRIBUTORS; \$28.00 daily possible. Flo-Glo Plastic wood-linoleum finishes. Acme, Box 404, Mount Vernon, N. Y. Puerto Rican Distributor, A. R. Torres & Associates, San Juan, Puerto Rico.

100% PROFIT With new electric gas lighter, eliminates matches, pilot. Write Optical Research Products, Fairview, N. J.

LARGE Variety fast selling items from \$1. Manufacturers, 264—5th Ave., New York.

MAGIC Cleaner and laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 5007 Irving Park, Chicago.

CHRISTMAS Card agents! New, exclusive, patented children's linenette books. Four books in attractive packet. Retail 50c. Sample on approval. Also cut-out valentine assortment. Elmcraft Card Co., 5928 South Western, Chicago 36, Illinois.

AMBITIOUS. Sell Xmas cards, stationery, big profits, colored catalog free. Beacon Hill Greetings, 115 Chauncey M, Boston, Mass.

EXCELLENT Sideline for printing and advertising salesmen. Decalomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

JUST Out! History of World War II. Huge volume. Popular price. Authentic text. Official photographs. Big profits. Riverside Book Company, Iowa Falls, Iowa.

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2.00, pants 35c, topcoats \$1.25, overcoats \$2.00, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 1250-B Jefferson, Chicago 7.

90c PROFIT Each \$1 sale. Sell positive mothproofing solution to housewives, stores, agents. Experience unnecessary. Postal brings details. Kinford, Wayne 3, Penna.

GREETING Card agents. "line up" with "Pines" for bigger, better, quicker profits. Rush name, address on postcard today. Box 32, Flushing 5, New York.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

137 COMPLETE Plans for starting own business: local—mail order. Particulars free. Elite Co., 220 Grand St., New York 13.

AGENTS—300 % Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

\$3 FIRE Extinguisher; quick sales, wholesale or direct; liberal profits. "Fire-Killer." 109 N. Franklin, Syracuse 1, N. Y.

PLATING Outfits for autoparts, reflectors. Connect to a battery. No tanks necessary. Free booklet and particulars. Gunmetal Co., Ave. N. Decatur, Ill.

GOLD Lacquered window sign letters. Large sizes penny each. New foils. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

SELL Personalized soap. Name on every cake. Ideal for gifts. Get sample offer. Dunbar Soap, New Brunswick, N. J.

HIGH-GRADE SALESMEN

PHOTO—Salesmen—Agents. Sell beautiful hand colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait, 3329 North Ave., Chicago, Ill.

SELL Advertising on our new farm account books. Astounding sales and profits. Sell to merchants only. Average town means \$20-\$30 commission daily. Write: Ampubco, 321 Jackson, Topeka, Kansas.

SELL Writewell specialties! Big profits! Huge Christmas demand! Samples free! Writewell, 140 Transit Building, Boston.

SELL Garages and airports direct simple machine for washing dirty, greasy metal parts. Liberal commission. Super-Soak Company, West Allis 14, Wisconsin.

FACTORY Salesmen—Sell Charles Chester nationally known cushion shoes direct. Complete line for entire family. Full time or sideline. Full time men earn up to \$20 per day in commission. Big repeats. Samples and equipment free to producers. Chas. Chester Shoe Co., 2001 Chester Bldg., Brockton, Mass.

AGGRESSIVE Salesmen. To keep stores supplied with self-selling 5c and 10c counter-card products. Nationally advertised throughout the year in leading magazines and more than 2300 newspapers. Biggest profits, full time or sideline. Write today. World's Products, Dept. 10-V, Spencer, Ind.

POCKET Pal: The all-purpose cutting tool, wagon jobbers, salesmen. Sell to retailers and jobbers. 50c seller. Steady repeat item. Exceptional profit. Sample 25c. Nelson Manufacturing Company, 222 W. Kellogg, St. Paul 2, Minnesota.

EARN Thousand dollars by Christmas. New, nationally advertised line, sells women on sight. Write Tugee Company (Dept. A), 112 South LaBrea Ave., Los Angeles 36.

MR. Salesman: Your problem is solved. You can't miss making at least \$25.00 daily. Your own business without any investment, offering nationally advertised aluminum cooking sets, pressure cookers at amazing almost wholesale prices, direct to public. Write at once for details. Best-Wear, P.O. Box 31, Bridgeport, Conn.

REPEAT Item. 100% profit; sell individuals, dealers, institutions. Over 10,000,000 sold. Trial selling samples free. Piper Company, Inc., St. Louis 17, Mo.

START Your own business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. J-U-PPM, Freeport, Ill.

ADVERTISING Book matches—Cash in on political campaigns. Sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit. Low prices. Protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M107, 7530 Greenwood, Chicago.

AMAZING New zipper shoe sells on sight. Big profits for salesmen. Leads line 200 splendid styles. Territories open. Get free sample outfit. Write. Consolidated Shoe, Dept. S-801, Chippewa Falls, Wis.

MAKE Money selling genuine leather jackets. Prospects everywhere. Top quality, full cut, exclusive features. Big cash commissions. Also 250 styles fine shoes. Sample outfit free. Victor Thomas, Dept. V-816, 610 W. Van Buren St., Chicago 7.

AUTOMATIC Fire extinguishers. Red Ball, Box 1552, Salt Lake City, Utah.

ADD Excellent line advertising pencils. High commission. Repeats. Nassau Pencil Company, 1947 Broadway, New York 23.

SOMETHING New in fire extinguishers. Red Comet Automatics. Company established in 1931. All year job. Exclusive territory. Dealers earning up to \$15,000. Write 503 Red Comet Bldg., Littleton, Colorado.

BRAND New! "Circline" fluorescent sweeping country! Fabulous profits selling stores, offices, homes. Also exclusive fluorescent table lamp. Complete line modern fixtures. Rush name for free sales kit, sample offer. Rose Co., 529LA South Franklin, Chicago.

AGENTS—Salesmen, we start you in business of your own. Earn \$75 and up weekly taking orders fast selling cosmetic line. Write for special outfit offer. Lady Raye Cosmetics, 517 E. 43rd St., Chicago 15, Dept. PM.

PLASTIC—Tablecloths, aprons, new nationally advertised fast selling Firestone Velon kitchen ensemble. K & D Products Co., Room 104-P, 4955 Delmar, St. Louis 8, Mo.

ADVERTISING Specialties. If you sell caps, signs, decals, pennants, memo books, aprons, auto ad-plates, pencils, banners, calendars, celluloid buttons or leather items, we manufacture them. Write for catalog. Universal Advertisers, Inc., 1114 Clinton S. W., Canton, Ohio.

AMAZING Profits selling personal initialed individualized buckles, belts, cap badges, tie holders, flexible cap bands, 2000 emblems to choose from. Repeats. Write today special outfit offer. Hook-Fast Company, Box 480-PM, Roanoke, Virginia.

INDEPENDENT Distributors, \$1000.00 per month class, able to finance self and travel introducing two new small vending machines to operators. Reply giving sales experience, references, etc. Automatic Enterprises, 635 South Kenmore Ave., Los Angeles 5, Calif.

WRITE For particulars on solid rubber custom built mats. Exclusive territories arranged. High commissions if qualified. Campro Company, Cambridge, Ohio.

GOLD Filled expansion watch bands. Men's \$2.50. Sample \$2.95. Pink or yellow gold. Crowe Co., Bristol, Tennessee.

NOW Get into the aluminum venetian blind business. Complete selling kit with sample for only \$7.50. Large demand. Profitable. Prompt made-to-order deliveries. Write. Humphrey Products, Wichita, Kansas.

WAGON Salesmen—Fast moving carded goods and 10c line. Long profits. Free facts. Peerless, 2720 Dodier, St. Louis 7, Mo.

SELL Commercial printing. Good profits. No investment. Every business a prospect. Repeat orders. Modern Press, Box 27-A, Crescent Hill Station, Louisville 6, Ky.

SELL Christmas cards! Choice of forty assortments! Earn 60c on dollar sales! Bulletins free! Elfco, 434 North Wells, Chicago 10.

BONUS Commissions selling photographic creations. Samples. Creative photography, Box 315, Cooper Station, New York 3, N. Y.

FREE! Latest issue Opportunity Magazine. Salesman's Guide. Inspiring, constructive. Shows how to earn money selling for others or in your own business. Hundreds postwar opportunities. Send name and describe what you have sold or are selling. Illustrated copy sent free. Opportunity Magazine, 620 N. Michigan, Dept. 17, Chicago 11, Ill.

AGENCIES WANTED

SURE Success! Appoint William Finau Store, Nukualofa, Friendly Island, Oceania, your distributor, annual sales: \$20,000. Bankers: Bank of New Zealand, Auckland. Interesting lists gratis.

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CO-OPERATIVE Industrial troubleshooting taught persons competent for field and contact engineers. All localities. Address: Troubleshooters Cooperative, 23535 Margareta, Detroit 19, Michigan.

WORK For "Uncle Sam"! \$1756-\$3021. Prepare now for next examinations. Veterans get preference. 32-page book on civil service free. Write Franklin Institute, Dept. N24, Rochester, New York.

TRAINED Letterers constantly needed. Talent unnecessary. Expert, personal instruction by mail. Information free. Joseph Boiger, 148 Concord, River Edge, New Jersey.

BEST Training U. S. Hobart Welding School. Complete equipment. Non-profit. G. I. Bill. Write for free booklet. Hobart Welding School, Box M-1076, Troy, Ohio.

LEARN Railway telegraphy at home. Instrument furnished. Operators needed. Jobs waiting. Bell Telegraph Ry. Institute, 10 Parker Ave., San Francisco 18, Calif.

PARENTS—Proven system mental stimulation for children under 7. Inexpensive. Lifetime benefits. Free literature. Write today. Harmon, Box 1057, Newark, N. J.

BE The one who directs the work of others. Learn industrial engineering. Free booklet gives you details of our money-making course. Herbert G. Hecketsweiller, Management Engineer, 3355A North Olcott Avenue, Chicago 34, Illinois.

GOOD Jobs and a sound substantial future await you in hotel and institutional field. Men and women—all ages—needed for well-paid positions that offer color, excitement, ever-new and fascinating duties. Record-breaking travel means even greater opportunities for trained men and women in hotels, clubs and institutions. Lewis School receiving calls for managers, assistant managers, stewards, hostesses, purchasing agents and 55 other types of important positions! From coast to coast there are important positions that offer splendid opportunities for advancement in a business where you are not dropped because you are over 40. Previous experience proved unnecessary! No need to leave your job to qualify. A good grade school education, plus Lewis Training qualifies you at home, in spare time. Our National Placement Bureau helps to place you—and our amazing Certified Job Plan—actually certifies you will "make good" when placed. Write today for Free book! Veterans: This course approved for veteran's training. Lewis Hotel Training School, Room LT-368, Washington 7, D. C. (First and only school of its kind—now in its 32nd year.)

BE A pedopractor—Foot correctionist. Extension. Degree. Alaska School of Pedopractic, Box 2894-A, Juneau, Alaska. Stamp appreciated.

LEARN To "speak in public." Gain self-confidence. Speak fluently and effectively. Amazing new method. Easily mastered. Surprisingly low cost! Write for details. Trissel-Heymann, Publishers, Mason City 1, Iowa.

EARN 50 to 200 Dollars weekly. Become a dental laboratory technician. Easy home study. Write for free details. Dental Arts Institute, 1122 Market St., San Francisco 2, Calif.

OIL Painting—Correspondence course. Write Carlos Art Academy, Correspondence Division, Watertown, N. Y.

HOW To land job you desire. Helpful pointers. "Job Seeker's Guide" \$1.00. Herman Publishing Company, Chatham, N. J.

PRACTICAL Course—Automobile radiators, repairing, recoring, cleaning. Ralph Hendry, Galt, Canada.

EDUCATION In a nutshell helps you think and talk intelligently on most subjects. Thousands have used these ideas. Send \$1 to Dad-P, 1310 Sanborn Ave., Hollywood 27, Calif. Information free.

ENGRAVING. Learn latest internal plastic carving, lettering, trophies, etc. Details free. Renzelman, 611 S.W. 23rd Road, Miami 36, Fla.

RAPID Calculation course, worth \$15.00. Introductory offer only \$1.00. Osborne College, San Bernardino, Calif.

3800 **LATEST** Used correspondence courses. Catalog 50c. EG, Elmsford, N. Y.

BOATING. Learn at home. Seamanship and piloting. Cruise scientifically. Prepare for a job on the water. Yacht captains earn to \$500 monthly. Write for particulars. Fairway School, Box 811, Old Greenwich, Conn.

READ, Write, and speak Spanish! Sensational course teaches you in double-quick time. Easy to understand! Money-back if you are not speaking Spanish in 30 days. Complete course only \$1.00. American Stamp Company, Wilmington-P, Delaware.

NOW You can have an office. Learn credit-collection business by new home study course. Many earn up to \$5000-\$15,000 annually. Free bulletin. Franklin Credit School, Dept. 202K, Roanoke 7, Va.

NO Special training needed to make \$1,000.00. If you like working with figures, you can make this much or more in three months spare time. Write without obligation to James A. Sherrod, Pavo, Ga.

WANT Better job? Executive who hired over 500 per year tells how. Only \$1. Money returned if plan fails. Send today sure. Marchner, 74 Park Avenue, Webster, N. Y.

VETERANS Needing guidance in G. I. Bill training send \$1.00 for service. Footcraft, 475 5th Ave., New York City.

PREPARE For Civil Service Examination. Pay for course after securing position. Write Free School, Kokomo, Ind.

UNCOVER Hidden treasure in service station field. "Making Your Service Station Pay" explains. \$1.00 postpaid. Hughes Enterprises, Box 126, Clear Lake, Iowa.

USED Correspondence courses and educational books bought, sold, rented, catalog free. Educational Exchange, Henagar, Ala.

HOME Study course, drugless therapy. Free literature. Institute of Drugless Therapy, Tama, Iowa.

LEARN Auctioneering by mail. Sample lesson free. Write Nelson School, Renville, Minn.

GOOD "Used" self-instruction educational books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 100-page illustrated bargain catalog free! Write—Nelson Company, Chicago 5.

USED Educational books on all subjects sold, rented, also bought and exchanged. Moneyback guarantee. Write today for free catalog and details. Lee Mountain, Pisgah, Alabama.

INVESTIGATOR Training. Phillips Secret Service, 1917B North Kenneth, Chicago 39, Ill.

29 LANGUAGES By Linguaphone. Russian, Spanish, Portuguese—Direct conversational method for mastering any language quickly, easily, correctly at home. Available under G.I. Bill of Rights. Send for free book. Linguaphone Institute, 83 RCA Bldg., New York 20.

MEDICAL Laboratory technicians in great demand. We train you in your spare time, in your own home. You can practice while studying. Write for free catalogue. Imperial Technical Institute, Box 973-E, Austin, Texas.

LEARN Photo-engraving at home or in oldest, largest school in America. Work for newspaper or establish own profitable business. New Tasope' Photo-Engraving equipment available soon. Write for information. Veterans ask about G.I. training. The Aurora School of Photo-Engraving, Tasope' Bldg., Aurora, Mo.

SECRET Investigation. Experience unnecessary. Investigators particulars free. George Wagner, M 125 West 86th, New York.

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NEW Writers needed. Nonfiction material demand is booming. Many magazine editors buy features and "fillers" from new writers. Our earn as you learn lessons prepare you to meet their requirements. Experience unnecessary. Reasonable price, unexcelled service. Details, sample lesson free on request. Use postcard. No obligation. Comfort Writer's Service, 200-PN S. 7th St., St. Louis 2, Mo.

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SOURCE Of supply on almost any article or material made in the United States. Write on your business letterhead for free details. Kelly, 9544-P Whitcomb, Detroit 27, Michigan.

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POSTMARK Your mail, "Washington, D. C."! Letters mailed, 10c each. Complete (receiving, re-forwarding) service, \$2.00 monthly. "Hawkins," 1300-L Taylor.

MAIL Forwarded from Rochester, 10c letter. Balch, Sodus Point, New York.

GOOD "Used" self-instructional books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 100-page illustrated bargain catalog free! Write—Nelson Company, Chicago 5.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

MAKE Up to \$100 weekly cartooning and illustrating at home. No experience necessary. Big, new, simplified method shows you how. Rush name for free trial offer. National Artists Bureau, Box 4248-A, Dallas 8, Texas.

"HOW To Make Money With Simple Cartoons"—a book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 910C, Pleasant Hill, Ohio.

WINDOW Sign letters; look like sign artist work. Easily applied. Free samples. Artistic, 74 Edmund Pl., Detroit.

LEARN Animated cartooning. A technical book preparing for movies, television. \$2 complete. Cartoonimator, 5029 Illinois N.W., Washington 11, D.C.

NEED Signs? Write, YD Sign Shop, 19-A Shawmut Street, Boston, Massachusetts.

SIGN Painting taught at home by an old master. Ben Kerns, Box 812, Greenville, S.C.

AMAZING Bargains. Art lessons, studies, magazines. Quick landscape painting. Free literature. Art Book Shop, Arnold, Mo.

GET Into cartooning, the fascinating field of the future. Course \$1.00 postpaid. Jason Creations, Box 135, Station "G," Montreal, Canada.

CUB Artists—Stop dreaming—Sell your work. Successful commercial artist (27 years in business) offers sensational plan. \$2.00 prepaid (refundable) brings beautifully illustrated 1947 copyrighted 88 page commercial art catalog, containing thousands of potential sales opportunity ideas with complete information. Brouillet Syndicate, 30 E. Superior St., Duluth, Minn.

STENCIL Beautiful showcards without practice. Kwiksign Stencils, 30 West Washington, Chicago 2, Dept. M.

TALENT Test free. American School Commercial Art, Box 8066, Dallas 5, Texas.

MAKE Signs. 9 complete alphabet pattern sets. 3 complete numeral pattern sets and catalog \$1.00. Sign Letter Distributors, P.O. Box 101, Mineola, N. Y.

CHALK Talks. Laugh producing program, \$1.00. Catalog 10c. Balda The Cartoonist, Oshkosh, Wisconsin.

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

FREE:—Advertisers rate and data bulletin covering the southern states. Alabama Advertising Agency, Exchange Building, Birmingham 3, Alabama.

LATE Mailing lists! Teachers, births, automobile owners, etc. Business Service, 1101 Kings Highway, Shreveport, Louisiana.

ANY Mailing list you want. Mail sales letters, ads, folders — Written for you. Print anything. Advertisers Organization, 3439-D Michigan, Chicago 16.

NAMES, Addresses any type business. Lohmer, 825 Lima, Burbank, Calif.

MAIL Order Advtg. with a profit guarantee. 20 yrs. exp. Azrael Advtg. Agency Chas. and Eager Sts., Baltimore, Md.

GARDENERS! Reach 12,000, 4c word. Garden Exchange Magazine. Sample 15c. Johnson, 683 Nevada, Reno, Nevada.

ADVERTISE: 24 Words, 77 weekly newspapers \$5.00. Write for free rate directory. A. Burton Carnes Advertising Agency, 410 South Michigan Ave., Chicago 5.

ADVERTISERS! Reach nearly 18,000,000 readers. 25 Sunday national key newspapers, 18 words, \$42.25. "Terrific pullers." 30 popular newspapers, \$8.50. "Free booklet." Special—One inch display 2,821,198 circulation, \$42.00. Newmark's Advertising Agency, (Established 1893) 217-7th Ave., New York 11.

MAIL Order ads, circulars, letters, by leading advertising agency in mail order field. Low prices. Moran Advertising Agency, Box 104, Wilkes-Barre 3, Pennsylvania.

ADVERTISERS: Mail order ad covering United States—2,200,000 circulation—\$28.00 inch. Classified ad, 24 words, 20 metropolitan Sunday newspapers—\$25. Magazine, newspaper, mailing-list ratebook, adwriting assistance—free. Chicago Advertising Agency, 20-PM West Jackson, Chicago 4.

ADVERTISE: 24 Words, 40 newspapers \$3.50. Lists free. Advertising Bureau, 229-G Dixon Blvd., Uniontown, Penna.

FREE! 1947 Advertisers Rate and Data Directory. 52 pages! E. H. Brown Advertising Agency, 20 N. Wacker, Chicago 6.

ADS Placed in out of town newspapers and magazines. Low rates. Catalogue free. Ideas that pay. Baker Advertising Agency, Successors Ankrum Agency, 189 W. Madison, Chicago 2.

MAILING Lists, certified, productive, inexpensive, \$5.00 1000. Homeworkers, agents, buyers, etc. Write Dixie Service, King, N. C.

24 WORDS In 64 weeklies \$4.96. H. J. Darnell, 730 Hays, Jackson, Tenn.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

DUPLICATORS \$9.95 Up. (New.) Immediate delivery. "Free circular." Rucker, 2836-PM Slevin, Louisville 12, Ky.

"PRINTOMATIC" Selffeeding post card stencil printing duplicators \$9.50 up. Office size duplicators, Speedprints, Hilcos, Xcellographs \$33.41 up. Literature free. Pittsburgh Typewriter Supply, 336-WK Fourth Avenue, Pittsburgh 23, Penna.

RECONDITIONED Typewriters, mimeograph, multigraph printing devices, appliances, supplies. Catalog. Dixiegraph Service, King, N. Carolina.

RUBBER STAMPS AND OFFICE SUPPLIES

KNOB Handle, 1 line 35c, 3-55c. Stamp Works, Centerport, N. Y.

LINE 20c; 2-35c; 3-50c. Stamp Works, Auburn, Nebraska.

RUBBER Stamps. Send for catalog. Excello, Box 500, Shreveport, Louisiana.

RUBBER Stamps. Buy direct from manufacturer. Literature free. Lee-Vall Press, Box 1242, Indianapolis 6, Indiana.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

1000 BUSINESS Cards prepaid \$2.50. Samples free. Reliable Print Shop, 901 E. Jefferson St., Louisville 6, Ky.

PRINTING Reasonable. Mail copy. Free estimates. Berliner, 3581 Milwaukee, Chicago 41.

VARI-TYPING—Mimeographing, planographing, letters, etc. Sample portfolio free. Cooperative, 609 Woodward, Detroit 26.

ENVELOPES—6 3/4 Printed \$2.85 per thousand in 5,000 lots. #10 \$4.25 in 3,000 lots. Smaller quantities price list free. Michel, Box 76F, New York 16.

500 6 3/4 ENVELOPES \$2.35. Mango, 555-A South 20th, Newark 3, N. J.

1000 BUSINESS Cards (embossed) \$2.95 postpaid. Rubber stamps. Zephyr Printing, Box 312, Venice, Calif.

ENVELOPES Our specialty, free price list. Doerr Printing, Lewiston, New York.

MIMEOGRAPHING—24 Hour service. Reasonable rates. Free samples. Jay Service, 1028m East 63rd, Chicago 37.

BUY Your printing at wholesale! Sell others. Details free. Adams-PM, 30 West Washington, Chicago 2.

PRINTING? Lowest prices, samples free. Basil Churchill, West Medway, Mass.

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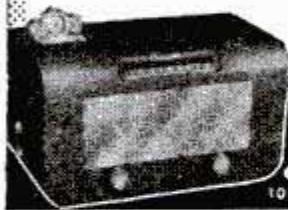
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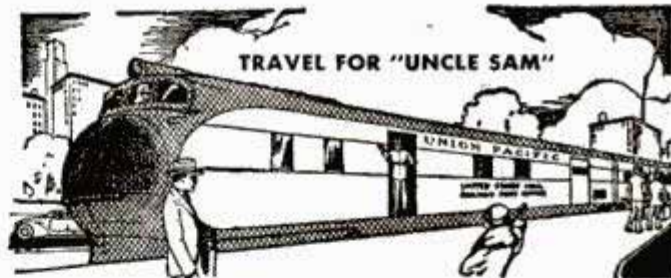
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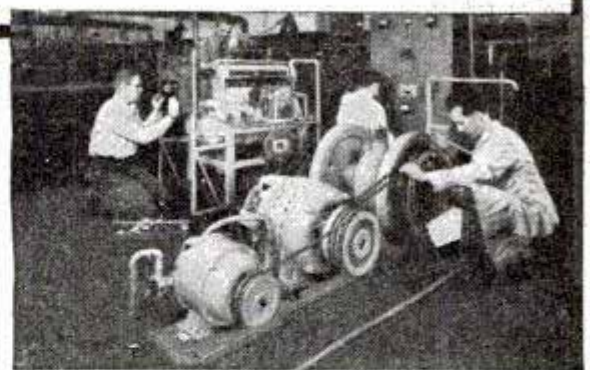
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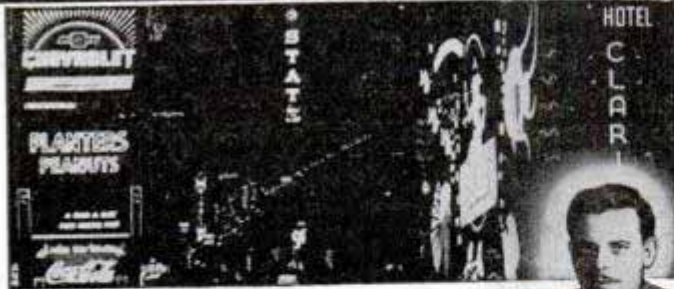
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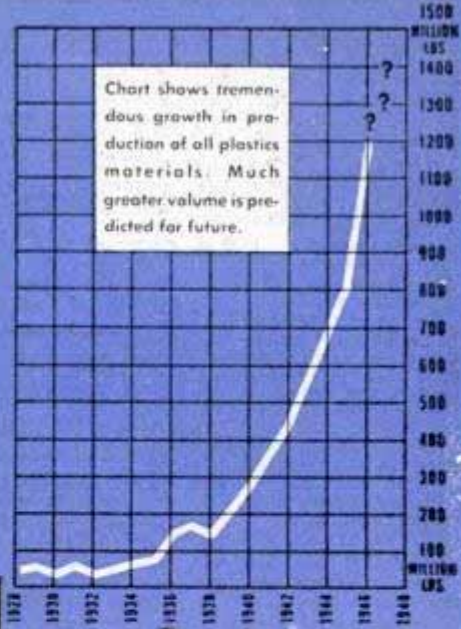


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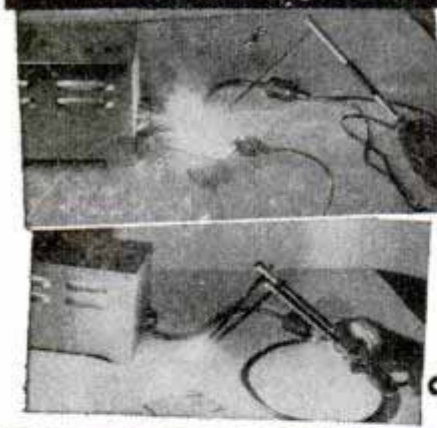
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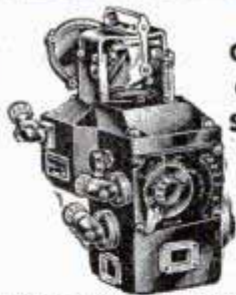


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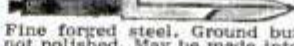
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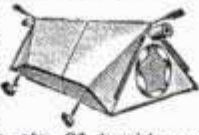
BAYONET BLADE

Fine forged steel. Ground but not polished. May be made into throwing or hunting knife or spear. Blade 6 3/4 x 7/8 inches, 11 3/4 inches overall. Will take and hold a fine edge. Shp. wgt. 1 lb.
No. 664-R—Each..... **49c**



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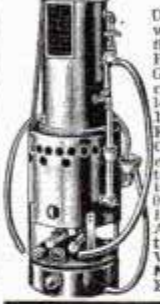
HORSEHIDE JACKET

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SHIP BELL

Purchased from U. S. Maritime Comm. Measures 10 inches high, 9 3/4 inch flare. Big 6 inch clapper. Weight 15 lbs. Fine for farms, clubs, estates, etc. All new A-541, ONLY **\$9.85**



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For your car, boat furniture, etc. Highly polished chrome finished strips with clinched edges for flush mounting to any surface. The 3 pound kit provides approx. 15 pieces in lengths from 6 inches to 3 feet and average 3/4 inches wide. Wgt. 4 lbs. No. R224. 3 lb. Assort. **\$2.00**
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Officers Watch Compass

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Parallel acting jaws. Wire cutter at top. Brand new. Wgt. 2 lbs. No. 168. Each..... **\$1.29**



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P.A.* means Pipe Appeal

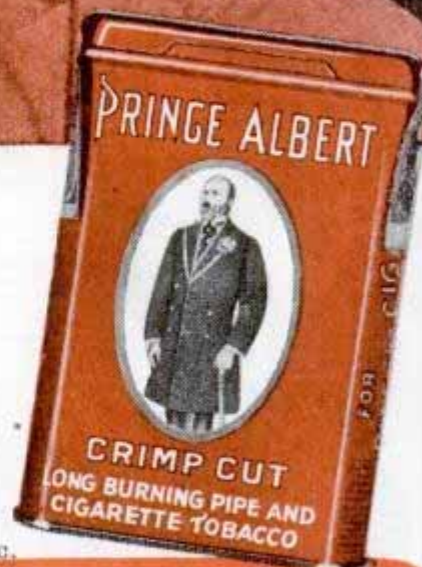
Women say a man with a pipe looks more rugged, more appealing. Pipe smokers say there's no tobacco like tasty, tongue-easy Prince Albert!

means Prince Albert

P.A. MAKES GRAND-TASTING
CIGARETTES TOO! ROLLS
UP FAST—AND NEAT

● And what a lot of smoking joy and comfort Prince Albert Tobacco provides! P.A. is so rich tasting...so mild and easy on the tongue. It's specially treated to insure against tongue bite! Try it—and see for yourself why more pipes smoke Prince Albert than any other tobacco!

H. J. Reynolds Tob. Co., Winston-Salem, N. C.

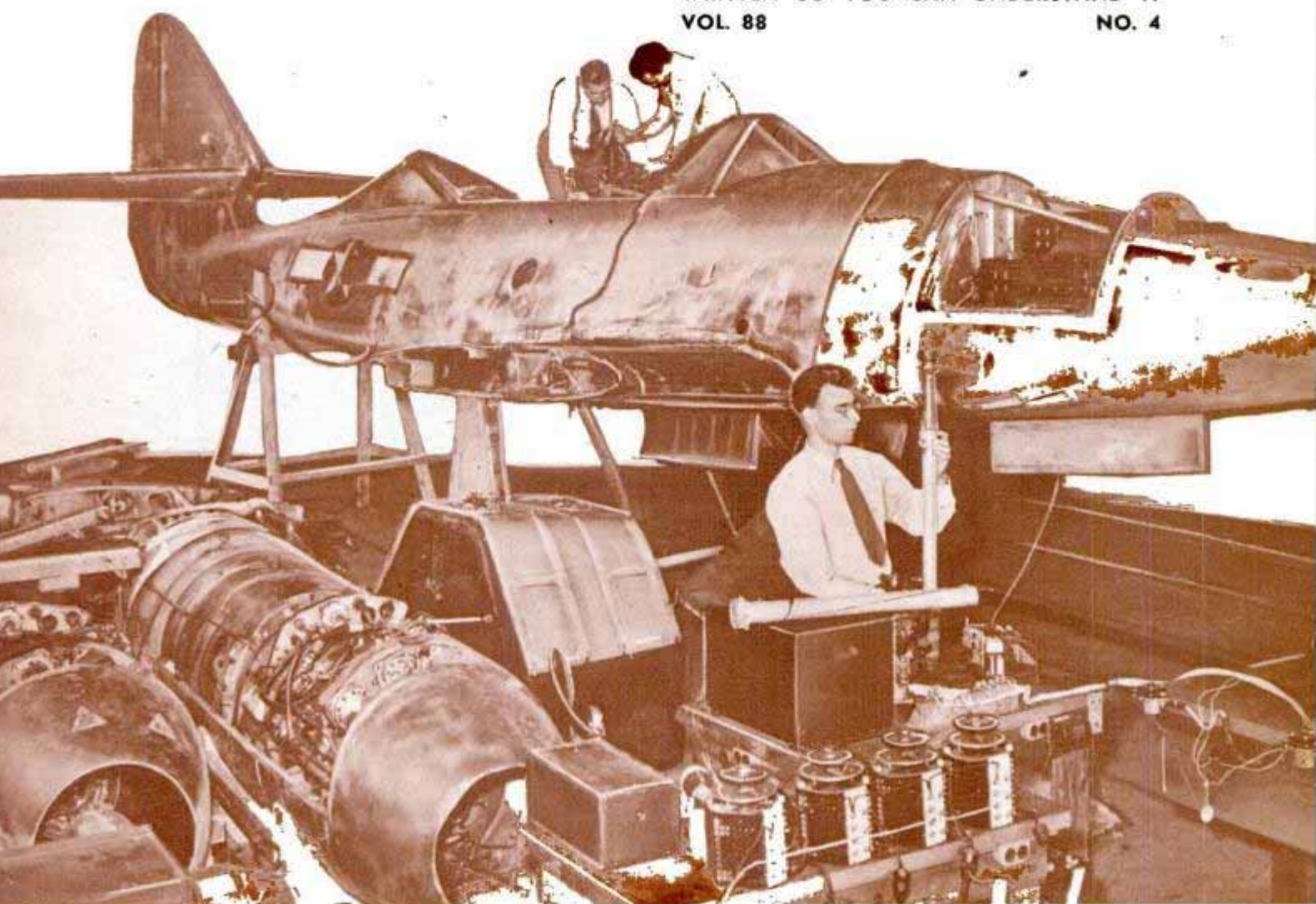


THE NATIONAL JOY SMOKE

Navy scientists install electrical equipment in a plane for tests in an altitude chamber. Motors, generators, wiring systems and instruments are checked this way

POPULAR OCTOBER 1947 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 88 NO. 4



Science HQ of the Navy

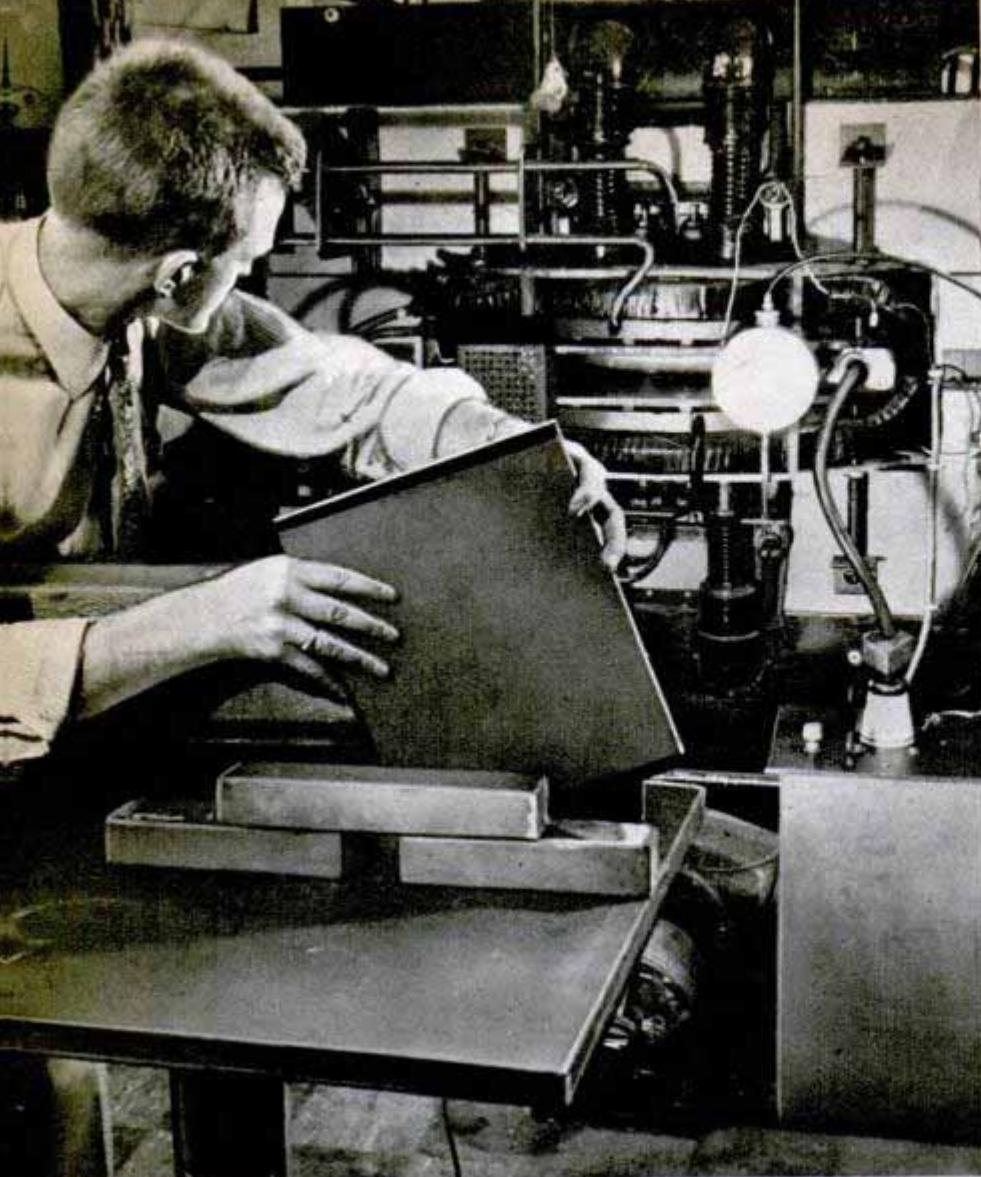
THE NAVY'S BIGGEST scientific establishment, where some of the most important new weapons for sea fighting were designed during the war, now has thrown off the cloak of military secrecy.

A group of about 20 enormous buildings—with the appearance of a big industrial plant—beside the Potomac River in a Washington suburb, emerges as one of the two or three largest research laboratories in the United States. Here, under the direction of Commodore Henry A. Schade, more than a thousand physicists, chemists and engineers have turned to fundamental researches in the

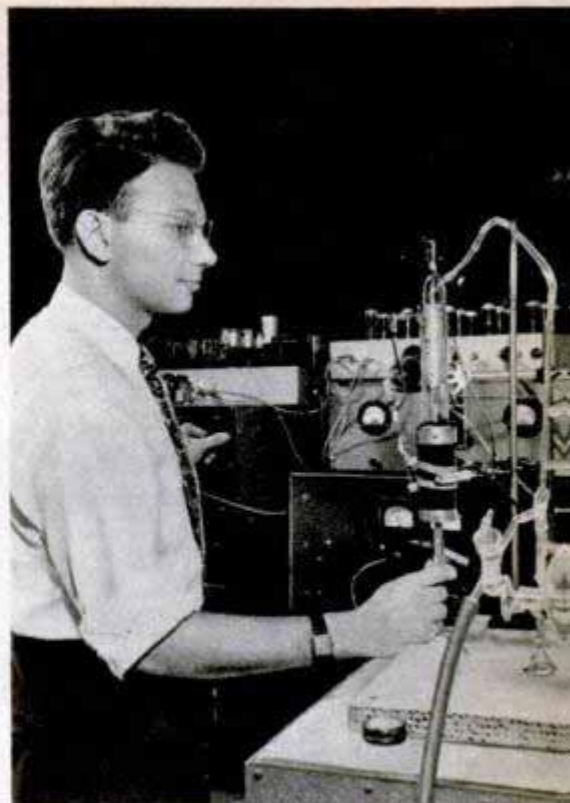
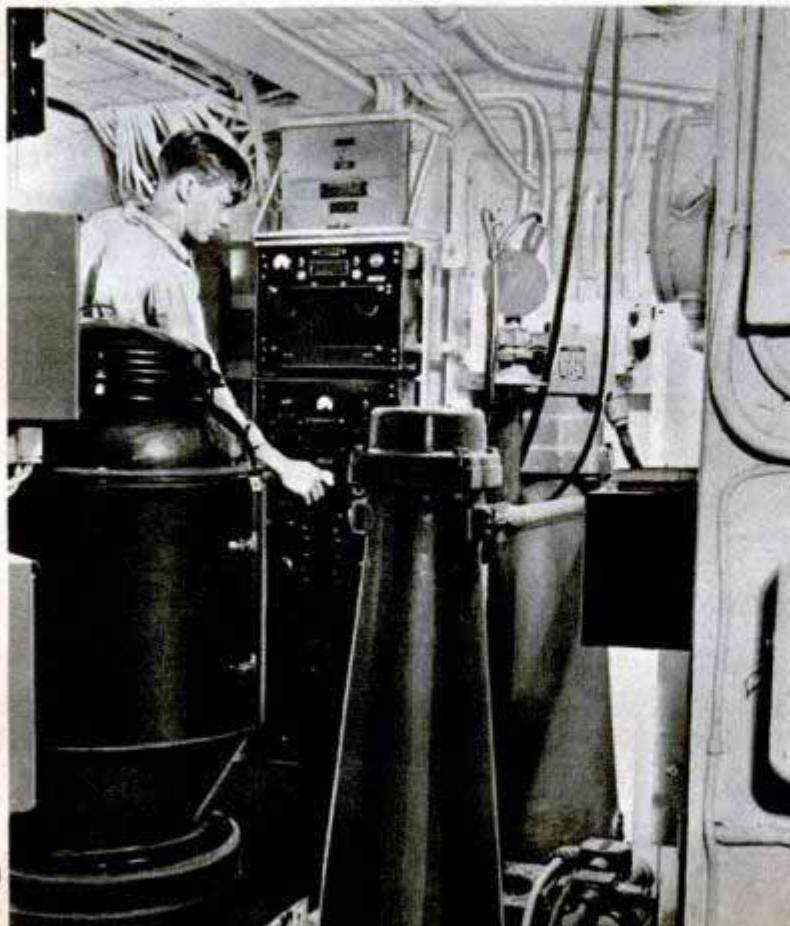
basic sciences. They no longer are forging scientific swords; they are making scientific plowshares.

This plant is the Naval Research Laboratory. Before the war it was a small establishment with a limited field of activity. Yet here was born the most important single war development except for the atomic bomb, the radar. Here originated the techniques of determining depths and mapping the bottom of the ocean by sound echoes. Here was developed much of the thermal-diffusion process for separating isotopes of elements which was an essential first step in

By Thomas R. Henry



Material sample is tested by a betatron, which emits high-speed beta particles that penetrate metals and other solids. Below, sonar equipment used on warships to detect enemy submarines by sound waves



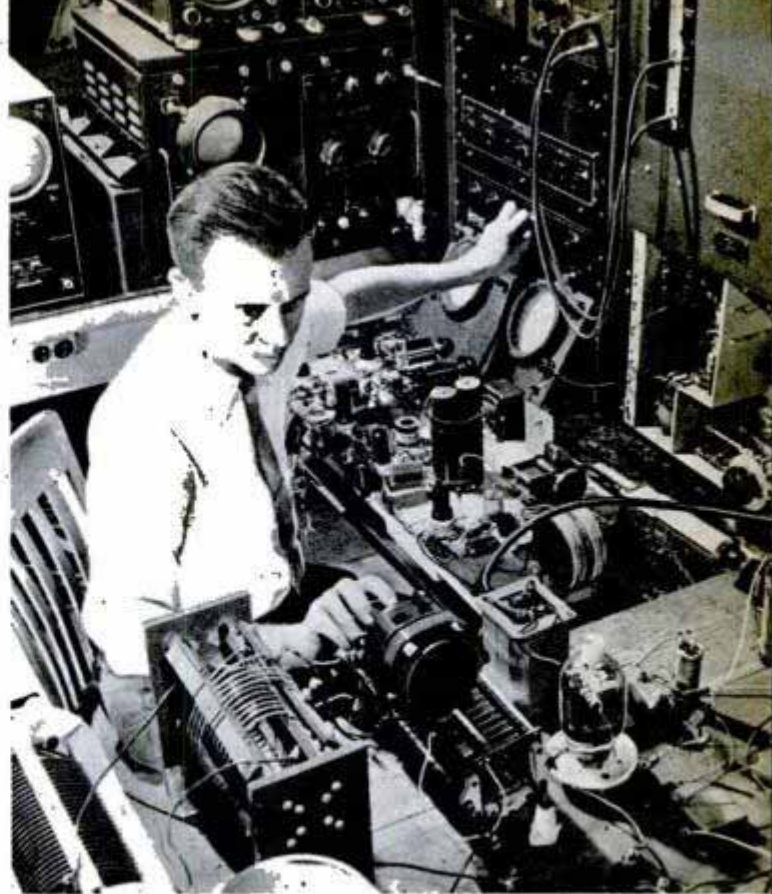
New Geiger-Mueller counter which detects, measures cosmic and radium rays

production of an atomic bomb.

The laboratory grew to its present size as a war enterprise. It is being continued, and its scope of activities increased, in line with the present Navy philosophy that military science must rest on a solid foundation of pure science — and that the potentialities up to now were largely exhausted during the war. So the purely naval aspects of the work have been reduced to a minimum. Among the personnel of more than 3000 scientists, technicians and administrators there are only 40 Navy officers.

Scores of projects with direct application to American life and industry are under way. Many of them are extensions of work undertaken during the war which developed quite unexpected possibilities in fields far removed from immediate military value.

Notable is the work in supersonics, in which extensive studies were carried out in the utmost secrecy through the war years. Mowing grass and dispersing fog over airports with the same supersonic apparatus are two of the present potentialities.



Pouring steel casting in Navy foundry where new techniques for handling metals are studied and experiments with new alloys and molding sands are conducted. Right, laboratory "breadboard" setup for testing radios

In an earlier and cruder form this has been tested to clear the Newark airport of low-lying fog which prevented planes from landing, and to mow the reeds of the New Jersey meadows just south of New York City. In each case it has been shown to have real promise. A much more delicate scale model now is being demonstrated.

The great difficulty aside from expense, it is explained, is that everybody in the neighborhood will be made extremely uncomfortable if the device is used with sufficient power to do any good. Even with the small scale model in operation one feels vaguely uneasy, without knowing why, a foot or more away.

The scheme calls for sending out powerful vibration waves through the air with a frequency just at the edge of audible sound. Some would hear these as a nerve-tearing shriek. Others would not hear them at all but would be sensitive to the waves beating against the body.

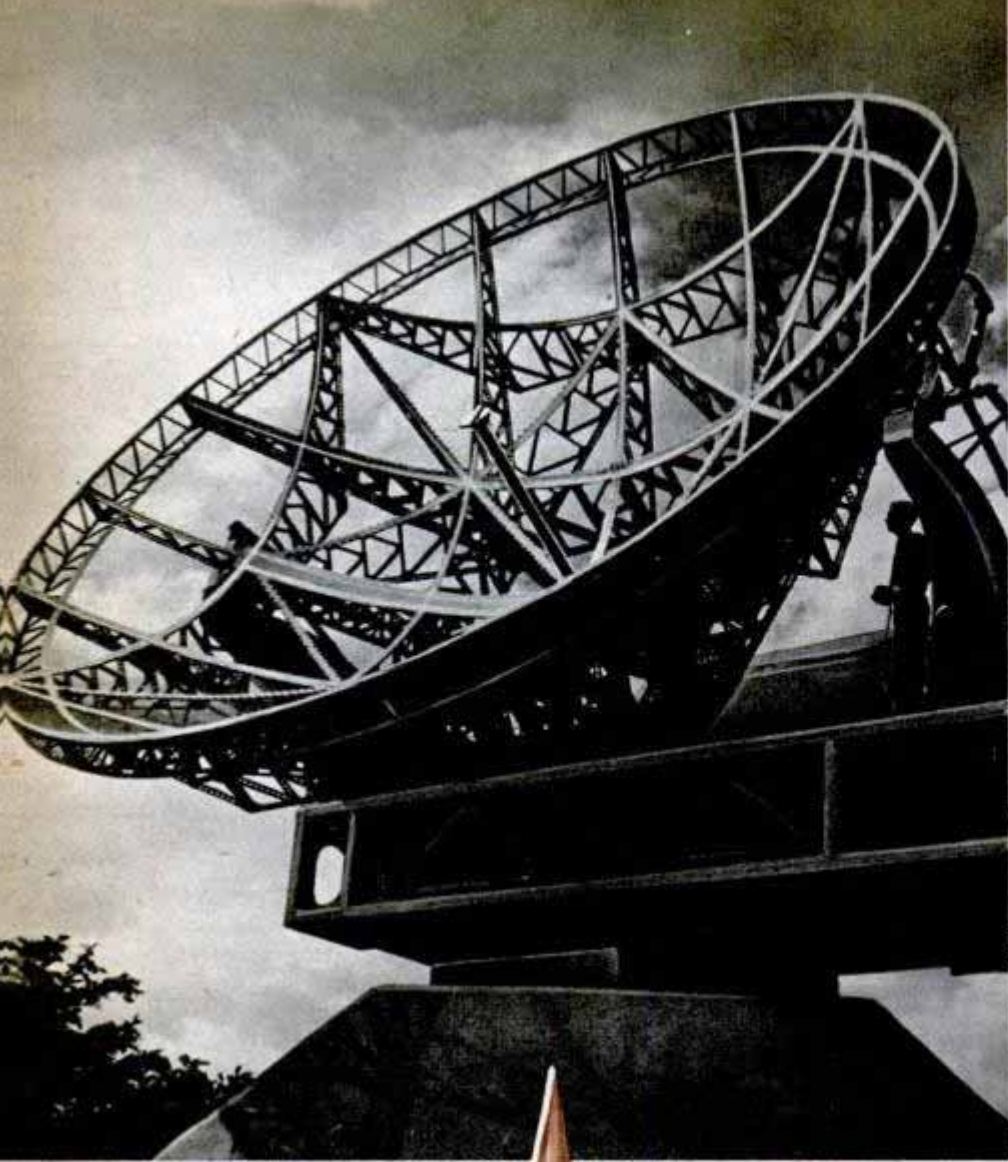
Such a supersonic wave, when passed through fog, causes the minute water-vapor droplets to coagulate to about the size of raindrops. As long as the vibration continues, they remain violently agitated and as soon as it stops they drop to the ground. The possibility is only for clearing fog over a relatively small area and usually it would form again in a short time. It would, however, probably be possible to clear a field while a plane was landing. The grass mowing is, at present, more of a stunt than a practical potentiality since the expense of

large-scale use would be so great. It might be valuable in a place like the Jersey meadows which are difficult to mow in any other way. The vibrations, striking the grass stems, agitate them violently, thousands of times a second, until they break.

In another laboratory, quartz is being "grown from seed." The object is to obtain a plentiful supply of perfectly oriented quartz crystals for use in electronic devices, such as underwater sound detectors. There are enormous amounts of this mineral in the United States—it is, in fact, one of the most common rocks in the earth's surface—but very little of it is of any use for that purpose.

Thus far it has been possible to produce only small crystals in the Navy laboratory, but apparatus now is being installed to grow a plentiful supply for all needs. During the war, Germany was short of quartz and was cut off from foreign supplies. Scientists there tried with limited success to work out a growing process, duplicating in the laboratory in a few weeks what Nature required thousands of years to do. U. S. scientists produced a synthetic crystal which was made by the hundreds of thousands for Navy sonar sets. One company alone produced over a million crystals.

Quartz is a mixture of oxygen and silica, the latter being the most plentiful element in the crust of the planet. The mixture occurs only in the form of crystals and these crystals are known as piezoelectric—that is, when a pressure or twist is applied to



One of many types of radar antenna developed at Naval Research Laboratory. Below, installing instruments in warhead of German V-2 rocket for tests



them, an electric current is produced. Also, when a current is passed through one of them a very rapid vibration is set up. Through its vibrating property the quartz crystal is the most accurate timekeeper known. There are several million vibrations a second and the rate does not change during the life of the crystal. At the Naval Observatory in Washington there is a quartz-crystal clock which is the standard timepiece for the United States.

Crystals can be grown by several methods—the simplest of which is to make a supersaturated solution in water of the elements from which they are to be formed and then either evaporate the water or slowly lower the temperature. If a small crystal, or “seed,” of the desired material has been placed in the water the substances in the solution will form around it in the desired orientations when the liquid no longer will hold them. The difficulty of making quartz crystals has been that silica is a difficult material to hold in solution. In the past 18 months, however, most of the technical difficulties have been overcome by the naval research workers, headed by Dr. P. H. Egli.

In still another section a series of synthetic motor oils and greases good for a temperature range from 100 below to 200 above zero Fahrenheit—compared to a range from 60 below to 250 above for the best products obtainable from petroleum—has been produced. The chief constituent is adipic acid, a by-product of the manufacture of Nylon which hitherto has gone completely to waste. This same acid is found in most animal fats.

At the bottom of the temperature scale the new products will not thicken and they will not evaporate with increasing heat. When the

(Continued to page 264)

Bowler's Stop Light

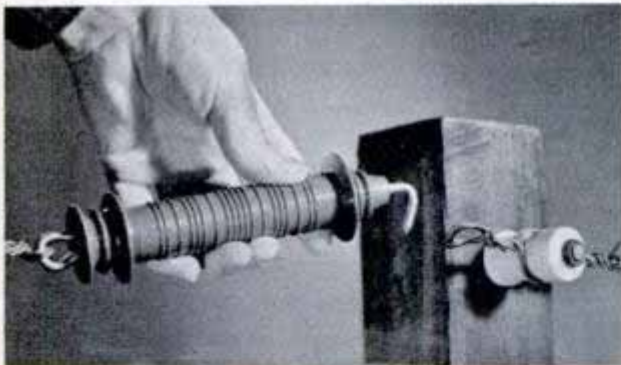
To protect pin setters against broken bones, a traffic policeman has devised a combination stop-go and foul light for bowlers. A red light shines to indicate the pin setter is at work; a yellow signal for a foul, and a green light for "all clear." Two of the lights operate automatically by means of a treadle working as a hinged floor in the pin-setting pit. When the setter steps off the floor it changes the signal from red to green. The yellow light is controlled by the foul-line judge. Tests of the system are being made on alleys in Kansas City, Mo.



DDT Kills Crawfish

DDT insecticide has been found effective in killing crawfish in experiments by the Mississippi Agricultural Experiment Station. Crawfish cause considerable damage in northern Mississippi and in parts of Alabama. In the experiments, one bushel of cottonseed bait was wet down with a 2½ percent water solution of DDT and scattered over an acre of

land. The following morning 8700 dead crawfish were found on the treated acre and no dead ones on the untreated land.



Tennessee Eastman Corp. photo

Electric-Fence Gate Handle

Electric-fence gates with nonconducting plastic handles can be used safely even during wet weather. The bright red handle has ridges molded along its smooth surface and safety guards at either end. Tenite is weather resistant and the metal parts are treated against rust. A metal compression spring encased in the handle maintains contact between the fence-wire ends connected by the gate.

Coal-Mine Tractor "Hugs" the Ground

Hugging the ground almost like a sled, a new coal-mine tractor can be driven from either a seated or reclining position, depending upon the height of the mine roof. The tractor, equipped with rubber tires, is coupled to various types of trailers to haul coal, supplies or men.

☛ Farmers own one third of all the trucks in the United States.





Encyclopedia Britannica photo

UNDERGROUND NEW YORK

What's underground in a big city is shown in a diorama that depicts a cross section of New York's Grand Central area, above and below ground, between Vanderbilt and Lexington Avenues on 42nd Street. It shows the underground transportation

system—the Lexington Avenue subway, the Grand Central-Times Square "shuttle" and the Queens subway, complete to model trains, passengers and advertising posters on the wall. Immediately below the pavement the cutaway reproduces such details as water ducts, telephone conduits, sewer and gas pipes, and mailing tubes.



Line Marker Has Finger-Tip Control

Interchangeable brushes for a mobile paint marker make guide lines two, three or four inches in width. The 22-pound unit holds $1\frac{1}{2}$ quarts of paint and is used to mark traffic lanes, tennis courts, swimming pools and factory floors. The paint is fed to the brush by finger-tip control.

Here's Relief for Accelerator Pushers

Tired leg muscles are given relief by a device that holds the accelerator at any desired speed. In cross-country driving, the motorist accelerates to the speed he wants, pushes a button on the dash, and the throttle is held at that speed. The button operates a pawl on the throttle arm. By touching the accelerator pedal again, the motorist frees the pedal for normal driving.

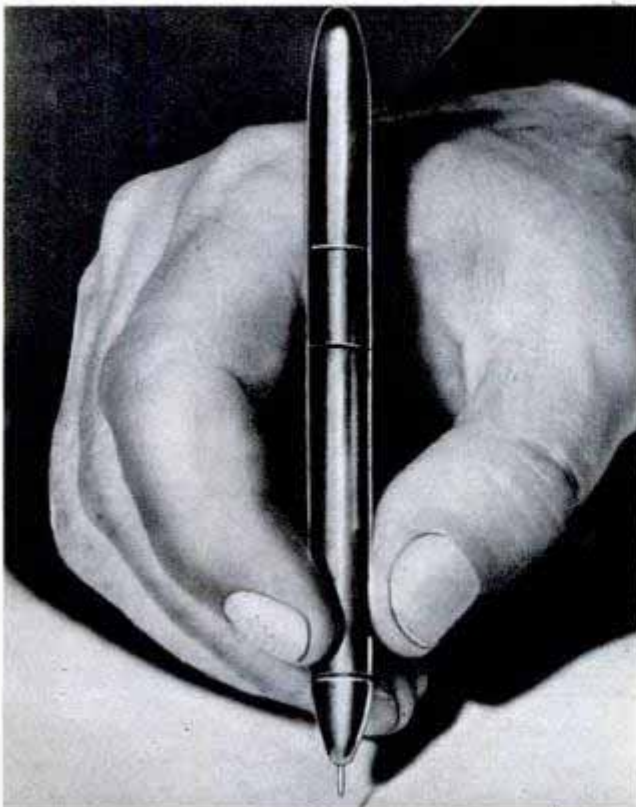


Cordless Soldering Iron

Delicate soldering work is made easier by a pencil-type soldering iron that has no electric cord. The tip of the tool is inserted in a heating unit screwed on an ordinary soldering iron. When the tip is hot the tool is removed and held like a pencil. The alloy tip holds 680 degrees for nearly one minute and reheats in about 20 seconds when reinserted in the heater. The tool was designed for assembling small switches, electric meters and instruments.

Fast-Drying Lacquer in Artist's Pen

Quick-drying lacquer is used in a capillary-action pen designed for draftsmen and artists. Extending from the barrel is a short length of fine tubing that comes to a rounded sapphire point. Immediate drying of the lacquer prevents it from running under rules, triangles and other drawing aids. A plunger inside the barrel, regulated by the screw top, forces more fluid out for heavy lines or releases pressure to make light lines. Interchangeable points permit different type lines as thin as a few thousandths of an inch. Errors can be removed with sandpaper or an ink or glass eraser.

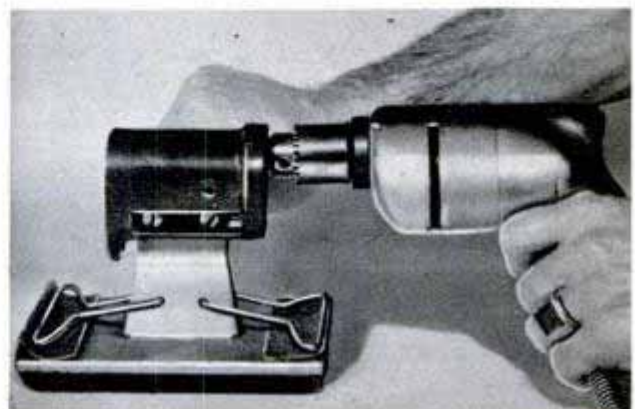


Scale Model of Giant Magnet

Engineers at Carnegie Tech have built a 1000-ampere electromagnet which performs such tricks as supporting a two-pound hammer in the air. The magnet is a working scale model of a giant magnet which will be built into a 200,000,000-volt synchro-cyclotron for atomic research. The model is built to a scale of 1 to 14. When finished the atom smasher is expected to cost \$1,000,000.

Drill Attachment Adds to Uses

Portable electric drills and drill presses are converted for wood chiseling, sawing, filing and sanding by an attachment that changes the drill's rotary motion into a reciprocating action. The attachment fits any drill that will receive a 1/4-inch shank and can be operated at speeds up to 2500 revolutions per minute. An additional attachment for sanding and buffing provides a mounting block for sandpaper or a polishing cloth.



By Estey I. Reed

THERE'S A MAN in Denver who makes heirlooms to order. Donald F. Allen is an artist who designs what he calls marriage plates.

Years ago the young art instructor sought a means of preserving the story of his romance with his wife. On a white pottery plate he painted pictures of a peasant boy and girl. Hearts and lovebirds added a sentimental touch. Around the edge were painted the couple's names. This was the first of hundreds of marriage plates which someday will be family heirlooms.

Allen became interested in ceramic art 16 years ago when he read an account of early Chinese and Egyptian art. The idea of telling intimate stories of individuals through pictures painted on pottery fascinated him.

The first step, Allen decided, would be to obtain the right clay which he knew to be plentiful in Colorado. The clay he uses is segregated into several groups, ranging from low-fired to high-fired types.

Color for all of Allen's work is obtained from oxides of minerals. The underglaze material consists of tin for white paint, copper when turquoise is desired, and magnesium for deep brown. Colors from yellow up to medium brown are made from lead or silver tailings. Gold produces red.

The plates are cast in plaster molds, which readily absorb water. When the clay is deposited in the mold, the moisture evaporates and is absorbed by the plaster. The plate is trimmed and smoothed on a

Allen's wife examines the birth plates made for their children. Above her hangs the first marriage plate he designed

HEIRLOOMS MADE TO ORDER

First step in making the sentimental heirlooms is to pour the liquid clay into a prepared mold

Into the kiln go the plates for baking. Circular holders and tubes keep them from falling out when door is opened





Designs depicting the romance are sketched on the plates in pencil. They are completed with metallic pigments

potter's wheel made from parts of a treadle-type sewing machine.

The plate is taken to the kiln, where it is baked by a low fire. After the plate has cooled, the designs are drawn and painted in appropriate colors with underglaze paints. A fluid consisting of finely ground glass mixed with certain chemical agents is sprayed on to give the finish glaze. Then the plate is baked for 3½ hours at

Allen sprays a coat of finishing paint on a new plate. It is made of chemicals and powdered glass

1950 degrees Fahrenheit and cooled slowly.

Both the pottery and glaze shrink in firing. As the shrinkage is not equal, the glaze is cracked when the plate is removed from the kiln. Allen then rubs an earth color into the cracks, giving each plate a crackle finish that adds to its beauty.

Allen made marriage plates several years for friends and relatives. They showed their gifts to others who wanted him to paint birth, family and anniversary plates. His hobby now is a business.

Most of his marriage plates have peasant figures in the center. Colored borders are painted around the plates. Below the figures are smaller designs telling the story of the couple's initial meeting and other sentimental events. Names and the wedding date are included.

Allen has depicted everything from a dozen red roses and moonlit nights to the tale of a young couple caught in a flood on their wedding day. They were compelled to wade through mud to meet the minister in a railroad station.

A western rancher had his brand painted on a plate. One couple ordered the names of 15 towns in which they had lived, along with figures representing a different job the husband had held in each. A Navy lieutenant and his wife wanted a bowl of strawberries, for they had met over such a dessert at an officers' club. Texans request cowboys dressed in blue jeans.

Although ceramic art is nearly as old as art itself, Allen has added a new twist to produce heirlooms made to order.





Peacetime Proximity Fuse

Industry may be able to use a device similar to the proximity fuse to detect motion in certain research or manufacturing processes. The proximity fuse was responsible for much of the effectiveness of the Allied anti-aircraft fire. Now, General Electric has developed an instrument which uses radio waves to detect movement of an object or person. The device rings a bell or flashes a light as a warning. It detects motion in objects moving as slowly as one mile per hour.



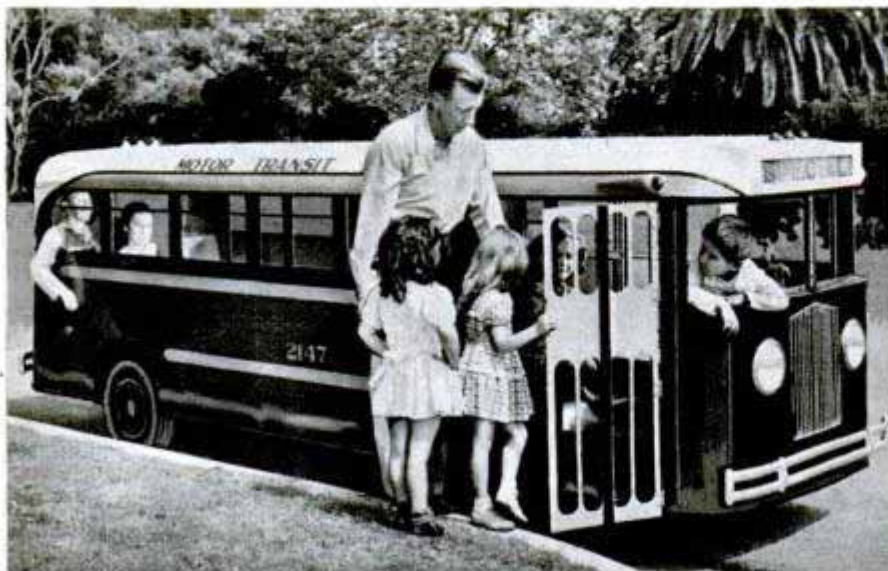
Hand Truck Moves Wire Coils

Coils of wire are moved easily by a hand truck with a protruding arm. The arm is pushed through the center of the coil to prepare the truck for loading. Pulling back on the handles and pressing down on a footrest lifts the load and properly positions it on the truck. The load rides over the wheels to provide good balance. The truck can be used to transport most articles with holes in the center such as box strappings, wheels, tires, lathe chucks, faceplates and strip coils.

Half-Size Bus for Youngsters Made From Scrap Parts

Using parts from a midget auto and a bomb trailer, a California youth built a half-size bus that's a perfect fit for youngsters. Made of sheet aluminum on a

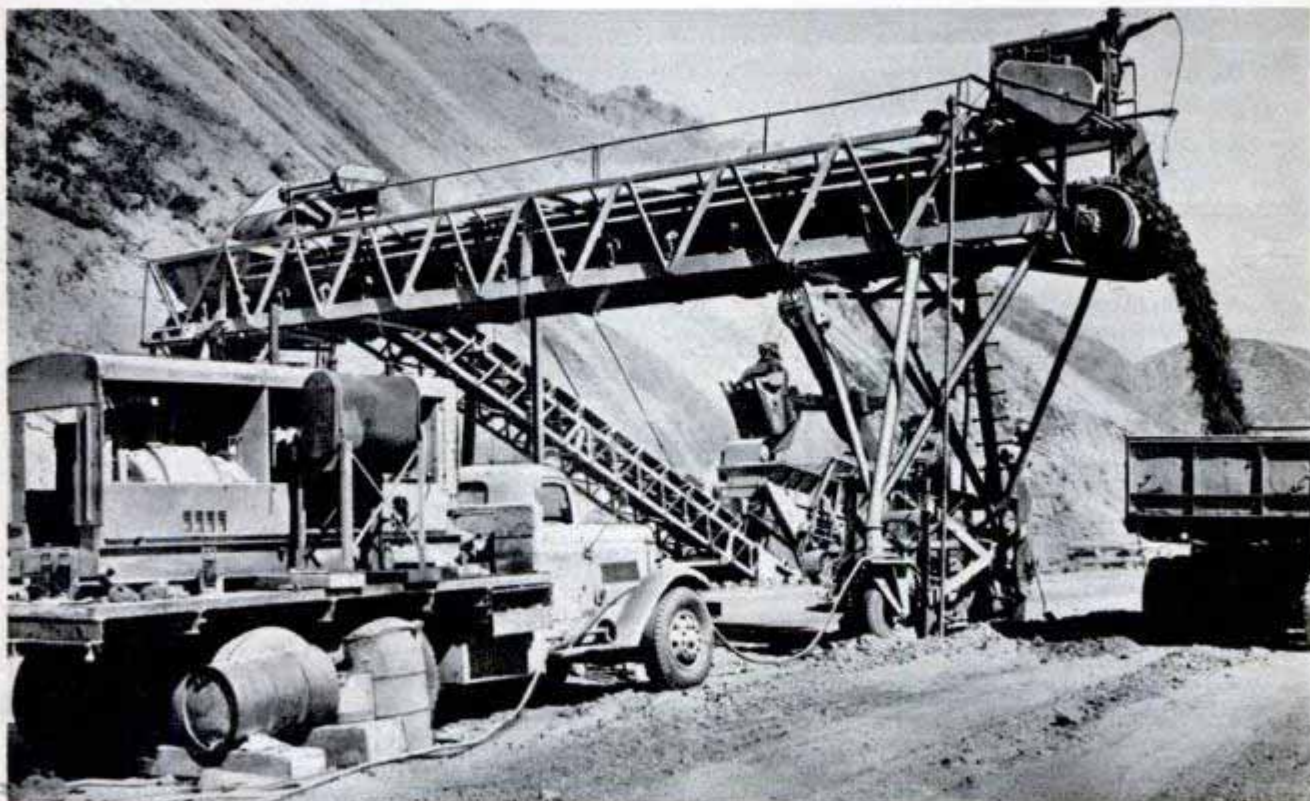
channel-iron frame, it has metal seats, an authentic folding door, lights that work and even a fare box as a realistic touch. The designer, Don Tibbetts of Redondo

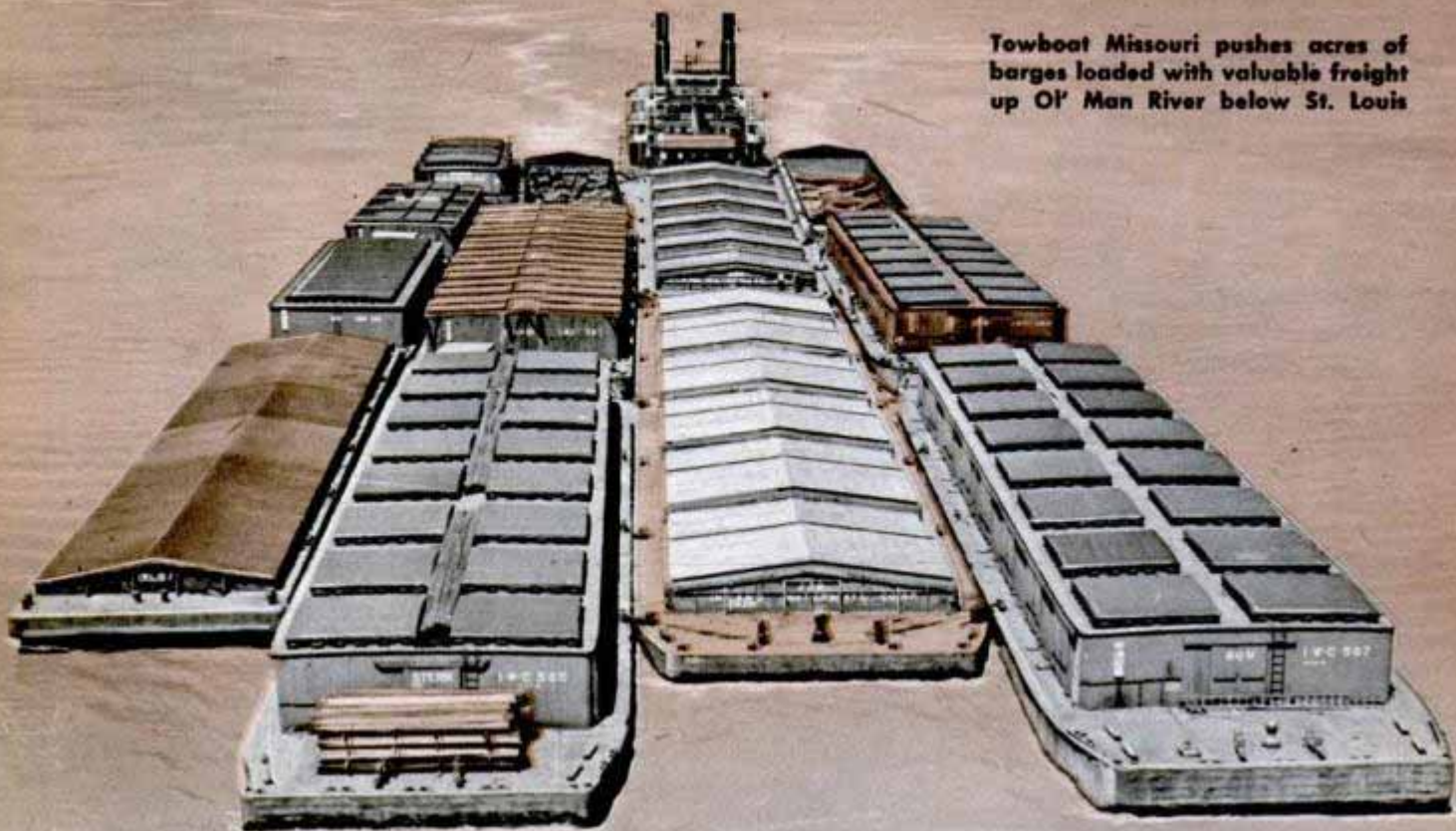


Beach, Calif., used the engine, clutch and transmission from a 1930 midget auto as a power plant. A war-surplus bomb trailer furnished the nine-inch wheels. The miniature bus is 16 feet long, 5 feet high and 4 feet wide, weighs 1800 pounds and has a top speed of 30 miles an hour. Along with a model trolley car and locomotive made by Tibbetts, who developed his skill as a Navy shipfitter, it will haul kiddies at an amusement park.



"BELT LINE" FOR GRAVEL. With an overhead conveyor spanning the road, traffic on a busy California highway moves along as usual while the road is being widened and straightened. The belt conveyor carries dirt and rock 20 feet above the four-lane pavement, permitting autos to pass beneath. Scene of the \$763,000 project is the Ridge Route across the Tehachapi Mountains between Los Angeles and the San Joaquin Valley. Dirt is removed by a Diesel-electric shovel from one side of the road, and then deposited in trucks across the highway





Towboat Missouri pushes acres of barges loaded with valuable freight up Ol' Man River below St. Louis

Fancy Freighters Ride Ol' Man River

By Robert A. Hereford

THE PACKET Robert E. Lee plowed full steam ahead through a Mississippi River fog one night to win history's most famous steamboat race from the Natchez.

That reckless dash of the Lee since has become legendary. But any one of the modern river steamers whose pilothouses are being equipped with radar would have ridden through that fog as easily as though the pilot were navigating the Mississippi on a clear day. Despite the fog, the banks and obstructions in the channel would have shown clearly on the radar screen.

The river steamer of today has another improvement which would have astonished the pilots of Mark Twain's colorful era. It's the wireless ship-to-shore telephone. Through it, the boat's clerk, who is a licensed radio operator, communicates with the home office or any other shore point having telephone equipment. Over its amplifier come the daily river stages and the positions of other craft, informa-

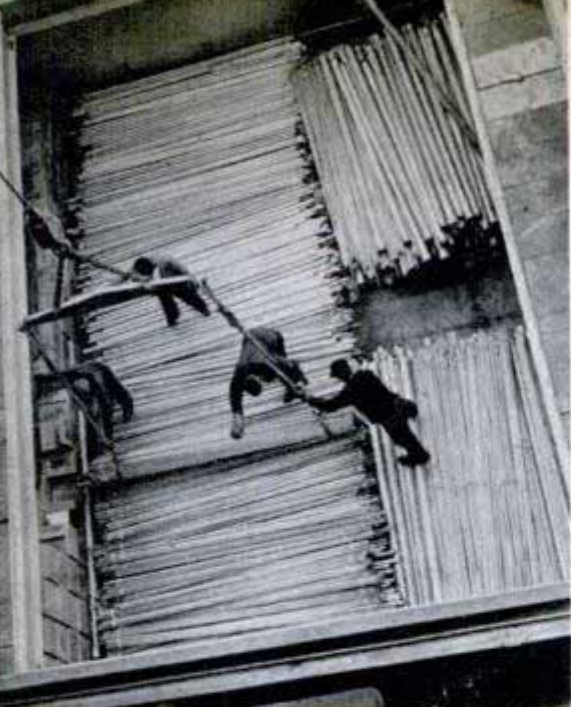
tion that is vital to the steamer's master.

Powerful searchlights illuminate the path of the modern river steamer, enabling the boats to maintain a regular schedule of night as well as day travel.

Oil, for the most part, has replaced the wood and coal with which the fireboxes of the pioneer packets were fed. Giant steel screws now churn the waters in the wake of the modern craft in place of the cumbersome paddle wheels of the packet era.

To communicate his orders to any part of his craft the pilot simply leans over and speaks into the pilothouse microphone. An electric loud-speaker bellows his orders so that they can be heard clearly a quarter of a mile distant by deck hands working on the lead barge of the boat's tow of barges which stretches out ahead.

The kitchens of the old river packets and the sumptuous fare they provided have long been a river tradition. The kitchen of a modern boat not only perpetuates but



↑ Iron rods are lowered by crane into position on one of the barges. Right, the master of the Ernest T. Weir checks the radar screen. Radar has eliminated many of the navigating hazards met by early packet pilots

enhances that tradition with the aid of modern refrigeration which makes possible a supply of fresh meats and vegetables as well as frozen dishes.

Because the floating palaces, which once provided the nation a principal means of travel, were unable to match the speed of the express train, the airplane or transcontinental bus, passenger transportation on the river has disappeared except on a few excursion boats.

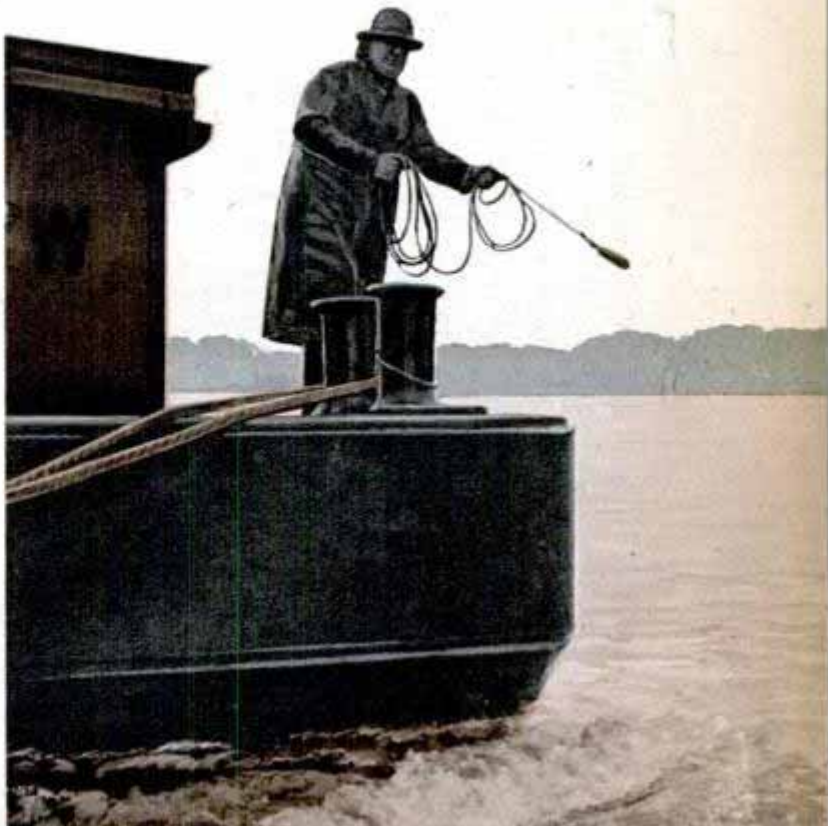
Gone is the splendor of the old packets. The Grand Republic, one of the most famous of the old boats, boasted a carpet valued at \$40,000. It was woven in one

piece and imported from Brussels. Living now only in memory are the silk-waist-coated and cold-eyed gamblers who frequented the packets. Gone also are the coquettish girls who waltzed on the packets' dance floors and flirted on their darkened decks.

But freight continued to move in ever-increasing volume over the nation's water highways. Furs were freighted down the Missouri to help build a business empire, cotton steamed upstream from Dixie in return for steel sent down the Ohio and Mississippi from Pittsburgh mills.

During the rush up the Missouri to the

↓ Deck hand makes fast a heavy line around a barge's timberhead in preparation for a threatening windstorm. Right, the leadsman's "Mark Twain" signifies safe water and echoes the romance of early river-packet days





At the St. Louis terminal of one of the barge lines, a crane loads cases aboard a barge for a trip down river

Montana gold fields in 1866, steamboat freight charges were as high as 12 cents a pound, with one boat, the Peter Balen, carrying 341 tons on a single trip. Another packet returned from the gold fields with \$1,000,000 in gold dust in her safe.

But the modern freight movement on the rivers would astound the old packet master. For, as Mississippi Valley Association statistics reveal, 12,000 tons of mixed cargo in one tow of six barges or more is not uncommon. Such a tow is equal to the capacity of 24 packets of the golden age of river transportation. It is equivalent, according to the association's estimate, to 241 average freight cars loaded to capacity or to 14.7 freight-train loads.

A cargo of 26,000 tons of coal has moved over the Ohio-Mississippi River system in a single tow of barges.

A stately procession of these modern towboats, which push their tows instead of pulling them, moves up and down the Ohio, Mississippi and Missouri Rivers and over other river highways.

The modern steel barges, designed to draw in accordance with the nine-foot channel provided by the government on the Mississippi River, range in capacity from 100 to 3000 tons. The snub-nosed towboats, which push before them literally acres of floating freight, range up to 2200

horsepower. They are all-steel craft costing as much as \$500,000 apiece.

In 1944, the latest year for which figures are available, this towboat fleet moved over the Mississippi River system (including the upper and lower Mississippi, the Ohio, Illinois and Missouri Rivers) 101,340,788 net tons of cargo, equal to the capacity of 2,027,000 freight cars.

Steel from Pittsburgh, refrigerators from Cincinnati and shoes from St. Louis are taken down river to New Orleans, with some of the consignment dropped off at such river cities as Memphis and Vicksburg. Other cargo moves from New Orleans to Texas and Louisiana cities over the intracoastal canal. Huge consignments are loaded aboard ocean-going steamships at the port of New Orleans bound for foreign ports.

For a real glimpse of modern river life, climb aboard the steamer Louisiana of the Mississippi Valley Barge Lines, leaving Cairo, Ill., for New Orleans. Likely she'll be pushing about a 21-piece tow.

You climb aboard the lead barge tied up at the dock and it's a quarter-mile hike to the Louisiana. Finally aboard, you stow your gear in a neat room with a bath that includes hot and cold water, a shower and tub. Across a tiny window are black shades. The shades have a double purpose

—to keep light from obscuring the pilot's vision at night, and to prevent light from interfering with daytime sleepers.

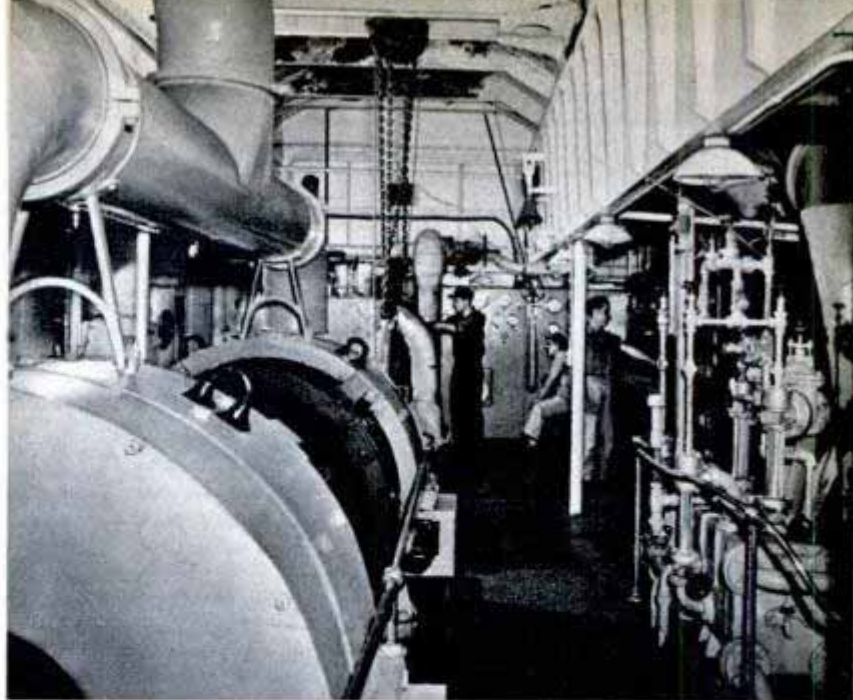
Through the window can be seen the crew at work rearranging the tow. The towboat has been cut loose from her barges. Now she is "shepherding" them into a formation that was worked out previously with a set of tiny blocks in the pilothouse. The downstream tow is wider, the tow upstream narrower because of current resistance.

The towboat gently nudges the barges into place where they are made fast by means of wire cable, which ratchet screws pull to fiddle-string tautness. The boat and barges become as solid as a single unit.

In the pilothouse the boat's master, Captain Edward Duckles, stands before two large steering levers and directs the work on the barges through a loud-speaker.

Work goes on continuously on a river steamer in a series of six-hour watches. The relief pilot relieves the master, the second mate the first, the second engineer the first and so on.

Radar is comparatively new to the river and boats not equipped with it tie up during a night fog just as careful pilots did in the days of the river packet. One packet may have carried \$1,000,000 in gold dust in its safe, but any one of the hundreds of



Huge 2000-horsepower engines are spotless aboard the Louisiana. Oil has replaced the coal and wood fuel of the pioneer packets

modern tows may be worth up to \$1,000,000.

You don't risk a \$1,000,000 cargo in a Mississippi fog.

The Louisiana isn't equipped with radar and sometime during the trip Captain Duckles may see a wall of fog advancing across the river. He speaks quietly into his microphone, addressing the first mate who is stationed a quarter of a mile ahead on the lead barge. "Tally, fog's closing in. We'll tie up."

He puts his foot on the pedal of the lead whistle, signaling for a starboard sounding. Sounding is one river operation which has survived the years unchanged.

Chugging down the Mississippi, the Louisiana pushes a tow of 21 fully loaded barges





Tow is brought to dock to drop off one barge. The rest of the load will go to New Orleans for reshipment

The captain wants to determine whether the water is deep enough offshore to float the Louisiana's 15,000-ton cargo. When a tow is grounded or hits the bank, loose barges often must be chased downstream for miles.

A deck hand grabs a line with a lead weight at one end. At intervals along the

line are various colored markers representing the depths. He cat-foots forward over the gunwales to the lead barge and throws the line ahead into the river.

Another deck hand has stationed himself halfway between the sounder and the pilothouse to relay the call.

The sounder studies his line and calls, "Mark Thyree. Oh, Mark Thyree."

"Oh, Mark Thyree," sings the relay man.

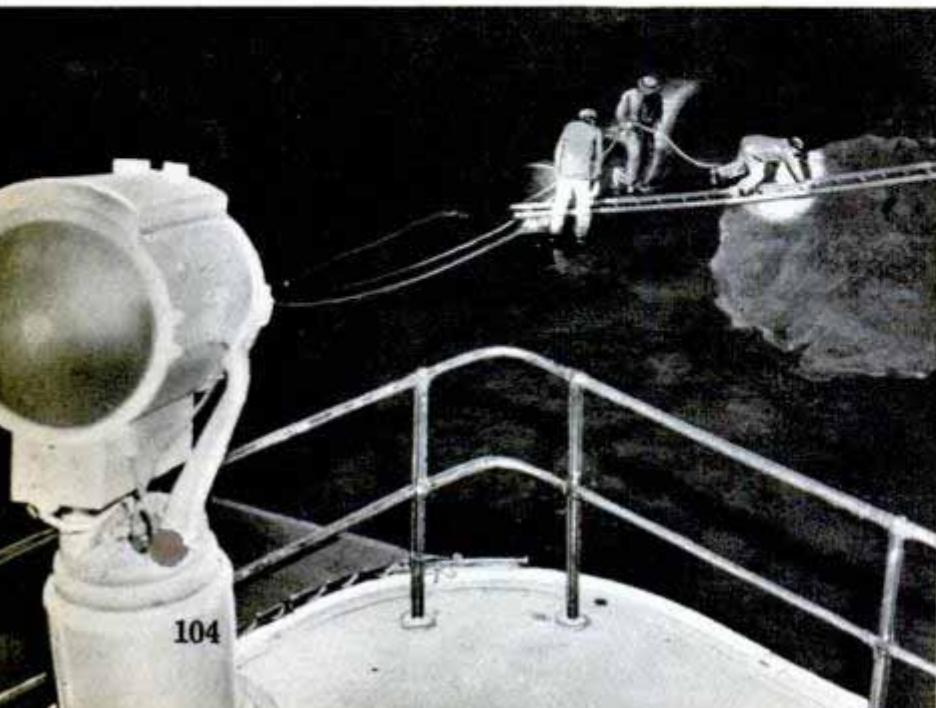
The water is 18 feet deep.

"On the Mark Twain," calls the sounder, meaning 12 feet. Then a warning: "Ten feet. Oh, ten-a-feet."

The boat shivers as the engines are reversed. Captain Duckles plays the beam of one searchlight alongshore until it picks out a giant cottonwood tree. The other light he fixes on a crouching deck hand who holds a long ladder in readiness. The shore looms 10 feet distant. The deck hand drops the ladder between boat and land and two other hands, carrying a steel cable, scamper across and make fast to the big tree.

(Continued to page 260)

Dramatic shot shows deck hands scurrying across a ladder from barge to shore to tie up in preparation for bad weather ahead



TEST YOUR SCIENCE

By Rex Taylor

i. q.

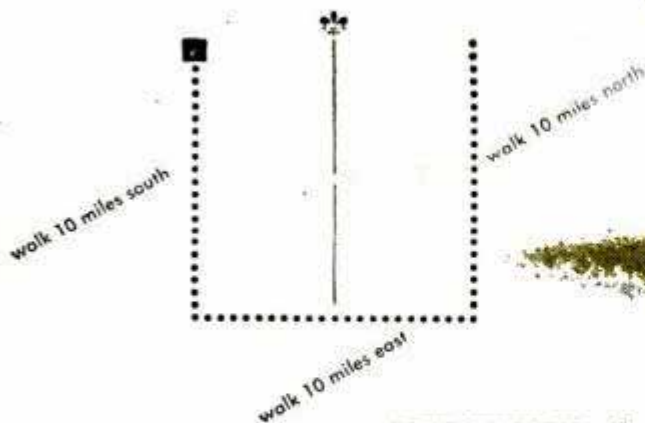
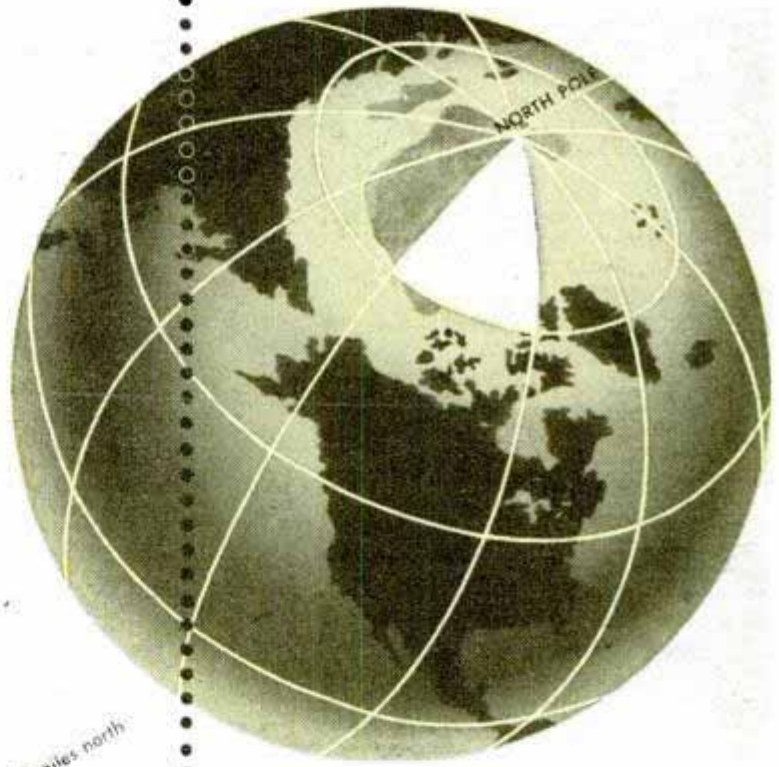
FROM WHAT POINT on the earth can you

Walk 10 miles south—

Walk 10 miles east—

Walk 10 miles north and arrive at your starting point?

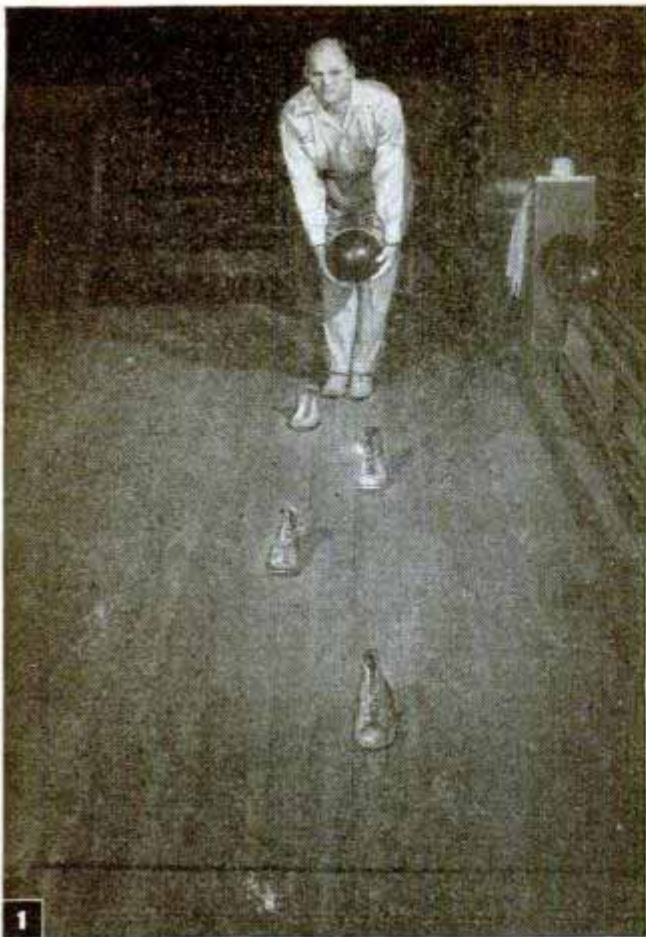
Ordinarily you'd be walking three sides of a square and finish 10 miles east of the spot where you started. But you know the easy answer for this one: It's shown by the diagram at the right. You start at the North Pole. Ten miles down any meridian you turn east for 10 miles, then north 10 miles and you're back at the Pole.



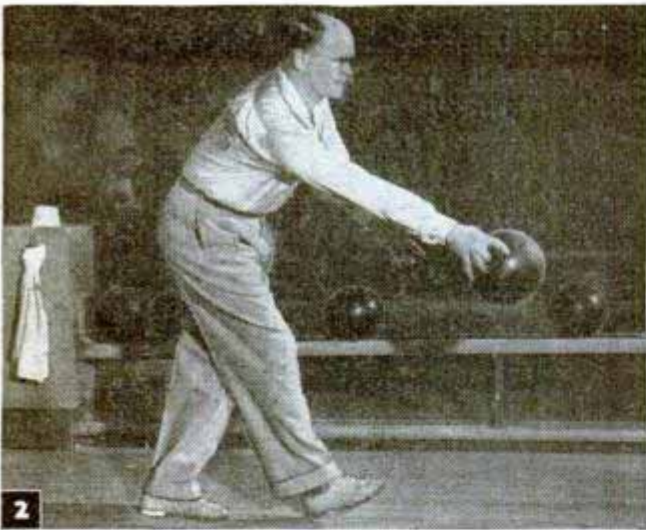
**BUT
HERE'S THE
BRAIN
TEASER**

ARE THERE other points on the earth where the same three-way trip will bring you back to the spot you started from? If so, name one of them.

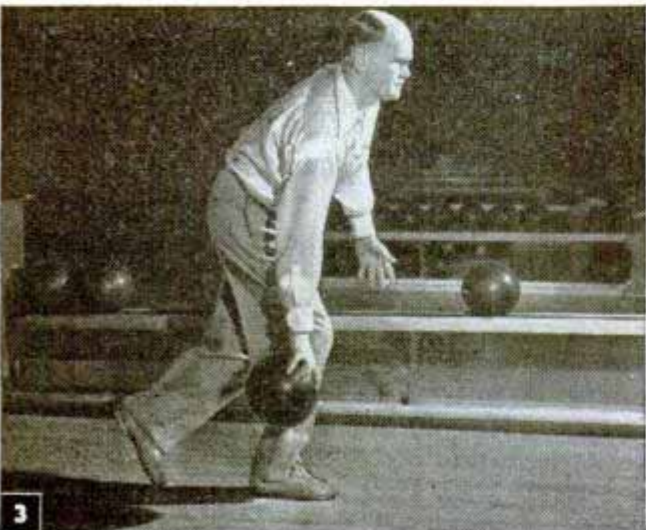
Get out the globe and the arithmetic book. If you're a genius or a little less, it should take you just a few minutes. Try it . . . No coaching from the audience, please! Well, just a hint: Start somewhere near the South Pole . . . Don't give up! But if you must, turn to page 238 for the answer.



1



2



3

FIRST AID for BOWLERS

By John R. Kinsey

Posed by Joe Wilman, "Bowler of the Year" in 1946, and one of the sport's all-time greats

BEFORE JOE WILMAN became one of the world's greatest bowlers, he tried to develop into a boxing champion. He had plenty of "stuff"—hooks and jabs—and good control.

Joe won 19 bouts in succession before an opponent's glove crashed against his chin and the young fighter woke up in his dressing room.

"Right then," Wilman relates, "I decided to give up boxing. I had a fair amount of stuff and control, but I couldn't control my opponent's punches."

The chunky athlete next took up professional baseball and within a few years was pitching in the Nebraska State league and then the Mississippi Valley league. He had excellent control over the ball and a fair amount of stuff, including a good curve.

The Chicago White Sox gave Wilman a tryout. They liked his control but decided he lacked the assortment of pitches, or



4

stuff, to make the grade as a big league hurler.

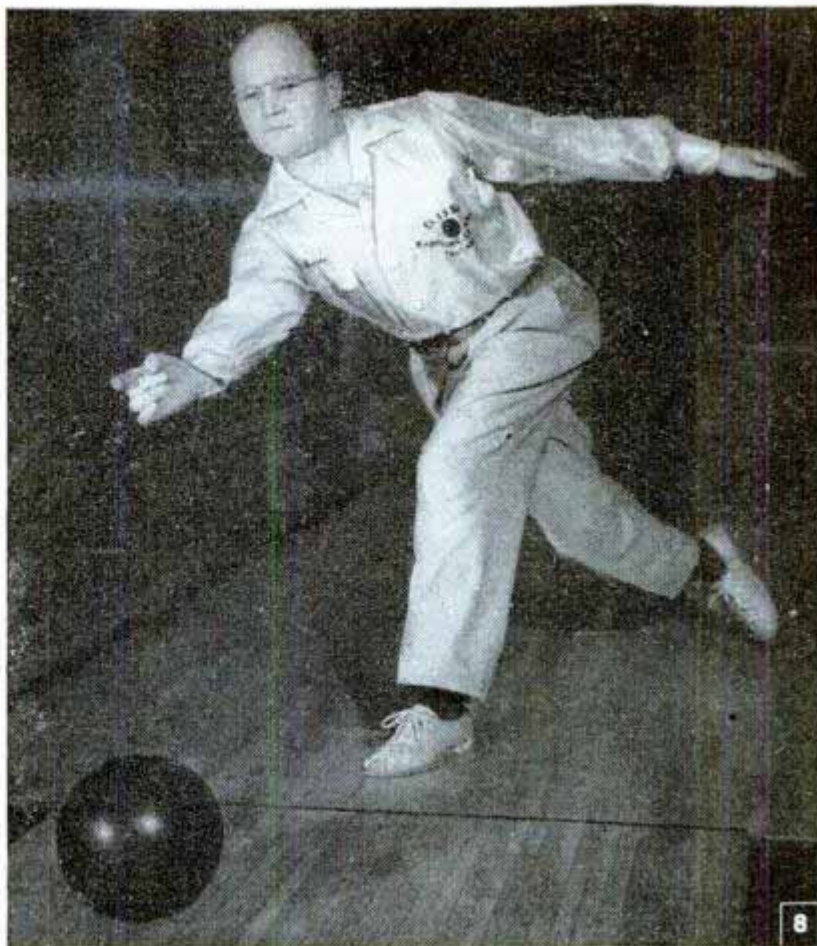
"That's when I decided to give up baseball and try to become a champion bowler," Joe explains as he looks back on his athletic career.

Wilman, then a better than average bowler, became a champion bowler because of two things: control and "stuff on the ball," bowling lingo for a sharp-breaking hook that churns the pins and makes a lot of strikes.

When Joe was asked to prescribe some first aid to help bowlers improve their game, he suggested that control and "stuff" be emphasized.

Those are the factors to which he credits his average of over 200 in league bowling, in exhibitions and in 11 appearances in the American Bowling Congress—the toughest competition in the world.

What's fun for 18,000,000 bowlers around the country



1. Shoes placed to show a four-step delivery

2. First half step, left hand is dropping away

3. Weight on right leg, ball straight down

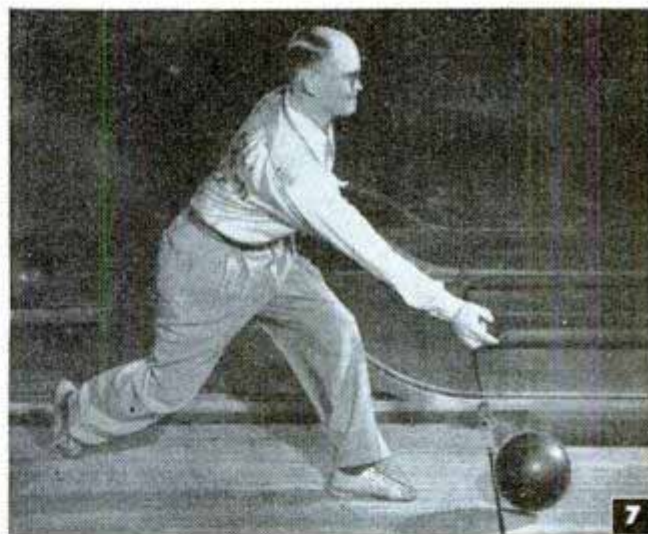
4. Weight shifted to left leg on second step

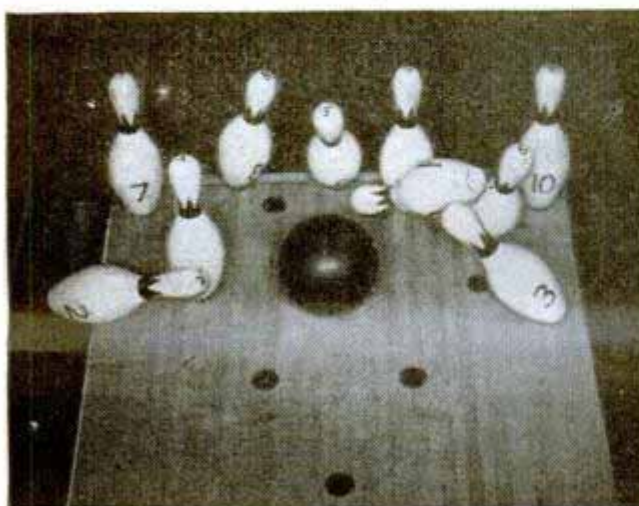
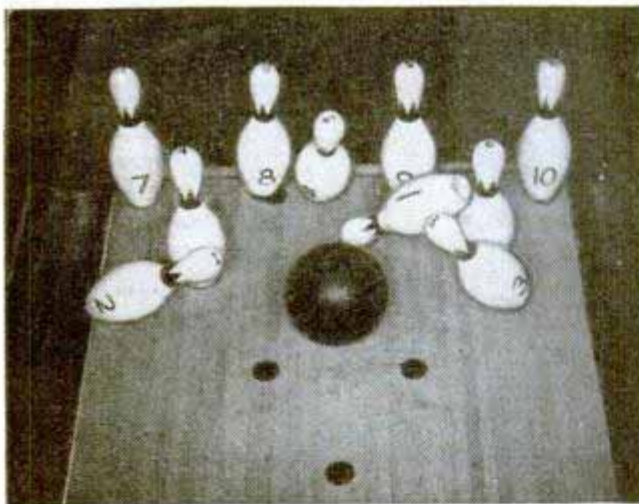
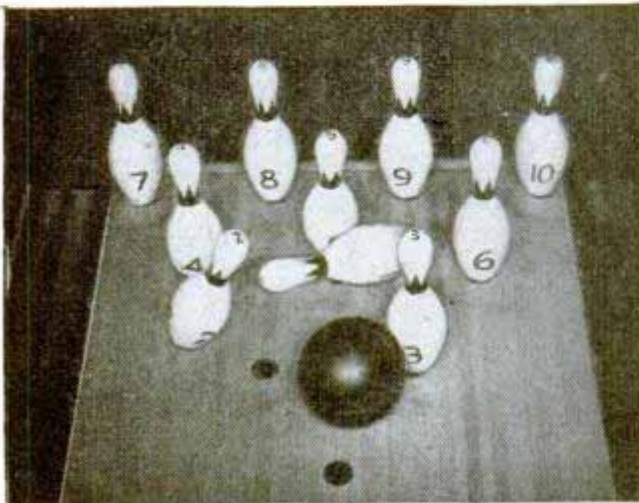
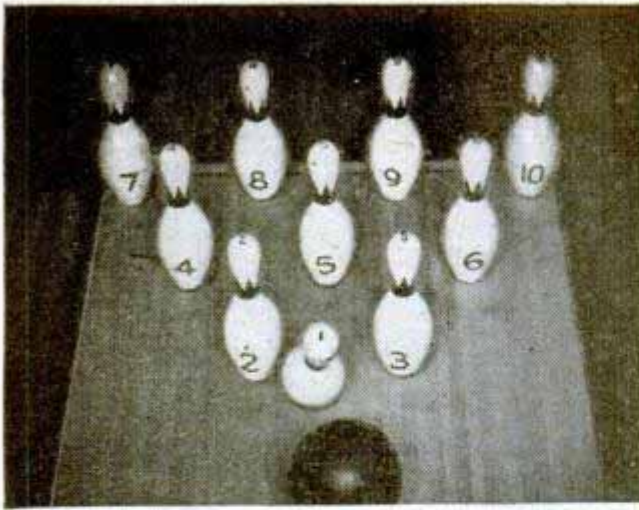
5. Ball at top of backswing as third step ends

6. Entire weight on left leg, thumb out of ball

7. Perfect body balance in the follow-through

8. Note how left arm, right leg, aid balance





has become a pleasant business for 41-year-old Wilman, who devotes all of his time now to coaching, exhibitions and other appearances in behalf of the Brunswick-Balke-Collender Company, bowling-equipment manufacturers.

The bowling writers of the nation named Wilman "Bowler of the Year" after he compiled an amazing record during the 1945-46 season. To mention one accomplishment, he won the ABC all-events for the second time with 2054 for an average of 228.2.

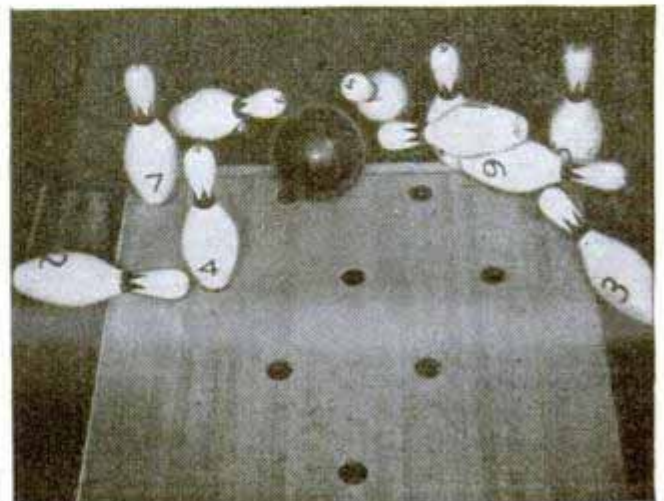
Not all 200-game bowlers agree on grip and delivery, but a substantial majority of the stars use the two-finger in preference to the three-finger grip, and Wilman is a two-finger advocate. He holds the ball in his left hand until starting his delivery so that his working arm won't be tired. His advice applies, of course, to right-handed bowlers.

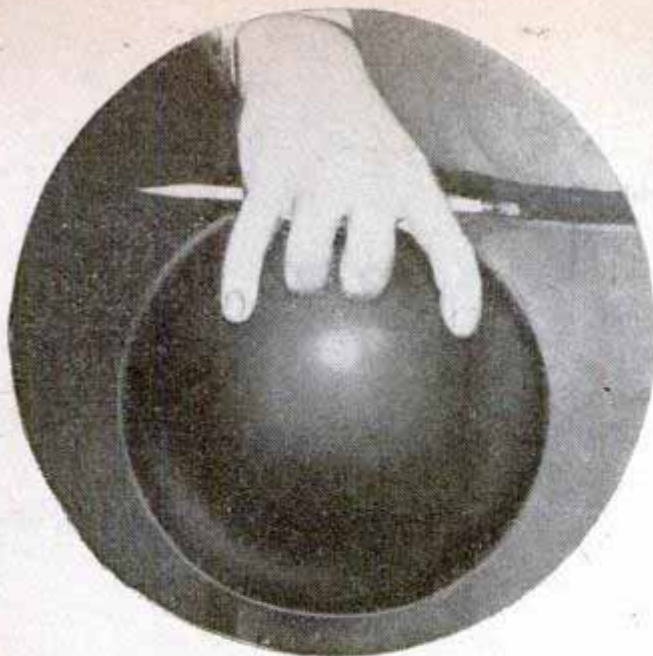
Again, some "hot" bowlers do a two-step or some fancy dance of their own to the foul line and still get results, but Wilman adheres to the four-step technique recommended for most bowlers. Taking his position 12 feet behind the foul line and holding the ball at waist level, he faces the pins squarely, feet together, slightly to the right of the alley's center, and lines up his right arm with the 3-pin.

He starts his delivery with a half step with his right foot, then a three-quarter step with the left. His third step covers the full distance for a normal walking step. The final step sends his left foot through a slightly longer stride, ending in a slide.

The first step begins a fraction of a second after Wilman reaches out with the ball to start his approach. As he takes the other steps, his right arm executes the back-

Flying pins at work. In sequence around border of these two pages are high-speed photos showing how ball and pins acted on hit that left the No. 7 pin standing. The No. 1 pin was hit too full to spill the No. 7. A glancing blow on the head pin's right side would have swept all 10 "sticks" off the lane





There should be only space enough for the thickness of a pencil between the bowler's palm and the ball

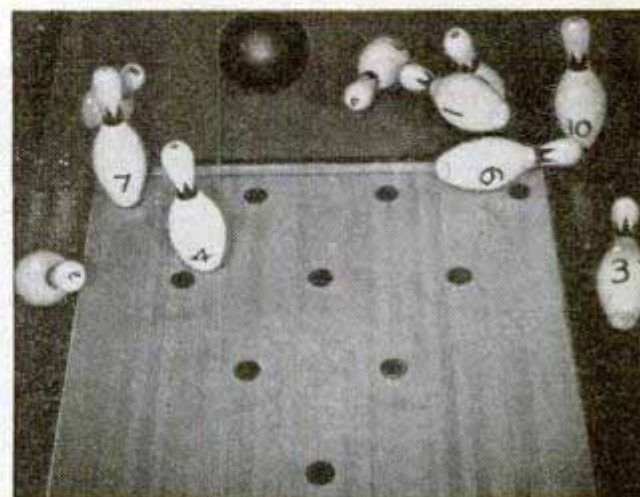
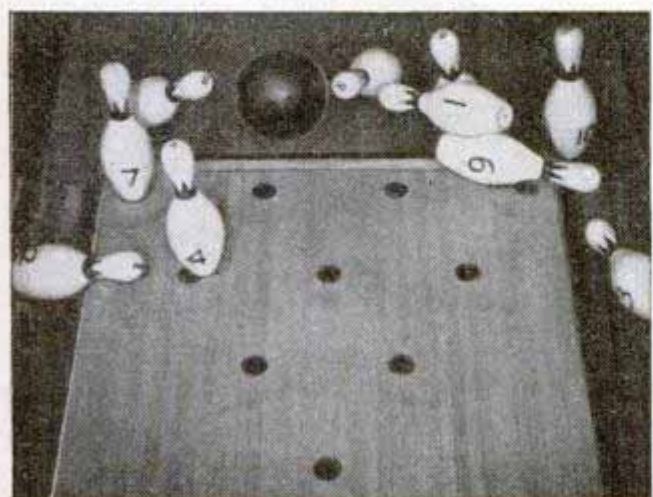
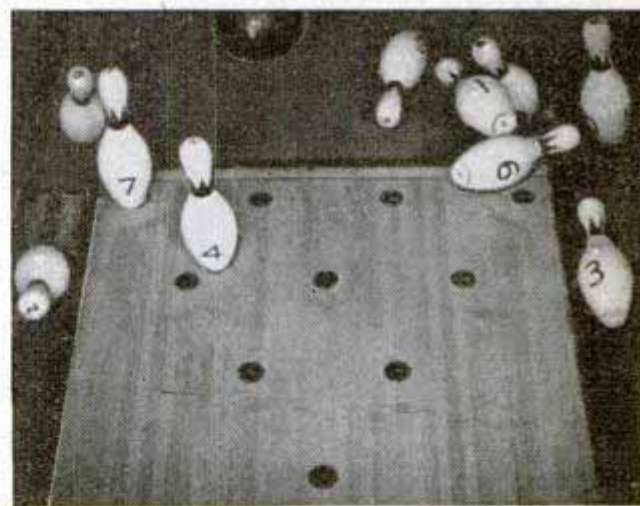
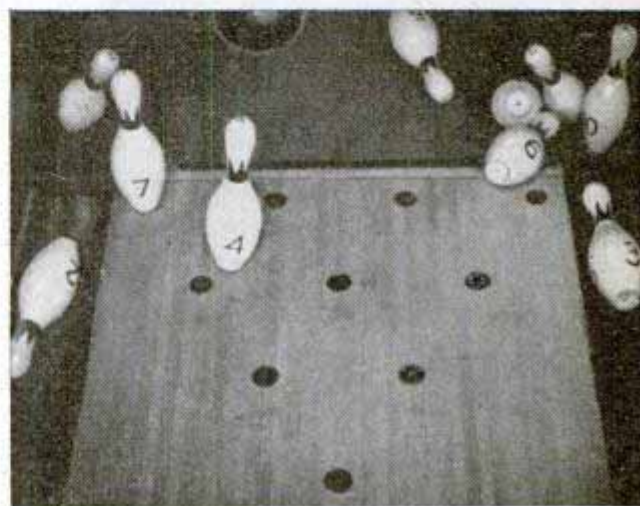
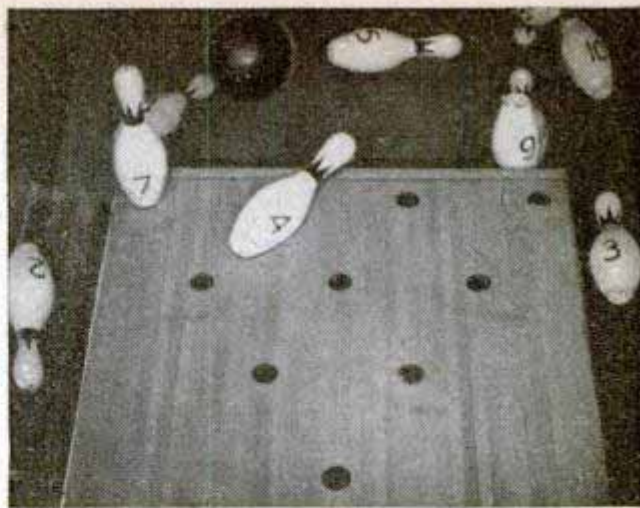
swing and forward swing in perfect coordination with his footwork.

Take it easy as you move to the foul line. Don't rush. Don't overdo your backswing in an attempt to throw a terrifically fast ball.

"And by the way," Wilman adds, "I should have said at the start that having your own properly fitted ball and shoes are fundamentals of good bowling. No par golfer ever wears street shoes on a course or uses different clubs every time he plays. Begin with the right equipment and use it constantly to gain control."

