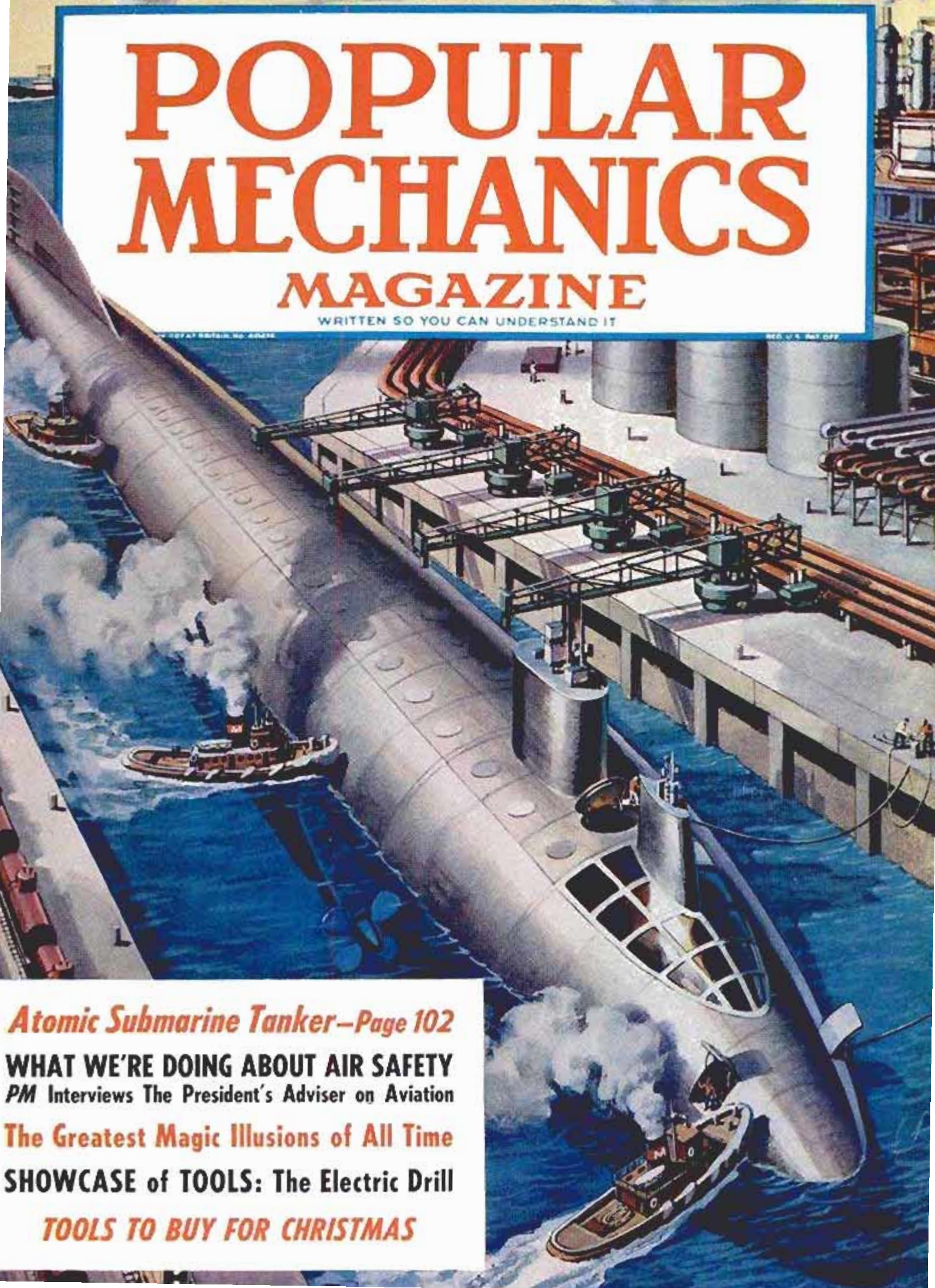


POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



Atomic Submarine Tanker—Page 102

WHAT WE'RE DOING ABOUT AIR SAFETY
PM Interviews The President's Adviser on Aviation

The Greatest Magic Illusions of All Time

SHOWCASE of TOOLS: The Electric Drill

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Give yourself **2 MONTHS** VACATION WITH PLAY!

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with the finest power afloat! See the new '59 Evinrudes . . . most advanced motors in 50 years . . . with new thermostat control . . . new sound-sealed cushioned power . . . 8 smartly-styled new models from 3 to V4 50 hp! See them at your Evinrude dealer (he's listed in your phone book under "Outboard Motors") where easy time payments can turn dreams into reality. Ask for new '59 catalog, or write: **EVINRUDE MOTORS**, 4392 N. 27th Street, Milwaukee 16, Wisconsin. *A Division of Outboard Marine Corporation. In Canada: Mfd. by Evinrude Motors, Peterborough.*



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This One



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DECEMBER 1958

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Next Month...

... brings the annual 50-page auto section. An outstanding feature will be double-size paintings in full color of "The Heroic Years of the Automobile," the era of adventure when goggled motorists literally raced around the world. There'll be a full run-down of the '59 cars, an exclusive interview in which top stylists strike back at their critics, and an engineer's evaluation of the numerous gadgets that are supposed to increase the performance of your car

Now... See in spite of



BRACE YOURSELF! Here comes another driver who hasn't dimmed his lights. He's 175 feet away. Your vision of your side of the road is "washed out" by his glare. Then after you pass,

it takes precious seconds for your eyes to re-adjust to the reduced light, and you still can't see the road ahead clearly. It's like entering a dark theatre on a sunny day!

