

POPULAR MECHANICS

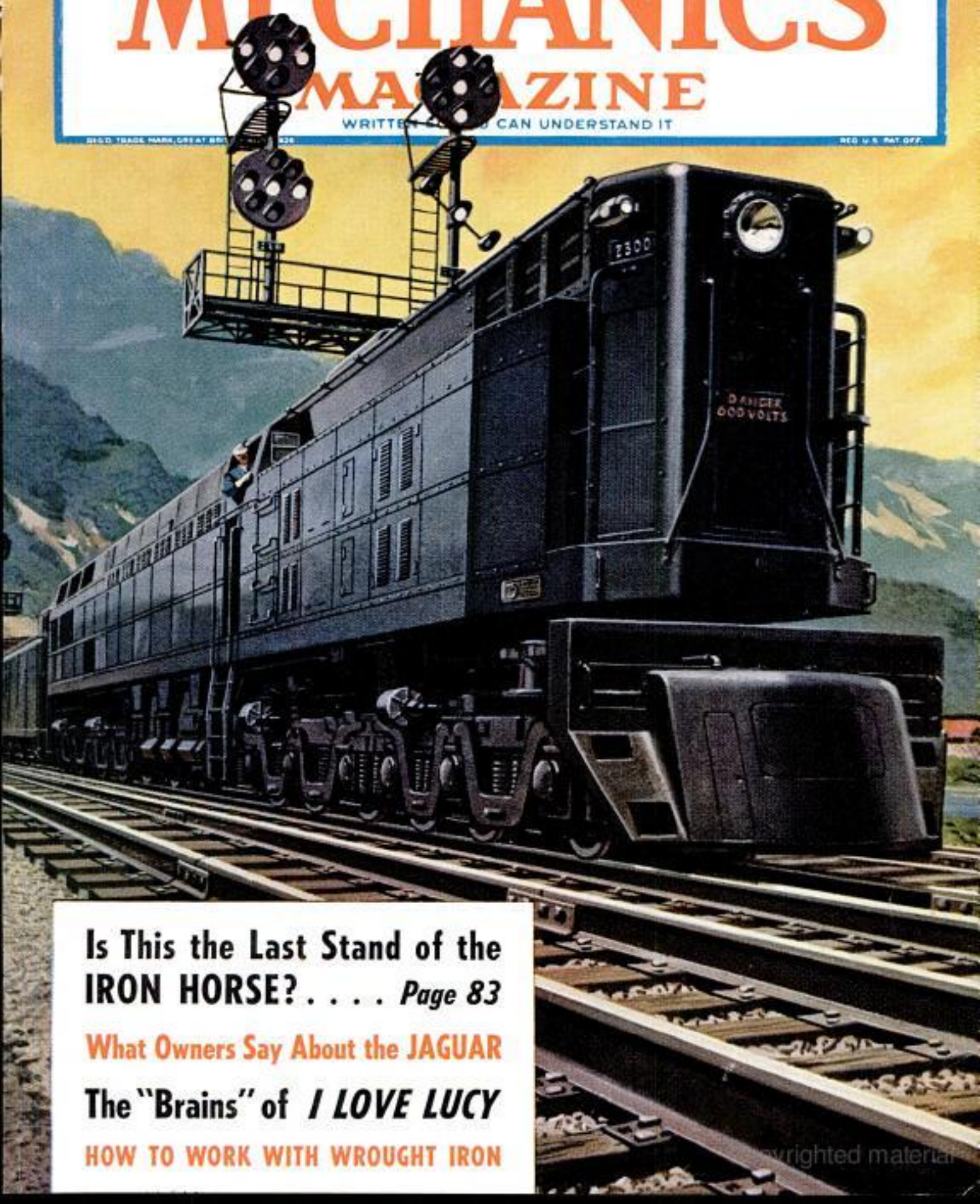
MAGAZINE

WRITTEN BY MEN WHO CAN UNDERSTAND IT

REG. U.S. PAT. OFF.

NO. 1

NO. 1



**Is This the Last Stand of the
IRON HORSE? Page 83**

What Owners Say About the JAGUAR

The "Brains" of I LOVE LUCY

HOW TO WORK WITH WROUGHT IRON

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This is the kitchen →

My name is Saturday (mechanic)

I'm a husband

The sink top is rotted

My job.....



FIX IT !



- 9:01 A.M. I ripped off the old surface.
- 9:57 A.M. Scraped the plywood core of the sink top clean of old mastic.
- 10:32 A.M. Went to my lumber dealer to buy Formica.
- 10:33 A.M. Looked for the Formica Trade-Mark on the sheets to be sure it was genuine--It was.
- 11:05 A.M. Marked and sawed Formica to size for new top and backsplash. Used carpenter's saw--worked fine.
- 12:15 P.M. Spread Formica Contact Bond Cement on back of Formica and on plywood core.
- 12:44 P.M. Knocked off for lunch while cement was drying.
- 1:30 P.M. Applied cemented back of Formica to cemented top of cabinets. Used ordinary rolling pin.
- 1:51 P.M. Filed edges of Formica, applied metal moldings.
- 2:30 P.M. Had a beer. Accepted kiss from lady of the house. **CASE SOLVED.**

Formica samples and complete illustrated instructions for doing-it-yourself with Formica. Write to The Formica Company, 4596 Spring Grove Ave., Cincinnati 32, O.

DEMAND THIS CERTIFICATION

This mark certifies genuine
REMOVE WITH SOAP AND WATER

Seeing is believing. If this wash-off identification is not on the sheet, it's not FORMICA.





"We got a big kick out of designing this new Chevrolet, and you'll get an even bigger one out of driving it."

— says Ed Cole, Chevrolet Chief Engineer

IT ONLY happens once in an engineer's life-time—when a company like Chevrolet hands you a blank sheet of paper and says: "Design us a car—from scratch." But what a wonderful sensation it is to plan a car from the very beginnings, so that it is *right*, all down the line.

That's the chance we were given with the 1955 Chevrolet . . . and we started right from fundamentals with a new frame (*lighter but 50 per cent more rigid*), new bodies (*quieter, bigger inside, with 18 per cent more glass all around*), new spherical-joint front suspension (*softer flexing and uniquely self-adjusting*), outrigger rear springs (*for greater stability on curves*), even an Anti-Dive braking control (*to check that "nosing-down" in front when you apply the brakes suddenly*).

We came up with three new engines—two new versions of the "Blue-Flame" 6's and a 162-h.p.

"Turbo-Fire V8" that has the shortest stroke in its field and an 8 to 1 compression ratio. We added a Touch-Down Overdrive transmission, and a smoother Powerglide as extra-cost options, and a sturdier standard shift—even provided a 12-volt electrical system for more reserve power and a High-Level ventilation system that draws in cleaner, fresher air.

We made so many improvements they can't even be *listed* here—and we got a big kick out of it. But I know you'll get an even bigger kick when you slide behind the wheel of a car that is blue-print-new—from the tubeless tires right on up.

You can't know how advanced the '55 Chevrolet is until you drive it, so why not call your Chevrolet dealer today and have him set up a ride for you? . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

MOTORAMIC



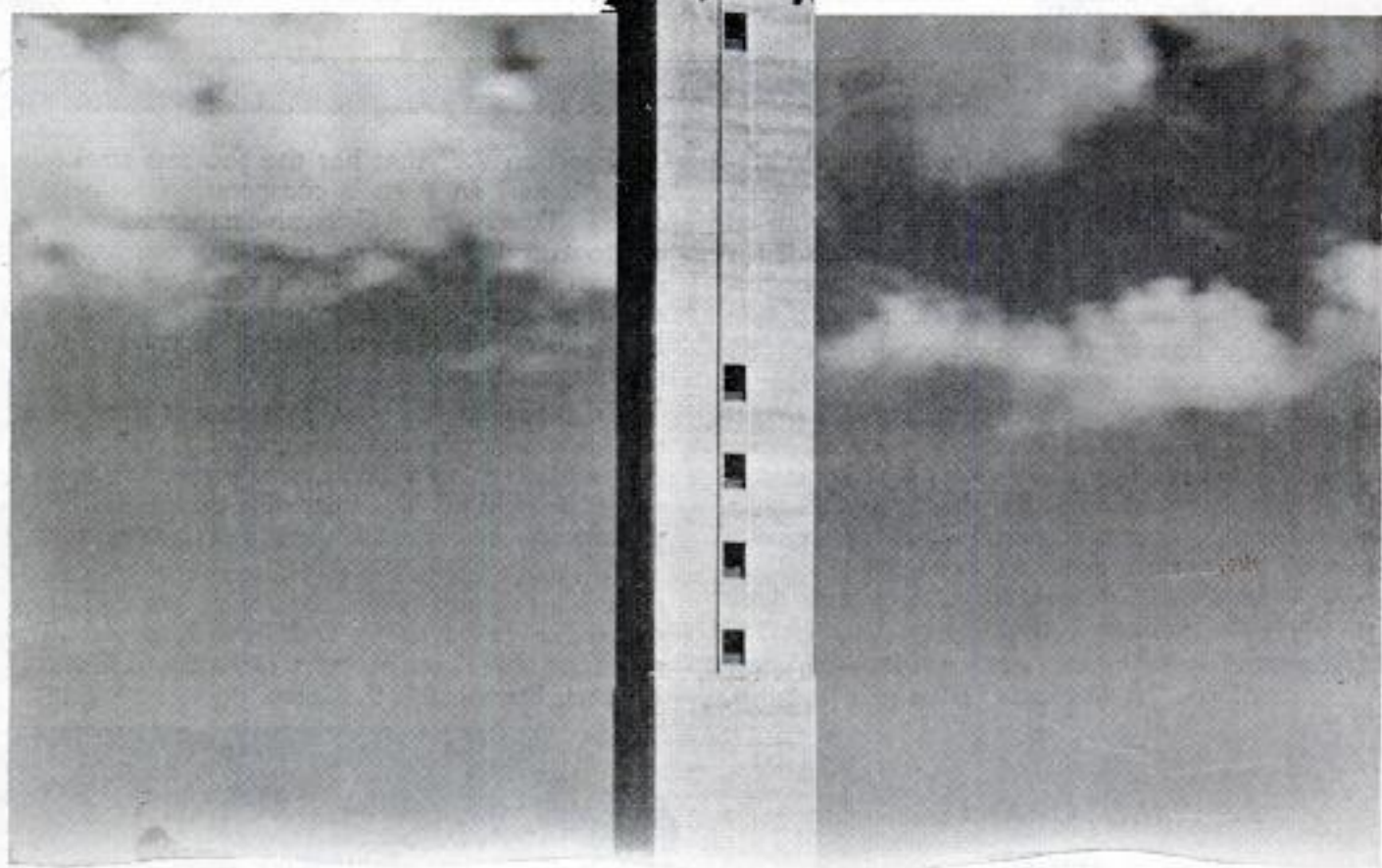
More than a new car . . . a new CONCEPT of low-cost motoring!

JANUARY 1955

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FOR TV...IT DODGES

TROUBLE YOU CAN'T STOP



Radio Relay station on route between Chicago, Ill., and Des Moines, Iowa. Every fifth or sixth relaying tower is a control station, where high-speed

switching equipment enables a TV picture to skip out of a troubled channel and into a stand-by protection channel faster than the eye can wink.

There's no way to stop atmospheric changes that threaten television with "fade." But, for TV that travels over Bell's Radio Relay System, Bell Laboratories engineers have devised a way to sidestep Nature's interference.

When a fade threatens—usually before the viewer is aware—an electronic watchman sends a warning signal back by wire to a control station perhaps 200 miles away. An automatic switching mechanism promptly transfers the picture to a clear channel. The entire

operation takes 1/500 of a second. When the fade ends, the picture is switched back to the original channel.

This is an important addition to the automatic alarm and maintenance system that guards Bell's Long Distance network for television and telephone calls. It marks a new advance in Bell Telephone Laboratories' microwave art, developed to make your Long Distance telephone service, and your TV pictures, better each year.

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Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



Next Month

AN AIRPLANE is missing and presumably down, and the Civil Air Patrol swings into action. Crews of an Air Force Rescue Service helicopter and a CAP light plane coordinate their search plans before taking off. With 7000 aircraft registered, the CAP stands ready 24 hours a day, 365 days a year, to undertake any mission—search, rescue or mercy flight. The dramatic story of the USAF's volunteer auxiliary appears next month under the title "CAP to the Rescue." The February *Popular Mechanics* also carries the big 48-page auto section, with specifications and pictures of all 1955 models, and a full-color feature on motorcar styling

Information not listed on articles in the index, starting on page 12, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, *Popular Mechanics*, 200 E. Ontario, Chicago 11, Ill.

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JANUARY 1955

Number 1

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JANUARY 1955

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AC HOT TIP

-greatest spark plug achievement
in high-compression history!



Ten years ago, AC increased "Scavenging" action as one step in meeting high-compression demands!

Engineers depend on scavenging action, as they term the high-velocity swirling of combustion chamber gases, to carry away the combustion left-overs that cause plug fouling. Years ago, 1944 in fact, AC Spark Plug engineers put this principle to work by increasing clearance between the plug shell and the insulator tip in the AC Type 48 plug. This extra "Scavenge" area alone did not satisfy AC.

An amazing thin-tip, fast-heating insulator added even more — and is still an AC exclusive!

AC developed the insulator material that has completely outmoded porcelain. And AC soon found a way to form this material into long, thin insulator tips that could be recessed around the center wire. These thin tips heat fast, burn away harmful combustion deposits, stay clean longer. No one else has yet been able to duplicate this design.

Proved by millions of miles of driving in every make of high-compression engine built in America!

Of course everyone expects AC to be in the forefront of research to improve ignition for high-compression engines. The important thing to remember is that these benefits of AC Spark Plug design have been available since the first high-compression engine came off a production line. *Today's AC Hot Tip Spark Plugs fit every American make of car!* They are the *only* plugs designed with double cleaning action. No other spark plugs offer anything like AC's thin, hot tip features.

AC Spark Plug engineers with GM resources can be depended upon to LEAD the ignition parade!



AC SPARK PLUG DIVISION SPARK PLUGS GENERAL MOTORS CORPORATION

Watch BIG TOWN on NBC-TV



-another AC feature story that can't be topped!

**Man with
stapler beats
man with
glue 10 to 1**



...and cuts fastening costs 70%!
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Zurich Tonhalle Orch.
Otto Ackermann, Cond.

BEETHOVEN

The Ruins of Athens
(March and Choir)
Netherlands Phil.
Walter Goehr, Cond.

BRAHMS

Academic Festival
Overture
Utrecht Symphony
Paul Hupperts, Cond.

MOZART

Piano Concerto in E Flat
Artur Balsam, piano
Winterthur Symphony
Otto Ackermann, Cond.

BACH

Toccatto and Fugue in
D Minor
A. Schreiner; Organ of
the Tabernacle,
Salt Lake City

WAGNER

Die Meistersinger,
Prelude, Act 1
Zurich Tonhalle Orch.
Otto Ackermann, Cond.

DUKAS

Sorcerer's Apprentice
Utrecht Symphony
Paul Hupperts, Cond.

MUSSORGSKY

Night on Bald Mountain
Netherlands Phil.
Walter Goehr, Cond.

in this corner..... THE EDITORS



Another Life Saved

Future, the magazine of the U.S. Junior Chamber of Commerce, reports another life has been saved by the use of the wooden lung which was a joint project of *Popular Mechanics* (Craftsman Section, Jan. 1952) and the Junior Chamber. Shortly after one of the lungs was built by the East St. Louis, Ill., Chamber and donated to St. Mary's Hospital, a patient's life was saved by its use.

Bulletin Boards on the Autobahnen

Blackboards along the West German Autobahnen keep motorists in touch with family and office, reports Joseph C. Scott of Kittery Point, Me. A phone call to the nearest highway office is relayed to service



stations in the estimated area of the traveling motorist, and attendants post the license number of the wanted car on the blackboard between the two strips of pavement. The boards are called "fernruftafeln," or long-distance-call boards.

To the Editor:

I have been a reader of your magazine for more years than I can remember and have always considered it a must on my list. I hope you keep printing your wonderful articles on homes

I have to do quite a bit of walking about the ship and yesterday, just for the heck of it, I kept track of how many times I was asked for your magazine. You can feel proud that it was 23 times in one hour.

L. Ohl,
USS *Shadwell* (LSD-15),
Fleet Post Office,
New York City.

(Continued to page 8)

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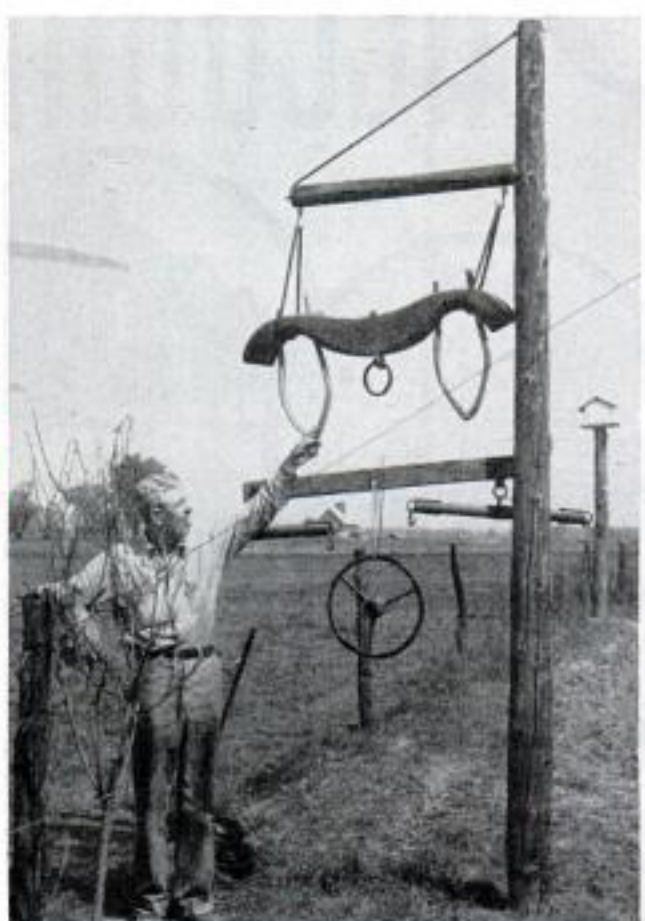


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(Continued from page 6)

Three Eras of Traffic

Kenneth R. Imig of Watseka, Ill., sends us this photo of a farmer's display showing three modes of travel of the last 150 years.



Harold Hartman, a farmer near Milford, Ill., mounted on a post a sturdy ox yoke, and below it a doubletree of the horsepower era. From this was suspended an automobile steering wheel of today's gas-buggy and farm-tractor era.

To the Editor:

On page 113 of your November 1954 issue, you make claims about a product we manufacture that are somewhat erroneous.

At no time, to my knowledge, did we ever say that our cleaner was good for "wallpaper." We did say "painted walls."

Norman Bassett, President,
 Demco Library Supplies,
 Box 1070,
 Madison 1, Wis.

To the Editor:

Enclosed is a picture of a boat that I built from plans I read in the May 1954 issue of *Popular Mechanics*. The plans called for 11-foot 11-inch length and 56-inch beam; I

(Continued to page 10)

How I foxed the Navy

by Arthur Godfrey



The Navy almost scuttled me. I shudder to think of it. My crazy career could have ended right there.

To be scuttled by the Navy you've either got to do something wrong or neglect to do something right. They've got you both ways. For my part, I neglected to finish high school.

Ordinarily, a man can get along without a high school diploma. Plenty of men have. But not in the Navy. At least not in the U. S. Navy Materiel School at Bellevue, D. C., back in 1929. In those days a bluejacket had to have a mind like Einstein's. And I didn't.

"Godfrey," said the lieutenant a few days after I'd checked in, "either you learn mathematics and learn it *fast* or out you go. I'll give you six weeks." This, I figured, was it. For a guy who had to take off his shoes to count

above ten, it was an impossible assignment.

I was ready to turn in my bell-bottoms. But an ad in a magazine stopped me. Here, it said, is your chance to get special training in almost any subject—mathematics included. I hopped on it. Within a week I was enrolled with the International Correspondence Schools studying algebra, geometry and trig for all I was worth.

Came week-end liberty, I studied. Came a holiday, I studied. Came the end of the six weeks, I was top man in the class. Within six weeks I had mastered two years of high school math, thanks to the training I'd gotten.

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- Building Maintenance
- Carpenter and Mill Work
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- Heating
- Painting Contractor
- Plumbing
- Reading Arch. Blueprints

ART

- Cartooning
- Commercial Art
- Fashion Illustrating
- Magazine Illustrating
- Show Card and Sign Lettering
- Sketching and Painting

AUTOMOTIVE

- Auto Body Rebuilding
- Auto Elec. Technician
- Auto-Engine Tune Up
- Automobile Mechanic

AVIATION

- Aeronautical Engineering Jr.
- Aircraft & Engine Mechanic

BUSINESS

- Advertising
- Bookkeeping and Accounting
- Business Administration
- Business Correspondence
- Public Accounting
- Creative Salesmanship
- Federal Tax
- Letter-writing Improvement
- Office Management
- Professional Secretary
- Retail Business Management
- Sales Management
- Stereographic-Secretarial
- Traffic Management

CHEMISTRY

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- Chemical Engineering
- Chem. Lab. Technician
- General Chemistry
- Natural Gas Prod. & Trans.
- Petroleum Engineering
- Plastics
- Pulp and Paper Making

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- Civil Engineering
- Construction Engineering
- Highway Engineering
- Reading Struct. Blueprints
- Sanitary Engineering
- Structural Engineering
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DRAFTING

- Aircraft Drafting
- Architectural Drafting
- Electrical Drafting
- Mechanical Drafting
- Mine Surveying and Mapping
- Plumbing Drawing and Estimating
- Structural Drafting

ELECTRICAL

- Electrical Engineering
- Electrical Maintenance
- Electrician Contracting
- Lineman

HIGH SCHOOL

- Commercial Good English
- High School Subjects
- Mathematics

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- Foremanship
- Industrial Supervision
- Leadership and Organization
- Personnel-Labor Relations

MECHANICAL AND SHOP

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- Industrial Instrumentation
- Industrial Supervision
- Internal Combustion Engines
- Machine Design-Drafting
- Machine Shop Inspection
- Machine Shop Practice
- Mechanical Engineering
- Quality Control
- Reading Shop Blueprints
- Refrigeration
- Sheet Metal Worker
- Tool Design Toolmaking

RADIO, TELEVISION

- Industrial Electronics
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- Professional Engineering
- Short Story Writing
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altered the plans to 13-foot 4-inch length and 60-inch beam and the freeboard is 2 inches higher all around. The boat has

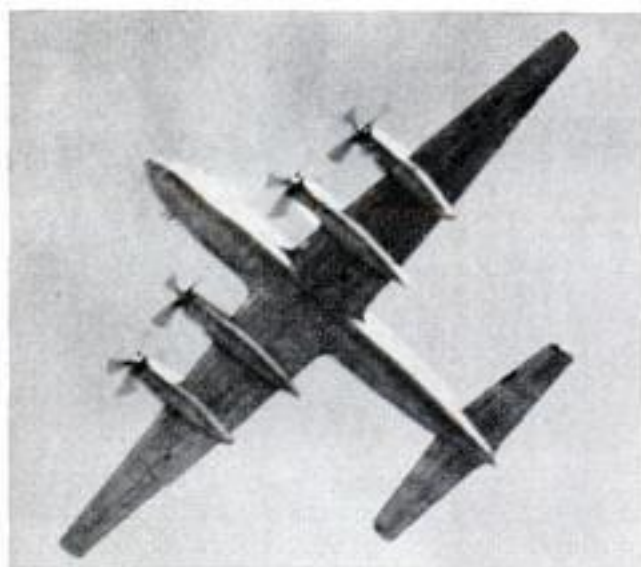


been launched in the Delaware Bay and has proven very seaworthy.

William C. Price,
7223 Bradford St.,
Philadelphia, Pa.

Era of the Turboprops

The jet airliner is already in the skies, yet suddenly a new breed of transports swarms onto the scene. Pictured here is one of the biggest of the new turboprop family—Britain's Bristol Britannia, a giant driven by turbines harnessed to four propellers, and capable of flying 100 passengers between New York and London. It is



due to fly the international routes in 1955. For the story of this new development in aviation, read "Listen—It's the Wail of the Turboprops" beginning on page 105.

Correction

The microfilm camera shown on page 148 of our November issue is not, as indicated in the heading, of German make but is manufactured by an American firm and was exhibited at Dusseldorf. The maker: Diebold, Inc., Flofilm Division, Norwalk, Conn. The price, \$3500.

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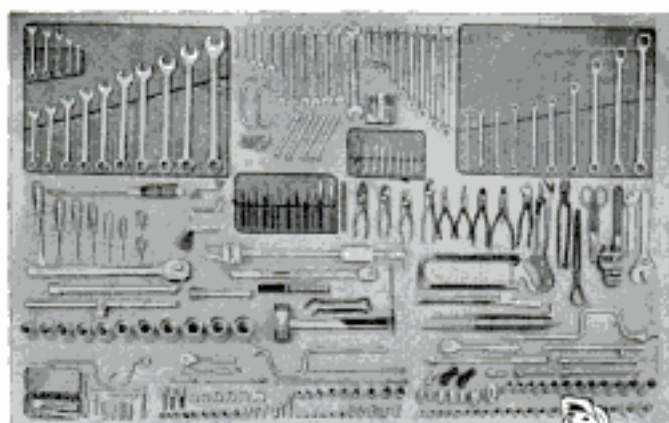
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5494



Eastern Factory—Jamestown, N.Y.
Canadian Factory—London, Ont.

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INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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



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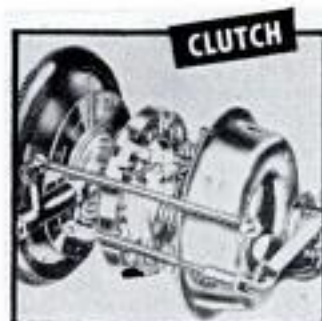
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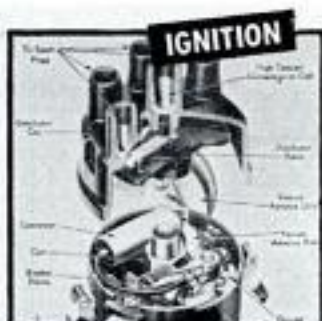
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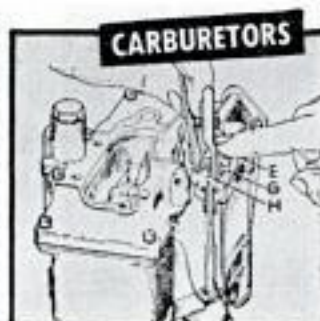
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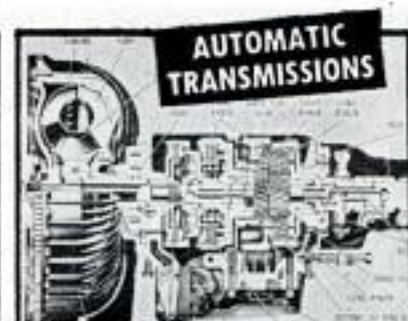
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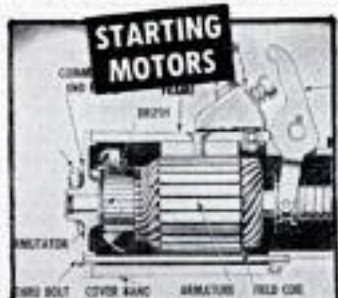


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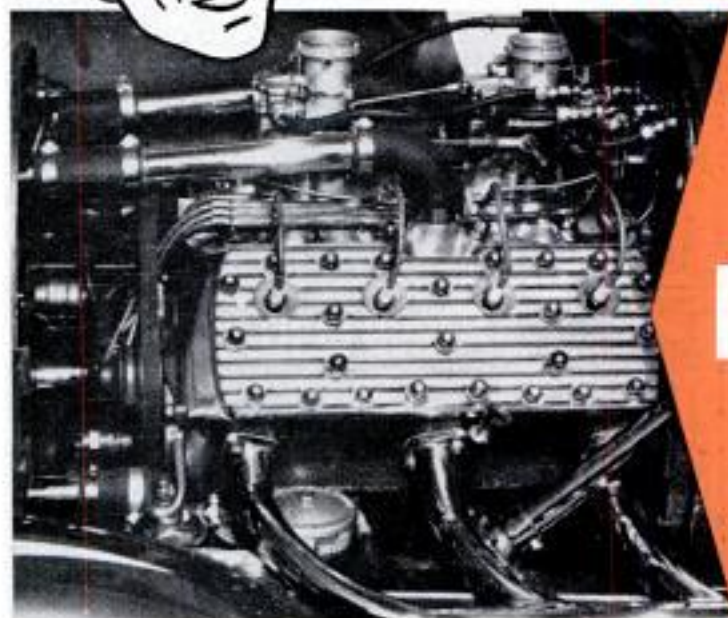
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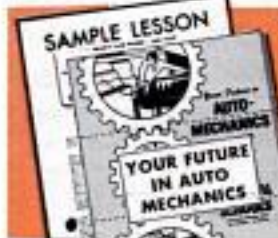
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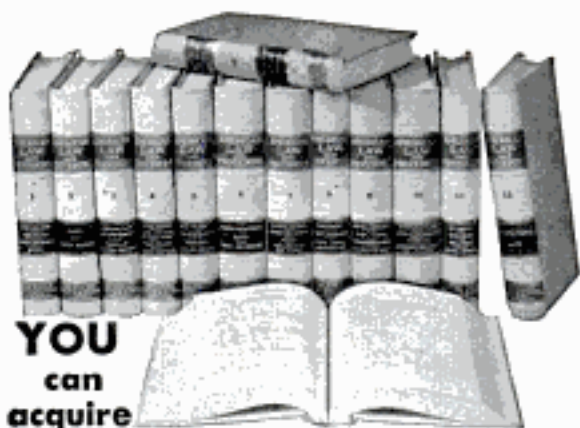
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H. Satterfield: "Duracleaned chair for largest department store and got order for 60 to 75 chairs, couches and davenportes."

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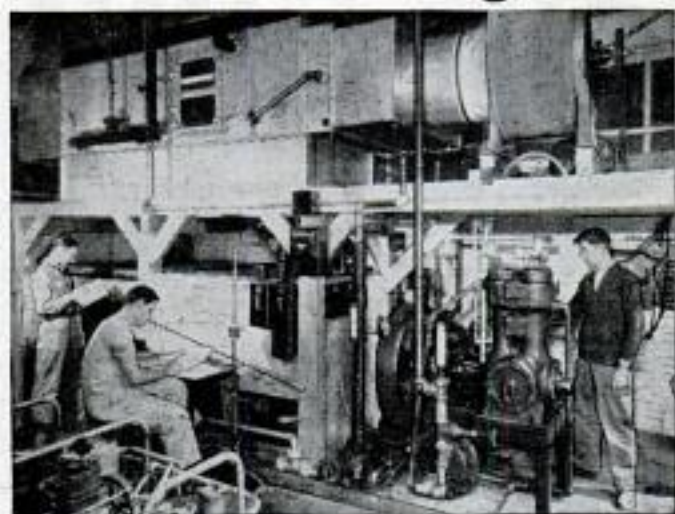
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Snow on all channels, raster OK; sound OK.
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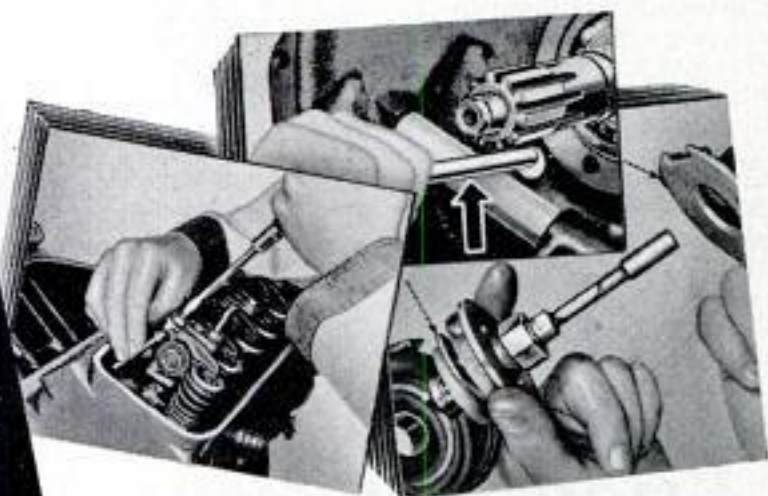
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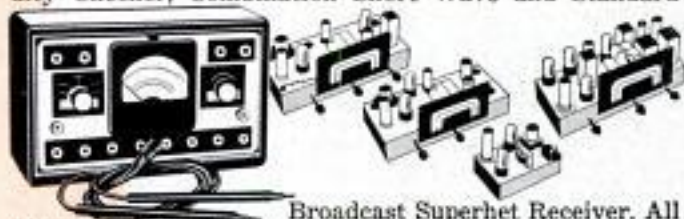
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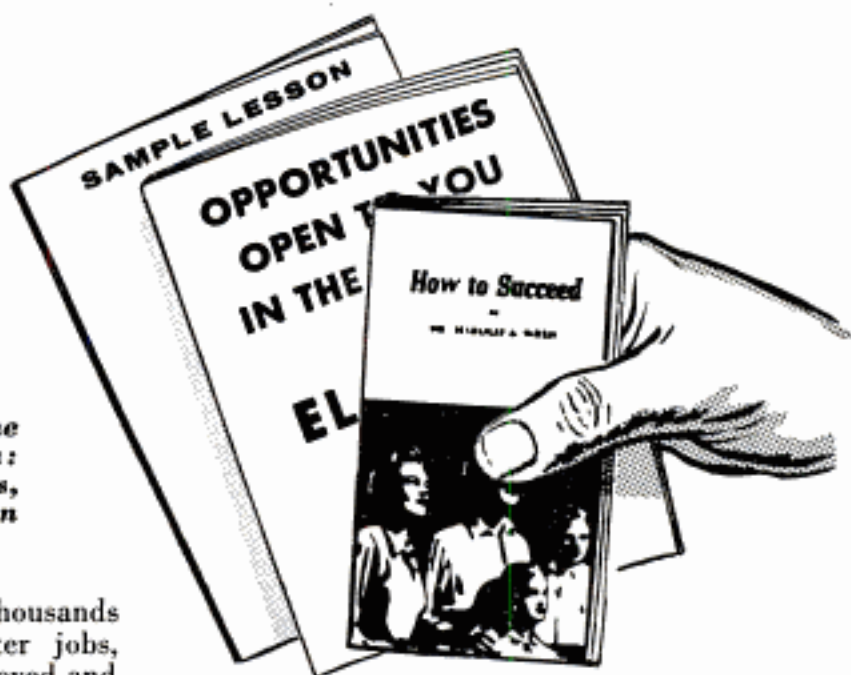
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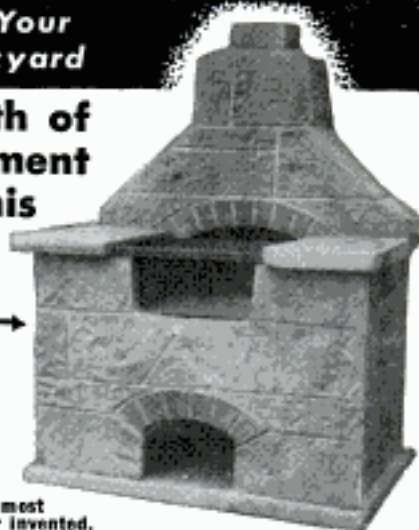
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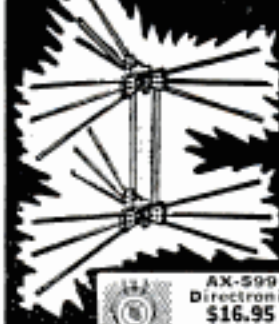
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GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

VAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start—ended up six years later with savings of \$50,000 and an income of \$5000.00 a year for life without further work.

DUGGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

MRS. NIXON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack writer at \$70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made \$18,000 the first year. He gives me credit for "showing the way."

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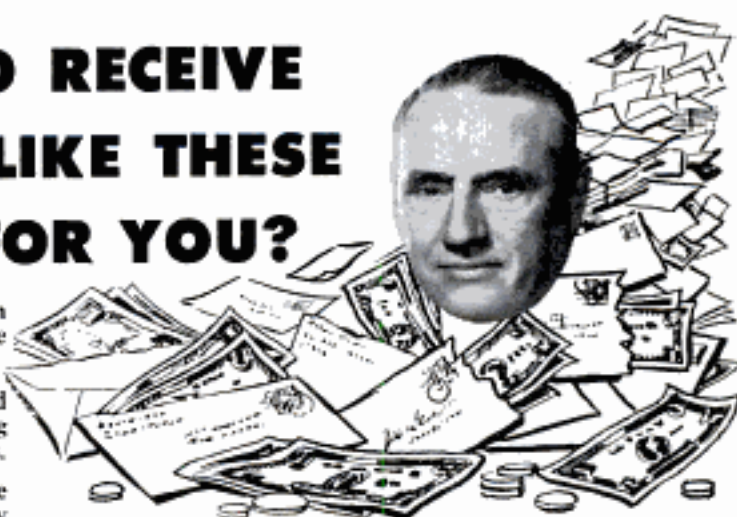
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START Home business—Make gold plated costume jewelry. Beginners kit \$1.00. Completed sells for \$3.00. Catalog 25c. Don-Bar Novelty, Dept. E-81, 3511 Armitage, Chicago 47.

MAIL Order plan, proved winner, practical, workable, profitable. Send now for copyrighted fact-packed booklet and complete plan, both for only 25c postpaid. Satisfaction guaranteed. Maine Industries, 22 Dartmouth, Bangor, Maine.

START Your own business on credit. Your own boss. 1661 of our dealers sold \$5,000 to \$28,500 in 1953. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. A-U-PPM, Freeport, Ill.

OWN, Operate route Wishing Wells. Place these new \$8.50 skill games on counters in cafes, luncheonettes, clubs, etc. Collect coins weekly. Write, Legalsharr, Box 929, Long Beach 1, California.

UNUSUAL Invention, earn \$500 month up. National company, full or part time. Automatic fire extinguisher exclusive. Big rural market. \$11 sales earns \$6. Sample outfit furnished. Write: Superior Products, Inc., Dept. 203, 4215 Michigan, Kansas City, Missouri.

OPPORTUNITY Seekers names, none over 60 days. From advertising in magazines. All seeking ways to make money at home. 500, \$5.00; 1000, \$8.00. Typed on gummed labels. Try 1000, you will be back for more. Ken-West, 7-K South Harlem St., Worcester 4, Mass.

BOOKKEEPERS, Increase earnings operating Kensington bookkeeping service. Kern, 5632 Lankershim, North Hollywood, California.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience—no capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500B, Mount Morris, Ill.

NEW Plastic mending tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Kristee 108, Akron, Ohio.

FISHWORM Breeder's book—\$1.00. Postpaid. Literature free. Dixdok, Kent, Ohio.

PROFITS Up to \$600.00 mailing 100 catalogs. Write: Your Best Distributors, 200 West 34th, New York 1.

MAIL Order and direct sales. Small cash outlay. Everything furnished. Dyer Co., Windsor 2, Mo.

START Spare-time mailorder business. Gedgard, Box 798-D, New York 1, N. Y.

FINANCIAL Independence by mail order. Details free. Opportunities Unlimited, Dept. 6, Box 1576, Boston, Mass.

\$1000 MONTHLY Possible in collection agency business. Free details. Write Cole Associates, Syracuse 2, N. Y.

IMPORT-Export opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established world trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger E701, Los Angeles 24.

METALLIZED Baby shoe mountings, supplies. Instructions. Foster, 1520 Ardmore, Chicago 26.

MAKE Perfumes, other products. Sell mailorder. Formula catalogue free. International, 6347 Parnell PM-1, Chicago 21, Illinois.

PRINT Without a printing press! Amazing new method! Print colorful signs, banners, cards, posters, glasswear; anything at home. Big profits. Moneymaking opportunity! We supply everything. Beautiful sample, home-business plan free! Write Screen-Print Company, Los Angeles 61, California.

FREE—Everything you need to make big money. World's famous French-type perfumes. Tremendous profits. "Husk" O'Hare, 5732 North Kenmore, Chicago 40, Illinois.

OWN A business without investment! Write for free display. America's finest work uniforms embroidered to advertise. Prospects, profits unlimited. Topps, Dept. 531, Rochester, Indiana.

TRADE Magazines. Business, vocational, professional, hobbies. Single current copies. Special get acquainted service. Choose from 4,387—all fields. Current list free. Commercial Engraving Publishing Company, 34C North Kitter, Indianapolis 19, Indiana.

WORK At home—No mail order, no selling; several ideas to choose from. Folder free. Greenplay, 541 West Third, Reno, Nevada.

MAIL Circulars, 100% commission. Free details. Fisher's, Dept. M1, 4750 So. Central, Los Angeles 11, California.

MAKE Big Money at home! Invisible reweaving pays up to \$10.00 profit in an hour. Make tears, holes disappear from fabrics. Constant demand from laundries, cleaners, home brings steady earnings. Details free. Fabricon, Dept. AE, 8342 S. Prairie, Chicago 19, Illinois.

FREE New 280-page book. 2000 businesses, farms, income properties for sale throughout America. Specify type of business desired, and general location. Book No. 76, 5400 Wilshire, Los Angeles, Calif.

MAKE Durable building plastic, easily, beautiful, tough. Any color. 101 uses. Exclusive district. 800% profit. Bays Laboratories, Oklahoma City 9.

IT'S Here! 1200% profit! Machineless laminating photos, documents, licenses, etc. in clear, self-sealing, plastic. Lifetime protection. No equipment needed! Also, sell through agents, homeworkers, etc., or cash in selling home laminating kits, local, by mail. Everybody a prospect. \$1 brings complete laminating kit (seals 10 articles) wholesale prices, all details, postpaid. Satisfaction guaranteed. Garen Sales, 1321-M3 Stanberry, Zanesville, Ohio.

WE Love our mailman—He leaves over \$1000.00 monthly in our rural mailbox. My college professor husband drafted a scientific home mailorder method. We bought a Texas ranch, live as we always wanted. Now we sell the Ranch Mailorder Method. Operates anywhere. Inquire: Eveningshade Ranch, Helotes, Texas.

PHOTOGRAPHIC Silk screen printing. Improved process, easily understood instructions \$2.50. Two important materials free to first 1000. Remie, 2946 Tyburn, Los Angeles 39, Calif.

YOUR Own established shoe polish business without investment if good salesmen. Write for details. Johnson, 1737 No. Campbell, Chicago 47, Ill.

EARN Money at home! Homeworker Magazine tells how. Sample 25c. Sizemore, 20-H East Delaware, Chicago 11.

COMMISSION Circulars—Offering real merchandise. Send 10c for samples and details. Products, Box 23, Boston 17, Mass.

EARN \$2.00 Hour! I do—Making sandals. Youngs, 1308-PM, South First, Arcadia, California.

\$70 WEEKLY Guaranteed—Potential, home, spare time. \$6.47 hourly full time. Shortcut public bookkeeping. Immediate income, easy! Revolutionary simplifications. Client producers. Auditax, 34651AF, Los Angeles 34.

ESTABLISH Chicago address. Mail forwarded daily. Continental, 20D West Jackson, Chicago 4.

OWN A mail-order paper products business. Sell envelopes, tags, bags, boxes, wholesale. Tremendous demand. Steady profits. No capital necessary. Omaha Envelope Service, Dept. 20, 4721 California, Omaha 3, Neb.

TIN-Cans. Turn them into cash. Nine methods. Instructions 50c. Charles Company, 12-DCK, Norwood, Ohio.

EXPORT Business made easy! Substantial income, home operated, low overhead, no merchandise buying. Complete setup service. Hermes Exports, 152 West 42, New York 18.

SELL Popular Mechanics and all other magazine subscriptions. Free catalog, supplies. Subscription Service Company, Dept. A, P.O. Box 2070, Birmingham, Ala.

WANTED! Home producers, by manufacturers in our clearing house service. Become subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer-industrial use. Cash in at home, without previous experience. Plastic Service Associates, Dept. 1-PM, East Boston 28, Mass.

WRITERS! Authors! Columnists! Get endless supply ideas. Instructions 50c. Charles Company, 12-DCM, Norwood, Ohio.

CHINCHILLA Dealership available for local representation of large western ranch. Huge profits made from fascinating business operated from home. Andes Chinchillas, Paramus, N. J.

INVESTIGATE Earthworm breeding! Pleasant, profitable home industry! Part; full time! Free revealing facts, information! Write Earthmaster System, 45D, El Monte, Calif.

OPERATE Your own mail order business! At home in spare time. Start right. Avoid costly mistakes. "Mail Order Business Manual" shows you how! Details free. Bud E. Hine, Box 93, Battle Creek, Michigan.

ENJOY Benefits and profits from co-publishing "Progressive Mail Trade" magazine. Sample copy and details 25c. Bud E. Hine, Box 93, Battle Creek, Michigan.

UNUSUAL Home mailorder business. Fascinating, clean, profitable. Ready to operate. Angora House, PM2, Springfield, Illinois.

GOOD Paying business silvering mirrors, plating autoproducts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit furnished. Free booklet. Gunmetal Co., Ave. H., Decatur, Illinois.

NEED Money? Raise earthworms. Write for easy plan. Earthworm Gardens, 104 Peacock Building, El Monte, Calif.

MAKE Money in landscaping—Start your own business, part or full time. Many good paying positions open. Earn while learning. Send for free book. National Landscape Institute, Dept. M-15, 310 S. Robertson Blvd., Los Angeles 48.

BUY Wholesale. Thousands items. Start home mailorder business. Literature free. Russell, Box 481, Roseburg, Ore.

HOME-Operated mail-order business. Everything supplied. Sensational plan for lifetime repeat orders. Literature free. Consumer Service, 1073 Piedmont, Atlanta, Georgia.

BE Listed! Receive latest-best low-cost starting book-merchandise mail selling offers. National, Box 88A, Dorchester 22, Mass.

BIG Mail 10c. Maxwell, 2938-Oak, Bettendorf, Iowa.

45 MONEYMAKERS 10c. Literature describing mailorder included. Service Bureau, Box 596, Toronto, Canada.

POPCORN And potato chip equipment. Eakins, Box 933-A5, Springfield, Ohio.

NEWEST Home business opportunities. Request free bulletin. Falcon, Winnebago 2, Ill.

FOR The best mail order deal in America write Modern Enterprises, Cynthia, Kentucky.

EXTRA Income. Do leathercraft easy way. Free information. Tandy Leather Company, Box 791-Q8, Fort Worth, Texas.

START Your own business at home. Sell subscriptions for popular magazines. Liberal commissions. Send for supplies, etc. DeSales Magazine Service, 60 East 42nd St., New York 17, N. Y.

I Average \$125 weekly selling books by mail! So can you! Start sparetime! Work home! Cooper, 246-R Taunton, Buffalo, N. Y.

PARTNERSHIPS. How to start. Withdraw. Oust undesirable partner. Particulars free. Reynard, Box 1265-A, Peoria, Ill.

OPERATE Profitable independent business. Sell lumber, wood products by mail. No investment. Chas. Webster, Guttenberg, Iowa.

WANT Up to \$100.00 weekly deposited in your mail box? Details free! Inquire Aldensmith, 2708 Ladera, San Bernardino, Calif.

CASH Now and year 'round from your home. No magic. Booklet 24 exact proven steps of mailorder business success. \$2.00 or c.o.d. Mailtest Research, P.O. Box 2, Little River Sta., Miami 38, Fla.

WANTED: 500 Mail order dealers! Literature 25c. Steinberger Press, 1274-C Stebbins, New York City 59.

MAKE Money! Start a mailorder business. Copyrighted instructions \$1.00. Home Enterprises, 817-C Park S.W., Canton, Ohio.

\$150 WEEK—Easy! Start home Venetian blind laundry. Revealing book free. AT Co., 101 S. 44th, Philadelphia 4, Penna.

LIQUID Rubber. Make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

MEN—Income from local information. No selling. Neherco, LaVerne, California.

WINNING Mail order plans. Merchandise, books. Details free. Mid-State, Box 214, Syracuse 1, N. Y.

RUBBER Molds for casting plaques, figurines, novelties. Catalog illustrating over 100 fast sellers, 10c. Castcraft Studios, 508-PM Marion Street, Brooklyn 33, N. Y.

INCREASE Your income. Build your own mail order business. Copyrighted booklet tells how. Only 25c postpaid. Satisfaction guaranteed. The Gerwigs, 366 South Huron, Columbus 4, Ohio.

BUY Wholesale thousand items. Lists free. Triple J. Industries, 132 Berkshire, Bridgeport 8, Conn.

NEWEST Spare, full-time home business. \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautify auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, Los Angeles 61.

FREE Wholesale kit guarantees you 33% to 60% profit on cameras, appliances, typewriters, etc. Arrow Distributing, 154F Nassau St., New York 38.

FREE Folio "Up to \$45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Works itself, home! Hayling, Carlbad, Calif.

FINANCIAL Security and success in business can be yours! Make us prove it. Write to Success Unlimited, Box 1945, Solvang, Calif.

\$500 MONTHLY Possible raising earthworms. My "senior kit" best yet for beginners. Complete, nothing else to buy. Get facts with raising instructions. Send 25c (refundable). Multiple Cabin Services, Kalkaska 1, Michigan.

START Home manufacturing business. Make cleaners, soaps, polishes, cosmetics. Free literature. Kemix, Park Ridge, Ill.

IMPORT-Export mailorder opportunities! Details. Warner, Box 6, Port Scott, Kansas.

PART Time or full time. Your own business, selling name brands. No inventory required. Manhattan-W, 225 W. 57 St., New York City.

MAKE Flexible molds. Cast figurines, plaques. Free sample. Tooker, 630-R Chestnut, Hamilton, Ohio.

FORTUNES Made raising crickets and fishworms. Guaranteed raising and marketing instructions, \$1.00. Carter Farms, Plains, Georgia.

NEW-Different home business opportunity! Address-mail literature featuring real merchandise. Everything furnished. Mills, 1752-A, Garden Ave., Lorain, Ohio.

METALIZE Baby shoes, jewelry, gifts. Bronze, gold, silver. Free bulletin. Kiktavi, 7217-PY South Broadway, Los Angeles 3.

HAVE Home business mailing postcards offering real merchandise. Big earnings. Write: Mednis, 10 Port Norfolk, Boston 22, Massachusetts.

NATURAL Molding rubber, extra thick. Free sample. Flock, W. Wooley, 115-A Donald, Peoria, Ill.

ELECTROPLATE Auto parts, novelties, mirrors, baby shoes. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-MM, Houston 19, Texas.

BOOKKEEPERS. Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

MAKE Money at home—Mail cards, circulars feature real merchandise. Everything furnished. Big earnings. Philip's, Box 3-P, Boston 22, Mass.

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

MAKE Rubber stamps, repair dolls; learn silk screen printing. Catalogue (60 ideas) free. Universal, Box 1076-A, Peoria, Ill.

TO \$40.00 Weekly. Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34, Calif.

COPUBLISH Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

SCHEMER Magazine, Canfield 1, Ohio, monthly mailorder ideas, plans. Year \$1.00. Sample 20c.

PLASTERCRAFT Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

BUY It wholesale! Manufacturers, distributors offer \$50,000 items. Literature free. Olsen, 1231-A East Third St., Duluth 5, Minn.

\$25 WEEKLY Working two hours daily at home. Lycke, Box 2471-A, Cleveland 12, Ohio.

GROW Mushrooms, Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid Babbitt \$4,165.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 172, 2954 Admiral Way, Seattle, Washington.

\$46 FROD square foot plywood; jigsaw necessary. Write: Woodarts, Bridgewater, Mass.

BREED Rare tropical fish at home. Earn big money! Learn secrets! Help fill huge demand. Amazing opportunity! Free plan. Tropicals, 1008-F Los Angeles St., Los Angeles 15.

RESILVERING Mirrors, formula 50c; two-way lookout mirrors, (No one sees you), 50c; coppered mirrors, 50c. All \$1.00. Nelko-Mir, Box 3462-J, Chicago 54.

LIVING Miniature ("Ming") trees only 10 to 20 inches tall. Grow at home. Big profits! Spare time opportunity. Fascinating! Amazing! Write for free seed and plan. National Nursery, Dept. FC, Inglewood 4, California.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

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

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, EEL, Wisconsin.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Orand Rapids, Minnesota.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanide, Calif.

FIX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write Typewriter, Building 1, Tarentum, Penna.

MONEY In new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. M. Ray Company, 3605 South 15th Ave., Minneapolis 7, Minn.

BRONZED Baby shoe supplies, instructions, mountings. Metal bookends, \$1.50 pair. Free catalog. National Bronze Supply, Box 56, Los Angeles 32, Calif.

MAILORDER Home business! Details stamp. Shirley, 20-Raspeburg, Baltimore 6, Maryland.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 72, 715 Ensor St., Baltimore 2, Md.

BRONZE Baby shoes. Instructions, equipment and mountings for genuine electroplated process. Free catalog. Hollywood Bronze Supply, Dept. B-3, 1624 East First Street, Los Angeles 33, Calif.

FLEXIBLE Rubber molds for plaster and Marble figurines. Sample and large illustrated catalog 25c, refunded on first order. K-C Novelties, Dept. 74, Easthampton, Mass.

NEW Exceptionally profitable plans. Ideas for home operated mail business. Rush name. Miller, 1881-P Roxbury Road, East Cleveland 12, Ohio.

START Venetian blind laundry, patented machine. Free information. Jet Company, 522 N. Rural, Indianapolis 1, Indiana.

ELECTROPLATING Turns spare time into dollars. "Professional Electroplating Technique." Information free. Plater C. Hyde, 327 West 120th Street, Los Angeles 61, California.

BUY Wholesale thousands items. Lists free. Cottage Industries, Omaha 12, Nebr.

FREE New 280-page book. 2000 businesses, farms, income properties for sale throughout America. Specify type of business desired, and general location. Book No. 76, 9400 Wilshire, Los Angeles, Calif.

WHOLESALE! 8,000 Nationally famous products. 30-80% discounts! Large catalog. Sensational business plans included. Consolidated Distributors, 21-11 Lafayette, Paterson 15, New Jersey.

INFORMATION Worth dollars. Free details. Wolfe, 8106 So. Park Ave., Chicago 19.

MAILORDER—Operate profitable home business using free advertising method. Revealing information free. Seidel, 6000-HF Sunset, Los Angeles 28.

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ACME Saw sharpeners are the finest you can own. Don't be satisfied with less. Send for free literature. Max Mfg. Co., 138 Stockton Ave., San Jose 26, California.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 630-P Linden, Buffalo, N. Y.

OPERATE Your own cafe, diner. Only minor investment needed. Guide reveals how. Write Restaurant Arts, MO11, Fremont, Ohio.

"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. 91-CM, Pleasant Hill, Ohio.

FREE! "301 Profitable Small Businesses!" Amazing abstracting plans! Work home! Start sparetime. Deumant Surveys, Kenmore 23-PM, N. Y.

LEARN Technical Metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Premier College of Technical Metaphysics, 2332, McKenzie St., Vancouver, B. C., Canada.

OPERATE "Escalator" mailorder system, selling our products or any products. Most revolutionary mailorder system known. Write: Selbyco, Decatur 162, Ill.

FORTUNE Positively offers wealth and power to any man with sufficient courage and tenacity to employ the same simple method that actually produced every single one of the world's great fortunes. Your acceptance of this real challenge could be your life's upward turning point. "Beckoning Fortune" tells you how. \$2.00 postpaid. Phillips Company, Box 6817, Towson 4, Md.

SPARETIME Profits taking subscriptions all magazines. Wholesale catalog free. Cassell Publishers, Westfield, New Jersey.

OPERATE Profitable mail order business. Robin Sales, 1001 Curtiss, Downers Grove, Ill.

OUR Book "Home Factory" tells how to make 101 products and articles used daily. Tells where to buy materials you need wholesale. 50c. Money back if dissatisfied. Ken-West Distributors, 7-K South Harlem St., Worcester 4, Mass.

PACIFIC Northwest job opportunities \$1.00. Baker, 1412 Jefferson Ave., Yakima, Wash.

COST Of things going up faster than your income? You can make more full or part time as a Rawleigh dealer. Write for full particulars. Rawleigh's, Dept. A-RR-PPM, Preepert, Ill.

CHINCHILLAS, Unusual terms, three years to pay, no interest or carrying charges. Box 348, Manhattan Beach, Calif.

EARTHWORMS: Raise for profit, bait. El Sobrante Earthworm Farm, 749 Rincon, El Sobrante 11, California.

PAST Selling engraved colorful plastic desk name plates. Send \$3.00 for samples, plus plate with your name. Refundable. Good mailorder item. Nemo Plastics, Wold-Chamberlain Field, Minneapolis, Minn.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience—no capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500C, Mount Morris, Ill.

GIANT Mails—Moneymaking offers. Send 25c today! Wrede, Atkinson 1, N. C.

MEXICAN Featherbird pictures. Enormous profits. Sample picture 25c. Mexican Importing, Northern Pacific 1190, Albany, Oregon.

SELL Merchandise by mail to women. We furnish everything. Big earnings. Tamolane, Box 244, Denver 1, Colorado.

MAKE To \$4.50 hour doing common pen lettering. National Artists, 801 1/2-A North Marsalis, Dallas 3, Texas.

INCREASE Your income, turn your spare time into cash—Making quick-selling, highly profitable lamps and fiber glass shades. Every home a prospect for one or more. Hundreds already doing it, so can you. No experience needed. No special tools required. Gearon's big, new 72 page 1955 illustrated Catalog No. 8 will show you how, quickly. One special 8-page section shows 6 beautiful lamps in kit form, ready for you to assemble. Another 12-page section shows you how to make stunning, ultra-modern fiber glass shades. Page after page filled with wide variety of other attractive shades, shade frames, figurines, and lamp bases. Also oil lamp converters, boring compound, and all kinds of cords, sockets, pipes, harps, finials, bases, and hundreds of other parts. Everything you need. And you can buy everything wholesale, sell at retail, make big profits, fast. Send only 25c right now for Gearon's big 1955 catalog and wholesale price list. Like hundreds of others, you'll be glad you did. Gearon Co., Dept. 503-B1, 27 S. Desplaines, Chicago 6, Ill.

YOU Can succeed using ten simple words. Amazing results. Details free. Litho Publishing Company, 1627 Belmont Avenue, Seattle 22, Wash.

LEARN Home mail order business. Actual proven plan 25c. Fisher Specialty Co., 716 West Hazel, Corning, Ark.

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YOU Can earn home profits. Write Lombard, 296 West 5th, South Boston 27, Mass.

LET Us sell your crafts. Home Enterprises-C. R-3, Box 94, Bend, Oregon.

\$200 MONTHLY Possible raising earthworms! Backyard, garage, basement. Complete illustrated booklet explains raising, feeding, packing, marketing. 25c postpaid! Ozark Worm Farm-J, Willow Springs, Missouri.

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NEW "x111" Ultra-blue signs. 7c, retail 50c. Sample free! Lowy, 812 Broadway, Dept. 834, New York 3.

GET \$10 Merchandise orders by mail! Keep \$5.00. Supplies furnished. Orders filled. Genmerco, Box 142, Dorchester 24 J, Mass.

HOMEWORKERS Profitivity packet 10c. O'Dell's, 33401 So. 6th St. Road, Springfield, Illinois.

JOHNSON'S Emergency cleaning kit, America's hottest money-maker. Cleans suit 3c. Dress 2c. Necktie 1c. \$25 daily. Free kit deal. Johnson Company, Box 944, Ashland, Ky.

EARN \$50.00 Daily making mats, shoes and mud guards from old tires. S and S Patents Inc., 1307 North Clark St., Chicago 10, Ill.

\$100 WEEK Possible; spare, full time; different, proven, successful plan. Herco, 319-B Sea Street, Quincy 69, Mass.

BIG Mails! Many offers, samples, etc. Get listed, 25c. Don Bates, Oakland, Iowa.

WHOLESALE! 8000 Nationally famous products. 30-80% discounts! Large catalog. Sensational business plans included. Consolidated Distributors, 21-12 Lafayette, Paterson 15, New Jersey.

JIGSAW Bandsaw owners, let your machine bring extra profits, fun. Free details. Nu-Art, Dept. B, Box 2235, Boston, Mass.

SELL Religious mottoes—Send no money. We trust you. Crystalglo, Box 96, Sidney, Ohio.

15 MILLION Dollars paid in '53 for suggestions! If your company has a system you can earn regularly. It's easy! Send \$1.00 for booklet, "Dollars for Ideas" and year's membership, in Suggesters Club, Box 227, Harvey, Ill.

START A profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions paid for new and renewal subscriptions. Start earning money in this pleasant work at once! Clip this ad and send with your name and address to: Agency Bureau, Dept. PM, Hearst Magazines, 250 West 55th St., New York 19, N. Y.

PROFIT! Prestige! Publish a magazine under your own name! Only \$3 per month! Sample, details 3c! Filmer, 910 Marion, Pharr 22, Texas.

RECEIVE Latest book selling and money-making opportunities. Write: Tradewinds, Box 82-8, Chattanooga, Tennessee.

FREE Folio "Up to \$45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Works itself, home! Hayling, Carlsbad, Calif.

EARN At home. Several ideas to choose from. No mail order. No selling. Folder free. Todaro, 433-A Motheral, Monessen, Penna.

FREE Leathercraft catalog, Do-It-Yourself. Write Tandy Leather, Box 397 AM, Tulsa, Oklahoma.

BOOKKEEPERS! Forget debits, credits, double entry! Govt. investigators want records, not systems. More firms use our simple, inexpensive method than any other. Popular demand. Unlimited earnings. Age no barrier. Live anywhere. Amazing details free. Penna. Business Service, Box 923, York 3, Penna.

FOREIGN Employment construction work. If interested in foreign projects with high pay write Foreign Service Bureau, Dept. P.M., Metuchen, New Jersey.

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ATTENTION! Typewriter owners. Make handsome profits. Write today. Groves Company, 682, Hastings 8, Nebraska.

GENERAL Contest Bulletin. Issued monthly. Sample, 25c. 1609 1/2 East 5th, Duluth, Minn.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid Babbitt \$4,165.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 173, 2954 Admiral Way, Seattle, Washington.

50,000 ARTICLES Wholesale. Source directory dime. Nelko, Box 3462-DR, Chicago 54.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

WINNING Prize contests is fabulous, confidential, home opportunity! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

BUILD Sales by recruiting productive distributors selling direct or to retail outlets. Secure most concentrated circulation through classified columns of Salesman's Opportunity. Write for facts. Gilbert, Salesman's Opportunity, Room 1700, 28 East Jackson, Chicago 4.

SELL—Buy Titania gems. More brilliant than diamonds. \$9.75 carat wholesale. Free catalogue. Diamonite, 1404-M Mitchell, Oakland 1, California.

SCHOOL Seniors—Sell classmates America's most beautiful graduation name cards. Largest selection. Highest commission. Outsell all others. Free sample kit. Printcraft, Dept. M, 1509 Maple Street, Scranton 5, Penna.

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300 YEAR Calendar in your head. Know day of week when dates known. (Good business astrologers.) Code \$1.00. Krystop, Felton, Calif.

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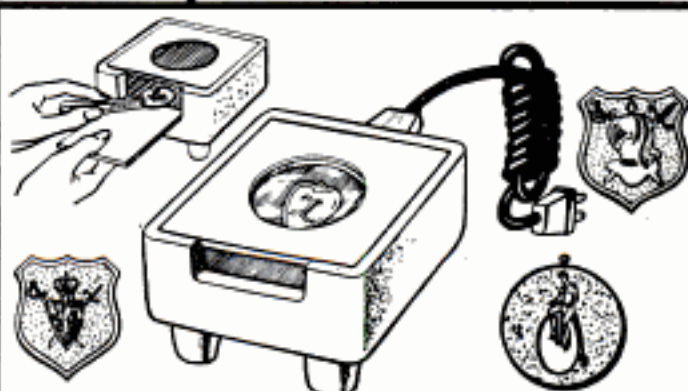
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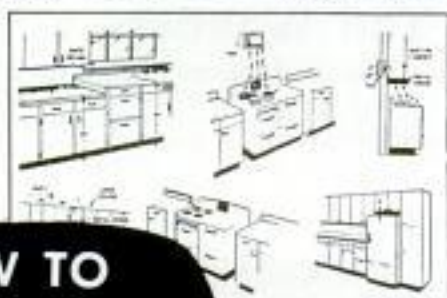


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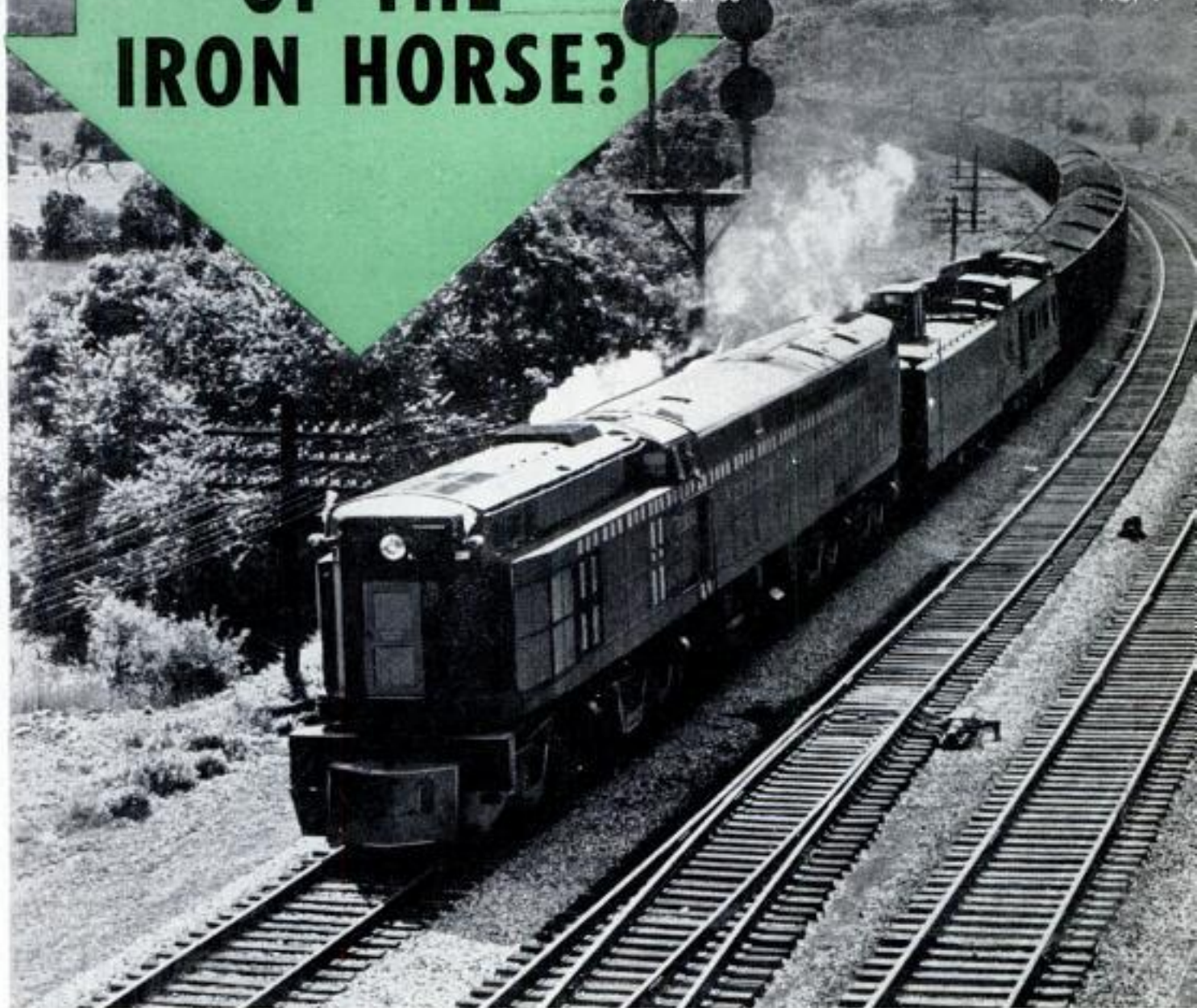
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44-173

IS THIS THE LAST STAND OF THE IRON HORSE?

POPULAR JANUARY 1955
MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 103 NO. 1



By Walton M. Rock

A BIG, BLACK monster of a locomotive is growling up and down the boiler-busting grades of the southern Appalachians these days, pulsing a defiant challenge to the sleek diesels so rapidly replacing its coal-burning brothers.

This new power plant on wheels burns coal, too, like all the other engines operated by the Norfolk and Western Railway. But the resemblance ends right there.

For this hulking brute is a coal-fired, steam-turbine-electric locomotive. Steam generated in the boiler at high pressure drives a turbine which develops 4500 horse-

power at an electric generator supplying power to 12 traction motors, one for each axle.

But though this is a steam locomotive, the legendary Casey Jones and his mates of a bygone day would never recognize it as such.

In size alone, it beats anything Casey ever saw. Together with its tender, it is a little over 161 feet long and weighs 586 tons.

The black giant is so long that, with its tender, it cannot be handled on existing turntables. When it is necessary to turn it around, the tender is uncoupled, the huge

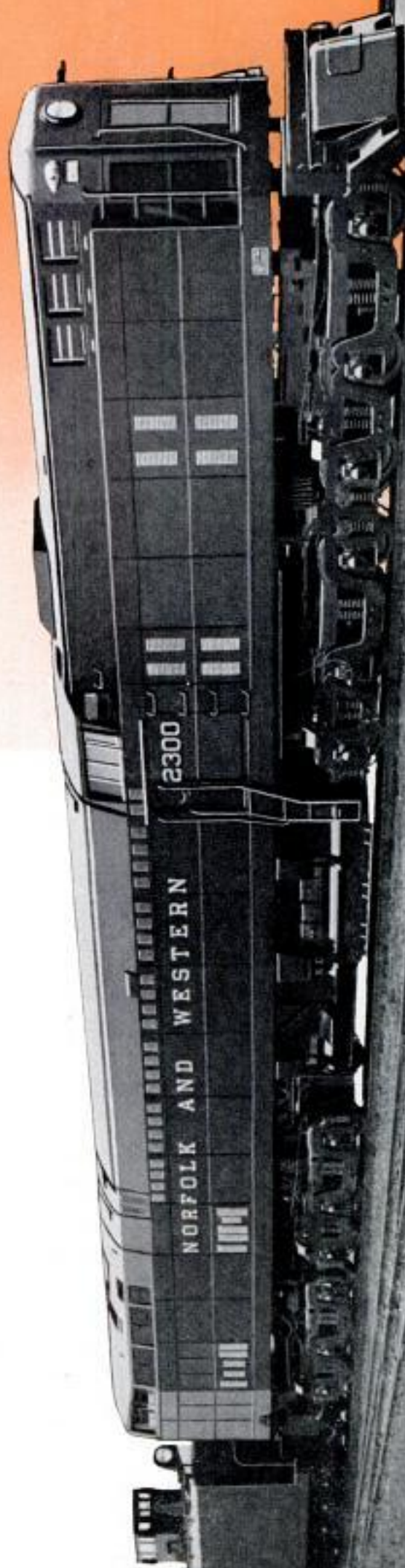


Norfolk and Western had some pretty-good-sized steam locomotives pounding its high iron before No. 2300 came along. But the big steam-turbo-electric job, with its 586-ton weight and 161-foot, 1½-inch length, puts them in the little-brother category. Former record-holders in the weight and length divisions were these articulated giants. The 2-8-8-2 Class Y6 (above) weighed 495 tons, while Class A 2-6-6-4 locomotives (below) were the road's longest, 121 feet, 9¼ inches. Both were made in N&W's own Roanoke shop





Designed for the heavy work of hauling coal over Appalachian grades, giant "Jawn Henry" is big and black and powerful, dwarfing sleek No. 600, a bullet-nosed, streamlined passenger locomotive. The Norfolk and Western is the only major railroad in the United States that has stuck to steam for all freight and passenger operations. With the great part of its revenue coming from haulage of coal, the road uses coal-fired steam for motive power. No. 2300 is the latest N&W effort to prove the diesel experts wrong





Automatic stoking in this coal burner takes the sweat out of the fireman's job. His cab has a minimum of simple controls

locomotive is turned, and the tender hitched onto the other end. It is nearly 40 feet longer than the N&W's longest conventional engine.

Casey and his friends would find a few other items turned around, too. Coal, 20 tons of it, is in a compartment of the engine itself, in front of the cab. The boiler is behind the cab, along with the turbine and generators. The tender contains only water (22,000 gallons) and a special water softener, with a brakeman's cupola perched jauntily on top.

Coal is fed from bunker to boiler by an automatic stoker. The softened, de-aerated, preheated water, preheated air for combustion and steam pressure all are fed and maintained at the proper levels by automatic controls. Even the ashes are removed automatically. The grate travels like an endless belt, depositing the ashes as it makes its turn.

Incidentally, one glance at the steam-pressure indicator would have sent Casey and his fireman jumping from the cab for their lives. The needle holds at 600 pounds per square inch, twice that of a conventional steam locomotive.

Locomotive 2300, the official designation given the engine by the N&W, is many things to many people.

To the mountaineer watching from his lonely shack, or the town dweller along the right of way, it is a long (the engine itself is nearly 112 feet), angular "shoebbox" on wheels that can haul a mile-long string of coal cars past his place at 60 miles per hour. Such smoke as there is comes from a stack that is little more than a hole in the roof, and there is no puffing. The sound that comes from No. 2300 could best be described as a dull roar.

Coal men look on it hopefully as a

development that may restore to them a once-great market that has been shrinking steadily since the advent of the diesel.

The N&W people see it as the answer—maybe—to the diesel power they have so far scorned. The N&W, alone among major railroads, has stuck to the steam engine for both freight and passenger use.

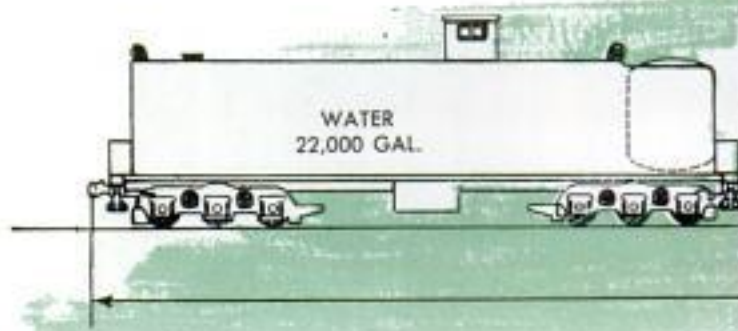
A quick glance at the railroad's operations shows the reasoning behind the N&W's position. Economically, Norfolk and Western makes a major portion of its living hauling coal out of the rich southern Appalachian field, and is not disposed to slap its best customer by using diesel power.

Moreover, it's good coal. And, by virtue of its availability, it's the cheapest fuel the railroad could burn.

Technically, N&W motive-power men believe they have developed the steam locomotive to the highest possible degree of efficiency. The railroad builds many of its own in the huge shops near Roanoke, Va., to fit the road's requirements. It has developed servicing facilities designed to get the best out of the huge locomotives. And aside from the lower initial cost of the steam engine as compared with the diesel, there remains the fact that, as one N&W motive-power man put it, "a steam engine is just getting broken in good when it's 30 years old."

So efficient are the N&W's giant "A" class (12 drivers) and "Y-6" class (16 drivers) locomotives that the road long ago tore down 208 miles of overhead wire and scrapped an entire fleet of electric locomotives once used to haul the long coal trains over some of the toughest trackage in the nation.

Nevertheless, N&W engineers recognize along with railroad men everywhere that electric drive is the best way to deliver power to the wheels of a locomotive. Electric drive means smoother operation and higher tractive effort. There are no reciprocating parts to eat up the power. It is easy



N&W's 600 series are big passenger haulers, but one is small when alongside No. 2300. Despite lack of rods, stack and cylinders, the giant is a steam locomotive



on the rails. Its light, standardized running gear means easier work for shop crews.

The most direct answer to this, of course, was the old electric locomotive. But the cost of stringing overhead wire or laying third rails over miles of track was prohibitive in most instances.

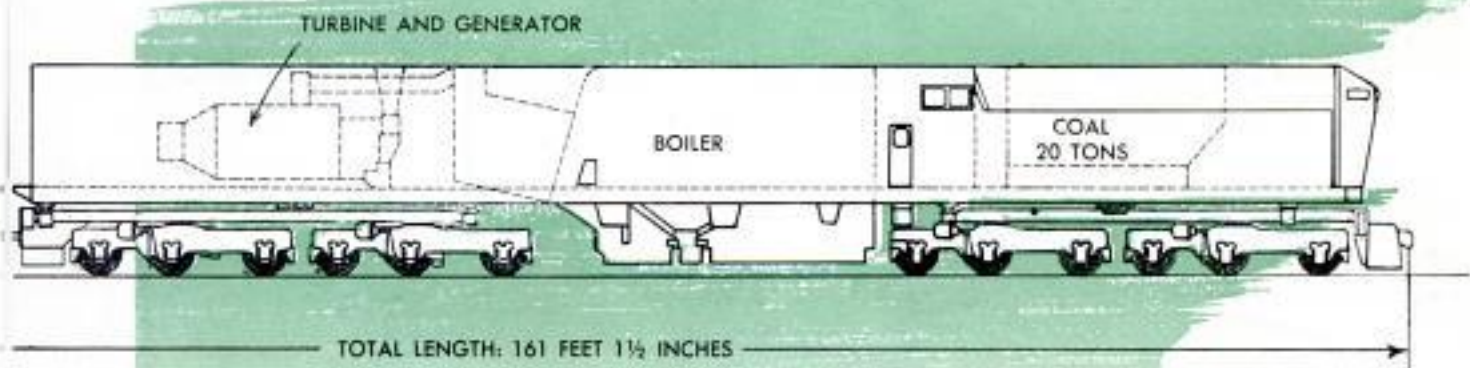
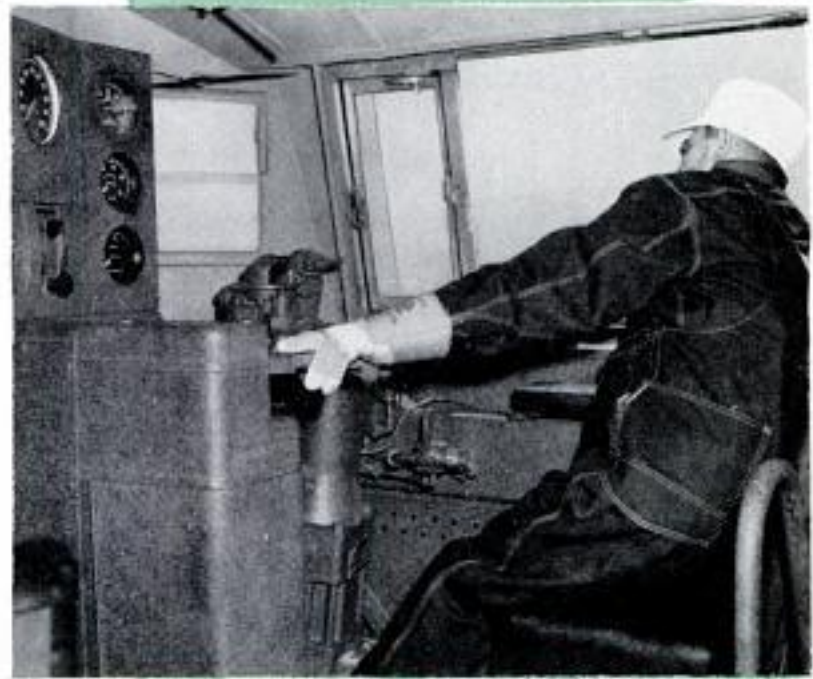
Then came the diesel-electric. To many railroads, this self-propelled power plant with its relatively high efficiency and low-cost operation was the answer to the rising coal cost and increasing obsolescence of the old steam locomotive.

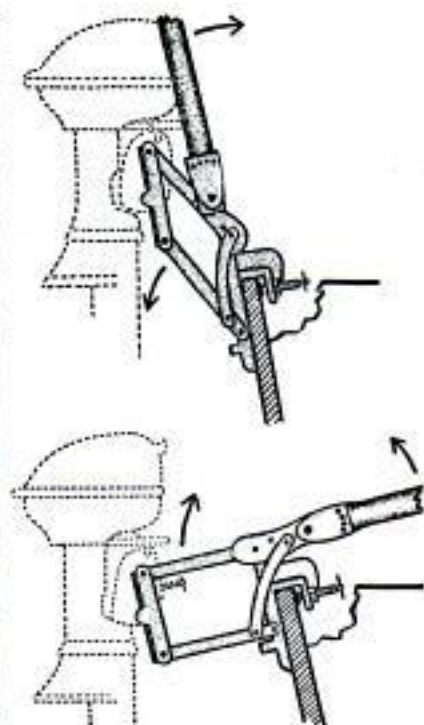
But not to the N&W. It stuck to coal and made the best of it.

Electric drive was still in the back of the minds of the N&W

(Continued to page 256)

Steam-turbine pressure, generator output and power delivered to each of 12 axle motors, are all controlled by one throttle lever





Handle on New Mount Lifts or Lowers Outboard Motor

You can raise or lower an outboard motor merely by moving a handle if the motor is clamped to a new mount. Raising the long handle lifts the motor in relation to the boat. Most outboards require 18 inches or more of water, but the new mount makes

it possible to use the motor in water only six inches deep. The mount is especially effective in turbulent water filled with rocks and shallows, as it gives the operator instant control over the depth of the propeller.

Wind Gauge for Home Use

Operating on the same principle as an aircraft air-speed indicator, a simple wind gauge has been developed by a Chicago manufacturer. Pressure derived from the wind entering a calibrated opening mounted on a weather vane is transmitted by flexible tubing to the indicator tube, which can be mounted any place inside a building. The indicator is calibrated in both miles per hour and the Beaufort scale, whose top reading is 12.

Bricklaying Made Easy

Designed to aid the novice bricklayer, a sheet-steel spacer automatically corrects mortar thickness and spacing. The spacer is placed under and at the end of each brick laid in a course, assuring uniformity for the amateur bricklayer. The spacer also serves as a wall tie.

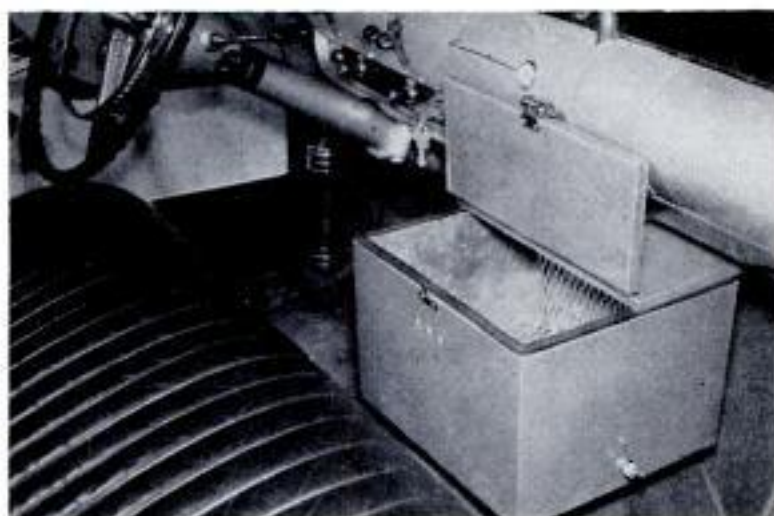




Install-It-Yourself Door Jackknives Above Car Inside Garage

Easily installed by the homeowner, a new aluminum garage door jackknives inside the building. As a result of its folding action, the door requires only six inches of overhead space and only six inches of clearance from the door to the car's rear bumper. The door is lifted by a torsion

spring and a spiral cable drum. The operator just unlatches the door and gives it a gentle push and the mechanism lifts it to the overhead position. The door is made in leather-grain embossed aluminum. It comes in the standard dimensions of seven feet high and eight feet wide.



Automobile Refrigerator Hooks to Air Conditioner

You can munch popsicles while driving through the desert if your car is equipped with a new auto refrigerator. The unit connects to any refrigerated, automobile air-conditioning system and can be installed in an hour. It mounts on the floor in front of the instrument panel, behind the front seat or in the trunk compartment. Its capacity is 960 cubic inches which is large enough for 18 bottled drinks or two dozen 12-ounce cans.

Coin-Operated Recorder Allows Dictation on Trip

Businessmen on trips can dictate letters to a new coin-operated recorder and mail one transcript home. A quarter buys a 15-minute recording belt and a stamped mailing envelope. Another quarter activates the recording machine for 10 minutes. The unit is housed in a soundproof booth and provided with a comfortable chair. It is being installed in hotels, airports and railroad stations throughout the country.

☛ There are 80,000 species of snails in the world, according to the Smithsonian Institution.





UNNOTICED AMONG the 1,000,000 Frenchmen who crowd into the Paris Auto Show each year are the world's most influential stylemakers: The men who style America's cars.

These stylists make an annual pilgrimage across the Atlantic to see what Europe has that is fresh, that might perhaps be adapted to American designs. Rarely do they find something they can pick up intact. More often, there is a suggestion, a hint, that can be reworked to fit American tastes.

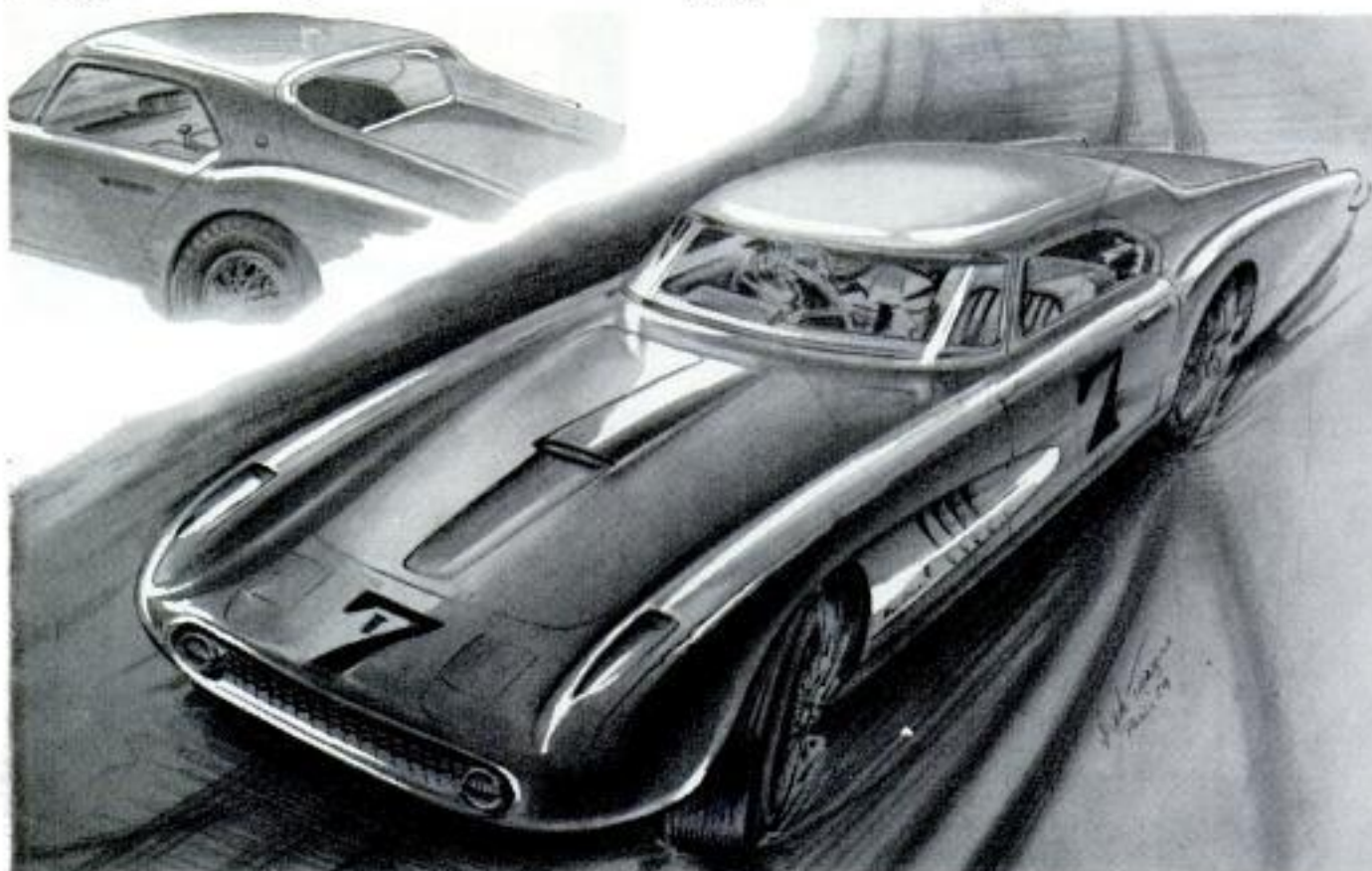
Cars from all over the world are shown at Paris, but those that the American stylists linger around longest and sketch most carefully are invariably Italian. In Italy, automobile styling has become a fine art.