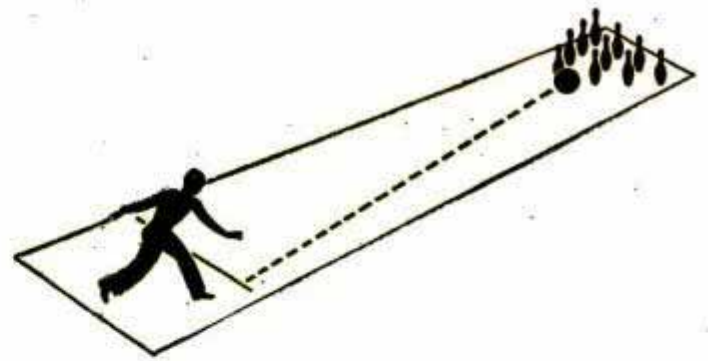
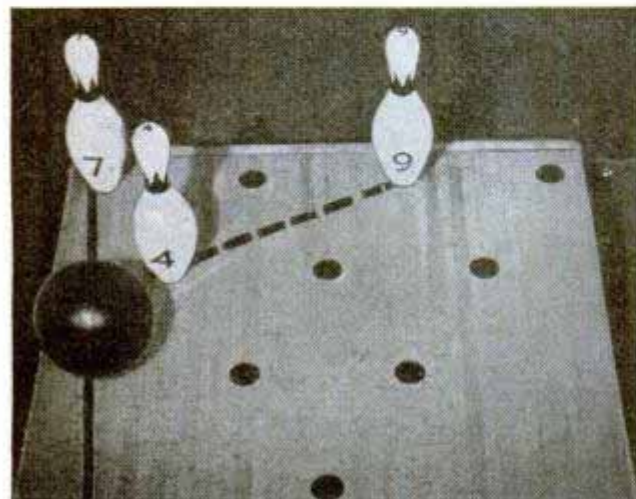
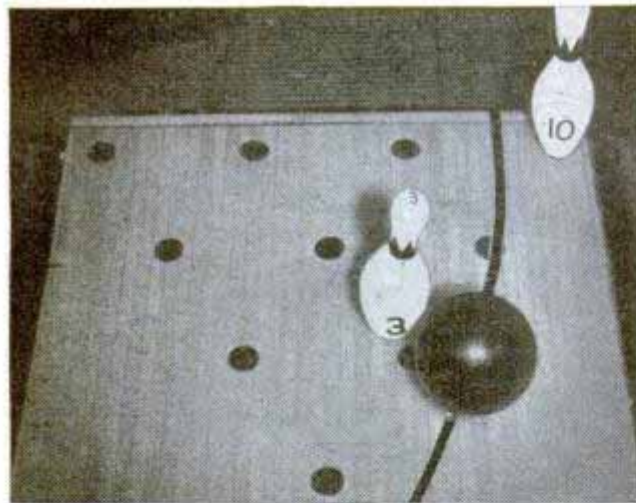
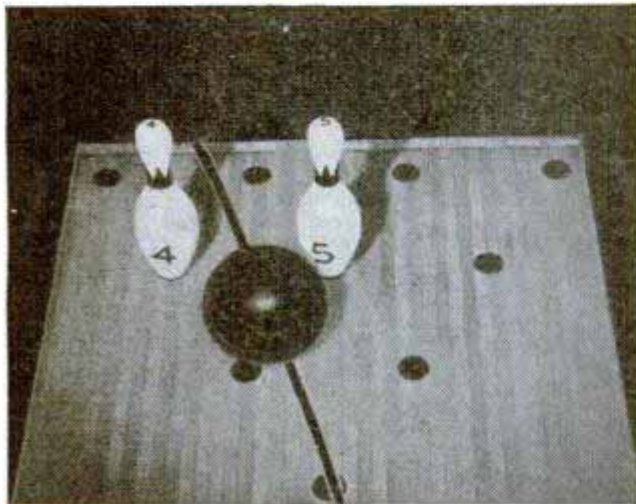
Watching Joe toss in one strike after another and studying his form, spectators are impressed by his pendulum swing. He keeps his right arm close to his body to prevent sidearming, which is the downfall of many bowlers.

Another reason for Wilman's prowess is that he approaches the foul line on a straight line. "Bowlers often fail to hit where they have aimed because they run

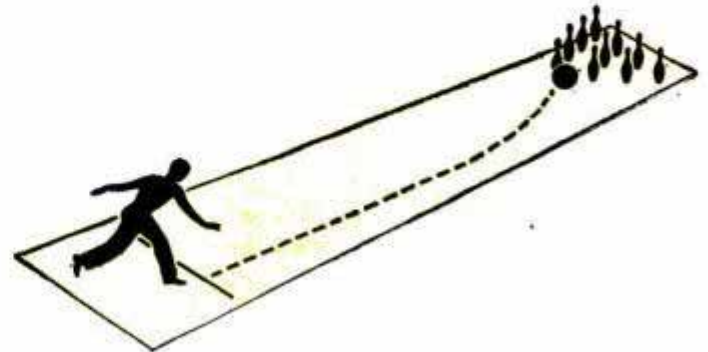




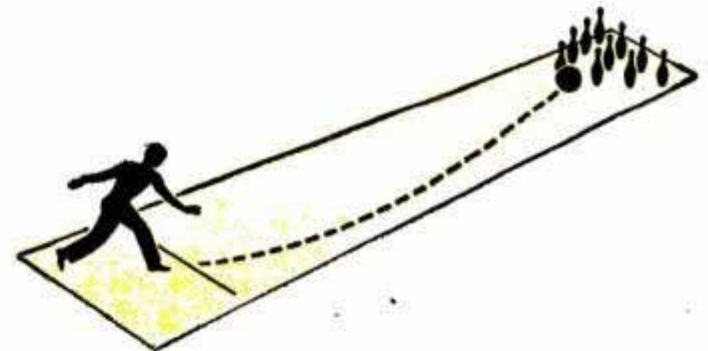
PICKING UP FIVE SPLITS



Path of a straight ball, which Wilman recommends for beginners until their delivery is easy and natural

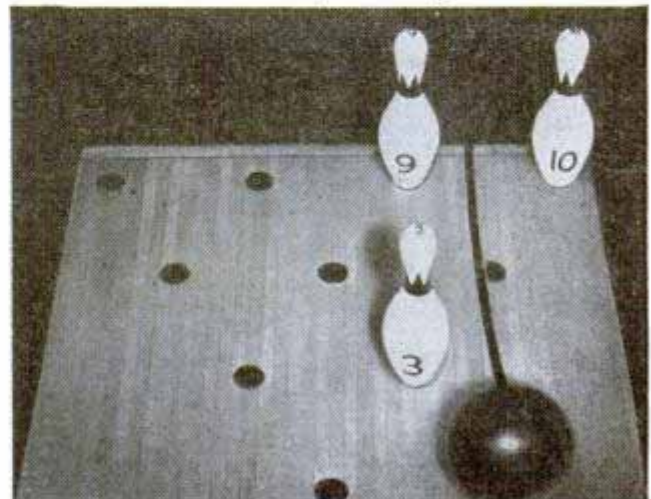


Most top bowlers throw a hook. It heads for No. 1 pin, then breaks sharply into the 1-3 strike pocket



Though effective on highly polished alleys, a curve is hard to throw and not recommended for beginners

These photos show how Wilman picks up troublesome splits. Upper left, among the most common, the 5-7 leave is made by hitting No. 5 thin on right, sliding it over to topple the No. 7 pin. Good judgment is as important as control on shots like these



in zigzag fashion or at an angle," Wilman points out.

Most bowlers have one or more serious faults. Maybe they run too fast. Or they fail to move forward on a straight line. Wilman believes that any bowler averaging 180 or less can add a few pins to his score by spotting his major faults and practicing to overcome them.

"If a fellow corrects two faults," Wilman emphasizes, "he will automatically correct certain other troubles and bowl better."

Every suggestion made thus far by Wilman points the way to better control. And control is the first word that Joe mentions when he's asked: How does a bowler improve his spare shooting?

He must get better control of his feet, arms, swing and direction. A good spare bowler is a good bowler because if he can pick up the 10-pin regularly, he can hit the 1-3 pocket and get his share of strikes.

But there are two other factors that Wilman stresses in teaching bowlers to become more adept in picking up spares. They are (1) face the pin or pins (not the alley) squarely, and (2) learn to use plenty of angle.

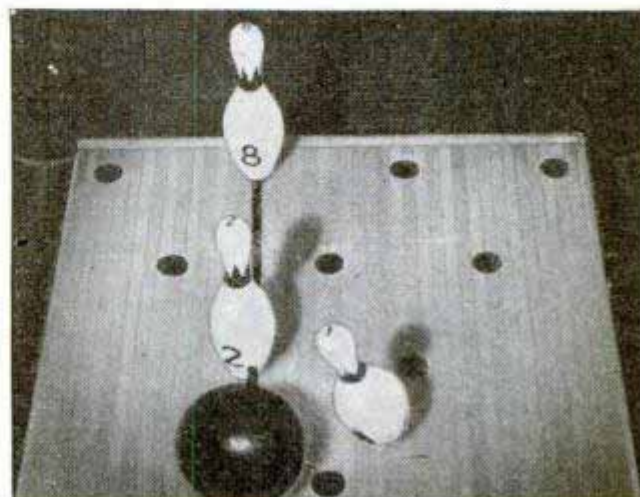
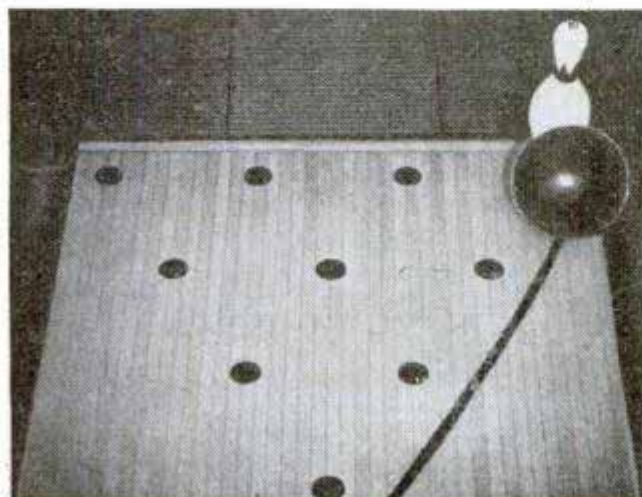
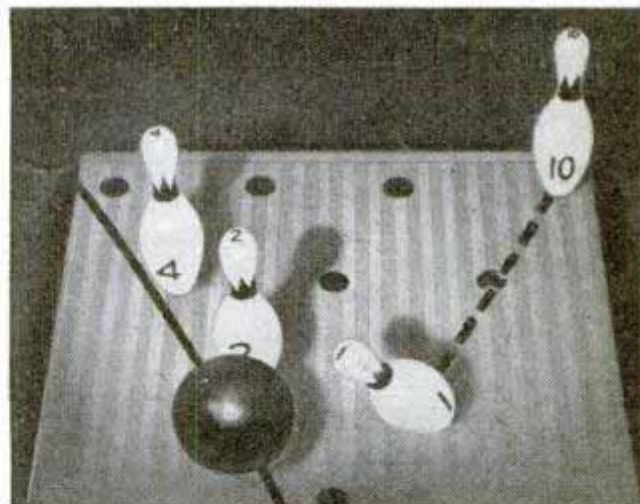
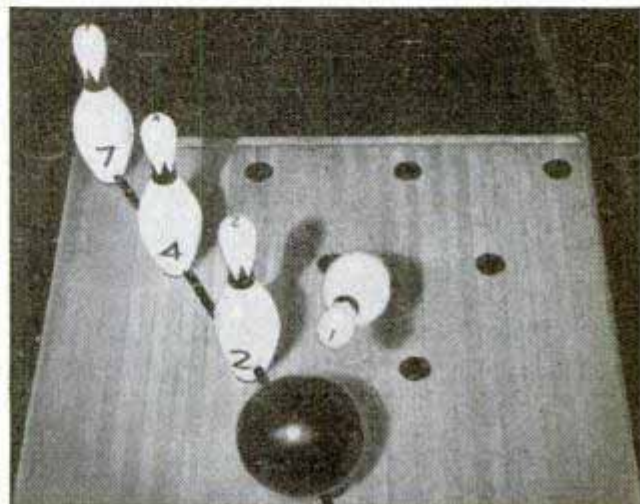
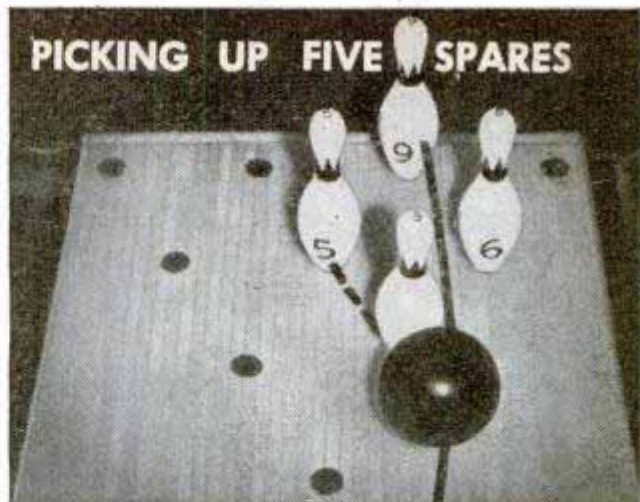
To illustrate these two points, let's assume that the 10-pin (back row, extreme right side) stands up after the first ball is thrown. The best way to shoot for the 10-pin is to stand at the extreme left side of the alley and face the 10-pin squarely. This provides plenty of angle. The approach is on a straight line toward the pin.

Bowlers who skid the ball along the right edge of the alley to pick up the 10-pin are doing it the hard way. It's very easy for the ball to roll into the gutter or hook to the left, missing the pin in either case.

When shooting for a pin or pins on the

(Continued to page 268)

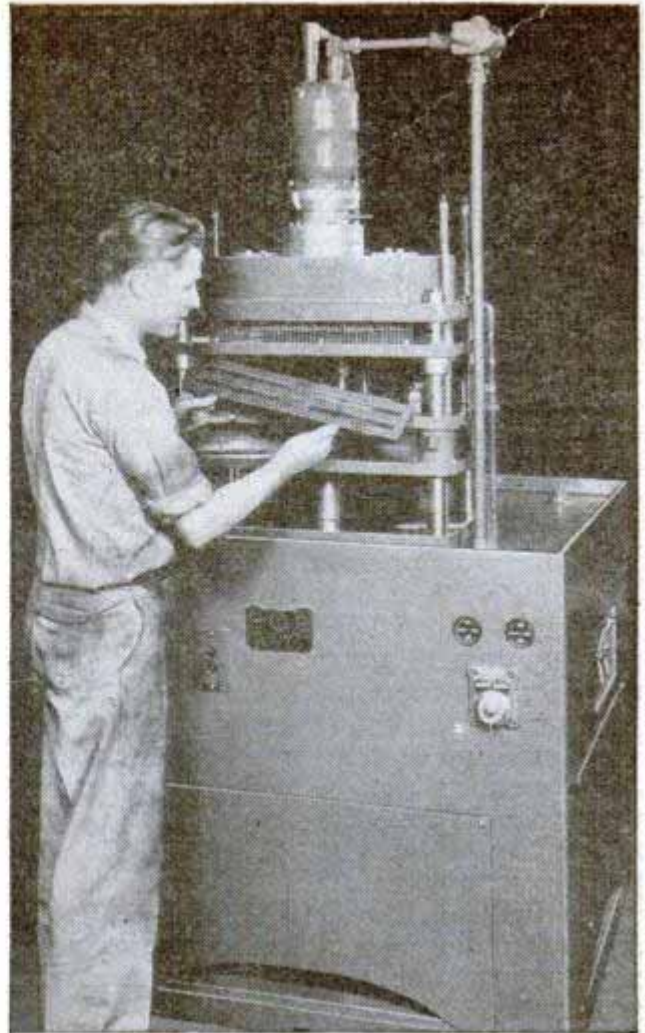
When shooting for spares, Wilman says, roll the same ball you do for strikes and angle it as much as you can. For spares on the left, move over to the right of the approach, but always come up to the foul line in a straight path from where you address the pins





Down Marker for Night Football

Four colored lights above the linesman's marker help night football fans follow the position of the ball and number of downs. Push buttons change the color of the signal at the top of the seven-foot standard. Green light indicates first down; amber light, second down; white light, third down; red light, fourth down. Devised by Paul Rickabaugh, former Nebraska star, it is powered by two flashlight batteries.



Drilling 385 Holes at Once

With a newly developed gearless hydraulic drilling unit, 385 holes can be drilled simultaneously in a gas burner. The entire drilling cycle is controlled by one operating lever. A hydraulic pumping system in the base operates the motor which runs the drill head, as well as the ram which brings the casting up to the drill head. New drills can be installed with pliers.



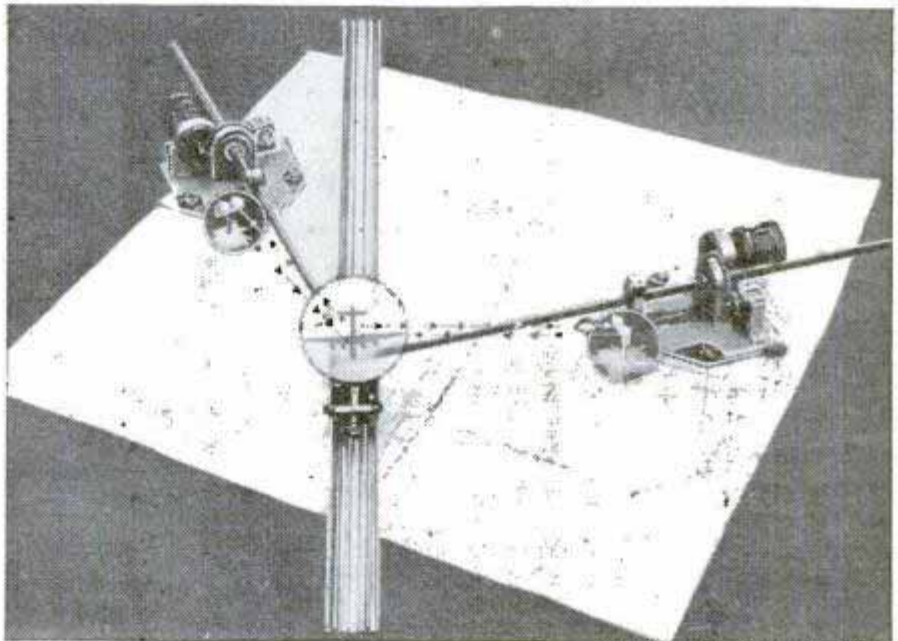
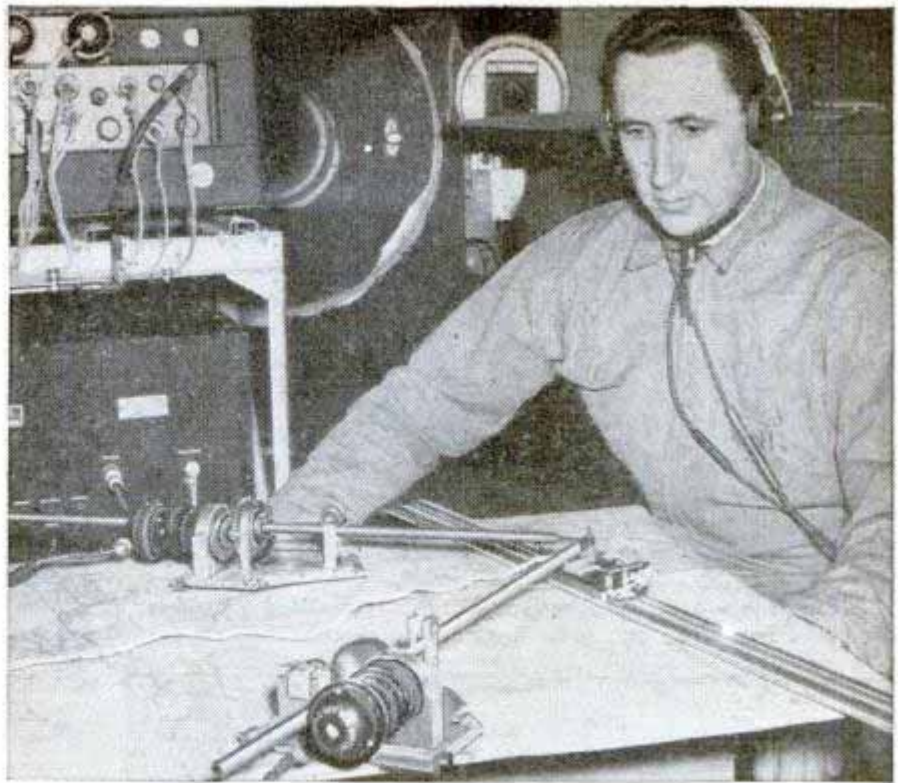
Floating Cafeteria

By drinking water and fluid nourishment through a tube, five-year-old Sandra Rhodes received the necessary strength to complete a one-mile endurance swim for which she trained for three months, in Lake Mead, Nev. Her coach, Louis Carter, himself a distance swimmer, accompanied the little girl on a float.

Names and addresses of manufacturers of new products featured in this issue will be supplied promptly by the Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11

Mapping Planes Fly Aerial "Chalk Line"

You can almost fly a "chalk line" 125 miles long with a precision flight indicator developed by the AAF for aerial surveys. Perfected models will limit the straight-line deviation to less than 100 feet, compared with best previous averages of more than 1500 feet. It operates in combination with shoran, used during the war to pin-point bomb targets through fog or darkness by triangulation. On mapping missions, high-frequency radio waves travel from the plane to two ground shoran stations, which retransmit the signal back to the aircraft. On the basis of the time required for the radio-wave round trip, distances to each ground station are automatically calculated to a thousandth of a mile. The indicator mechanically simulates, in miniature, the flight path. A pointer moving along a grooved metal channel duplicates the plane's progress and direction, while threaded rods, calibrated to scale, show actual distances from the plane to the ground stations. When the aircraft drifts off course the pointer pulls away from center on the simulated flight path and an instrument-board needle swings right or left. Experiments are now in progress at Wright Field, Dayton, Ohio,

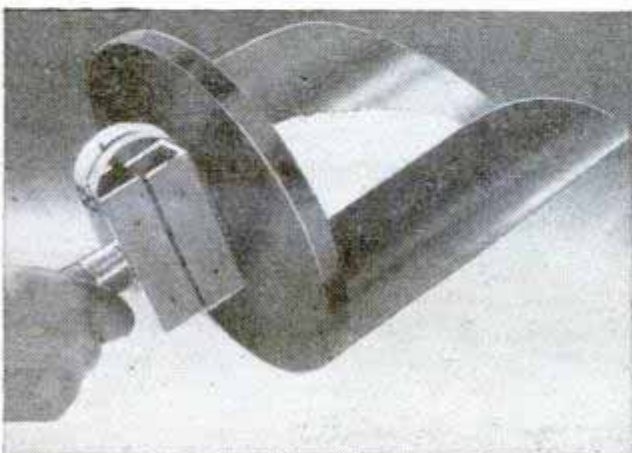


Air Materiel Command photos

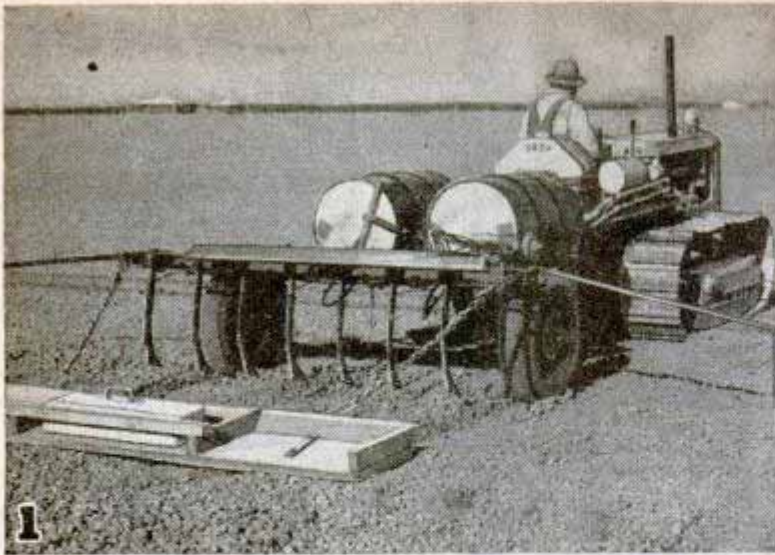
to connect the indicator to the automatic pilot so the plane can be held to its predetermined mapping line without attention from the pilot.

Scoop-Scale for Cattle Feed

Feed for cows is weighed in a combination scoop-scale that holds over four pounds. It will give accurate weight when held within 15 degrees of level. The scoop has a large maple handle, weighs 1½ pounds, and is rustproof.

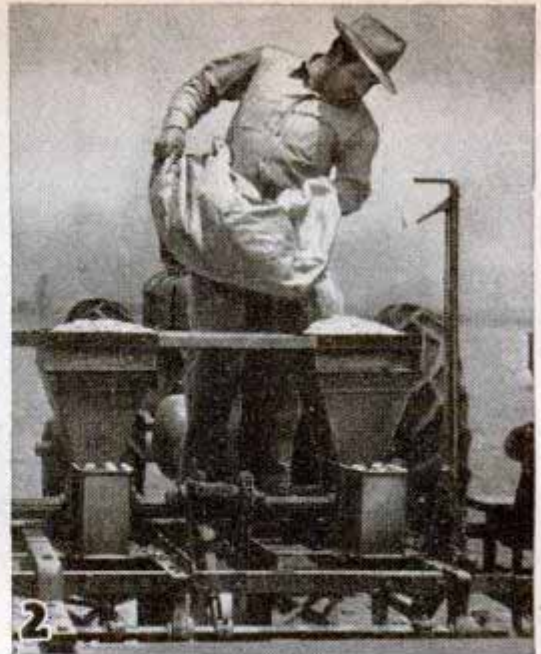


¶ Of the 5,726,000 trucks registered in the United States during 1946, California led the other states with 431,419; Texas ranked second with 369,409 trucks registered, and New York was third with 362,993.



1

Photos by Cy LaTour and Son
 1.—Soil is fumigated before lima beans are planted. Liquid is forced down tubes into soil. 2.—Loading a mechanical seeder



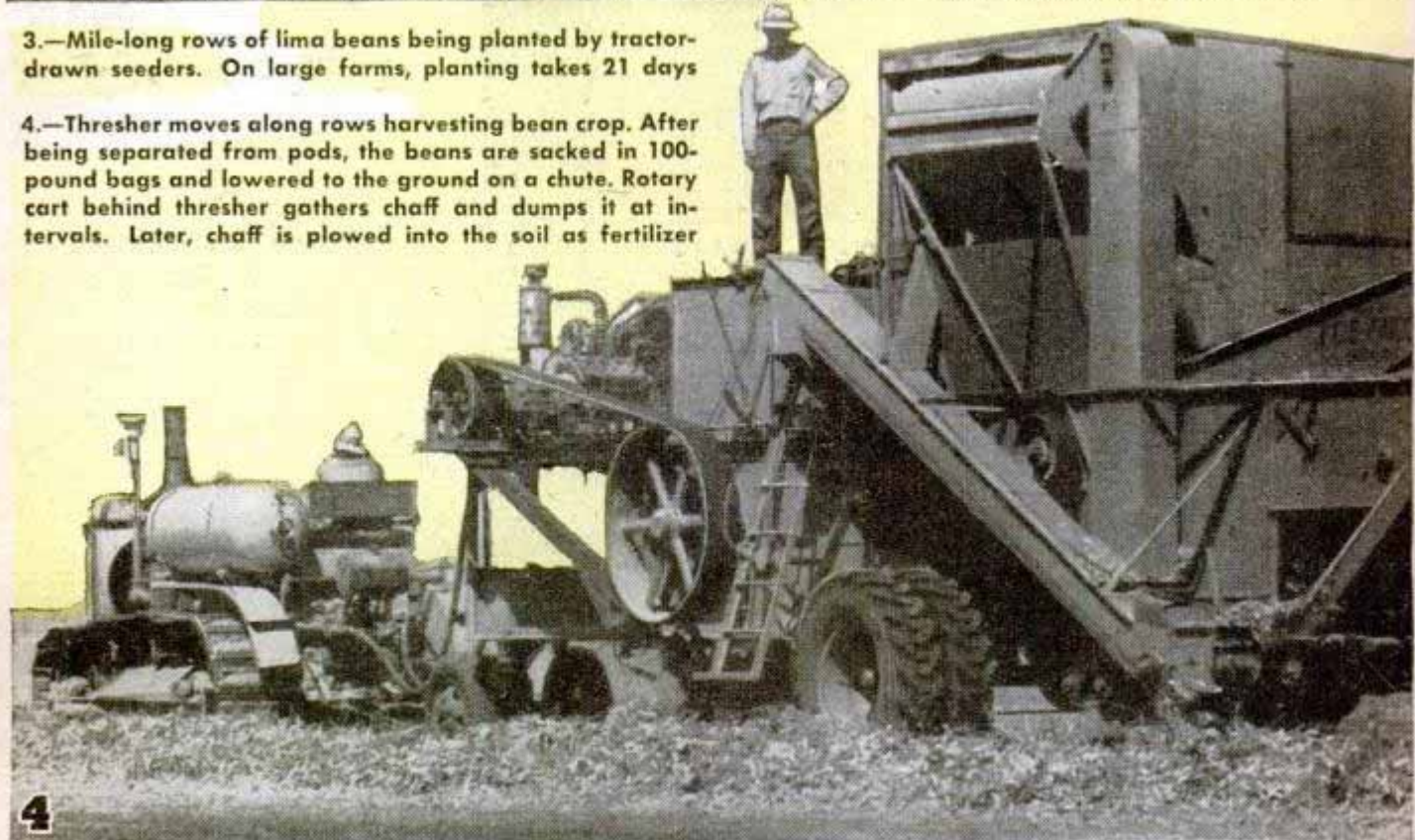
2



3

3.—Mile-long rows of lima beans being planted by tractor-drawn seeders. On large farms, planting takes 21 days

4.—Thresher moves along rows harvesting bean crop. After being separated from pods, the beans are sacked in 100-pound bags and lowered to the ground on a chute. Rotary cart behind thresher gathers chaff and dumps it at intervals. Later, chaff is plowed into the soil as fertilizer

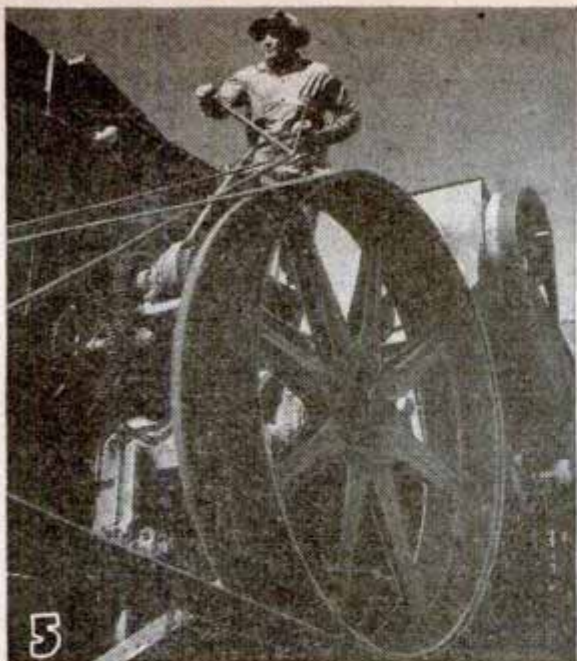


4

BEANS BY THE MILE

HAND-PICKING crops on the mammoth lima-bean farms of California is out of the question. Some rows are more than a mile long. Located on a narrow coastal strip between San Diego and Santa Barbara, lima-bean farms have gone mechanical.

The annual yield is valued at more than \$15,000,000. Lima beans



grow best in soil with a high moisture content. Morning fog along the west coast provides the moisture, but also makes harvesting a problem.

Mechanical pickers require dry bean pods. When pods are damp, they're pliable and can't be shucked by machine. So, harvesting starts late in the morning, after the sun has dried the pods, and continues long after dark.

Planting is done in April and harvesting begins in September. Thirty days later, the crop is on its way to the nation's dinner tables.

But beans are not the only useful product. The vines make excellent cattle feed and the chaff is used as fertilizer.

5.—Thresher operator sits atop machine. Large wheel is clutch. 6.—Threshed vines are baled for use as stock feed



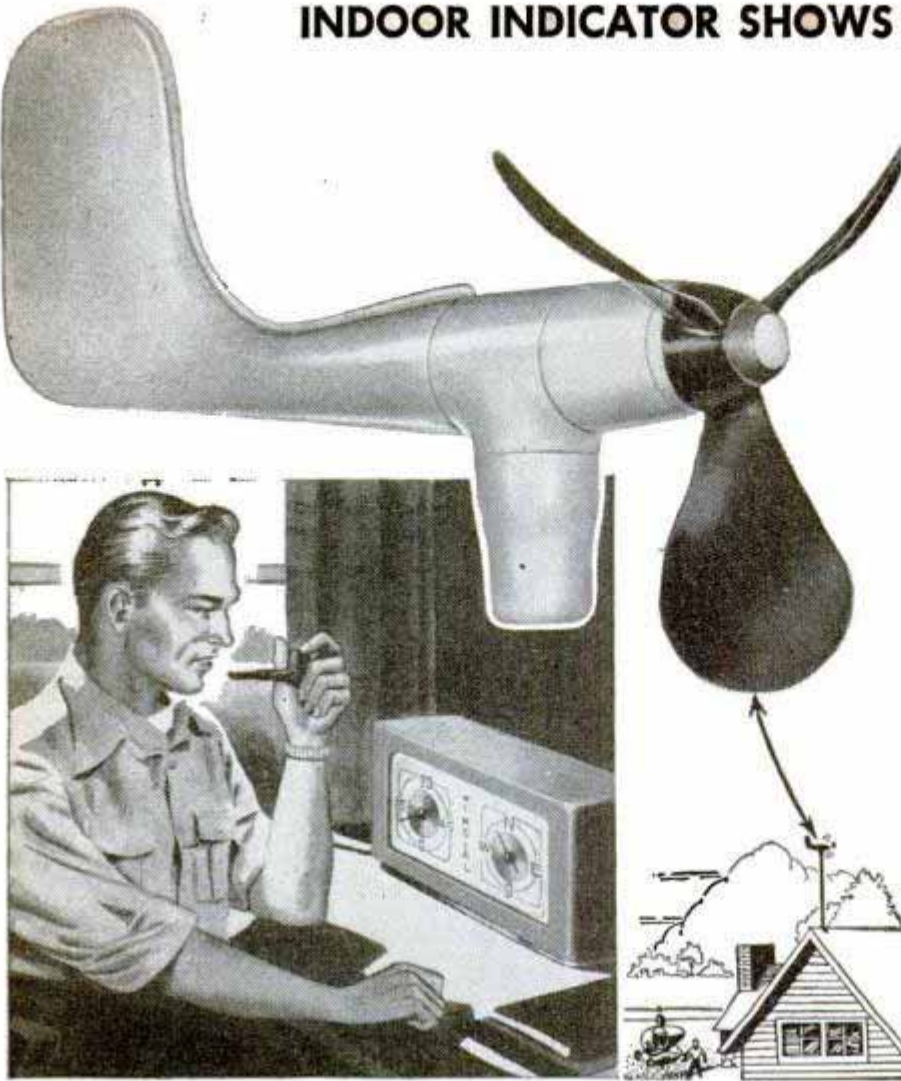
7.—Worker inspects beans on conveyor belt in warehouse. 8.—Threshing crew member removes sack from filler rack of moving thresher as work continues in the dark. Harvesting crews work long hours when pods are ready to pick



INDOOR INDICATOR SHOWS WIND CONDITIONS

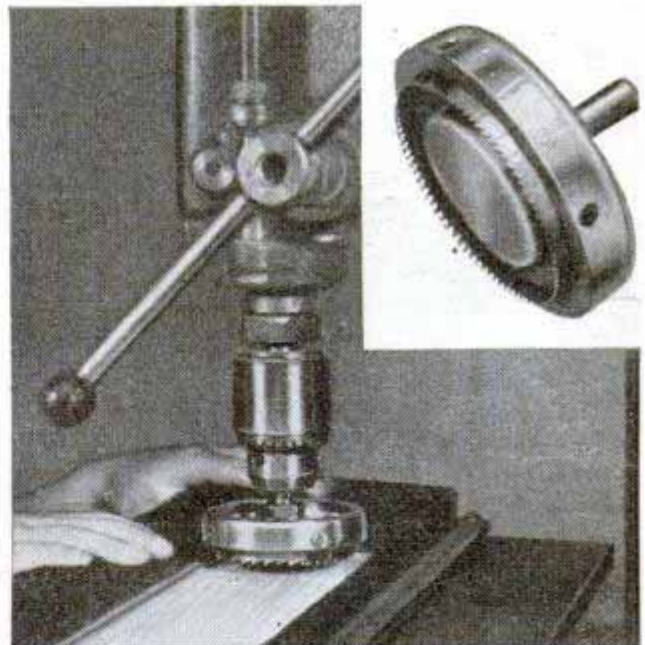
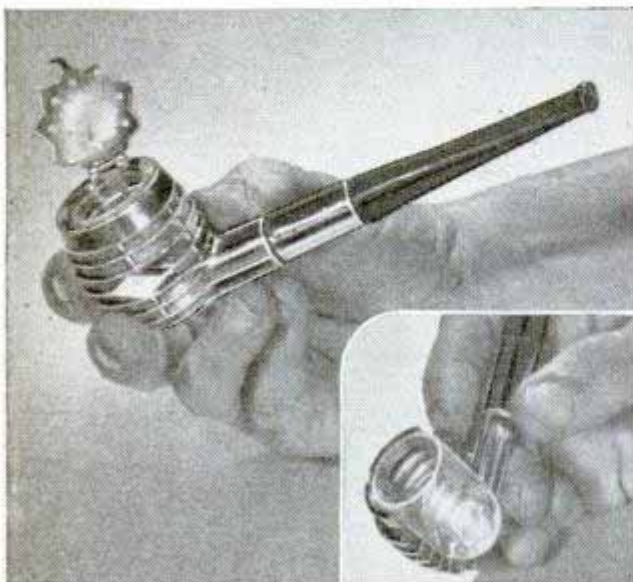
Wind speed in miles per hour and direction of the flow in degrees of the compass are shown on an indicator for the home or office. The instrument can be used at small airports, yacht clubs or flying schools. The detecting apparatus is a combination wind vane and propeller-type anemometer that is mounted on a stand outdoors in the unobstructed flow of the wind. It transmits wind speed and direction electrically to the indoor indicator, which is about the size of a small table radio. The unit can be plugged into any standard 115-volt a.c. outlet.

Travelers in 1870 could ride all the way from New York to St. Louis on six-foot-gauge railway track, the present standard gauge of 4 feet 8½ inches being adopted by most railroads by 1887.



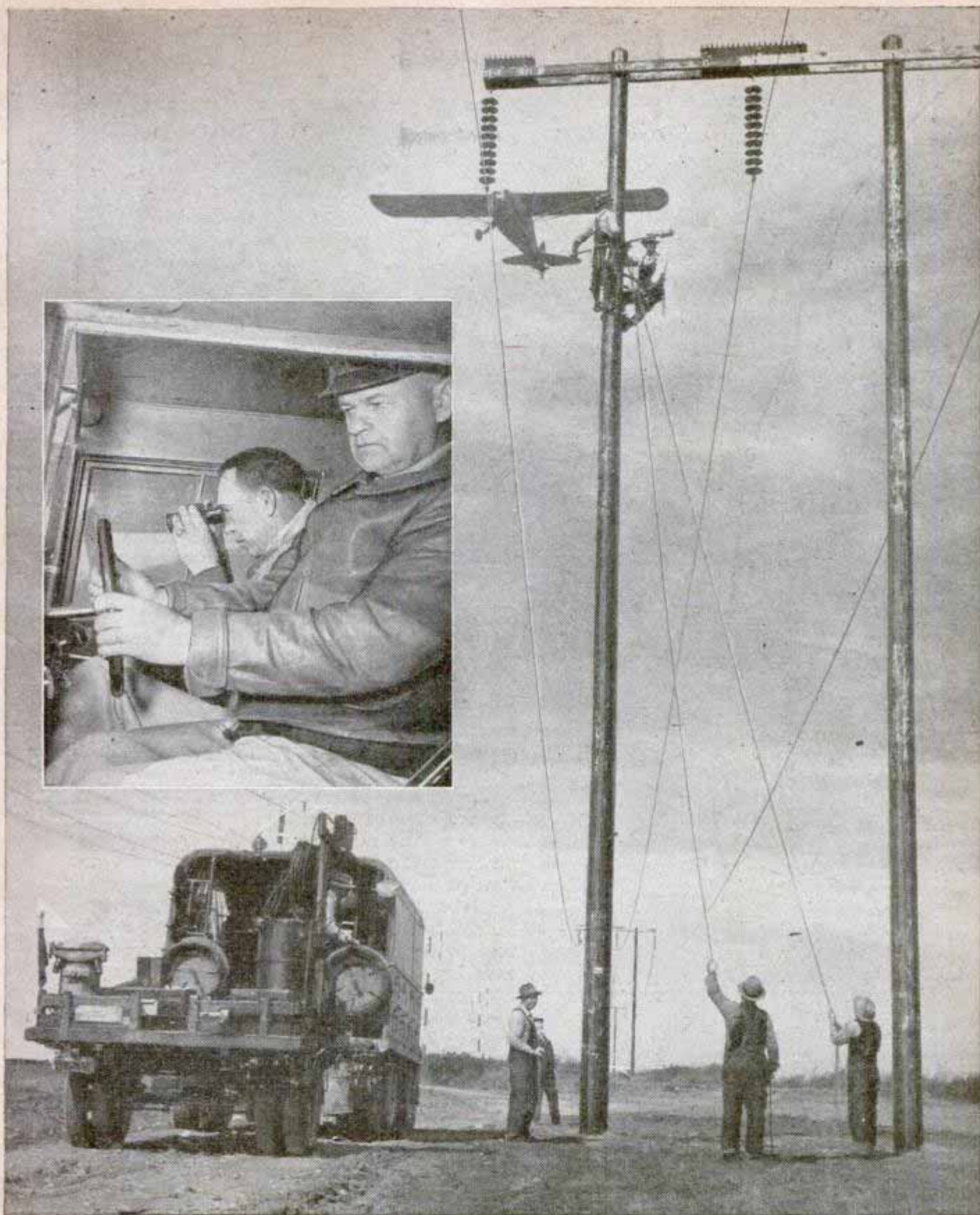
Rotary Planer Has 100 Teeth

With more than 100 saw-steel cutting teeth, a new rotary planer planes hundreds of feet of wood or plastic without adjustment or noticeable wear. When the cutting edge does wear down, the inexpensive blade can be replaced in two minutes without special tools. The aluminum head is fitted with an 8⅝-inch length of ⅝-inch bandsaw blade.



Pipe Has Bowl Made of Quartz

Quartz is used for the bowl of a new pipe to provide a cool, clean smoke. On the outside of the transparent bowl are aluminum ventilating fins which remain cool and make it easy to hold the pipe. A cap fits on top of the bowl to prevent hot ashes from flying out.



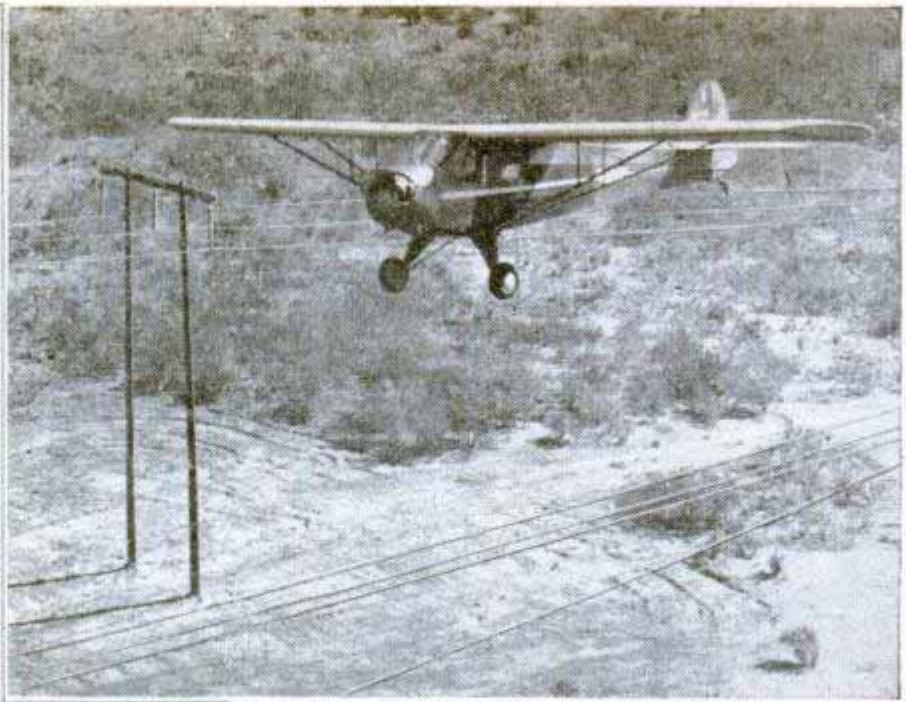
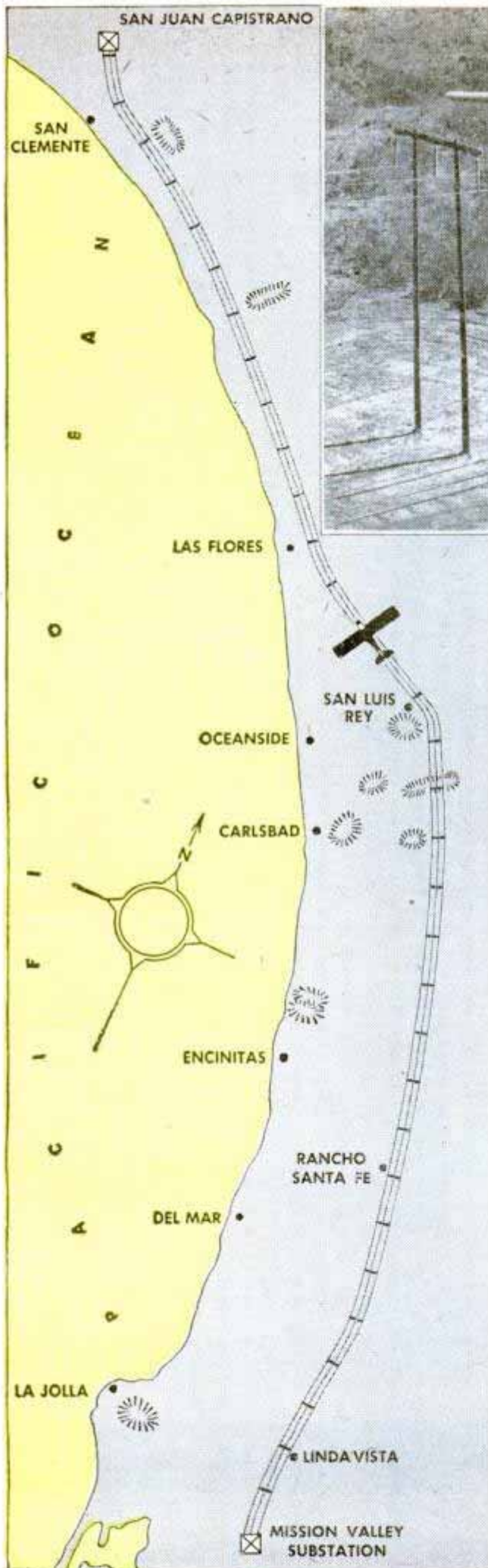
Plane carrying power-line inspector flies close to wires. Observer (inset) uses binoculars to check the line

By Howard E. Jackson

FLYING Trouble Spotters

THE AIRPLANE has replaced the horse for power-line patrol, but it has created a dangerous job for pilot and observer.

During the wartime ban on flying it took eight days to inspect the high-tension lines of the San Diego Gas and Electric Com-



It takes only two hours for the light plane to fly from Mission Valley substation to San Juan Capistrano and back. On horseback, the trip required eight days. Each side of the poles is viewed during the air trip

pany on horseback. Now it takes two hours to fly the same route—from San Diego to San Juan Capistrano, and back.

Every two weeks Arnold H. Peik, pilot, and Walt Stone, inspector for the company, fly this 130-mile round trip. It's Stone's responsibility to note any damage to the lines as they skim alongside at 70 miles an hour.

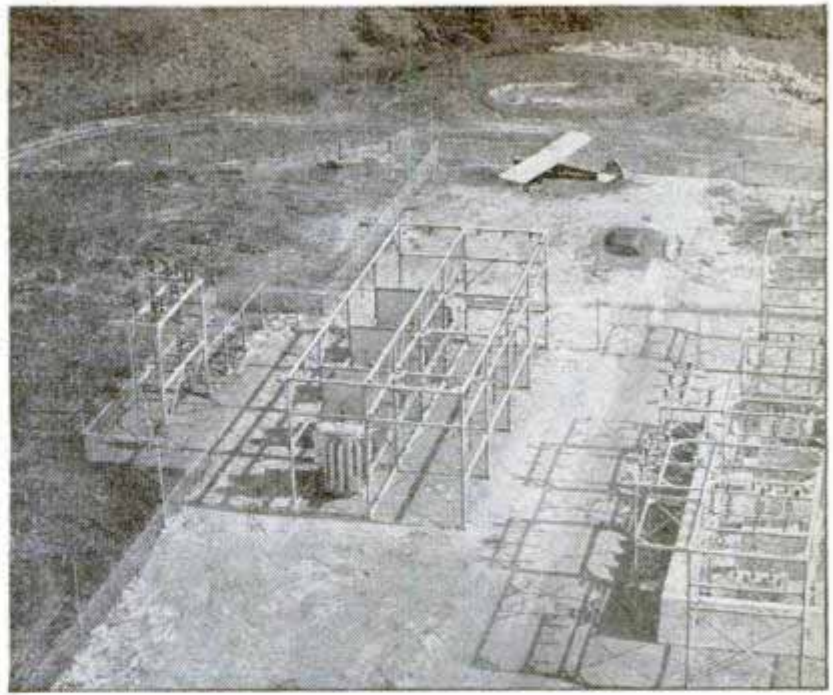
There are 450 two-pole structures to check, one every 750 feet. By keeping count of the number of poles from points or turns the inspector can mark the location of damaged poles on the map.

Close inspection means constant vigilance on the part of the pilot. Flying a few feet to the right or left of these wires, or crossing over them, is dangerous even for a veteran flyer. If a side gust, or downdraft, blew the plane onto the wires it might mean electrocution for the two men.

During more than 50 flights the "T" craft has never so much as burnt a wing tip, but hot wires are not the only hazards which are encountered. The country is rugged; flight altitudes seldom exceed 300 feet. Should the motor conk, the plane would quickly crash land in a tree or rock-strewn gully. Even though the landing speed is relatively slow, the pilot and observer could be severely injured.

One time the carburetor froze up, the engine started to sputter. Peik gunned it, desperately. The engine caught just as the wheels were skimming the tree tops.

There's plenty of wind and rain, resulting in rough rides, but only once was the plane forced back because of fog and stormy weather.



"Paul Revere" of power line is supplanted by inspection plane starting from station near San Diego, Calif.

Civil Aeronautics Authority issues a special permit for this plane to fly at such low altitudes, and the day before each flight the pilot must obtain clearance to fly over Camp Pendleton. Once the plane was almost blown to pieces when a shell exploded beneath it on the ground. The concussion pushed the plane upward, bent the wings violently but did not break them.

Despite the fact that the plane made special periodic flights over the camp during the war, no GI ever took a hasty pot-shot at it. But once a shepherd did. He thought the pilot was trying to frighten the sheep. So he let loose with his double-barrel and filled the fuselage full of holes. The boys at the airport counted 27 of them!

Despite all the hazards, neither pilot nor observer has ever been hurt. Only once did they inadvertently do anything to annoy the people who live near the right-of-way. They were unaware of this until after the lady of the house had sent in a complaint. It seems they flew so close to her home that the bees, which were lodged in her old chimney, got so excited they

swarmed into the house and stung her. Now the trouble spotters fly on the other side of the line.

As soon as the plane returns to the airport the inspector reports all damage and ground crews are directed to the trouble spots by two-way radio from headquarters. Ground crews often run across rattlesnakes and other wildlife on their trips into the back country to straighten up poles or clear out underbrush.

The company has 10 trucks and trouble cars equipped for radio reception. Once, during an emergency, a dispatcher located two trucks, both with two-way radios, and directed them to opposite sides of a deep ravine which was flooded. They were to save the two key poles. The trucks, in turn, communicated with each other across the canyon by radio and saved the long span of line that stretched between them.

After damage has been repaired, word is sent back to the company's own broadcasting station, KROA, in the main service building, and electricity once more flows through the lines.

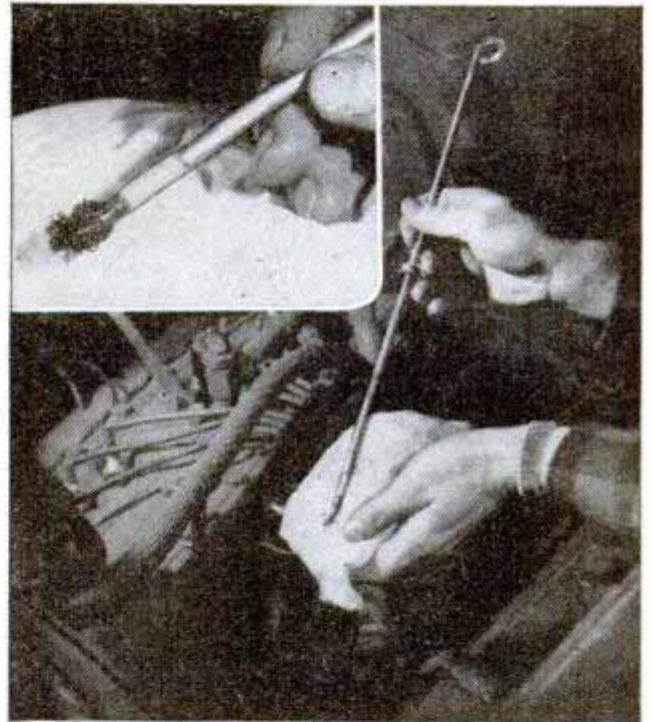
Taylorcraft taking off for power-line patrol is identified by "Elect. Insp.," marked on underside of wing





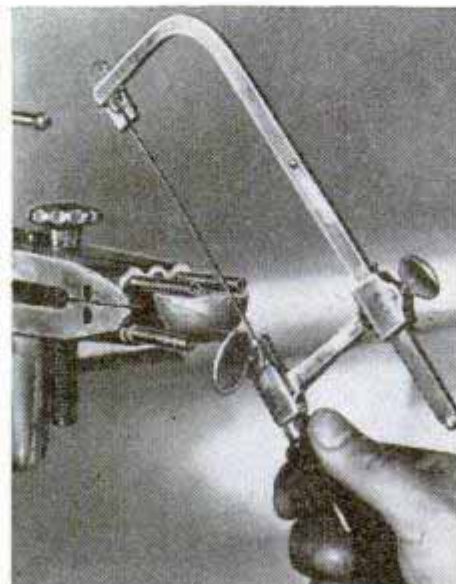
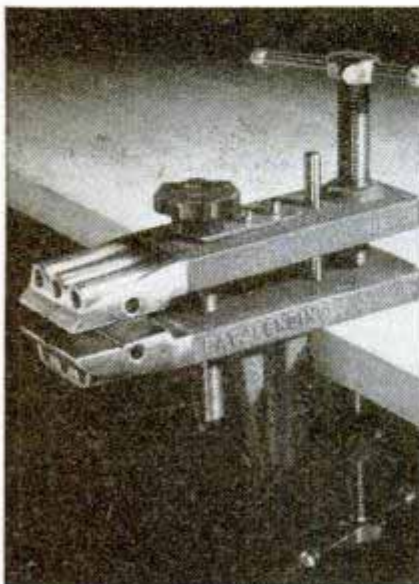
Navy Tests Frozen-Food Container

Frozen foods may be part of the everyday Navy diet if experiments with a new container are successful. Climate has been the big barrier to the use of frozen foods by the Navy. Foods that stood even a few minutes in tropical climates would spoil. Designed by a former supply officer, the new container is a canvas-covered, cork-lined bag that holds 200 pounds of food. Before the bag is filled it is precooled for two days in a refrigerator at 10 degrees below zero. After the food is packed inside, the bag is sealed in a cold-storage plant at below-zero temperature. The bag's inside temperature is not expected to rise more than one degree an hour when removed from cold storage and transferred from one ship to another. The Navy hopes to develop a cheap container that can be discarded after use.



Magnetized Oil Dipstick →

Metal engine particles which chip off into the oil stream are picked up by a magnetized dipstick that will measure the oil level. When the stick is removed and wiped off, the particles adhering to the magnetized end are also wiped off. Magnetic dipsticks have been designed for use in autos, trucks and planes. The stick has a knurled place at top and bottom to indicate full level and low level of oil. The tip is painted red.



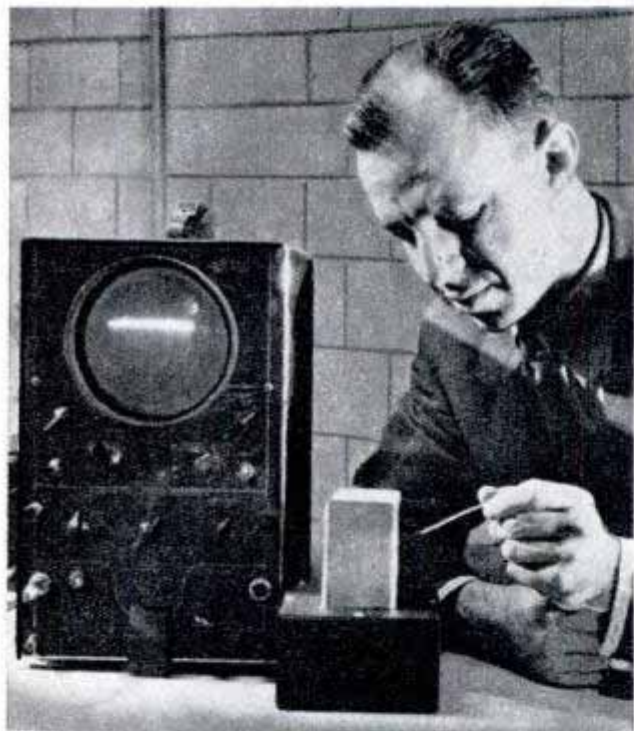
Vise With Fingers Holds Odd Shapes

Balls, disks or irregular-shaped objects are held firmly by a vise equipped with steel extension fingers. Made of solid bronze, the vise has holes drilled in three sides for the steel fingers. The rear clamp screw adjusts the angle of the jaws, while the front adjustment knob controls their relative position. The fingers permit a wide range of adjustment.

X-Raying Oil Fields

By X-raying sand removed from oil-well drill holes, petroleum engineers forecast how much oil, gas and water will flow through rock strata deep underground. In this method, developed by Gulf Oil Corporation, movement of oil, gas and water forced through sand samples is studied with an X-ray machine.

Rock sample is placed in X-ray machine. Inset, rock cast in Bakelite for test

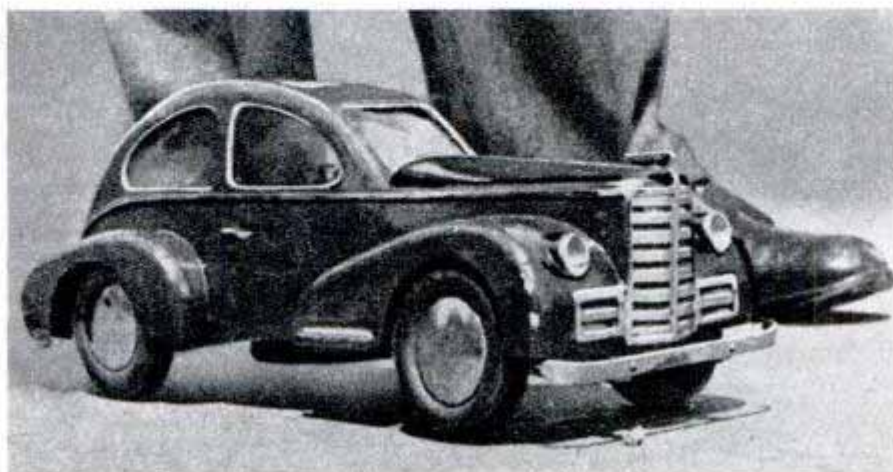


Atomic-Ray Counter

Radiations from exploding atoms are counted accurately at a rate of 100,000 a second by a detector that records any kind of rays or particles thrown off by radioactive atoms. Still in the experimental stage, the detector was developed by Westinghouse scientists. It is 50 times more effective than the Geiger counter which "chokes up" after an intensity of about 2000 radiations a second has been reached. Geiger counters also need separate attachments for the detection of different kinds of rays while the new instrument picks up all radiations. When a piece of wire tipped with radioactive material is held a few inches from the detector, particles from the exploding atoms penetrate a box and produce an electric current which is amplified 1,000,000 times. This current is transmitted to the fluorescent screen of an electronic oscilloscope where the exploding atoms appear as flashing peaks of light.

Tiny Diesel Engine Drives Toy Car

Miniature toy automobiles with real Diesel engines are being built by a German engineer for the export trade. The little cars, modeled after the modern European automobile styles, are less than a foot long. The Diesel engine is about the size of a cigarette package.



SALT-WATER RAILROAD



Steel framework at Edgewater, N. J., terminal supports two 125-ton cranes which load freight cars into seatrains

FREIGHT TRAINS a mile long, loaded on special ships in five hours, are floating 14,000 tons of cargo a week between New York and New Orleans. This seatrain service was recently resumed after a five-year interruption caused by the war.

The seatrains are loaded by pushing

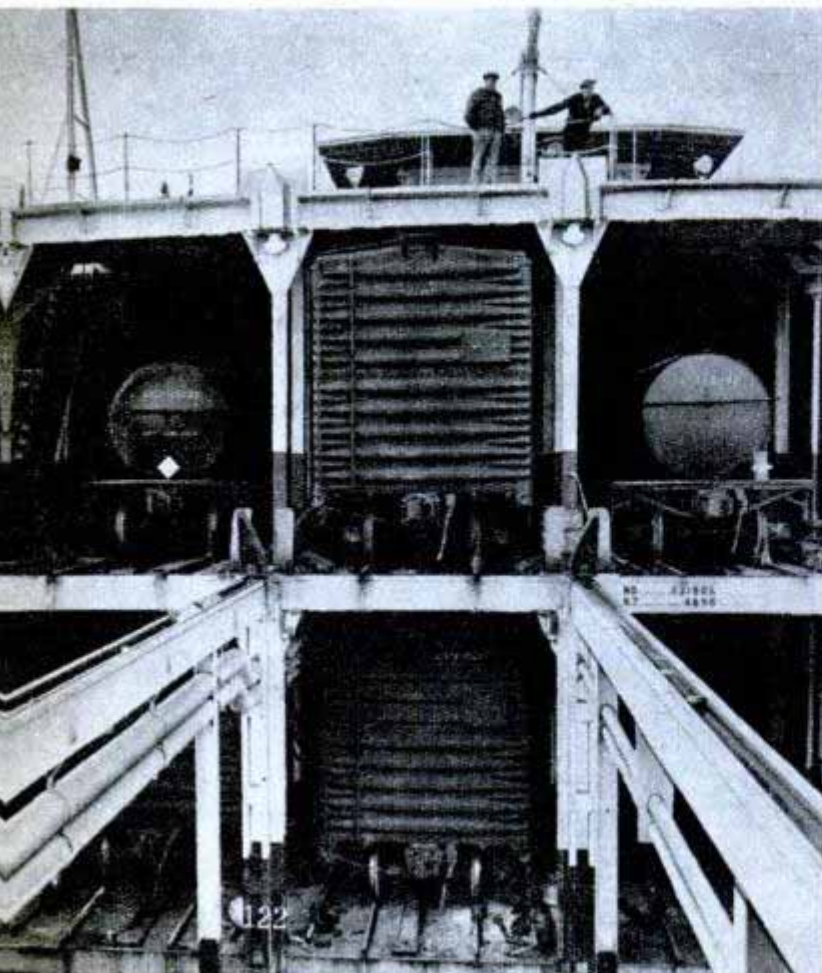
each freight car onto a special cradle with a Diesel locomotive on the pier. The cradle, a portable section of track and roadbed, is lifted by a 125-ton crane and deposited in an open section of the ship. The cradle is placed at a track level and the car is towed into position by a cable operated from a steam winch. The last car on each of the 16 tracks—four on each of four decks—with its cradle completes the length of track and eliminates waste space. The cradles placed on the top deck are weathertight, protecting the lower decks.

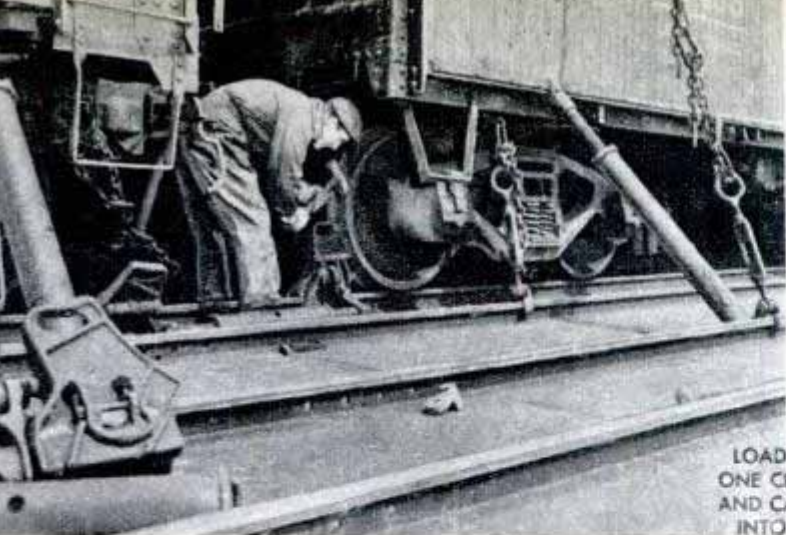
Four rail clamps for each car prevent them from rolling, and chains and turnbuckles draw the cars to powerful jacks, which prevent sideways in heavy seas.

Shipment of cargo in cars by water compares with straight rail in speed. Handling and damage to cargo are reduced to a minimum. Both New Orleans and Texas City were originally serviced, but the facilities at the latter were destroyed in the April disaster and currently all four ships are using the Louisiana port. New Orleans to Havana shipments by a fifth seatrain are scheduled to be resumed.

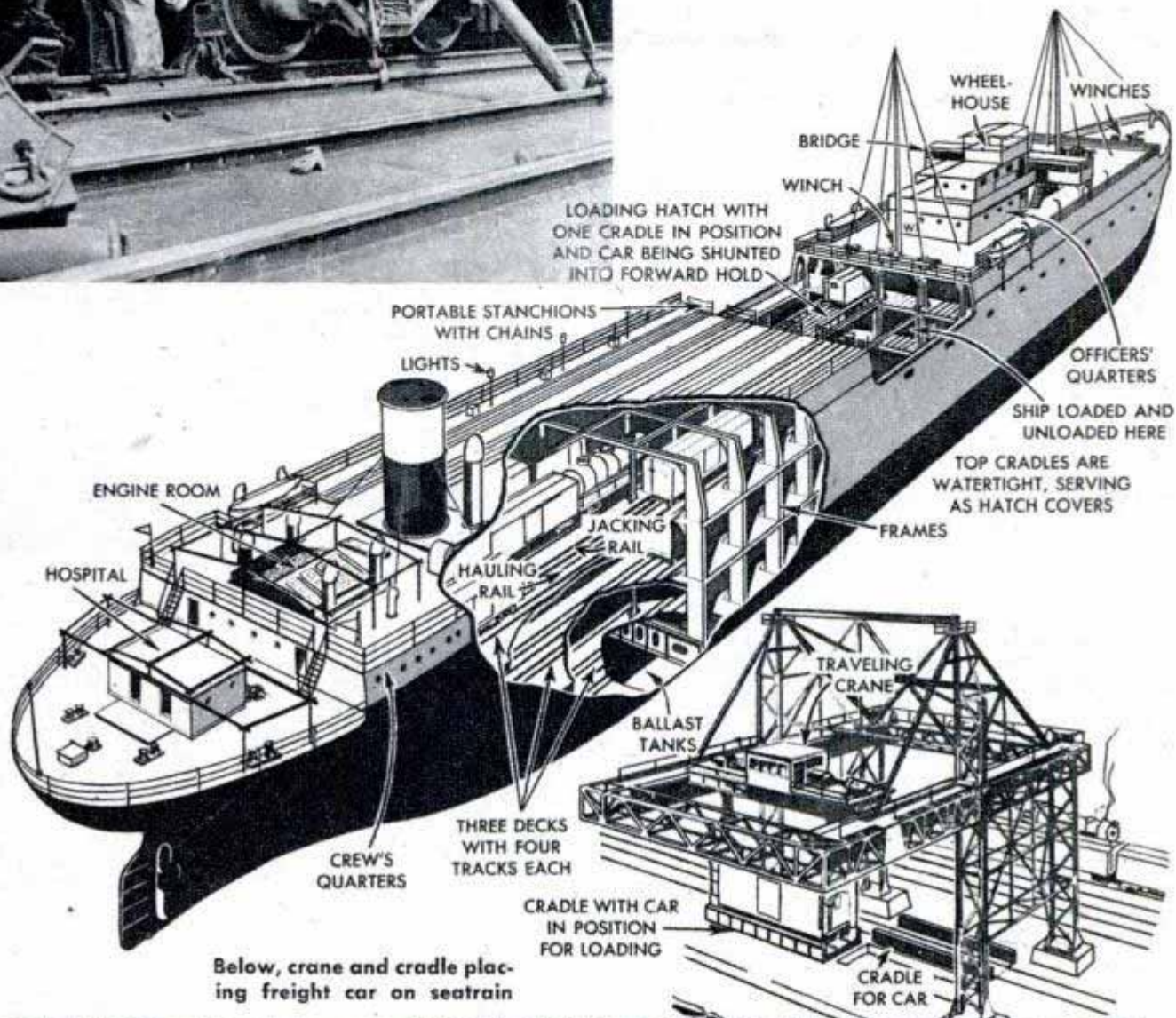
The seatrains are 480 feet long, with a 63-foot beam. They carry 100 freight cars, a net cargo of 4000 tons and a gross load of 6000 tons including the 100 cars. They cruise at 16½ knots.

View at open section shows three lower decks on which freight cars are loaded. Below decks, cars are moved by means of a special steam-driven gear

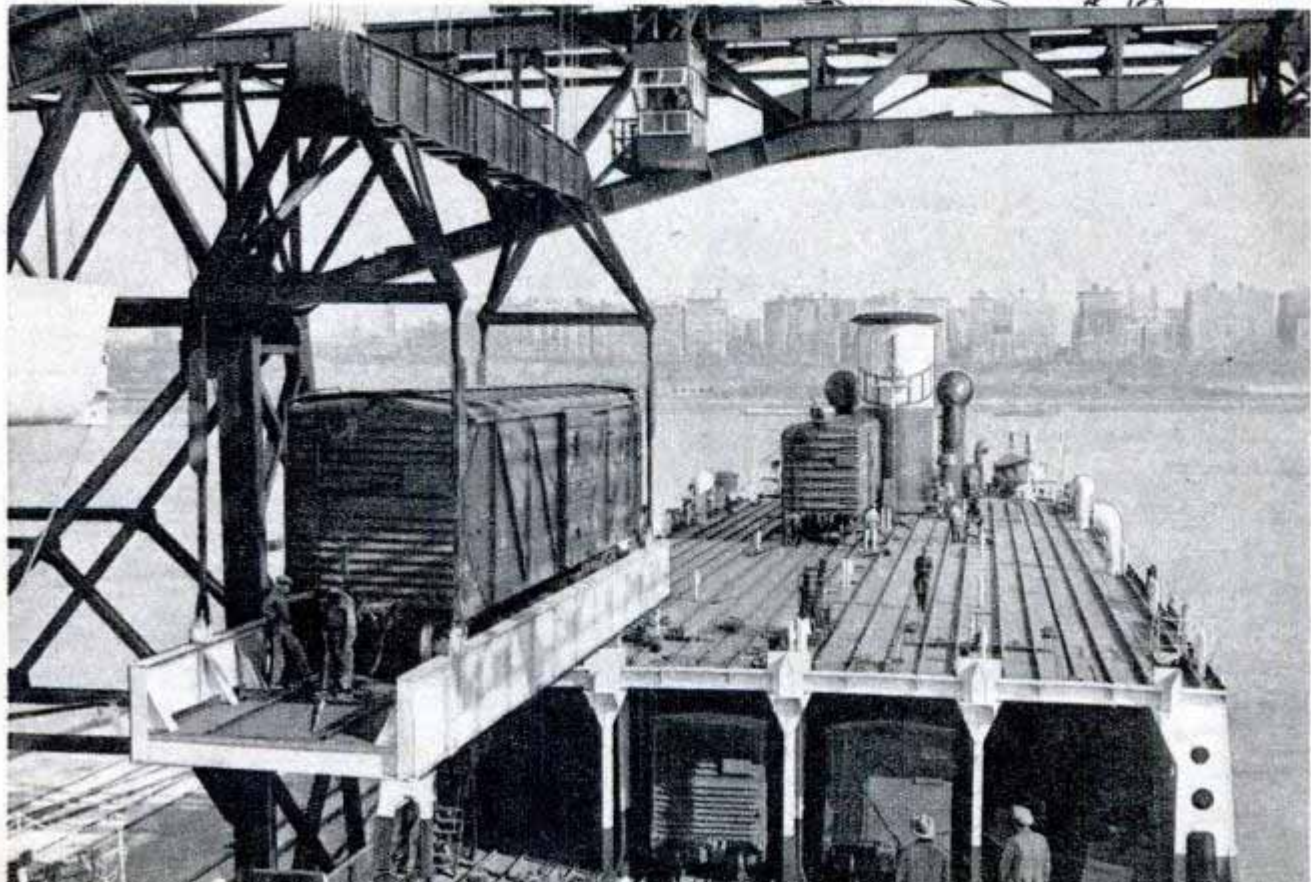




As soon as a car is placed in its assigned position, the wheels are locked by four rail clamps to prevent it from rolling along tracks



Below, crane and cradle placing freight car on seatrain





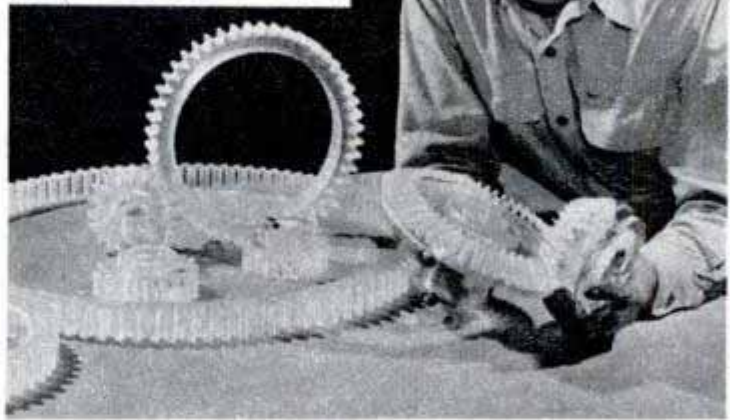
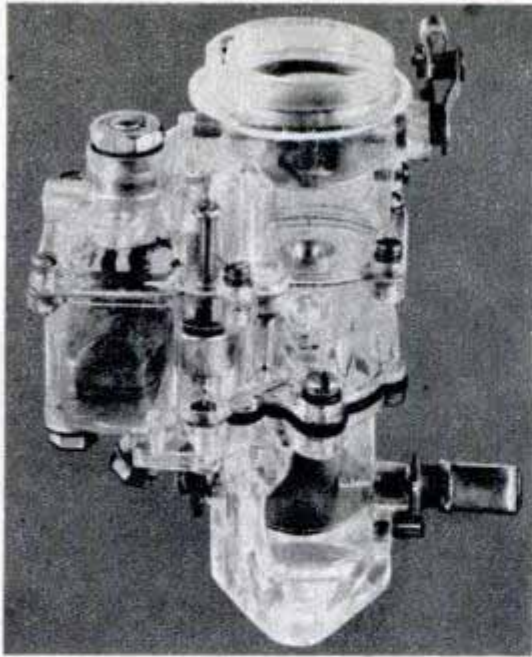
COLLAPSIBLE COPYHOLDER holds papers from 18 to 36 inches wide. After use, it can be folded for storage in the typewriter desk. One lever moves the copy up and down. It is held firmly by the typewriter's weight

SHALLOW-DRAFT HYDROPLANE is powered by a light Franklin airplane motor. Twin pontoons provide buoyancy and a wire screen protects occupants from the propeller. It is used on the Rogue River in Oregon

TRACK-TYPE landing gear may enable heavy aircraft to operate from rough fields. The retractable gear weighs 1075 pounds more than conventional equipment. It is being installed on a troop-carrying Packet for testing

Fairchild Aircraft photo

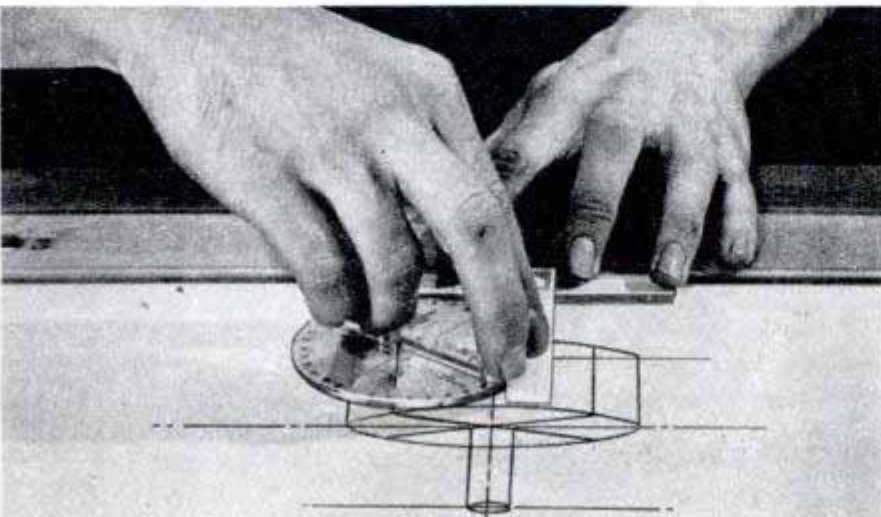
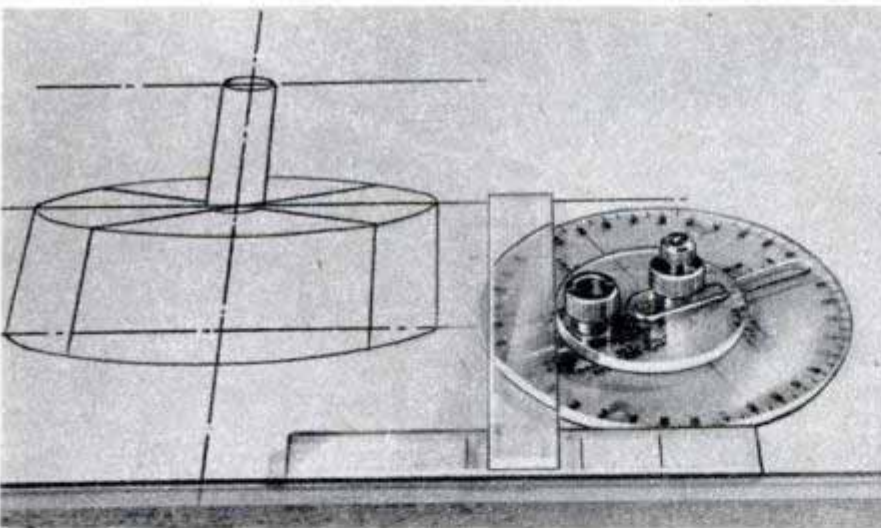




TRANSPARENT MODELS EXPOSE WORKS

His technique developed at Fort Belvoir for low-cost molding of plastic models has been put to use in civilian life by a former Army sergeant, who is molding transparent plastic electric irons and similar products for demonstration purposes. The

method was developed in the Fort Belvoir model shop, where complicated engine parts, carburetors and gears were molded in transparent form for teaching purposes. Dies made of zinc alloy were found to be the most suitable for this purpose.

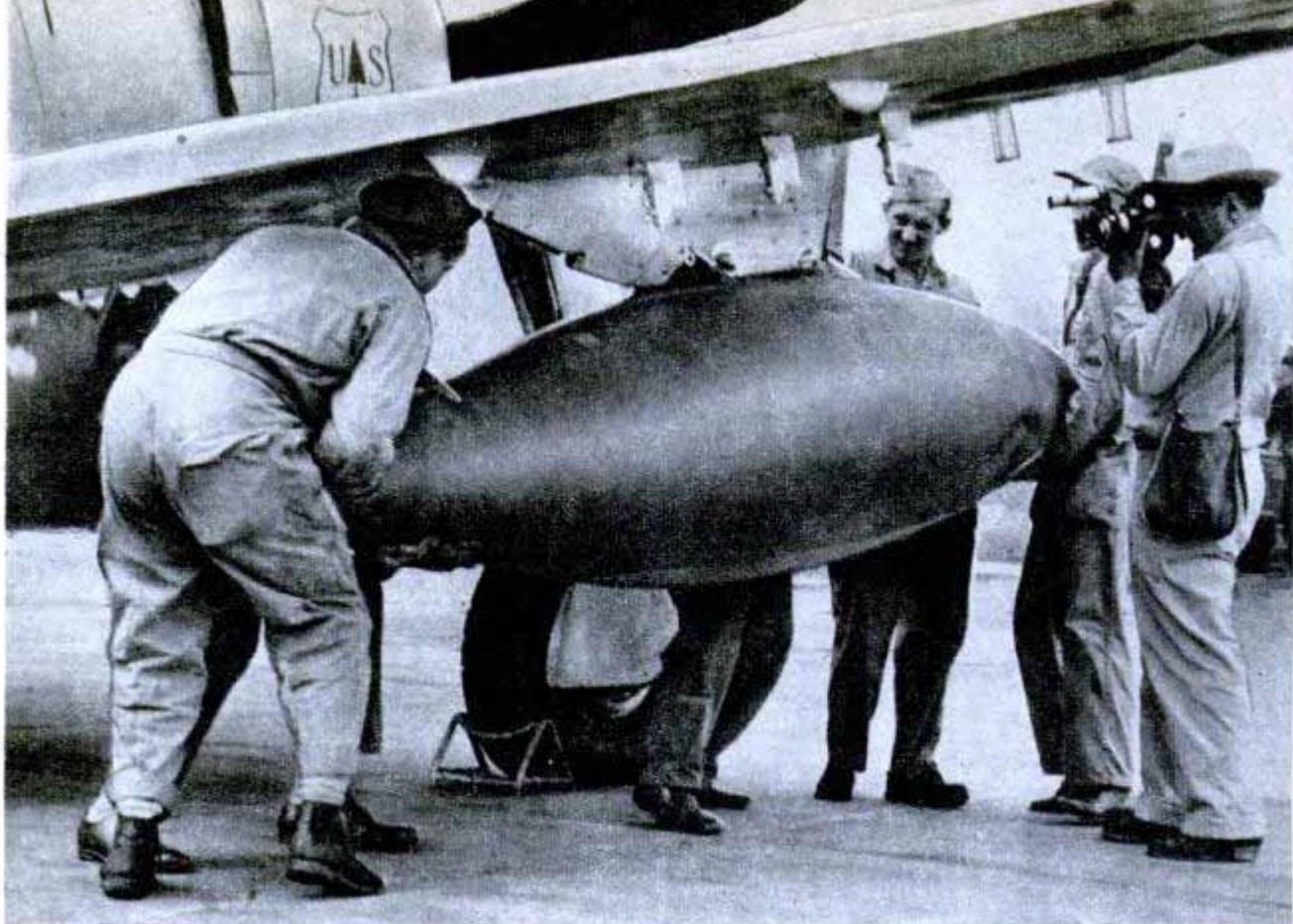


Plastic Instrument Draws Ellipses

Made of transparent plastic, an inexpensive instrument for draftsmen and artists draws ellipses of desired dimensions by setting two adjustable knobs. The unit consists of two disks and a T-shaped guide. In drawing ellipses in which the major axis is less than $1\frac{1}{4}$ inches, both disks are used. For making ellipses up to three by six inches, the small disk is removed and only the larger disk is used with the guide. For extremely fine work, the instrument can be used to draw ellipses the size of a pencil dot. It can be used with pencil or for inking or scribing.

Boeing high-altitude experiments have proved that big planes have shrunk several inches in size by the time they reach 40,000 feet.

*out of business
refer to Sept 48-101*



U. S. Air Force photos

Test unit attaching bomb under P-47 wing. To simplify handling, it's done before they're filled with water

WATER BOMBS **for** **FOREST FIRES**

BOMBS whose bursting looses tons of water or chemicals are getting their first tests against western forest fires. In doing it, fighters and bombers that once spread fire and destruction are helping to drench blazes that yearly destroy 31,000,000 acres of valuable timber in the United States.

The experiment sponsored by the Air Force and the U. S. Forest Service is going on over Lola National Forest in Montana, using a B-29 Superfortress and two P-47 Thunderbolts. Fires from 100 to 150 feet in diameter are set for the tests.

In contrast to meager prewar efforts, like kicking five-gallon cans of water out

Bombers can carry the water-filled tanks both inside and out. The test B-29 dropped three 4000-pounders



of plane doors, the three planes at Lola drop water-filled auxiliary fuel tanks weighing 13,000 pounds and more on a single sweep. In the initial test, three 4000-pound containers were attached beneath the B-29 and each P-47 carried a pair of 165-pounders under its wings. Tail fins and fuses added in Forest Service shops converted the thin-shelled tanks into bombs.

To evaluate aerial fire-fighting techniques, two of the big bombs had proximity fuses, set to explode over the target and saturate the flames. The third, and all four small fighter tanks, were fixed to shatter on impact, throwing water, dirt and debris in the inferno's path.

Experiments are also in progress to make water "wetter" with chemicals that reduce surface tension and make it flow better. Instead of forming beads and staying on the surface, the wetter water penetrates and spreads. It is especially effective in knocking out smoldering fire on the ground after the main blaze is stopped.

Speed is the biggest asset in fighting forest fires. Even with more roads, there are thickly wooded sections where foot and horse travel are the only means of access. Crews have taken a week to reach fires in such localities. As a result, in one holocaust, small fires merged to sweep a region



Bombing to halt instead of spread destruction, war-trained airmen drop their water-filled missiles within 25 feet of the blazing "bull's-eye"

150 miles long and 25 miles wide, destroying timber, small towns and taking 87 lives. Lightning frequently starts hundreds of fires in a single afternoon.

In all, some 200 modified fuel tanks will be dropped, along with 100-pound chemical bombs, 184 of which fit into a B-29 bomb bay.

Another facet of the program is aerial delivery of men and equipment to blaze sites. In just one of the Forest Service's regions, 160 trained "smoke jumpers" will parachute this season to otherwise inaccessible small fires.

One of the two techniques being tested by the Forest Service and Air Force is based on air bursts over the fire, drenching the flames. The impact explosion method concentrates more on halting the fire's spread

P-47 DROPS TWO 165-GAL. WATER OR CHEMICAL BOMBS

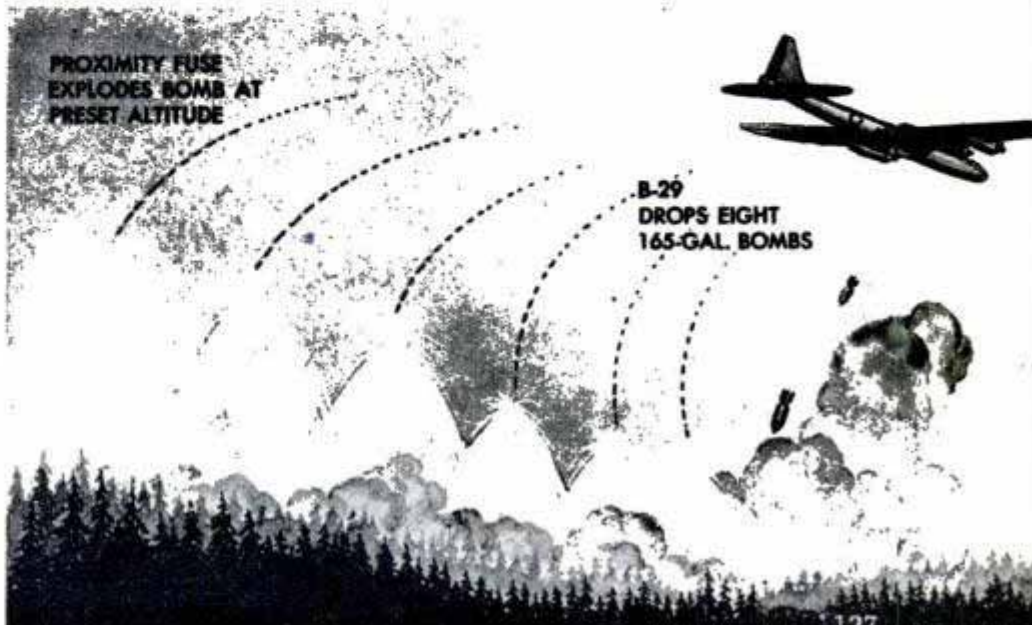


WATER OR CHEMICALS IN BOMB SPREADS OVER WIDE AREA

PROXIMITY FUSE EXPLODES BOMB AT PRESET ALTITUDE



B-29 DROPS EIGHT 165-GAL. BOMBS





Four-Wheel Steering Guides British Truck

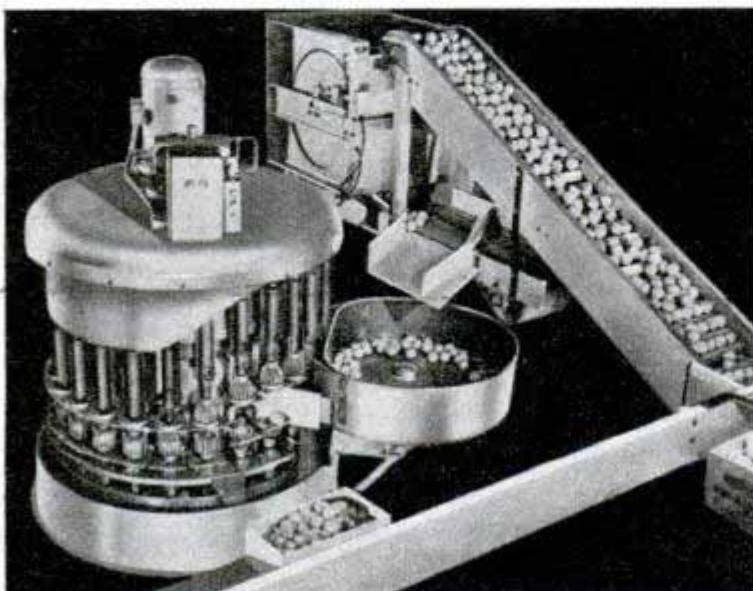
Operated by special steering apparatus, all four wheels of a British truck turn when the driver turns the steering wheel. The engine is equipped with a direct fuel-injection system in which gasoline is fed directly to the cylinders, eliminating the need for a carburetor. The fuel-injection system, which adjusts itself to engine-running conditions, is said to be more economical than ordinary fuel systems.

Steam Cooks "Spuds" By the Truckload

When the federal government gave the Colorado State Hospital at Pueblo 15 carloads of cull potatoes to feed to the hospital's 1000 hogs, officials had to devise a way to cook the "spuds," since a third more food value is obtained by cooking a potato. Boiling two tons at a time would have been an expensive method so the farm supervisor suggested steaming them in a truck body. The truck was filled with potatoes and driven to the hospital's heating plant where a steam hose was connected to jets in the bottom of the truck. Forty minutes after the steam was turned on the po-



tatoes were cooked. They then were mixed with mash and fed to the hogs. About 420 pounds of cooked potatoes have the food value of 100 pounds of expensive corn.



Whole Oranges Handled By Automatic Juicer

Whole oranges instead of halves are squeezed by a new juicer which can handle 480 oranges per minute and produce up to 300 gallons of juice per hour. As two metal cups press together, a hole is automatically punched in the bottom of the fruit through which the juice flows as the pressure is increased. A minimum of pulp and rind oil is mixed with the juice. Rind oil mars the taste and hastens spoiling. By using different sized cups which are easily added to the machine, lemons and grapefruit can be squeezed.

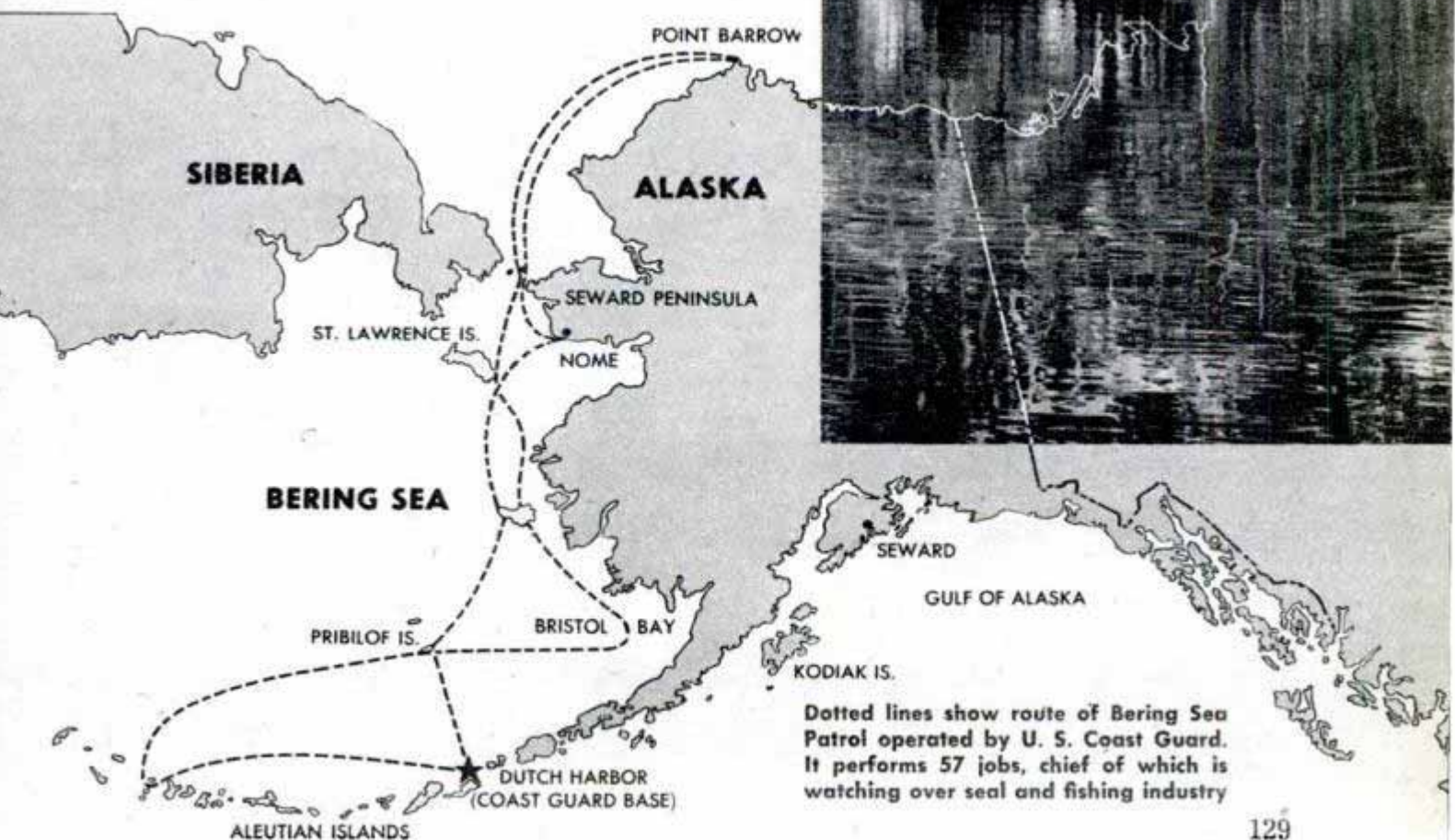
Policing the BERING SEA

By Andrew Hamilton

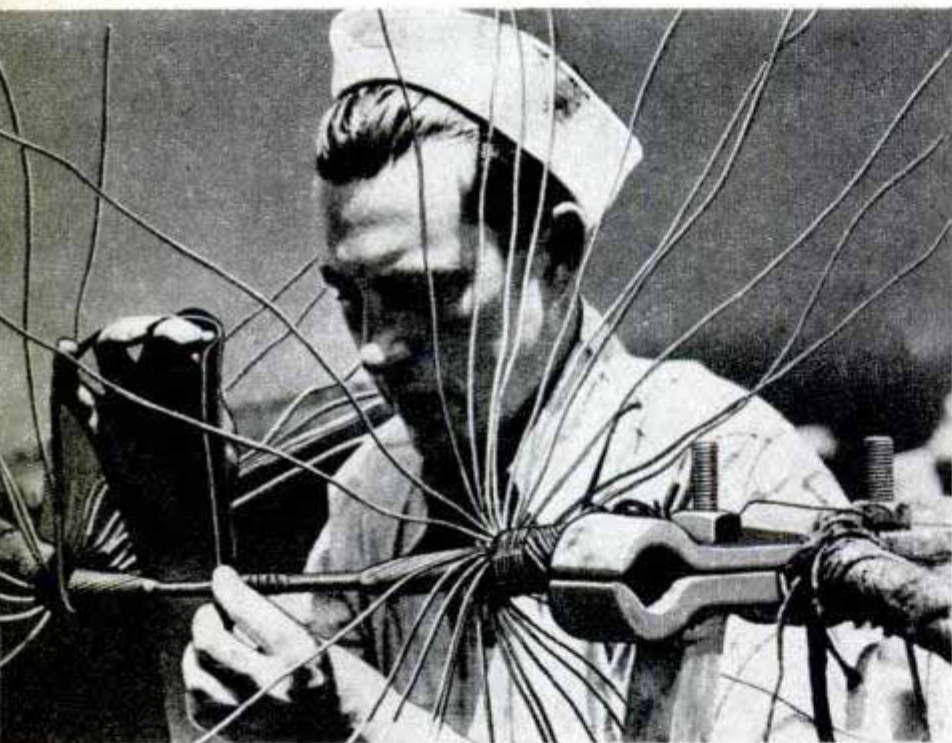
AFTER an interval of war duty, Uncle Sam's most northerly "cop" is back on his ice-water beat. The U. S. Coast Guard resumed this year its regular, peacetime Bering Sea Patrol with duties ranging from the protection of a multimillion-dollar fishing industry to looking after the welfare of some sick Eskimo trapper in a remote outpost.

Sometimes known as "The American Northwest Mounties" or "The F.B.I. of the Bering Sea," the patrol has been active in the fog-shrouded waters between Alaska and Siberia for 67 years. With world air lines looking toward polar routes and Alaska demanding full statehood, the work of the patrol is more important than at any time in history.

Ten Coast Guard cutters renewed the policing activities last spring from bases at Ketchikan, Seward and Juneau. On an average 50-day cruise, each vessel adds from 6000 to 15,000 miles to its log. Some of the craft assigned to the Bering Sea Patrol include 250-foot, 2200-ton cutters which played gallant roles in World War II. Others include light-house tenders, 180-foot, 935-ton vessels specially designed for icebreaking, tending aids to navigation and supplying lighthouses and lightships. These vessels will be on the job until winter chokes the area with ice in November or December.



Dotted lines show route of Bering Sea Patrol operated by U. S. Coast Guard. It performs 57 jobs, chief of which is watching over seal and fishing industry



When the Coast Guard vessels arrive in the Bering Sea they find ice extending from the mouth of the salmon rivers in Bristol Bay to the Pribilof Islands and northwest to the Siberian coast. The ice recedes during the summer until the Bering Sea, the Bering Straits and Alaskan coastline to Point Barrow are open to navigation.

Although the Coast Guard has 57 specific jobs to perform on its Bering Sea Patrol, its two main functions are (1) to watch over the seal and fishing activities in Alaskan waters and (2) to provide justice, health and transportation services to the people of Alaska. A seal-and-fisheries patrol is maintained by the Coast Guard from May to October and an arctic patrol from July to September.

Of the three leading industries in Alaska today—fishing, gold mining and sealing—the Coast Guard's Bering Sea Patrol has played an important part in developing the first and third.

The Coast Guard achieved much of its original jurisdiction in connection with sealing and fishing. In earlier days, enormous herds of fur seals and sea otters were slaughtered for the huge profits their hides would bring in China and Russia. Shortly after purchasing Alaska, the United States set aside the Pribilof Islands, 200 miles north of the Aleutians, as a restricted breeding ground.

Since that time numerous executive orders, acts of Congress and treaties among the United States, Russia, Great Britain and Japan have been set up to protect fur seals, sea otters, walrus, sea lions, whales, halibut, oyster and salmon fishing.

Each spring as bull seals head northward toward the Pribilof Islands, Coast Guard cutters stand by to protect them from poachers. Killing seals in the open sea and north of 30 degrees north latitude is prohibited. Later on in the summer as

Part of the day's work of the Bering Sea Patrol: Top, Coast Guardsman lights pipe for aged Eskimo; center, repairing telephone line; bottom, transported by Coast Guard, U. S. Public Health Service doctor examines children at Ketchikan, Alaska

the cows migrate to the Pribilof breeding grounds the Coast Guard stands watch. No vessel is allowed to sail near the islands or stop there except for bad weather.

Each year about 25,000 "bachelor" males are killed. Native Aleut workers, under the direction of Bureau of Fisheries men, club selected victims and skin the hides. Some 80 percent of the hides go to the United States, 20 percent to Canada.

Such strict conservation measures have prevented the Pribilof seals—source of 80 percent of the world's sealskin coats—from being wiped out like the buffalo and the passenger pigeon. In 1910, for example, the seal herd numbered 130,000 animals while today it is around 2,500,000.

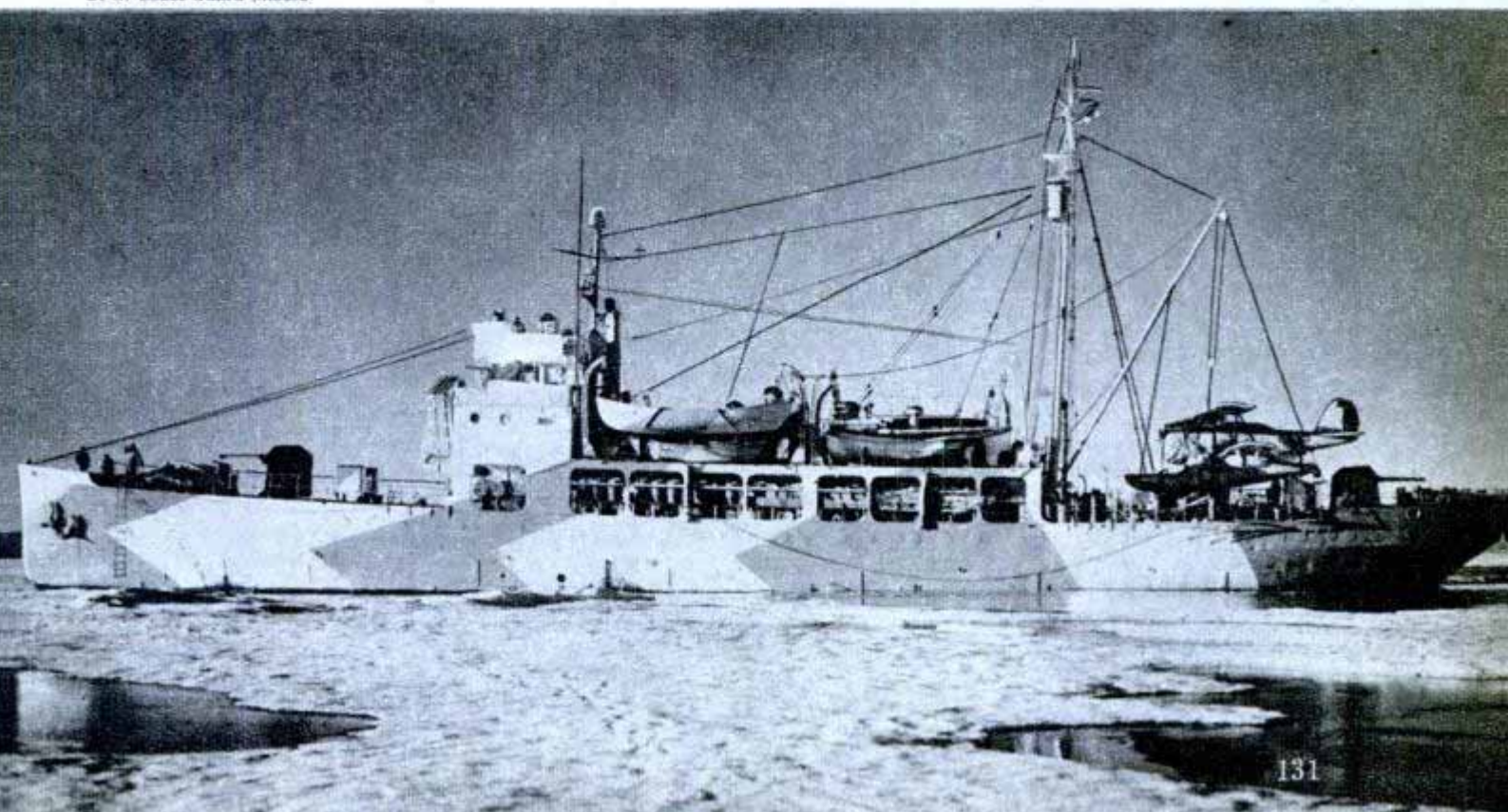
The fisheries patrol protects the \$30,000,000 salmon industry of Alaska from alien fishermen. Aided by American school teachers and missionaries in the area, the Coast Guard observes ships that enter the western half of the Bering Sea. Weekly reports are sent to headquarters giving names and locations of all alien vessels.

In keeping such a close watch on Alaskan fishing, the Coast Guard is merely enforcing an act of 1906 to protect all fisheries in Alaska by prohibiting aliens from fishing in its waters. This act was strengthened and amended by another in 1938.

The Alaskan salmon industry and allied industries employ thousands of American citizens and any threat to its future existence will affect shipbuilders, transporta-

Coast Guard "Duck" (right) patrols icy seas and remote beaches in Bering Sea area. Below, the combat cutter Northland returns to duty in Bering Sea after helping clear out Nazis in Greenland during the war

U. S. Coast Guard photos





"Cliff-hopping" Coast Guardsmen deliver drum of oil

tion companies, insurance companies, banks and producers of marine supplies and fishing equipment.

In addition to its policing duties in the seal-and-salmon fishing areas, the Coast

Guard's Bering Sea Patrol represents a benevolent Uncle Sam in that part of the world, who assists the people living under the American flag.

One of its most important jobs is that of furnishing medical and dental care to natives on lonely islands and the few white men in the area who serve as fishermen, missionaries and explorers. U. S. Public Health Service doctors carried by Coast Guard cutters may be called upon to check a diphtheria epidemic in an Eskimo village, remove a safety pin that a child has swallowed, help a sick native woman or set broken bones. Medical advice is often radioed to fishing vessels at sea.

Another man-sized job is providing assistance to ships and men in distress. The following are typical patrol-log entries:

"Received a radio message from the motor vessel Fern which needed help because of a broken tail shaft; the ship was towed to Unalaska."

"Found the motor vessel Einar Beyer helpless with two cracked cylinder heads and towed it to Kodiak."

"Sighted an overturned skiff and rescued a man clinging to it."

"Removed a sick man from the Bureau of Fisheries vessel Crane and delivered him to the hospital at Unalaska."

The longest cruise of the Bering Sea Patrol is that to Point Barrow, more than 1100 miles north of Dutch Harbor. Frozen fast in the polar ice most of the year, the far-northern outpost of the Stars and Stripes can be visited only during the summer months. The Coast Guard provides the slender lifeline that supplies food and equipment.

Aleutian homecoming—aboard the transport are Aleuts returning to their home islands. After Pearl Harbor they were moved to mainland for safety



Because of scarcity of transportation in the Bering Sea, Coast Guard cutters carry much freight. On the annual Point Barrow cruise, for example, a Coast Guard cutter would consider the following items a typical cargo:

4400 pounds of freight for the St. Thomas mission at Point Hope.

35 boxes of archeological specimens for the American Museum of Natural History in New York.

1000 pounds of household goods for Point Lay.

1950 pounds of freight for natives at Point Barrow.

1775 pounds of equipment for the Army radio station at Point Barrow.

1 bag of mail, Point Barrow Post Office.

900 pounds of freight for Shishmaref.

1000 pounds of Oogrok hides for Little Diomedes Island and 700 pounds for Nome.

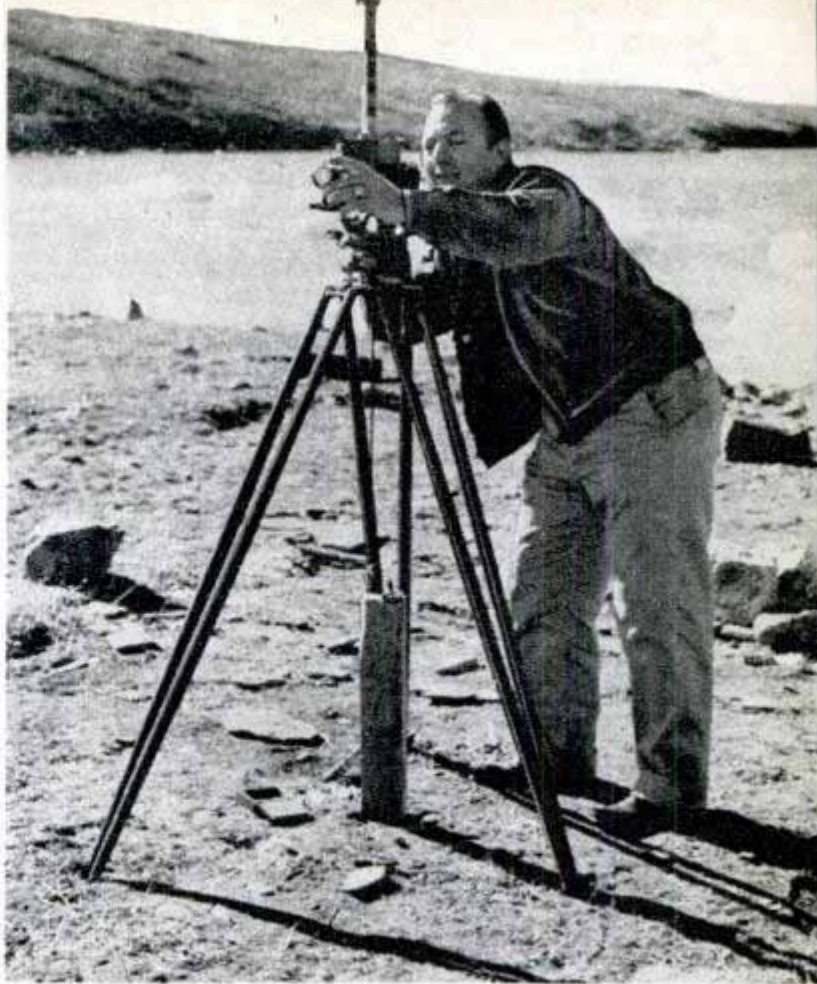
13 boxes of Father Hubbard's films for Santa Clara University.

1 34-foot oomiak (native canoe) for Mariner's Museum, Newport News, Va.

The Alaskan shoreline is 14,899 miles long and thousands of islands, large and small, dot the treacherous waters. Responsible for the safety of ships in this area, the Coast Guard installs and maintains navigation aids such as lighthouses, radio beacons, buoys and fog signals.

In the early days, ship captains were left to shift for themselves and the number of vessels lost in the Bering Sea is a large one. In 1894, however, the first lighthouse was established at Sitka. Today there are 54 lighthouses, 56 lighted aids, 507 unlighted aids, 79 fog signals and 16 radio beacons.

In addition to regular duties for the



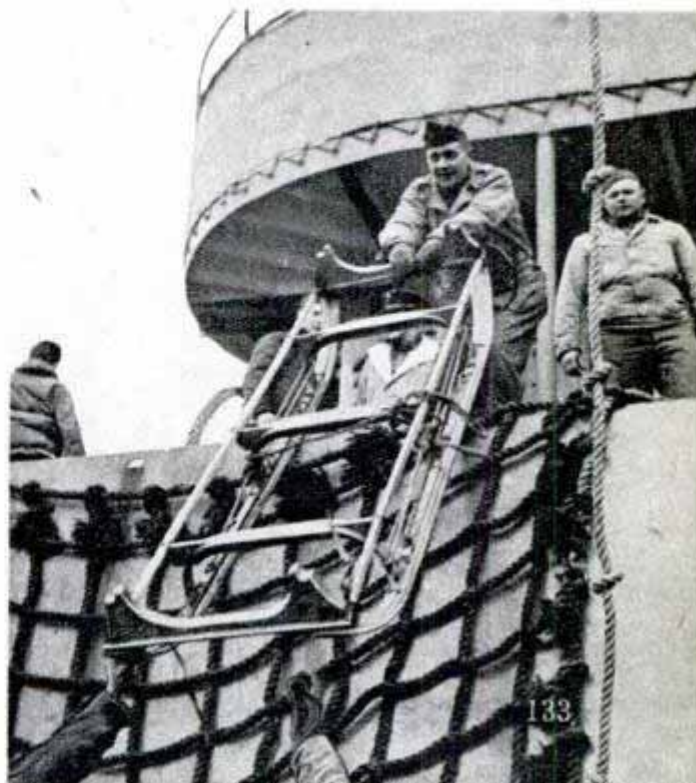
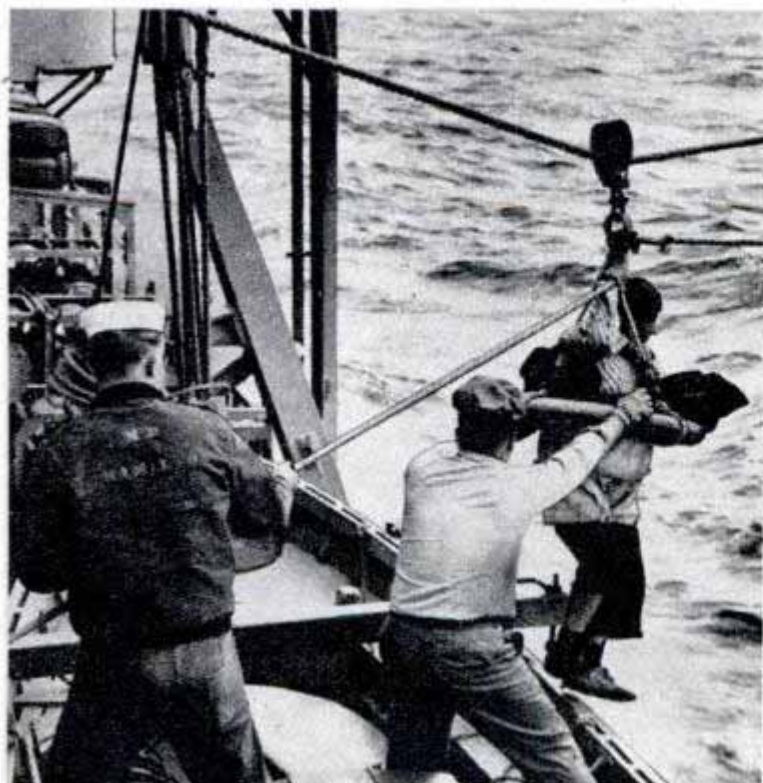
Three hundred miles north of Arctic Circle, scientist records magnetic variations which affect compasses

Treasury Department, the Coast Guard performs valuable services for a number of other federal agencies.

With the Navy Department it maintains a close alliance and cooperates on matters of intelligence. For the War Department it enforces navigation laws and other laws pertaining to anchorage and movements of

(Continued to page 256)

Stricken seaman on merchant ship is transferred to a Coast Guard vessel to receive medical care. Right, unloading sled from Coast Guard cutter into small boat drawn alongside; dogs are hitched to sleds of this type





Snowplow attached to homemade tractor saves builder many backaches. With two transmissions, it has 13 speeds forward

OLD AUTO PARTS PLUS SPARE TIME EQUAL TRACTOR

When R. A. Bigham of South Bend, Ind., decided that he needed a tractor he built one from old auto parts. He spent about six months of spare time making the vehicle, which has 13 speeds forward and 7 in reverse. The tractor is powered by a

1928 Chevrolet motor and has a differential from a Ford Model-T truck. The frame is built of 3-inch-square tubing, the tread is 56 inches and the wheelbase 75 inches. According to Bigham, the slow speed is 1 m.p.h. and top speed 40 m.p.h.