New G-E SUBURBAN Headlamps have

No other 2-headlamp system ever gave you as much light *in the low beam* as new General Electric SUBURBAN Headlamps. And you *need* more light in the low beam when meeting oncoming cars—even if the other driver dims his lights and has them aimed properly.

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ment is *optically centered* in the reflector—gives a "built-in spotlight" effect, puts more light where you need it to make passing easier and safer. Helps you recover your vision more quickly when the other car has passed.

Have a pair of new G-E SUBURBAN Headlamps installed and aimed by your

the other car's lights!



NOW YOU CAN SEE in spite of the other car's lights—better than ever before, because you have new G-E SUBURBAN Headlamps. Their "built-in spotlight" effect in the low beam pro-

jects more light along the right shoulder, helps keep your eyes on your side of the road. Now you can spot that fallen box at the 200-foot mark—which you *couldn't* see with old headlamps.

a "built-in spotlight" ..in the low beam!

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DECEMBER 1958



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GUYS...**

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ACROSS THE DESK



To the Editor:

My hat's off to Fangio (*PM*, Aug. 1958), a truly great and humble driver, a real sport, a real person.

About the only development of any significance as a result of racing in this country is an automotive tire for high speed and high temperature applications.

Edward Kramer,
Cincinnati, Ohio

☆ ☆ ☆

To the Editor:

Three out of every four "English" automobiles imported into the U.S.A. are really *American*.

The Vauxhall concern is owned by, and run by, your countrymen, who also design those "English" cars! Really Editor, since when was Henry Ford an Englishman? We do not like any of these cars anyway.

Rolls Royce makes a *real English* car. Here's hoping Art Railton will own one.

T. Atkins,
Nottingham, England

☆ ☆ ☆

To the Editor:

I enjoyed your article, "They Learn to Fly in High School," in the October issue.

A very successful school, similar in operation, was established some time prior to 1936 in Helena, Mont. The instigator and instructor . . . was Bill "Pop" Farner, who . . . worked hard to establish what I believe was the first high school to teach actual flight.

Our plane was a 125-horsepower Fleet II biplane and it cost each student \$3 per hour to fly. Many of the fellows soloed . . . many flew in World War II . . . and some didn't come back. Many of our class are now in maintenance repair and manufacturing of aircraft.

John D. Ballard, President,
El Gato Rental & Supply, Inc.
Los Gatos, Calif.

☆ ☆ ☆

To the Editor:

I just finished reading "Alaska — 'Big Land' of Contrasts" (*PM*, 1958). I am an Alaskan and I want to thank you for the best article on my country since statehood . . .

Might interest you to know I was born in Nulato, where they had many massacres and much fighting with the Koyukuks

(Continued to page 10)

Satisfied with my PRESENT PAYCHECK? NOT ME!!



TODAY, you are probably earning enough to get by—enough to provide your family with life's necessities, and perhaps you are depositing a few extra dollars in the bank.

BUT are you content with just earning a living wage? Do you say "Someday I'll really get a break and go right on to the top." THAT'S WISHFUL THINKING!

You know that the "breaks" go to the man or woman who is *prepared* to take advantage of them—to the person who can fill the better job and who is worth more money. He makes the "breaks" instead of waiting for them.

DO YOU QUESTION YOUR OWN ABILITY?

There is a field of business which has never been overcrowded—it's the ACCOUNTING FIELD. And the demand for skilled accountants—men and women who really know their business—is increasing. State and Federal legislation requires much more efficient accounting from business. Corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, and Federal Income Tax. Men who prove their qualifications in this important branch of business are promoted to responsible executive positions—given an opportunity to earn real salaries. The range is \$5,000 to \$10,000 a year—even to higher income figures.

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SKIPPED ME AGAIN!



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I WAS DETERMINED TO MAKE GOOD IN MY JOB...BUT DETERMINATION, I FOUND, WAS NOT ENOUGH!

I HAD PLENTY OF EXPERIENCE. AND THE BOSS SEEMED TO LIKE ME. I LACKED JUST ONE THING—**TRAINING!**



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BURT, I'VE JUST MADE YOU THE ASSISTANT MANAGER OF YOUR DIVISION...AT \$15 MORE A WEEK. AND THE WAY YOU'RE GOING NOW, THIS IS JUST THE BEGINNING.



GOSH! THANKS MR. TAYLOR!

I GOT IT, HONEY! I GOT THE PROMOTION! OUR MONEY WORRIES ARE OVER! TODAY'S OUR LUCKY DAY!

TODAY AND THE DAY YOU MAILED THAT I.C.S. COUPON!



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I WAS TIRED OF WAITING FOR "SOMEDAY."
I MADE UP MY MIND TO ACT! I'D GET THE
TRAINING I NEEDED...SOMEHOW!
JANE HAD A SUGGESTION...

I CAN'T QUIT MY
JOB AND GO BACK TO
SCHOOL! AND I SURE
DON'T WANT THAT
NIGHT CLASS
ROUTINE IN
THE CITY!

WHY NOT STUDY
AT HOME?...THE
WAY DAD DID...
WITH I.C.S.