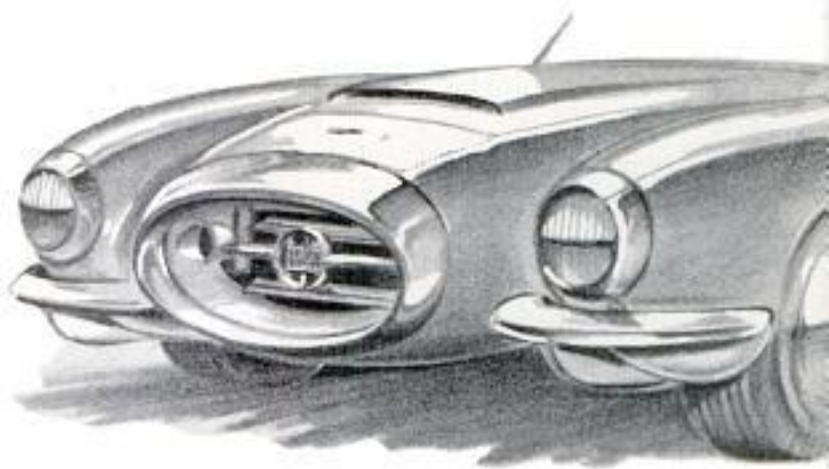
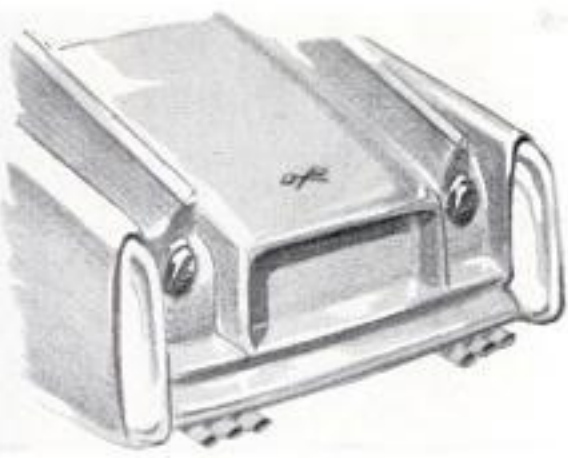
Representing the Packard Motor Car Company at Paris this winter were Edward Macauley, director of styling, and Richard Teague, chief stylist (shown at left).

Popular Mechanics asked Mr. Teague to sketch the show's high lights for its readers. Quotations are also by Mr. Teague. ★ ★ ★

An American Stylist at the Paris Auto Show

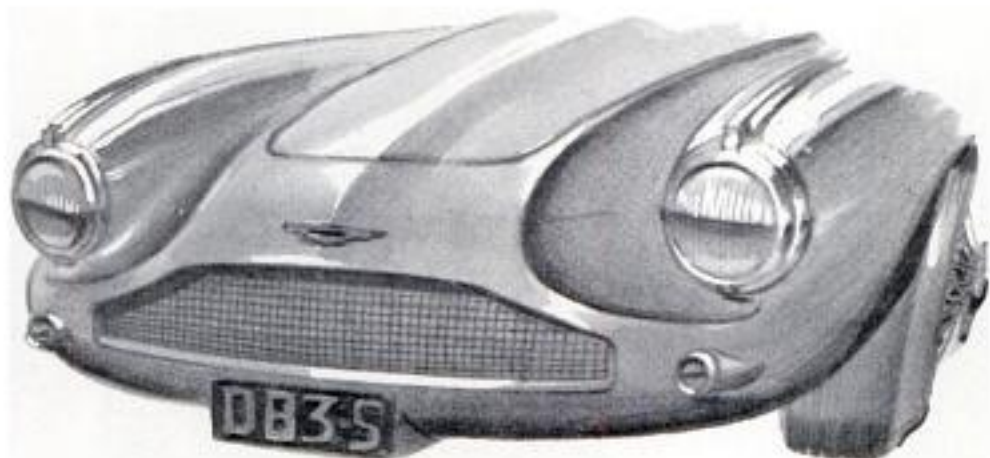
" . . . Most original was the Farina coupe on a 4½-litre Ferrari chassis . . . It has double rear-roof fins with a window overhang similar to that on our Balboa show car . . . and a long, low drop-off hood ending in a Venturi opening containing an egg-crate grille . . . Headlights are retractable. Two driving lights are set in the grille."





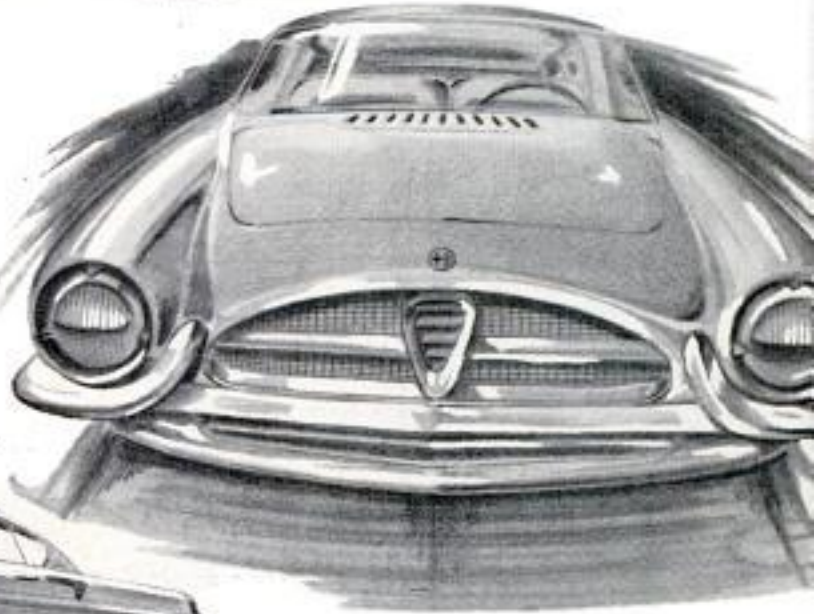
" . . . Second most interesting was also a Farina . . . this one on a V6 Lancia chassis. It has similar roof fins in the rear—watch for these on some of Detroit's cars of tomorrow. Front end is a large oval with horizontal louvers. I didn't think the styling work-out was as well done in the rear (left) as in the front. The recessed front grille is another styling trick that Detroit stylists may be using very shortly."

" . . . This year the foreign trend is toward the Venturi front grille . . . an excellent example is the Simca, right. It has its grille mesh recessed inside a single heavy blade. Headlights are set into the outer ends of the long oval."



" . . . On the way home from Paris I stopped in London at the Earls Court show. British are best in competition styling. Passenger-car styling is behind the trend. An excellent example of competition styling is the Aston Martin (left). It has a hood design using scallops like on our '51 Packard."

" . . . Ghia's body on an Alfa Romeo chassis is original in its front-end styling. Bumpers wrap around the base of the headlights, which are actually suspended in large fender openings, supported by three spokes. Air is taken in around the headlights, ducted down to cool the brakes."





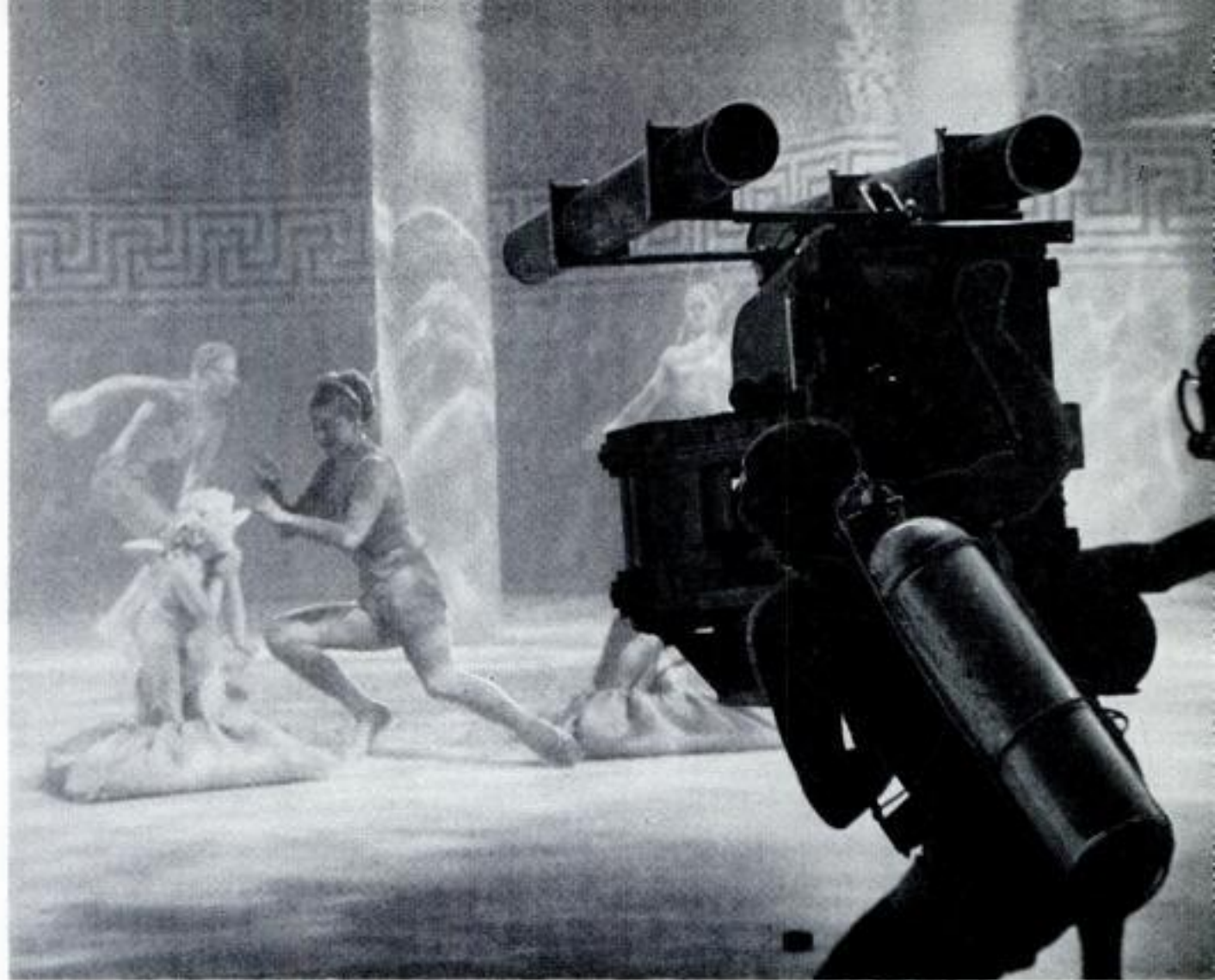
Railroad Tosses "Passengers" Over Cliff at Supersonic Speed

SURPASSING the fevered imaginations of children's TV scripters or comic-book artists is a new 12,000-foot railroad under construction near Utah's Zion National Park. Cars on this railroad toss "passengers" off the top of a 1500-foot cliff at supersonic speeds. Parachutes and other deceleration devices then are supposed to float them gently to the floor of the desert a mile or so away.

Fortunately the passengers will be mechanical dummies studded with recording instruments. They are the Air Force's robots testing bail-outs from supersonic

planes—bail-outs that might kill human pilots.

The trains on the railroad consist of two cars, a rocket pusher and a test sled. The latter carries the dummy or test ejection seat or capsule. The former provides the power and is halted by a water brake before it also plunges over the edge of the cliff. The facility is being built because the Air Force found that full-scale testing of ejection methods from high-speed aircraft was too expensive, and that tests from missiles were impractical. Scheduled completion date of the center is 1956.



Special free-floating underwater movie camera manned by aqua-lung crew follows action of Esther Williams

Even the Stagehands Have to Swim

THE BEST WAY to make a good underwater movie is to take the entire motion-picture company below the surface. That's what director George Sidney did when he filmed the underwater scenes for Esther Williams' forthcoming Metro-Goldwyn-Mayer picture, *Jupiter's Darling*.

The entire company, sometimes as many as 25 persons, went underwater and stayed there. Camera crews, property men and electricians for handling the lights wore aqua lungs that allowed them to stay down for two hours at a time. Part of the time Sidney directed the picture from the bottom, sometimes he observed the action from a glass-walled chamber built into the hull of a boat on the surface.

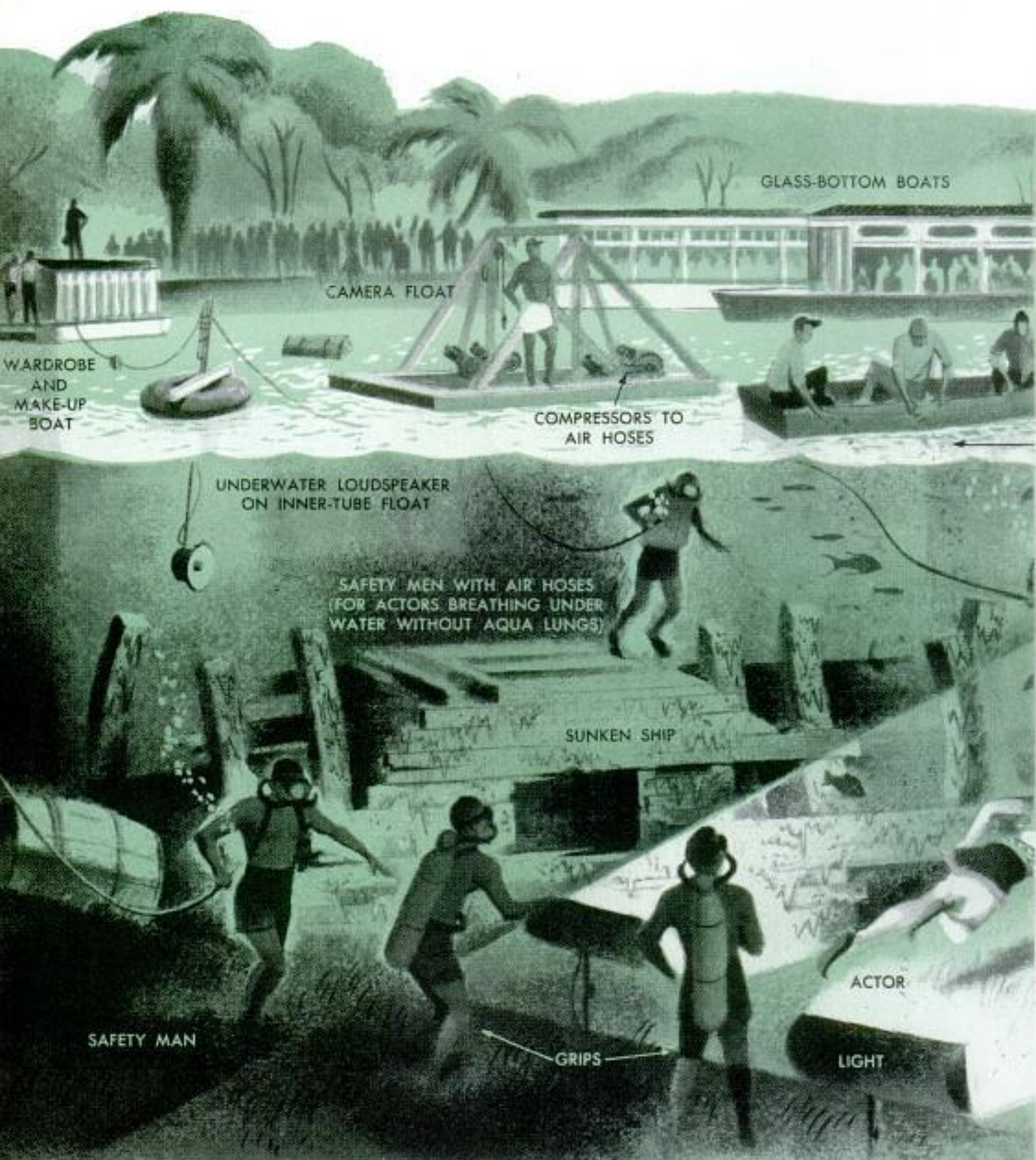
Even the actors, who wore no breathing apparatus, stayed under water

for half an hour or so. Between camera "takes" they gulped air from compressed-air hoses that were held by safety men who were out of camera range.

About the only members of the company who stayed on the surface were a pair of property men in a rowboat who looked

Stage crew on headquarters boat at Silver Springs, Fla., awaits orders
Eben Henson photo





This is the scene above and below water during the filming of *Jupiter's Darling* at Silver Springs, Fla.

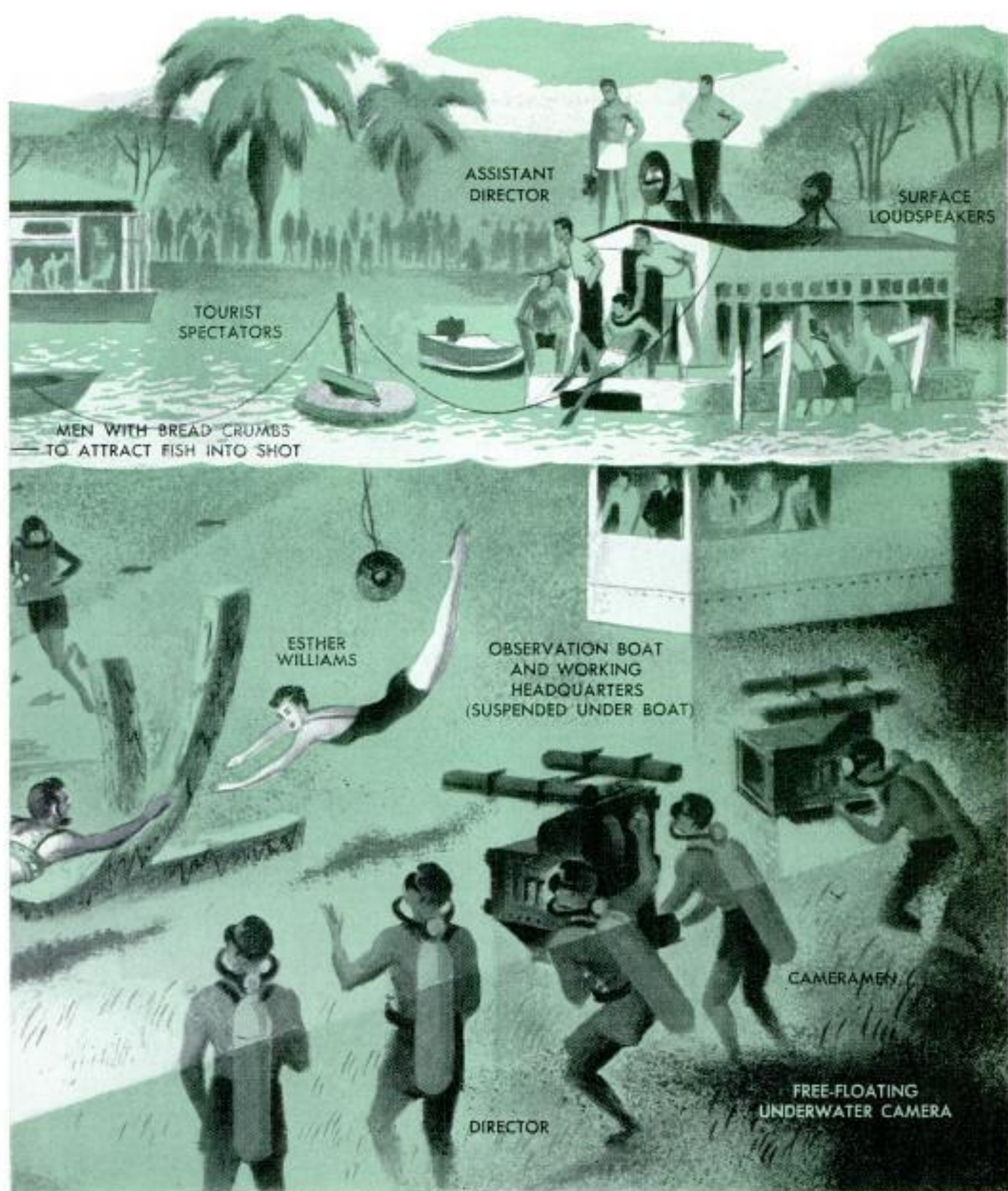
down on the action below them and released schools of fish into the scene when they saw Sidney wave his hand in their direction.

The picture tells the story of Hannibal's march on Rome and its underwater scenes are part of the story. The movie is said to include the longest underwater footage ever shot in color by a Hollywood studio. Some of the scenes were made in 20 to 50 feet of water at Silver Springs, Fla.,

and other sequences were made in a huge tank on the MGM lot in California.

Part of the action at Silver Springs called for an underwater chase in which actors dressed as gladiators swim in pursuit of Esther Williams. The chase occurs in and around the sunken wreck of an ancient Roman galley.

This set was built at the studio and is a replica of a galley's ribs and broken planking and is complete to such details as moss,



Assistants watch filming of scene from glass-walled observation booth suspended under headquarters boat

seaweed and barnacles, the last of which were made of rubber so that actors who brushed against them wouldn't be cut. Visible inside the wrecked part of the galley were urns and chests typical of the period. The set was taken apart after construction and shipped to Silver Springs, then re-assembled and sunk below the surface.

The big technical achievement that made it practical to film long scenes under water was the invention of a neutral-buoyancy

camera that neither sinks to the bottom, nor floats to the surface. It stays just where the cameraman puts it, at any depth down to 90 feet. The camera and its waterproof blimp and attachments weigh 510 pounds on dry land, yet below the surface it is literally weightless. In spite of its great bulk an underwater cameraman can point or pan with it as easily as you operate a small, lightweight, amateur-movie camera.

Pushing the unit in front of him, a

cameraman would swim down to the desired location, turn the camera in the right direction, tip it to the correct angle and then take his hands away. Unless there are currents in the water the camera remains motionless until it is purposely moved again.

The neutral-buoyancy housing, or blimp, was perfected by John Arnold, head of the MGM camera department. The camera was to be entirely self-contained with its own power so that there would be no trailing wires or connections to the surface. It was to be held by hand instead of operated from a tripod. It was to carry 1000 feet of film so that as much as an entire day's shooting could be recorded.

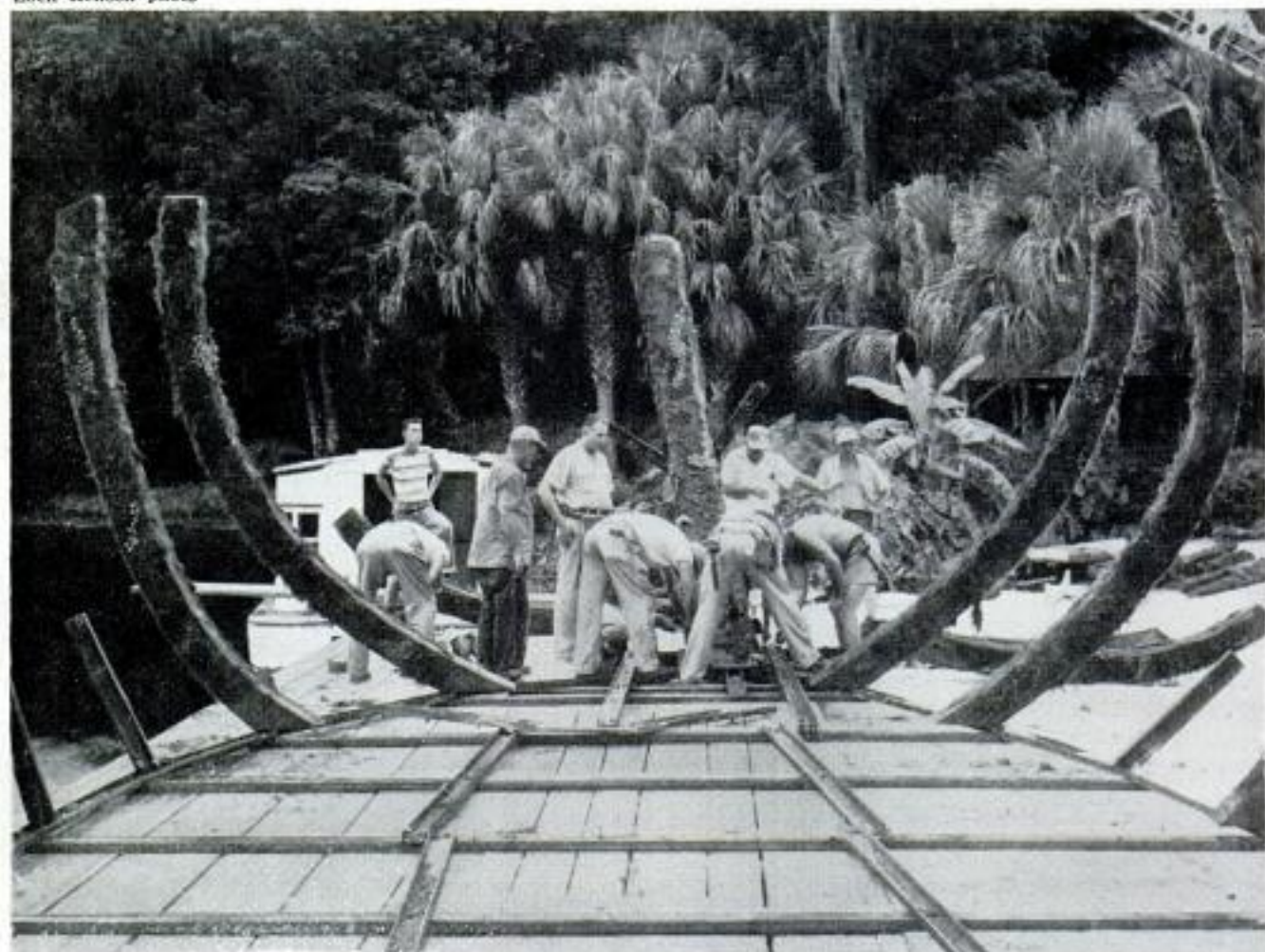
Arnold designed and built two outfits, one containing a standard motion-picture camera fitted with a CinemaScope lens, the other having a different kind of wide-screen lens. The waterproof blimp enclosing each camera is made of aluminum sections bolted together and having rubber gaskets in

(Continued to page 264)



Inventor Arnold and director Sidney inspect underwater camera. The parts labeled are: 1. Stabilizer tubes; 2. Film magazine; 3. Focusing knobs; 4. Different lenses; 5. Wide-screen lens; 6. View-finder lens; 7. Camera's own aqua lung; 8. Compressed-air tank; 9. Self-contained batteries; 10. Front cover of waterproof blimp; 11. Tripod used only when on dry land.

Eben Henson photo



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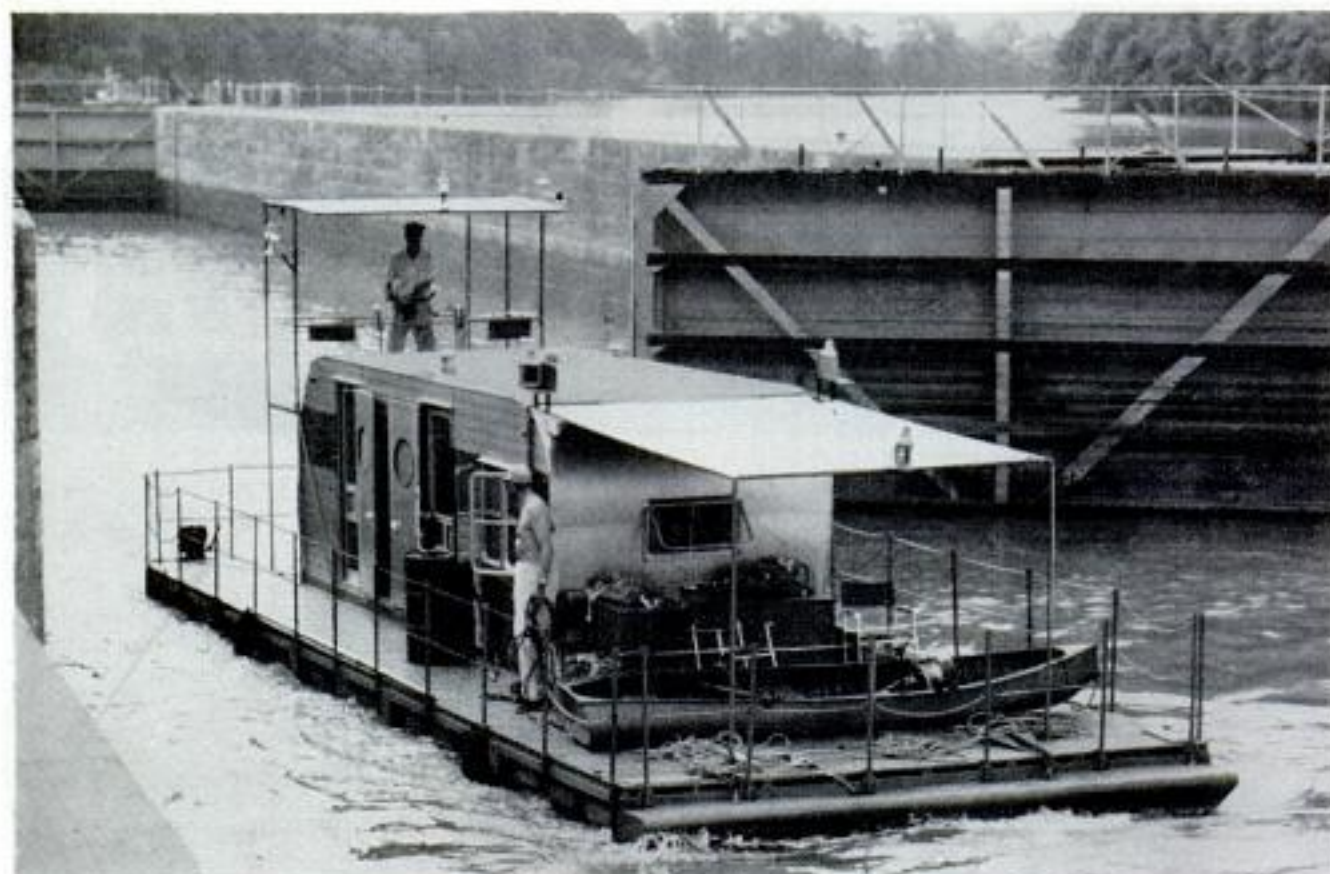


House Trailer Mounted on Pontoons Becomes Comfortable Barge

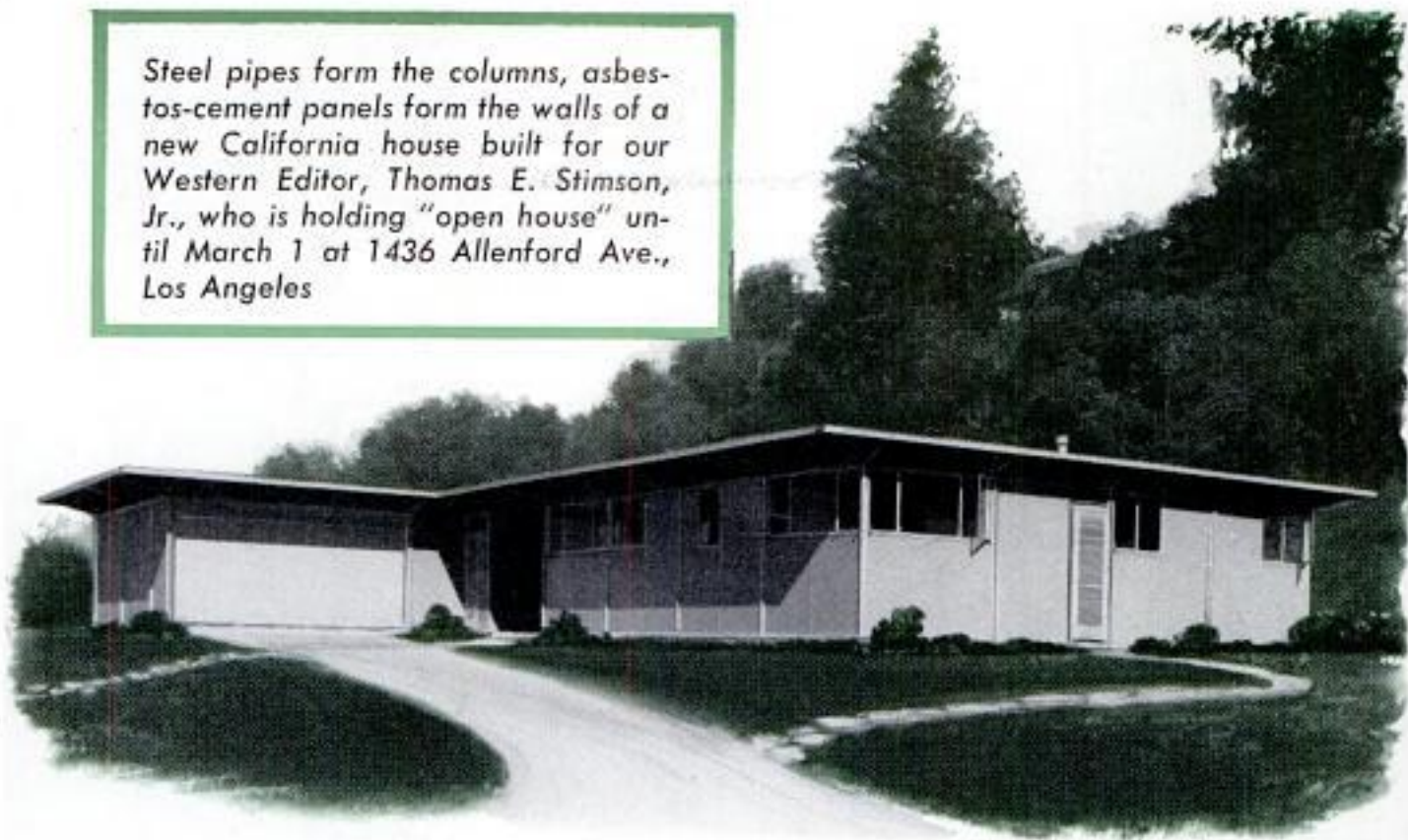
SOMETHING NEW in a boat with all the comforts of home is *Dumbo*, an ordinary house trailer mounted on pontoons. The craft is designed to meet the needs of confirmed landlubbers who want a comfortable home for fishing or just nosing around the inland waters. The barge measures 40 by 15 feet, and is mounted on 47 pontoons.

Secured to the deck is a standard house trailer minus its undercarriage. The craft is complete with a pressure water system, a generating plant (along with plugs for shore tie-in to 110-volt current), four bunks and a butane stove and refrigerator. Two 12-horsepower outboard motors push the barge along at about five knots.

Wheel is mounted on platform above the trailer to give pilot a good view. Beneath deck are 47 pontoons



Steel pipes form the columns, asbestos-cement panels form the walls of a new California house built for our Western Editor, Thomas E. Stimson, Jr., who is holding "open house" until March 1 at 1436 Allenford Ave., Los Angeles



I Chose a Steel-Frame House

By Thomas E. Stimson, Jr.

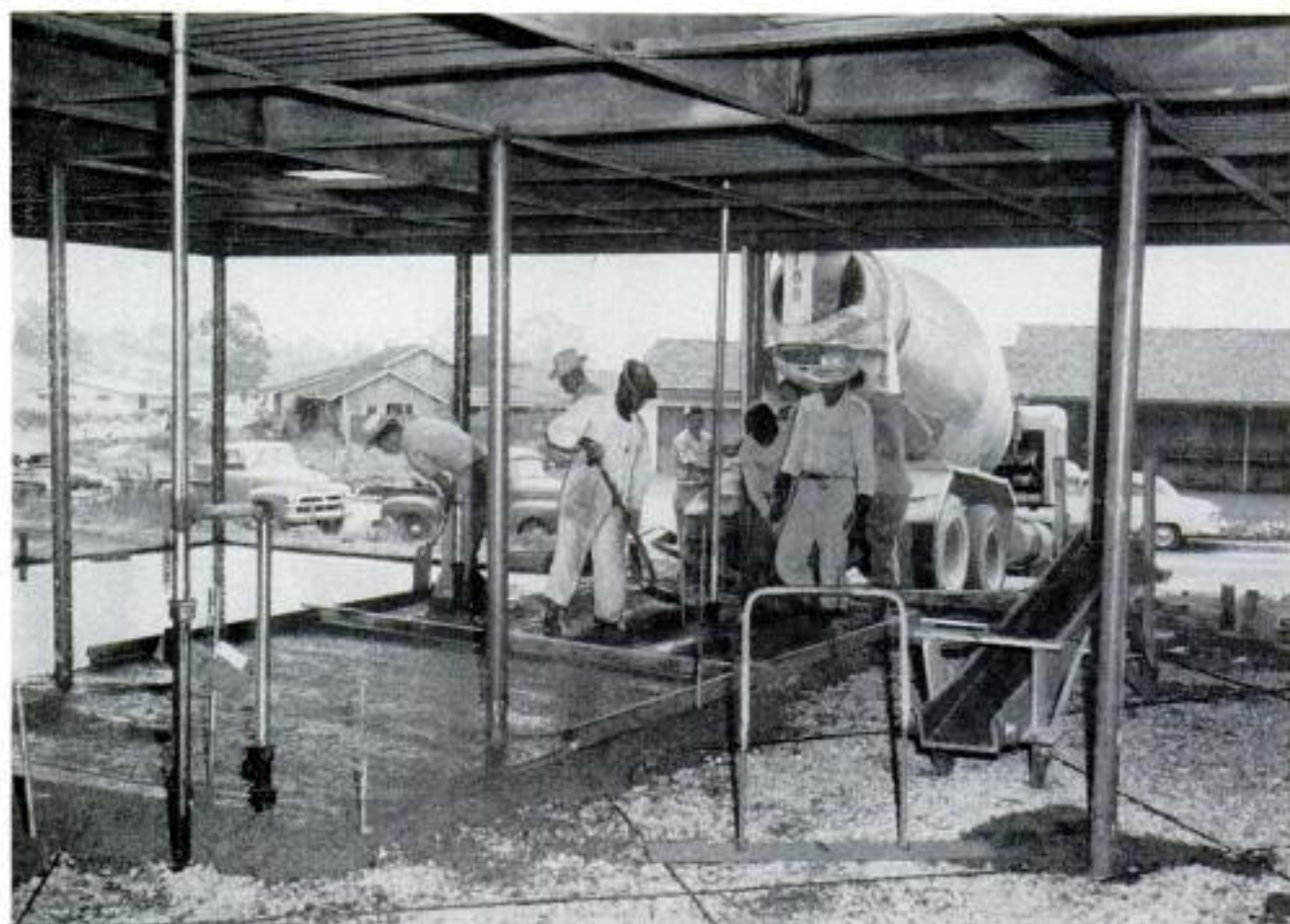
I'M JUST COMPLETING a new house that is a mechanical masterpiece. It was designed for comfort and easy maintenance and was built through a new construction system. It contains striking innovations for efficient living.

The house has a steel frame like an office building. To a large extent it was put together with a welding torch instead of hammer and nails. It has built-in sound insulation and is considered proof against fire, earthquake, windstorm, insects and extremes in temperature. Yet it cost no more than standard high-quality construction. It should last for a couple of centuries.

About the only addition it may require in the next 50 years or so would be a solar battery to provide all light, heat and power. When perfected, this battery could be placed on the roof adjacent to the space reserved for the future heliport.

I can open or close the aluminum garage door from my car from as far as 100 feet away, using a new magnetic-impulse transmitter that is keyed to my garage door alone. From a master panel in the bedroom I can control prowler lights outside the house as well as the principal lights inside. One button on the panel turns on the coffeemaker in the kitchen. Also, from the





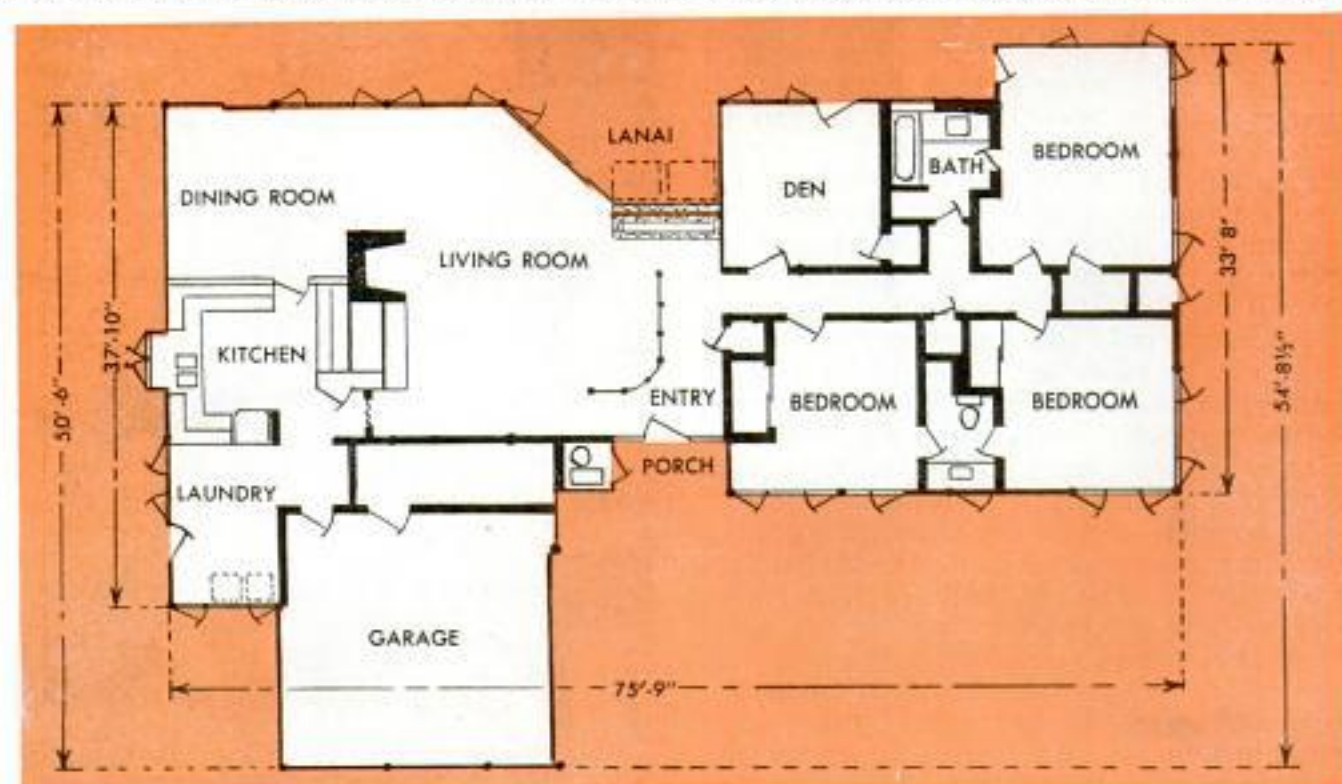
Footings and floors are poured in one operation. Reinforcing rods buried in slab tie columns together

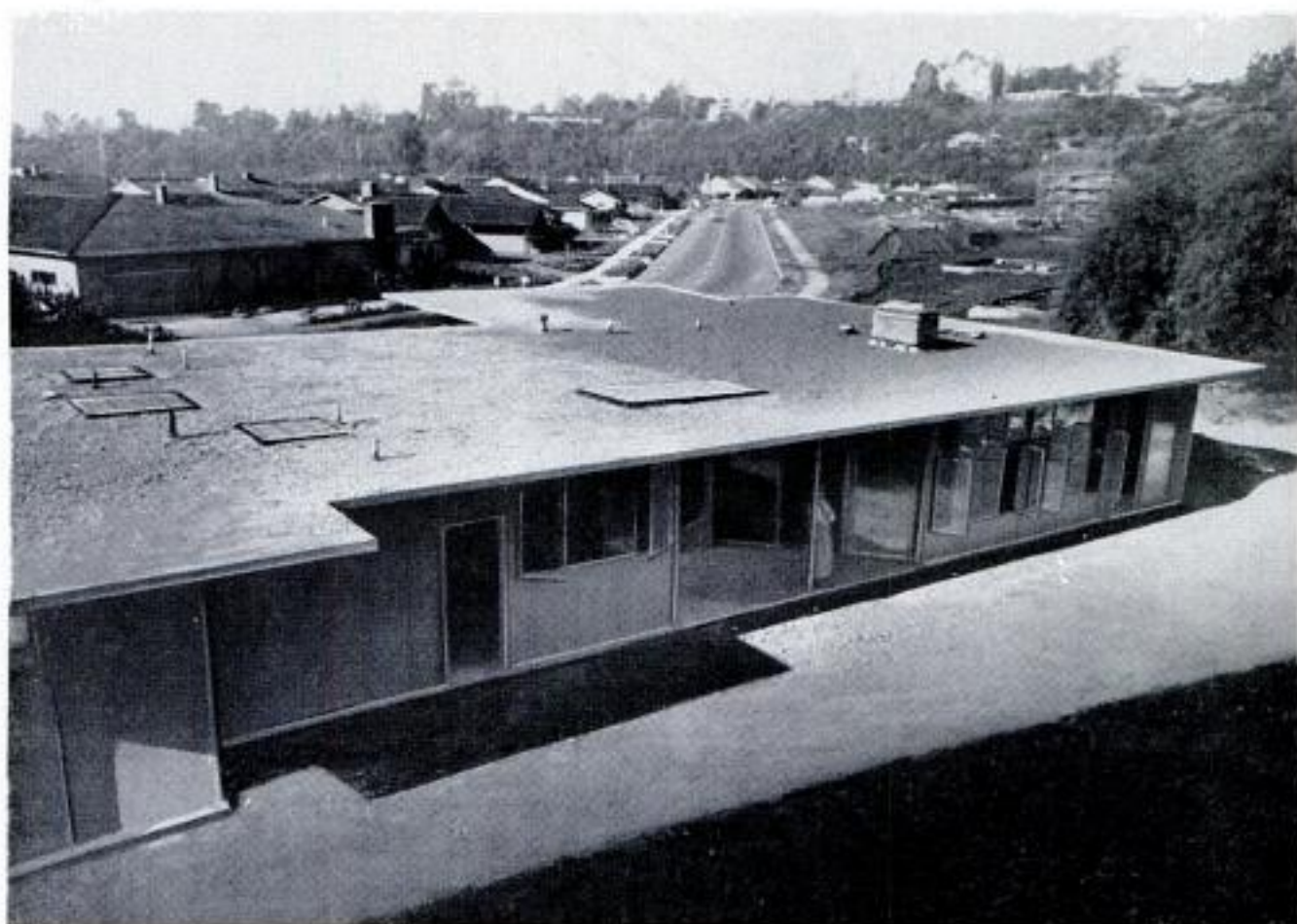
bedroom, I can talk over a built-in intercom system to the kitchen or to visitors at the front door.

Although the exterior of the house is plain in appearance, the inside is a dream. The house has three bedrooms, a study,

two bathrooms, a living room and entry, dining room, kitchen, a breakfast nook and laundry area. There's a lanai or semi-enclosed porch off the living room, along with some sliding glass doors. The two-car garage is in the front of the house where it

Bedroom area is separated from rest of house by entry. Garage, kitchen and laundry are at front of the house





Flat roof lowers construction costs. Nonglare skylights are placed strategically to illuminate rooms below

belongs, avoiding a long driveway to the rear on which unseen children might be playing. You can step directly from the garage to the kitchen with your bundles, a convenience housewives appreciate.

The steel-frame construction system that I used is the invention of Eugene Memmler of Glendale, Calif. Several years ago Memmler asked himself: "With all the new building materials and construction methods, why do people keep on building frame houses that constructionwise are about the same as they were a century ago?"

He evolved a new technique using steel, concrete, asbestos-cement panels and wood, and employed each material where it contributed most efficiently to the structure. Then he built a residence for himself as a test structure. He figured that the materials would cost a lot more than a conventional wood frame but that erection costs would be less, so he would come out even.

His system works so well that I used it, with his help and that of MackIntosh and MackIntosh, engineers, and architect Adrian Wilson, A.I.A. My contractors were Luther, Dahlin and Rogers.

In addition, a number of national companies lent some of their best engineering talent to help me put the house together. If you happen to be in Los Angeles you are invited for a visit any time up to March 1.

Columns are bolted to concrete piers. Later, footings will be poured around columns up to metal bar





Wall panels only 1½ inches thick have insulating value of 25 inches of masonry. Below, ceiling panels rest on metal straps



The address is 1436 Allenford Avenue.

The frame is made of 3½-inch vertical pipe columns spaced eight feet apart. Across the tops are welded 12-inch junior I-beams that support the flat steel-roof deck. The bases of the vertical columns are anchored in concrete and, in addition, are joined together by tightly stretched reinforcing rods. After the concrete floor slab was poured, these embedded rods provided a kind of prestressing to the floor that made other reinforcing unnecessary.

The roof consists of a half inch of insulation on top of the steel deck, with three plies of roofing paper mopped with hot asphalt and finished with a layer of light-weight crushed volcanic rock. The flat roof has several advantages. It is architecturally modern, costs less than a pitched roof and allowed me to install a new kind of nonglare skylighting that helps illuminate some of the rooms below.

The steel frame supports the entire weight of the roof, so all the walls are non-load-bearing. Exterior walls are only 1½ inches thick yet have the same insulating value as 25 inches of solid masonry. They consist of fabricated panels faced on each side with a layer of asbestos and cement. After the steel frame was erected, these panels were shoved into place and bolted to the frame, their edges sealed with calking compound.

Inside the house I used conventional wood-stud and plaster partitions because this type of wall is the most practical for concealing the necessary water pipes, plumbing stacks and wiring. After these partitions were set in place they were anchored permanently to the floor and the overhead beams by means of steel fasteners shot from a gun.

Where electric switches and outlets were required on the outside wall of a room, they were built into the sheet-metal covers that conceal the interior exposures of the steel columns of the house frame. The electric outlets, incidentally, have spaces for three plugs instead of the usual two. In some rooms I connected one set of contacts in an outlet to a handy wall switch at the

(Continued to page 260)



Converted Model A with vertical exhaust and oversize tires tows sledder. Handrails at right protect rumble-seat riders

Beach Buggies Tow Sand Sleds

FOLLOWERS of a new sport around Southampton, L. I., area, hitch homemade sleds to hopped-up, stripped-down Model As and ride the sand instead of the waves. A short rope gripped with both hands maintains the rider's balance as the towing car picks up speed, and a well in the rear of the sled furnishes a secure foothold as the device whips along the beach. A steel plate on the bottom protects the sled from the sharp sand.

Sand-sledding really got started when a group of enthusiasts formed the Southampton Beach Buggy Association, bought six Model A Fords and stripped them down. Most of the cars weigh only about 900 pounds. Each car was hopped up and equipped with oversize tires to give traction in soft sand.

When all is ready, the sled is hitched to the back of the beach buggy and the car starts out slowly, gathering speed as it goes. The sledders scoot along at 25 to 35 miles per hour on the dry sand.

Towing cars pull sleds at speeds up to 35 miles per hour. Sledders' club has six stripped-down Model As



Sand-sled ride offers thrills of water sport. Well in rear of sled provides firm foothold on curves





Drill With Cylindrical Bit Cuts Concrete and Stone

Like a mole tunneling through dirt, a new machine cuts its way through concrete, reinforcing bars or stone. It is equipped with diamond-embedded bits which are cylindrical in shape and which cut out a solid core of the material. Depending upon the bit used, the resulting hole is $\frac{1}{4}$ inch to six inches in diameter. The drill will cut a six-inch-diameter hole through a foot of concrete in less than two minutes. An extension arm can be used if the hole is to be more than 18 inches deep. It is quiet, dustless and electrically powered. It's portable, lightweight and will drill vertically or horizontally.

Rain Detector Buzzes Alarm

You're warned of the first few splatters of rain by a moisture detector that sounds a buzzer. This allows time before the storm to close windows, bring in laundry from the line and call in pets and children. A moisture-sensitive grid, placed outdoors, is connected by a long cord to the buzzer unit that is plugged into a standard electrical outlet. The detector is like units which raise convertible tops when it rains.

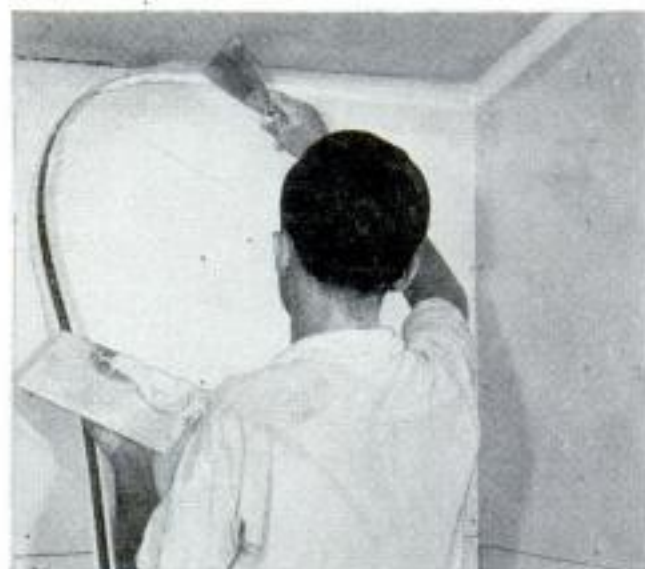


Tractor-Driven Pile Driver Tamps Soil and Digs Wells

Tractor engines can be made to do the hard farm work of driving fence posts, tamping soil or breaking up stone or concrete with a driver and breaker attached to a Ford tractor. Designed for one-man operation, the unit is operated by a single lever. A 200-pound drive weight is actuated by the tractor's power take-off, and attachments adapt the implement to post-driving, tamping or well drilling.

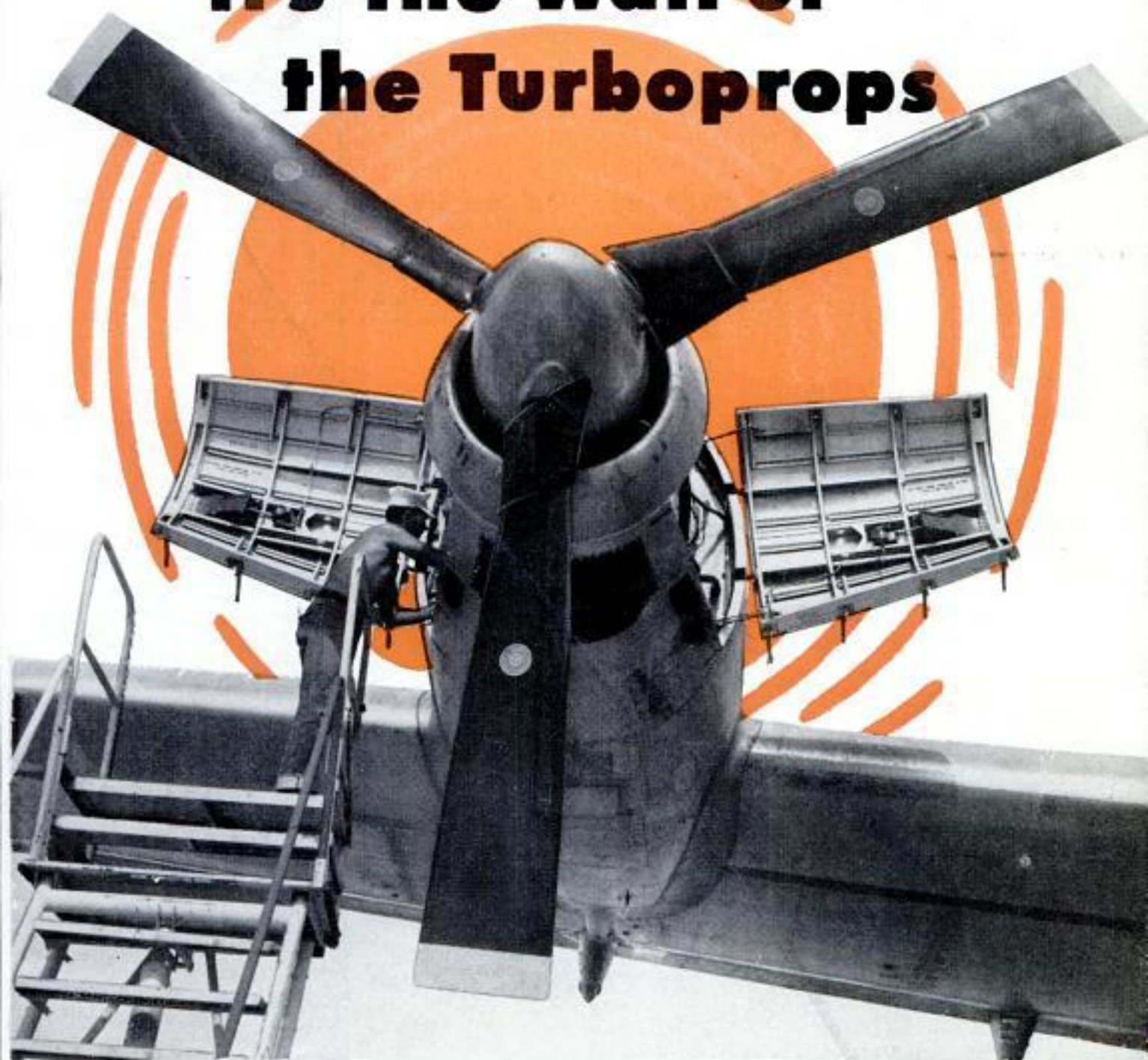
Corner Tape for Dry Walls

Packaged in 100-foot rolls and as easy to handle as ordinary paper tape, a new steel corner tape for sealing dry-wall joints has been marketed. The tape consists of two thin strips of steel mounted on paper, and can be shaped easily into the joints between wall and ceiling. It is applied with wallboard-joint cement and smoothed over.



LISTEN - - -

It's the Wail of the Turboprops



By Ewart Thomas

THERE'S A NEW SOUND in America's skies today, the eerie wail of the turboprops.

The distinctive sound comes from the whine of the propeller tips, the scream of the turbine and the roar of the jet exhaust. That's what you hear from the ground. Inside the plane there's often so little noise that one new turboprop transport has been dubbed the "hushliner."

There's a big surge to this kind of aerial

propulsion because the turboprop looks like the champion power plant for hauling heavy cargoes over long distances. It permits higher speeds than are practical with piston engines and is more economical than the jets.

Lockheed added 100 miles per hour to the speed of a Navy Super Constellation when it converted the plane to turboprop power, yet kept much of the economy that had been obtained with piston engines.



Capital Airlines' British Vickers Viscounts will be the first turboprop airliners operated in the U. S. (above)

An Allison turboprop drives the contrarotating propellers of Convair's experimental vertical-take-off fighter (left)



Cruise speed of Lockheed's Super Constellation increases 100 miles per hour with Pratt & Whitney turboprops (below)



Built for the Air Force, the Lockheed C-130 is the first U. S. transport plane specifically designed for turboprop power



Turboprops have greatly improved the performance of the giant Douglas C-124 Globemaster transport



The new turboprop "Super Connie" can fly 16-ton loads across the United States in less than six hours, a good two hours under present airline schedules.

Convair has converted some of its Model 340 piston airliners to turboprops for the Air Force; Douglas is testing a big C-124 military transport on turboprops instead of the original piston engines; Martin has some conversions under way, and Boeing has been modifying some of its Strato-freighters for turboprop power.

Recently Lockheed flew its new YC-130, the first cargo transport designed from the ground up for turboprop engines. The plane has a wingspan of 132 feet and a fat fuselage that sits close to the ground for truck-level loading through a huge door under the upswept tail. Douglas has under construction a similar and even larger transport that is designed to carry 25 tons of payload a distance of 3500 miles at better than 400 miles per hour. Both the Lockheed and Douglas turboprop transports might be able, as civilian transports, to haul cargo at five cents per ton mile, from one half to one third of today's costs with piston-engine transports.

Turboprops are used on the big Convair XP5Y flying boats, on Allison's demonstration Turbo-Liner and have been tested by North American and Douglas for carrier-based aircraft. The new engines power the vertical-take-off fighters built by Lockheed and Convair.

With the exception of Allison's Turbo-Liner, all American turboprop development so far has been for the armed forces. Meanwhile, English builders of turboprop engines have been busy in the civil as well as military field. Their turboprop-powered passenger transports have been used in Europe for several years. In the United States, Capital Airlines has ordered 40 of the English transports and begins using some of them on its routes this spring. The new Capital airliners are Vickers Viscounts that are powered by four Rolls-Royce turboprop "Dart" engines. The Viscount carries 40 or more passengers, has a normal range of 1000 miles and flies in excess of 300 miles per hour. Trans-Canada Air Lines also has ordered Viscounts for early delivery.

Basically, the turboprop has the same kind of gas turbine that is used to drive a jet aircraft. As a turbojet, all the thrust from the turbine is used as jet drive, out the tail pipe. When redesigned as a turbine-propeller power plant, more wheels are added to the turbine and these additional blades absorb most of the jet thrust. The main shaft now has enough torque to drive a set of propellers through a 10-to-1-reduction gearbox. Only about 10 percent of the

power goes out the tailpipe as jet thrust.

From the standpoint of fuel economy the turboprop is almost as good as a piston engine. A typical turboprop consumes .42 pounds of fuel per hour per horsepower at 460 miles per hour as compared to the .40 pounds of fuel per hour per horsepower required by a piston engine at only 345 miles per hour. A pure jet uses more than twice as much fuel.

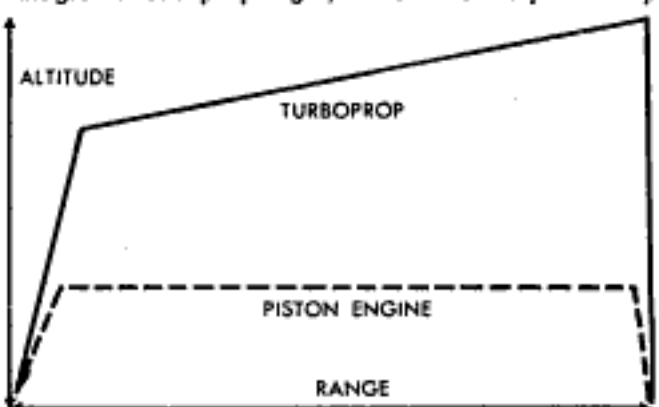
The turboprop has other advantages. Compared to a piston engine it weighs approximately half as much for the power developed. It has about half the frontal area and thus less drag. Compared to a jet, its propellers allow it to take off with much less runway and then to climb at a greater angle. It lands more slowly and comes to a stop much sooner. Engineers say that aircraft piston engines developing more than 4000 horsepower don't appear practical, yet turboprops developing 5500 horsepower already are in use. Ultimately the engines may be designed to produce as much as 15,000 horsepower.

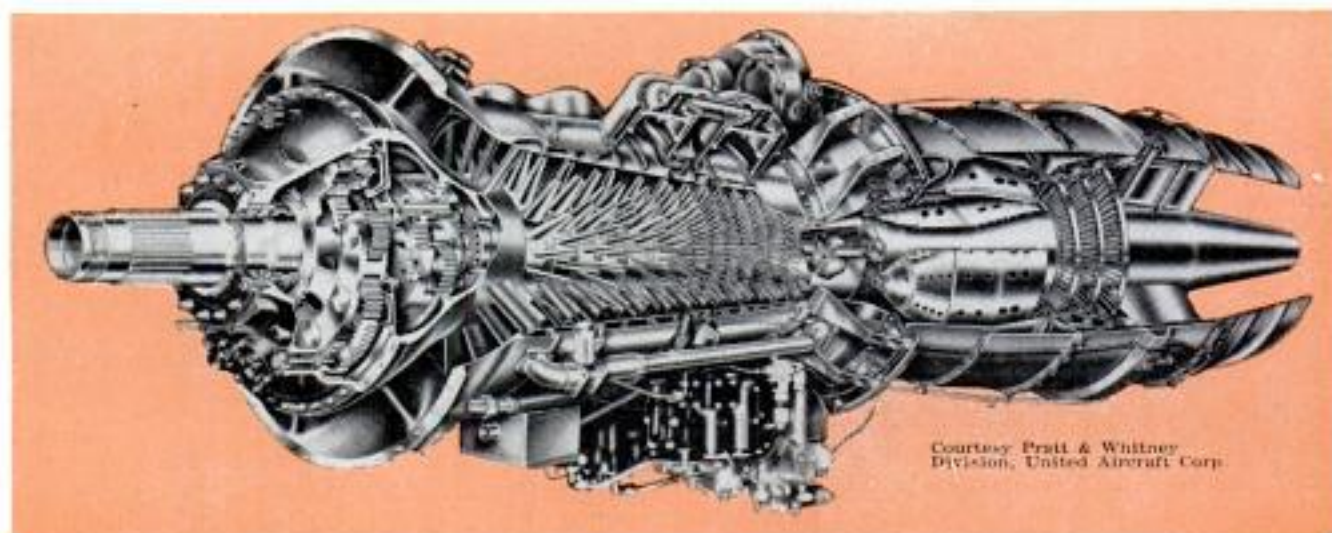
The turboprop is a constant-speed engine that runs continually at high revolutions per minute. The pilot doesn't change his power settings for climb, cruise or descent. His throttle simply changes the pitch of the propeller blades.

The controls in the cockpit are about the same as ever, the chief difference being that the engine throttle lever has two quadrants, one for ground operation and the other for take-off and flight. The throttle is moved through a gate to go from one range to the other.

Starting a turboprop engine is somewhat different from starting a jet because of the great drag of the propellers. A compressed-air starter rotates the gas turbine's shaft up to some 2000 revolutions per minute, at which point the burners "light off" and begin to produce power. But drag is so great that the engine would simply quit if left alone at this point, so the starter continues to boost it along until 6000 revolutions per minute are attained. At this speed the

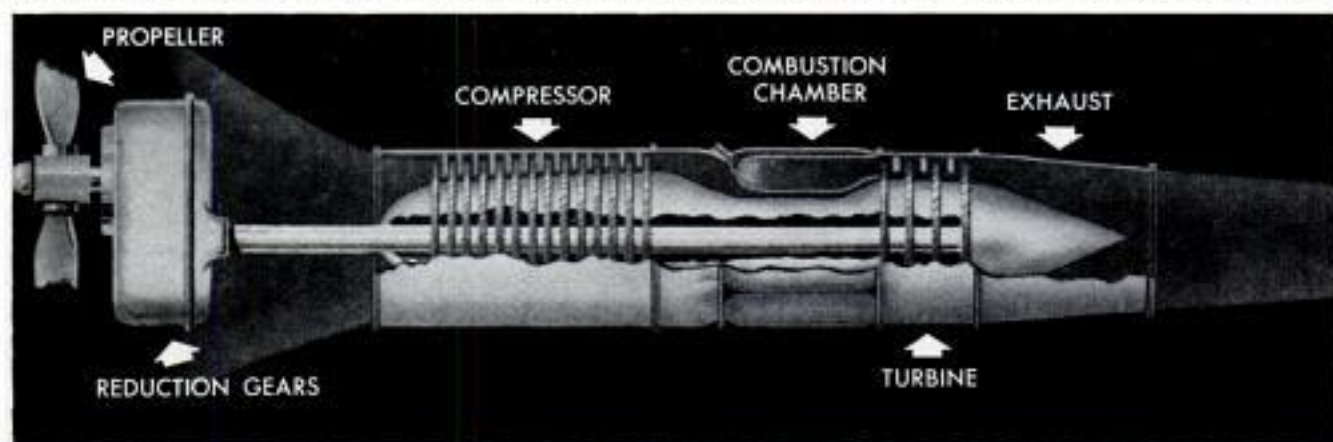
Turboprops fly higher and climb faster. Solid line diagrams turboprop flight; dotted line the piston ship





Courtesy Pratt & Whitney Division, United Aircraft Corp.

The simple principle of the turboprop is illustrated below, while complexity of the actual engine is evident in the cutaway above. Exhaust blast from combustion chamber drives turbine shaft, geared to prop



Courtesy Allison Division, General Motors Corp.

starter shuts off and the engine slowly accelerates up to "idle" at 13,000 revolutions per minute. At idle the propeller blades are turned to exert a slight negative thrust to counteract the slight positive thrust from the tail pipe.

Now the pilot can operate his throttle, pushing it ahead in ground range to taxi slowly ahead, or pulling it back to reverse the propeller pitch to make the plane move backward.

When he moves the throttle into flight range for take-off the propellers change their angle of attack to take deeper bites of air. In the meantime, more fuel automatically flows to the burners so that engine revolutions per minute remain unchanged under the heavier load. In a broad sense the propeller blades know only one speed and operate at that speed continuously. The blades merely change their angle of attack in response to movements of the throttle.

When flying a turboprop transport, the pilot doesn't climb at a rather flat angle until he reaches cruising altitude and then fly straight and level, as he would do in a piston-engine plane. Instead, he climbs at a very steep angle to the initial cruising altitude and then continues to climb gradually for most of the distance to his desti-

nation This is because the turboprop gains in efficiency with altitude, and the pilot can climb to greater altitudes as the plane's weight is reduced by the consumption of fuel.

Most turboprops built so far are of the simple direct-coupled type in which additional turbine wheels are added to a standard gas turbine. More complicated to build and much simpler to operate is the so-called free turbine. This is a standard gas turbine with a hollow main shaft having a second shaft contained inside the hollow shaft. This shaft contains the additional turbine wheels at one end, and is connected to the propeller gearbox at its other end. It is this shaft that rotates the propellers. The British "Proteus" is of this type.

Another kind, the dual-spool turboprop, is similar to the free turbine and has an additional compressor stage at its front, directly behind the gearbox. This also is called the "supercharged" turboprop engine. It is the most complicated of all to design and build, but is less affected by high ground temperatures (which can reduce take-off payload) and maintains full power to high altitudes. It can be designed for a fuel consumption so low that it is said to compete with a diesel in economy.

Still another turboprop engine consists of two gas turbines placed side by side and feeding into a common gearbox. One turbine can be shut down for economical operation at low altitude, both of them can be used for climbing and for high speed at high altitude.

Another design of gas turbine is the so-called bypass or ducted-fan engine. This would be a gas turbine with some extra-large compressor blades at its forward end. Much of the compressed air would travel through the turbine as usual, with the balance of the air being ducted along the outside of the engine casing to join the hot jet exhaust. On paper this engine is quite efficient although it has not yet been built.

Now that Capital Airlines is testing turboprop Viscounts, other airlines will be watching to see how the new power plants operate. Until now most airlines have had a wait-and-see attitude because the turboprops have not been entirely reliable in the past. In fact, various military turboprop aircraft have spent most of their lives on the ground waiting for replacement parts to be designed and built. The basic turboprop engine is pretty rugged, to be sure;

and the difficulties have had to do with propeller-pitch controls and with the safety controls that must function if an engine happens to overheat or overspeed.

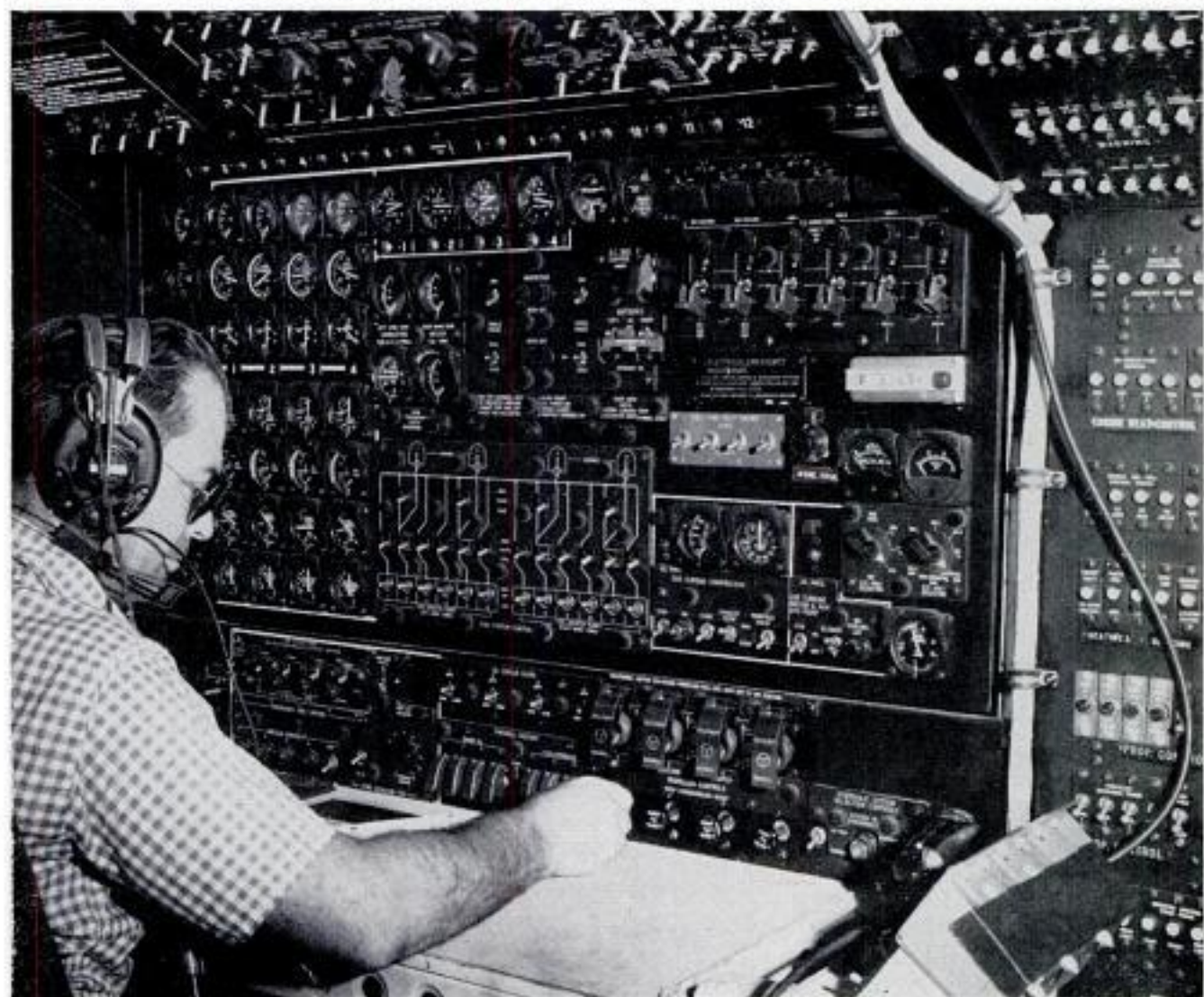
Among the most important safety features recently developed is a negative-thrust-control system that detaches the propeller assembly from the engine immediately in case of power-plant failure, even before the feathering device that weathercocks the blades into the wind has time to operate. Without such a system, the drag from one propeller of a multi-engined plane could be so great when a power plant failed that the plane could go out of control or even whip around so rapidly that it would break up.

Now that this and other safety controls have been proven, various air-transport manufacturers are expected to develop turboprop airliners within the next couple of years.

Turboprop airliners are the next step, and even when the pure-jet airliners begin to flash past them they won't go out of the picture. For short passenger hauls and for flying cargo they will still be unsurpassed.

★ ★ ★

Unnecessary with piston engines, propeller-pitch controls are added to turboprop flight engineer's board



Detroit Listening Post



By Leo Donovan

ABOUT TWO YEARS AGO, a Jaguar sports car set a record of 100.65 miles per hour for 10,000 miles. It was the first production car to average more than 100 miles per hour for 10,000 miles.

Now a 1955 Packard with its new V8 engine has averaged 104.74 miles per hour for 25,000 miles! The car was a Patrician four-door sedan with the new torsion-bar suspension. The 104.74-mile-per-hour average is figured on elapsed time—actual running time had to be several miles per hour faster to allow for pit stops. The top lap speed (2½-mile track) was 114 miles per hour.

Packard is bragging about the engine (and well it should) and the fact that oil consumption was the same at the finish of the 25,000-mile grind as at the start—a quart every 845 miles. But there will be little bragging about gasoline economy! It averaged about 7 miles per gallon! Let that be a lesson to you. If you want economical driving, don't average 104 miles per hour!

Twelve Drivers Used

Twelve drivers took part in the test. They were relieved every hour at refueling stops. The run would have been uneventful, says Packard, except for the weather. There was considerable rain during the period and driving at 110 miles per hour in rain is not exactly relaxing.

The unbelievable part of the feat is the fact that only one car was available for it. In most runs of this type, several cars are started with the hope that at least one will finish successfully. Packard's limited budget meant that only one 1955 car could be made ready for the run.

As it happened, there was a breakdown at just over 10,000 miles and the whole thing had to be restarted. A hydraulic valve lifter failed—something that could happen to anybody, as they say. The average speed at that point was 105.859 miles per hour—a new record itself.

But Packard decided to go for the 25,000 as planned so a new engine was installed

in the same car and the run restarted. This time the engine didn't miss a beat.

Most-Powerful Engine

Incidentally, the 1955 Packard engine has a 352-cubic-inch displacement and a reported 260 horsepower with one four-barrel carburetor. The Caribbean convertible will have two four-barrel carburetors and its horsepower, probably the highest in the industry, is still secret.

Besides Packard, the only 1955 cars still waiting to be unveiled are Hudson, Nash, Kaiser and Willys. Kaiser is still an unknown quantity. Willys will have a major styling change, say informed sources.

Hudson and Nash are now twins under the skin, but outwardly there is considerable difference. In fact, George Romney, president of American Motors, reports that the two cars share only one exterior body panel. The basic body shell is identical, however. You'll be amazed at what can be done with the same "skeleton"—both have the unitized, frameless construction.

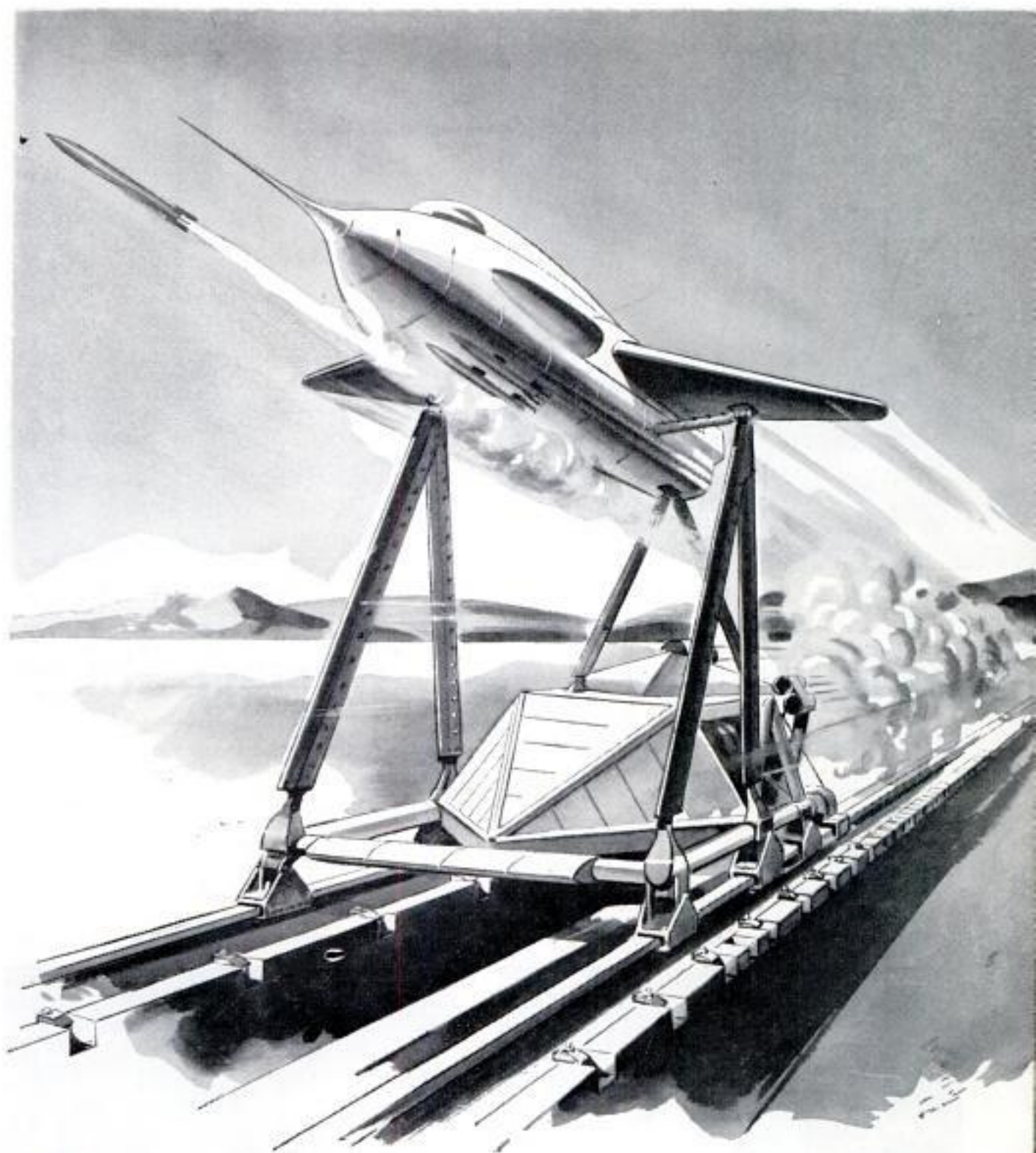
The 1955 Nash offers a unique fender treatment. Front fenders no longer house the headlamps. The lights are now inset in the oval front grille, similar to those on the Nash-Healey sports car. The front fenders come to a graceful curve with small parking lamps set into the lower halves.

Buick will spark the midseason sales period with its four-door hardtop sedan. This company is the one that set the trend when it brought out the two-door hardtop several years ago. It is expected (by Buick, at least) that the four-door hardtop will have a similar effect. The absence of any center post in the four-door sedan will make the traditional family car as sleek as a convertible. Whether the leak and rattle problems have been solved for four doors remains to be seen—these are still problems in some two-door hardtops!

Air-Cooled Engines

Chrysler Corporation has developed a 200-horsepower air-cooled engine for an experimental airborne military truck. It has six cylinders and a fuel-injection system instead of a carburetor. The truck body, wheels and axles are made of aluminum. Each wheel has independent torsion-bar suspension. The 2½-ton truck weighs only 9000 pounds, compared with 14,000 for a conventional model.

American Motors has bought the rights to the Mighty Mite, the midget more compact than the Jeep that will run on three wheels if necessary. Engineers at American Motors have developed an air-cooled, lightweight engine for the tiny vehicle. This may be a hint of future plans for the small, basic car so dear to Nash.



"Snort" Makes Supersonic Tests for Navy

CAPTIVE TESTS of guided missiles, rockets, model or full-size airplanes and assorted parts are being made at supersonic speeds at the Navy's new research track at China Lake, Calif. The track has been dubbed the "Snort" due to the sound from its powerful rocket motors. The Snort is 4.1 miles long and was designed to bridge the gap between wind-tunnel and free-flight testing. Among its many advantages are the recovery of test objects intact and instrument (including photographic) recordings of all phases of the tests. The

Snort affords accurate measurements of thrust, acceleration, velocity, lift, drag, vibration, shock-wave effects, flutter and many other factors. Measuring instruments include magnetic-pickup track coils, a telemetering system and cameras stationed every 500 feet along the track. Test items can be mounted on either monorail or dual-rail carriages which ride on metal shoes. The Snort's supporting facilities at the station consist of a test-control building, an assembly building, a blockhouse and a magazine for storing explosives.



This Panagra pilot (top left) can see a radar "map" of the weather ahead in the hooded scope at his left

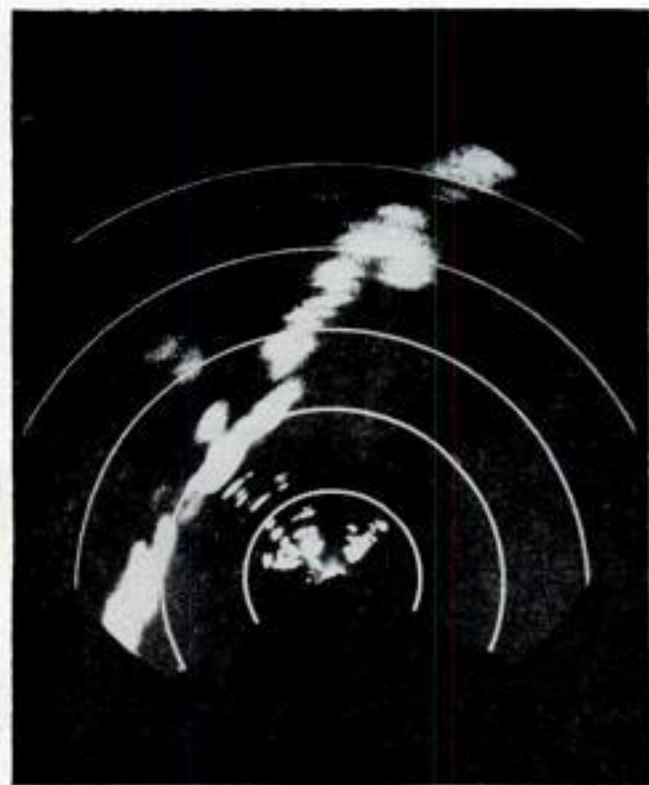
Airborne Radar Sees Through Storms

NORTHBOUND over the Caribbean in a flight from Panama to Miami, the pilot of a Panagra DC-6 saw the sky ahead of him illuminated by lightning flashes from horizon to horizon. Normally this would call for greatly reduced speed to meet expected thunderstorm turbulence,

or a lengthy, schedule-destroying detour. The pilot neither reduced speed nor did he detour markedly from his course. He arrived in Miami on schedule and with no discomfort to his passengers.

At North Platte, Neb., airport a DC-3 took off directly into a front 152 miles long,

Dark storm centers, invisible on ordinary circuit (left), stand out with special weather wiring (right)





The United DC-3 at left above took off and flew directly into this threatening front, detoured by other aircraft. Actual danger in the storm was in three centers spotted on scope of same front, right

with clouds 40,000 feet high. Three scheduled flights in the vicinity prudently detoured widely, but the DC-3, a United Air Lines cargo plane, flew right into the front and 20 to 30 miles through it. Only "mild choppiness" was experienced.

Neither pilot unduly endangered lives, cargo or aircraft. Each was able to "see" the storm centers hidden in the cloud masses and widespread lightning flashes with one of electronics' greatest contributions to safety on schedule for the airlines—airborne weather radar.

The storm centers appeared to them as "doughnuts" of light surrounding dark spots on hooded radarscopes in their cockpits. The dark holes in the doughnuts—the cores of the storms—were clearly visible because of isoecho contour circuits in the radar sets.

These formidable-sounding circuits actually have the simple function of eliminating return signals, or echoes, of greatest intensity from the scopes. Thus very heavy rain at the storm center appears as a black spot surrounded by reflections of lesser precipitation.

Airborne weather radar can probe storms as far as 200 miles ahead and report them faithfully on the scope in the cockpit.

It enables a pilot to determine whether a threatening sky is truly dangerous or whether slight detours around storm centers can carry him ahead on his course. It also can help him to spot prominent terrain features in heavy weather. ★ ★ ★



The black plastic radome on the nose of this DC-6 conceals and streamlines the weather-radar antenna





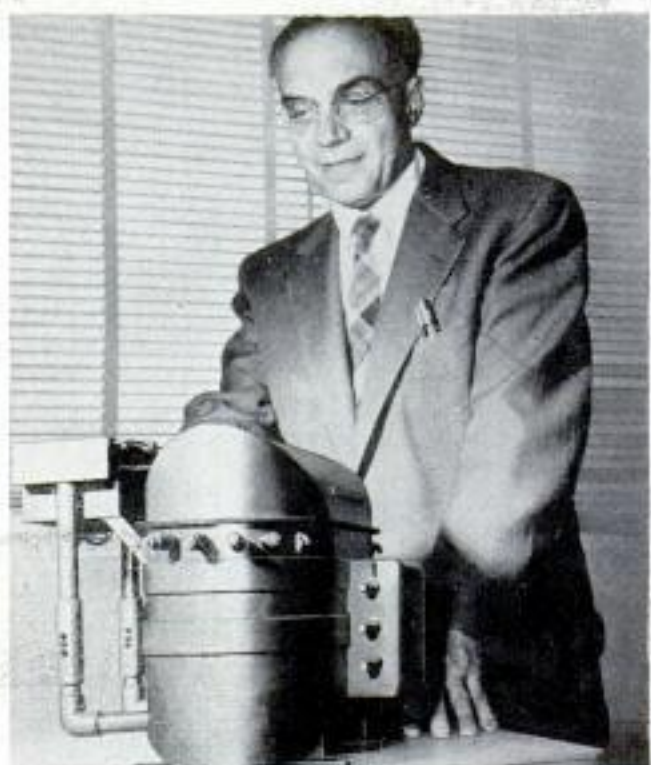
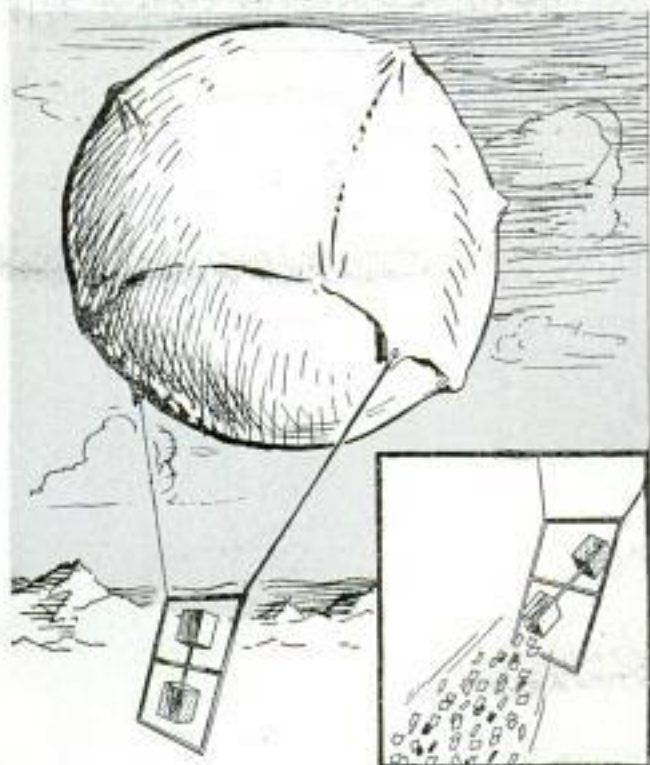
Long-Range "Voodoo" Fighter

Powered by two 10,000-pound-thrust Pratt and Whitney J-57 turbojet engines, the McDonnell F-101A "Voodoo" fighter is one of the most powerful fighter planes ever built. Performance figures are secret, but the aircraft is in the supersonic class and can carry atomic weapons. It is ca-

pable of in-flight refueling. A long-range fighter, the Voodoo will be assigned to the Strategic Air Command. Dimensions are: 39-foot, 7-inch wingspan, 67-foot, 4-inch length and 18-foot height. Wings and stabilizers are swept back 35 degrees. The wing skin is of heavy, preformed sections.