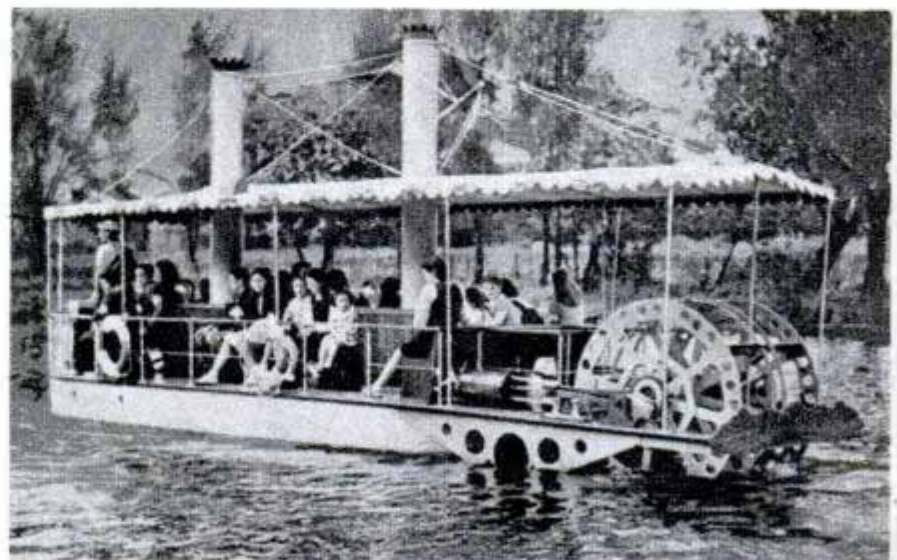
Glider Cottage

With vacant houses difficult to find in Southbourn, England, one businessman solved his problem by converting the fuselage of a huge glider plane into a cozy little cottage. The living room is 7 by 15 feet, bedroom 7 by 10, and kitchenette 7 by 8. The glider was the type used by Britain's airborne troops during the war. One building contractor plans to convert other gliders into homes.

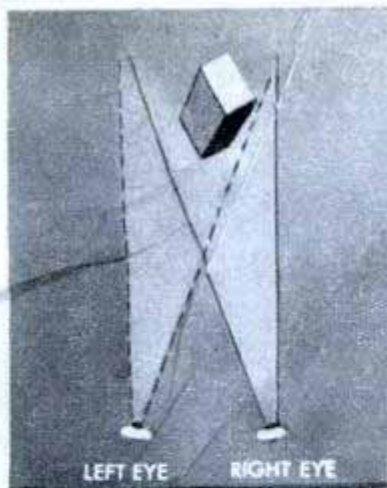
Paddle-Boat From War Barges

Paddling around a lake in Barking Park, Essex, England, is a miniature stern-wheeler resembling an old Mississippi River boat. The craft was constructed from two wartime river assault barges by two members of the Barking Borough Council in spare time.

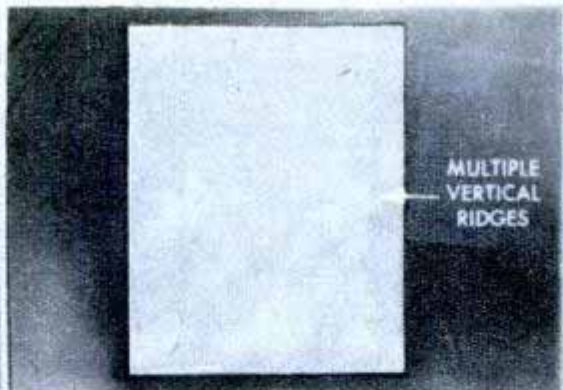
☞ Concrete brake shoes on streetcars in Munich, Germany, save iron.



Stereoscopic Camera Moves During Exposure



Each eye sees a different view for depth perception



Lenticular screen has many vertical ridges

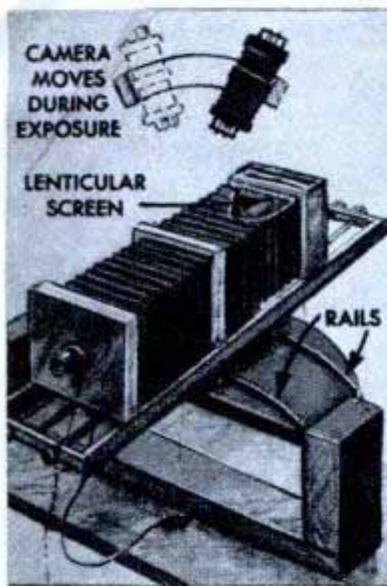


GLASS

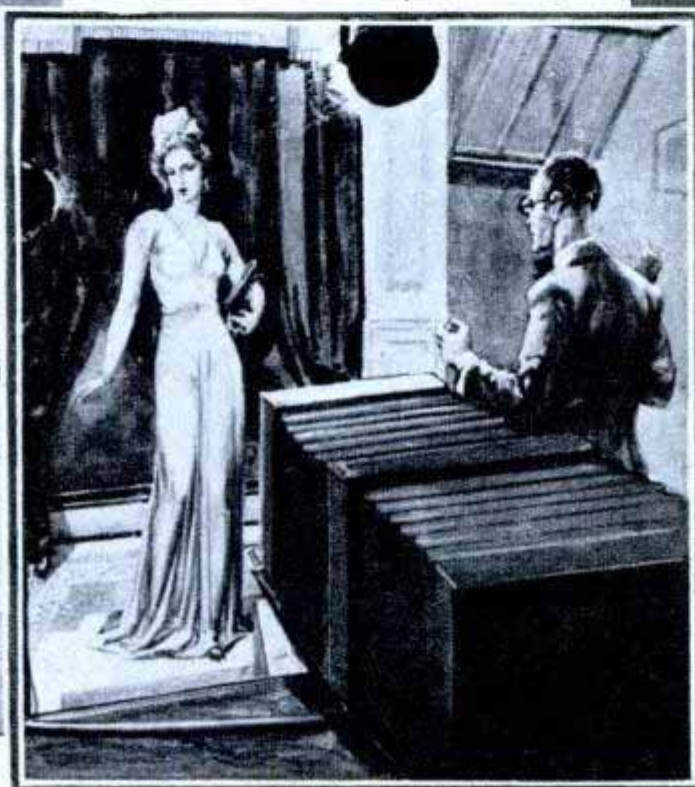
MULTIPLE VERTICAL RIDGES

CELLULOSE ACETATE

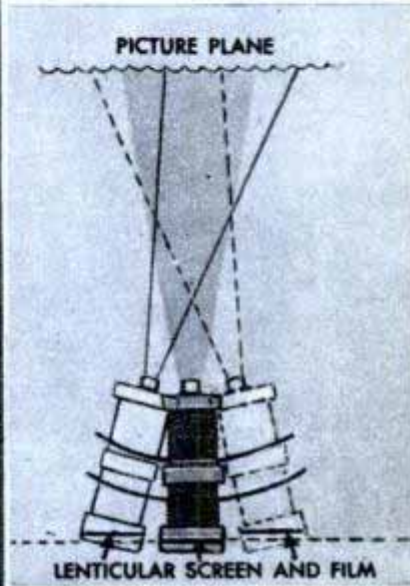
Enlarged view of screen shows ridges that add depth to photo



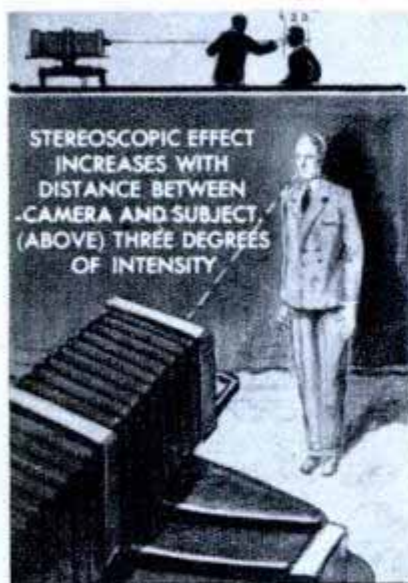
Camera moves 16 degrees during three-second shot



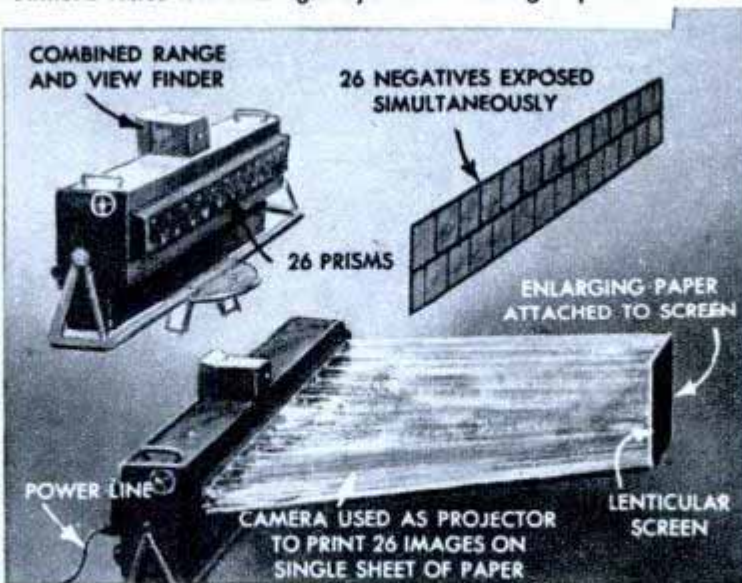
Camera takes left and right-eye views during exposure



Screen and film pivot to stay parallel to the picture plane



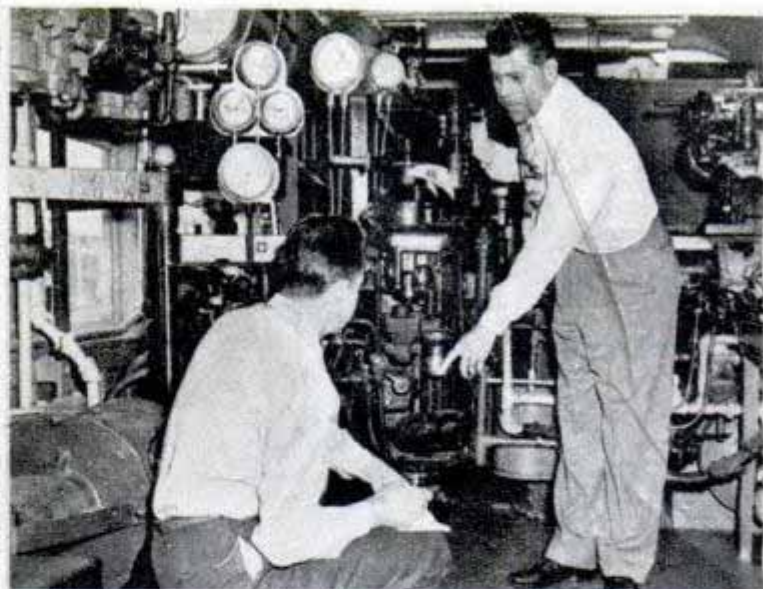
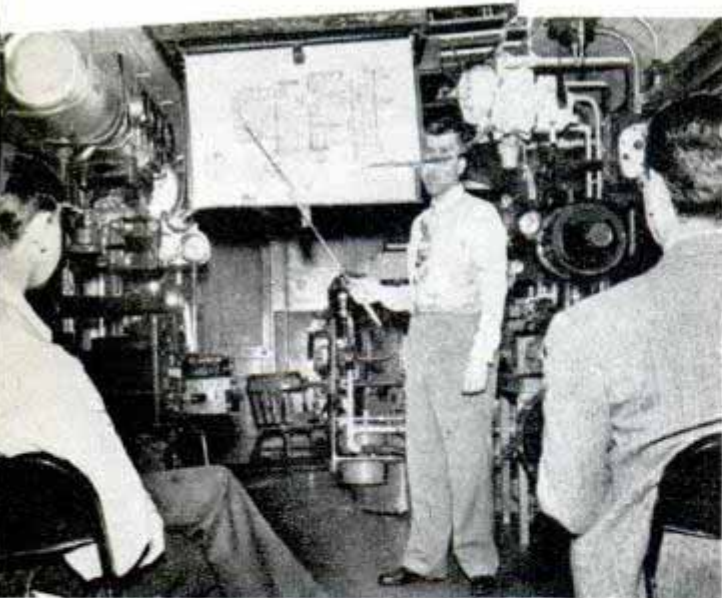
Subject must be motionless during time of exposure



Instantaneous stereoscopic pictures are taken by this unusual camera equipped with 26 prisms instead of a conventional lens. Action of moving vehicles is stopped by camera



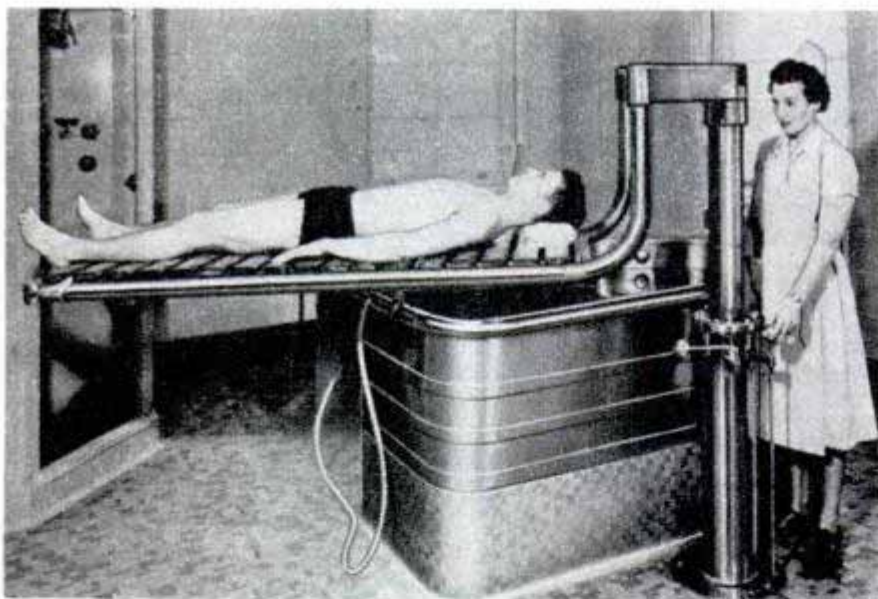
Photographs that appear three-dimensional are made by a British camera using a lenticular screen. The screen consists of a series of tiny corrugations. Looking through the screen, each eye sees a slightly different view of the image, thus providing binocular vision. Previously, three-dimensional prints have had to be viewed through two-colored glasses or a stereoscope. A similar process called Trivision was described in *Popular Mechanics* in May 1942. However, Trivision photographs were transparencies only. The new process, invented in France, makes positive prints.



Railway School Has "Course" 10,000 Miles Long

Not only classroom and teacher, but also the latter's home and family will come to railroaders who want to learn more about Diesel air brakes. The instructor and his wife will live in the classroom-car in which he'll lecture twice daily at stops along the Union Pacific's nearly 10,000 miles of main

trackage. The tour is expected to take a year. Working and cutaway models of air-brake equipment valued at \$25,000 are installed in the car to illustrate instruction. The classroom was outfitted by a correspondence school which also provided the instructor, a former railroad engineer.



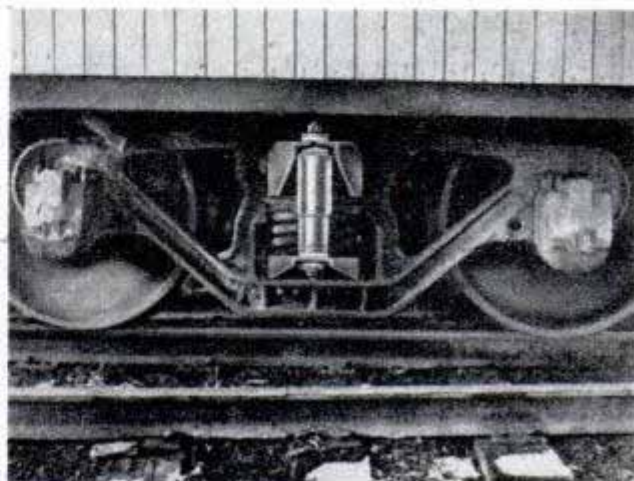
Hydraulic Hoist Lifts Patients


Hydraulic lifts make easy work of lowering patients into hydrotherapy baths. Moved from a stretcher to a pallet of stainless steel and wood, the patient is lifted, then slowly swung to a position above the bath, and lowered into the water. Lifting power is supplied by a six-inch cylinder with a capacity of 500 pounds. Air pressure from a compressed-air line actuates the lift.

Shock Absorbers for Trains

Shock and vibrations in freight cars are reduced as much as 93 percent by direct-action hydraulic shock absorbers. Tests conducted during the past 10 months by the Monroe Auto Equipment Company of Monroe, Mich., demonstrated that the use of modern shock absorbers cuts down lading losses, repairs and roadbed upkeep.

☐ A 12,874-foot oil well has been drilled in the Gulf of Mexico, 10 miles offshore from the mouth of the Atchafalaya River, which is 37 miles south of Morgan City, La.





Behind the mask, Chester Morris does a favorite trick with metal globe which appears to rise through the air and roll along edge of the scarf held in his hands

THERE'S MAGIC UP YOUR SLEEVE

By Chester Morris

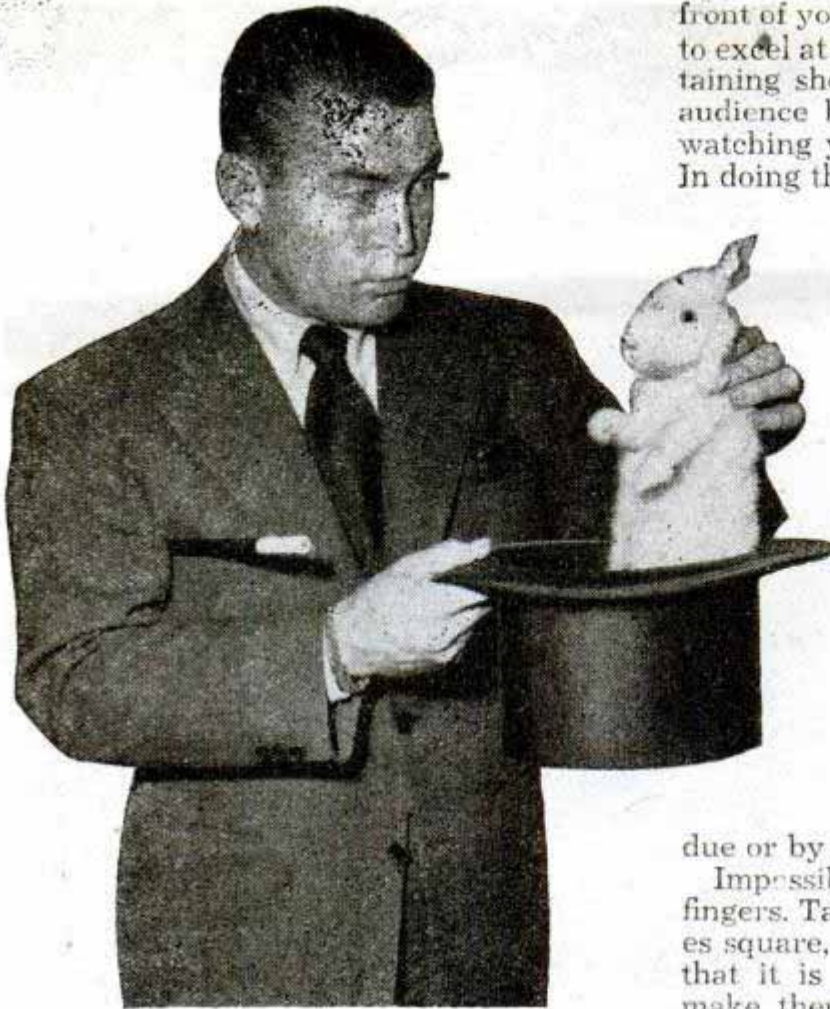
WHEN THE GREAT escape artist, Houdini, performed his stunt of escaping from a large padlocked milk can, almost full of water, he kept his audience in suspense by sheer acting and theatrical effects.

One assistant held up a watch, calling off the seconds before Houdini would suffocate. Another stood by with upraised ax, ready to smash the airtight container if Houdini failed to emerge on time. Mean-

while, the music built up to a stirring climax. The audience couldn't help cheering when Houdini finally broke loose and stood before them.

The act would have been a flop if the magician had worked his way from the milk can during a dead silence and then had stepped from behind the drape and remarked, "Well, I got out."

The point is, performing magic tricks in



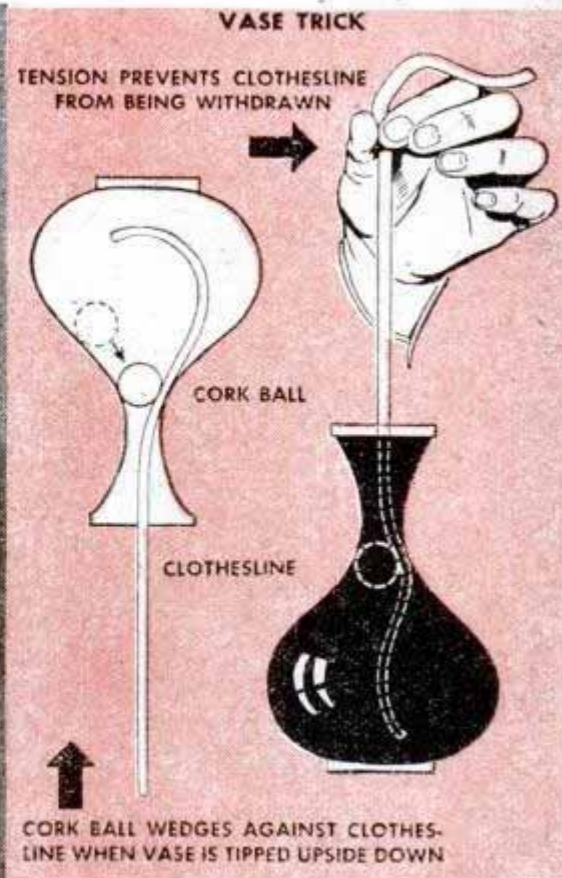
Actor Morris proves his ability by pulling a rabbit out of his hat; spring in rabbit makes it lifelike

front of your friends is a form of acting and to excel at magic you must put on an entertaining show. It's up to you to keep your audience busy listening to what you say, watching you, and obeying your requests. In doing this you can divert their attention from what you don't want them to observe.

A good example of how to keep the audience busy is the "living and dead" trick, a bit of misdirection that has been used with great success by fake spiritualists. The medium hands you a piece of paper, asks you to print on it the name of some friend or relative who has died, and then to fold up the paper. Then he tears the paper into bits and asks you to burn it. Even though you burn it completely and pulverize the ashes the medium is able to spell out the name, letter by letter, by poking through the residue or by gently blowing on it.

Impossible? It's as easy as snapping your fingers. Take a piece of paper about 3 inches square, fold it once and fold it again so that it is quartered. Crease the folds to make them sharp. Open the paper again and draw a circle in the center no larger than an inch in diameter. This circle, you

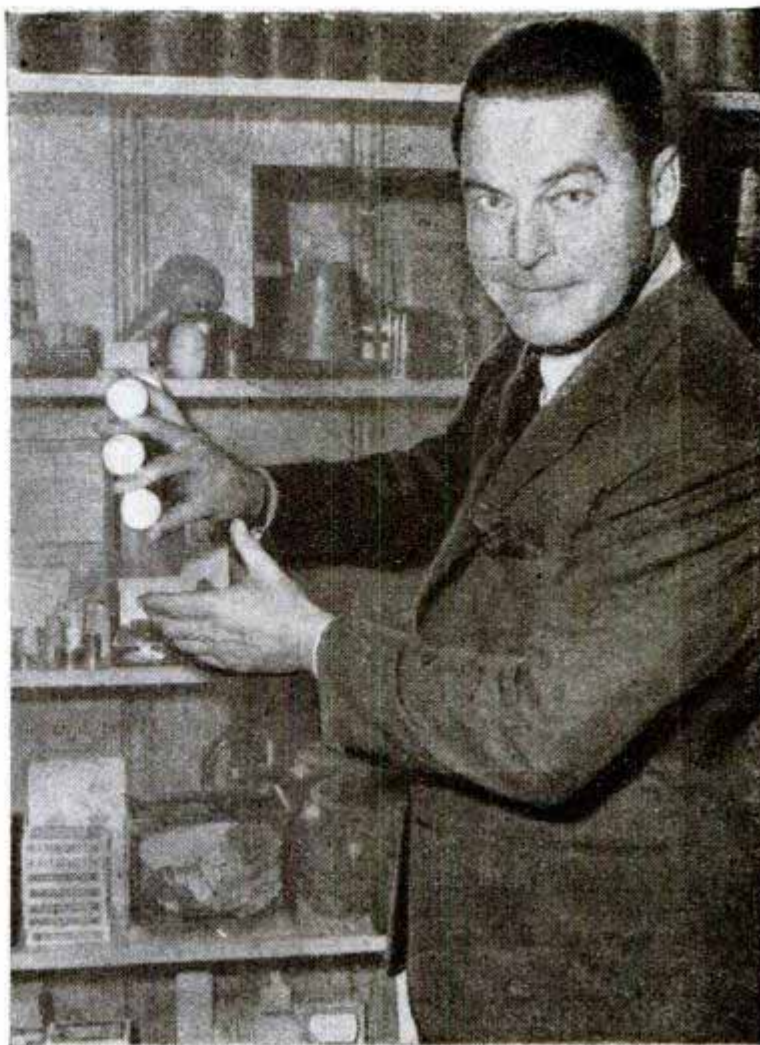
Below, this easy trick requires only a small-necked vase, cork ball, piece of clothesline and an audience



explain to your audience, represents death. Next you draw a series of radiating lines like sunrays outside the circle. These represent the living, you explain.

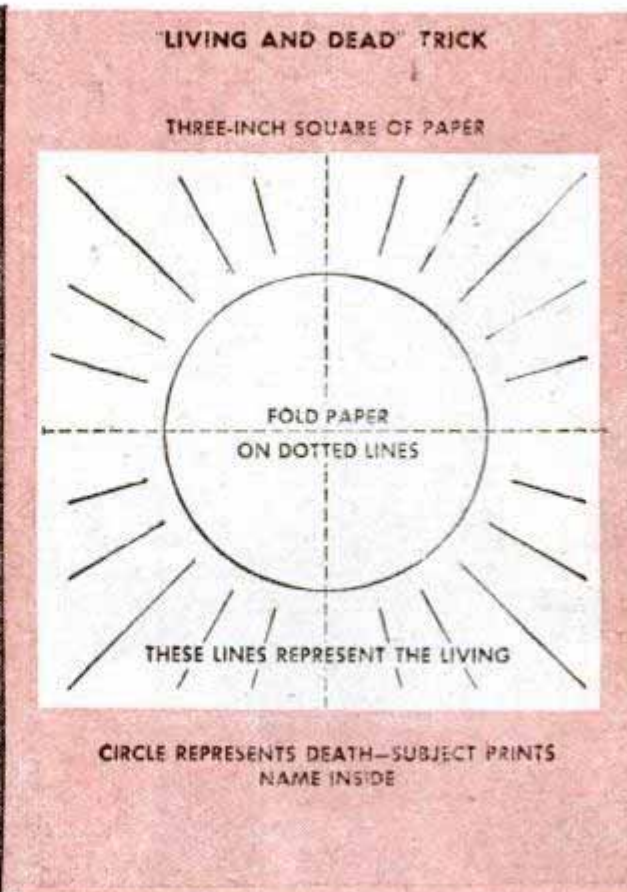
Now, at your request, a member of the audience prints a name inside the circle and folds the paper twice. He naturally folds along the creases you have already made. Then you tear the paper in two, placing the folded half on top, and tear the pieces in two once more, placing the folded quarter on top. This top piece of paper you retain between your left thumb and forefinger while handing the rest of the pieces with your other hand to the member of the audience. While he is busy burning this paper with a match you have plenty of time to open the folded slip you are holding. Actually it is the center of the original paper. Turn away for a moment and read the name printed there. Then you can be just as mysterious as you please while poking through the ashes and pretending to find a letter here and a letter there until you have the full name.

Another trick that seems positively supernatural is the ability



Morris practices finger exercises by holding the small balls

A name written in circled area is retained by the magician who appears to destroy paper. Details in text





How can he pull all of those silk flags out of an empty metal cylinder? Morris reveals secret below: inside the cylinder is load chamber holding flags



to pick up a folded piece of paper and read the question written on it without a glance and without hesitation. Anyone who knows how can read the questions on a dozen sheets of paper one after the other and never miss. It's known as the "one ahead" technique and to perform it you need a friendly stooge in the audience.

After members of the audience have written their questions, folded their papers, and placed them in the hat, you pick up one of the papers and hold it against your forehead, or even over the top of your head.

"Someone wants to know," you declaim in a strained voice as if you actually are trying to read by power of thought alone, "the date on which the pond will freeze over this winter. Is that right?"

"Yes, that's right," comes back the answer from the helper you have planted in the audience.

"November the twentieth," you might announce in a positive maner, giving any plausible date and at the same time unfolding the piece of paper. After a glance at it you lay it to one side.

Now you can understand how the trick is done. Your stooge was tipped off to answer affirmatively when you asked if the first question was correct. You really made that question up out of your own imagination. Then, when you unfolded the paper and glanced at it you read the question that someone actually had written. This is the question you will repeat when you hold the next paper to your forehead. In

Metal cylinder is first displayed in cabinet with dark lining to match exterior of load chamber. As the cylinder is lifted the cabinet appears to be empty and when trick is over magician lifts load chamber with cylinder leaving audience puzzled. Details in text

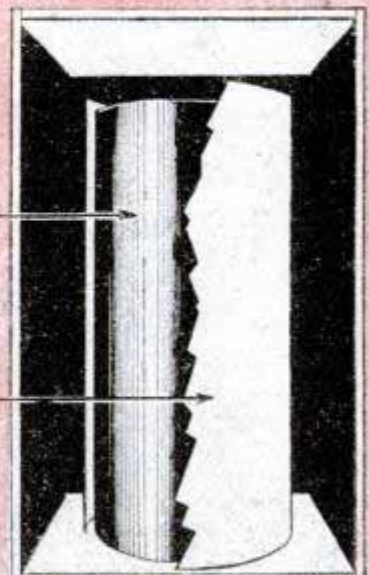
CABINET-AND-CYLINDER TRICK

CABINET 6½ INCHES SQUARE, 10 INCHES HIGH
PLYWOOD SIDES AND BACK
PAINTED BLACK

LOAD CHAMBER INSIDE TUBE

OPEN 5-INCH-DIAMETER TUBE
PAINTED WHITE
IS ¼ INCH TALLER THAN
LOAD CHAMBER

GRILLE REVEALS INTERIOR



CABINET PLACED ON
BLACK CLOTH

turn you will glance at that paper in laying it aside to learn the question you will "read" next. As long as the audience doesn't learn that you used a stooge for the first question they will gasp at your uncanny ability.

Mystifying friends and intriguing people with magic tricks is a hobby that is popular the world over and many famous amateur magicians delight in putting on performances that have all the finish of professional acts.

Orson Welles, for instance, specializes in big stage illusions that are worthy of the greatest magicians in history. Jimmy Stewart and Henry Fonda have a comedy magic act that convulses audiences. Bert Kaimar, the song writer, is an expert at cards and coins and sleight of hand. Harold Lloyd does a mind-reading act that amazes everyone. Milton Berle puts on a performance in which everything purposely goes wrong and he keeps his spectators howling with glee. Cliff McBride, the cartoonist, has some excellent card tricks and Edgar Bergen is an expert at producing a bowl of goldfish out of thin air.

In my current motion picture "Boston Blackie and the Law," I do a piece of magic that has puzzled tens of thousands of people and that you might like to master. Like most illusions, it's really very simple when you understand it. But as long as you don't disclose the secret to your spectators they will swear you did the impossible.

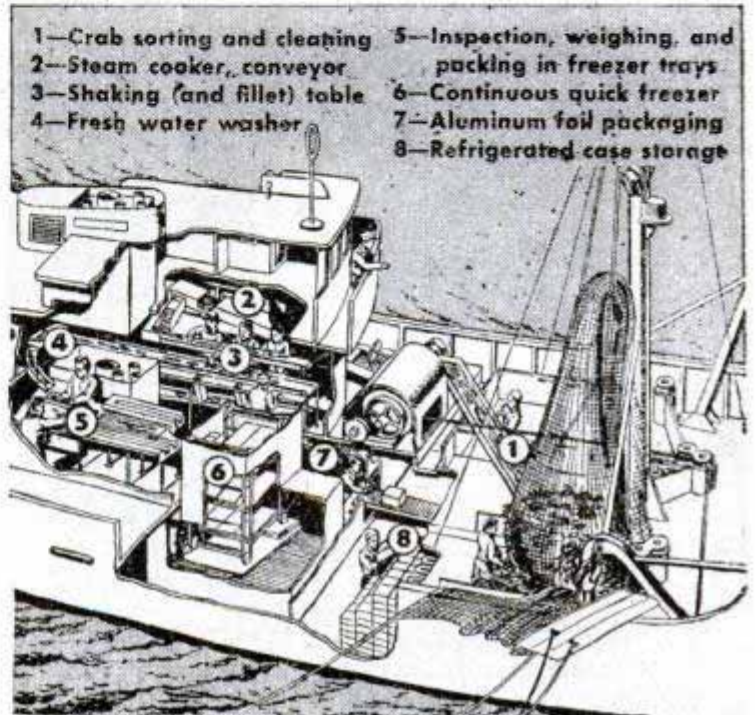
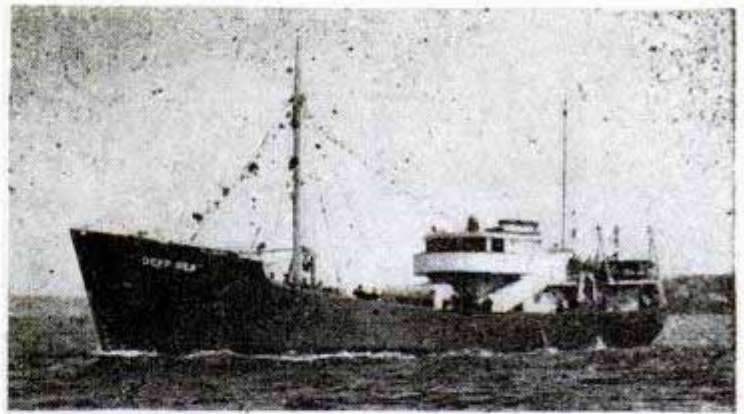
The trick is merely this: You have a cabinet standing on the table with an open front, top, and bottom. Inside the cabinet there is an empty cylinder. There's nothing else and to prove it you pick up the cabinet and exhibit it in the air. Then you pick up the empty cylinder, look through it at the audience, and show that it's empty. Nevertheless, when you place the cylinder back inside the cabinet you

(Continued to page 252)



Magicians refuse to reveal how this one is done. As the guillotine blade slams down it misses subject's head but cuts celery under his chin! Below, Morris shows rabbit left in coat which went to the cleaners





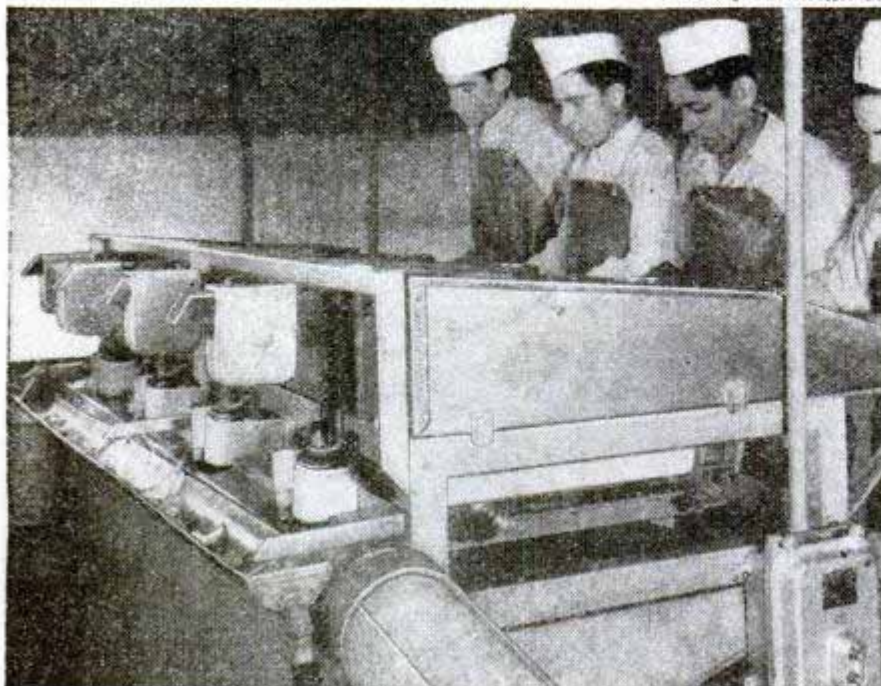
- | | |
|------------------------------|--|
| 1—Crab sorting and cleaning | 5—Inspection, weighing, and packing in freezer trays |
| 2—Steam cooker, conveyor | 6—Continuous quick freezer |
| 3—Shaking (and fillet) table | 7—Aluminum foil packaging |
| 4—Fresh water washer | 8—Refrigerated case storage |

Floating Refrigerator

Quick freezing of crab meat at sea is the latest innovation in deep-sea fishing. A new 140-foot crab trawler, *Deep Sea*, carries a complete processing and packaging plant into Bering Sea waters where the 20-pound king crabs are found. The Diesel-powered trawler has a cruising range of 4000 miles and a speed of 12 knots. Her displacement load is 551 long tons and the refrigerator capacity is 8500 cubic feet. The *Deep Sea* is designed to buck the roughest weather and is fitted with the most modern navigation equipment, loran, and radar for opera-

tions in the foggy Bering Sea. Fish will also be caught and processed. By filleting and processing at sea the vessel can triple the volume of fish per trip. Two thirds of a fish are discarded in the filleting.

Courtesy The Kröger Co.



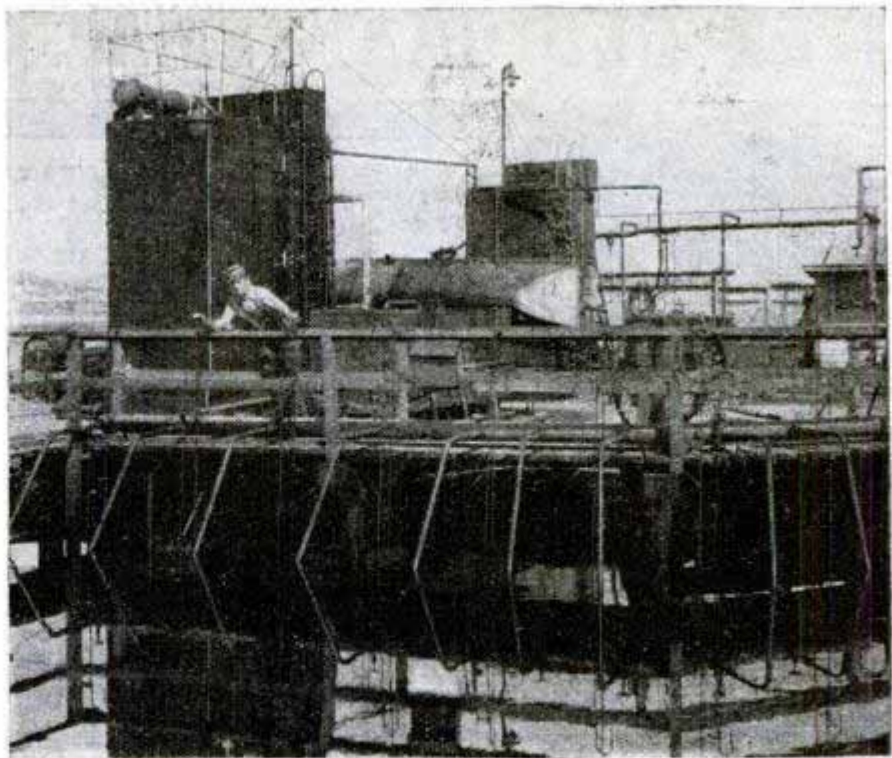
Shrimp Cleaner

Black veins in shrimp are removed by machinery in four packing plants of a national grocery company. The veins run the length of a shrimp's body and must be removed before processing. Small saws cut the shell and a jet of water then flushes out the vein.

☐ The stern half of a Russian tanker wrecked in the Gulf of Alaska a year ago is now moored at Eureka, Calif., where its steam-turbine electric plant furnishes power to inland transmission lines.

Steam Heated "Lake" Reclaims Used Oil

By installing steam heating pipes in an oil-storage lake, the San Francisco Naval Shipyard raised the temperature of contaminated oils and speeded the recovery of usable fuel oil. In five months the reclamation plant produced 13,450 barrels of oil valued at \$18,426. Previously, the Navy paid to have dirty and contaminated Diesel, fuel and other industrial oils hauled away and dumped. The system was developed by Charles H. Kimball, foreman of the yard's power plant.



U. S. Navy photo

Wrench With Heavy Handle Shocks Lug Nuts Loose

Badly rusted and jammed lug nuts on truck and tractor wheels are shocked loose by a pendulum wrench that strikes them with the momentum of a free-swinging weighted handle. The operator swings the handle around the shaft and it rotates 120 degrees before striking the lugs on the nut. The result is a hammer-like twisting blow that tends to shock the frozen lug nut loose. Both handle and shaft of the wrench are drop-forged steel, cadmium plated. The wrench, which has a 24½-inch handle, fits all standard ¾-inch drive sockets.



Three-Piece Trailer For Small Boats

Three pieces—two wheel assemblies and a towing attachment—constitute all the parts of a lightweight trailer for boats. Designed to permit motorists to take a boat along on trips, the trailer hitches directly to the car. It weighs less than 50 pounds and fits compactly into the trunk. The wheels snap onto the boat and are held tightly in place. Spring suspension of the wheels permits the boat to ride bumps smoothly.



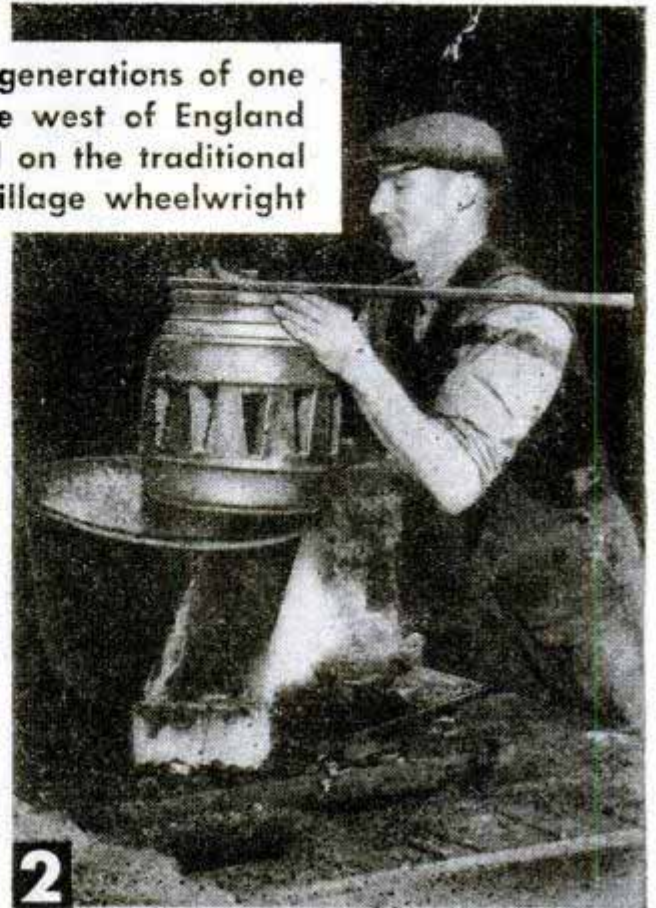
Popular Mechanics is always ready to supply further information to readers about various products described in any issue. Just write to Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, Ill.

AN OLD CRAFTSMAN PRESERVES

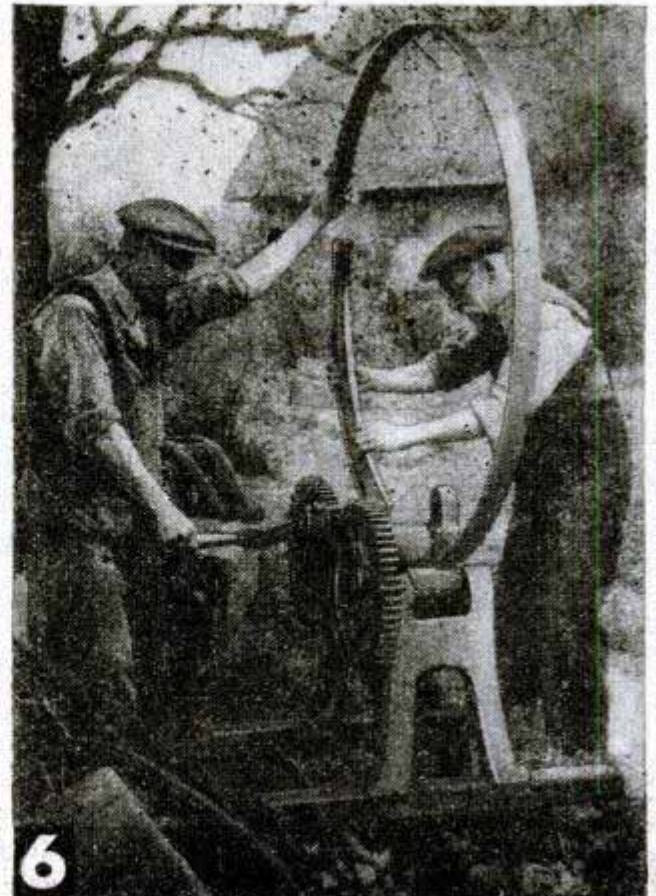
Since 1730, generations of one family in the west of England have carried on the traditional craft of a village wheelwright



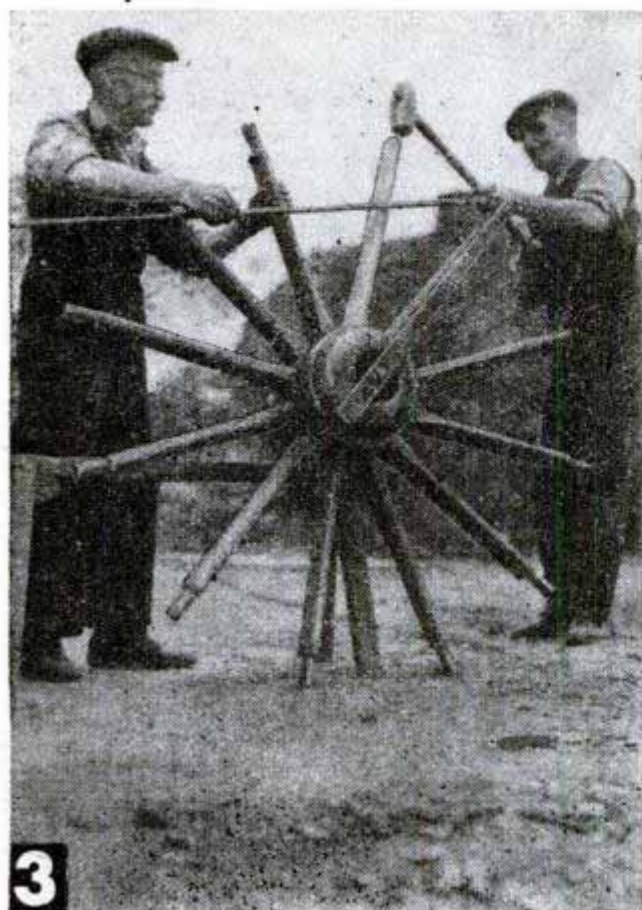
Master of an ancient art, George Sibley, Berden, England, bores spoke hole in an elm hub
In measuring for a tire, the wheel is revolved and a chalk mark is made on the tire material



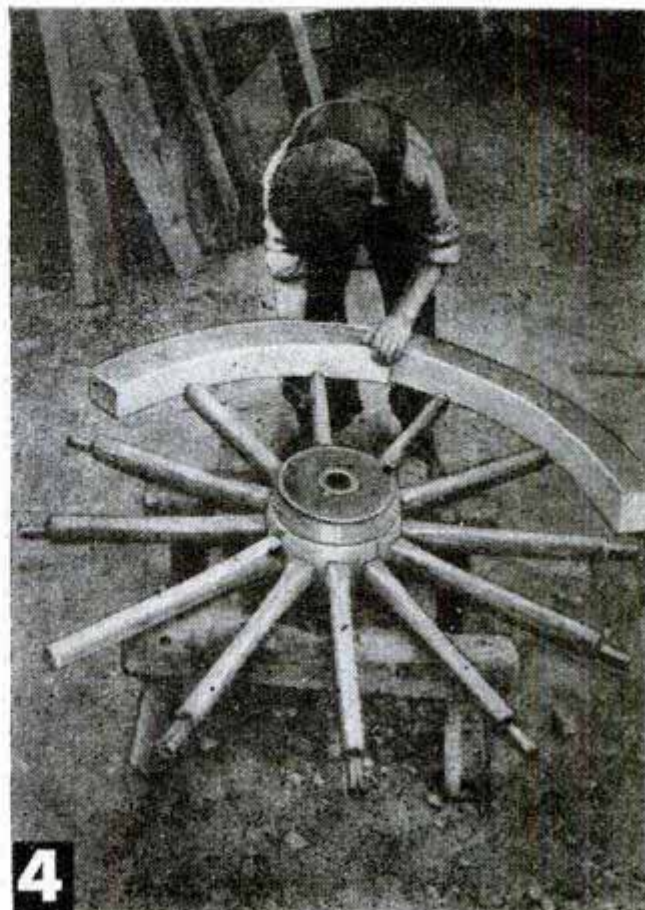
Next, hub is treated for half hour in boiling caldron to assure tight placing of spokes
Tire is bent on a machine to conform to shape of wheel. Proper curving is checked by gauge



THE WHEELWRIGHT'S TRADE . . .

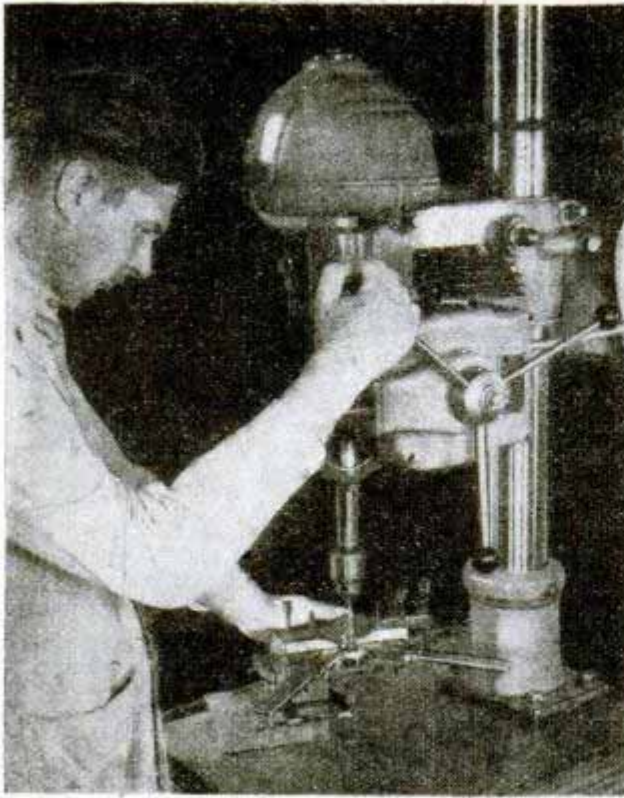


When spoke is "driven home," Sibley uses a straightedge to check alignment of each spoke
With tire ends riveted together and made red-hot in fire, welding is completed on the anvil



This is called "marking out fellies." Rim segments meet at center point between spokes
After tire is fitted and hammered while hot, quenching with water makes it contract and fit



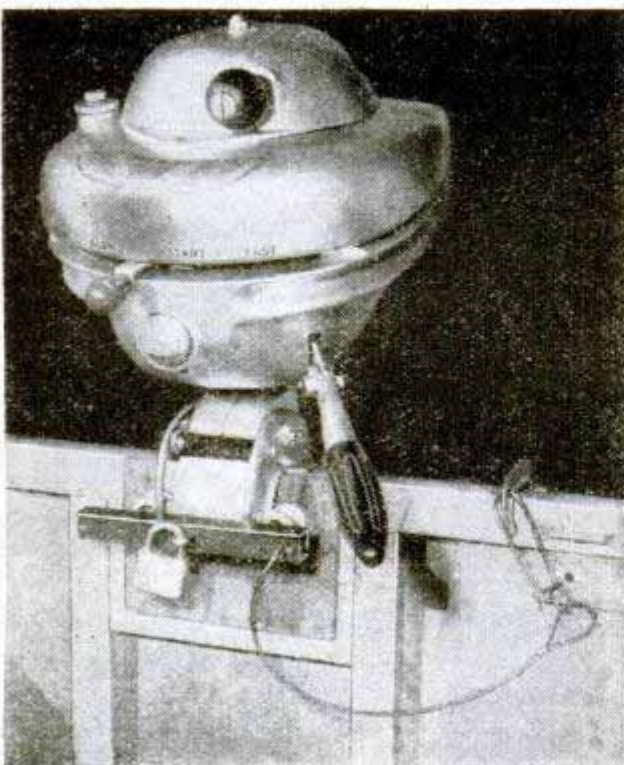
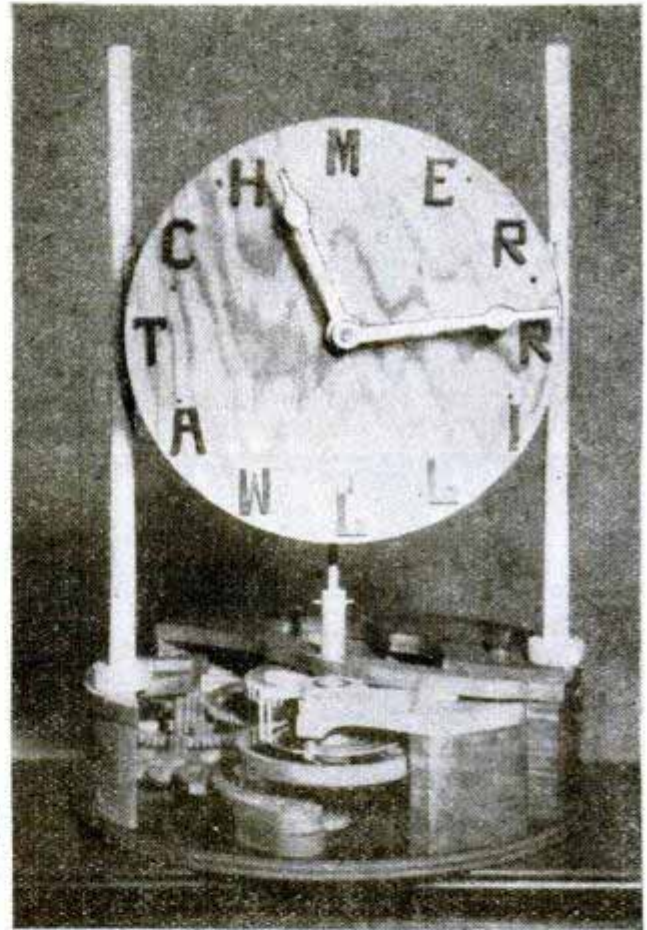


Instrument Used With Drill To Locate Center of Holes

Holes to be drilled can be located accurately with an instrument that uses two sides of the work piece as reference sides. The locator consists of two arms made of tool steel set at right angles to each other. At the exact vertex of the right angle is a tapered hole in which drill bushings are clamped. A vernier stop slides along each of the arms. To locate a hole the two stops are set at the proper dimensions and the instrument is clamped to the work piece with the stops against the reference sides. The center of the tapered hole then is at the exact location desired and may be center punched. The instrument also can be used as a drilling and reaming jig by changing the size of the drill bushing. The centers are located in the same manner.

Clock Has Wooden Parts

Wooden wheels, pinions and springs are the "works" of a clock built by T. C. Merrill, Preston, Idaho, jeweler, to demonstrate watch and clock movements. The clock has 20 wheels and pinions made of oak, cut on a jigsaw and filed to minute exactness. The hairspring consists of two strips of reed from a woven basket. Merrill soaked the strips in a solution for a week, dried them around a metal band for a month and then coated them with lacquer. The clock loses only 10 minutes a day.



Locking Device Prevents Theft Of Outboard Motor

Outboard motors are protected from theft by a locking attachment that fits over the mounting-bracket clamp screws. Any standard padlock can be used. The motor can be locked either in operating position or with the propeller out of water. In addition, a safety cable prevents the motor from being lost overboard whether it is locked or unlocked.



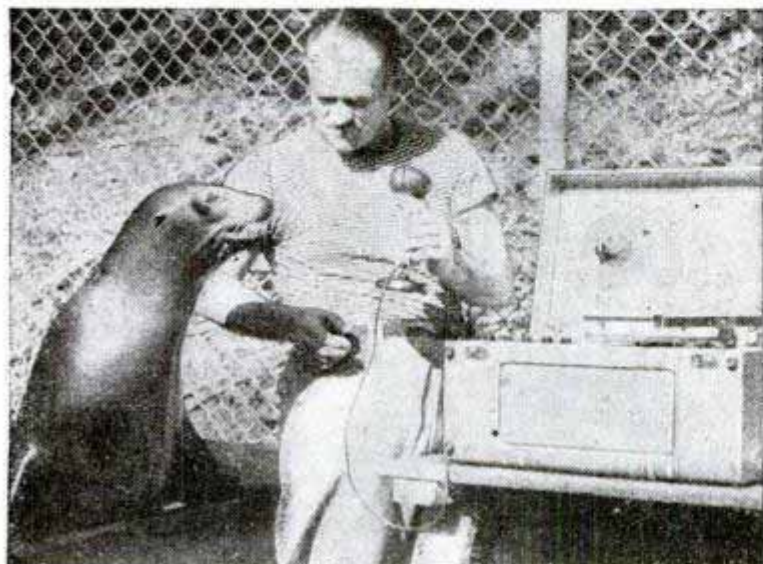
Helicopter Dusts Crops

Hazards of aerial crop-dusting are reduced to a minimum by using specially built helicopters. In addition, these maneuverable aircraft can provide heavy applications by hovering, or lighter dusting by speeds from a slow walk to 100 miles per hour. Effectiveness of the operation is increased by the downwash of the main rotor blades which swirls the DDT-laden dust onto the underside of the foliage. Two easily attached hoppers behind the cockpit hold 400



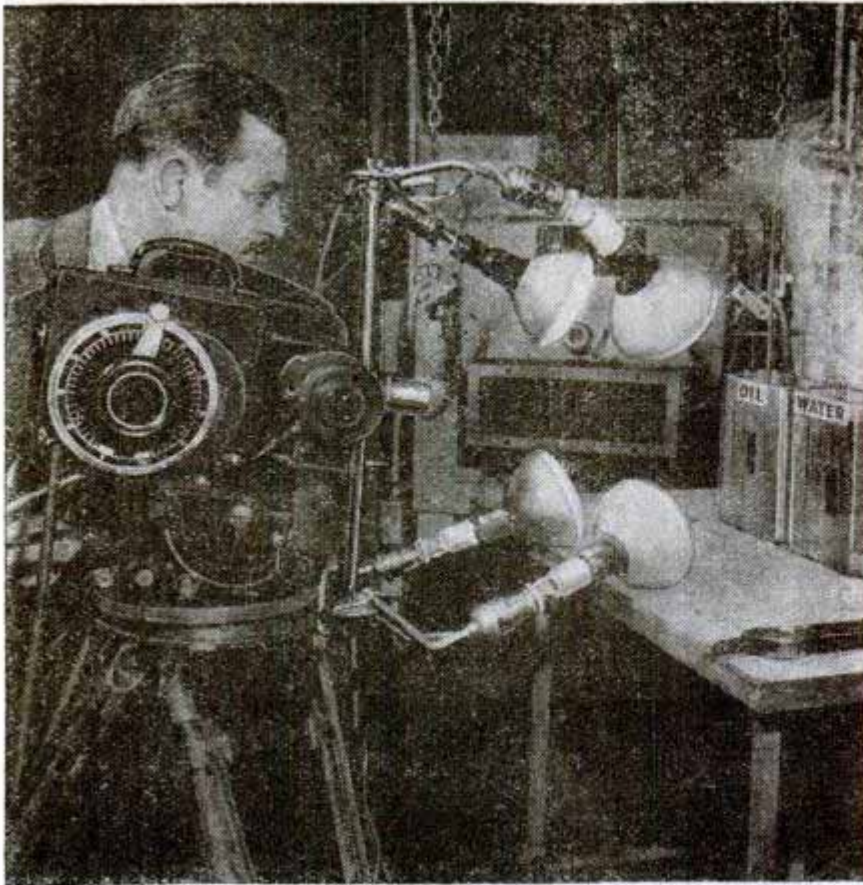
Bell Aircraft photos

pounds of dust. They are quickly reloaded and little time is wasted. Tests show it can dust from 100 to 200 acres an hour.



Sea Lion Hums and Talks

One of the San Francisco Zoo's performing sea lions has learned to say "mama" and hum four notes. A trainer taught Flipper to hum by putting his hand on her throat and humming. When she mastered the first lesson, three more notes were added to her repertoire. Then, by gently pressing her neck muscles and repeating "mama" over and over, the trainer taught her to say the word. Flipper is now entertaining daily in a duet with a singing sea lion who carries the "melody" while she hums.



Courtesy Eastman Kodak Co.

High-speed movie camera shows what happens when hot steel is quenched in oil and water; the camera can stretch a second's action into minutes

★
INDUSTRY
has a
MILLION
EYES
★

By Eugene W. Nelson

PHOTOGRAPHY and photographic processes are such important industrial and research tools today that many industries have separate divisions employing hundreds of photo specialists.

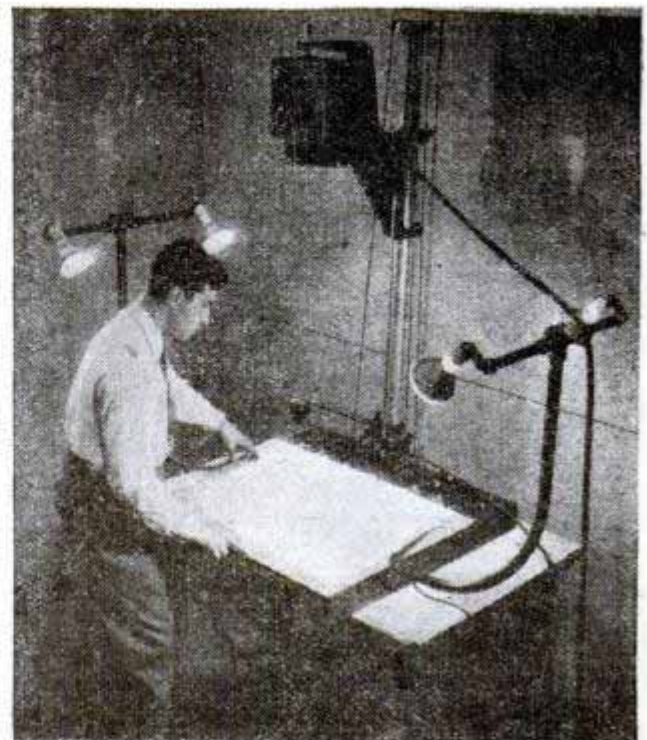
Before World War II, there was a trend toward putting photography to work. The demand for increased speed and accuracy in both manufacturing and testing war material speeded up the industrial applications. Photography rapidly took on such diversified jobs as instrument recording, photo-analysis of materials, making templates, duplication of office records, microfilm filing, and personnel training with motion pictures.

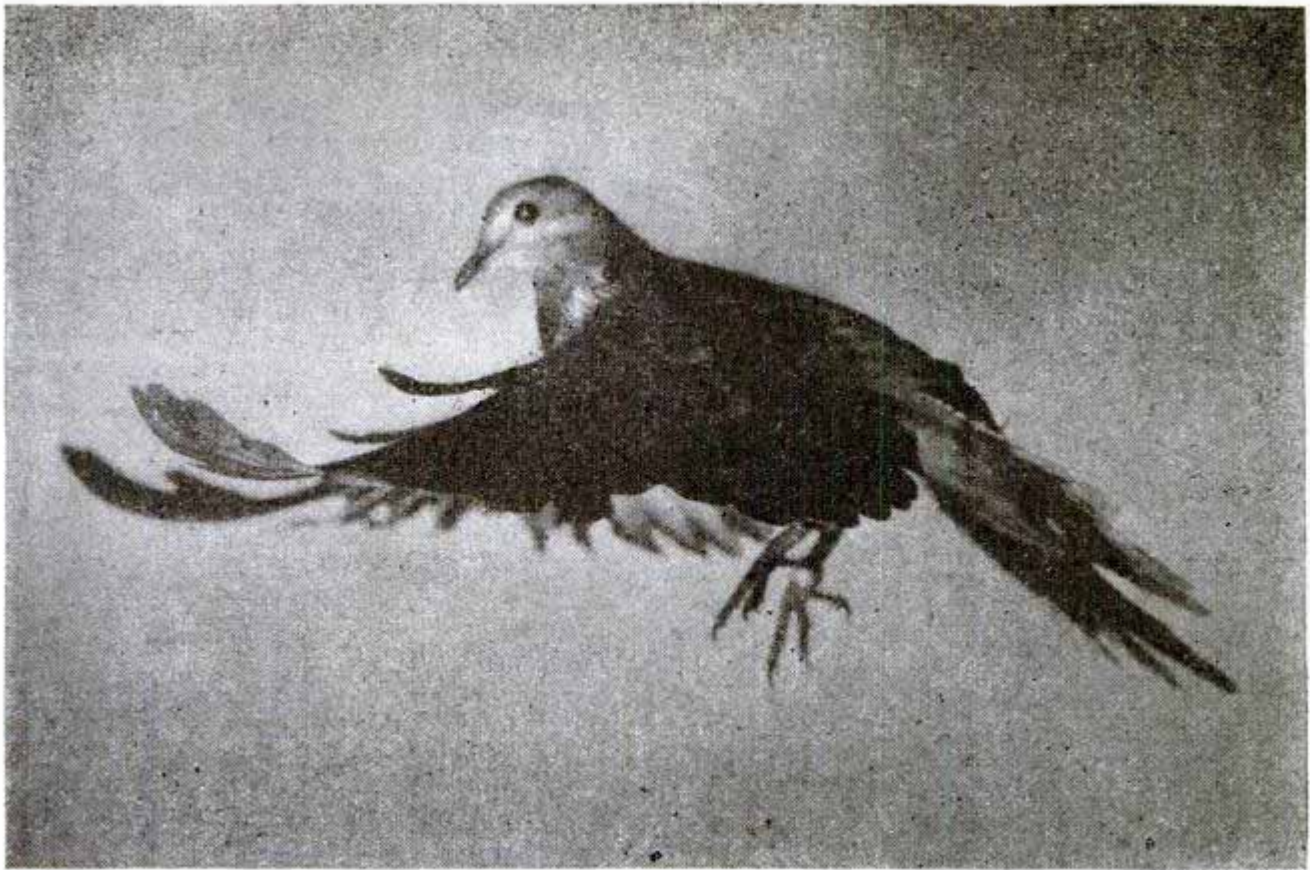
These functions proved so valuable in saving time and money that many companies established separate photographic divisions. General Motors, for instance, has a photo department that employs more than 500 persons. Ford Motors also has such a unit, and most aircraft and chemical firms do, too.

One important photographic process which was evolved by the aircraft industry during the war permits the reproduction of engineering and production information directly from engineering drawings to metal templates (patterns). In this technique, the engineering drawing is photographed and the negative used for making contact prints on the specially treated sur-

Starting out as the "odd job boy" around the laboratory and factory, the camera has made itself indispensable to scientific progress and to business efficiency

Bulky drawing is microfilmed to reduce storage space by 98 percent; films provide a convenient reference





Courtesy M.I.T.

This photograph of a mourning dove in flight shortly after release is an example of high-speed photography

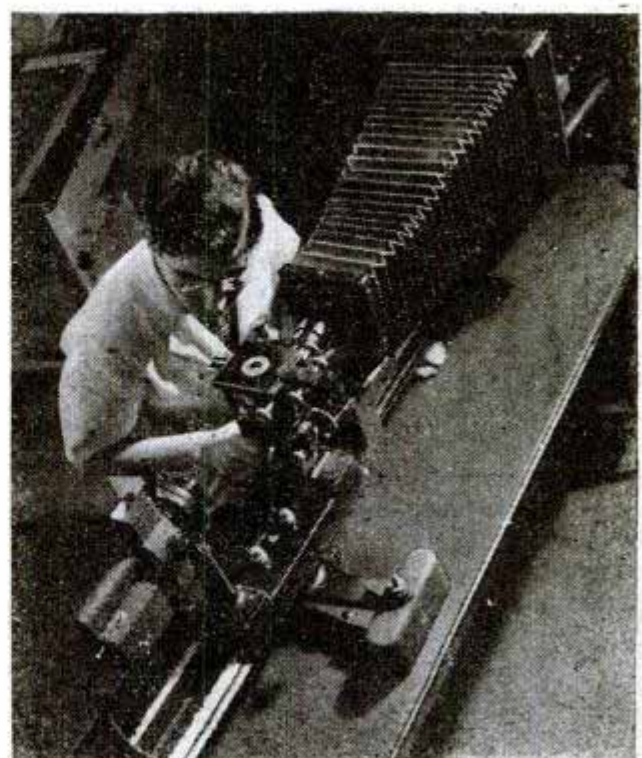
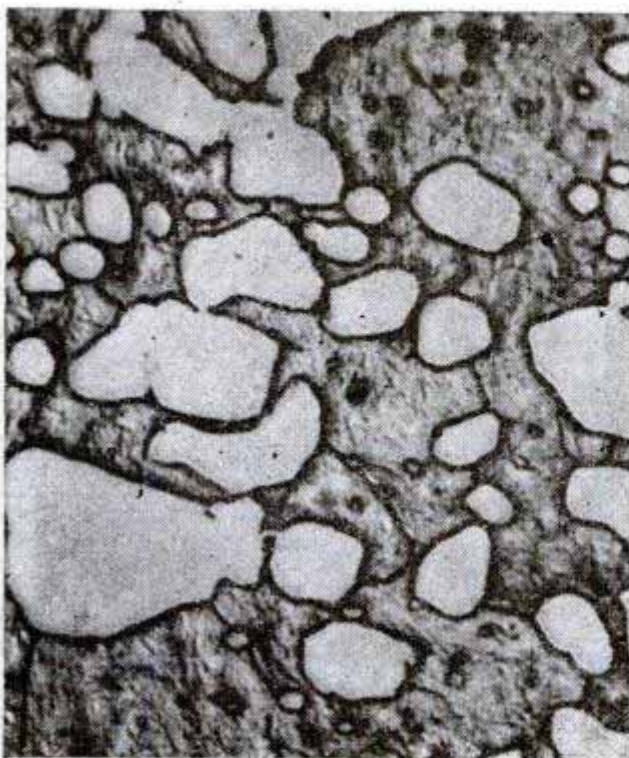
faces of small parts. Large drawings are photographically reduced and optically projected again to the correct scale against the sensitized metal sheets. It is estimated that 50 hours of such photographic work equals 12,000 hours of redrafting time.

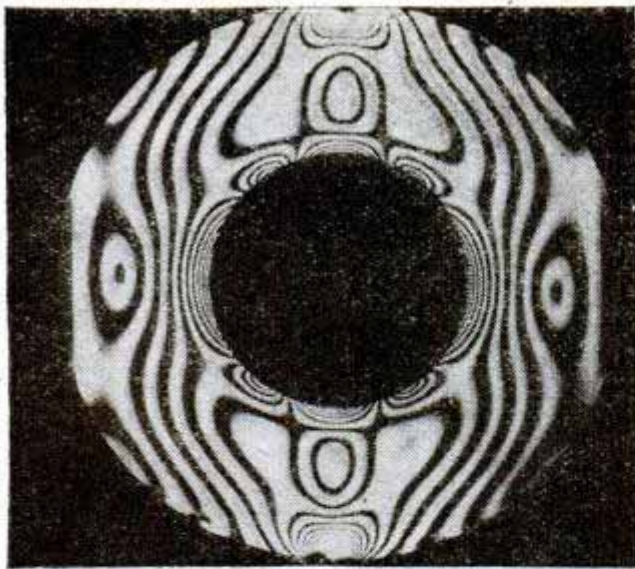
A similar process which has recently been perfected for reproducing any draw-

ing, legend, or picture on firm, nonabsorbent surfaces such as metals or plastics. This method—known as the Transfax process—is a light-sensitive process but is not, strictly speaking, a photographic process. The Transfax method permits the transfer of drawing details from the original drawing to a sheet of steel.

Photomicrograph shows what a piece of high chromium tool-steel forging looks like magnified many times

Camera "wedded" to microscope produces photomicrographs with magnifications up to 5000 diameters





Courtesy Eastman Kodak Co.

Stress-analysis photograph gives engineers and designers advance information on experimental parts

To transfer a drawing, such as a shop layout, to another surface, the surface is first sensitized to light by being sprayed with the quick-drying Transfax solution. A transparent or translucent drawing is placed in contact with this surface and exposed to strong light. The surface is then flooded with a clearing solution, rinsed and coated with a tough primer.

This transferred drawing will not come off when the material is bent, sheared, or cut with the oxyacetylene torch. Transfax faithfully and clearly reproduces lines as close together as .003 inch. This makes possible the quick, inexpensive printing of complicated wiring diagrams on electrical equipment, the layout of lines and working instructions on metal parts that are to be formed or joined together, and putting

dials, labels and nameplates on products.

High-speed, motion-picture photography is a tool that has already proved of immense value to engineers and research scientists in many fields. In high-speed photography, motion pictures are snapped at speeds as high as 3000 frames a second. When the film is projected at the normal speed of 16 frames a second, time is literally magnified almost two hundredfold. Split seconds are stretched out into whole minutes in this manner so that action too fast for the unaided eye is made plain.

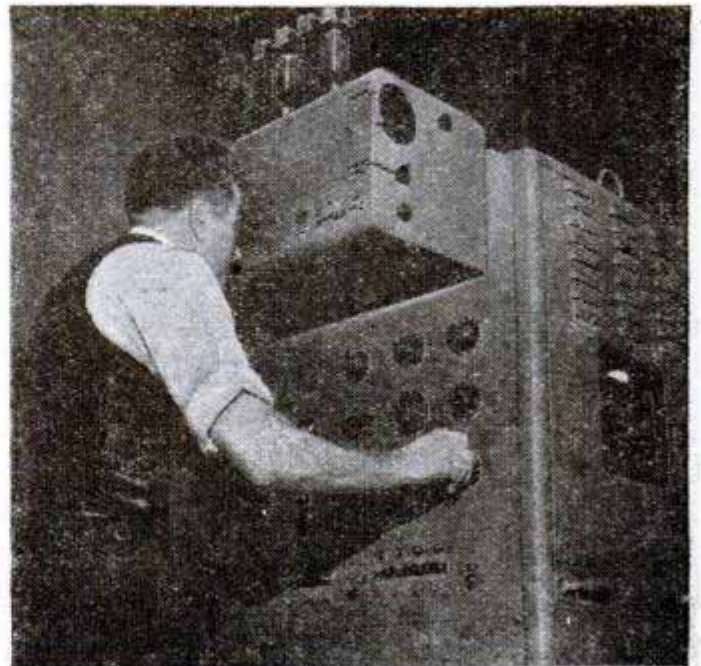
In the working of metals, high-speed photography has produced valuable information regarding the proper adjustment of punches and dies to insure the longest service. Ultra-speed photography of welding operations has saved money by pointing the way to faster and better welding techniques. Scientists are enabled to see, measure and analyze the action of flames in internal-combustion engines.

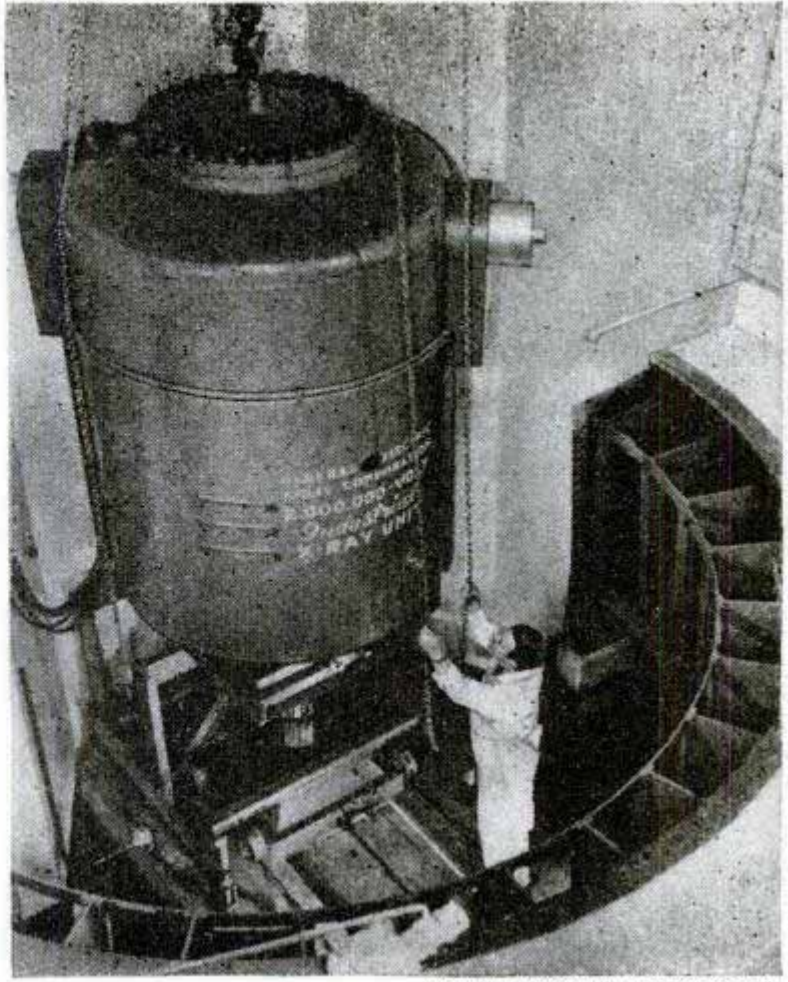
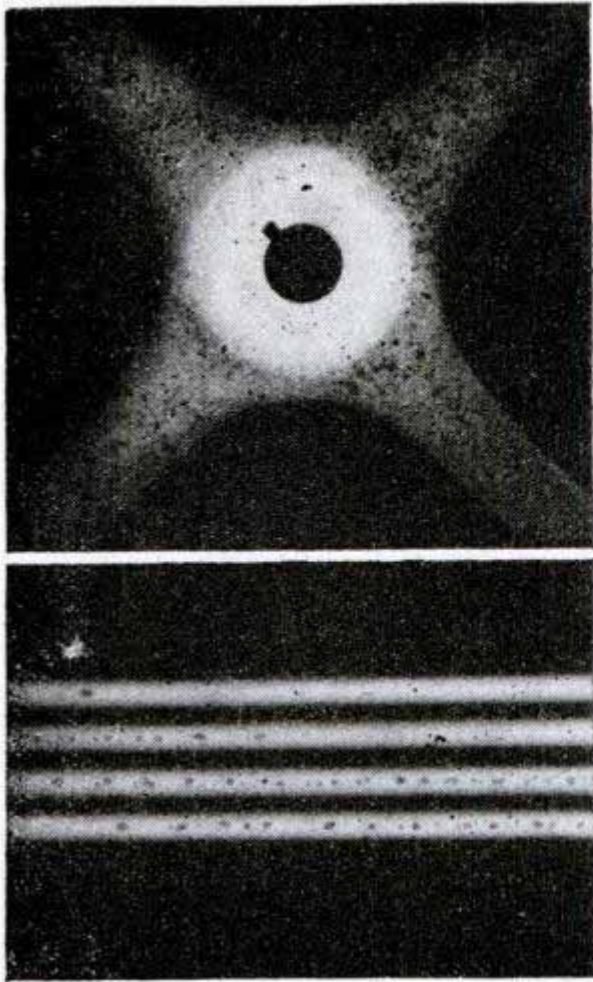
Photography has helped remove the knock from automobile engines. It has also revealed new and startling facts concerning the action of various liquids when hot steel is quenched and hardened in them, leading to stronger steel parts for cars, refrigerators and other products.

Of future value to industry is the use of slow-flying planes equipped with color motion-picture cameras for seeking new mineral deposits. The chief use of aerogeology to date has been to show the presence of likely looking geological formations where minerals may lie.

Treasure-laden rock deposits are seldom visible to a prospector on the ground since they are blanketed under from a few inch-

Millionth-of-a-second camera (shown at right below) has a built-in developer-projector and produces finished projection within 30 seconds. Inventor Nicholas Rohats (left) of General Electric is adjusting hypo storage tank





Courtesy General Electric X-ray Corp.

The 2,000,000-volt X-ray machine (right) permits engineers to look through solid parts. Top left, shows radiograph of blowholes (spots of weakness) in aluminum steering wheel and below it are gas cavities in plastic rods

es to hundreds of feet of soil and decayed rock. These formations can be traced by an observer from the air due to slight variations in the color of the land.

Aerogeologists expect that by using new color film and photographic techniques in slow-flying planes and helicopters they soon will be able to get valuable "prospecting" pictures of mountainous regions.

Airborne cameras are at work in other fields, too. The job of mapping our globe—which is said to be aerial photography's most important job to date—will go on as long as we continue to establish new air lines and as long as changes continue to take place on the earth's surface.

An example of the realms into which aerial photographic mapping can be carried is the work of the Beach Erosion Board of the Army Engineers. Assisted by the University of California, the engineers have developed methods for determining the depth of offshore waters to an accuracy measurable in inches from photos taken from altitudes up to six miles. From such photographs, the engineers can determine the exact nature of underwater obstacles to shipping like seaweed, coral reefs, sand bars, rocks, and sunken vessels, and also the depth of water over the obstructions. This technique was developed for planning

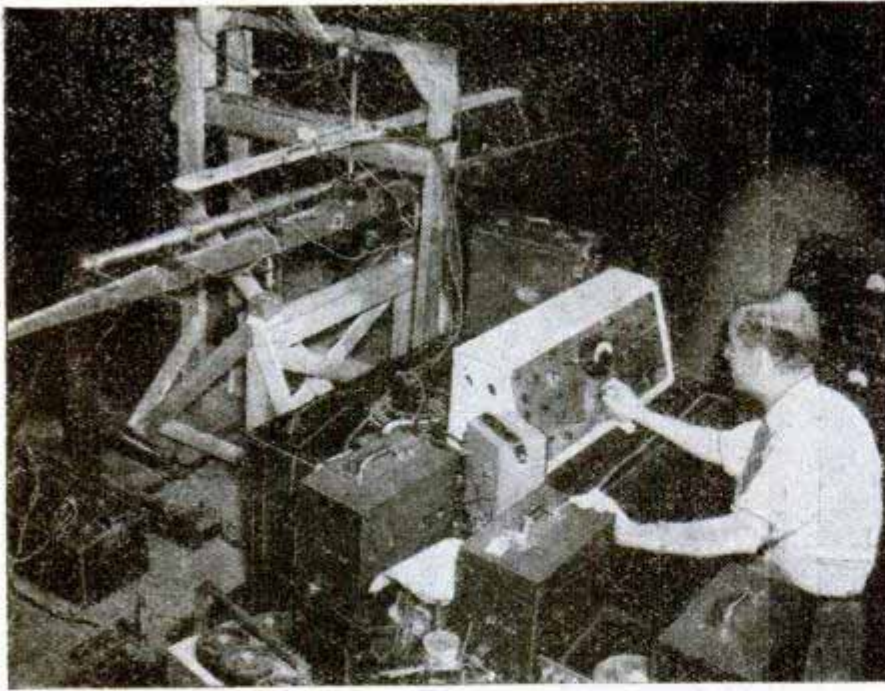
naval operations during World War II.

In the 1930s, aerial mapping—by means of cameras operated from captive balloons—was used by the Oriental Institute to map ancient, ruined cities in the Near East. The Shippee-Johnson expedition used airplanes for mapping the 11 square miles of the ruins of the ancient Indian city of Chan-Chan and also the 40-mile-long great wall of Peru. Complete photographic records of finds at archaeological "digs" are today rapidly replacing the old-fashioned hand-drawn diagrams.

An important industrial use of photography is in the field of spectroscopy. In the modern spectroscope, a tiny sample of material to be analyzed is burned and the light given off is photographed on spectrum-analysis plates. Each of the elements has its own particular combination of lines and bands forming its spectrum. Thus, spectrographic analysis is often referred to as "fingerprinting the elements." The cost of such an analysis is much less than for tests made by the "wet" chemical methods, and the photographic plates also furnish permanent records.

Photomicrography—the science of photographing prepared metal surfaces and enlarging them as much as 5000 diameters

(Continued to page 244)

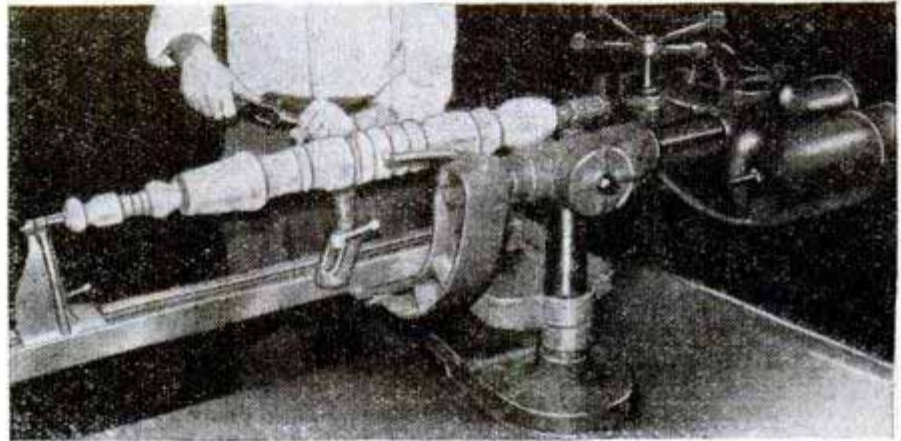


"Crackup Charlie"

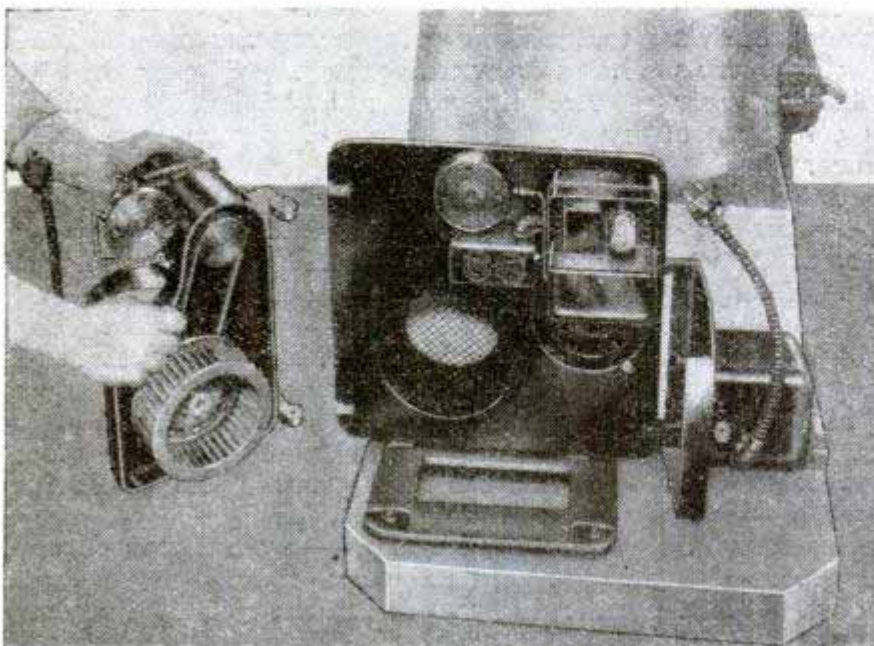
"Crackup Charlie" is helping the U. S. Bureau of Standards determine how much punishment airplane wings can take. "Charlie" is a thin piece of reinforced aluminum, just over six feet long, resembling a wing. Electronic tubes and other sensitive instruments are connected to recorders on a nearby control panel. To check stresses engineers drop the model from varying heights and study results recorded on graphs. Findings go to private manufacturers and the government.

Drill Press Doubles As Wood Lathe

Drill presses are converted into wood-turning lathes by an attachment that saves floor space and eliminates the need for an additional motor. The attachment can be used on any drill press with a $2\frac{1}{2}$ or $2\frac{3}{4}$ -inch-diameter column. To make the conversion the column is replaced by a two-piece pivoting tube. No other changes are required. When used as a lathe the cast-iron bed is locked to the drill-press table and the motor and column pivoted until they are parallel with the bed. The adjustment



of work between centers is accomplished by moving the drill-press quill, eliminating the need for a handwheel screw. For drill-press work the lathe bed is fastened out of the way beneath the table.



"Plug-In" Oil Burner

All the major parts of a new oil burner can be replaced within two minutes in case of mechanical failure. To make a quick replacement one threaded screw is removed which disconnects three fuel lines. When an electric plug is pulled, all wiring is disconnected at once. The entire casting holding the motor and pump swings out on hinges and can be lifted off and replaced as a unit. The transformer can be similarly replaced.

Paradise for Sidewalk Superintendents

Climb aboard the behemoth of the strip mines—the dragline that walks to work. Its every bite is a carload

SEVERAL MILLION MEN would regard as a fascinating pastime the job of one man who pushes the buttons and pulls the control arms bringing to life a gargantuan earth mover at an Indiana coal mine.

This electrical "toy" is as big as an eight-room house. It lumbers to work on its two great flat feet and in two mouthfuls it scoops enough earth and rock from the surface to fill a railway gondola car.

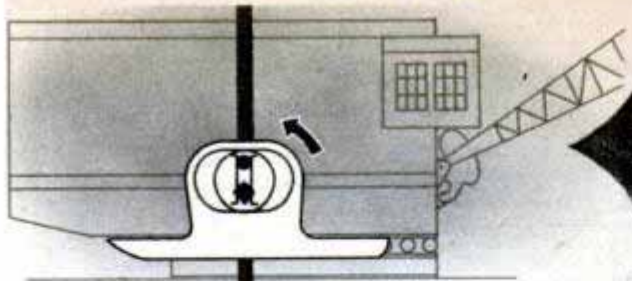
This walking dragline, one of the most powerful right arms man ever invented for himself, never gets to touch the coal which is the treasure it is hired to uncover.

Its function is to tear away the "overburden" of clay, sandrock and shale lying above a coal seam previously located by drilling. Sometimes the dragline scoops away as much as 76 feet of soil and rock to lay bare a three or four-foot vein of coal. Then the smaller electric shovels move in to scoop up the coal and load it into 30-ton tractor-semitrailers for

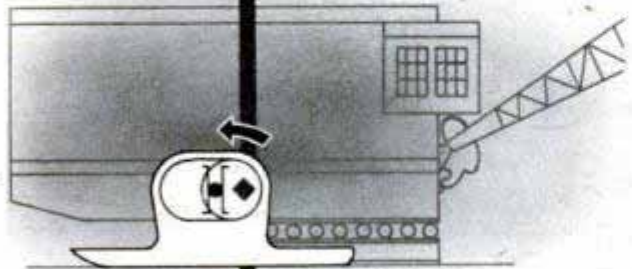
With a boom 180 feet long, the dragline can reach out 150 feet to pick up a 25-cubic-yard bite of earth at an Indiana strip mine



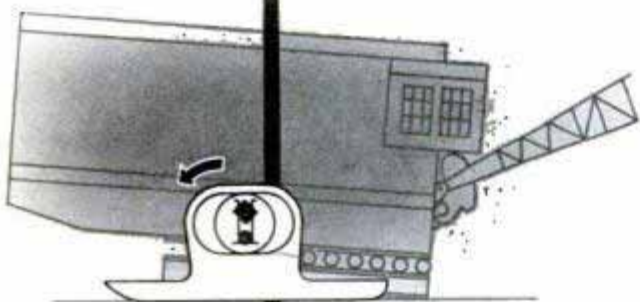
HOW THE DRAGLINE WALKS



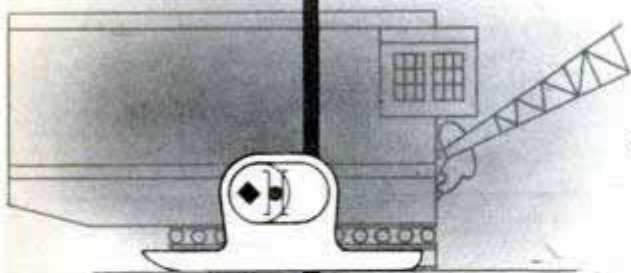
Position of cam and pin for digging and swinging



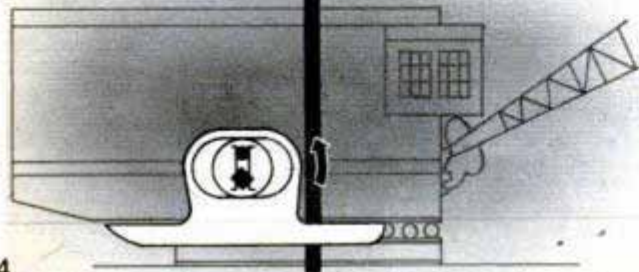
Cams rotate to advance and place shoes on ground



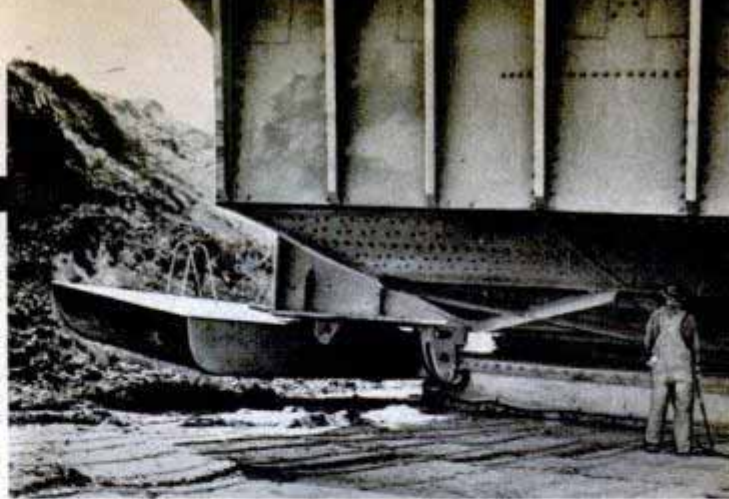
Cams lift and slide base forward. Base tilts so that forward part raises to lift clear of the rim



Cams continue to rotate to complete the step. Note that at no time is the entire base off the ground



Cams rotate to lift shoes to the digging position



One of the dragline's big shoes which enable it to "leapfrog" forward seven feet four inches at a time

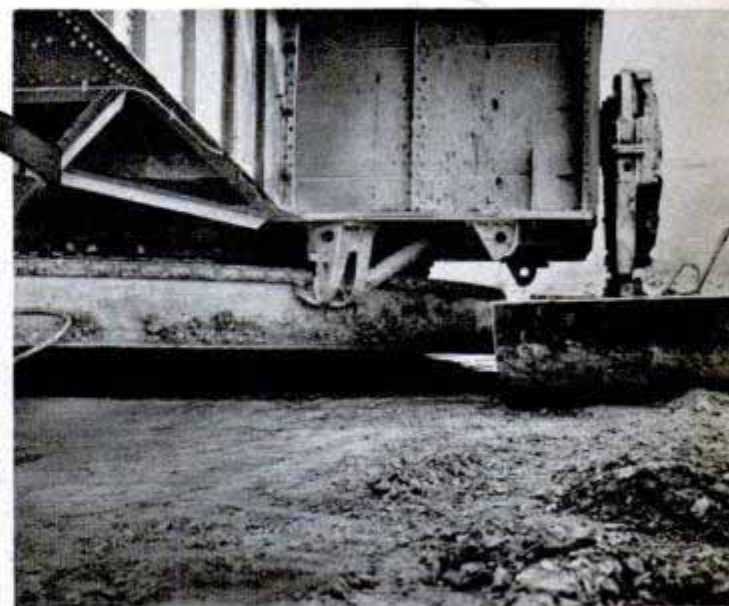
hauling to the processing plant. Once the "black diamonds" have been taken from the strip mine, the ponderous dragline walks back to work and drags the earth back to fill the hole it made.

A day on this Paul Bunyan of earth movers would be a holiday to most grown-up boys. Its steel arm reaches out 150 feet to lower a scoop big enough to take aboard a big truck, then swings on a turntable base 44 feet in diameter.

It took 45 freight cars to haul the parts—and three months to put them together—for this machine which operates at a strip mine near Terre Haute, Ind.

The Maumee Collieries Company operates its Bucyrus-Erie walking dragline constantly to dig as much as 35,000 cubic yards of dirt every 24 hours. That's the equivalent of the dirt excavated from approximately 200 house basements.

It takes a big, powerful, fast-operating machine to move so much dirt in such a short time. This walking dragline meets all these requirements. It weighs 1100 tons and carries 140 tons of gravel for ballast.



When the shoes are flat on the ground, the base moves to carry machine toward new location as shown at left

The base or tub is circular and consists of seven steel sections welded together. The base forms the foundation for the entire machine and carries the load of the revolving parts. These parts and the gravel ballast are positioned to locate the machine's center of gravity so that during operation it shifts through a limited range. This range has been determined in such a way that there is no danger of the machine tipping over when picking up huge bites of earth.

The steel house mounted above the base is 63 feet long, 30 feet wide and 17 feet 3 inches high. The house contains generators, motors, hoist and drag drums, and other machinery that put the giant dragline through its paces.

The boom is 180 feet long which enables the machine to pick up dirt as far as 150 feet from its base. Steel steps extend the entire length of the boom to provide easy access for inspection and oiling.

Electricity operates the dragline which takes 4000-volt alternating current from a power line and converts it to direct current to drive its motors.

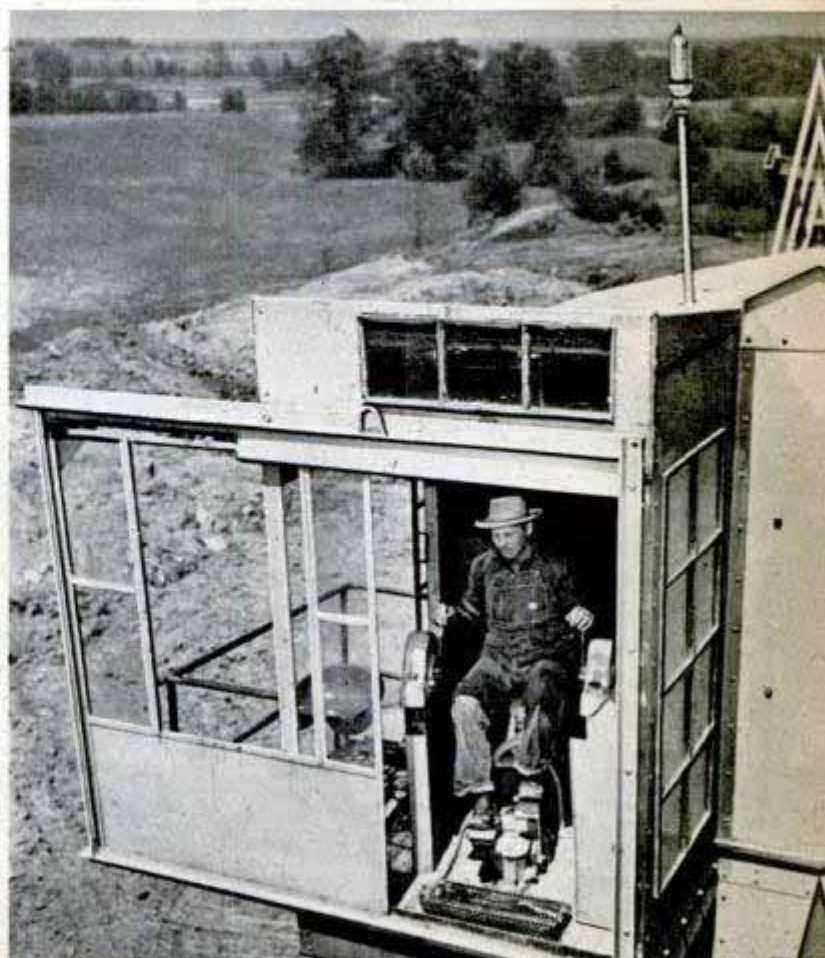
Power equipment includes two motor-generator sets, consisting of two 900-horsepower motors which drive 11 generators. These generators supply the power for two 425-horsepower drag motors, two 425-horsepower hoist motors and three 125-horsepower swing motors.

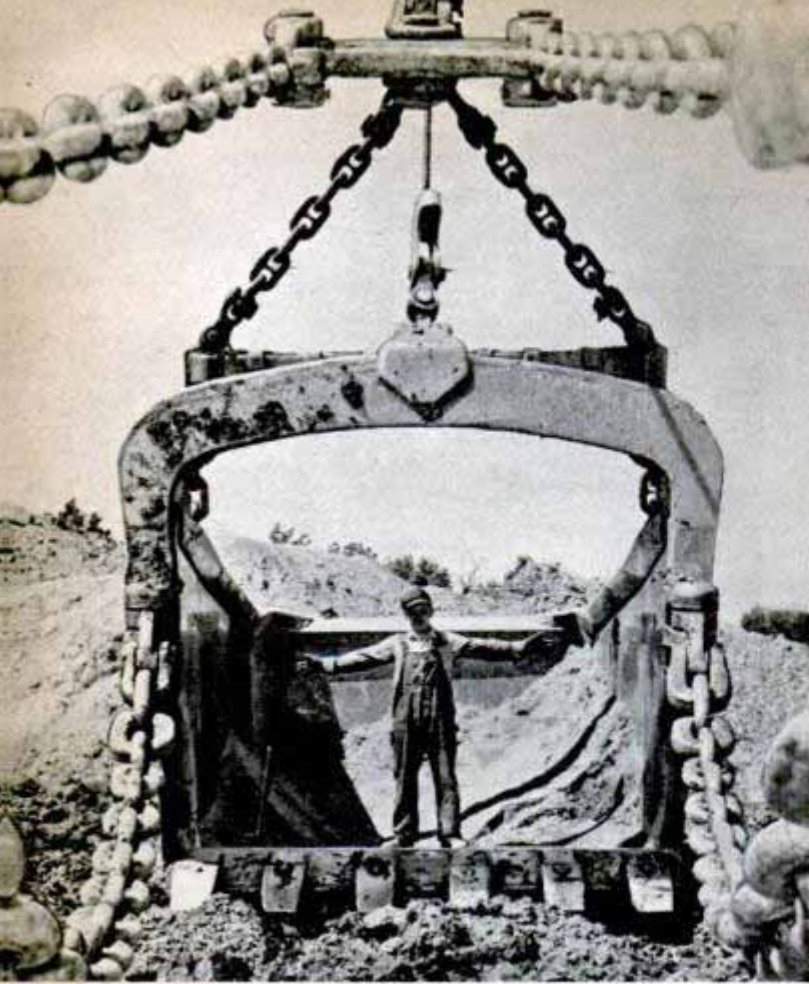
Despite the maze of motors and machinery, only three men per shift are required to operate the mammoth digger: an engineer who uses four controls (two hand levers and two foot pedals), an oiler

A highly sensitive instrument in the dragline house records the number of swings, when they are made, and the angle and direction for a permanent record



Looking up walkway of the boom which enables the oiler to inspect parts and oil them. Below, operator has two foot pedals and two hand-operated controls



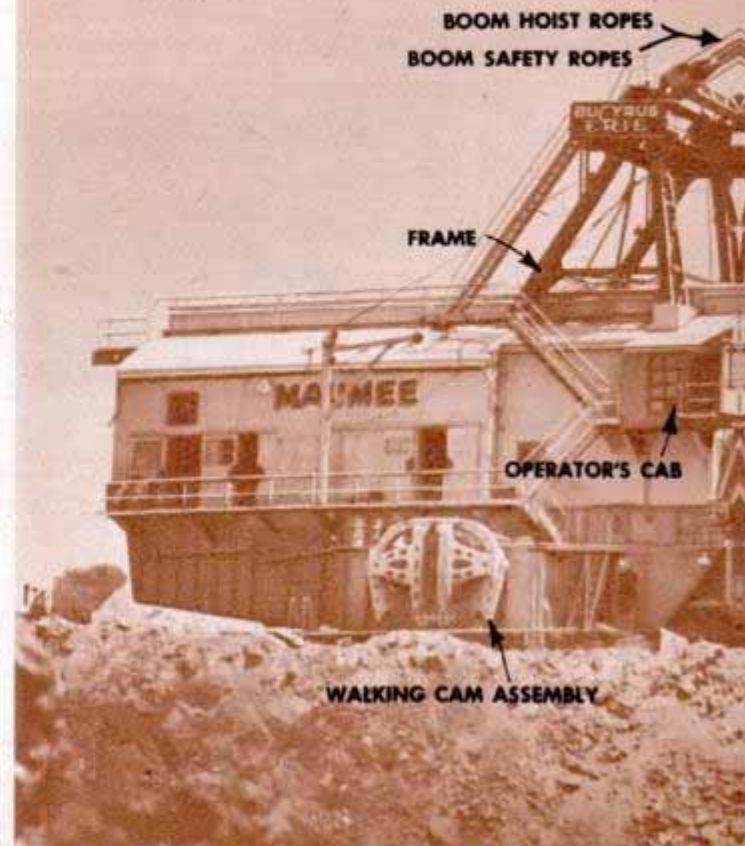
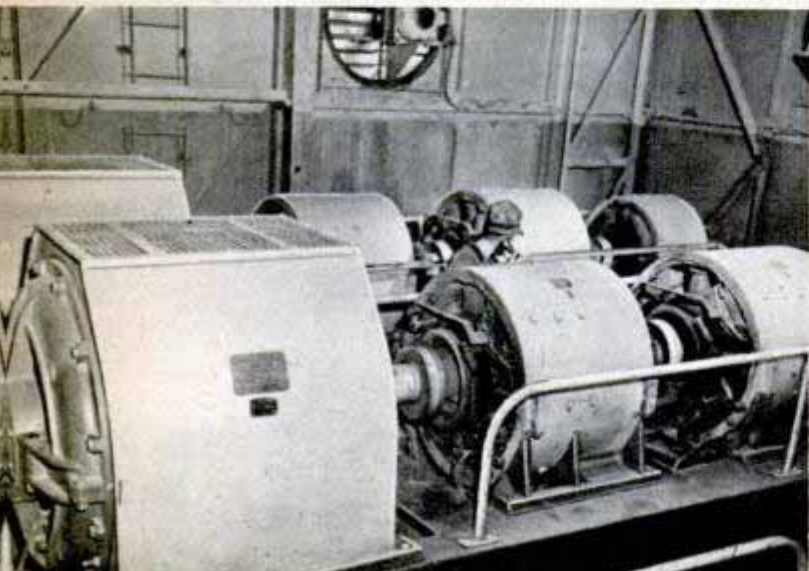
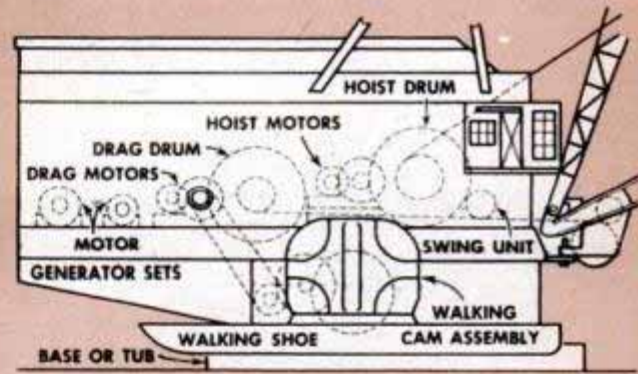
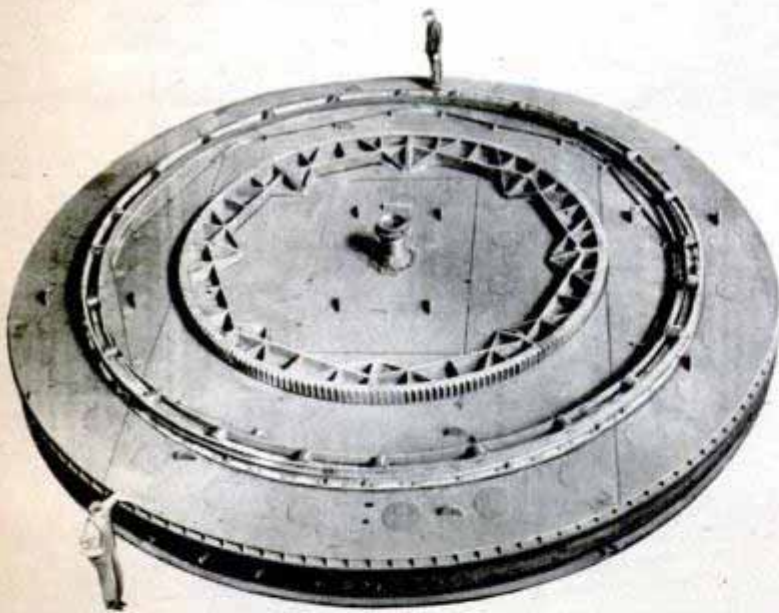


and a groundman who signals where dirt is to be picked up and dumped.

It's quite a sight to see this excavator pick up a big chunk of earth, then swing around swiftly on its base and dump the material. But people who like to watch construction work would get a bigger kick out of seeing it walk.

As shown in drawings accompanying this article, walking is easy for this 1100-ton machine. The walking mechanism consists of three major parts on each side of the revolving frame: an eccentric cam, an elongated circular-track cam frame and a walking shoe 48 feet long and 8 feet wide. The shoe is attached to the cam frame by

The bucket, which dwarfs a tall man, is big enough to hold a truck. The base (left center), 44 feet in diameter, consists of seven sections welded together; the dragline swings on this disk. Motor-generator sets (bottom) include synchronous a.c. driving motors (left) and d.c. generators (right) to power d.c. motors



two strong hinges so that it can pivot sideways on the hinge pins as well as fore and aft on the cam.

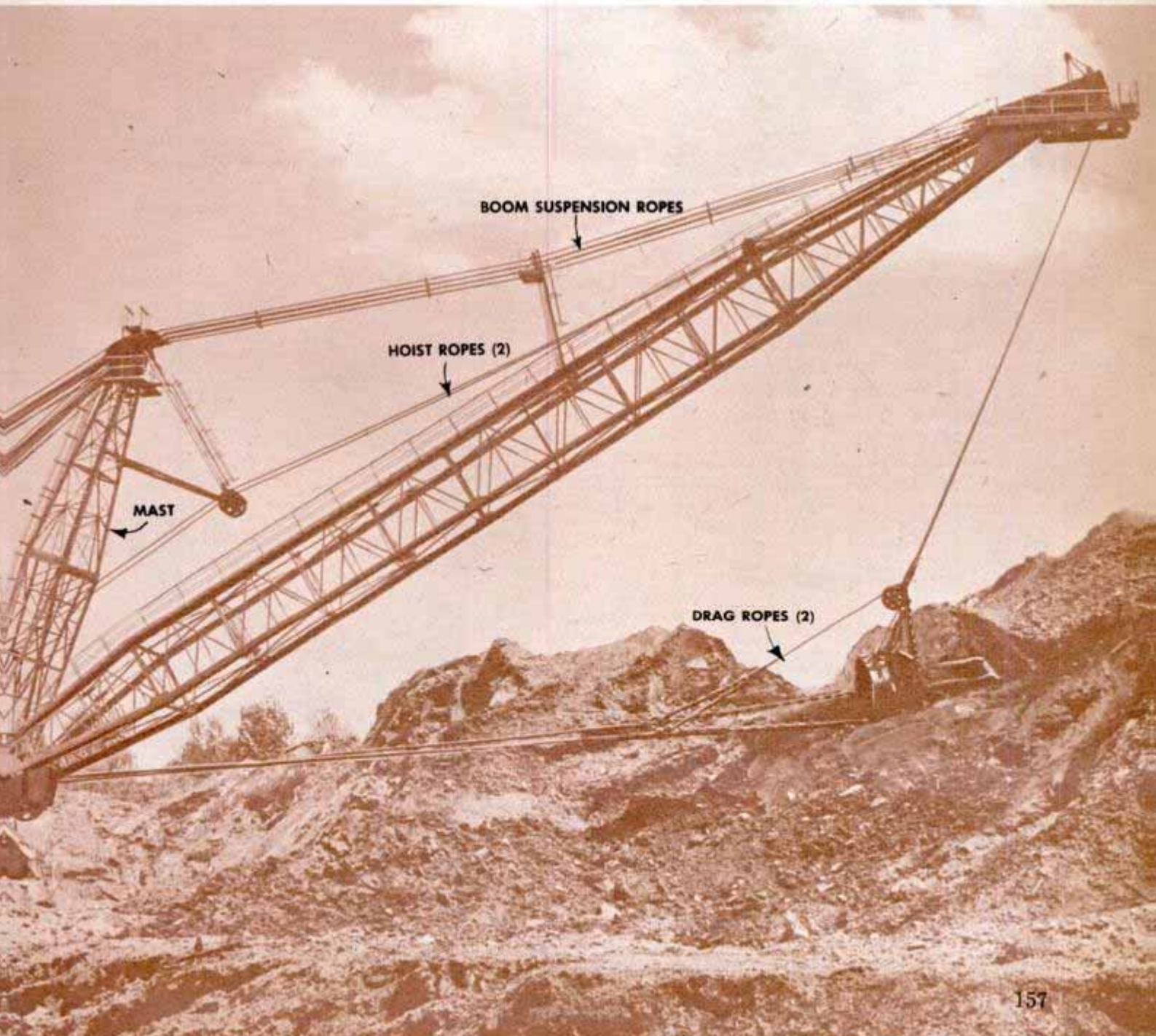
A walking shaft, extending across the machine and mounted under the revolving frame, carries the cams and binds the two walking assemblies together for simultaneous action. Mounted on the cams opposite the walking shaft are guide rollers which move up and down in vertical slots guiding the cams to advance the shoes or the machine as the cams roll.

The machine walks somewhat in the manner of a boy leapfrogging over another boy's back. The jumper's hands, placed on the bent-over lad's back, are comparable to the base of the machine. And the jumper's feet move simultaneously, as do the immense shoes of the dragline. However, the dragline takes a step seven feet four inches long.

(Continued to page 240)



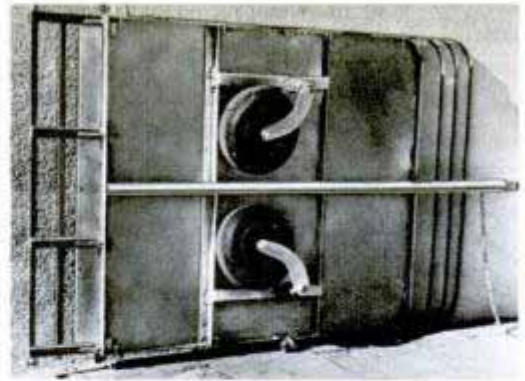
View inside the dragline shows drag drum in the foreground and hoist drum in background with motor between them. Machine has 2000 feet of steel rope



TENT-TRAILER SLEEPS FOUR PERSONS AND FOLDS FOR STORING



Trailer unit serves as roomy tent (above) or roadside sleeper for two (below). When not in use (right) it takes little space



Four campers can sleep in a tent-trailer that collapses to only 13 inches high for storage. The trailer has two wheels that retract into the bottom when the unit is stored. With the wheels in place the trailer becomes a flat bed for general hauling. The canvas cover can be used to protect luggage and other gear. Within five minutes the cover can be pitched as a tent containing a mattress-covered compartment as large as a double bed with additional room for two camp cots. The trailer weighs 360 pounds and has a capacity of 1000 pounds. The wheels are suspended on rubber springs to reduce sway and shimmy.