JANE SHOWED ME AN I.C.S.
ADVERTISEMENT IN POPULAR
MECHANICS. THERE WAS THE
FAMOUS COUPON. AND THERE WAS
EXACTLY THE COURSE I WANTED..

SAY, THEY'LL SEND ME
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DAD SAYS
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WOULD
HAVE BEEN
MANAGER IF IT
WEREN'T
FOR I.C.S.



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City _____ Zone _____ State _____



(Continued from page 6)

(also the town's name) about 18 miles up the Yukon. Many are the exciting stories my Russian mother used to relate to me.

Once she said the town of Nulato was plundered and raided, leaving only four people who escaped to the Kaiyuh Hills. A woman carrying a child managed to escape by hiding in a garbage can.

Alvin Manook,
China Lake, Calif.

☆ ☆ ☆

To the Editor:

This is a snapshot of a clock case we made from the plan by John Bergen in your *Popular Mechanics What to Make and How*



to Make It, 1957. The case is 7 feet 3½ inches tall and made of solid walnut. We are very proud of it—think it is worth several times the \$155 it cost us.

Mr. and Mrs. J. Herman Neese,
Graham, N. C.

To the Editor:

We have no phone in the house, but our next door neighbor always obliges us by allowing its use.

If he is away with his house locked, we can still hear the telephone ring. If any of my three particular friends have an urgent call to make to me, we use the following prearranged "call signal."

My first friend puts the receiver down

(Continued to page 14)



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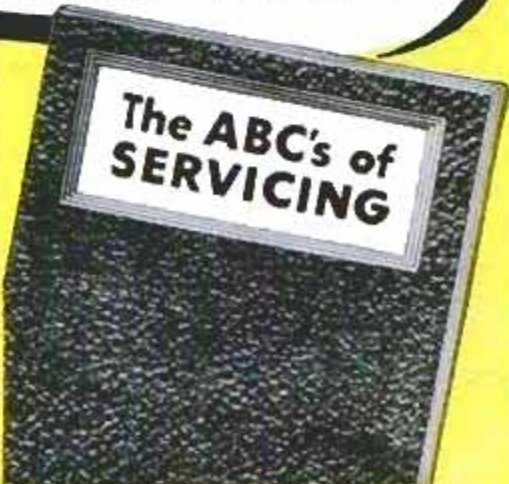
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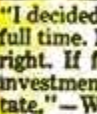
Clearly written, well-illustrated NRI lessons teach TV-Radio-Electronics principles. Also, *without extra charge*, you get NRI kits developed especially to give you actual practice with TV-Radio equipment. You build, test, experiment with actual Television-Radio receiver or broadcasting circuits, build, use testing equipment. All equipment is yours to keep. In your own home you gain knowledge, develop skills needed for jobs in this vast industry.



NRI Trained These Men



"I have my own Radio-TV business and my income has provided me with financial security. Business is great. I can't keep up with the work."—**EDWARD M. DUDEK, Chicago, Ill.**



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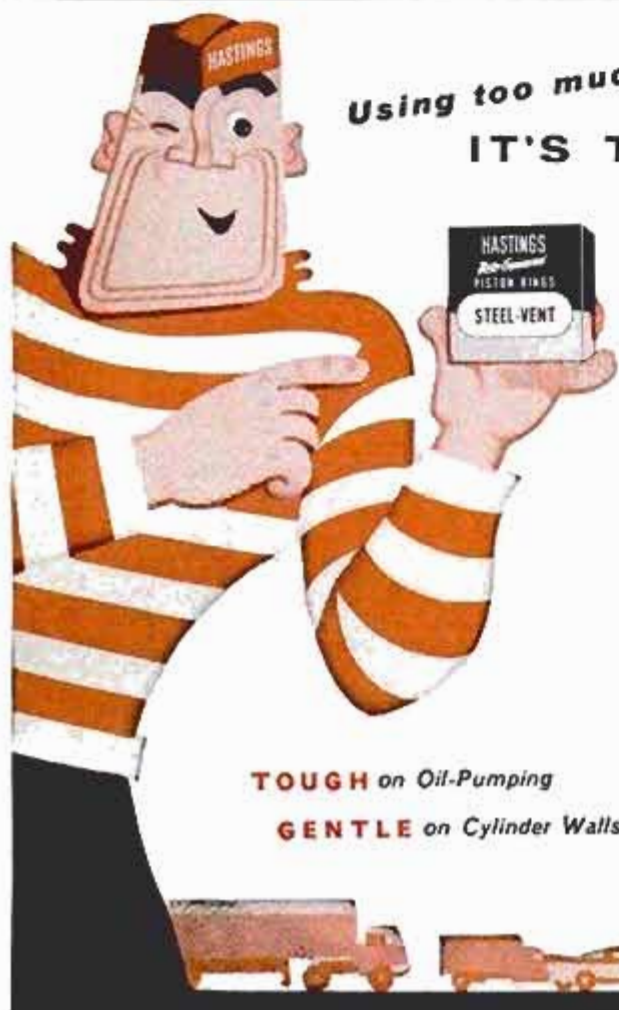


U.S. Forest Service photo

Do You Know This Old-Timer?

This brings back the good old days, when roughing it was really roughing it—and maybe even more fun than in these days of crowded tourist camps in the national parks. The car you should recognize: It had a distinctive shape that

everyone knew a generation ago. The photograph was taken in the Cibola National Forest in New Mexico in 1924. And take a good safety tip from these campers—chock your wheels against a sturdy pine. The car? Turn to page 216.