Dry-Ice Balloon

Dry Ice has been adopted to time the release of anti-Communist leaflets from Free Europe balloons wafted over Hungary. A frame carried beneath the plastic balloon is fitted with two cardboard boxes, one at each end of a free-swinging rod. The Dry Ice evaporates, allowing the upper box to tip and spill its load of leaflets.



Gas Insulates New Transformer

Gas, rather than liquid, insulates and cools new transformers under development by General Electric Co. Sulphur hexafluoride, a heavier-than-air gas, is the agent used in this first application of a gaseous insulation to high-voltage power transformers. The new insulator allows design of transformers rated at 69,000 volts.

Hay Compressed Into Spool-Size Pellets Seems to Please Cows

Hay is compressed into pellets about the size of large spools at the University of Wisconsin. H. D. Bruhn, agricultural engineer, began experimenting with hay in pellet form in the hope of finding a way to reduce the labor of haymaking. He has developed an experimental machine that forms the pellets in a tube under hydraulic pressure. Both long and chopped hay have been pelleted successfully. Bruhn believes the farmer may some day pellet the hay in the field, drop it into a wagon, dump it from the wagon into an elevator and run it into a bin. The pellets are about two



University of Wisconsin Electric Farm photos

inches in diameter and 1½ inches high—too large for a cow to swallow whole. How do the cows like the pellets? They simply picked them up and began chewing them.



Old-Car Trailer Gives Safe Ride

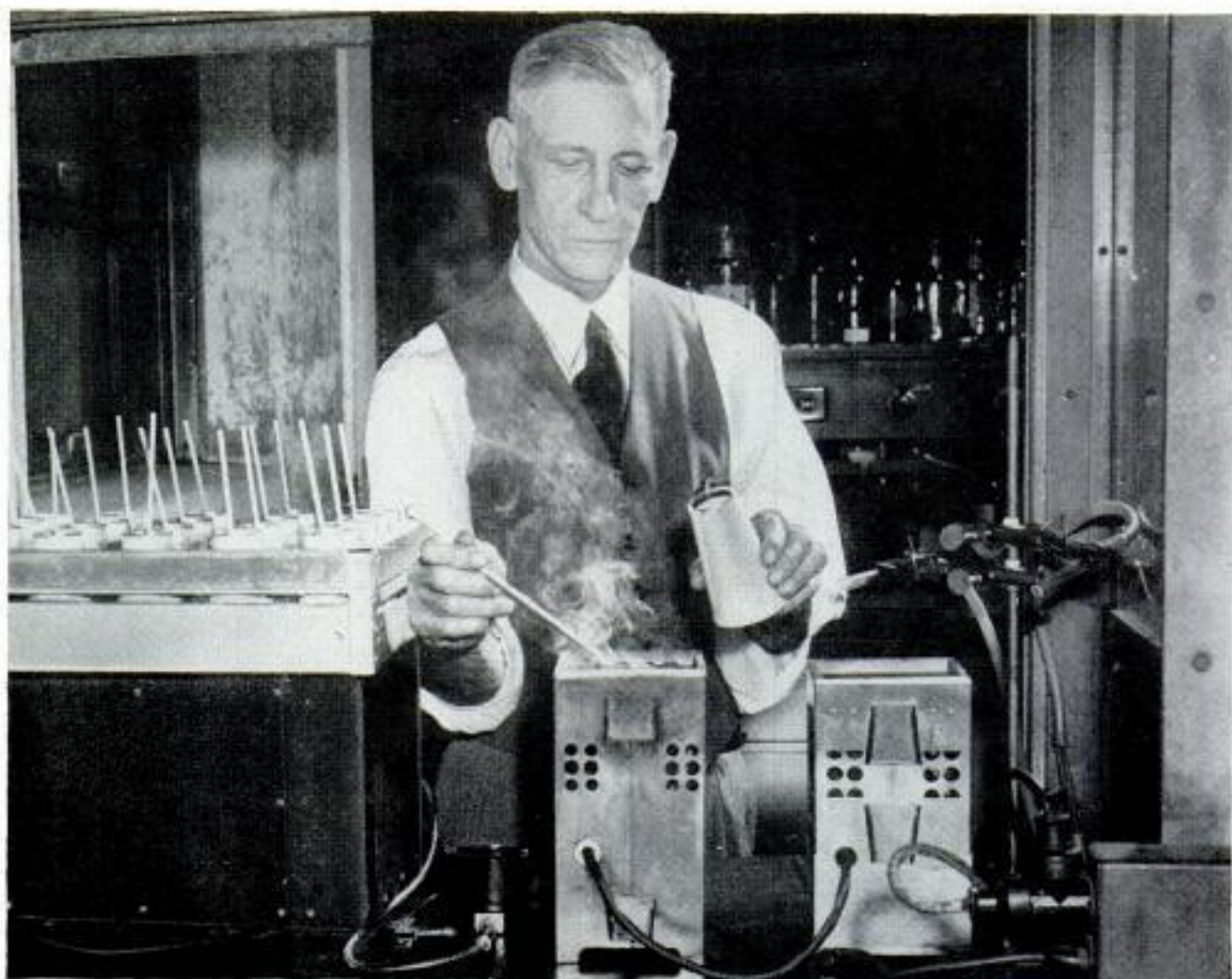
Antique-car restorer Eldon Neibling, of Topeka, Kans., hauls his "classic cars" safely in a custom trailer that is only eight inches above the ground. Slung beneath two axles, the four-wheel trailer is so low it is easy to jack up the front end to bring the back end level with the ground.

Lifesaving Bellows Powered by Crank

Breathing is restored by a hand-operated bellows connected by flexible hose to a face mask. Developed in Sweden, the respiratory apparatus weighs less than six pounds and costs around \$140. Designed for emergency use, it was recently tested at the Epidemic Hospital of Gothenburg, Stockholm.

☐ Latest thing in door mats is a rubber mat with luminous "hello" at its center to greet visitors night or day.





Testing process starts when sample of oil from locomotive is carefully dropped onto pellet warmed by hot plate

They Photograph Engine Wear

By Phil Hirsch

IF YOU'VE ever missed railroad connections because your train fell behind schedule, you'll be glad to know that something is being done to prevent such mishaps in the future.

The "cure" depends upon an instrument known as an emission spectrograph, which looks a little like a fugitive from a comic strip. The complete system requires, among other things, milk bottles, fountain straws and an electric hot plate. Recently, several railways each invested \$25,000 in such contrivances to make their trains run on time.

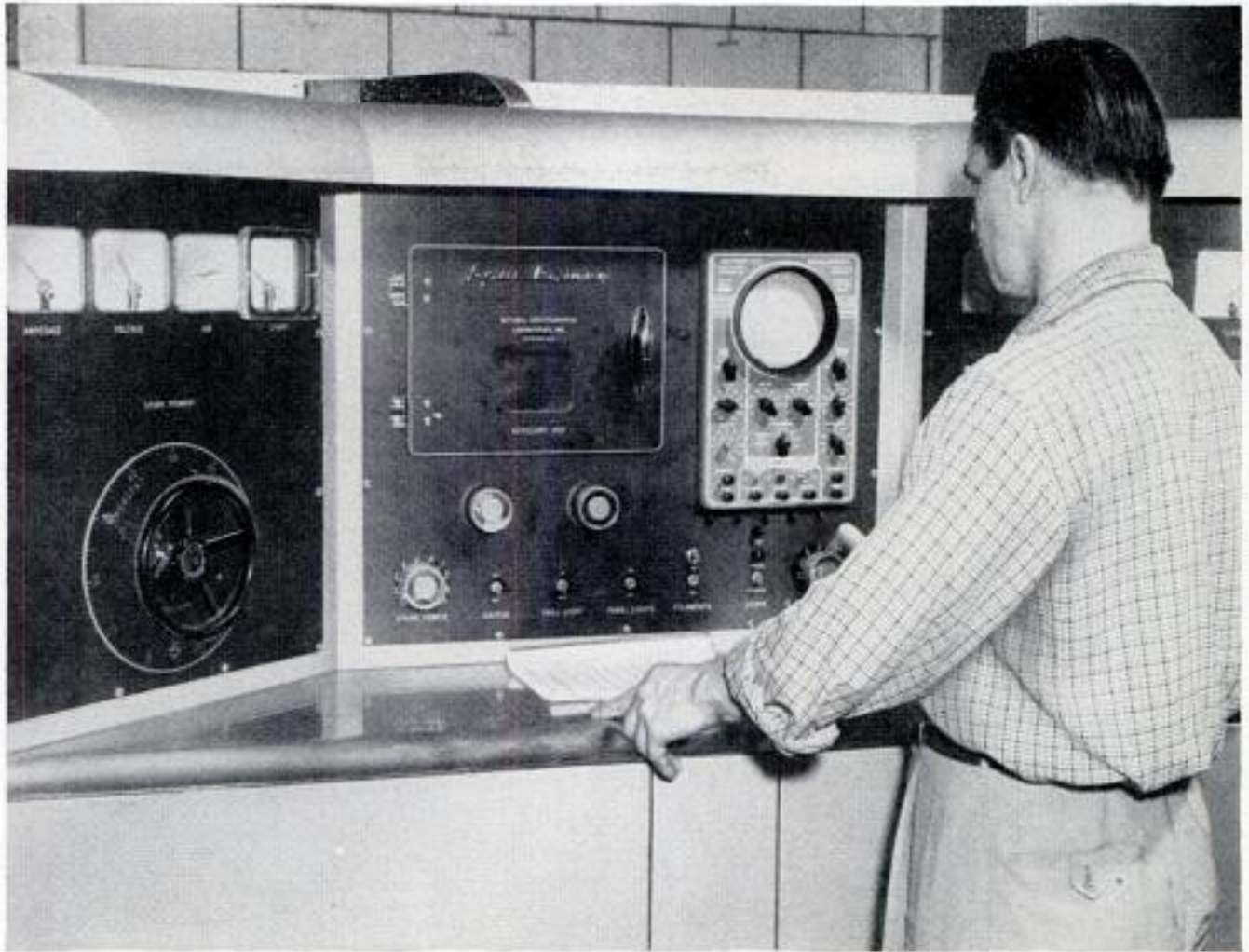
The machine "photographs" wear and tear inside a diesel engine. It sees the same things a mechanic would if he could crawl under a cylinder head or perch on top of a bearing and stay there during every mile the engine was in operation. Thanks to the emission spectrograph, late arrivals due to mechanical failures have dwindled to the vanishing point on many

of the railroad lines in this country.

Briefly, this is how the emission spectrograph works: Pulling freight and passengers back and forth causes two major kinds of wear inside a diesel engine. One is leakage—gaskets and piston rings loosen, and water or fuel oil gets into the lubricating system. Also, air filters begin to let in dirt, as well as air, after a while. This dirt is the villain primarily responsible for the second type of wear—erosion. Just as sand kicked up in a storm will chip paint off a building, these small dirt particles will chip tiny bits of metal off engine parts which, in turn, means overhauling more often.

Now, if you had a method of measuring the amount of water and fuel oil leaking into the lubricating system, and a method of measuring the dirt and other foreign bodies, you would know when the engine had to be pulled in for an overhaul and what parts had to be replaced.

You can obtain both measurements from



Meters and dials stud control board of emission spectrograph which measures foreign elements in oil sample

the emission spectrograph. And, by analyzing lube-oil samples at periodic intervals, the gadget accurately produces a continuous diesel-engine history covering every operating mile.

The machine supplies engine data in the form of numbers. Each number represents the concentration of a particular foreign element in the lubricating oil. A high silicon concentration, for example, means a lot of dirt is getting in (since silicon is the chief chemical element in airborne dirt), and the engine's air filters should be checked. A high concentration of boron (one of the elements in radiator water) means there is a leak in the cooling system. Similarly, a large quantity of copper, lead, silver or other metal in the lubricating oil indicates which parts should be checked for wear.

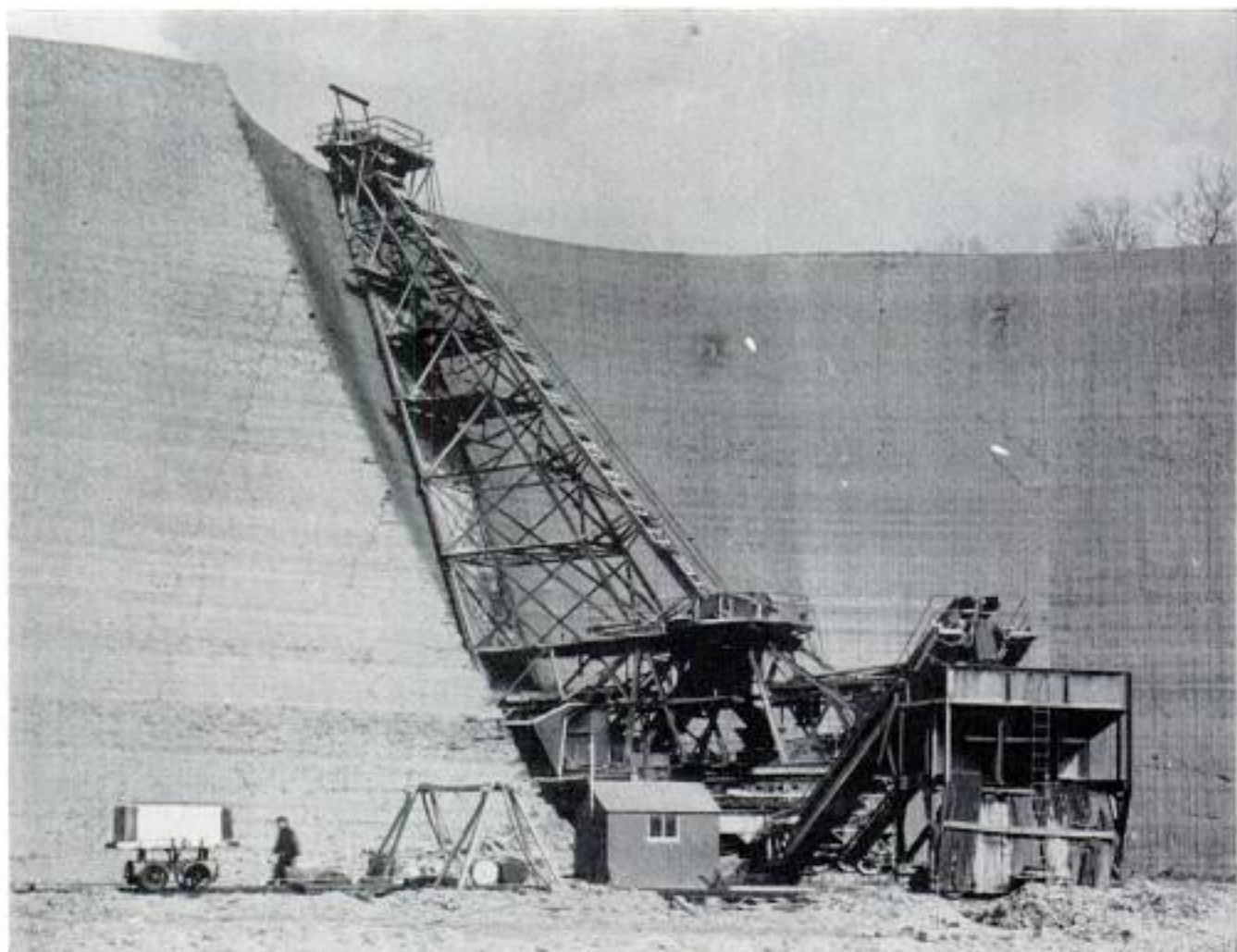
Recently, I saw the instrument put through its paces at the Rock Island Lines' Chicago research laboratory. The Rock Island's emission spectrograph keeps tab, not on one engine, but on 600, which operate along 6000 miles of track between Memphis and Denver, Minneapolis and Houston.

Rock Island's chief chemist, J. T. Rudd, showed me one engine-history report that described what was going on outside the engine, as well as inside. He pulled a card out of a file and pointed to a column headed "silicon," which contained the numbers

(Continued to page 230)

Pellet coated with oil residue is placed in spark-gap chamber with tweezers. Current is turned on, and light from the spark indicates the type and amount of each foreign element in oil



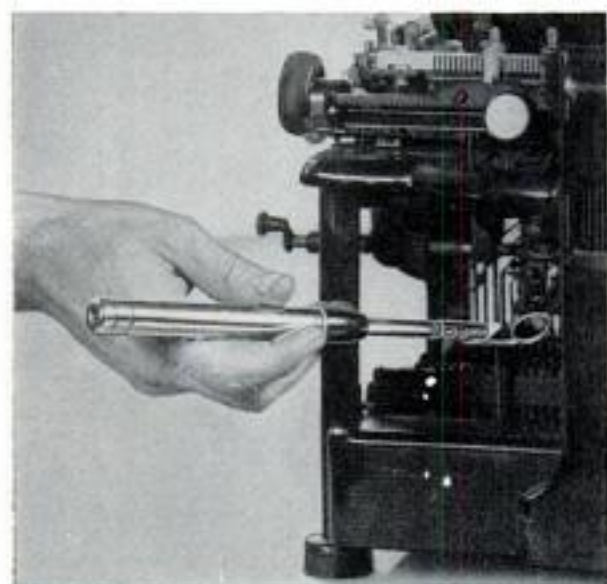


London Times photo

Towering Excavator Moves Along As It Scrapes Clay From Bank

Clay for bricks is planed from the sides of deep pits with a slanting excavator. The 92-foot-high tower of the machine rests against the face of the clay bank. Cutters and scrapers mounted on an endless chain travel from top to bottom of the bank and carry the cut clay into a chute feeding a central hopper. From the hopper the clay is carried by conveyor to an outside hopper where wagons transport the clay to the

brickyard. The machine moves along the clay face at six inches per minute. The tower can be adjusted to various angles and also turns about its axis. When digging, it swings back and forth to make a semi-circular cut. The design of the English machine permits a safe angle of digging and a smooth, stable face. The clay is delivered in small, workable lumps. It can dig a clay face 90 feet deep at the rate of 110 tons per hour.



Tri-Duty Inspection Tool Casts Light in Right Spot

Inspection of tight wiring or close machine areas is easy with a three-way tool. Essentially, it is a flashlight powered by miniature batteries. When a plastic probe is inserted in its nose, light is beamed to the tip of the probe and given off in a flood of illumination. A small round mirror that is clipped to the probe permits inspection of tight areas. The compact probe is designed for engineers, machine and TV technicians, dentists and repairmen. It offers the proper illumination at the spot desired.





Radar truck tracks cloud formations and radio direction-finding truck records lightning 1000 miles away

Let's Import Rain for the Dust Bowl

New Mexico scientists pursuing the rain-making project turn up a strange discovery: Water changing into ice generates electricity

By Thomas E. Stimson, Jr.

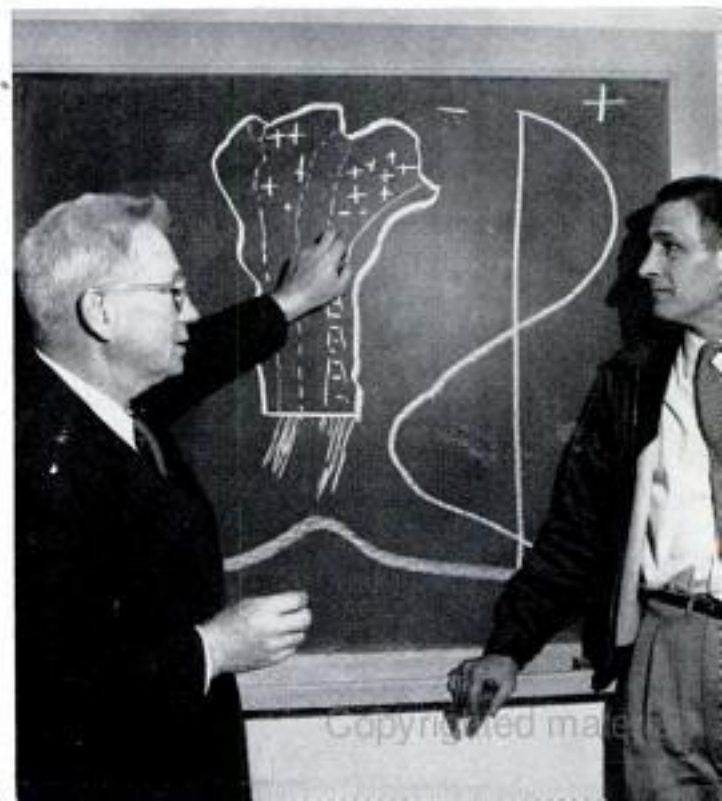
YUCATAN? This is Dust Bowl. We'd like about 800,000,000 tons of rain next week. Start your ground generators!"

Fantastic instructions like this may not seem farfetched a few years from now. There's a possibility that dry Texas and much of the drought area can be changed into a vast garden spot simply by seeding rain clouds over the Yucatan peninsula in Mexico.

The idea of controlling the weather from a distance stems in part from a striking relationship that has been observed between periodic cloud-seeding activities in New Mexico and subsequent heavy rainstorms as far away as the Ohio valley. The air masses that were seeded in New Mexico were on their way east toward the Ohio.

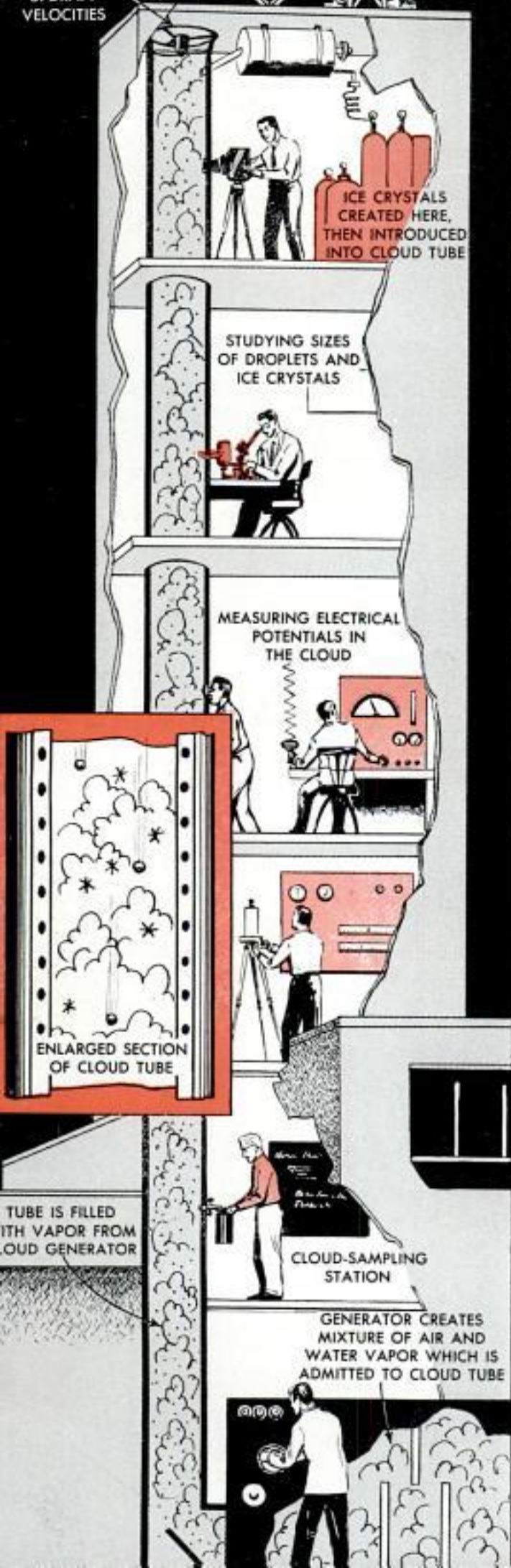
To test the long-range idea, a proposal to seed the Yucatan clouds is advanced by

Two thunderstorm scientists, Doctors Workman and Reynolds, diagram some electric fields inside a cloud



RADIATION FROM RADIO EQUIPMENT USED TO MEASURE LIGHTNING UP TO SEVERAL THOUSAND MILES AWAY

FAN CONTROLS UPDRAFT VELOCITIES



Dr. E. J. Workman, president of the New Mexico Institute of Mining and Technology. The Socorro campus of the institute has been headquarters for much of the rain-making research conducted in the United States.

"Summer winds frequently sweep north from the Gulf of Mexico after leaving much moisture in the Yucatan area," Doctor Workman states. "It would be a worthwhile experiment to seed the Yucatan area in an effort to reduce rainfall in that wet region and thus force the air masses to transport their moisture farther north.

"Quite possibly all of northeastern Mexico, Texas and parts of New Mexico and Oklahoma would benefit.

"Usually when you seed clouds with silver iodide or other nuclei you are trying to increase the rainfall in the immediate area. But the same method can actually reduce precipitation. If an immature cloud is seeded, for instance, the cloud-building mechanism is disrupted and the cloud vanishes.

"Similarly, overseeding can put a mature cloud right down on the ground and end its life, bringing a relatively quick end to its rain production.

"Either or both of these methods should be tried off Yucatan in efforts to increase the rainfall where we need it."

Modern research on rain making (actually rain augmentation) has been going on continuously ever since Dr. Irving Langmuir and Dr. Vincent J. Schaefer of General Electric developed their seeding techniques in 1946. Yet the subject is so broad that it is still far from being an exact science, although about a dozen groups in the United States and abroad are actively studying it.

To learn more about how to make it rain, the cloud physicists at the New Mexico institute go aloft in aircraft studded with research instruments. They bore through thunderstorms, tag air masses with fluorescent aerosols and then trace the air masses for hundreds of miles to observe the mixing of the atmosphere. Today they

Thunderstorm laboratory, below, has tower in which scientists can simulate most cloud conditions. Drawing shows cloud formed in big tube for close study



are preparing to create artificial thunderstorms and other rain clouds inside a huge test tube at Socorro, and to use radio direction-finding apparatus on a continental scale (with stations in Minnesota, Florida and New Mexico) for tracing thunderstorms by their electrical discharges.

Already, working with zero-freeze boxes and other apparatus in their thunderstorm laboratory, the Socorro scientists have learned a number of brand-new facts about nature. One of their milestones was the discovery of what probably causes lightning. Doctors Workman and S. E. Reynolds found that an electric charge is created when water freezes into the solid state, no matter whether the freezing occurs in a cloud or in your refrigerator at home.

A sample no larger than an ordinary ice cube, they discovered, may generate as much as 250 volts while changing from water to ice. The amperage is extremely small, usually less than 100 microamperes, but enough to be significant in thunderstorm electrification.

At Socorro this Workman-Reynolds effect is demonstrated by inserting one lead from an electrostatic voltmeter into water contained in a plastic cup with a platinum base placed on a freezing unit. The base of the cup is grounded to the unit. The voltmeter needle remains at zero until freezing begins, then slowly swings over to 40, 50 or 150 volts, depending on the impurities in the water. The voltmeter needle returns to zero when all the water has frozen.

In a thunderstorm, Doctor Workman theorizes, water that is shed from growing ice generates enough voltage to produce a lightning stroke, apparently a logical theory.

The step-by-step sequence is something like this: The thunderstorm has its beginning as an updraft of air from the heated surface of the ground, or as a breeze that is deflected upward by a mountainside. In either event, the warm air travels upward until it encounters sub-zero temperatures.

The moisture in the air freezes into ice crystals and becomes electrified in doing so. Soon the ice crystals become heavy enough to begin falling through the ascending column of air or in the region alongside it, and it is at this point that the separation of the electric charges begins. Water droplets in the ascending air column rob the ice and



Doctor Reynolds measures the time that water, freezing in cup, generates electricity as indicated on the dial of the voltmeter



Generator on car creates clouds of silver-iodide smoke, seeding cloud formations in experiments to increase the rainfall

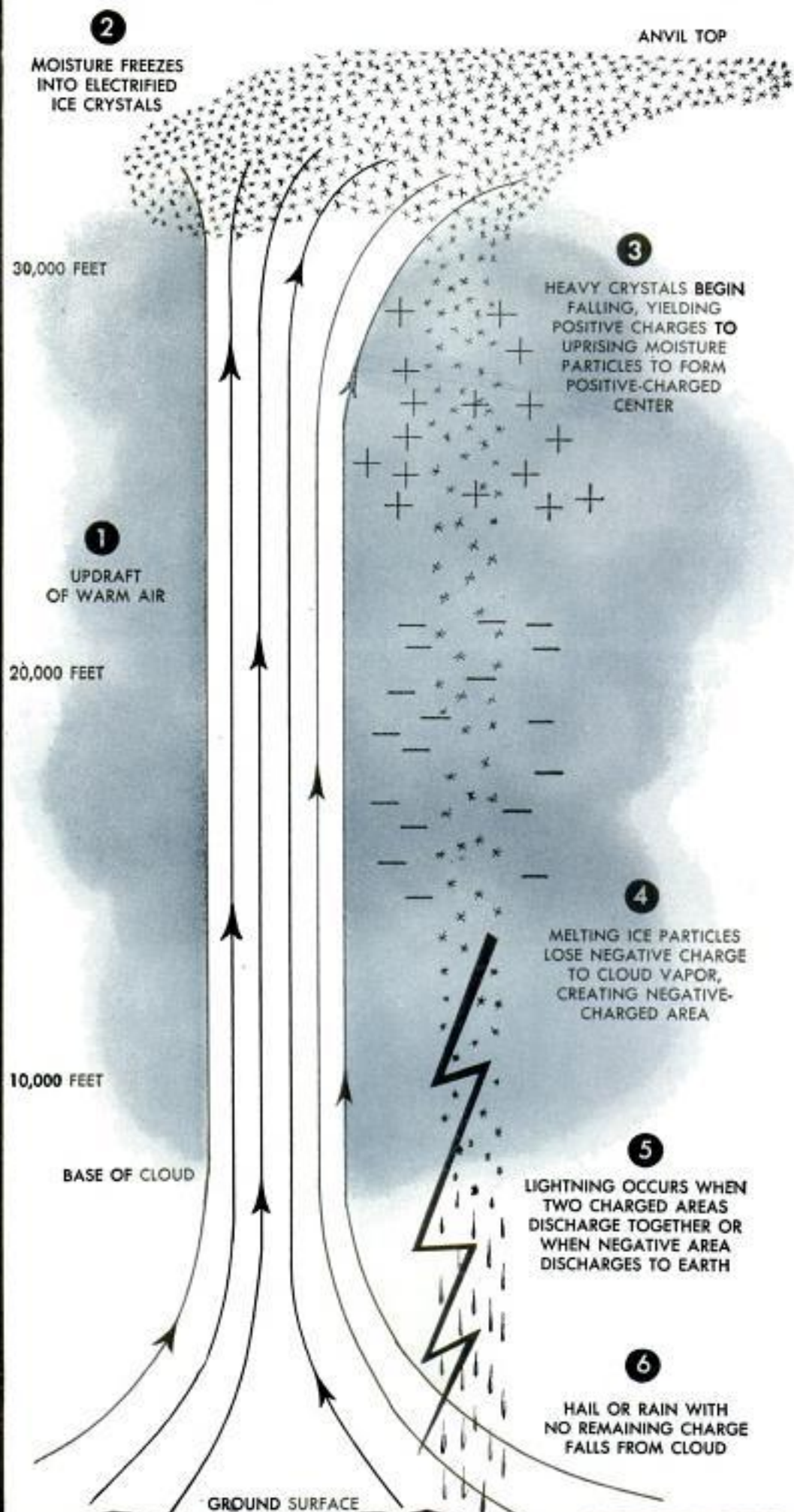
hail pellets of their positive charge and thus a region of positive charge is built up high in the cloud.

As the pellets continue to fall, they encounter warmer temperatures and begin to melt, yielding their negative charge to the water vapor low in the cloud.

The result of this process, extremely simplified here, is that a region of positive charge builds up high in the cloud and a negatively charged center gathers in the lower portion of the cloud. These centers may discharge together as sheet lightning, or the discharge may occur between the ground and the low negative center in the

Spectacular lightning discharge, according to the thunderstorm scientists, may result from electrical fields caused by moisture freezing in the cloud

Numbers on diagram show the sequence as freezing moisture produces electrical fields in clouds. These discharge as sheet lightning or lightning strokes





Floating copper screen measures voltage and amperage of freezing water. Metal sheet tests electrolytic action

form of a lightning stroke. This last event leaves the cloud with a net positive charge, something that explains the "fair-weather positive field" that surrounds the earth.

A thunderstorm goes through its whole complicated life in about half an hour. It begins with an updraft, then precipitation drags the air downward and creates a downdraft, killing the system. But this action in turn generates a second cell. This is the explanation of why a weather pilot flying through a line of thunderheads may find an updraft in one, a downdraft in the next.

The same electrical phenomenon that causes lightning and thunder may be the key to other natural conditions that have puzzled scientists in the past.

"For instance," Doctor Workman suggests, "every lake and pond apparently produces current during winter freezing. Some electrolysis takes place, converting small amount of water into free oxygen and free hydrogen. This has been demonstrated in the laboratory. Thus the freezing of water can account for the constant trace of hydrogen in the atmosphere, something that has been difficult to explain in the past."

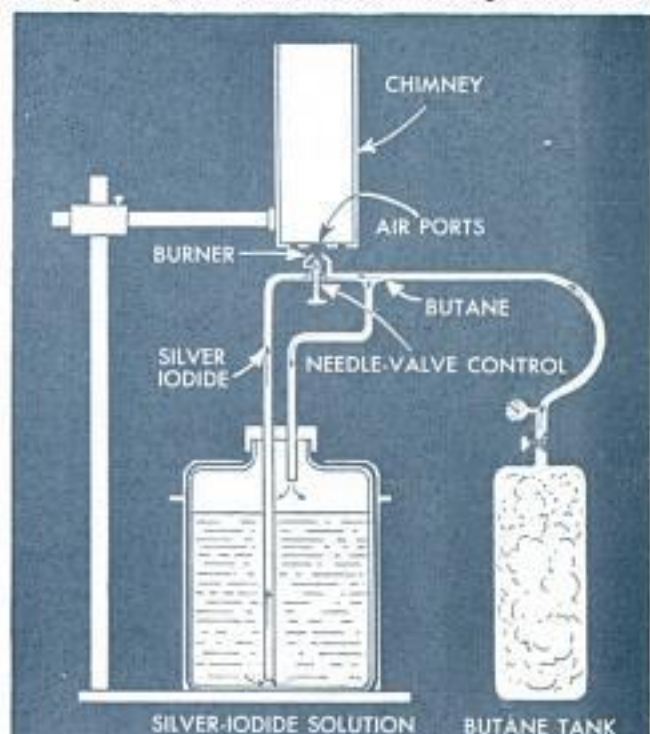
This winter a reservoir on the Socorro campus is being used in large-scale tests of the Workman-Reynolds effect. The electric potential between the ice and water will be measured during the time the reservoir is freezing. Amperage likewise will be

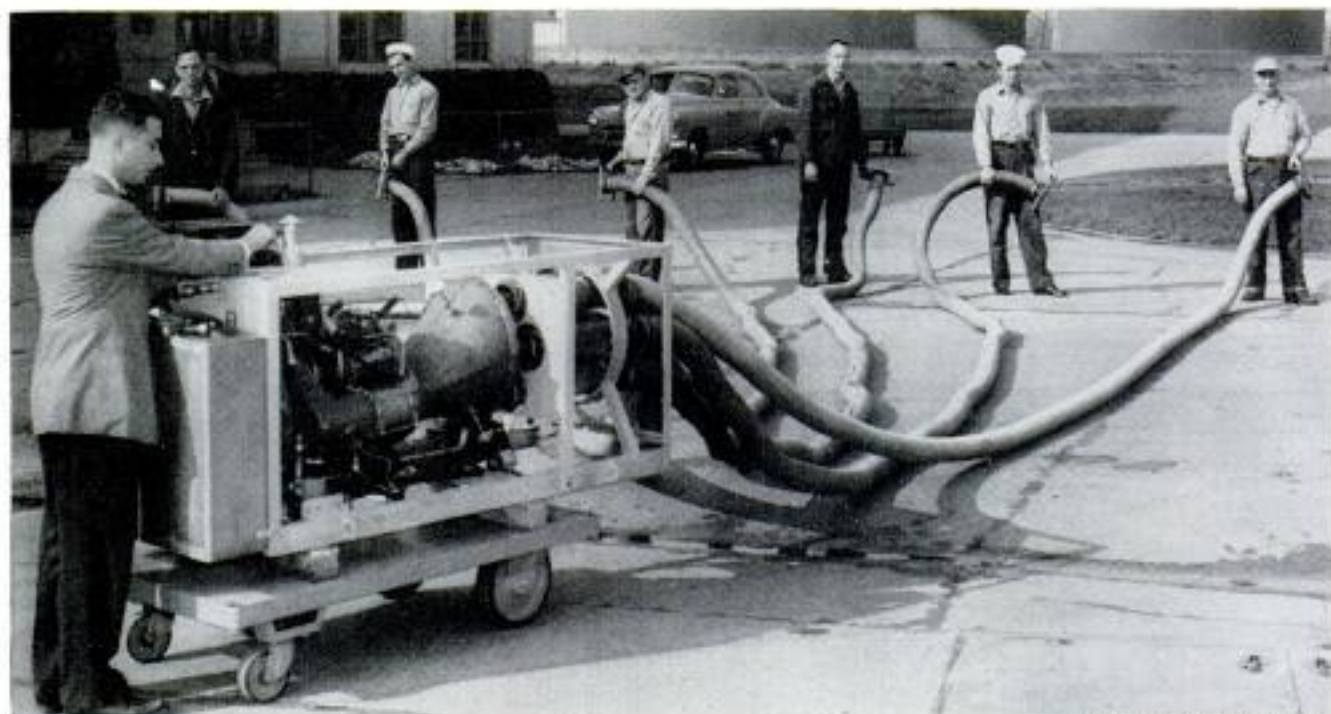
measured and it may be that the reservoir will be found to be producing several amperes of current. Copper and tin electrodes will be placed in shore waters to learn whether the "freeze" electricity can perform an electroplating action. If it does, this could be an explanation of how, in quite a few instances, some natural deposits of pure metals were created.

Other research at the institute has shown that ice can be an efficient conductor of

(Continued to page 234)

Cross section shows how one type of portable generator produces silver-iodide cloud through combustion

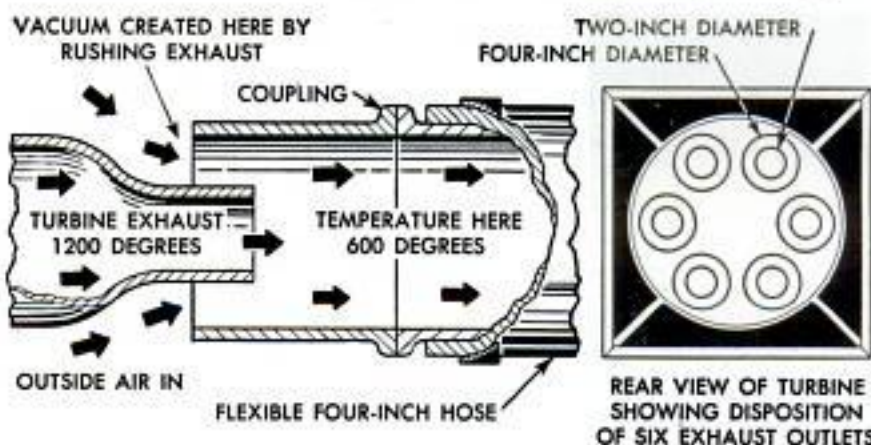




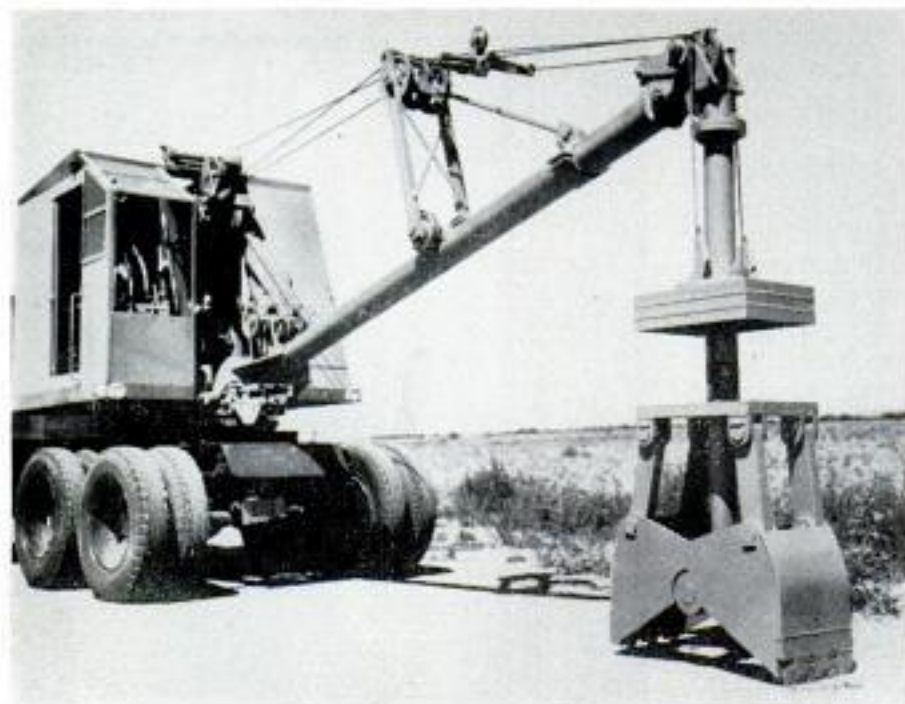
Official U. S. Navy photo

"Octopus" Melts Ice on Ship

Hot exhaust gases from an airplane gas-turbine engine may be used by the Navy to melt ice on ships in arctic waters. The engine, a Boeing Model 502, would supplant the axes and steam now used to clear masts and deck gear. Six flexible reinforced-rubber hoses are connected to extensions on the engine's exhaust pipes. The extensions, four inches in diameter, overlap the two-inch exhaust outlets. Cold air rushes in around the two-inch pipes, mixing with the 1200-degree-



Fahrenheit exhaust gases and lowering their temperature to 600 degrees. Two of the modified engines are being tested on icebreakers in arctic regions.



Crane Attachment Pounds Deep Hole

Deep holes for cisterns, wells and for drainage are dug rapidly with an attachment for a crane. With powerful pile-driver strokes, the unit eats through dirt or asphalt street. Essential features of the unit are a grapple, a bucket with sharp digging teeth and a hammer. The hammer smashes down on a metal frame connected to the coupling arms of the open bucket. The bucket opens to dig a rectangular hole, closes to lift the material and deposit it.



Minneapolis-Honeywell Co. photos

Monitor on bedsprings signals nurse if the patient becomes restless

Push Buttons Ease Hospital Work

STAFF WORKERS at the new Long Island Jewish Hospital, in Floral Park, N. Y., have an army of electronic aids ready to assist them at the push of a button. These include a two-way communication system between patient and nurses, vest-pocket portable receivers carried by doctors to pick up messages from a high-frequency-radio paging system, and units outside operating rooms to test doctors and nurses for static electricity. Another innovation is an electronic bed monitor attached to the springs that relays a signal to the nurses' station if a patient tosses about more than usual. The hospital also has a cooling system which uses water from a deep well.



Nurse stands on tester for static electricity outside the operating-room door

Conveyor belt from central supply room carries medical supplies quickly to the operating room above

"Patient to nurse. Over." Two-way communication to nurses' station will save thousands of steps



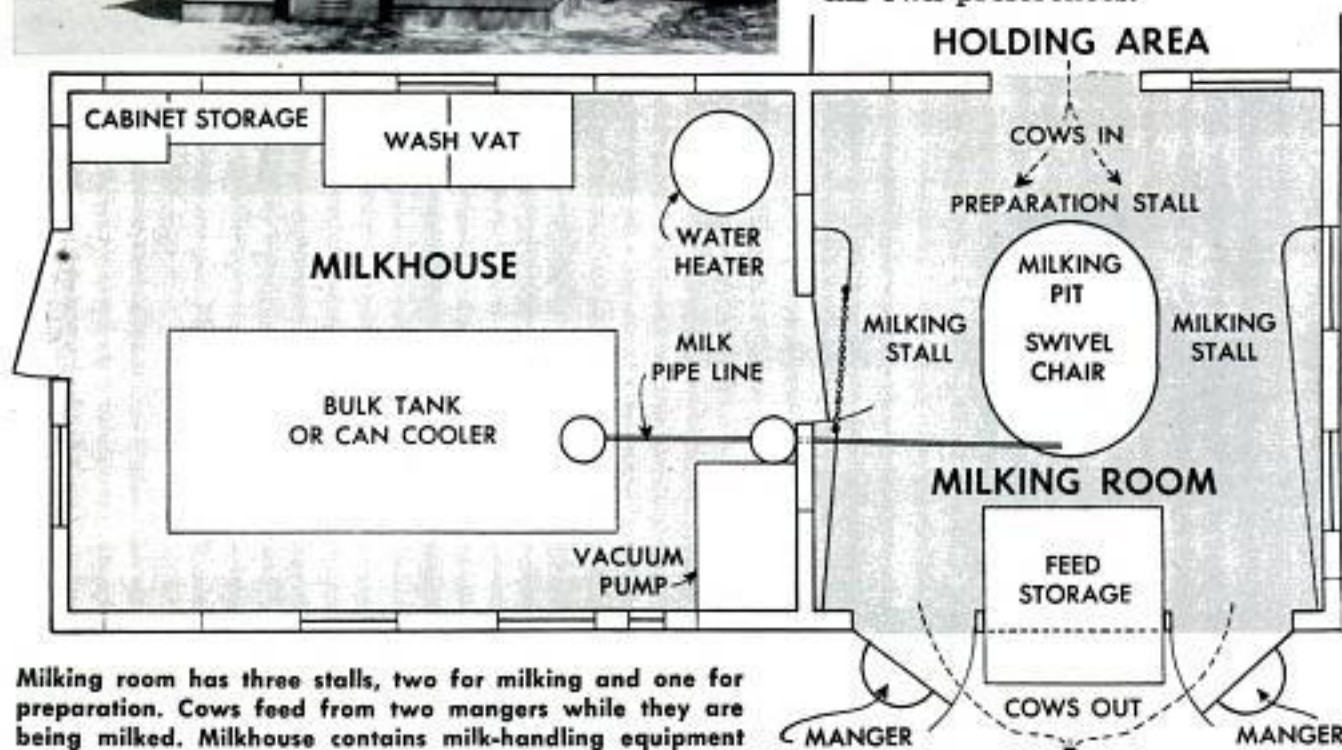
Farmer Relaxes in Swivel Chair of Milk Plant



Without leaving his swivel chair in the pit, farmer can milk from 25 to 30 cows per hour. Below, the little steel building, measuring 11 by 26 feet, can be attached to an existing barn



IN A NEW milk plant, the dairy farmer does all his work from a swivel chair. The "packaged plant" includes the prefabricated building and most of its equipment, right down to the cushioned swivel chair itself. The steel building measures 11 by 26 feet and is divided into two rooms. The milking room contains the milk-handling equipment. The remainder of the building is the milking room, which has a pit in the center. From his swivel chair in the pit the farmer pulls a cord, which opens a sliding door to admit a cow from the holding area. The cow is stopped in the first stall for cleaning and then moves on to the next stall for milking. The arrangement of the stalls permits two cows to be milked simultaneously while a third cow is being prepared for milking. From his comfortable chair the farmer can twist a crank, dropping mixed grain and feed supplement into two mangers from an overhead hopper, permitting the cows to feed while they are being milked. The walls and ceiling of the building are insulated and the inside walls are lined with easily cleaned plastic. The stalls, mangers, swivel chair and even a towel dispenser are provided. Only the milking equipment, plumbing and wiring are not included since each farmer has his own preferences.



Milking room has three stalls, two for milking and one for preparation. Cows feed from two mangers while they are being milked. Milkhouse contains milk-handling equipment



Lucille Ball helps producer-inventor Oppenheimer cut birthday cake



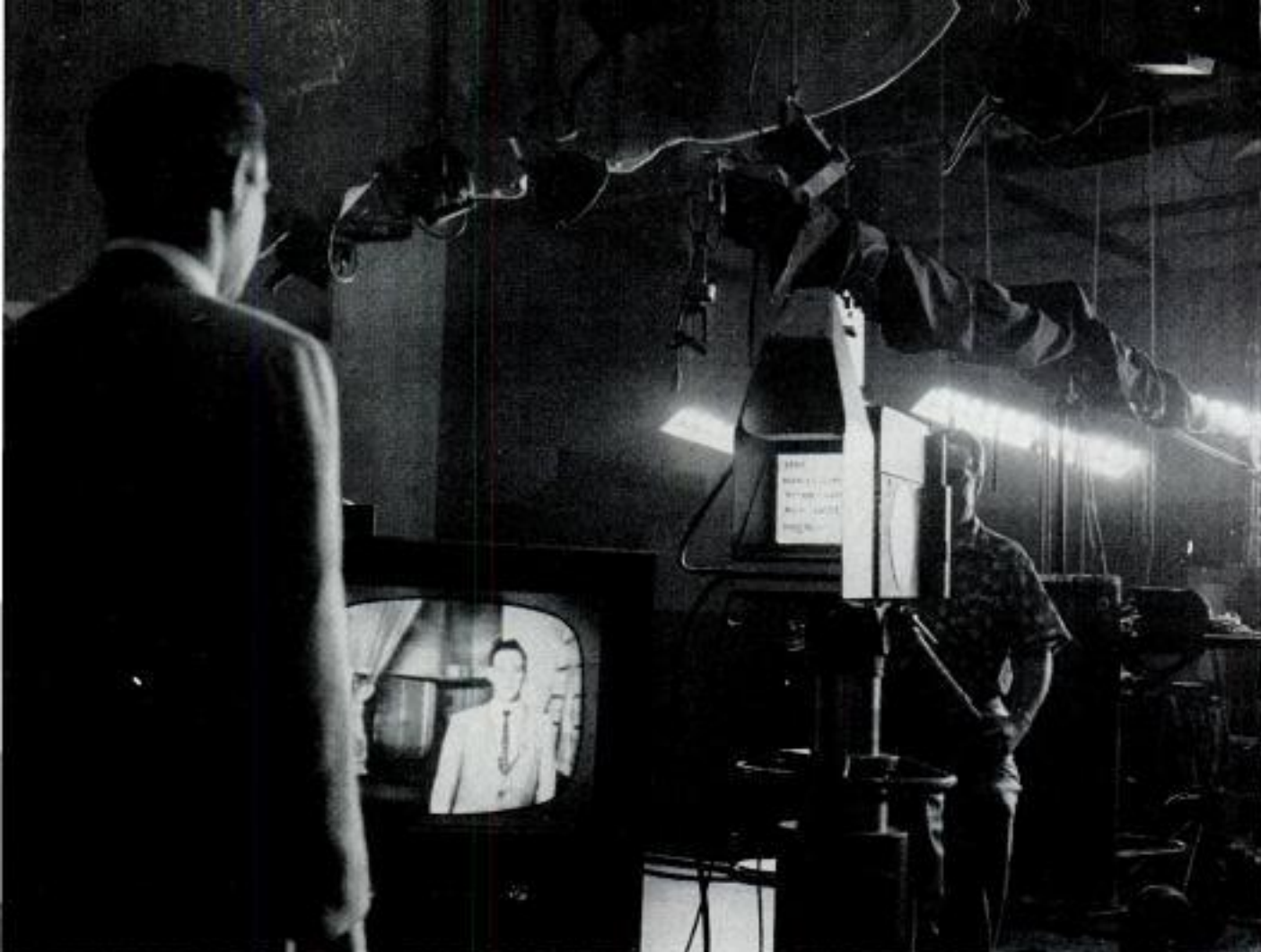
By
Bill Tusher

He's "The Brains" of *I LOVE LUCY*

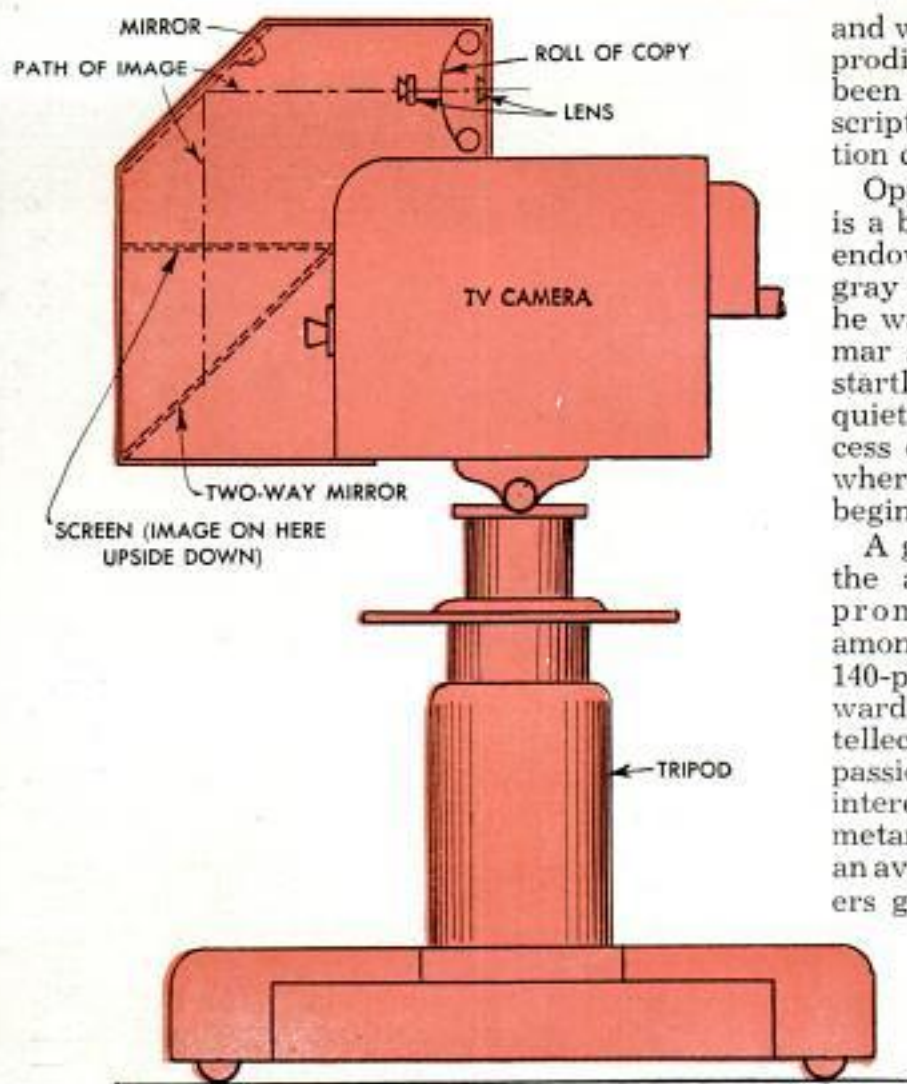
AT LUNCHEON recently on the Hollywood set where *I Love Lucy* is filmed for TV, Lucille Ball said to me: "By the way, if you ever want anything invented, see 'The Brains.'"

The name of Jess Oppenheimer, head writer and producer of *I Love Lucy*, had come up during our discussion, and it was to this one-man "idea factory" that Lucy was referring when she spoke of The Brains.

Oppenheimer came by the appellation of The Brains because of an amazing penchant for inventing mechanical devices at the drop of a problem. He dreams them up—



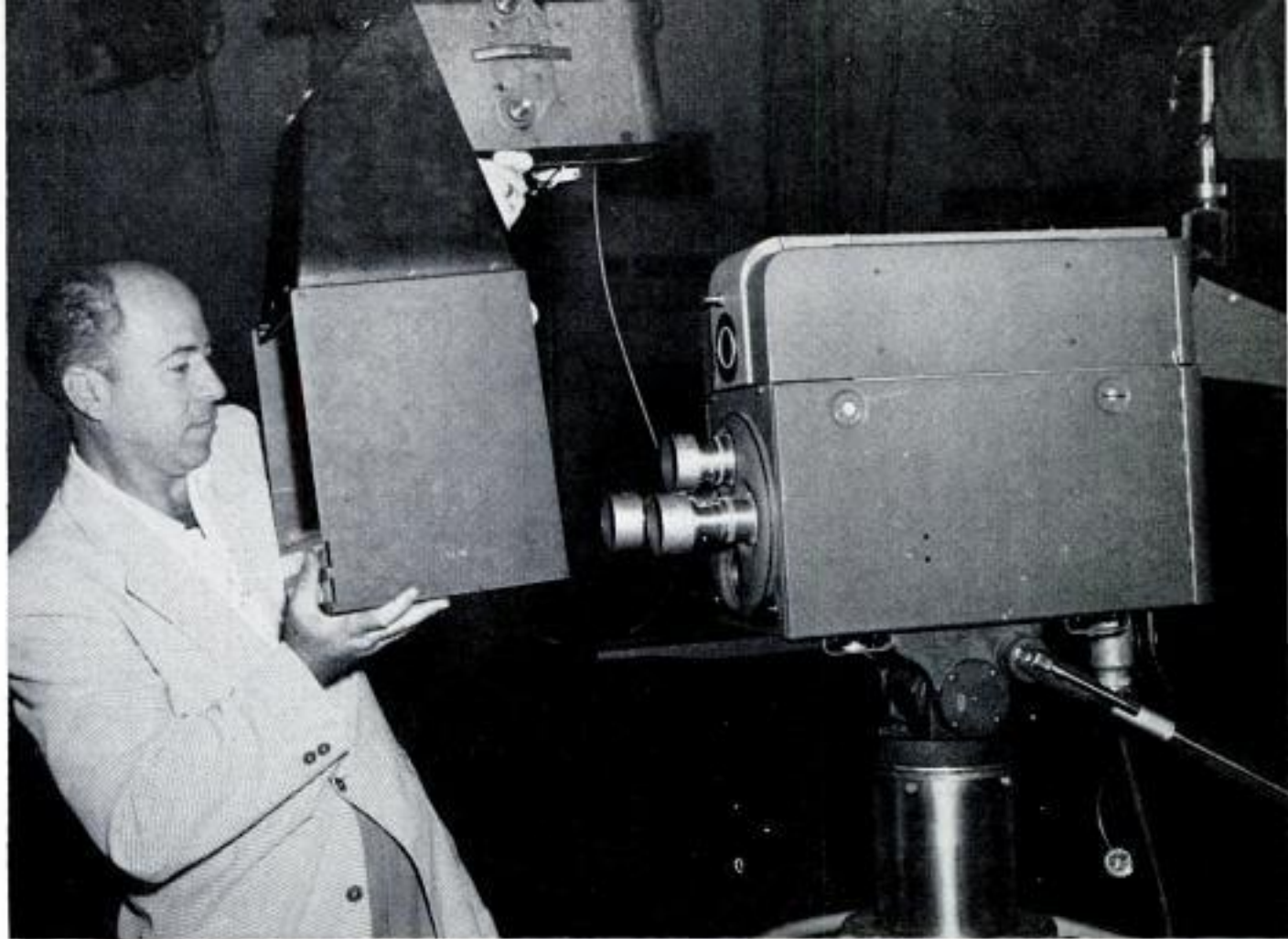
Oppenheimer's tricky viewer for commentators permits them to look directly into TV camera and read script



and works them out—with the same prodigiousness and facility that he's been turning out award-winning scripts for the most popular situation comedy on television.

Oppenheimer's associates say he is a bona fide genius who has been endowed with a surplus supply of gray matter from childhood. When he was in the third grade of grammar school, his teachers made the startling discovery that he was quietly toting around an IQ in excess of 140, that mental borderline where normalcy ends and genius begins.

A group of college savants under the aegis of Stanford University promptly included young Jess among the 1000 gifted children of 140-plus IQ, and from that day forward Oppenheimer has been an intellectual guinea pig followed with passionate interest by psychologists interested in the social and economic metamorphosis of the genius. On an average of once a year, fieldworkers go forth and check on what is happening to these human brain trusters. It is obvious that Jess Oppenheimer has been no disappointment at all to Prof. Lewis Terman,



The inventor prepares to mount his Jayo Viewer in front of TV camera. It does not interfere with the lens

head of the test-study group and dean emeritus of the psychology department at Stanford.

For years before the advent of TV, Oppenheimer was a top radio writer, and he made the transition to the new medium as the head writer and producer of *I Love Lucy*, having been the chief scribe of Lucille Ball's kilocycle forerunner, *My Favorite Husband*.

So far in his inventive binge, Oppenheimer has come up with the following:

1. The Jayo Viewer—a device which makes it possible for a television commentator or actor to look directly into the camera while reading his lines, rather than to the side or below the camera.

2. An ingenious push-button system for authentic audience reaction on filmed TV shows, which does away with actual audiences, stops actors in their verbal tracks and answers all the criticisms hurled, he feels justly, at phony laugh tracks.

3. A directional-control ball caster which provides flexibility and speed of movement not possible with conventional camera dollies.

4. An inexpensive system for synchronizing series-wound motors.

5. Special glasses designed to take the headache out of third-dimension films by permitting the viewer to watch 3D in 2D!

6. Safe home electrical outlets from

Viewer not only provides clear view of script for commentator or actor, but also cues from director



which children cannot receive a shock even if they insert a screwdriver.

There will be more on the way. Oppenheimer is thinking all the time. Almost all his inventions have materialized after he explained his idea, and his wife, Estelle, scoffed, "That's impossible!"

The first time this happened was when their 5½-year-old daughter, Joanne, was one. Just because children from time immemorial had been given to spilling their food over themselves was no valid reason, in Oppenheimer's opinion, why he should put up with that nuisance.

He went to the nearest machine shop with the baby's spoon, had them put a swivel on it, and from then on, no matter how precariously Joanne conveyed the spoon to her mouth, the swivel connecting the handle and the bowl prevented the spoon from turning over.

Since then someone has come out with the same idea commercially. That was before Oppenheimer was impressed with the profit-making potentialities of his inventions. Patents have been applied for and granted on all his subsequent inventions. Oppenheimer has formed his own corporation, and invested thousands of dollars in working models of his viewer and directional-control ball caster with the intention of bringing them promptly to a waiting market.

Oppenheimer's associates at Desilu Productions, the organization which handles the filming of *I Love Lucy* and four other major television shows, got their first indication of his

inventive genius when they came to him with a problem involving the splicing of film. They found that every time they used a paper clip to splice two sections of film, the clip made a click on the magnetic sound track. They tried using tape, but this was unsatisfactory, too, because the tape was sticky and gathered dust.

"The answer," smiled Oppenheimer, "is simple. All you need is aluminum paper clips."

He ordered a supply manufactured by a company in the East, and they have been filling the bill perfectly ever since.

From that time on, it became the standard procedure on the TV movie lot, when thrown by a problem, to implore Oppenheimer to invent a way out. Having been dubbed *The Brains*, Oppenheimer good-humoredly accepted his new extra-curricular position in the Desilu kingdom.

It had been a continuing source of annoyance for Oppenheimer to watch television newscasters surreptitiously looking beside or below the camera to read their scripts. Oppenheimer kept saying, "If only there was something they could put in front of the lens to do away with that."

One night while the Oppenheims were watching a TV news show in the den of their

Brentwood home, the drapes happened to be pulled back, and Oppenheimer happened to look at the window. He saw a reflection of the room in the window, jumped up excitedly and cried: "That's it!"

"Dear," his wife asked quietly, "what is it?"

Oppenheimer (standing) inspects a new film for the *I Love Lucy* show



Oppenheimer jubilantly explained that because it was dark outside and the lights were on in the room, it was possible to see the reflection in the window. Yet, he pointed out, if he were outside in the dark, looking inside, he wouldn't see any reflection at all in the window.

"Well," he concluded triumphantly, "there's no reason why I can't apply the same principle to the television lens and figure out a way of looking directly into the camera to read the script without interfering with the picture."

Oppenheimer promptly built a working model of the Jayo Viewer. It works so well that he stands to make a young, or even a more substantial, fortune renting the viewers to television stations which have been praying for just such a miracle.

His viewer projects a reflection of the script—in letters that are $\frac{5}{8}$ inch high—onto a two-way mirror placed in front of the lens at a 45-degree angle. The commentator or actor can't even see the lens. He merely sees the script going by. Conversely, the lens penetrates the antireflective coating on the rear of the mirror and photographs the performer without picking up any of the light illuminating the script. The effect is that the commentator may relax, and in fact give the impression that he is thinking up his lines as he goes along.

Oppenheimer's viewer not only achieves the illusion of spontaneity in newscasts, but it effects other improvements and short cuts which the industry is expected to welcome.

For purposes of visibility, it previously had been necessary to develop a special typewriter with letters $\frac{1}{2}$ inch high. Special paper—usually teletypewriter paper 12 or 13 inches wide—was required. This

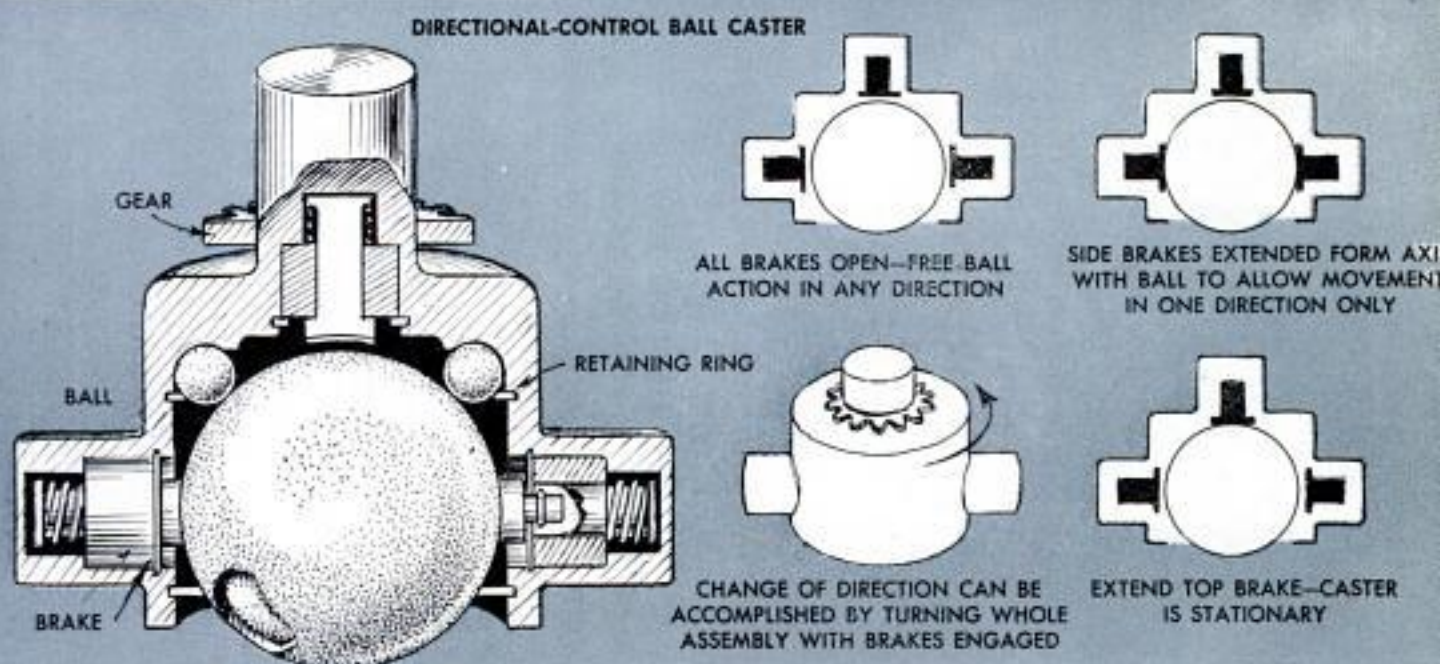


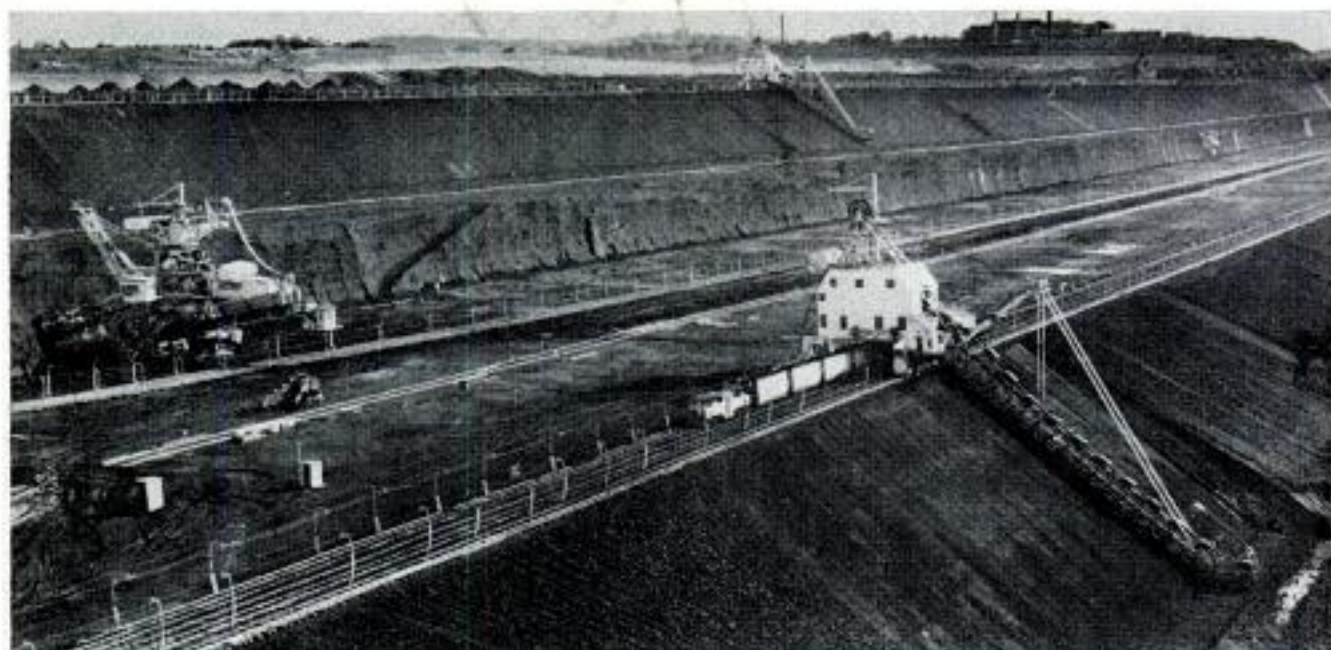
By flicking tiny rod on one lens of Oppenheimer's 3D glasses, the image is converted to restful 2D

paper had to be placed before the performer in sections or panels.

With the Jayo Viewer, any conventional typewriter may be used. A roll of carbonized acetate is fed into the typewriter, and wherever the surface is struck by a typewriter key the carbon is removed, leaving a transparent film—or white letter—against a black background. When this film is projected onto the beam splitter—the Oppenheimer two-way mirror chemically treated with 25-percent-transmission and

(Continued to page 238)





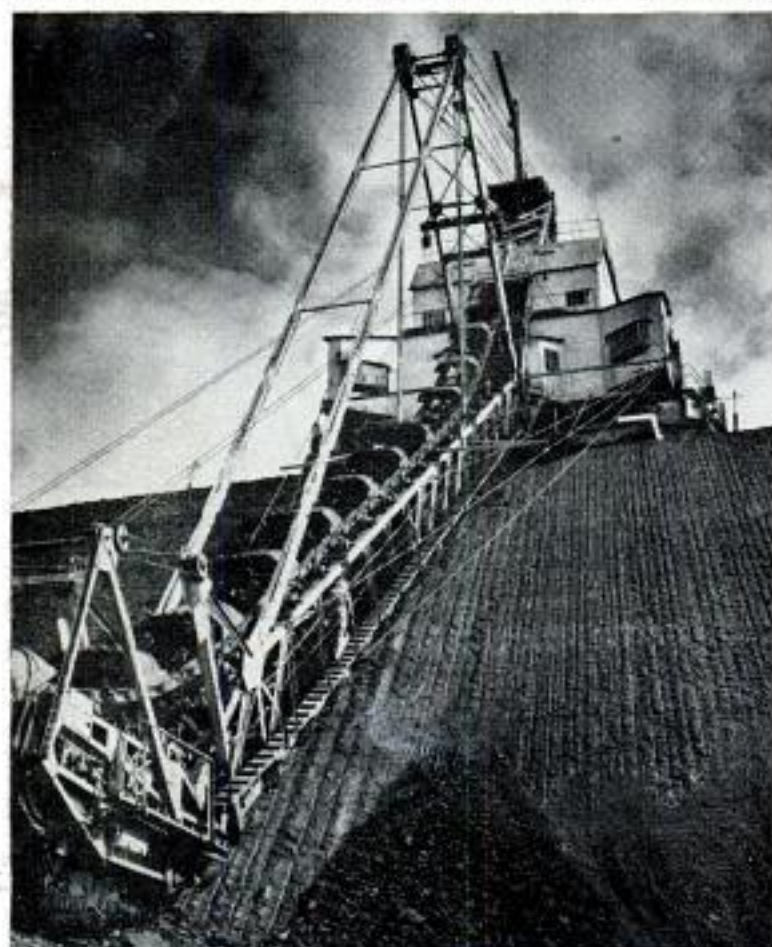
Three giant dredgers in brown-coal open cut at Yallourn, Australia, produce 20,000 tons of coal daily

Australians Mine Brown Coal for Gas

BROWN COAL, which lies untouched in many countries, will be turned into gas for commercial and household use by a new plant near Melbourne, Australia. The fourth of its kind in the world, it will be similar to three plants built in Germany and now behind the Iron Curtain.

Earthy brown and crumbly, brown coal is much different from black coal and has a high moisture content, low heating value, deteriorates rapidly in storage and often ignites spontaneously. Although unmined in the United States, it comprises almost one third of our total coal resources. In

Dredger's endless chain of buckets digs 550 tons of coal hourly



Australia, brown-coal reserves outnumber black-coal reserves. Nearly 7,000,000 tons of brown coal are taken each year from the great open-cut mine at Yallourn.

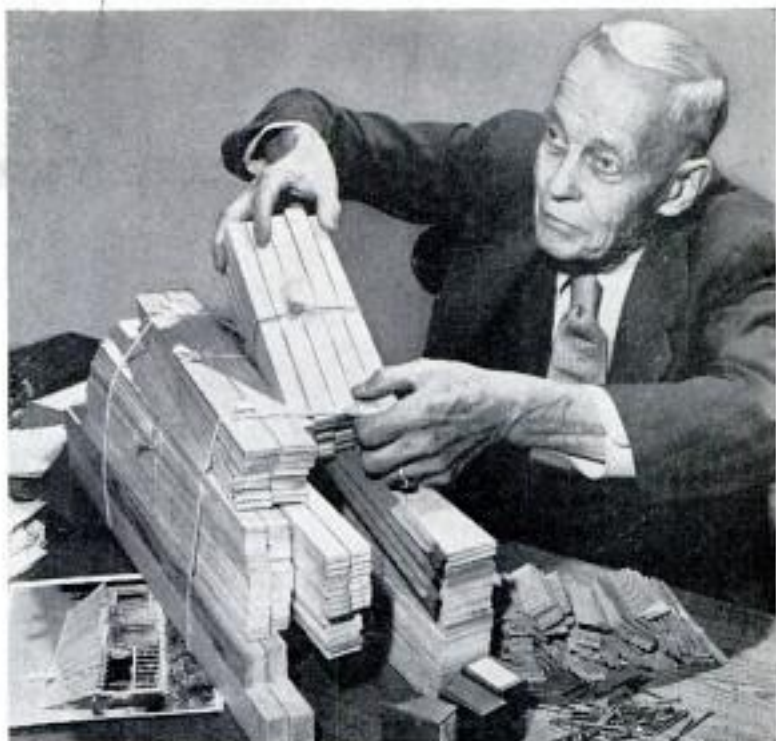
The Melbourne plant, due for completion in 1956, will use a mixture of one third raw coal and two thirds dried briquettes. Oxygen and superheated steam are mixed outside the generator and fed into it through the grate. They come in contact with the carbon derived from brown coal to produce a mixture of hydrogen and carbon monoxide known as "water gas." As this rises through the bed, its temperature falls and methane formation takes place, increasing the heating value of the gas. The gas is then washed and precooled in a spray cooler and further cooled under pressure in tubular coolers, where tar and oil by-products are condensed and recovered. It is stripped of the benzol it contains, dried, and piped into town mains.

It is expected that within 30 years all of the gas used in Victoria will come from brown coal. Gasoline, diesel oil and tar will be among the valuable by-products.

Art of Carpentry Taught by Kits

A SCALE-MODEL method of teaching carpentry is being used with great success in a number of high schools and colleges. Each student is furnished with a complete kit of miniature lumber for building a cutaway model of a house, barn, church or some other structure. Called Minimalic Construction, the method was developed by O. G. Hughson of Portland, Ore., 89-year-old philanthropist and educator, who has spent 20 years perfecting this means of giving boys a trade know-how along with the fun of a hobby.

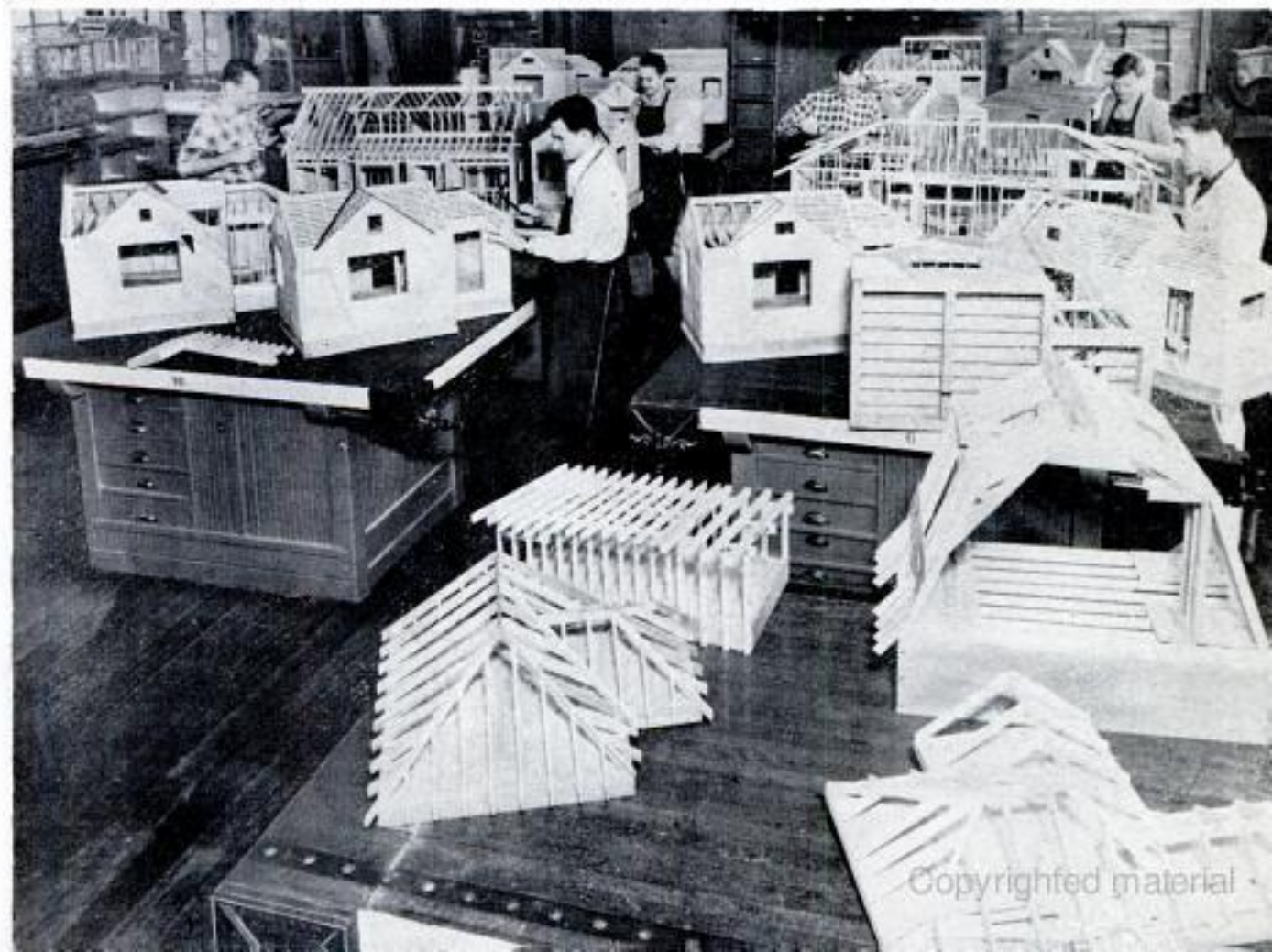
Each Mini kit contains a full stack of lumber (230 pieces) plus blueprints, nails and instructions. Because a complete model house would be immensely complicated, these are of cutaway plan. The building's framework is completed; enough of the siding, roof, doorways and so forth is installed to give the principles involved. The models are of good size, scaled $1\frac{1}{2}$ inch to the foot, so they can be assembled by standard methods. Regular carpentry tools are used and each board



O. G. Hughson inspects a kit of miniature lumber for building a cutaway model house. Even the nails are scaled to size

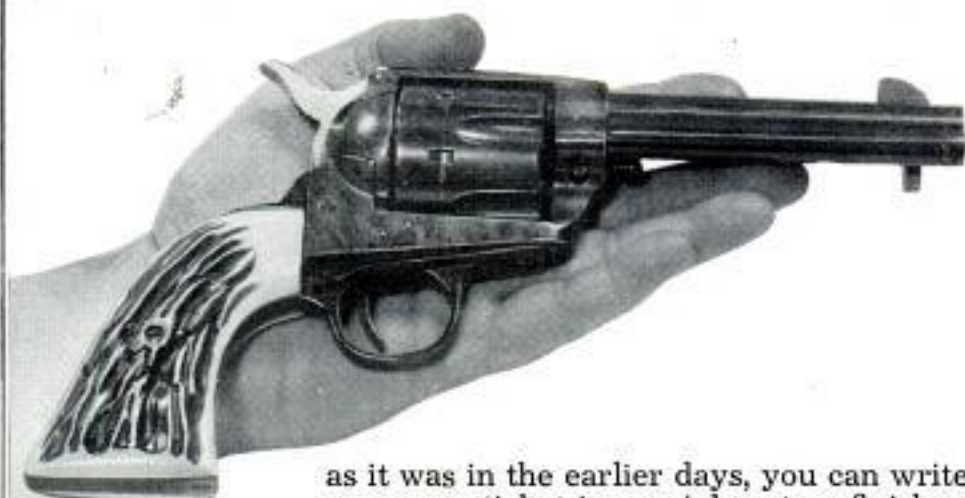
is fitted and assembled with small nails just as if it were on a real house. The student learns how to use a carpenter's square, to read blueprints, methods for putting in a foundation and framing, then finishing with siding and window frames. Kits are available only to schools and most of the cost is absorbed by West Coast lumber companies.

Houses, barns and even churches are constructed in cutaway design by students learning building principles





Six-Shooter of Frontiersmen Stages Comeback

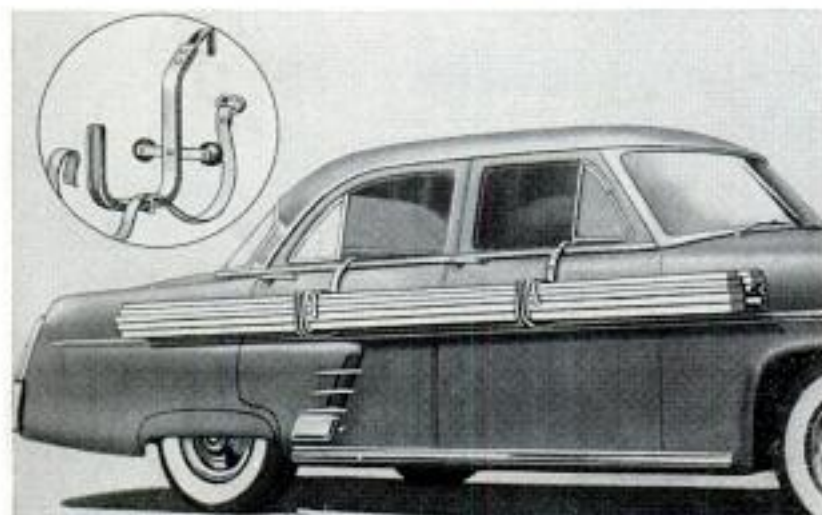
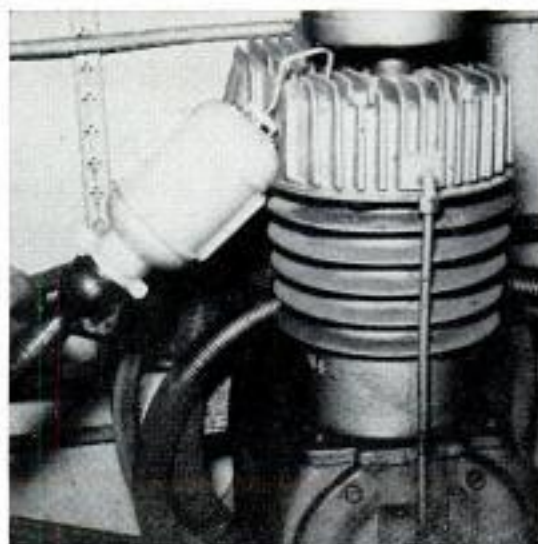


Expert handgunners, collectors and gun fanciers generally agree that among heavy handguns the Colt Single-Action Frontier Revolver is a natural, one of the finest ever designed. It was made by the originators for nearly 70 years, but was discontinued prior to World War II. An exact duplication is now offered by another manufacturer, with modern steels and new calibers. Just

as it was in the earlier days, you can write your own ticket in special custom finishes, nickel, chrome, silver, gold, both plate and inlay. The engraving ranges from the simplest scrolls to full presentation. With only a few minor exceptions, involving changes in screw threads and firing-pin assembly, the new gun is a perfect reproduction of the old Frontier Model. It has the same weights, lines and barrel lengths. To the eye, it is the same handgun that recalls so vividly the stories, legends and personalities of the frontiersmen who many years ago made it famous.

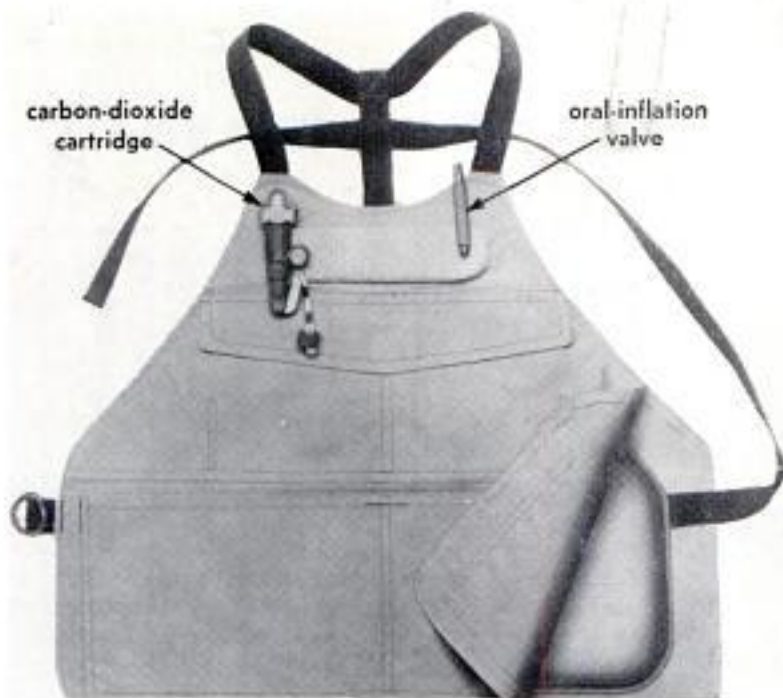
Droplight Hook Clamps in Position

Droplights with reflectors stay put when a new plate with an attached hook replaces the existing hook. The replacement is made after removing the old hook and drilling or punching two holes. Strong spring tension holds the light in any of six positions. The position of the light can be easily changed by rotating the hook.



Car Carrier Goes on Or off in Seconds

Ideal for carrying pipe, lumber, poles or other long, narrow items, a hook-type car carrier simply slips between the window glass and the door. There are no clamps to apply or screws to tighten. Suction cups protect the finish of the car door. The load is tied down and held in place by straps. With a pair of the carriers, 12-foot lengths of lumber can be carried easily and safely.