Foot-Operated Tire Spreader Leaves Both Hands Free for Work

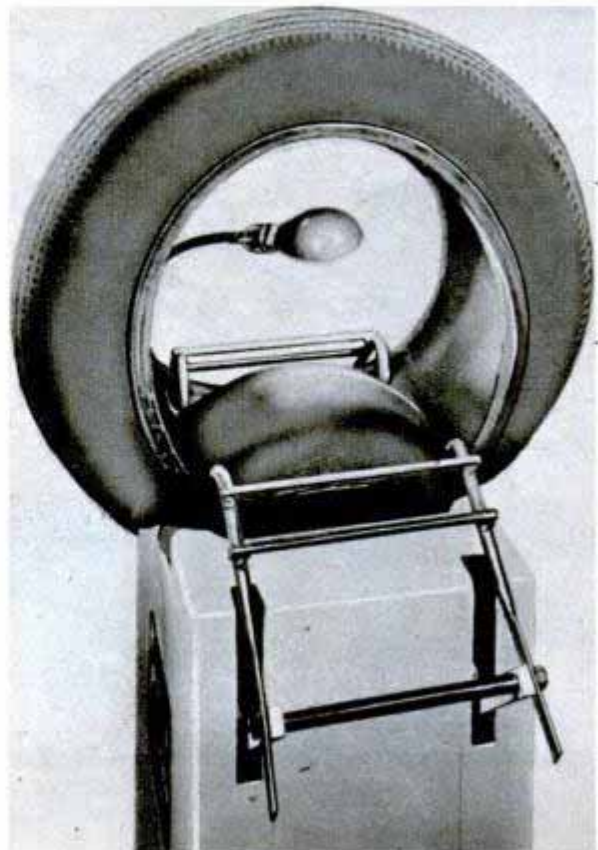
Any size or type tire can be inspected and repaired on a pneumatic spreader operated by two foot-button controls. This leaves the operator's hands free for work. After putting the tire on guide rollers and swinging both gripper arms and hooks inward, stepping on the left button spreads the tire and raises a cylinder platen that pushes the lining inside out. Pressing the right button reverses the process.

Braille Wrist Watch for Blind



Braille dots are raised on the face of an experimental wrist watch for the blind. Most former timepieces for the blind have been pocket models. The new wrist watch was designed at the

request of blinded veterans. The watch will not be produced until reports have been received from several veterans who are wearing the experimental model.

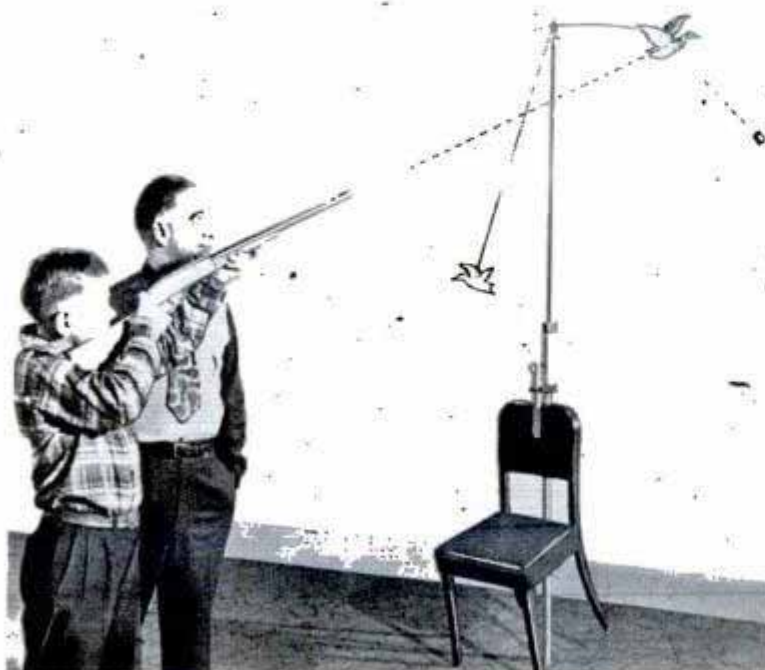
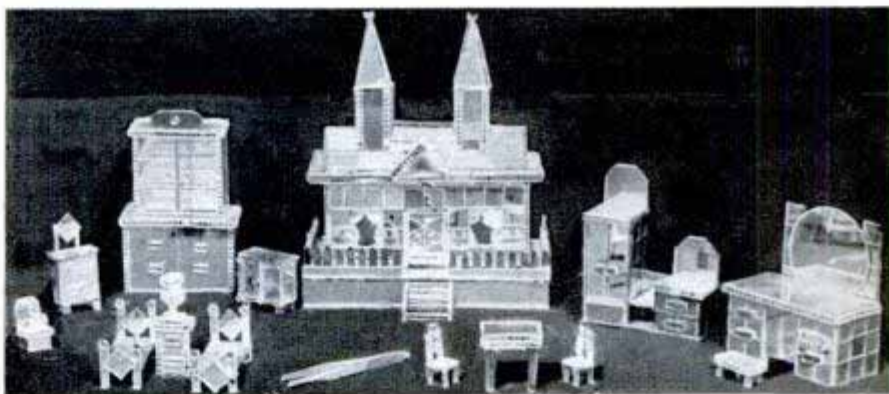
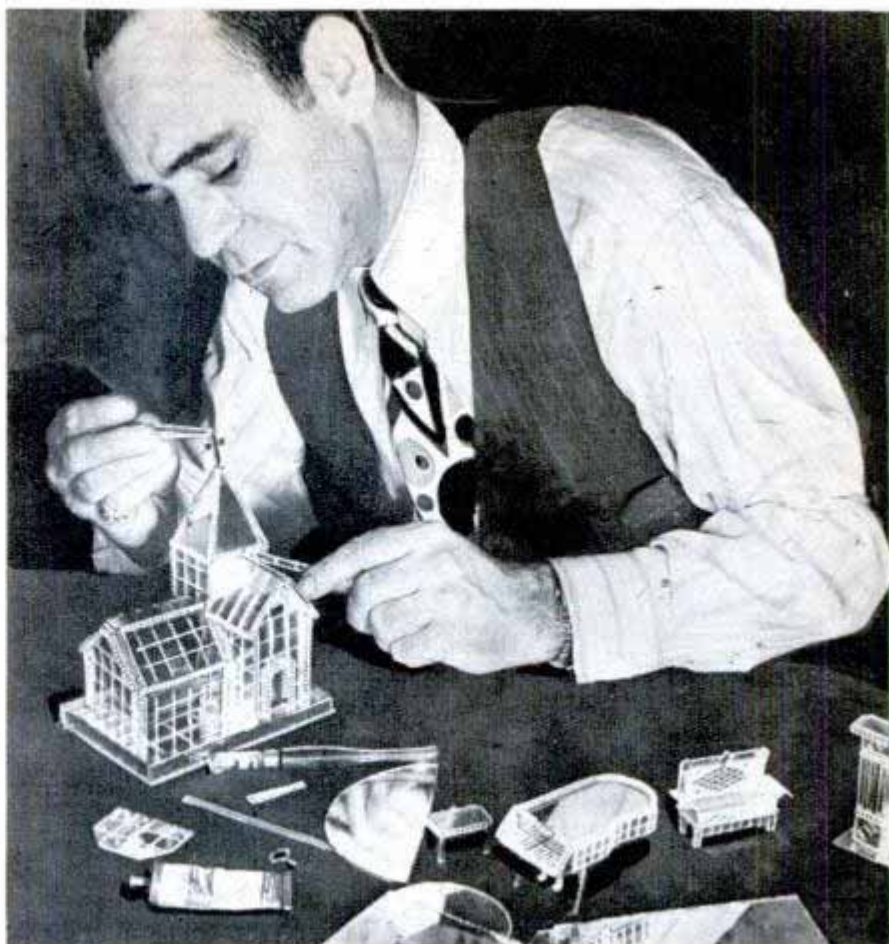


Glass Miniatures

Using a cutter, tweezers, a tube of cement and waste material, Garry Antman of New York has made enough glass miniatures in a year to fill a 10-room doll house. A chair $\frac{3}{8}$ inch high, with a seat $\frac{1}{8}$ inch square, is believed to be the smallest in the world. He gets his raw material from the waste barrel of a manufacturer of mirror-glass objects. Some of the pieces he fashions are only $\frac{1}{32}$ inch wide. Antman, who does the work as a hobby, has also made full-size glass floor and table lamps, flower boxes, clocks and radio cases.

Insecticide Atomizer

Warehouses, storage plants and large barns are kept free of insects and odors by a compressed-air sprayer that atomizes liquid insecticides and deodorants automatically from vents along pipe lines. During the heating season, the sprayer can be used to maintain proper humidity by piping water into it. The device will atomize from one to five gallons of liquid an hour.

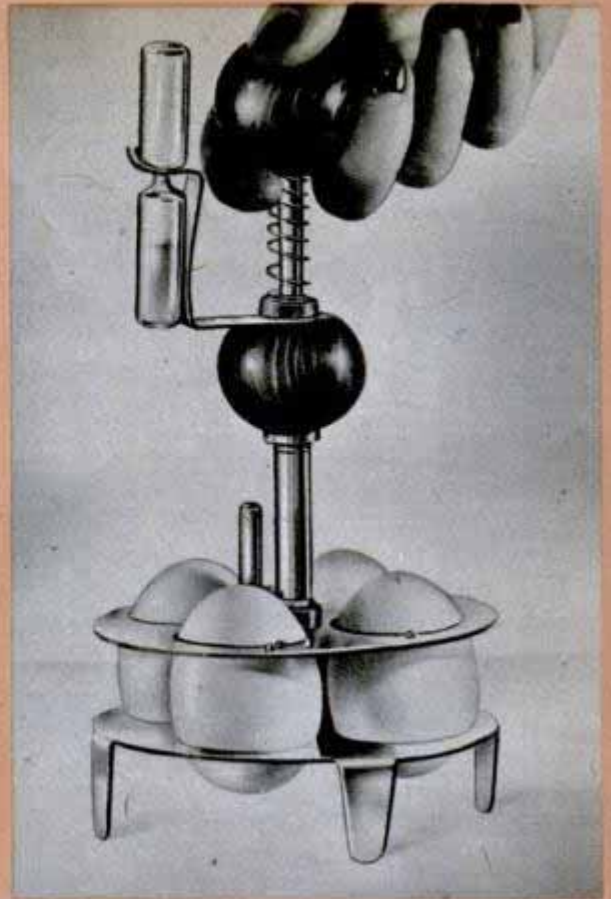


Indoor Wingshooting

Wingshooting can be learned indoors with an outfit that includes rotating target, a cork-firing gun and instruction manual. The three-quarter-size gun, operated by compressed air, is designed so that it will not break glass. Two moving targets, chosen from an assortment of metal ducks, crows, quail and rabbits, are attached to rigid arms that swing from the top of a standard. The standard is adjustable and can be clamped into position on the back of a chair. A slight push or wind from an electric fan sets the targets in motion. The swinging arms, four feet long when fully extended, pivot in a socket at the top of the standard.

SAFETY HOLDER for boiling eggs has timer→

FLAT-PLATE IRONER has 300-square-inch ironing board which can handle several handkerchiefs or hand towels at one time



FLEXIBLE PLASTIC ice-cube trays (below) make it simple to remove cubes without use of hot water
STAINLESS-STEEL kitchen tool (lower right) removes core from grapefruit, cuts fruit from rind and divides "meat" into 10 sections—in one operation

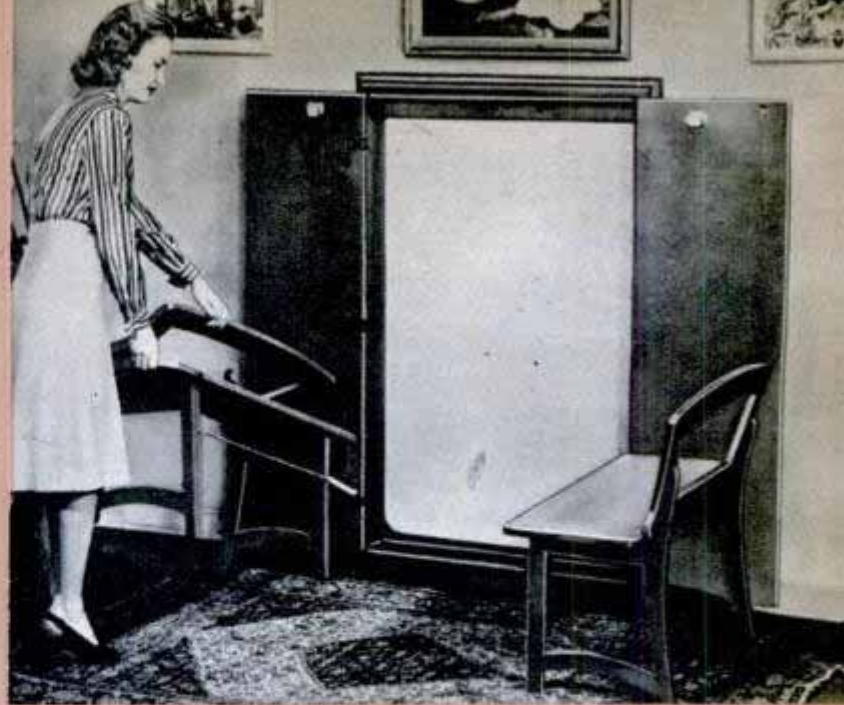


WHAT'S NEW *For Your Home*

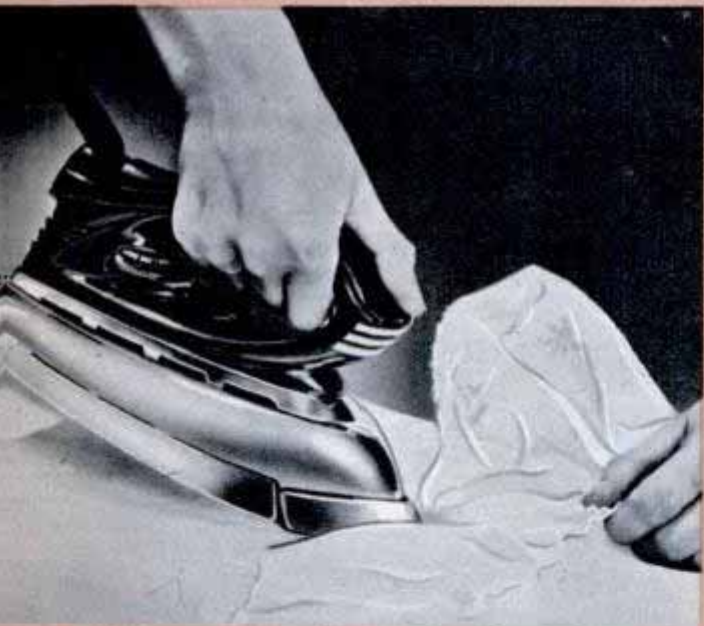




FLOOR WAXER automatically applies liquid wax as the operator pulls a trigger attached to the handle. The liquid flows from a container to a plush applicator



FOLDING DINETTE serves as dining-room table and conserves space in small apartments by fitting into a wall cabinet. Plastic top measures 32 by 48 inches



HAND IRON has hinged toe which simplifies the job of ironing delicate work such as gathers and ruffles

SERVING TRAY can also be used as sloping dish drain



AUTOMATIC WINDOW LOCK goes into action when a window is closed. It pulls upper and lower sash together. Lock is easy to open



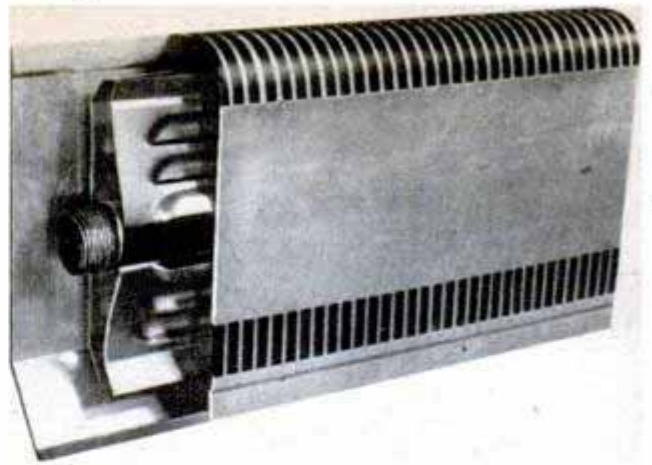
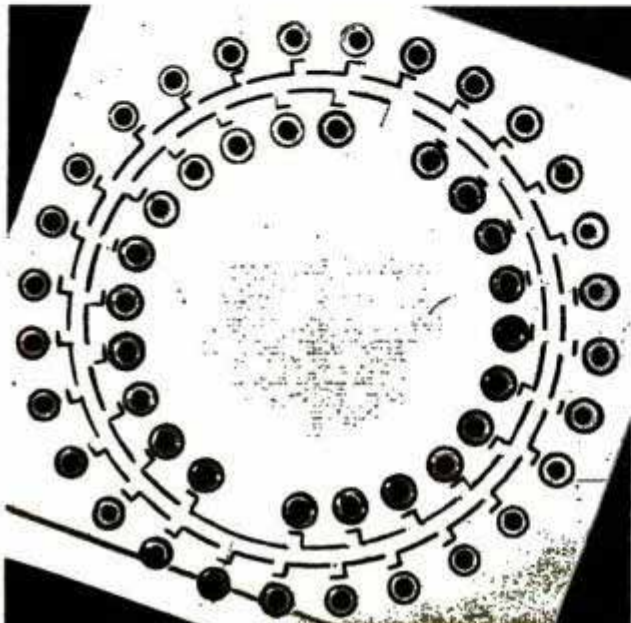


Rods Cut By Multiple Leverage

Rods made of metal, wood, plastic and rubber are cut without distortion by a rod parter that has a multiple leverage arrangement for ease of operation. The rod to be parted is slipped through a hole of the same size in the cutting head. Several holes permit a wide variation in diameters. Extremely small diameter rods used in the manufacture of delicate instruments can be cut in the machine with close tolerance in concentricity. The cutter is available in two sizes, one taking rods from $\frac{1}{32}$ to $\frac{3}{8}$ inch and the other from $\frac{1}{16}$ to $\frac{5}{8}$ inch.

Three Guesses—What Are They?

Give up? They're plastic eyes for duck decoys. Molded 50 at a time from transparent Tenite, the eyes are painted on the inside with black pupils and brown irises, and later cemented to decoy heads. The plastic sheets are cast by injection.



Aluminum Baseboard "Radiators"

Hollow aluminum baseboards with attached aluminum heat reflectors take the place of conventional radiators in a new hot-water heating system. The unit takes cold air from the floor, heats and circulates it through the room. A five-room house is heated with 30 gallons of water. The reflectors are clamped onto pipes along the outside walls. The baseboards and reflectors can be substituted for radiators in existing systems or in new installations.

Football-Shaped Street Lamp

Shaped like an oversize football, an unusual street light illuminates a 20 percent larger area with the same power lamp. The unit also minimizes glare to motorists. Both aluminum reflector and glass refractor are oval. The unit uses a 400-watt, 20,000-lumen mercury lamp.

Westinghouse photo

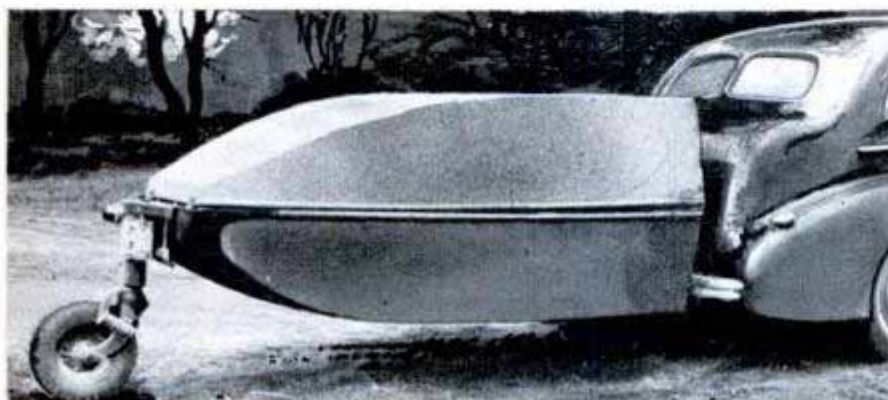


Machine-Made Check Rows

Two 113-horsepower tractors are required to pull a mammoth "checker" that is preparing land in California for permanent pasture. The machine, more often used in rice fields, makes rows of earth six feet wide and four feet high around the edge of level fields and along the contours of sloping land to retain irrigation water. It constructs $1\frac{1}{2}$ miles of "checks" an hour. Tractors pull the huge machine, 16 feet wide at the open end, along rows previously tilled. The funnel-shaped gathering blades form the soil into the type of check desired. An engine on the machine regulates the depth of the gathering blades and the height of the forming blades.

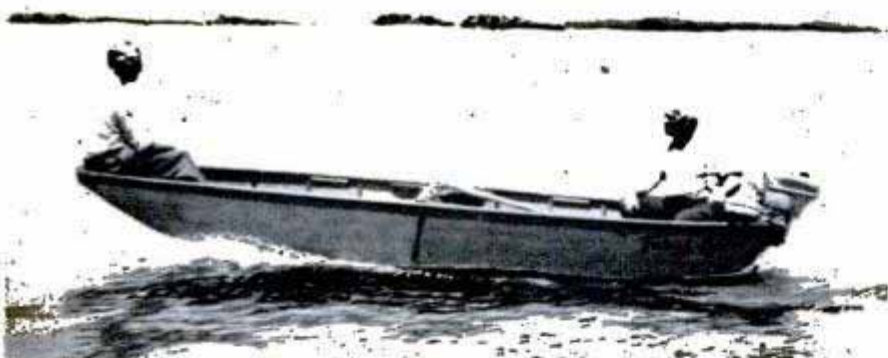


Caterpillar photo



Hinged Boat Folds To Form Trailer

Built in two sections, a collapsible boat can be folded in half and a single wheel installed to make it a trailer. The bow section of the 14-foot craft pivots on hinges and forms a cover for the stern half, to which the single caster-type wheel is attached. The resulting trailer is seven feet long and provides a waterproof storage compartment. Two steel locking pins fasten the center bulkheads together when the boat is in the water and the same pins lock the trailer to a double car hitch for traveling.



Pedal Taxis

Pedal taxis that are a cross between a jinrikisha and a bicycle are providing cab service in Japan where there is a shortage of regular taxis. The vehicles have an enclosed seat for the rider resting on a pair of wheels directly behind the pedal-pushing driver. Called a Rintaku, the taxi is constructed partly from duralumin.

If you would like additional information concerning the new products described in this issue, including names and addresses of manufacturers and distributors, write to Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11



Pan American World Airways photo

Airplane Seat-Bed Has Foldaway Table

Transpacific air travelers are the first to use a seat that becomes a 78-inch-long bed at the touch of a button. Called sleeperettes, each unit has curtains which are quickly installed for complete privacy. Planes using them have been refitted to carry 30 instead of 44 passengers, providing 20 inches additional leg room at each seat. A foldaway table, which is built into the underside of the leg rest, is used for meals, reading and writing.

Shearing Jig

Asbestos-cement panels used in construction work can be cut with a shearing jig into any desired shape six times faster than with a hand-saw. The jig is manually operated, requiring no power. The blade slips along a track on the frame, cutting one foot each stroke. Circular cuts can be made by revolving the piece around a nail. The jig cuts up to $\frac{3}{16}$ -inch stock.



Fuel Atomizer For Gas Turbine

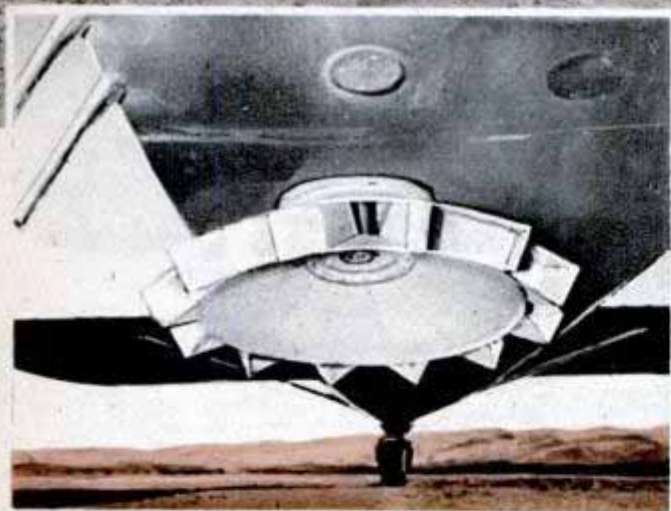
Designed for use on a 2000-horsepower oil-burning gas turbine, a fuel atomizer whips heavy oil into a miniature cyclone of tiny droplets less than $\frac{4}{10,000}$ inch in diameter. By reducing oil to such tiny droplets, 96 percent of the fuel is converted into heat over a wide range of



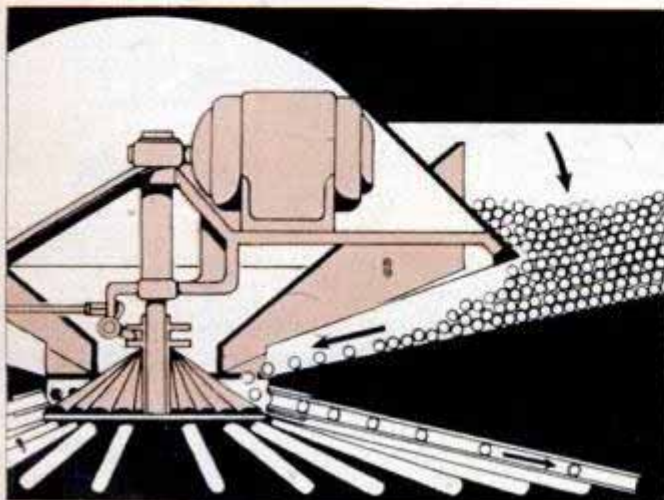
speeds, according to Westinghouse engineers who developed the new type nozzle. Fuel particles produced by conventional nozzles are at least 10 times larger than wind-driven droplets sprayed by the atomizer nozzle. Key to the new nozzle's atomizing power, even at low pressures, is a blast of air that enters through six very small slots cut at an angle in the nozzle.



Bombing the Desert With Seed



Seed-pellet spreader is attached to plane's fuselage. Rotating vanes spread seeds evenly. Below, movement of seeds from hopper to vanes is shown by the arrows



By William Winter

PLANTING GRASS SEED from planes is the newest technique in the fight against erosion—the land scourge that costs the nation \$3,840,000,000 a year.

In the Southwest alone, Indian reservations covering 50,000 acres of once barren land have been seeded by clay-coated pellets dropped from whirling fanlike machines attached to low-flying Cessna Bobcat planes.

More than 135,000 acre-feet, 44,224 from the Indian lands alone, are deposited as silt each year in Lake Mead, behind Hoover Dam, the biggest artificial lake in the world. Each square mile of eroded land contributes enough silt to cover one acre to the depth of two feet. A Reclamation Service survey for the period 1910 to 1939 shows a loss in water storage capacity of the four reservoirs on the Salt River amounting to 7562 acre-feet each year, or enough silt to form a one-acre pile considerably more than a mile in height. Similar reports exist on such dams as the San Carlos, on the Gila River; the Zuni, on the river of the same name; and Elephant Butte, on the Rio Grande. The consequent loss in investment, including cattle sales and crops, runs into hundreds of millions of dollars a year.



The plane is loaded with grass-seed pellets by a tractor equipped with a hopper attached to a hydraulic lift

The trouble is so acute that the Navajos, for example, have been restricted to one third the number of sheep grazed 28 years ago, despite a steady rise in tribal population. Dr. Lytle S. Adams, who did the planting by plane, estimates that between 200,000,000 and 300,000,000 acres support no better than two to four head of cattle for each 640-acre section. Overgrazing has reduced some 90,000,000 acres to semidesert. Only grass can save the bulk of this land and only the airplane can plant it fast enough to halt steady inroads of erosion.

After the burning over of the Los Angeles watersheds some years ago, mustard seed to bind the soil was successfully planted from the air. But usually seed cannot be thrown loose in the wind. African love grass, the best seed for the tough conditions of the Southwest, runs 6,000,000 to 7,000,000 seeds to the pound. Not only would such fine seed drift with the wind, but it would be destroyed by the weather or eaten by insects or animals.

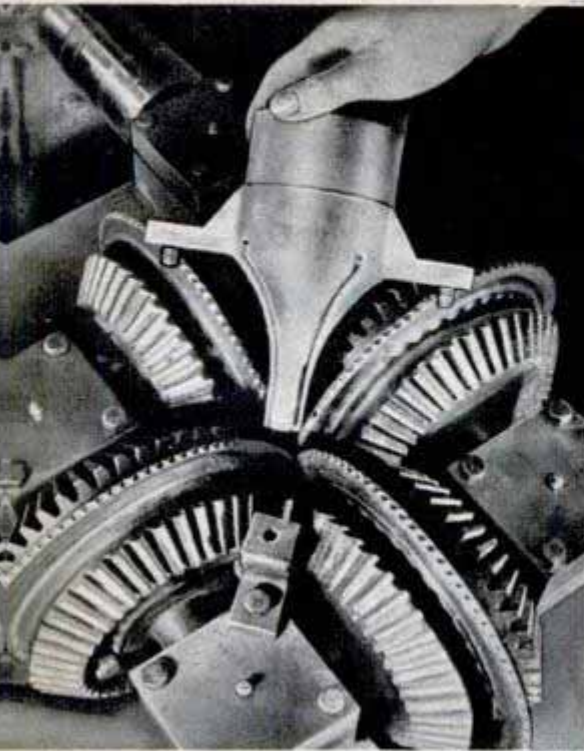
Adams' first problem was how to mass-produce insect and rodent-repellent adobe or clay-coated seed pellets, each containing several of the minute seeds, which would penetrate the earth when dropped, then lie dormant until rain came. Although plantings usually preceded rains, rain might not come in the more arid locations for many weeks. For use in hard-caked earth or for reforestation, metal-covered pellets with tiny moisture holes, could be

used. To make these earth pellets, Adams developed an ingenious machine.

Raw, fine clay is pulverized by running it through a hammer mill. Then it is blown under pressure through a metal pipe into hoppers mounted above troughlike containers. A fine spray of water is blown into the containers and a worm gear kneads the mixture to a doughy consistency. Then the recipe calls for added fertilizer, rodent and insect repellent, fungicides, and finally the grass seed. The dough is then placed in hoppers of a machine that pours out finished pellets from twin chutes at the rate of 48,000 a minute, or three tons a day. This is enough to cover 4500 acres. The pellets may be either one quarter inch or three eighths inch in diameter.

To spread the pellets from an airplane, Adams (who, incidentally, invented an airmail pickup device), dreamed up a disseminator. This is a rimless wheel affair which has sheet-metal chutes for spokes. Whirled by the wind, this blower tosses out pellets by centrifugal force. An electric motor governs the speed of the blower, insuring an even planting pattern. The Bobcats used on present contracts carry one blower, but the ideal plane would provide for four blowers which are necessary to maintain density of pellets when a very wide swath is planted; flying at 500 feet, it would seed a 1000-foot-wide swath at the possible rate of 20,000 acres a day. Ten thousand acres require 240 tons of small

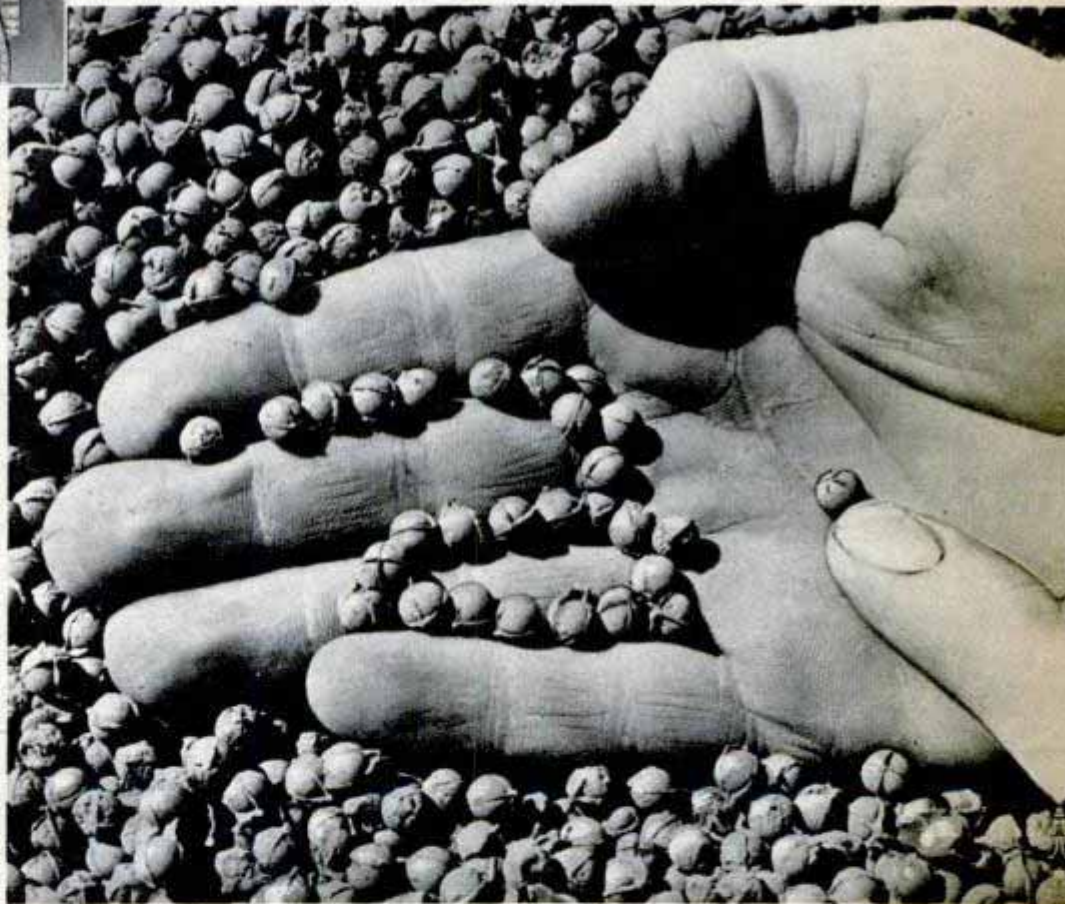
These machines form the → small pellets from moist clay, seed, fertilizer and insecticide



Four disks operated by gears press the materials into pellets. Chemical treatment prevents mold and deterioration, assures proper germination

pellets or 300 tons of the larger pellets. Sky planting costs \$2.03 per acre which includes 28 cents for seed. This compares with \$4.50 for slow and pathetically small-scale hand planting. Adams has refined airplane seeding to the point where one quarter pound of seed may suffice for an acre. To check his ability to plant one pellet to the square foot as demanded by contract, four men held taut an army blanket having about 30 square feet of area. When the plane passed overhead, 26 pellets remained in the blanket and another 6 to 8 bounced off.

On the Papago and San Carlos Reservations, and the Safford Grazing District, Lehman love grass, African love grass, and sand drop seed were employed. Crested wheat grass and western wheat grass proved best on the Hopi Reservation and the New Mexico Grazing District Number Two. Sweet clover is another commonly used seed.



African love grass is particularly good where grazing cattle menace the shoots. The cattle bite off the higher branches, but low shoots run along the ground and take new root at every joint. In test plantings on the Papago Reservation, the animal-carrying capacity of the ground was doubled. Whereas a 10-acre test field grazed two horses for a year, an adjacent untreated 640-acre section carried only the usual two head of cattle.



Blanket catches grass-seed pellets dropped from plane to check ability to plant one pellet for every square foot

The Indian reservation plantings were done for the Department of the Interior by the International Pellet Company. The 50,000 acres so far sowed by plane are only a beginning. Seven million acres of the Navajo Reservation alone require erosion-control measures.

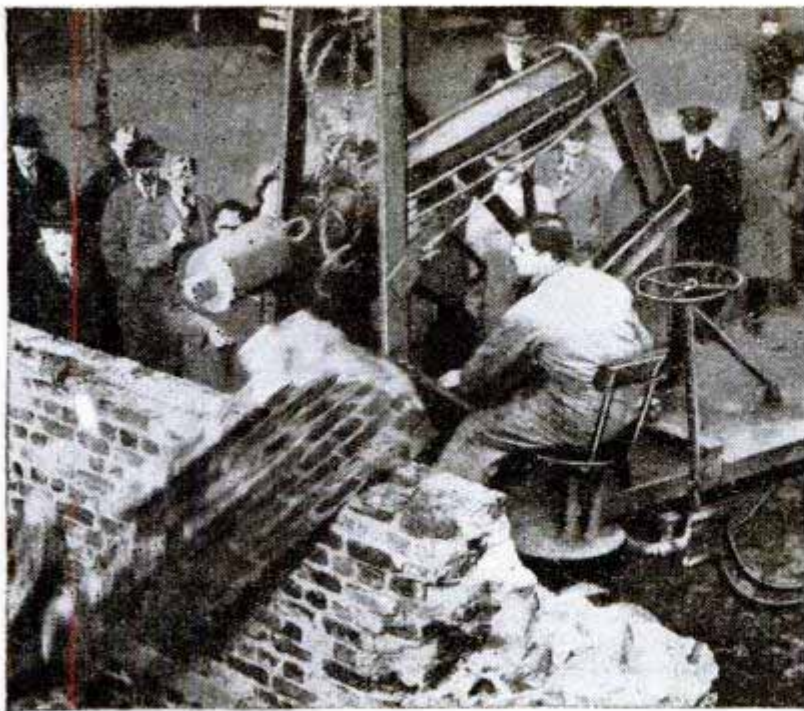
The value of reseeding is shown in a 50,000-acre tract atop the Chuska Mountains along the Arizona-New Mexico boundary. The land was once covered with meadows and thick stands of pine. Today, the grass is sparse; Navajo sheep destroyed most of the forage. Within five years after reseeding, the land will sup-

port almost four times as many sheep per acre as it does today.

Reforestation by aerial sowing of seed offers exciting possibilities. For example, the almost impossible scrubland of Florida could be readily planted by plane. Long-range planes can penetrate almost inaccessible regions. Shifting sand dunes of New Mexico and Arizona can be pinned down with Johnson grass. Irrigation has proved that the alluvial soil of the southwestern river valleys is highly fertile with the addition of life-giving moisture. While putting a stop to erosion, airplane reseeding enables the soil to retain that moisture.

Dr. Lytle S. Adams, who plants grass seed from a plane, inspects a stand of grass specially suited for dry areas

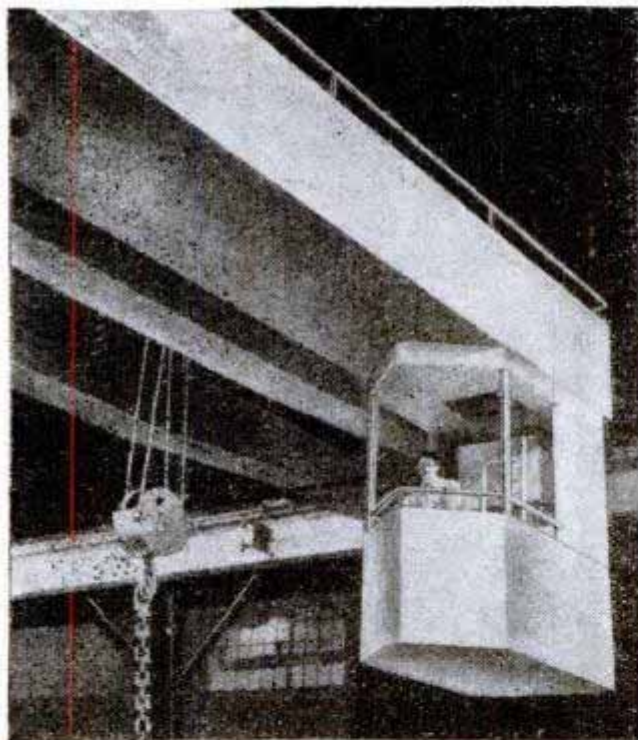




Air-Driven Rammer Clears Remains of Blitzed Buildings

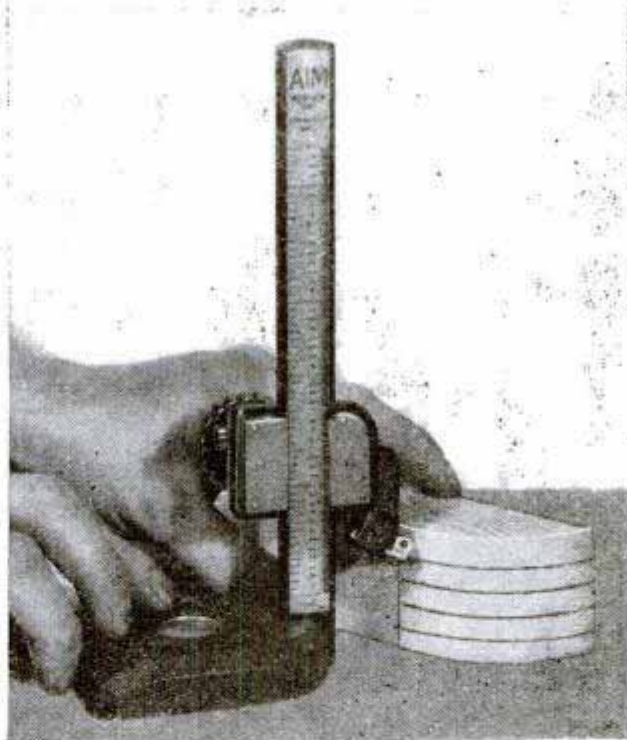
Powerful hammer blows from a compressed-air machine are battering down what remains of blitzed English buildings. The mobile equipment is brought close to

the target to punch out its short, ramming strokes. A square tip on the ramming barrel increases its effectiveness. The machine has speeded the clearing of bombed areas.



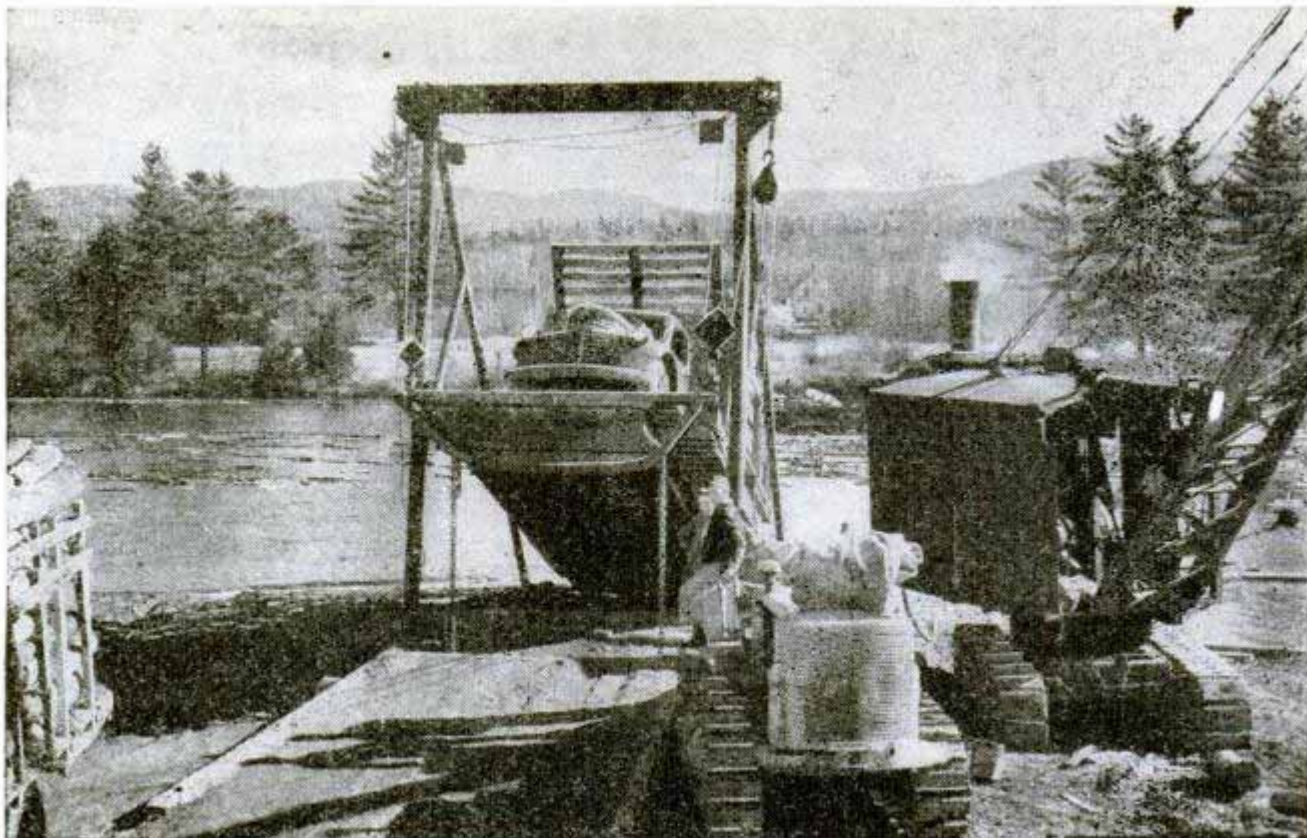
Brightly Colored Crane Safer

Bright colors are useful safety factors in a streamlined overhead traveling crane. The hoisting trolley, lower block and hook, the handrail on the platform and the cage are a brilliant orange which stands out against the blue of end trucks and girders. Because of the strong color contrasts, men working under it are constantly aware of its movements.



Woodworking Height Gauge

Odd-shaped objects made by the home craftsman are quickly and accurately marked for special cutout work by a new height gauge equipped with a pencil-lead holder. The instrument is adjusted by gear action operated by a plastic knob. The scale is graduated on one side to read from 0 to 6 inches in hundredths of an inch and on the other side in sixty-fourths of an inch.

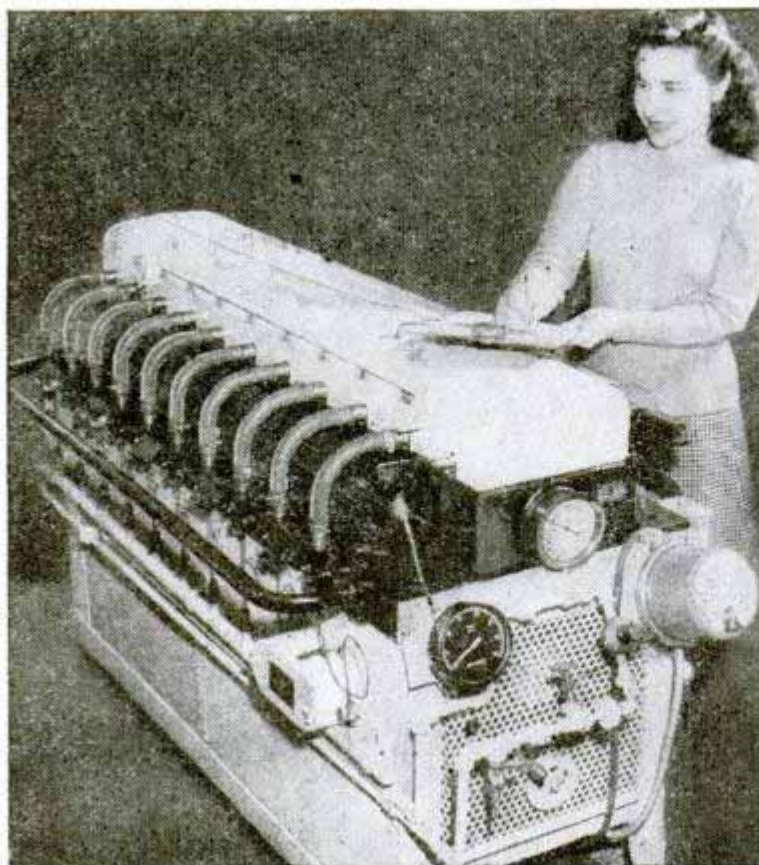


Caterpillar Tractor Company photo

Tractor-Powered Unloading Platform Dumps Trucks

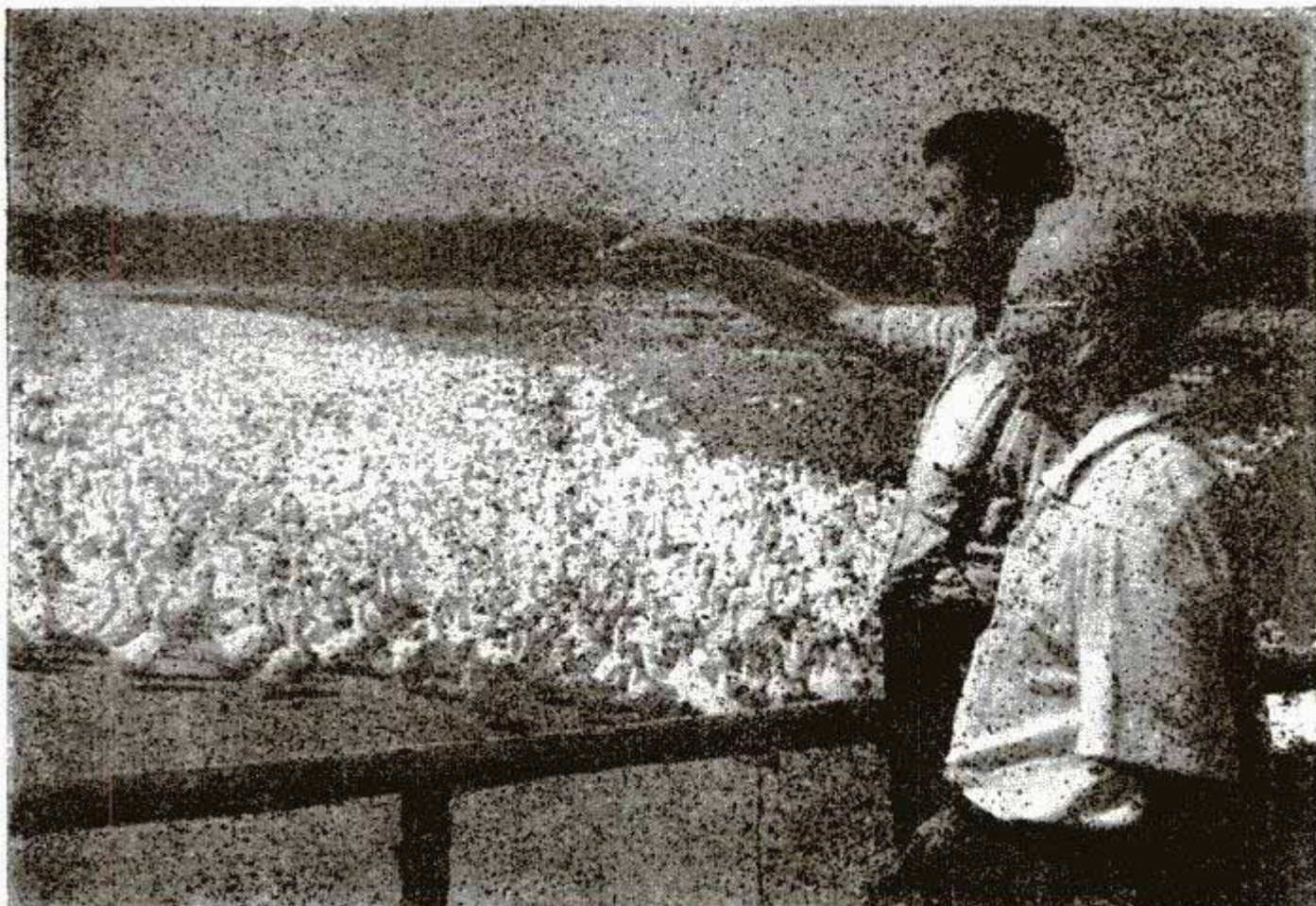
Pulpwood hauled by truck from nearby woods is dumped into a New Hampshire mill storage pond by an unloading platform that raises the front end of the truck several feet. Operating cables suspended from a stationary superstructure are attached to the forward end of the platform and run to

a tractor which provides the power. A truck to be unloaded is driven onto the platform and securely blocked. The tractor winch then elevates the front end, sliding the load directly into the stream. As many as 4000 cords of pulpwood are unloaded in nine hours from the platform.



Test Simulates Tire Wear

Whirling spindles in a testing machine tell in a few hours as much about experimental tire fabrics as a 20,000-mile road test. The machine, developed by Goodyear, subjects 20 fabrics to the stresses of hard driving. The fabrics are made of cotton, rayon, Nylon and synthetic materials and are coated with rubber to form the layers of a tire. Previously, the fabrics were made into tires and given expensive road tests. Now they are made into sections of miniature tires about one foot long and as thick as garden hose. The ends of each section are fastened to two spindles and air pumped under pressure into the hose. The spindles revolve to bend the fabric, alternately compressing and expanding it. If the fabric breaks down quickly it is eliminated. Fabrics that pass this test are then given standard road tests.



Poultry & Egg Natl. Board photo

Ducks blanket the ground at the New York farm of Hollis Warner (pointing), largest duck grower in the world

THERE ARE ABOUT 300 full-fledged duck farms throughout the United States and a few hundred more where duck raising is a part-time proposition. Over 50 percent of the farms are in New York State, mostly in Suffolk County, Long Island. Suffolk's 77 duck farms account for close to 8,000,000 ducks yearly, out of a national total of some 15,000,000, of which 60,000,000 pounds go to market.

The largest duck farm in the world, owned by Hollis V. Warner, is in the middle of this noisy aggregation of quackeries near Riverhead, the county seat. Warner's duck domain covers 250 acres of sandy soil hugging the mouth of the Peconic River which flows into Peconic Bay. He raises 500,000 White Pekins yearly. A half dozen other farms in Suffolk have annual outputs over 100,000; Harry Corwin's farm raises 400,000 a year.

When you speak of ducks commercially, you mean White Pekins, a breed brought to America from China in 1873 by a sea

captain. Other breeds seen in poultry shows are the Rouen, Muscovy and Aylesbury for meat, and Indian Runner for laying. This article deals with the White or Imperial Pekin.

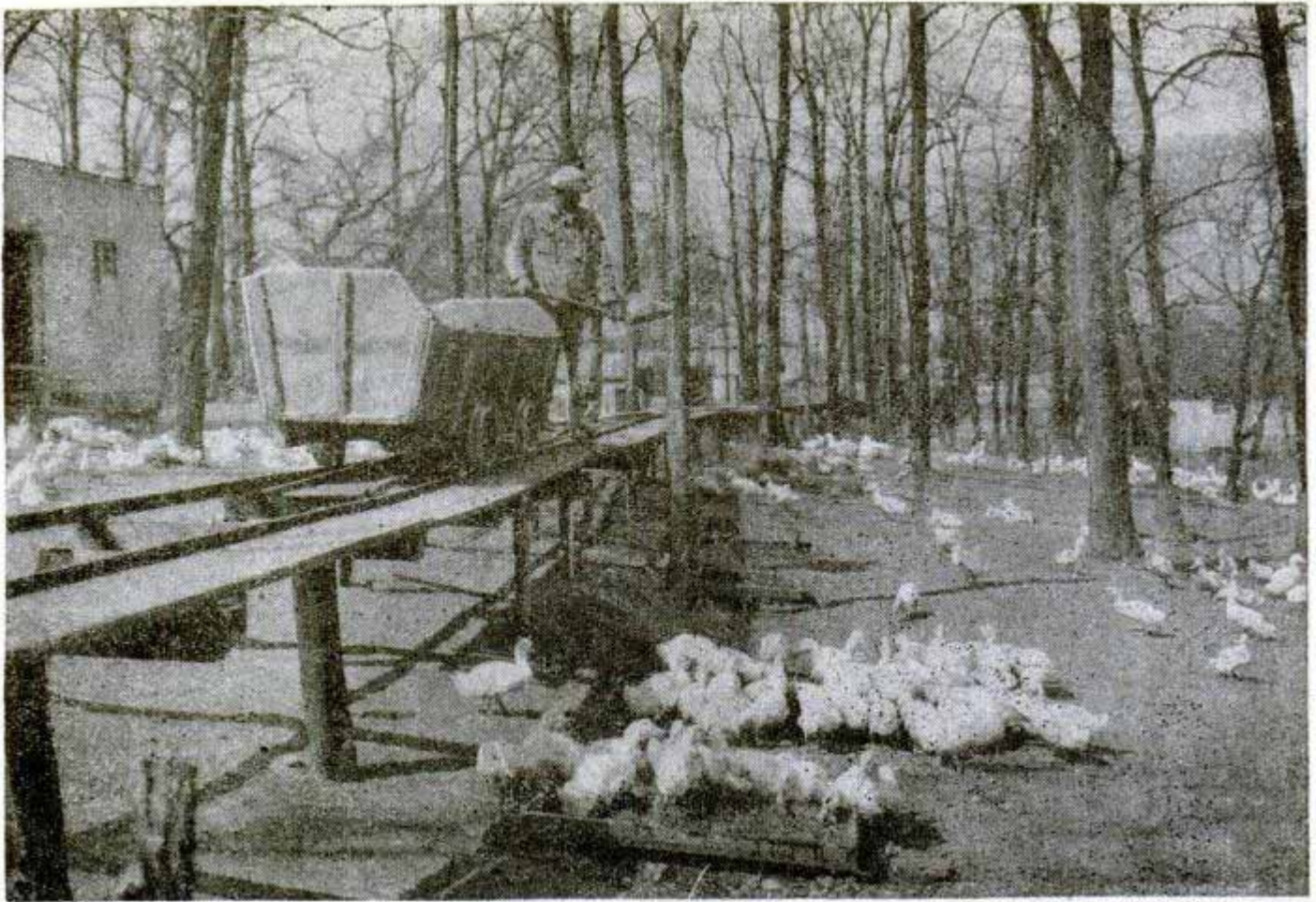
Duck farming is such a specialized operation, requiring years of experience and considerable outlay of cash and land, that new duck farms develop slowly. The very nature of a duck farm limits the available sites. It must be situated near a body of fresh water. It should be on high, sandy ground, sloping off into a stream, lake or inlet. Since duck markets are limited, farms must be

located close to metropolitan areas, yet far enough away for land to be cheap and plentiful and meet the physical requirements. Duck farms have to be near railroad terminals, or at least have access to a good trucking road so the produce can be shipped to market daily. Suffolk County's duck country fills all of these stringent qualifications.

Warner inherited his farm from his

DUCKS by the ACRE

By Paul D. Green



U. S. Dept. of Agriculture photos

Mash is shoveled into the feed pans from hand-pushed carts which travel on two miles of narrow-gauge track

father, and has been working it for over 25 years. He built it up from a medium-sized operation to its present top-ranking position by gradually acquiring one piece of land after another.

To take a tour through the duck farm, a visitor starts with the egg house. The eggs are brought here from the huge laying house next door and stored in a cold box

until setting day. Six huge electric incubators with glass doors line one side of the building, while five hatchers are on the other side. This setup can accommodate 115,000 eggs simultaneously. In addition, during the peak of laying activity in March, Warner also uses old-fashioned coal-heated incubators in the basement of another building. Electric incubators are cleaner, faster and easier to handle, according to Warner, "but we got by with the coal-burners for years without much trouble."

The eggs are set in a cool box in large racks which hold 120 eggs each. They are rotated by hand every few hours so the yolks won't stick to the shells, making the eggs infertile. Culls—imperfects, double-yolks, infertile and otherwise unhatchable eggs—are set aside for the minor egg-eating trade.

When the eggs are set in the incubators, they are rotated by an automatic switch. The boxes are kept at a steady tem-

Tracks pass brooding pens where ducklings six to eight weeks old are fed



perature of 99.5 degrees, through thermostat control, and humidity is maintained at 50 percent. The temperature and humidity must be accurately controlled or large losses may result from spoilage. Water lines feed into the boxes and the water drips down special drainboards which keep the boxes humid and cool, offsetting the warming effect of dim interior lights and Sterilamps.

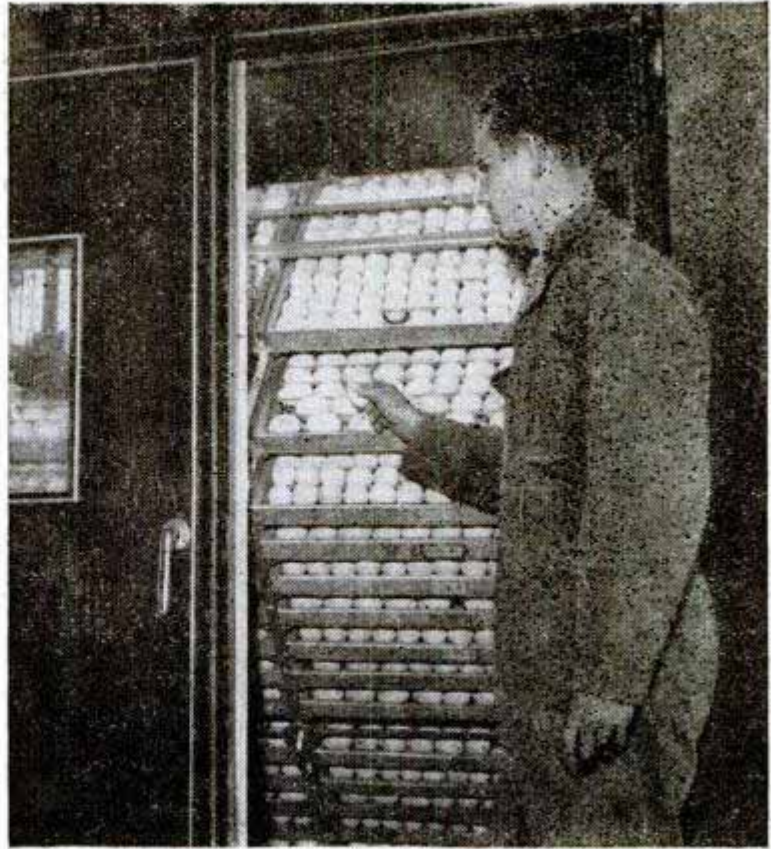
After 25 days in the incubators, the eggs are removed to hatcher racks covered with chicken wire so the ducklings won't fall out when they emerge.

After the hatching process, the ducklings begin a series of steps which eventually lead them to their doom at the packing plant a mile or so away. They begin at the first hot brooder, next door to the hatchery, where they stay for about eight days, feeding on pellets, washed down with plenty of water. Water is extremely important to ducks at all ages. They die quickly or develop the staggers if they are unable to drink plentifully. Floating-ball water troughs are set up in each broodery.

After eight days in the 70-degree house, the ducklings are moved to the next brooder, kept at 60 degrees, and they stay there a week. After that they go to a third brooder, with temperature controlled at around 50 degrees, and remain another week. By the end of 3½ weeks they are ready for the open and the water, and begin to change color from golden yellow to white. Actually ducklings can take to the water soon after hatching, but they are so frail and susceptible to colds that they are usually kept away from the stream until strong enough to withstand climate changes.

Each week after graduating to the yards, the ducks are driven into newer and larger pens, wire-enclosed on sloping grounds extending from the houses to the water. At all times thousands of ducks can be seen along the banks of the inlet where a wire net prevents wandering.

One part of Warner's farm is devoted to wheat raising to augment feed rations and for straw bedding in the duck houses. Seven large feed buildings are spotted in strategic places from which wet



After 25 days of incubation, duck eggs are placed in hatching boxes (above) and three days later ducklings emerge. Sterilamps at top of hatching box (below) kill airborne bacteria



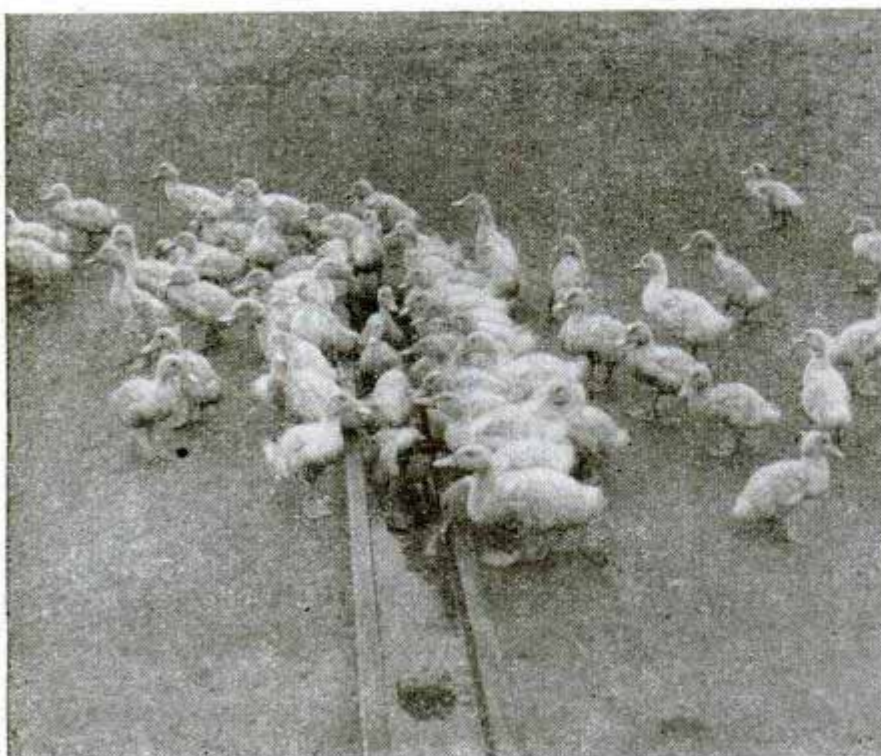


Metal spokes on a revolving wheel of mechanical plucker remove feathers

mash and dry feed pellets are shipped to the various duck yards. The mash is mixed in huge flour mixers and used six days a week. Dry pellets are "week-end and holiday" food, because the help's away then.

The wet mash contains cornmeal, bran, middlings, flour, meat scraps, alfalfa and other ingredients mixed with water. Different farms have varying percentages in their combinations, producing feeds which give distinctive flavor to their ducks. Feed is shipped out in hand-drawn carts on a narrow-gauge track from the feed houses, and distributed in the hundreds of low feed

Drinking troughs equipped with ball-valves provide plenty of fresh water



pans along a two-mile route. The Corwin farm in Aquebogue has a two-horsepower engine drawing the feed train around, requiring only one man for handling, whereas the hand-drawn method requires two.

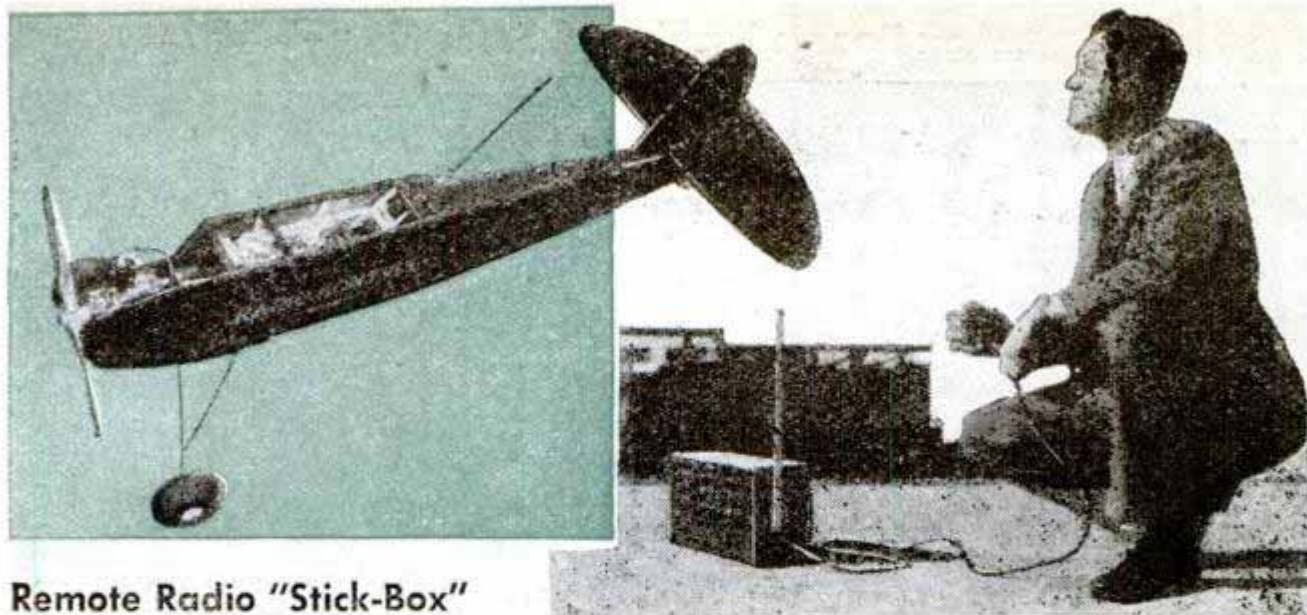
In addition to the feed centers there is a score of other large buildings—incubator house, brooding houses, huge double-decker buildings with long, wide ramps for the ducks to climb when they get older. There are numerous storage houses, a few bungalows where families of workers live, and the killing, picking and packing plant through which the entire crop of ducks is siphoned at the end of their 11 to 12 weeks' career.

The whole operation keeps 150 people busy during the height of the season, and provides a comfortable living for Warner, whose farm grosses over \$750,000 annually. He ships to the New York market close to 2,500,000 pounds of dressed ducks a year. The prevailing price last summer was around 27 cents a pound, but it went as high as 32 cents in wartime winter months. This is considerably higher than prewar.

But it's not all "duck soup." The upkeep and operating costs are terrific. Since each bird consumes in its lifetime approximately 25 pounds of feed, at an average cost of four cents a pound, or \$1.00 a bird, that makes a feed bill of over \$500,000 alone. That pays for over 6250 tons of various grains and feed ingredients. Labor gets at least another \$125,000 a year. The rest of the income has to pay for 3,000,000 pounds of ice yearly, 18,000 barrels, a huge amount of power, a terrific trucking bill, the upkeep and replacement of some \$150,000 worth of heavy equipment and buildings, other operating costs and, of course, the taxes.

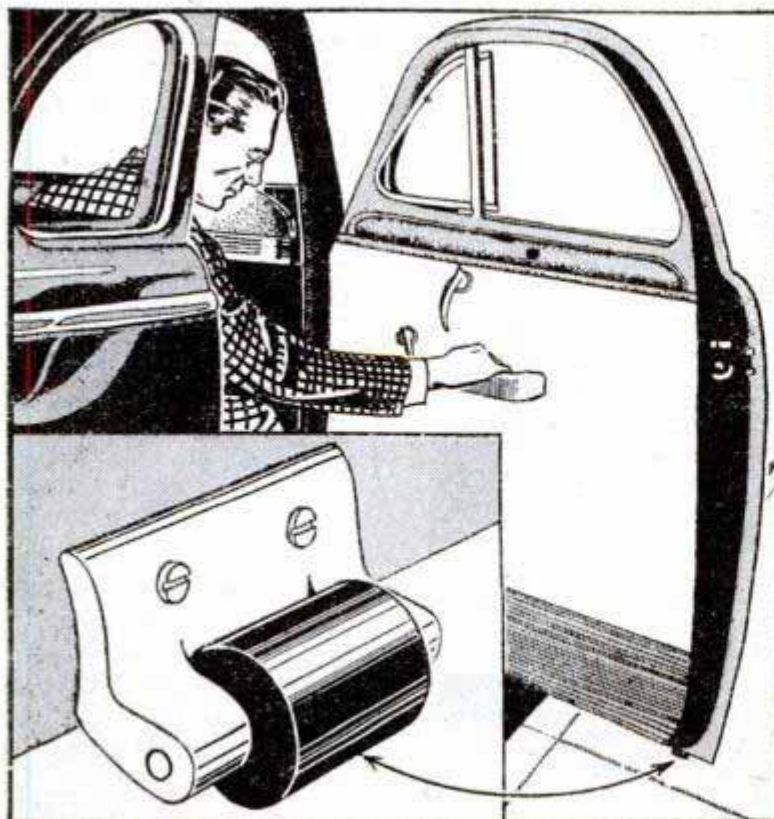
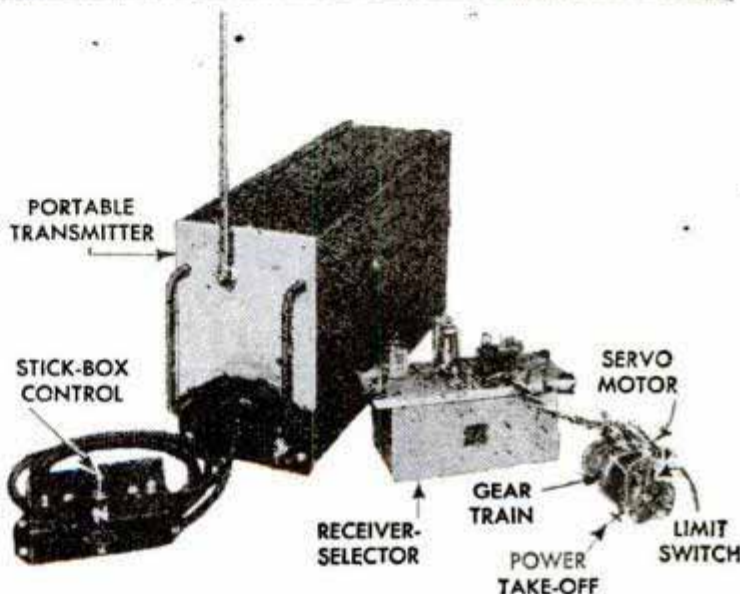
In addition to labor, transportation and feed problems, duck farms suffer a high mortality rate

(Continued to page 236)



Remote Radio "Stick-Box" Controls Model Planes

Complete flying control over model airplanes is possible with a remote radio "stick-box." The radio "stick" is moved just as the control wheel would be used in a full-size plane. This causes a model to take off or land, bank and turn, climb or dive. The control consists of a small radio receiver and electric motor installed in the plane, a portable battery-operated 144-megacycle transmitter and the stick-box. Movements of the stick are transmitted to the plane where the receiver relays the impulses to the motor which adjusts the controls of the model.



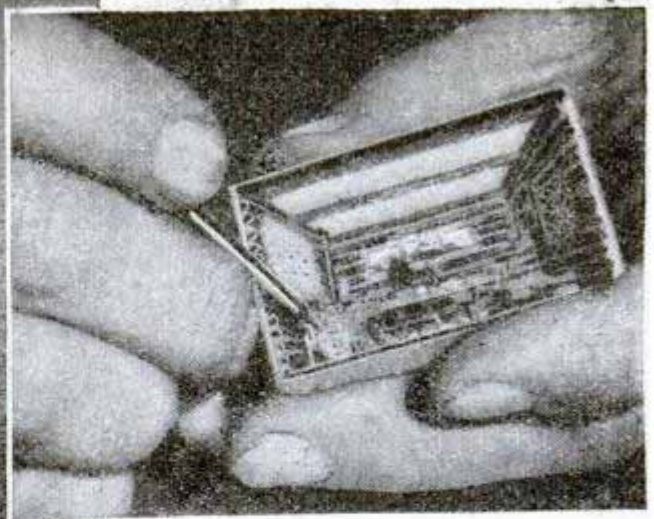
Roller Prevents Doors From Jamming On Curbs

With a roller device at the bottom, car doors jammed down on curbs or sidewalks can be closed without getting out to lift and release them. It is particularly helpful on low-slung-model automobiles. The roller fits in a metal holder that is attached to the outside of the door, at the bottom, with two screws.

Ⓜ A rubber conveyor belt $\frac{1}{2}$ mile long will lift 600 tons of coal per hour from a mine at Birmingham, Ala., to the tippie, 715 feet above the mine bottom.

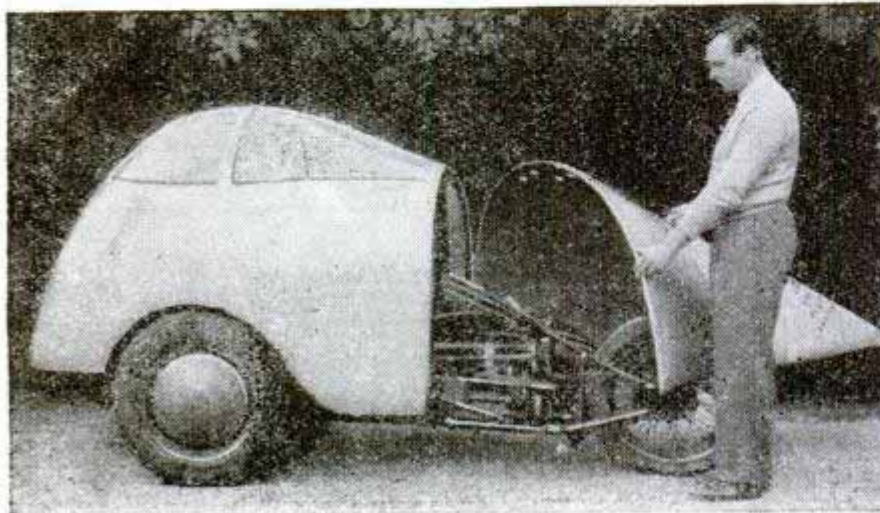
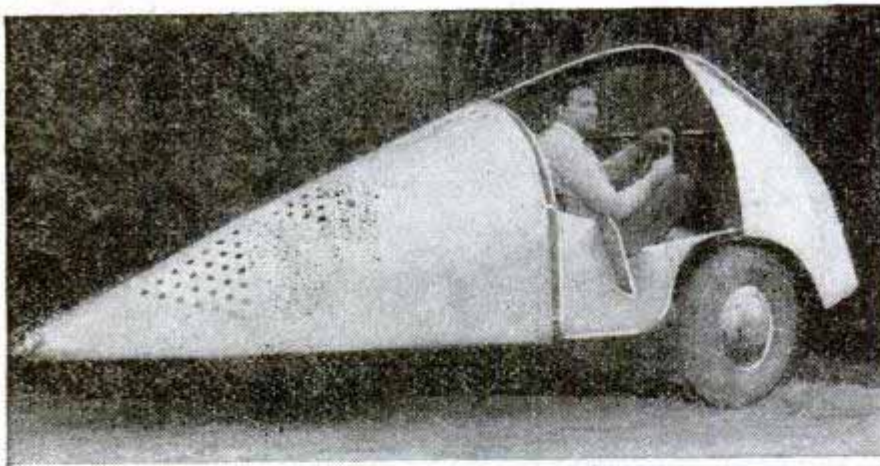
Information, including manufacturers' names, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

Furnished Matchbox-Rooms Fashioned From Household Materials



With such ordinary materials as spaghetti, tin foil, screen wire, pinheads, gum, sponges and broom straws Ray A. Herbeck

of Milwaukee, Wis., creates unique three-dimensional room settings and outdoor scenes inside matchboxes. He uses tweezers to install the realistic furnishings in his tiny rooms. Every item in each matchbox is built to a scale of six feet to the inch. Herbeck can complete a room or an outdoor scene in one day. A log-cabin room has spaghetti logs painted brown with tapestries covering the walls. Herbeck started his hobby only a few months ago.



Motorcycle-Car

Salvaged auto parts, an old motorcycle engine and sheet aluminum have been assembled into a three-wheeled car by William Schmidt of Xenia, Ohio. The body is shaped like an airplane cockpit and has a Plexiglas windshield. The body, covered with sheet aluminum, tapers to a point in the rear. A 1930 model four-cylinder engine drives the single rear wheel through a motorcycle transmission. Because the engine is covered, Schmidt had to build an air scoop to cool it. The steering mechanism is taken from an old car and the wheels are made from Ford V-8 rims. The car carries two people, will go 65 miles an hour and travels 45 miles on one gallon of gas. It cost Schmidt about \$400.

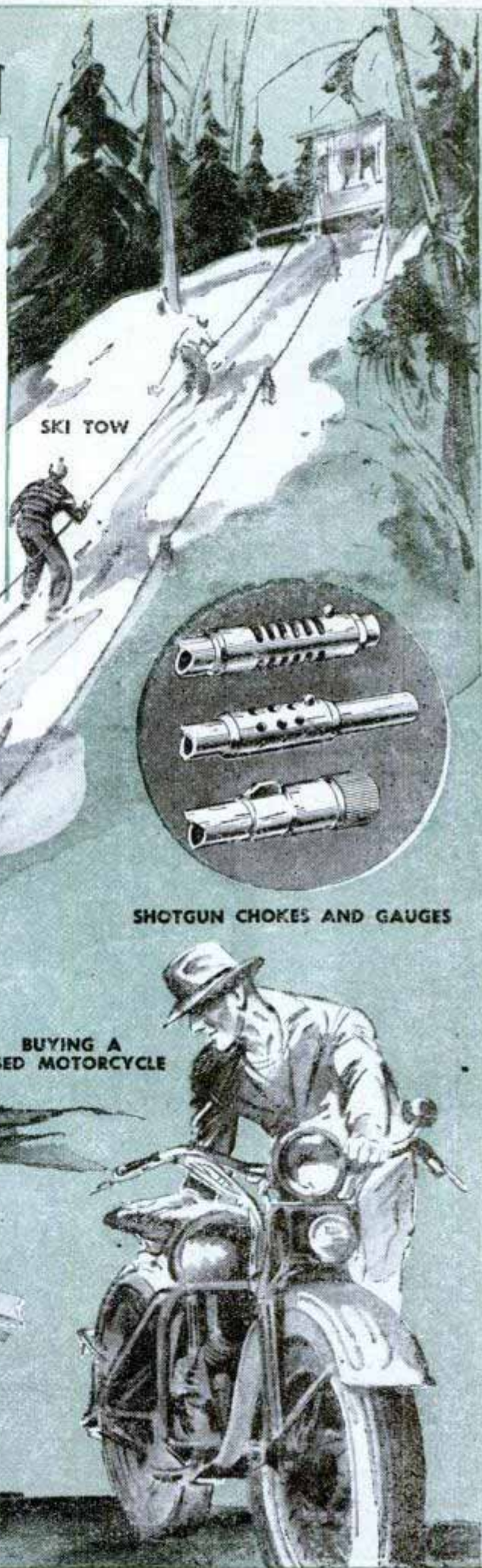
The CRAFTSMAN

★ Making "herringbone" trails uphill on skis is no fun for any ski fan. But getting back to the top of a hill is not difficult with a ski tow. We describe how to build a simple, inexpensive one on page 186.

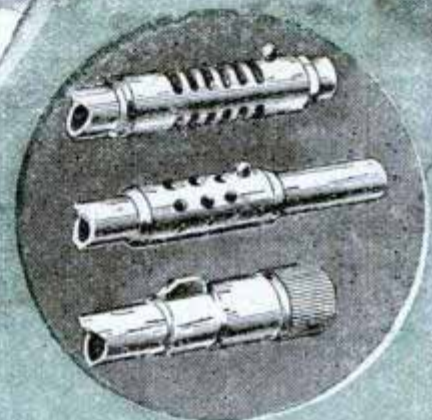
★ In game shooting nowadays every shot must count. That's why modern shotgunners pay close attention to the choke and gauge of the gun they take afield. Essential pointers are given on page 196.

★ "Jet" is the name we've given a boy's iceboat and that should be enough to start you reading the story on page 202.

★ Buying a used motorcycle wisely is merely a matter of knowing the common symptoms of wear on vital parts. A story on page 214 covers most of the angles.



SKI TOW



SHOTGUN CHOKES AND GAUGES

BUYING A USED MOTORCYCLE

BOY'S ICEBOAT

Easy-To-Make

It's actually a 5-gal. paint pail fitted with a padded seat and tailored inside and out with a gay-colored slip cover. Seat lifts off for storing shoes inside

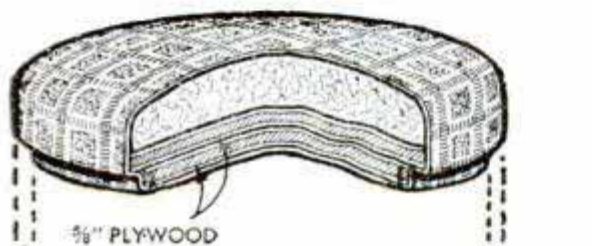
By Peter R. Ruppe

UTILIZING a common 5-gal. pail for its framework, this vanity stool is both lightweight and sturdy, simple to make and provides a convenient storage compartment for shoes, hats, etc. Select a pail having straight sides—one in which paint comes will do—remove the handle if it has one, and clean the inside thoroughly by scraping or burning out the old paint.

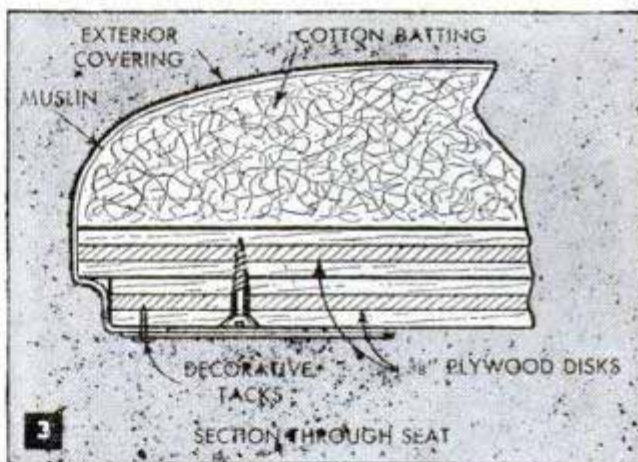
A tacking strip or ring is fitted inside the pail about 2 in. down from the top and is fastened with flathead screws from the outside as in Fig. 2. The ring need not be in one piece—it can be of several segments



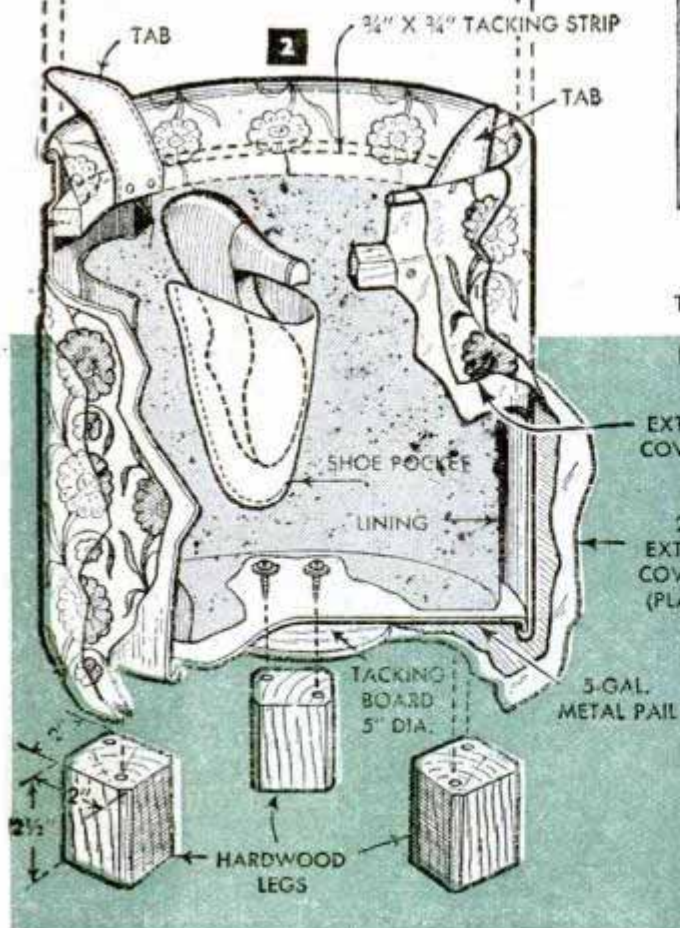
1



2



3



4

VANITY STOOL

as it is hidden from view. Next, the bottom of the pail is drilled for screws to attach the three stub legs. These can be made of fancy hardwood and varnished, or cut from pine and painted. Two 1-in. screws are used to attach each leg. Holes are drilled in the bottom also for fastening a $\frac{3}{8}$ by 5-in. wood disk to serve as a tacking surface for the outer covering. This is located in the center of the pail. The rabbeted edge of the seat board is formed by two $\frac{5}{8}$ -in.-plywood disks screwed together, one being the same diameter as the pail and the other about $\frac{1}{4}$ in. smaller, Fig. 3.

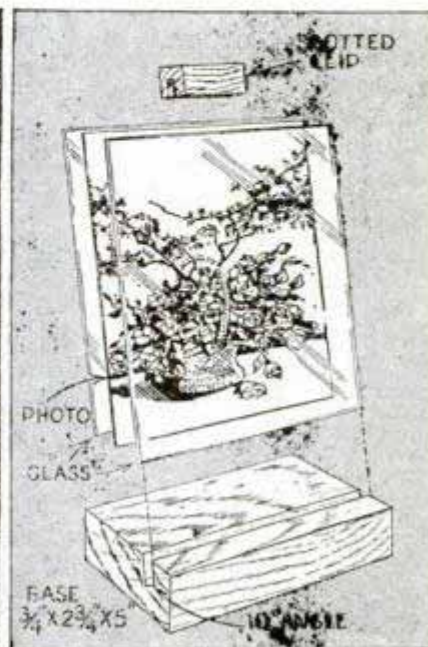
You're now ready to tackle the upholstery. The inside lining is applied first. This can be of a material contrasting with that used on the outside. Make a tubular-shaped bag of it to fit the inside diameter of the tacking ring. If the stool is to be used for shoe storage, pockets should be sewed to the lining before it is tacked in place at the top. The outside covering is likewise sewed in a tubular shape to be pulled snugly over the pail. Fold the upper edge of it under and tack it neatly to the wood ring, forming small pleats where necessary to eliminate wrinkles. After the top edge is tacked, the fabric is pulled down smoothly and tacked to the wood disk at the bottom. Although optional, the outside covering of the stool can be protected from soiling by covering it with any of the transparent plastic materials, tacking it the same as before. See Fig. 4. Finally, two strong tabs of cloth are tacked to opposite sides of the wood ring to provide handles for carrying



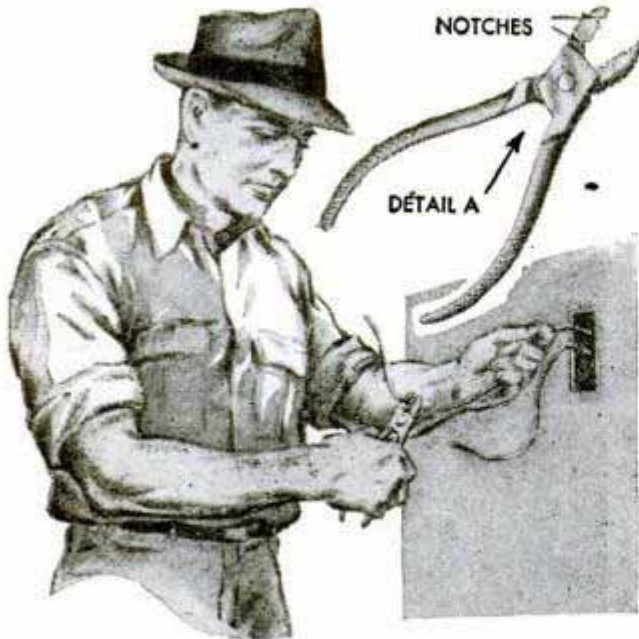
the stool. These should be long enough to extend out from under the seat as shown in Fig. 1. This leaves the seat to be padded as indicated in the cross-sectional view in Fig. 3. Cotton batting is first applied generously and is held in place with a muslin cover. Several thicknesses of foam rubber, available in sheet form, could be used in place of the cotton. The outer covering is brought around and tacked neatly to the under edge and finished with a circular piece. Where the material covers the rabbeted edge it should be tacked to the underside of the top disk.

Attractive Four-Piece Picture Frame Can Be Dismantled in a Jiffy

Just four parts make up this novel picture frame, a slotted wood base, two pieces of glass and a slotted wood clip. The whole thing goes together without a fastening of any kind. The slot in the base has a 10-deg. rake to give the glass a slight backward slant. The photo is sandwiched between the two pieces of glass and held together at the top by the slotted clip. The base dimensions given will accommodate a 5 by 7 photo, although it can be made to take almost any size picture.



Small Notches in Side-Cutting Pliers Strip Insulation off Wire

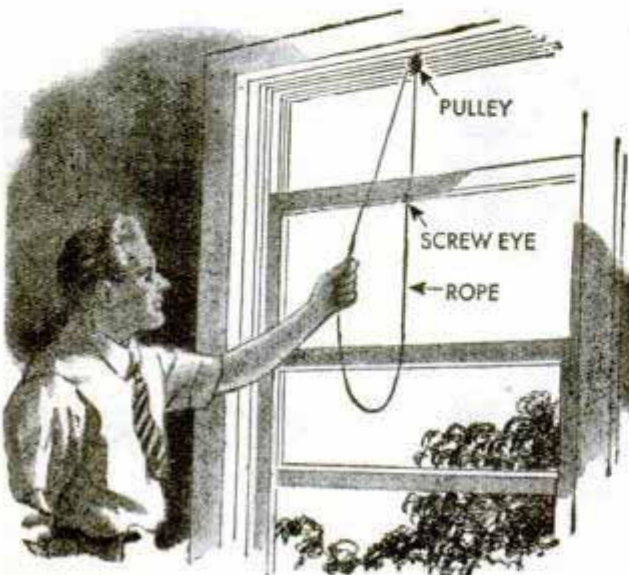


Two sets of notches in the blades of side-cutting pliers will be useful in stripping insulation off electric wire. Vary the size of the notches to handle different gauges of wire. In addition to their utility as strippers, the notches near the point of the pliers can be used to pull cotter pins. Another way to remove insulation is to place the wire between the handles of the pliers, detail A; loosen the insulation by applying pressure and then work it off by pulling on it. This method is handy if there are no notches in the blades of the pliers.

L. A. Potts, Panama City, Fla.

Upper Half of Window Operated From Sash Pulley

To open and close the upper half of a window that is in a hard-to-reach location, such as above a bathtub or other inaccessible place, the rope and pulley arrangement

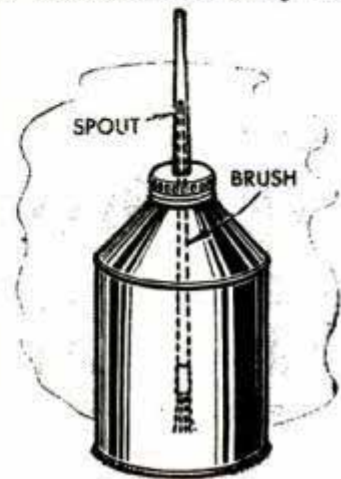


shown here will save a lot of effort. The pulley is attached to the top of the window frame and a rope passes through it, both ends being tied to a screw eye set in the top frame member of the sash. Pulling on one side of the rope will raise the window and pulling on the other will lower it.

Edward Laben, Chicago.

Oilcan Makes Shellac Container

Handling shellac is always something of a problem, but with this converted oilcan, you have a container and brush in one unit. A small brush, which will fit inside the spout, as indicated by the dotted lines, is used. Probably it will be necessary to trim the handle to make a tight fit, but this will seal the opening so air cannot get at the shellac. For convenience, the spout should be shortened as much as possible, leaving it long enough to serve as a handle.—J. W. Kratzer, Raymond, Nebr.



Jar Lid Used as Picture Frame

Two-piece lids that are used to seal fruit jars will make clever frames and pictures. The lid part is placed with the white side out and decorated with a decal, and the sealing ring is used as the frame. Hang the picture with a ring and short length of ribbon. This type of decoration will be found especially attractive for a child's room.—Benj. Nielsen, Aurora, Nebr.

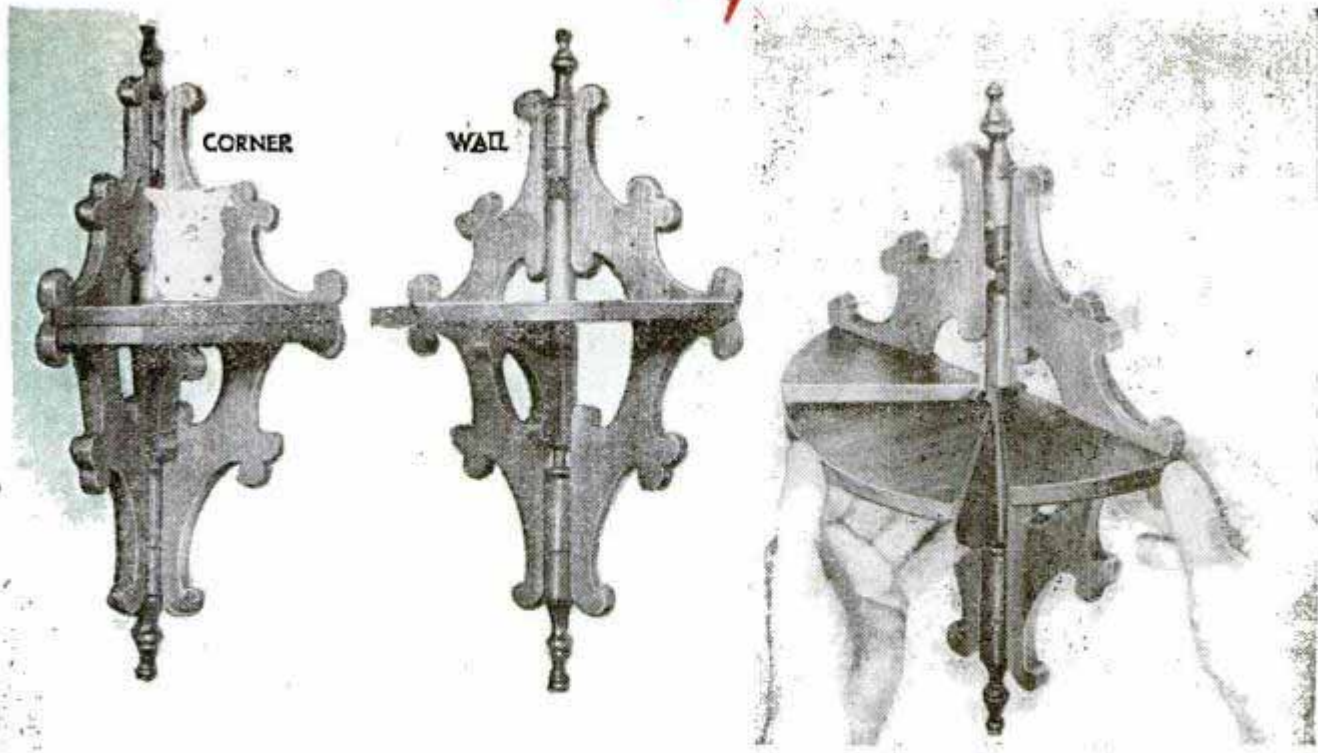


Gilt Finish for Metal Surfaces

Lasting and beautiful gilt surfaces can be applied to metal with spar varnish and powdered bronze. First cover the surface with a light coat of the varnish and allow it to dry until "tacky." Then, using an ordinary powder puff, dust on the bronze. Let this dry for a short time and then polish. The finish will be a lasting one and is ideal for small, decorative pieces.

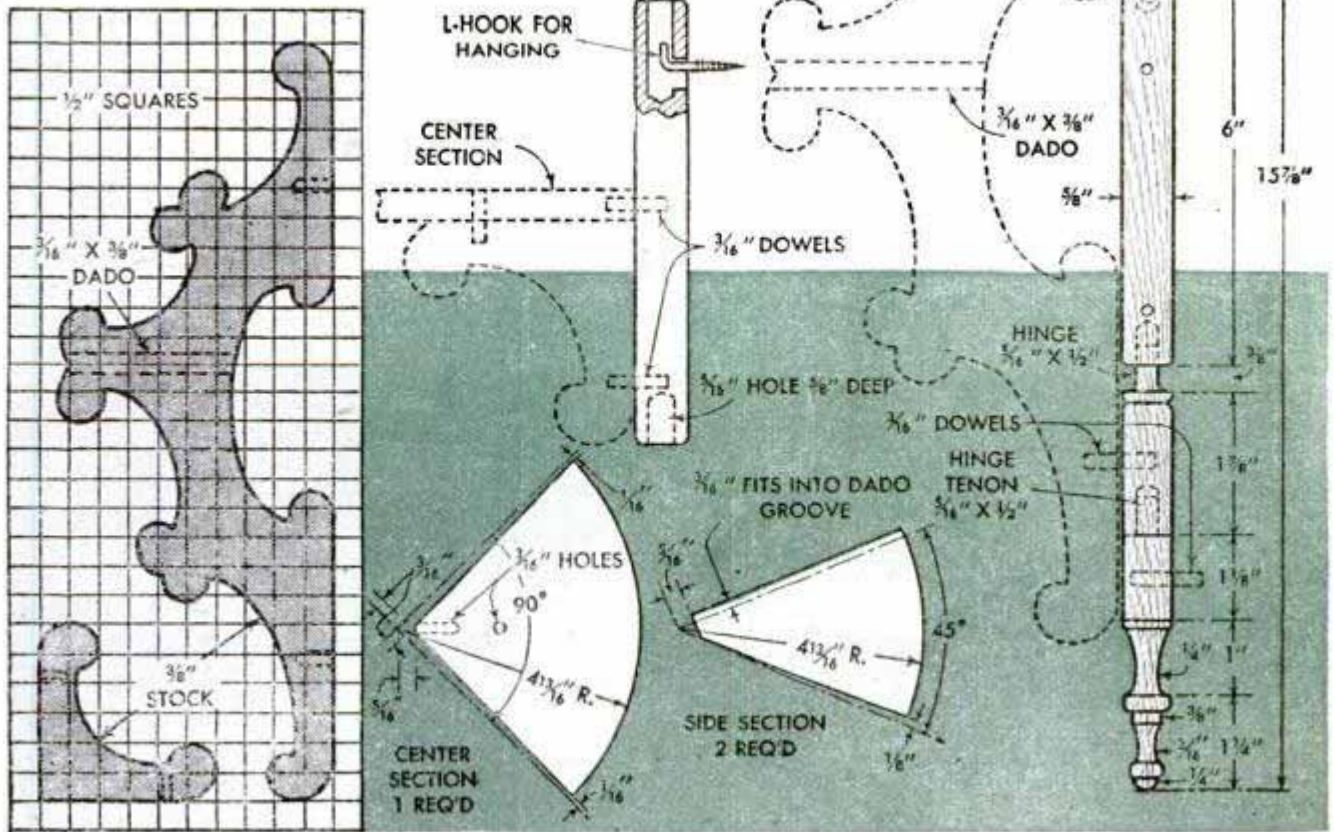
William M. Maddox, Jackson, Ga.

Rep. L.C.B. #142

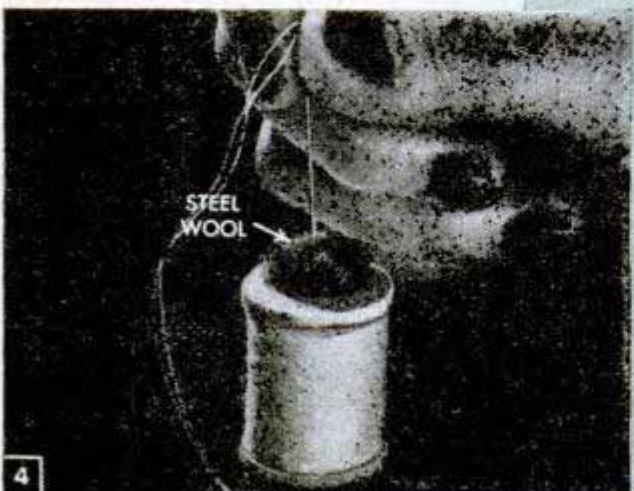
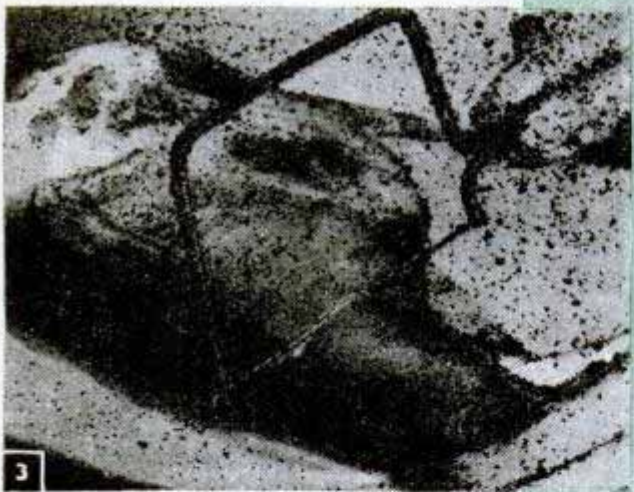
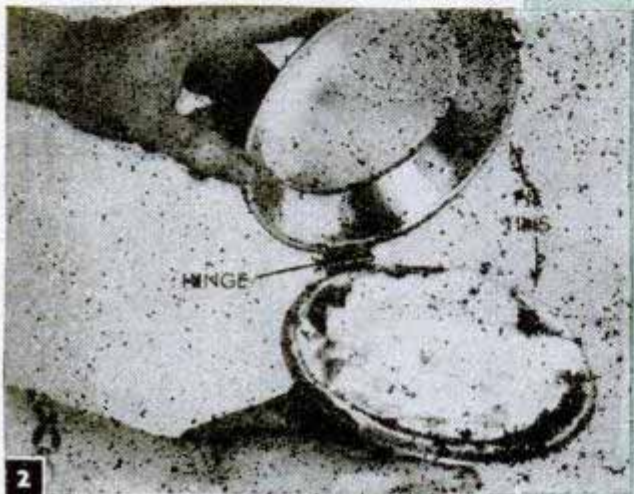
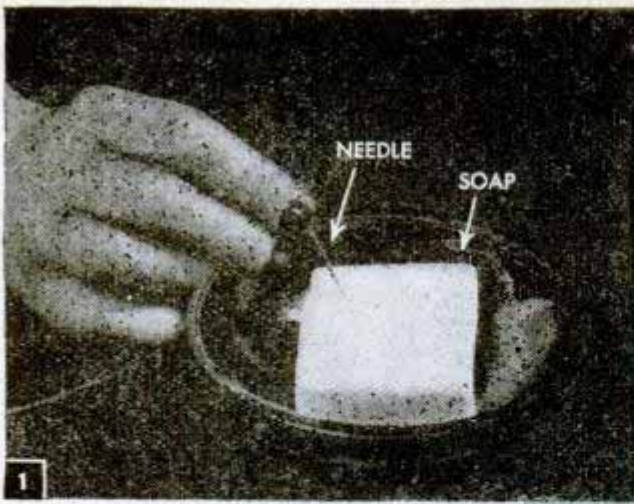


TWO-WAY SHELF

This attractive shelf will either fold to fit into a corner or open to hang flat against a wall. When hanging in a corner, the center section of the shelf fits beneath the two side sections, and raises up to be flush with them when opened. Reference to the right-hand drawing will show that the center post or standard is made up of five pieces fitted with hinge tenons. The middle piece, to which the center section and bracket are attached, slides on tenons to permit raising and lowering. A 5/16-in. hole 1 1/4 in. deep, center detail, is drilled in the top of this sliding piece to allow for an L-hook. All other dimensions and assemblies are given in the drawings. If available, use 3/8-in. walnut for the shelf and brackets



Solving HOME



— 1 —

Sewing needles that have become slightly rusted will tend to stick when used. To correct this condition, press the needle into a cake of soap to remove rust

— 2 —

If you don't want "squashed" pie in a lunch bucket or picnic basket, hinge two pie tins together to make a safe container. Even though heavy jars are placed on top of the tins, this won't spoil the pie

— 3 —

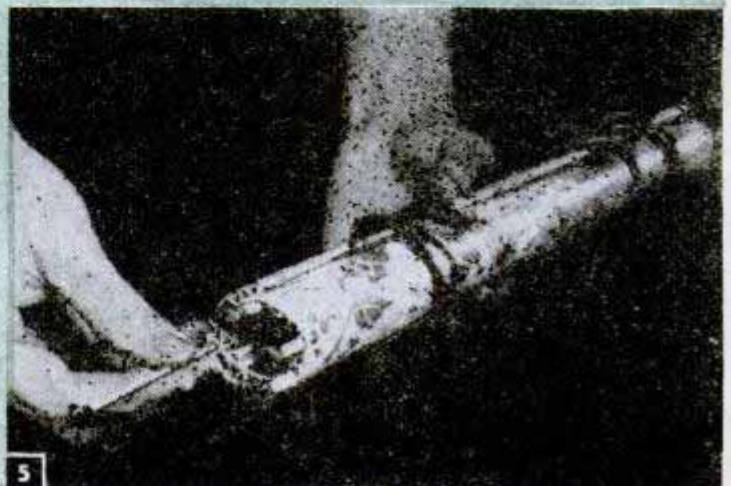
Add a small coping saw to your kitchen cutlery set. It will be indispensable for cutting through meat bones when carving or preparing a roast for the oven

— 4 —

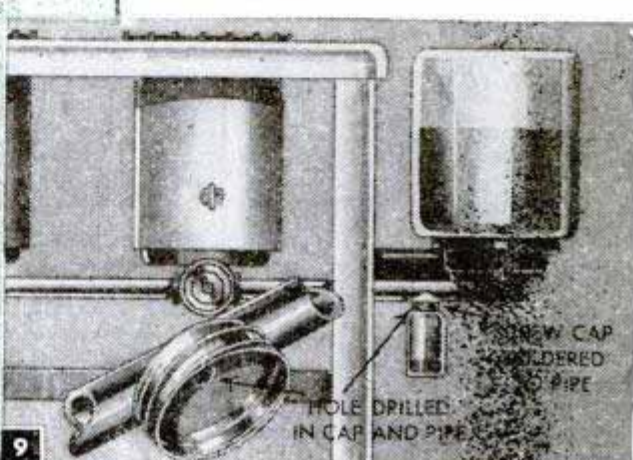
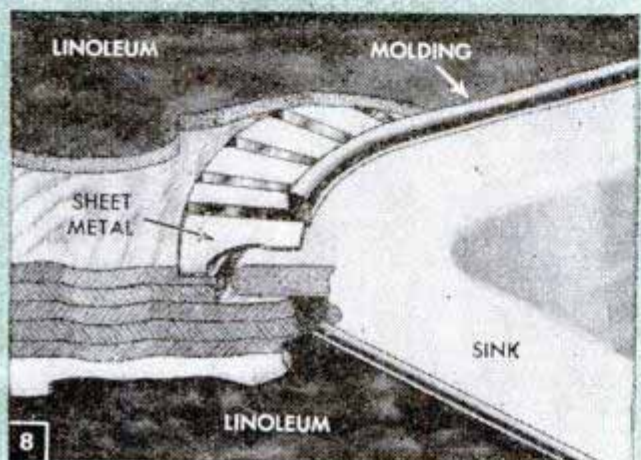
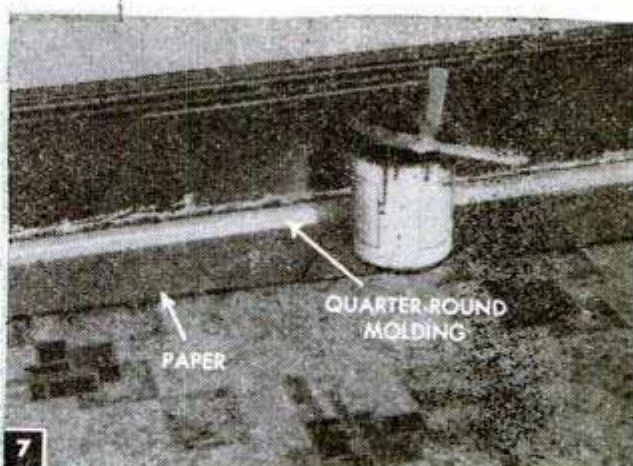
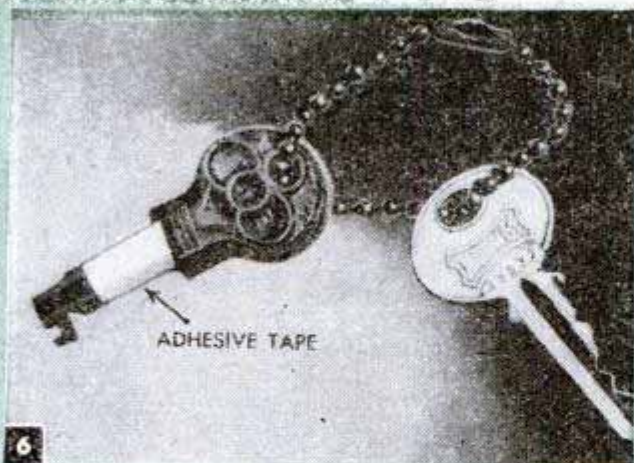
It's a common practice when laying sewing aside to insert the needle through threads on the spool. Instead of doing this, put a small wad of steel wool in the hole of the spool and place the needle in it

— 5 —

Carried in this easily made kit, knitting needles can be kept together so that they are easy to find. Flexible corrugated cardboard, covered with decorative paper and tied with cord, is used for the kit



PROBLEMS



-6-

When carrying several keys on a chain, tape together the ones seldom used. Then the key needed most frequently will be easy to select and the others, being taped together, won't rattle in your pocket

-7-

To lay quarter-round molding over linoleum and, at the same time, mask it for painting, try this method: Place a strip of paper about 6 in. wide against the baseboard and then nail the molding over it. After painting, remove the paper when the finish dries

-8-

Strips of thin-metal backing under curved sections of sink molding will provide a solid base for the application of filler between kerfs in the molding. After the filler has been applied and sanded, you'll have a level surface on which to lay the linoleum

-9-

Attach a sediment bowl to the feed line of a kerosene stove to collect water and dirt. Take a glass jar with a metal screw cap; drill a hole in the cap and another in the bottom of the feed-line pipe. Then solder the cap to the pipe and screw on the jar

-10-

By keeping knives separate from other utensils, cut fingers are avoided. The drawing shows a drawer for this purpose which fits in a kitchen-table drawer



SECTION CUT OUT



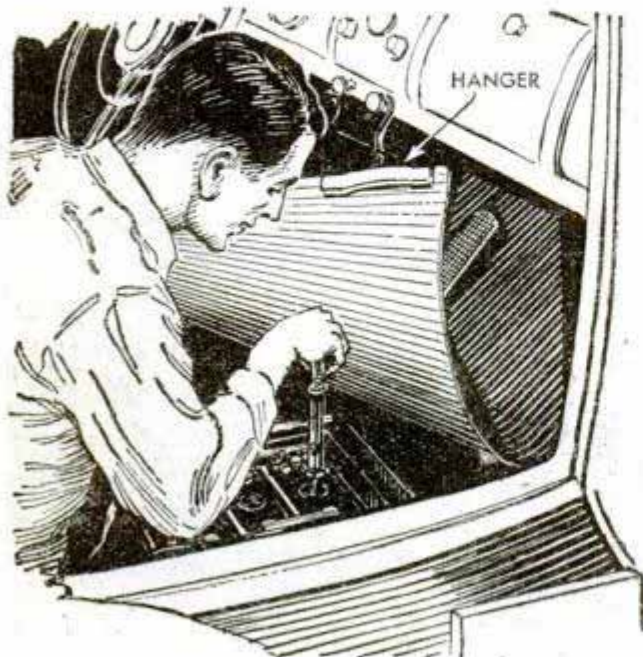
Shower-Curtain Pins Are Used When Carrying Small Game



If you slip a few shower-curtain pins over the belt of your trousers, it won't be necessary to wear a hunting coat, or to carry small game and birds and not have both hands free. The narrow part of the pin is slipped over the neck of the animal and the large end is looped over the belt.

Trousers Hanger Holds Floor Mat While Servicing Battery

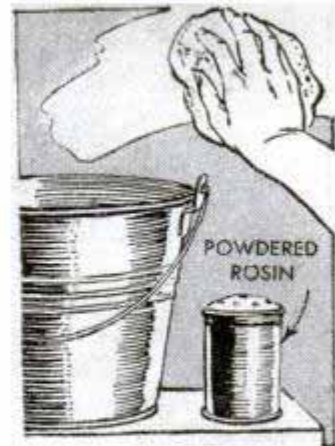
When servicing a battery or working on parts of a car beneath the floorboard, the floor mat can be held out of the way with a trousers hanger. The hanger is fastened to the mat and the hook is attached to a knob



on the instrument panel. To prevent scratching or marring the knob, wrap the hook with adhesive tape.

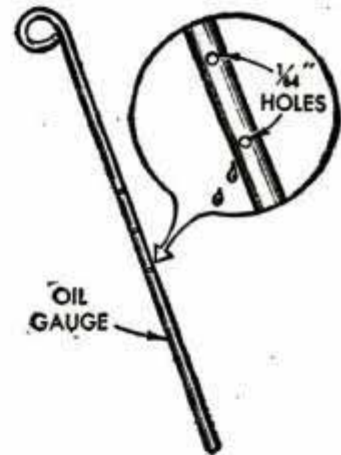
Rosin Removes Cold-Water Paint

Next time you have to remove cold-water paint from a wall or other surface, try using powdered rosin. Dust it lightly on a cloth which has been dipped in hot water and rub it over the paint. To apply the rosin to the cloth, use a large salt shaker or similar dispenser. This will distribute it uniformly. The rosin has an abrasive action that is effective in removing this kind of paint.



Making Oil Gauge Easy to Read

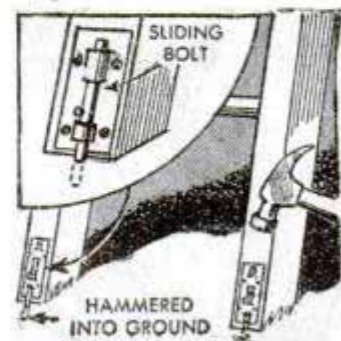
The oil-gauge stick on many cars is difficult to read, especially when fresh oil has just been added to the crankcase. To overcome this, drill $\frac{1}{64}$ -in. holes at the "empty," "half" and "full" marks that are stamped on the gauge. These small holes will retain the oil so that it will be easy to determine whether the oil level is at any of these marks.