Using too much oil and gas?
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U.S. Patent Nos. 2614892, 2712271



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The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him: We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

Registered Patent Attorneys

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(Continued from page 10)

after five successive ringing-tone buzzes. Two minutes thereafter, he once again allows five successive ringing-tones and immediately places the receiver down. The other two friends follow six and seven ringing-tones each. With a little practice all my family members seem to count the ringing-tones instinctively each time.

I then immediately go down the street to the nearest grocer and call up the particular friend.

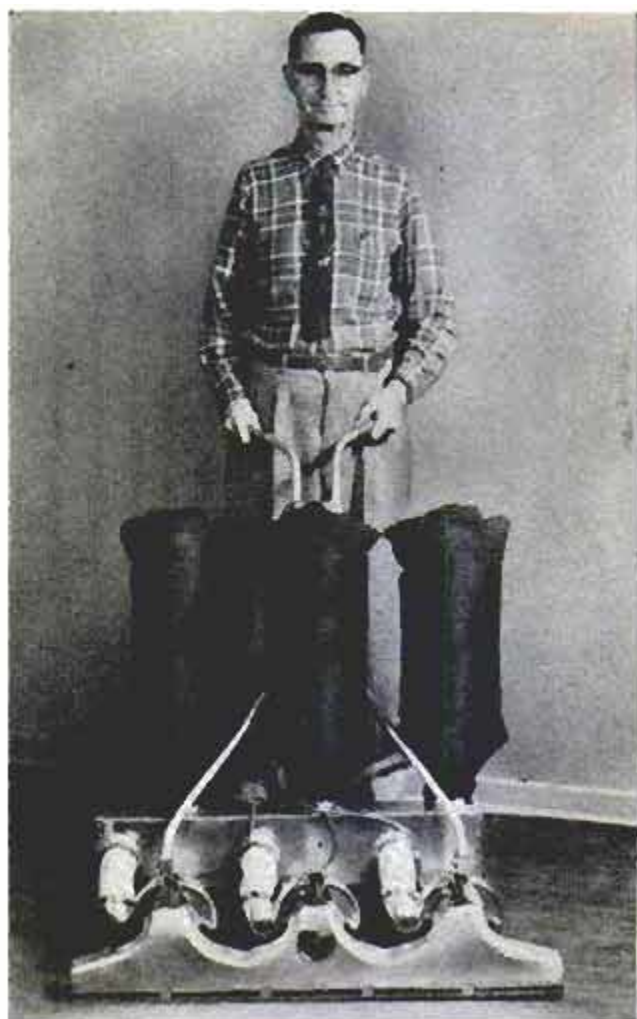
Mrs. Perin Phiroze Bilimoria,
Ahmedabad, India.

☆☆☆

Three-Motor Vacuum

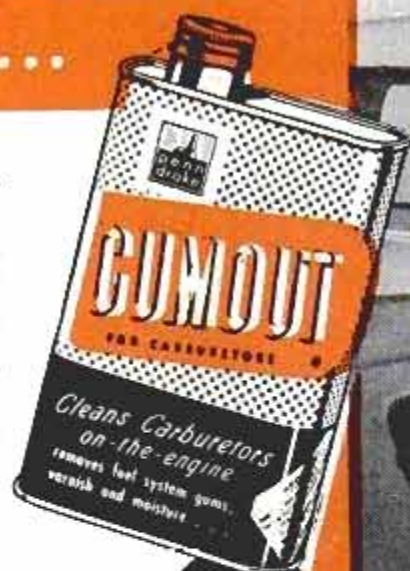
Glen W. Swihart of Greenland, Ark., has developed a tri-engine vacuum cleaner for dance floors, roller skating rinks and similar large areas. Equipped with three $\frac{3}{4}$ -horsepower motors, it cleans a path 33 inches wide and has 83 feet of extension cable for traveling over wide floors. The center motor produces vacuum and also drives three rows of nylon bristles, while the other motors are used only to add suction. Five Alnico magnets in front of the sweeper pick up metal particles from the floor.

(Continued to page 34)