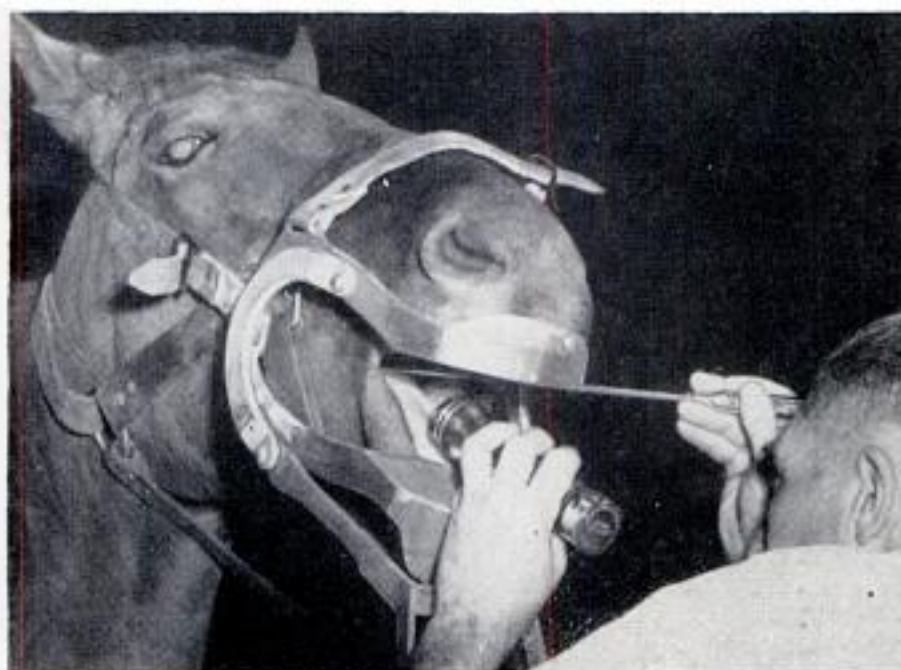


Bladder inside vest is inflated by carbon-dioxide cartridge or lung power. Vest has pockets for equipment

Dual-Purpose Fishing Vest Becomes Life Preserver

Fishermen need not fear deep water when they're wearing a new inflatable vest. Inside it is a detachable, rubberized cloth bladder that is blown up by a cartridge of carbon dioxide when a plunger cord is pulled. There is also a valve for deflation and for oral inflation. A main advantage of the garment is the fact that it doesn't have the appearance or bulk of a conventional life preserver. On the poplin vest is a pad for hooking flies and spoons for ready access or drying. Six pockets hold a variety of articles. The harness is of heavy web straps that are adjustable to fit any person. The wearer can swim easily or simply float on his back.

Vest easily supports man with hip boots and heavy clothing. User always floats in a face-up position



Mouth Prop Protects Hands

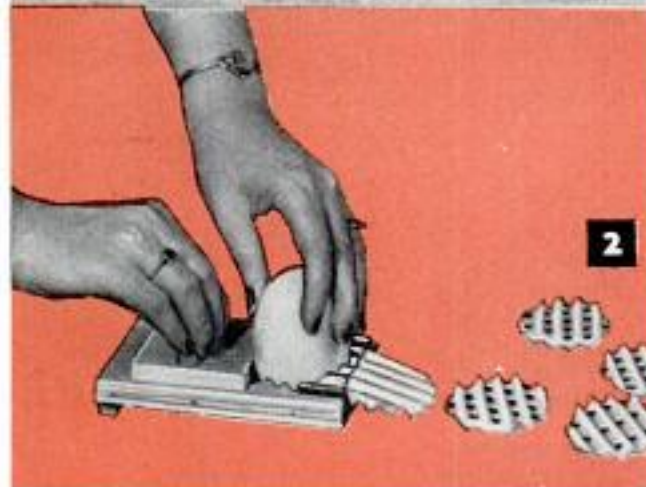
Veterinarians at their recent national convention got a peek at a handy device for propping open a horse's mouth. The sturdy metal unit allows a doctor to inspect throat, tongue and teeth without danger to hands or equipment, and without loss of time.

Composed of fly ash, lime and coal slag, a new runway material has been developed that resists the terrific heat of jet-engine exhausts.

WHAT'S NEW FOR Your Home



1. NOZZLE for tank-type vacuum cleaners is made to clean cotton, shag, hooked, loop and rag rugs. Bottom surface of nozzle is a gridded plate which glides smoothly over stringy carpet. Fluffy nap or strings are lifted and vibrated to loosen the dirt, but plate prevents nap from being sucked into nozzle



2. POTATO SLICER produces latticed wafers for frying. The unit consists of a cleated wooden block and stainless-steel cutters, and cuts crisscross strips and holes in the slices by a push-pull motion. The slices are uniform and are cut without waste. Diamond-shaped or square holes can be cut in wafer



3. STEAMING BASKET with collapsible sides adjusts to fit any cooking pot, transforms it into a steam cooker. It can be used for warming bread and leftovers, to defrost frozen foods, as well as for cooking. Telescopic fold-in legs keep basket from touching water. Handles protect hands from steam



4. BEVERAGE DISPENSER mounts rubber bulb which is pressed when a glassful of liquid is wanted. Spillage and breakage are eliminated because the container remains in the refrigerator until empty. The gallon unit, when filled with milk, encourages children to serve themselves

5. ADJUSTABLE MATTRESS is inflated or deflated to regulate firmness. Sleeping surface is of foam rubber and foundation consists of air cylinders. Each half of the double mattress can be inflated independently. The one-piece mattress foundation rests on a wooden platform



6. REVOLVING TRAY equipped with ball bearings turns at light touch even with a heavy load. Tray can be used by Scrabble players, or by an amateur chef to hold sauces and spices. Placed on refrigerator or cabinet shelves, the tray turns to bring foods "front and center"

5

7. FIRE ALARM consists of a gas-filled pressure can that sounds a shrill, five-minute warning and releases a sharp odor when room temperature reaches 135 degrees. The self-contained unit requires no maintenance, and is designed to supplement sprinkler systems and serve as a low-cost home fire detector



6

8. FIREPLACE SCREEN rolls up with the press of a foot lever, rolls down with the touch of a hand lever. A durable ball-bearing roller operates a cable to raise and lower the brass screen. The fine-mesh screen does not obscure the fire and allows heat to pass through easily. Finish is baked enamel

7



8





Turbine Fan Blows In or Out

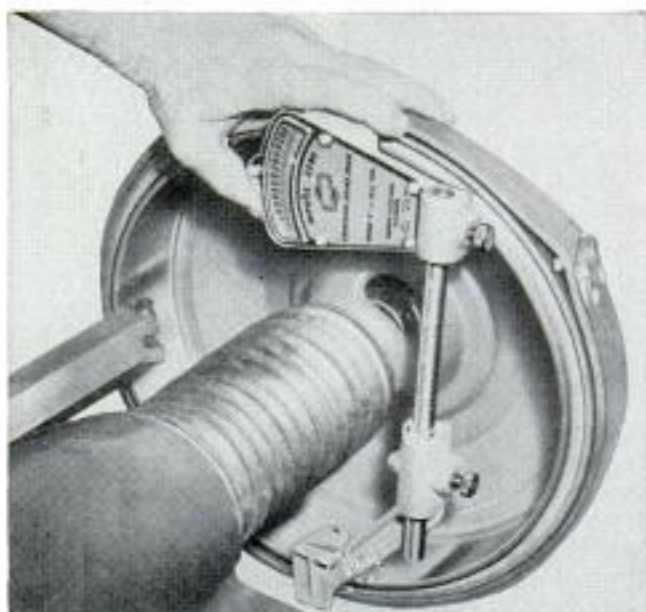
Air is forced in or out of a room by a turbine-type fan that fits in the window like an air conditioner. Filters fitted in the ends of the cylindrical unit clean the air of dust and pollen. Air is supplied at the rate of 540 cubic feet per minute.

Fowl Feathers Removed By Dip in Solution

All feathers, even the pinfeathers, can be removed easily from ducks and other fowl with a new powder which is dissolved in water. The bird is dipped in the solution and, the manufacturer says, the feathers wipe off easily. The product also deodorizes the birds.

Most Powerful British X Ray

Reported to be the most powerful instrument of its type in the world, a 15,000,000-volt linear accelerator for research and treatment of cancer has been perfected in England. The machine will be installed in St. Bartholomew's Hospital in London. It first will be used for research, and later for high-voltage cancer therapy.



Gauge Measures Brake Drums

Featuring micrometer accuracy, a gauge for brake drums checks diameters to determine if the drums are round and safe enough for continued use. Measuring drums from 8 to 18 $\frac{3}{8}$ inches in diameter, the gauge can be used on drums on or off the lathe. Readings are seen on a large, direct-reading scale. By establishing diameter, the mechanic can match the lining to the drum for 100-percent contact.

Dolly Eases Tire Changing

One man can change truck tires weighing from 30 to 300 pounds with a lightweight dolly. The tool aids in pulling off the wheel and transporting it over floors, soft or hard dirt or over graveled terrain. It weighs less than seven pounds.





Fan in Place of Light Bulb Makes Lamp Produce Breeze

You can turn a desk lamp into a ventilating unit with a recent German invention. It's a compact fan that screws into any light-bulb socket. The three propeller blades are plastic and the device comes in a variety of colors.



Stroboscopic-Flash Unit Fits Miniature Cameras

Designed especially for miniature and candid-camera work, a lightweight stroboscopic-flash unit will provide 1000 flashes on one set of dry cells. The unit weighs only 50 ounces and comes in a case slung on a shoulder strap. Duration of the flash is about $\frac{1}{14}$ second, with three to four seconds required for the unit to build up power between shutter openings.

Uplifted Airplane Cockpit Protects Pilots While Dusting Crops

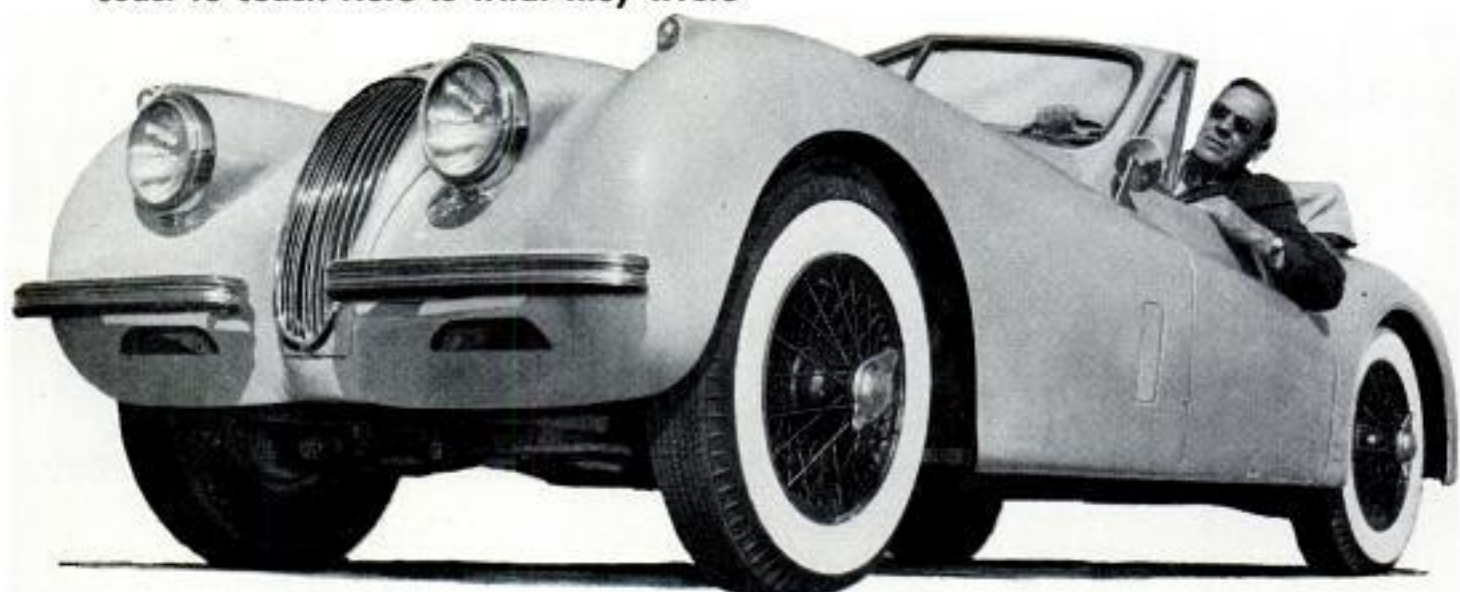
Perched several feet higher than they customarily are, pilots in a newly designed crop-dusting airplane are less likely to be crushed between the engine and the cargo in the event of an accident. Most dusters now in use are converted trainers in which the pilot sits directly ahead of hundreds of pounds of chemical. The new airplane also has sharp steel blades on the leading edges

of the landing gear to cut any wires it might accidentally strike while flying low. It weighs 886 pounds empty and carries an 800-pound load of chemicals. When it has been certified by the Civil Aeronautics Administration, the plane's builders, Charles Kellenbarger and the Ohio Aviation Research and Development Foundation, plan to make the blueprints available.



OWNERS REPORT:

No other car in its field is as famous as the Jaguar XK 120. To learn its good and bad qualities, we polled owners from coast to coast. Here is what they wrote



Owners Praise:

Roadability

"A pleasure to drive on a twisting road."

Oklahoma retailer

Performance

"Very fast acceleration. Eats up the miles on long trips."

New York actor

Handling

"Gives a feeling of security at fast speeds."

Oklahoma produce dealer

Owners Dislike:

Leaks

"Terrible dust leaks. Doors not tight. Water comes in."

Iowa farmer

Brakes

"Brakes not easily adjusted. Still do not work properly."

Ohio physician

Ventilation

"After the first hot, rainy day with the side curtains up I was ready to sell the car."

New York executive

ROADSTER



HARDTOP



CONVERTIBLE



Jaguar Owners Rate Performance And Roadability As Top Features

By Jaguar Owners

PARKED IN FRONT of a banker's home or in the pits at Watkins Glen, the Jaguar looks as though it belongs! Performance or prestige—the Jag has it. Conservative businessmen and radical sports-car fanatics all share this attitude—they all love their Jaguars. Why?

To find out why, *Popular Mechanics* polled Jaguar owners from coast to coast.

As you might have guessed, the best-liked features of the Jaguar XK 120 are its performance and roadability.

"I like best the high-speed performance. This car can cruise all day at 100 m.p.h. and still have sufficient reserve power. Good gas mileage at high speeds also."—Ohio mechanical engineer.

"Has quick response. Seems to be alive."—Iowa cattle feeder.

"It's willing to go under all conditions. Top speed is 138 miles per hour when tuned to perfection."—New Jersey pharmacist.

Not far behind performance was roadability in the owners' list of best-liked

features. (Roadability is a car's ability to hold its course on any type of road at all speeds. It is a characteristic that any successful sports car must have.)

"Flat cornering and a feeling of security at fast speeds."—Oklahoma produce dealer.

"Its roadability will tolerate many mistakes on the part of the driver, even at high speed."—New York technician.

"There is nothing that can compare with it as a very fast touring car."—New York engineer.

"Roadability excellent except on wet pavements where it is very skiddish."—Ohio business executive.

"A pleasure to drive on a twisting road. Cornering among the best. Rear end hard to make break loose."—Oklahoma retailer.

Owners Do Have Complaints

Although owners are almost unanimously enthusiastic about their Jaguars, there are some complaints. Roadster owners

(Continued to page 142)

CLYMER ROAD TESTS THE JAGUAR

By Floyd Clymer

FOR ANYONE who wants to drive a different kind of automobile, one that packs a terrific punch and handles unlike any American car, the Jaguar XK 120 is his dish.

I drove the test Jaguar XK 120 M (modified) in California, to Santa Maria, to Bakersfield, over the hot Mojave Desert, over winding mountain roads of the Lake Arrowhead region, returning over the Angeles Crest mountain highway to Los Angeles, a distance of 512 miles. The test was over all types of roads, including some off-highway roads that were no more than trails.

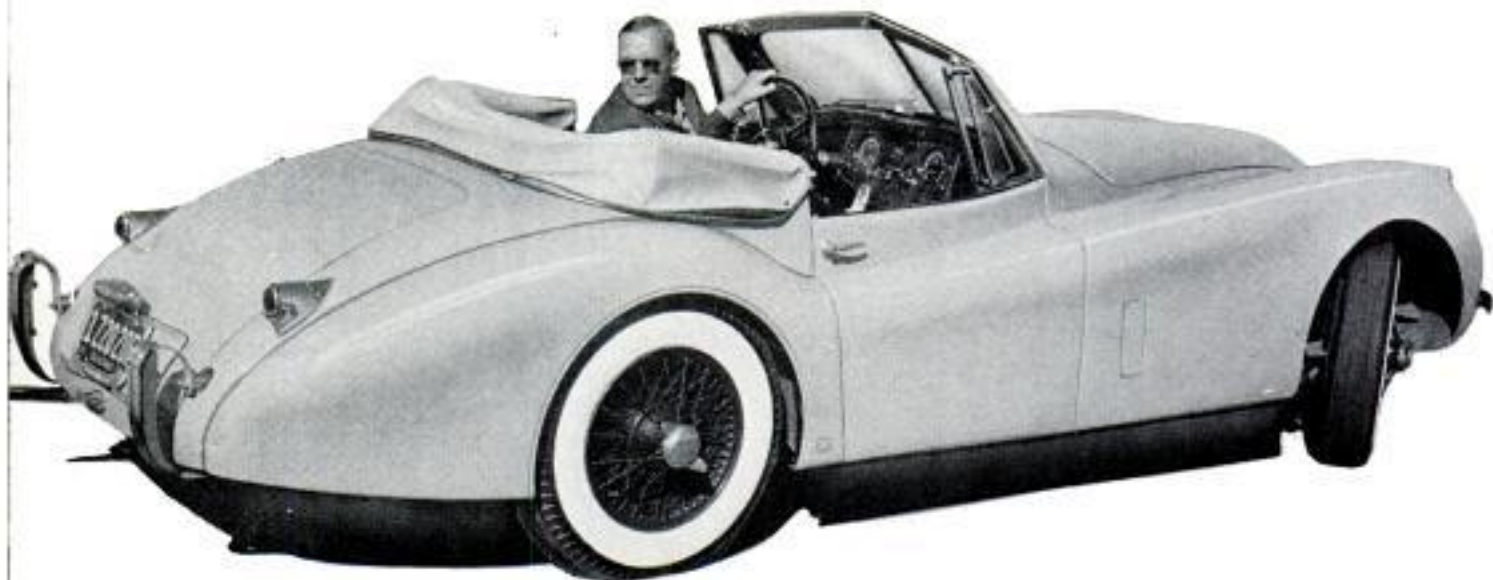
Outside of a lot of necessary gearshifting



in city traffic and on hills, the car is easily controlled and flexible in performance. Handling on corners is excellent, due to the combination of a short wheelbase, narrow tread, excellent power and suspension and its light weight that is well-balanced with 1500 pounds on front and 1610 pounds on rear wheels.

The six-cylinder engine develops 190 horsepower at 5400 revolutions per minute, with a compression ratio of 8:1. With 210-cubic-inch displacement, the engine size is smaller than either a Ford Six (223.0 cubic inches) or a Chevrolet Six (235.5 cubic inches). This engine provides high power

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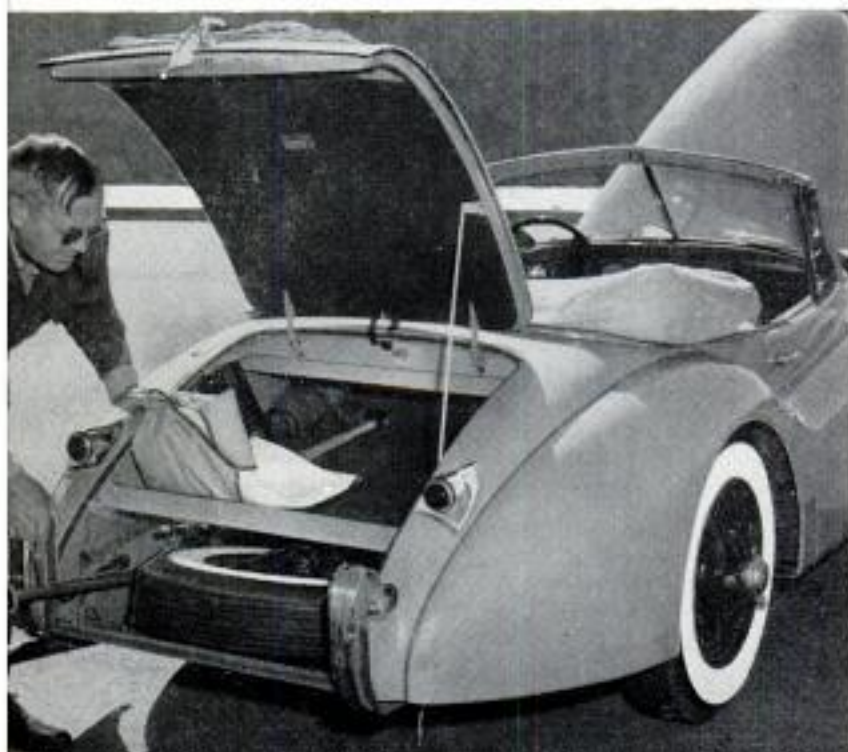


With its small turn-circle diameter (31 feet), narrow tread and short length, the Jaguar is easy to park



Telescopic column enables the driver to adjust steering-wheel position to suit himself. Instrument panel is made of hardwood

Luggage space in trunk is inadequate, say some owners. The spare tire fits in separate compartment under luggage space



complain principally of annoying rain and dust leaks in passenger compartment and trunk. Owners of the other two models, convertible and hardtop, made no such complaints.

"Roadster top leaks."—New York realtor.

"Canvas top could be better designed to prevent leaks and avoid scratching body."—Illinois broker.

"Too many openings on roadster for water to be blown in during rain."—New York businessman.

"Not very happy with side curtains. Rain leaks in through them and also into trunk."—Indiana beautician.

"Side curtains leave drafts."—New York accountant.

"Top on my convertible does not leak and I put it up and down with one hand."—New York model.

"Rain does leak in some, but amount is insignificant."—Ohio physician.

Second on the list of complaints was that old bugaboo—poor dealer service.

"I have had trouble with my dealer. It seems to me that he has dollar signs in his eyes."—New York serviceman.

"I am trading my Jaguar in on a regular American car. Why? I can't afford two cars and you must have two if you own a sports car so you will be able to get around when the dealer is working on yours—that is if you're lucky enough to get to leave it at his exalted location!"—Ohio salesman.

"Dealer service in this area is very poor. Car was taken to garage with complaint of missing at high

Percentages From PM Poll of Jaguar Owners

Average mileage reported
by Jaguar owners...5204 miles

Average miles per gallon:

On trips.....17.2 m.p.g.
In traffic.....14.6 m.p.g.

Owners having:

Roadster model.....63%
Convertible coupe.....11%
Hardtop coupe.....26%

Handling:

Excellent.....88%
Good.....10%
Poor.....2%

Roadability:

Excellent.....82%
Good.....18%
Poor.....0%

Structural rigidity:

Excellent.....69%
Good.....27%
Poor.....4%

Acceleration:

Excellent.....88%
Good.....12%
Poor.....0%

Average time from 0-60

m.p.h.....8.5 sec.

Average top speed.....120 m.p.h.

Engine:

Excellent.....89%
Good.....11%
Poor.....0%
Prefer some other kind.....0%

Over-all rating of Jaguar:

Excellent.....78%
Good.....19%
Fair.....3%
Poor.....0%

Transmission:

Excellent.....70%
Good.....26%
Poor.....4%
Prefer automatic.....4%

Body styling:

Excellent.....87%
Good.....13%
Poor.....0%
Would prefer roll-up windows.....62%
Would not prefer roll-up windows.....38%

Canvas top:

Easy to operate.....49%
Difficult to operate.....51%
Owners reporting rain leaks into body.....73%
Owners reporting no rain leaks into body.....27%
Prefer additional passenger space.....23%
Would not prefer additional passenger space.....77%

Brakes:

Excellent.....67%
Good.....27%
Poor.....6%

Steering:

Excellent.....88%
Good.....8%
Poor.....4%

Riding comfort:

Excellent.....50%
Good.....50%
Poor.....0%

Have previously owned another sports car.....59%

Haven't owned another sports car.....41%

Own another car in addition to Jaguar.....70%

Would buy another Jaguar:

Yes.....81%
Might.....5%
No.....14%

Owner's rating of dealer service:

Excellent.....27%
Good.....27%
Fair.....17%
Poor.....29%

Owners belonging to a sports-car club or group.....21%

Owners using Jaguar in races, rallies or other competition.....20%

Best-liked features:

Performance.....64%
Roadability.....44%
Handling.....35%
Styling.....32%
Engine.....10%

Most frequent complaints:

Leaks.....21%
Poor service.....14%
Spark-plug fouling.....9%
Brakes pull when wet.....8%
Heats up in traffic.....8%

speed. A new set of plugs (the third in 4500 miles) and a sport coil were installed. A bill of \$30 was submitted for this service.” —New York physician.

“The car cannot be beaten. The dealer service, however, stinks. Dealer acts as if he is doing you a favor to sell you parts. Parts are slow coming and handled with an extreme lack of courtesy.”—Ohio student.

This complaint of poor dealer service was made by 29 percent of the owners. For

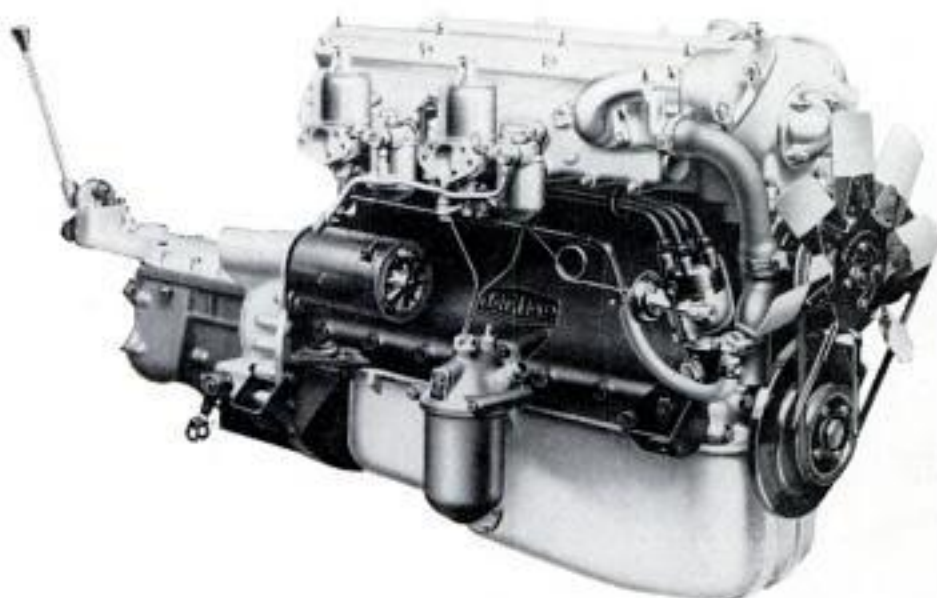
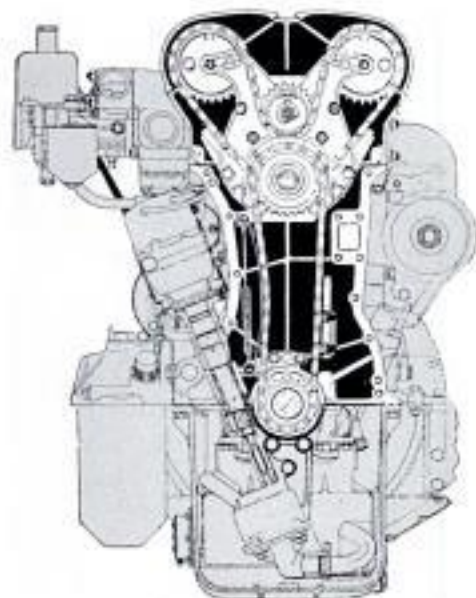
other percentages see chart on this page.

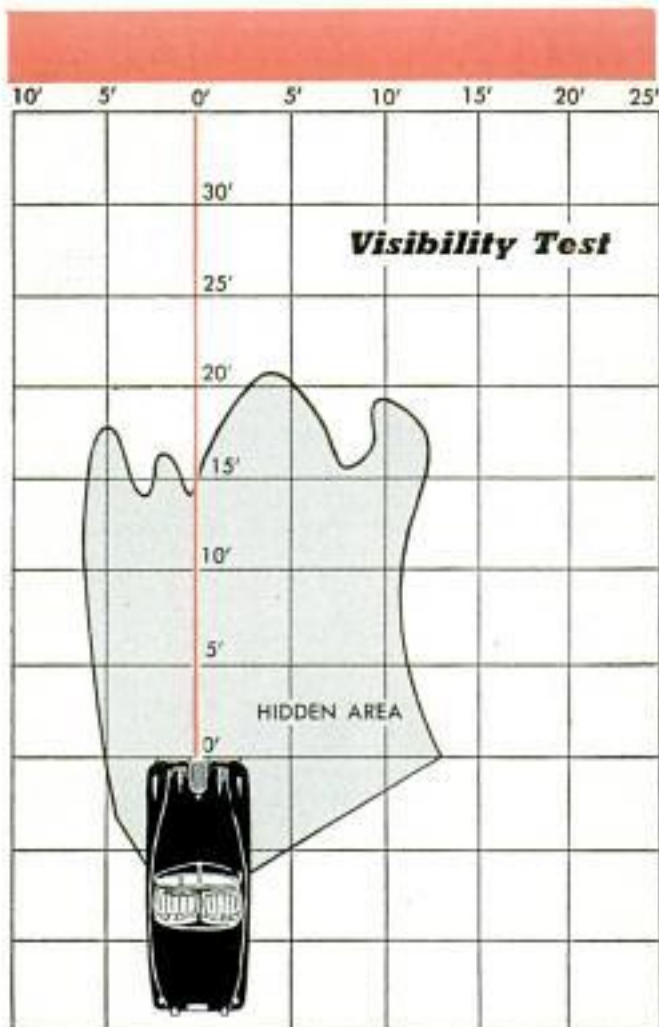
There were many owners (21 percent of them) who said they had absolutely no complaints to make about their Jaguars.

Why Own a Sports Car?

Anyone who has never driven a sports car always asks why would anybody buy such a small car? In quantity alone (how much per passenger) the sports car is certainly expensive. What, then, makes it

Cutaway shows location of chain-driven twin overhead camshafts, outstanding feature of the Jaguar engine





Acceleration Test

JAGUAR XK120M CONVERTIBLE

¼ mile from zero	16.9 seconds
½ mile from zero	26.5 seconds
0 to 30 miles per hour	3.6 seconds
0 to 60 miles per hour	8.7 seconds
Top speed by speedometer	132 miles per hour
Actual top speed about 120 miles per hour	

Economy Test

Constant-Speed Mileage

At constant 30 miles per hour	21.4 miles per gallon
At constant 50 miles per hour	19.2 miles per gallon
At constant 60 miles per hour	16.4 miles per gallon
At constant 75 miles per hour	13.1 miles per gallon

Cross-Country Mileage

Los Angeles to Santa Maria (moderate traffic)	17.4 miles per gallon
Santa Maria to Lake Arrowhead	16.1 miles per gallon
Lake Arrowhead to Los Angeles (Premium gasoline used)	17.2 miles per gallon

To provide a complete report on each automobile, PM combines two separate tests. One is written by the owners themselves and is the result of a coast-to-coast mail survey of owners selected from the registration lists. The other is a road test by auto writer, Floyd Clymer

as popular as it is both here and abroad?

"An excellent buy for the money. It puts the fun back in driving."—Iowa musician.

"The best method of getting from Point A to Point B with the least fuss and time and in a comfortable and enjoyable manner."—New York rocket engineer.

"An almost instantaneous response to steering. A fine car for the money. However, you must like fine cars and be willing to learn how to maintain and service them yourself."—New York embalmer.

"I drive it, it doesn't drive me. Most Detroit products feel like juggernauts."—New York automotive-parts jobber.

"This car is for those who enjoy being a factor in the operation of an automobile."—Illinois salesman.

"When I drive it, I feel we (the car and I) are one—a team. It steers so beautifully it almost anticipates. You own a sports car for individual pleasure. It's like owning a bike when you were a small boy."—New York manufacturer.

Other Best-Liked Features

Handling characteristics are third on the list of best-liked features.

"Superb handling at all speeds. Also superior acceleration."—New York mechanical engineer.

But there were a few who disagreed.

"Need too much strength to steer at low speeds and when parking."—New York construction superintendent.

"Superior in everything but downtown driving and parking."—Oklahoma adjuster.

The Jaguar's low, alert lines appeal to just about every car lover. It looks like its name—like a huge, powerful cat ready to pounce. It is not surprising then that the owners rated styling high on their list of best-liked features.

"A car that I am proud to drive. It is admired by all who appreciate fine cars. Its sleek lines and furnishings are outstanding."—New Jersey housewife.

But here again some disagreement.

"I like its appearance, but should have a better-looking top for the roadster."—Ohio photographer.

Farther down on the list of complaints were a few of a mechanical nature.

Spark-plug fouling was complained of by 9 percent of the owners. Brakes pulling when wet was a complaint of 8 percent. Tendency of the engine to heat up in traffic was also mentioned by 8 percent.

"Spark plugs foul up every 200 or 300 miles. I have used 3 or 4 different sets in 6000 miles."—New York executive.

(Jaguar now recommends the installation of N8B spark plugs during break-in period to prevent fouling.—Editor)

(Continued to page 246)



Double-Purpose Tire Tool Acts as Dolly and Wrench

Tires are changed quickly and safely with a tool that keeps you out of danger should the jack fail. One end of the tool serves as a cradle for the tire so that it can be lifted, lowered or spun around to match up with the studs. The tire rests on rollers which permit easy rotation. The other end of the tool contains a socket for tightening nuts. The rollers on the cradle serve as the handles of the wrench to permit fast tightening.

Hose Flushes Auto Radiator

To simplify flushing of automobile radiators, a radiator cap has been developed with a coupling for an ordinary garden hose. This enables the automobile owner or service-station attendant to flush out radiators and engine blocks simply by attaching a hose to the cap, opening the drain cocks on the block, the radiator or both and turning on the water at moderate pressure. Caps are made to fit all cars.



JANUARY 1955



Device Allows Musicians to Turn Music With Their Feet

Teutonic inventiveness and love of music merge in a German device that allows musicians playing string, wind or reed instruments to turn sheet music without using their hands. Operated by a pedal, the page turner moves only one sheet at a time —by reaching behind the pages. The music stand and turner can be folded for carrying without removal of the score.

Motorized Cherry Pitter Speeds Fruit Preparation

Designed primarily for the housewife, an electric cherry pitter perfected in Germany should also prove a boon to small canners. The pitter takes cherries from a hopper, slits them, pits them and drops them into a waiting dish in one operation. Pits drop into another container and juice is diverted to a glass.





Huge Rolling Dry Dock Repairs Small Boats

Designed by the Army Transportation Corps to speed repair of landing barges and other small craft where permanent facilities are not available, a rolling dry dock mounted on huge, tubeless, pneumatic tires is undergoing tests at Fort Eustis, Va. The dry dock will pick up vessels 60 feet long and weighing 75 tons. It is not powered, but is hauled ashore by Caterpillar tractors. Mounted on 36 by 41-inch tires with a 9½-foot inflated diameter, the dry dock is 42 feet long and 32 feet wide.



Homemade Power Mower Built From Scrap Parts

Fred Dunham of Nashville, Tenn., used parts from a Crosley, a Cushman scooter, a sewing machine and an airplane to make a homemade power mower. The job took up his spare time for a month, but he has what he wanted—power, maneuverability and economy. A Crosley engine does the work. A chain-and-sprocket assembly provides drive through the Crosley transmission. A belt assembly pulls the two 25-inch rotary blades which cut a 50-inch swath. He gets about “two acres per gallon” of gasoline.

☐ Natives of the Bocas del Toro province of Panama get their houses screened by spiders that spin their golden, lacy webs around entire huts.



Cycle Magazine photos

Heavy padding protects the driver's left knee as it rides along the ice when he cuts sharply around corner

Motorcycle Racing on Ice Is Rugged Swedish Sport

Motorcycle racing on ice is one of the most spectacular of Sweden's many winter sports. The motorcycles speed in tight circles around small tracks on ice, depending for traction on scores of spikes embedded in the tires. Sturdy guards are installed over the wheels to minimize chances of injury to riders in case of collisions. The riders wear heavy knee pads on one leg because in cornering they drag their inside knees on the ice to maintain balance.

Thick Rims Protect Records

Thick rims on some of the new long-playing phonograph records protect the grooves from nicks and scratches during storage. Because the outer rims are slightly higher than the rest of the records, there is no contact between playing areas when the disks are stacked atop each other. RCA developed the feature and is making it available to other manufacturers.

Closeup shows the spike-studded front tire and the metal guard that reduces danger to driver in crash



Temperature Alarm

Now you can leave your home untended without worrying about a breakdown of the heating system. A compact device flashes a warning red light if the temperature drops below 50 degrees. A neighbor can check your house daily by glancing in the window.



An Old Mill Grinds Again

ONE OF THE few remaining gristmills in the Midwest now is grinding corn meal for the market again, thanks to a group of Muskogee, Okla., citizens and some modern engineering equipment. The mill has been a landmark at Bitting Springs, Okla., for four generations. A few years ago the group of citizens bought the old mill and put it back into operation so they would have a source of whole-grain corn meal. Since then they have added modern equipment to condition the grain so it will not become rancid and are packaging it for shipment to market. An electric motor whirls the extractor to remove moisture from the grain, which then is dried under infrared lamps. But the 20-foot water wheel still turns the stone burrs which grind the grain, and the romantic building looks much as it did a century ago. ★ ★ ★

To clean the grain, it is placed in a container and lowered by hand into a tank of running spring water





Grain flows from container into moisture extractor



Electric motor whirls extractor to remove the water



Infrared lamps around belt continue drying process
Corn trickles slowly between stone grinding burrs



Grain is cured in ventilating racks before milling
Old-fashioned ground corn meal is packaged for sale





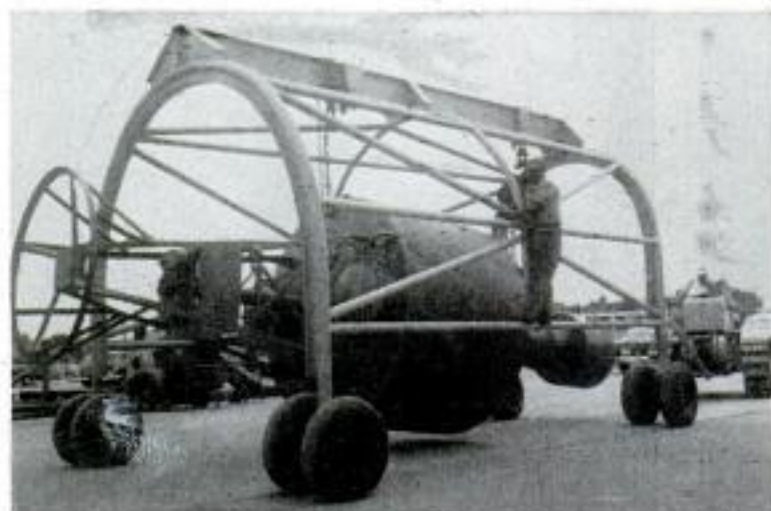
Combination Boat and Sled Travels Over Water or Ice

Specially designed for travel over water or ice, a combination boat and sled now links Frauenchiemsee Island off Germany with the mainland all year around. Winter ice that blocked boat travel had previously

isolated the island for lengthy periods. The new boat-sled navigates easily over mixed stretches of ice and open water. It is poled over ice and rowed or poled through water, slush or splinter ice.

Chopper Shreds Bales

Farmers can "unbale" hay or straw with a shredder that chops, loosens, fluffs up the tightly packed material and blows it into a pile. It eliminates the job of shaking bales and slabs apart by hand. Baled straw torn apart by the shredder and used for bedding covers a larger area because it can be spread evenly. Hard-packed hay is made palatable by shredding. The machine is powered by a $\frac{1}{2}$ to $\frac{3}{4}$ -horsepower motor.



Coast Guard Buoy Carrier Made From Surplus Parts

Buoys, like icebergs, have most of their bulk beneath water. On dry land the bottom-heavy giants are awkward to handle. But Coast Guard engineers at Portsmouth, Va., have built a carrier that easily handles the largest, 12-ton buoy. They put it together with four-inch steel pipe, a metal center brace, surplus airplane wheels and two chain hoists, at a cost of \$1200. It is pulled from place to place by a crawler-type tractor.

Make-It-Yourself Carving Material

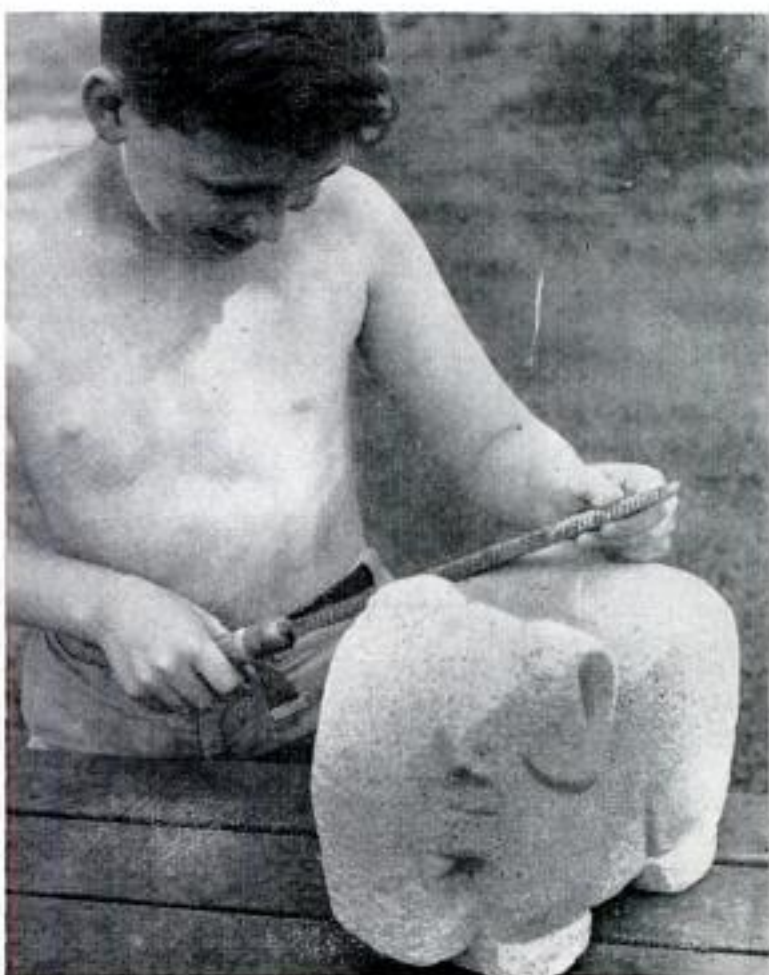
LOOKING for a new craft material? Then try your hand at Girostone, a homemade material that looks like granite, yet is almost as light as balsa. Larry Argiro, associate professor of art at State University Teachers College, New Paltz, N. Y., discovered Girostone by accident. It is a mixture of vermiculite aggregate, cement and sand. You can make it hard or soft by varying the amount of vermiculite. Argiro recommends starting with a soft mix of four parts vermiculite to one part cement, with a little sand. Add enough water to form a thick paste and pour into a shoebox or other container. In two or three days knock it out of the container and it's ready for your knife. The soft varieties can even be carved with a spoon, making them ideal for children, while harder types may require a hammer, chisel and coping saw. You can carve anything from Girostone that you can carve from other materials, so projects are limited only by imagination.

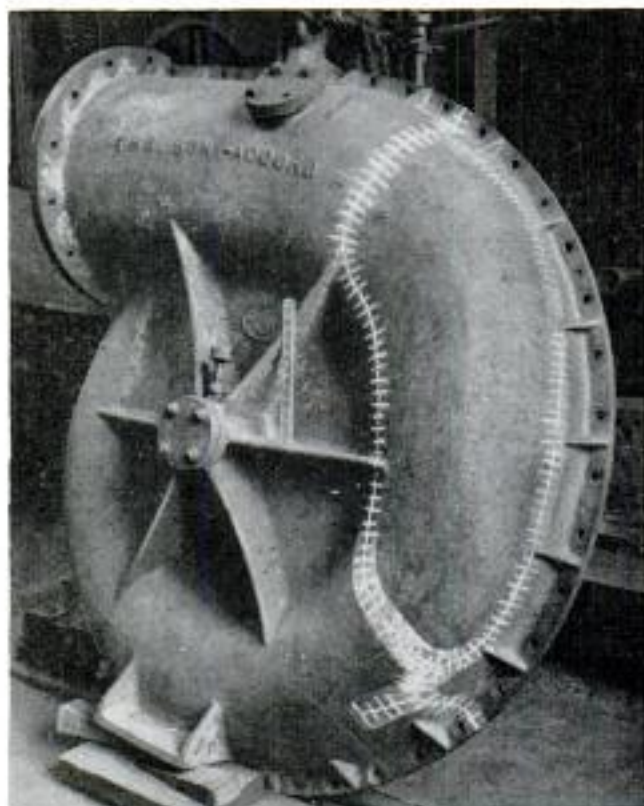


Plaque takes shape as youngster wields a paring knife. Girostone can be cast in any thickness and as soft as desired

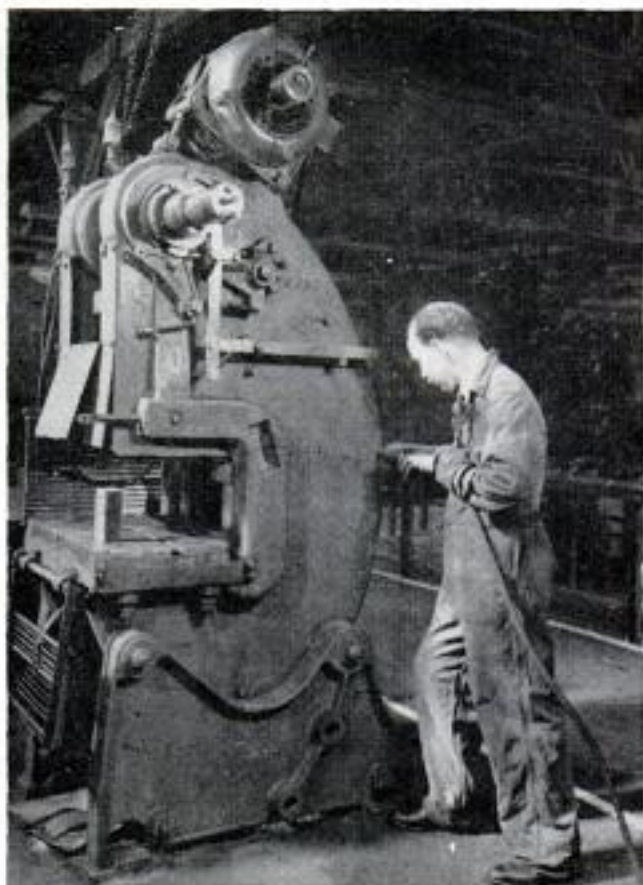


Coping saw cuts Girostone easily and rasp quickly gives form to a carving. The soft carving material makes a hit with children because it can be easily worked by them





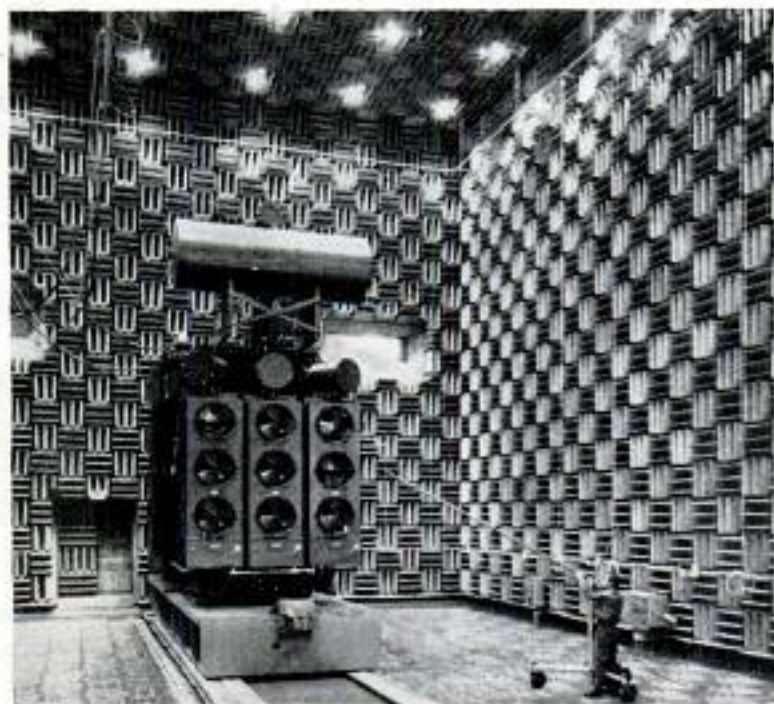
Metallock "stitches" cracks in heavy metal, such as the turbine casing above and the tool frame, right



Metal Stitching Saves British Industry Millions of Pounds

American ingenuity in applying the principle of ordinary corrugated fasteners, or "wobble nails," to metal has saved British industry millions of pounds in the past few years. The process, called Metallock, consists of inserting a series of metal locks, or stitches, across a fracture line in a casting or forging, and then crossing them with a line of interlocking studs forced into the fracture itself. Perfected in the Texas oil fields where repair of metal without weld-

ing heat is often necessary, the process was adopted by the Navy during the war, but was not widely used in England or on the Continent until 1946. Scarcity of replacement parts in war-damaged countries boomed the business. Metallock has been used in Britain for speedy repair of such irreplaceable items as steam cylinder heads of foreign or obsolete design, for pump and turbine casings, generator frames and winding drums.



Largest "Quiet" Room To Test Transformer Noises

You might hear a pin drop, but you couldn't get an echo with a cannon cracker in the world's largest anechoic chamber, or "quiet" room. Anechoic means "without echo," and a room without echoes was precisely what General Electric had in mind when the immense chamber was constructed. The walls are completely lined with glass-fiber wedges arranged in a pattern that absorbs all sound. The chamber is 43 feet high, 58 feet long and 48 feet wide and has walls 5 feet thick. It was built to aid engineers attempting to reduce the hum and sound-reproducing qualities of electrical transformers of all sizes.

Taking That Spot-News Picture

By Richard W. Emery

IT'S A COMMON THING in a newspaper photo lab to hear someone complain: "Too late! Some amateur beat me to it!"

That means that once again the nonprofessional who just happened to be on the spot in time got a "spot news" picture the press cameraman didn't get.

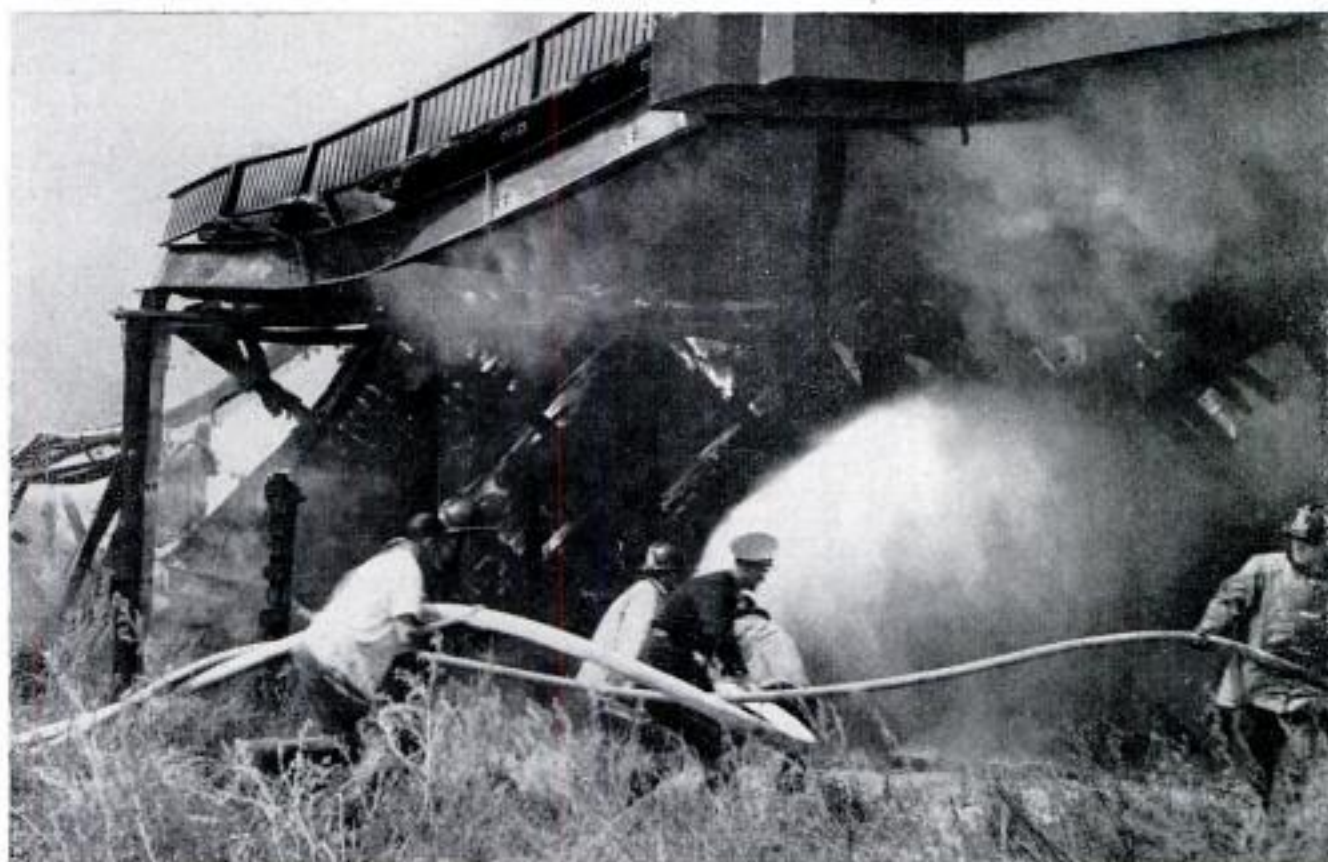
Nobody doubts that the most essential single thing about getting that "big picture" is being *there* while the picture can be shot. Newsmen go to great pains to "be there." Their employers at great expense set up

news-gathering organizations backed up by telephones, radios, automobiles, planes—everything possible to aid the day-and-night vigil for spot-news breaks and coverage by photography.

But the unexpected happening has a way of popping up at unlikely times and places. Press cameramen can't always clip off the miles in time. That's when the photographic honors may go to someone else who has a camera and uses it well.

There's no love lost between the working

Firemen run as burning bridge collapses. This picture was cropped; photographer was not in danger area





Ben Heddick photo (above)



Earth-shaking, roaring "gasser" could be heard for miles. Loud sounds may so distract photographer that he makes mistakes

press photographers and the "amateurs" who often beat them to the punch. Press management, however, usually looks with friendly eyes on the amateur photographers.

"Amateur" photos many a time have saved the day for a newspaper. Most newspapers and news-photo services have a standing offer for good photos of spot news, and members of their staffs have been warned against "growling" or "biting in clinches" with amateur competitors.

Sometimes the newsman and the amateur break even on arrival time, prowl their respective paths around the big event and come up with pictures in which the newsman is grievously outpointed. The disgruntled newsman may then see the amateur's pictures replace his in his own newspaper. That's when you'll hear another old complaint in the news-photo lab: "These amateurs have a million dollars to spend on equipment. They have the best cameras and every gadget money can buy. They're walking dictionaries on photography. They aren't amateurs! They're real experts!"

But a modest housewife with an inexpensive camera won the Pulitzer Award for Press Photography for 1953. Her "li'l old beat-up 15-year-old" camera took a sharp, clear picture of a truck and its driver hanging perilously from a high bridge.

"Just happened to be

Camera far back of fire lines caught this shot of hotel fire. Closer view would have cost the picture its foreground of people



Ocean waves make news sometimes—but may damage your camera. Fast “grab shots” need high shutter speeds

there,” said the press experts, enviously. “Just luck. Anybody there could easily have shot the same thing!”

The lamenting press cameraman, however, knows better than that. Through his own wide experience he realizes that luck alone won't get the picture for you, or deliver it to a picture editor. He knows that there are 10 *musts* in spot-news photography.

The 10 *musts* apply equally to professional news cameramen and their amateur opponents.

1. You must have your camera with you in working order.

2. It must be properly loaded with good film.

3. You must know your camera is focused sharply on the subject in regard to distance.

4. You must expose the

Pictures like this rescue of a young swimmer are not often secured by press photographers. Amateur must be ready for emergencies





Rescue workers in dory search for flood victims. Shot was taken at dusk with 1/10-second, wide-open exposure



H. S. Melvin photo

Dramatic evidence of earthquake damage makes good material for the amateur's camera. Below, a mother thrown to the street by a traffic accident tries to console her weeping youngsters. Certain types of pictures won't wait for the press photographer



film to enough light to completely register a picture-image while also stopping action.

5. You must aim the camera at the subject.

6. Your camera must be motionless while its shutter is open.

7. You must avoid accidents and oversights.

8. You must get enough facts about your picture to identify it—accurately and as fully as possible.

9. Your picture must be transported from the scene to the outlet which will use it.

10. Your negative must be properly developed and printed.

Each one of those 10 points is full of possibilities for *not* coming up with a spot-news picture on the editor's desk. To take a closer look:

You must have your camera with you in working order. If you don't habitually keep a camera near you, you won't have it in an emergency. Provide a dust-tight, insulated case to carry your camera in, in your automobile. If you have a large camera, too big to be handily carried, get a small, spare one which will slip into a pocket. Use your camera often enough to keep acquainted with it. Keep it in repair, ready for quick use.

It must be properly loaded with good film. Film past its expiration date (printed on the package) may still be good, but fresh film is a safer bet. Load film into your camera very carefully, in subdued light. If you don't, you may light-streak the film before you have taken a picture on it. There are fast films and slow films, black-and-white and color. You must know what kind of film you are

(Continued to page 242)



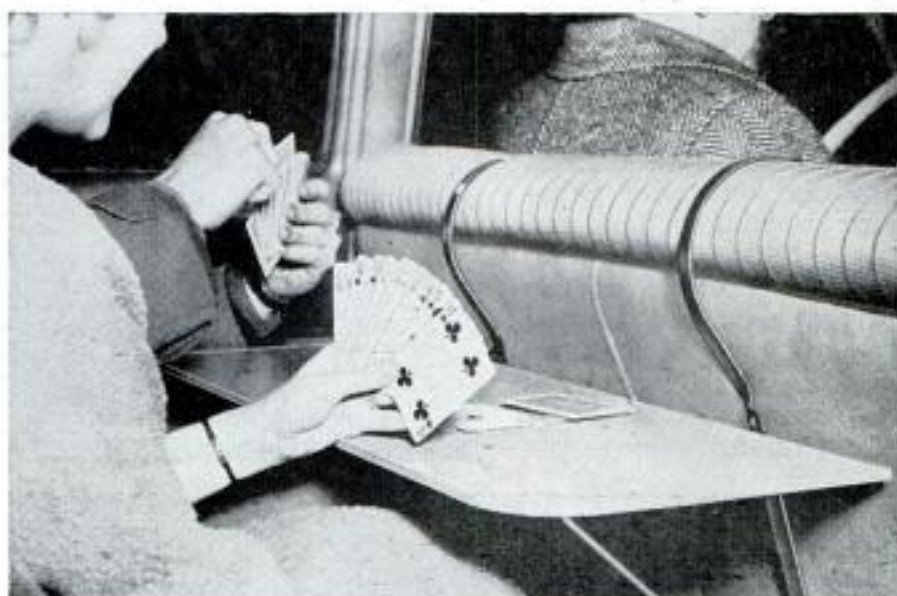
Italian Design Borrowed for American Executive Amphibian

Taking a leaf from the sports-car makers' book, a newly formed Milwaukee aircraft company plans to market a gull-wing amphibian combining Italian-made air frame and wings, American engines and other components. The plane, known as the Royal Gull, is a five-place, executive-type

amphibian. Wings and air frame are made by Italy's Piaggio & Co., while power comes from two 260-horsepower Lycoming engines turning pusher-type three-bladed Hartzell propellers. The aircraft is in the 180-mile-per-hour class and can cruise seven hours. It carries a 1940-pound load.

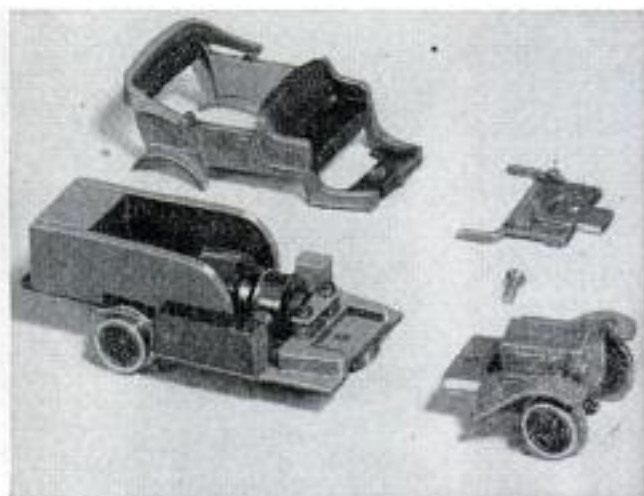
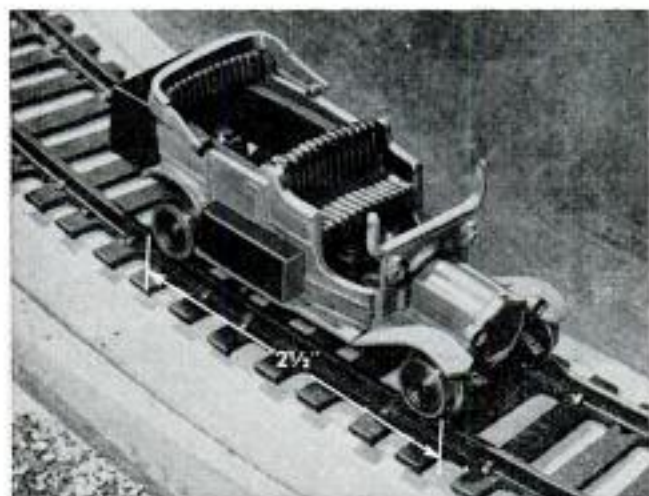
Rear-Seat Table

Metal straps suspend a sturdy table from the back of an automobile front seat, giving back-seat riders a chance to play cards, type, sew or otherwise amuse themselves. The 12 by 30-inch table top is resin-treated hardwood fiberboard finished in enamel. Hangers, legs and supports are sturdily made of steel. The table top can be folded down or the entire unit removed and stored in the trunk.



Reverse Pickaback

Semitrailers on flatcars are becoming common sights in the United States as more and more railroads adopt the pickaback method of moving less than carload freight, but in Germany the situation is reversed, and freight cars are mounted on trailers for movement through city streets. Lack of sidings hampered West German railroads until this method was devised.



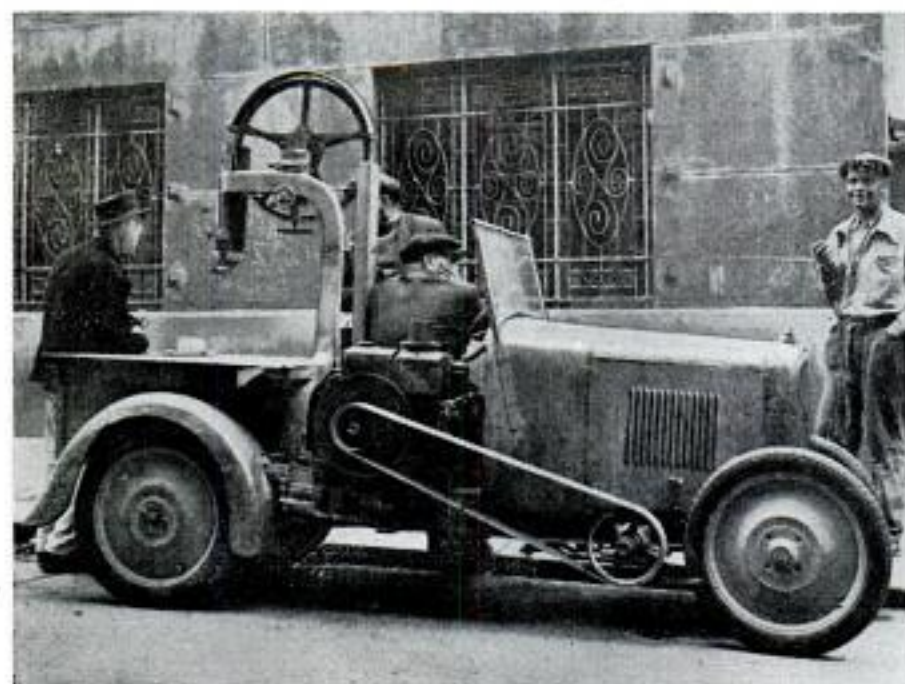
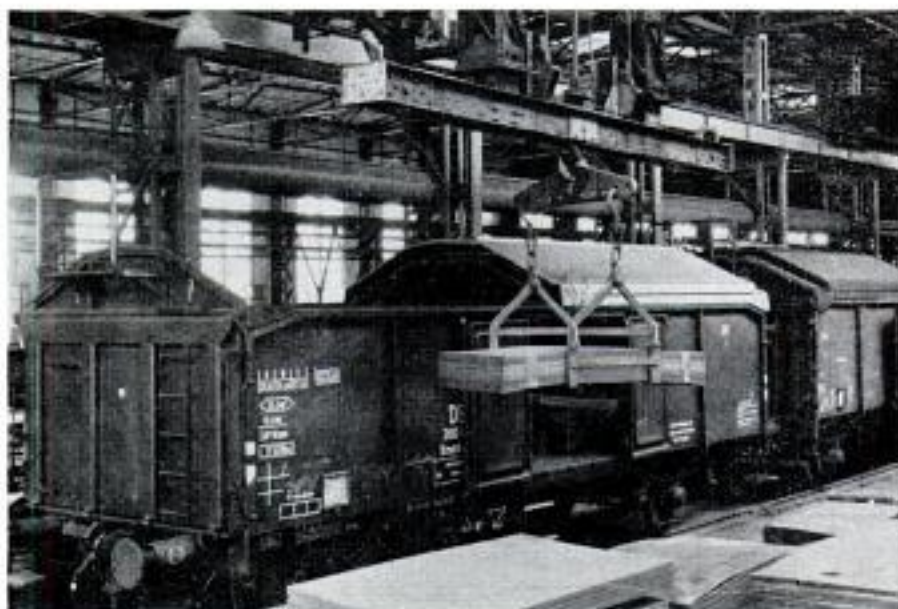
Model of Rail Auto Built for Assembly by HO Enthusiasts

Model-railroad fans can now obtain an authentic HO model of a rail automobile in kit form. The all-brass model is a copy of a 1907 Thomas Flyer once used on the

Diamond & Calder Railroad near Diamond Springs, Calif. It is powered by an electric motor and is quickly assembled by the purchaser from a few basic sections.

Sliding-Roof Cars Loaded From Above

Freight cars built in Germany have sliding roofs so large loads can be dropped into place from above. The roof is built in two sections which operate like sliding doors. Mounted on roller bearings, the roof sections can easily be moved by one man. The ends of the freight cars are hinged like the gate of a dump truck so the freight cars can be unloaded faster by tilting them.



"Car"-pentry Shop

Itinerant carpenters in Yugoslavia have used their ingenuity to build a traveling workshop. They mounted saws and drills on an old automobile and devised a system of gears and belts from an engine to power the tools. Now they can move their shop from door to door and even town to town in search of customers.

☐ Test pilots at a major aircraft plant flew 3,700,000 miles in 1953 to check new production models as well as for engineering test purposes.

HOW TO OPERATE YOUR

By Frank L. Brittin, W9DCX

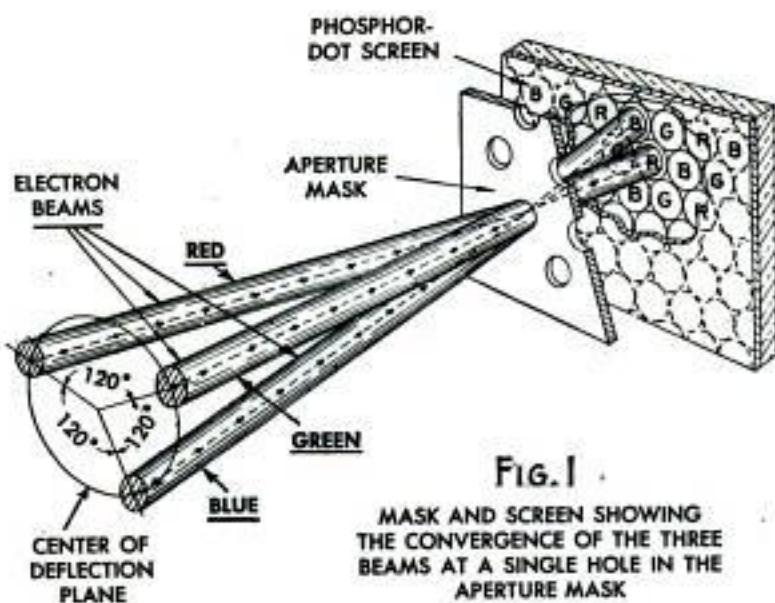


COLOR-TELEVISION receivers have been simplified in circuitry and the number of controls reduced to a practical minimum. Only two added controls need be adjusted by anyone, in the Motorola receiver illustrated, to turn a good monochrome (black-and-white) picture into beautiful "live" color provided that the program is being telecast in both mediums.

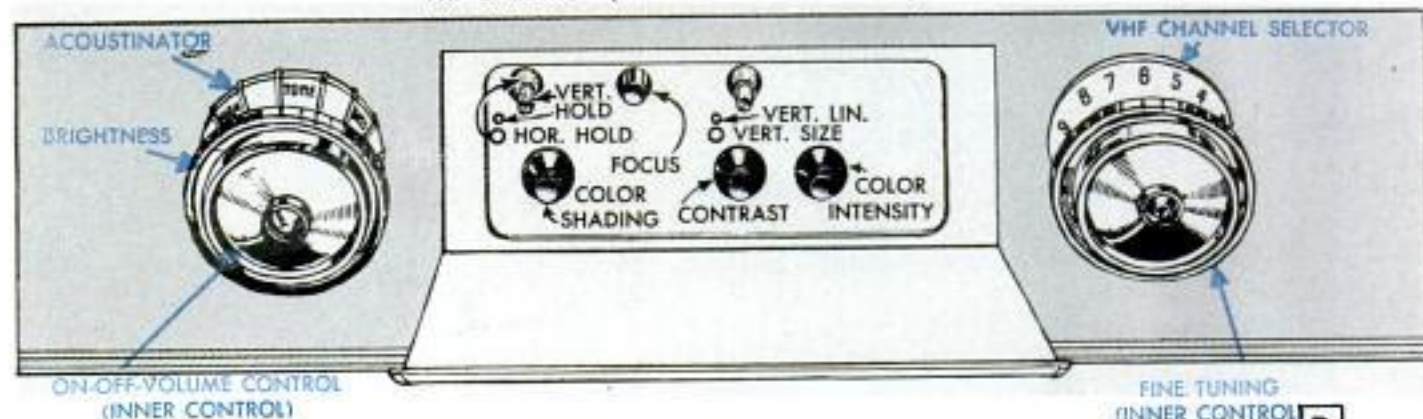
More than 75 percent of the nation's 30,000,000 TV households are now within the areas receiving color broadcasts. Live-color programming averages about 10 to 15 hours per week with several added hours of selected films in color. Tricolor-picture tubes with large screens have been perfected to a point where manufacturers no longer hesitate to get into full production. These tubes are now made in the popular 19 and 21-inch sizes. The Model 19CT1 Motorola color-TV set shown in photos A and C employs a 19-in. Hytron "205" tricolor-picture tube.

Many years of experimenting and field testing, by this manufacturer and several others, have gone into the development of color-TV receivers. Today the results are highly satisfactory when the programming is good and the telecasting meets the technical requirements. In this writer's opinion both CBS and NBC engineers have done, and are doing, an excellent job.

Early color telecasts leaned heavily on vivid greens, blues and reds. This distracted from story continuity as such emphasis on



VHF OPERATION (CHANNELS 2 THROUGH 13)



CONTROLS FOR MONOCHROME (BLACK & WHITE) RECEPTION

POPULAR MECHANICS

NEW COLOR-TV RECEIVER

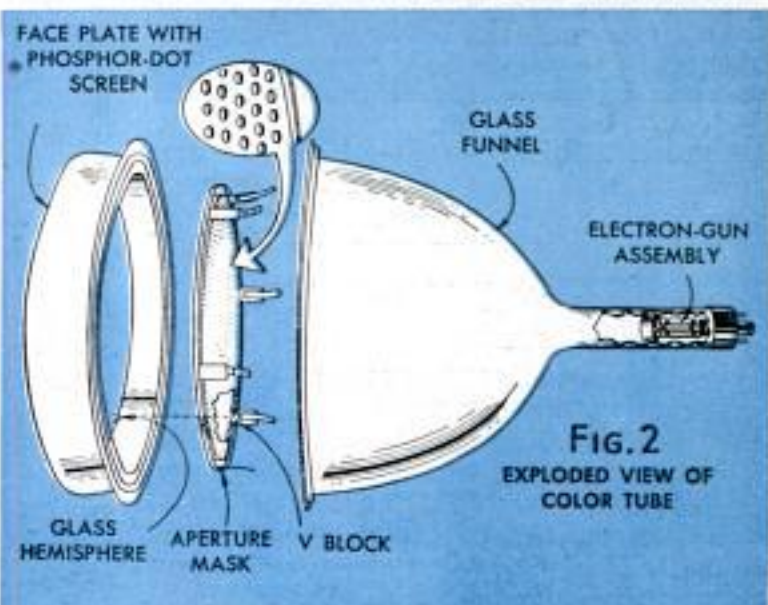
color was not natural or pleasing to the average viewer. Early color movies went through the same growing-up period. Today programming has been greatly improved and there are fewer complaints of "forced" color in either system. In other words: a poor program is not improved by receiving it in color.

It has been estimated that color-TV production for 1955 will be about 150,000 sets. In 1957 it should reach 3,500,000 and 4,500,000 by 1958.

As comparatively few color-TV sets are now in homes, you probably do not have yours as yet. However, as a reader of *Popular Mechanics Magazine*, you are interested in what they look like and what they do. Operation is easy and no technical knowledge is necessary. Sketch B shows all of the controls that are located on the front of the receiver. You will note that with two important exceptions they are no different from those found on most modern black-and-white-TV sets.

A color-television picture screen is composed of extremely tiny phosphor dots of three different colors, arranged in a regular sequence and the different dot colors are red, green and blue when lighted. An exploded view of the tricolor-picture tube is shown in Fig. 2, and a diagrammatic illustration of the mask and screen appears in Fig. 1. The screen dots are of such minute size that it is very difficult to see the individual dot colors even when viewed closely and the final result is a blending of the three colors to form a lighted screen of a particular tint. Note in Fig. 1 that the converging beams from the three electron guns, sketch G, pass through the hole in the aperture mask and strike their respective phosphor dots.

When the blue, green and red dots of the picture screen are mixed in the proper intensities, the screen will appear white to the viewer. It is on such a white screen, made up of these three different colors, that a black-and-white picture may be constructed. It is easy to see that a black-and-white picture is actually being formed on a colored screen, also that there is actually no black or white area on the screen. To



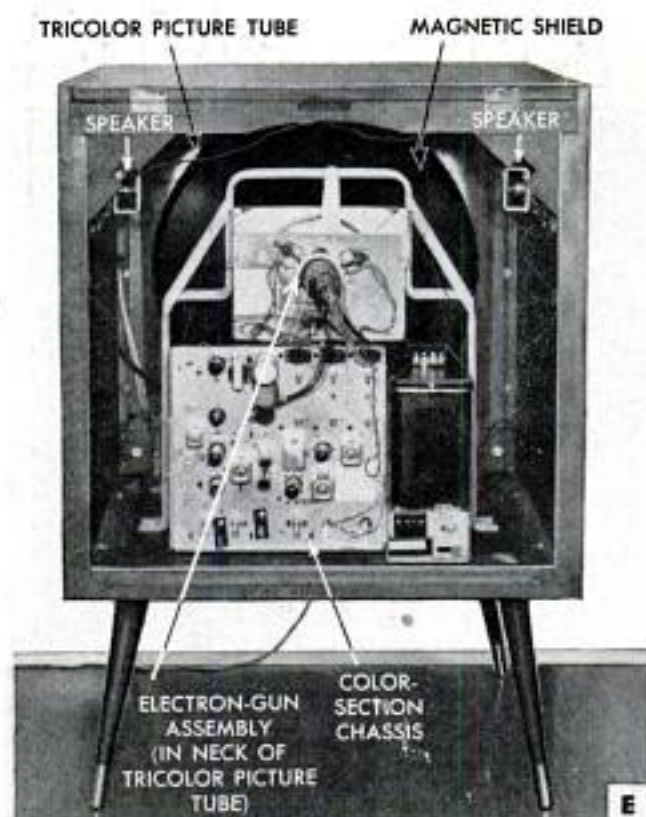
RECEIVING COLOR PROGRAMS

COLOR-INTENSITY CONTROL

Advance this control slowly to the right until color begins to appear in the picture. Continue to adjust the control until the desired strength of color is obtained. In some color-TV sets this is called the Chroma control.

COLOR-SHADING CONTROL

This really is a master control and is only operative when the color picture is on the screen. Adjust this control next for the most-pleasing and natural flesh tones or for some object having familiar coloring. The final touching up for best picture detail and most-satisfactory color reproduction is done with the usual fine-tuning dial at far right. If the fine-tuning control is not adjusted correctly the color may be removed from the picture.



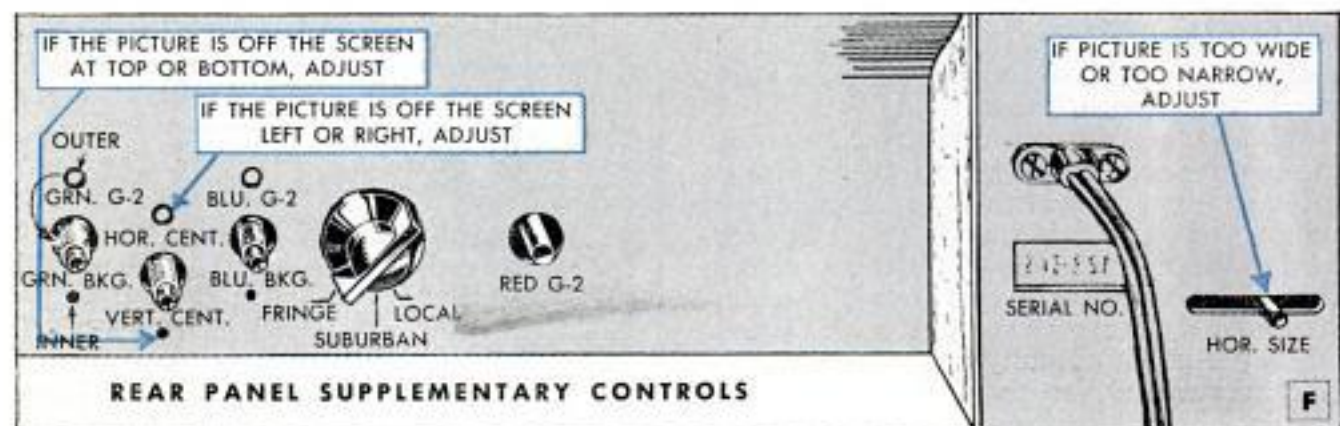
distinguish a black-and-white picture formed on a three-color screen from one formed on a regular white screen, TV engineers use the word "monochrome." This word will be used from now on to describe a black-and-white picture on the screen of a color-television receiver. The basic color adjustments are all made at the factory but it is necessary that the dealer's serviceman make the final convergence-coil adjustment and check the supplementary controls on the rear panel, sketch F, to correct any misadjustment caused by rough handling in shipment. This job is done by the serviceman who uses a color-dot generator which produces a pattern of small dots on the face of the color tube and provides a quick and easy method for making accurate convergence adjustments.

The first operating step on front panel B is to turn the receiver on by rotating the on-off-volume control to the right until a click is heard. Now, before advancing this

control, let the circuitry warm up for two or three minutes. In a color receiver this warm-up period is necessary in order to produce a good picture either in color or in monochrome. The three color channels require slightly different warm-up periods. After warm-up, advance this control for medium volume. Always adjust the receiver for a good monochrome picture first with color-intensity control turned off by counterclockwise rotation until stop is reached. Turn the contrast control to about the middle of its range; then adjust the brightness control until the picture screen is well-lighted. Now turn the channel selector to the desired channel number and adjust the fine-tuning control for best picture detail. Then readjust contrast control for most-pleasing picture. Adjust the acousticator (tone control) for tone desired. None of the other controls need be touched. The small undercover combination controls at top center are the conventional-TV picture-adjustment controls to be found on any television receiver and are seldom used. Now, if the program is being telecast in color on that channel, and you are getting a good monochrome picture on the screen, refer to the color-receiving controls in sketch D and follow the simple steps for receiving color programs. Any member of the family who can tune your present black-and-white-TV set, can operate this color set and get satisfactory results. Just remember to warm up the set first; adjust for the desired strength of color and then use the color-shading control for the most natural and pleasing flesh tones. After the color program is off, turn the color-intensity control completely off and you are all set for monochrome programs. These have an interesting background-lighting effect not found in regular black-and-white sets. The blacks are soft and velvety and the whites are pleasingly clean and clear.

Photo E shows a rear view of this Model 19CT1 color-TV receiver with the back cover removed. Note that the color-section chassis is mounted in a vertical position for

(Continued to page 258)



the POPULAR MECHANICS CRAFTSMAN



RAILROAD *in a* SUITCASE

WHEN FRANK BEATTY, *Popular Mechanics* art director, craves a bit of diversion, he dons his cap and bandana and loses himself in the operation of his Lilliputian railroad. Frank refers to his HO system as his "railroad in a suitcase" for he designed it so it can be folded in a compact case for easy carrying and storing.

Covering an area only 4-ft. sq., Frank's layout takes his fast freights through villages, mountain gaps and countryside in remarkable realism, as everything is in Tom Thumb scale. Every inch of space is put to use; even the top of a mountain lifts off to provide storage for some of the rolling stock. Except for the transformer, which is carried separately along with the rolling stock, all the scenery and parts of the layout are integral, with ample clearance being provided for the tiny buildings when the unit is folded.

Color photos by Don Honick, staff photographer

Right, storage for several pieces of rolling stock is provided inside corner mountain. Spackle-covered mountain top is held in place with two wood screws





Above, separate cover board fitted with handle (shown on floor) is used to hold two halves of folded unit together. Below, HO freight on elevated siding



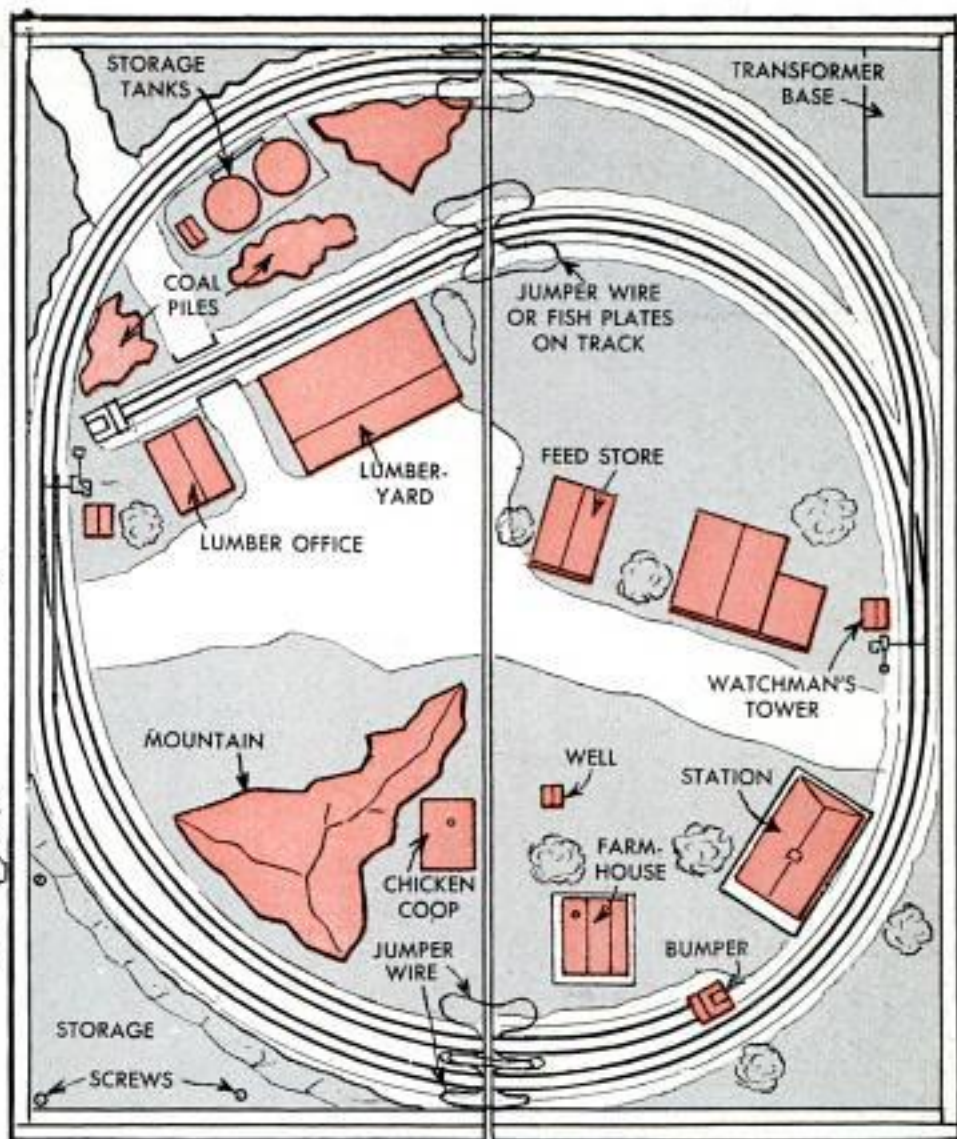
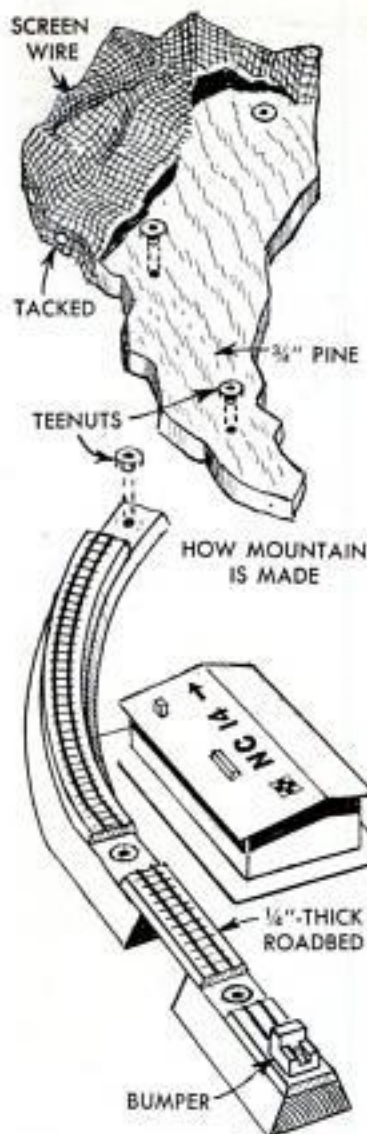
Frank's railroad is supported at chair height by four detachable pipe legs which are turned into pipe flanges screwed to blocks attached to the corners. Detached, the legs are stored on top of a cover board and held with either spring clips or short straps.