Spencer A. Pease, Wauwatosa, Wis.

Sliding Bolts Will Secure Ladder

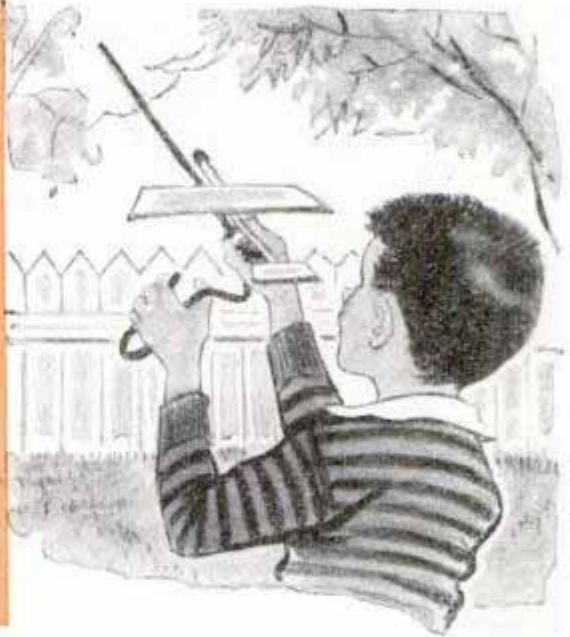
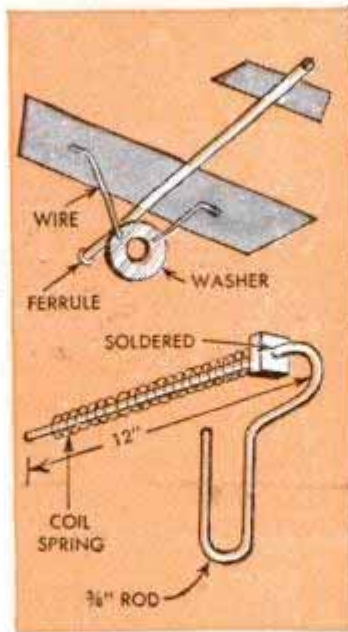
Sometimes a ladder will show a tendency to "walk" away from the wall or other object that it is leaning against. To prevent this, attach heavy-duty sliding door bolts to the base of each leg. Then, when the ladder is set in place, hammer the bolts into the ground and the ladder will remain stationary until it is moved.



Toy Glider Shot From Hand-Operated Catapult

Easy to make and easy to fly, this toy glider is launched into high, curving flight by means of a hand catapult. "Fuselage" of the glider is a length of tubing with a ferrule soldered to the front end. The balsa-wood wing and tail are glued to the fuselage, and the landing gear, which consists of a washer and two wire braces, is fastened to the wing. Note that the inside diameter of the washer should be just large enough to fit over the $\frac{3}{8}$ -in. rod that forms the body of the catapult.

After the pistol grip has been bent to shape, solder a square-head nut onto the rear of the straight section of the rod to act as a stop for the spring. Use a light coil spring, but one that has strength enough to



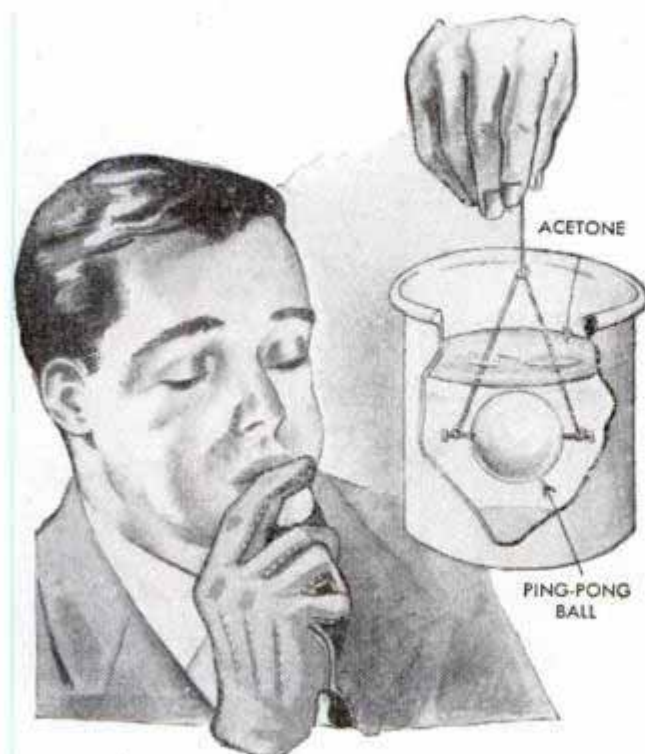
give the plane a fast take-off. To fly the toy, slip the washer over the rod and pull the glider back to compress the spring, then release for flight. For decoration, paint an insignia on the wing and tail.

Acetone Used to Repair Cracks and Dents in Table-Tennis Balls

Here's a way to reclaim table-tennis balls that have been cracked and dented by hard usage. To repair cracks, insert two pins in the ball so it will rotate on its axis and suspend it from a string. Quickly dip the ball in acetone. Then spin the ball to remove excess acetone and hang it up to dry. Leave for about an hour and, after this, remove the pins and touch up the

holes with clear nail polish. When dry, rub the ball lightly with a paste of pumice and oil applied with a soft cloth. Pay special attention to any ridges that show when rubbing with the paste. If, before treatment, the crack is very bad, hold the edges together and paint with clear nail polish, brushing in the direction of the crack. Follow with the acetone bath. For dents, try the following hot-water treatment: Puncture the surface opposite the dent with a needle. Wearing gloves for protection, immerse the dented area only in boiling water. As soon as the ball is removed, blow into the needle hole steadily and evenly. It may be necessary to repeat this several times. After the dent is removed, seal the hole and treat as before.

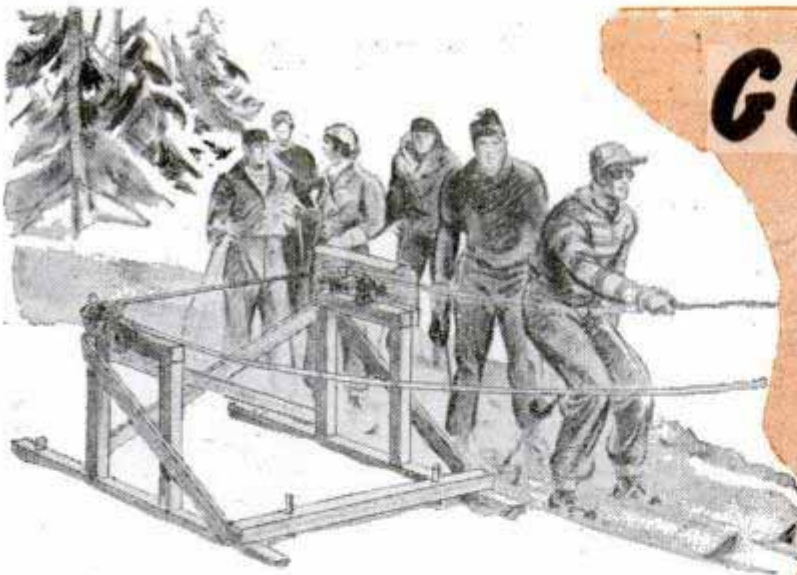
Simon S. Palestrant, New York City.



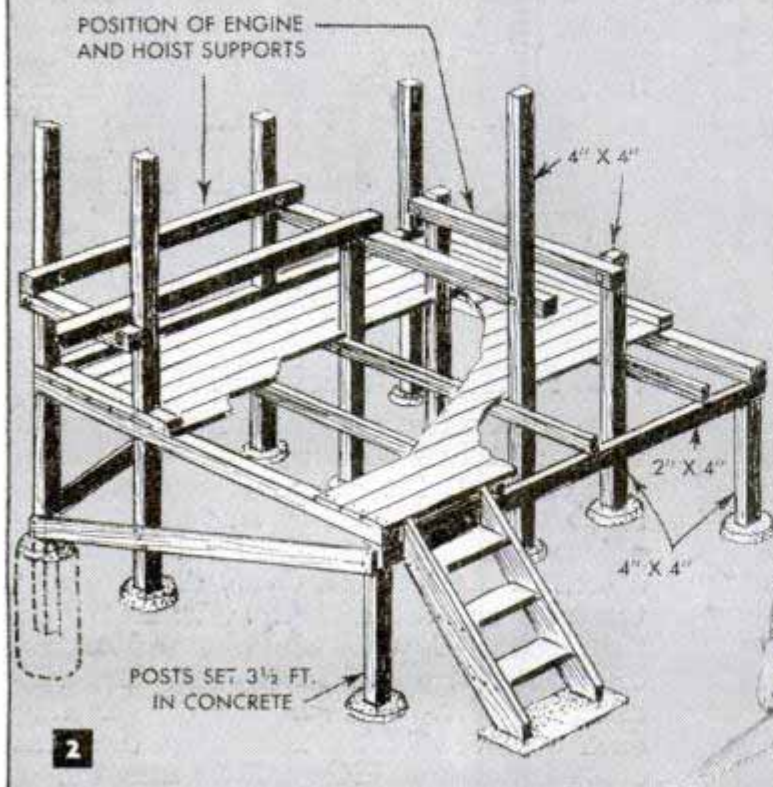
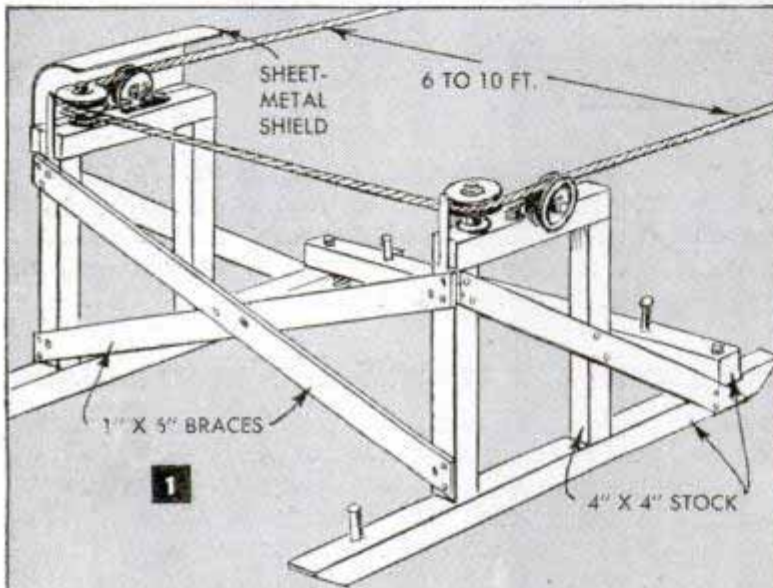
Fine Finish on Interior Woodwork

To get a smooth finish on interior woodwork that has been painted previously, first clean off the old paint with remover and brush over the entire surface with turpentine. After this is dry, sand and apply a coat of the selected color, thinned with turpentine to act as a filler. When this in turn has dried, putty all holes and broken or splintered parts. Then apply as many coats of paint as are necessary, allowing each coat to dry before adding the next one.—Francis W. Henry, Pottsville, Pa.

GOING UP!



BY POOLING time and money members of a ski club can put this ski tow together at very little cost to each individual, and at the same time add immeasurably to enjoyment of the sport. The first important thing is the selection of the hill on which to build the tow. If possible, locate it on a north slope where the snow is out of the direct sunlight. In such a location you are more likely to have good skiing conditions throughout the winter season. There should be plenty of trees and shrubs to catch and hold snow on the hill, but not so many as to interfere with skiers or the operation of the tow. Ski track over which the "going-up" side of the endless tow rope will operate should be straight, and the slope, although it can be quite steep, should be uniform without dips or sharp rises. Of course, such irregularities can be graded smooth, but this will add to labor

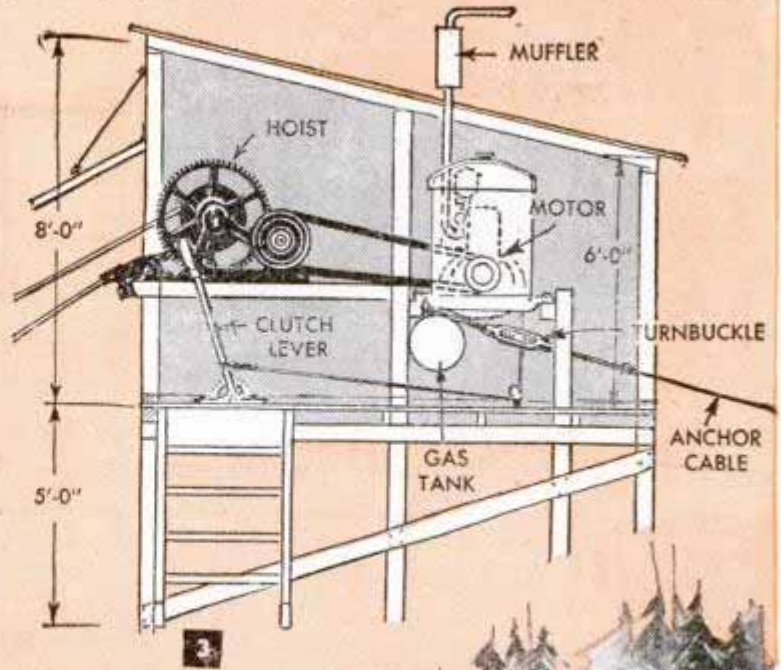


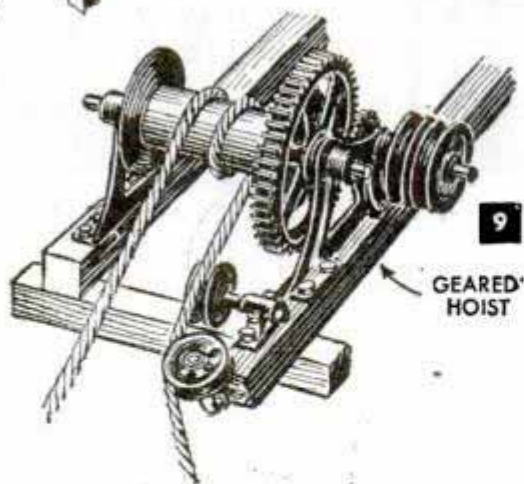
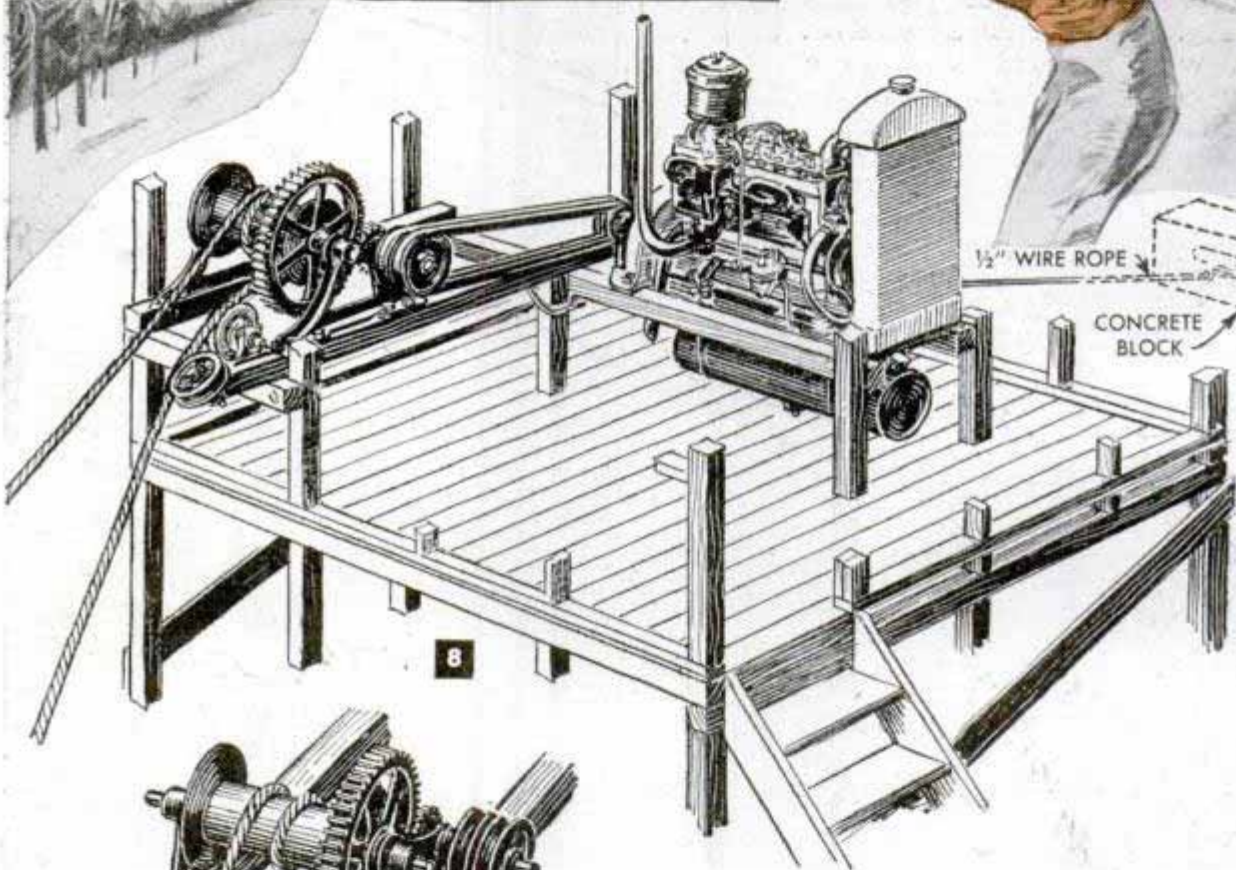
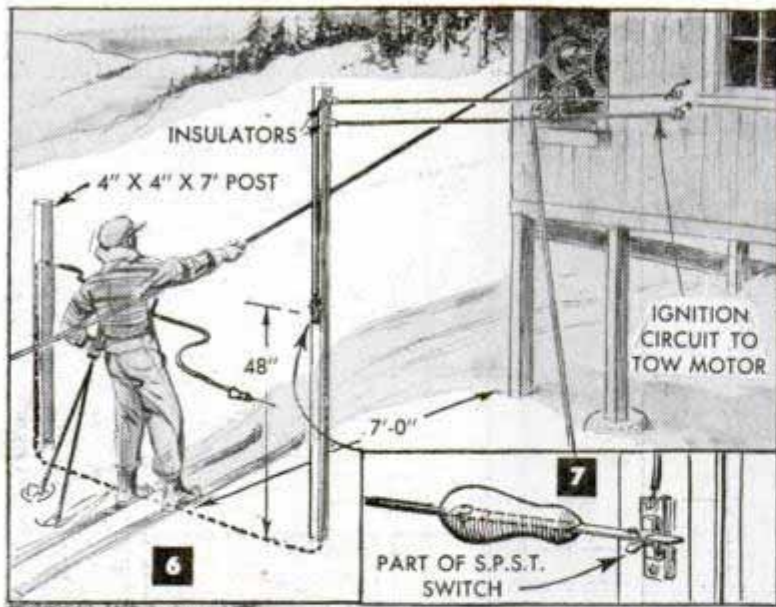
That slow climb back to the top is no fun for even the most ardent ski fan, but this safe, motor-driven tow takes you up just the way you came down—on skis

and cost and require more time.

Towing mechanism and the auto engine which supplies power are built into a shelter, Fig. 3, erected on a level area at the top of the hill. The house should be far enough back from the top of the slope so that skiers coming up can let go of the rope and ski away on the level. At this point the rope should clear the ground by at least 4 ft. To get this height, it probably will be necessary to build the engine house on high supports set in concrete pedestals as in Fig. 2. Anchor the house with $\frac{1}{2}$ -in. wire rope attached to a heavy concrete block buried in the ground at the back, Fig. 8.

Engine and hoist supports are





installed as in Figs. 2, 3 and 8. Dimensions and location of the supports must be determined from the engine and hoist at hand. A single-gear hoist, Fig. 9, works very well, although it may be necessary to lag the drum to build up the diameter and give the rope a better grip. The roller-bearing sheaves which carry the slack side of the

tow rope are mounted on posts as in Figs. 4 and 5. They should be located 10 to 15 ft. apart. The lower tow-rope guide or "sled," Fig. 1, is anchored by means of steel stakes which can be driven into frozen ground. Use $\frac{3}{4}$ or 1-in. rope as it is easier to grasp and don't let it drag in the snow at any point. Keep it dry. Speed of the rope should not exceed 1000 ft. per min.

Have an attendant in the engine house at all times when the tow is in operation and provide a safety device as in Figs. 6 and 7, to break the ignition circuit and stop the engine automatically should one of the skiers fail to release the rope in time to clear the house. Keep the rope sheltered when not in use.

Drawing Silhouettes From Models

Even though you're not an artist, it's no trick to draw lifelike silhouettes. Try it at your next party. A flashlight and clamp, large-sized sheets of paper and a charcoal pencil are all that's needed. The flashlight is clamped to the back of a chair and the subject sits between it and the sheet of paper so that the light casts a sharp shadow. The projected silhouette is traced on the paper and later filled in. Some arranging is necessary to get just the right setup. The "pictures" can be drawn quickly and the results are surprisingly accurate. To get as sharp a silhouette as possible, use a flashlight that can be focused.



Secret Drawer in Buffet

Located behind the top drawer of a buffet, a concealed compartment will hold your guest silver and keep it safe from intruders. The hidden drawer is formed by cutting off part of the original drawer and fitting it with a front. The remaining portion is fitted with a back and a pivoted stop to prevent spilling the contents of the drawer if pulled out too far.

Memo Card Gives Correct Sizes To Stretch Curtains

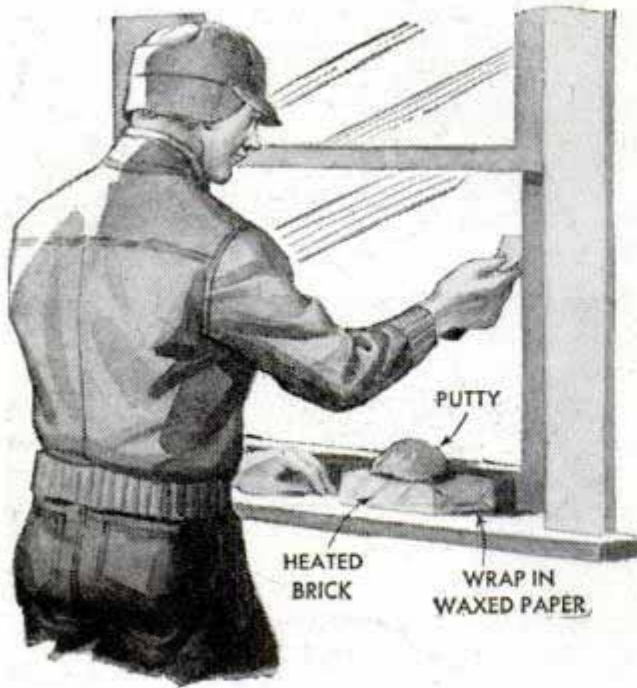
When stretching curtains after laundering them, considerable time can be saved if the correct size for each curtain is written on a card that is attached to the stretcher. Once the measurements are noted, it's a simple matter to refer to the card and set the stretcher correctly for each curtain. Use a water-resistant material for the card and write on it with waterproof ink.



Mixture for Filling Holes in Wood

If you want to fill some holes in wood and there is no plastic filler on hand, try this substitute mixture. Mix fine sawdust and water glass (sodium silicate) to a paste-like consistency. Apply this like putty and, when it has dried, finish in the usual manner.—H. Levy, New York City.

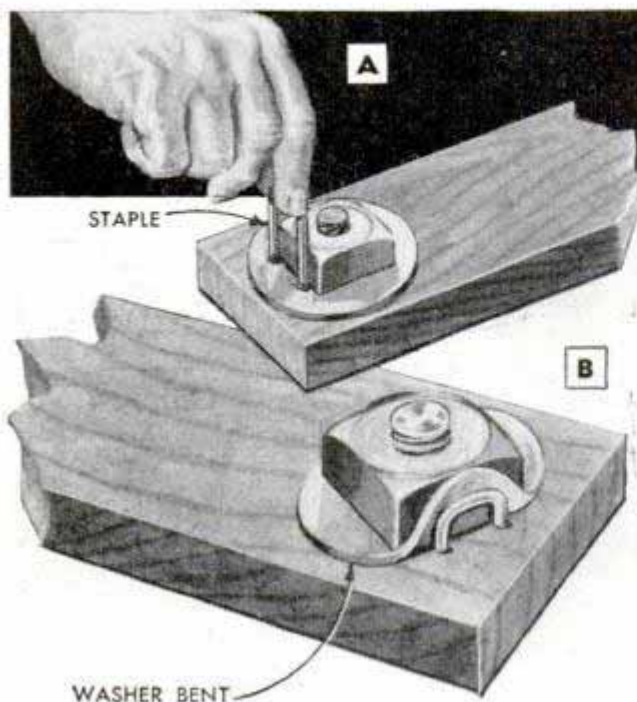
Heated Brick Keeps Putty Warm When Glazing Sash in Winter



Putty can be kept soft and pliable while being applied outdoors during cold weather, if it is placed on a heated brick. Wrap the brick in waxed paper so the putty will not stick. This "warmer" will keep the putty soft for some time.

Two Ways to Lock Nuts on Bolts

Nuts on bolts that are used to anchor machinery to wooden bases frequently are difficult to keep from loosening because of vibration. Here are two ways to lock the nuts and prevent this. In detail A, the washer used under the nut is drilled to receive a staple, which is driven through into the wood. In detail B, the washer is



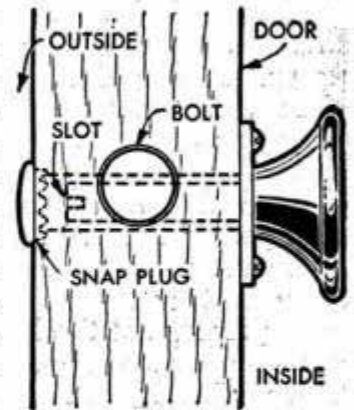
WASHER BENT

bent up against the nut and the staple is driven against the flange thus formed.

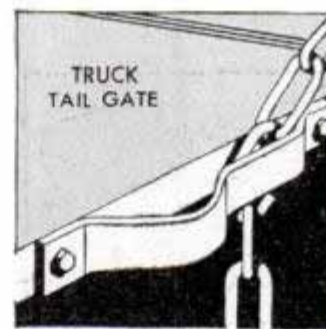
Improved Lock for Bathroom Door

To keep a youngster from locking himself in the bathroom, one parent altered an ordinary bolt lock so that, in an emergency, it could be opened from outside the bathroom. The lock is installed in the usual manner, then the outside knob is removed and the end of the shaft is slotted to fit a screwdriver. Finally, the hole in the door for the knob is capped with a snap plug. To unlock the door from outside, remove the plug and turn the bolt back with a screwdriver.

Robert C. Glass, Fraser, Mich.



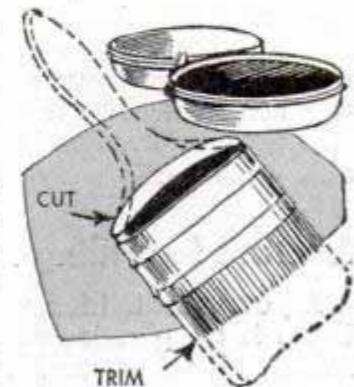
Truck Tail-Gate-Chain Adjustment



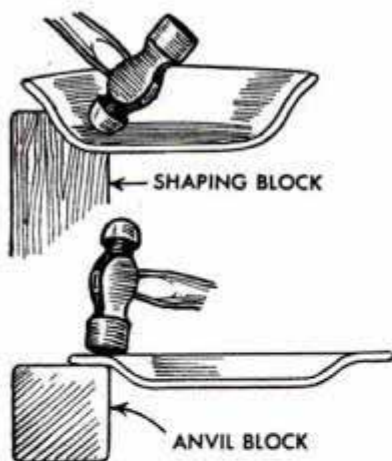
With this chain adjustment, you can set the tail gate of a truck at almost any height. The chains are fastened to the sides of the truck and are inserted through strips of flat iron bolted to the ends of the tail gate. The iron is bent so that the chain will run through it freely when passing through the part that is bowed out, but will catch and hold the tail gate when a link is slipped into the narrow part.—George W. Carter, Olds, Alta., Can.

Paintbrush Applies Shoe Polish

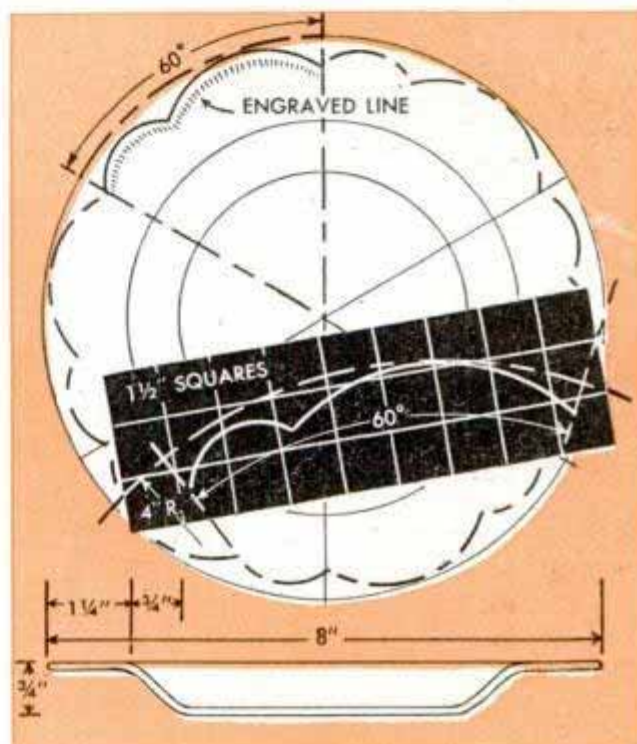
If you have a small, worn paintbrush, it can be used as a shoe-polish applicator. Trim the bristles so they are short and even, as shown, and cut the handle off so it can be gripped properly. Because of the shape of the modified brush, it's easy to get at hard-to-reach spots such as where the upper and the sole are joined.



Pewter Bonbon Dish Typifies Homespun Craft



As an example of hand-wrought craftsmanship and design, this pewter bonbon dish is typical of the fine work that can be turned out with only a few hand tools. Material required for the dish is an 8-in. disk of 18-ga. pewter. To begin, locate the center of the disk and scribe two concentric circles, one with a radius of 2 in. and the other 2 $\frac{3}{4}$ in. With the disk flat on an anvil, use a ball-peen or planishing hammer to finish the surface of the inside circle, giving it a texture similar to that shown in the photograph. Then cut a shaping block out of 2 by 4-in. stock and form the bowl, using either a round-head mallet or a 14-oz. ball-peen hammer. Keep rotating the disk as you form it. When the dish has the approximate shape shown in the upper left-hand detail, form the lip on an anvil block, lower left-hand detail. Skill and care are required to produce flowing curves and smooth surfaces. Set the dish on a solid metal plate and, with a rawhide mallet, flatten the bottom so it will not "rock." Then reverse the dish and treat the lip in the same way, this time using a chisel-edged mallet. Referring to the lower right-hand detail, divide the dish into six equal parts. "Step off" this distance around the circumference of the 8-in. circle with dividers set for 4 in. The segments are at an angle of 60 deg. Sketch and cut a template having the outline indicated by the ruled squares and trace this pattern on each of the six segments. With curved shears, cut to the outline, but allow for finishing and smoothing the edge. Then scribe a line parallel to the outline $\frac{3}{16}$ in. inside it and tool in an ornamental border with an engraver's burin. Finish by removing all surface scratches with No. 0 emery cloth and follow by rubbing vigorously with pumice-and-oil paste. A high luster is obtained when the dish is rubbed with fine steel wool. In time the pewter will become dull, but the polish can be restored by washing with soap and water or, if neces-



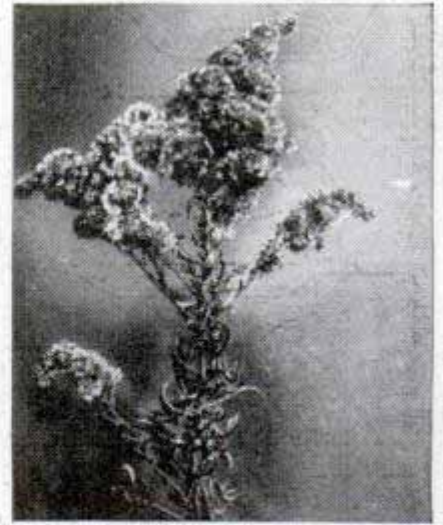
sary, polishing with fine steel wool and soap. Since pewter is a soft metal, care must always be taken not to scratch it.

Soles Protected From Skate Clamps

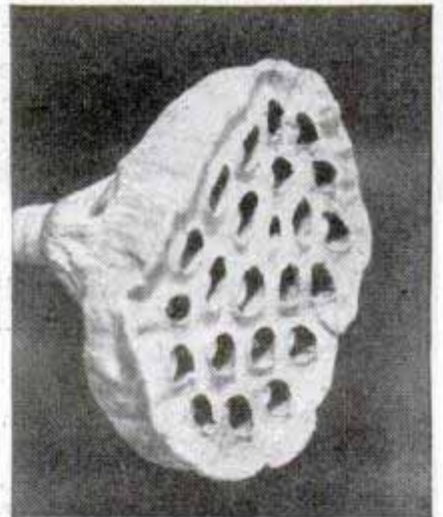
Children's shoe soles frequently become torn and loosened by the toe clamps on roller or ice skates. But if U-shaped clips are formed from sheet metal and used on the soles as shown, the clamps will have a better grip and they will not cut into the sole. When not in use, the clips are removed from the soles of the shoes.



Winter Bouquets



Goldenrod makes a beautiful and lasting bouquet. This was gathered in mid-winter, dried and sprayed with a flat-type paint. You'll find pastel shades give the best results



Large seed pods of American water lotus and Yoncopin, gilded, can be used to form the predominant part of a winter bouquet when combined with bushy-type grasses

There's money in making and selling artificial bouquets and it's practically all profit, too, for they can be made of dried flowers, grass or even weeds and decorated with dime-store paint

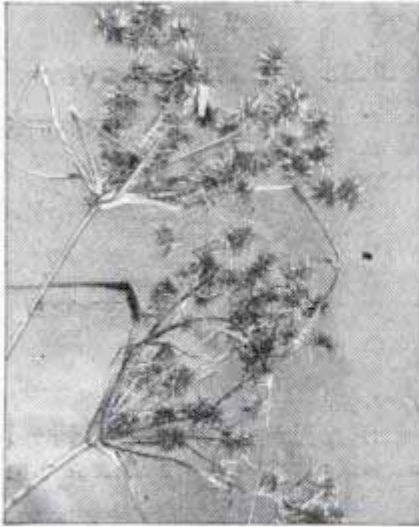
DRIED AND SPRAYED or painted by hand in a riot of colors, common garden flowers and even lowly roadside weeds become a thing of beauty in the form of a winter bouquet. The best flowers for this purpose are the everlastings as they are of a papery, strawlike quality and when dried retain their shape and color exceptionally well. These include helichrysum (strawflower), cantananche (Cupid's dart) and winged everlastings. Others frequently grown in average gardens are sea lavender, globe amaranth and babies'-breath. To prepare everlastings for bouquet material, pick them when the flowers first open from the bud and hang them upside down in small bunches in a warm room, after first stripping off the leaves. Let them remain until the heat has drawn the last vestige of moisture from the stems. If you wish, the stems can be removed and replaced with ones of wire. Wire stems will permit forming sprays and other unusual arrangements. The bouquet is preserved by

By
**PAUL
HADLEY**

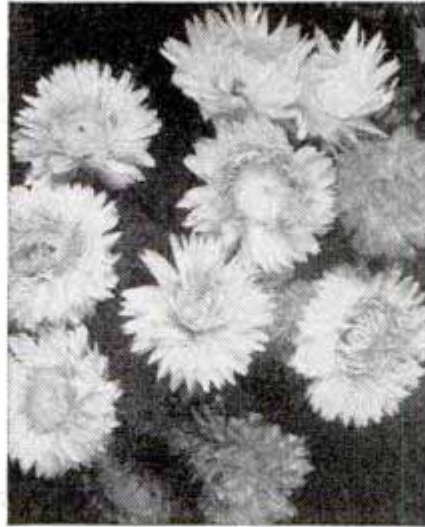
spraying it with clear lacquer which brightens the original colors and gives the bouquet stiffness.

You don't need to stick to flowers alone. Many attractive bouquets can be made up of berries, seed pods and grasses. As for berries, there are those of the bittersweet vine, barberries, Indian currants, coralberries, etc. The hard seed pods of larkspur, primrose, tulip tree and mallow, as well as the globular heads of poppy plants, all lend themselves to forming attractive bouquets. There are also the pods of okra and dried tassel of corn. Roadside weeds, such as the

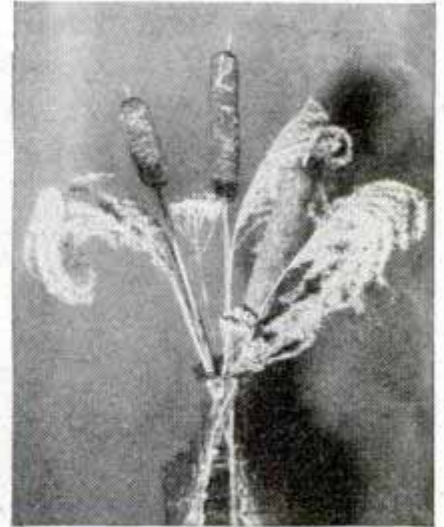
From Your Summer Garden



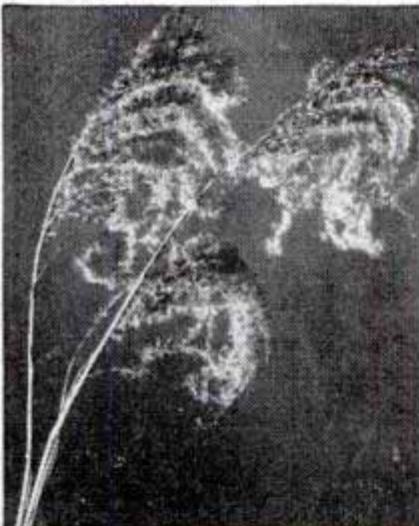
Burr grass, a rough grass, is ideal for winter bouquets. It can be left its natural color and sprayed with clear lacquer to preserve it, or colored by spraying it with paint



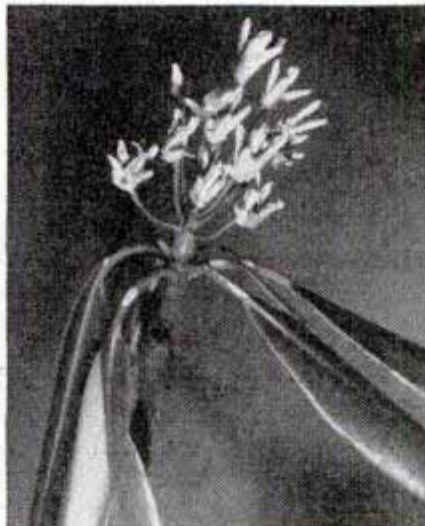
Flowers of the helichrysum plant (strawflowers) when dried retain their shape and colors almost indefinitely. Stems usually are removed and replaced with wire



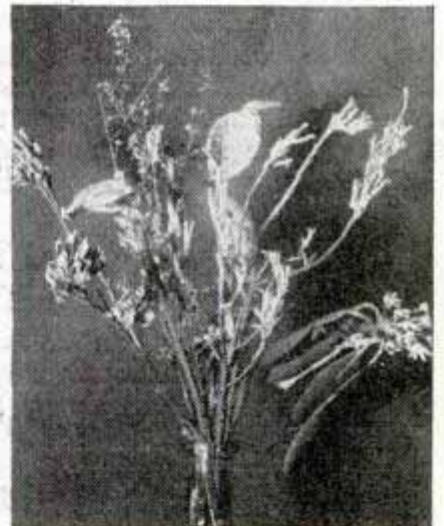
A bouquet combining plume grass with cattails. The grass must be sprayed with thin lacquer to prevent shedding the seed, while the cattails are dipped in collodion



Here's what plume grass, a cultivated grass, looks like when used by itself in a bouquet. This, like pampas grass, must be sprayed with lacquer to prevent shedding



Seed pods of a rhododendron bush when painted pink or orchid color in contrast with its glossy green leaves make a striking bouquet to add a decorative touch to a room



Seed pods entirely make up this bouquet. It combines those of milkweed, wild primrose and mallow. Pods are painted various colors to contrast with green stems

Jimson, milkweed, primrose and many others, are suitable, too. Bouquets of these materials usually are painted with quick-drying paint or enamel, painting the pods in various colors and the stems green.

There are a number of grasses that will do. Plume grass and pampas grass are very good. A variety called sea oats, a tall grass with oatlike panicles, is used commercially. Cattails also are popular in winter bouquets, but like grasses, they have light downy seeds that shed very easily. These can be made nonshedding by coating with collodion cement. Grasses are made non-

shedding by spraying them uniformly with thin, clear lacquer or white shellac.

The accompanying photos show a few of the many combinations of seed pods, flowers and weeds that can be used. An unusual bouquet which is appropriate at Christmas time can be made from a few ordinary tree branches and twigs. These are first painted red or white and then dusted with mica-type artificial snow while the paint is still wet. A rhododendron branch with its flowerlike seed pods forms a novel bouquet when the pods are painted pink or orchid and the leaves green.

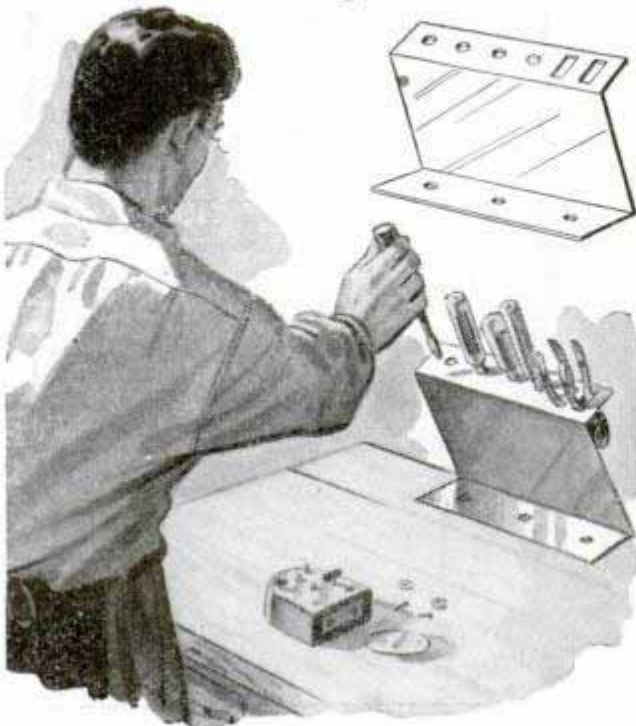
Mold Cut in Ground Simplifies Casting Flagstones



Instead of making regular forms for flagstones and then removing the "stones" from the forms and setting them, dig shallow holes in the ground the shape of the stones and pour concrete in them. Smooth the concrete flush with the ground so it will be easy to mow over the flagstones.

Metal Holder for Hand Tools Fastened on Workbench

This tool holder can be fastened to the top of a workbench where it will keep small hand tools in an easy-to-reach position. It is formed of fairly heavy sheet metal bent to a Z-shape as shown in the



detail. The holes to fit the tools are made to accommodate the ones you have and, naturally, must be varied to suit individual requirements.

Rufus P. Turner, New Bedford, Mass.

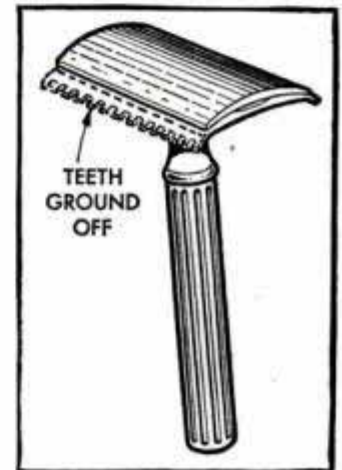
Sawdust Absorbs Paint Remover

When refinishing woods, it's a good idea to have a supply of clean sawdust at hand to sprinkle on paint remover as the old finish is scraped off. A cleaner and neater job will result than if rags were used and the sawdust can be disposed of when the work is done.



Safety Razor Serves as Scraper

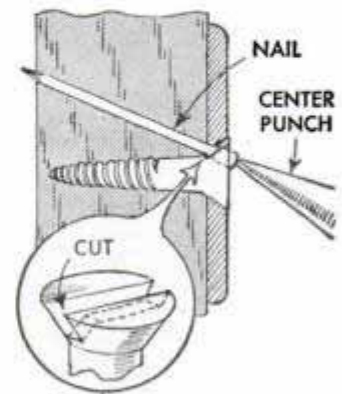
An old safety razor can be altered to serve as a scraper for small work by filing down the teeth of the guard so that the edge of the blade projects slightly. Discarded razor blades will prove satisfactory for use in the scraper. In fact, until the edge of the blade has been dulled somewhat, it will not work too well. A double-edged blade and razor are used to make the scraper.



Andrew Stelmach, Millville, N. J.

Screws Hard to Remove From Hinge When "Locked" With Nail

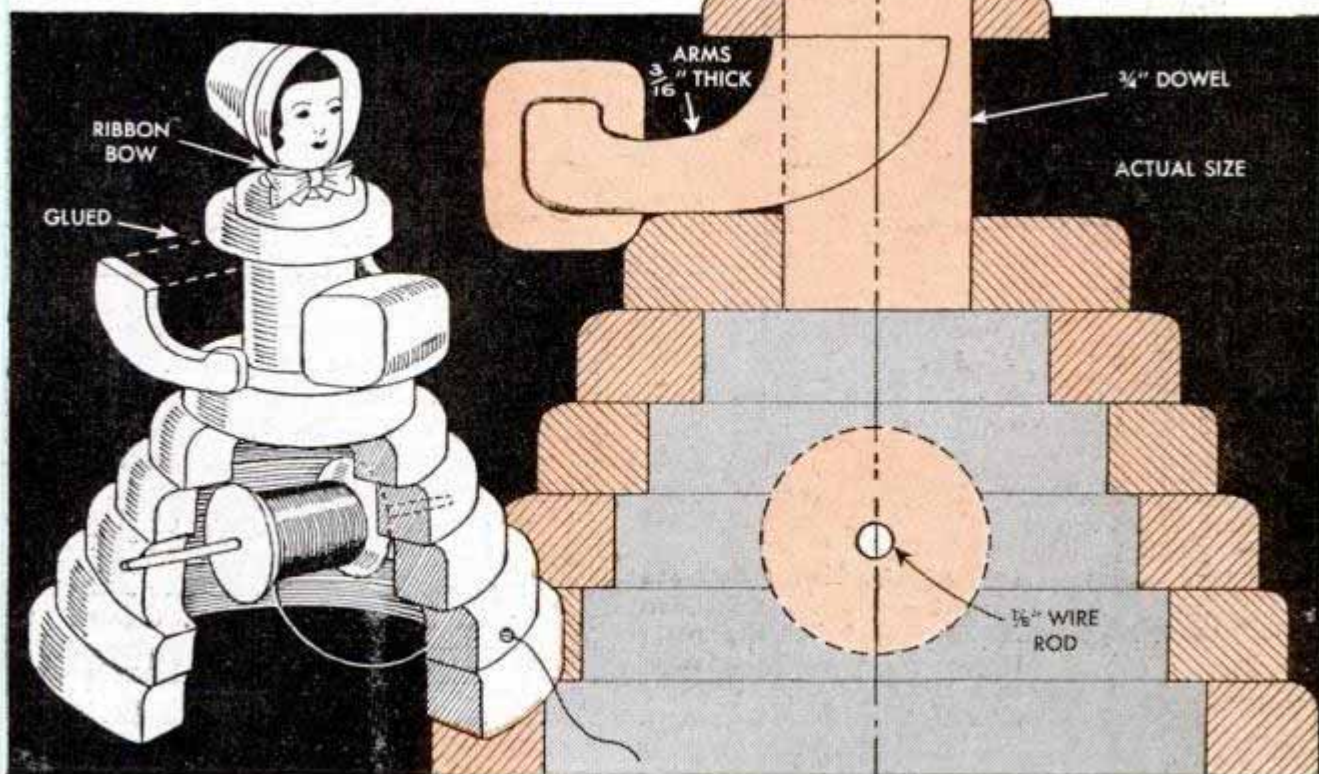
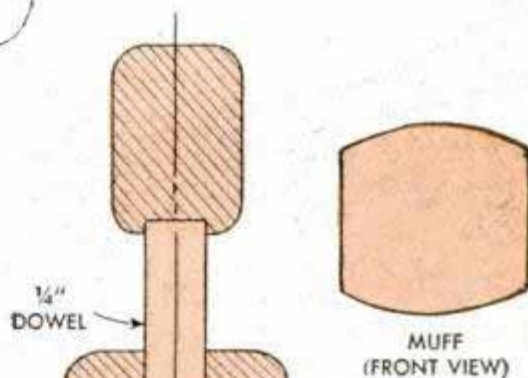
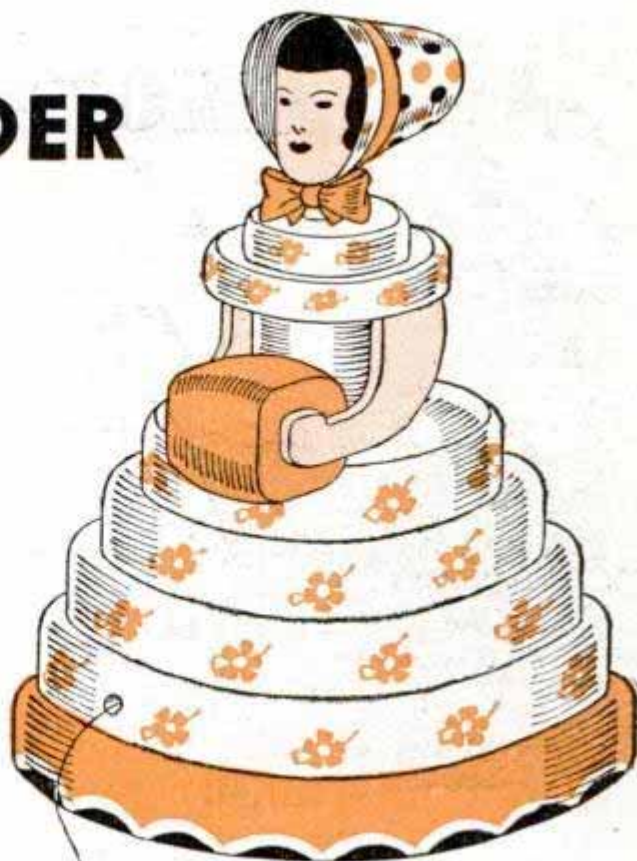
Hinges and hasps are difficult to remove from doors, tool chests, etc., if the screws holding them are locked so they cannot be removed with a screwdriver. To prepare the screw, deepen the slot at an acute angle at one end. Then turn the screw in place and drive a finishing nail into the slot so that the head is below the surface, using a center punch to countersink it.



Turn this novel THREAD HOLDER

Here's a novel and practical little project for the beginner in lathe work. It's a doll thread holder which conceals a standard spool of thread on a removable wire rod under the skirt. The doll consists of eleven turned parts, although the neck and body can be pieces of dowel. The six wood rings which form the skirt are first jigsawed roughly to size, sawing the outside diameter of each one about $\frac{1}{8}$ in. oversize. Then they are all glued together, one centered on top of the other, after which a scrap of $\frac{3}{4}$ -in. pine is glued to the top with paper in the joint. Next, the glued assembly is attached to the lathe faceplate and the outside is turned down according to the sectional view, then sanded smooth and pried from the scrap block at the paper joint. A $\frac{3}{4}$ -in. hole is bored in the skirt for the body which is capped with two disks, the top one being bored for the dowel neck. The shape of the arms can be traced directly from the full-size pattern, jigsawed and glued as shown. The doll is completed by adding the muff, paper bonnet, the ribbon bow around the neck and painting to suit. Shellacking it first will keep the end grain from absorbing the paint. The thread is brought out through a hole in the front of the skirt.

N. Bogoch, Winnipeg, Man., Can.



SHOTGUN CHOKES

By W. Clyde Lamme



Photo by Roberts from Underwood

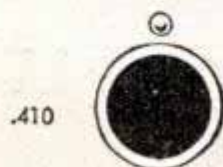
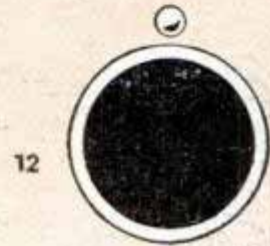
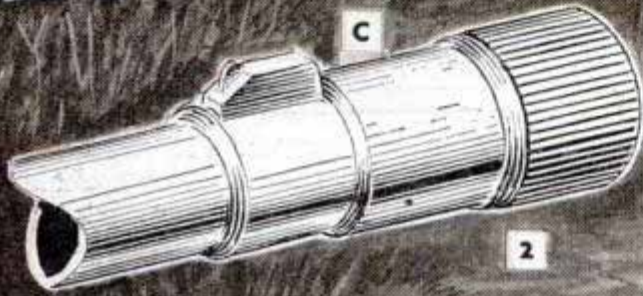
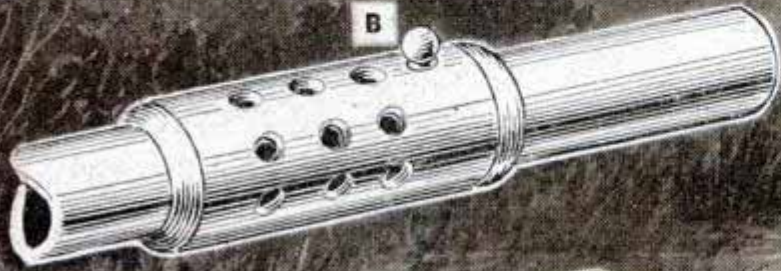
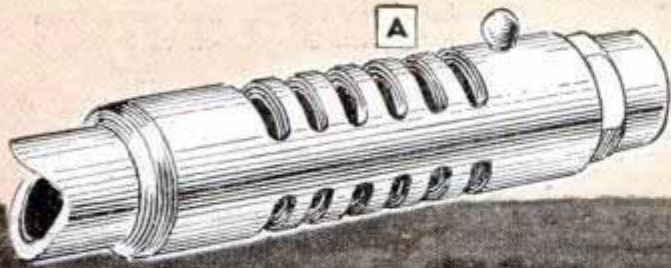
1 POPULAR SHOT SIZES Chilled Shot

No.	No. in Oz.
10	868
9	585
8	409
7½	345
7	299
6	223
5	172
4	136
3	109
2	83
1	73

Left, popular shot pellets are shown in comparative sizes. Common loadings include sizes ranging from No. 9, a standard skeet load, to No. 4, loaded in 2¾ and 3-in. shells for long-range work

CHOOSING A SHOTGUN by gauge alone is not always the best way of determining its suitability and usefulness. For one thing, some good shotgunners find it difficult to get accustomed to the comparatively heavy recoil of the larger gauges, even though they may use the heavier gun over a period of time. To them the larger gauges are a definite handicap to better shooting. Such shooters should settle for a smaller-gauge gun of lighter weight or a gun of the auto-loading type which gives less recoil. In the long run they will bag more game. Others, to whom recoil is no handicap, object to the comparatively heavy weight and slower swing of the big-bore shotguns.

AND GAUGES

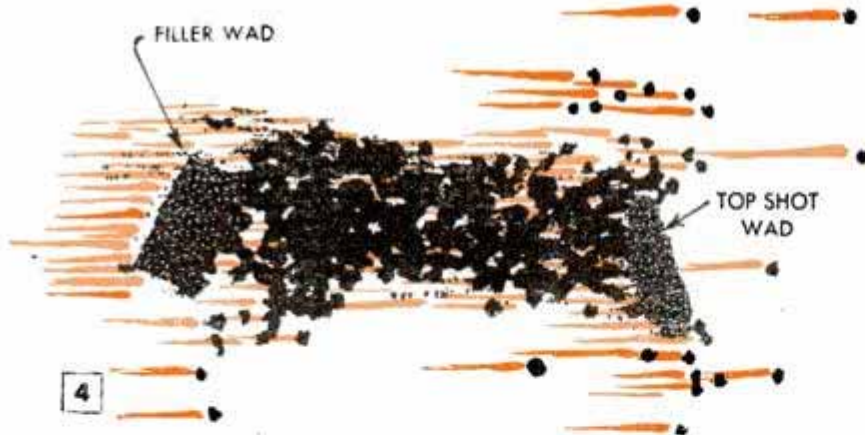


3 GAUGES IN COMMON USE

Variable choke devices fitted to single-barrel guns give consistently uniform patterns and some types known as compensators, or "brakes," aid in reducing recoil

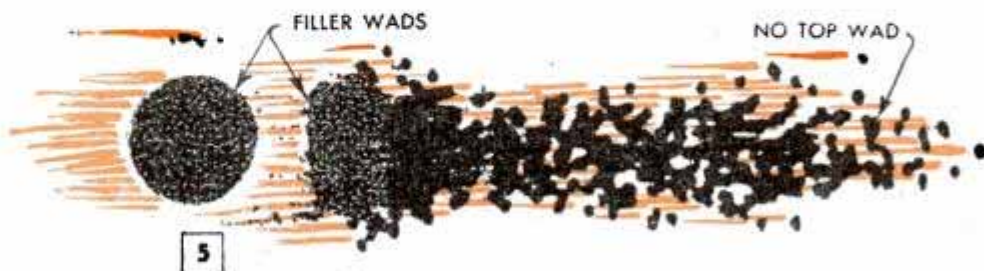
For them the solution also is a lighter, faster gun of smaller gauge. Then there are the hardy wild-fowlers who must sacrifice something in choice to get the extra-long-range killing power generally required to bag their game under average present-day hunting conditions. These special requirements call for a heavy gun, chambered and bored to handle super-long-range loads.

The trick is in selecting the gauge of the gun to fit the personal likes, purposes and inclinations of the shooter. In some cases that's a rather large order, but for ordinary upland shooting a ratio of about 100 ounces of gun weight per ounce of shot is a good average for most shooters. Type of shotgun is optional, of course, and all high-quality shotguns are furnished in a choice of chokes, gauges and barrel lengths. Both the gauge and the choke are determined largely by the game you are after. The degree of choke determines the spread of the pattern. If you are shooting quail over dogs in thick cover you will need a medium-lightweight gun and an open boring



Left, high-speed photos reveal what happens to a shot charge fired from the older-type shot shell closed with a top wad and the conventional crimp. This shot charge is being deflected by the top wad—may form a "cartwheel" pattern as in Fig. 9

Right, shot charge in flight a few inches from the gun muzzle. Note uniformity of shot column. Fired from a shell with the newly developed flat crimp which eliminates the separate shot wad

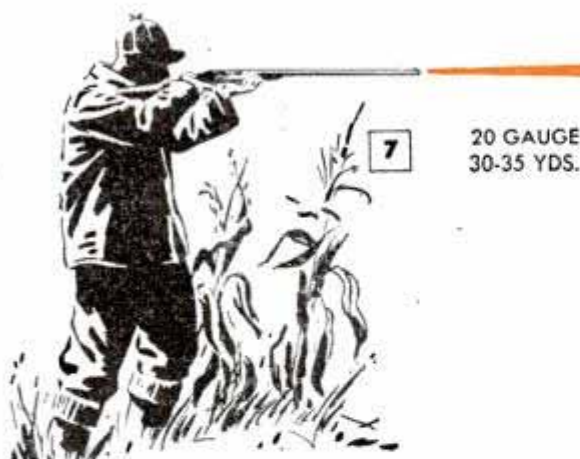


Courtesy Remington Arms Co., Inc.

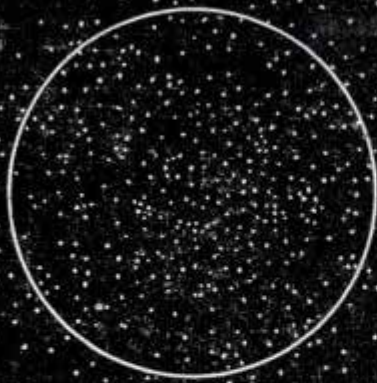


to give wide-spreading shot patterns. On the other hand, if you are shooting at passing ducks or geese, driven pheasant or doves, the average ranges will be much longer. For this work you'll need a somewhat heavier gauge choked to throw a tight pattern at greater distances.

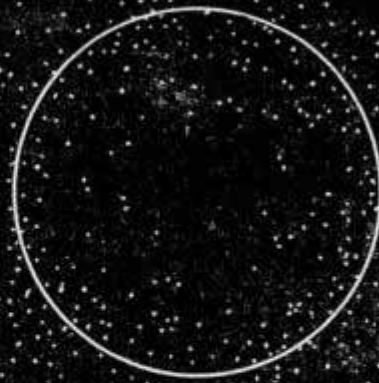
In the double gun with side-by-side barrels or the over-and-under type with superposed barrels, you can have two degrees of choke in the same gun without additional fittings. But with any of the single-barrel shotguns in single-shot, pump action or the auto-loading type you have only one barrel and, of course, only one degree of choke. The alternatives are to have interchangeable barrels fitted to the gun, each with a different choke, or any one of the three devices shown in Fig. 2, A, B and C, attached to the original barrel. Any of these latter accessories is good, the first two, A and B, giving exceptionally uniform patterns of varying density and spread merely by changing the choke tubes. In addition, the open body of this device, which is permanently attached to the barrel, allows gases to dissipate more rapidly in a lateral direction, thus materially reducing the recoil. The third, detail C, is simply a choke-changing device and is the handiest of all in the field as it permits a change in pattern by merely turning the knurled ring. Index marks indicate the various degrees of choke. However, this accessory does not reduce the recoil of the gun.



A recent development in shot shells eliminates the top, or shot, wad by a new process of crimping. By use of the high-speed camera researchers verified what had long been suspected—that the top wad was the cause of spotty shot patterns. Notice in Fig. 4 how the top wad is breaking up the shot column only a few inch-



UNIFORM DENSITY



"CARTWHEEL"

9

Courtesy Remington Arms Co., Inc.

es from the muzzle of the gun. This early breakup of the shot column often results in the "cartwheel," or open-center pattern shown in Fig. 9. Fig. 5 is a copy of a high-speed photo showing a shot charge fired from a shell with the new flat-top crimp. This improvement in shot-shell loading has been found to give consistently uniform patterns in barrels bored with varying degrees of choke.

When you consider density of pattern, shot size in relation to gauge is of some importance. Notice in Fig. 1 how the number of shot pellets per ounce falls off as the shot size increases. In 1 oz. of No. 4 shot, for example, there are less than half as many pellets as there are in 1 oz. of No. 7½ shot. A 10-gauge takes 1½ oz. of shot while a 12-gauge gun handles 1¼ oz. in the standard 2¾-in. shell; the 20-gauge takes 1 oz. of shot, while the .410-gauge handles ¾ oz. of shot in the 3-in. shell. From this you can compare easily the variations of pattern density when different sizes of shot are used in gauges ranging from the smallest to the largest, assuming, of course, the same degree of choke in each instance. The 10-gauge gun, Fig. 3, although still preferred by many wild-fowl hunters, has been largely supplanted by the 12-gauge chambered for 3-in. shells. These heavy loadings in specially bored barrels make the 12-gauge gun effective at ranges up to 60 yds. or more. Figs. 6, 7 and 8 show average ranges at which various gauges are considered most effective. The figures given do not in any case represent the extreme ranges. Effective ranges of those gauges between 12, 20 and .410 will vary only slightly.

Shotgun barrels vary somewhat in pattern percentages, the common basis of reckoning



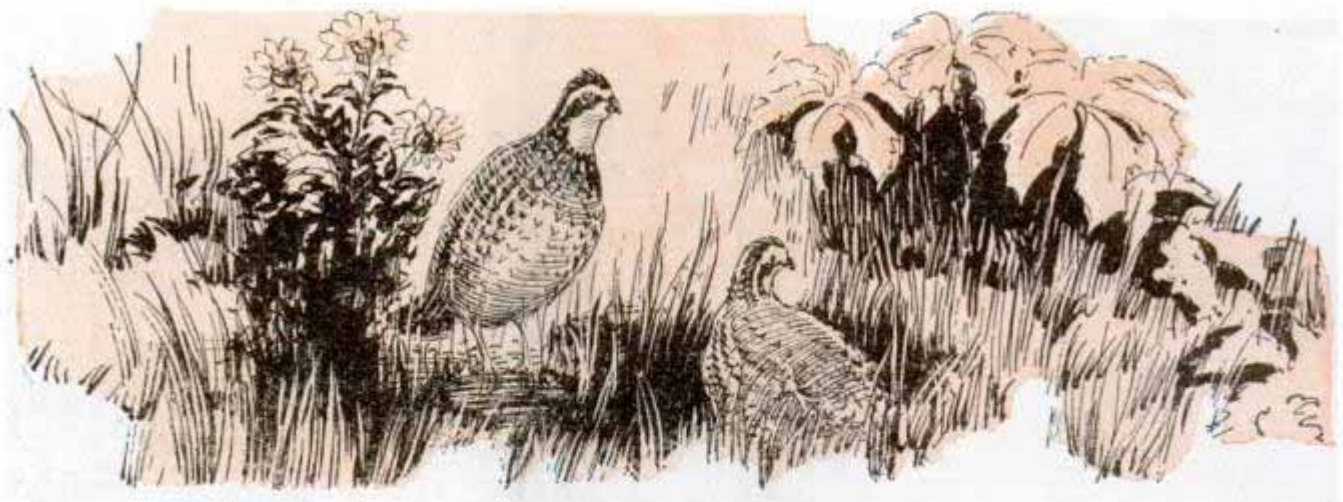
For quail and other small game birds taken in heavy cover at ranges under 40 yds., you'll need a light gun with open-bored barrels for fast handling and wide pattern spread. The 20-gauge gun is a good all-around choice



As a rule pheasant and other large upland game birds found in more open cover flush at greater distances. To bag these birds consistently you need a heavier gauge, larger shot and a somewhat tighter barrel boring

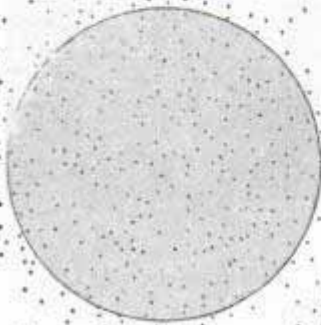


Average duck and goose shooting calls for a gun of the larger gauge, close choke boring and heavily loaded super-long-range shells



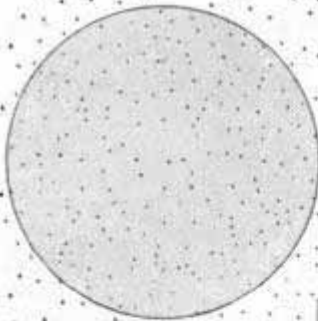
being the number of shot pellets placed in a 30-in. circle at 40 yds. Some full-choked barrels, Fig. 10 A, will hold 75 percent of the shot charge within the circle at this range, using a given shot size. Varying the pellet size will often give different results in the same barrel. For this reason it's a good idea to test a new gun to determine which shot size it patterns best. To do this, cut a number of sheets from heavy paper, each about 48 in. square and paint a 4-in.-dia. black circle on each one to serve as an aiming point. Set up a single sheet on a supporting frame 40 yds. from the muzzle of the gun and fire one test shot at each sheet, using a shell loaded with different size pellets for each test. After each shot draw a circle 30-in. in diameter around the area on the paper containing the greatest number of perforations made by the shot charge in passing through the target. You may have to repeat this test several times in order to determine what shot size gives the most consistently uniform results in the particular gun you are testing.

There is some difference of opinion among shooters as to the proper shot size to use on various game birds. For smaller birds such as quail and doves, most experienced hunters use small shot sizes ranging from No. 7½ to No. 9. For shooting medium-sized game birds, such as grouse and pheasant, shot sizes ranging from No. 4 to No. 7½ are an average choice. Large birds difficult to kill cleanly generally call for the use of the larger bores and shot sizes ranging from No. 4 to No. 1. However, it is density and uniformity of the pattern that count, rather than the shot size. Some shooters prefer the smaller shot sizes even for the larger birds, relying on the density of pattern given by the smaller pellets rather than the greater killing and ranging power of the larger individual pellet. Fig. 10 C shows roughly about what you can expect in shot patterns from full choke, modified choke and cylinder-bore barrels. Percentages for modified choke and cylinder bores also are frequently given as 45-55 and 25-35 percent, respectively.



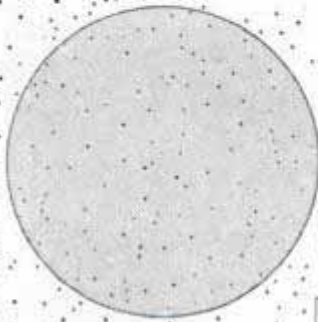
A

FULL CHOKE 65-75%



B

MODIFIED CHOKE 55-65%



C

OPEN OR CYL. BORE 35-45%

10

Focus Mark Filed on Binoculars Permits Quick Adjustment

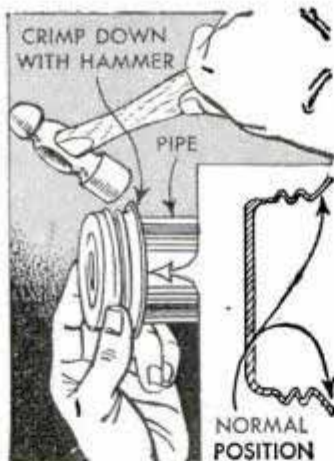


To focus a pair of binoculars quickly, scribe an indexing mark on the sliding barrel and adjust to this mark before sighting to make the final setting. Of course, the mark is set for a predetermined

distance and would be of use only where the object to be viewed is within such limits. Looking at football games, races, etc., where the distance is roughly known are examples of this. If several persons are using the glasses at the same time, it's an easy way for the owner to readjust them after letting someone else use them. When scribing the mark, be careful not to leave any burrs on the barrel as this might damage other parts of the instrument.

How to Recondition Jar Covers

After the screw-type covers found on some fruit jars have been used a few times, the edges flatten out and no longer grip the jar rubbers tightly. To recondition the covers, crimp down the edges with a hammer, using a large pipe or round wooden block as an anvil, and remove any burrs with sandpaper. The covers will again be in good condition.—E. J. Murawski, Baltimore, Md.



Handle Aids in Emptying Basket



Riveted to the side of a wastebasket near the bottom, a metal handle similar to a drawer pull, will provide a good grip for the hand and make it easy to empty the basket. The handle will be found

especially convenient when it is undesirable to have the contents of the basket come in contact with the hands.

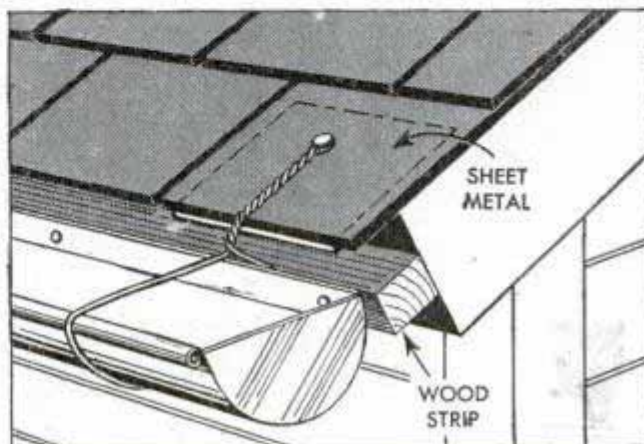


Oil Drum Supports Rural Mailbox And Serves As Package Holder

An oil drum provides an ideal support for a rural mailbox, and, if a door is cut in one side, will also serve as a good container for packages too large to go into the box. The door is made by cutting out a section from one side of the drum and hinging it in place. Provide a latch by welding or riveting on a hasp and staple to take a pin. Since the door naturally will not be rain tight, locate the drum with the door in the direction opposite to that from which most storms come in your locality. Four flat-iron legs braced and then welded to both the drum and mailbox support the latter at the desired height above the drum.

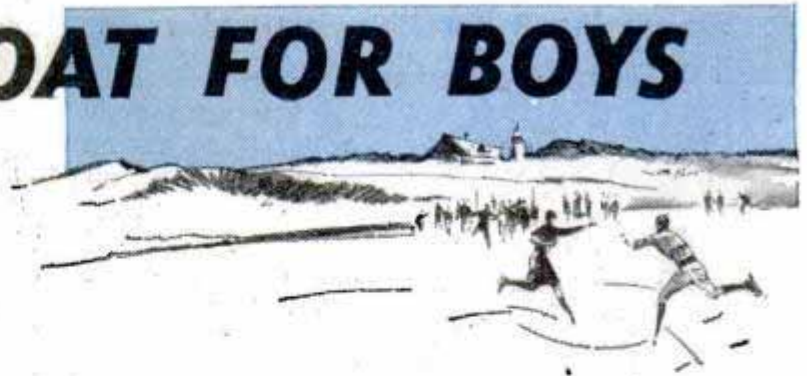
Fastening Rain Gutters Securely

If a gutter is fastened securely at the time it is installed, much needless maintenance work will be eliminated. To fasten the wire hanger to the roof, tack a square of galvanized sheet metal under the shingle and drive the hanger nail through this. Then nail the inside edge of the gutter to a wood strip that serves as a spacer. Finish the spacer with several coats of house paint to keep it from rotting.



"JET"—ICEBOAT FOR BOYS

It's made boy-size and it can be boy-built, but there's no reason why you can't make it grown-up size by merely increasing the dimensions

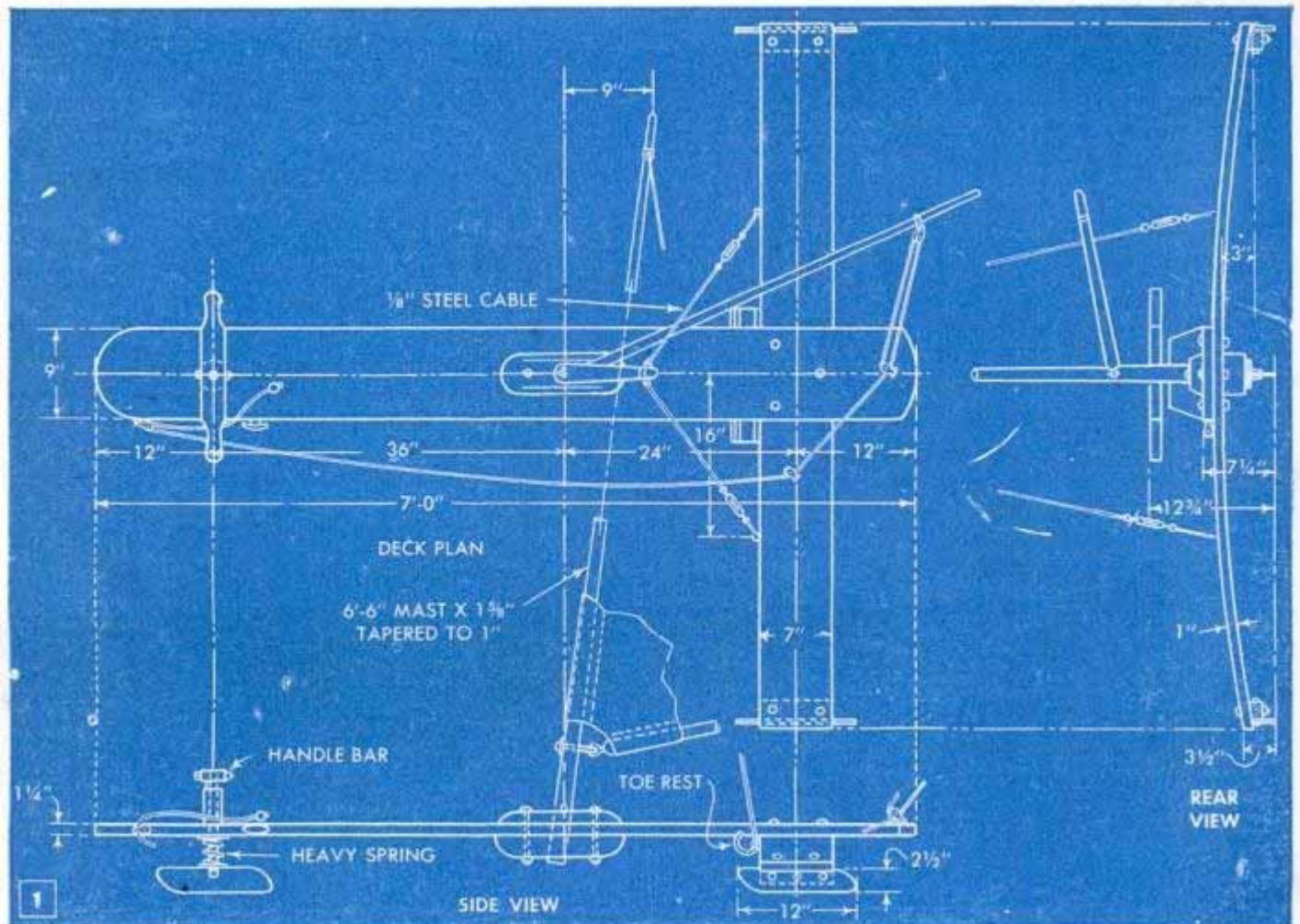


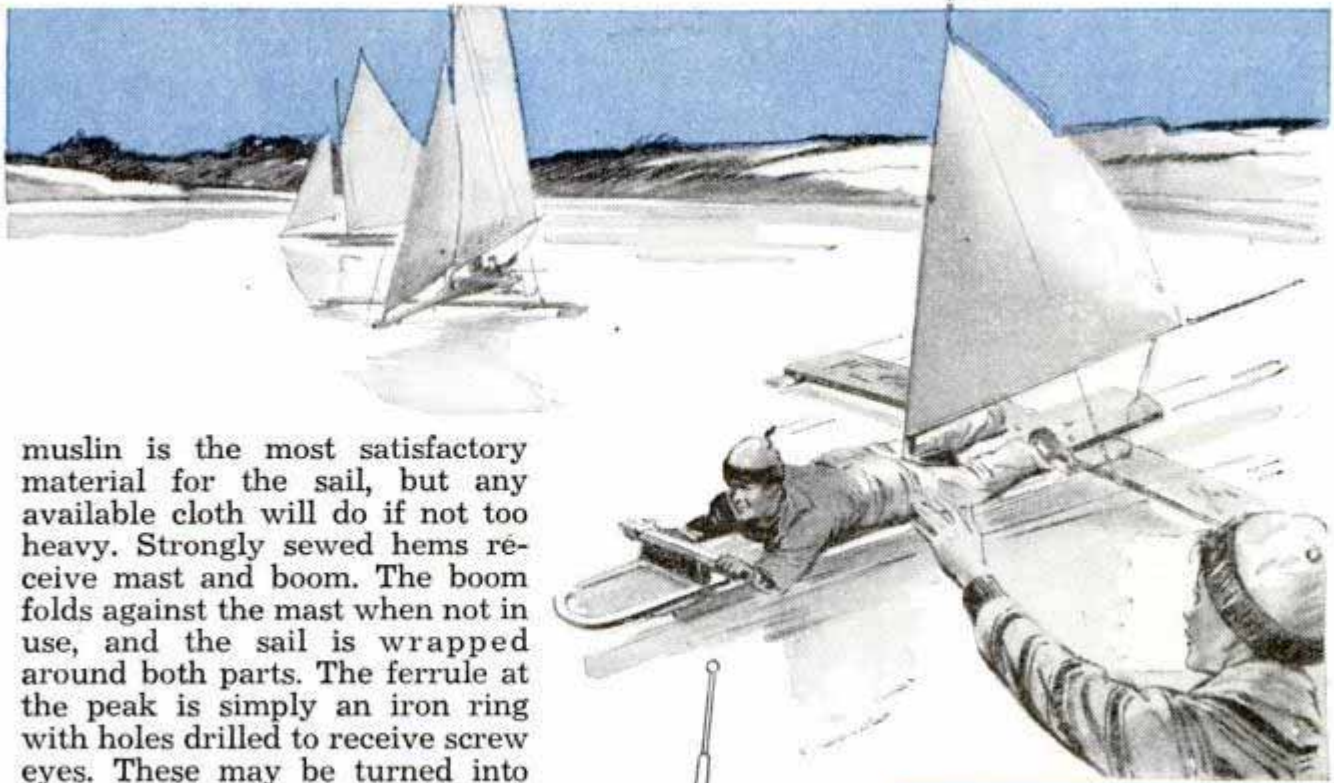
By Hi Sibley

THIS SPEEDY little iceboat has the advantages of unobstructed vision, low center of gravity and spring action to absorb shocks from rough ice. These characteristics make it especially suitable for iceboating on ponds, small lakes and rivers. With the mast unstepped it is compact enough to be carried on top of a car, and light enough to be towed by hand like a sled.

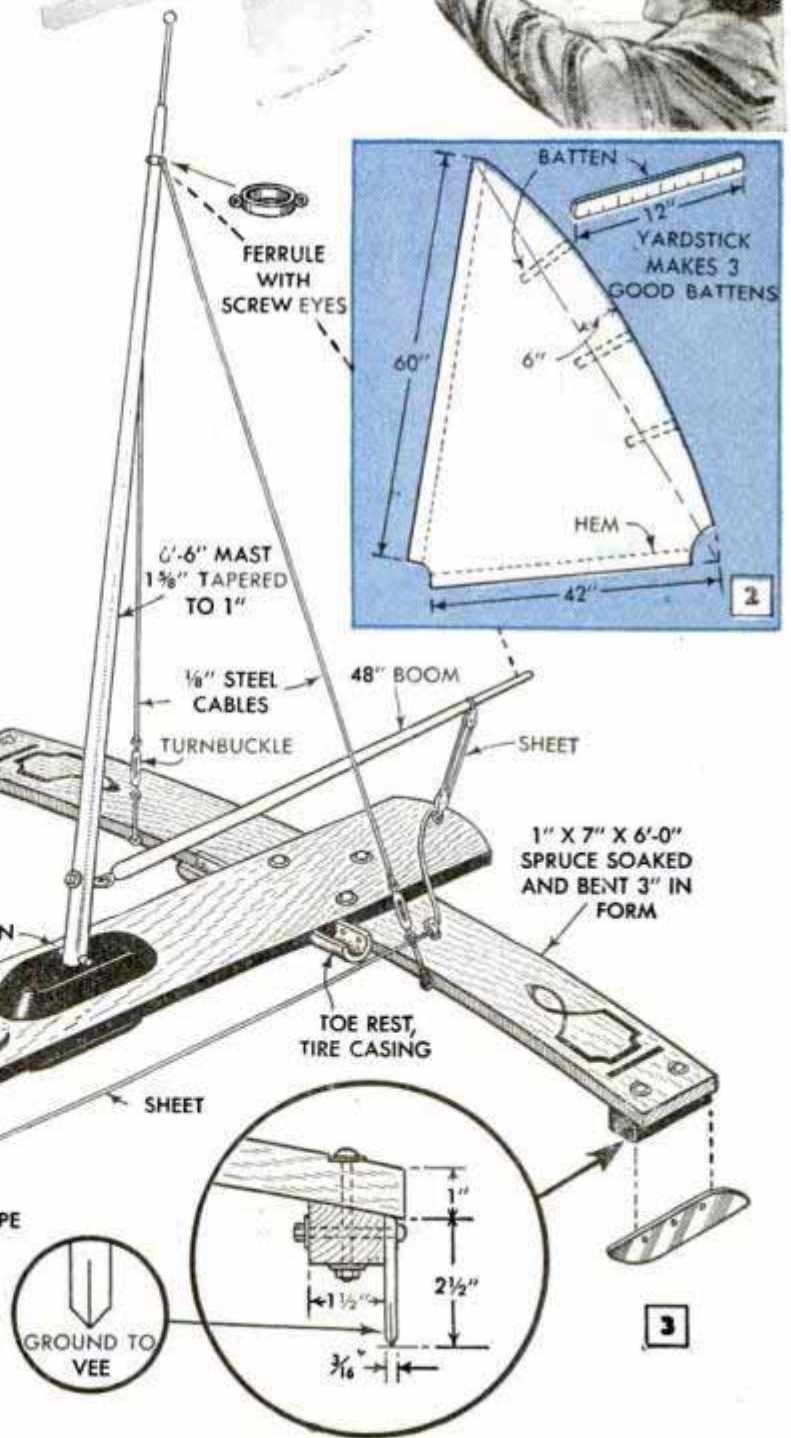
The frame or chassis consists of only two parts, the runner plank and the body plank. The runner plank is bent as shown in Fig. 1, by soaking the piece overnight or steaming it an hour or more and placing in a rough form until it dries and sets. Spruce is the best wood for the runner plank, although selected white pine will do if the former is not available. Figs. 1, 2 and 3 detail the simple construction clearly.

Runners, Figs. 1 and 3, are of steel, ground to a V-shape on the running edge. Forward end of the frame is carried on a coil spring mounted as in the lower left-hand detail in Fig. 3. Upper end of the steering shaft turns in a bushing cut from brass tubing. Rear runners are bolted to hardwood blocks which are attached to the ends of the curved runner plank. The mast, you'll note, is tapered above the step and is held in position when stepped by a transverse pin. Shrouds or stays are made from 1/8-in. steel cable and fitted with turnbuckles. When rigging the craft, draw the stays only moderately tight. This precaution allows the leeward stay to go just slightly slack when in use, which gives better control of the sail and prevents any undue strain on the mast. Unbleached





muslin is the most satisfactory material for the sail, but any available cloth will do if not too heavy. Strongly sewed hems receive mast and boom. The boom folds against the mast when not in use, and the sail is wrapped around both parts. The ferrule at the peak is simply an iron ring with holes drilled to receive screw eyes. These may be turned into the wood, or the ferrule can be drilled and tapped, and threaded eyes turned into the ring only. An eyebolt passing through the mast and a heavy screw eye turned into the end of the boom make the gooseneck. The sheet may be rigged on the right or left side, to suit the skipper. Finish the wood in natural color, using a clear sealer and two coats of spar varnish. Decorations in colored enamels can be added, using the black accents as a pattern.



Electric Shaver Used as Eraser



Typed or written matter is erased quickly and neatly with an eraser which can be attached to the power arm of some models of electric shavers. Cut off a wedge-shaped piece of rubber from the end of an eraser and drill a small hole in it that will be a tight fit over the projecting arm of a shaver from which the cutting head has been removed. When using the eraser, apply pressure lightly and the vibrating power arm will do the work.

Implement Seat for Garden



Comfortable to sit in and easy to move about, this portable garden seat is made from a discarded implement seat. A heavy metal rod serves as the supporting standard for the seat and slips through a metal disk, which serves as a base and prevents the standard from sinking into the ground under the weight of the occupant. Two holes spaced $\frac{3}{8}$ in. apart are drilled through the standard to take large cotter pins on each side of the disk.—W. C. Horst, Denver, Colo.

Hammering Pin on Shade Roller



If it's necessary to shorten a window-shade roller and then replace the pin, don't rest the other end on a floor or table when driving the pin. Instead, place it on an empty thread spool and insert the pin. This way, no damage will result.

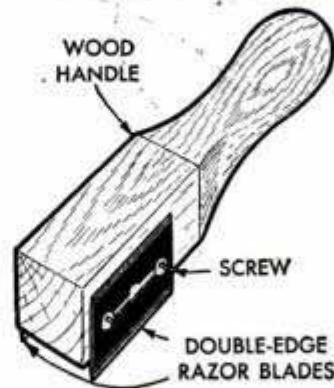
Sleeve Quiets Oarlock Squeak

An old remedy to stop a squeak in an oarlock is to wet it and stop the noise temporarily. Better than this, however, is a

sleeve or tube fashioned of galvanized sheet metal which fits into the oarlock and acts as a bearing. The tube should be lubricated to lessen friction.

D. E. Horn, River Forest, Ill.

Cutting Strips of Leather Evenly



With this handy tool, it's possible to cut strips of paper, leather or similar material to the same width. The handle serves as a spacer block as well as a grip and its width determines the size of the strip. It's not adjustable, of course, but a number of handles can be made to cut any dimensions you require. A double-edge razor blade, which is easy to replace, is fastened to each side of the block with wood screws.

Herbert H. Fey, New Braunfels, Tex.

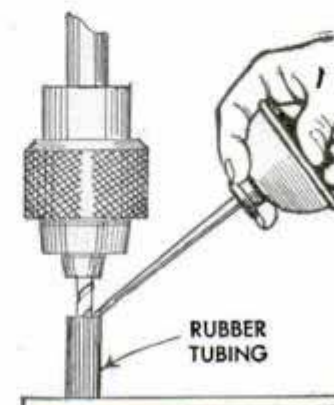
Money Concealed in Pocket Flap



The flap over the side pocket of a suit coat or overcoat is a handy place to keep valuables and currency if a special pocket is sewed inside the lining of the flap. A slit is cut in one end for removal and insertion of articles.

Lubricating High-Speed Drill

Many times the life of a high-speed drill is shortened because it was improperly lubricated. If a length of loose-fitting rubber tubing is placed over the drill when it is being used and oil is applied through the



tubing, the drill will last longer. The lubricant that ordinarily is thrown off the drill by centrifugal force will drain down the inner wall of the tubing and flood the work at the point where it is needed.



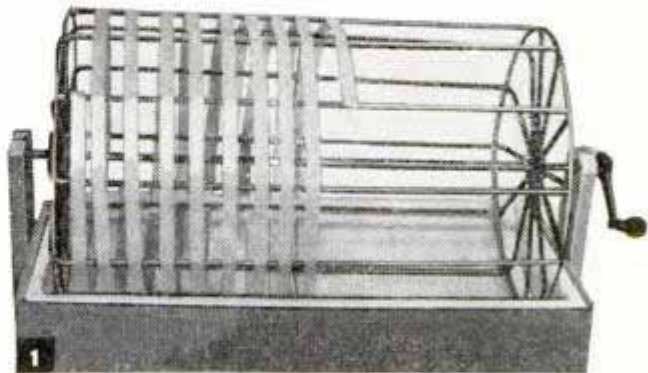
3 SIMPLE REELS for Developing Movie Film

One holds 100 ft. of 16-mm. film, another 50 ft. and a third one 25 ft. All are inexpensive to make from scrap material

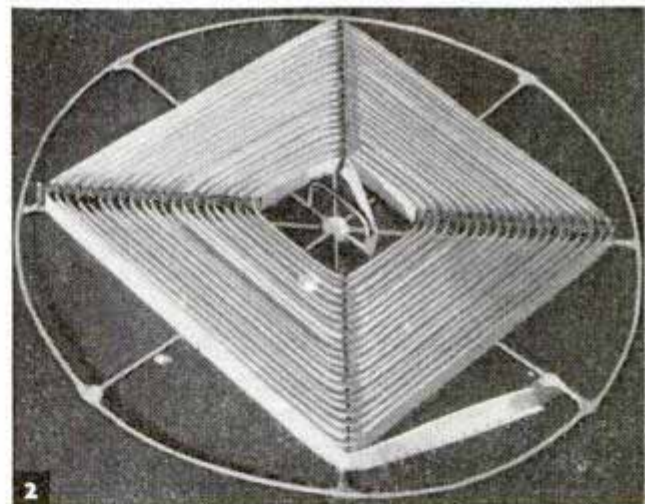
By R. E. Merriman

THERE'S nothing difficult about processing movie film at home with one of these simple developing reels. You merely load the reel, in a darkroom, of course, and run it through the developer solution the same as when processing any black-and-white film. This produces a negative and to change it to a positive you re-expose the film to strong light while it is still on the reel. Then it is run through the developer a second time, after which the film is rinsed, fixed in a hypo bath, washed and finally dried.

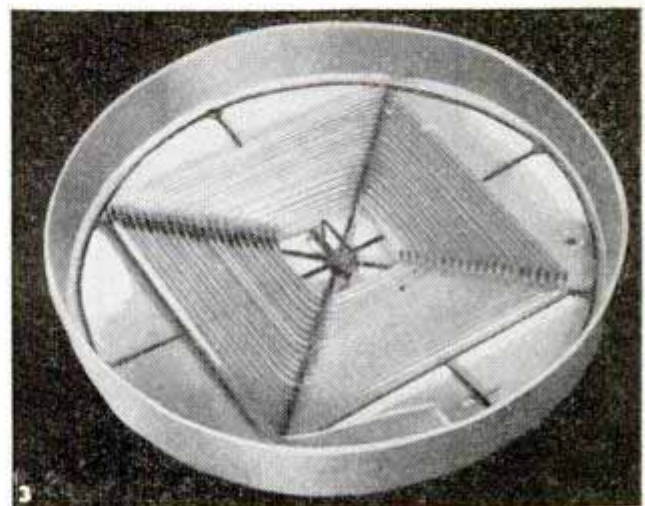
You have a choice of three sizes and styles of reels. One is a drum type which is rotated by a hand crank, the others are flat reels which are used in shallow trays. The drum-type reel shown in Fig. 1 will hold up to 100 ft. of 16-mm. or 50 ft. of 35-mm. film. It measures 14½ in. in dia. and 24 in. long. While the reel pictured was made of ¼-in. brass tubing, it can be constructed of soft-iron rod or heavy-gauge wire. The axle of the reel, which should be about 30 in. long, has two 2-in. metal hubs, one soldered 2 in. from one end and the other about 4 in. to permit attaching a hand crank. Each hub has twelve ¼-in. holes drilled ½-in. deep equidistantly in the edge to receive twelve U-shape spokes. If tubing is used for the spokes, it should be heated at the points of bend to keep it from kinking. It's best to make a bending jig of wood to assure all spokes being uniform in shape and length. When made of tubing, one of the spokes can be assembled to expand outward from the hub to take up any slack in the film resulting from stretching. To make the spoke expandable, first cut a 1-in. section out of it about 1 in. from the hub. Do this at each end of the reel. Then place a light coil spring over a short length of metal rod and insert

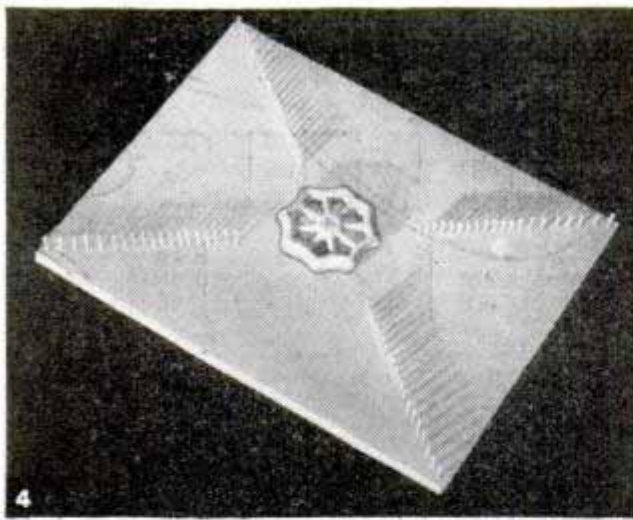


This drum-type reel will handle up to 100 ft. of 16-mm. movie film. While shown partially loaded with the film fairly far apart, ordinarily it is spaced about ⅛ in. apart. You rotate this reel slowly in using it



With the film standing on edge, this flat-type reel will hold 50 ft. of either 16 or 35-mm. movie film. The wire framework is coated with a rubber-base paint and in use it is set in a round tray as below





This flat reel consists of nothing more than a nail-studded board, heavily painted, with a handle in the center

the rod inside the spoke so that the spring will bear against the severed ends. Two $\frac{1}{2}$ -in. projections of tubing are soldered to the spoke at a 90-deg. angle, one on each side of the spring, and these serve to keep the spoke depressed when they are held together with a wire paper clip at the time the film is placed on the reel. After the first development, the paper clips are removed, allowing the spoke to expand and take up any slack in the film.

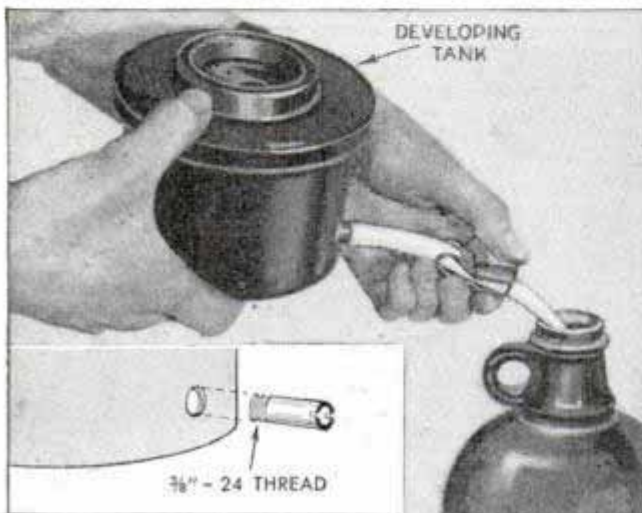
A ring of wire, 11 in. in dia. is soldered to only eleven spokes at each end to complete the drum. Just two trays are actually needed if you plan to develop and fix black-and-white film, such as 35-mm., but for movie film it's best to have four trays so that time is not wasted when changing solutions. These can be formed of light-gauge sheet metal and set in wooden frames as shown in Fig. 1. They should measure 12 in. wide, 25 in. long and 3 in. deep, the bottom being curved to correspond with the shape of the reel. Wood shaft supports should suspend the reel about $1\frac{1}{2}$ in. above the bottom of the tray.

The flat-type reel shown in Figs. 2 and

3 consists of a wheel-shaped framework of $\frac{1}{8}$ -in. wire, 15 in. in dia. Four of its eight spokes have twenty 1-in. lengths of wire soldered upright on them and about $\frac{1}{4}$ in. apart. A wire handle with a sharp barb on it is installed at the center of the reel to which the film can be fastened. This reel will handle 50 ft. of 16 or 35-mm. film. You can use a commercial tray for this reel; a 16-in. one, $2\frac{1}{2}$ in. deep will do.

The most simple reel of the three, which has a capacity of 25 ft., is shown in Figs. 4 and 5. It's made by driving 80 small nails, $\frac{3}{16}$ in. apart and in four groups, into a $\frac{1}{4}$ -in. plywood board measuring $7\frac{3}{4}$ by 10 in. Note that the nails are arranged in a diagonal pattern and that a suitable handle is placed in the center of the reel for removing it from a standard 8 by 10-in. tray. All reels should be given several coats of paint of the type having a rubber base, such as is recommended for painting sidewalls of tires, so that the metal parts will not contaminate the developing solution. Also, in loading the reels, you should remember to keep the emulsion side of the film away from contact with the reel.

"Spigot" in Roll-Film Developing Tank Speeds Draining of Liquid

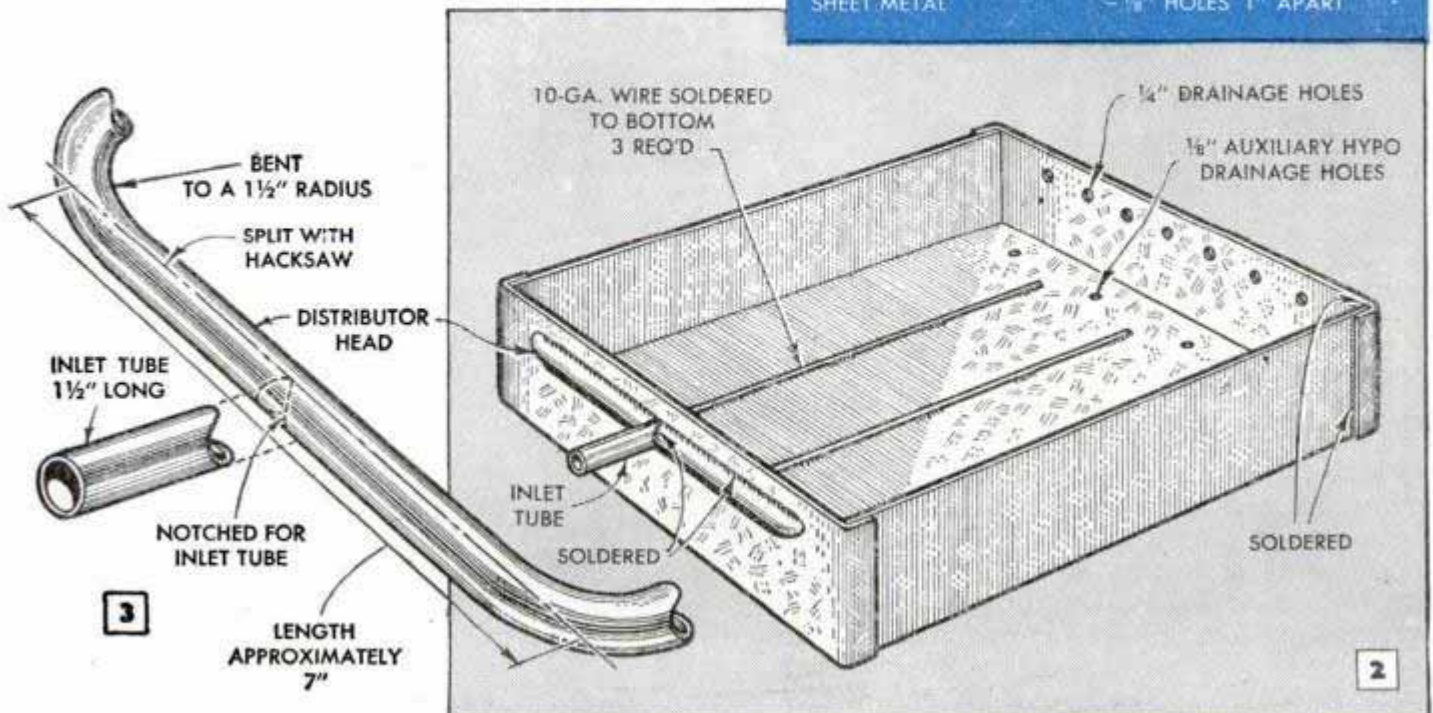
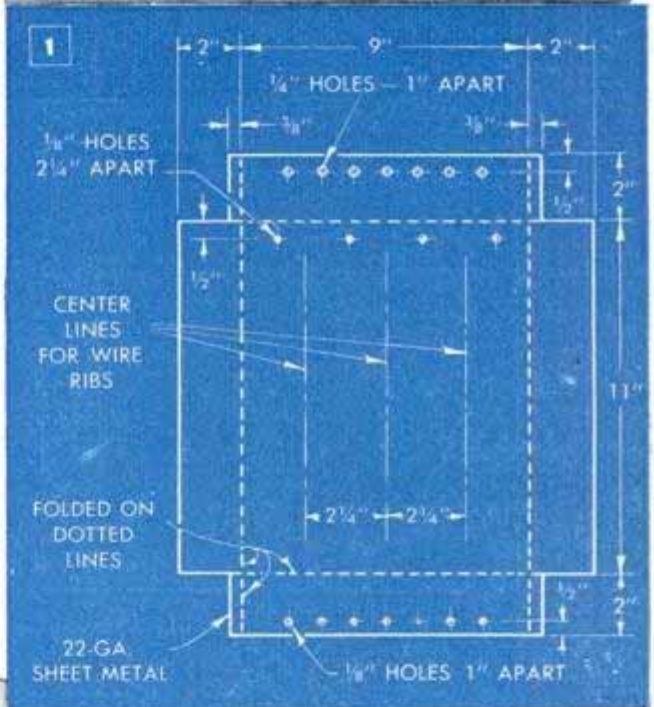


Pouring developing liquid from a roll-film tank into a narrow-neck bottle can be done faster and without a funnel if you install a small drain hose with a shutoff clamp near the bottom of the tank as shown. First, a hole is drilled carefully in the tank and then threaded with a $\frac{3}{8}$ -24 tap to take a 1-in. length of thick-wall, brass or plastic tubing. A cross slot in the end of the tube permits it to be turned into place with a screwdriver, after which sealing wax is used around the joint to make it leakproof. Besides speeding the draining of developing liquids, the outlet also improves the efficiency of the tank for washing film.—Richard Hanscom, Elmhurst, Ill.

CONSTANT-FLOW PRINT WASHER

By Darrel Ward

Photo prints are washed thoroughly in a measured, continuous flow of clean water if this tank is used. As detailed in Figs. 1, 2 and 3, it is nothing more than a tray fabricated from 22-ga. galvanized sheet metal and fitted with an inlet tube soldered to a distributor head. Fig. 1 gives the size and indicates the shape of the sheet-metal cutout for the tray. Drill all holes shown in Fig. 1 and before you bend to shape, score on the dotted lines with a steel scriber. This aids in making a neat, square bend in the metal. One way of soldering the tray corners is to flux and tin the flaps before bending the cutout to shape. Clamp the flaps firmly in place and heat the metal at the corners with a small torch. Withdraw the flame as soon as the solder melts and flows. Solder three 10-ga. wires to the bottom of the tray to prevent prints from sticking. Make up the inlet tube as in Fig. 3 and solder it to the tray, centering it over the row of $\frac{1}{8}$ -in. holes drilled in the end. Smooth all joints and remove burrs from the holes with a file. Paint the tray with two coats of rubber or plastic-base paint. Cover the inlet-spray holes with cellulose tape and fill the tube with the paint. Pour out the excess and allow the whole thing to dry thoroughly before using. In use, adjust flow of water so the outlet holes discharge at full capacity, but see that the tank does not overflow. Wash single-weight prints 15 to 20 minutes; double-weight 35 to 40 minutes.



Pad Serves as Built-in "Lens Cap" On Folding Camera



The lens of a folding camera is protected from dust when camera is closed if felt is cemented to the inside of the folding cover, as shown in the detail. Enough thicknesses must be built up so the felt will press against the lens frame when the camera is closed. One advantage of this cover is that it can't be misplaced, as can the conventional kind.

Protective Cover Fits Flash Gun



As protection against the possibility of a shattered flash bulb causing injury when taking close-ups of people, one photographer covers the reflector of his flash gun with a plastic dish cover. The cover should be as nearly transparent as

possible. Although there is a loss of density in the light, additional diffusion is obtained.—R. E. Hedges, Los Angeles, Calif.

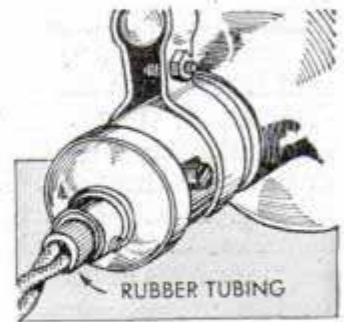
Determining Number of Exposures

When using roll-film cameras of some types, it's often confusing to know whether or not the number that shows in the window is for a portion of the film that has been exposed. To avoid double exposure or unexposed film, the following method has been used: After a picture has been taken, turn to the dots that are just ahead of the

next number. Then when you are ready to snap a picture, turn to the number, take the picture and wind the film on to the next group of dots that shows. This eliminates any uncertainty as to whether a picture has been taken.

Safe Connection for Photoflood

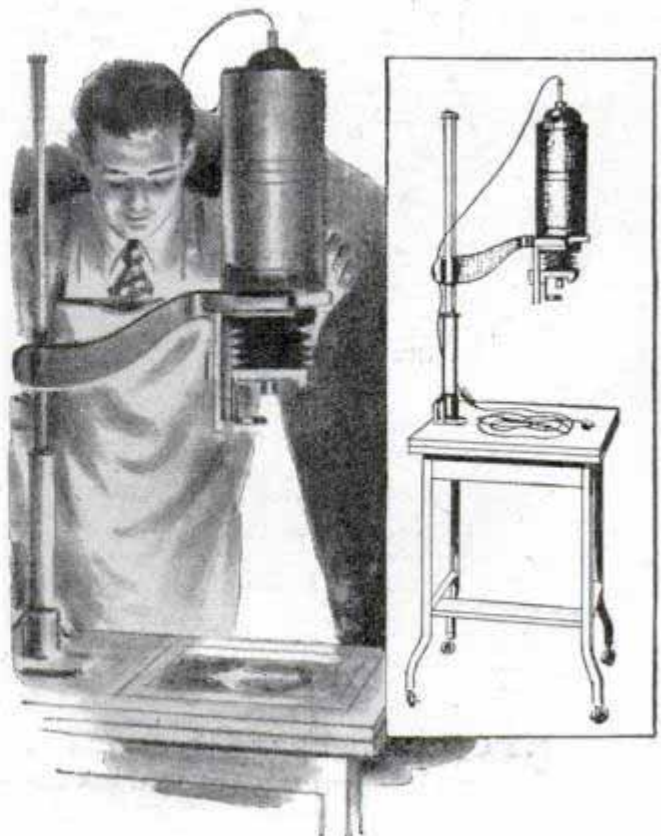
Friction on an electric cord at the point where it enters the socket may wear off the insulation and cause a short circuit. This is true of photoflood sockets because they are subject to hard usage. As an added precaution, slip a short piece of rubber tubing over the wire to act as a buffer between the cord and metal socket.



H. Klein, Pittsburgh, Pa.

Typewriter Stand Holds Enlarger In Small Apartment

If space in a small apartment or home is at a premium, a typewriter stand is just about the right size to support a small enlarger. Then when not in use, it can be stored in a closet. When working, always be sure that the stand is steady or fuzzy enlargements will result. To keep the easel from slipping on the stand, drive rubber-covered tacks into the underside at the corners.—Bob Hurst, Chicago.



CRAFT QUIZ



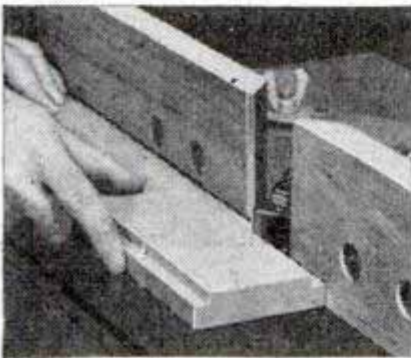
1. He is using a—
 (a) Center rest (c) Boring bar
 (b) Slide rest (d) Thread stop



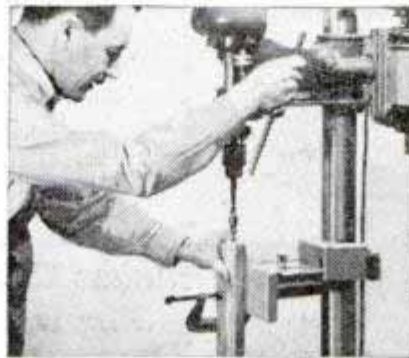
2. One cement for plastics is—
 (a) Lithopone (c) Vinyl trichloride
 (b) Glycerin (d) Methylene blue



3. This popular finish is usually—
 (a) Air-dried (c) Undercoated
 (b) Brushed (d) Baked



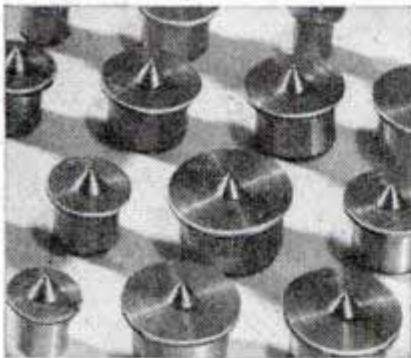
4. What's wrong?
 (a) Cutter on top (c) Feed direction
 (b) Hands (d) Order of cuts



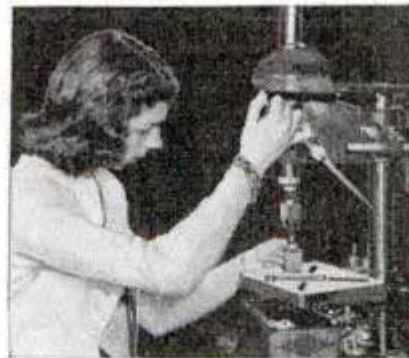
5. Best drill for end grain is—
 (a) Flat cut (c) Single spur
 (b) Solid center (d) Multi-spur



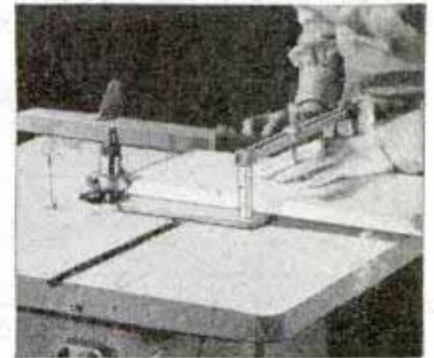
6. This clamp is used by a—
 (a) Carpenter (c) Modelmaker
 (b) Plumber (d) Welder



7. What's this?
 (a) Booby trap (c) Moms
 (b) Lathe centers (d) Pops



8. Drill operator has—
 (a) Upsweep hairdo (c) Easy job
 (b) Too much jewelry (d) Blue eyes

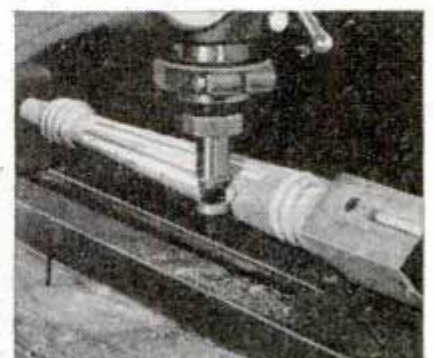


9. Mill men call this shaper a—
 (a) Peeler (c) Hogger
 (b) Slicer (d) Sticker

ANSWERS: 1-b; 2-c; 3-d (some types also air-dry); 4-a (cutting on underside is preferable); 5-a (no spurs); 6-d (screw is shielded); 7-d (dowel pops or centers); 8-b (a hazard in all tool operation); 9-d; 10-c (job is gem polishing); 11-d

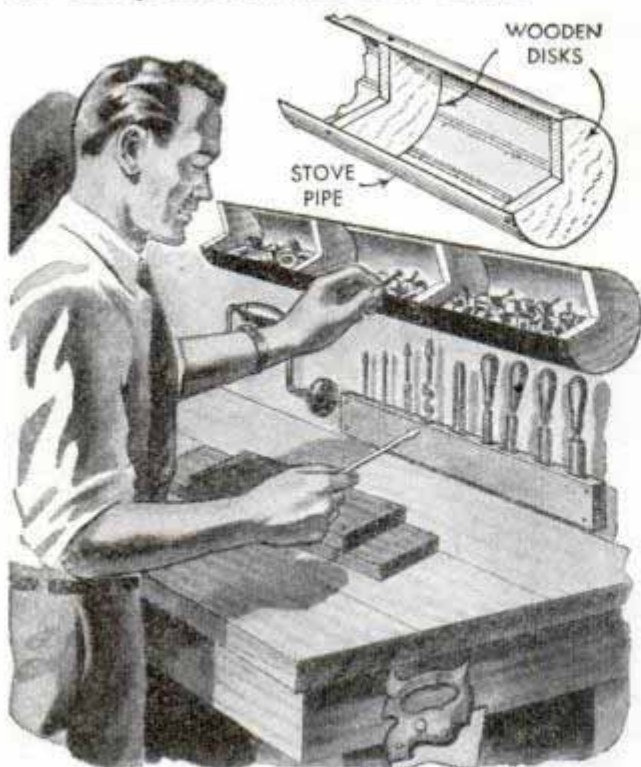


10. This worker knows his—
 (a) Dowels (c) Agates
 (b) Marbles (d) Slide rule



11. This job is—
 (a) Beading (c) Doweling
 (b) Reeding (d) Fluting

Altered Stovepipe Serves as Rack To Keep Miscellaneous Parts



By cutting out a quarter section from a length of stovepipe and then dividing the pipe into compartments with wooden disks, a convenient rack for miscellaneous parts and supplies can be made. The rack is fastened to the wall above the workbench. Use wood 1 in. thick for the dividers as these will make the relatively thin metal of the pipe more rigid.

Depth Gauge on Garden Trowel



If marks are filed in one edge of a garden trowel to indicate depth in inches, planting seeds will be much simpler when using this gauge. After making the marks, check their location by holding the trowel in an upright position against a ruler.

Because of the curvature at the end of the tool, the marks will have to be farther apart than where the edge is straight.

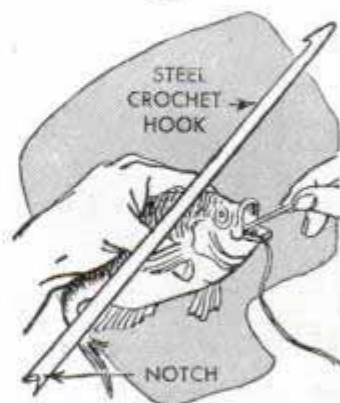
"Lifting" Chipped Fingernail Polish

Often fingernail polish is used instead of other finishes to decorate bric-a-brac and other small objects. At times the polish becomes chipped and it is desirable to remove it and refinish the object. In some

cases this may be done by covering the polish with cellulose tape, smoothing it and then lifting off the tape and polish. This will not work on all surfaces, however, and it's best to do a little experimenting and try a small area first.