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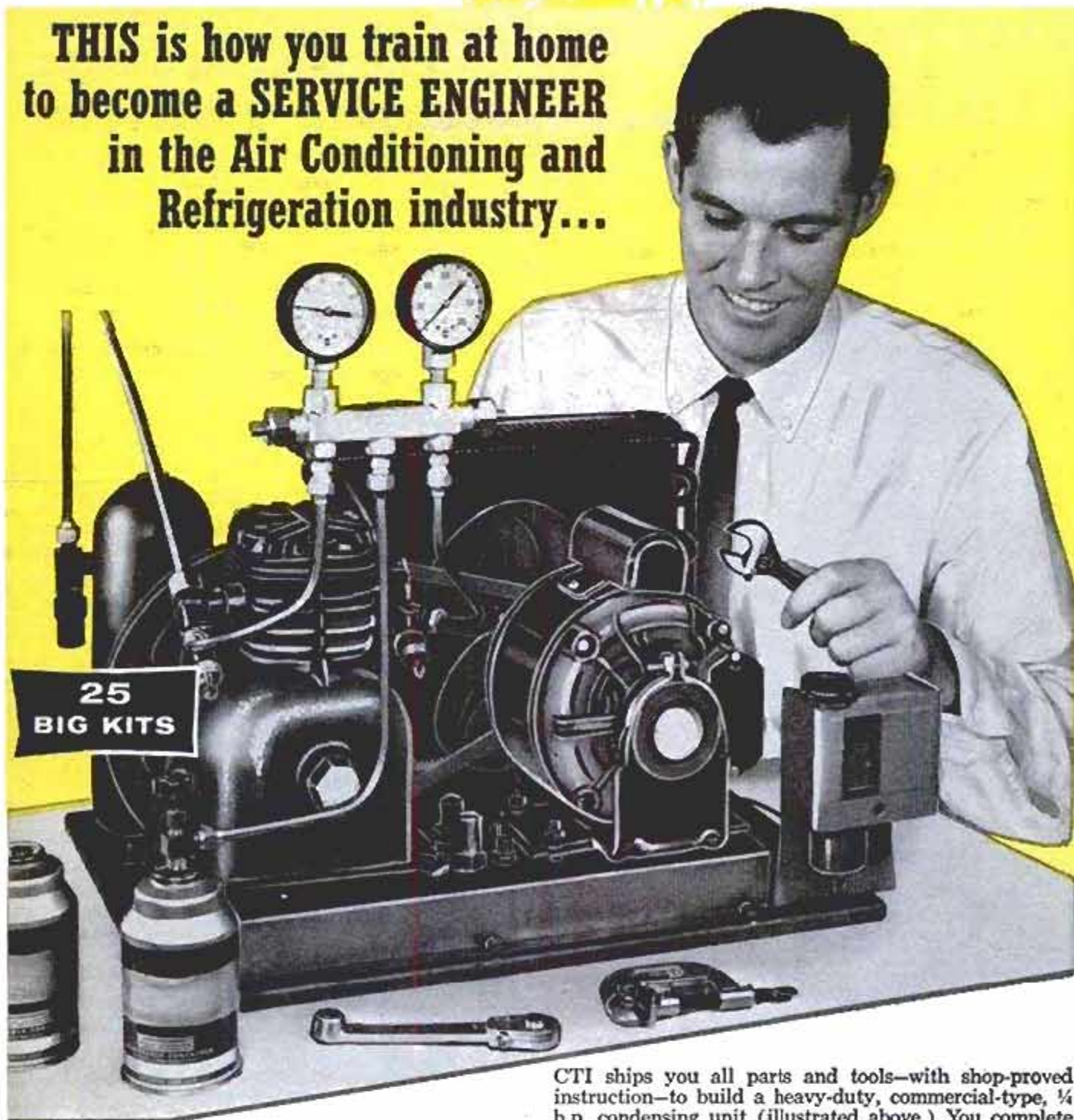
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The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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Mail your disclosure to the registered patent attorney or agent whom you select to assist you, together with a letter authorizing him to conduct a

preliminary search among previously granted U. S. patents for similar types of invention. He then prepares for you a report on the probable patentability of your invention and, if the report is favorable, recommends the further course you should take.

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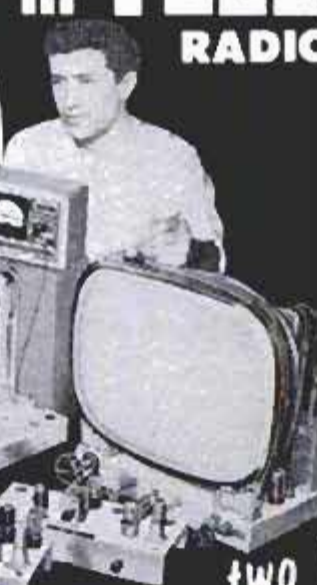
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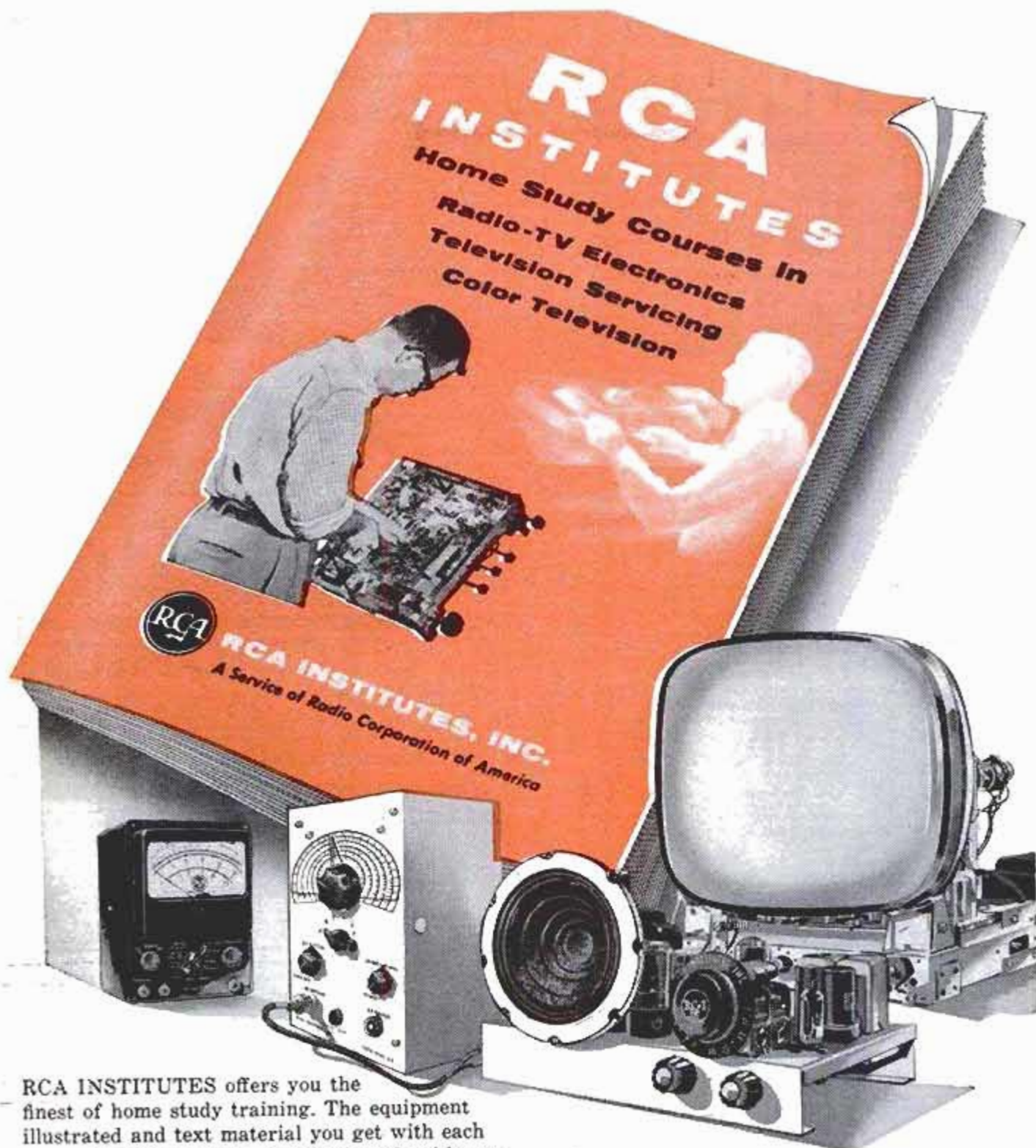