The general layout is shown in the diagram on the opposite page which also spots the location of the various buildings, mountains, shrubbery, etc. The curve sections of the track are laid out on a 20-in. radius, using standard wooden roadbed which is sold in hobby shops. The pull-apart drawing on page 166 shows how the "suitcase" is made. The bottom consists of



LUMBER OFFICE

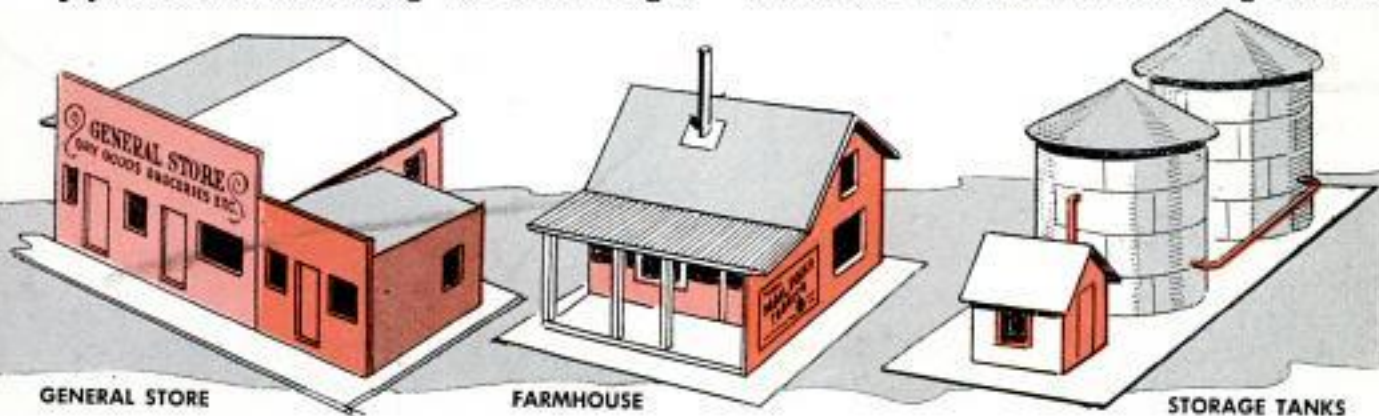
WATCHMAN'S TOWER

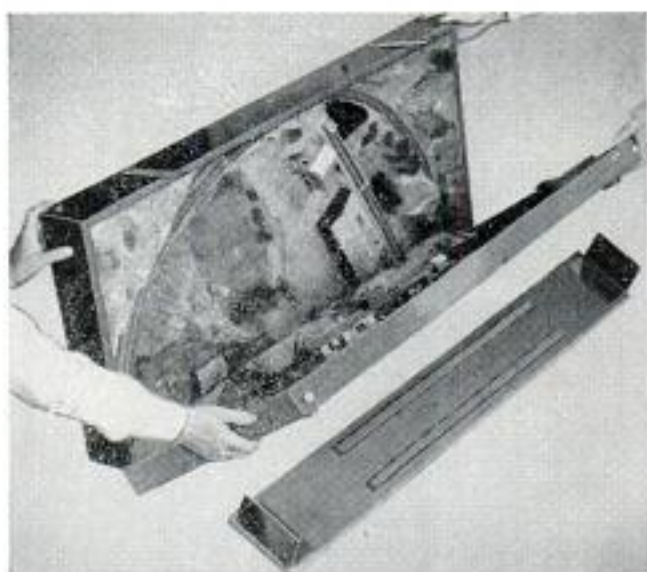


two sections of $\frac{1}{4}$ -in. plywood which are spaced $\frac{1}{16}$ in. apart with two sheet-metal straps held with screws. The straps are removed for folding. A strip of cloth tape, tacked to one side only, is placed over the joint. One section of plywood is framed on three sides with pieces of 1 x 4, while the other section is framed with pieces of 1 x 2. Both sections are held together with 1 x 2 cleats, bolted across the ends. These cleats are made removable and are bolted to a cover board during storage. Teenuts have been used for all bolts as they permit flush mounting. Reinforcing cleats, $\frac{1}{2} \times \frac{3}{4}$ in., are glued and nailed to the bottom of the plywood sections along the outer edges.

The cover board, which is fitted with a suitcase handle and a sheet-metal bracket at each end, holds the two sections together when they are dismantled. Registering holes to match those in the brackets are made in both sections for bolts and Teenuts. Two cleats on the underside of the cover board provide extra rigidity.

The mountain storage compartment is formed in one corner of the layout with plywood and fitted with a triangular wooden cover held with two screws. Then regular plaster-patching compound called Spackle is applied with a spatula to simulate rocks and typical mountain terrain. The other mountain in the foreground is

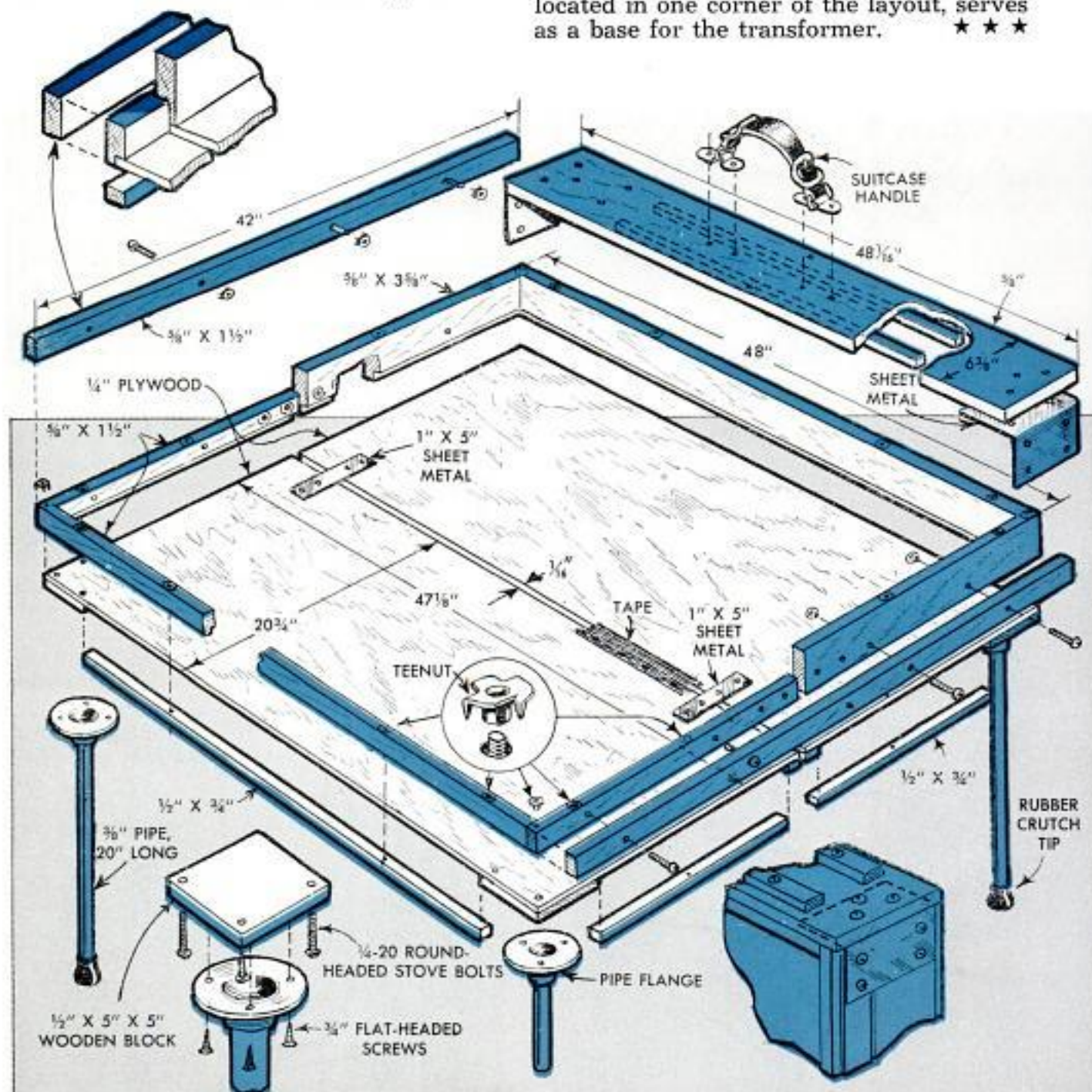




Flat-iron straps hold both halves together on one side while a cover board bolts to the opposite side

formed by tacking screen wire to an irregular wooden base, forming the wire into peaks and plastering it with Spackle.

The track roadbed is elevated 1 in. from front to rear of the layout to provide a gradual grade and allow underpasses to be formed under the raised portion as well as the lumberyard siding. Spackle is applied to the sloping sides of the roadbed, after which it is painted appropriately and finally coated with varnish and sprinkled with sand when tacky. The road through the town is treated similarly, and "grass" is planted by sprinkling packaged hobby-store grass in wet shellac or varnish. The various buildings are glued permanently in place. Where the track layout crosses the joint in the plywood, regular fish plates or jumper wires may be used to wire the abutting ends of the track. A wooden block, located in one corner of the layout, serves as a base for the transformer. ★★★



Cork Inserted in Vacuum Bottle With Aid of Toothpick



An ordinary wooden or plastic toothpick can be used to relieve the vapor pressure which makes it difficult to insert the cork in a vacuum bottle filled with hot liquid. The toothpick is held alongside the cork as it is pushed into the bottle and allows the excess pressure to escape.

The toothpick is removed when the cork is in place. The cork should be moistened before it is inserted in the bottle.

Henrietta Muller, Danboro, Pa.

Child's Broom Used to Clean Snow Off Auto Windshield

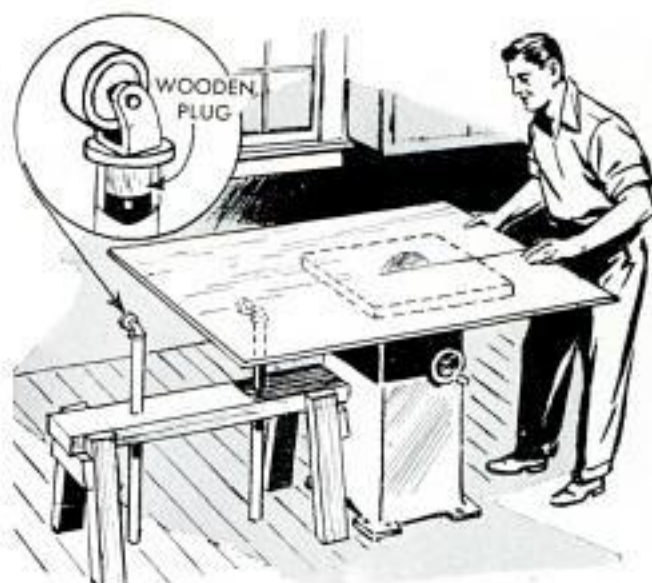
A child's toy broom carried in your car during winter is handy for cleaning snow from the hood, windshield and rear window. The long handle enables you to clear away the snow without getting it on your clothes. It is also useful for sweeping out snow which has been tracked onto the floor of the car.—R. M. Woodbury, Natick, Mass.

Inexpensive Negative File Utilizes Cigar Box

An ordinary cigar box, similar in size to the one shown, will provide an inexpensive, durable file for storing negatives up to 116 in size. Cataloguing of the negatives, which should be kept in kraft-paper or glassine envelopes, will be simpler if cardboard dividers having appropriate data written across the top edge are used to keep the negatives separated.



JANUARY 1955

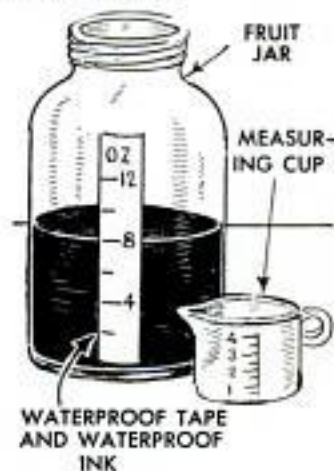


Plywood Supported on Saw Table By Pipe-and-Caster Assembly

When ripping plywood on a bench saw, additional support for the plywood sheet can be provided by a pipe-and-caster assembly, as shown. Wooden plugs are driven into the ends of two lengths of pipe and then drilled to take casters. Holes are drilled in the cross member of a sawhorse in which the pipes are inserted. In use, when the plywood extends beyond the saw, the work rolls across the casters. For extra-wide work, two of these assemblies could be used side by side, or a single one can be turned parallel to the saw table.

Graduate for Home Workshop Improvised From Fruit Jar

A graduate for mixing various solutions needed around the home workshop can be improvised from a glass fruit jar. Attach a strip of waterproof adhesive tape vertically to the jar and mark it with waterproof ink. To accurately mark the volumes, use a kitchen measuring cup to pour water into the jar in measured amounts. For a quart jar, every 4 oz. would be precise enough. For 1-oz. measures, use a smaller container, such as a small mayonnaise jar.



Hugh Lineback, Stillwater, Okla.

When the color cakes of a child's water-color set come loose from their backing, they can be stuck in place again with clear nail polish.

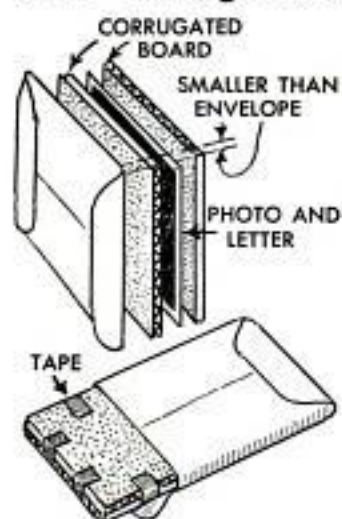
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Condensation Inside Metal Window Prevented by Extra Storm Sash



Condensation appears on the frames of some metal casement windows, even when the regular metal-framed storm sash is installed, because the window frame is not completely covered. One way to overcome this problem is to install an inside storm sash which covers the entire window, and is spaced 1 or 2 in. away from it. The storm sash should fit the window opening snugly and be provided with felt or rubber gaskets on all four edges. The sash is kept in place by screws which pass through it and into tapped holes in the metal frame of the window. Sleeves fitted over the screws hold the storm sash the proper distance from the window.

Photographs in Mail Protected With Corrugated Cardboard

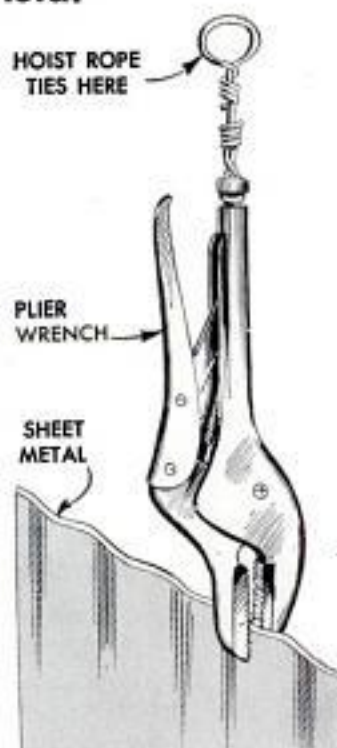


When mailing photographs or artwork, use corrugated cardboard instead of flat cardboard. The corrugated material is not only stronger, but lighter, so it will save on postage. Cut the pieces slightly smaller than the size of the envelope, and also cut them so that they can be inserted in the envelope

work between the sheets of cardboard, fasten strips of tape over the edges to keep them together and to prevent the work from slipping past the edge where it would be damaged.

Plier Wrench on Hoist Rope Lifts Sheets of Metal

When hoisting flat or corrugated sheets of metal or other material to the roof of a building, a plier wrench will provide a quick and convenient way of attaching the sheets to the hoist rope. One end of a length of strong wire is twisted tightly around the adjusting screw on the plier, then the other end is formed into a loop through which the hoist rope is tied.—Howard R. Clark, Springdale, Ark.



Containers for Lens Filters From Fishhook Boxes

Small round boxes of the type in which fishhooks are sold will come in handy for storing and carrying lens filters. Transparent tops set in plastic slip-on covers make it possible to identify the filters without removing the covers. For added convenience, cement one of the boxes to the camera, so a filter is carried with the camera.

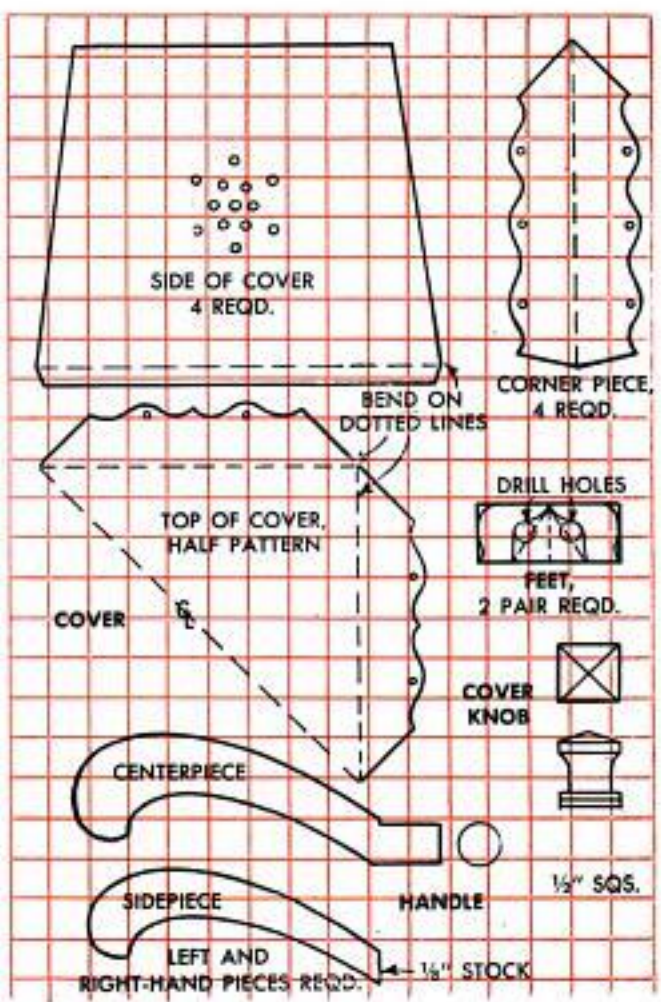
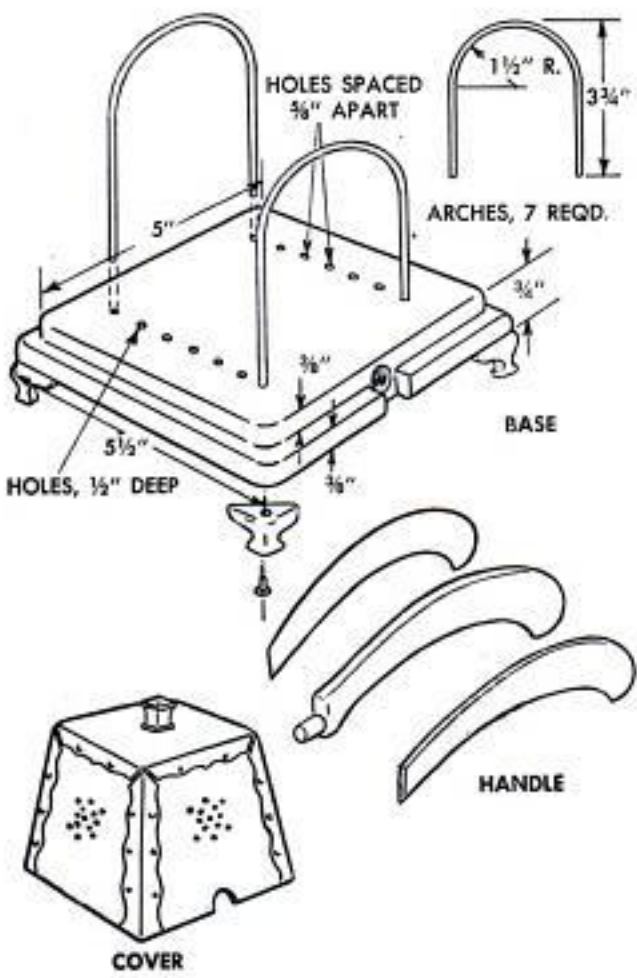
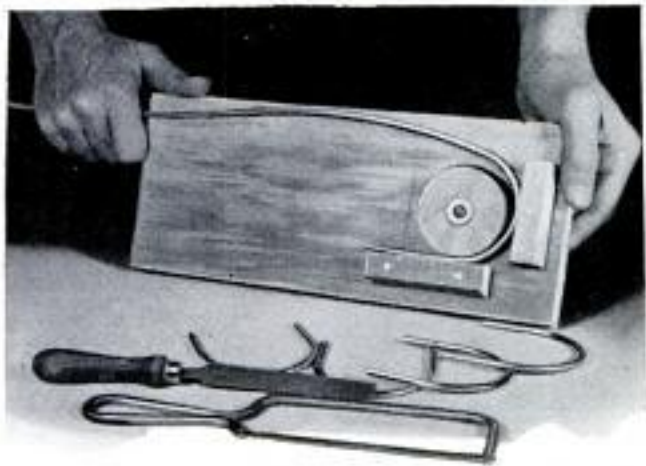
Eugene Lee Burner, Morgantown, W. Va.



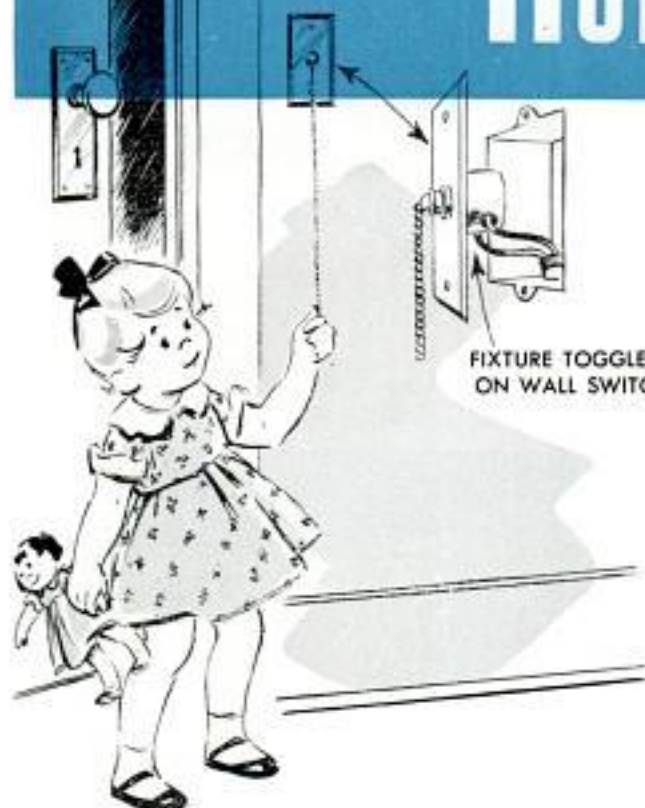


TOAST RACK with a COZY

FOR PRACTICAL as well as decorative reasons this toast rack, which is a replica of an old English toast cozy, is a fine project for the craftsman. It will keep toast warm for quite a while and, at the same time, prevent it from becoming soggy. The cover is made of sheet metal cut from ordinary cans and then peened and burnished. It is assembled with rivets. The arches for the rack are of heavy wire bent to a uniform curve by means of the simple bending jig shown in the photo. The base and handle should be made of hardwood for durability.

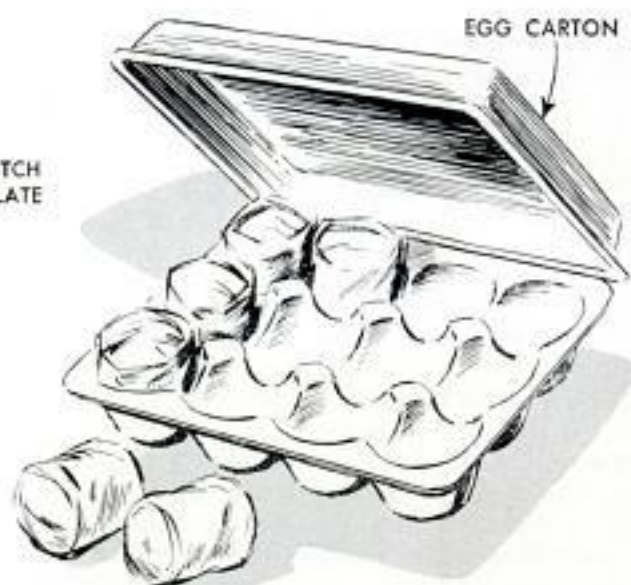


Solving Home Problems



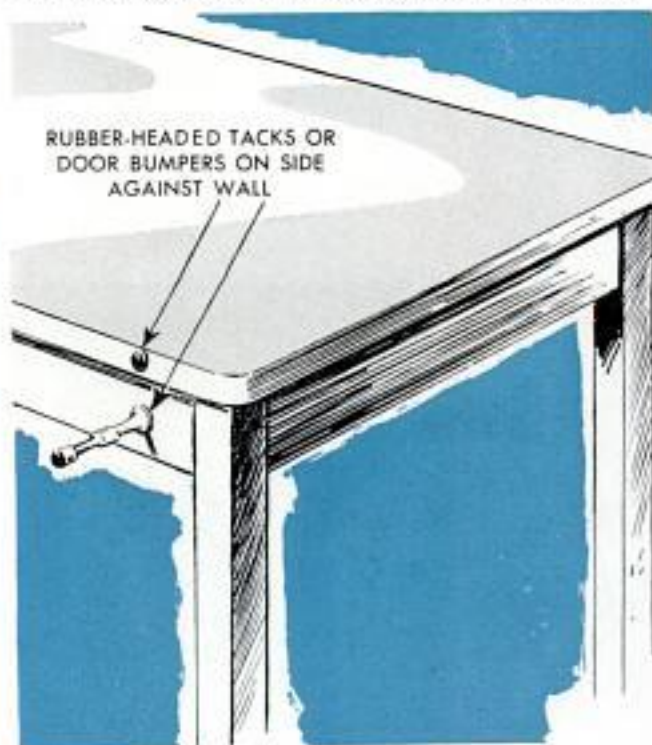
YOUR CHILD can operate the light in his room without the need of climbing on a chair if you replace the regular push-button wall switch with a fixture-type toggle switch. Simply connect the wires to the toggle switch and attach it to the old switch plate

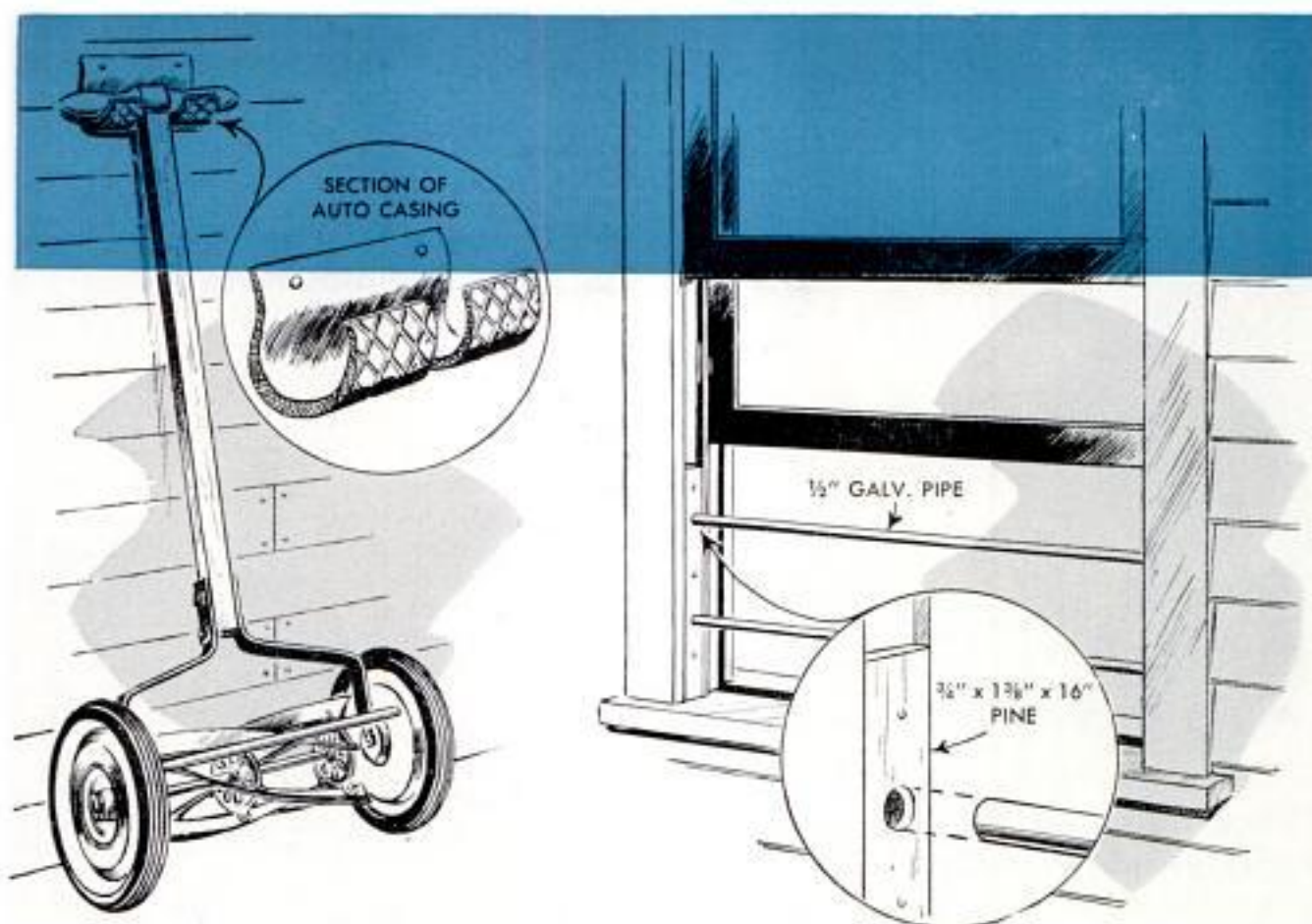
WHEN USING A FUNNEL to fill narrow-necked bottles, you can avoid overflowing of the liquid with this stopper. It is made by inserting a length of stiff wire in a small rubber ball. The ball is pushed down to stop the flow of water when the bottle becomes full



BABY'S SOCKS won't be lost among the clothes in the drawer where they are kept if you use an egg carton as a sock tray. Give it a coat of shellac, then one of enamel and, finally, another coat of shellac. Roll each pair of socks tightly for storage

SCRATCHES on a kitchen wall, caused by a table being pushed against it, won't be a problem anymore if large rubber-headed tacks or door bumpers are fitted to the table. Attached to top of legs or to apron, they extend far enough to prevent contact



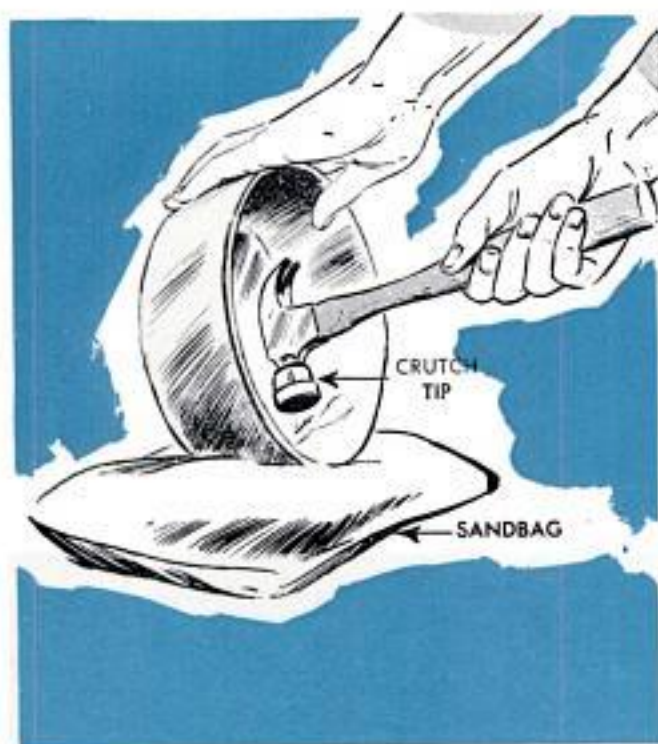


THE LAWN MOWER will occupy less space if stored against the garage or shed wall with the handle supported vertically. To hold it in this position, cut a section of auto-tire casing and notch it as shown. Nail it to the wall at the height of the handle

TO PREVENT the possibility of small children falling from second-story windows, one homeowner installed protective bars. The bars are lengths of $\frac{1}{2}$ -in. pipe cut to the window width and set in holes drilled in pine spacers attached inside the upper sash track

DENTED KITCHEN POTS and pans can be restored easily. First, fill a small sack with sand. Next, slip a rubber crutch tip over your hammer head. Finally, hammer the dents out from the inside of the utensil while dented portion rests firmly against the sandbag

A GLASS JAR having a metal or plastic screw cap can be converted into a handy holder for a ball of twine and a pair of scissors. Cut a slot near one side of the cap to hold the scissors and punch a hole in the center of the cap for dispensing the twine

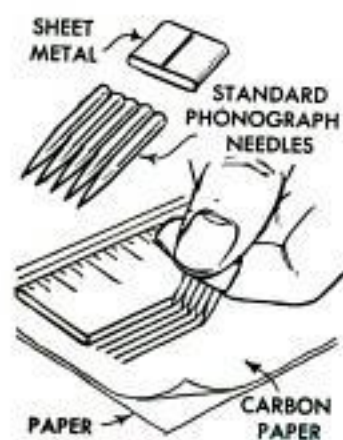




Hinge Modified as Spring Latch Locks Window in Open Position

A double-hung window sash cannot be opened from the outside when it is held by a lock made from a T-hinge and a length of flat steel. The short leaf of the hinge is screwed to the top edge of the lower sash so the long leaf will contact a length of flat steel screwed to the side member of the upper sash. The hinge then is fitted with a flat spring, as shown in the detail. The top end of the long leaf is filed to a narrow width and bent at right angles to fit into holes drilled in the flat steel. Positions of the holes in the flat can be varied to suit individual requirements. When the window is opened from either top or bottom, the spring-loaded leaf is pulled back, then released to fit into the hole corresponding to the opening of the window. The lock also can be used on horizontal-sliding windows.

Five Dulled Phonograph Needles Provide Music-Staff Scriber

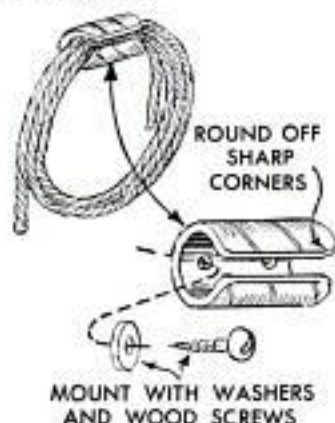


Music students and musicians who have frequent occasion to copy or transpose music can make a simple staff scriber by soldering five phonograph needles in a sheet-metal holder. When the assembly is soldered, rub the points of the needles against

a piece of emery cloth to dull them. This prevents the needles from cutting through the carbon paper over which they are drawn to produce carbon lines on blank paper underneath.

Wall Hanger for Rope Coil Cut From Radiator Hose

A short length of automobile-radiator hose can be utilized as a handy wall hanger for a coil of rope or line. Slit the hose lengthwise and round off the corners at the ends of the cut to permit easy insertion and removal of the rope. Punch two holes in the hose and screw it to the wall, using washers under the screwheads.



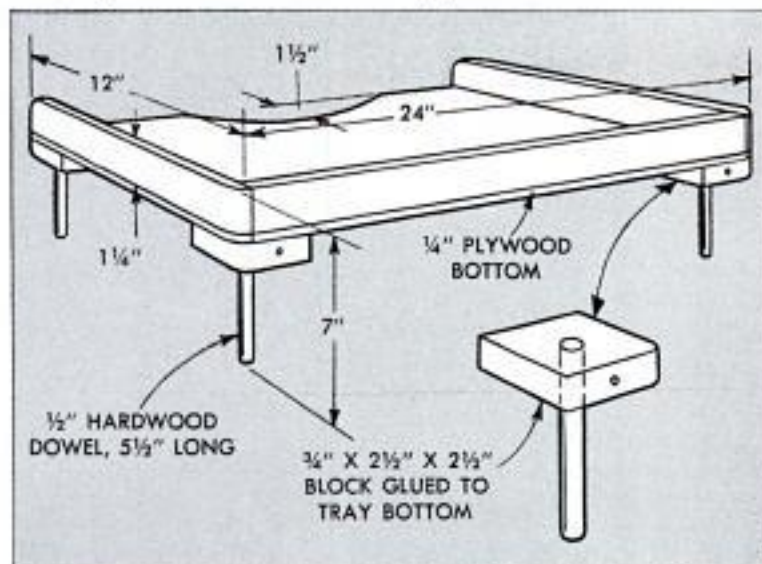
Norm Jacky, Fond du Lac, Wis.

Photo-Developing Time Reduced By Utilizing Washer Agitator

The job of agitating a film tank during lengthy fine-grain processing can be simplified by utilizing the agitator of a washing machine. A bolt that fits the threaded hole in the agitator shaft is used to bolt a block of wood to the shaft. The tank is held on the block with clips shaped from coat-hanger wire. Development is so efficient that the time can be reduced approximately 10 percent. In the case of Microdol, for example, developing time can be cut from 16 to 13 min.—Turk Smith, Phoenix, Ariz.



Simple Bed Tray You Can Make in One Evening



This simple and attractive lap tray will help mother in a dozen ways around the house to save time and eliminate extra cleaning, especially in the sickroom. Complete meals can be placed on the tray and carried to a bedridden child or adult, then placed on the bed over the patient's lap. Between meals, the cleared tray can be used as a play surface for a youngster or as a card or writing table for an adult.

The suggested dimensions for the tray

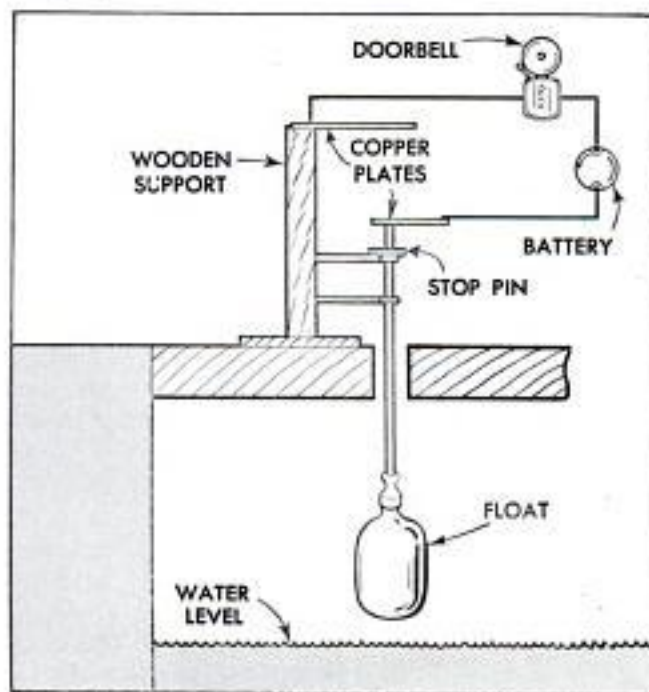
can be varied to suit the individual needs, but care should be taken to see that it is not so large as to be awkward to handle the tray nor so small that it is impractical. The cutout at the back of the table top, which allows the tray to fit closer to the person using it, was cut with 1 1/2-in. radius on the original. This size is all right for a child, but might have to be increased for an adult. For purposes of storage, the dowel legs of the tray could be removable.

Alarm Warns of Sump-Pump Failure to Prevent Basement Flooding

A flooded basement may be prevented by this alarm installed in the sump tank to give warning if the pump fails to operate because of some minor defect. The alarm system is actuated when the water level in the sump reaches a predetermined height, which raises the float so the copper

plate on top of the float rod contacts the plate fixed to the wooden support. This connection closes the circuit which causes the doorbell to ring. The doorbell may be powered by a 6-volt battery or other 6-volt supply source. The wooden support for the alarm is simply a 2 x 4 with two long screw eyes set in it so they align vertically to assure free motion of the float rod. A stop pin keeps the rod from dropping too far. A pump that seldom runs may become inoperative because the float rod has become corroded so it cannot raise with the float and close the switch, or the electric motor itself may become "frozen." A preventive measure to assure that the pump will operate properly when necessary is to fill the sump with water every couple of months and allow the pump to empty it.

George P. Schmid, Deerfield, Ill.



Shellac Sizes Plaster Patches

To do a finished job of painting over patched plaster surfaces, sandpaper the patched areas when completely dry and then apply a coat of shellac. The shellac will size the porous plaster and prevent absorption of the fresh paint.

I. M. Fenn, Chicago.

UNUSUAL SMALL BOAT



Above, this little boat is seven feet of safe water fun for children. It's good looking and easy to use



The boat has many uses; among other things it can serve as a picnic table, as above. Below, with the three sections nested, it makes a compact package that is lightweight and fits into most car trunks



By H. W. Bull

HERE IS A SMALL BOAT, which divides into three sections, that is designed primarily for children's fun. It is safe, lightweight and, in addition to boating, can be used as a picnic table or as a back-yard wading pool. For ease of handling and carrying, the three sections of the boat nest one inside the other, making a compact package small enough to fit into the trunk of a car. The boat has unusually good stability, provided by a flat bottom and very wide beam. The heaviest section weighs only 32 lb., and the total weight of all three sections is only 76 lb., all of which make for easy handling and transporting.

The boat is constructed of $\frac{1}{4}$ -in. exterior plywood throughout. Every effort was made to be economical in the use of this material, and all of the plywood parts can be cut from one 4 x 16-ft. sheet if desired, as shown in Fig. 4. Note dotted lines on ends of sidepieces in pattern. This indicates waste material which should be cut off after each side is in place on the boat. The frame is made from hardwood. On the original model, the chine molding and cross members were cut from white-oak flooring and the uprights were cut from beech. The dimensions of the chine, frame and upright members are given in Fig. 3.

The first step in the assembly of the boat is to cut out all of the plywood pieces. Check over-all dimensions in plan view,

WTM 56

Fig. 2. Next the $\frac{3}{4}$ x 1-in. cross members are installed. They are glued to the bottom sheets and held by $\frac{3}{4}$ -in. No. 7 flatheaded brass screws driven in every 2 in. Note that cross members are set in $\frac{5}{16}$ in. from the ends to provide a seal for the partitions to be installed later. Now the chine pieces are cut to size. To make them easy to bend to the shape of the plywood bottom, rip each of these lengthwise vertically through the center. The outer half of each chine is then glued and screwed in place, being bent as you go. The inner half is then placed against the outer piece and fastened to it and to the bottom with glue and screws.

The bulkheads, bow and stern pieces can now be installed. They are attached to the bottom frame and the upright members of the frame are attached to them and to the bottom frame. Then temporary braces are used to hold the endpieces at the proper angle, as shown in the photo on page 177. With this much of the three sections of the boat complete, they are placed on the floor and, with cardboard between them to provide $\frac{1}{8}$ in. of spacing, they are clamped together while the sides are put on.

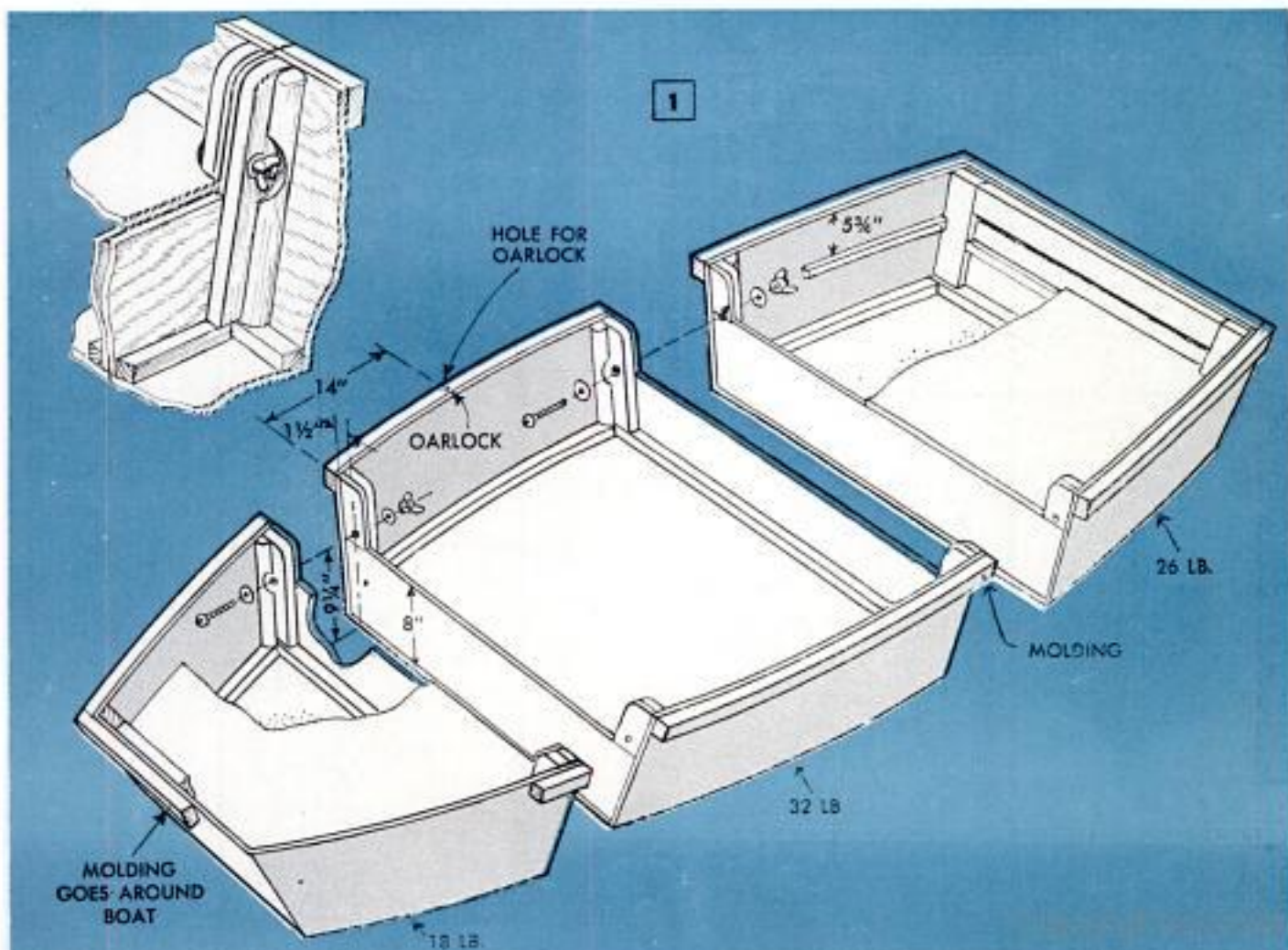
The sides are temporarily positioned on the boat. They are held in place by drilling holes through the excess material at the ends of the sidepieces and running wires through them. The wires are drawn taut between the two sides until the sidepieces are drawn snugly against the uprights. Once they are in position, they are care-

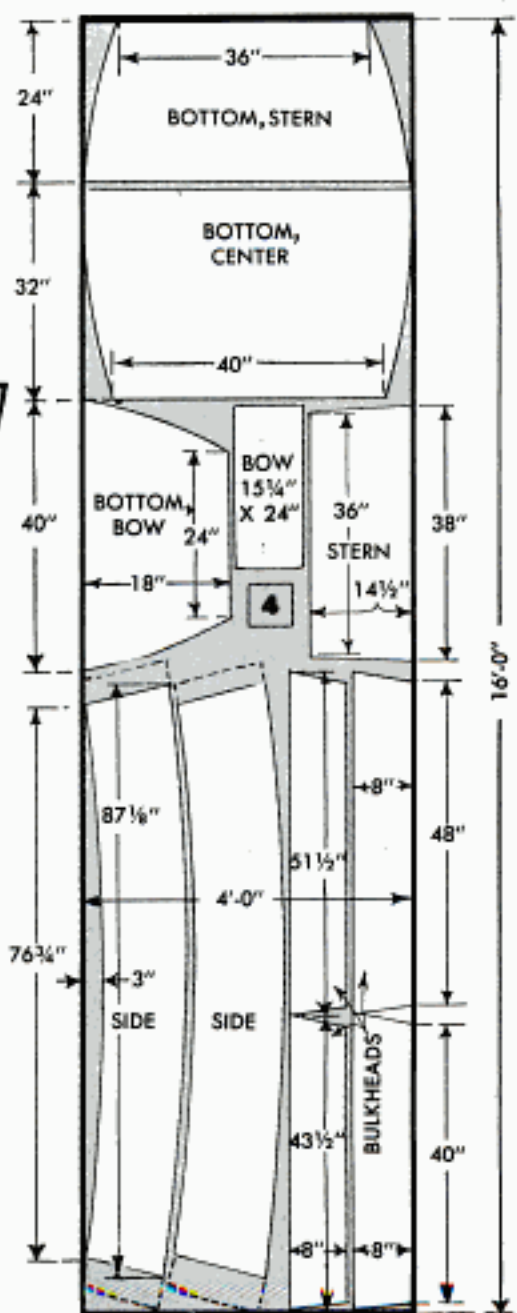
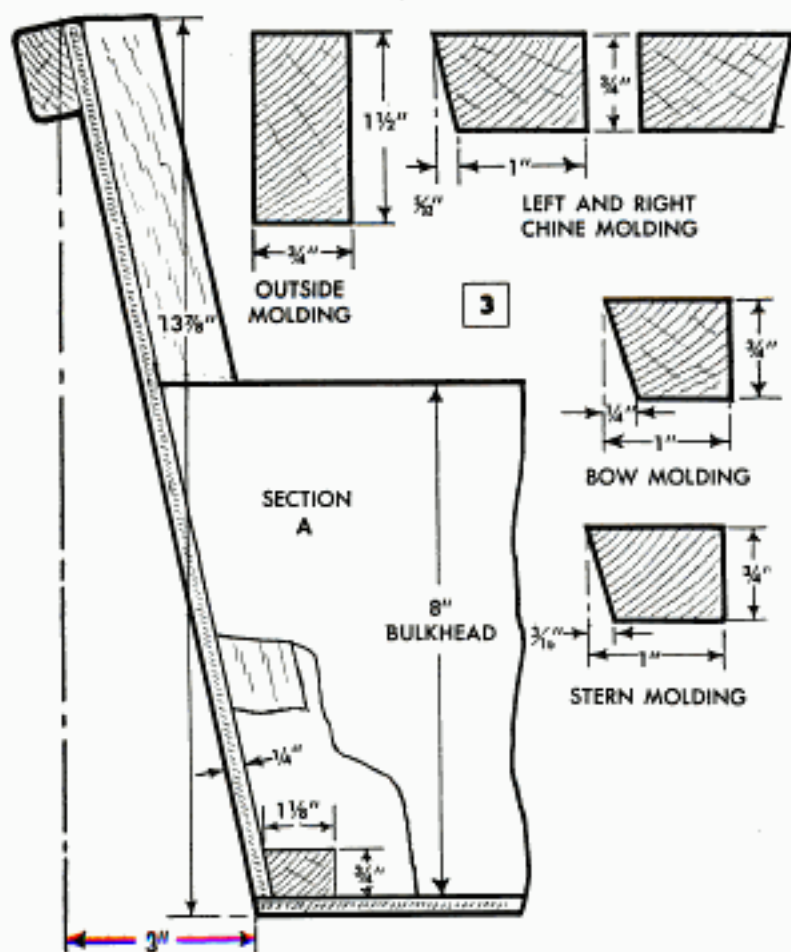
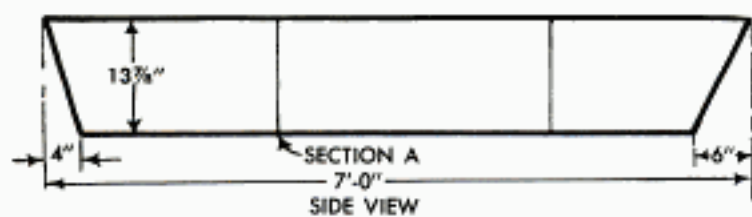
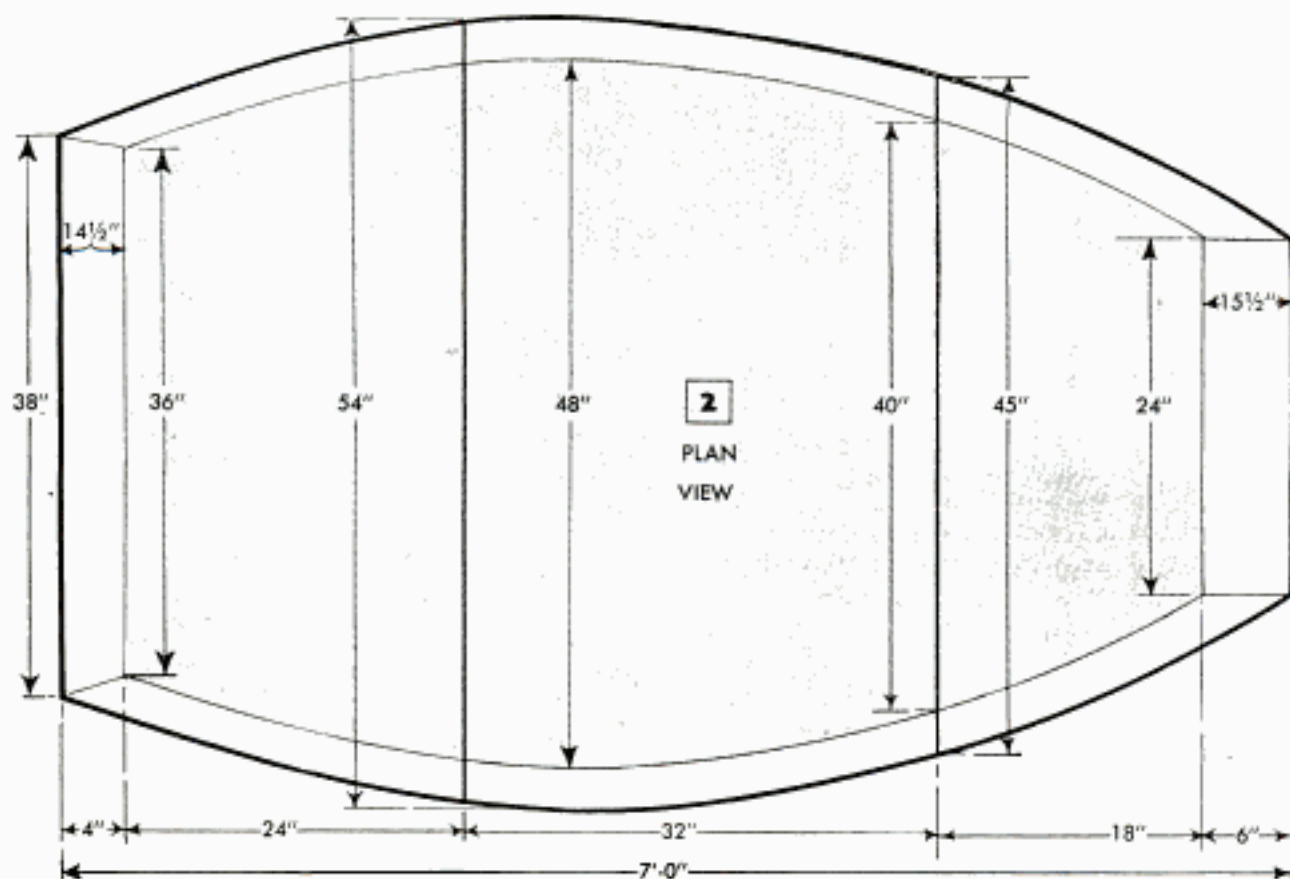


When you can't take the boat to the water, bring water to the boat and you have a little wading pool

fully marked and removed. Along the top and bottom edges, the sides are cut to within $\frac{1}{16}$ in. of the marked line. The ends are not cut, since they must be used to hold the sides in place as the glue sets. Once the sides are trimmed, they are replaced on the boat, held once again by the wire. All joints are flooded with glue, and then screws are driven 2 in. apart into all of the upright members and into the chine molding.

The outside molding is now put on. The bow and stern moldings, see Fig. 3, are installed first. The side moldings are ripped in half lengthwise so as to be easier to bend around the curve and held with screws driven from the inside of the boat. Note





that the stern molding is made wider so that it will support an outboard motor.

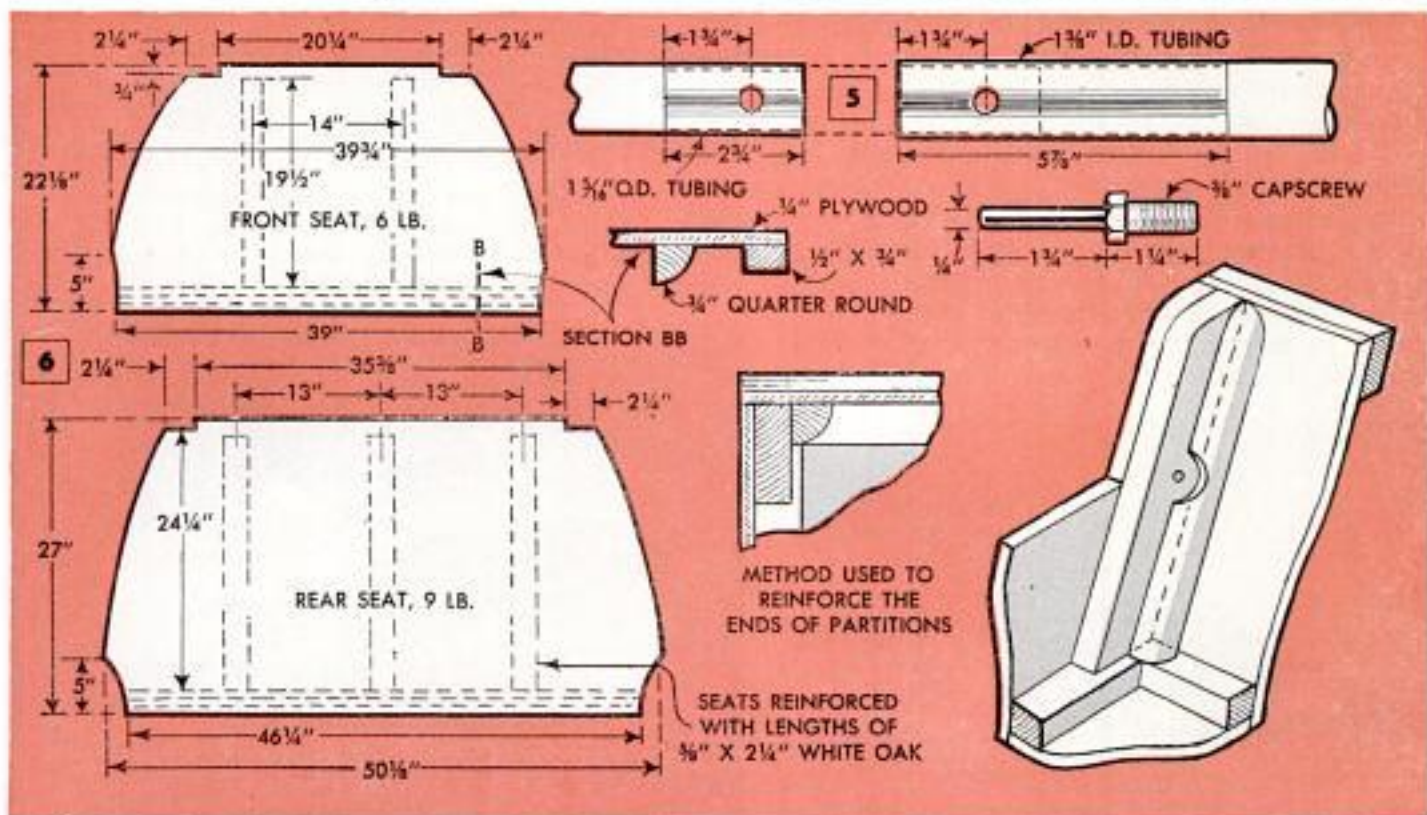
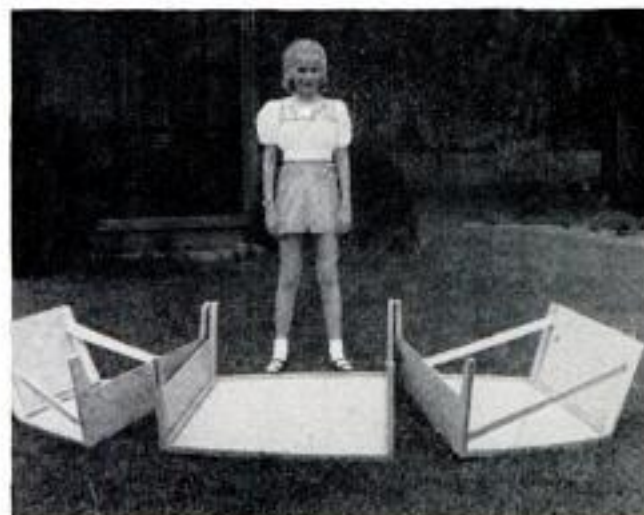
When all the glue has dried thoroughly, the three sections of the boat are cut apart by sawing the sides through at the junction points. The excess material is trimmed off the ends and all edges are sanded smooth. The three sections are held together with clamps while holes are drilled for the bolts and wing nuts which hold the sections together. The holes are $\frac{9}{16}$ in. in dia., and into these are fitted $\frac{1}{2}$ -in. cap screws, 2 $\frac{1}{2}$ in. long. The screws are fitted with standard wing nuts and washers.

The seat rails are $\frac{3}{4}$ -in. quarter round, and 1 $\frac{1}{4}$ -in. quarter round is installed to strengthen upright members and notched to clear the wing nuts. The seats are cut from ordinary $\frac{1}{4}$ -in. plywood, and another section of floor is cut for the center section of the boat from the same material. See details in Fig. 6. This floor is glued in the bottom of this section because of the hard wear it gets. To prevent excessive wear on the underside of the bottom, two strips of $\frac{5}{16}$ x 1 $\frac{1}{2}$ -in. white oak were run the length of the bottom, spaced 24 $\frac{1}{2}$ in. apart. The boat was finished by sanding it completely and staining a deep red mahogany. The molding was painted green. Several coats of spar varnish completed the boat.

Collapsible oars are made by sawing 7-ft. softwood oars in half and fitting them with aluminum ferrules as shown in Fig. 5. Small tubing fitted to the end of one oar section fits into larger tubing fitted to the other oar end. The two are held together by a cap screw. The position of the oarlocks is given in Fig. 1. ★ ★ ★



Above, the three sections are nested. Below, the boat is ready to have sides put on. Note that bow and stern are held at proper angle by temporary braces. Next step is to clamp sections together



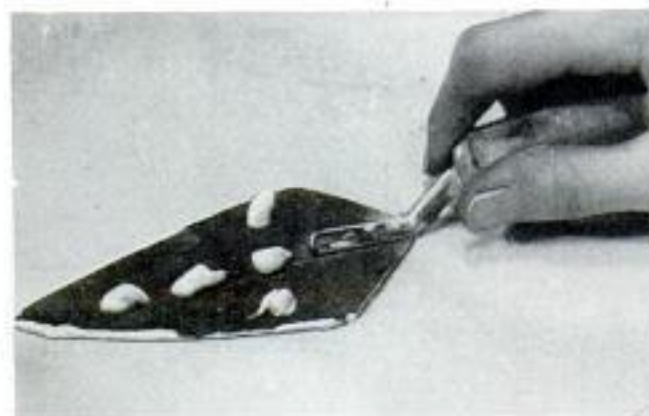


Notebook Lists Home Repairs

A small notebook and pencil tied to strings and hung on a nail next to the workbench are used by one family to keep Dad aware of needed home repairs. Whenever a member of the family notices a needed repair he drops by the workshop and jots it down in the book. Checking through the book also gives Dad the chance to order needed parts and supplies, such as hinges and brackets, ahead of the time he will use them.—B. Ainslie, Ottawa, Can.

Holes Drilled in Trowel Blade Remove Excess Plaster

Amateur plasterers often have difficulty in removing excess plaster from a patching job without gouging out too much and breaking the key to the laths. A number of $\frac{1}{4}$ -in. holes drilled in the trowel, as shown in the photograph, will allow the excess plaster to be forced through the trowel as the plaster is leveled, thus maintaining a smooth surface. A regular trowel should be used for the finish troweling of the whole patch to assure a smooth surface that will align with the wall.

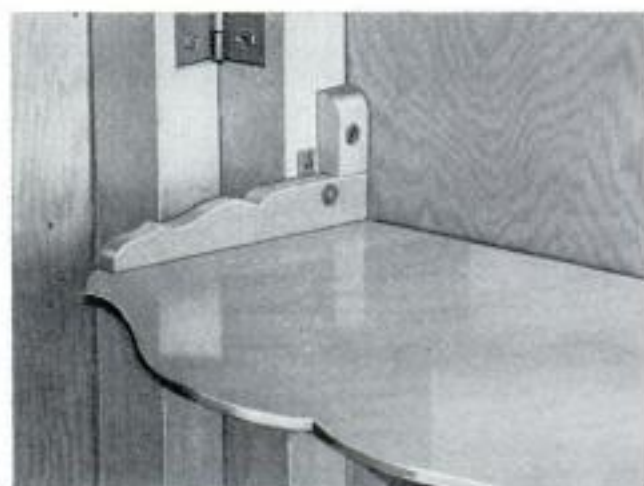


FLAT-FOLDING

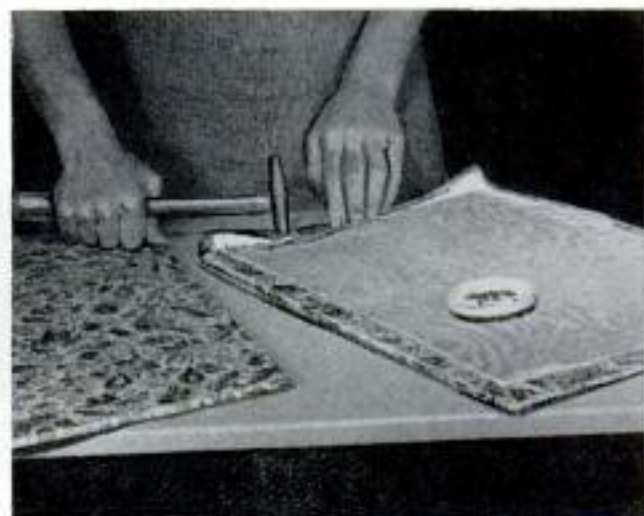
By Bertram Brownold

DESIGNED to fold flat like a cigarette case, this unusual sewing caddy with its drop-leaf shelf can be stood open beside an easy chair to make sewing a real pleasure. Closed, it is flat enough to be stored behind a door or hung in a closet.

Each half is made exactly like the other and both are surface-hinged together along one edge to swing open. In addition to the drop shelf, one half is fitted with a spool rack, swing-out button drawers and a trough for odds and ends. The other half has an elastic-top cloth storage pocket tacked to the inside. A row of hooks at the top holds such items as scissors, darning egg, tape measure and pincushion. The two plywood handles are jigsawed at one time and are set flush in each half of the stand. The outside of the stand is faced with plywood panels that are first covered with gay cretonne or chintz and then tacked to the legs. Sheet-brass catch completes the stand.



Above, stop blocks, one on each side, support the tilting shelf at right angles when lowered. Below, the outside panels are covered with cloth which is wrapped around the plywood and tacked to rear side

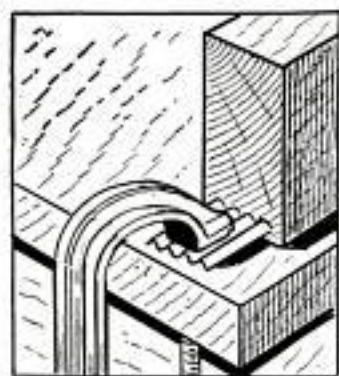


Auxiliary Cabinet Shelves Permit Additional Storage



When kitchen cabinets become overcrowded, it often is possible to gain additional narrow auxiliary shelves at the back of the cabinets. Dishes, plates and bowls usually are stacked only 4 to 6 in. high and the space above, while necessary at the front, is wasted at the back. This space generally will allow the installation of shelves about 3 in. deep. If the original cabinet shelves fit on brackets which are adjustable in holes drilled in the cabinet ends, the auxiliary shelves can be installed in the same manner. Cut the auxiliary shelves $1\frac{1}{2}$ in. shorter than the regular shelves and nail $\frac{3}{4} \times \frac{3}{4}$ -in. cleats across the ends. The cleats should be as long as the regular shelves are deep.

Fastener Provides Planing Stop



Instead of driving a nail into the top of the workbench to serve as a temporary bench stop, use a corrugated corner fastener held with a C-clamp. Face the sharp edge of the fastener toward the work.

Cleaning Soiled Holiday Candles

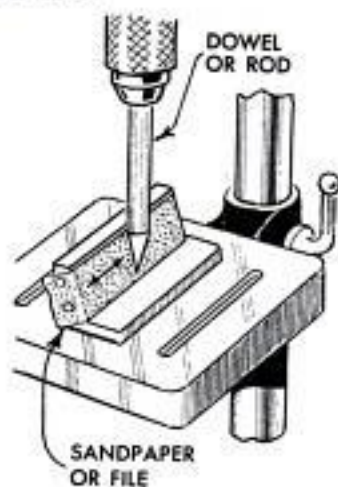
To make soiled holiday candles look like new again, wipe them with a soft cloth dipped in kerosene and then wrung out. Do this quickly, using a smooth up and down motion. Then, using the same motion, reharden the wax with a cloth dipped

in cold water. To polish the candles and restore their original luster, simply rub briskly a few times with a crumpled sheet of tissue paper.

La Verne Howell, San Diego, Calif.

Dowels Chucked in Drill Press Sandpapered to Point

A number of wooden dowels or metal rods can be shaped to an identical point by chucking them in a drill press and using the tool illustrated, which is a beveled wooden block screwed to a base plate. The angle side of the block is covered with sandpaper to shape wooden dowels and a file is held against it when shaping metal rods. In use, the block is moved slowly back and forth to prevent the sandpaper or file from becoming clogged in one spot.



Plastic Cable Shaped as Guide For Drawing Irregular Curves

Draftsmen, and others who have occasion to draw irregular curves, will find that a length of flat, plastic wiring cable can be shaped to almost any desired curvature. It has a smooth edge for use with either a pencil or ruling pen, and permits a line to be drawn in one continuous sweep rather than in short segments as is the case when standard fixed curves are used. Once the cable is bent, it will retain its shape until it is deliberately rebent.



WTM 56

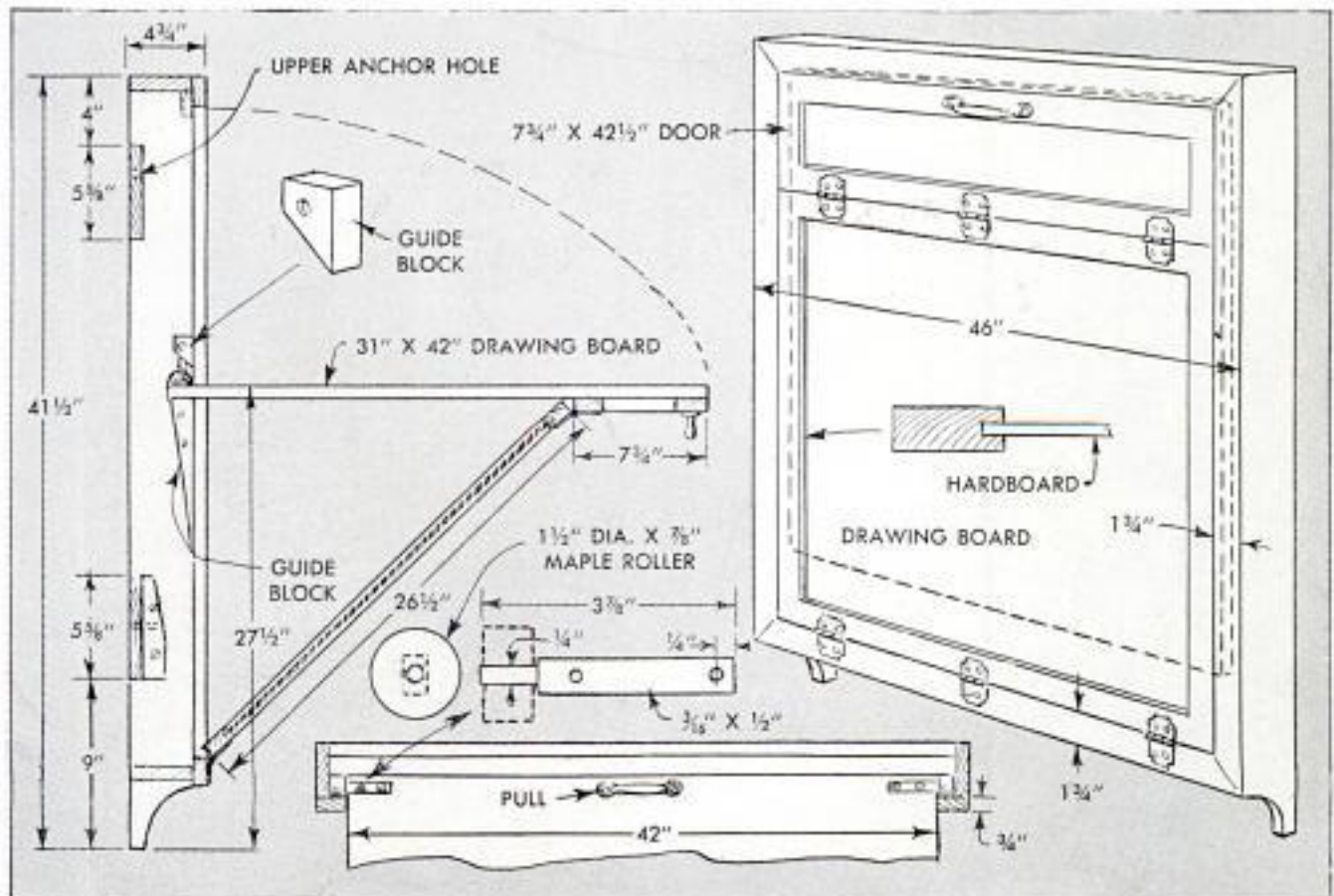
FOLD-AWAY DRAWING TABLE



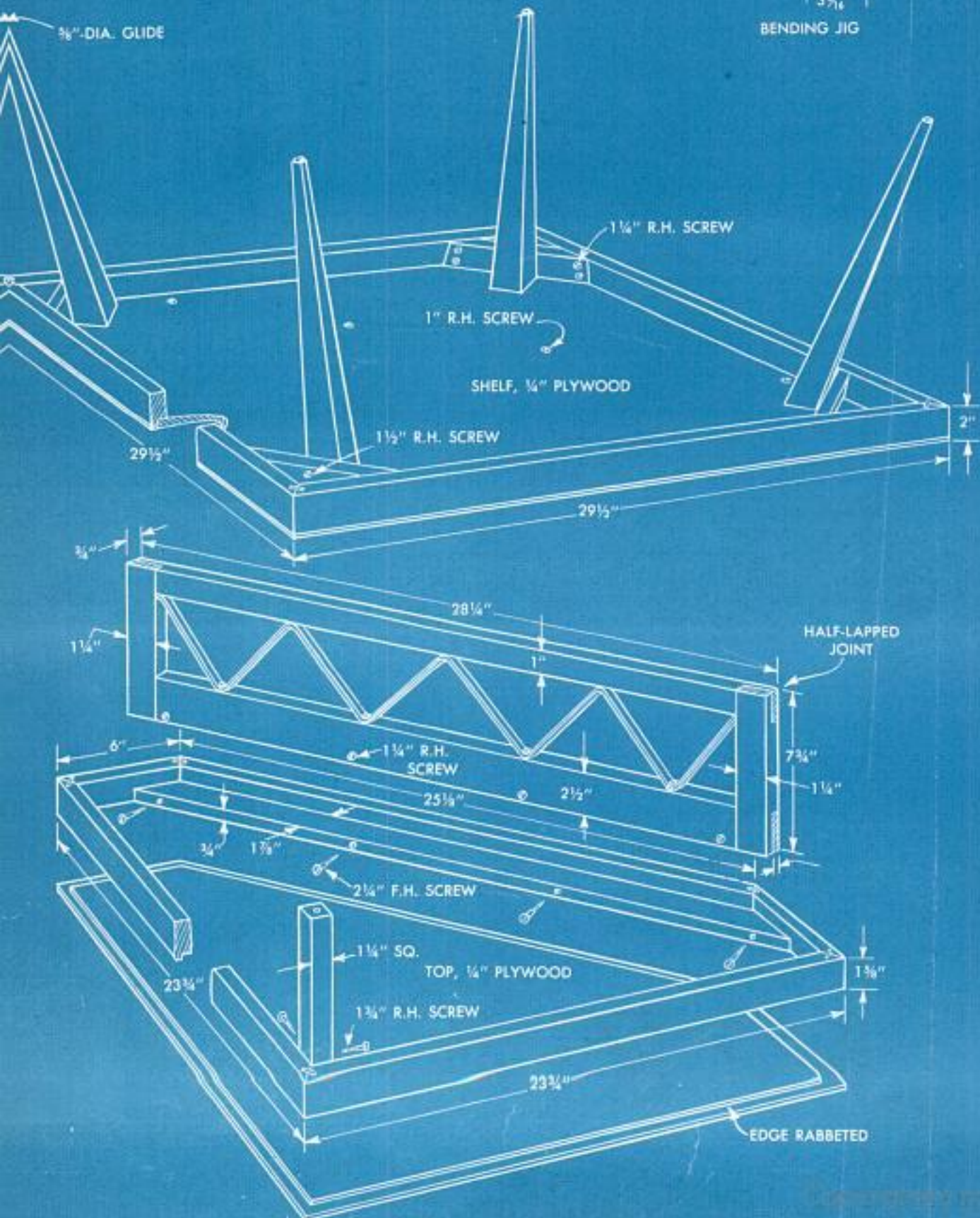
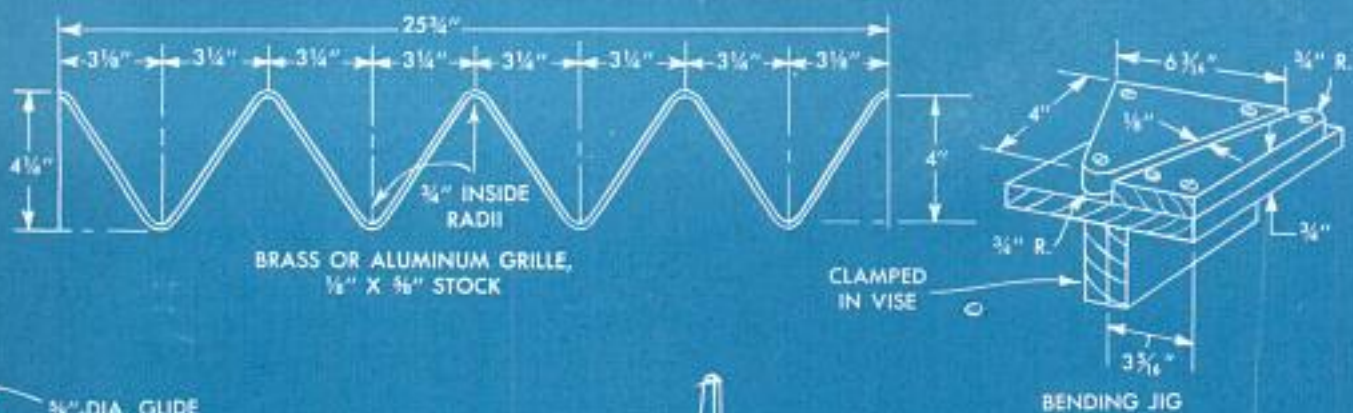
By C. D. Macy

IF YOU HAVE only an occasional need for a regular drawing table but are faced with the problem of where to put it, this compact, disappearing unit may be the answer. Opening out from a shallow wall cabinet, $4\frac{3}{4}$ in. wide, the table actually takes no floor space at all. The novel way that it folds is shown in the sectional view. A standard-size drawing board, 31×42 in., provides the table top. This is fitted with wooden rollers which operate in channel tracks

formed by the sides of the cabinet. The drawing board is faced on the underside with two paneled frames, a short upper one being permanently screwed to the board itself while a lower frame is hinged to the upper one and to the cabinet at the bottom. The hinged panel provides the supporting brace for the drawing board. The cabinet is mounted at the top of the baseboard and securely screwed to wall studs through the mounting cleats.

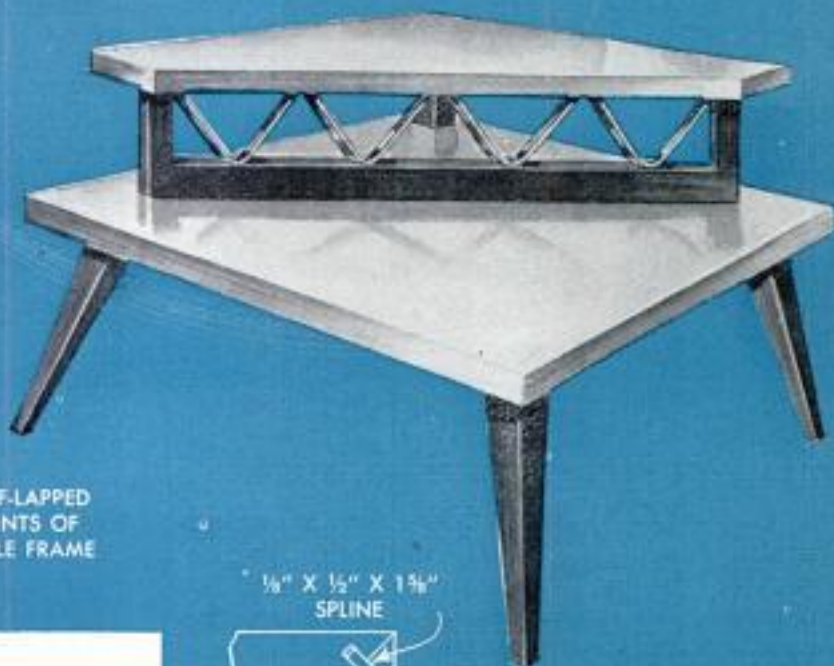
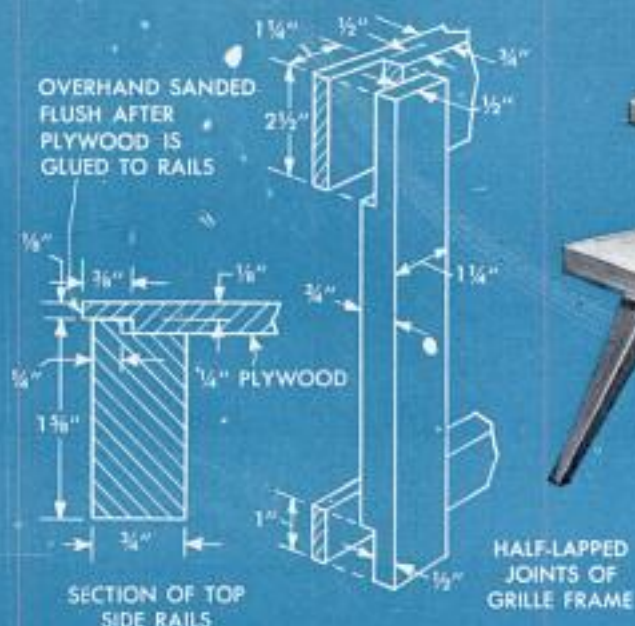


PLAN of the MONTH...



... Corner Table

W T M 56
Modern Furniture



While designed as a companion piece to the coffee and step tables presented in the October 1954 Plan of the Month, this attractive corner table can be used alone with any grouping of contemporary furniture. The same matching brass grillwork used in the previous designs is incorporated here and general construction closely follows that of the other tables. Both the square and triangular table tops are made up separately by first assembling an outside frame of rabbeted pieces and then covering with plywood. You'll note in the details that the plywood also is rabbeted and allowed to overhang the edges of the frame so it later can be sanded flush with the face of the frame. Canted corner cleats provide a means of attaching the tapered table legs with screws from the inside. The triangular top is supported with a simple rectangular frame, plus a post at the back

MATERIAL LIST

Plywood

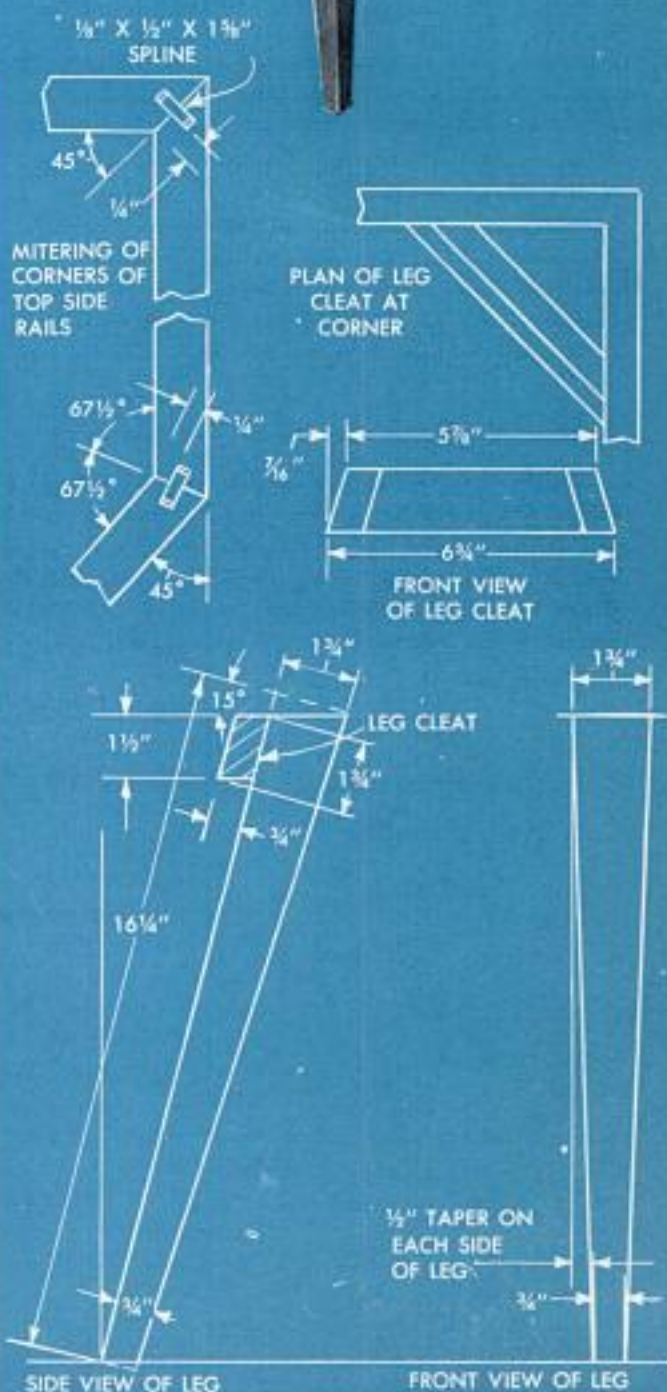
- 1 pc. — $\frac{1}{4}$ " x $23\frac{7}{8}$ " x $23\frac{7}{8}$ " — Top
- 1 pc. — $\frac{1}{4}$ " x $29\frac{5}{8}$ " x $29\frac{5}{8}$ " — Shelf

Lumber

- 2 pcs. — $3\frac{1}{2}$ " x $1\frac{1}{8}$ " x $29\frac{1}{2}$ " — Top back rails
- 2 pcs. — $3\frac{1}{4}$ " x $1\frac{5}{8}$ " x 6" — Top end rails
- 1 pc. — $3\frac{1}{4}$ " x $1\frac{5}{8}$ " x $25\frac{1}{8}$ " — Front top rail
- 4 pcs. — $3\frac{1}{4}$ " x $1\frac{5}{8}$ " x $29\frac{1}{2}$ " — Shelf rails
- 1 pc. — $3\frac{1}{4}$ " x $2\frac{1}{2}$ " x $28\frac{1}{4}$ " — Top frame rail
- 1 pc. — $3\frac{1}{4}$ " x 1" x $28\frac{3}{4}$ " — Bottom frame rail
- 2 pcs. — $3\frac{1}{4}$ " x $1\frac{1}{4}$ " x $7\frac{3}{4}$ " — Frame posts
- 1 pc. — $3\frac{1}{4}$ " x $1\frac{7}{8}$ " x $28\frac{1}{4}$ " — Frame cleat
- 1 pc. — $1\frac{1}{4}$ " x $1\frac{1}{4}$ " x $7\frac{3}{4}$ " — Back post
- 4 pcs. — $1\frac{3}{4}$ " x $1\frac{3}{4}$ " x $16\frac{7}{8}$ " — Legs
- 9 pcs. — $\frac{1}{8}$ " x $\frac{1}{2}$ " x $1\frac{1}{2}$ " — Splines
- 4 pcs. — $3\frac{1}{4}$ " x $1\frac{13}{16}$ " x $7\frac{5}{8}$ " — Leg cleats

Hardware

- 8 — No. 14 x $1\frac{1}{2}$ " Roundheaded wood screws
- 20 — No. 10 x $1\frac{1}{4}$ " Roundheaded wood screws
- 4 — No. 10 x 1" Roundheaded wood screws
- 4 — No. 10 x $2\frac{1}{4}$ " Flatheaded wood screws
- 1 — $\frac{1}{8}$ " x $5\frac{1}{2}$ " x $\phi 2$ " — Flat brass
- 4 — $\frac{5}{8}$ " Dia. — Furniture glides
- 9 — No. 14 x $\frac{1}{2}$ " Escutcheon pins



Floor of Insulated Hardboard Can Be Installed Quickly



Photo courtesy Insulite Div., Minnesota and Ontario Paper Co.

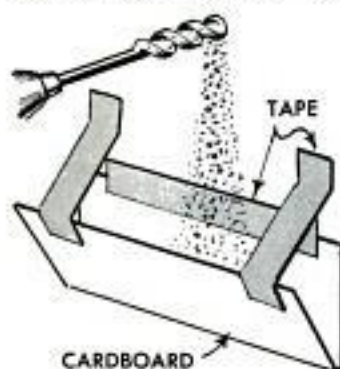
One method of installing a floor quickly when finishing an attic or other space to provide living quarters, is to use 4 x 4-ft. sheets of $\frac{1}{4}$ -in. tempered hardboard. Because the floor will be smooth and have relatively few joints, tile can be installed with a minimum of labor. To provide sound insulation against the noise of footsteps, the hardboard should be nailed over an underlayment of $\frac{1}{2}$ -in. insulation board. When nailing the hardboard over the insulation, draw lines on the hardboard to show the locations of the floor joists, and use 9d nails.