Handy Tool When Fishing

To have a multi-purpose "tool" in your fishing-tackle box, take a short steel crochet hook and file a V-shaped notch in the handle end. The notch is used as a hook disgorging and the other end of the tool is used to clear a fishline of snarls and backlashes. As a safety precaution, keep the hook in a fingernail-file case when carrying it in the tackle box.



Leaf Guard for Broom-Rake Teeth Makes Cleaning Easier

When raking leaves with a broom rake, it is often necessary to stop frequently and clean the teeth. This nuisance is overcome and the work speeded if a rubber guard is slipped over the teeth. It is cut from a rubber inner tube and the holes are spaced so they will neither spread nor pull the teeth together.

Edward H. Stutz, Cleveland, Ohio.





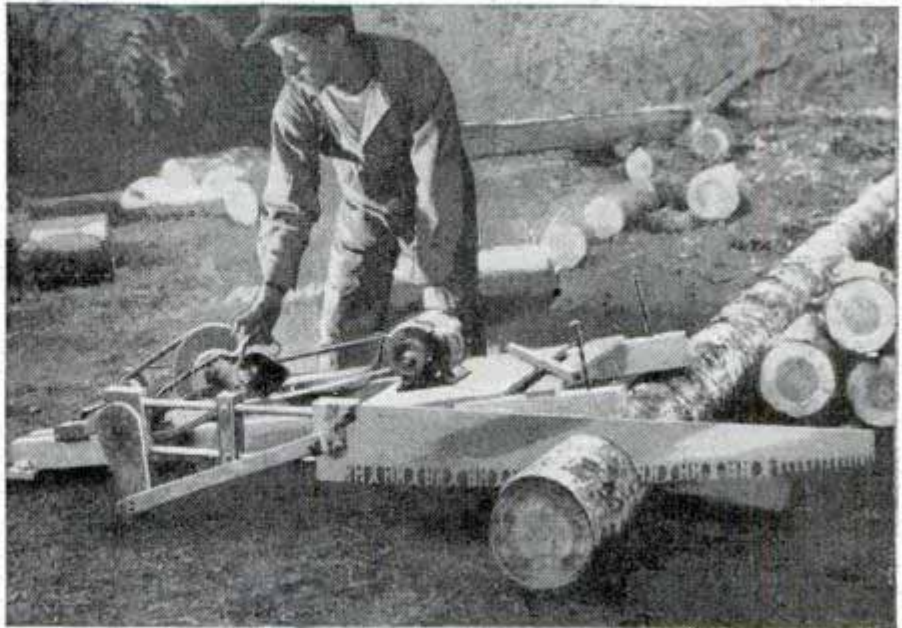
Shop Notes



POWER DRAG SAW

A small electric motor drives blade 100 strokes per minute, cutting logs up to 24 in. in diameter

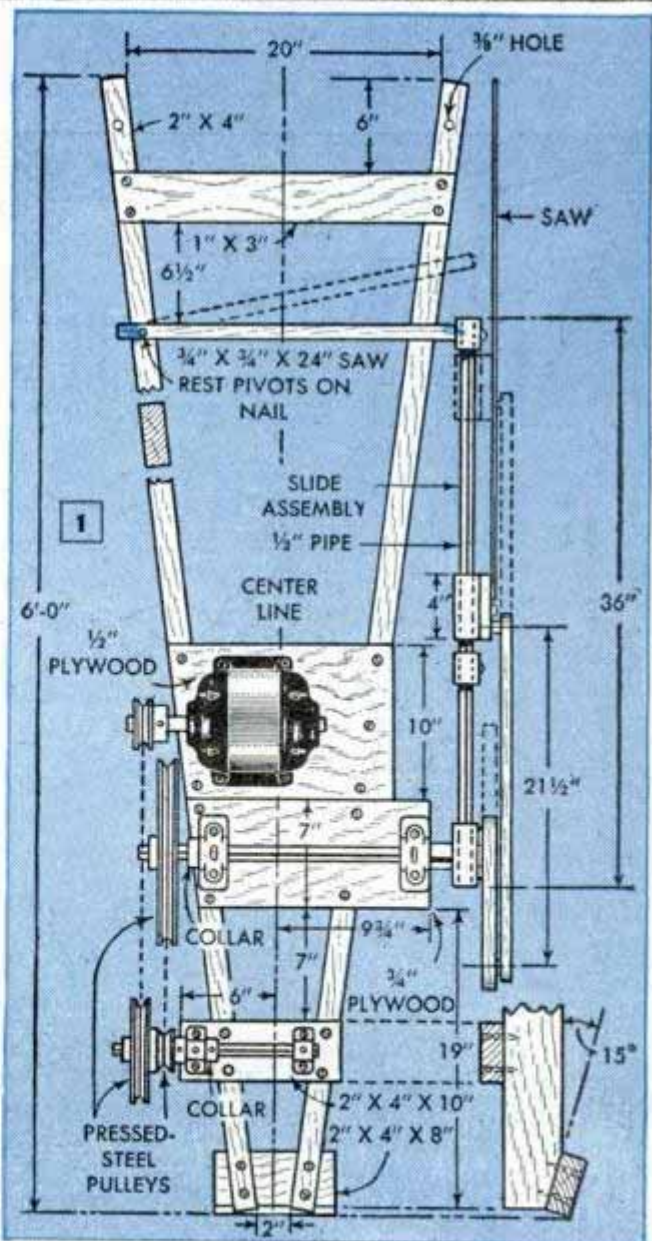
By Edward R. Lucas



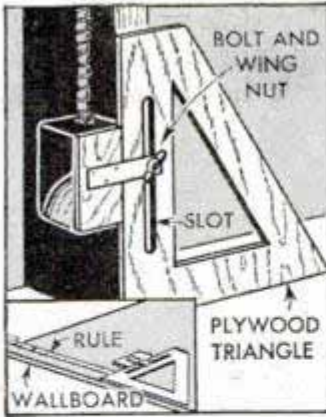
BUCKING LOGS and large limbs into cordwood or stovewood lengths by any hand method is a hard, time-wasting job no modern farmer or woodsman likes to think about. A power drag saw like the one pictured will do this work in less than half the time, and the only labor involved is moving the unit from one cut to the next.

The simple A-frame, Figs. 1 and 4, is made of 2 by 4-in. pine. Also, the base for the jackshaft and the foot at the narrow end of the frame are of the same material. Lower ends of the long frame members are cut at an angle of 15 deg. so that when attached, the foot will rest squarely on the ground. Both the crankshaft and jackshaft run in ordinary pillow-block bearings, and the shafts are held in position with collars. Construction of the pitman-drive assembly is detailed in Figs. 3 and 5, and side and top views are supplemented by sectional details A-A, B-B and C-C, which show the inner construction at various points. The crosshead carriage must be of the floating type to allow the saw blade free movement up and down. Crosshead guides are cut from 1/2-in. black pipe, this grade being used because it is easier to polish than galvanized pipe. Polishing is done by clamping the length of pipe in a vise—being careful not to crush it out of round—and first cutting off the paint and surface irregularities with a coarse abrasive cloth. Loop a strip of the cloth over the pipe and pull it back and forth. Polish in the same manner with a fine-grit abrasive strip 1 in. wide. Light oil makes abrasive cut cleaner.

Make the pivot block, section C-C, of



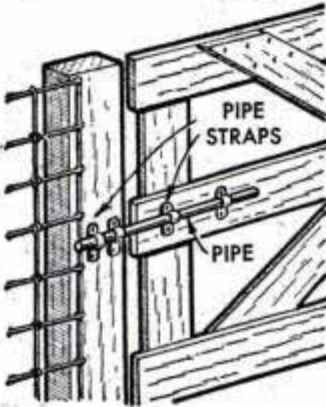
Gauge Marks Electrical Outlets



When installing wallboard, locating the areas to be cut for electrical outlets is always a problem. However, with this gauge, the task is simplified. Cut from plywood a template the same shape and size as the front of the outlet and fasten

it to a wooden triangle so that it can be adjusted vertically by means of a bolt and wing nut riding in a slot. Then, using a rule and the triangle, locate the outlet in relation to the studding and transfer these measurements to the wallboard and cut the hole for the outlet.

Pipe and Straps Make Gate Latch



With a length of iron pipe and a few pipe straps, you can make a gate latch that will be satisfactory for most purposes. Two straps are nailed to the fence post and two more are fastened to the gate. Make the pipe a fairly loose fit in the

straps. A stop welded to the pipe between the straps on the gate will prevent it from being pulled out accidentally.

Lantern Fount Packed With Cotton Reduces Fire Hazard



As a guard against barn and stable fires caused by kerosene spilled from overturned lanterns, one farmer packs the founts with absorbent cotton. The cotton absorbs the fuel so that it cannot spill and flow over the

floor or other flammable surfaces, but does not impair the flow of kerosene to the wick. When filling the lantern, use only an amount of fuel that the cotton can absorb.

Jack Bronte, Colfax, Calif.



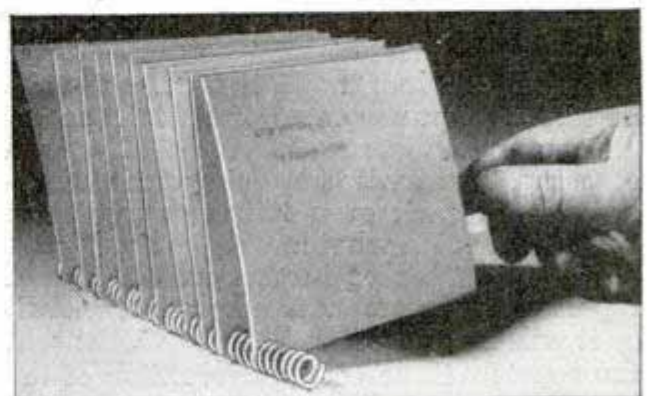
WALNUTS
ALMONDS

Approximate Weights on Scoop Speed Measuring

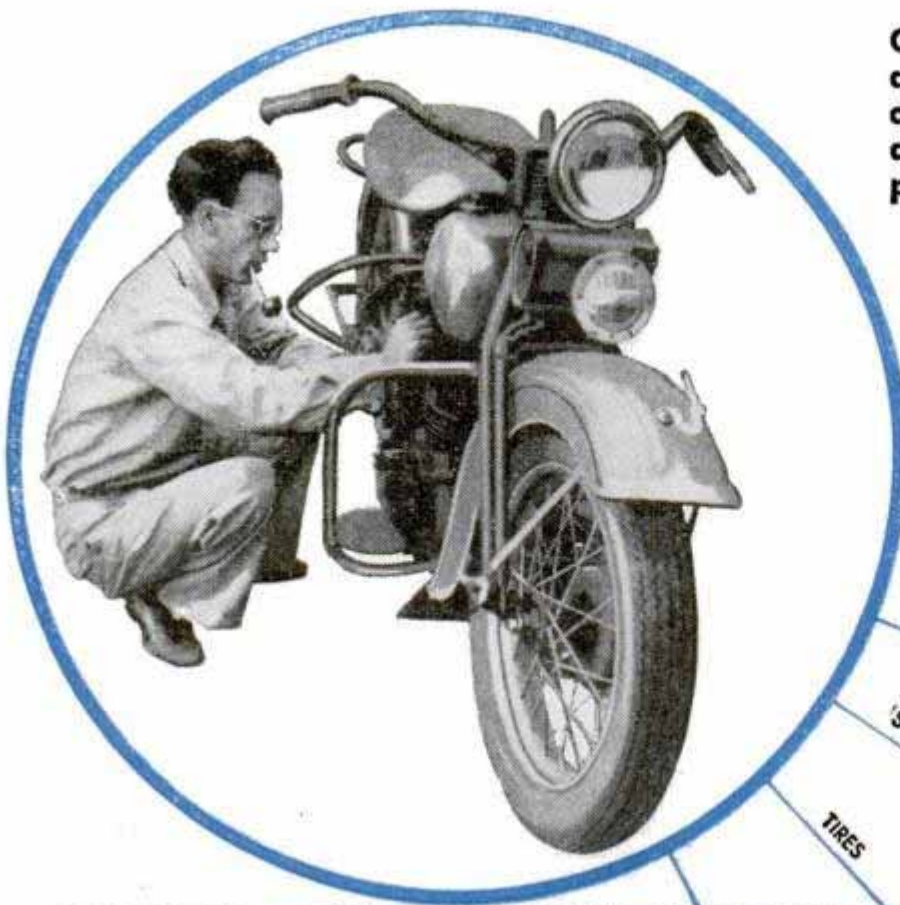
By drawing lines on a scoop to indicate the approximate volume of a pound of walnuts, almonds and other foodstuffs, one grocer found that he could save considerable time when measuring out these items. The lines were put on with paint, a different color being used for each product. Although this method is not exact, it is close enough to make it well worth-while.

Sorted File Cards Racked in Spring

You'll do a quicker job of sorting file cards if a coil spring is tacked to the desk to hold the cards upright and in the proper order. The spring should be stretched to separate the coils and allow space for the thickness of the cards. Screen-door springs have about the proper tension and length to make these "racks."



Getting your money's worth in a used motorcycle is a matter of accurately determining the amount of wear on the vital parts. Here's how you do it



AGE

ALIGNMENT

STRUCTURAL DEFECTS

WHEEL BEARINGS

STEERING-HEAD BEARING

TIRES

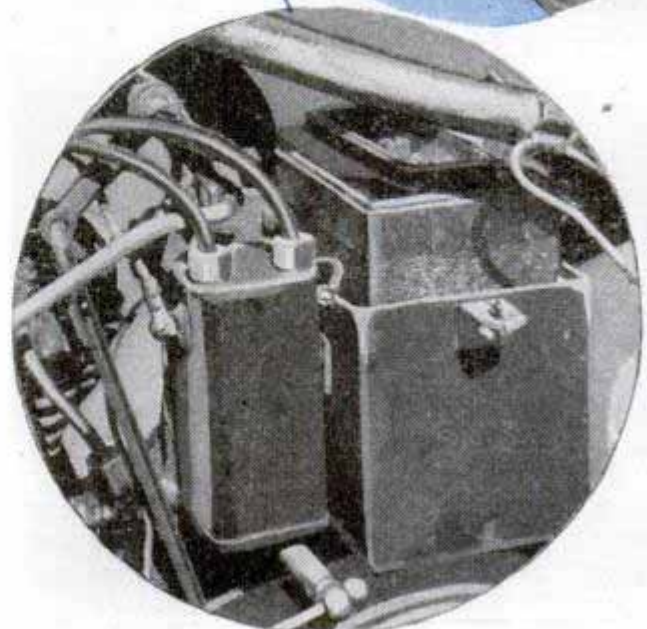
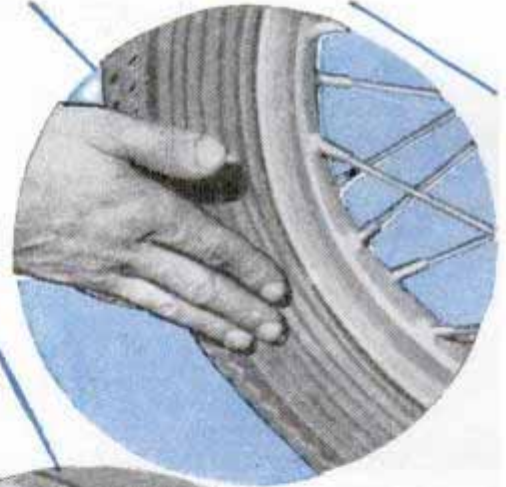
HINTS ON BUYING USED MOTORCYCLES

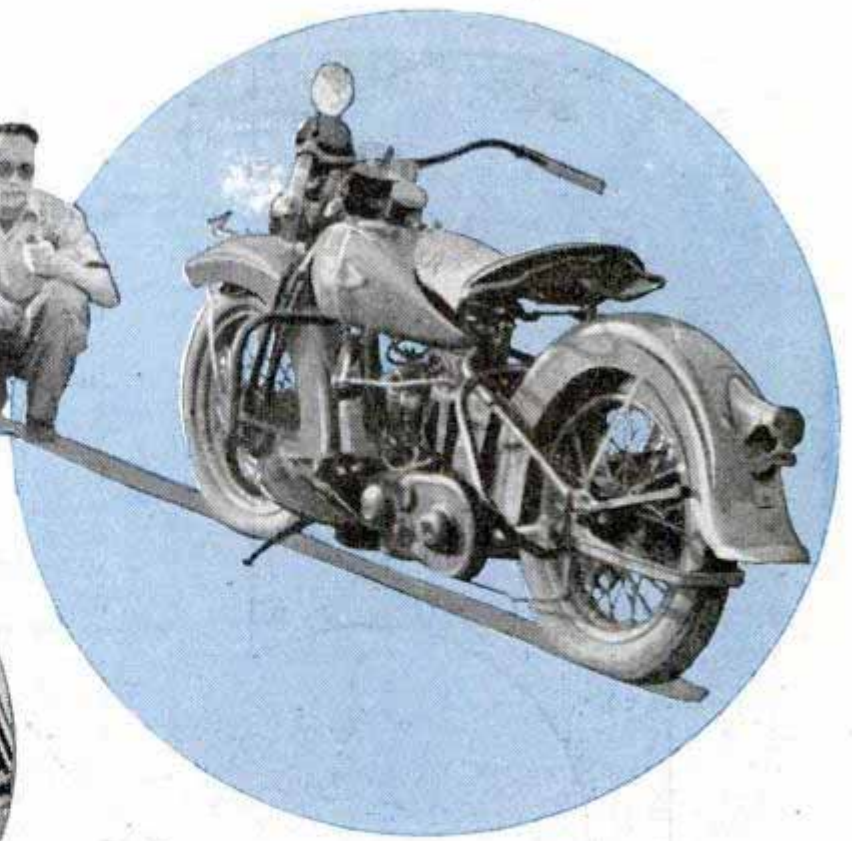
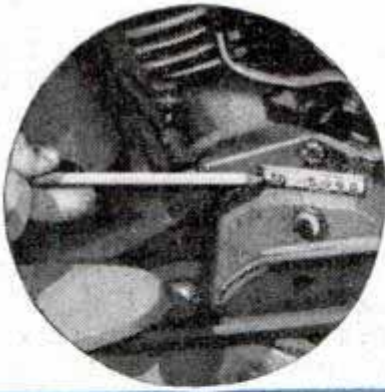
By Manley Mills

BEFORE BUYING a used motorcycle you should make a thorough appraisal of its mechanical condition, and have in mind a clear idea of what type of machine you want, the service and performance you'll expect of it, and the kind of work in which it will be used. For short trips, a lightweight machine has several advantages—less fuel is required, less wear on tires, etc. Also a good rider on a lightweight job can keep going under soft-road conditions where a heavier machine would become unmanageable. There isn't a very wide choice of motorcycles in the lightweight class, only two or three of American manufacture. This excepts the motor bikes and scooters which are not true motorcycles. If the greater part of your riding will include long, overland trips at fast cruising speeds, or other heavy-duty work requiring high performance, it is best to choose one of the heavier types. The heavy job is less tiring on long trips, it holds the road better, and is much steadier at high speeds.

Some wear is inevitable on any used machine. The trick is to determine whether or not a part or unit is actually worn beyond repair, whether adjustment will make it capable of further service, or, if repair or replacement is necessary, whether it will be expensive. If it is evident that the repair will be costly, evaluation of the

BATTERY

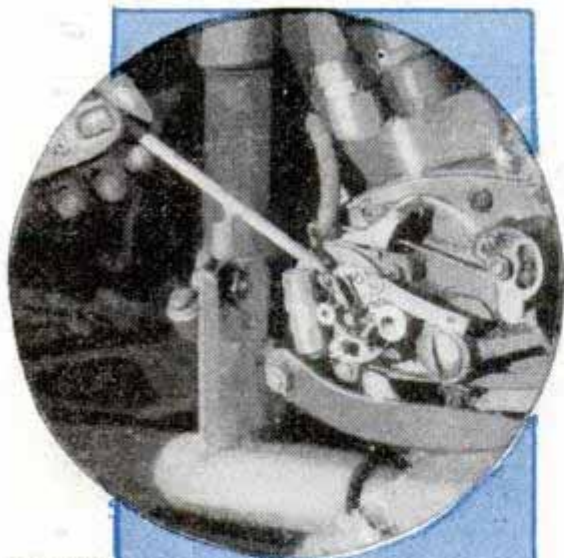




machine should be lowered accordingly. First, learn what year the motorcycle was built. On most well-known makes the first two numerals of the engine number indicate the year, or age of the machine. You'll find the engine number somewhere on the crankcase as in one of the photos. Next, before you get into other details, check the machine as a whole for general appearance and frame alignment. The best way to check frame and fork alignment is to sight from various angles and let your eye be the judge. You can spot anything seriously out of line. Note if the paint job is well preserved, or merely shined up. Using the handle of a screwdriver, or something that won't scratch the finish, lightly tap the fuel tank, while empty, at various points. A dull sound will indicate where the tank has been heavily leaded to fill a dent. This, as well as dented or split fenders and battered boltheads, may mean that the machine has been in a bad spill, which might have sprung the frame or caused other structural defects. Distortions of this kind may seriously affect stability.

Take firm hold of the front fork members with one hand and rock the front wheel from side to side with the other hand. There's no need for alarm if a bit of side-play is evident, because a barely discernible amount is the best assurance that

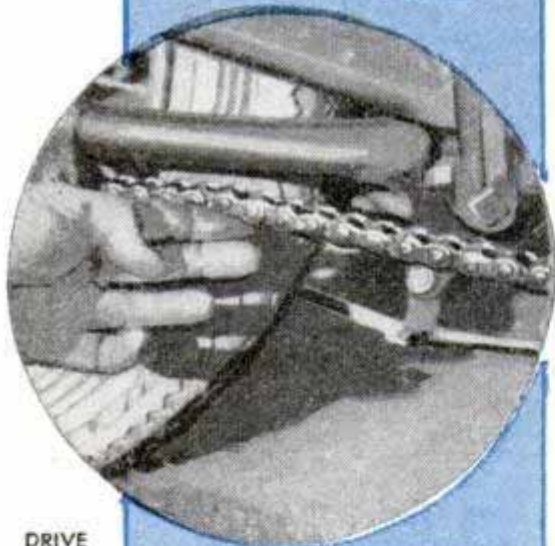




IGNITION



FUEL SYSTEM



DRIVE CHAINS



COMPRESSION

the bearings are free. Excess play can be taken up, but too tight an adjustment will quickly cut out the bearings. Wheels should spin freely and silently. Clicking, or any other undue noise, often means a damaged bearing. Get astride the machine and pull up strongly on the handle bars, or apply the front brake and push forward. If the steering-head bearings need taking up, it will be indicated by this test. Swing the handle bars from side to side. They should be free, but not too loose, through the whole range of movement. Inspect the tires, giving particular attention to the side walls, for breaks or other signs of damage. Also, see whether the rims are dented or warped, and look for bent, loose or missing spokes in the wheels.

If the spark plugs are fairly clean and the porcelain not badly discolored, you may consider them okay. Inspect the high-tension wires for breaks, and the insulation for cracks, burns or frayed spots. Notice whether or not the battery is anchored securely in place. Inspect the ignition system and check the breaker points to see if they are burned or pitted. The fuel system is quite simple to check, since any leaks around the joints or tank seams would be visible at once. On the fuel line itself, look for pinched or dented places that might develop cracks from vibration. Check drive chains and sprockets for wear. The teeth on a badly worn sprocket are not uniform in size or contour, but have a hooked shape something like a comma. The final drive chain should not be so loose that it can be pulled well away from the sprocket. About 1 in. of slack at a point midway between the sprockets is correct. The primary drive chains from engine to transmission should have no more than $\frac{1}{2}$ in. of slack at the midway point. And don't forget to inspect the chains themselves for cracked or broken rollers and badly-worn joints. A bad chain will quickly ruin the sprockets. Try all controls for free movement and positive operation through the entire range and see if the control cables are frayed or sticking in the guides.

With clutch engaged, and the transmission in neutral, test the compression with the kick starter. This is an important test. If the compression is good and if the clutch holds properly, a twin-cylinder engine will support a heavy person on the starter pedal for 4 or 5 seconds before it lets go. If the compression passes this test, throw your full weight on the starter and note any tendency of the clutch to slip. The clutch should be free from drag when disengaged. If the starter pedal shows any tendency to jam, examine the teeth in the segment. Usually the first two or three teeth will be worn badly or chipped. This

often calls for replacement, but sometimes you can remedy the fault by grinding.

Finally, road-test the machine. After starting the engine, look for blue smoke in the exhaust. If it's absent, you can be reasonably sure that the cylinders, pistons and rings are still in good condition. Don't expect the engine to be as quiet as a new one. There may be a few harmless rattles and clicks, caused by worn valve tappets, chains, etc. Defects in the engine that spell eventual serious trouble are the metallic hammering of loose connecting rods, the rattle of worn wrist pins, or the thud of a main-bearing knock. A connecting-rod knock diminishes or disappears under load and becomes louder on a rapidly closing throttle. A loose main bearing is at its worst under load. Shaky valves and loose wrist pins are audible at all engine speeds but the noise usually increases at higher engine speeds.

Grinding of the gears, especially when going into low, unless it's due to poor shifting technique, may be caused by a dragging clutch. In most cases, clutch drag can be remedied by adjustment, but if this fails, the trouble is likely due to a bent shaft or buckled plates. Apply the brakes gently while running at moderate speed. If the transmission jumps out of gear, and the trouble isn't due to faulty adjustment of the linkage from shift lever to gear box, it means that the transmission gears are worn badly. Test the engine for acceleration and smooth running. If it falters and shows poor response to the throttle on a level road, the fuel mixture may be too weak, or the plug and breaker points need cleaning and adjusting. On a hard pull in high gear, lack of pep is often caused by insufficient valve-tappet clearance which can be corrected easily. Sticking, warped, or burned valves, or badly worn pistons and rings call for more expensive repairs.

Don't forget to try the brakes for smooth stopping within a safe distance. If there is grease or oil on the linings, no slowing effect will be apparent when brakes are first applied, then they may grab suddenly and cause a skid. Chattering noises often are due to loose rivets in the linings. However, as a rule, brake repairs are the least expensive of any.

How to Solder Small Copper Tubing

Soldering copper tubing end to end is difficult as it is hard to keep the ends aligned while doing the job. Here's how you can do this easily: The two lengths of tubing are slipped over a wire that is a snug fit and this holds them in position for soldering. After the work is completed, the wire is removed.

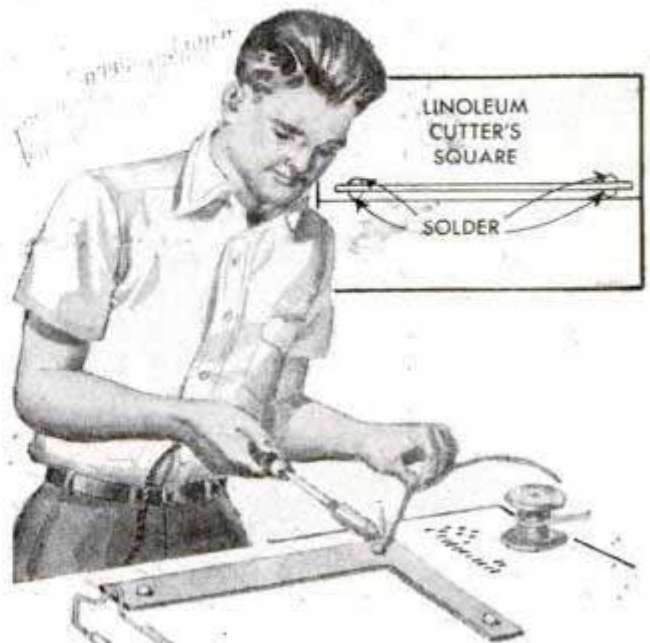
Window-Shade "Blackboard" Aids Stock Clerk



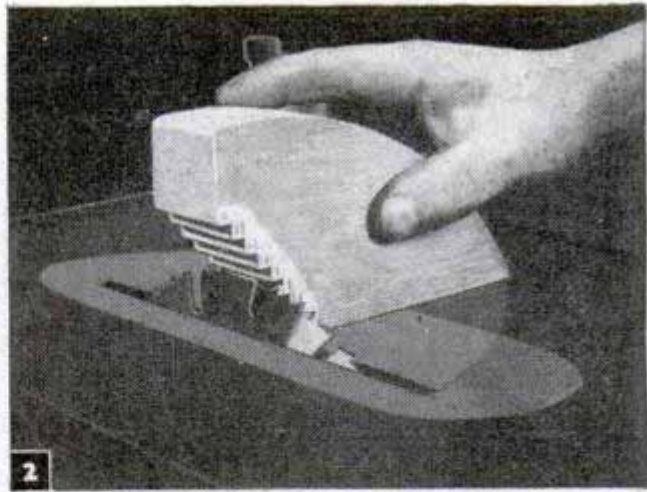
To help him remember daily price changes when marking canned goods and other commodities, a stock-room clerk attached a window shade to his push truck on which he could list, with chalk, the current price of each item.

Small Dots of Solder on Square Make It Easy to Pick Up

Because his square was difficult to pick up when lying on the floor, one linoleum fitter put small dots of solder at the corner and ends. The solder is applied to both sides. This keeps the square from being in actual contact with the floor.

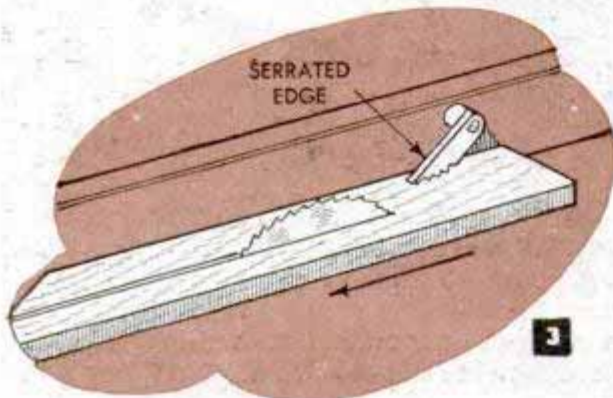


X507



POWER-TOOL

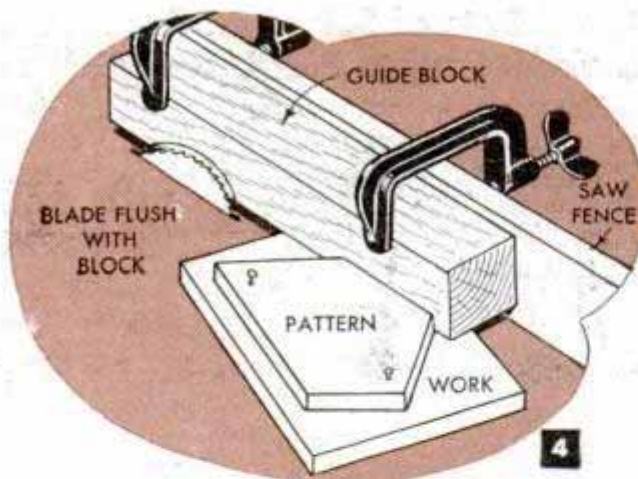
Part I



1—When making duplicate angle cuts keep the miter gauge set at 90 deg. and use angle blocks to guide the stock. This saves much time in production work, especially where the angles vary from lot to lot

2—It's easy to get the correct depth of cut when you have a stepped depth gauge. Each step is simply a rabbet cut in the sloping face of a hardwood block

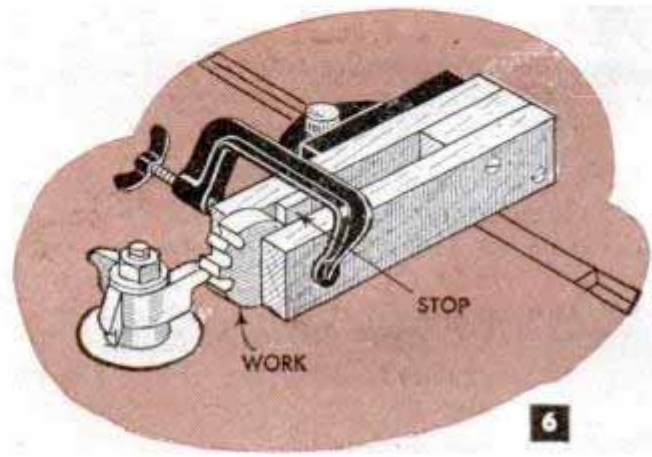
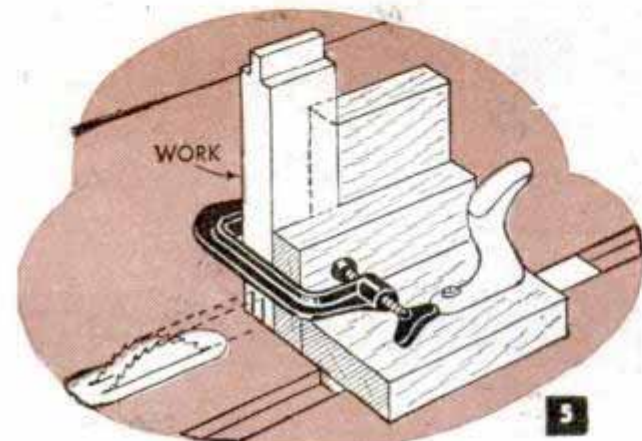
3—If you are making a number of duplicate ripping cuts in thin stock it's a good idea to fit an anti-kick-back pawl on the rip fence. File a serrated edge on a length of $\frac{1}{8}$ x $\frac{1}{2}$ -in. flat iron and bolt to the fence with a spacer between. Pawl should be free to rise as the end of the work passes underneath it

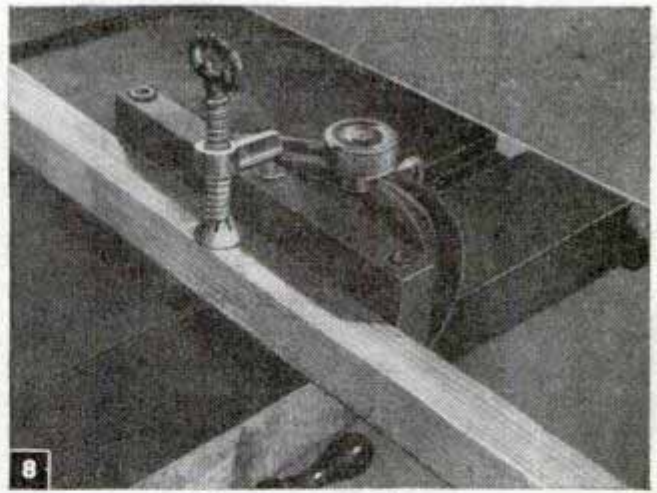
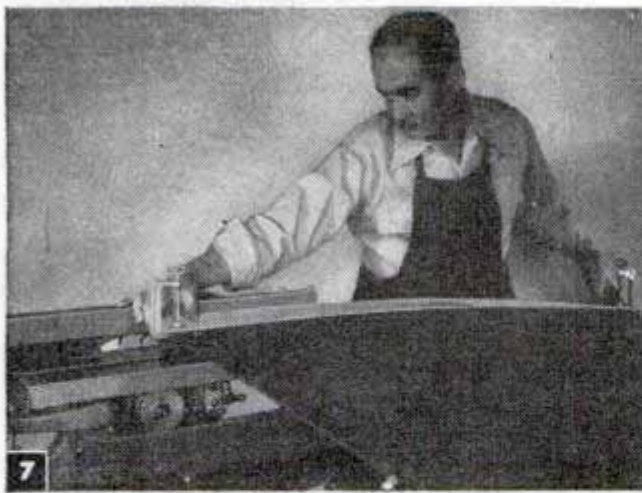


4—Pattern sawing is easy to do if you clamp a wood guide piece to the saw fence at such a height that the work will slide under it. Outer surface of the blade should be flush with the face of the wood guide

5—Tenoning goes much faster with a jig that rides in the table groove and supports the work in a vertical position. Two saw blades are placed on the arbor with a spacer between equal to the width of the tenon. In this way you can make the cuts in one pass

6—Improved clamps attached to a crosscut guide enable you to make some unusual cuts on the shaper. Here's a safe way of holding a disk for cutting flutes around the edge. It's a handy jig for making decorative rosettes of the type having a molded edge





SHORT CUTS

By Kenneth Murray

7—To square large pieces of hard-pressed board on the circular saw, clamp a straightedge to the work so that it projects over one edge and rides against the ripping fence, thus acting as a guide for the squaring cut. Repeat the operation on the four edges

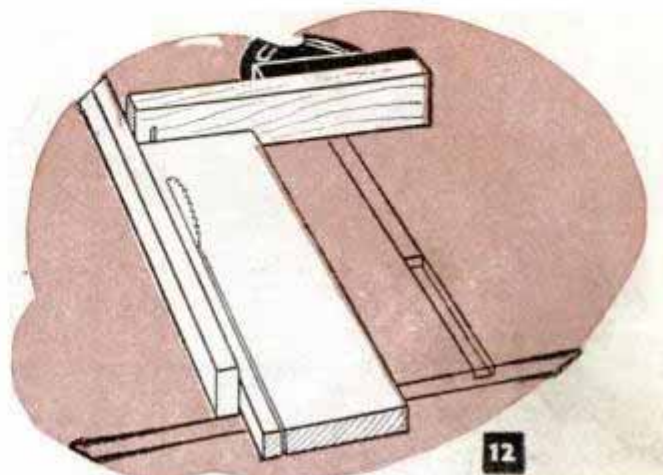
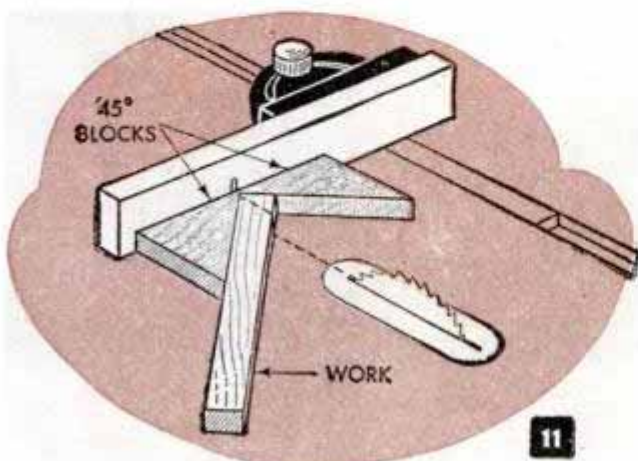
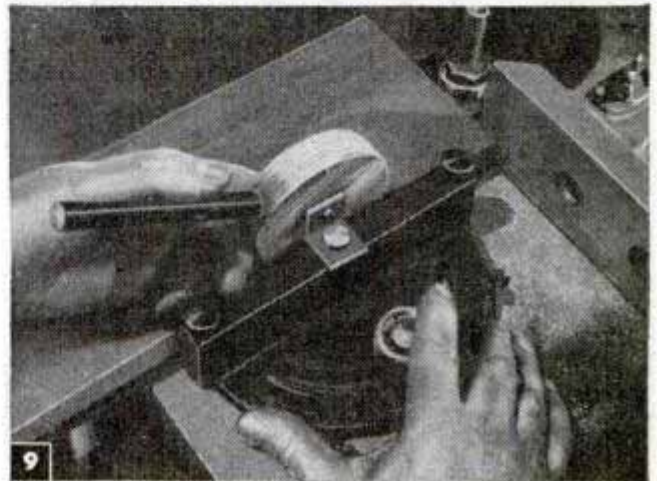
8—A good serviceable hold-down for small pieces can be made from a broken C-clamp. Use the screw part of the clamp as shown and weld a threaded section of rod to it so that it will screw into the crosscut guide in a hole already drilled and tapped for it

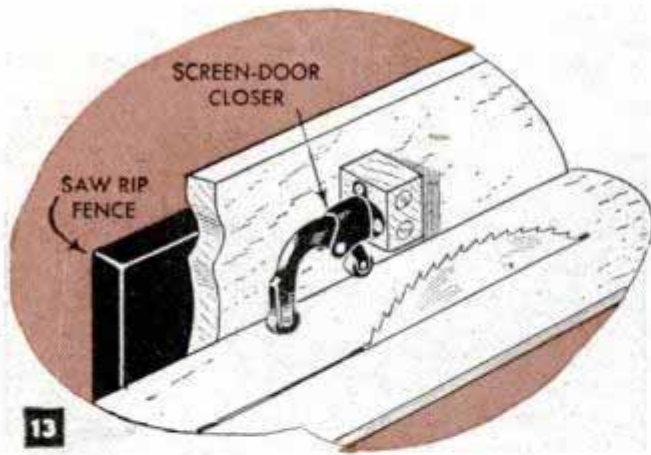
9—Another clamp, which is simply a wood cam operated by a handle, can be attached to the crosscut guide by means of a bolt and metal angle. The clamp is handy on shaper when cutting across the grain

10—For sanding small duplicate parts in the lathe make a quick-acting chuck by fitting a length of rubber hose into a turned wood holder. It is not necessary to stop the lathe when changing work

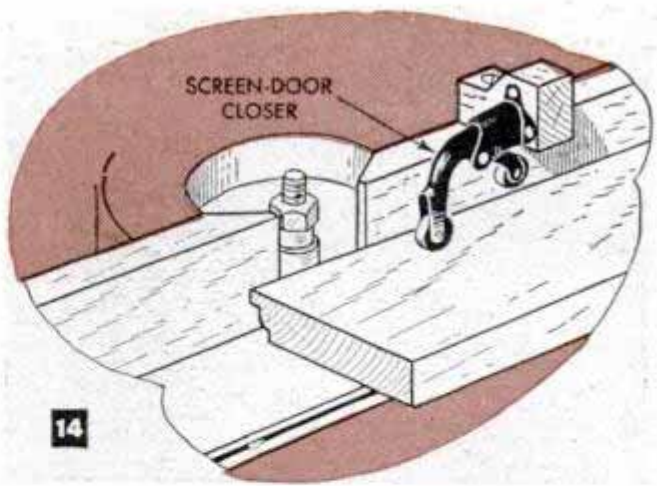
11—A "right-left" miter gauge is a real timesaver for you can miter both ends of a single piece without changing the gauge. The drawing shows how to make it and how it works. Use hardwood for all the parts

12—Ripping duplicate narrow strips on the circular saw is a ticklish business. It can be dangerous, too, unless you take proper precautions. Of course, any careful workman will use a push stick, but another and faster way is to screw a block to the crosscut guide and let it push the strip safely past the saw blade





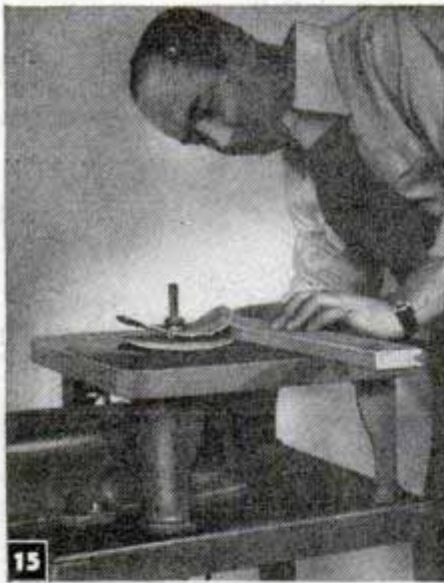
13—A screen-door closer of the snap-action "over-center" type makes a good hold-down when cutting thin stock on the circular saw. It prevents the stock being lifted by the blade and thrown forward and also aids in holding material firmly against the fence



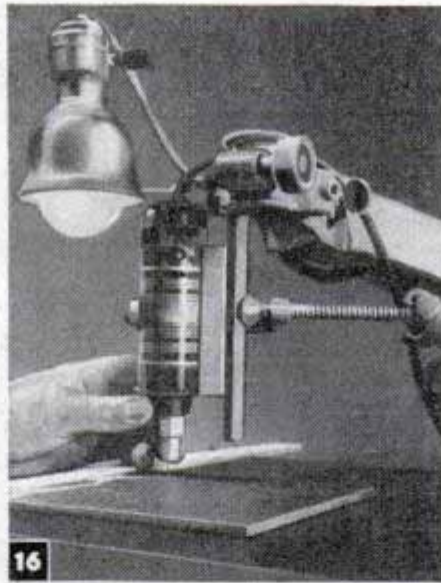
14—This same type of door closer also will serve as a hold-down when molding straight work on the shaper. Moreover, it bears right at the point where you ordinarily have to place your fingers when the shaper cutter is working on the lower corner of the stock

15—Mount a sandpaper disk and another of 1/8-in. plywood on the shaper spindle with a spacer between and you have a good setup for rounding corners. As wood disk guides stock it should be smaller than the sandpaper disk. Wear goggles for this operation

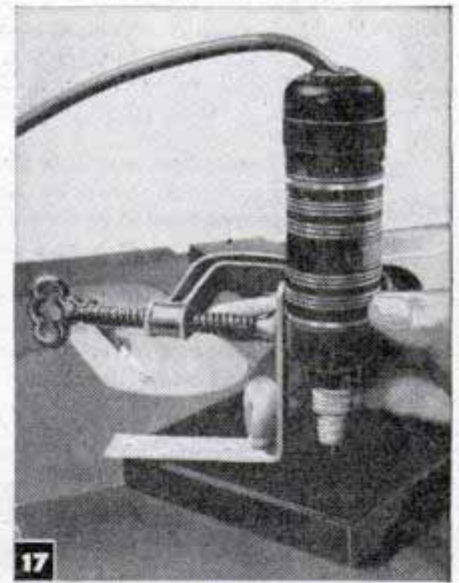
16—A high-speed hand grinder clamped to the jigsaw blade guide gives you a router suitable for light routing and veining operations. The guide gives the necessary depth adjustment. On some operations it's better to move the work rather than the router



15



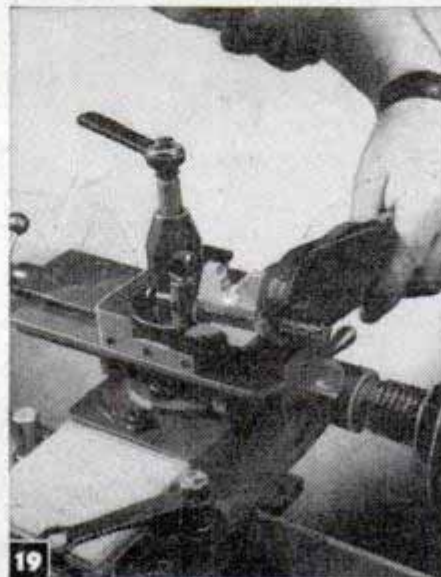
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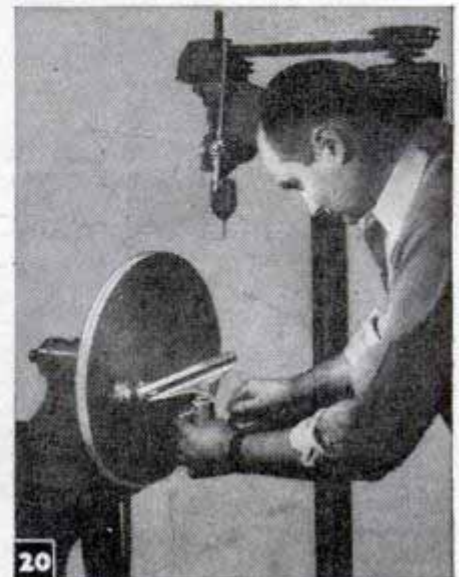
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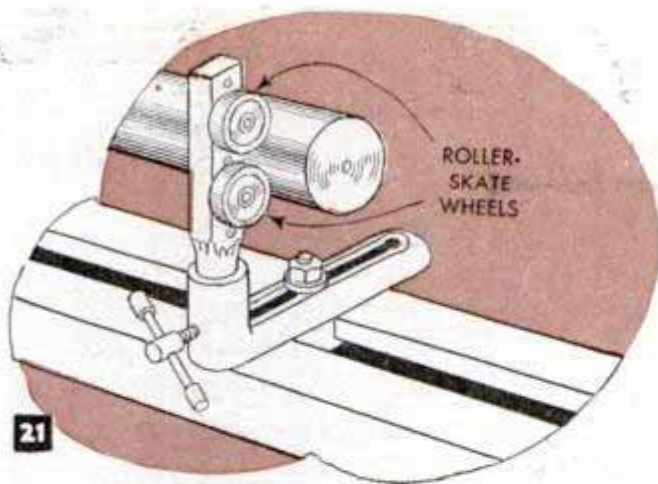
18



19



20



17—Using a metal corner brace, a small C-clamp and a hand grinder you can quickly improvise a high-speed router that can be guided anywhere over the surface of the work. It's especially suitable for cutting shallow recesses for inlay designs of irregular shape

18—The problem of supporting small turning squares in a steady rest is overcome by cutting several plywood disks which slip over the square as shown. Supported in this way the work rides smoothly in the rest. It's easy to make disks for different sized squares

19—A pattern knife, for pattern turning in the lathe, can be made up easily by sliding several shaper cutters over a bolt. Supported in a slide rest, the cutting edges are fed slowly into the work with the cross-feed. Work should be rotated at high speed

20—When you have to turn large-diameter work on the outer end of the lathe spindle, there's no use bothering to construct a makeshift tool rest if you have a floor drill press. Just bolt the lathe tool rest to the drill-press table and you have a solid support for the turning tool with universal adjustments

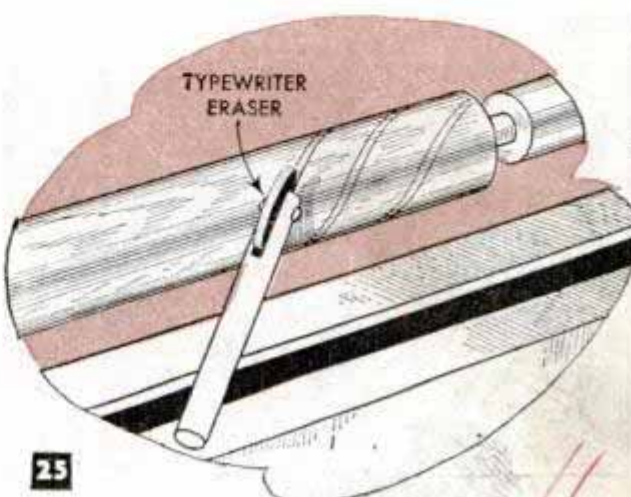
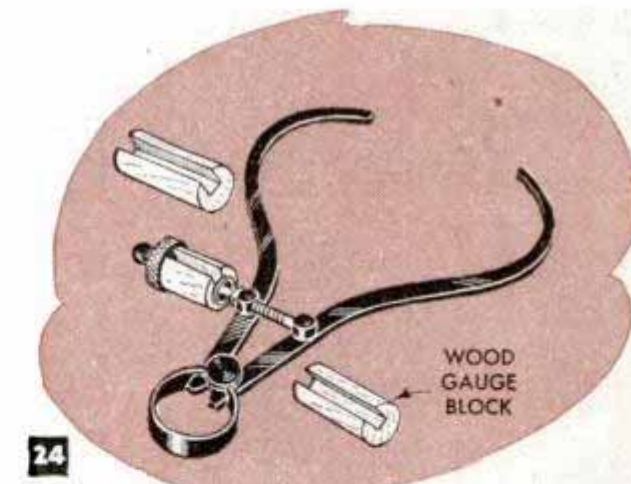
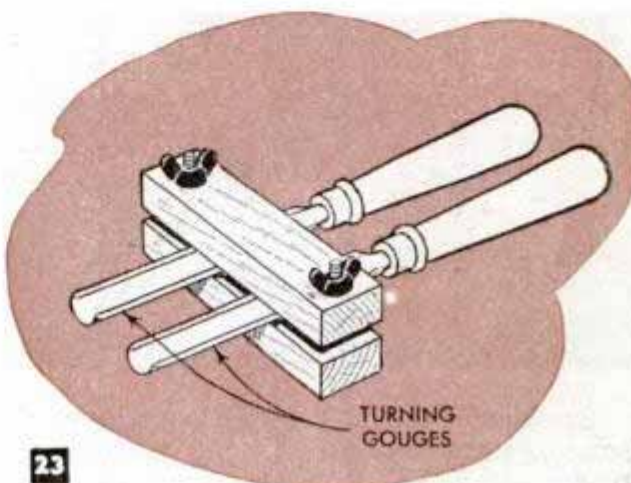
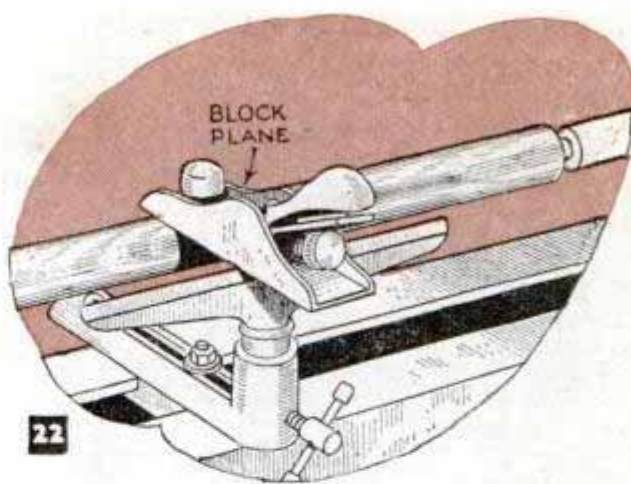
21—A rolling back rest is usually necessary when turning long spindles in the wood lathe. Two discarded roller-skate wheels bolted to a short length of hardwood will do the trick. Support this improvised rolling rest in the regular tool-rest holder as shown

22—If you require a fine finish on cylindrical turnings, particularly if these are of softwood, try using a block plane as illustrated. Plane should be held at a slight angle with the axis of the work to obtain a shearing cut. It leaves a clear, glass-smooth finish

23—To rough-size a cylindrical turning to a given diameter, clamp two turning gouges between hardwood blocks with both cutting edges projecting the same distance. Then merely slide the block along the tool rest, which has been located parallel with work axis

24—You can check a number of diameters quickly with a single caliper if you first take time to make hardwood gauge blocks for each setting. These act as stops for each predetermined setting. Of course, settings should be carefully checked before using caliper

25—To lay out spiral turnings to almost any pitch an inked "wheel" taken from an ordinary typewriter eraser works fine. The wheel is fitted in a simple holder made from dowel rod. It is held freehand against the work which is supported between centers in the lathe and rotated slowly by hand. Angle of the wheel with the work determines the pitch of the spiral



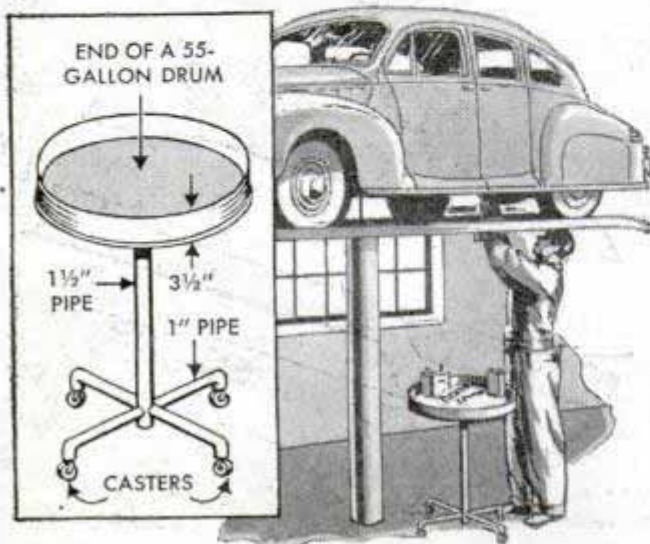
Ends of Molding Are Colored To Indicate Length



One lumber dealer found that he could save considerable time by painting the exposed ends of molding in stock different colors to help in quickly determining length. The code is printed on a chart and when it is desired to obtain several lengths, they are identified by reference to the chart, making it unnecessary to pull the pieces out and measure them. The molding is painted when it is put in stock.

Tool Table Made From Oil Drum Holds Mechanic's Equipment

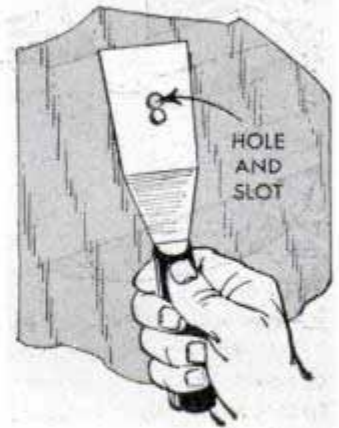
Here's a tool table that will come in handy around the garage when working under a hoist. The top is cut from the end of an oil drum with a rim left to keep the



tools from rolling off. Pedestal and legs are a welded-pipe assembly with casters on the feet to make the unit portable.

Paint Scraper Used as Tack Puller

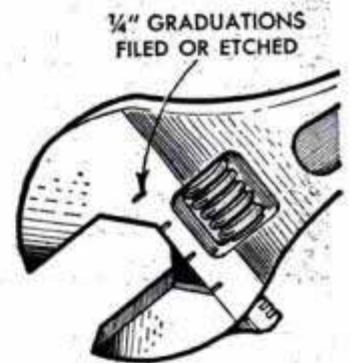
When removing paint from a building, frequently it's necessary to remove tacks and small nails, and this means loss of time in picking up another tool to do the job. However, if a keyhole type of slot is cut in the scraper, it can be used to pull tacks.



Slip the slot under the head of the nail or tack and lift it out. This tool would not be strong enough for larger nails.

Settings for Adjustable Wrench Marked on Fixed Jaw

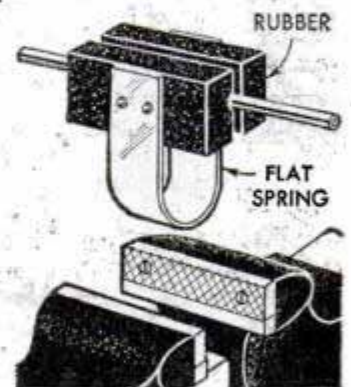
Considerable time can be saved when setting an adjustable end wrench if gradations about $\frac{1}{4}$ in. apart are filed or etched on the fixed jaw. In this way it's possible to set the wrench for a particular size of nut without having to try it for size. Nut sizes can be marked on the wrench with a set of stamping dies.



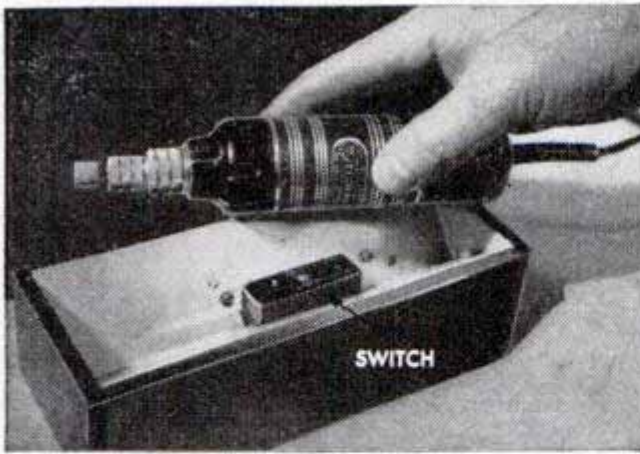
Arthur B. Taylor, Spokane, Wash.

Accessory Clamps Polished Rod

Polished rods and tubes can be gripped safely in a vise if this accessory is used in conjunction with the vise. Two rubber blocks with sides having an area equal to that of the faces of the jaws are bolted to a length of flat spring steel. When placed in a vise, the blocks hold the work but will not mar or scratch it. This accessory clamp will work equally well with either polished metal or plastic materials.



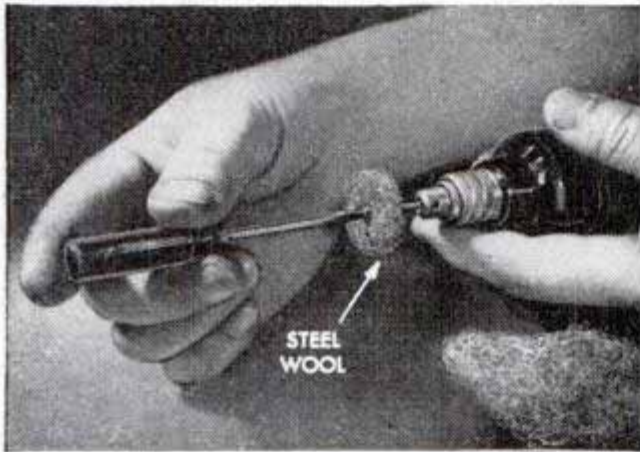
HANDY KINKS for HAND GRINDERS



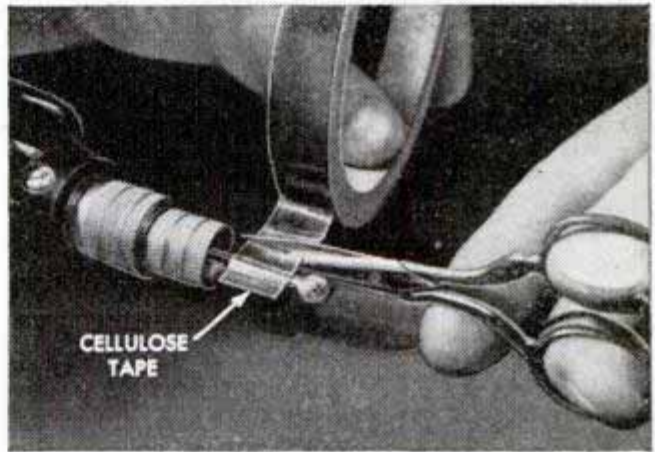
A TOOL CRADLE with a snap-action switch in the bottom, which turns on power when the tool is removed, will be found especially handy by the repairman working at a bench where the tool is used repeatedly. The holder is V-shape and fitted with a midget-type switch



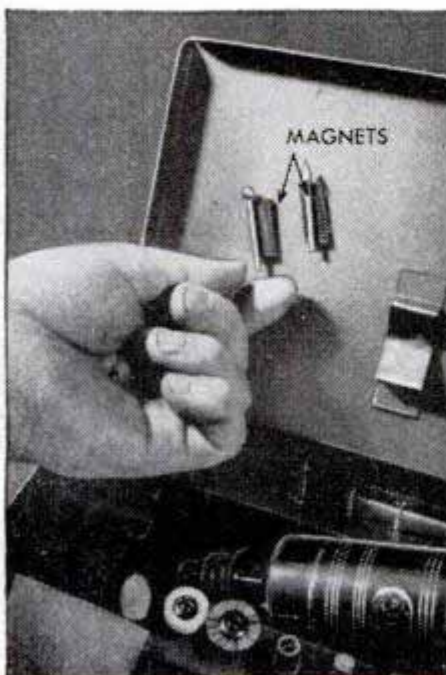
PIPE-CLEANER "BUFFERS" will come in handy in polishing intricate objects carved or cast in plastic. Sections of ordinary pipe-stem cleaners are used and chucked in the tool. The buffers are charged with buffing compound, using rouge first and then tripoli



WIRE SCRATCH BRUSHES, which will serve temporarily in place of regular ones, can be improvised from common steel wool. Simply form a piece into a small disk and mount it on an arbor consisting of a machine screw and two washers, then chuck it in the tool



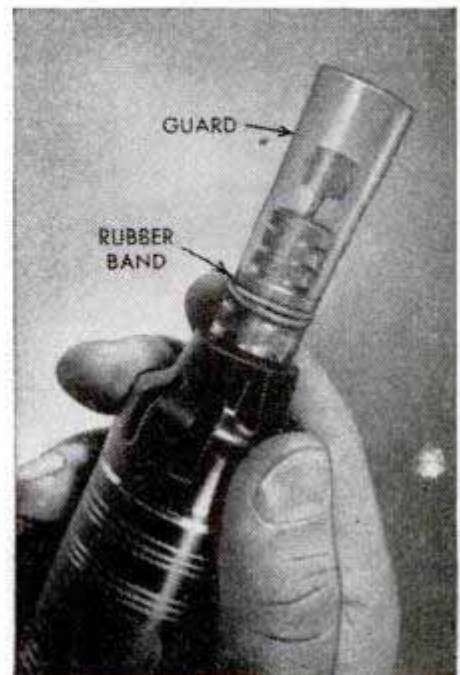
AN EFFICIENT BLOWER that will keep the work free of dust and chips can be made from a piece of cellulose tape. All you need to do is double a strip of it with the shaft between to form a fan blade. Tape is better than metal as it will not mar the work if it strikes it



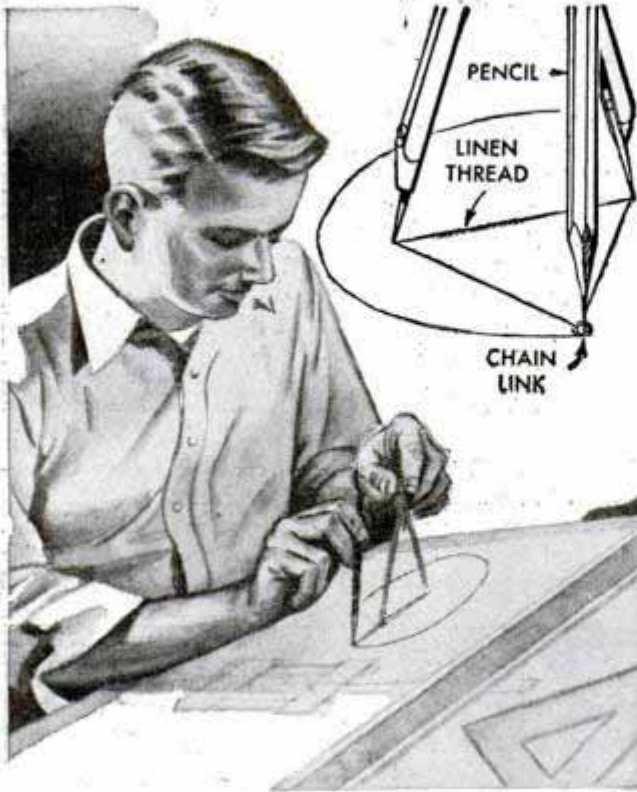
BIT HOLDERS of magnets are handy to keep tiny drills and other tool accessories at finger tip. Place a couple of permanent magnets on the metal lid of the toolbox and use them to keep track of the tool bits most frequently used



AN EYE GUARD of Celluloid should be used whenever there is a possibility that a chip or bit of abrasive may fly and cause injury. Fasten a strip of clear Celluloid to the neck of the tool and hold in place with a rubber band



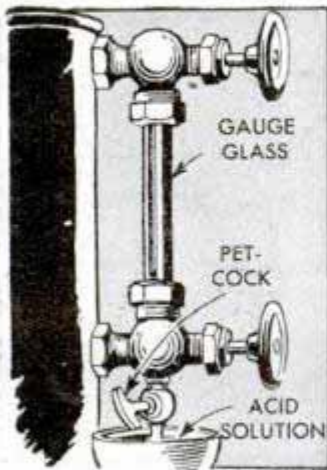
Ovals of Various Sizes Drawn By Using Simple Tools



Using only a length of thread, dividers, and a chain link, ovals of many sizes can be drawn easily. The thread is tied to the link. This loop is dropped over a pair of dividers whose points are set in the paper on which you wish to draw the oval. A pencil point is inserted through the hole in the link; the loop is stretched outward and the oval is drawn. Some experimentation will be necessary to get the exact size and shape of the ovals you want.

G. E. Harrington, New York City.

Gauge Glass on Boiler Cleaned Without Being Removed



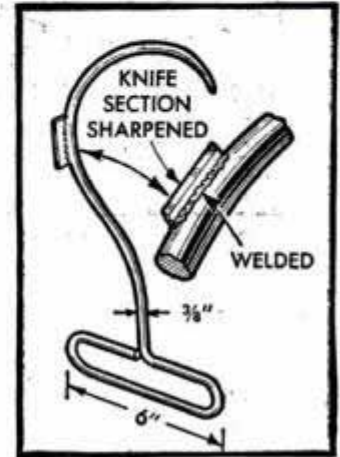
To avoid removal of water-gauge glasses from boilers when cleaning them—and to prevent breaking the glass or losing gaskets—use the following method: Prepare a solution composed of about 1 pint of hot water and several tablespoons of dilute muriatic acid.

Place this in a shallow, acidproof vessel and set it near the gauge. Close both top and bottom shutoff valves on the gauge. Then open the petcock, and bottom and

top valves in that order. Blow the gauge out enough to thoroughly heat the glass and close the top valve. Immediately, immerse the petcock in the acid solution so that the vacuum formed by cooling of air in the glass will draw the solution into it. Close the petcock and let the solution stand for 10 or 15 minutes, or until the glass is clean. Then blow out the gauge and put it back in service.

Combination Cutter and Bale Hook

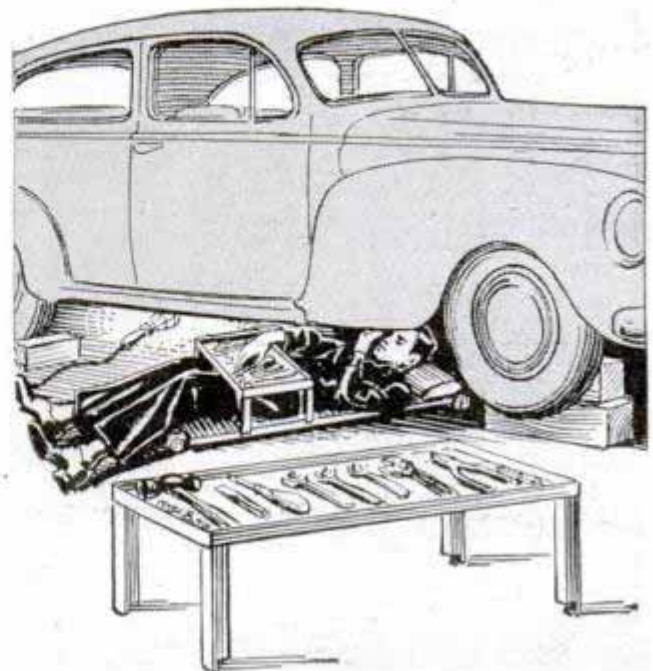
By welding a knife section to the back of a bale hook, the usefulness of the tool can be increased. Converted in this manner, the hook can be used to handle bales of hay, and cut wire and twine as well. Use a heavy blade and weld it with stainless-steel rod, holding a wet rag against the hook to keep it cool so that the temper will not be drawn from the knife.



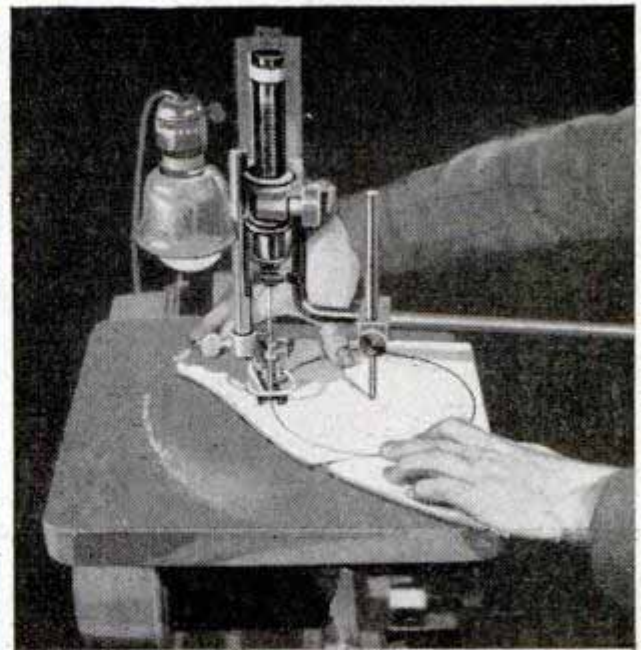
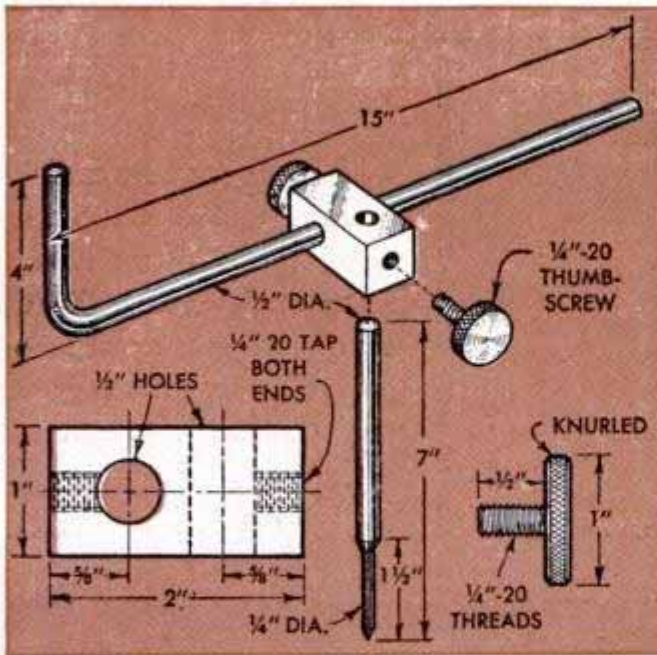
Kenneth Sidal, O'Fallon, Ill.

Tray Holds Mechanic's Tools Close at Hand

Made of plywood and fitted with legs of a suitable height, this tray will hold your tools within easy reach while working on a creeper. The tray legs fit the sides of the creeper. With this arrangement it is not necessary to lay the tools on the floor and waste time searching for them.



Accurate Circles Are Cut With Jigsaw Fixture



When one or a number of duplicate circles are to be cut on a jigsaw, the work can be done quickly and accurately by using this simple fixture or circle cutter. Only parts required are a length of rod to form the guide arm, another length for the center pivot, a metal block that slides on the guide arm to serve as a holder for the pivot, and two thumbscrews to adjust the holder. The detail gives dimensions for the parts and the method of assembly. In use, the guide arm is locked in the hold-down

bracket at the end of the jigsaw arm and the pivot point is set at the desired distance from the saw blade (the radius of the circle); then the point is clamped down on the work and the piece is rotated. To cut an outside circle, advance the work until the cut is tangent to the circumference; clamp the pivot in place and use the fixture to complete the circle. For an inside cut, drill a hole inside the circle, insert the saw and run the cut to the circumference.

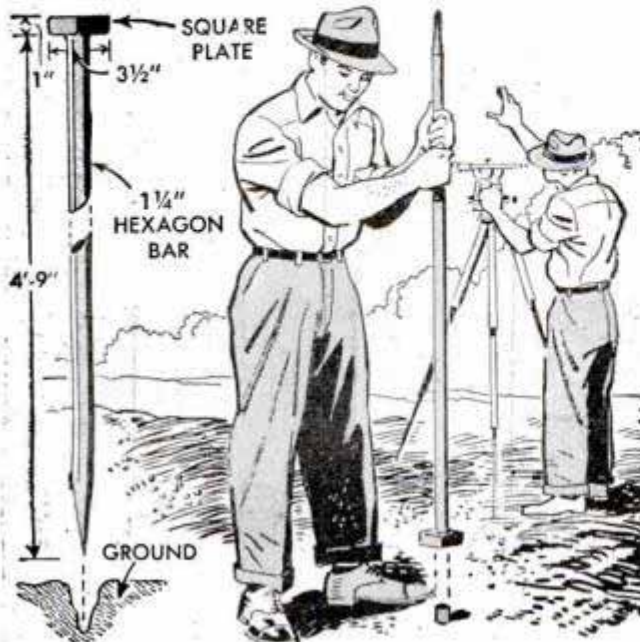
D. J. Bachner, Jackson Heights, N. Y.

Combination Tool for Surveyors Increases Efficiency of Workers

For surveyors who work on streets and highways where it is necessary to drive hubs and stakes in graveled, oiled or black-top surfaces, this combination bar is more efficient and easier to use than a

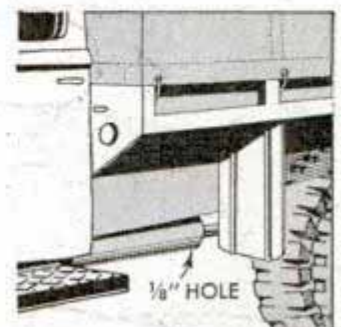
pick, or gad and hammer. It also means that there are fewer tools to carry. A hole, smaller in diameter than the bar, is drilled in a square steel plate. Then one end of the bar is drawn to fit this hole and the plate is brazed in place. The other end is pointed. In use the plate serves as a hammer head and the point as a pick.

R. H. Eide, Seattle, Wash.

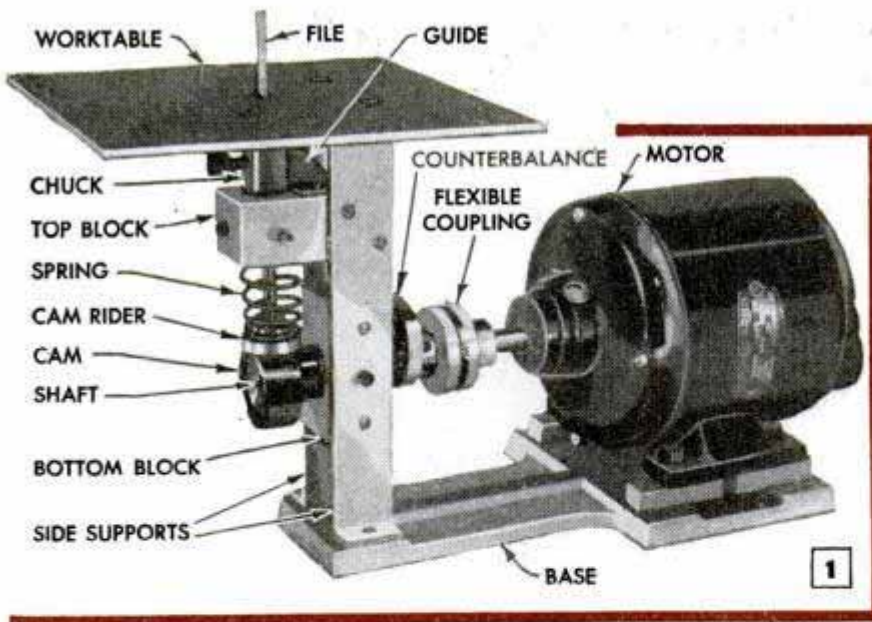


Hole in Muffler Drains Moisture

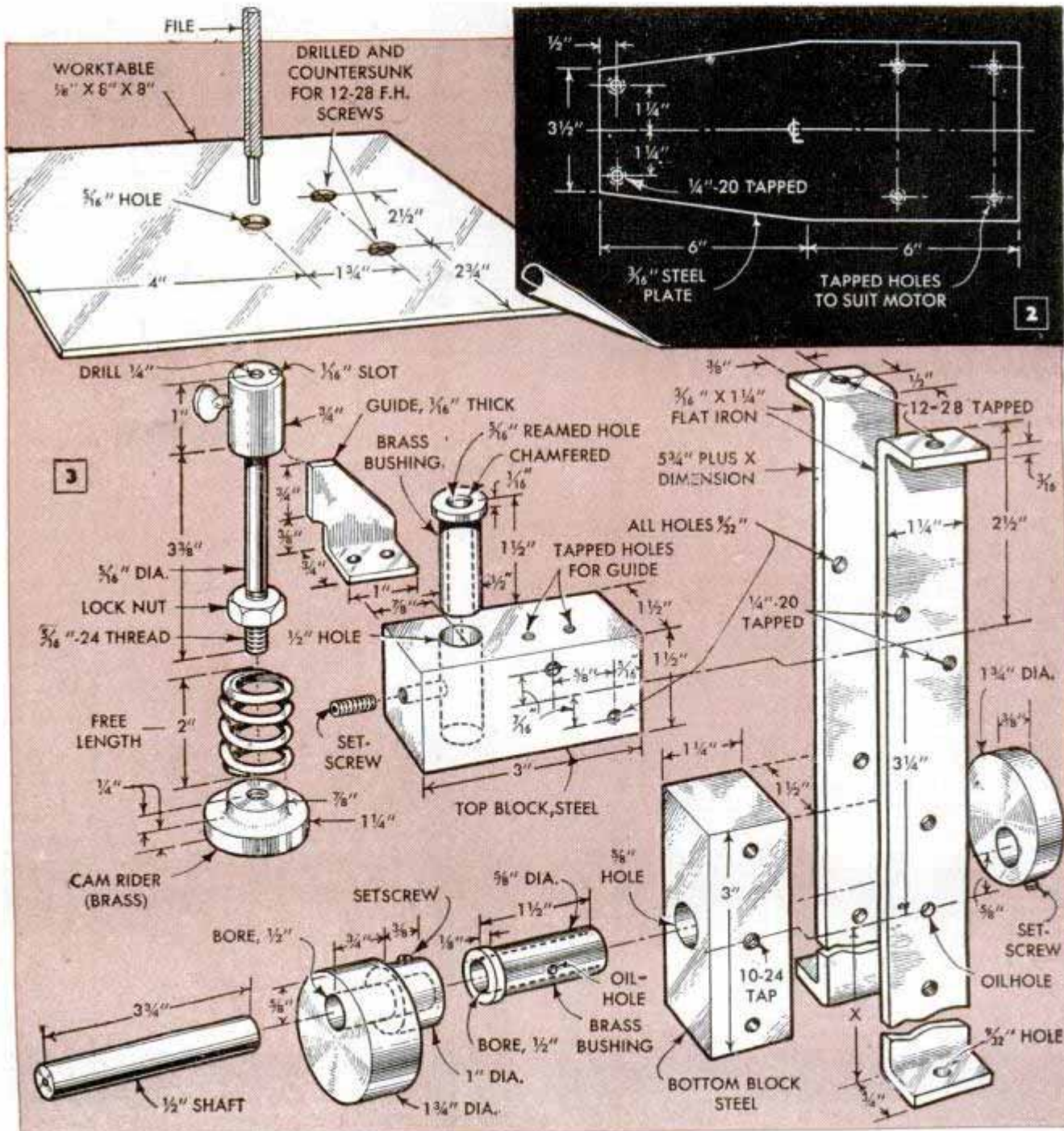
To prevent the accumulation of condensation inside the shell of a truck or automobile muffler, drill a hole at the lowest point in the shell. In this way, any moisture that collects will drain out and help prevent rusting. One fleet operator was able to report considerable savings by following this procedure.



FILE



Both modelmakers and die makers will like the precise internal and external filing this machine can do on a wide variety of small intricate work. It uses the standard machine file



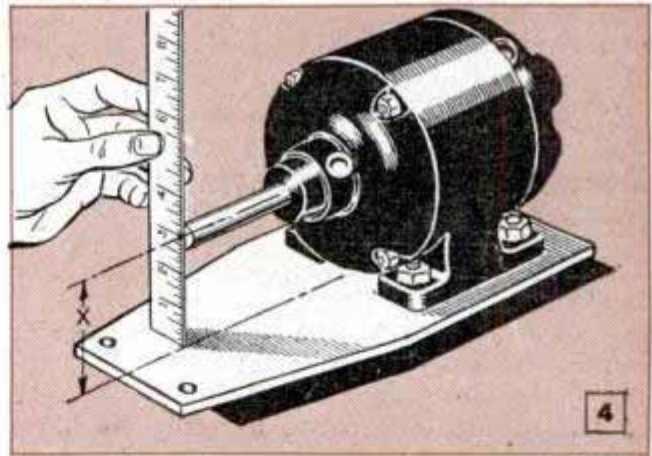
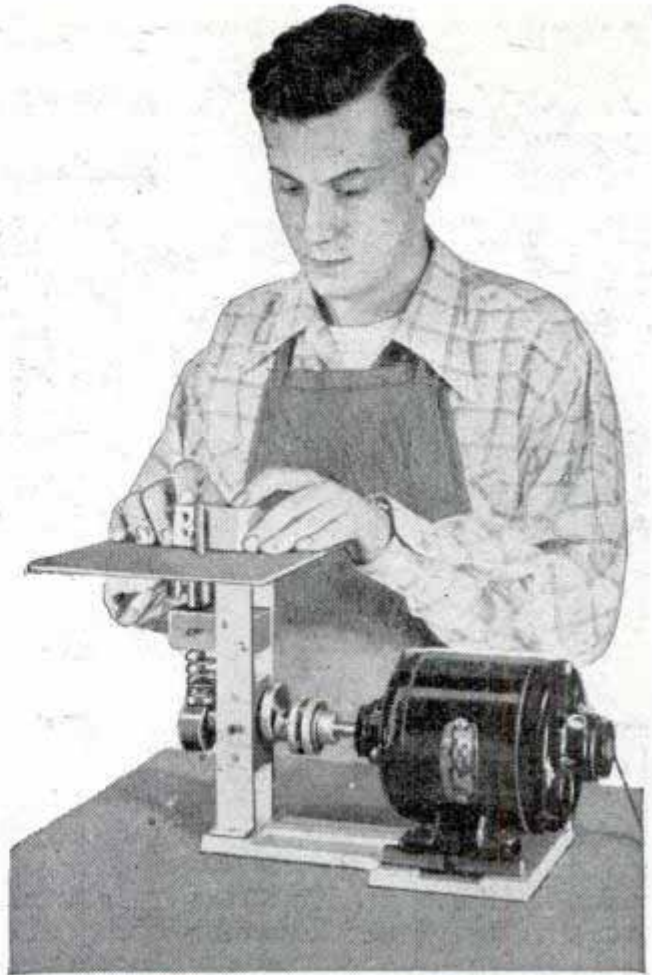
IT FASTER

By Jack Mellinger

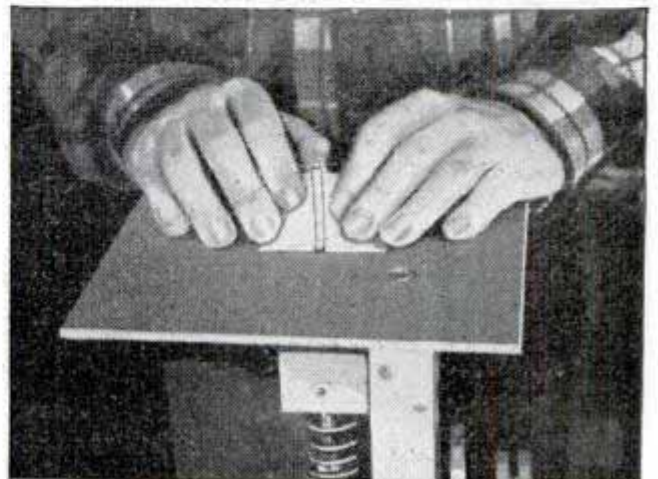
INSIDE OR OUTSIDE die filing, squaring small parts, and truing irregular inside or outside shapes in model work—these are jobs for this motor-driven filer. Fit it with a special chuck to take saber-type blades and you have a speedy jigsaw. No castings are used, only cold-rolled round, flat and bar stock in standard sizes. Fig. 1 shows the complete machine and names all principal parts. Dimensions of these are given in Fig. 3, while Fig. 2 details the base. Dimension "X," Fig. 4, determines the position of the bottom or bearing block, Fig. 3. Check this dimension first so that you'll know where to locate holes in the side supports. In order to get the motor shaft and drive shaft in alignment it may be necessary to shim under the motor as in Fig. 1.

Note that there is a flanged brass bushing in the bottom block, which forms the bearing for the main shaft. This bushing should be reamed to a precision fit on the drive shaft. The cam is cold-rolled steel and the cam rider is brass or bronze. Cam and rider are ground and polished on the meeting faces. The top block also is fitted with a flanged bushing of either brass or bronze, and forms a bearing for the file spindle. As these parts travel at fairly high speeds, ream the bushing to a precision fit on the shaft. The spring can be made by winding No. 8 phosphor-bronze wire on a 1/2-in. mandrel in a lathe. Free length of the spring should be 2 in. When removed from the mandrel, the coils will expand to about 7/8-in. inside diameter. A stock spring also can be used. The chuck and spindle are turned from one piece and the body of the chuck is slotted for a guide which prevents it from turning. This slot can be cut with a shaper, milled, or filed by hand. It is essential that the guide be a close fit in the slot.

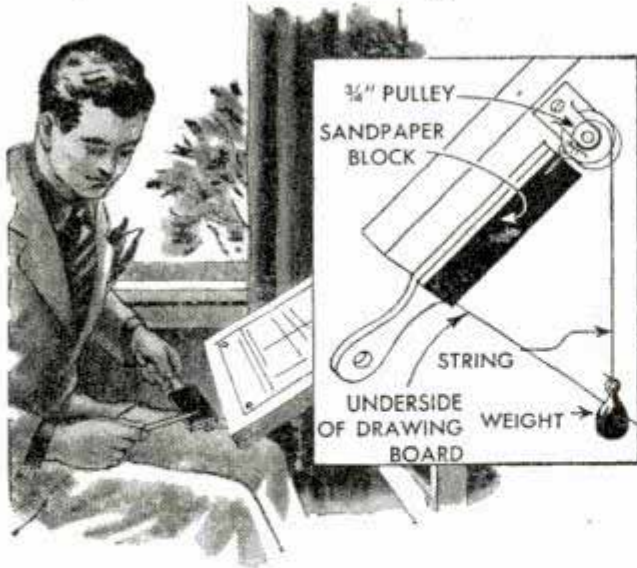
The counterbalance is of steel, and does not fully balance the cam, for there also is the tension of the spring to overcome. The size of the counterbalance detailed was determined experimentally and was found to be correct for this machine. Use a 1/4-hp. 1750-r.p.m. motor and connect it to the main shaft of the machine with a flexible coupling. When the machine is to be used continuously it's best to fit pressure-grease fittings or snap-cover oil cups provided with felt wicks. A felt washer cut to fit snugly over the spindle just underneath the chuck will prevent metal filings from reaching the bearing.



Above, be sure of this dimension as it will vary with different motors. Below, standard machine files with 1/4-in. round shanks are used. By fitting an interchangeable chuck, machine makes a speedy jigsaw



Weight Tied to Sandpaper Block Keeps It Out of the Way

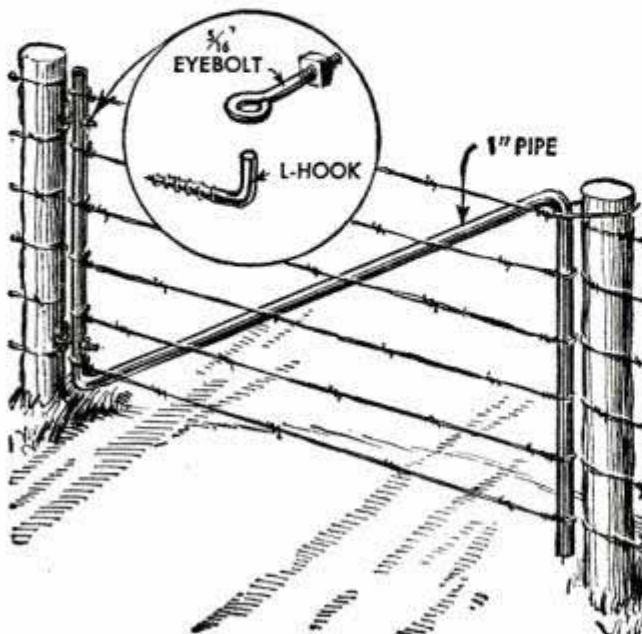


Ordinarily a pencil-sharpening sandpaper block is attached to the drawing board by means of a string and swings free at some distance from the board, soiling the trousers of the draftsman who brushes against it. To prevent this, attach a small pulley to the underside of the board, and insert a string through the pulley with the block attached to one end and a weight at the other. When not in use, the weight will pull the block up against the board where it will be out of the way.

W. B. Eagan, Louisville, Ky.

Durable Farm Gate Formed From Single Pipe

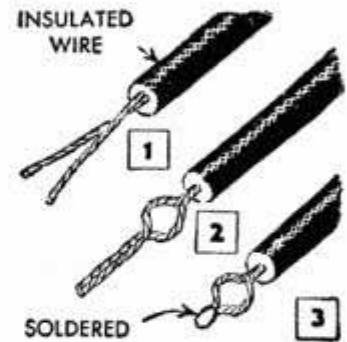
All you need to assemble this farm gate is a length of pipe, some barbed wire, two eyebolts and L-hook screws. To make the bends, fill the pipe with sand that is absolutely dry, plug the ends and heat the pipe at the points where the bending is to be



done. After the gate is shaped, drill holes for the barbed wire in the side legs. Thread the wire through these holes and tighten. Ends of the pipe are fitted with caps before painting.—Don Brooks, Chicago.

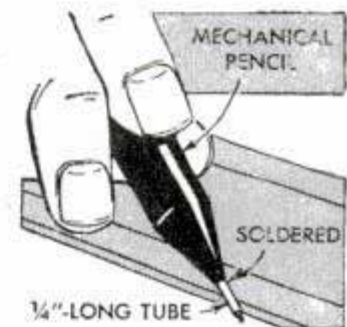
Making Loop in Ignition Wire

Loop ends in ignition wires are made by stripping the insulation off the ends for a short distance and separating the wire into two strands, detail 1. Then form the loop and twist the free ends, as in detail 2, cutting off the excess wire. Finally, dip the twisted end in solder, detail 3, to prevent unraveling.



Extension Tip on Mechanical Pencil Is An Aid When Drafting

To keep the lead in a mechanical pencil from being broken, and to hold the pencil steady against a rule or triangle, solder a metal extension tip to the point of the pencil. The extension tip should be about 1/4 in. long to guide the lead and keep the tapered part of the pencil away from the rule.



Bottled Tags Identify Trees

To identify young fruit and shade trees or shrubs, and to be sure that the labels do not fade or wash off in the rain, place the labels in tightly corked medicine bottles and tie the bottles to the trees. As an extra precaution use waterproof ink when making the labels. Such labels will remain legible until the trees are easy to identify.



⚠ Naphtha, benzine, gasoline and other flammable liquids employed as cleansing proper conditions. In many localities the use of volatile and flammable liquids will invalidate a fire-insurance policy.

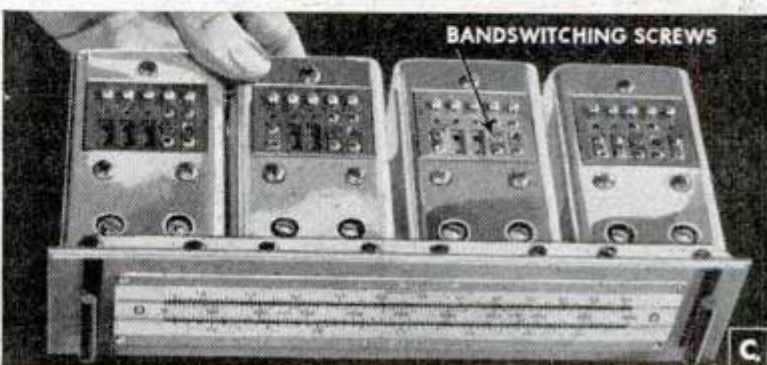
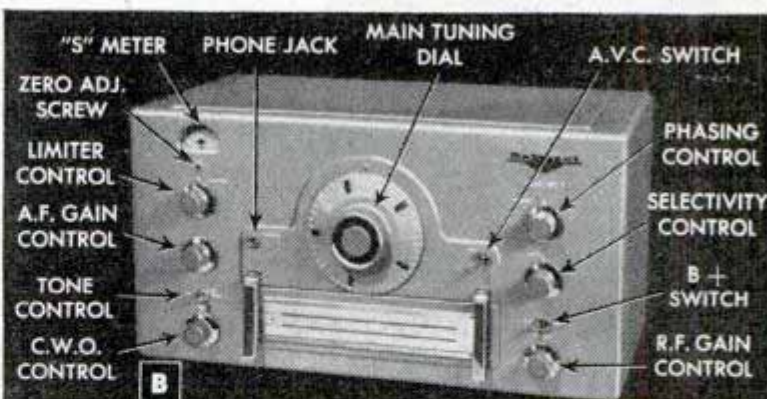
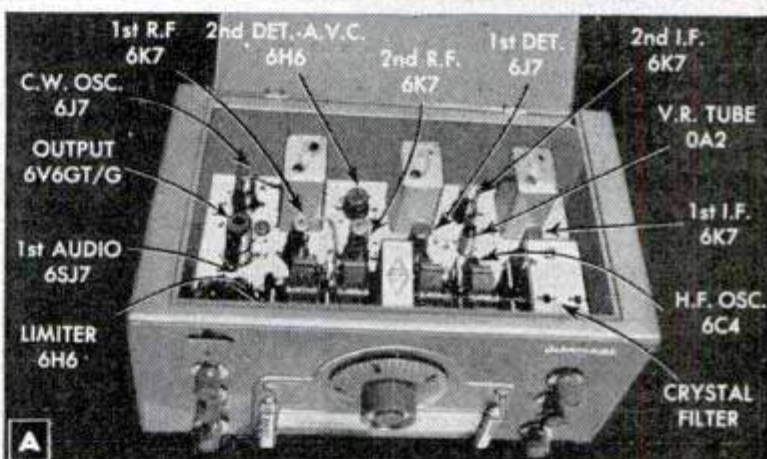
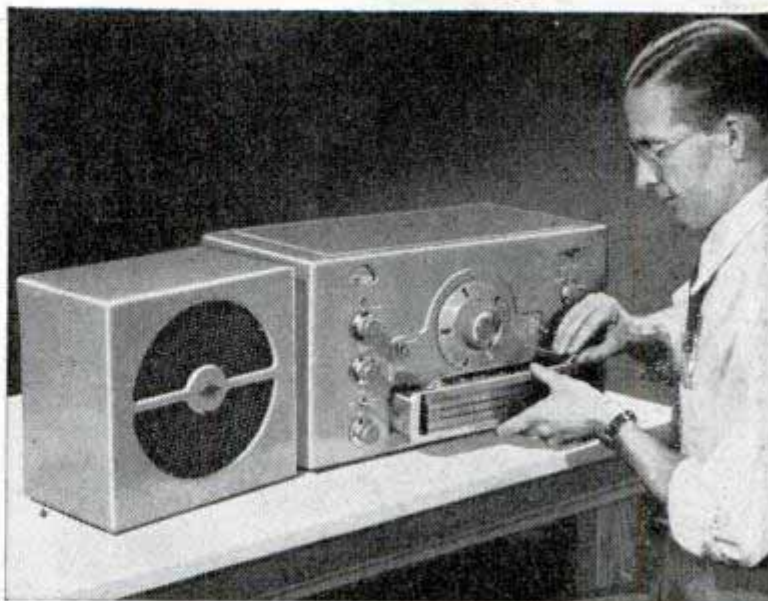


Twelve-Tube Super Covers Nine Bands

WITH ACCURATELY calibrated plug-in coils for efficiency and flexibility, this high-frequency superheterodyne offers top-flight performance throughout its entire frequency range of 50 to 430 kilocycles, and from 480 to 30,000 kilocycles. Incorporating all of the strong points of a favorite prewar communications receiver, this National HRO-7 includes a number of modern refinements. It is housed in a streamlined gray cabinet; the speaker and power supply are separate matching units.

The new features include a double-action noise limiter that effectively reduces interference caused by external noise pulses. There is a 6-position switch for crystal-filter operation; also an accessory connector socket that makes possible the use of a wide variety of accessories such as a narrow-band FM adaptor, phonograph, or HF converter. Two new miniature tubes, a 6C4 high-frequency oscillator and an OA2 voltage regulator, are employed to give a high order of oscillator stability. Photo A shows a top view of the chassis; all panel controls are identified in photo B. One of the nine plug-in coil sets appears in photo C; coil sets for the amateur bands provide separately calibrated band-spread coverage available by merely moving the band-spreading screws indicated. The micrometer-type main tuning dial drives a 4-gang variable condenser through a worm drive having a reduction ratio of about 20 to 1.

Although primarily designed for communication and amateur radio services, it provides excellent broadcast reception as well as clear foreign broadcasts of interest to short-wave listeners. For the amateur, the attractive gray cabinet easily overcomes the wife's former objections to bringing your "rig" into the living room.



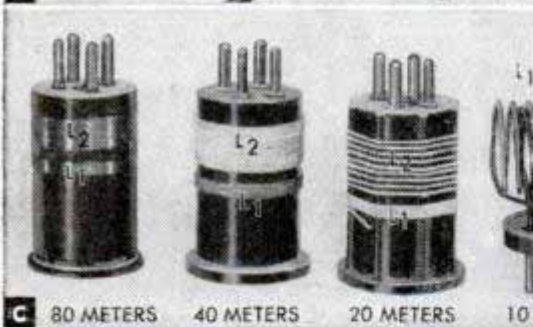
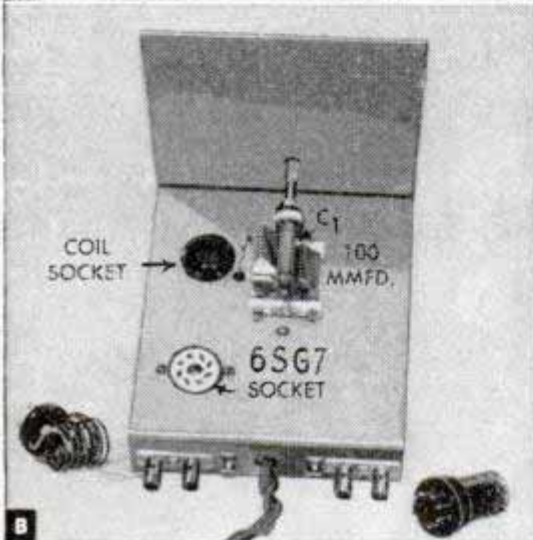
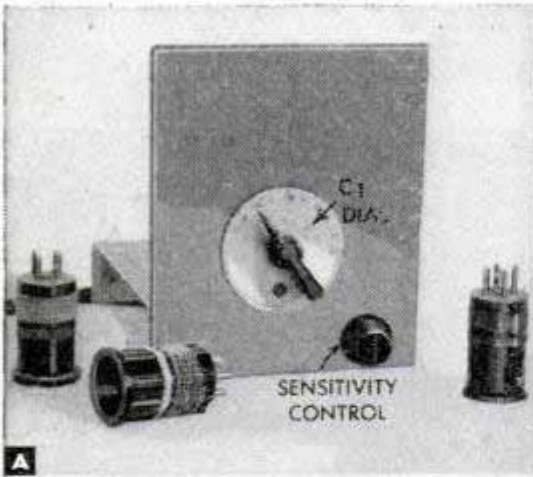
6SG7 SIGNAL "BOOSTER" INCREASES

By S. A. Johnson

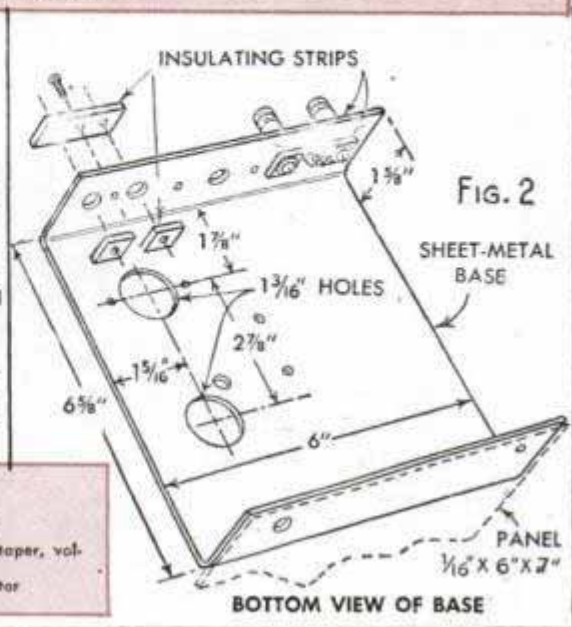
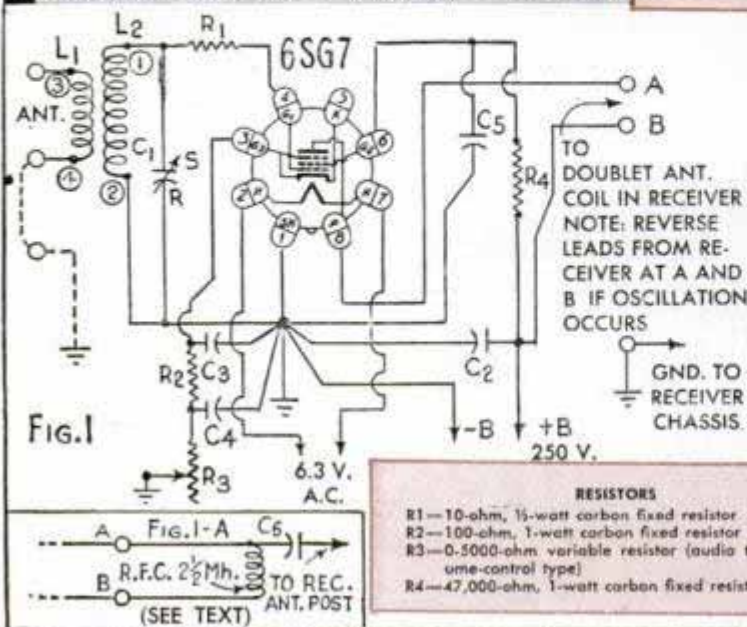
SHORT-WAVE LISTENERS who are using simple superheterodynes, with no R.F. stages ahead of the mixer stage, find that they do fairly well on weak signals under ordinary conditions. But when the "going is tough" and they are trying to "pull in" a weak station halfway around the world, these sets lack sufficient sensitivity for satisfactory reception.

A small signal "booster" will solve this problem by means of a 1-tube R.F. section which can be added ahead of most types of short-wave receivers, and the power for it may be obtained from the receiver power supply. The unit illustrated will boost weak signals from "below readability" level to the "perfectly readable" class in a surprising number of cases. It employs a type 6SG7 high-frequency amplifier tube that has good gain but is not tricky to use. Four hand-wound plug-in coils are employed. This gives a frequency coverage of from 2 to 31 megacycles, covering all "ham" bands with plenty of tuning range above and below.

Various views of the simple unit appear in photos A, B, D and E. It is built on a plain $\frac{1}{16}$ -in. sheet-aluminum chassis that is easily bent to shape over a wooden block. The front panel consists of a sheet of the same material rubbed down with fine sand-



COIL-WINDING CHART	
L-2	L-1
10 meters 7 turns No. 14 enameled wire $1\frac{1}{2}$ -in. I.D. spaced to $1\frac{1}{2}$ in.	3 turns of No. 16 insulated push-back hook-up wire, interwound
Note—This is a self-supporting coil on a 4-prong plug (see text)	
20 meters 9 turns of No. 26 d.c.c. wire spaced to occupy $\frac{1}{2}$ in. on $1\frac{1}{2}$ -in.-dia. 4-prong plug-in coil form	6 turns of No. 26 d.c.c. wire, close-wound and spaced $\frac{1}{8}$ in. from L-2
40 meters 19 turns of No. 24 s.c.c. wire close-wound on $1\frac{1}{2}$ -in.-dia. 4-prong plug-in coil form	8 turns of No. 26 s.c.c. wire close-wound and spaced $\frac{1}{8}$ in. from L-2
80 meters 38 turns of No. 30 enameled wire close-wound on $1\frac{1}{2}$ -in.-dia. 4-prong plug-in coil form	14 turns of No. 30 enameled wire close-wound and spaced $\frac{1}{8}$ in. from L-2



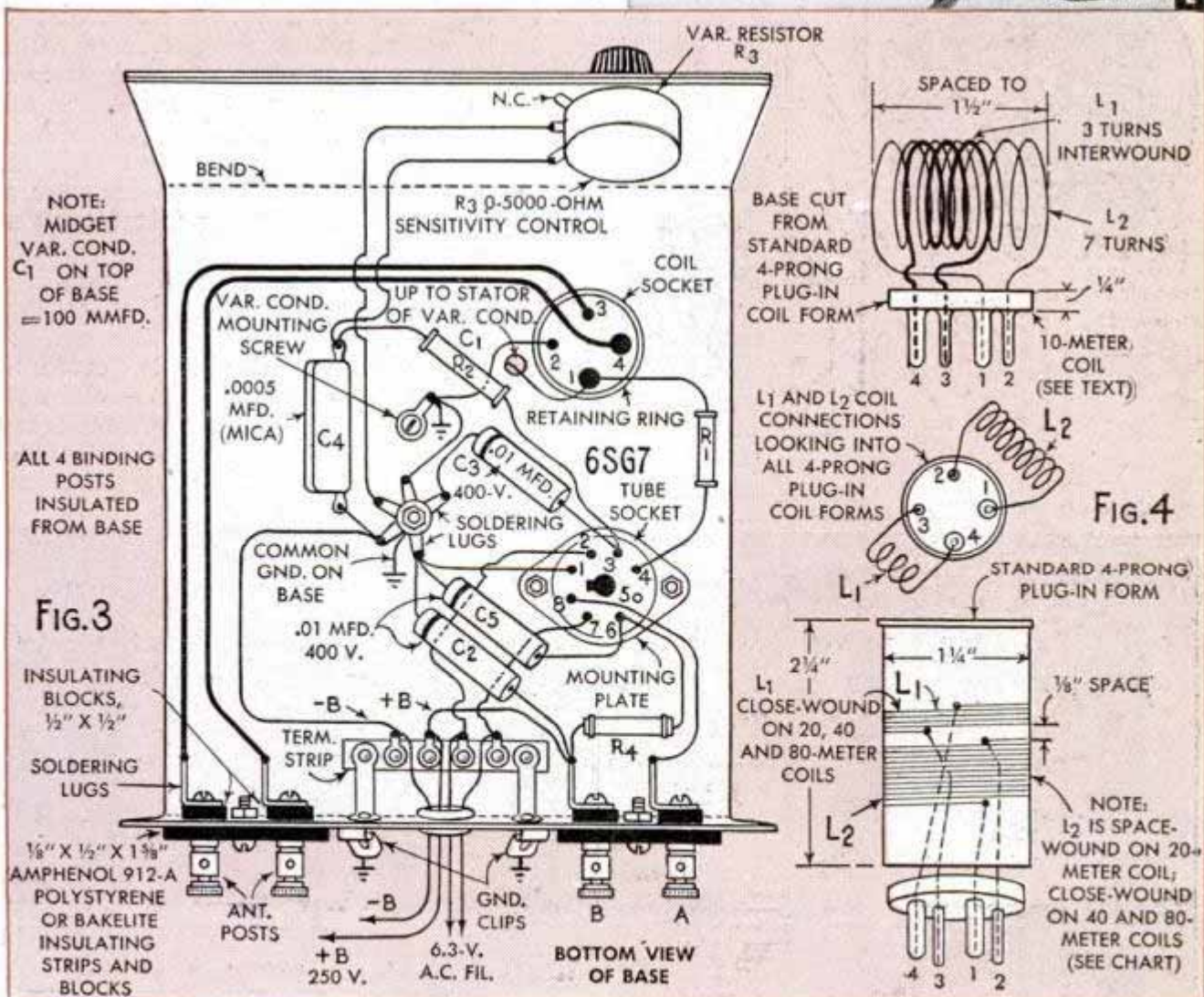
SENSITIVITY of SHORT-WAVE RECEIVERS

paper to give a dull finish. Complete chassis base details are given in Fig. 2; note that large holes are drilled in the rear to permit centering the binding posts on small strips of polystyrene or similar low-loss insulating material. The two Fahnestock grounding clips are mounted directly on the base.

The schematic circuit diagram is given in Fig. 1 and the pictorial wiring diagram is shown in Fig. 3. No. 14 bare copper wire is used for the self-supporting leads running from the antenna posts to the coil socket. All other circuit connections are made as short as possible. Make good soldered connections with rosin-core wire solder and bring all common ground connections to the chassis at a single point by means of soldering lugs held tightly to the chassis base by a short machine screw, lock washer and hex nut. It is difficult to solder sheet aluminum and, therefore, it is necessary to use the method shown.

Three of the plug-in coils are wound on standard forms; the 10-meter coil is wound

(Continued to page 234)



PROPOSED PHONE-TELEVISION SYSTEM

By F. L. Brittin

TELEVISION without commercials, and presenting such unusual entertainment as first-run movies, Broadway plays and similar special features not available for ordinary television because of prohibitive production costs, may be offered soon by means of a telephone pay-as-you-see hookup recently proposed by the Zenith Radio Corporation.

"Phone vision" works by diverting a few key frequencies from the complicated television (video) signal and routing this separate signal through the subscriber's telephone. Without this key signal, the owner of any television receiver sees a distorted image when he tunes in the special pay-as-you-see program. The subscriber to the service merely picks up his telephone (B) and asks the operator (A) for "phone vision" for whichever station or show he wishes to receive. He can then hang up his telephone and the missing key frequencies from station (C) will be fed through his telephone line to his television receiver; he can still use his home phone for ordinary calls. The resulting clear image is shown in photo (D), and the same picture received on another set, without key control, appears in photo (E). A small telephone attachment with a wire leading to the television receiver, supplies the key signal. Regular television programs are received as usual. Use of the telephone enables the television station to bill the customer each month. It is claimed that tests have been successful, but there are still many details to be worked out.

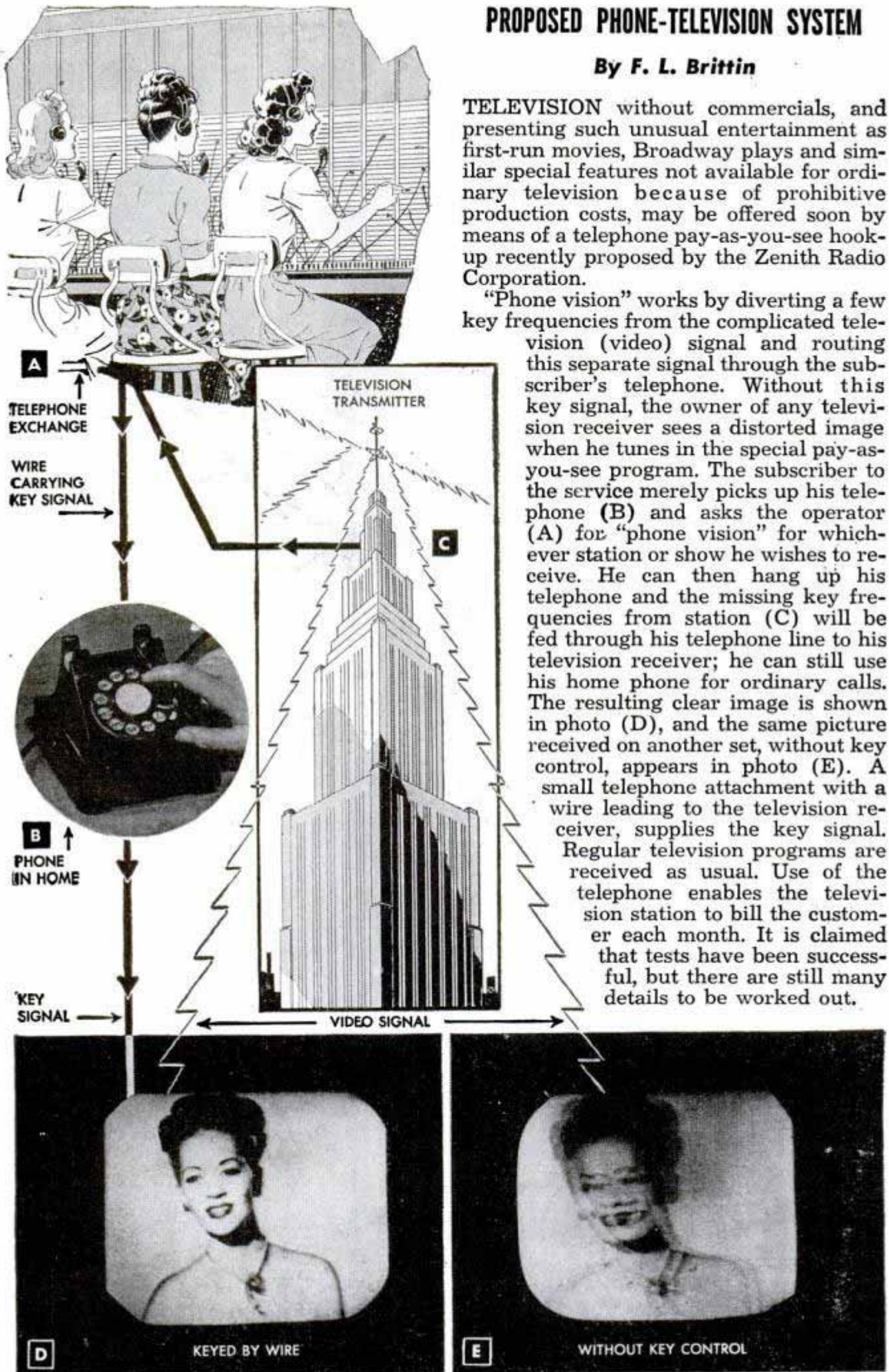


Photo-greeting cards are "personal" — different

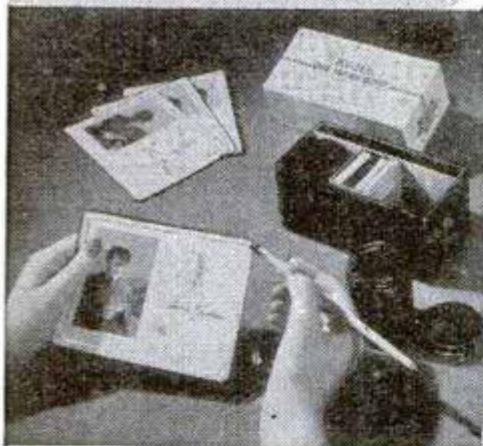


You make them yourself or order from your photofinisher

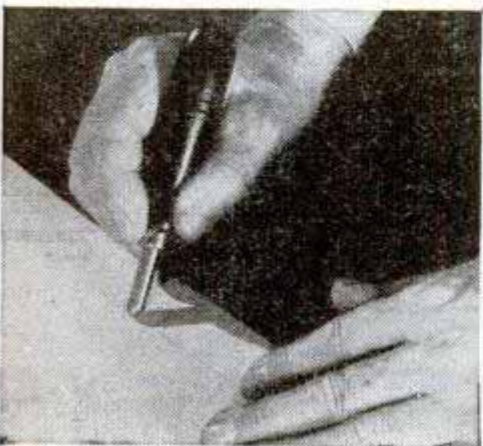
Photo-greeting cards are fun to turn out with Kodak "masks." You start with a pet negative—you use your own printing equipment—all you need besides are the greeting card supplies shown and described here. See your Kodak dealer.