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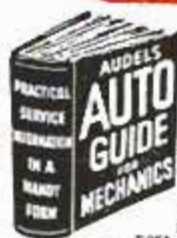
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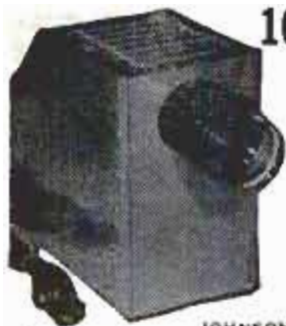
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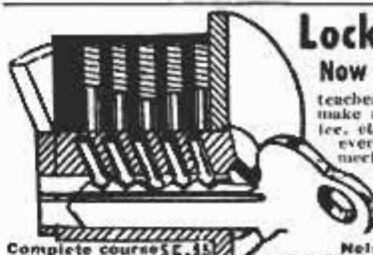
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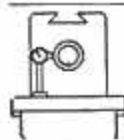
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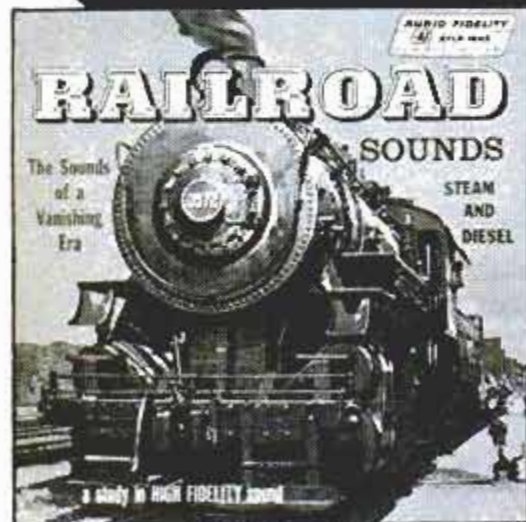
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To the Editor:

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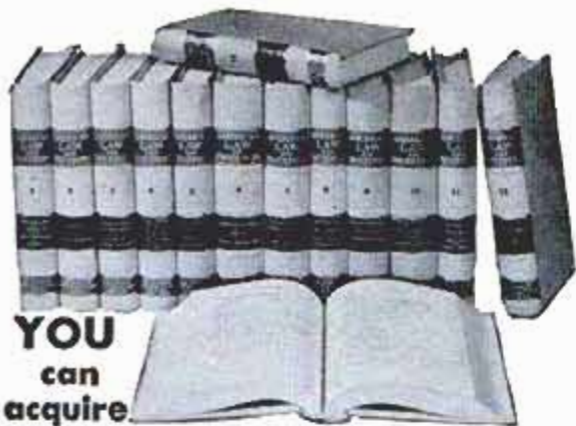
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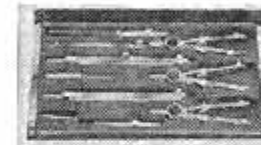


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MAIL Trade magazine has moneymaking opportunities galore. Sample 25¢. Donovan, 79-PM Greenbelt, Levittown, New York.

FREE "Franchise profit letter" describes nationwide opportunities. Exclusive distributorships, dealerships, agency operations. Write today. National Franchise Reports, W-528, 333 North Michigan, Chicago 1.

TREMENDOUS Possibilities in home mail order. I retired after five years. Plan and help given absolutely free. Norris Cole, 217 West 49th, Bradenton, Florida.