Freeing Stuck Drinking Glasses

If two drinking glasses stick together, separate them by pouring cold water in the top one and setting the bottom one in warm water. The cold water will cause the top glass to contract slightly, while the warm water will make the bottom glass expand sufficiently to free them easily.

Sam Fenn, Chicago.

Cardboard Trough Taped to Wall Catches Plaster Dust



Positioned just beneath the work, a trough made of light cardboard or heavy paper will catch most of the plaster dust and shavings caused by drilling into a plastered wall. The trough is held against the wall

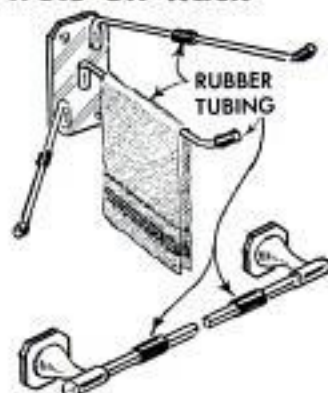
with a strip of masking tape along the back edge and two tape "braces" which lead from the front edge of the trough to the wall. When pulled from the wall after the

job is done, the tape will leave only faint marks that can be removed. The trough is useful when installing wall switches and outlets, and larger versions can be made for use under more extensive repair jobs.

Rex W. Logan, Kansas City, Mo.

Tubing Keeps Towels on Rack

If you have trouble keeping towels from sliding off smooth towel rods, a few short lengths of rubber tubing slipped over the rods will overcome the problem. If the rod is clamped at both ends, slit the tubing lengthwise.

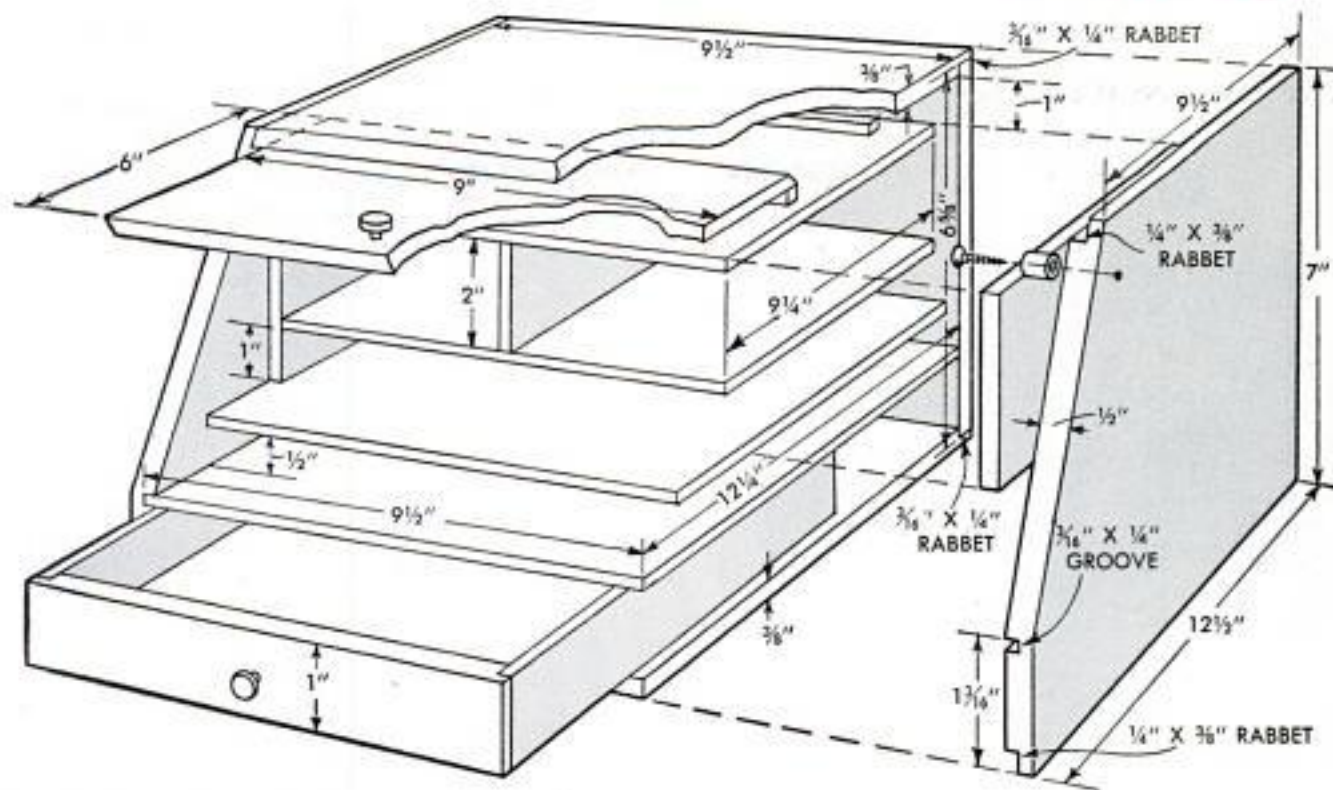


Cabinet Under Open Lavatory Stores Bathroom Supplies

Soap, scouring powder and other frequently used bathroom supplies can be stored neatly out of sight in a simple cabinet built under an open lavatory. The base of the cabinet is a platform made of 1-in. stock and is set back about 4 in. from the front edge of the lavatory to provide toe space. The door and side panels of the cabinet consist of a frame of 1 x 2s covered with hardboard. Shelves fitted with rails may be attached to the inside of the door to store small items. In the cabinet shown in the photo, time and materials were saved by eliminating the side not usually visible.

Photo courtesy Crane Co.

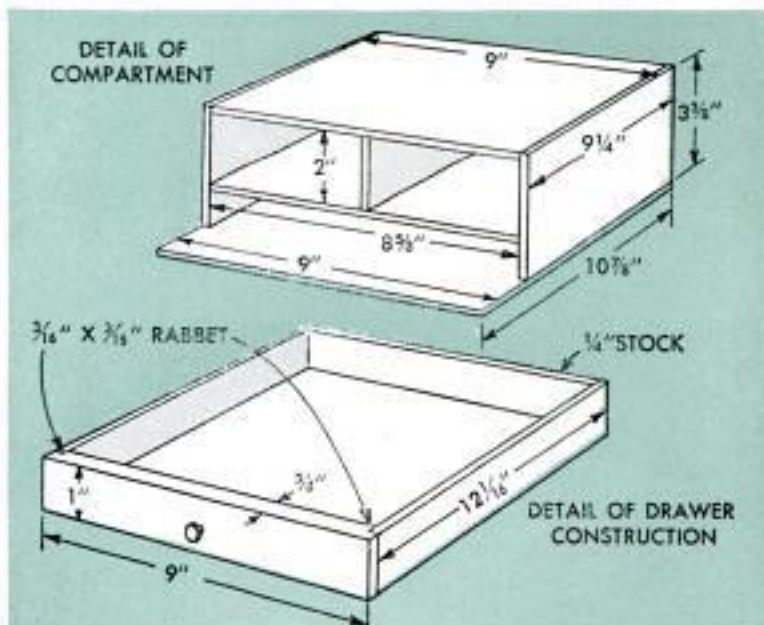




A ONE-EVENING PROJECT ★ STATIONERY CABINET

By I. M. Fenn

LETTER WRITING becomes twice the pleasure when your stationery is stored near at hand in a convenient little cabinet such as this one. There are separate compartments for both writing paper and envelopes and a shallow drawer for pen, pencils and stamps. It may be made from common fir plywood and painted, or from fancy hardwood-faced plywood and varnished. You'll need pieces of $\frac{1}{2}$, $\frac{3}{8}$ and $\frac{1}{4}$ -in. stock. The sides are cut out first, a rabbet being run along the top, rear and bottom edges, and a $\frac{1}{4}$ -in. groove made $1\frac{3}{16}$ in. up from the bottom. The back, top, bottom and pull-out lid are cut from $\frac{3}{8}$ -in. stock. With the exception of the lid, all three members are glued in the rabbeted edges of the side pieces. The lid rides on two $\frac{3}{8}$ -in.-dowel rollers, and a stop cleat across the rear edge of the lid prevents pulling it all the way out. Obviously, the lid must be in place before the separate paper-and-envelope compartment is installed. The drawer is made to fit the opening.

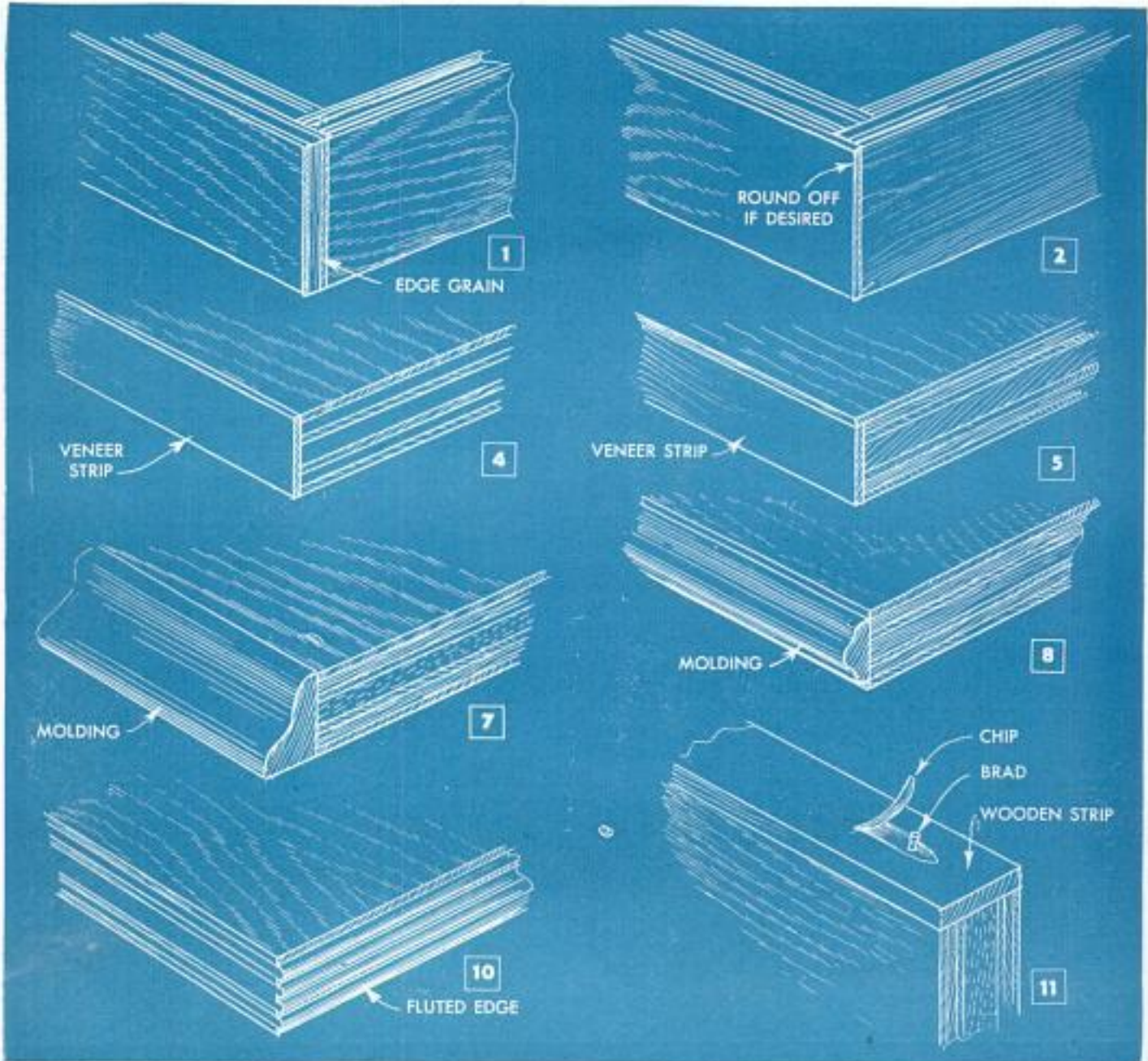


SN 56

HOW TO TREAT PLYWOOD EDGES

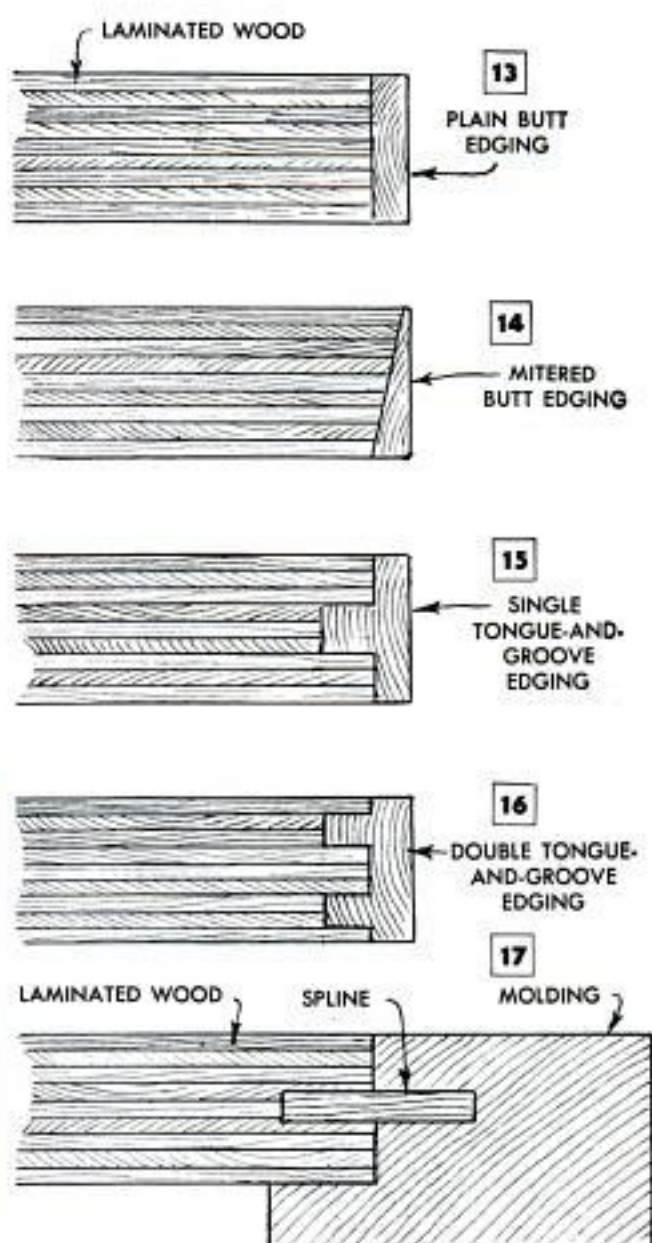
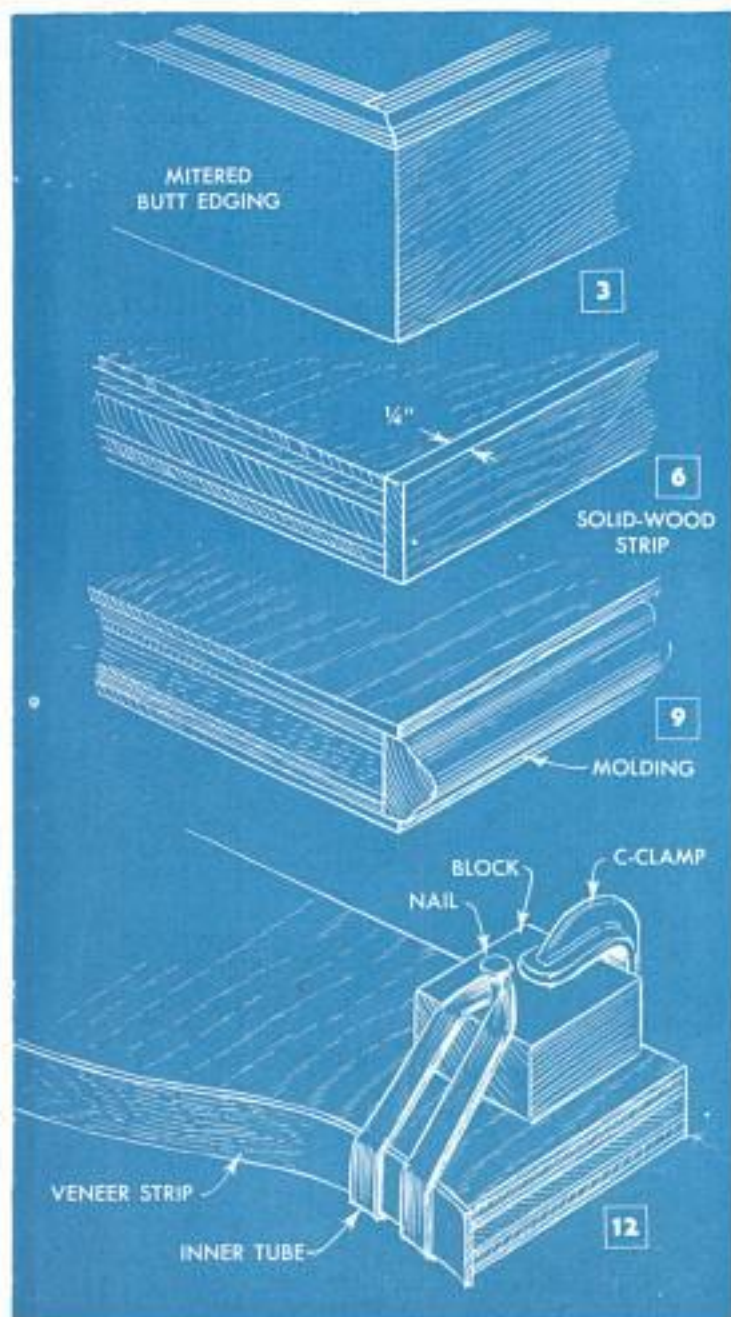
By William B. Eagan

WHILE THE USE of plywood has become universal in both the building and furniture industries, its use in the home shop has always confronted the craftsman with the problem of how to conceal or treat the exposed laminations of the material. The drawings on this and the following two pages illustrate a number of ways that the edges can be covered. Some of the methods are comparatively simple while others are more involved.



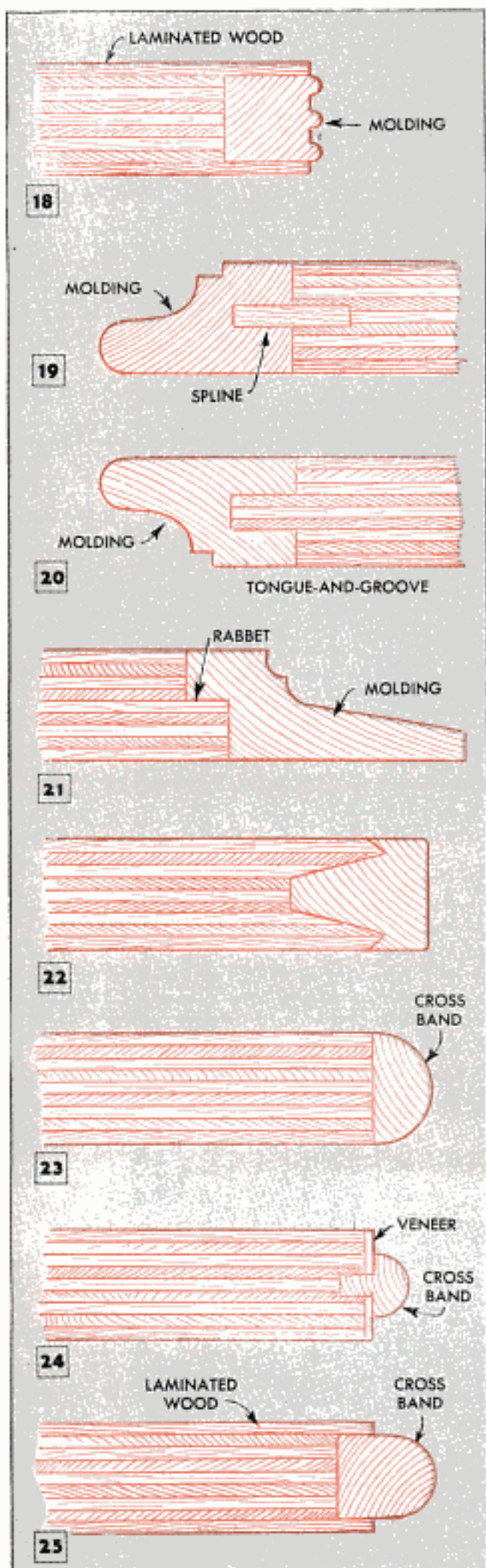
The most common type of drawer joint is shown in Fig. 1, but here the edge grain is exposed and conspicuous. Figs. 2 and 3 show how the same drawer joint can be made so very little or no edge grain is exposed. The amount of edge grain exposed in Fig. 2 may be further reduced and even camouflaged by rounding the corner.

You also have the problem of what to do with plywood edges when the material is used for the shelves in a bookcase or for a table top. The easiest solution is to hide the exposed plies with strips of veneer as shown in Fig. 4. Usually the grain of the veneer is placed lengthwise, but a pleasing variation is had by letting the grain run vertically. In this treatment, often referred to as crossbanding, two plies of veneer produce the best job. This consists of gluing two sheets of veneer together with the grain at right angles and then cutting the edging strips from it. Here, the veneer is brought flush with the top surface of the



Below, left, simple fixture for holding veneer to curved edge while glue dries consists of rubber band hooked over nails in two blocks clamped to each side of work. Strong band is cut from inner tube



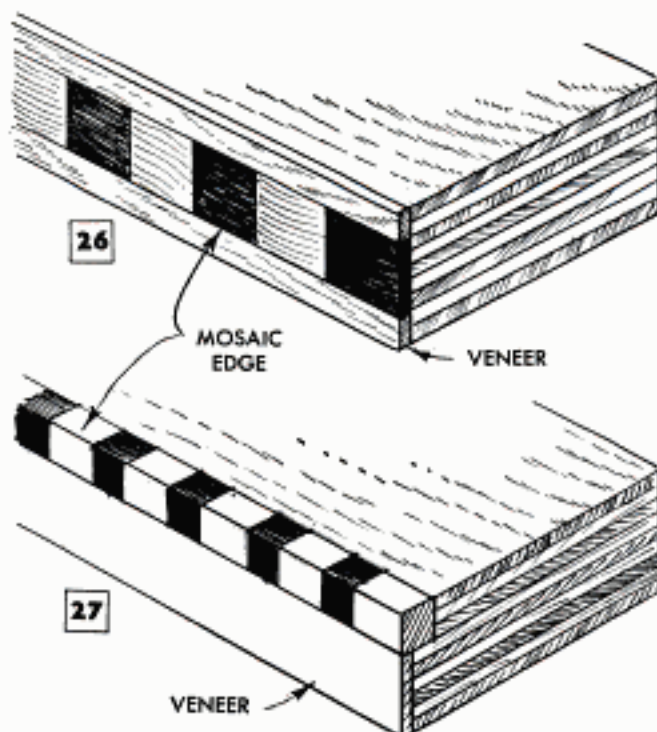


plywood. The objection to having the edge of the veneer show can be overcome by first rabbeting the laminated edge of the plywood as shown in Fig. 5 and letting the top ply overhang the edge of the veneer banding. This latter method also tends to protect the edge of the veneer from wear and damage.

Instead of using thin veneer as in Fig. 4, a 1/4-in. strip of matching solid stock may be glued to the edge to hide the plies, Fig. 6. Similar treatment is shown in Figs. 7 and 8 except that stock molding is used. By running a groove in the center of the plywood edge to receive a molding which is narrower than the thickness of the plywood, a variation can be had resulting in a stronger joint, Fig. 9. There are cases where the objectionable plies can be "concealed" without actually adding anything to the edges. Such is the case when a piece of furniture is given a two-tone treatment by painting or staining the plywood edges, or when design permits the edges to be beaded or fluted on a shaper as shown in Fig. 10. Beading should be limited to furniture such as Duncan Phyfe.

In facing the edges with banding or molding, glue alone is not relied on. The striping is nailed also. Fig. 11 shows how the nailheads are concealed by first lifting a chip with a narrow gouge, driving the brad and then gluing the chip down again. Done properly, the chip seldom can be detected when the final finish is applied to the wood. When veneer is to be applied to a curved plywood edge, Fig. 12 shows a simple method for holding the work until the glue sets.

Figs. 13 to 25 inclusive show additional ways that molding of one kind or another can be used to dress off the edges of plywood. Plain butt edging, Fig. 13, in which



the strip is surface-glued, is the easiest of all to apply. Where it is desirable to reduce the visible thickness of the strip, the mitered butt joint can be used, Fig. 14. Here, the strip is dressed at an angle to match a similar bevel cut in the plywood and simply surface-glued and nailed in place. Splines, Figs. 17 and 19, often are used to give a stronger joint when applying edge moldings. The use of a spline is especially recommended where a wide molding is involved. If molding equipment is available, plain solid stock may be applied to the edges and shaped afterward. The home craftsman will find many stock moldings adaptable. Fig. 22 pictures a joint that perhaps is the strongest of all but one that requires a complicated cut made by a special machine.

A bold treatment of the plain cross-banded edge is shown in Figs. 26 and 27. Here, inlaid banding is used. A strong contrast is obtained by using rare woods, such as ebony, holly, ivory or boxwood. In Fig. 27, a rabbet is cut along the upper edge of the plywood to take a built-up mosaic strip and veneer covers the rest of the exposed laminations. ★ ★ ★

Clothespins Utilized as "Staples" To Make Temporary Fence



A neat temporary fence, such as the kind needed to protect a newly seeded lawn, can be made quickly and easily by using wooden clothespins to "staple" a wire or rope to lengths of $\frac{3}{4}$ -in. pipe. The pipes first are

driven very firmly into the ground and spaced around the area to be protected. Then the clothespins are fitted over a length of wire or light rope and slipped into the ends of the pipes. Tie the line to the first pipe, keep it fairly taut all the way around the fence and tie it to the last pipe. *Caution:* An extremely low fence is hazardous for adults and running children.

Waxed Sheet Under Plywood Speeds Jigsaw Operation

To simplify moving and turning small pieces of thin plywood on a jigsaw table, place the work on top of a sheet of wax paper. This also is helpful if the stock is of resinous quality, as the wax paper "lubricates" the saw blade.

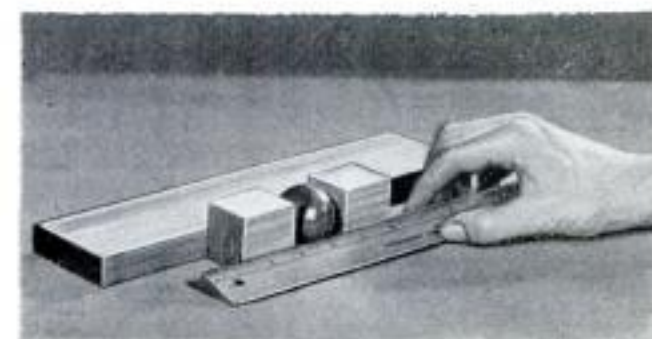
Stacked Cans Resist Toppling When Held With Paper



To aid in keeping stacks of boxes or cans in a warehouse or store from being knocked over easily, place a sheet of wrapping paper between the tiers. A stack so arranged will resist considerable impact because only the top layer of cans or boxes is loose. The paper "binds" the units in each layer together so that the full weight of one or more layers must be overcome before the stack will topple.

Diameter of Sphere Measured By Using Wooden Blocks

The diameter of spheres, disks or round stock can be determined quickly by using two wooden blocks and a straightedge. The sphere or other object to be measured is placed between the blocks—which should have parallel sides and a squared end—and a straightedge rule is held against them. The distance between the blocks is the diameter of the object. Various types of flat-jaw clamps can be used in a similar manner for this kind of measuring.



Miniature Wardrobe Closet Stores Child's Dresses



With only limited closet space in the house, one handyman provided hanging storage for his small daughter's dresses by building a miniature wardrobe closet to sit on top of a chest of drawers. Plywood was used in the construction of the closet which is a simple box fitted with a hinged door. The box is 12 in. deep x 24 in. high and can be made any convenient length. The exterior is painted to match the chest on which it sits and decal decorations may be applied to the door. The inside can be covered with a dainty wallpaper or painted. A 1-in. dowel, set in brackets, supports the hangers for the dresses.—Maurine M. Remenih, Arlington Heights, Ill.

Tray on Stepladder Tread Holds Small Parts



When using a stepladder on a job where small parts are involved, a tray made from a pie tin can be clipped to the top tread to hold the parts. A sheet-metal or spring-steel clip is soldered to the bottom of the tin as illustrated.

Scratched Floors Rejuvenated

Wood putty can be used effectively to fill unsightly scratches and gouges in hardwood floors. Apply the putty with your fingers or a putty knife and work it into

the scratch, building it up a little higher than the board surface. When the putty has hardened, sand it flush with the floor, using a medium-fine sandpaper. Then finish with shellac. If the floor is light colored, the putty may be used as it comes from the can. However, if the floor has darkened, the putty should be stained to match before it is applied, or stain can be applied to it after it has been sanded smooth.—Bureau of Industrial Service, Inc., New York City.

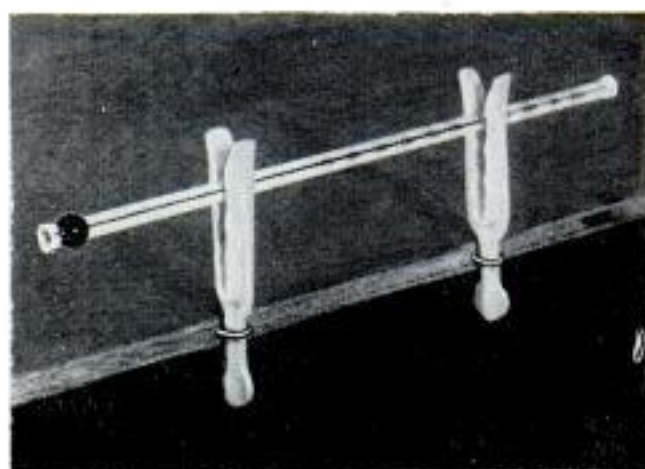
Wood-Screw Lubricant Kept in Cosmetic Jar

To be sure of always having a supply of lubricant for use with wood screws, fill a small cosmetic jar with cotton and saturate it with linseed oil or liquid soap. The wood screws then can be wiped across the cotton to pick up oil without the problem of having an excess that will drip from the screws. Be sure the jar has an airtight lid to prevent evaporation or hardening of the liquid when not in use.



Clothespins Provide Holder For Darkroom Thermometer

Two plastic clothespins, of the type shown in the photograph, can be used to provide a simple and convenient holder for a photographic stirring-rod thermometer. The light spring action of the clothespins holds the thermometer firmly, yet allows it to be picked up easily. The clothespins are fastened to the edge of a table or shelf with small staples.



Pipe Fittings Form Sturdy Closet Clothes Pole

Unlike the wooden clothes pole that bends and creaks under the weight of winter garments, this pipe rack will handle your heaviest garments safely. Its strength is limited only by that of the shelf to which it is attached. The original rack was made up of 1-in. pipe and fittings, although $\frac{1}{2}$ or $\frac{3}{4}$ -in. pipe can be used. As shown in the drawing, the lengths of pipe which form the clothes pole are suspended from the underside of the closet shelf with floor flanges and nipples, the latter being about $2\frac{1}{2}$ in. long. The nipples are turned into an elbow at each end of the clothes pole and into one or more pipe tees



used to join the pipe sections. The rack is completely assembled before the flanges are screwed to the underside of the shelf.

Thomas P. Ramirez, Fond du Lac, Wis.

Refrigerator Recess Decorated With Valance Hung on Hooks

Because his wife was dissatisfied with the blank, unfinished look of the refrigerator recess in the kitchen, one home handy man installed a deep valance in which is mounted a clock. The valance is jigsawed from plywood and the clock is fastened to the back so the face shows through a framed opening. Artificial ivy, purchased at the 10-cent store, is used for decoration. The installation of the valance was simplified by hanging it on hooks and eyes, which also permits easy removal for cleaning.

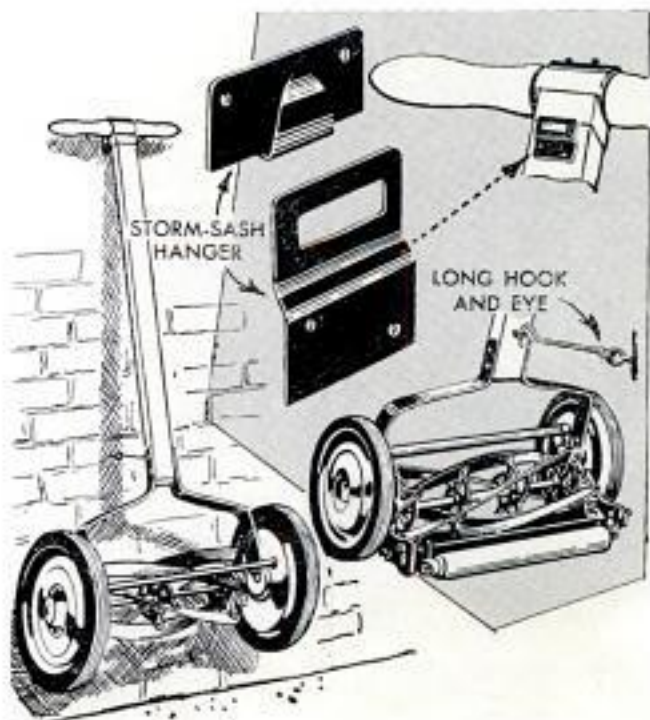
John Krill, North Lima, Ohio.



Lawn Mower Stored Close to Wall By Using Storm-Sash Hanger

A lawn mower can be stored to occupy a minimum of floor space by using either a storm-sash hanger or a long hook and screw eye to hold it close to a wall. When using the sash hanger on wooden handles, the eye, usually screwed to the sash, is fastened to the mower handle near the top and the tongue is screwed to the wall. When using a hook and eye, the hook is screwed to the wall and the eye is driven into the mower handle near the bottom. Either method can also be used on metal-handled mowers, machine screws being substituted for the wood screws.

☐ When sending clothes to the cleaner, outline bad spots in white thread and, if you know what caused the spot, tag it so the spotter can use the correct cleaning fluid.



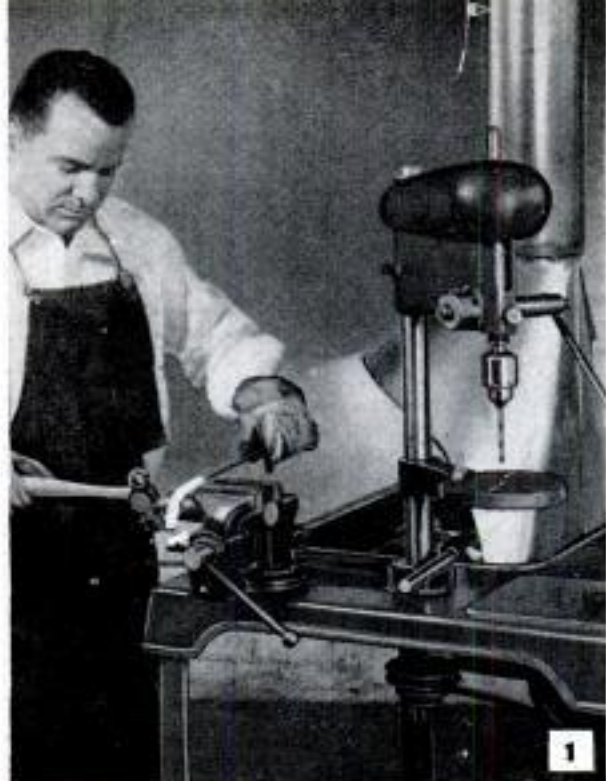


Photo courtesy Champion Blower and Forge Co.

By Sam Brown

AN INTRODUCTION TO

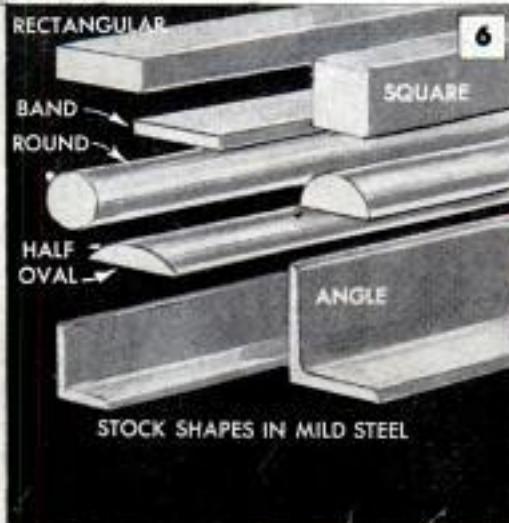
WROUGHT IRON

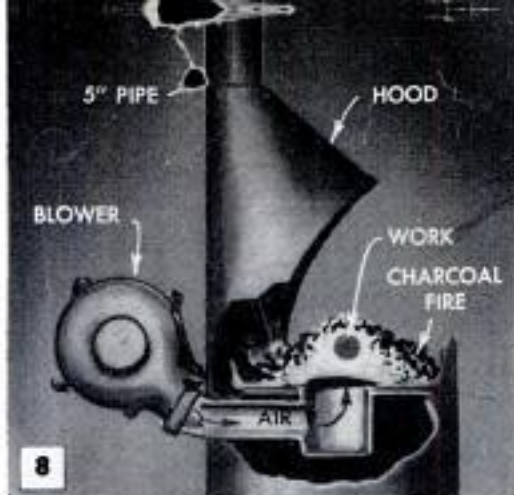
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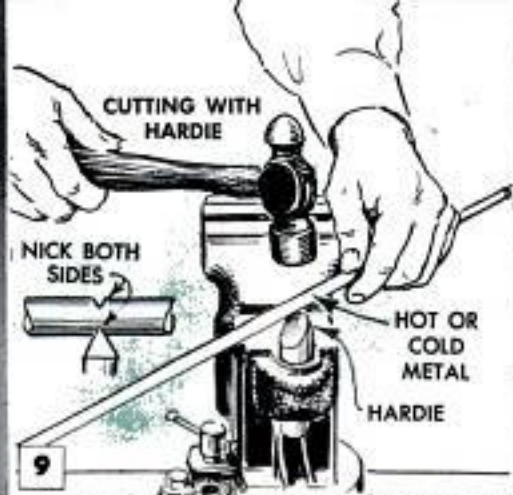
FIRE IS THE SECRET of working ornamental wrought iron—a red-hot piece of iron can be bent easily to almost any shape. While the traditional heat source for iron working is the open forge, excellent results can be achieved with an ordinary liquid-fuel hand torch. A torch, a hammer, a drill and some rivets are all the basic equipment needed. Figs. 2, 3, 4 and 5 show a few examples of the type of work that can be done either with the torch or a small forge.

The metal: Old-fashioned wrought or puddled iron is no longer manufactured to any great extent because mild steel is nearly identical to it and much less expensive to make. The main feature of wrought iron or mild steel is that they contain only a trace of silicon and carbon. Such a material is tough, malleable, bends easily and welds beautifully. Unlike carbon steel, it does not harden when heated red-hot and plunged into water. Some of the many stock shapes available in mild steel are shown in Fig. 6. The rectangular shape with rounded edges, usually called band iron or strap iron, can be purchased at many hardware and farm stores, while complete iron stocks for craftwork are available from





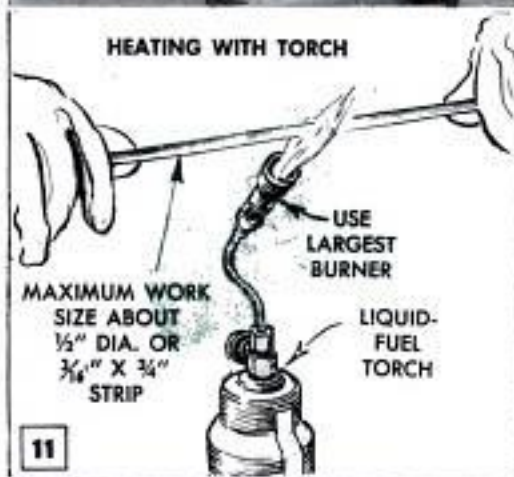
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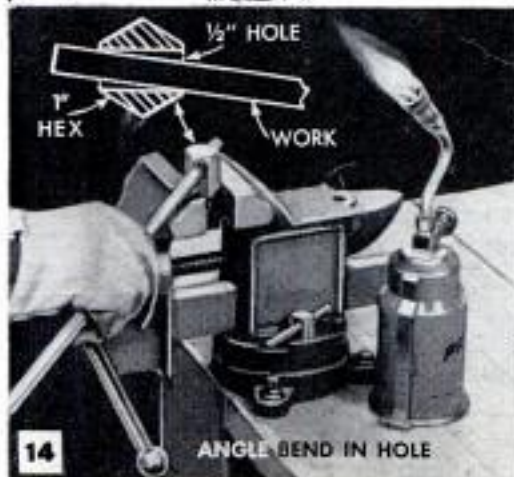
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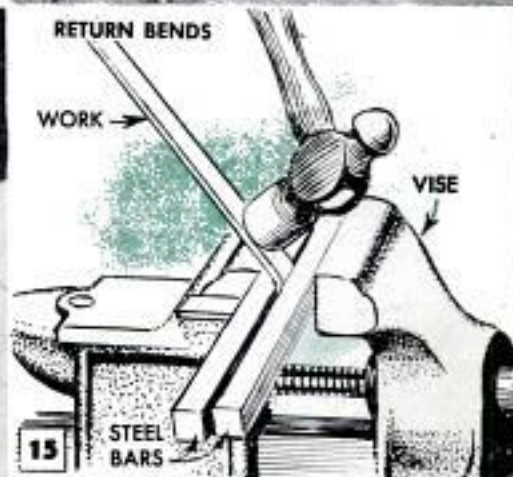
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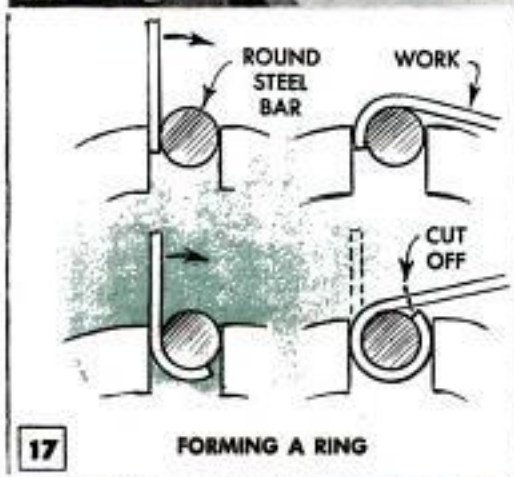
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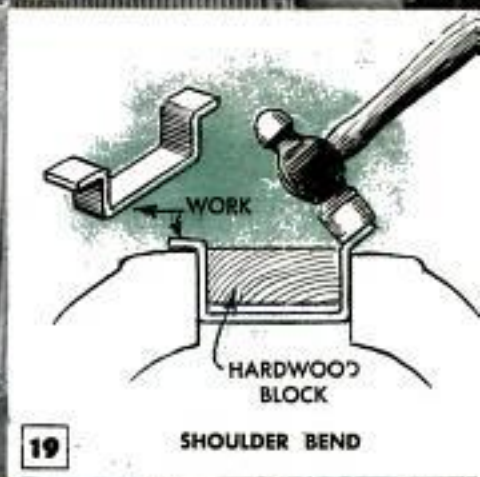
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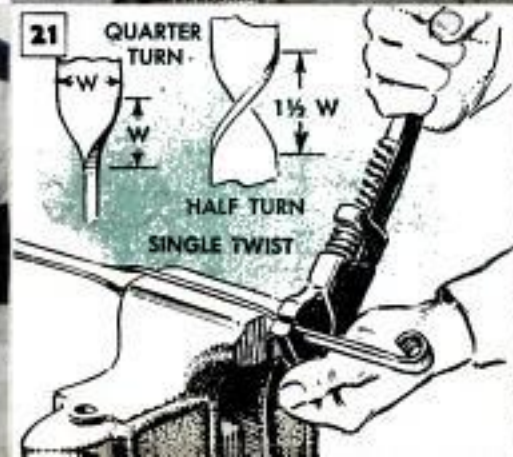
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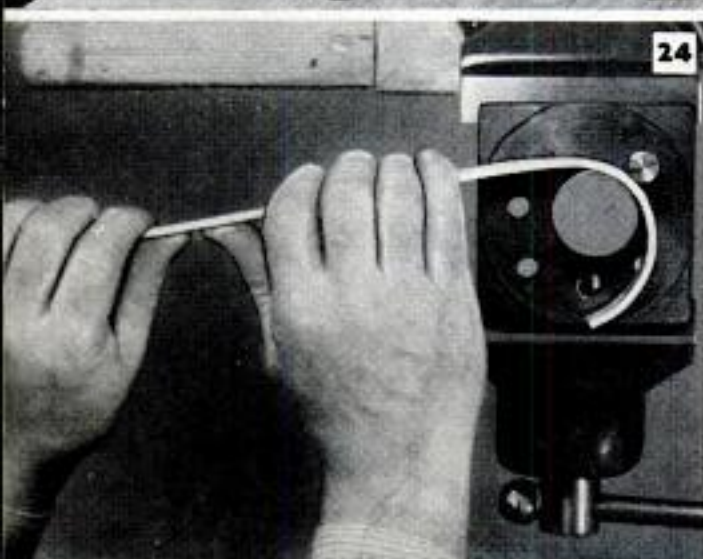
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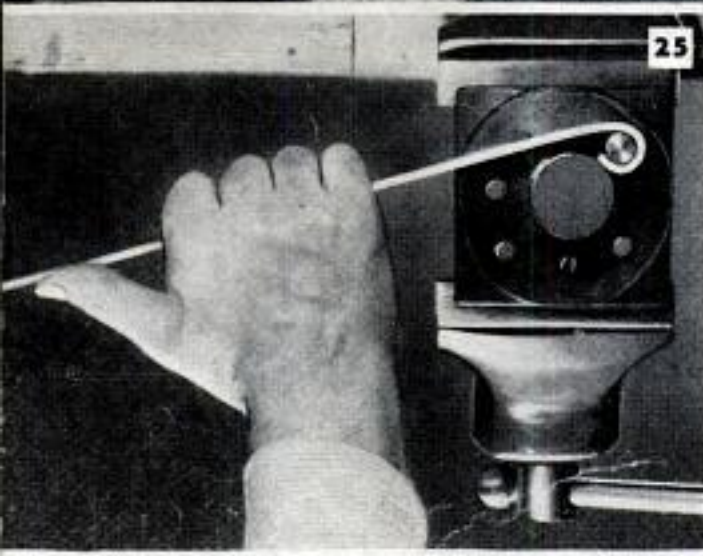
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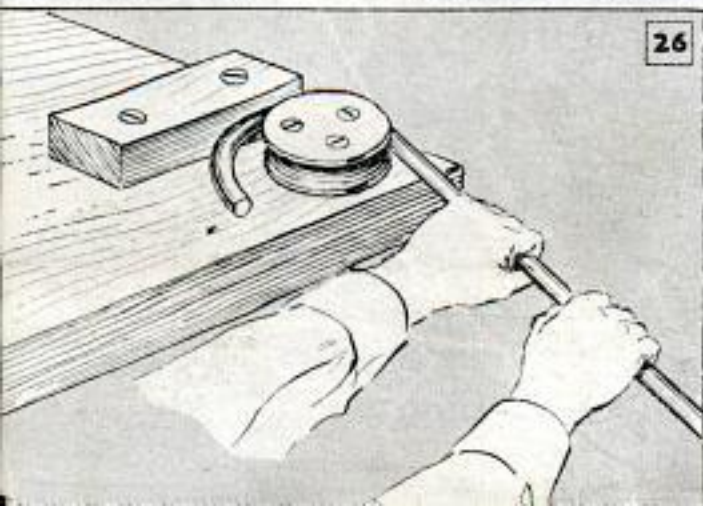
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craft and metal-supply houses. The material usually is available in 10-ft. lengths for craft use.

Heating equipment: Many projects in wrought iron can be worked cold. However, band iron over $\frac{1}{8}$ in. thick and rounds over $\frac{1}{4}$ in. in dia. become increasingly more difficult to bend. An inexpensive liquid-fuel torch is the least expensive and simplest solution. This type of torch will put a red heat on band iron up to about $\frac{3}{16}$ x $\frac{3}{4}$ in. and rounds to a $\frac{3}{8}$ -in. dia. The localized nature of the heat, Fig. 11, makes the torch ideal for angular bending. As in Fig. 12, rod stock can be bent with hand pressure alone.

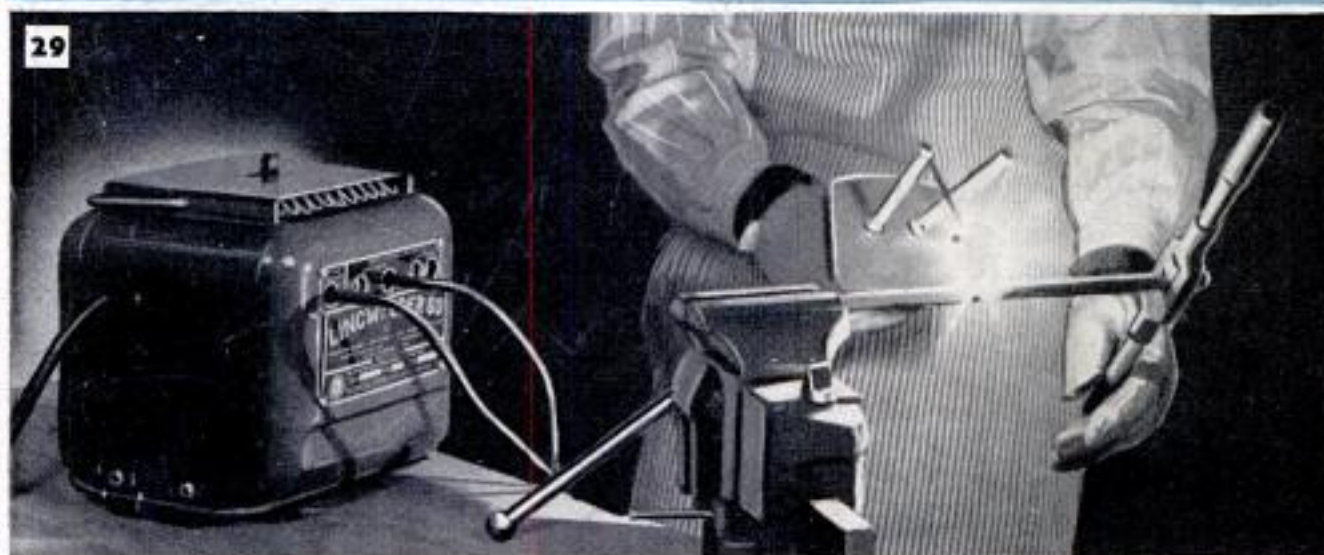
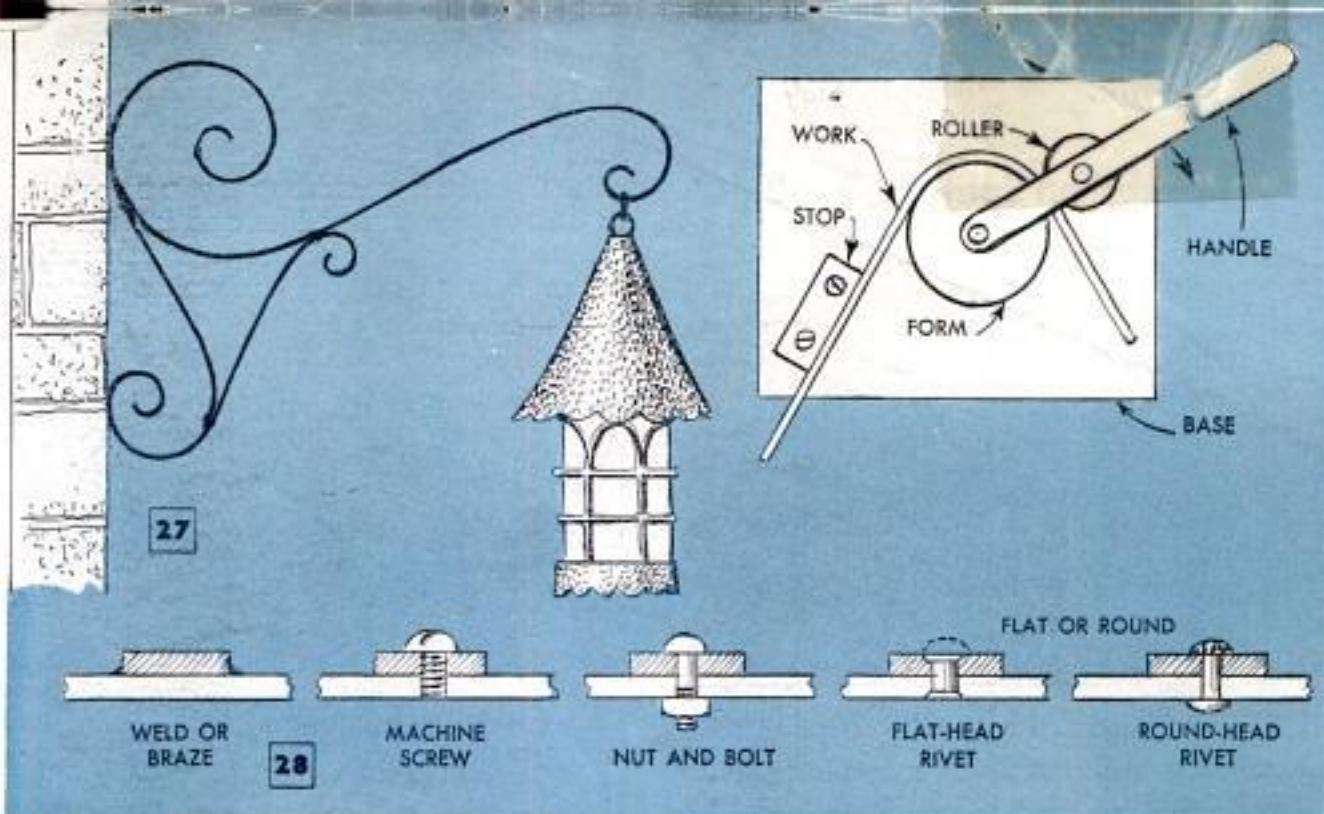
One of the hottest heat sources is the twin-carbon arc torch, Fig. 29. An obvious disadvantage of the arc torch is that you have to wear a helmet and gloves for protection against the ultraviolet and infrared rays. A small arc torch, working on 110 volts, will heat rounds up to about $\frac{3}{4}$ in. in dia. for angular bending. Like all torches, however, it is generally unsatisfactory for heating a long length of rod.

Most fascinating and satisfying of the heat sources is the time-honored forge, Fig. 1. This is the most flexible, most economical heat source for regular work. And, if you burn smithing charcoal, the fire will be clean and smokeless—practical for use in the basement workshop. A draft connection should be made to a chimney or to a basement window, in the latter case using a low-speed exhaust blower. A typical home-shop forge is shown in Fig. 7. The fire itself should be deep enough to bury the work yet protect it from direct air from the blower, Fig. 8. The forge will put a red heat on 2-in.-dia. bar stock in about 5 min. With the forge fire, a large area or a long length of work can be heated uniformly, this being especially important for such jobs as making a long twist, Fig. 22.

Basic operations: The basic operations in working with wrought iron are cutting and bending. Cutting is done with a hacksaw or with a chisel or hardie, Fig. 9. A 3-in. bench shear, Fig. 10, is ideal for cutting light stock.

Most of the basic bends are shown in Figs. 12 to 22. One of the most useful bending devices is a bar or a block of metal having one or more holes bored through it. This is used in the same way as the hex bar pictured in Fig. 14. An eye is formed by first making a ring, Fig. 17, and then bending the standing metal with the aid of a vise, Fig. 18. Gradual bends of all kinds can be hammered hot or cold on any type of round anvil or bar, Fig. 20. Single twists of a quarter or half turn are made with a wrench, Fig. 21. In the details, W equals the width of the stock.

Scroll bends: Gradual curves or scrolls



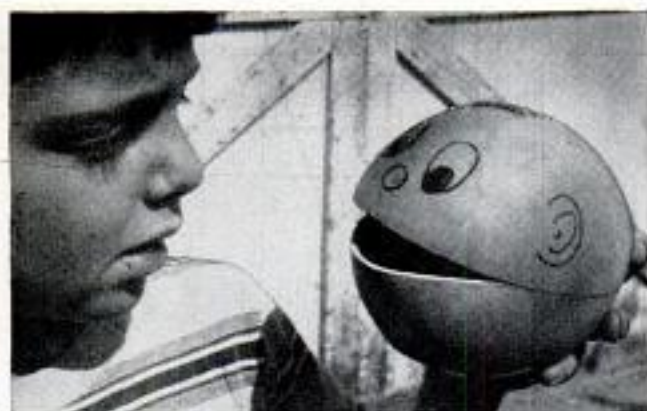
predominate all period designs in wrought iron. These curves are made on a bending jig. The jig consists of a purchased or home-made setup of two metal pins around which the work is bent, Figs. 23 to 25. Eye bends can be made directly around the smaller pin, Fig. 25, while large bends are worked gradually with a series of bends, Fig. 24. Large work also can be bent over wooden forms, Fig. 26, a method which is used widely for bending tubing. When a number of pieces are to be bent to the same curve, a handle-and-roller setup, Fig. 27, saves time and assures perfect work.

Fastenings: Ironwork is assembled by welding or brazing, or with machine screws, bolts or rivets, as in Fig. 28. Riveting is the most popular home-shop method, and most riveting jobs can be done with the simplest of equipment, as in Fig. 30.

Finishing: The most popular finish for all ironwork is flat or satin-black paint. A protective or rust-inhibiting undercoat should be applied on all ironwork used outdoors. This also is desirable on indoor ironwork to secure better finish adhesion. ★ ★ ★

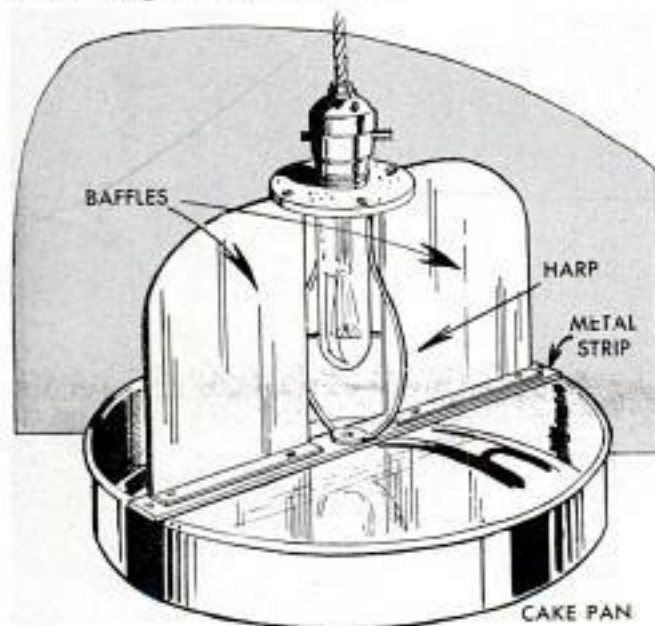


Face Painted on Split Rubber Ball "Talks" When Squeezed



A child's rubber ball, when split as in the photo, can be painted to resemble a doll's face. The split section will then serve as the doll's mouth, which can be made to open or close by pressure on the side of the ball. Children can have hours of fun practicing to be ventriloquists with such a doll.

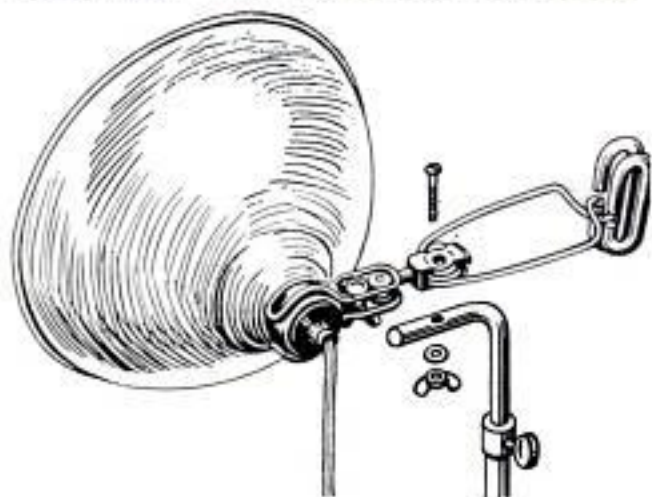
Trap for Night-Flying Insects Uses Light As Bait



A screened-in porch or enclosed patio will be a pleasanter place if this simple trap for night-flying insects is hung near the outside entrance. The trap consists of two baffles of bright sheet metal which are flanged and screwed to a strip of metal. The strip is fitted on the diameter of a cake or pie pan and the ends then are screwed to the rim of the pan. A lamp harp, of the type with a threaded base that screws onto a lamp socket, is inverted and screwed to the center of the strip between the baffles. The bulb is a special type that gives little visible light, but is highly attractive to insects. Such bulbs are available at most appliance stores. The insects are attracted

to the light, and when they try to fly around the bulb, strike the baffles and fall into the pan. A thin layer of kerosene or insecticide in the bottom of the pan takes care of the rest.

Floodlight Clamp Bolted to Stand



The problem of attaching spring-clamp type photo-floodlamp reflectors to portable light stands so the floodlamp does not "drop" can be solved by drilling a small hole in the horizontal section of the light standard. A machine screw then is passed through the clamp fixture and through the hole in the standard and held with a wing nut. The spring clamp of the reflector now can be utilized to store the cord when the light is not in use.

Jack Wilson, Los Angeles, Calif.

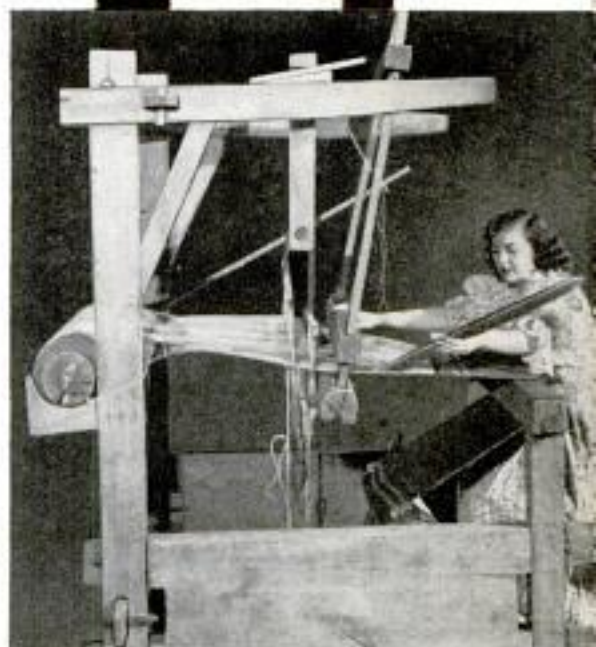
Negative-Retouching Viewer Made From Picture Frame

One photography enthusiast made his own negative-retouching stand by utilizing an old deepset picture frame. The clear glass was removed from the frame, which then was inverted and fastened to a gooseneck lamp by a simple bracket, as shown in the photograph. A piece of frosted glass, cut to fit the recess in the frame, completed the viewer.—H. Leeper, Canton, Ohio.





Just compare this modern aluminum loom with the old-fashioned treadle variety pictured below. The warp, the threading of which was the difficult part of weaving, is supplied by maker



WEAVING REVIVED BY TABLE-TOP LOOM

By Norb Hildebrand

HAND-WEAVING, once a necessary skill in every American household, is again entering the home. But this time it comes as a creative and extremely practical hobby for those looking for an outlet for artistic expression or just a relaxing kind of do-it-yourself fun. It's fun that can pay off in a well-dressed look, too. For example, you can weave material for a suit or coat of the finest imported wool, hand-spun if you like, in the color you prefer and according to your own choice of pattern. This can be done for around 10 dollars. Even after you have paid a tailor to

Photos by Vories Fisher





Photo above shows chair seat being fitted with cover of hand-woven material. Bedspread pictured below is another example of what can be done with hand-weaving



Comparing pattern of weave below with that of the colorful tartan shown at the right will give you some idea of the versatility of the modern hand loom



The unique screen, pictured above, was made by weaving thin strips of bamboo into coarsely woven cloth

make the suit or coat for you, it will still cost only about half the retail price of a similar garment.

Unlike the old-fashioned treadle loom, today's loom is as modern and practical as the power saw or sewing machine. There is a portable, lightweight model made of tubular aluminum that is set on a table top and can be stored in a closet. And you can make anything on it that grandmother made on her cumbersome treadle loom. In fact, the weavers of today can do things that grandmother never dreamed of because of the synthetic yarns at their disposal. If you like to experiment, you can combine things like split bamboo, leather and plastic. This can be easily done without any prior training. A half-hour practice session to learn the operation of a modern loom and how to throw a shuttle is all it takes.



In the past, the only stumbling block to learning to weave had been the problem of making warps. But now the manufacturer of the loom does this for you. The warp is the yarn which runs horizontally from the back of the loom to the front, the woof, or weft, being passed through it at right angles during the weaving operation. At least one manufacturer provides a warping, or threading-in, service for his customers who send him the detachable parts involved in dressing the loom. For a nominal fee he puts on the warp and threads it properly, using whatever materials the customer specifies or supplies. In this way, it takes you only a few minutes to set up the loom, compared to hours of tedious work formerly required.

Such a service simplifies hand-weaving to the point where even a 10-year-old child can weave. You can buy a loom or rent one on a monthly basis. The only other costs, in addition to the warping service, are those of the materials used. These will vary with the size of the project and the selection of yarns.

Regardless of the type of loom, weaving is accomplished by raising a certain number of threads in the warp so that the weaver may pass the weft through at right angles and thus make the web. The harness raises the threads in the warp by means of heddles, each of which controls a single thread or a group of threads. The manner in which the warp threads are strung through the heddles is determined by the pattern desired by the weaver. Thus, a

PARTS OF THE LOOM

A—WARP BEAM: Cylinder of wood or metal at back of loom around which warp is wound.

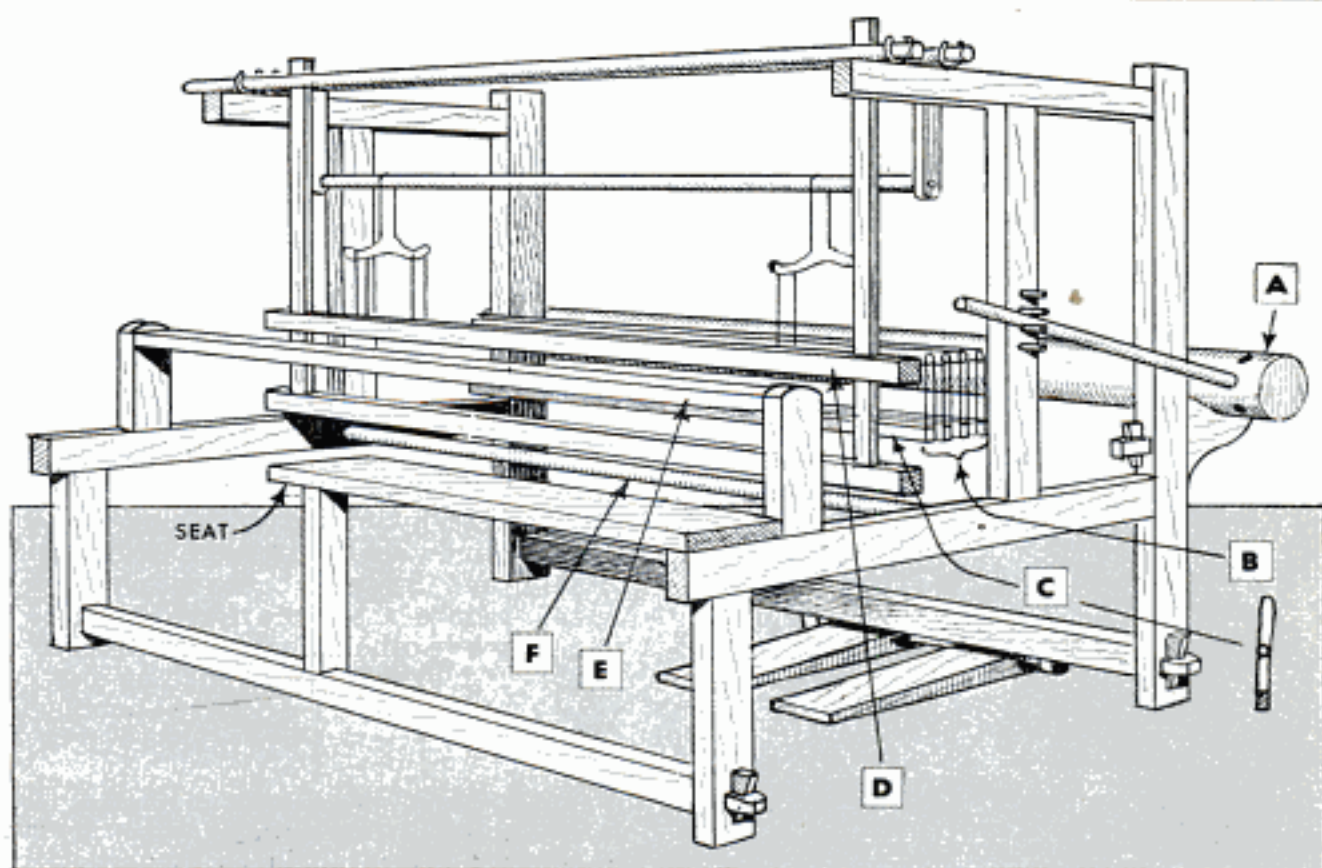
B—HARNESS: Frame of wood or metal holding heddles which permits weaver to raise a selection of warp threads. Harnesses of treadle loom are foot-operated while harnesses of some modern looms are operated by levers or a cylinder-and-pin arrangement at top of loom.

C—HEDDLE: Device of string or flat metal having an eye through which warp is threaded according to pattern. Each heddle may control single thread or combination of warp threads.

D—BEATER: Heavy wooden or metal frame swung against woven material between each row of weft yarn. Amount of beating varies with type of yarn and desired tightness of material. Rhythm is most important in beating. The reed is a comblike device held in the beater through which the warp is threaded. Reed serves to keep warp threads properly spaced. Individual teeth in reed are known as "dents." Number of dents per inch designates the kind of reed.

E—BREAST BEAM: Cylinder of wood or metal at front of loom over which web is held taut.

F—CLOTH BEAM: Wooden or metal roller at front of loom and below breast beam on which finished cloth is wound.





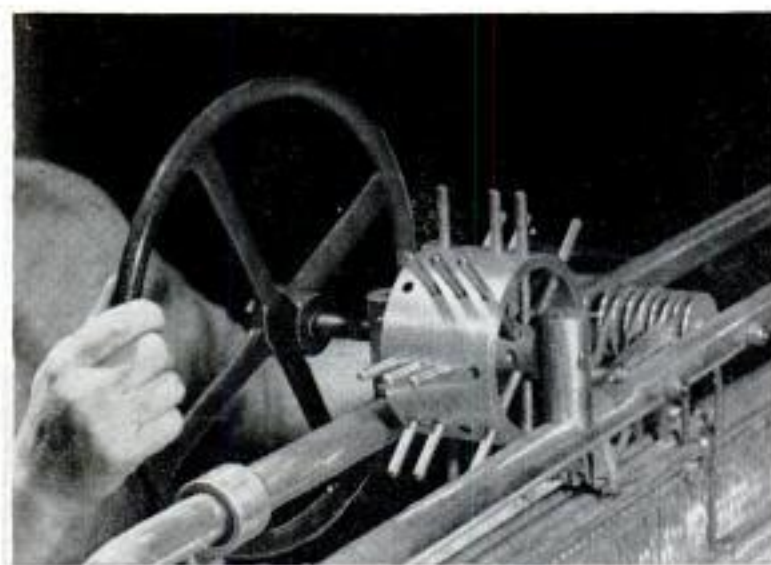
Here the boat-shaped shuttle is being thrown through the shed. Weft yarn unwinds from shuttle as it is moved

single harness may control every other thread, every two threads, every three, four or whatever the desired combination may be. By adding harnesses, the weaver adds the variety of control. For the beginner, the four-harness loom is adequate since, coupled with the variations of warping and the variety possible in the weft, there are hundreds of possible patterns from which to choose.

The foot-operated treadles, or the hand-

operated wheel, raise the harness which in turn raises a specific number of warp threads. This forms a V-shaped opening between the warp threads known as the shed, and it is through this opening that the yarn for the weft is passed. As the weaver throws the shuttle through the shed, the yarn unwinds.

After each "throw" the harnesses are shifted, interlocking each thread in the weft with the threads in the warp. Then the weft is beaten, or pressed firmly together, according to the tightness desired in the finished material. Getting a rhythmic beat assures uniformity in the woven fabric. That is all there is to the weaving operation; raise the harness by means of the treadle or handwheel, throw the shuttle and beat the weft. Some weavers beat before they change harnesses while others beat before and after. It makes no difference as long as the beat is consistent and rhythmic. ★ ★ ★



Cylinder-and-pin setup of modern loom raises harness according to pattern. Pins are relocated in holes as desired

WEAVING TERMS

THREAD: A length of tightly spun or twisted filaments which produce a smooth, fine strand. Warp material usually is called a warp thread.

YARN: A length of loosely twisted filaments in a single strand. Weft material usually is called weft yarn.

WARP: Threads running lengthwise in loom.

WEFT: Yarn woven crosswise in the warp.

SHUTTLE: A device, usually of wood, for holding weft yarn. There are two basic types: A "stick shuttle" for holding heavier materials which are pushed through the warp threads. A "throw shuttle" which is a boat-shaped and hollowed-out block holding weft yarn wound on a quill. As the shuttle is thrown through the warp threads, the weft material unwinds.

SHED: A V-shaped opening, as seen from the side, in the warp threads. This is produced when certain warp threads are raised by the harness. The shuttle is pushed or thrown from side to side through the shed, bringing the weft over and under a combination of warp threads.

PICK SHOT OR THROW: A single traverse of the warp threads by the weft yarn.

BEAT: After each throw of the shuttle, the beater is swung against the woven material, or web. The beat must be rhythmic and of the same force each time in order to produce evenly woven material. Force of beat is varied depending on the material used and the desired tightness.

SELVAGE: The edges of the woven material running parallel to the warp threads.

WEAVE PATTERNS

TABBY OR PLAIN WEAVE: Alternate warp threads—one thread up, one thread down (1-2, 1-2, 1-2, 1-2). This results in a fifty-fifty arrangement of the warp and weft color and the material is the same on both sides.

TWILL: Progressive alternation of warp threads (1-2, 2-3, 3-4, 4-1). By coming back on the next four warp threads in reverse order (4-3, 3-2, 2-1, 1-4) a herringbone results. When the material is turned over, the pattern will be the same on both sides but the colors will be reversed.

BASKET: Two sets of alternate warp threads are raised in opposition (1-2, 3-4, 1-2, 3-4). As with the twill, the pattern will remain the same, but the colors will be reversed on opposite sides of the material.

Lanterns to Light Skating Pond Held by Tree-Branch Supports

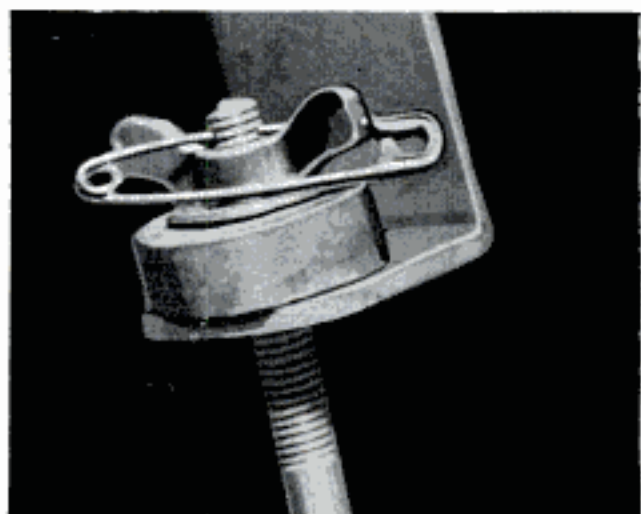


To support several lanterns above the ice for illuminating large areas of a skating pond, one sportsman hit upon the idea of using forked branches and discarded implement wheels for the purpose. Each branch was inserted in the hub of a wheel as shown, thus providing a base for holding it in an upright position. Then a lantern was hung from the forked end of each limb at the height desired, providing not only light but a rustic decoration.

Safety Pin Used as Cotter To Provide Quick Release

To prevent the wing nuts on the clamps of his boat trailer from working loose when the trailer was towed over rough roads, one man drilled holes in the bolts just above the nuts and installed large safety pins. Safety pins were used, rather than cotter pins, to provide quick release when it was necessary to loosen the wing nuts.

Grover Brinkman, Okawville, Ill.

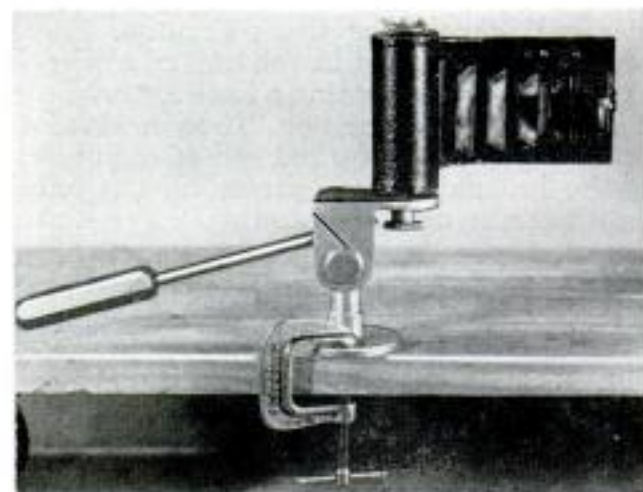




Handy Hints for the PHOTOGRAPHER

MOVIE MAKING, still close-ups and developing all can be done more easily by adapting one or more of the five hints illustrated on this page. Left, home-movie title fade-ins and fade-outs are made by using a sheet of cellulose-acetate tracing film cemented to a cardboard frame. In use, the title card is held against the back of the film. Then with the camera running, title card is slowly tipped backward to produce a "dissolve." Fade-ins of titles are accomplished by reversing the procedure. Titles can be filmed in color or black and white.

Below, to combine rigidity with freedom of camera movement when photographing small objects at short range on a table top, clamp a pan head to the table with a C-clamp. A single C-clamp will do for most small cameras, while the larger ones may require two clamps to hold the pan head rigidly in place



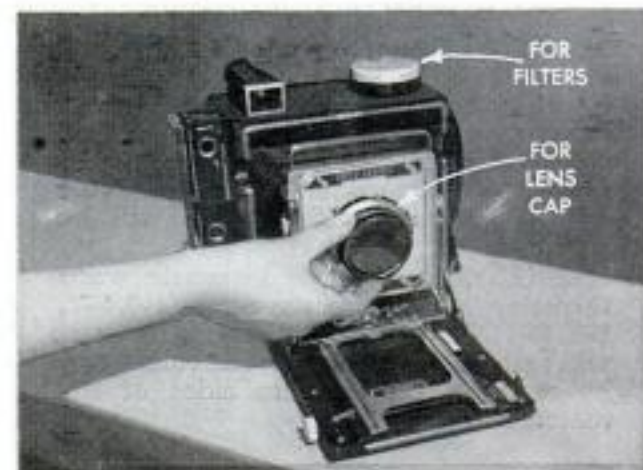
Below, when feeding film into the reel of a plastic film-developing tank, the film will stick and buckle if perspiration on the hands dampens the edges which contact the reel. To prevent this, dry the hands carefully, make sure the reel is completely dry and handle the film only by the edges, as shown in photo



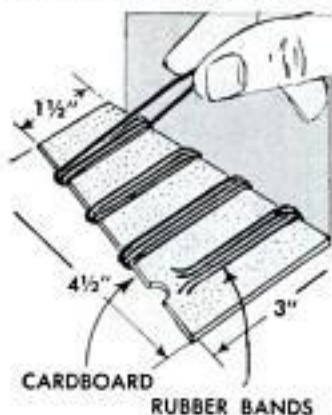
Below, when using a slow, fine-grain developing solution, fit the 5 x 7-in. developing tray inside a war-surplus .30-cal. ammunition box. The clamps on the lid hold it tightly in place so the box is completely light-tight. With the developer inside the box, dark-room lights can be left on during the developing time



Below, empty filter boxes can be utilized in a number of ways for use with camera equipment. Fastened to the top of the camera, the box provides an excellent way of carrying a pair of filters right with you on a field trip. The bottom half of the box, fitted with a felt strip inside the rim, can be used as a lens cap



Rubber Bands Stored on Card Permit Quick Selection



A notched card, cut from heavy cardboard, provides a convenient method of storing various sizes and lengths of rubber bands. The size of the card can be varied to take a variety of sizes.—H. M. Suttle, Dayton, Ohio.

Prevent Battery Shorting

Accidental shorting of the battery connectors by tools when making repairs around the car can be avoided if both connectors are painted with undercoating material. A small spot on the top of each connector can be left uncovered so that testing equipment can be used.—Henry Hanscom, Elmhurst, Ill.

Dowels Protected From Vise Jaws With Spring-Type Clothespins

Small wooden dowels may be held in a regular vise without being damaged by the jaws if a spring-type wooden clothespin is used. The clothespin is clipped around the dowel and both then are slipped into the vise jaws. When the jaws close, the dowel is held firmly and the clothespin absorbs any damage from the jaws.—Gilbert C. Close, Hawthorne, Calif.



JANUARY 1955



Fresh Water for Camping Trip Supplied by Gravity-Feed Can

To carry a supply of fresh water on automobile and small-boat camping trips, one outdoorsman has made a gravity-feed storage container from a new 5-gal. kerosene can. When stored in the trunk of the car, the can eliminates the necessity of pouring water, allowing it to be drawn from the supply without disturbing the luggage you have so carefully packed. The container is made by soldering a hose connection to the side of the can near the bottom and attaching a 5-ft. length of plastic hose to it. To the other end of the hose, a standard faucet is attached. An air vent is provided by soldering a copper tube over a small hole in the spout cap.—George Brook Taylor, Daytona Beach, Fla.

Clothespin Provides Handle When Carrying Rubber Boots

When obliged to carry heavy rubber boots by the small finger loops, sportsmen and hunters will find that a common clothespin can be used as a comfortable handle. The clothespin is inserted through the loops, as shown in the illustration, and distributes the weight evenly across the palm of the hand. When on a trip or in the field, a short length of a small-diameter twig, or even a pocketknife can be used.



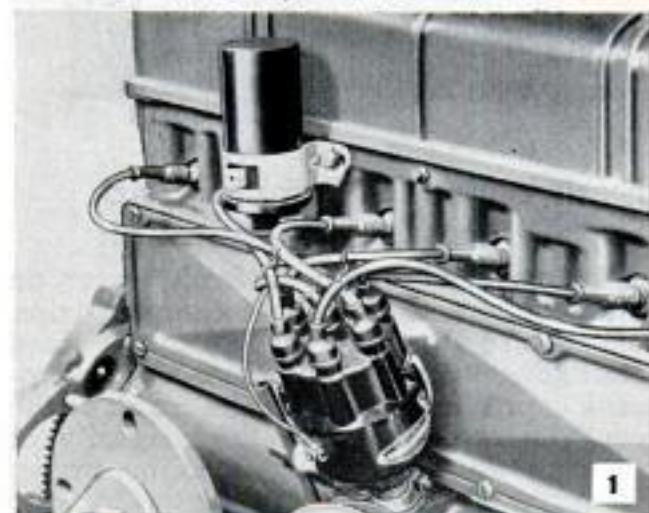
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RESTORING IGNITION SYSTEM

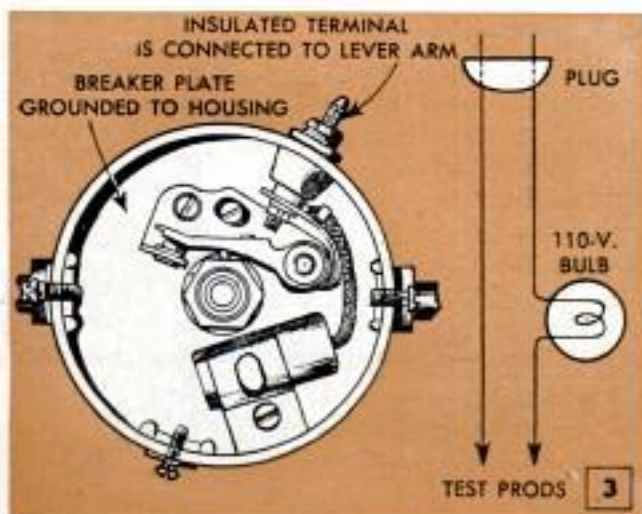
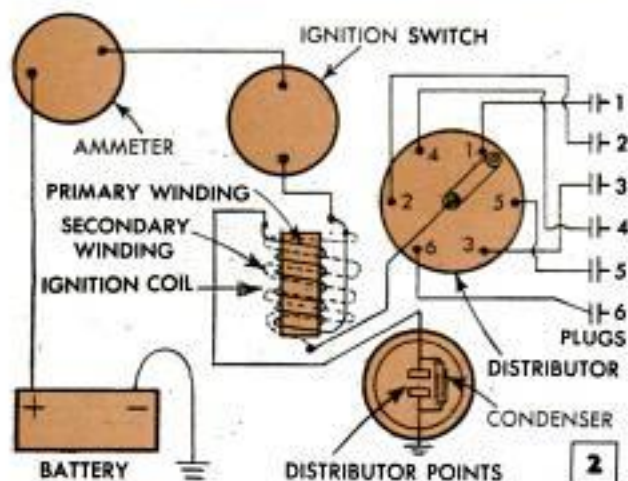
By Ed Packer

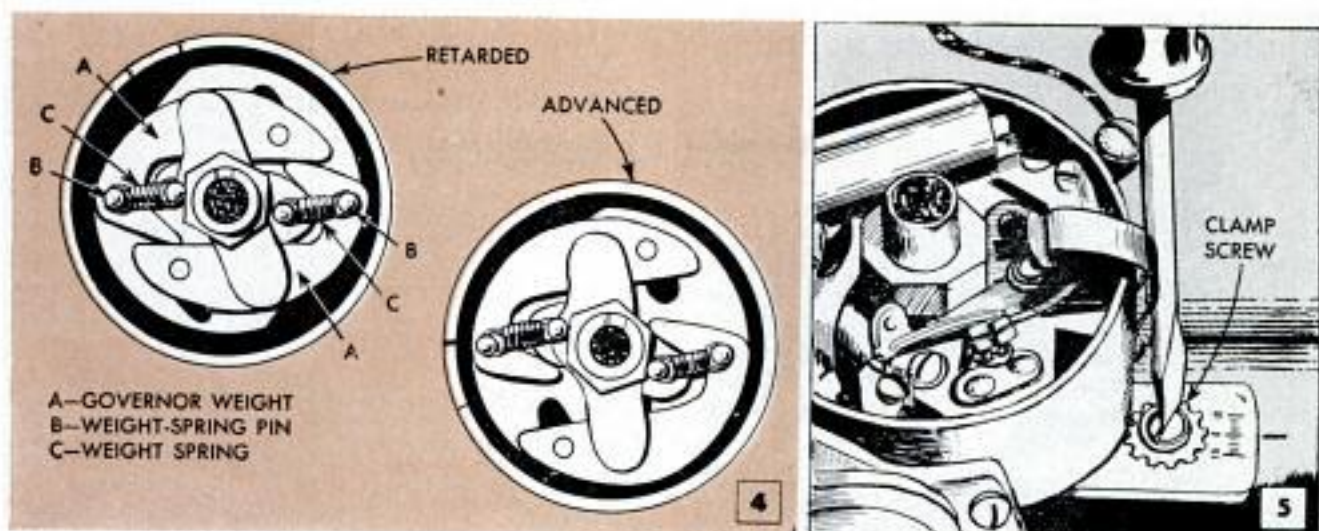


GENERALLY, the job of reclaiming an old car, truck or tractor engine includes an overhaul of the ignition system, as many of its parts frequently require rebuilding or replacing. First, the parts must be checked for electrical and mechanical defects. To do a thorough job, the distributor, Fig. 1, should be removed from the engine. Before removing the unit be sure to note the position of the distributor arm. Some mechanics mark its position relative to the housing so that there can be no error in replacing the unit in precisely the same position. Also, the engine crankshaft must not be moved until the distributor, Figs. 1 and 2, has been replaced. These precautions make it unnecessary to retune the engine after assembly.

One of the important electrical checks is for a grounded terminal, Fig. 3. Using test prods, place one on the terminal and one on the metal distributor housing with the breaker points open. The test bulb will light if the terminal is grounded. Another fairly reliable test for grounded terminal, when the system is complete with battery, is to remove the wire from the terminal, turn on the ignition switch and then flash the wire to the terminal with the points closed. Normally there will be a spark. But if there also is a spark when the points are open, it generally indicates a loose terminal or defective terminal bushings. There also is the possibility of a shorted condenser or a grounded contact-arm spring. If the tests turn up none of these common defects the unit probably is still in serviceable condition electrically.