If you are not a darkroom fan, you can still have your own photo-greeting card. Just take a favorite negative to your photofinisher—he will show you a wide variety of attractive designs and do the whole job for you.

EASTMAN KODAK CO., ROCHESTER 4, N. Y.



KODAK EDGE TINTING OUTFIT—2-ounce bottles quick-drying red and green ink . . . four felt nibs and holder . . . Price: \$1.50.



KODAK EMBOSSING GUIDE—easy to use . . . gives each card that custom-made look. Price: 75 cents.



KODAK SERIES 20 GREETING CARD MASKS—each mask is a negative with greeting message and cut-out space for *your* 620 negative . . . 2 designs, horizontal or vertical. Price of each mask: 85 cents plus tax.

KODAK AZO E PAPER—ideal for printing photo-greeting cards . . . double-weight, 4¼" x 5½" . . . straight or deckle edge. Price: package of 25 sheets, 45 cents plus tax; 100 sheets, \$1.60 plus tax.

Kodak

WORKS LIKE THE BIG CRANES!

REAL PLAYTIME FUN for the youngster with this husky Sturdybird! Works like the real ones! Clamshell grab bucket closes with powerful action . . . dumps with a pull on the trip line! Boom hoists and lowers . . . hoist drum's complete with clutches. Cab swivels around. Runs on wide moulded rubber treads. Honest-to-goodness welded steel takes all rough play kids can give! A big heavy job 31 inches long, in bright play colors.

T HIS STURDYBIRD CRANE challenges the skill and imagination of every boy and girl . . . and their big folks, too. They all want to work and play it, indoors and out!



Line production enables us to put a Sturdybird Crane in your home for only \$8.50, express prepaid. Send us check or money order with the coupon below. We'll ship your Sturdybird Crane.

AND the Sturdybird Electro-Magnetic Hoist with battery-powered magnet . . . lifts 10 lbs. Big and strong like the Sturdybird Crane. Express prepaid . . . \$10.00. One of these Sturdybirds . . . or both of them . . . will keep Christmas alive all year!

M ail coupon with your check or money order now so we can get your Sturdybirds off to you before the holiday rush!

TECH-ART, INC., MILFORD 5, OHIO:

Send to me without further charge,

- (Quantity) Sturdybird Cranes at \$8.50 each, express prepaid;
- (Quantity) Sturdybird Electro-Magnetic Hoists at \$10.00 each, express prepaid;
- (Quantity) Matched Sets of both Sturdybirds at \$18.50, express prepaid.

(Ohio residents only add 3% Ohio Sales Tax)

NAME.....

STREET.....

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

Signal "Booster" for S-W Receivers

(Continued from Page 231)

on a wooden dowel rod 1 in. in dia., after which the form is removed and the coils are self-supporting on a plug-in base cut from a standard plug-in coil form, as detailed in Fig. 4. The completed coils appear in photo C. Voltage for the signal-booster unit can be obtained from just about any short-wave receiver that uses 6.3-volt tubes. However, before making connections to one of the tubes in the receiver, check a standard tube chart for that tube's base connections to be certain which are actually the tube heater pins. They are usually the No. 2 and No. 7 pins, but there are exceptions. To obtain the plate voltage in most sets, the "B positive" can be picked up by running a lead to the "screen" prong of the tube socket of the final audio amplifier tube. In practically all a.c.-operated sets "B-minus" is the receiver chassis base. In a.c.-d.c. sets the tube heater voltage must be supplied by a separate 6.3-volt filament transformer. The B-positive voltage can be obtained from the receiver by running a lead to the screen pin of the power tube, and a second lead to the negative side of the filter condenser to pick up the B-negative. Always check these connections with the original schematic circuit diagram of your short-wave receiver. With either a.c. or a.c.-d.c. sets, the chassis base of the signal-booster unit and the chassis base of the receiver must be connected together by means of a short lead, to prevent body capacity effects when tuning.

The booster unit is connected in series with the antenna circuit of your receiver and, in most modern sets, this is very easily done by merely running a short length of 300-ohm Amphenol twin-lead cable between posts A and B on the signal-booster unit and the "doublet" antenna coil posts on the receiver. Before doing this, check the receiver antenna coil to be certain that it is not grounded. If the antenna coil is grounded on one end, or the receiver has no provision for a doublet antenna, use the alternative hookup shown in Fig. 1-A. This 2½ mh. r.f. choke, and .00025 mfd. mica-type fixed condenser (C6) will result in less gain but must be used. To operate the booster unit, tune in a signal on the receiver in the usual manner, then rotate the dial of the booster to the point that gives the loudest signal. The sensitivity of the receiver can be controlled by R3 on the signal booster. Detailed student material list R-360 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

Dependable **CHAMPION**

AMERICA'S FAVORITE SPARK PLUG



The school bus is symbolic of a whole new generation which has never known the necessity for trudging weary miles to school. We are literally a nation on wheels with buses, cars, trucks and tractors playing a vital part, directly and indirectly, in our daily lives. Engines turn and

wheels roll. Spark plugs are a vital factor in keeping these engines operating efficiently and economically. On sheer merit, Champion Spark Plugs have earned the preference of most users because, in a word, they are *dependable*. Champion Spark Plug Company, Toledo 1, Ohio.

FOLLOW THE EXPERTS DEMAND NEW DEPENDABLE CHAMPIONS FOR YOUR CAR

Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network

Smooth-finishing the edges and joints of this handsome sheet-aluminum post lantern was done with a Nicholson Aluminum Type "A" File



"Basement craftsman" who knows his files



Having the right tool for each job not only multiplies the fun of home-workshop hobbying, but also speeds the development of mechanical skill. And no hand tools offer a wider range of applications or conditions than files.

In the Nicholson lines of more than 3000 kinds, cuts and sizes are files designed for use on all kinds of ferrous and non-ferrous materials—including the newer materials, like plastics, magnesium, stainless steel; and for the roughest work down to delicate precision filing, as on jewelry and fine instruments.

Three generations' experience goes into making Nicholson and Black Diamond files in such high quality that it is a pleasure as well as a source of profit to work with them. Their reasonable cost and long efficient life make them *your best buy in files*. At good hardware stores.



NICHOLSON FILE CO.
22 Acorn St.
Providence 1, R. I.



(In Canada, Port Hope, Ont.)



NICHOLSON
FILES FOR EVERY PURPOSE

Ducks by the Acre

(Continued from page 174)

from various poultry diseases. Medicine mash can cure mild cases of sickness, but it is difficult to save many ducks once they become ill. The best over-all preventive for duck diseases is complete sanitation of the grounds, the brooding houses and incubators. All of Warner's buildings are equipped with Westinghouse Sterilamps, ultraviolet-ray lamps which kill bacteria in the air.

Ducks are extremely sensitive creatures, both to change in temperatures and to outside disturbances. A severe thunderstorm can kill baby ducklings by drowning if they are exposed. Sometimes, after a heavy rain, Warner finds hundreds of drowned ducks around the yards. Many of them had just stampeded into the sides of houses and knocked themselves out.

In brooding houses, the slightest footfall sends ducklings skittering away, screeching. Even in maturity they are frightened by a falling leaf or a piece of paper. They bunch together, then march away single-file or in wedge formation after the lead duck, seeking safety. This trait is exploited by duck handlers who drive them easily from one duck house to the next as they grow older.

At night ducks are easily frightened, so farms provide dim artificial light in the brooder houses and in the yards. Artificial light also stimulates the production of eggs in the laying flock. Yet, when in the open, ducks dislike the sun and hover in shaded areas, so duck farms must have ample trees, bushes and overhanging sheds. Despite the utmost care, duck losses average five percent of total production on Warner's farm.

When ducks are 11 to 12 weeks old they weigh between 5½ and 7 pounds, just right for marketing. Ducks are killed on Warner's farm at the rate of 2000 to 4000 daily.

The ducks are scalded in vats containing water heated to just under boiling, to loosen the feathers. Skilled pickers quickly strip the fowl of its feathers in about four minutes. One woman can pick as high as 150 ducks in a 10-hour day, but 100 is a good average. A mechanical picker has been developed and is used extensively in New England. Although it is faster than hand-picking, this mechanical aid has not yet reached Long Island farms. Some duck farmers also pluck the birds by dipping them in hot wax. When it cools and is knocked off, it takes most of the feathers with it.

(Continued to page 240)

NEW

EVEREADY

TRADE-MARK

FLASHLIGHT BATTERIES

*Now last 93% longer!**

**Enough Energy to
Hurl This Daring Miss
Over 100 FEET!**


Imagine!—the girl weighs 110 pounds! Yet the total energy in one tiny "Eveready" flashlight cell—properly expended—is equal to the charge that sends her flying up—up—over the gasping audience, to land over 100 feet away.

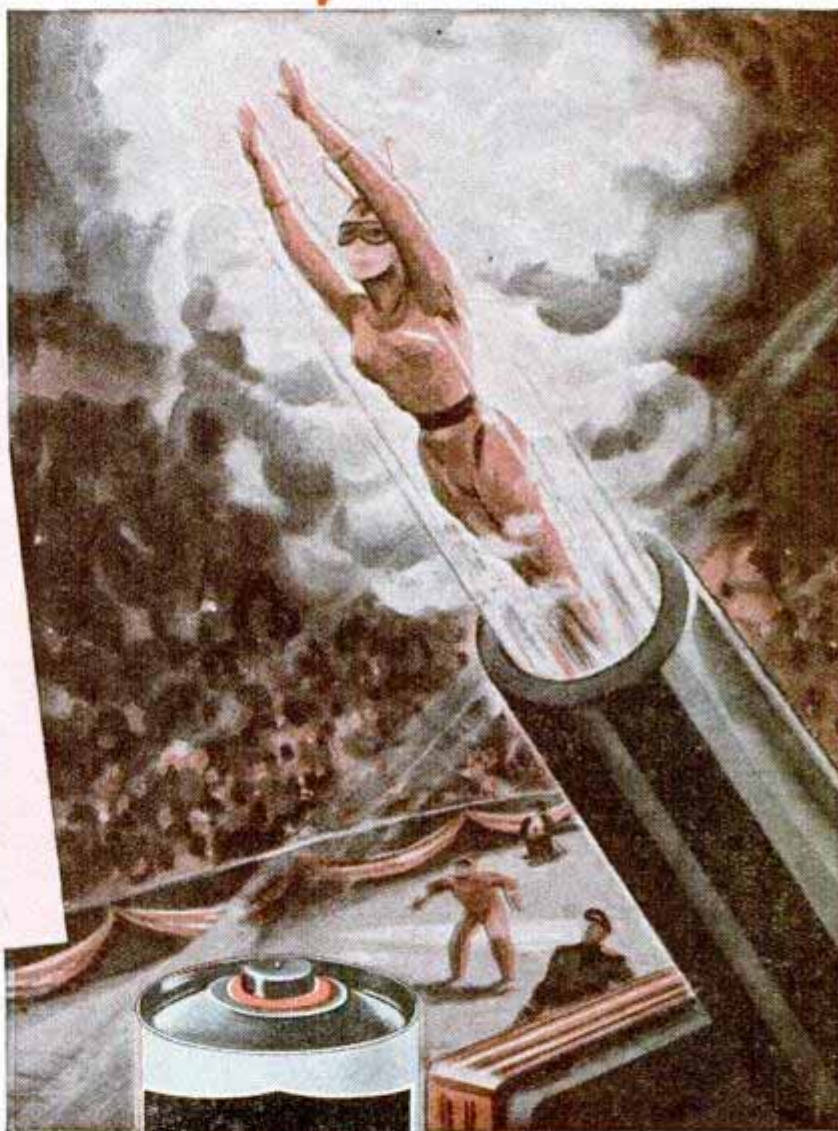
PACKED with new dynamic power... dazzling in performance... durable beyond any flashlight cells you've ever known, "Eveready" flashlight batteries give you the year's greatest energy value. That's a 93% increase over the great record made by pre-war "Eveready" cells... nearly double the life of light. Yet you pay no more.

The registered trade-mark "Eveready" distinguishes products of

NATIONAL CARBON COMPANY, INC.

30 East 42nd Street, New York 17, N. Y.

Unit of Union Carbide  and Carbon Corporation



High Energy

**MEANS BRIGHTER LIGHT,
LONGER LIFE**



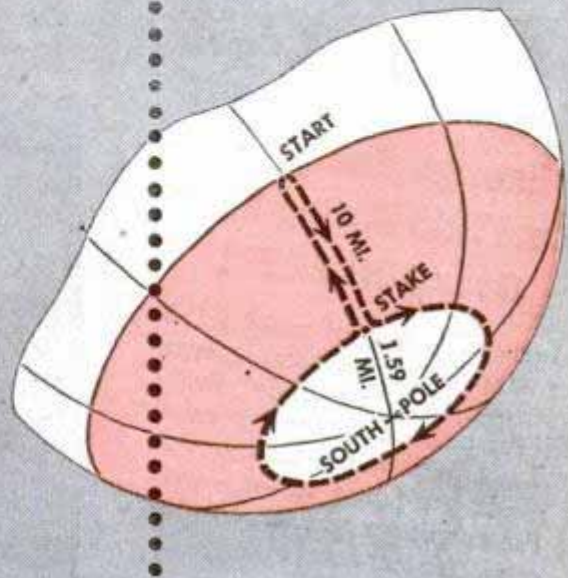
* To you, this means nearly twice the energy... almost two times longer life of bright white light. And it's yours for the pre-war price... still only 10¢!

TEST YOUR SCIENCE

i.q.

Answer to problem on page 105

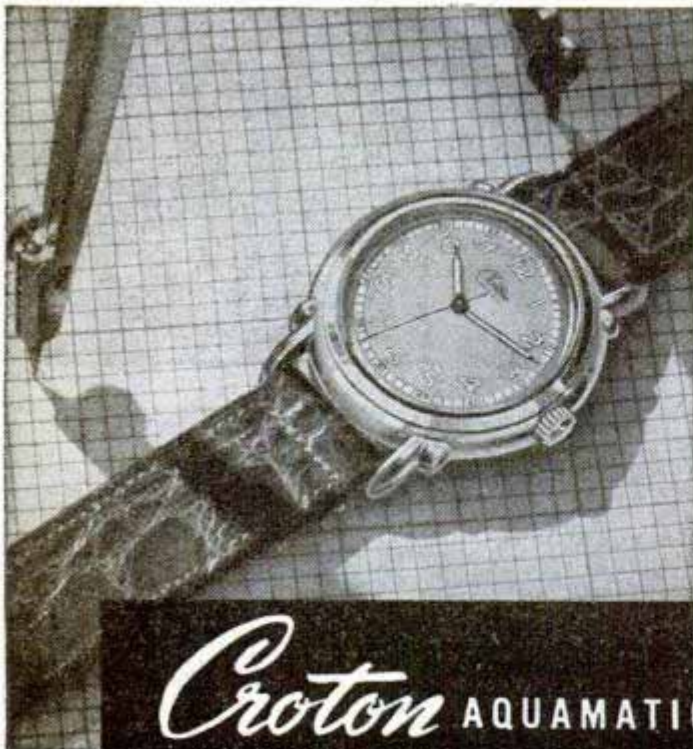
Your problem was to name one of many points on the globe from which you can walk south 10 miles, walk east 10 miles, walk north 10 miles and arrive at your starting point. Here's how: Fly down to the South Pole for your start. From the Pole, walk up any meridian approximately 1.59 miles. Drive a stake there. Using the 1.59 miles as a radius, draw a circle centered on the Pole. This circle is a parallel of latitude 10 miles in circumference. Any point 10 miles north of this circle (and there are a limitless number of such points) is the spot for which you are looking. Wrap up for a 30-mile antarctic hike and prove your answer. From your chosen point 11.59 miles north of the South Pole, walk south 10 miles to the circle you have drawn. Walking due east, you follow the parallel of latitude which is your 10-mile circle. Ten miles brings you back to the same meridian, and you turn north, retracing your steps for 10 miles to your starting point.—By Rex Taylor



13.5% more accuracy without winding

that's what you get with the

CROTON AQUAMATIC



Croton AQUAMATIC

THE WORLD'S MOST CAREFREE WATCH

You're always *on time* because you *don't* wind your watch! Your Croton Aquamatic keeps itself wound just right, by the ordinary motions of your wrist. It can't run down, *can't* overwind. It keeps better time — 13.5% *better time*° than famous hand-wound watches. The Croton Aquamatic quietly and efficiently tends to its own business, while you go about yours. A wonderful idea for a wonderful gift — or for yourself. Made only by Croton — famous since 1878.



AQUAMATIC SHEDS WATER LIKE A DUCK!

Handsome, serviceable — the Aquamatic is certified *waterproof*, before it goes to your jeweler, by United States Testing Co. Inc. Just make sure *only* your Croton dealer opens, closes and services your watch.

Other features — dust-proof, shock-resistant, the dial's easy to read in the dark, *the glass crystal can't shatter!* Only \$57.50, including federal tax.

° 3 Aquamatics were tested against the average of 9 famous watches wound by hand, in a 30-day wearing test by a leading laboratory. Aquamatic proved 13.5% more accurate! Write for free booklet. Croton Watch Co., Inc., 48 W. 48th St., N. Y. 19.

© 1947 Croton Watch Co., Inc.



The RCA Metal Detector "blows the whistle" on any particle of metal that may have crept into the package.

RCA Electronic Metal Detector— arrests "stowaways" in packaged products!

It stands guard over everything from breakfast cereals to after-dinner mints, from cigarettes to cough drops . . . eliminating any bit of foreign metal that might slip by.

It helps American industry—that employs every precaution to assure product purity—to protect automatically the foods you buy. High-frequency radio waves form an invisible wall—sound the alarm, if any metal is accidentally present.

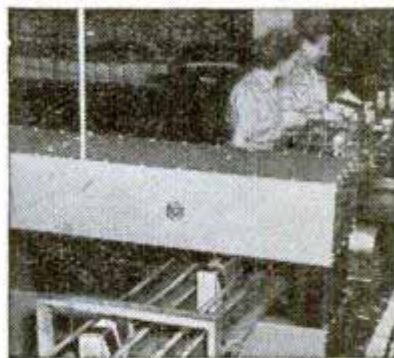
The RCA Metal Detector was developed by RCA product engineers with the co-operation of RCA Laboratories. Moreover, similar pioneer-

ing and research keep *all* RCA products at the top in their fields.

So when you buy anything bearing the RCA emblem—an RCA Victor radio, television receiver, Victrola radio-phonograph, phonograph record or radio tube, you get one of the finest instruments of its kind science has achieved.

"Victrola" T. M. Reg. U. S. Pat. Off.

When you're in New York, don't miss seeing the radio and electronic wonders at RCA Exhibition Hall, 36 West 49th Street. Free admission. *Radio Corporation of America, RCA Building, Radio City, New York 20.*



The RCA Metal Detector operates through a rejection device, or by stopping the conveyor belt, or giving an alarm or signal.



RADIO CORPORATION of AMERICA

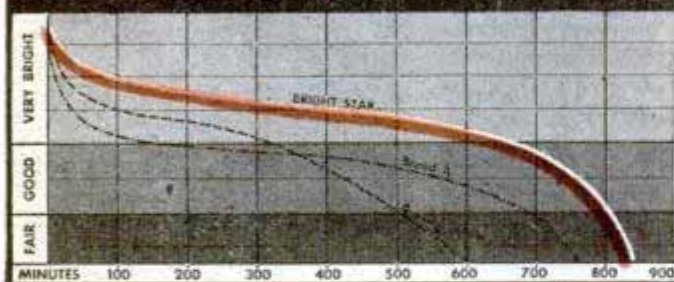
Now! tests prove-

BRIGHT STAR BATTERIES



give more
bright light
longer

Here is your proof!



These results of vital service tests* prove that Bright Star batteries give you more *bright light* longer than two other leading brands tested. Insist on the best—it's Bright Star by test!

*Chart based on laboratory tests conducted in accordance with government standards.

Ask for popular Bright Star model batteries.

BRIGHT STAR BATTERY CO., CLIFTON, N. J.

After picking, feathers are barreled for sale to a cooperative. Six ducks yield a pound of feathers, priced at 91 cents. Duck farmers figure the sale of feathers pays for the complete picking operation. The chances are that your pillows are filled with feathers from Long Island farms.

The cleaned birds are tossed into large cold-water boxes to cool for about three quarters of an hour, after which they are ready for packing. They are packed in layers separated by shaved ice, averaging about 27 to 28 fowl to a barrel. They are then stored in a refrigerator until nightfall when they are trucked into New York City to the Farmers' Commission House, which sells direct to consumers or wholesalers. Warner's farm fills 80 to 100 barrels daily.

There was always a large foreign market for "L.I." duckling which disappeared during the war; but is now opening up again. Large quantities used to go to England, Bermuda, South Africa and many other parts of the world. Wartime conditions caused a wide shift in the market, and in part contributed to the increased demand of recent years. Many municipal and government agencies which bought ducks in small quantities before the war earmarked one fourth of the production for themselves as chickens and turkeys became scarce. Consequently, many thousands of people became acquainted with ducks as a food because of conditions, and duck farmers optimistically expect many of them to continue to like them.

Long Island duckling has earned a place on American menus as a culinary favorite alongside of such stalwarts as Vermont turkey, Virginia ham and Idaho potatoes. So well-publicized have Long Island ducklings been that many ducks grown out of state are marketed as "Long Island Style."

Paradise for Sidewalk Superintendents

(Continued from page 157)

The walking mechanism is controlled by the operating engineer, sitting in his cab. First he flips a switch which engages a jaw clutch to the drag shaft. Then he pushes his left-hand lever to make the huge machine walk.

In digging operations, the engineer controls the various movements in this manner: he pushes the right-hand lever to hoist; pulls back on the same lever to lower the bucket. He pushes the left-hand lever to pay out the dragrope, and pulls the handle toward him to take up the drag.

(Continued to page 244)



Pouring new horsepower into an old engine

WHEN your car begins to show its age, burning oil and losing power, there's a sure-fire way to make it young again. You can pour new horsepower into the old engine and eliminate excessive oil consumption by having it reconditioned and equipped with new Sealed Power Piston Rings. By doing this you restore original power, lengthen engine life, save oil, save gas!

Whatever the make or model of car, truck or tractor, whatever the condition of cylinder wear, there's a Sealed Power Individually Engineered Ring Set specifically engineered to do the best possible job in that particular engine. These sets are made up from twenty-six (26) basic designs of piston rings, proud product of 36 years' use as original equipment by major engine builders. See your Sealed Power Franchise Dealer. Send a postal for illustrated, informative new booklet on 7 ways to save oil. It's free and may save you lots of money. Sealed Power Corp., Dept. G-10, Muskegon, Mich.

For better results 26 Basic Ring Designs

No one piston ring design can meet all replacement needs. Sealed Power Individually Engineered Ring Sets are made up from twenty-six (26) basic ring designs, which permit each set to be specifically engineered to do the best possible job in a particular make of engine.

These ring sets are engineered to save gas without sacrifice of oil economy, to save oil without inducing friction and cylinder wear. Each set gives balanced performance in a particular engine.

Piston Rings
Pistons
Cylinder Sleeves
Valves
Water Pumps
Chassis Parts



© 1947.
Sealed Power Corp.

SEALED POWER PISTON RINGS

BEST IN NEW CARS! ★ BEST IN OLD CARS!

FREE!

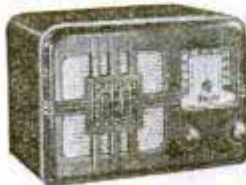


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BIG 164-PAGE
RADIO
CATALOG

Everything in Radio at Lowest Prices!

Here is *everything* you want in Radio! New home radios and phono-radios, Ham receivers and gear, new kits, thousands of parts, tubes, tools, complete PA equipment, diagrams, latest radio books. The most complete stocks anywhere—in one *big* book—all at money-saving low prices!

BUILD THIS AMAZING 5 TUBE RADIO



LOW-COST SUPERHET KIT
Complete with Plastic Cabinet,
Loop Antenna, and Tubes

It's here! The first ultra-modern 5 Tube AC-DC Superhet kit at so low a price! Here's what you get—full broadcast band coverage (550-1600 Kc); built-in loop antenna;

latest 5" PM dynamic speaker; handsome walnut plastic cabinet. Unbelievably easy to build; no special tools required. Sockets are riveted in place on chassis base; just assemble, wire and slip into cabinet. Outstanding for power and tone quality. Highest grade components only. Complete with all parts, tubes and full instructions. **ONLY \$14.95** No. 83-275. Complete.....

GET THESE VALUABLE ALLIED RADIO BOOKS!



- Radio Formulas & Data No. 37-752....10c
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- Rush FREE 164-page Catalog
 - Send Kit No. 83-275
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 - Send Calculators checked above
- } \$.....enclosed

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

FUN TO USE—this fast, easy-to-handle powerful tool for use in home or shop



- Polishing
- Grinding
- Carving
- Drilling
- Buffing
- Plastic
- Glass
- Metal
- Wood
- Bone

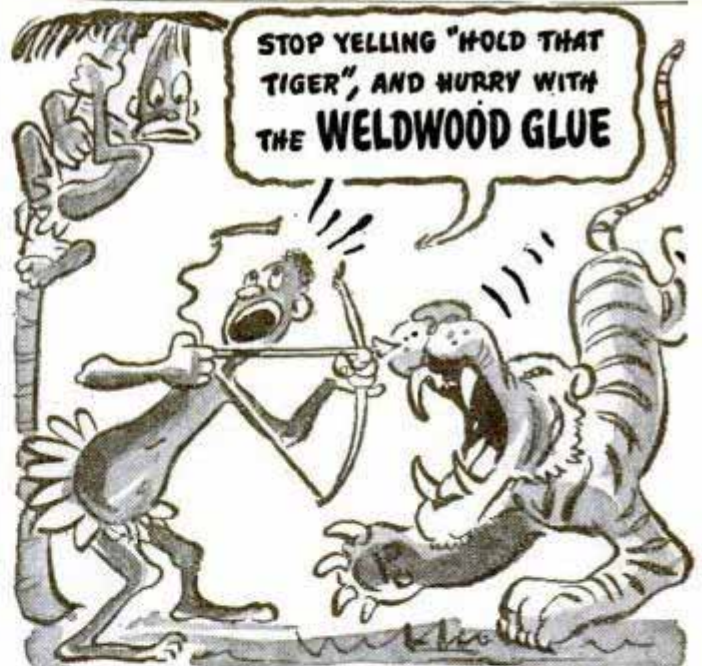
You'll be surprised how many interesting, money-saving jobs you can do with the Bantam Grinder. Balanced for easy handling. Precision-built of quality materials for years of dependable service. Plenty of power—operates on 110-115 Volt AC-DC. Speed approx. 20,000 R.P.M. Internal ventilating fan. Finger-tip switch. Weight only 15 oz. 8-ft. cord and plug. 23 useful accessories. Attractive gift box. Get the Bantam now for faster, finer work, for more pleasure in your work shop.



At your dealers—or order from us today **\$25**
—immediate shipment—postpaid—only

SMALL MOTORS Inc

Dept. 80, 2076 Elston Avenue, Chicago 14



When you want to fix things fast... remember Weldwood Glue. It's quick to mix... easy to use... tremendously strong... stain-free... rot-proof... and permanent. At hardware stores, lumber yards, chain stores.



WELDWOOD
PLASTIC RESIN
WATERPROOF GLUE

United States Plywood Corporation, New York 18, N. Y.

POPULAR MECHANICS

*Before you put
in anti-freeze*



Clean out rust with

DU PONT Cooling System CLEANSER

Don't put anti-freeze into a rust-clogged radiator. Clean out the rust and scale *now* before winter sets in. Just pour a can of DU PONT COOLING SYSTEM CLEANSER into your radiator, run the engine 30 minutes or more, then drain. That's all! It cleans thoroughly without reverse flushing. It's safe, sure, dependable, and easy to use.



Then keep out rust with

DU PONT Acid and Rust INHIBITOR

After cleaning out the radiator, you can keep it free from rust all season by pouring in a can of DU PONT ACID AND RUST INHIBITOR. This neutralizes the acid and prevents damaging rust from forming.



Avoid leaks and loss of anti-freeze with

DU PONT Cooling System SEALER

You can stop leaks quickly and securely—and make the cooling system LEAK-PROOF—by pouring in DU PONT COOLING SYSTEM SEALER. It will not clog the radiator or harm hose or metal parts.

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

NOW TRY Dustless SWEEPING



**Reduce Germ
Laden Dust
Eliminate
Sweeping Compound**

Dustless brushes used with Arbitrin sweeping fluid eliminate up to 97% of germ laden dust and reduce sweeping costs 20%. Arbitrin fluid, poured into a metal reservoir in the brush back, filters through the tufts and keeps dust down as you sweep. Dustless brushes are used in thousands of schools, factories, offices, stores, and institutions. There is a Dustless brush to fit your needs. Write for sizes, styles and prices today.

Milwaukee Dustless Brush Co.
530 N. 22nd St., Milwaukee 3, Wis.
Please send complete facts about Dustless Brushes.

Name _____

Street Address _____

City, State _____



To swing the machine to the left, he steps on the left-foot pedal; to swing right, he steps on the right-foot pedal.

Two sizes of steel rope are used to maneuver the bucket. The hoist rope which raises and lowers the bucket is two inches in diameter, and the dragrope which pulls the bucket toward the machine to scoop up overburden is 2½ inches thick. Altogether, the machine is equipped with about 2000 feet of steel rope.

All operations of the machine are basically simple. The dragline swings around on its circular base by a system of gears and bearings. The engineer steps on a pedal and a motor transmits power to make the desired swing.

The 25-cubic-yard bucket is raised and lowered by the action of a 65-inch drum winding and unwinding the hoist ropes. The bucket scoops up dirt by the action of another drum (70 inches in diameter) winding the dragropes, which pull the bucket toward the machine.

Because of its out-of-the-way location, the mountainous excavator performs its daily feats for only a small audience of workers. But it would be a paradise for the nation's "sidewalk superintendents."

Industry Has a Million Eyes

(Continued from page 151)

—today rates as industry's basic metallurgical tool. It is of major importance in studying the effect of heat treatments, forging and other processes on metals; photomicrographs provide valuable data for study to improve machining, welding and cutting-tool performance and also give a standard method for quickly comparing the quality of materials and processes with standard specifications.

Going further than ordinary photomicrography is the electron microscope which shows structural details of materials far beyond magnifications previously regarded possible. Using a stream of invisible electrons instead of a beam of visible light to obtain initial magnifications of 20,000 times, these can be increased to 200,000 diameters by photographic means.

Although only recently made available to industry and research, electron micrography has revealed new and heretofore unsuspected facts on the internal structure of metals; has cleared up certain baffling problems about the abrasion and corrosion of metals; is being used to improve the flavor of foods; and in research on solvents, oils, dyes and rubber. In the field of medicine, electron micrography is

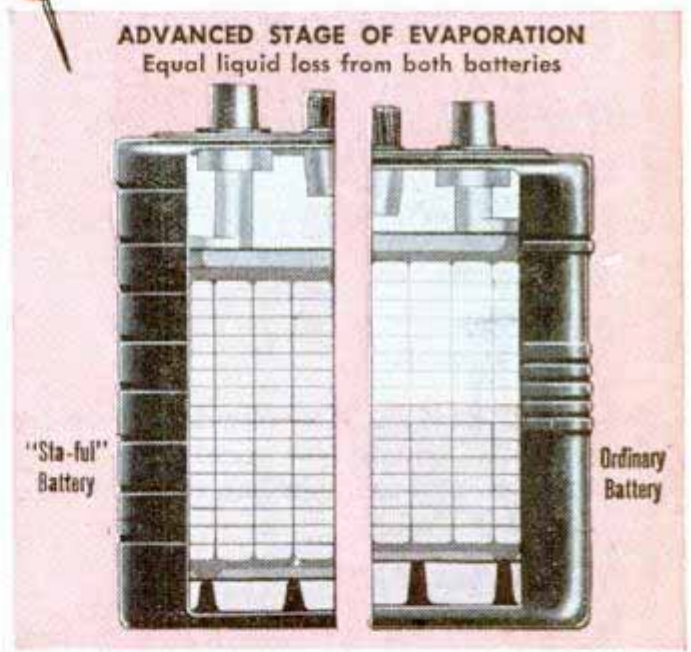
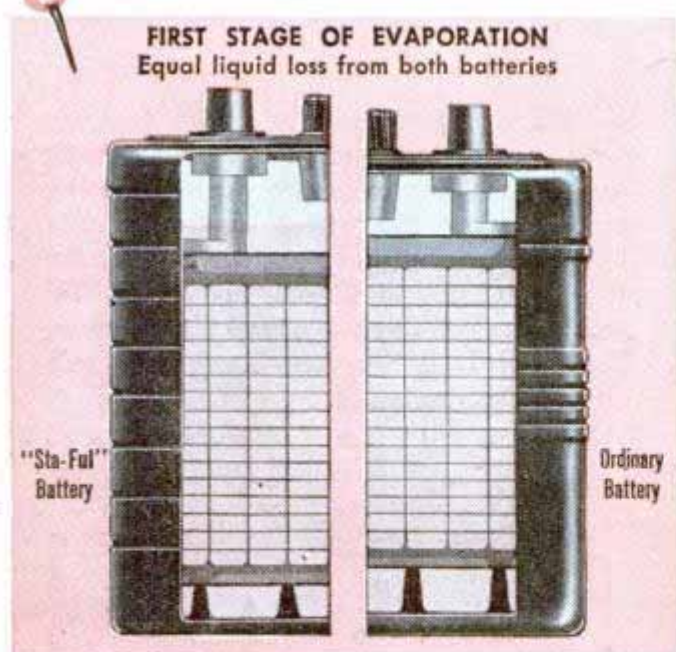
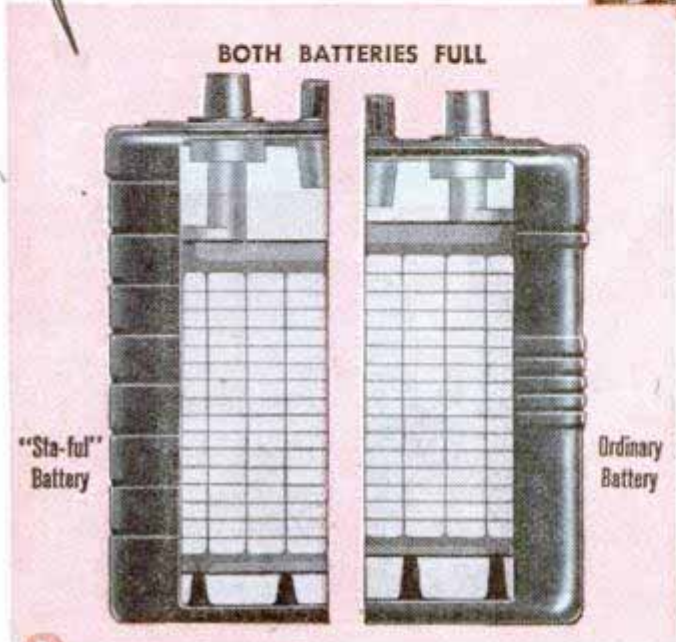
(Continued to page 248)

HERE'S WHY NEW AUTO-LITE "Sta-ful" BATTERY...



needs water only

3 times a year!*



LASTS LONGER TOO! *In normal car use, because of "Sta-ful's" extra liquid reserve, plates are kept submerged to help deliver full life and power, when the same liquid loss leaves the plates in ordinary batteries exposed and inactive. This "Sta-ful" principle, oversize electrical capacity, plus Fibre-glass insulation, give longer life than batteries without Auto Lite "Sta-ful" features.

AUTO-LITE BATTERY CORPORATION
Toledo 1, Ohio

AUTO-LITE

Sta-ful
BATTERIES



"My Dad's smarter'n your Dad"



BETTY:He is not!

BILLY:He is too. How about that wrench your Dad bought last week? It's already broken—and today he had to borrow one from my Dad.

BETTY:What of it?

BILLY:Well, if he'd bought a *good* wrench, like the one *my* Dad has, it wouldn't be broken now.

BETTY:Oh, you think you're pretty smart, don't you?

BILLY:I'm not saying *I'm* smart, but my Dad is. He says people who buy tools at bargain counters are just throwing money away. He gets all his tools at the hardware store, and he always looks for the brand name before he buys. He wouldn't even pay *one penny* for a wrench like your Dad bought—because there's no brand name on it.

Your **HARDWARE DEALER** sells **QUALITY** tools
and hardware... Buy from HIM



POPULAR MECHANICS

IT'S ALWAYS
FUN-
TIME!



When You Own a HARLEY-DAVIDSON

OWNING a Harley-Davidson opens a whole new world of thrills for you! Anytime you get the urge you swing into the saddle and go where there's fun and excitement! The whole outdoors is yours to enjoy — you can do more and see more — as you go "adventuring" on evenings, holidays and weekends. And what a continual round of

good times awaits you as you join other fun-loving riders on pleasure trips and gypsy tours — or take in race meets, hillclimbs and other thrill-packed events that make motorcycling the world's greatest sport! See your Harley-Davidson dealer NOW — and mail the coupon today!

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Motorcycles



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Send me free copy of 24-page ENTHUSIAST Magazine, filled with thrilling motorcycle action pictures and stories; also catalog.

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

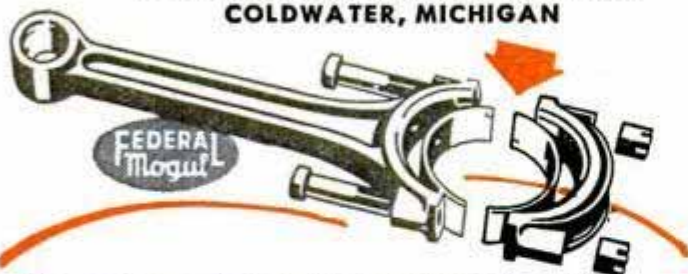
Performance goes up in smoke...

when worn
connecting rod bearings
cause oil pumping



Smoky exhaust behind signals *engine trouble ahead!* It warns that, inside your engine, worn bearings are permitting excess oil to enter combustion chambers. There it burns to motor-fouling, performance-stealing carbon. At first sign of smoky exhaust, replace worn engine bearings with genuine Federal-Mogul bearings, *engineered for the job of oil control.* They restore power, pep and economy! *Ask your mechanic!*

FEDERAL-MOGUL SERVICE
DIVISION OF FEDERAL-MOGUL CORPORATION
COLDWATER, MICHIGAN



Replace in sets with Genuine
FEDERAL-MOGUL
Oil-Control Bearings

being hailed as a new and potent weapon in the fight against such diseases as cancer and the common cold.

In one branch of engineering, stress studies recorded on film are being used extensively to show the behavior of experimental parts—such as car parts of radical design—under working conditions. A scale model of the object to be tested is made of a transparent plastic. Different stresses are applied and then—by viewing the model through a polariscope—a pattern of light and dark bands can be seen and recorded with the camera. A study of these film records enables engineers, draftsmen and others to shorten the time needed to design and develop new parts to the point where they can be safely incorporated in planes, cars or trains.

Radiography—which uses X-rays and gamma rays—permits foundrymen, engineers and designers to look right through solid parts and study in detail the structure of large parts. Before this tool became generally available, the piece under observation—a crankshaft or cylinder block—had to be cut into pieces if a study of its interior was to be made. Of course, the piece had to be scrapped after the study was completed.

Now, radiography permits the non-destructive examination of such things as welds and castings for points of weakness and soundness. Its use in foundries alone has saved millions of dollars.

The uses of photography today run into the scores. They range from the Recordak microfilm process of putting bulky reports, drawings or charts on tiny rolls of microfilm with a saving of 98 percent in storage space to General Electric's new speed camera which takes pictures at a millionth of a second. The G.E. camera has built-in developing equipment and produces a finished photographic projection within 30 seconds.

A whole new science is developing around the use of photography in law enforcement. Photographs of skid marks in traffic accidents; of evidence taken at scenes of crimes of violence and arson; photographs of death-dealing weapons and of fingerprints—all of these are helping law-enforcement officers gain convictions.

No story of cameras at work could be complete without some mention of teaching "know-how" by "show-how" with slide films and motion pictures. Tests have proved that films are the most effective method of teaching. Thousands of training films were used during the war. Manufacturers and educators are now turning to films to teach people everything from the classics to how to sell can openers.



**MORE
CAPACITY**

**MORE
DURABILITY**

**MORE
VERSATILITY**

**MORE
POWER**



A handgrinder that's
really more than one tool!

The Sensational New Dumore Duplex makes your work easier, faster and twice the fun!



Flexible-shaft attachment doubles the usefulness of your Duplex.



The Duplex can handle 1001 different jobs as a hand tool.



Bench stand converts your Duplex into a third tool.



With a toolpost bracket, your Duplex serves as a lathe-grinder.

If you want a good handgrinder — get a Dumore!

Here's the handgrinder you've always wanted for your workshop — the tool that gives you *more* of everything you want, than any other handgrinder. Its full 1/14 HP motor has the extra power for "heavy" jobs. Its extra-capacity chuck takes all 3 tool sizes — 1/4", 1/8", 3/32".

With a simple, easy-to-use attachment, your Duplex becomes a flexible-shaft tool. Other attachments convert it instantly for bench or lathe work.

Think what you can do with the extra

power, capacity, and versatility of the Dumore Duplex! Work in wood, metal, and plastics is faster, easier — and twice the fun! And the Duplex costs no more than an ordinary handgrinder: 27-accessory Deluxe Kit (as illustrated) — \$27.50; 9-accessory Standard Kit — \$19.75; attachments extra.

The powerful Duplex is the perfect gift for any hobby-minded man or boy. See it in your local hardware store today — or send in the coupon below!

Satisfaction guaranteed — or your money back in 10 days!

Tear out this coupon and mail today!

The Dumore Company, Dept. K-51, Racine, Wisconsin

Please send complete information on Duplex Grinder.

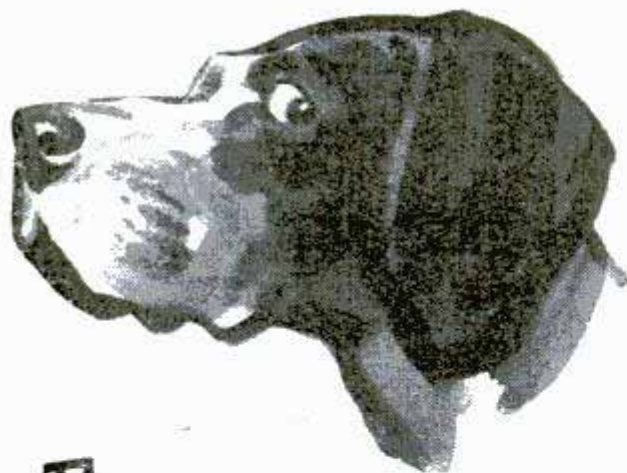
Send me Deluxe Duplex Kit (27 accessories); \$27.50 enclosed.

Send me Standard Duplex Kit (9 accessories); \$19.75 enclosed. Shipping charges C.O.D.

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Sergeant's SURE SHOT Capsules kill worms fast and leave me feeling like my old self again. They're safe and dependable, too.

Pups, and small dogs weighing less than 10 pounds, get the same sure relief from worms with Sergeant's Puppy Capsules.

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Get this catalog for your shop. It lists and shows a wide variety of tools and materials—some hard-to-get items in addition to a big 20 page section on books and project information. A gold mine of practical help. Shows how we test and approve all materials and tools in our own shop before we offer them to you—your assurance that they are tops in quality—everything fully guaranteed or your money refunded. Hurry to get this catalog. save money with our new Book Dividend Plan. Send 25c today—do it now, to

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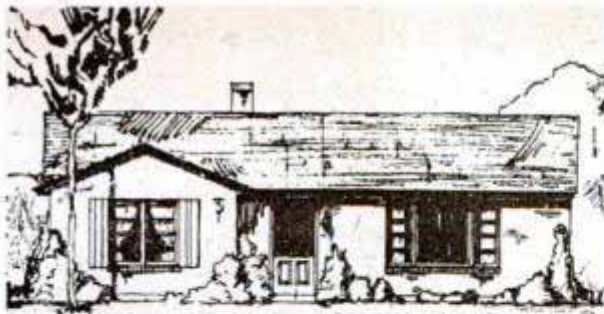
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No Priority Necessary!

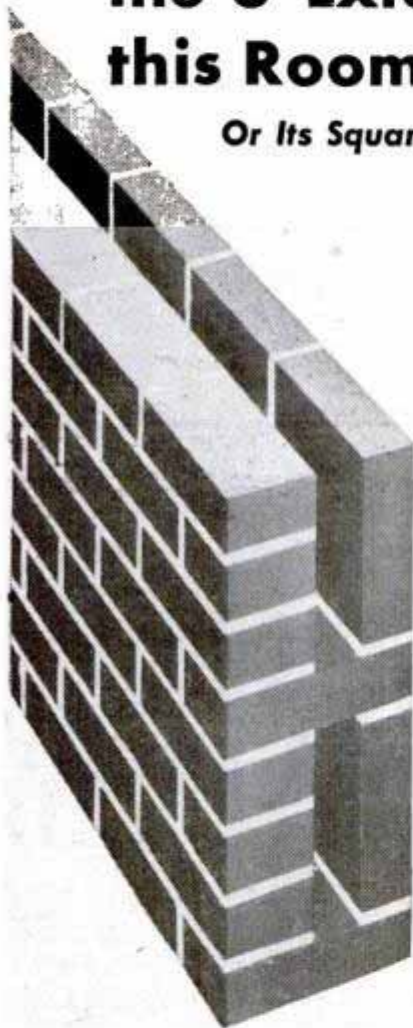
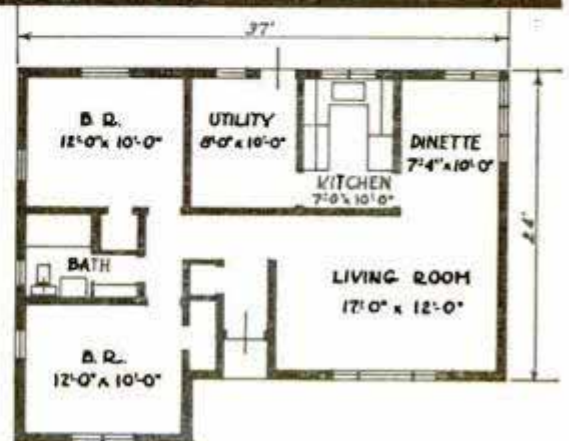


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**Sufficient to Build
the 8" Exterior Walls of
this Roomy Bungalow**

Or Its Square Foot Equivalent



**Dunbrik and Dunstone combine to
create new standards of Colorful
Beauty, Comfort, Long Life . . . for
amazingly low cost of materials**

Here's wall construction at a new peak point of *practical permanence*. All the long-life endurance values of solid 8-inch masonry, combined with a series of 2" wide horizontal chambers which imprison dead air to provide vital insulation.

Face Dunbrik on the outside—in a wide selection of smart colors. Dunstone for

back-up, in a size to fit the job. The two securely tied by a bonding course of 8" x 8" Face Dunstone.

This construction opens up tremendous new opportunities for building contractors and operative builders in the low-cost home field. Especially because it is directly in line with the swing toward masonry.

*Based on a national average selling price of 22¢ per square foot for Facing units, and 15½¢ per square foot for Back-up. May vary slightly according to local costs of raw materials.

Dunbrik and Dunstone are produced by a country-wide chain of regional plants operating under franchise. Write us direct for name of manufacturer nearest you.

New territories for local manufacturing are being arranged. If interested in this opportunity, wire or write for reservation.

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W. E. DUNN MFG. CO.
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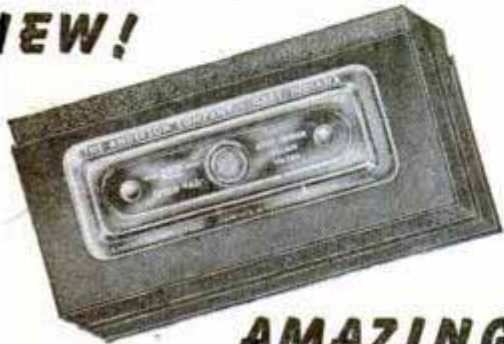
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ANCO[†]

SPEED PAD

gives you a
TRULY CLEAN WINDSHIELD
at the gas pump

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AMAZING!

Removes . . . swiftly and gently . . . from your windshield . . . all stubborn film, bug smear and other obstructions to safe driving vision. Uses only water . . . no chemicals. Leaves glass film-free . . . and crystal clear. Eye strain . . . FILM FATIGUE . . . a serious driving hazard. GONE!

DON'T BLAME YOUR GAS-PUMP MAN!

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WHO tells HIM?

After all, YOU have a lot to gain . . . in safety and in restful driving comfort. So why not YOU tell HIM . . . about this amazing new ANCO year-round device? Show him this ad. He'll win friends . . . with Speed Pad.

Yes . . . he can get . . . from his ANCO distributor . . . an extra ANCO Speed Pad . . . for your own convenient use . . . in cleaning your windshield . . . or your windows and mirrors at home. And he can equip your windshield . . . quickly . . . NOW . . . with keen new ANCO Wiper Blades and Arms . . . to KEEP that windshield CLEAN . . . in storms ahead. Get yours today!

May save you a costly smashup!

[†]Trade Mark Reg. U. S. Pat. Off.

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Quality Protected Under Fair Trade Laws
ANCO Patented Products—Patents Make Jobs

THE ANDERSON COMPANY
Established 1918
GARY, INDIANA

There's Magic Up Your Sleeve

(Continued from page 141)

are able to pull all sorts of things out of the cylinder. Half a dozen thin silk flags, feather fans, dollar bills, neckties, and other small objects seem to be drawn out at will.

You can buy this apparatus at a magic store or build it yourself from the accompanying diagram. The cabinet is of plywood, painted flat black inside. The open metal cylinder that fits inside the cabinet is painted white or some other light, bright color. Resting inside the cylinder is a load chamber that is covered with black velour and that contains the objects you will materialize. They are there all the time, invisible to the audience.

The load chamber is concealed by the cylinder that surrounds it when you pick up the cabinet. When you replace the cabinet and pick up the cylinder the audience still can't see the load chamber because its black velour covering blends in perfectly with the black interior of the cabinet.

The load chamber consists of another metal cylinder, $\frac{1}{4}$ inch shorter and about $\frac{1}{4}$ inch smaller in diameter than the brightly painted cylinder that fits over it. The chamber should be heavy enough to resist being tipped over accidentally and it should be open only at the top.

When your stunt is over you may pick up the cabinet in one hand and the visible cylinder in the other, a thumb or forefinger holding the load chamber in place inside the cylinder at the same time. Nothing is left behind and the illusion is perfect.

A simple little trick that will intrigue and exasperate your friends is performed with a short length of cotton clothesline and an ordinary small-necked vase. You merely push the end of the clothesline into the vase and turn the vase upside down. The clothesline should fall out when you release it, of course, but it doesn't. Then you grasp the free end of the line and slowly raise it, letting go of the vase. To everyone's surprise the vase dangles at the end of the line and you can swing it to and fro or rotate it in circles.

It won't work for anyone else even after they carefully examine the rope and vase. There's one little gimmick needed for the trick that they don't have, and that is the small cork ball that you placed in the vase before you started the performance and that you palmed in your hand before passing the vase around. The cork ball automatically acts as a wedge when you stuff in the clothesline and turn the vase over. Then, as long as there's tension on the

(Continued to page 256)



See and Hear



LIONEL TRAINS in Action

This year not alone do we offer you the 32-page full color catalog, but we have provided a Sound Effects Record as well so you can HEAR LIONEL Trains whistle, and thrill to the excitement of LIONEL model railroading. The new LIONELs are simply out of this world. See them! Hear them!



SPECIAL OFFER

For 25c we'll send you the 32-page full color catalog, the sound effects record with narration by Bill Stern, famous Sports Commentator, also a 32-page "FUN With LIONEL" book, a R.R. Guide Wall Chart, and an ideal layout Blue Print. It's a grand package!



SEE THEM —



LIONEL R. R. GUIDE



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LIONEL TRAINS

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Please send me offer checked below. Complete special offer of Catalog, Sound Effects Record, Fun Book, Wall Chart, and Ideal Layout—all for 25c.

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a new
extra "car"

for only
\$249⁵⁰



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SERVI-CYCLE IS AMERICA'S FIRST AND FOREMOST POWERCYCLE!

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UT-10A Press f.o.b. factory \$28.25



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ONE-MAN SAWMILL LESS THAN \$200

Easy To Turn Trees Into Money

Makes lumber, ties, shingles, crates, lath, studding, siding.



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in 10 to 24 foot

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MECHANICAL FEED, accurate set

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Thousands used for commercial sawing.

Pays for itself quickly. Send post card today

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You're really set for good-looking work comfort when you wear a Big Yank navy-blue cotton suede shirt. You get features like wet-resistant cigarette pocket, elbow-action sleeves, strainproof yoke—many other exclusive benefits. Coupled with Big Yank corduroy pants with the reinforced crotch, you've got yourself a double guarantee of rugged, cool weather comfort! Full range of sizes at better stores.



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8" FLOOR MODEL TILT-ARBOR SAW

**UNCONDITIONALLY
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1 YEAR**

Complete as shown with Trans-axial Ball Bearing Motor Drive, Ball Bearing Saw Arbor, Table including extension 18" x 25", Aluminum Fence & Saw Insert, Complete Mitre Gauge, 3 1/2" steel column and cast iron base, Precision segments on mitre gauge and cradle.

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TILTS
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TABLE
STAYS
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\$79.50 F. O. B.
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**UNUSUAL
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BENCH MODEL, \$59.50
Shipping Wt., 118 lbs.

Cast iron table extension bracket furnished. Will support plywood top much larger than 9" x 18". Motor pulley and belt furnished. Blade & Motor NOT included. Overall height 35 1/2", Shipping Wt. 156 lbs.

AMERICAN MACHINE & TOOL CO. Inc.
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Write for free illustrated folder.

MARGIE

**DOES THE COLD
BLOW IN?**

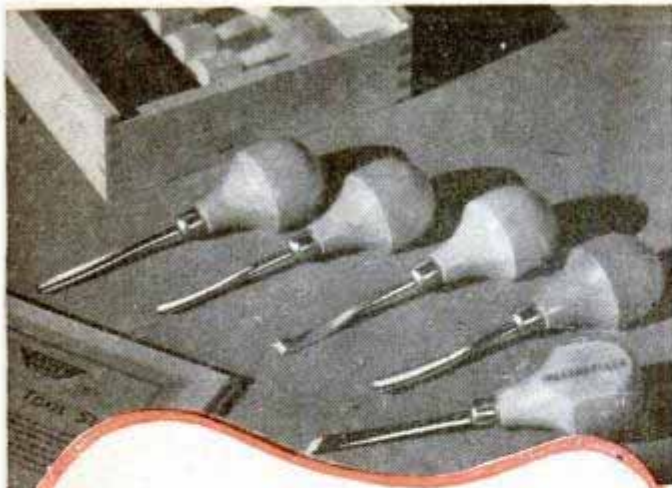
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STRIP
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Mortite**

KEEP WARM — SAVE FUEL

Don't put up with dangerous, drafty zones in your home when it's so easy and inexpensive to weatherstrip with Mortite. Simply press pliable Mortite around windows, doors, baseboards, etc. It keeps cold out, keeps heat in, shuts out dust and dirt, too! Mortite adheres to any clean, dry surface. No tools, no tacking needed. Anyone can apply it.

3 Sizes: 29c - 98c - \$1.25
Higher cost of the Rockies and Canada
Get at stores or write for free circular

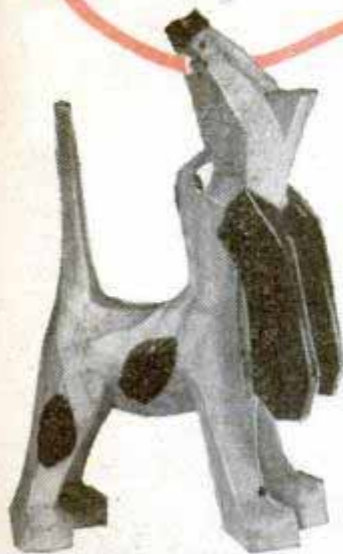
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Carve Real Gifts for fun and profit

Pleasure and profit are yours when you work with a Millers Falls Carving Tool Set. With these high-quality tools you can carve wood and linoleum blocks into a variety of useful or fun-provoking objects. Their fine quality, heat-treated steel blades take and hold a razor-keen edge.

You're your own gift-maker with a carving tool set — so get ready for Christmas by carving animals, toys, model airplanes and ships the children will love. Print your own colorful greeting cards from linoleum blocks you can cut yourself. And remember Millers Falls carving sets make fine gifts themselves — for fellow craftsmen.



See Millers Falls carving tool sets at your hardware dealers.



MILLERS FALLS COMPANY
GREENFIELD • MASSACHUSETTS

line the cork ball keeps the rope and vase locked together. With practice you can slip the ball in and out of the vase with no one being aware of it. You can use almost any small vase, or obtain the apparatus at a magic store.

Let me suggest that you never give away the secret of any trick that you perform successfully. All of us like to be fooled.

Peter Godfrey, the movie director who is a serious student of magic, ends the shows that he occasionally puts on with a mystifying illusion that has even his fellow magicians guessing. A chromium framework something like a hammock is lowered onto the stage from overhead and Godfrey asks his beautiful wife, who acts as his assistant, to lie in the hammock. He drapes a bit of net over her and then hoists the hammock 20 feet in the air by means of a rope.

He calls up to her, "Are you there?" and in reply she reaches out a hand from the hammock and waves it.

"Then go!" he commands with a clap of his hands and to everyone's horror the hammock crashes to the floor. Godfrey walks over and picks up the gown his wife was wearing. That's all there is. His wife has utterly disappeared. That's an illusion his friends would like to understand.

Policing the Bering Sea

(Continued from page 133)

vessels. For the Department of Justice it maintains "floating courts," performs the duties of a United States marshal and enforces immigration laws. For the Department of the Interior it conducts sociological surveys of Alaskan villages and makes recommendations on living conditions. For the Department of Agriculture it enforces game laws relating to the protection of bird life. For the Department of Commerce it provides transportation for steamboat inspectors. For the Post Office Department it carries the U. S. mail.

In 1939, when war threatened, the Coast Guard's Bering Sea Patrol was entrusted with enforcement of the Neutrality Act and was charged with guarding against espionage and counter-espionage. Cooperating with the Navy and the F.B.I., the Coast Guard began to scrutinize carefully ships of other nations that wandered into western Alaska waters.

When Jap Zeros screamed down on Pearl Harbor, the Bering Sea Patrol was discontinued and the Coast Guard became a part of the Navy. Because of its special knowledge of Alaskan waters, it played an

(Continued to page 260)



MOTO-TOOL ★ The "Pocket-Size Machine Shop"



PRE-WAR PRICES STILL PREVAIL

Moto-Tool Kit No. 2 with 23 accessories (high speed steel cutters, grinding wheels, polishing accessories) and heavy-duty professional Model 2 Moto-Tool in natural-finish, hardwood case . . . \$23.50 (Items purchased separately would cost about \$30.00; you save \$6.50.)
 Moto-Tool No. 2 with one emery point \$16.50.
 Moto-Tool Kit No. 1 with 34 accessories and Model 1 Moto-Tool in wood case \$17.50
 Model 1 Moto-Tool with one wheel point . . . \$9.95.

A TOOL THAT PACKS EXTRA YEARS OF PLEASURE

... LOOK AT THE REST, THEN BUY THE BEST
 Here's a tool to please a man's heart . . . one that holds promise of endless creative hours. Dremel Moto-Tool is a "war-veteran" . . . used by all branches of the Armed Forces in far-flung repair bases . . . helped to set production records at General Electric, Westinghouse, Remington Arms, Ford and others. Hobbyist or expert craftsman, first choice is Model 2 Moto-Tool Kit with its handsome felt-lined, highly finished wood case with rows of tools begging to be put to work. Write for FREE catalog of Moto-Tool attachments and accessories.

14 REASONS WHY MOTO-TOOL'S A BETTER BUY

- Housing has "penell-type" finger grip
- Instant-action, wrenchless chuck
- Oil-less (sealed) trouble-proof bearings
- Patented automatic chuck-lock pin
- Over-size armature shaft, hardened, ground and polished
- 110 volt, universal type (AC-DC) motor
- Easily replaced commutator brushes
- About 27,000 R.P.M. cuts cleaner . . . saves cutters
- Sliding snap-type switch
- Handy hanger hook
- Sturdy, shockproof bakelite housing
- Dust filtered, air-cooling system
- Weighs only 13 oz. . . . shaped to fit the hand
- Dynamically balanced for vibrationless operation.



Do These Better - Faster

Approx. 27,000 R. P. M.

- Cleaning
- Rasping
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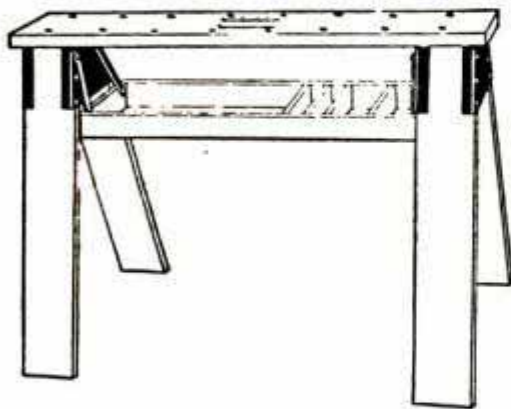
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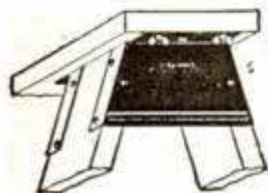
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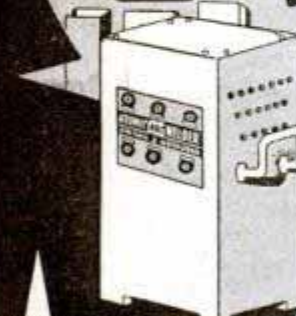
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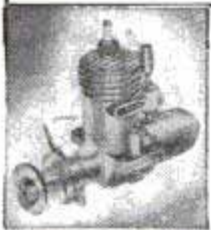
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important part in the war of the North Pacific. Its cutters transported troops, escorted vessels, carried ammunition and war cargoes. Some of its ships were assigned to the Northern Surface Search Group Unit and stood special submarine-patrol duty in the Bering Sea. The U.S.S. Arthur Middleton, a transport manned by Coast Guard officers and crew, took part in the occupation of the island of Amchitka.

Now, wartime activities are at an end and the Coast Guard is under the Treasury Department once more. But its peacetime job patrolling the U. S.-Russian border is an important one. Alaska is fast becoming the crossroads of the world.

Fancy Freighters

(Continued from page 104)

A \$1,000,000 cargo rides securely at anchor, tied to a cottonwood tree on a lonely Mississippi River bank.

Maybe you've heard about the system of government shore lights that has simplified river navigation so that the pilot simply lines the bow of the boat on one light and then another to stay in the channel. You ask the pilot about them.

"It's true," he says, "that the government has helped tremendously with its lights and the nine-foot channel. But piloting a modern steamboat isn't as simple as it might appear. The pilot still must know how to read the surface like a map."

He points to a raffle some 50 feet to port. "That raffle there," he says, "marks a hidden reef. You easily could wreck boat and cargo on it. And negotiating these hairpin bends of the lower Mississippi isn't as easy as it might look."

Maybe sometime during the trip one of the pilots will put your hands on the steering levers and say, "You steer for a spell. Just keep the jackstaff trained on the light ahead." Then he disappears into the lounge.

Soon you notice that the jackstaff or forward flagpole is veering slightly off the shore light ahead. You push the port levers but they don't budge. It seemed easy when the pilot did it.

You put your weight behind the levers and shove. They move. You feel a sense of power as the giant tow responds to your direction by slowly altering its course.

Suddenly you notice you're approaching a bend, a very narrow bend. You look at the long tow, then at the bend. It seems impossible that boat and cargo can be steered around that horseshoe curve.

"You'd better take the controls," you call to the pilot.

"Guess we'll flank it," he says.

(Continued to page 264)

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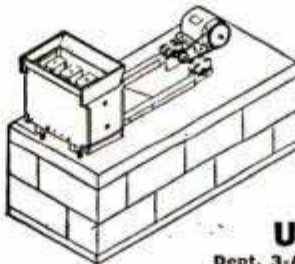
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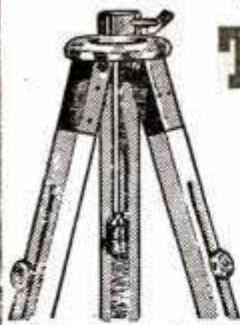
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He cuts off the engines, allowing the big tow to drift with the current so that the fast water catches the head of the tow and swings it gracefully around the curve with only feet to spare between bank and barges. Then he turns on the power again.

The glamorous days when the river packet plied the nation's rivers are gone forever. But despite the many modern inventions and improvements, the character of the swashbuckling river man remains much the same, and there's still plenty of adventure and excitement in river navigation.

Science HQ of the Navy

(Continued from page 92)

final evaporation point is reached they disappear immediately and completely without leaving any waste products to clog up the machinery. Cold-weather tests of these oils and greases were made in the antarctic on the recent Byrd expedition. They proved ideal for the lowest temperatures encountered and are looked upon as one of the answers to problems of lubrication in stratosphere flying of the future. The oils naturally have a considerably wider temperature range than the greases.

A particular advantage of the new substances, the Navy scientists say, is that they can be made to order for the particular use for which they are needed. They also can be made on the production line. A pilot line has been set up at the laboratory. The great advantage is that there is no lost motion. Ordinarily products obtained from petroleum need a lot of chemical juggling before they can be turned out to meet a particular specification. With the synthetic products the chemist knows precisely what he will get when he starts working on a batch. At present, the products are considerably more expensive than those from petroleum and would be used only for special purposes. The high price is due largely to the fact that they are made on a small scale. With quantity production, it is likely that the price will be lower.

Among the major jobs of the Naval Research Laboratory at present is that of analyzing and interpreting the records obtained by instruments carried on V-2 rocket flights above the stratosphere and into the hitherto unknown region of the earth's atmosphere. To date there have been some significant findings.

For example, about 75 miles above the earth the temperature is about 100 degrees Fahrenheit. It rises from approximately 20 below at an altitude of 50 miles,

(Continued to page 268)

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Regardless
of loss!

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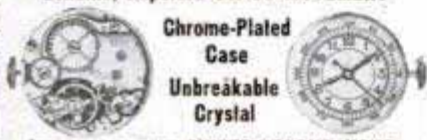
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 Ship C.O.D. I'll pay postman \$..... plus postage.

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	1947 PETITE LADIES' MODEL, Imported Swiss Watch.	\$6.98 plus 70c tax	
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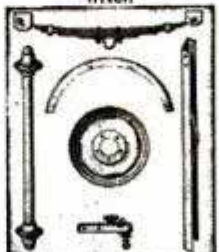
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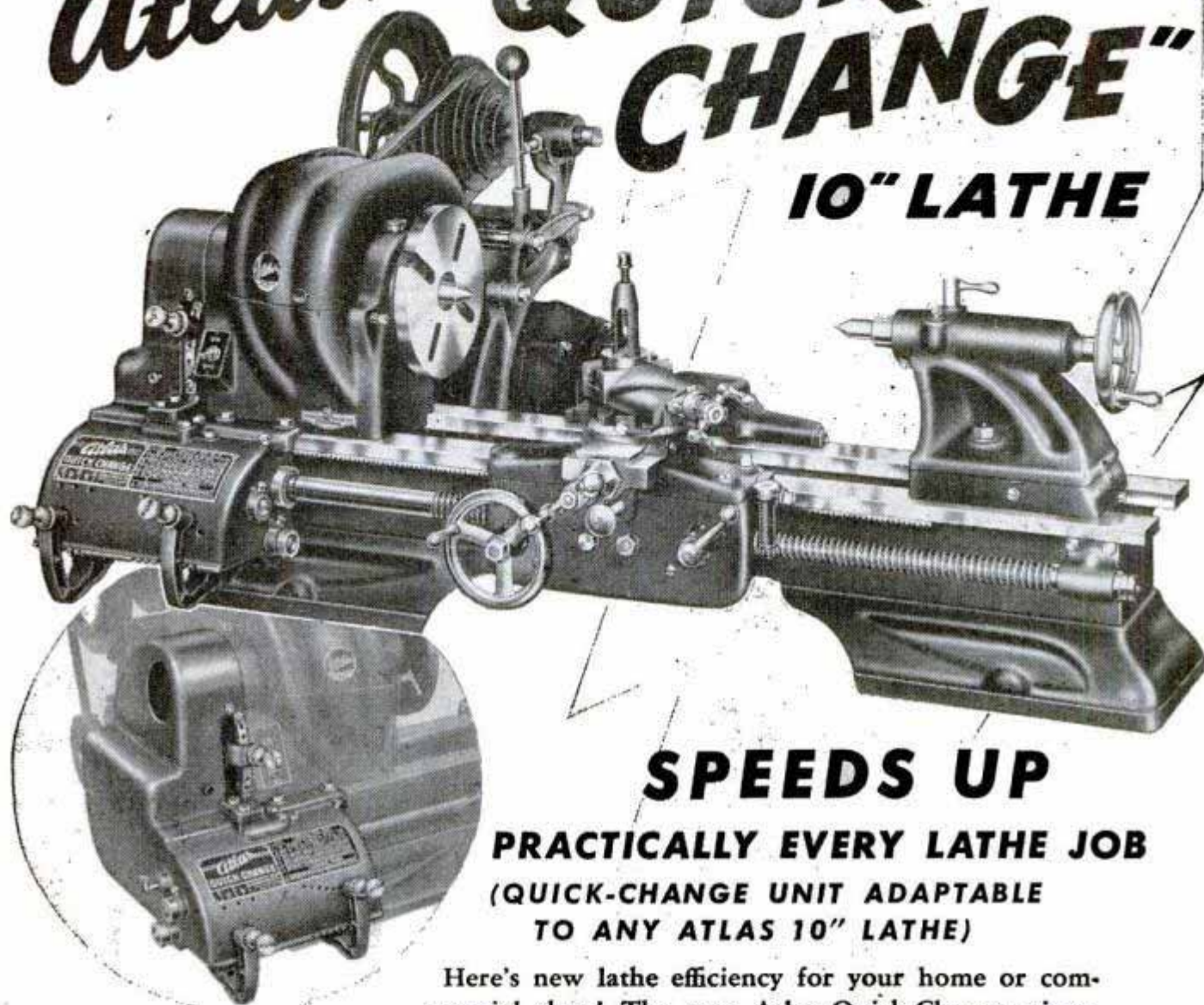
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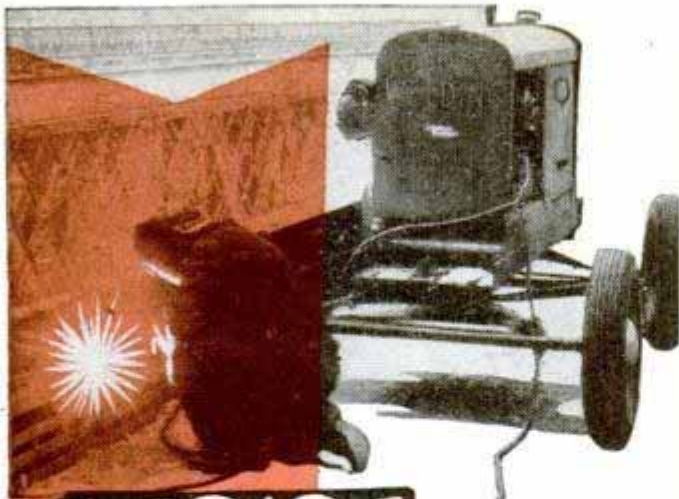
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after having dropped from approximately 35 above at 40 miles. This second "inversion layer," or atmospheric stratum where the temperature goes up rather than down with increasing altitude, was almost entirely unexpected. The findings support sensational theories that, after a certain critical distance above the earth, it gets hotter and hotter. The probable explanation, the Naval Research Laboratory scientists say, is that at high altitudes there is an enormous absorption of the shorter, invisible, ultraviolet-light rays from the sun by the gas molecules which make up the extremely thin atmosphere. Very little of this radiation reaches the surface of the earth. Great amounts of heat are created in the absorption process.

Whether there is another stratum of declining temperatures followed by another layer where the thermometer goes up again may be determined by future flights. It seems theoretically possible.

On one flight a few months ago seeds of corn and rye were carried in an effort to determine if cosmic rays would produce mutations resulting in new species. The seeds have been tested at Harvard University, but the results have been entirely negative. The corn apparently was so injured by the great heat that it failed to germinate. The rye grew normally. This was about what was expected because the chance of a direct hit on so small a thing as a seed was very slight.

The laboratory has made other discoveries of interest to science in the outer reaches of the atmosphere 100 miles above the earth. There are no horizons to hold back the research activities of Navy scientists!

First Aid for Bowlers

(Continued from page 111)

left side of the alley, the bowler starts from the right side of the approach to allow for sufficient angle across the alley.

Improved control will cut down the number of splits a bowler gets because he will be scoring more strike hits and staying away from hitting the head pin square "on the nose." Also, he will pick up a higher percentage of the splits he does have to shoot for.

With the most important phases of control covered, Wilman groped for the right words to explain how to put "stuff" or spin on the ball.

"Frankly," he began, "a lot of bowlers would be better off if they'd forget all about hooking or curving a bowling ball. If they'd be content to roll a straight ball

(Continued to page 272)

PRECISION *and* CRAFTSMANSHIP *at* CRESCENT*



Heavy, modern machinery, such as this broach, insures sharp and accurate machining of Crescent Tools.



Frequent inspections during production eliminate size variation and provide a continuous check on quality.

A huge array of gauges including Verniers, Go and No-Go, Dial Micrometers and many others, are constantly checked against standards.

● Complete control of quality throughout manufacturing operations at CRESCENT is more than idle boast...it is reality. Many elements are combined to insure continuous production of quality tools: Heavy, modern machines hold tools firmly, insuring clean, sharp and accurate machining. Forging dies are cut to templates to assure uniformity of parts... resulting in perfect interchangeability for repair parts, even though they are made years later than the tool in which they are used. Frequent inspections during production eliminate the possibility of machines getting out of adjustment and varying from allowable tolerances. Gauges used for inspection are constantly checked against standards.

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Only these patented filters have the 66 baffles that whirl smoke cleaner and cooler into your mouth. Replace filter when discolored.

Frank Medico V.F.Q. (Very Fine Quality)
Bowls of rich-grained beauty. Wide variety of shapes. With 10 filters. . . . **\$2**

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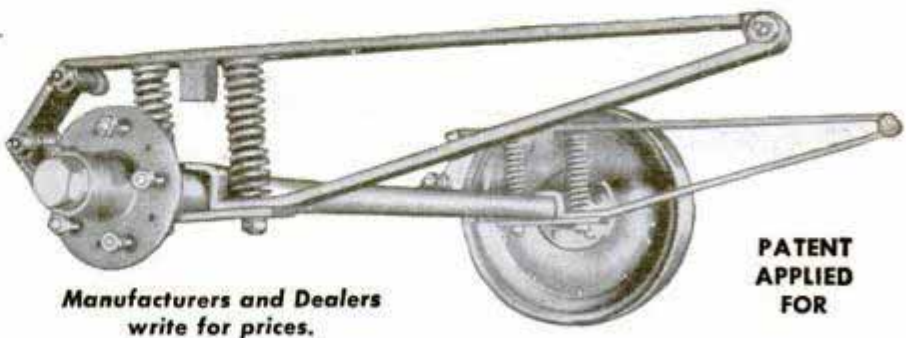
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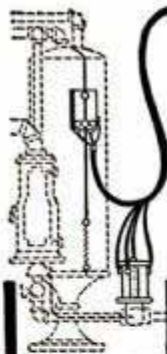
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and concentrate on control, their scores would improve."

So, the first advice he wanted recorded was that a straight ball, aimed directly at the head pin, is the best ball to throw until a bowler's delivery is easy and natural.

Once the kegler grooves a good swing and develops an effortless approach, he then is ready to concentrate on a sharp hook that picks up more pins than a straight ball.

The hook ball is thrown out of the side of the hand. Spin is imparted to it by lifting up and turning the fingers and wrist smoothly to the left as the ball is released.

This takes practice, as do all phases of good bowling. Wilman cautions that the average bowler will get better results by releasing the ball with an easy, natural hook delivery than by exaggerating the motion to produce an extra-sharp hook. The latter delivery is difficult to control.

Wilman is so machine-like in his approach and delivery that he knows almost to the fraction of an inch exactly where the ball will go.

For that reason, he employs a system he calls "line bowling." He stands at the 12-foot line and puts his left foot directly behind a small dot which is in line with the head pin. Then he picks out a spot on the alley in line with the 3-pin and about 15 feet past the foul line.

Drawing an imaginary line from his starting position to the spot on the alley, he approaches the foul line and rolls his ball toward the spot in line with the 3-pin. He doesn't look at the pins when he releases the ball.

His hook ball, with amazing regularity, heads straight for the 3-pin, then cuts in sharply to the left for a perfect 1-3 strike hit. Wilman's "line bowling," which most bowlers call spot bowling, requires a grooved swing, control and coordination.

Asked to summarize the main requirements for high bowling scores, Joe had this to say:

"I tell hundreds of bowlers to learn the fundamentals—such as the factors that produce a smooth, well-balanced approach and delivery—then practice, work on timing, concentrate when you are bowling. Be as jolly as you wish between frames, but when you throw the ball, mean business. Be relaxed, but try hard.

"Know what you can and cannot do. If you can't throw a hook ball, roll a straight ball. If you don't have terrific speed, be content with what speed you have. Actually, some 'fireball' bowlers get fewer pins because of the speed on the ball.

"Improve your bowling, and you'll have more fun."

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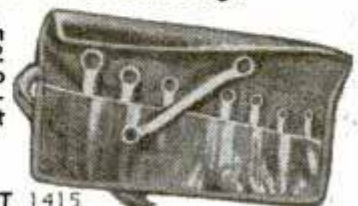
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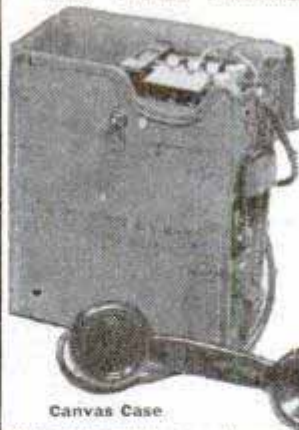
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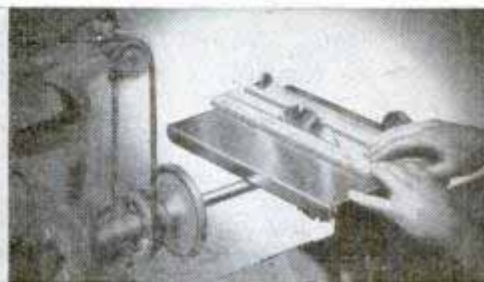


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Takes 6" to 8" blade. Arbor handles scratch brush, grinder, buffer. Saw blade not included.



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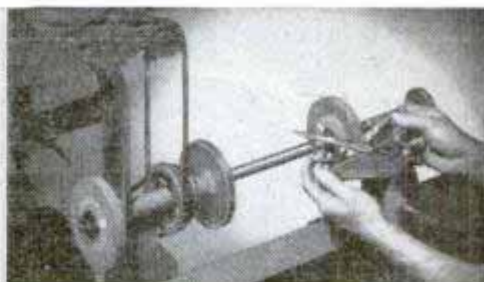
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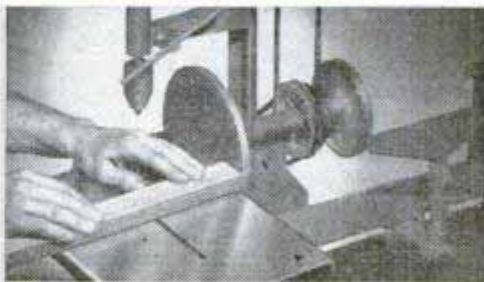
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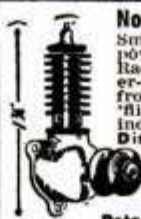


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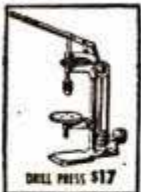
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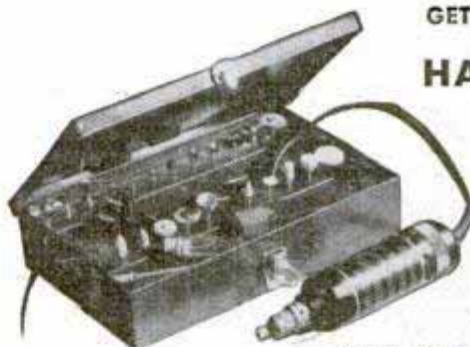
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Send Handee Kit Handee Tool Precision Attachments
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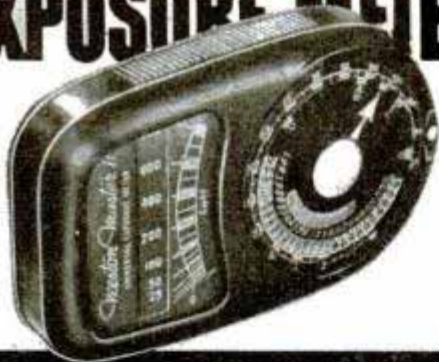
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TAP AND DIE KIT

\$19.95 Complete with Case

THREAD THESE SIZES (NATIONAL COARSE SERIES)

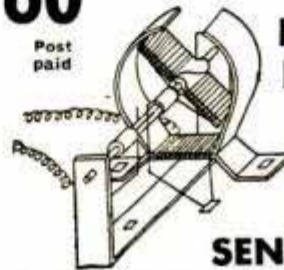
$\frac{1}{8}$ ", $\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ ", $\frac{3}{8}$ ", $\frac{7}{16}$ ", $\frac{1}{2}$ "

Tap holes, cut threads quickly, easily, accurately in any material! *Threadwell* 50-S SCREW PLATE SET contains Die Stock, Tap Wrench, seven $1\frac{1}{2}$ " O. D. Round Dies and seven Hand Taps for cutting National Coarse Series threads. Each die adjustable for standard, over or under-size cut. Steel guide for each die insures straight, accurate threads. All in handsome, sturdy, fitted box with complete instructions. Order through your dealer or send \$19.95 for prepaid, same-day shipment (C. O. D. \$19.95 — you pay charges). Money-back guarantee if returned in 5 days.



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ONLY **60¢** **ELECTRIC MOTOR**
CONSTRUCTION KIT
EASY TO ASSEMBLE
FUN—EDUCATIONAL

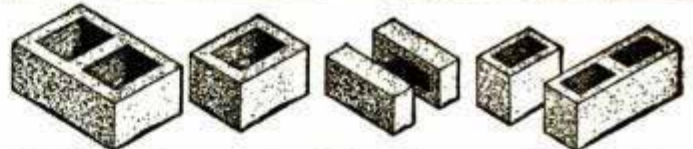


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Runs on a Single Dry Cell (not included). Use it to run Toy Pumps, Pulleys, Etc.

Size 2"x2"x2 1/2"—complete with illustrated instructions and explanations of how the motor works.

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New superior method makes square, true, easy-to-lay units which will pass any building code. Small investment, high production, big profits. One \$30.00 machine will make four 5"x8"x12" blocks per minute. Pays for itself in a few days. Sell blocks or save 25 building cost by making and laying your own.

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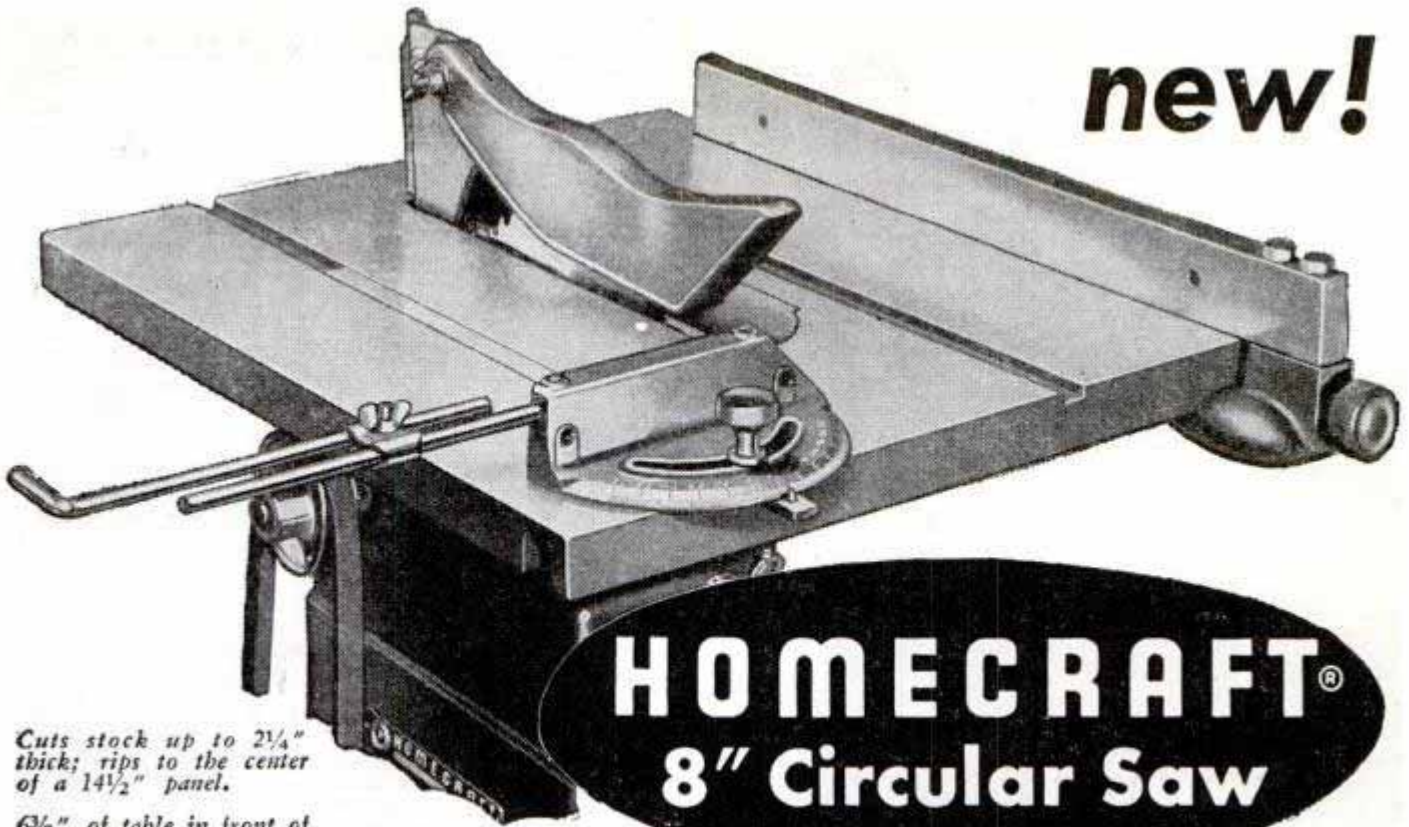
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Cuts stock up to 2 1/4" thick; rips to the center of a 14 1/2" panel.

6 3/8" of table in front of blade supports large stock.

Only \$34.95 for this Dependable Saw Built Expressly for the Hobbyist!

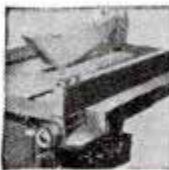
Answers the demand for a moderate-priced tool that delivers all-around satisfaction



The 8-inch saw blade gives you plenty of big cutting capacity.



Swing guard, splitter, and anti-kickback fingers provide safety.



Rip fence locks securely in any position on table.

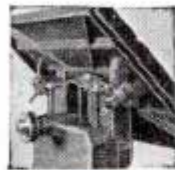


Table tilts 45° to right; firmly locks in place.



Convenient ball-crank handle quickly raises or lowers table.



Miter gauge provides accurate angles of cut — either side of blade.

This good-looking, versatile *Homecraft* Circular Saw is made especially for folks who enjoy the fun and healthful recreation of "puttering around" with woodworking.

With this practical tool, you can rip and cross-cut . . . make mouldings . . . cut mitres and curves . . . do drawer-joint work, rabbeting, etc.

Built by the Maker of Quality Tools
Behind the *Homecraft* Circular Saw is the engineering skill of the men who make Delta Power Tools — the famous top-notch tools that practically every woodworking enthusiast dreams of owning some day.

In schools and factories, as well as home shops, Delta tools have long been recognized as outstanding, for safety, accuracy, and dependability.

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With the *Homecraft* Circular Saw, Delta meets the long-standing need for a really good, popular-priced tool that is exactly suited to the intermittent use the average hobbyist gives a machine.

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The arbor runs in oil-impregnated bearings that are constantly wick-lubricated.

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With Every Kit or first order 6" Steel comb, rule & depth gauge with pocket clip.

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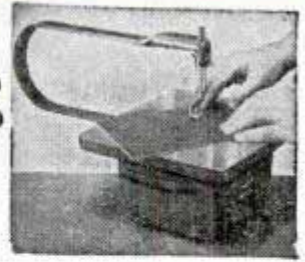
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For Hobbyists, Craftsmen and Light Production

ONLY
\$17.50

FOB FACTORY

Shpg. Wt. 18 lbs.
Complete with cord, 3 blades



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PORTABLE . . . SAFE . . . CUTS CLEAN
AND SMOOTH—NO SANDING NECESSARY!**

ANNOUNCING a remarkable, PATENTED, MAGNETIC Jig Saw — better-performing, better-quality than famous PRE-WAR SYNCROS — now ready for immediate shipment anywhere! SYNCRO needs NO belt, NO gears, NO oiling, NO motor to buy. The high-speed, short stroke action, and freedom from belts, makes SYNCRO so SAFE even small boys and girls may operate it. Get this husky, powerful, 18 pound saw . . . so easily portable . . . you can use it anywhere—even on the kitchen table . . . so smooth-cutting no sanding is necessary! Cuts intricate designs on $\frac{1}{8}$ " soft wood, $\frac{1}{2}$ " medium hard plywood and thinner hardwoods, plastics, thin metals. Leaves NO ragged undersides on plywood or heavy cardboard. The rapid action blade cuts to the center of a 27" circle. SYNCRO is a rugged, powerful power tool for exceptionally high quality work. Ideal for hobbyists, craftsmen, light production. Perfect for models, displays, puzzles, inlays, silhouettes, toys, marquetry, games, what nots, etc. Order yours NOW on our 10 Days Money Back Trial offer — enjoy a LIFETIME of use!

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Slide of plated steel and adjustable to varying wood thicknesses. Adjustment Screw permits easy, quick changes to compensate for voltages of 110 to 130 A.C. (10) **THROAT CLEARANCE** 13 $\frac{1}{2}$ " permitting work on square sheet of wood, metal, plastic, 27" on the diagonal. (11) 5' cord . . . extension Underwriter's approved electric cable with molded rubber plug. (12) **BLADES** are 5", pin end style, of finest steel, 18 teeth per inch. (13) **NO-MAR, NON-SLIP RUBBER FEET.** (14) **DURABLE** — will last a lifetime. (15) **HIGHEST QUALITY**—guaranteed by the trademark name "SYNGRO."

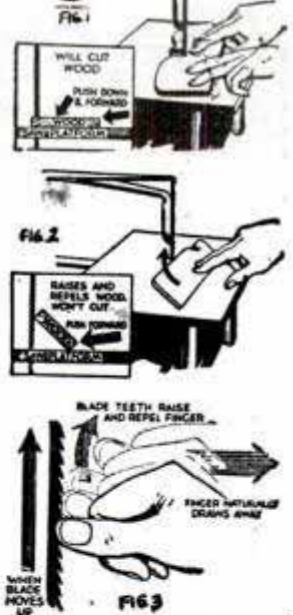
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SYNCRO has No continuous cutting blade nor "Long stroke" blade to pull fingers in to teeth—instead there are 14,400 strokes per minute — 7,200 short cutting strokes plus 7,200 upward NON-CUTTING, REPELLING strokes! (Fig. 1) SYNCRO will not even CUT wood unless piece is pushed FIRMLY DOWNWARD AGAINST blade and FIRMLY FORWARD—both actions at SAME TIME! SYNCRO blade teeth cut ONLY on DOWN stroke. (Fig. 2) Teeth raise, repel, push away any object on UP stroke. (Fig. 3) When blade moves UP it KICKS finger away free. On down stroke, blade does not move far enough to accidentally cut finger unless finger is intentionally, deliberately fed into blade like wood is fed in Figure 1. No wonder SYNCRO is the world's SAFEST saw . . . a feature old and young users acclaim!

MODEL NO. 2000
Prices slightly higher in foreign countries



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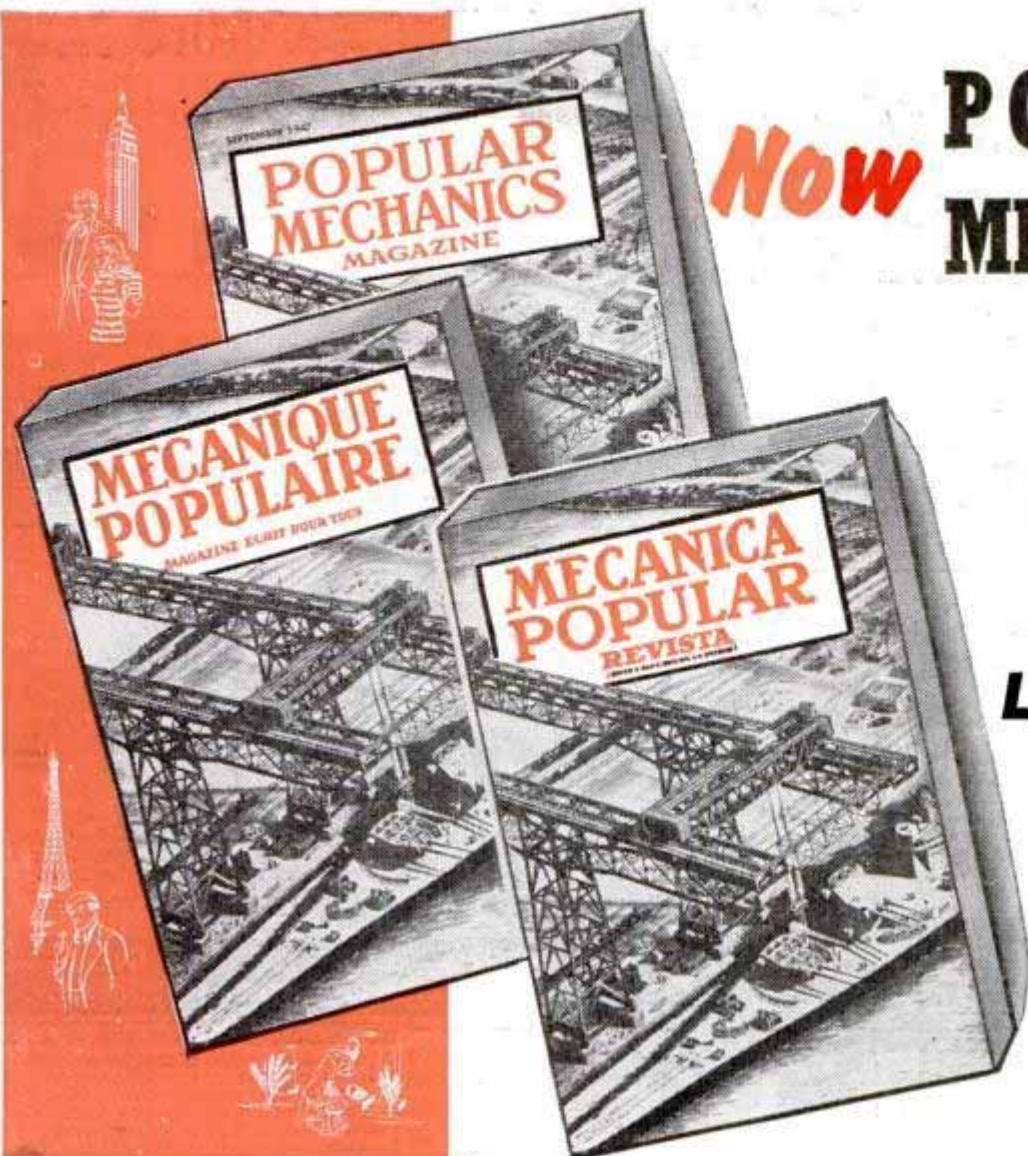
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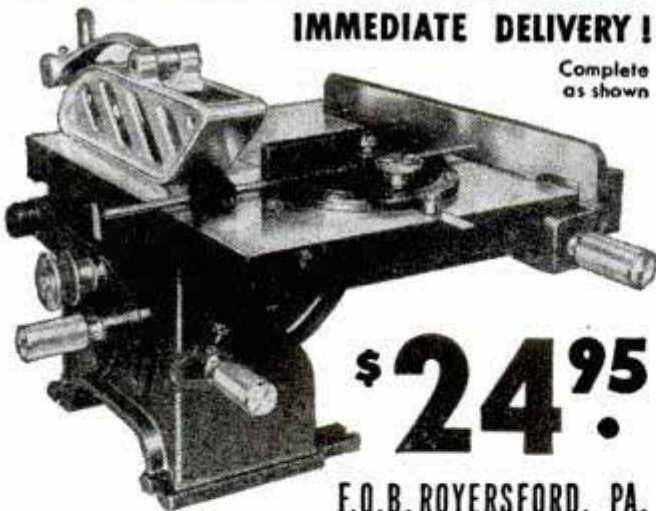
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**STURDY!
VERSATILE!
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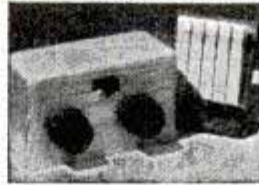
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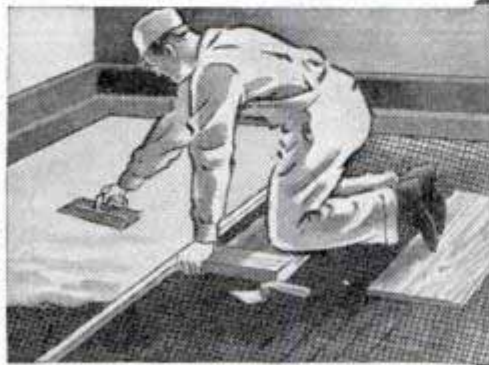
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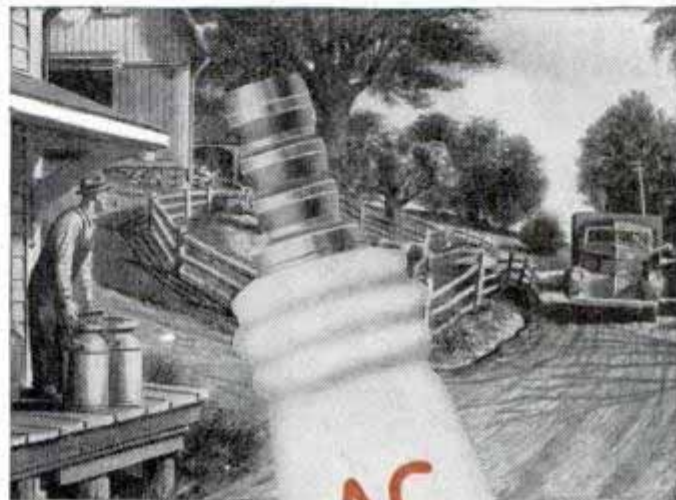
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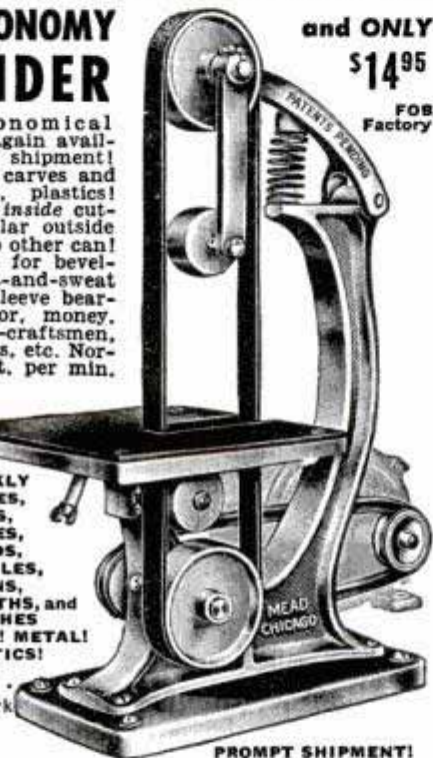
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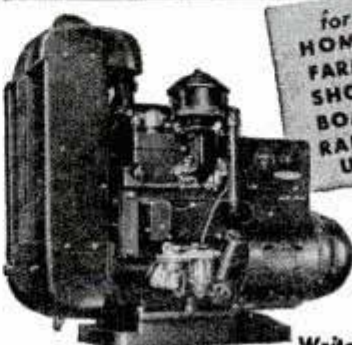
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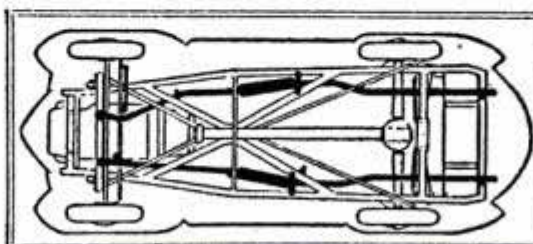
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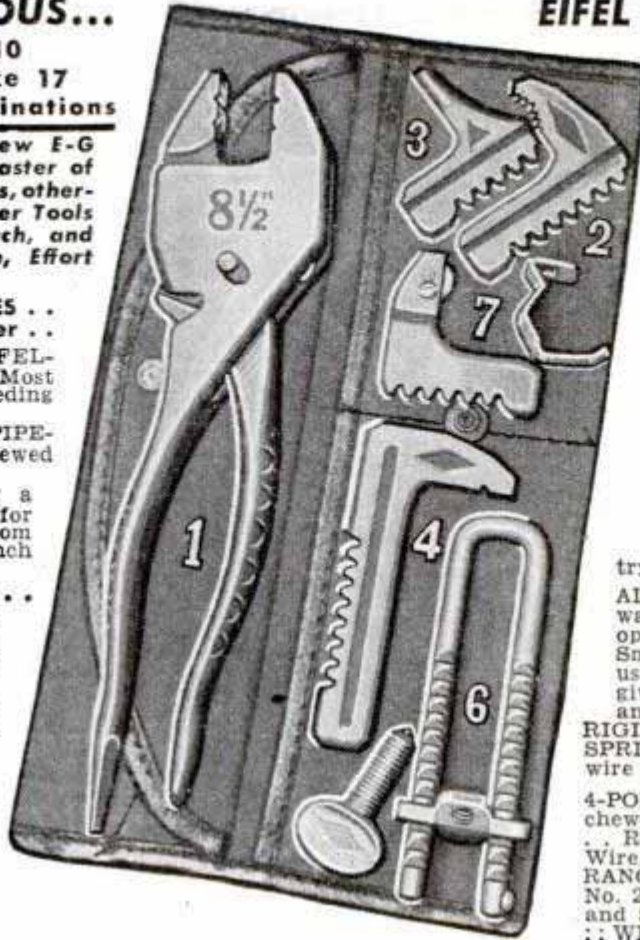
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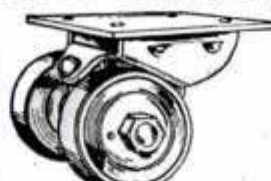
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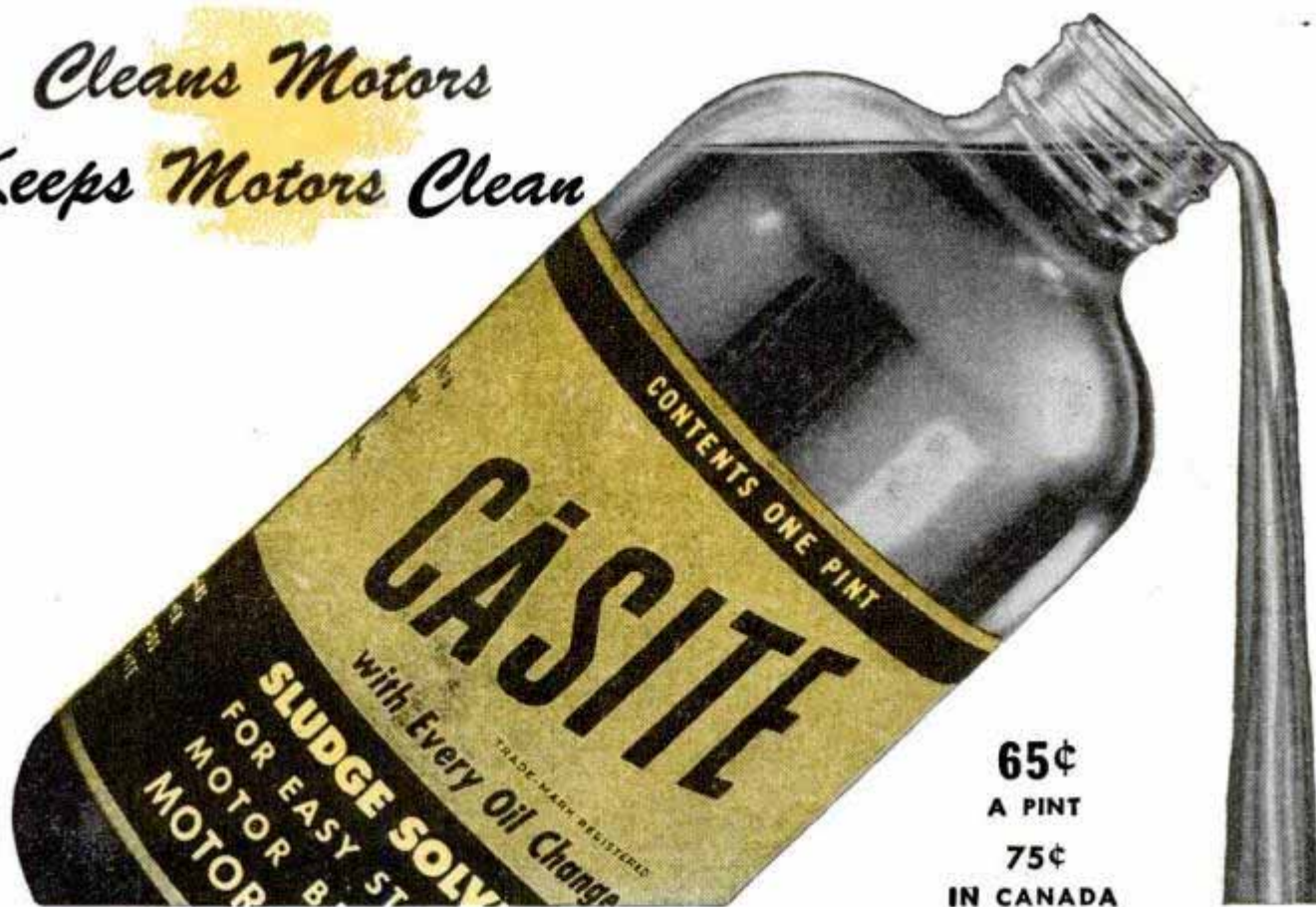
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Here are two tools that belong on every bench.

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The standard for years!
BERNARD complete leathercrafter's kit with interchangeable attachments. Also BERNARD Spring Belt Punches with revolving head and drive tubes.

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Boys and Mechanics thrill over the many interesting things that can be made with this NEW ALL-STEEL THERMO-SAW . . . You can cut out any pattern or design in 1/2 the time . . . Difficult patterns are made QUICK and EASY . . . No turning of work . . . Cuts in every direction! . . . Cuts plywood 1/8" or 1/4" . . . Cuts 14" x 36" board. Will cut 1/8" Plexiglas very well . . . A special transformer produces high frequency current in a tough steel wire "blade" from ordinary Alternating (AC) Current . . . IMMEDIATE DELIVERY!
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COMPLETE SAW outfit as illustrated with transformer and 12 spare blades. Ready to use.

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MOTORS 1/4 HP to 2 HP Single Phase
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ELEC. DRILLS—1/4" 110 volt \$17.95

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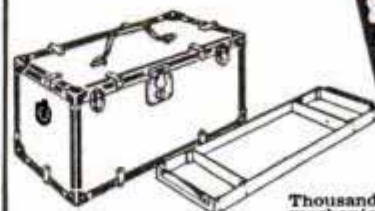
Oil-less ball bearing compressor
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MADE IN 5 SIZES

SIZE	PRICE
14x6 1/2 x 8	\$3.50
16x6 1/2 x 8	3.75
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Web shoulder strap	65c

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COMPLETE SELF-PRIMING UNIT (less motor): Pump, motor stand, special bracket, 18" flexible shaft, 14" length 1" suction hose, bolts, etc. \$13.95 postpaid

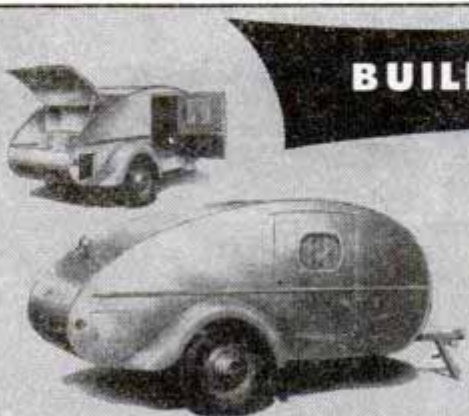
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Now—this beautifully streamlined sports trailer—made and sold by Modernistic Trailer Manufacturing Co. for years at a price over \$500, is being shipped in a complete, prefabricated kit. Comes to you ready to assemble. It's easy—all you need is a screwdriver and wrench! Anyone can do it! Complete instructions furnished. Trailer has all-aluminum exterior. Accommodates 2 adults. Overall length, 12'7", width 6', height, 5'. Has roomy galley, and plenty of storage space. Total weight slightly over 400 lbs.—hardly noticeable behind your car. Kit comes complete with every part needed, less tires and tubes.

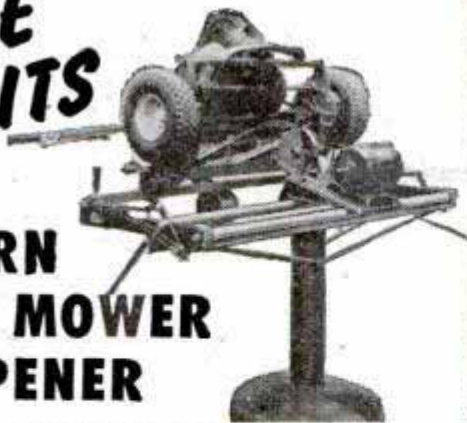
Build this deluxe sports trailer for your own use—or sell it and make money! Order your prefab kit today . . . fit and quality of every section unconditionally guaranteed. Price only \$279.50, plus tax, f.o.b. Los Angeles. Enclose full remittance, or, if you desire C.O.D. shipment, enclose \$50 deposit. If more convenient to you we will ship trailer in two kits—one kit now, the other later when you're ready for it. Price is slightly higher but you pay for each when you order. First kit, containing chassis and outer shell sections, only \$157.50. Second kit, containing balance of trailer, \$139.00. Order today specifying complete kit or first half of kit. Write for free folder.

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SHARPEN ANY LAWN MOWER from 5-inch Edger to 36-inch Power Mower in ten to twenty minutes with a MODERN LAWN MOWER SHARPENER because dismantling is unnecessary — neither handle, roller, wheels nor motor need be removed when sharpening any mower. . . . the MODERN SHARPENER eliminates all hand filing; it precision grinds to the extreme ends of both left or right reel blades. Bottom knife is held in same brackets for sharpening. NO EXTRA ATTACHMENTS! Order today! Price \$241.50 (less motor) f.o.b. Pasadena. (1/3 or 1/4 H.P. single phase motor recommended.)

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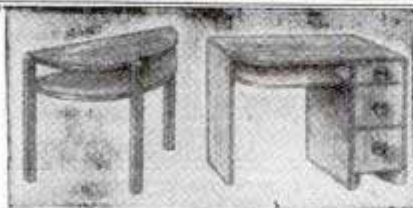


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Unbelievably strong — fastens to any car or truck bumper like a belt. Attaches in a jiffy. 10" s-t-r-e-t-c-h avoids jerks and car damage when starting and towing. Widely used on farms for pulling stumps, securing heavy loads, etc. Woven linen web — breaking strength 5000 lbs., more than most tow chains. In compact box — fits in corner of glove compartment. Send check (or M.O.) for only \$2.95 and your Motorists' Tow Web will be sent prepaid anywhere in U.S.

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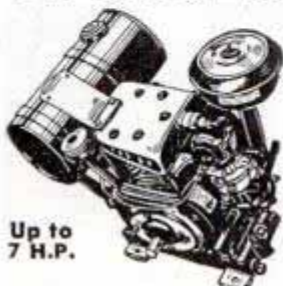


It's so simple to build these smart, sturdy pieces of furniture for your home. Full size plan, printed in ink, makes patterns unnecessary. Wood finishing instructions included. Send \$1.00 cash, check or M.O. for Plans 26 and 33 (shown). Postpaid in U.S. and Canada only.

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1/2" ELECTRIC DRILL
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Light in weight, convenient and handy, this improved drill has a special aligning grip that makes straight drilling natural. Backed by 35 years of electric drill manufacturing, produced in great quantities by modern methods, this is today's best drill buy. For every day farm, garage, construction and maintenance use, you can't get a better drill at any price. Specially wound, long life, high torque, fan-cooled motor. Cut steel gears, self-lubricating bearings, sturdy die cast case and a full sized snap action chuck (no key to lose).

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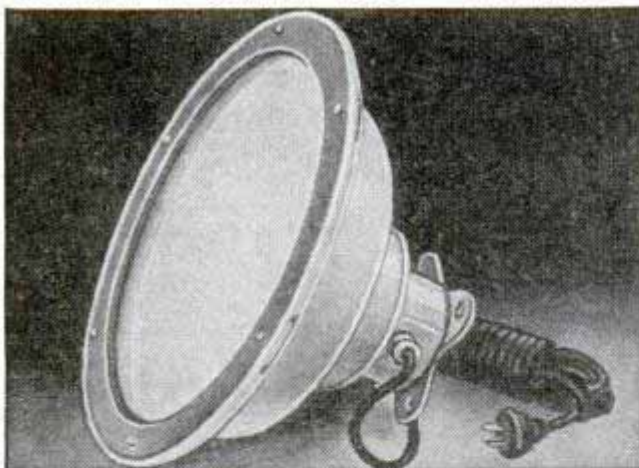
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Drill Stand
(less drill)
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WHAT a headache! Here's the answer! A new liquid **RUST REMOVER**—quickly dissolves rust on iron or steel, tools, hardware, machinery, etc. **NO RUBBING** or hard work. Brush, swab, spray or dip. Put **ON**—let **SET**—wipe off—**RUST GONE!** On sale at all Sears Retail Stores in **HARDWARE DEPTS.** 50c and \$1.00 in Mid-West (slightly higher elsewhere.) Valuable manual of rust control **FREE** with each bottle.

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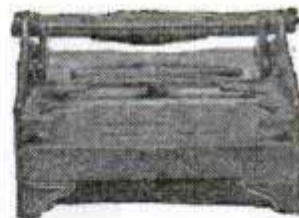
For further information, write **ALLIED PRODUCTS COMPANY, Dept. L-1, 1133 Newport Ave., Chicago, Ill.** Manufacturers of CorOdex.