MONEY Raising earthworms. Instruction booklet 40¢. Organic Gardens, Mountainburg, Arkansas.

OPERATE Your own home mail order business, it's profitable. Write. Webb Imports, Pico Rivera, Calif.

OPERATE Mailorder folio business. Free details. Ballard's, 1323 Winter, Louisville 4, Ky.

BOOMING Business. Ground floor opportunity. Free booklet. Stone-Craft, Box 856-A, St. Louis, Mo.

MAKE Signs. Just nail on. Hoag's Sign Letters, 507 E. Chicago Blvd., Tecumseh, Michigan.

SELL By mail profitably. Beginner's manual gives tested methods. 25¢. Alfano, 19 Pine, Closter, New Jersey.

\$34.70 **TWO** Hours. Manufacturing concrete products. No selling. Carlayne Castings, 1803 Fremont, Rapid City, South Dakota.

TO \$100.00 Weekly. Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34.

LEARN Real estate by listening to records. Lee Institute, Brookline 46, Mass.

CAMERA Owners! Earn \$50.00 weekends! Instructions \$1.00, information free! Kline, 935-PM North Austin, Chicago 51, Illinois.

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, Grand Rapids, Minnesota.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Champaign, Ill. (Founded 1935).

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MAKE Flexible molds. Cast plaques, figurines. Free sample. Tooker, 1045-R Fairview, Hamilton, Ohio.

NATURAL Molding rubber, extra thick. Free sample. W. Wooley, 1016-A Donald, Peoria, Illinois.

I want to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. Include literature if possible. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

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MONEYMAKING Vending machines. Catalog. Rake, 607 Spring Garden, Philadelphia 23, Penna.

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THE All profit offer plus my big mail 30¢. Satisfaction guaranteed! Crews, Box 58, Valrico, Florida.

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SALES-By-Mail could be your opportunity. Valuable food for thought free. Rawson Wood, 3974 Milwaukee, Chicago 41.

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PLATE Baby shoes, jewelry, gifts, bronze and colored pearl. Free booklet. Platex, 11029 South Vermont, Los Angeles 44.

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FREE Catalog. Contains hundreds of businesses, farms and income properties throughout U.S., Canada. Specify type and location desired. Deal direct with owners. U. I. Buyers Digest, 1608 Hillhurst, Dept. PM-3, Los Angeles 27, Calif.

MOTEL Supplies business and mailorder to institutions. New! High income. Investigate. Hermes Advertising, 152-C West 42, New York City 36.

BRONZE Baby shoes: Instructions, equipment and mountings for genuine electroplating process. Largest supplier of all plating equipment, supplies. Free catalog. Hollywood Bronze Supply, Dept. B-3, 1624 East First, Los Angeles 33, Calif.

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LIQUID Molding rubber, free sample. Shellcraft supplies. Chaney's, 1907-A East Road, Jacksonville 11, Fla.

\$5,000 YEARLY. Spare time at home. Nothing to buy. No local selling. Dignified. Guaranteed. Home Harvest, 1933 Lakeview Road S.W., Albuquerque, N. Mex.

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HOW To make money—Over 150 plans \$1. Catlin, 68 North Ellsworth, San Mateo 8, California.

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WIN Contests. Complete information, 10¢. Spence, Box 11569, St. Petersburg, Fla.

NEW Magazine shows you how to operate profitable mailorder business. Free details. Mailorder Income, 2639-217 Howard, Chicago, Illinois.

SELL Books by mail, 400% profit. Royal, Box 368-X, Cleveland 27, Ohio.

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EARN Money evenings copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

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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.

MAIL Order rules for beginners. Book \$1.00. Central Trading Co., Box 254, Sudbury, Ontario, Canada.

PREPARE Tax returns—Remunerative! Write Taxbus, 6196 Walnut, Omaha 6, Nebraska.

EASY To start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write to Roberts, 1512 Jarvis, Room CR-2-L, Chicago 26.

FORMULAS, PLANS, ETC.

100 SELECTED Formulas \$1. Catalog free. Ogg Laboratories, 4314 Downing, Tampa 3, Florida.

10,000 FORMULAS \$5.00. Universities-libraries endorsed. A. Hanlon, Malvern, Penna.

MONEY-Saving formulas. Send 10¢ (refundable) for list. Enterprise Products, Box 8573B, Oklahoma City 14, Okla.

FORMULAS For latest money-making discoveries. New! Good! Valuable literature free! Miller, Chemist, 1517-D, Tampa, Florida.

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NEW Liquid casting plastic, clear, colors. Embed real flowers, butterflies, photos, coins. Send 25¢ for two handbooks "How to Cast Liquid Plastics" and "How to Make Extra Money at Home." Castolite, Dept. P-101, Woodstock, Illinois.

PLASTICS! New, do-it-yourself casting and molding materials. Crystal clear for embedding specimens, ivory, ebony, marble and colors for jewelry, novelties and industrial castings. Illustrated catalog 25¢. Castacraft Corp., Dept. D-67, P.O. Box 555, Palo Alto, California.

ELECTRIC Laminating kit. Hobby or profit. Burr, 330 East Center St., Kalamazoo, Mich.

LAMINATING Plastics. Plastic sheets, vinylite, acetate, plexiglas. Free catalogues. Arthur Blank & Co., 44 Causeway, Boston 14, Mass.