One of the most important mechanical checks is to determine the amount of side play in the distributor shaft. If this is excessive, above .005 or .006, new bushings are needed. Also it should be remembered that normally the distributor cam rides freely on the distributor shaft. If it is frozen on the shaft, due to rust or other causes, the automatic spark advance will be rendered inoperative. If the cam does



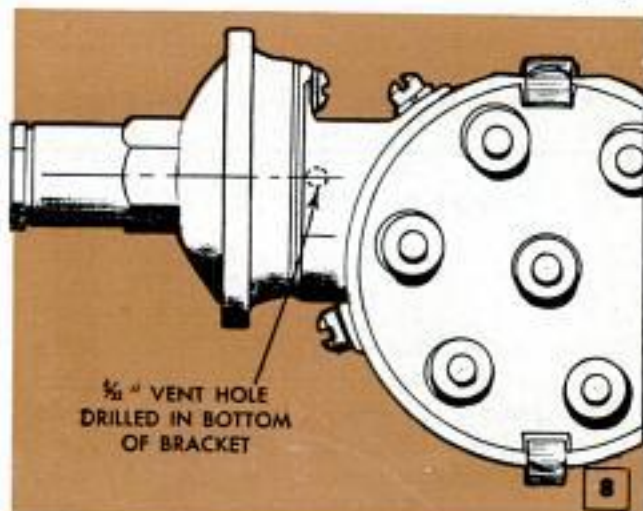
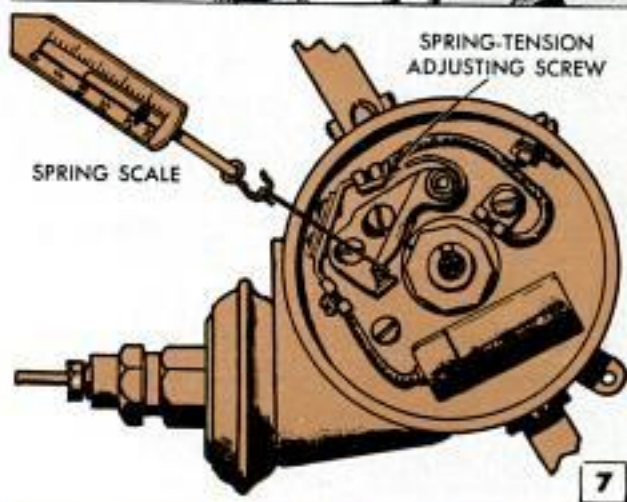
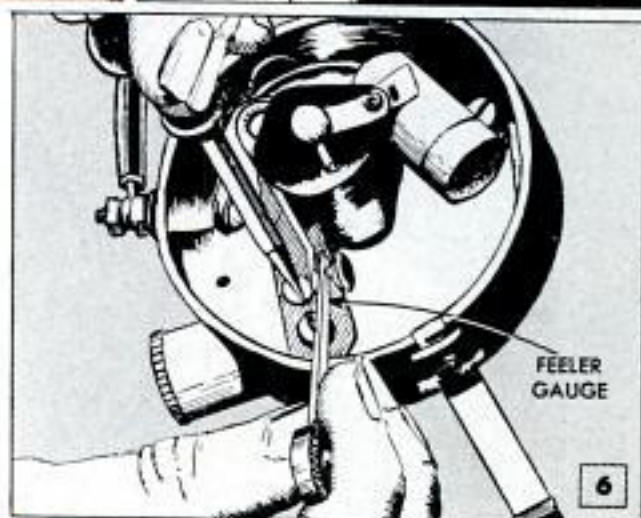


not move freely under finger pressure, then dismantle the unit by removing the breaker plate and the insulated terminal. This will expose the centrifugal governor weights which are driven by the distributor shaft. These weights rotate the breaker cam on the shaft to advance or retard the spark according to engine speed. The cam can be freed and lifted off the end of the shaft by removing the governor-weight springs, Fig. 4, and then working it off the end of the shaft. Clean the parts in a solvent, polish the shaft and cam with crocus cloth and oil and then examine the weight springs carefully for spots of rust. If the springs show any sign of rust, they should be replaced. Be sure that the weights move freely from the retarded to the advanced positions. These movements involve the three parts A, B and C in Fig. 4.

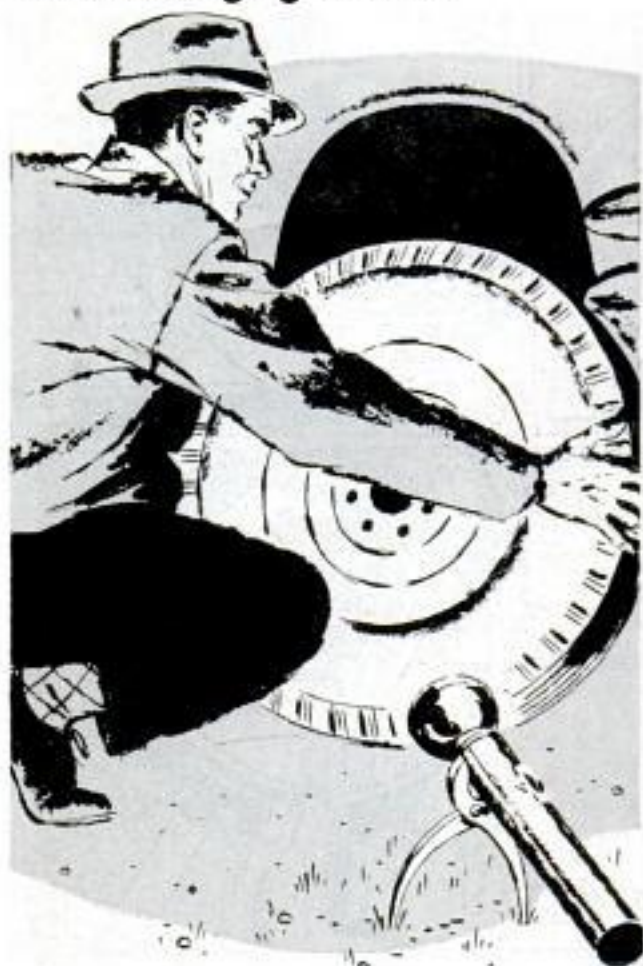
Nearly all distributors are equipped with a vacuum advance. The weights (centrifugal advance) control spark advance in relation to engine speed while the vacuum unit controls spark according to engine load. When overhauling old engines most mechanics replace the vacuum unit as, in most cases, it is not practical to attempt a repair.

When assembling and replacing the distributor on the engine, check to see that the timing-adjustment screw is tight. Fig. 5 shows one type. Also check the breaker-point gap with a feeler gauge as in Fig. 6. If necessary, reset according to the manufacturer's instructions. Be sure that the wear surfaces of the cam are smooth. Also, it's a good idea to check the tension of the breaker-arm spring as in Fig. 7. Lubricate the parts as they are assembled.

To prevent the possibility of explosion shattering the distributor cap, a comparatively rare occurrence and due to a fuel-air mixture entering the distributor through the vacuum unit, mechanics vent the unit by drilling a $\frac{5}{16}$ -in. hole in the bottom of the bracket, Fig. 8. This prevents the fuel mixture reaching the distributor. ★ ★ ★



Pliers Provide Flashlight Support When Changing Flat Tire



When he had to change a flat tire at night with only an ordinary flashlight for illumination, one motorist used a pair of pliers to support the light. The ends of the handles are forced into the ground and the barrel of the light rests in the open jaws of the pliers.—L. W. Mitchell, Carrsville, Ky.

Thickness of Acoustic Tiles Varied To Eliminate Harmonics

The sound-absorbing qualities of acoustic materials applied to closely spaced parallel surfaces sometimes can be cancelled because of the short distance between the surfaces. In one case involving soundproofing a double door joining two rooms in a motel, $\frac{1}{2}$ -in. acoustic tile had been applied

to both doors. Noise from one room was still clearly audible in the other, even though the walls also were soundproofed. The solution to this particular problem was to apply $\frac{3}{4}$ -in. tile to the face of one door, leaving the $\frac{1}{2}$ -in. tile on the other. The different thicknesses of tile on each surface cancelled out the harmonics which had been responsible for the transference of sound.—Robert F. Welch, Venice, Calif.

Electric Motor and Tools Carried in Bucket

A fractional-hp. electric motor, which is difficult to carry because of its shape, can be transported easily from one job or building to another by placing it in a bucket. Wrenches, V-belts and other necessary accessories for the motor can



be carried in the bucket at the same time. Because of the extra weight, the handle of the bucket should be provided with a grip made from a section of rubber hose to make it easier to carry.

Plastic-Backed Print Smoothed On Ferrotypc Tin With Alcohol

Photo paper which has a plasticized or water-resistant back sometimes is difficult to roll smoothly onto a ferrotypc tin. To overcome this, squeegee the excess water from the print, then moisten the back with denatured alcohol. When the alcohol has softened the material on the back, force the paper into smooth contact with the ferrotypc tin with a roller or squeegee.

Walter E. Burton, Akron, Ohio.



Keep Your Tools Sharp . . .

To get the most out of your workshop tools and bits, keep them sharp, for even the best quality tools, when dull, can't do a good job. Sharpening tools isn't difficult, but there is a right way and a wrong way for each edge, and there are tricks that make the job easy. All the information you need to do a professional job on your tools is in next month's big story on tool sharpening

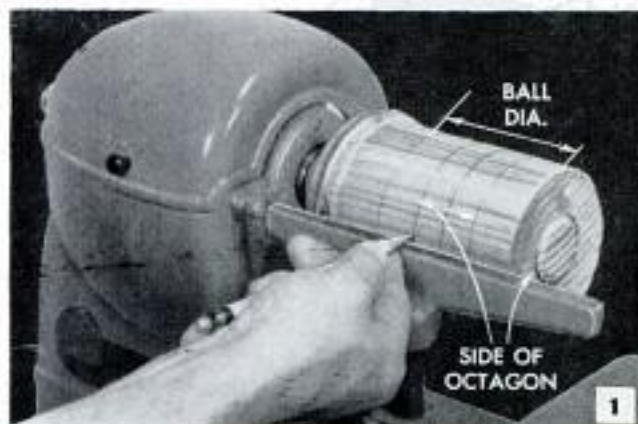


SHOP NOTES

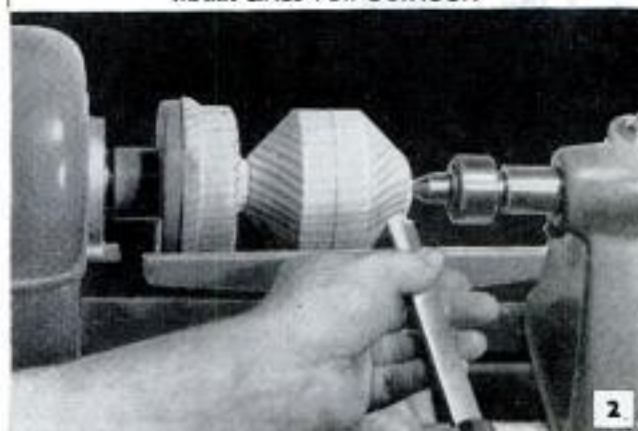
How to TURN A BALL

TURNING A wooden ball, or sphere, in your wood lathe is easier than it looks. The trick is in following through with all details of a step-by-step procedure. Follow the proper sequence and you end up with a perfect ball on the first try. Ordinarily, it is best to use hardwoods of dense grain such as birch and maple.

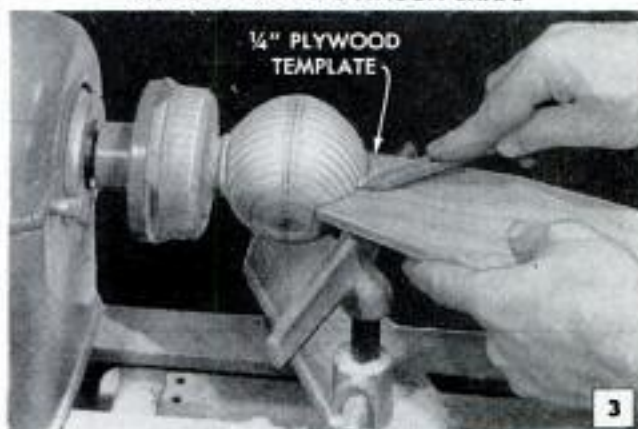
Figs. 1 to 5, inclusive, picture the several steps in turning a ball on the screw center where the diameter of the finished ball does not exceed 4 in. When mounted on the screw center as shown, only one separate step, that of mounting in a cup chuck as in Fig. 5, is required to finish the ball completely. The first step is to turn the stock to the cylindrical form and to the exact diameter of the ball as in Fig. 1. The table, Fig. 8, gives the length of the octagon side for balls ranging from 1½ to 6-in. dia. Note how the measurement is made in Fig. 1, also the upper detail in Fig. 8, the latter showing the work mounted between centers. Rough-turn to the octagonal shape as in Fig. 2. Then make a template of ¼-in. plywood, bandsawing the end to the same radius as that of the ball. Taper the radius end of the template to a width a trifle more than one fourth the diameter of the ball, lower detail, Fig. 8. Wrap a piece of fine sandpaper around the partially turned ball and sand the curved end of the template. Now turn the ball shape by working the tool directly over the template as in Fig. 3.



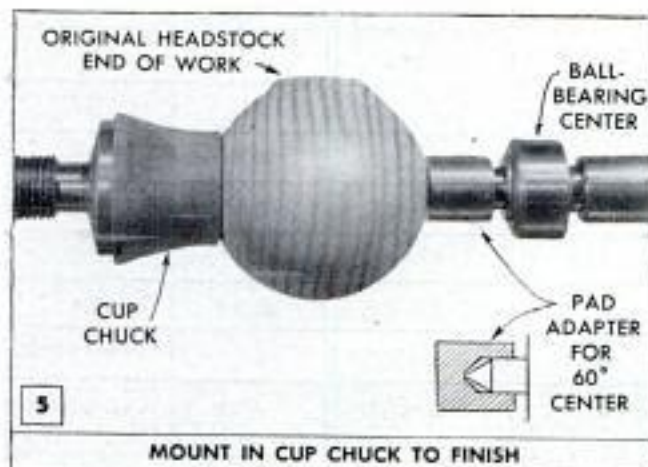
MARK LINES FOR OCTAGON



ROUGH-TURN TO OCTAGON SHAPE



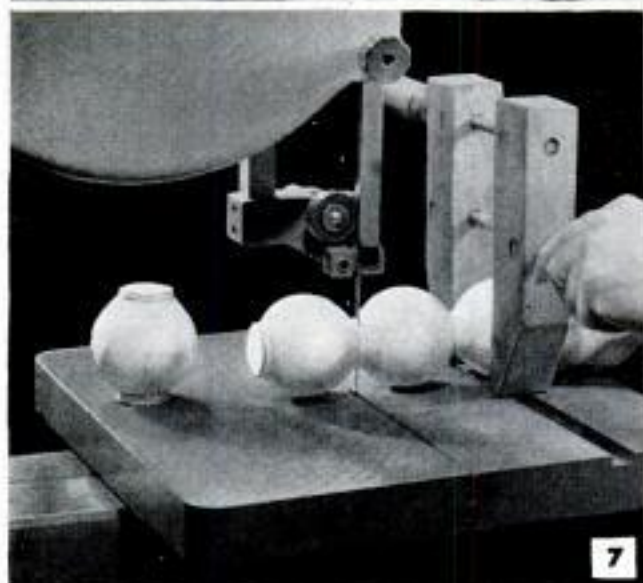
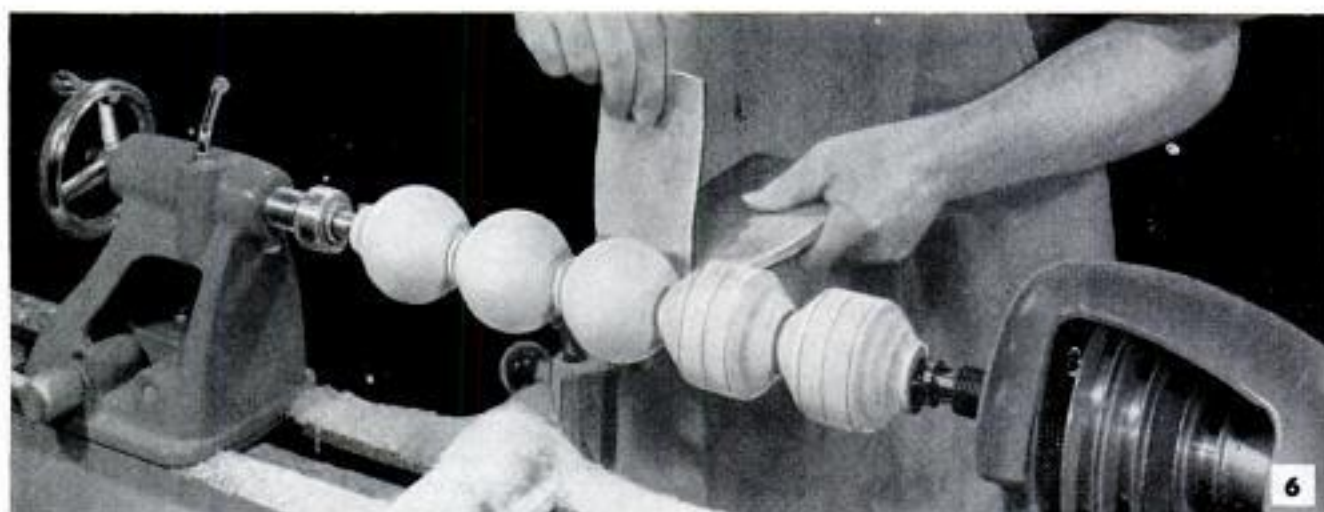
TURN BALL SHAPE



MOUNT IN CUP CHUCK TO FINISH

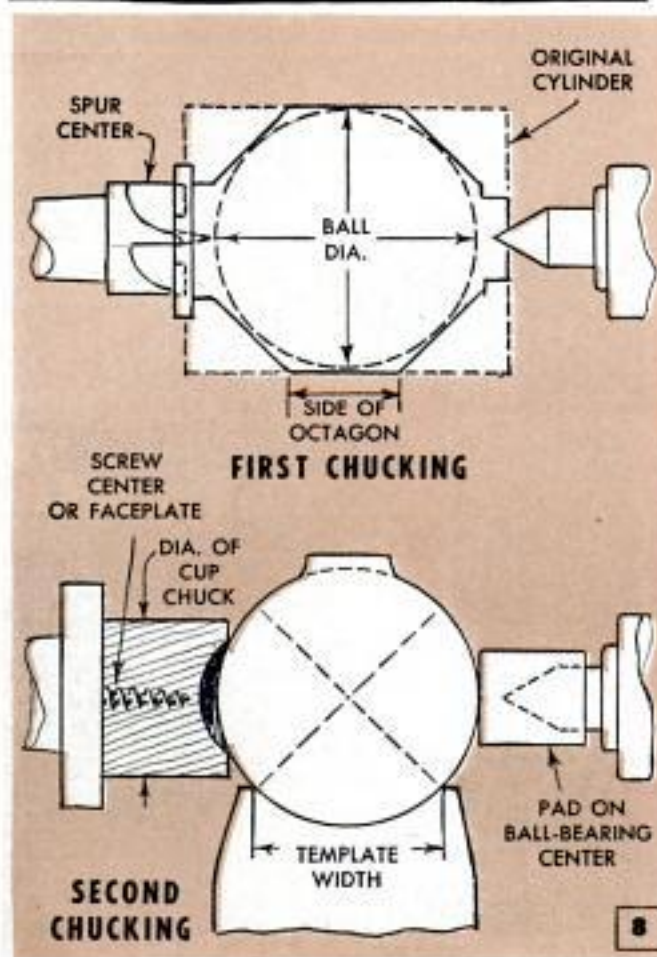


SAND BALL WITH TEMPLATE



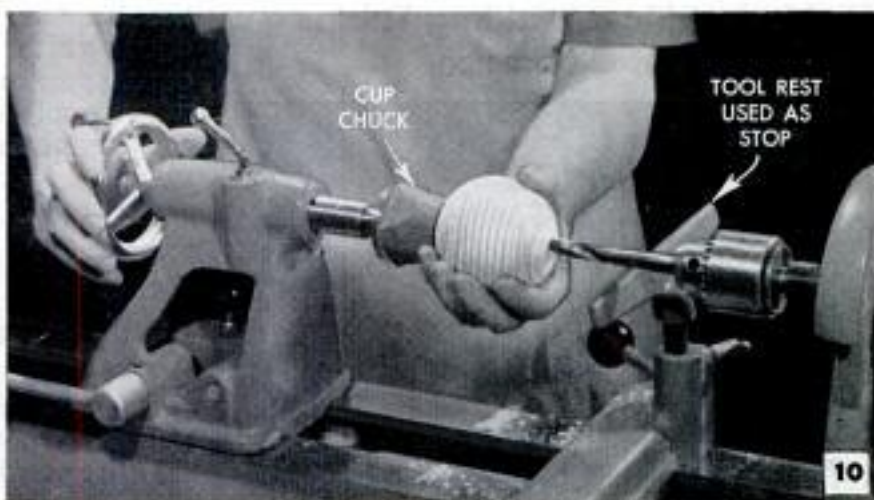
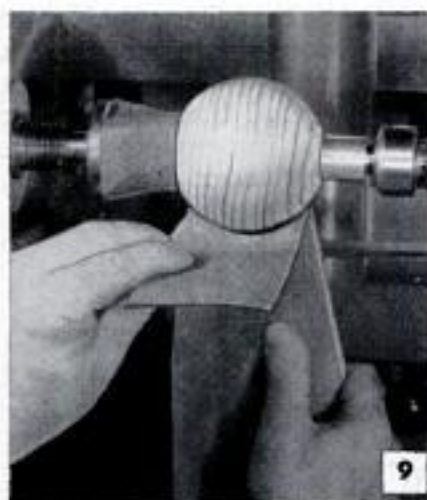
Then sand as in Fig. 4. Keep the paper and template moving uniformly over the surface, as otherwise a flat or groove may be produced. If the ball is to be center-drilled this operation can be carried out before removing the turning from the screw center. Lathe speed used in these operations should be about 2400 r.p.m.

There are several precautions to be taken when sanding the ball shape. The first thing of importance is the choice of a sandpaper grade to suit the type of wood. As a rule you can use a grade-coarser paper on softwood than on the average piece of hardwood and get a smoother job without scratching or burning. When sanding a ball, select a grade of paper that will work



Data - TURNED BALLS

BALL DIAMETER	SIDE OF OCTAGON	TEMPLATE WIDTH	CUP CHUCK DIAMETER
1½"	¾"	1¾"	¾"
1¾"	¾" - ⅜"	1¾"	1"
2"	1⅛" + ¼"	1¾"	1½"
2¼"	1⅝"	1¾"	1¾"
2½"	1⅝" - ¼"	1⅝"	1¾"
2¾"	1⅞" + ¼"	2½"	1¾"
3"	1¾"	2⅝"	1¾"
3¼"	1¾" - ¼"	2½"	1¾"
3½"	1⅞" + ¼"	2⅝"	2½"
3¾"	1⅞"	2⅞"	2¼"
4"	1⅞" + ½"	3⅝"	2½"
4½"	1⅞"	3½"	2¾"
5"	2⅛" + ¼"	3¾"	3½"
5½"	2¼" + ¼"	4⅝"	3½"
6"	2½" - ¼"	4½"	3¾"



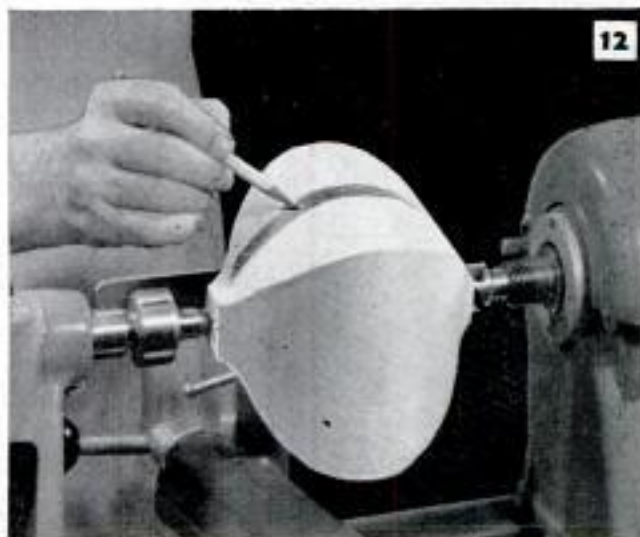
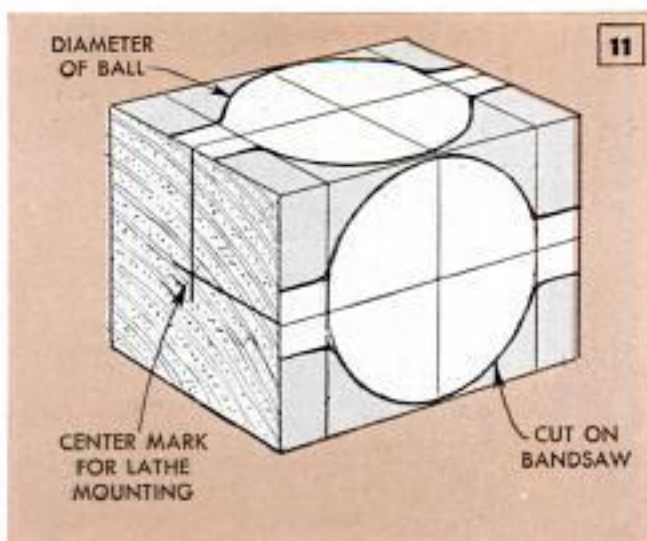
on the flat grain of a piece of waste of the same kind of wood without leaving scratches. Touch this to the rotating ball with the template as in Fig. 4, then stop the lathe and observe the results carefully. If there are no pronounced scratches on the surface, it probably is safe to proceed. The reason for this precaution is that the purpose of sanding is only to smooth the ball, not to shape it. Also, before sanding, be sure that the paper used is not creased. A crease in the sandpaper will leave a scratch, or groove, that is difficult to remove without reducing the diameter of the ball.

The final step is to cut the ball from the waste and mount it in a cup chuck as in Figs. 5 and 8. Then turn off the hub, or boss, remaining after sawing the ball from the waste. This must be done with special care as the interrupted cut may cause the turning chisel to dig in and spoil the work.

When a number of balls of the same diameter are required, turn a spindle to the ball diameter, then remove the waste and partially turn each ball individually as in Fig. 6. Cut them apart with a bandsaw as in Fig. 7, or with a handsaw, then mount in the cup chuck as in Fig. 8 and finish each one separately. If the balls turned between centers require center holes, they may be

accurately drilled with the setup pictured in Fig. 10, using the cup chuck on the tail center. Ordinarily, the diameter of the cup chuck should be slightly less than one fourth the diameter of the ball. Note also that the ball-bearing lathe center in the tailstock is fitted with a pad as in Fig. 5.

Where the ball is to be 4 in. or more in diameter it is best to remove a portion of the waste by compound bandsawing, the layout on the rough block being made on all four sides, as in Fig. 11. Then bandsaw the block to the shape shown in Fig. 12 and blacken one face with a soft-lead pencil. The blackened strip should be about $\frac{1}{2}$ to $\frac{3}{4}$ in. wide so that it is readily seen while the work is rotating. After the ball has been partially finished between centers, be especially careful when turning down center projections, or bosses, to prevent over-cutting. Have lathe in a good light so that you can see the double image of the ball as it rotates. The double image will gradually fade out as the work comes to a spherical shape. Then sand with the template as in Fig. 9, stopping the lathe frequently to note the progress of the work. When the fine sanding marks begin to criss-cross those made in the first sanding operation the curve is uniform. ★ ★ ★

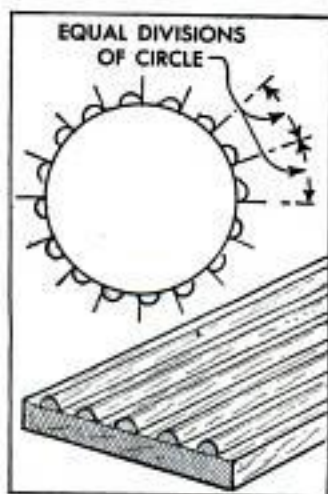


Single-Leg Steel Welding Table Provides Foot Clearance



Because its top is supported on a single center leg, the heavy-duty welding table, shown in the photograph, eliminates the problem of foot clearance when working around it. The table top is a 36 x 36-in. piece of 1½-in. steel plate welded to the leg, which is a length of 5-in.-dia. steel pipe set in the concrete floor. The lower shelf on which the tools are stored is 29 in. square and is a light steel plate. A steel flat welded to the edge provides a flange. The table is used both for welding and cutting and its extra-strong construction will absorb the heavy hammering required when fabricating or straightening metal shapes.—Leland Elam, Sacramento, Calif.

Beaded Surface Can be Simulated With Half-Round Molding



The easiest way to simulate a beaded surface on either flat or curved work is to apply half-round molding as shown in the illustration. For round work, the periphery must be divided accurately for the strips and spaces between them. The spacing between the strips can be varied for

best appearance, but all spaces must be of equal width. The easiest way to obtain this equal spacing is to use a spacing block when applying the strips. Unusual effects can be obtained by using spacing strips made of a darker wood than the molding strips, or by staining them beforehand.

Reversible Poultry-Feed Trough Easily Cleared of Rain or Snow

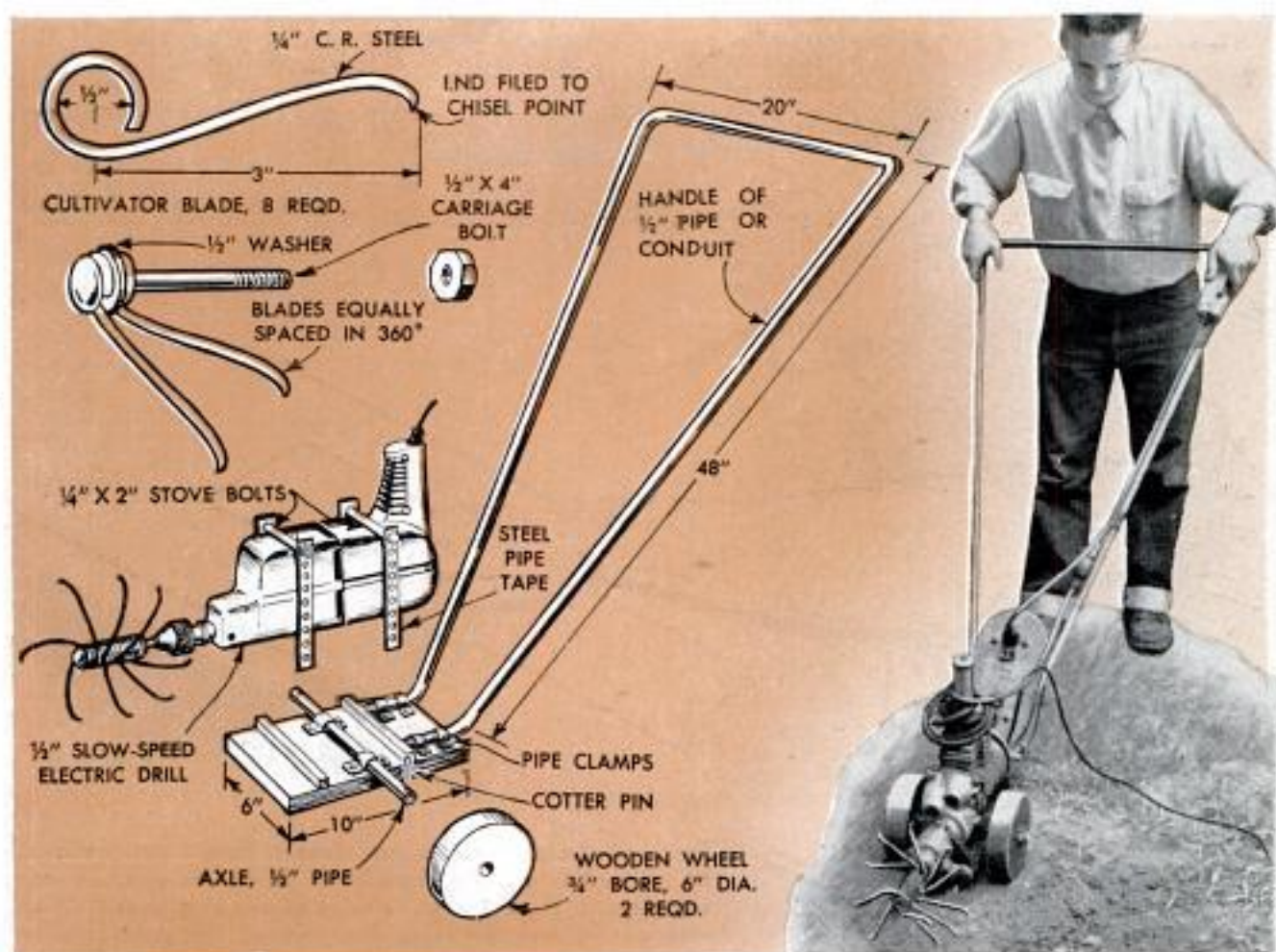
Rain or snow, which often fills outside poultry-feed troughs, is merely dumped out by inverting a two-way trough made from two sections of eaves trough riveted together. Turned up, the trough can be filled with feed immediately while the lower trough drains and dries.



Sickle Bar Raised Hydraulically On Converted Mower

To avoid having to raise the sickle bar manually on a horse-drawn mower adapted for use with a tractor, one farmer mounted a hydraulic cylinder on the mower tongue to operate off the tractor hydraulic unit. In mounting the cylinder, the upper end was pivot-bolted to the sickle-bar lifting lever. The lower end pivots on a bolt in a bracket formed by welding square pieces of flat steel to a triangular-shaped piece. The bracket then is bolted to the tongue.





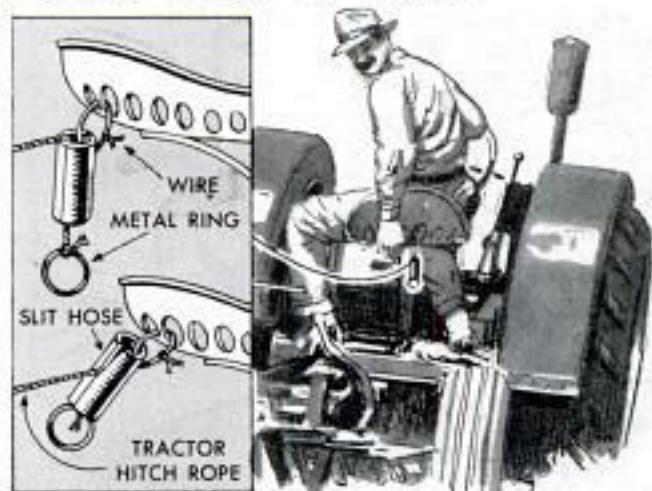
Portable Electric Drill Powers Garden Cultivator

For surface cultivation of garden row crops this improvised unit, powered by a portable electric drill of $\frac{1}{2}$ -in. capacity, has all the principal advantages of a rotary cultivator. It's especially handy in small gardens because of its light weight and maneuverability. The drill, which should be of the slow-speed type, is mounted in the inverted position on a wooden platform supported by two wooden wheels. Small rubber-tired wheels can be substituted. The handle is formed by bending $\frac{1}{2}$ -in. pipe

or conduit and the ends are attached to the platform, or base, by means of pipe clamps. The axle is attached in the same manner. The cultivator blades, or teeth, are bent to the shape indicated and placed side-by-side on a $\frac{1}{2}$ -in. bolt with spacer washers between. After spacing the blades the nut is drawn tight to hold them in position. The switch on the drill is locked in the on position and a separate two-pole switch is located on the handle to provide more convenient control of the drill motor.

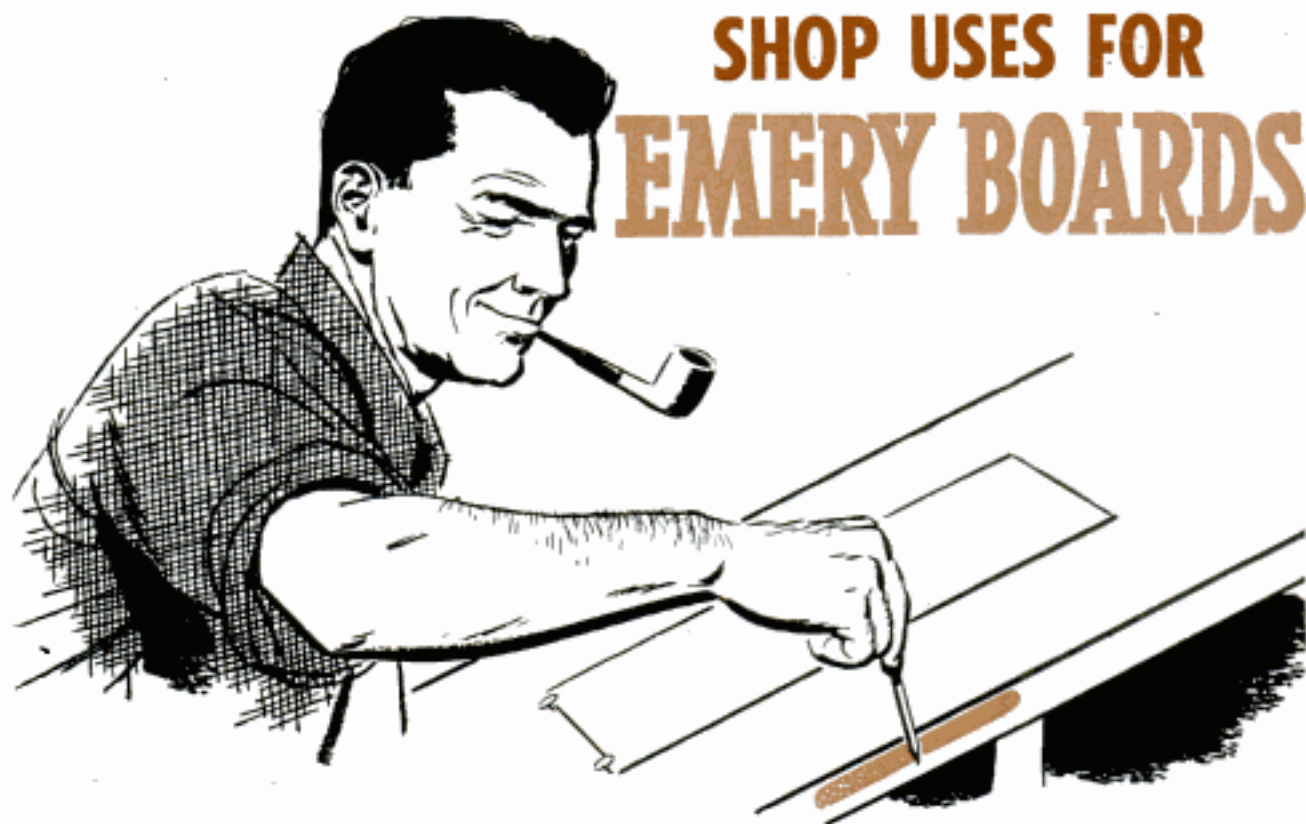
Automatic Release for Trip Rope Protects Driver of Tractor

The danger of the seat being pulled off a tractor by a trip rope tied to the seat, when an implement accidentally becomes unhooked, can be eliminated by using a "slip fitting" to hold the end of the rope. The fitting is a short length of auto-radiator hose slit down one side and attached to the tractor seat with a wire loop. The trip rope is passed through the hose, then a metal ring, length of dowel or just a large knot is tied in the end so the hanging weight of the rope will not pull it through. A heavy pull on the rope will cause it to slip through the slit in the hose, thus preventing it from pulling on the seat.



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SHOP USES FOR EMERY BOARDS

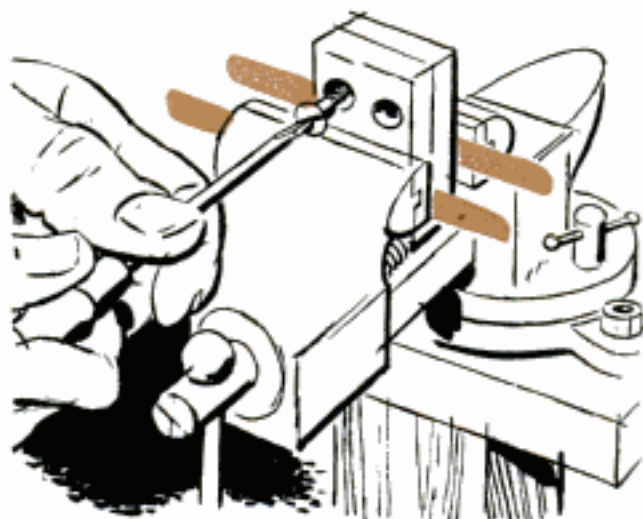


Every good artist has his own ideas of how a pencil should be pointed to suit the work he is doing. An emery board cemented or thumbtacked to edge of drawing board, either side out, is just the thing for pointing the pencil. For a sharp, flat point it's usually best to use fine side of board

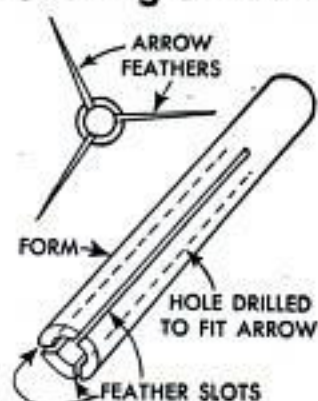
Lower left, small parts gripped in the vise may suddenly slip sidewise if a little too much pressure is applied when driving a screw or drilling a hole. To prevent this mishap, place an emery board on either side of work before tightening vise jaws. Friction surface of boards holds securely

Flexibility of a large emery board makes it especially useful for finishing small metal parts. It is better and smoother than an ordinary file for this purpose and also much easier to control when the dimension is close to the required size. Both sides can be used

Below, right, when laying out work to close dimensions, a carpenter needs a fine, flat point on the pencil so that the dimension line is not over or under when marked along the blade of the square. An emery board cemented to the handle of the try square is handy for pointing the pencil



Arrow-Fletching Jig Made Quickly Utilizing Short Dowel



When gluing new feathers on an arrow, the problem of holding them in position until the glue has dried can be solved by using a jig made from a short length of dowel. The dowel is drilled lengthwise to fit over the end of the arrow and three equally spaced slots are cut to hold the feathers. The jig should be coated with paraffin to prevent the glue from adhering to it. In use, the jig is slipped over the end of the arrow, and the feathers, their one edge dipped in glue, are inserted in the slots. When the glue is dry, the jig is removed from the arrow, leaving the feathers in the required position.

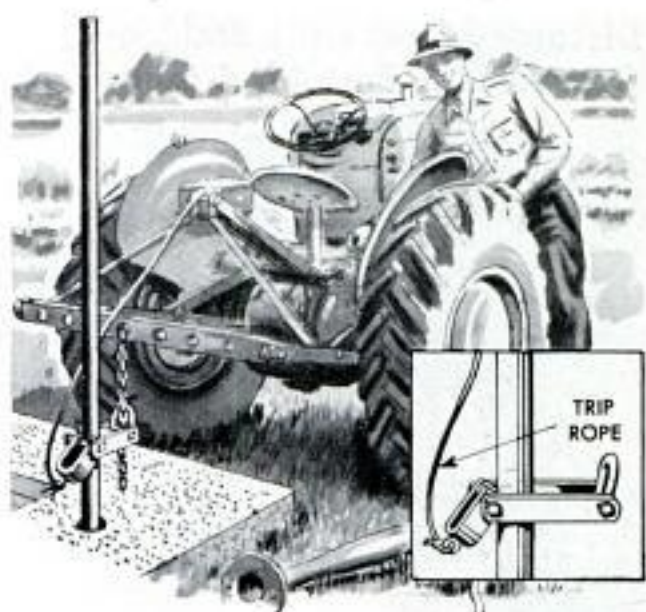
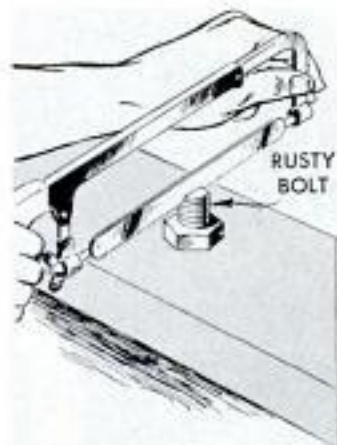
Rubber Band on Ball of Twine Prevents Unwinding



One method of assuring that a ball of twine will not become unwound when it is dropped is to use a wide rubber band with a hole punched in it. The band is snapped around the ball and the loose end of the twine is pulled through the hole, as shown. If the ball of twine unwinds from the inside, the rubber band need not be removed to use the twine.

Cut Bolt to Take Off Rusted Nut

When a bolt on which a nut has rusted fast is in a restricted location that prevents gripping the head with a wrench, and a hammer and chisel cannot be used, split the bolt lengthwise with a hacksaw. Cut down through the bolt until the nut also is cut in half, then drive out the bolt with hammer and punch.—Hugh Lineback, Stillwater, Okla.



Welded Clamp on Tractor Lift Pulls Pipe Out of Well

Tractor power and a welded clamp have replaced muscle power on one farm for pulling the pump pipe from a well. Consisting of two $\frac{3}{8}$ x 2 x 9-in. flat-steel sides with a steel block welded between them near the center, the clamp has a clevis fitted at each end. One clevis is used to suspend the clamp from the hydraulic lift of a tractor. Shaped from flat steel, the clevis at the opposite end has squared ends which aid the clamp to grip the pipe. A trip rope, passed through an eye welded on this clevis, is used to release the grip of the clamp. To use the clamp, the pump must first be jacked up from the platform and unscrewed from the pipe which is held with a regular alligator-jaw clamp. The welded clamp then is fitted over the pipe and it is raised the limit of the hydraulic lift. The clamp then is released with the trip rope and the clamp lowered. The process is repeated until all the pipe is pulled.

A. M. Wettach, Mt. Pleasant, Iowa.

Magnet Removes Drill Chips From Blind Hole in Steel

Chips caused by drilling or tapping a blind hole in iron or steel can be removed by using a soft iron or steel rod and a strong magnet. The rod should be long enough to reach the bottom of the hole, and small enough in diameter to enter the hole freely. Drop the rod to the bottom of the hole and place the magnet on the end. When magnet and rod are removed from the hole, some of the chips will cling to the bottom of the rod. Pull the magnet away from the rod to clean it of chips, then repeat the complete operation until all the chips are removed from the hole.

Charles R. Haynes, Vestal, N. Y.

Discarded Steel Truck Bed Converted to Portable Granary



Using a steel truck bed as the bottom half, one farmer constructed this ratproof granary. It has a capacity of 200 bu. and can be set on blocks, as shown, or mounted on skids so that it is easily moved with the tractor from place to place on the farm.

George Laycock, Batavia, Ohio.

Notch Ground in Claw of Hammer Provides Tool for Pulling Tacks



When working with old lumber, you often find tacks and brads that are driven so far into the wood that the claw of a regular hammer cannot be slipped under the heads. To overcome this problem, and eliminate the need for a second tool, file or grind a V-notch

in the end of one claw. The sharp-edged notch can be used to pull most tacks and brads and will not hinder the use of the hammer claw for pulling nails.

William B. Eagan, Louisville, Ky.

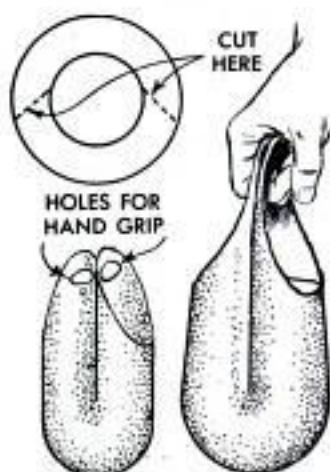
Repairing Threads Over Keyways

When chasing worn threads on slotted keyways, chipping sometimes occurs, since the thread die may jump or chatter during

the cutting of the first few threads. However, if a small spot is welded or brazed at the very end of the keyway—just enough to fill the tip of the slot—the die won't chatter as it is started for the chasing process.—Harry J. Miller, Philadelphia, Pa.

Handy Water Bucket Improvised From Automobile Inner Tube

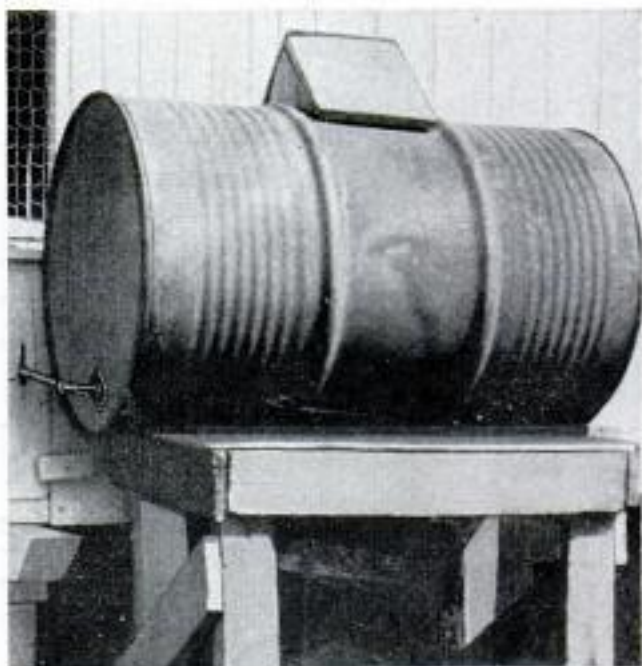
An excellent emergency water bucket that can be carried in the car and will take up little storage space, can be improvised from a sound, but discarded auto inner tube. Cut the tube in two, as shown, then cut oval handholes for carrying. For added strength,

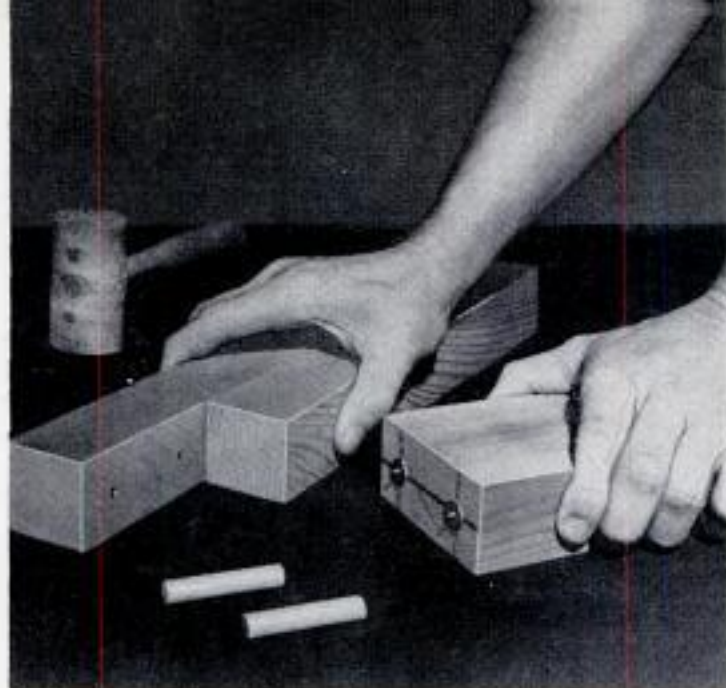


cement a piece of inner-tube rubber on both sides of each end of the tube around the handholes. The bucket also would be handy on an outing or camping trip.

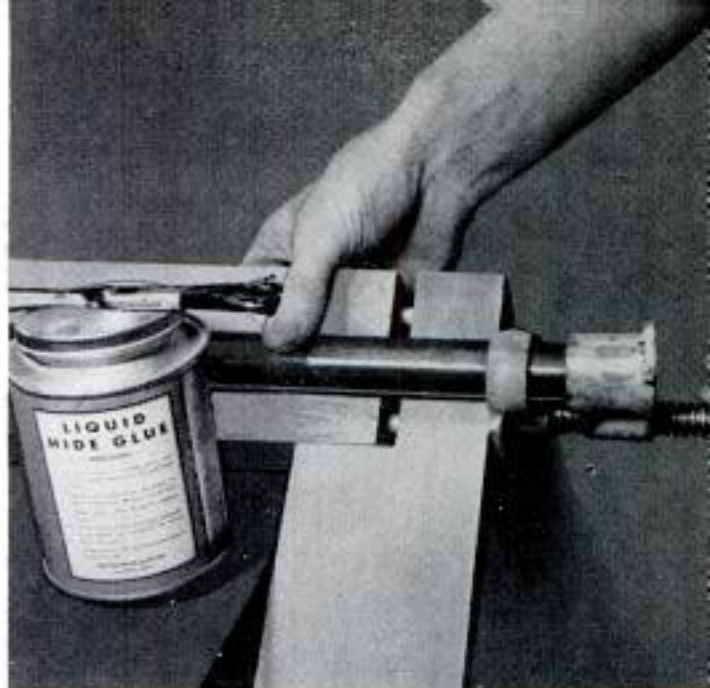
Oil Drum on Elevated Platform Fuels Brooder-House Stove

To eliminate frequent filling of the oil stove in the brooder house, one farmer installed a 55-gal. oil drum on a raised platform outside the house. The bung on one end of the drum is pushed down to receive a small-size supply line. The bung on the top is left open to provide a supply of air and is covered to keep out the rain.





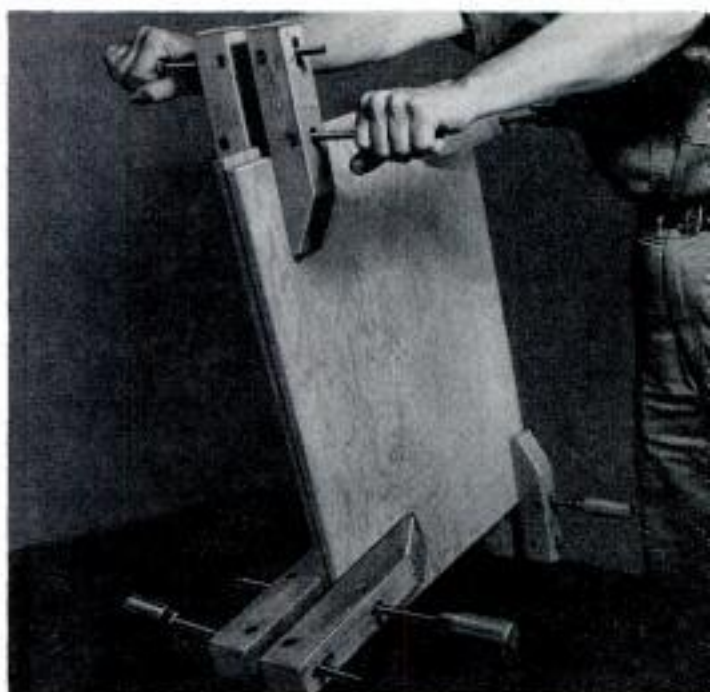
In this doweled joint, end grain is joined to flat grain. End grain should have two coats of glue before joining. Dowel locators assure perfect alignment



A bar clamp is used to draw the joint tight after application of the glue. Care should be taken to assure a perfect fit between all meeting surfaces



A tub filled with water makes a good "clamp" for flat work such as veneering a small surface. Place a piece of plywood under the tub to distribute pressure



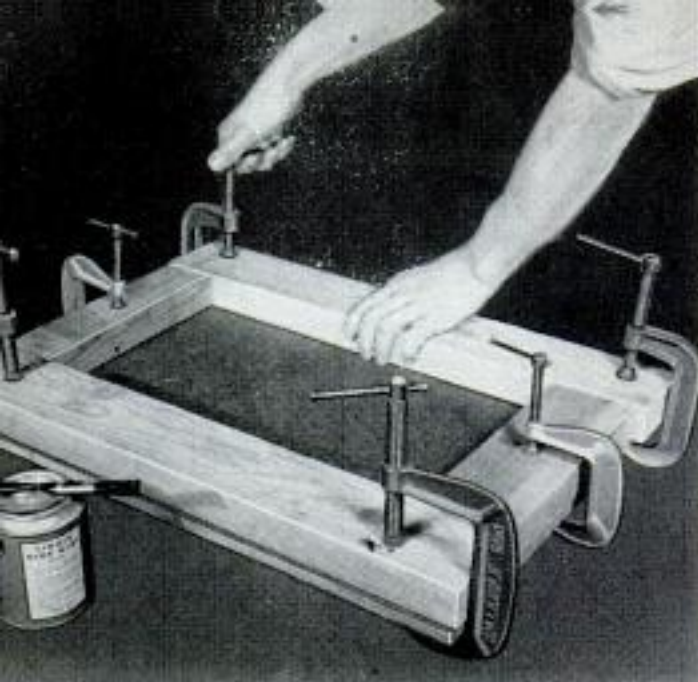
Laminating and veneering can be carried out with hand screws, using four or eight screws, depending on size of work. Adjust hand screws for uniform pressure

By Jerry Parker

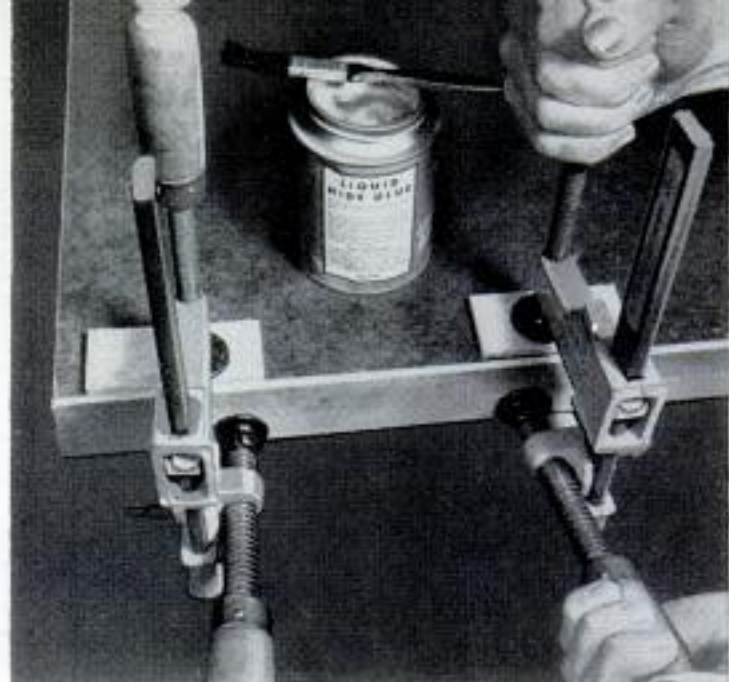
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SN 58

GLUE KNOW-HOW has been simplified by the ready-to-mix and ready-to-apply cold adhesives which eliminate heating and the temperature problem at the time of application. Liquid hide glues have supplanted the older hide glues that were supplied in the flake form and required heating for a period of time to reduce them to a usable consistency. Although the older glues were highly effective in durability and holding power, they are not so suitable for use in small manufacturing plants and home shops due to the special equipment required for preparation and application. Both the liquid hide glues and the newer resin glues, the latter having the appearance and consistency of thick cream, are especially useful in home-shop joinery. Both these glues, also the

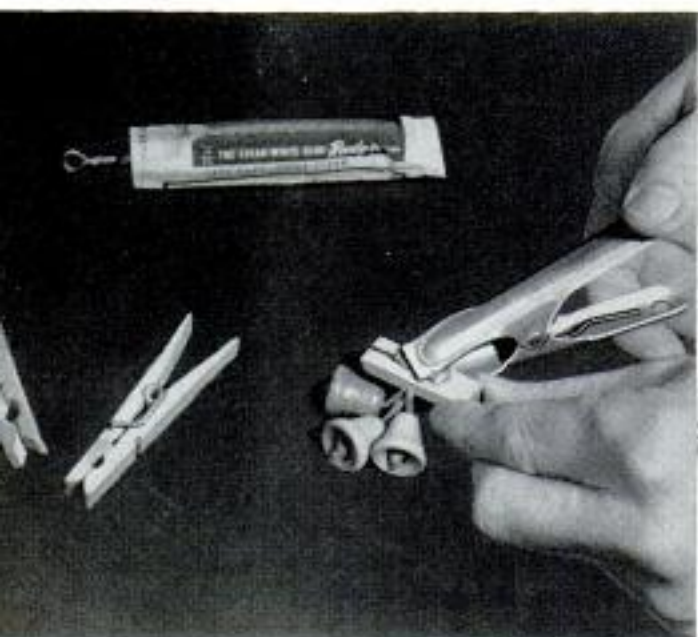
All About
GLUE
and
GLUING



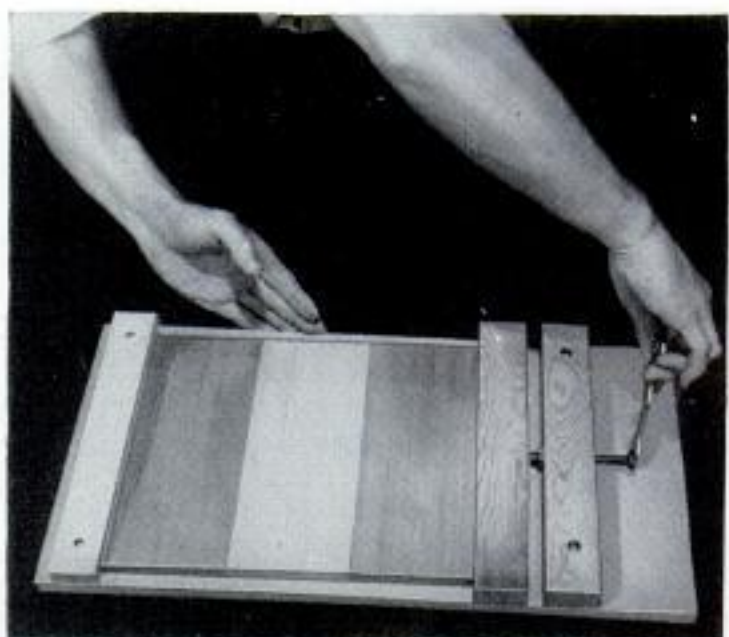
Laminating hardboard to wood is easy with the setup pictured. C-clamps should be equally spaced to distribute pressure uniformly. Wipe away excess glue



Edge clamps are large C-clamps with a sliding fixture that permits applying pressure in two directions. They are especially useful for gluing strips to edges



Spring clamps and clothespins of the spring type are used for joining small parts, border inlay and assembly of models. Spring clamps come in several sizes

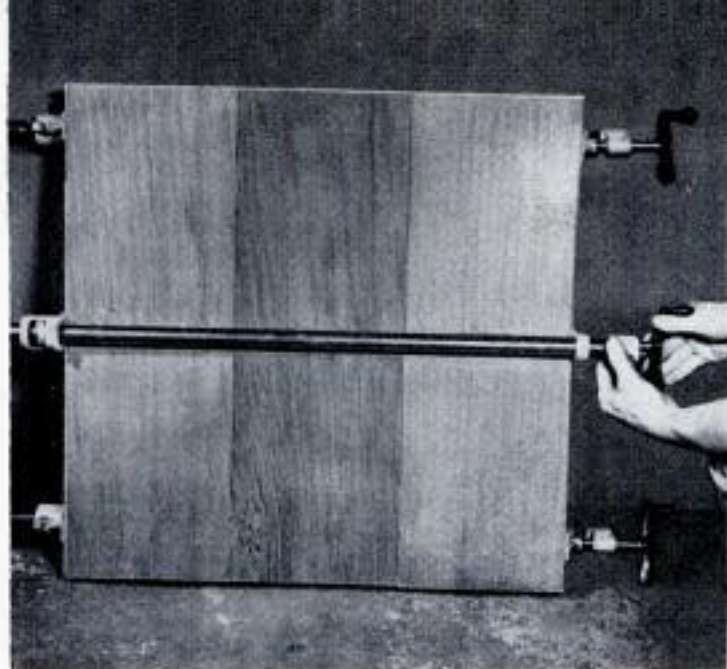


Improved clamps for edge-gluing can substitute for bar clamps. The simple unit pictured is very effective. Bolt forces the movable jaw against the edge of work

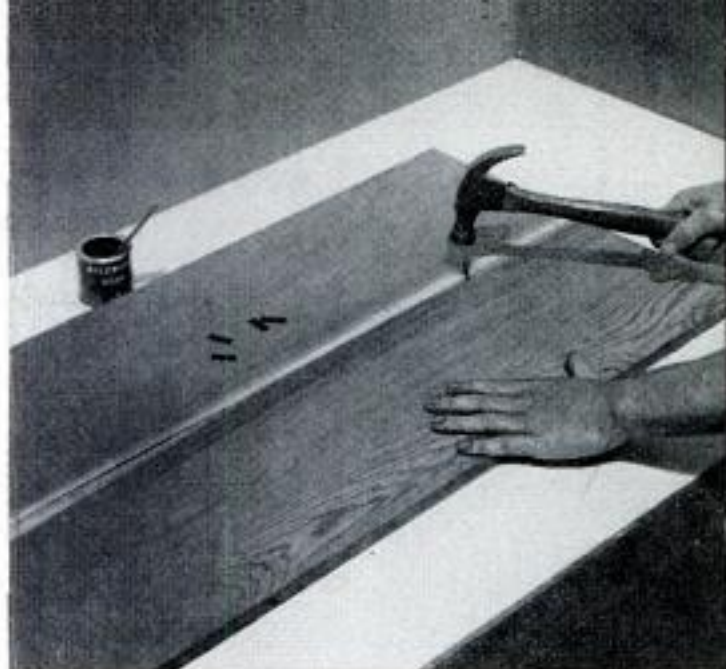
ready-to-mix type supplied in the powder form, require only the simplest clamping equipment. All are water-resistant in the sense that holding power is affected little, if any, by ordinary dampness. When a completely waterproof glue is required, the craftsman uses a resorcinol glue supplied in a two-part container, one part of which contains a dry powder, the other a catalyst in liquid form. When the powder and liquid are mixed in accordance with instructions they form a waterproof glue of great holding power. When gluing woods which contain natural oils such as rosewood, teak, lemon and yew wood, the craftsman uses a casein glue, which comes as a powder and is mixed with water to form a fairly heavy liquid.

Edge-gluing and joint-gluing of frames

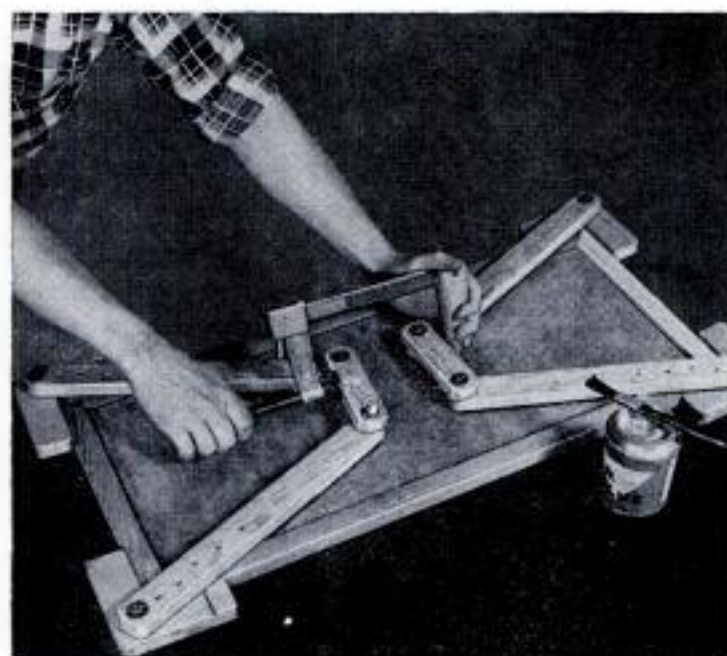
and cabinet parts require not only the use of the correct glue, but a careful trial fitting of the parts to insure full contact over the whole area of the meeting surfaces. When edge-gluing a number of strips to form a wide panel, the edges of the strips must be jointed true, either by machine or by hand-planing. Craftsmen make a trial assembly of cabinet frames before applying glue to the joints. This will assure a perfect fit of the parts when they are glued and clamped. When gluing cabinet-frame members where end grain is joined to flat grain, it is important to apply two coats of glue to the end grain. Allow the first coat to become tacky, then apply a second coat and join. When joining flat grain, as in edge-to-edge work, the important thing is to apply the glue in a uniform coating. This can be done



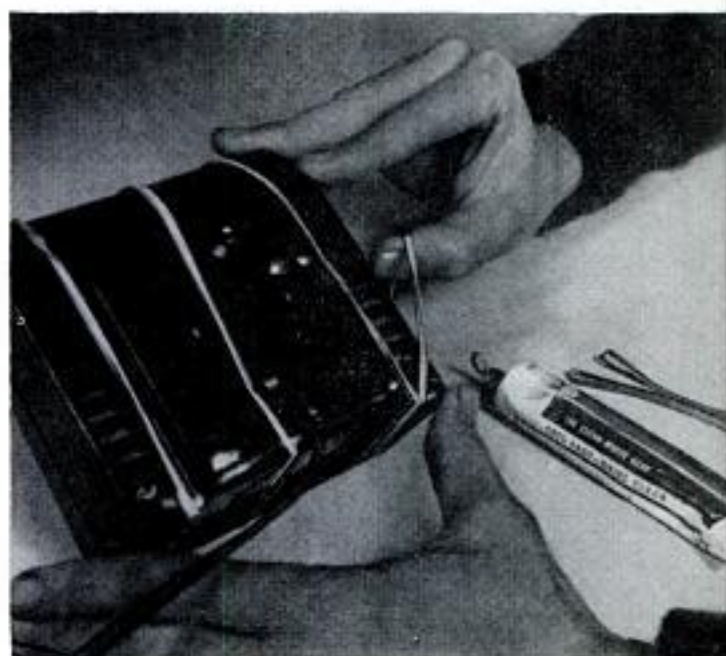
Bar clamps, or carpenter's clamps, are best for edge-gluing a number of strips to form a wide panel or top. Note spacing and alternate position of center clamp



On work where exposed metal is not objectionable, corrugated fasteners are suitable "clamps" for edge-gluing. Usually they are driven into both sides of joint



A self-adjusting miter clamp is handy in the home shop. You can make one like this in a few minutes. Note how two members are drawn tight with C-clamp

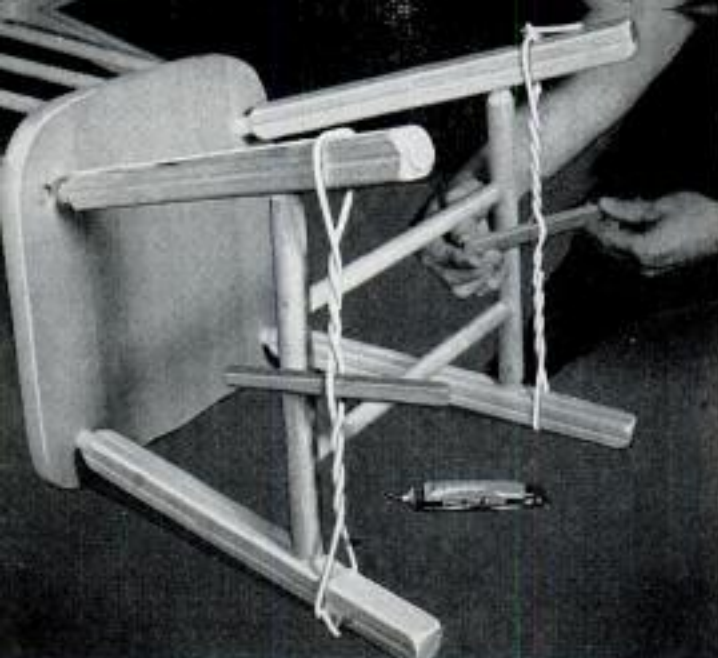


Ordinary rubber bands of various sizes are just the thing where it is necessary to apply a light, uniform pressure when gluing or cementing small parts

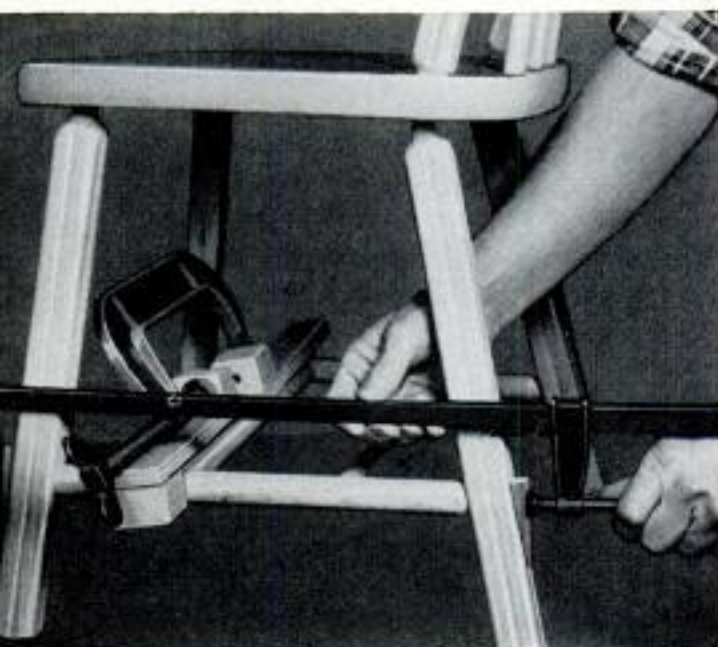
For certain clamping operations requiring light pressure, cellulose tape is useful. Simply spread glue on joining faces, locate parts and wrap with tape

Craftsmen often improvise bar clamps when building or repairing chairs. This simple, two-part clamp is especially effective for this type of parts assembly



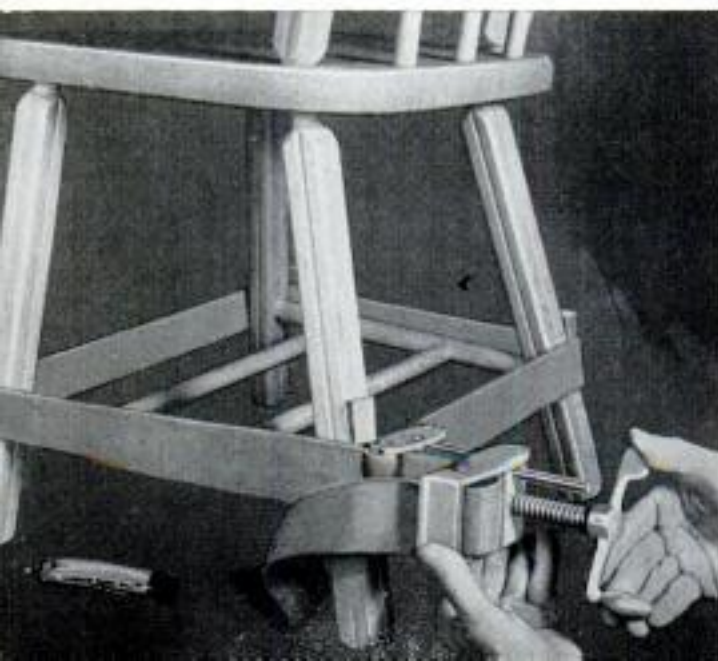


For repairing a single chair, twisted cords can be used to apply pressure until glue sets. Cord clamp is quickly improvised from a length of clothesline



In some cases, chair assembly can be speeded up by applying pressure in two directions simultaneously. Here three bar clamps will be placed at right angles

When the amount of work to be done justifies its purchase, the band clamp is best for chair work. Here the lower assembly is clamped in one operation



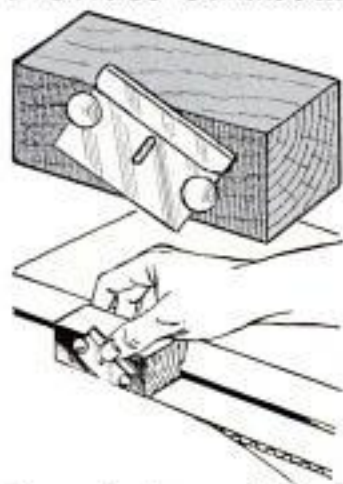
with a thin wooden paddle, a brush, or best of all, a glue applicator of the roller type. This applicator operates in a manner similar to a wheel-type paint striper.

Beginning with the two right-hand photos on page 215, various methods of clamping are pictured. Correct application of the clamps and the amount of pressure applied are the two most important points about clamping. Bar clamps, C-clamps and wooden hand screws, or adjustable clamps, are the most commonly used in the small shop. Bar clamps, or carpenter's clamps, are used chiefly in edge-gluing several strips of stock, also in cabinet-frame assembly. It is important that bar clamps be located square with the work so that pressure is exerted uniformly. Also, when more than two bar clamps must be used, locate the center clamp, or clamps as the case may be, equidistant from those near the ends of the work. The upper left-hand photo on page 217 is a good example of correct bar-clamping. Note that the center clamp is placed with the bar across the opposite face of the work. This position of the third clamp helps to equalize the pressure and also prevents any tendency of the work to buckle. If the work has been cut to the finish size before clamping it will be necessary to protect the edges at the point where the metal clamp jaws engage. This is done by placing small pine blocks between the edge of the stock and the jaws, or by cementing pieces of leather to the face of the jaws. You also can improvise a good substitute for bar clamps, the clamp in the lower right-hand photo on page 216 being a good example.

C-clamps and edge clamps, upper left and upper right-hand photos on page 216, are used when it is necessary to apply pressure near the edges of the work, as in gluing on an edging strip, or in veneering. Edging clamps, upper right-hand photo, page 216, are provided with a sliding bracket, or jaw, which makes it possible to apply equal pressure in two directions. Another clamp which belongs in this classification is the simple spring clamp shown in the lower left-hand photo, page 216. This clamp works in a manner similar to pliers, the spring acting to close the pivoted jaws. Spring-type clothespins also can be used in the same manner.

Improvised miter clamps, rubber bands, cellulose tape, corrugated fasteners, "chevron type" fasteners, all these can be made to serve as clamps in certain gluing operations. In building or repairing chairs, the band clamp, lower photo at the left, is universally useful. It consists of a length of canvas or other tough fabric attached to a special fixture having a snubbing device which permits adjustment of the fabric band to any required length. ★ ★ ★

Razor Blade Attached to Block Provides Cardboard Cutter



One man who had frequent need to cut corrugated cardboard for packing inserts, mailing photos and other purposes, made a simple and efficient cutter by thumbtacking a single-edge razor blade to one side of a small wooden block. The blade is set to just cut

through the cardboard. When one corner of the blade is dulled, the blade is easily changed end for end. A double-edge blade also could be used for this purpose, but the upper edge of the blade should be covered with cellulose or adhesive tape to prevent injury to the fingers.

Vertical-Sliding Haymow Door Is Counterbalanced

The time and labor involved in closing a conventional hinged-type haymow door can be reduced considerably by using this counterbalanced door that slides vertically. Tracks for the door are provided by first nailing 2 x 4s to the outside surface of the barn, then nailing 1 x 6s on top of them and allowing one edge to project. Ropes tied to each side of the door lead up over pulleys and down to free-hanging weights which counterbalance the door so it can be operated with a minimum of effort.



JANUARY 1955

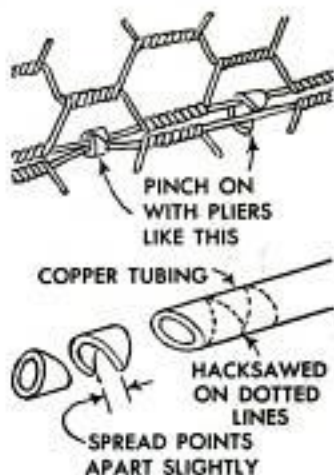


Tanks Set in Concrete Floor Furnish Water for Hog Lot

The waterers in the hog lot of one farm are buried 5 ft. in the ground to aid in keeping the water at a constant temperature and to prevent winter freezing. The waterers are discarded hot-water tanks, each having one end removed. The tanks are set in the ground at such a depth that when the concrete floor is poured around them, 3 in. of the tank projects above the surface. The water line that supplies the tank is run underground from a boxed-in pan and float just outside the fence. A 12-quart bucket, with holes punched around the sides, fits in the top of each tank, to prevent feed and dirt from dropping into the tanks. The buckets are cleaned simply by lifting them and pouring their contents on the ground.—G. Laycock, Batavia, Ohio.

Chicken-Wire Fencing Spliced With Sections of Tubing

Splicing together two lengths of chicken-wire fencing, which usually is done by sewing with wire or by twisting the strands together, can be accomplished more easily with diagonal sections cut from a length of copper tubing. Cut the tubing as indicated by the dotted lines in the detail then spread the points of the resulting rings with a screwdriver. Use a pair of pliers to pinch the rings onto the chicken wire, as shown in the illustration. The rings should be spaced every 5 in. along the splice.



219

SHOPPING



1

1. SHEET-METAL BRAKE for bench-vise mounting forms angles, brackets and channels. Box-bending and end-folding attachments are available. Handles 18-ga. metal in sheets up to 24 in. wide. Assembled, ready for use. Easily adjusted for various bends

Television Accessories Co., Box 6001, Arlington 6, Va.



2

2. VACUUM LIFTER is connected to an air line to provide a powerful hand lift for sheet metal, glass, hardboard and other materials having flat surfaces on which a vacuum can be maintained. Saves time, labor in warehousing and production operations

Littell Mach. Co., Air Div.,
4555 Ravenswood Ave., Chicago 40

3. JOINT TROWEL for dry-wall finishing has a wide, replaceable steel blade which produces a perfect cemented joint in two strokes, one to apply cement and one to feather edges. Eliminates cement waste, cuts finishing time in half. Comes with special cement pan

Mudmaster Co., 2927 Richmond, El Paso, Tex.



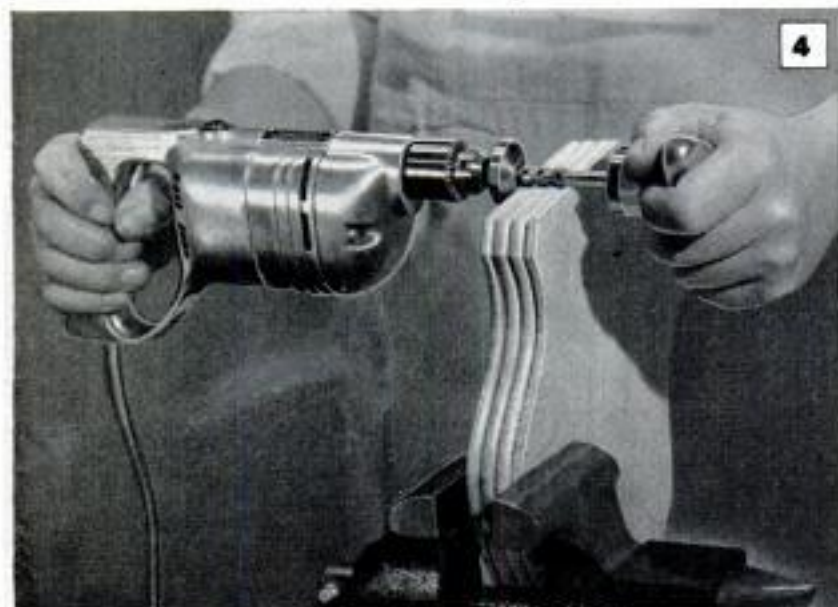
3

4. SHAPER SPINDLE with integral cutter comes in a variety of sizes and shapes. Can be driven by electric drill, drill press or flexible shaft. Adjustable ball-bearing guides assure consistently accurate work. Kit includes handle, guides and three cutters

Biddle Mfg. Co., Racine, Wis.

5. FLEXIBLE SLEEVE permits continued use of taper-shank twist drills, reamers and end mills having worn or damaged shanks. Sleeve consists of a tapered coil spring wound from square-section spring steel. Spring grips shank securely. Runs true in spindle

Pilot Tools, Inc., 225 Lafayette Street, New York 12, N. Y.



4



5

FOR TOOLS

6. PORTABLE-DRILL GUIDE makes it easy to drill true holes vertically, horizontally or at any angle with a portable electric drill. Unit adjusts mechanically to different positions by means of a scale and pointer, no spirit level being used. Can be removed from drill and replaced without altering adjustment. Easy to attach and has an accurate built-in depth gauge

High Standard Mfg. Corp., Hamden, Conn.

7. PAINTBRUSH HOLDER clamps securely to the edge of paint bucket, or can, and holds brush in position pictured. Bottom of holder forms a shallow receptacle which catches and retains drippings from brush so that they may be returned to container. Holds any regular-size brush, the handle always projecting within easy reach. Made from heavy sheet metal

Hirosa Products, Inc., P.O. Box 224, Lansing, Ill.

8. HAND-PLANE GUIDE enables user to joint edges of boards at right angles with the face, plane accurate bevels to any angle up to 45 deg. and true irregular edges of rough-sawed stock. Clamps to any standard hand plane and consists of a fixed bracket and a pivoted wing which swings and locks at any angle. Unit can be clamped to either side of plane

Perrine Company, Harrison, N. Y.

9. MAGNETIC BRAD DRIVER picks up and drives small brads without any possibility of damage to the work or injury to the fingers, which so often happens when attempting to drive brads with a hammer. Magnetic plunger picks up the brad and withdraws it into a guide with the point protruding. Pressure on handle forces plunger forward, driving the brad

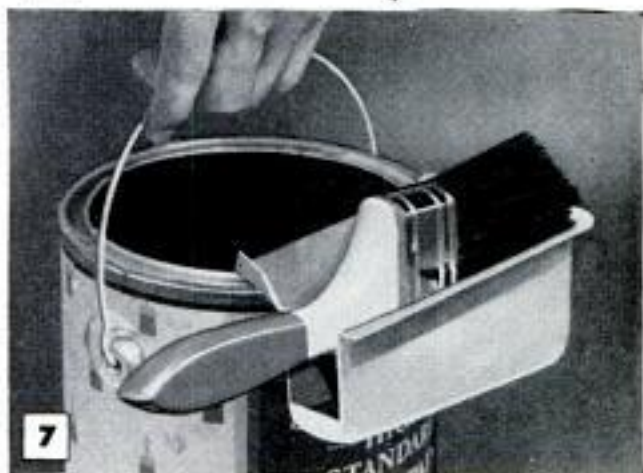
Phillip Unsinger & Son, 607 Ohio Ave., Fremont, Ohio

10. TEMPLATE for setting of friction door catches, without the necessity of making individual measurements, is adaptable to cupboard doors of the flush and lipped, or rabbeted, types. Screw holes for catches are accurately located and punched as in the three photos below. In the final step, lower photo at left, door is closed against pins to locate catch

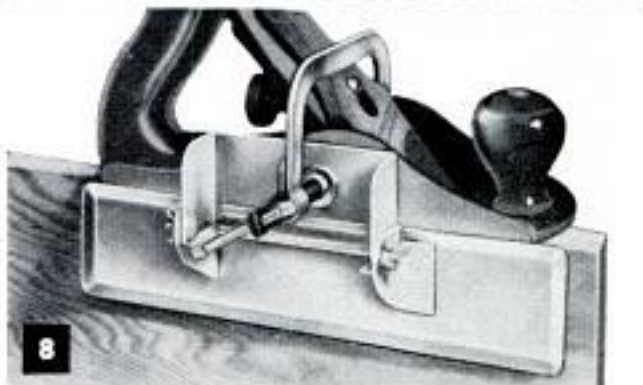
Badeo Sales, Box 1, Station A, St. Petersburg, Fla.



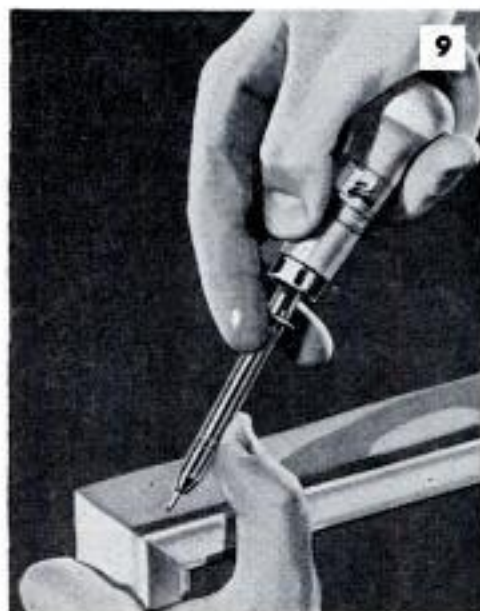
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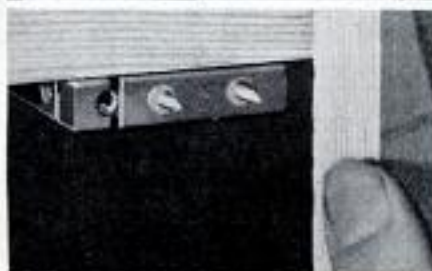
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9



10



Wheelbarrow Hand Guards Prevent Skinned Knuckles

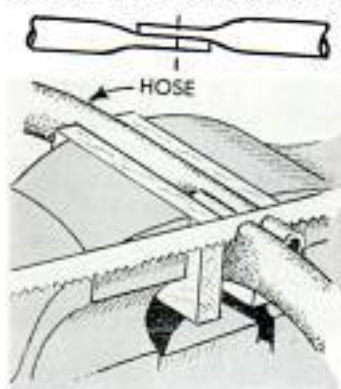


Skinned or bruised knuckles, caused by striking your hand against a wall or other object when pushing a wheelbarrow, can be prevented by installing hand guards on the handles. Sections of auto tire can be used as guards on steel-pipe handles by cutting holes in the sections and slipping them over the pipe. The casing sections are screwed to wooden handles with washers under the screwheads. When an extremely heavy wheelbarrow is used in a confined area, steel barn-door handles bolted to the wheelbarrow handles will provide maximum protection.