CORODEX Liquid **RUST REMOVER**

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Gold Plated Razor with 10 Extra Blades, only 89c.

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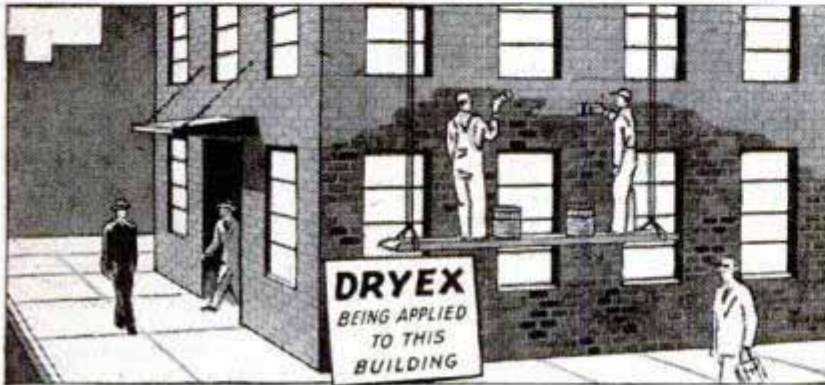
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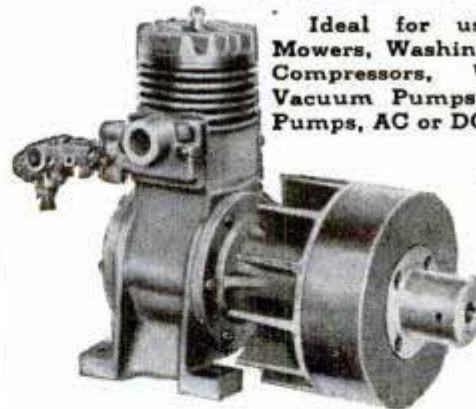
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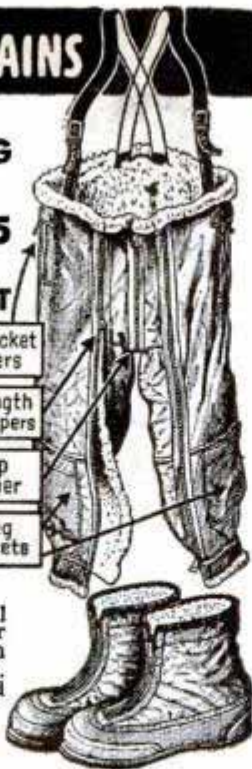
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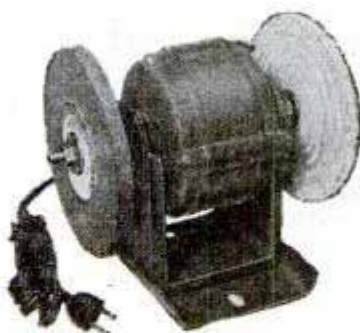
ORDER NOW—Enclose full amount for postpaid delivery. Better order both Pants and Boots at our low prices. Satisfaction or return for refund within 5 days.

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WORKSHOP
GRINDER
OF YOUR
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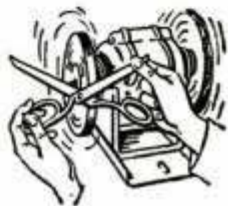


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You will need this amazing home workshop grinder to sharpen knives, scissors, screwdrivers, small tools, lathe bits and many other around-the-house items . . . polish silverware, jewelry, golf clubs and keys.



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Air Compressor Blows Built-In Whistle or Operates Models.

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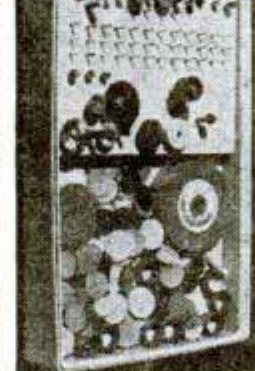
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Get this superb assortment of top quality grinding, cutting and polishing wheels and other useful tools, and be money ahead. Save \$35.25. Have JUST THE RIGHT ATTACHMENT for every job. Order today. Send check or send \$2.00 deposit with C.O.D. order.



- MASTER KIT**
- Now Only **\$9.75** A \$45 Value
- POSTPAID IN U.S.A.
- 102 Grinding, Cutting and Polishing WHEELS PLUS 150 assorted items for Home or Shop.
 - 2 Grinding Wheels 3" and 2" dia.
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 - 1 Mandrel 1/2" Shank.
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Kit comes in compact container with special rack for drills. Over 250 tools and items in this deal.

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DUALS.....	\$17.50	SINGLES.....	\$7.50
V-8 Ford-Mercury		Buick, Olds., Chrys.	
SINGLES.....	\$5.50	ORDER TODAY! Will outlast three ordinary mufflers.	
Chev., Ford, Plym.		Dealers—Write Today for Full Details	

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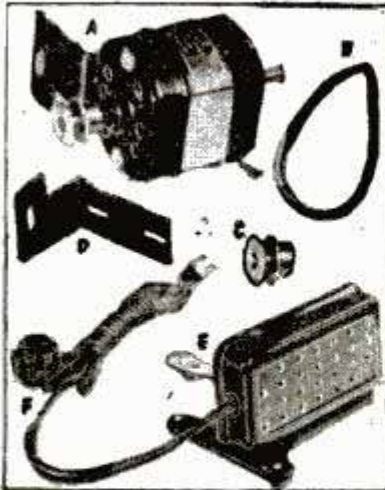
Speed your work on wood, metal, plastic and other materials with this powerful Cummins 1/4 inch drill. Scientifically designed for balance and ease of operation. Lightweight — portable — FULL SIZE CONVENTIONAL DRILL — weighs approximately 5 pounds. Popular Saw Handle Grip for accurate control in all working positions. Power switch at thumb tip. Special motor does not stall even under heavy direct pressure! It's the Drill that's favored by men who know and use fine tools. See it today at your favorite dealer. If he does not have it write direct.

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COMPLETE

Shipping Wt. 4 lbs.
ADJUSTABLE FOR USE WITH ANY TYPE OF SEWING MACHINE ANYBODY CAN INSTALL IT!
Takes but a few seconds
Complete set consists of:
A—MOTOR & BRACKET, Universal AC or DC, 40 cycle, 115 V. B—BELT, Long Wearing Rubber Belt. C—PULLEY, Single Grooved Steel Hubbed Pulley. D—BRACKET, New and Improved. E—FOOT CONTROL, 7 Step Rheostat. F—CORD SET, Extension cord fitted with plug and socket.

Also can be used for anything where foot control is needed.

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Because this farm-size rotary tiller prepares seedbeds most ideally suited to your soil and crop conditions, it helps produce higher yields and better quality crops. Can be adjusted for fine pulverization, coarse or medium tillage . . . just the way you want it. Mixes fertilizer and humus into the GROWING AREA of seedbed; aerates soil; eliminates air pockets and hard plow soles; conserves moisture; promotes earlier and more complete germination of seed; helps to destroy many crop pests and certain varieties of fungus; provides effective weed control; reduces erosion . . . all with ONE machine!



SEAMAN ROTARY TILLERS are available in power take-off and motorized models 3 to 7 ft. tillage widths. See your Seaman dealer and write for complete information.

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The ACE Set is complete—there's nothing more to buy. Drop forged by the manufacturers of cutting tools used by 96 per cent of the plants and shops in industry they are correctly designed, are of special steel, are finely finished, are stronger—will last a lifetime. You can cut easier, faster and more accurately with ACE TOOLS.
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MUFFLERS
STEELS and ALUMINUMS with a motorboat tone
SINGLES, Chev, V-8, Plymouth, Steels \$5.50, Aluminum \$6.50. Chry., Olds., Buicks, etc., Steels \$7.50, Aluminum \$8.50. V-8 and MERCURY DUALS, Steel \$17.50, Aluminum \$20.00. Aluminums are guaranteed for life of your car.
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Now! YOU CAN INSTALL DUAL WHEELS

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IN LESS THAN 10 MINUTES



- INCREASE LOAD CAPACITY
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Now you can convert your vehicle to dual wheels without the high expenses of changing to truck-type wheels and hubs or changing the entire rear axle. This

new patented converter does the job at a fraction of the old cost. For use on Ford passenger and 1/2-ton truck, 1928 to 1947 (except 1936-39); Chevrolet passenger and 1/2-ton truck, 1927 to 1947; Dodge-Plymouth passenger and 1/2-ton truck, 1933 to 1947; Willys and Ford Jeep vehicles, all models; all trailers and farm wagons equipped with any of the above type wheels.

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Only \$2850 Complete Set

It's EASY as A-B-C
No changing required.
No drilling necessary.
Rim-wrench does the job.

1. Mount the first wheel.
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THAT'S ALL!

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FORD CHEV DODGE-PLYM JEEP
Also Fits Farm Wagons Using Above Type Hubs

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READY TO
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• A super value for all types of intermittent service in pumping large volumes of liquid for stock watering, home and shop water systems, irrigation, draining pools, basements, etc. At 1750 RPM on 23 foot head will pump 42 gallons per minute; at 3600 RPM on 52 foot head will move 88 gallons per minute. Cast aluminum housing. Accurately machined bronze impeller vanes. Complete with mounting bracket and 3 1/2 inch V belt pulley. Run with electric motor, gasoline engine, power take-off on tractor, etc. Shaft rotates on sealed ball bearings with grease gun fitting. Has 1 1/2 inch threaded intake flange, two 1 inch outlets. Use one or both as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines. Comes complete with pulley and mounting bracket. Original cost approx. \$147.00. Sold F.O.B. Chicago. Shipping weight 23 pounds. Complete engineering reports and operating instructions free with pump. You can't beat this pump value at anywhere near this price. Satisfaction guaranteed.

ORIGINAL COST APPROX. \$147.00
IMMEDIATE DELIVERY FOB CHICAGO
SPECIAL PRICE, WHILE THEY LAST

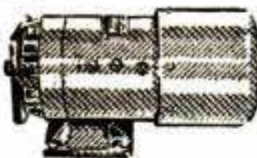
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MOTOR-GENERATOR

Emerson Electric Mfg. Co. 3 HP Motor ... AAF Type D50 FD-222-0435, 28 Volts DC, compound, 3800 RPM, 115 Amp, windings glass insulated, blower cooled, shaft dimension 5/8", Wgt. 27 Lbs. As Generator, puts out 115 Amps. ... ideal for portable welder ... **\$13.95 each.**



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Transformer Automatic Winding Co. Filament Transformer, 6 to 900 Volts, step up or step down, 12 points for variation of voltage, can hook into 110 or 220 Volt and 50 or 60 Cycle Current, Wgt. 14 Lbs., all new ... will work any 6-12-24-28 Volt aircraft gadget off house current ... **\$7.95**



25% DEPOSIT REQUIRED ON C.O.D. ORDERS

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Underwriter Approved, 100 Watt, quick heat, durable rubber plug, wood heat resistant handle, sturdy and long-wearing ... **\$2.95 each.**



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Chrome plated, 1" Capacity, precision engineered and carefully tooled to give long life and highest degree of accuracy ... **\$7.65 each.**



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For Light or Heavy Work. 75-200 amperes. Complete PLANS 35c. Send today and we'll include FREE our Big NEW Catalog.

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CALIBER—Chambered for the dependable ".30-.30"
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WEIGHT—About 6 1/2 lbs. Overall length 40 inches.

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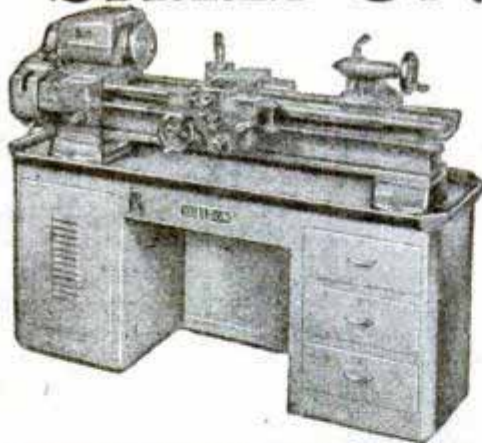
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With 11 1/4" swing, 1" collet capacity and a 56" bed, it has capacity. With "Zero Precision" Taper Roller bearings (heretofore available on large and costly lathes) it has extreme accuracy. Mounted on a modern 5-drawer steel bench with enclosed 8 spindle speed, double V-belt underneath motor drive it has convenience, extra power and speeds for both today's and tomorrow's machining, and, frankly, class, not found in ordinary shops.

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Never before such tremendous cutting power in so small and compact a unit... fits pocket! Patented leverage action gives you one ton cutting pressure in the palm of your hand! Cuts anything—heavy gauge spring wire, nuts, bolts, etc. Replaces bulky cutters many times its size and cost.

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PRESSURE IN THE
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EVERY FARMER, TRUCKER AND AUTO OWNER SHOULD HAVE STA-TI

Easy now to hold or pull your heavy loads with Sta-Ti. Absolutely will hold without slipping or scarring any size rope intended. Quickly and easily tied and untied—even when wet. Sta-Ti is ready to do your rugged hauling jobs. Order direct from this ad today. Write Dept. 1411.

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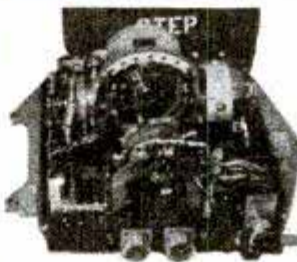
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Government paid \$100.00

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Orig. housed amplifiers and other instruments. Consists of magnesium cabinet that mounts 7 DPDT Allied Relays, 1 SPST Relay, a Weston 0-125 AC Volt Meter, a 350 to 450-cycle Frequency Meter, a 115-volt, 400-cyc. Transformer and many other parts. This unit is of special interest to "Hams"! The cabinet would be excellent for small transmitters or receivers. 12 1/2 x 14 x 10"; 22 lbs.



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Designed for B-29 Superfort. Aluminum casing, housing one 400-cyc., 115-v., 3-ph. motor-propelled gyroscope; two 24-v. DC shunt-wound motors; 2 electronic relays; auto transformer; hundreds of other parts. A masterpiece of precision and engineering. 15 1/2 x 14 x 10"; 35 lbs. Army paid \$2855.00.

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9 or 18-volt in; 450-volt out. A simple change converts these to run on 110 volts AC. Made by Pioneer and Wincharger Co. Govt. cost, \$34.00 each. 8x4x4"; 7 lbs.



Brand new **\$3⁹⁵**

Others, brand new but
dismounted from ABK sets,

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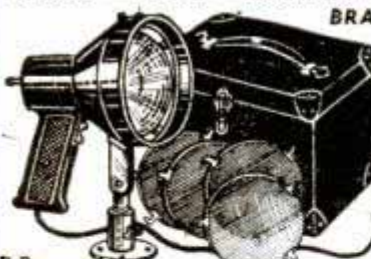
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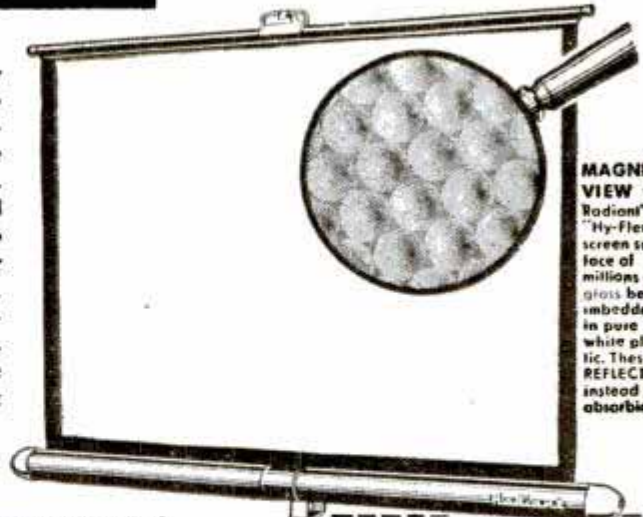
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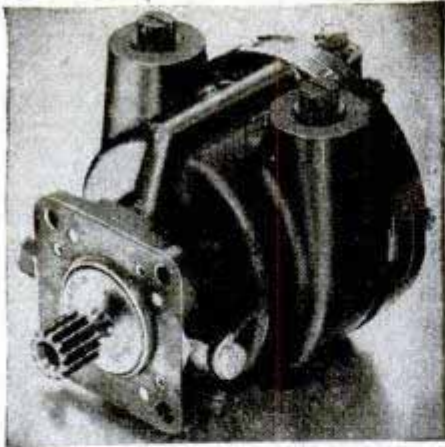
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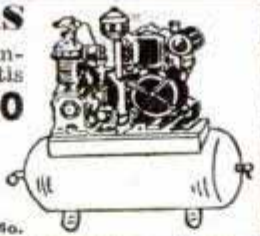
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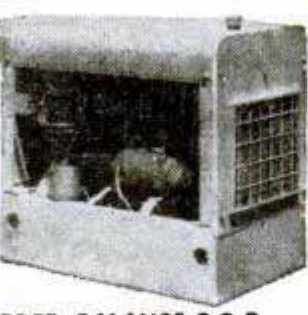
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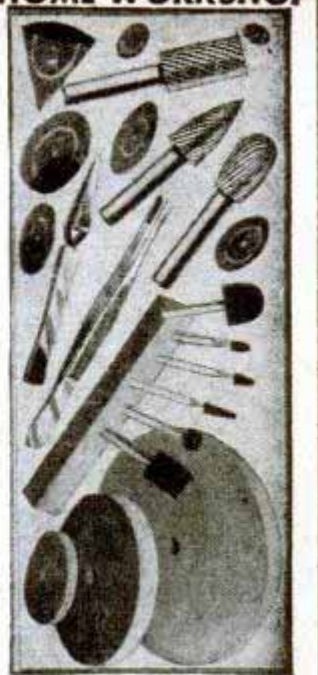
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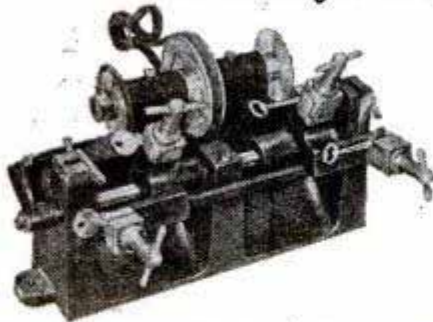
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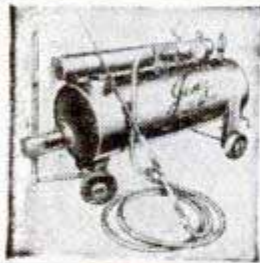
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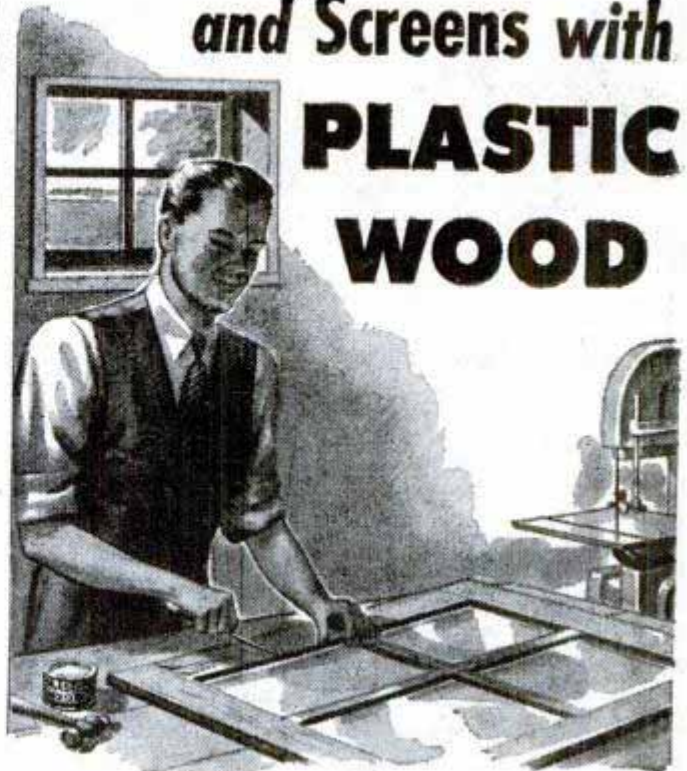
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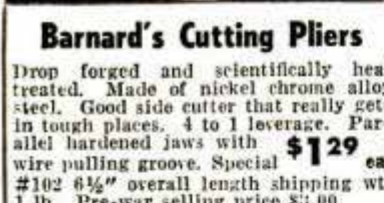


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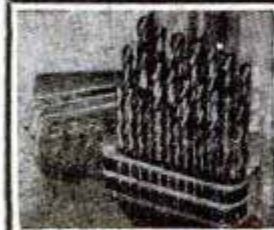
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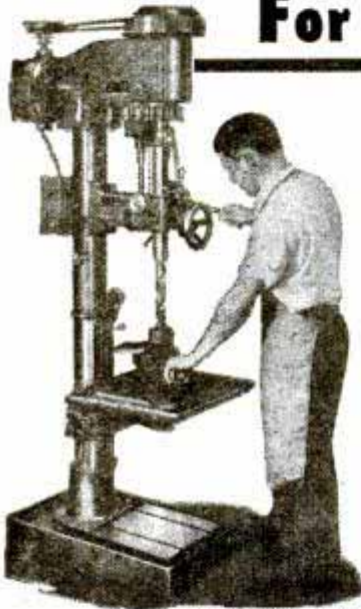


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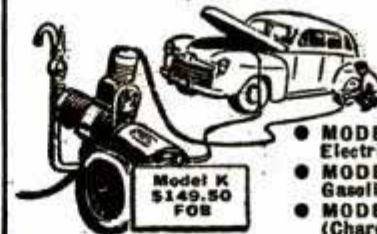
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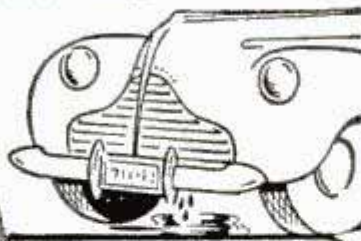
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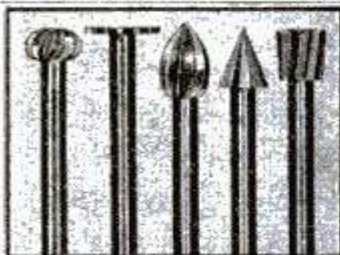
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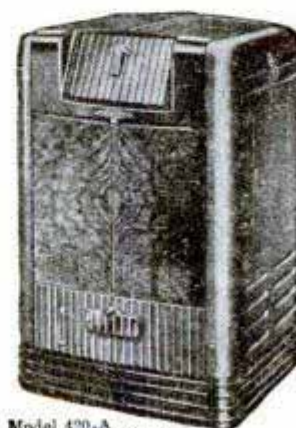
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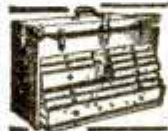
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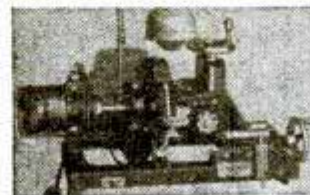
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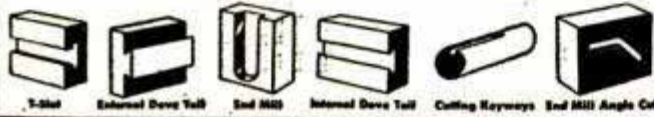
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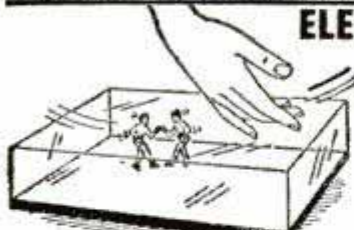
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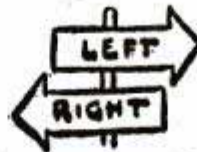
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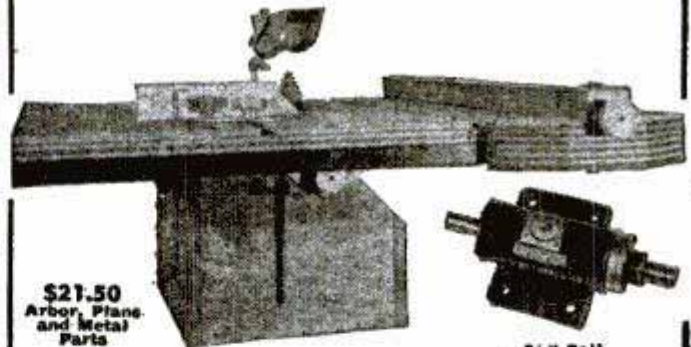
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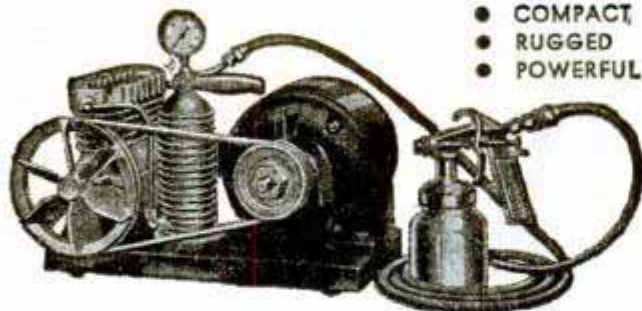
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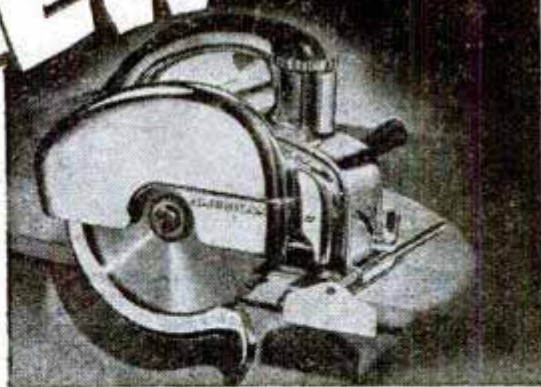
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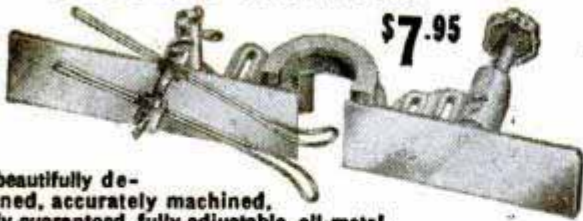


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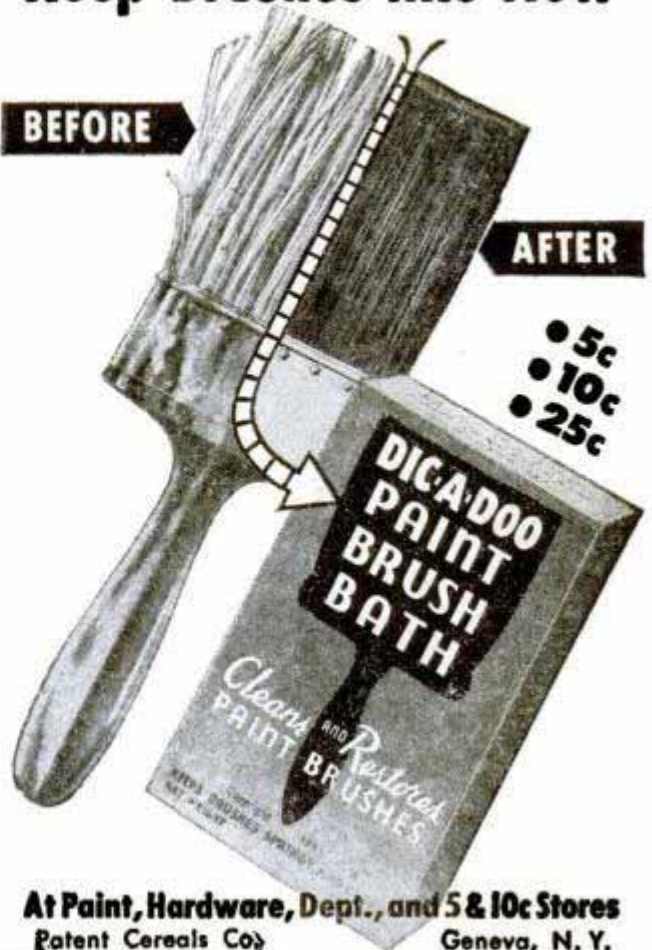
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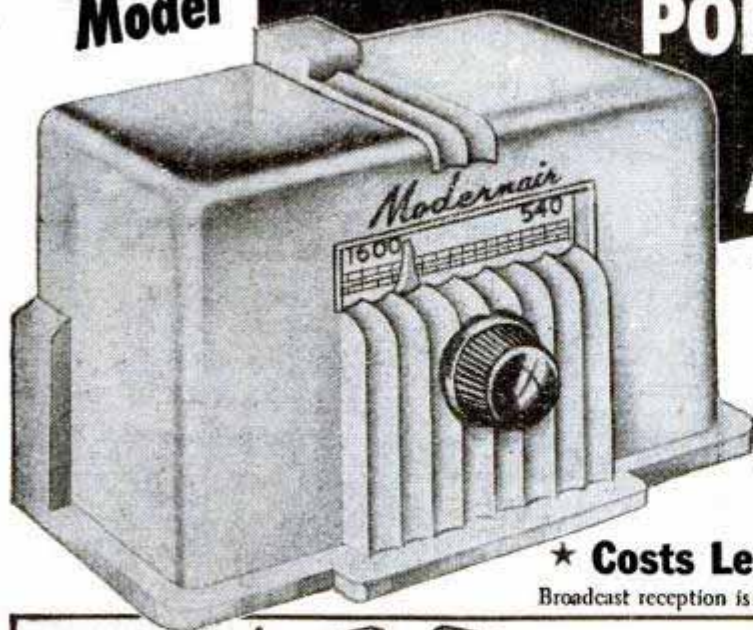


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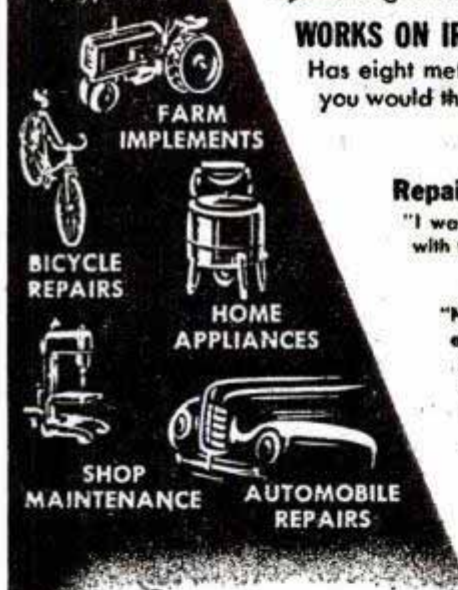
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Aero-Seal. Rust Resistant. Slotted with screw gear top. 1/2" to 3". #120 Regular 27c Now 10c

FIRE EXTINGUISHER Kiddle Lux CO2 Type #601

15 lb. Chgd. CO2 with Horn. \$30.00 value \$10.75
 2 lb. CO2 type \$22.50 value \$8.75
 10 lb. Chgd. CO2 with Horn. \$60.00 value \$24.50
 15 lb. Chgd. CO2 with horn. \$80.00 Value #605 \$27.50

indispensable for small for large planes, trucks, auto, home, factories.

BEARING MIX #170

Needle, ball and roller bearings in excellent assortment. Sizes from 1/2" to 2".
15 Bearings at \$2.95

SPRING MIX

Torsion, compression and tension springs. Assorted sizes. #206
2 lbs. 89c

A treasure chest for emergencies

NEW FLEXIBLE GOOSENECK LAMP

110 V. A. C. 13 ft. wire with socket, switch and plug. In mounting bracket suitable for home or workshop.
 Wire alone worth our price of **.99c** each.

RUBBER GOODS

28 x 24 in. 1 1/2" thick. \$1.95
 Soft & supple. Ideal for use as a mat for workers who stand on their feet. Cashiers, Demonstrators, machinists, etc.

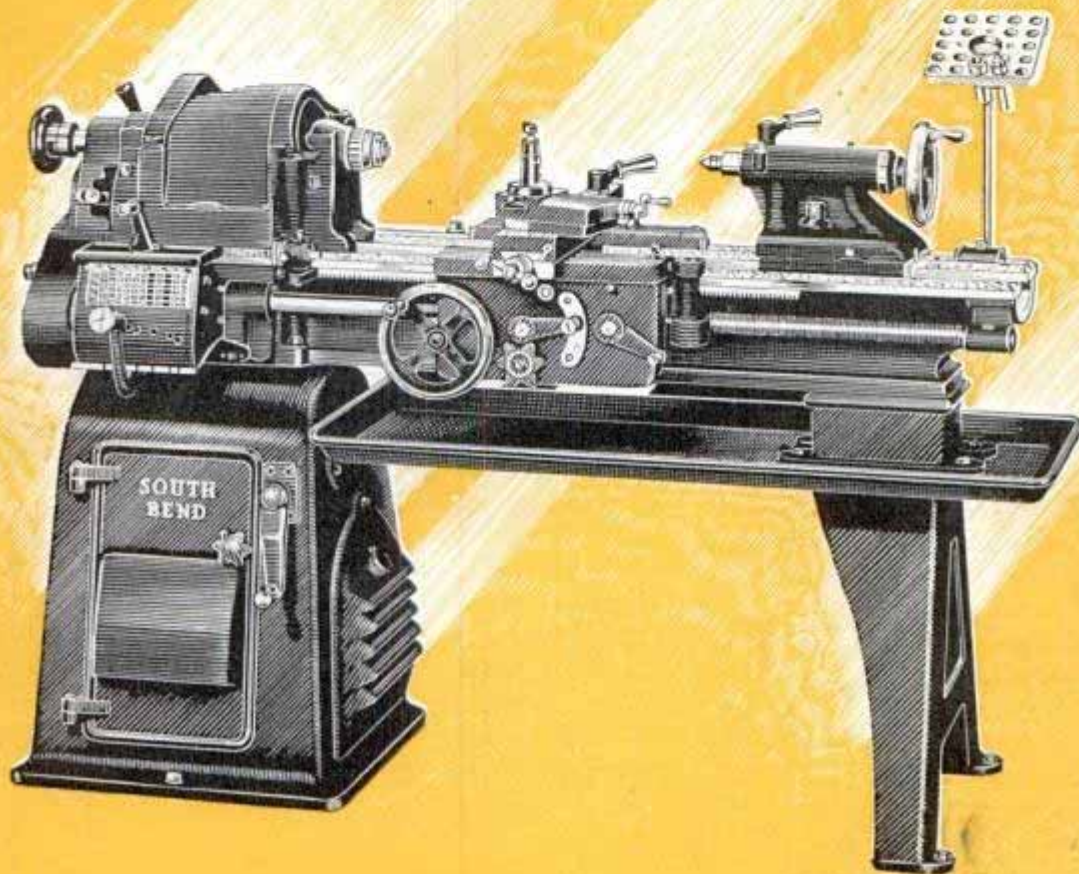
NEOPRENE SHEET RUBBER

Thick.	approx.	Price per area
#129	3/16"	1.44
#130	1/8"	1.28
#131	3/32"	1.12
#132	1/16"	1.00
#133	1/32"	.88
#134	1/64"	.76

ORDER DIRECT FROM THIS AD
 All sales final. Make remittances by money-order, bank draft or personal check. Purchase orders acceptable from D & B firms. All quotations F. O. B. Los Angeles.
BIG ILLUSTRATED CATALOGUE AVAILABLE
 Send 1/5 deposit with C. O. D. orders. Also Aircraft Supply Catalogue

SOUTH BEND

Precision Lathes



The South Bend Precision Lathes and Lathe Attachments shown on the following pages are the result of forty years of experience in building fine lathes. The workmanship and materials entering into their construction are the best that can be obtained and the highest standards of accuracy are maintained throughout their manufacture.

SOUTH BEND LATHE WORKS



BUILDING BETTER LATHES SINCE 1906 • 543 E. MADISON STREET • SOUTH BEND 22, INDIANA, U.S.A.
CABLE ADDRESS "TWINS" SOUTH BEND

ESTABLISHED 1906
INCORPORATED 1914

PROMPT DELIVERY

Quick deliveries can now be made from distributor's stock in all principal cities, or from factory. For name of distributor see "Machine Tools" in classified section of phone book. If there is no distributor near you, send your orders and inquiries direct to the factory.

PRICES

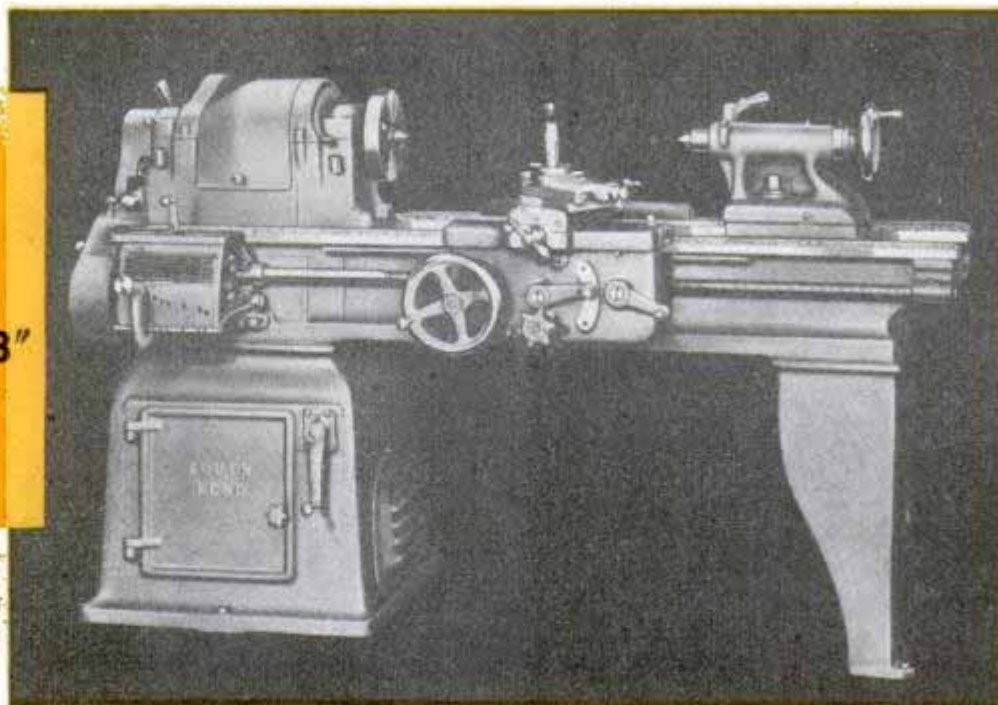
Prices of South Bend Lathes are reasonable, the average increase over pre-war level being less than 15%. All prices are net f.o.b. factory, crated for domestic shipment.

SOUTH BEND

16", 14½", and 13"
Quick Change
Gear Lathes

South Bend 16" x 6"
Quick Change
Gear Lathe

\$1640.50



SPECIFICATIONS	16-INCH	14½-INCH	13-INCH
Swing over bed and saddle wings.....	16¼"	14¾"	13⅝"
Swing over saddle, chip guard removed.....	11⅞"	10¼"	8¾"
Swing over saddle with chip guard.....	9⅝"	8¾"	7¾"
Spindle speeds.....	21 to 725 r.p.m.	27 to 800 r.p.m.	34 to 875 r.p.m.
Thread cutting range.....	4 to 224 R.H. or L.H.	4 to 224 R.H. or L.H.	4 to 224 R.H. or L.H.
Power longitudinal feeds.....	.0015" to .0841"	.0015" to .0841"	.0015" to .0841"
Power cross-feeds.....	.0006" to .0312"	.0006" to .0312"	.0006" to .0312"
Hole thru spindle.....	1⅝"	1⅝"	1"
Collet capacity.....	1"	¾"	11/16"
Spindle centers.....	No. 3 Morse Taper	No. 3 Morse Taper	No. 3 Morse Taper
Size motor.....	1½ h.p.	1½ h.p.	1 h.p.

South Bend Quick Change Gear Lathes are equally efficient on precision toolroom work or close tolerance manufacturing operations. Hundreds of nationally known manufacturers select them when streamlining their shop equipment to meet present day needs. Substantial savings in capital investment, power consumption, floor space, and labor costs have resulted from their installation. They will give you the same efficient service.

The Underneath Motor Drive provides an unusually wide range of spindle speeds. The belt drive to the spindle is silent in operation and develops smooth, steady power entirely free from gear vibration.

Price includes 3 ph., 60 cy., 220 v. A.C. motor and drum control, and regular lathe equipment such as belts, centers, face plates, tool post, etc. Chucks and tools are extra. See following pages.

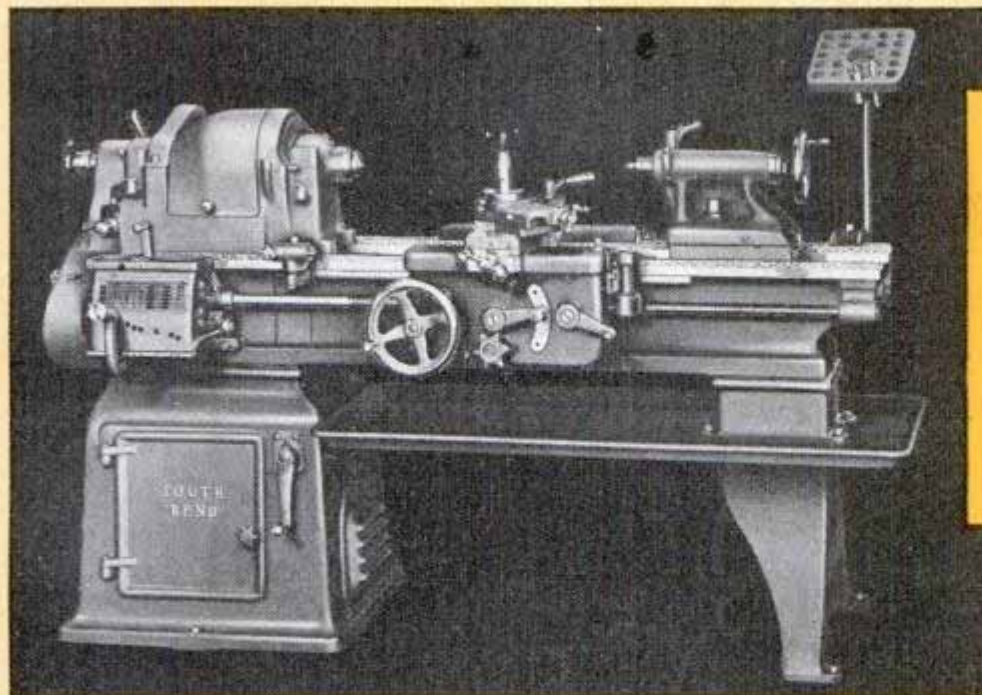
**TIME
PAYMENT
PLAN**

25 per cent down
12 months to pay balance
moderate finance charges

Quick Change Gear Underneath Motor Driven Lathes

Catalog Number	Swing Over Bed Inches	Length of Bed Feet	Distance Between Centers Inches	Approx. Shipping Weight Pounds	Price f.o.b. Factory
16" QUICK CHANGE GEAR LATHES					
117-C	16¼	6	33½	2300	\$1640.50
117-D	16¼	7	45½	2380	1678.50
117-E	16¼	8	57½	2460	1716.50
117-G	16¼	10	81½	2620	1826.50
117-H	16¼	12	105½	2850	1936.50
14½" QUICK CHANGE GEAR LATHES					
183-B	14¾	5	24½	1995	\$1382.50
183-C	14¾	6	36½	2070	1420.50
183-D	14¾	7	48½	2145	1458.50
183-E	14¾	8	60½	2225	1496.50
13" QUICK CHANGE GEAR LATHES					
113-A	13⅝	4	16	1460	\$1117.50
113-B	13⅝	5	28	1510	1153.50
113-C	13⅝	6	40	1560	1189.50
113-D	13⅝	7	52	1615	1225.50

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.



SOUTH BEND

16", 14½", and 13" Toolroom Lathes

South Bend 16" x 6'
Toolroom Lathe
\$2031.50

SPECIFICATIONS	16-INCH	14½-INCH	13-INCH
Swing over bed and saddle wings...	16¼"	14⅝"	13⅞"
Swing over saddle cross slide.....	9⅝"	8-15/16"	8"
Spindle speeds.....	21 to 725 r.p.m.	27 to 800 r.p.m.	34 to 875 r.p.m.
Thread cutting range.....	4 to 224 R.H. or L.H.	4 to 224 R.H. or L.H.	4 to 224 R.H. or L.H.
Power longitudinal feeds.....	.0015" to .0841"	.0015" to .0841"	.0015" to .0841"
Power cross-feeds.....	.0006" to .0312"	.0006" to .0312"	.0006" to .0312"
Hole thru spindle.....	1⅜"	1⅝"	1"
Collet capacity.....	1"	¾"	11/16"
Spindle centers.....	No. 3 Morse Taper	No. 3 Morse Taper	No. 3 Morse Taper
Size motor.....	1½ h.p.	1½ h.p.	1 h.p.

Toolroom Underneath Motor Driven Lathes

Catalog Number	Swing Over Bed Inches	Length of Bed Feet	Distance Between Centers Inches	Approx. Shipping Weight Pounds	Price f.o.b. Factory
16-INCH TOOLROOM UNDERNEATH BELT MOTOR DRIVEN LATHES					
8117-C	16¼	6	33½	2525	\$2031.50
8117-D	16¼	7	45½	2605	2075.50
8117-E	16¼	8	57½	2685	2119.50
14½-INCH TOOLROOM UNDERNEATH BELT MOTOR DRIVEN LATHES					
8183-B	14⅝	5	24½	2180	\$1735.50
8183-C	14⅝	6	36½	2255	1778.50
8183-D	14⅝	7	48½	2330	1821.50
8183-E	14⅝	8	60½	2405	1863.50
13-INCH TOOLROOM UNDERNEATH BELT MOTOR DRIVEN LATHES					
8113-B	13⅞	5	28	1665	\$1481.50
8113-C	13⅞	6	40	1715	1519.50
8113-D	13⅞	7	52	1770	1557.50

South Bend Toolroom Lathes are equally efficient on precision toolroom work or close tolerance manufacturing operations. Their versatility reduces set-up time to a minimum. Smooth, vibration-free operation permits finish turning or boring with such precision that subsequent machine operations can often be eliminated. A convenient arrangement of controls makes for an ease of operation which reduces fatigue and lowers the probability of error. A wide range of spindle speeds permits machining work with maximum tool efficiency.

Improved Features include: alloy steel headstock spindle; replaceable headstock bearings; double wall apron; quick change gear box for threads and feeds; and semi-steel lathe bed.

In Addition to 3-ph., 60 cy., 220 v., A.C. motor and drum control, and all equipment supplied with quick change gear lathe (see preceding page) the following toolroom attachments are included in price of lathe: handwheel type draw-in collet chuck attachment; collet rack; telescopic taper attachment; thread dial indicator; chip pan; and micrometer carriage stop. Chucks, tools, and collets are extra.

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

SOUTH BEND

10"-1" Collet Lathes

SPECIFICATIONS

- Swing over bed and saddle wings.....10 $\frac{1}{8}$ "
- Swing over saddle cross slide.....5 $\frac{3}{4}$ "
- Spindle speeds (12).....50 to 1357 r.p.m.
- Thread cutting range....4 to 224 R.H. or L.H.
- Power longitudinal feeds.... .0015" to .0836"
- Power cross-feeds..... .0006" to .0309"
- Hole thru spindle.....1 $\frac{3}{8}$ "
- Collet capacity.....1"
- Spindle centers.....No. 2 Morse Taper
- Cross slide travel.....5 $\frac{3}{4}$ "
- Compound rest top slide travel.....2"
- Size motor..... $\frac{3}{4}$ h.p.



\$933.60

10-inch Swing South Bend Precision Lathes are capable of the most exacting operations on both tool and production work. This accuracy, together with their speed and versatility, contribute to lower machining costs. They contain all the design features that make the larger models so dependable.

Price includes 3 ph., 60 cy., 220 v., A.C. motor; drum control, and regular lathe equipment such as belts, centers, face plates, tool post, etc. Chucks and tools are extra. Toolroom Lathes also include: handwheel type draw-in collet attachment (without collets); collet rack; telescopic taper attachment; thread dial indicator; and micrometer carriage stop. Bench is included in price of bench lathe.

**TIME
PAYMENT
TERMS**

25 per cent down
12 months to
pay balance
moderate finance
charges



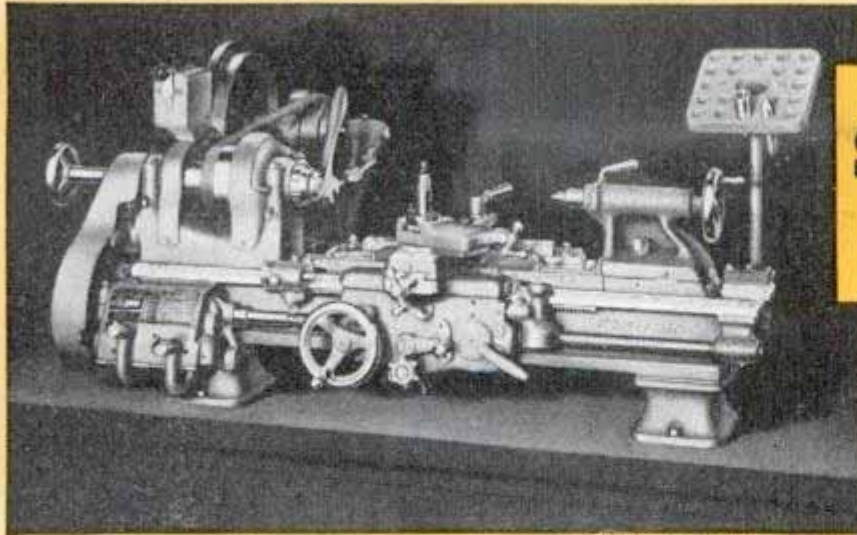
South Bend 10" x 3 $\frac{1}{2}$ ', 1" Collet Toolroom Lathe **\$1168.60**

10"-1" Collet Quick Change Gear and Toolroom Lathes

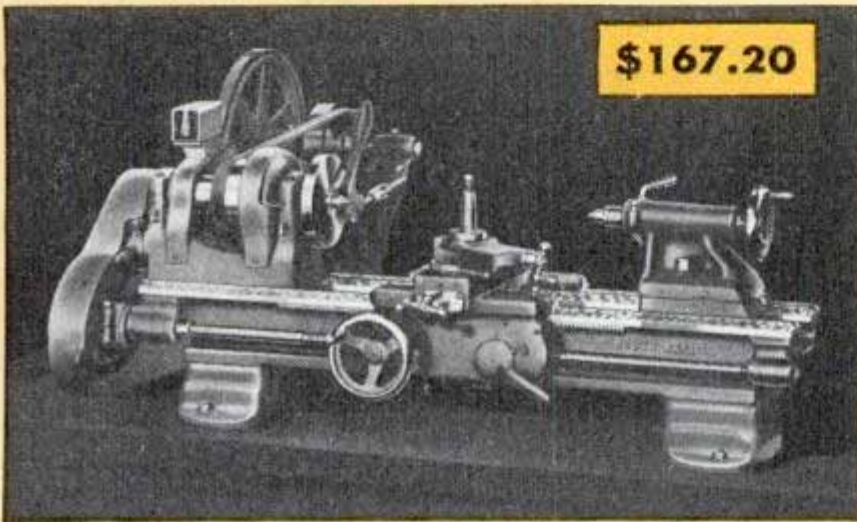
Catalog Number	Swing Over Bed Inches	Length of Bed Feet	Between Centers Inches	Shipping Weight Pounds	Price f.o.b. Factory
QUICK CHANGE GEAR BENCH LATHES					
187-YS	10 $\frac{1}{8}$	3	15 $\frac{3}{4}$	850	\$933.60
187-ZS	10 $\frac{1}{8}$	3 $\frac{1}{2}$	20 $\frac{3}{4}$	880	949.60
187-AS	10 $\frac{1}{8}$	4	26 $\frac{3}{4}$	950	975.60
187-RS	10 $\frac{1}{8}$	4 $\frac{1}{2}$	33 $\frac{3}{4}$	980	998.60
QUICK CHANGE GEAR LATHES WITH FLOOR LEGS					
187-Y	10 $\frac{1}{8}$	3	15 $\frac{3}{4}$	810	\$863.60
187-Z	10 $\frac{1}{8}$	3 $\frac{1}{2}$	20 $\frac{3}{4}$	835	879.60
187-A	10 $\frac{1}{8}$	4	26 $\frac{3}{4}$	860	895.60
187-R	10 $\frac{1}{8}$	4 $\frac{1}{2}$	33 $\frac{3}{4}$	885	918.60

Catalog Number	Swing Over Bed Inches	Length of Bed Feet	Between Centers Inches	Shipping Weight Pounds	Price f.o.b. Factory
TOOLROOM BENCH LATHES					
8187-YS	10 $\frac{1}{8}$	3	15 $\frac{3}{4}$	960	\$1196.60
8187-ZS	10 $\frac{1}{8}$	3 $\frac{1}{2}$	20 $\frac{3}{4}$	990	1212.60
8187-AS	10 $\frac{1}{8}$	4	26 $\frac{3}{4}$	1060	1238.60
TOOLROOM LATHES WITH FLOOR LEGS					
8187-Y	10 $\frac{1}{8}$	3	15 $\frac{3}{4}$	935	\$1151.60
8187-Z	10 $\frac{1}{8}$	3 $\frac{1}{2}$	20 $\frac{3}{4}$	960	1168.60
8187-A	10 $\frac{1}{8}$	4	26 $\frac{3}{4}$	985	1185.60

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.



South Bend 9" x 3' Toolroom Bench Lathe **\$486.70**



South Bend 9" x 3' Model C Bench Lathe

SOUTH BEND 9-Inch Bench Lathes

SPECIFICATIONS

Swing over saddle wings..... 9 1/4"

Swing over chip guard..... 5 1/2"

Spindle speeds:

6 speed drive..... 41 to 658 r.p.m.

12 speed drive..... 41 to 1270 r.p.m.

Thread cutting range:

Model A..... 48 pitches R.H. or L.H.
4 to 224 per inch

Models B & C... 45 pitches R.H. or L.H.
4 to 160 per inch

Power longitudinal feeds:

Model A..... 48—.0015" to .0853"

Model B..... 26—.0021" to .0155"

Model C..... 14—.0021" to .0156"

Power cross feeds:

Model A..... 48—.0004" to .0252"

Model B..... 23—.001" to .0046"

Belt, width of pulley step for..... 1"

Centers, Morse taper..... No. 2

Collet capacity, maximum..... 1/2"

Headstock spindle hole..... 3/4"

Lead screw 29° Acme Thread..... 3/4"—8

Motor, size required:

For 6-speed drive..... 1/4 h.p.

For 12-speed drive..... 1/2 h.p.

Spindle nose threads..... 1 1/2"—8

Tailstock top set over..... 5/8"

Tool holder cutter bit..... 1/4" sq.

Tool holder shank..... 3/8" x 13/16"

Approx. shipping weights:

3 ft. bed lathe..... 355 lbs.

3 1/2 ft. bed lathe..... 380 lbs.

4 ft. bed lathe..... 405 lbs.

4 1/2 ft. bed lathe..... 430 lbs.

Model A 9-inch Lathes have heat-treated alloy steel spindle, quick change gear box, and friction clutch worm drive for power longitudinal feeds and power cross-feeds.

Model B 9-inch Lathes are same as Model A Lathes except that they have independent change gears, instead of the quick change gear box, for threads and feeds.

Model C 9-inch Lathes are same as Model B Lathes except they do not have the worm drive for power feeds. The cross-feed is hand-operated, and

longitudinal feeds are obtained by engaging half-nuts with the lead screw.

Toolroom 9-inch Lathes are same as Model A Lathes except that they have the following toolroom attachments: collet chuck; collet rack; taper attachment; thread dial; and micrometer carriage stop.

Price includes 1 ph., 60 cy., 115 v., A.C. motor, drum control, and regular lathe equipment such as belts, centers, small face plate, tool post, etc. Chucks, collets, and tools are extra.

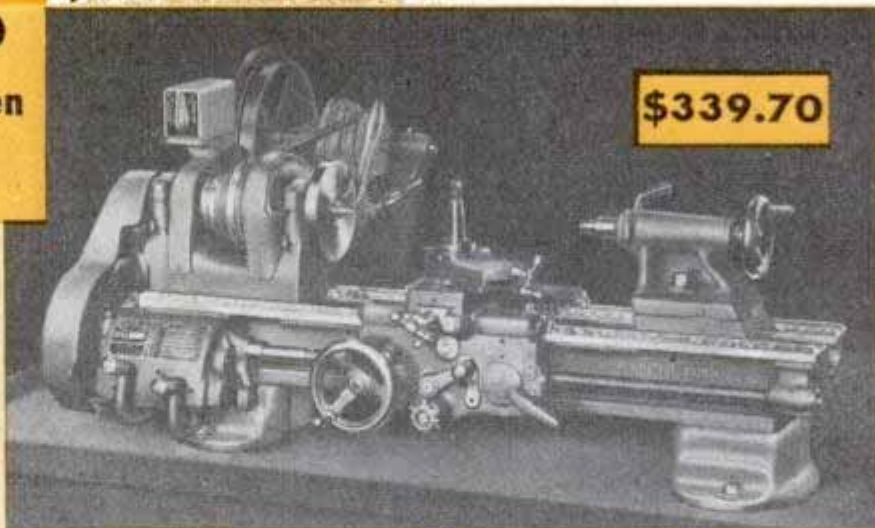
9-Inch Swing Horizontal Motor Driven South Bend Precision Bench Lathes

Length Bed Feet	Be- tween Cent- ers Inches	9" TOOLROOM LATHES		9" MODEL A LATHES				9" MODEL B LATHES				9" MODEL C LATHES			
				6-speed drive		12-speed drive		6-speed drive		12-speed drive		6-speed drive		12-speed drive	
		Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price
3	16	8644-Y	\$486.70	444-Y	\$272.20	644-Y	\$317.70	477-Y	\$217.20	677-Y	\$262.70	415-YC	\$167.20	615-YC	\$212.70
3 1/2	22	8644-Z	501.70	444-Z	287.20	644-Z	332.70	477-Z	232.20	677-Z	277.70	415-ZC	182.20	615-ZC	227.70
4	28	8644-A	516.70	444-A	302.20	644-A	347.70	477-A	247.20	677-A	292.70	415-AC	197.20	615-AC	242.70
4 1/2	34	.....	.....	444-R	324.20	644-R	369.70	477-R	269.20	677-R	314.70	415-RC	219.20	615-RC	264.70

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

9" SOUTH BEND V-Belt Horizontal Motor Driven Bench Lathes

\$339.70



The 9" Bench Lathes with 8-speed and 16-speed V-belt horizontal motor drives offer more spindle speeds—an advantage when surface speeds are critical. These lathes are identical in all other respects to those described on the preceding page.

Price includes 1 ph., 60 cy., 115 v., A.C. motor, drum control, and regular lathe equipment such as belt, centers, small face plate, tool post, etc. Chucks, collets, tools, and bench are extra.

**TIME
PAYMENT
TERMS**

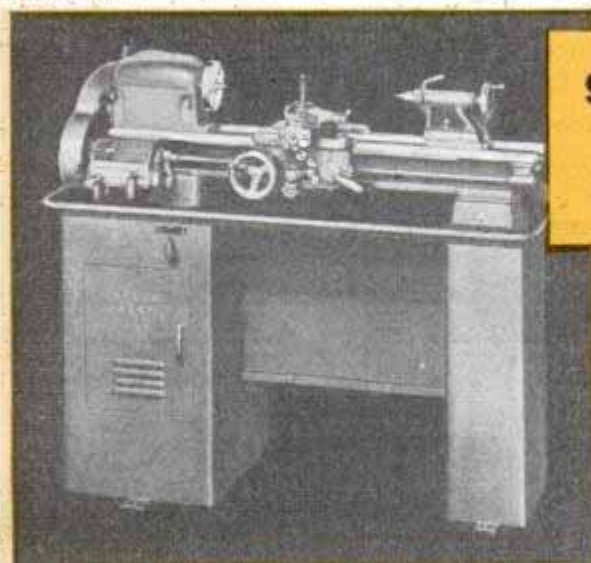
25 per cent down
12 months to pay
balance
Moderate finance
charges

SPECIFICATIONS

Swing over saddle wings.....9 1/4"	Power longitudinal feeds
Swing over chip guard.....5 1/2"	Model A......48—.0015" to .0853"
Hole thru spindle.....3/4"	Model B......26—.0021" to .0155"
Collet capacity.....1/2"	Model C......14—.0021" to .0156"
Spindle speeds	Power cross-feeds
8 speed drive....46 to 609 r.p.m.	Model A......48—.0004" to .0252"
16 speed drive....46 to 1176 r.p.m.	Model B......23—.001" to .0046"
Thread cutting range:	Spindle centers.....No. 2 Morse Taper
Model A.....48 pitches R.H. or L.H.	Size motors
4 to 224 per inch.	8 speed drive.....1/4 h.p.
Models B & C.45 pitches R.H. or L.H.	16 speed drive.....1/2 h.p.
4 to 160 per inch.	

9-Inch Bench Lathes with V-Belt Horizontal Motor Drive

Length Bed Feet	Between Centers Inches	Ship. Wt. Crated Pounds	MODEL A		MODEL B				MODEL C					
			8-speed drive		16-speed drive		8-speed drive		16-speed drive		8-speed drive		16-speed drive	
			Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price
3	16	355	544-Y	\$294.20	744-Y	\$339.70	577-Y	\$239.20	777-Y	\$284.70	515-YC	\$189.20	715-YC	\$234.70
3 1/2	22	380	544-Z	309.20	744-Z	354.70	577-Z	254.20	777-Z	299.70	515-ZC	204.20	715-ZC	249.70
4	28	405	544-A	324.20	744-A	369.70	577-A	269.20	777-A	314.70	515-AC	219.20	715-AC	264.70
4 1/2	34	430	544-R	346.20	744-R	391.70	577-R	291.20	777-R	336.70	515-RC	241.20	715-RC	286.70



9" SOUTH BEND Underneath Motor Driven Lathe

Capable of machining work to the most exacting tolerances, this lathe is recommended for precision work in the toolroom, laboratory, or machine shop. Fully enclosed motor drive unit provides

twelve spindle speeds, 41 to 1270 r.p.m. See above for other specifications. Price includes 1 ph., 60 cy., 115 v., A.C. motor, drum control, and regular lathe equipment. Chucks, collets, and tools are extra.

9" Underneath Motor Driven Lathes

Catalog Number	Model	Length of Bed Feet	Between Centers Inches	Weight Crated Pounds	Price f.o.b. Factory
344-ZN	A	3 1/2	22	570	\$486.70
377-ZN	B	3 1/2	22	560	431.70
8344-ZN	Toolroom	3 1/2	22	630	655.70

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

SOUTH BEND

Precision Turret Lathes

SPECIFICATIONS	SERIES 900	SERIES 1000	SERIES 2-H
Collet capacity.....	1/2"	1"	1"
Hole thru spindle.....	3/4"	1 1/4"	1 3/4"
Swing over bed and saddle wings.....	9 1/4"	10 1/4"	16 1/4"
Swing over double tool-slide.....	3-9/16"	3-9/16"	6 7/8"
Swing over compound slide.....	5 1/2"	5 7/8"	6 1/8"
Turret tool feed.....	4"	4"	6 1/8"
Turret face to spindle distance, max.....	20 3/4"	19 3/4"	6' bed—28 1/4"
Double tool slide cross travel.....	3 5/8"	3 3/4"	9 3/4"
Thread cutting range, 48..	4—224 per in.	4—224 per in.	4—224 per in.
Spindle speeds, 12.....	41-1270 r.p.m.	50—1357 r.p.m.	16-880 r.p.m.
Carriage power feeds:			
Longitudinal, 48.....	.0015"—.0853"	.0015"—.0836"	.0015"—.0841"
Transverse, 48.....	.0004"—.0252"	.0006"—.0309"	.0006"—.0312"
Carriage longitudinal travel.....	18"	16"	6' bed—22 1/2"
Turret power feeds.....	.....	.....	.0001"—.0148"
Turret indexing tolerance at 4" from turret face.....	.0005"	.0005"	.0005"
Size motor.....	1/2 h.p.	3/4 h.p.	1 1/2 h.p.

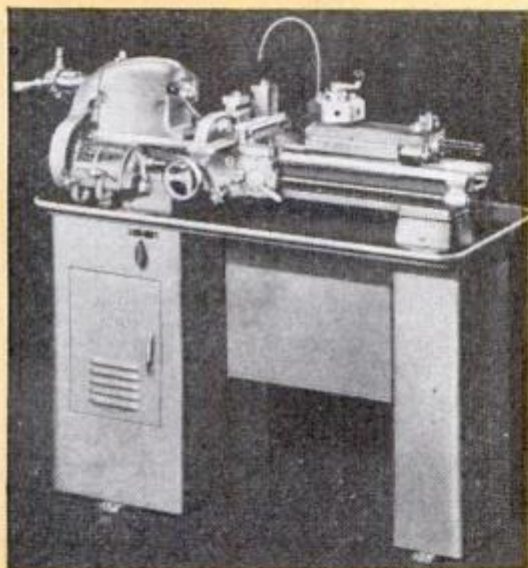
Series 900. This turret lathe is specifically designed for second operations on small, precision parts. Its accuracy, and speed of handling and machining produce appreciable economies in manufacturing that are not possible with heavy turret lathes. Price includes 1 ph., 60 cy., 115 v.,

A.C. motor, drum control, power feed universal carriage, handlever bed turret, handlever cross slide, compound rest cross slide, coolant return assembly, and metal column base with built-in oil pan.

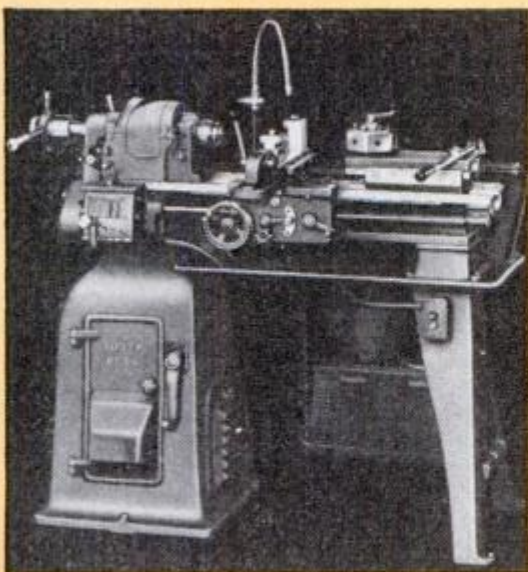
Series 1000. Designed for the same types of applications as the Series 900, these turret lathes with their larger capacities are ideal for machining a wide variety of precision parts. Numerous choices of spindle speeds, power longitudinal and transverse carriage feeds, and thread cutting feeds keep production efficient. Price includes 3 ph., 60 cy., 220 v., A.C. motor, drum control, power feed universal carriage, handlever bed turret, handlever cross slide, compound rest cross slide, oil pan, and coolant return assembly.

Series 2-H. The production of precision duplicate parts in both machine shops and toolrooms is simplified with 2-H Turret Lathes. They are especially suited for exacting second operations on large work because of their accuracy and ease of operation. Price includes 3 ph., 60 cy., 220 v., A.C. motor, drum control, power feed universal carriage with screw feed double tool slide having front and rear tool blocks, power feed ram-type turret, and oil pan.

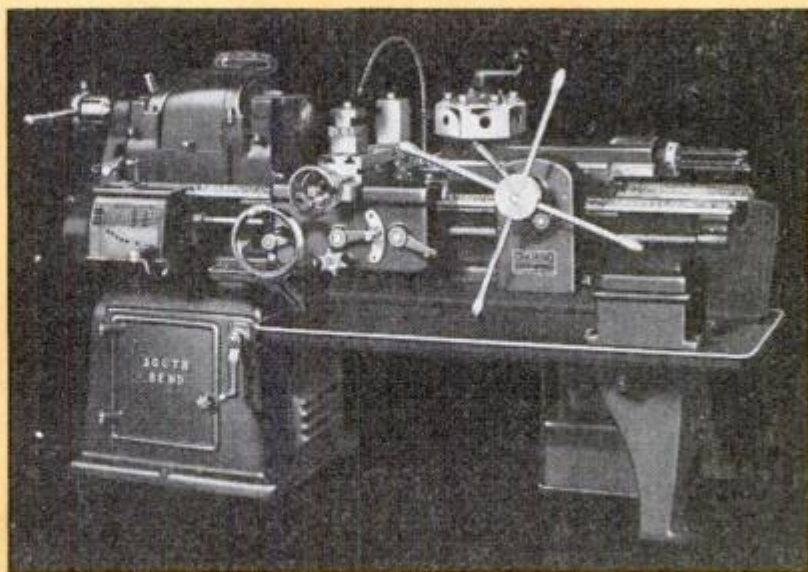
Prices of turret lathes do not include coolant pump or collet equipment.



Ser. 900, Cat. No. 930-Z Turret Lathe **\$765.70**



Ser. 1000, Cat. No. 1006-Z Turret Lathe **\$1199.60**



Series 2-H, Cat. No. 2-CT Turret Lathe (6' bed) **\$2500.00**

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

SOUTH BEND LATHE ATTACHMENTS

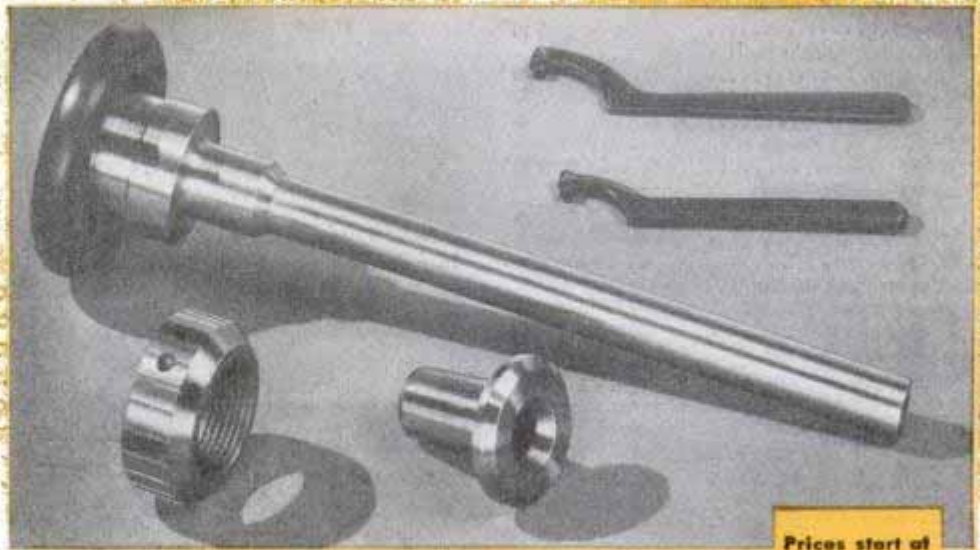


HANDLEVER COLLET ATTACHMENT

The Handlever Collet Attachment is an aid to rapid production work. Stock can be released and fed through the collet without stopping the lathe.

Collet Attachment HANDWHEEL TYPE

The Handwheel Collet Attachment is a very accurate type of chuck. It is used for precision toolroom work and for the manufacture of small parts, or wherever extremely close tolerances are required. Bar and tube stock can be fed through the hollow draw-bar that operates the collet. Equipment includes draw-bar, spindle nose cap, spanner wrench, and closing sleeve. Collets are not included.



Handwheel Draw-in Collet Attachment

Prices start at

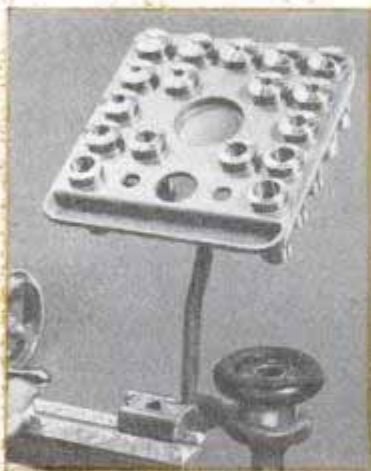
\$25

DRAW-IN COLLET ATTACHMENTS

Size of Lathe	Collet Required	Max. Collet Cap.	Handwheel Type		Handlever Type	
			Catalog Number	Price	Catalog Number	Price
9" and Series 900.....	No. 3	1/2"	4306-W	\$25	5206-W	\$ 85
10"—11/16" Collet.....	No. 2	11/16"	4310	40	5210	120
10"—1" Col. & Series 1000.	No. 5	1"	4312	50	5219	150
13".....	No. 2	11/16"	4313	40	5213	120
14 1/2".....	No. 4	3/4"	4314	45	5214	140
16", 16/24", & No. 2-H.....	No. 5	1"	4316	50	5216	150

Collet Rack and Collet Chest

Collet Rack No. 1770-W holds 19 collets, all others hold 17 collets. Collets are not included.



COLLET RACK

Holds collets, centers, spindle sleeve, draw-bar, spindle nose cap, wrench, etc.

COLLET RACKS

Catalog Number	Size of Lathe	Price
1770-W	9" and 900	\$12
1752	10"—11/16" Col.	15
1753	10"—1" Col.	17
1753	Ser. 1000	17
1772	13"	15
1791	14 1/2"	17
1774	16" & 16/24"	17

No. 2225—Collet Chest only, for holding handwheel collet attachment and collets for 9" lathes. Collet attachment and collets not included. Price: \$7.50

No. 2220—Collet Chest, 9" handwheel collet attachment and 29 steel collets for round work, 1/16" to 1/2" by 64ths. Complete: \$122.00



COLLET CHEST

Holds handwheel collet attachment and 29 collets. Well constructed of wood.

**TIME
PAYMENT
TERMS**

When order includes lathe
25 per cent down
12 months to pay balance
moderate finance charges

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

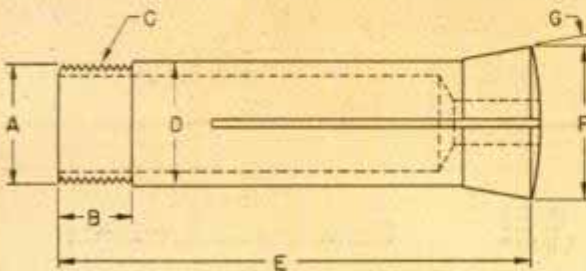
Collets and Collet Sets

South Bend Collets, manufactured with the same exacting care as South Bend Lathes, deliver long, dependable service on precision work. Each collet is carefully inspected and tested, and packed in substantial plastic box with transparent lid through which the size can be read for easy selection.

Steel Collets are carefully heat-treated for maximum service and are precision ground to exceedingly close tolerances.

Brass Collets, a South Bend innovation, have many practical applications.

Their low cost makes them desirable for odd sizes that are used only occasionally. They can be readily machined on the job for holding tapered or irregular shapes. When worn, they can be rebores to larger diameters.



Steel Collet



Brass Collet



Collet Packaged in Plastic Box

Specifications of Steel and Brass Collets

Collet Number	* For South Bend Lathes	A Thread Diameter Inches	B Thread Length Inches	C Threads Per Inch	D Body Diameter Inches	E Collet Length Inches	F Head Diameter Inches	G Angle Length Degrees
3	9" and Series 900	.650	3/4	26	.6495	2-11/16	.852	12
2	10"-11/16" Col. and 13"	.855	13/16	20	.8595	3-5/16	1.095	15
5	10"-1" Collet, 1000, 2-H, 16", and 16/24"	1.250	3/4	20	1.2495	3-9/32	1.452	10
4	14 1/2"	.950	13/16	20	.9495	3	1.150	10

*Collets can also be used on any other lathe or machine which they will fit.

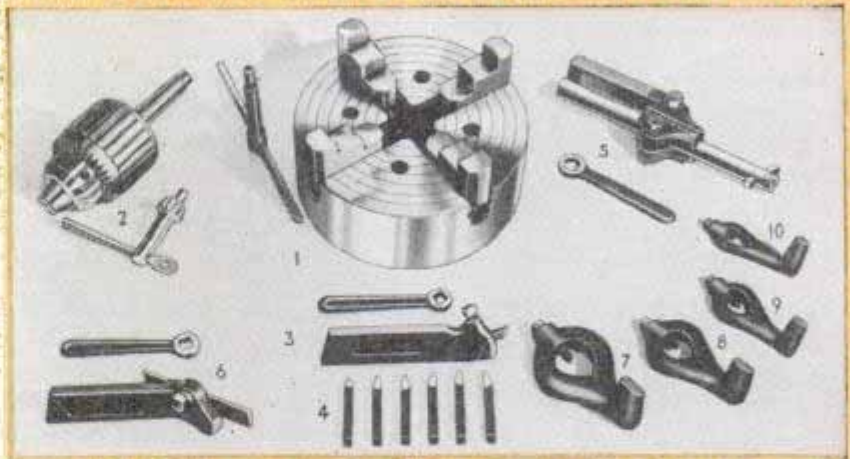
South Bend Collets and Collet Sets

Collet	Description	Steel Collets		Brass Collets	
		Cat. No.	Price	Cat. No.	Price
No. 3	1 Collet, any standard size 1/16" to 1/2" in 64ths.....	609-W	\$ 3.75	1696	\$ 2.00
	Set of 8 Collets in 16ths, 1/16" to 1/2".....	2047	27.00	2235	15.00
	Set of 7 Collets in odd 32nds, 3/32" to 15/32".....	2476	24.00	2534	13.00
	Set of 14 Collets in odd 64ths, 5/64" to 31/64".....	2477	46.00	2535	24.00
	Decimal Collets (.0625" to .500") each.....	769-W	4.00	1856	2.15
	Metric Collets (1.5 mm to 12.5 mm) each.....	773-W	4.00	1702	2.15
No. 2	1 Collet, any standard size 1/16" to 11/16" in 64ths.....	1721	4.00	1697	2.25
	Set of 11 Collets in 16ths, 1/16" to 11/16".....	2432	39.00	2238	23.00
	Set of 10 Collets in odd 32nds, 3/32" to 21/32".....	2478	36.00	2536	21.00
	Set of 20 Collets in odd 64ths, 5/64" to 43/64".....	2479	71.00	2537	40.00
	Decimal Collets (.0625" to .6875") each.....	769-N	4.25	1857	2.40
	Metric Collets (1.5 mm to 17.0 mm) each.....	773-N	4.25	1703	2.40
No. 5	1 Collet, any standard size 1/16" to 1" in 64ths.....	1722	4.75	1698	2.50
	Set of 16 Collets in 16ths, 1/16" to 1".....	2435	68.00	2241	37.00
	Set of 15 Collets in odd 32nds, 3/32" to 31/32".....	2482	64.00	2540	35.00
	Set of 30 Collets in odd 64ths, 5/64" to 63/64".....	2483	127.00	2541	65.00
	Decimal Collets (.0625" to 1.000") each.....	769-R	5.00	1858	2.65
	Metric Collets (1.5 mm to 25.0 mm) each.....	773-R	5.00	1704	2.65
No. 4	1 Collet, any standard size 1/16" to 3/4" in 64ths.....	1713	4.25	1699	2.35
	Set of 12 Collets in 16ths, 1/16" to 3/4".....	2438	46.00	2244	26.00
	Set of 11 Collets in odd 32nds, 3/32" to 23/32".....	2480	42.00	2538	24.00
	Set of 22 Collets in odd 64ths, 5/64" to 47/64".....	2481	81.00	2539	45.00
	Decimal Collets (.0625 to .7500") each.....	769-K	4.50	1859	2.50
	Metric Collets (1.5 mm to 19.0 mm) each.....	773-K	4.50	1705	2.50

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

Chuck and Tool Assortments

The chucks and tools in the assortments shown are recommended for use with the various South Bend Lathes. This is the basic equipment required for the average shop for general machine work, such as turning, boring, drilling, cutting-off, chucking, etc. A 3-jaw Universal chuck can be substituted for the 4-jaw Independent at additional cost.



Contents of Assortment

- 4-Jaw Independent Lathe Chuck fitted to lathe. Sizes: 6 in. on 9" and 10" Lathes; 7½ in. on 13" Lathe; 9 in. on 14½" Lathe; 10 in. on 16" and 16/24" Lathes.
- Jacobs 3-Jaw Drill Chuck. Sizes: ½ in. on 9" and 10" Lathes; ¾ in. on 13" and 14½" Lathes; 1 in. on 16" and 16/24" Lathes.
- Arbor Fitted to Above Drill Chuck.
- Straight Shank Tool Holder.
- 6 Ground Cutter Bits for Tool Holder.
- Boring Tool Holder, Style "B." 9" Lathes take Style "D."
- Cutting-Off Tool Holder, Right-Hand.
- 4 Malleable Lathe Dogs. Sizes: ½", ¾", 1", and 1¼" on 9" and 10" Lathes; ½", ¾", 1", and 1½" on all others.

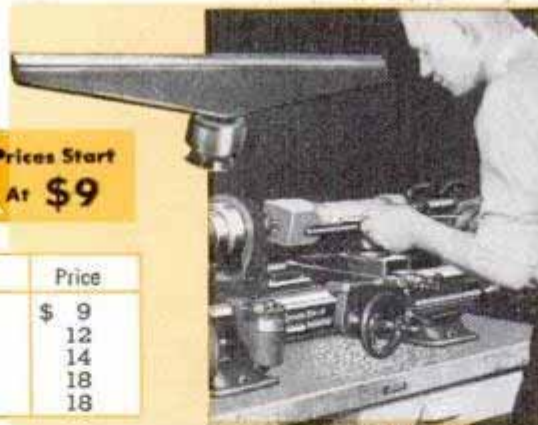
Prices of Complete Assortments

Size of Lathe	Catalog No.	Price
9" & 900.....	105-WT	\$53.44
10"—11/16" Collet.....	110-T	87.87
10"—1" Collet & 1000...	110-L	88.87
13".....	113-T	103.01
14½".....	114-T	115.28
16" & 16/24".....	116-T	135.68

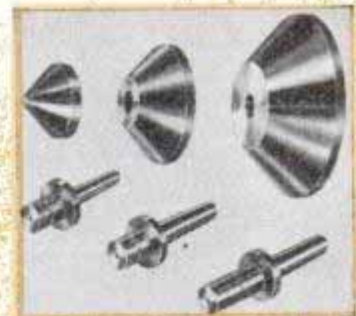
Wood Turning Rest

Mounts on compound rest base to convert lathe for wood turning. See following pages for centers for wood turning.

Prices Start
At \$9



Size of Lathe	Catalog No.	Price
9".....	896-W	\$ 9
10".....	1069	12
13".....	1073	14
14½".....	1165	18
16" and 16/24".....	1075	18



Pipe Centers

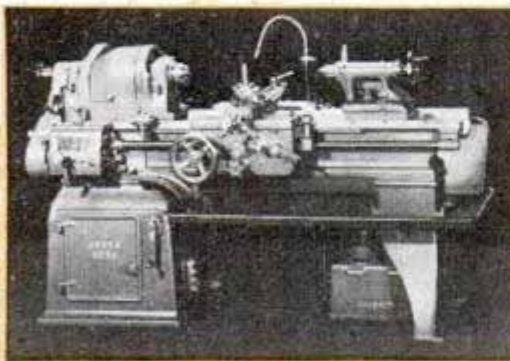
Cat. No.	Takes Pipe	Requires Shank	Price
2160	½" to 3"	2172-NR	\$4.50
2161	3" to 5"	2172-TH	6.00
2162	5" to 8"	2173-TH	9.00

Pipe Center Shanks

Cat. No.	Taper	Price
2172-NR	No. 2	\$4.50
2172-TH	No. 3	4.50
2173-TH	No. 3	7.50

Chip Pans and Oil Pans

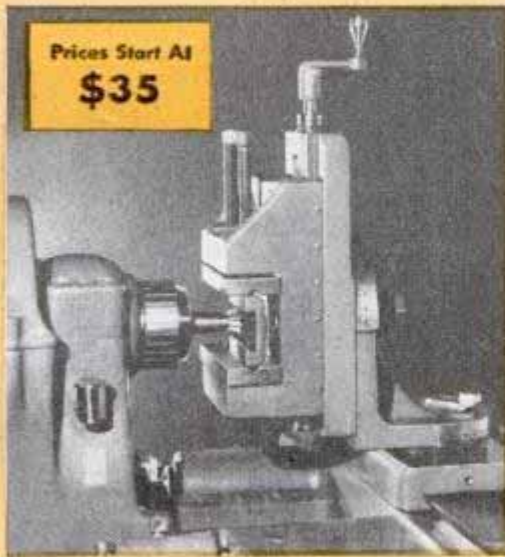
Oil Pans, Splash Pans, and Chip Pans can be supplied for all South Bend Lathes. Oil Pans should be factory-installed for proper fit. Complete information and prices will be supplied on request.



**TIME
PAYMENT
TERMS**

When order includes lathe 25 per cent down 12 months to pay balance Moderate finance charges

Milling and Keyway Cutting Attachment



Milling and Keyway Cutting Attachment

This useful attachment is ideal for shops not having enough of this work to justify a milling machine. Mounts on compound rest base of lathe, permitting the power cross and longitudinal feeds to be used for milling, boring and keyway cutting operations on work held in the milling attachment vise. Vise swivels in any direction, 180° horizontal and vertical graduations. Vertical slide adjusting screw equipped with micrometer graduated collar.

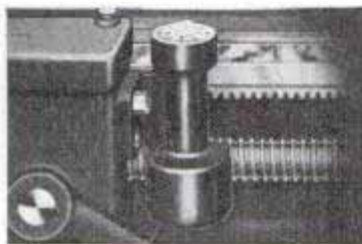
Size Lathe	Cat. No.	Vise Cap.	Price
9" & 900	9-W	1 1/2"	\$35
10" & 1000	1-N	1 3/4"	45
13"	3	2 3/8"	55
14 1/2"	4-K	4"	65
16", 16/24"	5	4"	75

Arbors for Milling Cutters



Holds cutters with 1" holes. Capacity between nut and shoulder, 1 1/2". 3 spacing collars furnished. All shanks No. 3 Morse Taper.

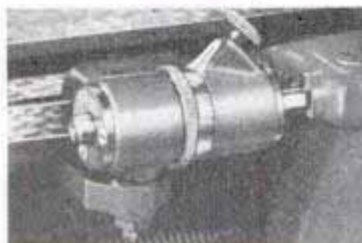
Lathe Size	Catalog No.	Price
9" & 900	109-NH	\$7
10" & 1000	109-NH	7
13"	109-NH	7
14 1/2"	109-NH	7
16", 16/24"	109-NH	7



Thread Dial Indicator

Eliminates reversing of lathe spindle when cutting threads. Dial is numbered and graduated to show when to close half-nuts on lead screw to catch the thread on the next successive cut, after returning carriage to starting point.

Lathe Size	Catalog No.	Price
9" & 900	810-W	\$ 8
10" & 1000	1588	13
13"	813	15
14 1/2"	813	15
16", 16/24", 2-H	813	15



Micrometer Carriage Stop

Locates the carriage at any point along the bed for accurate facing, turning, boring, etc. Has accurately graduated micrometer collar. Stop is hardened on both ends for use on either side of carriage. Can be locked for duplicate work.

Size of Lathe	Catalog No.	Price
9" & 900	968-W	\$15
10" & 1000	1518	16
13"	973	18
14 1/2"	1502	19
16", 16/24", 2-H	975	19



Follower Rest

Supports long, slender shafts being machined between centers. Attaches to, and travels with, the carriage. Adjusting screws and lock screws are provided for setting the jaws in position. Slots in bottom of follower rest permit quick attachment or removal.

Size of Lathe	Catalog No.	Capacity		Price
		Max.	Min.	
9" & 900	34-W	2"	3/16"	\$4.75
10" & 1000	1353	2 1/2"	3/16"	7.00
13"	376	3 1/4"	3/16"	8.00
14 1/2"	1351	4 1/4"	3/16"	9.00
16"	730	4 1/4"	3/16"	10.00
16/24"	1352	4 1/4"	3/16"	15.00



Center Rest

Clamps on inside ways of lathe bed and is used for supporting long shafts, boring spindles, etc. The 3 jaws are adjustable, and are made of cast iron. Top of center rest is hinged to facilitate inserting and removing shafts.

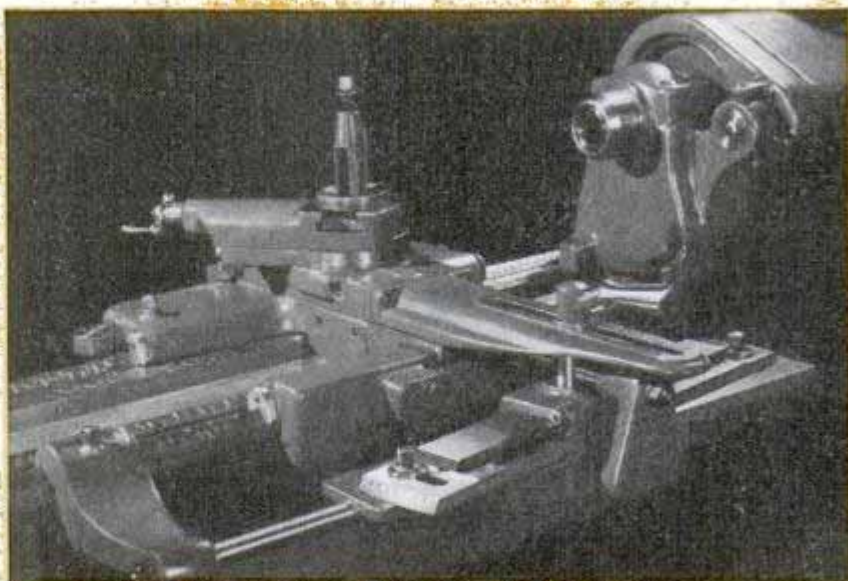
Size of Lathe	Catalog No.	Capacity		Price
		Max.	Min.	
9" & 900	125-W	3"	1/4"	\$ 7
10" & 1000	1177	3"	1/4"	10
13"	341	3 3/4"	3/8"	13
14 1/2"	1174	4 3/4"	3/8"	16
16"	720	4 3/4"	3/8"	18
16/24"	1175	4 3/4"	3/8"	24

Taper Attachments

Telescopic and Plain

Taper turning and boring are as easily accomplished as straight turning on lathes equipped with South Bend Taper Attachments. The Taper Attachments are permanently mounted on the lathe carriages, and must be fitted at the factory. Accuracy and smooth operation are assured by their practical design and rugged construction. The swivel bar is graduated in both degrees and taper per foot.

Telescopic Taper Attachments are used only on 10" and larger lathes. A telescopic cross-feed screw eliminates the necessity of disconnecting the cross-feed nut when tapers are machined. The Plain Taper Attachment used on 9" Lathes requires the disconnecting of the cross-feed screw and nut.

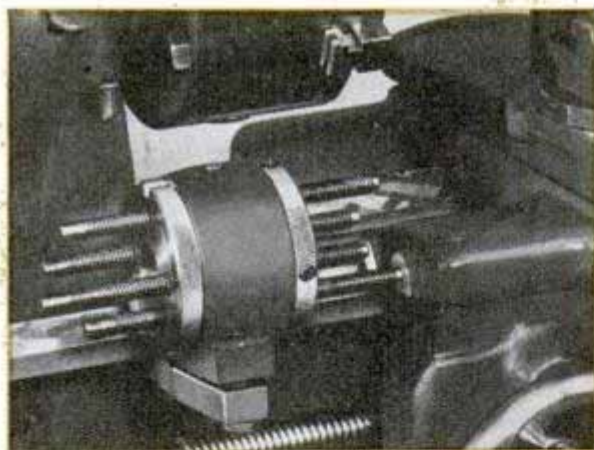


Telescopic Taper Attachment

Size of Lathe	Catalog Number	Max. Length at One Setting	Max. Taper per Foot	Max. Taper in Degrees	Price
9" and 900....	428-W	7"	3 1/2"	16 1/2°	\$ 75
10" & 1000....	1545	8 1/2"	3 1/2"	16 1/2°	137
13".....	379	9 1/4"	3 1/2"	16 1/2°	154
14 1/2".....	399	9 1/4"	3 1/2"	16 1/2°	165
16" & 16/24"..	381	11 1/2"	3 1/2"	16 1/2°	185

**TIME
PAYMENT
TERMS**

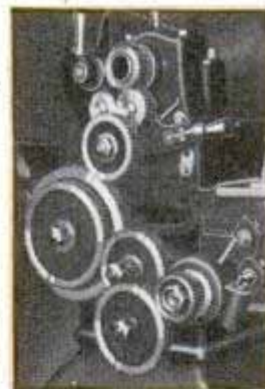
When order includes lathe 25 per cent down 12 months to pay balance Moderate finance charges



Four Position Carriage Stop

Much time can be saved in positioning the cutting tool for repetitive operations, by using this four position carriage stop. Each of the four adjustable stops may be set for a different tool position, and may be revolved to locate the carriage for each of four successive cuts. This attachment is especially desirable when a square turret tool block carrying up to four cutting tools is used. It may be clamped on either side of the carriage to position the tool either from left to right, or from right to left.

Cat. No.	Size Lathe	Price
2185-N	9".....	Price on Request
2185-R	10".....	
2185-T	13".....	
2185-F	14 1/2".....	
2185-H	16", 16/24", 2-H	



Metric Transposing Gears

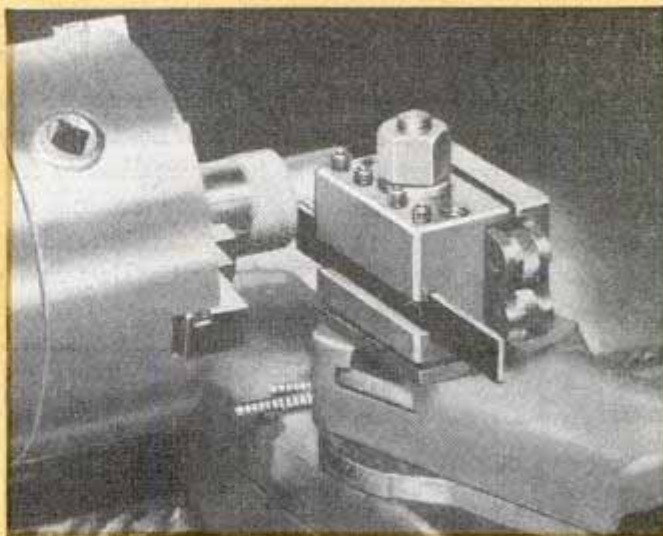
Metric screw threads from 6 mm to 0.20 mm pitch (L.H. & R.H.) can be cut when Metric Transposing Gears are used. Prices when ordered with lathe.

Size of Lathe	Catalog No.	Price
Mdl. A 9" & 900...	1955-W	\$10
Mdl. B or C 9" & 900...	1759-W	12
10" & 1000.....	1963	40
13".....	1957	45
14 1/2".....	1961	50
16".....	1959	55
16/24".....	1960	50

Universal Tool Block

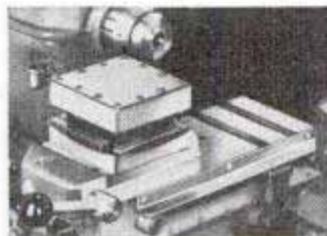
The new Universal Tool Block replaces the conventional tool post and various tool holders ordinarily used for general lathe work. It provides rigid support for turning, boring, threading, and cut-off tool bits. In addition, it is equipped with a self-aligning knurling head. Screw adjustments for tool height are easily made, and they stay put. No re-adjustment is required when replacing tools. This tool block can be adapted to fit other makes of lathes.

Size of Lathe	Cat. No.	Price
9".....	1413-N	\$11.25
10".....	1413-R	11.75
13".....	1413-T	13.75
14 1/4".....	1413-F	15.75
16" & 16/24"	1413-H	16.25



Universal Tool Block

Patent Pending



Patent Pending

Square Turret Tool Block

for Double Tool Cross Slide

The turret indexes within .0005", permitting each of four tools to be used in sequence for rough turning, facing, boring, cutting-off, or other operations as required. A quick-acting lever locks the turret securely in each of the four positions. Rocker adjustment is provided for adjusting height of each tool. For use on the double tool cross slides of South Bend Lathes, but can be adapted for use on other makes.

Patent Pending



Patent Pending

Square Turret Tool Block

for Compound Cross Slide

Used on compound cross slides for same purpose as tool block described at left. Turret indexes within .0005" to each of four positions and locks by means of lever. Rocker adjustments provided for tools. Ruggedly constructed. This tool block is for use on compound rest cross slides of South Bend Lathes but can be adapted for use on other makes.

Tool Blocks for Compound Cross Slides

Size of Lathe	Catalog Number	Size Square	Takes Tools	Price
9" & 900.....	40-NC	3"	3/8" x 3/8"	\$45
10" & 1000.....	41-NC	3"	3/8" x 3/8"	45
13".....	43-NC	3"	3/8" x 3/8"	50
14 1/2".....	44-NC	4"	3/8" x 3/8"	70
16" & 16/24".....	42-NC	4"	3/8" x 3/8"	75

Tool Blocks for Double Tool Cross Slides

Size of Lathe	Catalog Number	Size Square	Takes Tools	Price
9" & 900.....	41-ND	3"	3/8" x 3/8"	\$40
10" & 1000.....	41-ND	3"	3/8" x 3/8"	40
16".....	42-ND	4"	3/8" x 3/8"	70



Handlever Double Tool Cross Slide

Ideal for increasing production on repetitive operations. Three 7/16" square cutter bits can be used—two in front tool block, one in rear tool block. Mounts on saddle cross slide in place of compound rest. Can be operated by handlever or power cross-feed.

Size of Lathe	Catalog Number	Swing over Slide	Price
9" & 900..	2030-W	3-9/16"	\$75
10" & 1000.	2031	3-9/16"	90



Handlever Bed Turret

Turret head indexes automatically when lever is moved to extreme right. Each turret face has independently adjustable feed stop screw which accurately regulates length of cut. Effective feed of turret slide 4". Turret indexes within .0005" four inches from turret face.

Size of Lathe	Cat. No.	Price
9" & 900.....	1611-W	\$200
10" & 1000....	1612	210
13".....	1613	225

SOUTH BEND LATHE ATTACHMENTS

Standard and Safety Lathe Dogs

Lathe dogs should correspond in capacity to the diameter of the work if the work is to be held securely. These lathe dogs are made of heavy malleable iron and are properly designed for maximum strength and long service. The Standard Lathe Dog has square head alloy steel set screw. The Safety Lathe Dog has a headless alloy steel set screw.



Lathe Dogs for 13" and Larger Lathes

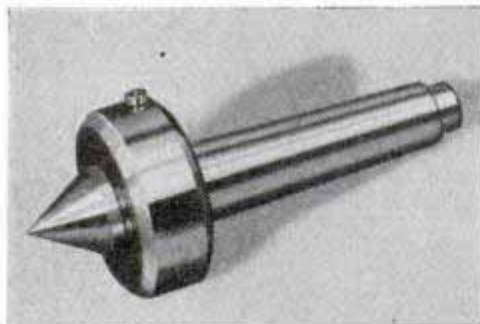
Cap. In.	STANDARD		SAFETY		
	Cat. No.	Price	Cat. No.	Wrench Required	Price
1/2	3843	\$0.80	3826	2385	\$0.80
3/4	3844	.95	3827	2386	.95
1	3845	1.05	3828	2387	1.05
1 1/4	3846	1.20	3829	2388	1.20
1 1/2	3847	1.40	3830	2389	1.40
1 3/4	3848	1.55	3831	2389	1.55
2	3849	1.70	3832	2389	1.70
2 1/2	3850	1.95	3833	2390	1.95
3	3851	2.20	3834	2390	2.20
3 1/2	3852	3.00	3835	2390	3.00
4	3853	4.00	3836	2390	4.00

Lathe Dogs for 9" and 10" Lathes

Cap. In.	STANDARD		SAFETY		
	Cat. No.	Price	Cat. No.	Wrench Required	Price
3/8	3837	\$0.70	3820	2385	\$0.70
1/2	3838	.75	3821	2385	.75
3/4	3839	.90	3822	2386	.90
1	3840	1.00	3823	2387	1.00
1 1/4	3841	1.10	3824	2388	1.10
1 1/2	3842	1.35	3825	2388	1.35

A complete set of lathe dogs is a must in any shop.

Lathe Centers and Drill Pads

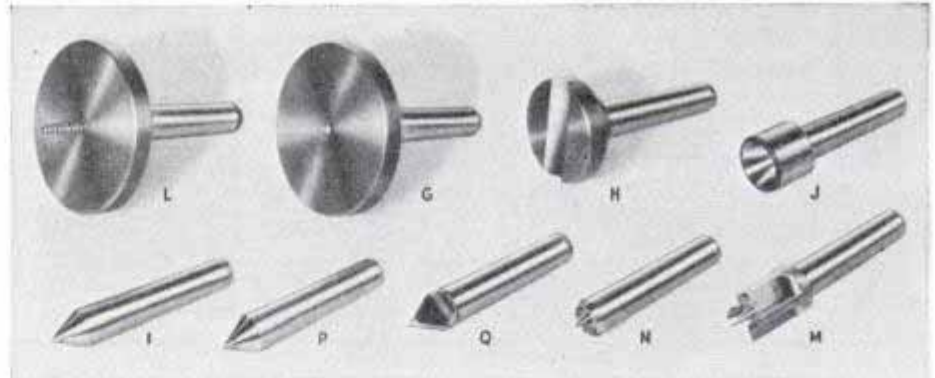


Patent Pending

Ball Bearing Live Center

Designed for maximum strength and rigidity, the Ball Bearing Live Center is recommended for high speeds, heavy roughing cuts, etc. 60° point runs in substantial precision ball bearing which is easily replaceable.

Catalog No.	Shank Taper	Price
3900	No. 2	\$11.50
3901	No. 3	13.50



L—Screw Center for wood turning. G—Drill Pad to support flat work for drilling. H—Crotch Center supports round work for cross drilling. J—Hollow Center for supporting centerless shafts up to 3/8" dia. I—60° Center for headstock or tailstock spindles P—Carbide Center. Q—Half Center. N—Cup Center. M—Spur Center, for all wood turning operations.

Description	No. 2 Taper for 9" and 10" Lathes		No. 3 Taper for 13", 14 1/2", & 16"	
	Cat. No.	Price	Cat. No.	Price
L—Screw Center.....	731-NR	\$3.00	731-TH	\$3.25
G—Drill Pad.....	727-NR	2.50	727-TH	2.75
H—Crotch Center.....	728-NR	2.50	728-TH	3.25
J—Hollow Center.....	1896-NR	2.00	1896-TH	2.75
I—60° Center.....	726-NR	2.25	726-TH	3.00
P—Carbide Center.....	1889	4.50	1890	8.00
Q—Half Center.....	926-NR	2.25	926-TH	3.00
N—Cup Center.....	733-NR	2.00	733-TH	2.75
M—Spur Center.....	732-NR	3.00	732-TH	3.25

**TIME
PAYMENT
TERMS**

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Moderate finance charges

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

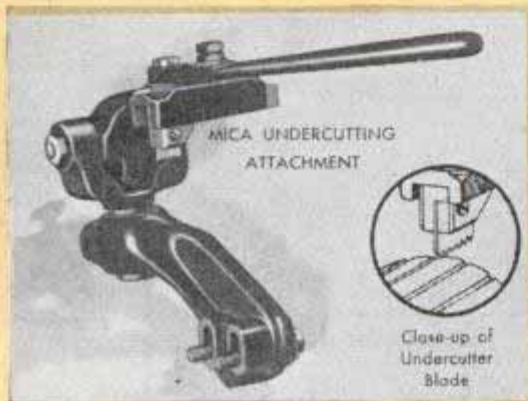
SOUTH BEND LATHE ATTACHMENTS

Coolant Pump and Reservoir

(Not Fitted to Lathe at Factory)

The coolant equipment listed below includes motor driven coolant pump, tubing, reservoir and tray, 1/4 h.p. motor (see table below), switch, and wiring for connecting switch to motor. Pump is self-priming as it is below the oil level. Reservoir intake is fitted with large filter screen. This coolant equipment can be used with lathes and other machine tools. When ordering, specify voltage, phase, and cycle of motor wanted.

Cat. No.	Motor Specifications				Price
	Current	Phase	Cycle	Voltage	
2003-C	A.C.	3	50	220	\$117.00
2003-D	A.C.	3	60	220	117.00
2003-E	A.C.	3	50	440	117.00
2003-F	A.C.	3	60	440	117.00
2001-A	A.C.	1	50	115	105.00
2001-B	A.C.	1	60	115	103.00
2001-C	A.C.	1	50	230	106.00
2001-D	A.C.	1	60	230	105.00
2000-K	D.C.	...	...	115	128.00
2000-L	D.C.	...	...	230	128.00



Patented

Mica Undercutting Attachment

Any shop that repairs armatures for motors, generators or starters will have a lot of use for this practical attachment. It attaches to the saddle of the lathe which insures rigidity and alignment. The blade travels parallel to the commutator bars which insures clean, straight cutting. Upper portion is hinged so the blade holder can be swung back so it does not interfere with turning the commutator.

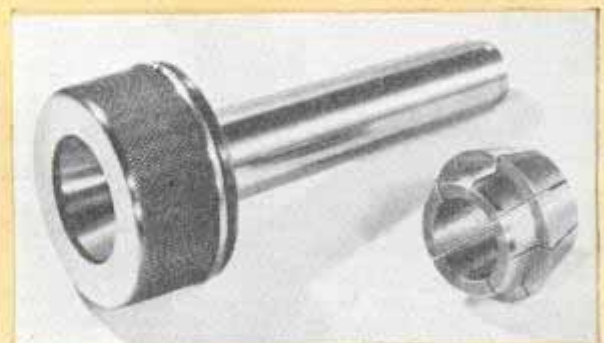
Price includes one blade .020" thick. Extra cutter blades .020" and .015" thick are available as listed below.

Size of Lathe	9"		10"		13"		14 1/2"		16"	
Description	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price
Mica Undercutting Attachment.....	675-N	\$18.00	675-R	\$18.00	675-T	\$19.00	675-F	\$20.00	675-H	\$21.00
Extra Blade, .015".....	2028	.15	2028	.15	2028	.15	2028	.15	2028	.15
Extra Blade, .020".....	2029	.25	2029	.25	2029	.25	2029	.25	2029	.25

Adjustable Collet Bushing Chuck

The adjustable collet bushing chuck provides an extremely accurate, but inexpensive equipment for mounting centerless armature shafts, and similar parts, in the lathe. Can be used in either head or tail spindle of lathe. Collets are made of brass, and may be adjusted for either running fit or driving fit on shaft.

Description	Cat. No.	Shank	Price
Adjustable Collet Bushing Chuck Only.....	1615-NR	No. 2	\$6.25
	1615-TH	No. 3	6.75
Adjustable Collet Bushing Chuck with set of 3 collets, 9/16", 5/8" and .637" capacity for popular armatures.....	1608-NR	No. 2	8.95
	1608-TH	No. 3	9.45



Cat. No. 1659, Extra Collets for round work, any capacity 1/4" to 1" round by 16ths, price each \$1.00.

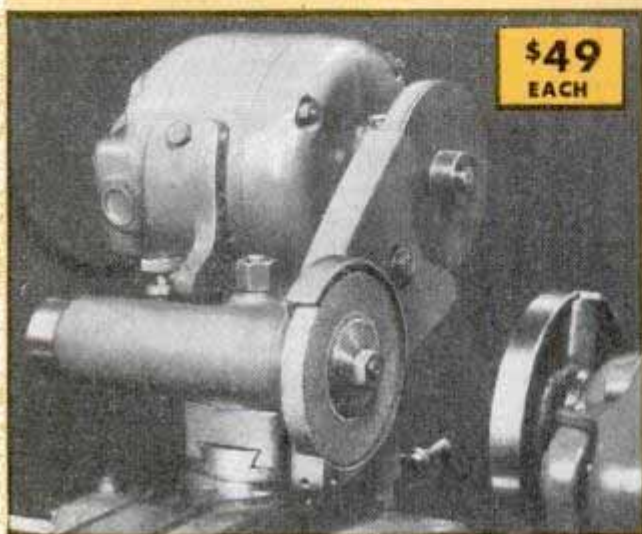
SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

Two Superb Grinding Attachments

South Bend Design and Manufacture

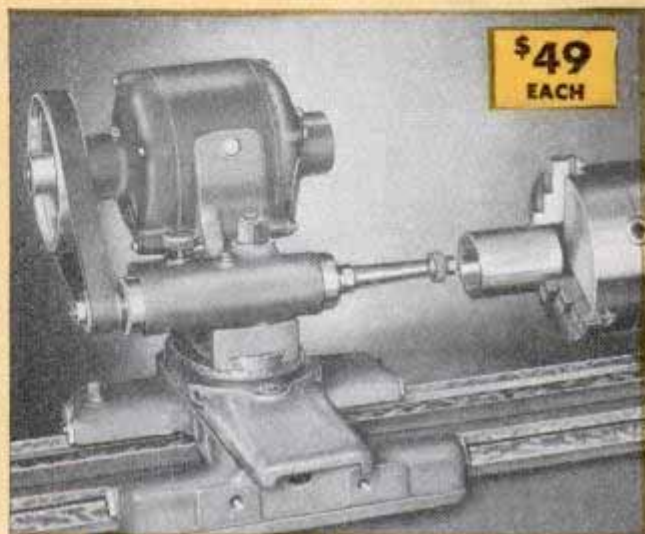
External—This powerful and efficient grinding attachment is recommended for external grinding. Designed to fit the various sizes of South Bend Lathes, it is easily adaptable for use on milling machines, shapers, planers, or other makes of lathes. The spindle revolves on pre-lubricated, precision ball bearings which are sealed to protect them from damage by dust, grit and metal particles produced when grinding. Supplied with $\frac{1}{4}$ h.p., 1725 r.p.m. constant speed continuous duty motor, 4" x $\frac{1}{2}$ " grinding wheel.

Internal—Designed as a companion to the External Grinding Attachment, this grinder is intended for all types of internal grinding. It is equipped with a $\frac{1}{8}$ h.p. constant speed continuous duty motor. Spindle runs in precision ball bearings. Changeable pulleys provide 3 spindle speeds of approximately 13,000, 15,000, and 18,000 r.p.m. Uses standard Norton and Carborundum grinding wheels. Extension quill permits grinding holes up to 2 $\frac{1}{4}$ " deep. Price includes belt and three assorted grinding wheels.



\$49
EACH

External Grinding Attachment



\$49
EACH

Internal Grinding Attachment

Prices include motor for 115 v., 60 cy., 1 ph., A.C. current.
Prices with other motors quoted on request.

TIME PAYMENT TERMS

When order includes lathe 25 per cent down 12 months to pay balance moderate finance charges

Size of Lathe	EXTERNAL GRINDER		INTERNAL GRINDER	
	Catalog No.	Price	Catalog No.	Price
9" & Series 900.....	301-BN	\$49	201-BN	\$49
10"—11/16" Col.....	301-BR	49	201-BR	49
10"—1" Col. & 1000.....	301-BR	49	201-BR	49
13".....	301-BT	49	201-BT	49
14 $\frac{1}{2}$ ".....	301-BF	49	201-BF	49
16" & 16/24".....	301-BH	49	201-BH	49



Above: Grinding a cutter with spring stop in holding fixture. Right: Grinding spiral reamer.

Reamer and Cutter Grinding Stops

Consists of adjustable holding fixture which clamps on lathe bed for holding adjustable grinding stops and diamond dresser for grinding wheels. Also a grinding stop which attaches to grinding wheel guard and travels with grinder for grinding spiral reamers and cutters.

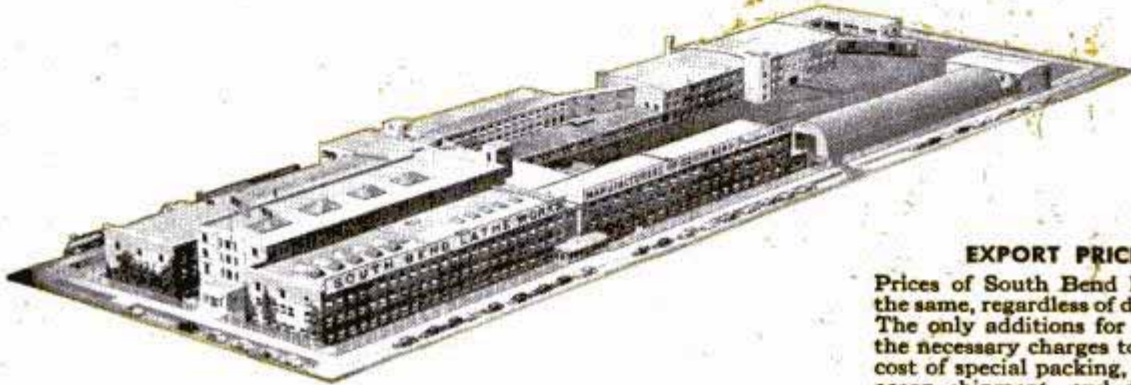
Size of Lathe	9" Ser. 900	10" Ser. 1000	13"	14 $\frac{1}{2}$ "	16"	16/24"
Catalog No.....	1512-N	1512-R	1512-T	1512-F	1512-H	1512-V
Price.....	\$15	\$16	\$18	\$20	\$20	\$29

SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U. S. A.

SOUTH BEND LATHES

Are Known Throughout the World for Their

Quality



EXPORT PRICES

Prices of South Bend Lathes are the same, regardless of destination. The only additions for export are the necessary charges to cover the cost of special packing, boxing for ocean shipment, and delivery to ship side at U. S. ports.

How to Run a Lathe
A 128-page book on the operation of metal working lathes. Printed in English. Price postpaid 50 cents.

Manual del Tornero
Un libro de 128 páginas sobre el manejo de tornos mecánicos. Editado en español. Precio 50 cents en moneda de los E.U.A.

Manual do Torneiro
Livro de 128 páginas sobre a condução de tornos mecánicos. Editado em português. Preço, 50 cents em moeda dos E.U.A.

Manuel du Tour
Livret à 128 pages concernant le fonctionnement de tours travail sur métaux. Imprimé en français. Prix 50 cents en monnaie des Etats-Unis d'Amérique.

Although prices of South Bend Lathes are low, their quality is unsurpassed. High quality at a low price is made possible by the efficiencies and economies obtained through standardization and large production. This company produces annually a substantially greater number of lathes than any other manufacturer in the United States.

Aun cuando sean bajos los precios de los Tornos South Bend, su calidad no ha sido sobrepasada. Excelente calidad a precio económico se obtiene por medio de la normalización y de una gran producción. Esta compañía fabrica anualmente un número de tornos considerablemente mucho mayor que cualquier otro fabricante de los Estados Unidos.

Embora sejam baixos os preços dos Tornos South Bend, a qualidade destes não é ultrapassada. A alta qualidade a preço baixo é resultante das eficiências e economias conseguidas por meio da padronização e da grande produção. Esta companhia fabrica anualmente um número consideravelmente maior de tornos que qualquer outro fabricante dos Estados Unidos.

Bienque le tour South Bend se vende à bas prix, la qualité en est néanmoins non surpassée. La haute qualité du tour à bas prix provient de l'action productrice et les économies obtenues par la mise en série et la production en grand. Cette compagnie fabrique annuellement beaucoup plus de tours que tout autre manufacturier des Etats-Unis.



SOUTH BEND LATHE WORKS, 543 E. Madison Street, South Bend 22, Indiana, U.S.A.

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EARLY MORNING BLAZE**

Sub-Zero Temperature Adds to Danger of

*When safety's a must
... it's "Prestone!"*
ANTI-FREEZE

*"No freeze-ups for my car... it's first at
the fire. I've got to be safe—and know it!"*



Charles A. McGinley

*Chief, East Orange, N.J., Fire Dept.
America's most vital cars... the
cars of police chiefs, fire marshals,
doctors, tow-car drivers... and
millions of average motorists de-
pend on "Prestone" anti-freeze
for protection. It's SAFE!*



*In your
car too!*

**NO RUST...
NO FOAM...
NO FREEZE...
NO FAILURE...**

One shot lasts all winter!

YOU MAY never race to fires. Or buck a blizzard to reach a patient's bedside. But *your* car—to *you*—is one of the most important things in the world. Give it the finest protection you can! Like fire marshals and ambulance drivers, you want to be *safe*—and *know* it!

You don't have to *guess* what anti-freeze to choose. The record of "Prestone" brand anti-freeze in cars that *dare not fail* gives you your answer. Like these drivers, you'll be *safe*—and *know* it.

SAME PREWAR PRICE

1926...\$6.90	1933...\$2.95
1929...\$5.90	1935...\$2.70
1932...\$4.95	1939...\$2.65

1947...\$2.65 PER GALLON

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Unit of Union Carbide
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Freeze*

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National Carbon Company, Inc.