Wax for Ferrotypes Plates

Paraffin dissolved in lighter fluid makes an excellent solution for waxing ferrotypes plates. The fluid evaporates quickly, leaving a thin wax coat. A lighter-fluid can provides a handy dispenser.

Ends of Cut Hose Join Tightly When Hacksawed Together



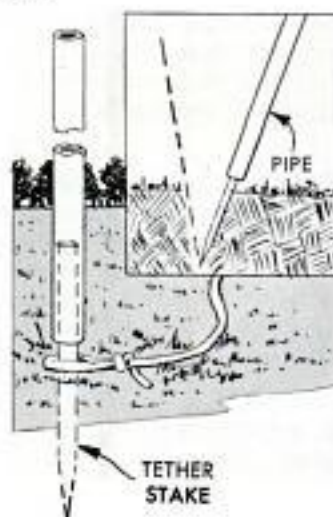
It is a fairly simple job to repair a leaking rubber garden hose by cutting out the damaged section and splicing the ends together on a pipe nipple; the difficulty lies in making the cut ends meet exactly.

After removing the damaged section, clamp the severed ends in a vise and hacksaw through both pieces at the same time. The ends will now meet exactly when slipped over the pipe nipple and clamped.

George Eyck, Redlands, Calif.

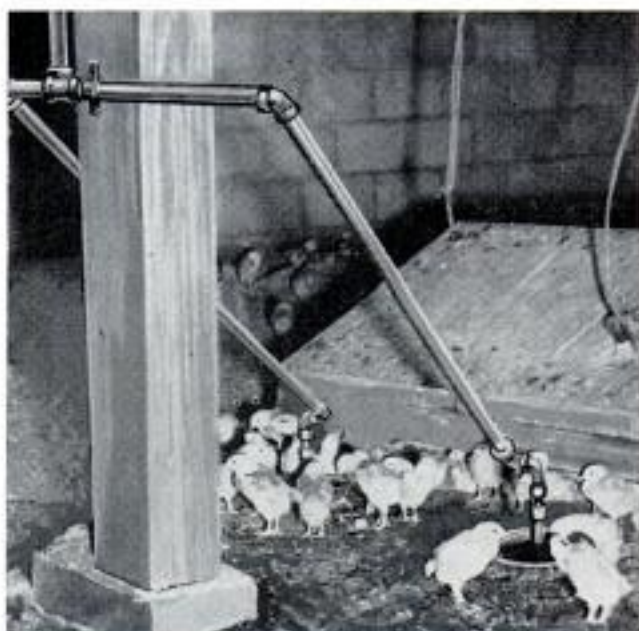
Safety Guard on Tether Stake Also Aids Removal

A length of pipe slipped over a much-used steel tether stake will protect the tethered animal against injury from the jagged edges of the battered top. Besides protecting the animal, the pipe provides a handy means of loosening the stake when it is to be removed.

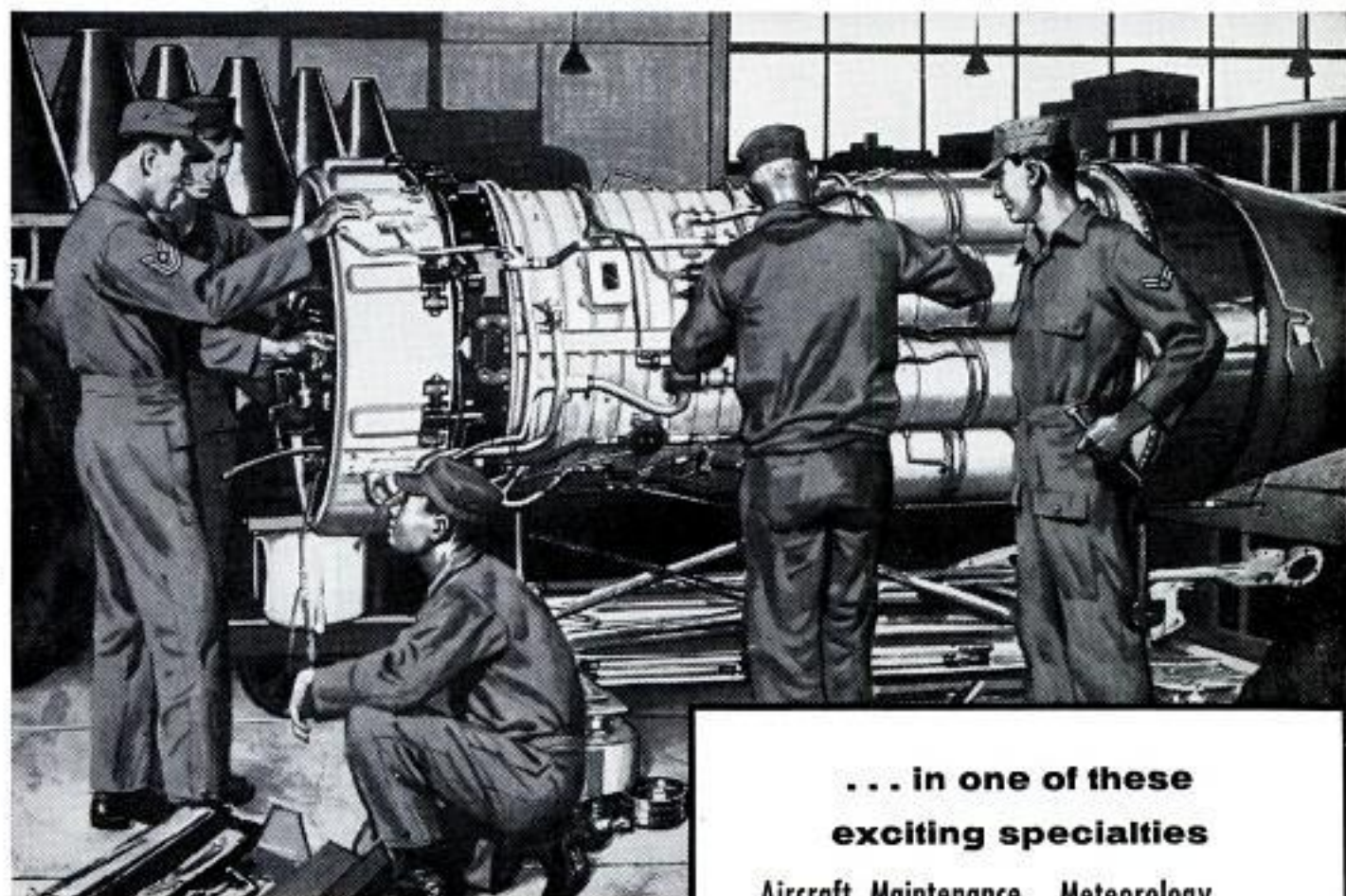


Poultry Fountains Suspended From Pivoted Supply Lines

As an aid in keeping the litter dry and water fountains clean, one poultry raiser suspends the fountains with the water-supply pipes. A swing joint, provided by two pipe elbows connected directly to each fountain, permits the fountain to be gradually raised and kept level as the chicks grow. Also, the fountains can be lifted out of the way when the floor is cleaned. Under ordinary pressure the elbows will not leak when used in this manner. However, for use over a period of years, a regular swing-joint fitting in place of the elbows would assure complete watertightness.



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Portrait of you with your family—and nobody at the camera! It's simply and easily done by tripping camera shutter with a Kodak Ektalux Remote Release and solenoid. An Ektalux Extension Unit (on left) provides dramatic side-lighting.

This FLASH makes pictures with a difference

You can make new, exciting flash pictures when you use equipment with versatility designed into it! Read all about it—

The Kodak Ektalux Flash system makes possible a whole new range of lighting effects. It will give you ideas for pictures which never occurred to you before. These two pages show examples. Your photo dealer most likely can demonstrate others.

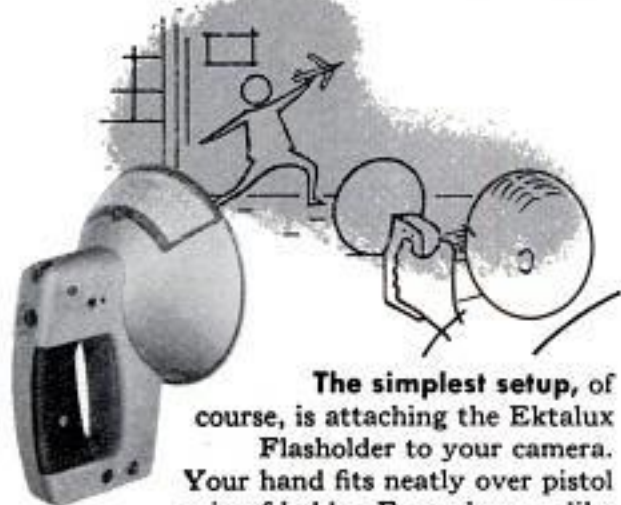
Kodak Ektalux is the most dependable kind of flash system, too. It uses the B-C (battery-condenser) circuit. The condenser acts as a storage reservoir. It builds up an electrical charge, fires the flashbulb with a full surge every time. You never "miss" a picture because of a weak battery firing the flashbulb late. And you can use six or more extension units for lighting big areas.

Your photo dealer will be glad to demonstrate the Ektalux Flashholder on your camera. Then you can see for yourself how many things it can do!

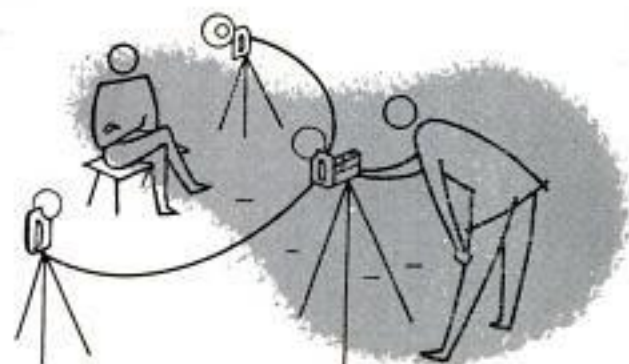


Kodak Ektalux Flashholder—B-C powered, fires 6 or more extension units, each unit having 20-foot cable. Features pistol-grip handle; removable, easy-to-pack reflector; quick load-eject sockets for midget and medium-base bulbs; durable, lightweight. Now only \$19.75*. Extension Units, each \$9.75. Addition of solenoid trips shutter from Flashholder; Remote Release with solenoid permits exposure control up to 20 feet from camera; Synchro-Switch permits external synchronization if needed.

LOOK WHAT YOU CAN DO WITH THE KODAK EKTALUX FLASH SYSTEM



The simplest setup, of course, is attaching the Ektalux Flashholder to your camera. Your hand fits neatly over pistol grip of holder. For a close-up like this, you can use any midget flashbulb (also has socket for medium screw-base bulbs).



For a pleasing portrait, you can attach two Ektalux Extension Units to your Ektalux Flashholder—and fire *all* simultaneously from the camera, exactly timed for perfect results. The Extension Units use the dependable B-C power of the Flashholder. 20-ft. cords allow freedom in placing units.



Cute pictures of babies are easy when you divert their attention *from* the camera. Simply hold Ektalux Flashholder away from camera, trip shutter solenoid from Flashholder. You'll catch a more natural pose.



Here's a hobby shot you'll find most useful. Set up the Ektalux Flashholder away from the camera for side-lighting. 20-ft. cord gives great freedom of movement. Fire bulb from camera as you trip shutter.

Other Kodak Flash Equipment for Round-the-Clock Pictures



Kodak B-C Flashholder—Offers dependable B-C power at low cost—only \$9.95*. Highly efficient Lumaclad reflector, exposure guide, Flashguard.



Kodak Extension Unit, Model 1—Makes multiple-flash shots easy. 20-ft. cord, support clamp, Lumaclad reflector, Flashguard \$11.00 each



Kodalite Midget Flashholder—Uses new low-cost M2 bulbs. For Brownie Hawkeye, Bull's-Eye and Holiday Flash Cameras. Lumaclad reflector. \$3.20*



Kodak Standard Flashholder—Same size and design as B-C Flashholder but without B-C feature. \$7.95*



Kodak B-C Flashpack—Converts two-cell flashholders to B-C power. Uses 22½-volt photoflash battery. \$2.95* *Batteries extra

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Care and Feeding of Engines

BY
S. P. CORP



FACTS ABOUT ANTI-FREEZE

Before adding anti-freeze, your cooling system should be flushed with clear water and allowed to drain. After adding anti-freeze, run engine till solution is thoroughly mixed, leaving radiator cap off so air can escape. Then stop engine and check level of solution in radiator, being sure hydrometer is clean and bulb is free to move. Fill and empty hydrometer several times to get a correct reading, as all hydrometer tests are calibrated for the temperature of the solution.

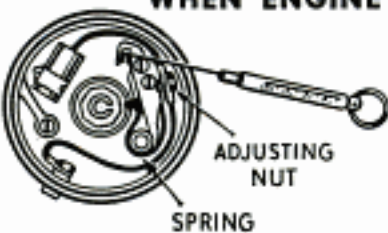
ANTI-FREEZE SOLUTIONS PROTECTING TO -20°F



Never mix glycol-type anti-freeze with alcohol-type, as freezing points vary widely and accurate testing would be impossible. Do not mix different brands of alcohol-type anti-freeze, as rust-inhibitors may cause a chemical reaction that would reduce anti-rust effect. Do not use anti-freeze from one year to the next unless you add new rust-inhibitor. Rust-inhibitor will lose its effectiveness after one year.

Always tighten hose clamps or replace hose when adding anti-freeze. Anti-freeze will seep through places where water will not pass. Be careful with stop-leak compounds; don't use them to stop a hose-leak.

WHEN ENGINE CUTS OUT



If your engine cuts out at speeds over 50 mph, here are two of several possible causes: **SPARK PLUGS** may be of too hot a type, missing fire under extreme heat, and should be replaced. Or

SPRING TENSION in distributor may need adjusting. This tension should be 17 to 20 ounces. Measure with an ounce scale as shown, then loosen adjusting screw and move spring in or out till correct tension is reached.

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Ice Dams

Q—Last winter ice formed near the eaves along the north side of the roof on my ranch-type home. Several leaks developed just above the cornice. Water has damaged the plaster. After ice melted in the spring the shingles appeared to be in good condition. The roof did not leak during the spring, summer or fall. What was the cause?

—N.R., Conn.

A—Snow on the lower edge of the roof melts during warmer weather and then freezes during a cold snap, forming a dam which retains much of the water running down from a higher level as the snow melts during a warm day. The water held above the ice dam thus formed seeps under the tabs of the shingles and leaks into the attic, usually at a point just above the plate. You did not say, but apparently the shingles were laid directly on the roof boards without an underroofing of smooth roll roofing or asphalt-coated paper made for this purpose. Many homeowners experiencing this trouble have installed lead-coated electric heating cable, looping the cable across the width of the roof in vertical loops extending from 15 to 30 in. above the eaves. The cable must be properly connected to the power line and a switch provided for turning the current off and on. Such units are said to be quite effective when correctly installed.

Snow Mold

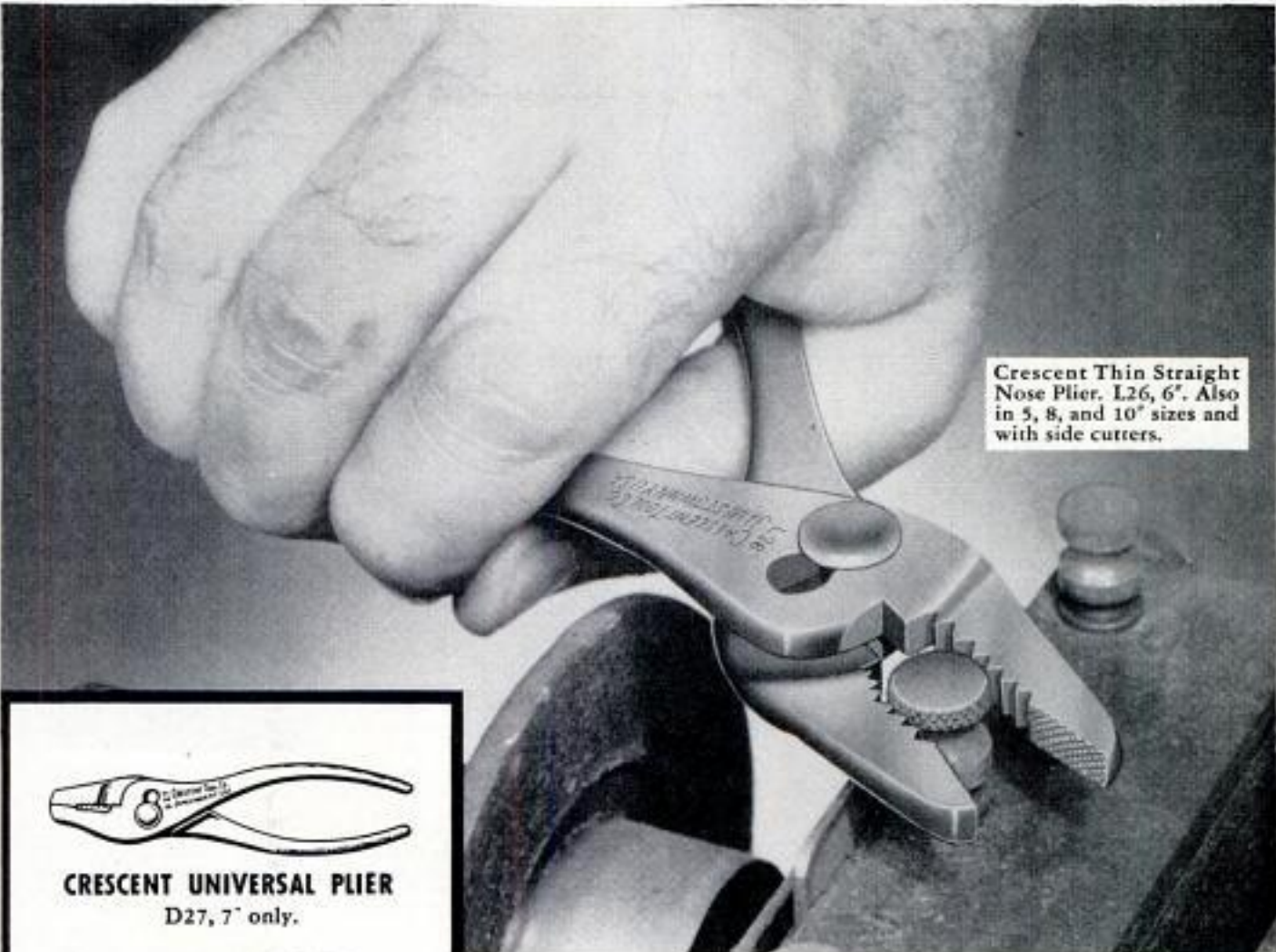


Q—When my lawn started last spring I noticed that in several small patches there was no new growth, the plants apparently having been killed. However, the grass near these spots seemed entirely unaffected. I raked the soil in the bare spots and reseeded, using the best seed and a fertilizer of recommended proportions. The new seeding caught immediately and made a good growth. What was the cause?

—O.H., Neb.

A—Did you spill oil, dry-cleaning fluid or any other root-destroying chemical on the areas affected? If not, then the description would indicate that the bare spots in the lawn resulted from what is known as snow mold. The fact that the new

(Continued to page 228)



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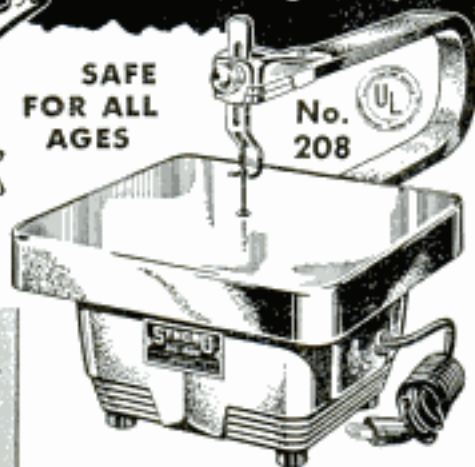
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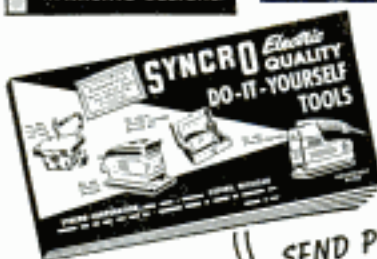
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(Continued from page 226)

seeding germinated and grew readily would tend to bear out this conclusion. What is called snow mold on lawns generally results when the area is covered for long periods with drifted snow or ice to a considerable depth. As a preventive it might be practical to level small snowdrifts and it is said that recurrence can be prevented to some extent by treating the soil with mercuric chloride at the rate of about 3 oz. per 1000 sq. ft. However, in your own experience this would appear to be unnecessary. Piles of leaves, grass clippings and newspapers also can damage grass in the manner you describe if covered with snow during the winter. However, the damage is seldom as extensive and complete as that caused by the so-called snow mold.

Winter House Plants

Q—What varieties of house plants can I grow in a large old-fashioned bay window located on the north side of the house? If possible I would like to grow plants in the bay the year around. During the summer months plants would get some direct sunlight during the morning and evening hours, but how about the winter months? Storm sash are used all during the winter, but the bay is directly exposed.—R. H., Mo.



A—Nearly all potted plants should do reasonably well during the summer months, but only certain ones can be expected to thrive during winter in a north window. Ordinarily the common ferns, ivies and variegated-foilage plants do best, especially during the cold months. There are others, of course, but these seem to be the most consistently successful. Start them in large pots that provide plenty of space for rich soil. Place gravel and a small amount of sand in the bottom of each pot to provide aeration and ample drainage. Water on a regular schedule. Most careful indoor gardeners place the pot in a shallow container which can be filled with water at regular intervals. Liquid plant food should be supplied frequently. When nights are severely cold, tender plants should be moved away from the window or may be protected by covering the lower half of the sash with heavy corrugated cardboard held in place with cellulose tape. On more moderate days when the sunshine is bright, move the plants close to the window. In some cases indoor gardeners build a removable flat of metal, or wood with a metal lining, in which the potted plants can be arranged attractively.

Noise Problem

Q—We moved into our new home three years ago. It is of frame construction, 1 1/2-story with brick veneer across the front and on one side, full basement and hardwood floors. Walls are plasterboard, dry-wall construction throughout. Ever since we moved in we have been puzzled by unusual snapping, or creaking, sounds which seem to originate in the attic space, but also are sometimes heard in the walls in different locations and at different times, but more particularly at night. This has become so objectionable that we are thinking seriously of selling, but have hesitated to do so because we like the location. What is the cause of the objectionable noise?—C. M., Wash.

A—We wouldn't sell for the reason given. There are several possible causes of the phenomenon you describe, but the most likely one is a slow shrinkage of the framing materials. This can take place over a considerable period of time, especially in a humid climate where dry-out of the housed frame members of the structure is impeded by the comparatively high moisture content of the air. As the materials dry they contract slightly along the length. Wherever framing parts are joined, any contraction of the members causes meeting surfaces to slip past one another, resulting in the squeaks, or creaking sounds. The movements are so very slight that as a rule no damage results and in time the wood will stabilize at some point.

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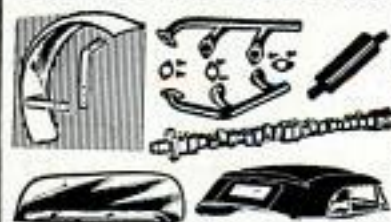
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They Photograph Engine Wear

(Continued from page 117)

"14," "175," and "12.3." These numbers represented the amount of silicon found by the emission spectrograph in successive samples of lubricating oil taken from one engine during a three-week period.

"The second sample, registering 175, was taken right after the unit finished a run through the Texas Panhandle during the height of the dust storms there early this year," Rudd explained. "So much dirt was in the air that the engine filter couldn't handle it. Notice also that the copper and lead counts went up, too. That represents the damage to engine parts caused by the dirt. You can see from this report what kind of a job the emission spectrograph is doing for us."

Rudd then showed me an empty milk bottle. "This is where the analysis begins," he explained. The bottle was made of cardboard, in the shape of a cone. After a lubricating-oil sample comes in, 30 grams are poured into one of these cardboard bottles.

Rudd walked over to a laboratory bench with a small box on it. This was an electric hot plate.

He opened a drawer and brought out a black pellet about the size of an aspirin tablet. He put this on the hot plate and turned on the juice, first setting the dial at 700 degrees Fahrenheit. While the pellet was "cooking," he used a fountain straw to remove 10 drops of oil from the milk bottle containing the sample. He let this oil fall on the pellet, one drop at a time. As each drop hit, it burned. The residue, consisting of a tarry coating on the top of the pellet, contained the contaminants that were in the oil.

After Rudd had prepared the pellet, we walked into a small room near by. Inside, and taking up most of the space, was the emission spectrograph and a related piece of equipment known as a "densitometer." The important parts of the emission spectrograph include: A spark gap, like those on the spark plugs in your car; a prism; a camera and enough controls to keep my two-year-old son happy for a century.

The pellet was placed on a small platform, only a little larger than the pellet itself. This platform is actually one of the two electrodes that form the spark gap. A small motor turns the pellet, much like a midget phonograph record. Meanwhile, high-frequency electric current arcs across the spark gap. Color of the spark is determined by impurities coating the pellet.

You may remember, if you took high-school chemistry, that every chemical

(Continued to page 232)



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element gives off a light of a certain color when it burns. Thus, if you can separate the colors in the spark, you can identify the elements coating the pellet.

That is what the prism is for. It separates the light from the spark into its component colors. These colors are then "painted" on a photographic plate.

The actual colors don't show up in the picture; rather, each color is designated in terms of its wavelength. What you get in the photo is a line about 1/4-inch thick and just about six or seven inches long. There are dark and light places along this line which correspond, respectively, to large and small quantities of a particular color in the spark. Since the colors designate particular contaminants, these dark and light points along the line represent large and small concentrations of contaminants in the lubricating oil. In other words, as the concentration of each contaminant varies, so does the shading along the line in the emission-spectrograph photo.

To find out the exact concentration, you need some means of measuring this shading. The densitometer handles this job. It rates the darkness or density of any point along the line in terms of a number. A dark point might receive a rating of 2, and a lighter portion a rating of 20. The scale ranges from 0 (black) to 100 (white).

The final step in the process is to convert the densitometer reading, with the aid of a standard formula, into figures which represent the concentration of each contaminant per million parts of oil. This is done on a glorified slide rule which was developed by Rock Island chemists.

Although the Rock Island paid \$25,000 for its emission spectrograph, "the money was well-spent even if we have saved only one crankshaft," explained J. E. Tiedt, supervisor of operations at the Chicago lab. Fortunately, crankshaft failures are almost as rare today as a snowstorm on the Sahara. But, as Tiedt pointed out, when a crankshaft does burn out, the cost of replacing it, including labor and engine down time, is well above \$25,000.

Actually, of course, the emission spectrograph is saving more than engine crankshafts. For it is able to spot troubles that can affect every part in the engine.

The new method is much speedier and far more thorough than the technique it replaced. Railroad chemists formerly checked engine wear by burning a few drops of an oil sample and then mixing the ash with various acids to find the contaminants. It took three men about a week to process 30 engine samples. With the emission spectrograph, three men can process over 50 samples a day.

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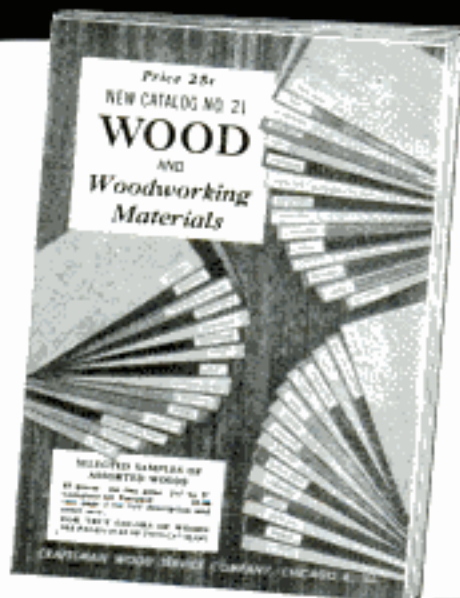
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Let's Import Rain for the Dust Bowl

(Continued from page 123)

electricity in one direction and an almost perfect insulator when the current is reversed. The flow of electrons is always toward the surface at which freezing began, and the ice must "grow" in one direction so that all its crystals adhere together evenly. The discovery that ice can behave something like a vacuum tube or transistor eventually may contribute toward a more scientific understanding of electricity and its conductors.

Their studies of thunderstorm electrification have led the Socorro scientists to suggest an intriguing possibility: Why not convert thunderstorms into mild rainstorms that would deliver plenty of rain and yet produce no lightning? Drawing the fangs of thunderstorms could reduce huge timber losses caused by lightning fires, as well as prevent disastrous lightning strikes in inhabited areas.

The scientists learned in the laboratory that the electrical effects caused by freezing become neutralized in the presence of ammonia; now they propose to infuse ammonia into a thunderstorm from ground generators or from aircraft. If the idea works, the storm will produce a soaking rain without any lightning.

Cloud physicists think that every drop of rain begins with a nucleus of some sort on which cloud moisture gathers, eventually building up to a raindrop. About a million particles of cloud moisture must be collected to make up a drop of rain. The ice crystals that serve as nuclei in thunderstorms don't exist in relatively warm clouds at low altitudes, and one of the present problems is to learn what kind of nuclei, if any, induces precipitation from such clouds.

Dust particles and pollen are pretty well distributed in the atmosphere, but these don't attract or absorb moisture and so don't appear to be good condensation nuclei. Salt particles drawn up into the air during ocean storms could be ideal nuclei, and physicists from Socorro have flown over many parts of the country seeking these particles. So-called "chloride clouds" have been found in the atmosphere along the Pacific and as far inland as Utah, but east of the Rockies the particles are relatively scarce. So far, the scientists haven't been able to pin-point definitely any kind of particle as the one that brings on rain from warm clouds.

In the hope of finding out, and also to learn more about thunderstorms, the New Mexico institute is completing a six-floor tower on top of its Socorro Thunderstorm

(Continued to page 236)

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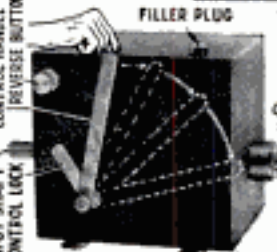


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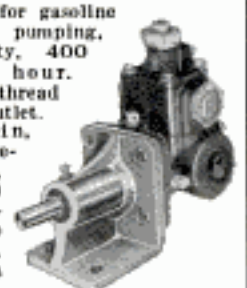
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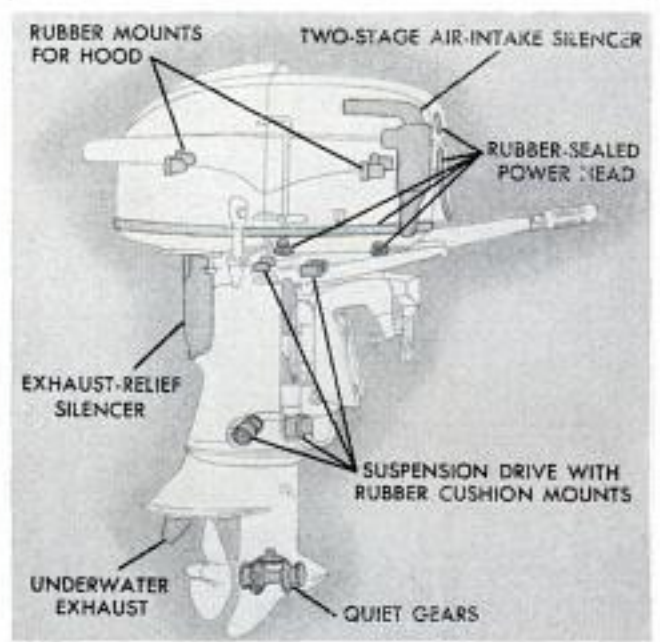


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He's "The Brains" of I Love Lucy

(Continued from page 131)

75-percent-reflective coating—the letters are magnified to 5/8 inch.

It does away completely with the need for uniform or special equipment. And as a bonus feature, Oppenheimer's invention has standard cues boxed on the top and bottom of each page. They are printed instructions such as "Speed Up," "Slow Down," "One Minute to Go," etc. The director merely has to push a button to light up the particular instruction he wishes his performer to follow.

Another use to which the Jayo Viewer lends itself, although this is not its primary purpose, is that of an off-camera prompter. By being placed at strategic positions during a performance, it can make fluffing a thing of the past.

If Oppenheimer was annoyed by newscasters who did not look him squarely in the eye from his TV screen, he has been no less put out with filmed comedy shows which resort to canned laughter. Probably the seed for this particular public service was planted when Oppenheimer was a boy in San Francisco. He and his pals used to patronize a movie house which had a special section equipped with earphones for the hard of hearing. Whenever there was a comedy, Oppenheimer and his cronies would sit in that section and use the earphones so they could hear the dialogue which otherwise would have been drowned out by audience laughter.

Oppenheimer worked out two intricate methods for getting authentic laugh tracks on filmed TV comedies. One system delays the actors on the set by means of a silent signaling system which suspends the dialogue for the predetermined duration of the laugh. During this lull in the conversation, the performers fill the breach with pantomime action known in the trade as pieces of business. If the line is considered to warrant a seven-second laugh, a nudge of the push button puts the light on for seven seconds. If the actor is supposed to come in after one or two seconds, the signal lasts that long. Laughs are recorded later, and in that way there is adequate audience reaction and no conflict with the movement of the story.

The second system plotted out by Hollywood's "Leonardo da Vinci" is the one that renders audiences superfluous. It provides, through the use of tape recording, a method of playing the laughs on the set while the performance is in progress. This is another multiple push-button device which operates a complete catalogue of laughs

(Continued to page 240)

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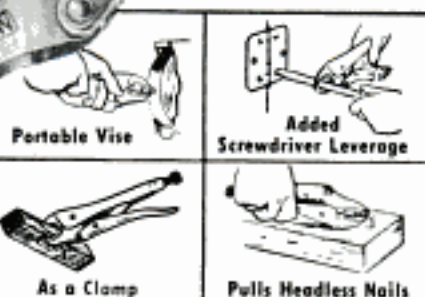
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As producer of *I Love Lucy*, Oppenheimer was concerned with the limitations of the conventional camera dolly inherited by TV from the movie sound stages. He realized that it was impossible to set up certain camera shots with existing dollies, so he invented the Jayo directional-control ball caster. It operates on giant balls instead of the wheels on which the conventional dolly moves. This ball-caster principle permits his dolly to move in any direction, yet keeps it susceptible to control when desired. When the brake assembly is applied, it converts the balls into wheels and allows the dolly to be steered in any direction. At the same time the assembly facilitates prompt change of direction whenever required.

It was while perfecting the Jayo Viewer that Oppenheimer developed his low-cost method for synchronizing series-wound motors. He came up with an idea, for which some of his patents now are pending, which synchronized three motors at a cost of \$40, supplanting the established method requiring a master motor costing \$250.

Oppenheimer and his wife were seeing a 3D picture, *The House of Wax*, when he got the inspiration for glasses that permit a person to see 3D in 2D. He noticed people holding their hands over one eye because of eyestrain and headache.

He solved this problem by inventing a pair of polarized glasses in which one lens is variable. This permits the viewer, by flicking a tiny rod extending from the circular eyepiece, to switch the variable lens to an opposite plane from the fixed lens. Presto! This converts the 3D image to 2D.

Mrs. Oppenheimer sometimes questions the wisdom of putting so much money in inventions. Oppenheimer insists the expenditure is justified.

"Aside from the fact that business investments are deductible," he smiles, "I don't think I've ever had any experience which I haven't sooner or later incorporated into a radio or TV show. So, one way or another, it can't help but pay for itself." ★ ★ ★

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Taking That Spot-News Picture

(Continued from page 156)

using and, in a general way at least, know how to use it in your particular camera. Fast black-and-white film is best for press use. When you unload exposed film from your camera, again take great care to protect the film from strong light, especially direct sunshine.

You must know your camera is focused sharply on the subject in regard to distance. If you are shooting a simple box camera, which has fixed focus, you have no worries here. Other cameras must be focused upon the picture-to-be. Focusing is easy enough; the problem is to remember to do it. If you make camera adjustments in the same order each time you take pictures, you'll be less likely to forget an essential step in an emergency.

You must expose the film to enough light to register the picture-image while also stopping action. Many camera users shy from the job of trying to understand what "exposure" means. Exposure is putting enough light on the film to burn the picture-image completely into the film's sensitized surface. If exposure is too "thin" you lose all shadowy areas of the picture. If exposure is too "heavy" the picture is muddy.

Your judgment is required in choosing a shutter speed and an aperture (size of opening in lens; also called diaphragm opening or iris; this is the f-stop shown on the dial) which together will admit the right total quantity of light.

The shutter regulates how long the light enters the camera.

The aperture regulates how fast the light comes in.

The total amount of light needed is determined by the speed rating of the kind of film you are using.

You must measure (with a light meter) or estimate the brightness of light illuminating the subject.

You must choose a shutter speed fast enough, if possible, to stop action in the scene you are shooting. If you intend to hold the camera in your hands for shooting, the shutter speed shouldn't be less than $\frac{1}{50}$ second; $\frac{1}{100}$ would be better.

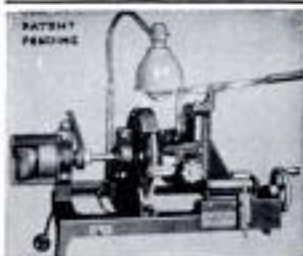
Your choice of aperture depends on what shutter speed is required and on intensity of light on the subject. By buying and using a good light meter you can save yourself years of photographic aches and pains. You'll educate your eye to light values, and you'll take a short cut to understanding and applying the ABCs of exposure. The meter does its service by eliminating one big "guess" from your photography; the meter

(Continued to page 244)

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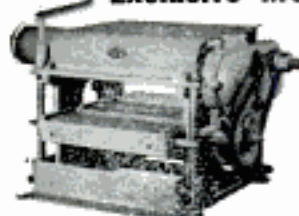
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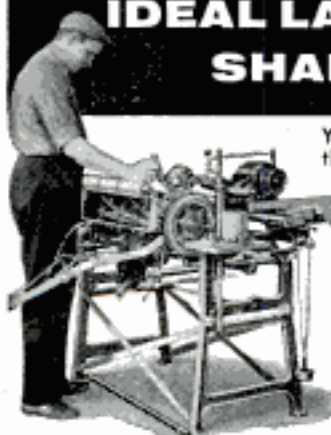
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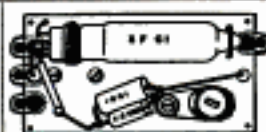
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takes a look at what you're going to shoot and tells you how bright the light is.

Lacking a meter at the time of your big picture, you make your best guess at light intensity. For protection against error you can bracket your shots. Give one shot much heavier exposure, and one shot much thinner exposure, than your best guess; of the three exposures, one should be close enough to give you a printable negative.

You must aim the camera at the subject. This sounds like an only too obvious rule, but many a news photo has been lost because the camera lopped off somebody's head, or because the camera was too close to take in the essential parts of the picture.

Your camera must be motionless while its shutter is open. Camera movement spoils more pictures than any other error. High shutter speed reduces the bad effect of camera movement; shutter speed alone won't eliminate it. Only immobilizing the camera solves the problem. The trouble here is that you probably won't have a tripod handy at the time and place of the unexpected big picture. You may be able to improvise a roosting place for your camera where it will cover the subject.

You must avoid accidents and oversights. There's an endless list of things which can defeat the camera user on the threshold of glory. The usual hullabaloo around the scene of a spot-news event raises the hazard level photographically and otherwise.

Do your picture-taking from a place where you won't get hurt. Camera and picture alike may be lost if the camera gets smashed, dropped or drenched. Trying to take pictures from a dangerous place raises mental hazards; you are much more likely to forget some step in camera mechanics—focusing, for example. Find a safer spot and shoot with care!

You must identify the picture. What happened? Who are the people? Where did it happen? When? What other essential facts must be known to describe the picture? So far as possible you must get those facts for a spot-news picture.

Your picture must be transported to the news channel. Time counts in news photography. Instead of taking time to go home and develop your films, telephone newspapers that might want your pictures.

Your negative must be properly developed and printed. News-photo labs like to do their own developing and printing. They have cut the time of such processing to the minimum and they have their own ideas about contrast, cropping and size of prints. Their lab men are wizards at making the most out of a negative. Hand your exposed films over to them and hope for the best!

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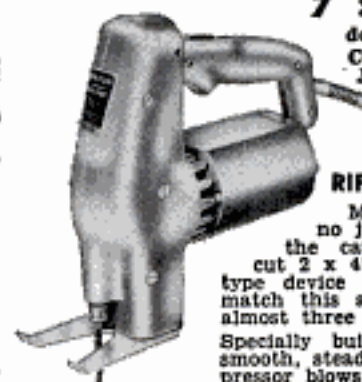
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- Air is pumped from top down through the center section, cooling unit as well as blowing sawdust from line.

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IT SAWS circles — curves — straight lines — intricate designs.

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Owners Rate Features of Jaguar

(Continued from page 144)

"Motor difficult to keep in tune. Spark plugs foul out."—Illinois restaurateur.

"Brakes are excellent except in rain when they grab unevenly."—Maine professor.

"Brakes should be fixed so they don't get wet."—Ohio radio announcer.

"Brakes are apparently not easily adjusted."—Ohio surgeon.

"Overheats in traffic. No ash tray. Have to clean and change spark plugs too often."—New York manufacturer.

"Compared with American cars, the water temperature zooms sharply in traffic."—Connecticut musician.

But many owners wrote that they expected some minor disadvantages when they bought the Jaguar because it is, after all, a sports car.

"Don't let petty gripes mislead you. I'm wild about the car. You can't come near it without paying a few thousand dollars more."—New York actor.

Here are some complaints taken at random from the owners' replies.

"Lack of foot space brings cramps on long trips."—Oklahoma student.

"Needs larger rear window in roadster and a more adequate rear-view mirror."—New York artist.

"Side curtains are bothersome. Visibility with top up is very poor."—West Virginia accountant.

"Only complaint is that the doors hit the curb when parked close. Tail pipes hit road when going up into my garage."—New York production manager.

"Latest model has very poor seats."—New York executive.

"Insufficient knee room."—Ohio retail merchant.

"Have to have tires aired every week. The natural-rubber tubes leak air."—Indiana businessman.

"Aluminum doors get dented easily by careless parkers."—New York manufacturer's field representative.

"Would appreciate a bend in oil dipstick to keep from getting burned on the manifold."—Oklahoma student.

"Steering wheel could be a little lower. Short person has to look through wheel."—New York farmer.

"Should enlarge rear deck for more luggage room."—Ohio broker.

"Takes 10 minutes to put up top on roadster."—New York restaurateur.

"Needs more bumper protection."—Oklahoma oilman.

(Continued to page 248)

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WORK AT HOME
IN SPARE
OR FULL TIME**

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- **MORE SATISFIED CUSTOMERS**

**Read What These
Universal Owners Say:**

J.S. of Michigan writes:
*"I figure my profits
(last season) at over
\$1,000.00."*

Mr. C. H. R. of Ohio,
says, *"This season, I
have taken in \$3,688.20."*

Another Universal own-
er from Pennsylvania
tells us: *"I spent only
40c for a newspaper ad
and have done nearly
\$500.00 worth of busi-
ness."*

Mr. B. of California
writes: *"The lawn mow-
er grinding business,
with my Universal
Grinder, has been a
gold mine these last two
years."*

G. E. of Arkansas says:
*"I have had my Univer-
sal Grinder two months
and made a net profit of
\$227.00 in spare time."*

● Thousands of men have started this profit-
able business of their own with a small invest-
ment. The Universal is low in price and high
in value. You can start in your garage or base-
ment; and, by following our simple instructions,
the Universal Lawn Mower Grinder will put
you on the road to profit.

The Universal Lawn Mower Grinder is a
simplified design built to sharpen power and
hand mowers with a minimum of effort. Any-
one having a little mechanical ability can do
a good job, without previous experience. The
Universal is the only lawn mower sharpener in
the world that enables you to grind both bed-
knife and reel blades in one set-up, without
removing them from the mower. No extra at-
tachments or equipment necessary to do a
complete job. Just follow a few simple in-
structions and you can turn out a perfect job
on your very first mower.

If you are now working, you can start this
fine business and still keep your present job.
It takes only 20 to 30 minutes to grind a
mower and, by using just a few evenings a
week, you can earn a substantial spare-time
income to develop a full-time business of your
own and buy all those extra things for yourself
and family that help make this a better world
to live in.

There are probably 50,000,000 hand and power
lawn mowers in America that should be
sharpened every year. A good number of these
are in your very community. Commercial
mowers at golf courses, cemeteries, hospitals,

parks, schools, etc. bring even larger fees; and,
with the speed, ease, and accuracy of opera-
tion the Universal provides, you can build a
business that will provide a lifetime future. It's
a business that no one is too young to earn a
good living in; and, likewise, one that you
never grow too old to operate at a good profit.
(Some of our most successful users are re-
tired). You can shape your own future, make
your business as modest or as large as you
wish. You are your own boss, to come, go, and
do as you like.

As long as grass continues to grow, mowers
will have to be sharpened in order to cut it.
Having a Universal Lawn Mower Grinder will
enable you to get your share of this profitable
business.

You can operate your business from home—no
trudging to the job; fighting crowds; no more
dissatisfaction with job or boss in this good
business. It's easy, profitable work; so easy a
boy can do it. It's pleasant, convenient, and,
best of all... it's highly profitable. Others
are enjoying the happy, carefree life of being
their own boss—why not you? Whether you
want the security and independence of a full-
time business of your own, or the extra living
comforts spare time profits can bring, you
owe it to yourself and family to send the
coupon today. Now don't put it off. Investi-
gate our proved success plan now. We furnish
complete instructions, everything you need to
start and develop a good profitable business.
Just fill in and mail the coupon now.



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SHARPENED IN ONE
EASY SET-UP, WITHOUT
REMOVING BLADES
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At the first symptom of power drop-off or oil-pumping, you should go to your motor specialist for a ring check-up.

Wasted oil costs money. Needless repairs cost more. Both can be avoided by replacing the piston rings at the first symptom of ring wear.

Hastings rings are especially designed for replacement service. They deliver the lubrication that older motors must have—but always with complete oil control.

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If your motor specialist recommends new rings, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car!

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STEEL-VENT PISTON RINGS

Regular or Chrome



TOUGH on Oil-Pumping
GENTLE on Cylinder walls

"Poor license-plate arrangement in rear. Too close to trunk handle."—New York farmer.

"Carbon throw-out bearing on clutch has no life at all."—New York executive.

Owners Praise Engine

The twin overhead-camshaft six in the Jaguar is recognized as one of the world's finest engines. And the owners agree, although some complained that it was so fine it had to have frequent tuning.

"One of the smoothest engines I know."—Ohio miller.

"Overhead-cam engine hard to work on."—Massachusetts machinist.

Almost all owners praised the hand-shift four-speed transmission.

"I like to downshift for passing and for fast cornering."—Iowa butcher.

"Wouldn't under any conditions have an automatic transmission on my Jaguar."—New York television performer.

"I like best the lack of automatic gadgets."—Illinois diemaker.

Typical of the owner devotion to the Jaguar is the following quotation from the questionnaire of a Oklahoma chemist:

"Altogether we love our Jaguar although we have had it only three months. We are only sorry we didn't get one several years ago so we could have enjoyed it more."

★ ★ ★

For the report on Floyd Clymer's road test of the Jaguar XK 120 turn back to page 141.

Clymer Tests the Jaguar XK 120

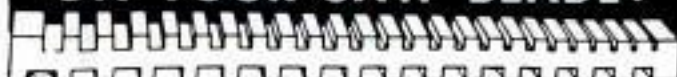
(Continued from page 141)

output by means of dual overhead camshafts, mounted at a 70-degree angle, which operate the overhead valves by a two-stage duplex roller chain. Because of its relatively small displacement, compared with American cars of similar output, the Jaguar uses dual carburetors, extra-large intake valves and header-type exhaust scavenging for maximum breathing. Naturally, these high-performance practices step up the engine revolutions for brake-horsepower rating, but likewise make this engine very effective in the lightweight Jaguar. Best performance is obtainable in the range above 4000 revolutions per minute, about where maximum torque occurs, whereas most American cars develop maximum torque in the 2000-2500 range.

Even though the Jaguar engine attains its best performance with high revolutions, it is interesting to note that, unlike the present engine trend (large bore and short

(Continued to page 250)

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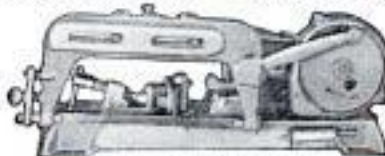
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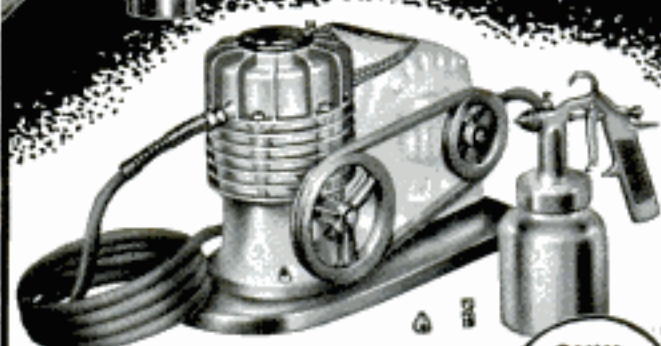
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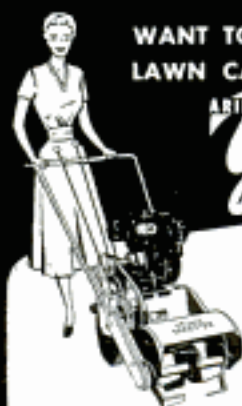
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stroke), it has a comparatively long stroke (4.173 inches) and a smaller bore (3.268 inches). Long-stroke engines usually are not considered ideal for extreme high speed but Jaguar seems to be the exception and the long stroke does permit the handling of a high gear ratio with ease. The cylinder head is aluminum alloy with hemispherical combustion chambers. Twin S.U. horizontal carburetors are used with an electrically controlled automatic choke. Seven large steel-backed bearings carry the 2 $\frac{3}{4}$ -inch-diameter crankshaft and the engine has minimum vibration.

At high and low speeds and around sharp corners the fast steering enables one to

SPECIFICATIONS
Jaguar XK 120M

ENGINE

Type 6 cyl., in-line, OHV, twin overhead camshafts
Displacement 210 cu. in.
Bore and stroke 3.268x4.173 in.
Brake horsepower 180 at 5300 r.p.m.
Compression ratio 8:1
Carburetors Two S.U. horizontal
Transmission Four-speed

GENERAL

Wheelbase 102 in.
Tread, front 51 in.
Tread, rear 50 in.
Tire size 6.00x16
Weight 3110 lb.
Turning circle 31 ft.
Steering wheel turns lock to lock 2 $\frac{3}{4}$
Front suspension Independent front suspension with wishbones and long torsion bars
Rear suspension Semielliptic springs
Brakes Lockheed hydraulic, 12-in. drums with cooling ducts on front drums
Electric equipment Two 12-volt batteries, 64-amp. capacity
Gasoline capacity 15 gal.

correct skids quickly. From lock to lock only 2 $\frac{3}{4}$ turns of the wheel are required. This is a good safety feature, even though more effort is necessary to turn the wheels. Turn circle is small (31-foot diameter).

The four-speed gearbox is synchromesh in second, third and fourth speeds, with a fourth-gear ratio of 1:1 which, with the rear-axle ratio of 3.54:1, enables the Jag to cruise at high speeds with little effort or strain. I found the best maximum speeds on level ground for shifting up are as follows: From first, 30 miles per hour; from second, 63 miles per hour; and from third to fourth, 85 miles per hour.

The short, stubby gearshift lever is handy for top performance in traffic or on winding roads where quick shifting is often desired. A hand shift is a "must" for every true sports-car driver.

It is definitely a high-performance car

(Continued to page 252)

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and the Jaguar's makers claim it to be the fastest stock-production car in the world. It will loaf along at 100 miles per hour and, by speedometer, will hit 130-132 but, like American speedometers, a check showed the British Smith speedometer to be about 8 percent fast at top speed.

The ride is not soft and springy by American standards, but the independent front suspension, using wishbones and long torsion bars coupled with a rear suspension of semielliptic springs controlled by Girling hydraulic shocks, makes the car hold the road with little bounce, float or sponginess. The low-slung body and chassis still boasts a 7 1/8-inch ground clearance, comparable to American cars.

Lockheed hydraulic brakes with 12-inch drums are used. Front drums are fitted with air-cooling ducts. Jaguar brakes are definitely improved over earlier models and at all speeds the car could be brought to a straight-line stop without side pull in either direction, although the pedal pressure is harder than is necessary for braking most American cars.

The gasoline economy, for a high-performance sports car, is good.

Jaguar certainly offers many different features as compared to our cars. The driving position is excellent and one feels as though he is a "part of" and master of the car, due to the low center of gravity and the seating position. Like most other sports cars, entering or getting out of a Jag takes a little body "English" or twisting, but practice soon makes the entry a simple routine matter.

The Bluemel telescopic steering wheel can be moved in or out about three inches so that the driver may select the driving position that suits him best. Once a position is selected a large nut locks the wheel in one position. If desired, the wheel position can be changed while driving.

The divided bucket-type seats are finished in good-quality leather but, by American standards, they are rigid and without much spring—but a sports-car driver likes them that way. They can be individually adjusted. The body has a rigid feel and the doors open and close easily. The British must like to turn cranks for, unlike the quick-action steering wheel, it takes 3 1/2 turns of the short crank to lower or raise the window of the convertible.

The clutch pedal requires considerable pressure, as does the brake pedal, and the foot must be lifted 4 1/2 inches from the throttle pedal to reach the brake pedal—which is too much. The hand-brake lever, located alongside the shift lever is locked instead of released by pushing down on the

(Continued to page 254)

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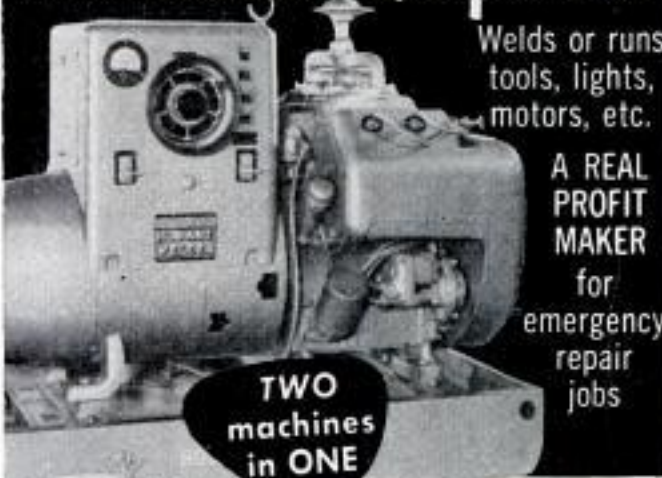
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button on top. Jag calls it a "fly off" type. It is handy for quickly applying and releasing the hand brake in an emergency or in cornering because it will fly back to the off position automatically. It is also excellent for use in starting up on a hill.

The horn will not blow unless the ignition switch is on. A directional-signal lever is located directly above the horn button, with a warning light working when the lever is set for a turn in either direction. Twin electric windshield wipers operate satisfactorily. The instruments are well-located in a walnut-wood instrument panel which appears expensive but old-fashioned.

Of course, no true sports-car enthusiast would be found dead without a tachometer on his car. Many drivers shift and drive by the "tach" to indicate when gears should be shifted for best performance.

Mounted within the Smith's tachometer dial is an electric clock with very small but readable dial. One unusual feature is part of the gasoline gauge. When the gasoline supply is almost exhausted, a small warning light flashes—a good idea. Oil and temperature gauges are mounted under a single glass dial.

As in most sports cars, rear vision in the convertible is not good because the tiny cowl mirror has small scope and the rear window glass is very small. The side-mounted mirror is more useful. Front vision, however, is excellent and little red guide lights appear at each front-fender tip. There were no sun visors on the convertible, but the chaps with the long-visored caps may not need them for, like golfers, fishermen and other outdoor sportsmen, they like the sun, front or rear.

One thing the foreigners do supply is an excellent set of tools, as does Jaguar. Many sports-car owners like to tinker with their cars. A central jack operates amidships to lift both wheels on one side of the car at the same time in case of a tire change.

The bumpers should be deeper and should afford more protection for use in traffic and parking. They are definitely too narrow and many cars with massive bumpers do not match up with the bumper positions of the Jag. Sometimes this causes damage to body, grille or trunk-lid handle and lock.

The acceleration of the Jaguar is great. Its excellent road-holding qualities, low road position of the car and its unique suspension make it fun to drive. Its performance came up to my expectations. It isn't exactly the type of car that every John Doe would enjoy for driving through traffic or for use as a family car, but it definitely offers something that cannot be had in any mass-produced American car. ★ ★ ★

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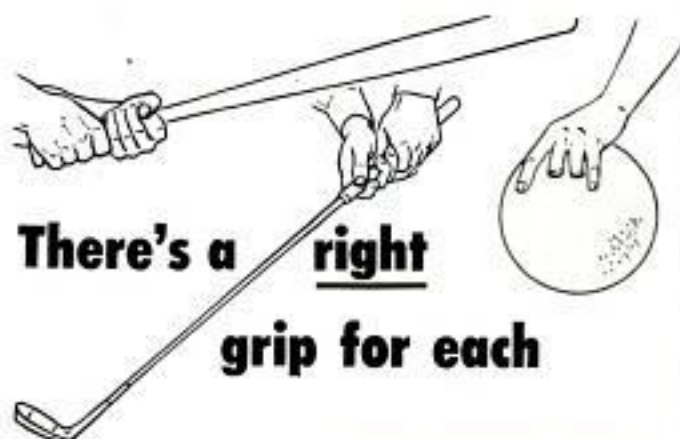
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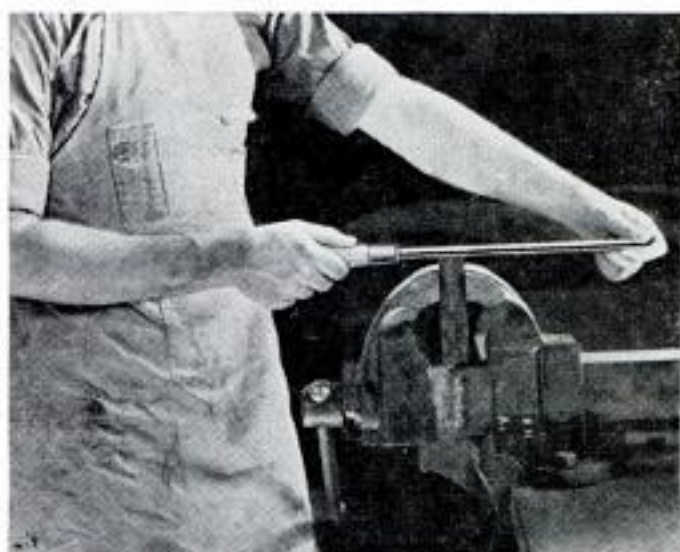
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Is This the Last Stand Of the Iron Horse?

(Continued from page 87)

motive-power men, however. And more than five years ago they got together with Baldwin-Lima-Hamilton, Westinghouse and the Babcock and Wilcox Company.

The problem they faced was the development of a heavy-duty locomotive that had the flexibility of electric drive, but which burned coal for its fuel.

Actually, the idea of a steam-turbine-electric locomotive was not new. Other locomotives, embodying similar features, had been built, operated—then scrapped.

The fault, engineers felt, lay in the boiler design. Previous steam turbines had used low-pressure boilers that gave poor fuel results. At least one ran into continual boiler trouble because of the stresses resulting from rapid drops of pressure every time the train was started.

So Babcock and Wilcox came up with a water-tube boiler in which a 600-pound pressure is maintained over the entire operating range by automatic controls.

N&W men say any crew on the board can take the 2300 up over the mountains after only a short period of instruction. C. E. Pond, the general superintendent of motive power, says it's even easier to operate than a conventional steam locomotive.

How is it working? The higher-ups in the N&W motive-power department won't talk—yet. Although 2300 has been in regular service since May 31, with a dynamometer car loaded with testing gear hitched right behind the tender, performance data has been kept a deep, dark secret pending completion of exhaustive tests.

But around the shops and among the men who have worked with the big boy since its inception, you sense a feeling of optimism and accomplishment.

"It's doing everything we thought it would, and then some," one young engineer said in an unguarded moment of enthusiasm.

The locomotive hasn't been given a formal name yet, although one imaginative writer dubbed it "Jawn Henry" after another legendary railroad figure and publicity men have fallen in line. Around the shops, though, it's more often referred to as "the big one."

Anyway, you come from the roundhouse with the feeling that the Norfolk and Western has got something.

Some of those concerned are already worrying about what will happen to the 2300s when the atomic-powered loco comes on the scene.

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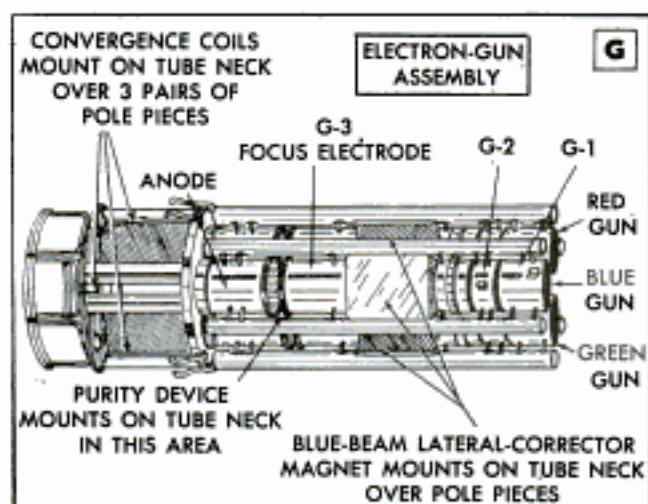
How to Operate Your New Color-TV Receiver

(Continued from page 162)

easy servicing and that two speakers are employed for high-quality sound distribution. See sketch G for further details of the electron-gun assembly that is installed in the neck of the tricolor-picture tube.

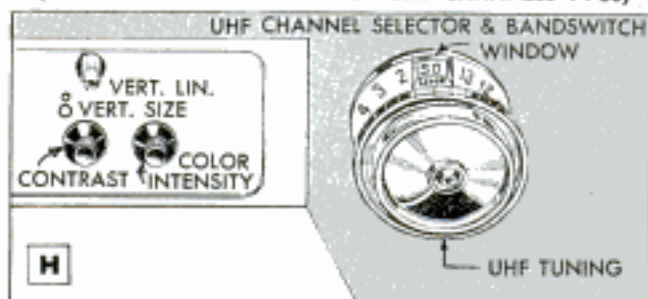
When the back cover is in place, the rear-panel supplementary controls appear as in sketch F. The average color-TV-set owner will leave these to his serviceman. Students and experimenters will find interesting data on the adjustment of these supplementary controls in the manual. These supplementary controls need adjustment so infrequently as to be negligible. The three-position area-selector switch allows you to adapt the receiver to your location.

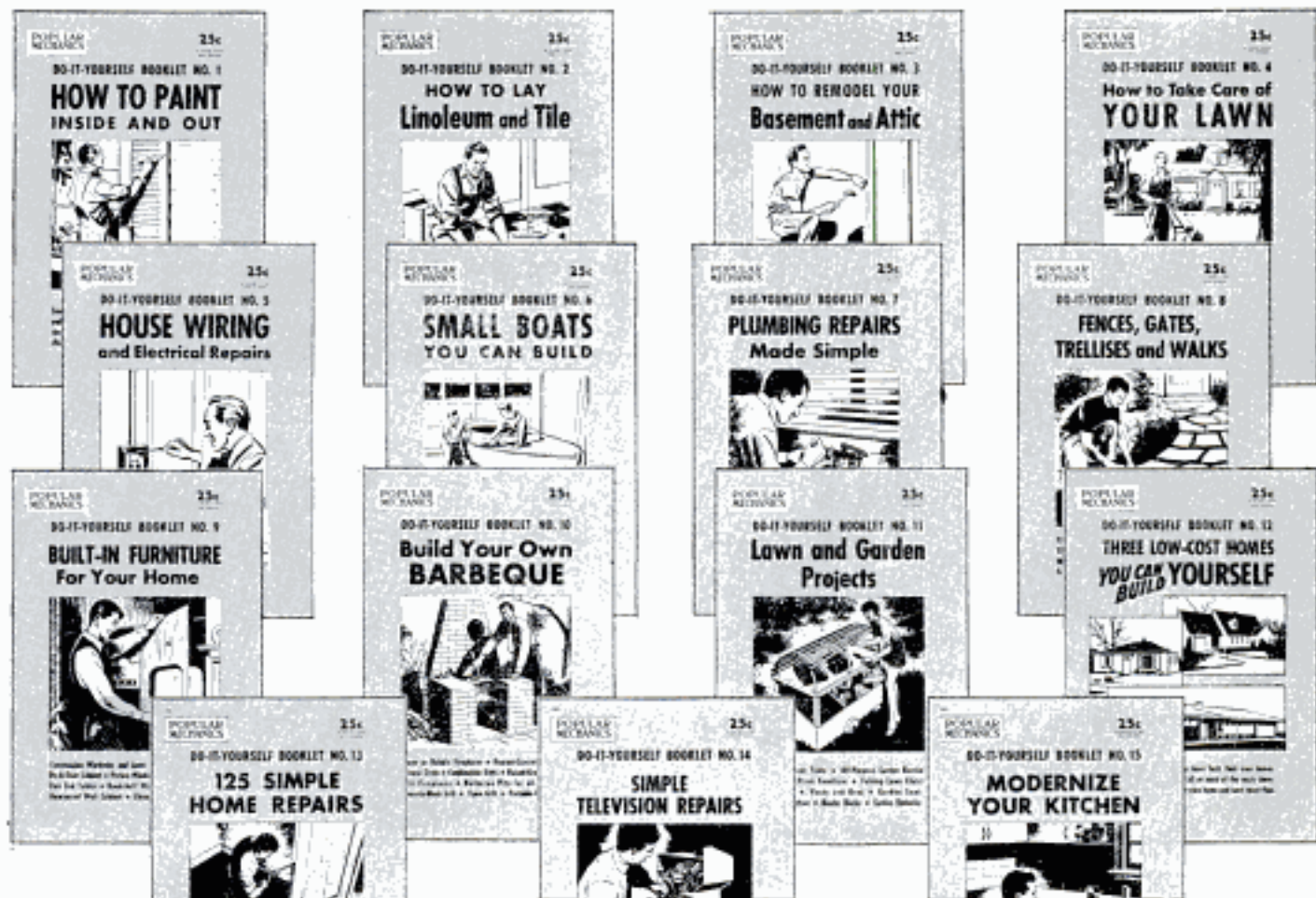
A color, as compared to monochrome, signal contains a number of additional signals which must reach the receiver for



good color reproduction. Color reception requires a broad-band type of antenna. Narrow-band, single-channel antennas are unsatisfactory. In strong-signal areas, indoor antennas often give good color reception; however outdoor broad-band types are best. Colored room lights and colored lamp shades should be avoided as they can change the color rendition. Sketch H shows a tuning dial arranged for the UHF stations, to include channels 14 to 83. ★ ★ ★

(ONLY FOR SETS EQUIPPED FOR UHF CHANNELS 14-83)





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I Chose a Steel-Frame House

(Continued from page 102)

doorway so that from the door I can switch on a table lamp. The other contacts in the outlet remain "hot" at all times.

Other lighting is provided by incandescent lamps or fluorescent tubes recessed above ceiling panels of corrugated plastic.

My ceiling consists of four-by-four-foot panels of glass-fiber insulating material spray-painted a pleasing light shade. These rest on the lower flanges of the I-beams and on steel straps that divide the areas between the I-beams into appropriate spaces.

There is a 12-inch space above the ceiling which represents the depth of the I-beams. All the wiring for the house as well as the gas pipes for heating and cooking run in this space through small holes cut in the beams. All hot and cold-water piping may also be placed above the ceiling. If one of the overhead utilities ever requires service you can reach it simply by lifting out one of the ceiling panels.

For heating I used counterflow forced-draft gas-fired heating furnaces at two locations. Hot air from the furnaces circulates through large perimeter ducts along the outside edges of the floor slab.

The exterior of the house is painted with a plastic coating that was developed to stand up under severe industrial and chemical conditions. It is expected to last several times longer than most ordinary house paints. For the interior I selected a vinyl-resin coating that is available in numerous decorators' colors.

I used cork tile on much of the concrete floor slab, vinyl-tile flooring in the kitchen and bathroom areas and carpets in the bedrooms. Wall paneling in the dining area is another new product. It consists of wide, thin strips of walnut veneer woven together in a diamond pattern and then compressed flat in a press.

Other features of the house include clothes hampers that are built into the walls and that have enough room for large amounts of soiled clothes, gas-stove and oven-broiler units that are built right into the kitchen cabinets with an automatic timer for the oven, sliding wardrobe doors that extend all the way up to the ceiling and a front-door peephole with a swivel eyepiece so that all parts of the front entrance can be viewed.

Kitchen and bathroom tile has striking designs that were created by the silk-screen process, then baked in permanently by firing in a kiln. Another attraction is a rotating platform in the cabinets alongside the fireplace. A table-top television set on

(Continued to page 262)

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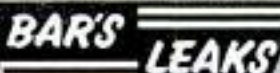
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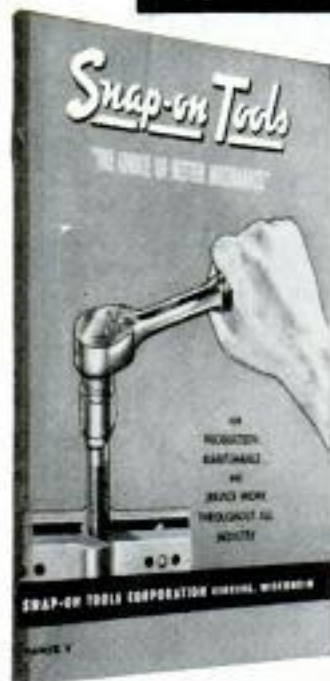
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this platform can be turned so it can be seen from the living room, from out-of-doors or from the dining area.

The house has some 2250 square feet of heated living area. When an additional 265 square feet are added (half the area of the garage and porches) for estimating purposes, the house cost \$14 per square foot to build. This figure includes all normal profits for the contractors, but does not include the price of the land or the cost of architects' plans or financing.

By eliminating the remote-control garage-door operator, the budget set aside for landscaping and for draperies and by other economies, this house could be built for \$12.50 per square foot. Construction-wise it would be no different.

The steel-pipe columns, I-beams and the other materials are available in all parts of the United States, so a house like this can be built anywhere. In extremely rigorous climates the cost might rise a few cents a square foot because of extra floor insulation and a larger-capacity heating plant.

You can build as large a house or as small a house as you want with this construction system. Practically any floor plan can be adapted to it. Its basic principle is a four-foot module (the width of the exterior wall panels) and costs are kept down when this module is followed. Unless you have had considerable experience in steel fabrication and erection this is not the kind of building that the average "do it yourself" home builder can put together. It calls for a portable welding and cutting outfit and the knowledge of how to use these tools.

There's one thing about a house like this that's an actual handicap: It is so novel in appearance, especially when the steel frame is standing by itself, that people passing by just can't help stopping in to ask questions. Time is money and that runs up the costs. And some craftsmen and subcontractors are lost at first. Plumbing drains, for instance, have to be laid out with care ahead of time, before the floor is poured or the partitions are erected.

Too, carpenters and electricians find that they can't nail into the overhead beams as usual. Then they learn that wonders can be done with a welding torch. With the portable electric-welding outfit you not only weld the house frame together, you tack onto it all the brackets and clamps that the subcontractors require. With the same torch you cut holes through the steel just where they are needed.

Memmler spent a couple of years working out all these details and the final result is a house that's a masterpiece of construction. ★ ★ ★

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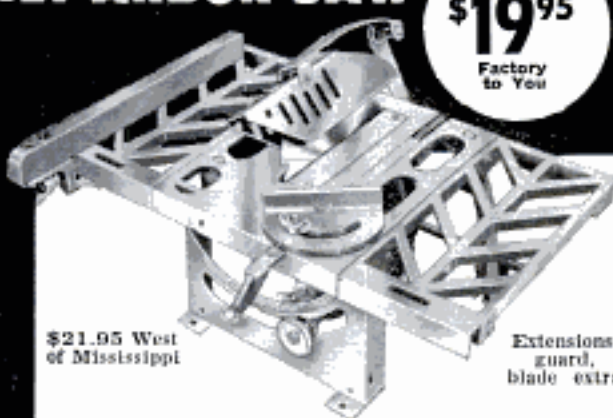
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Esther Williams swims toward the realistic-looking sunken wreck covered with moss and rubber barnacles

Even the Stagehands Have to Swim

(Continued from page 96)

the seams. The front of the blimp contains a large faceplate of half-inch optical glass, and that serves as a window for the lens. Behind the camera another port in the blimp allows the cameraman to read the footage indicator on the camera.

By means of remote controls on the outside of the blimp, the cameraman can start and stop the camera, change focus and diaphragm setting, adjust his view-finder lens and make all the other changes required.

The neutral-buoyancy feature is provided by a complete aqua-lung unit similar to those worn by the cameramen and technicians. Operated by water pressure, a valve automatically admits air into the blimp from a compressed-air storage cylinder when the camera is moved downward in the water.

Four hollow buoyancy tubes on top of the CinemaScope camera (two for the lighter, wide-screen camera) are used as stabilizers that normally keep the camera upright when under water. Arnold provided each unit with a battery-powered propeller so it could move along under its own power while the cameraman swam or walked beside it.

Complete with its cameras and lenses, each neutral-buoyancy blimp cost \$22,000. Both have performed so well that MGM is thinking about making more underwater movies, some of which may be filmed below the surface in their entirety. ★ ★ ★

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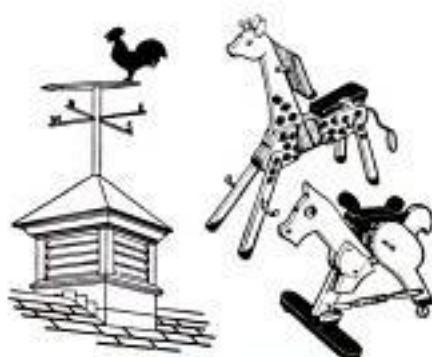
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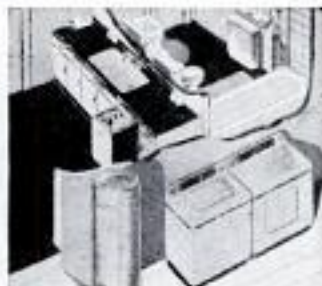
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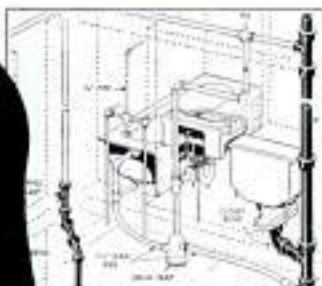
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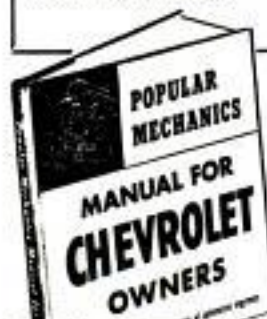
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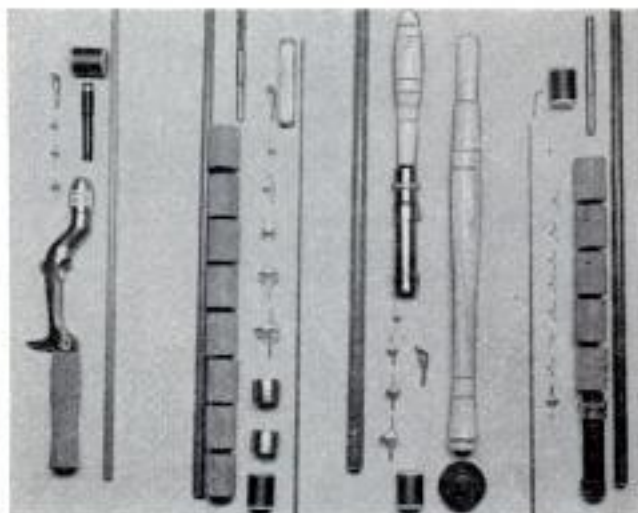


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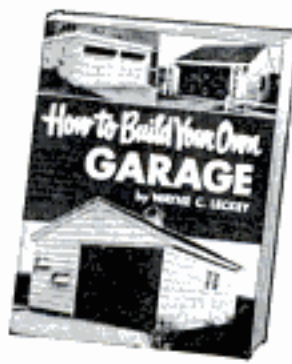
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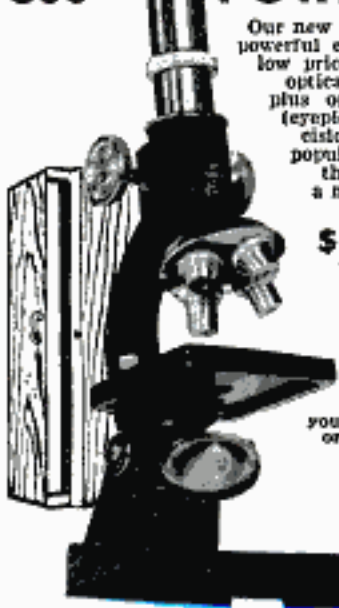
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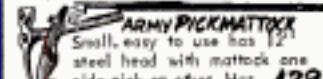
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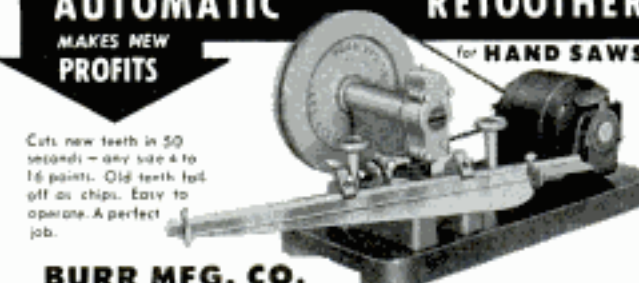
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Enjoy 2-wheel drive pep, speed, extra mileage, performance—keep 4-wheel drive power and traction with **WARN HUBS**. Change 4-wheel to 2-wheel or back in seconds with fingertip control. Front end assembly stands still in 2-wheel drive—ends drag, stops shimmy, cuts front tire wear, increases gas mileage. Willys factory approved. For Willys \$70.60; Willys Automatic \$122.83 pr. — both sold exclusively by Willys dealers everywhere. Dodge Locking Hub \$74.00. Standard Hub \$25.00 pr., ppd. direct or at Dodge dealers. All hubs guaranteed. Write for literature.

WARN MFG. CO., RIVERTON Box 6064-A4, Seattle 88, Wash.

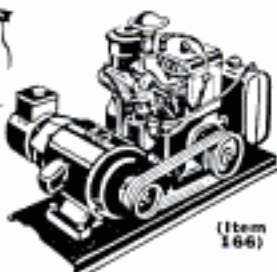
power...



instantly, where you need it!



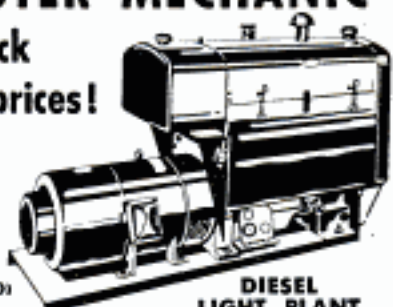
STANDBY or CONTINUOUS DUTY
by **MASTER MECHANIC**
at bedrock
factory prices!



(Item 166)

HI LINE 6000 WATT PLANT

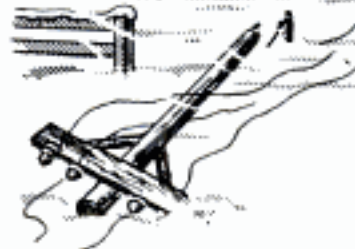
HEAVY DUTY—110/220 v. 60 cyc. AC. A brute of a power plant with a rugged 14.6 hp. Wisconsin engine. Affords both 110 & 220 volts. Ideal where heavy current is needed. Wt. 500 lbs. Item 166. Easily worth \$995. With crank start **\$585.00**
Same plant, but with Generator & control box only, self-starter **\$645.00** (Item 162)
Belt driven. Wt. 240 lbs. Item 163 **\$345.00**



(Item 1680)

DIESEL LIGHT PLANT

11-12 KW (Item 1680) Diesel Master 110/220 v. AC single or 3 phase, 1800 rpm direct connected. Electric self-starting. Engineered for permanent power where continuous low-cost heavy duty service is important. Wt. 1350 lb. Reg. **\$1895.00** list \$3650.00. Factory price...
GAS DRIVEN PLANT 10-11 kw. 110/220 v. 60 cyc. AC single or 3 phase, powered by a 4 cyl. Wisconsin air cooled engine. Belt driven—simple reliable 5 V-belt drive. Mounted on rugged steel skid. (Item 217) with crank start) Wt. 900 lbs. **\$1075.00** Factory price...
Same plant with self-starter... **\$1145.00**



Operate Heating Plants



Keep Freezers Going



Run Milking Machines

Power failure need not be a disaster!
Instant starting MASTER MECHANIC light plants provide electricity immediately... keep oil burners, water pumps, milking machines and food freezers in operation. Don't risk costly freeze-ups, meat spoilage, blackouts and other vital machinery stoppages. Master Mechanic's direct from factory prices make it possible for every one to have the insurance of uninterrupted electric power, regardless of storm, tornado or hurricane!

And you can have power wherever you want it! Master Mechanic's portable plants can be taken anywhere... to provide standard 115 volt, AC power to operate saws, drills, chain saws, floodlights, etc... on building construction, road work or in the woods!



(Item 31)

GIANT 2000-2500 WATT PLANT

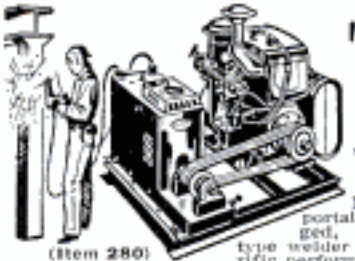
110/120 v. 60 cyc. AC. Exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted—portable. Powered by an easy starting Briggs or Wisconsin 6 hp engine—easily disconnected for other uses. Bag outlet box, voltmeter, no wiring necessary. Item 31. Wt. 210 lbs. Reg. \$345. Special... **\$299.50**
Same plant with electric self-starter. Item 31a **\$329.50**
Generator only and control box... **\$169.50**
DUAL VOLTAGE—110/220 available on any of the above models for \$20.00 additional.



(Item 23)

DYNA POWER 3500 WATT PLANT

Push Button Start. 115 v. 60 cyc. AC. Built-in battery charging. Powered by a sturdy 8 hp air-cooled Wisconsin engine. Built for continuous duty, yet compact and portable. Integral positive drive—an exclusive Master Mechanic feature. Includes control box, plug-in power receptacle and voltmeter. Item 23. Wt. 370 lb. **\$379.50** Factory price...
DUAL VOLTAGE—110/220 available for \$20.00 additional.



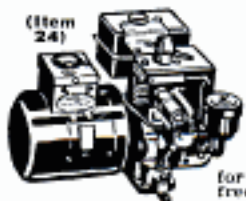
(Item 280)

MASTER DC ARC WELDERS

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/2" rods. Built-in stabilizer and cooling system makes easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 10 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.
WELDER ONLY—DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 280) **\$119.50** Wt. 110 lbs. \$450 value.
WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) **\$99.75** Wt. 110 lbs. \$450 value. Special...
COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Complete with welder costing \$1200. Special for January only... **\$399.50**
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder... **\$10.50**

Any of our plants may be equipped to operate automatically if desired
WRITE FOR DETAILS!

MASTER PORTABLE LIGHT PLANTS



(Item 24)

ELECTRA LITE 600-700 WATT

Push Button Start 115 v. 60 cyc. AC. Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. Which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. \$275. value. **\$143.50**
1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output **\$199.50**
Little Giant 350 Watt Plant
Imagine—65 compact pounds of portable power that goes with you anywhere—easier to carry than an outboard motor. Provides plenty of current for lights, radios, small power tools, electric shavers, etc. Perfect for hunters, campers, contractor's service trucks, etc. 220 watts, 115 v. DC. Ruggedly constructed with 1 1/2 HP Briggs engine. List price \$224.75. Item 27a. **\$99.75** Spec. factory price.



(Item 20)

PORTO POWER 1500-1750 WATT

115 v. 60 cyc. AC. Push button start. Powered by a 4.5 HP Briggs engine. Combines compactness and easy portability with higher output for handling heavier starting loads. Built-in winding for charging 12 v. batteries. An ideal standby power plant for operating oil burners, sump pumps, freezers, television, lights, communication systems, etc. Perfect for contractor's power tools. Item 20. Reg. \$429.50. Wt. 146 lbs. Factory Special. **\$279.50**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for... **BIG 1955 Catalog**
MASTER MECHANIC MFG. CO., DEPT. 55-1 **Burlington, Wis.**

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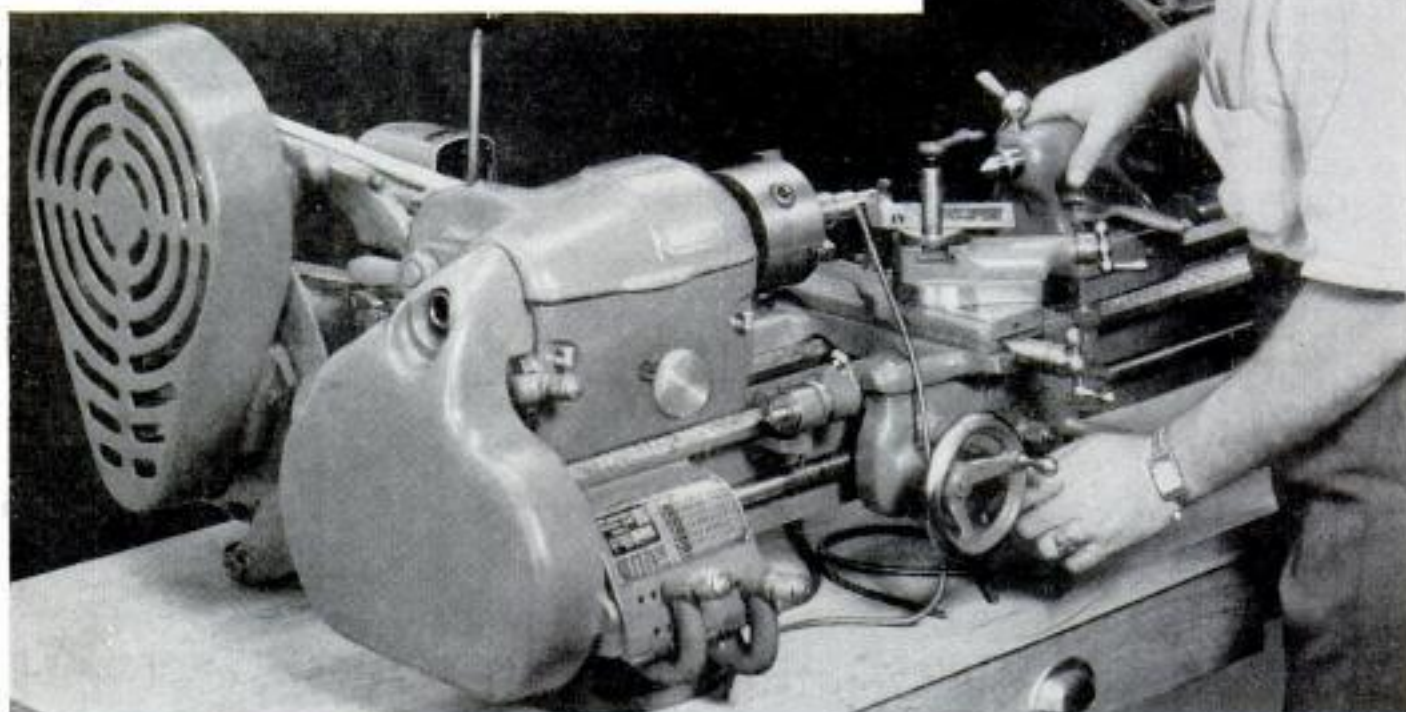


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Yes, only 3¼% interest on original unpaid balance. Low down payment and balance in up to 24 equal monthly payments.



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All 52 entries in the Darlington, S. C. 500-Mile Grand National Stock Car Race used **Champion Spark Plugs** and not a single **Champion** was replaced during the entire race! The cars competing were: **Buick, Cadillac, Chrysler, Dodge, Ford, Hudson, Mercury, Nash, Oldsmobile, Plymouth, and Studebaker.**



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Big-time stock car racing is a brutal test of spark plugs . . . they must stand up and deliver under punishment equal to many thousands of miles of normal driving. Only the best spark plugs can meet this challenge.

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