CASTING; Mold supplies. Catalog 25¢. Gel, Box 261, Union, N. J.

PHOTO-Seal. Complete electric laminating kit for wallet size photo's, cards. \$14.95. Refills available. Therm Appliance, St. Charles, Illinois.

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BOXES, Plastic. Free list. Althor, 170 Bay 23 Street, Brooklyn, N. Y.

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AMAZING New book of science experiments, formulas, and catalogue of laboratory supplies. Only 25¢. National Scientific Co., Dept. PM-12, 500 West Road, Lombard, Illinois.

CHEMISTRY—Science magazines. Literature free. Lankton, Box 5126C-21, Lansing, Mich.

CHEMICALS, Supplies, 54 page catalog, 25¢. Laboratory Sales, Box 161-A, Brighton, Mass.

BOOKLETS! Chemistry, Physics, Astronomy, Science, Relativity, Electricity, Radio, Light, Tables, Mathematics, 10¢ each. Franks, 3121 South Racine, Chicago 8.

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AGENTS—Sideline, students sell rubber stamps, 3 lines—name, street, city. Costs you \$1. Sample \$1 refunded 5 orders. Dean Shop, 1189 N. Grand Ave., Baldwin, N. Y.

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YOUR Ad in this space will get some good agents for you. Yes, I'll prove it. Write for Folder "A" right now. F. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

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TILE Agents wanted, sell floor and wall tile, sparetime. Chicago's largest tile wholesaler. Catalogue and samples upon request. Century Supply, 3005-P N. Austin, Chicago 34.

PRINTING, Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Ralco, XL, Boston 19, Mass.

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AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 1217-D West Newport, Chicago.

YOUR Own business—Used suits \$1.50, overcoats 65¢, mackinaws 35¢, shoes 12½¢, ladies coats 30¢, dresses 15¢. Enormous profits. Catalog free. Nathan Portnow Associates, 2109-AA Roosevelt Road, Chicago 8.

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NATIONALLY Advertised merchandise, below wholesale. Catalog 50¢. Refundable first order. Ware's, Box 225, Rosemond, California.

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REMINGTON Rollelectric, \$25.00 postpaid. Check, money order. B. Cooper, Box 178, Marietta, Ga.

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LP Records \$1.25. Kaster Music, Room 309, 707 S. Broadway, Los Angeles, Calif.

HANDMADE Western boots, Jodhpurs, Wellingtons. Free catalog. Western Saddlery, Box 7302, El Paso 1, Texas.

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GUARANTEED 17J new gold Swiss watches \$10.00, \$60.00 dozen. Wholesale catalogs \$1.00, refundable. Millen 791-A East 160th Street, Bronx 56, New York City.

MOST Unusual catalog—Gift included, 25¢ (refundable). Seegay, Box 10126, San Antonio 21, Texas.

WHOLESALE! 30,000 Items! "Free Wholesale Plan." United Wholesalers, 1265-M Broadway, New York 1, N. Y.

LUBRICATING Oils and petroleum products. Highest quality, send for listings. Moderne Oils, Lyceum Bldg., Tarrytown, N. Y.

NEON Window signs—Custom made. Save 50%. Salesmen invited. Neon Tube Co., 1758 South Cleveland Ave., Canton 6, Ohio.

RONSON '66' Electric shavers \$11.66! Watches \$5.99! Transistor radios \$6.95! All new! Free catalog describes these and hundreds of other bargains. Appliances, toys, jewelry, tools, novelties, all at sell-out prices! Meridian Trade Corp., Dept. M, Box 1236, Cincinnati 1, Ohio.

BUY Wholesale! 30-80% discounts! Nationally famous brands. Typewriters, housewares, appliances, watches, furniture, musical instruments, cameras, tools, etc. Consolidated Distributors, Clifton 3, New Jersey.

USED And new watches \$2 up. Free list. Southern Watches, 5-PM So. Wabash, Chicago 3.

BUY Wholesale! 100,000 nationally advertised products. Appliances, cameras, sporting goods, housewares, watches, typewriters, tools, clothing, etc. Discounts to 80%. Buy-Rite, Box 258, Hawthorne 4, New Jersey.

LARGEST Wholesale supply source in U.S.! Furniture, clothing, appliances, housewares, automobiles and accessories, tools, sporting goods, hobby supplies, farm equipment, imports, new products, bargain merchandise. Free details. Associated Wholesalers, Box 52-DD, Burlington, Iowa.

FREE Wholesale catalog! Christmas gifts, toys, appliances, etc. Big savings! Housewares Distributors, 1216-P West 79th Street, Chicago 20, Illinois.

BUY Wholesale! 25,000 nationally advertised products. Get amazing dealer catalogs. Complete details free. American Wholesalers, 1841C Levee, Dallas 7, Texas.

ELECTRIC Guitars, amplifiers, wholesale. Free catalog. Carvin PMW, Covina, Calif.

SALESMEN—DISTRIBUTORS

TAKE Over your area—Agents, dealers, farmers, make \$125 up weekly selling nationally advertised Campbell's Go-Green liquid fertilizer concentrates. No investment. Everything free. Campbell Co., (Est. 1928), Rochelle 5, Illinois.

SALESMEN: Sell ten fast selling items to gas stations. Write: Arrow Co., 291 East 7th St., St. Paul, Minn.

AD Match sales! Your own business, without investment! Sell for world's largest direct selling manufacturer of advertising matchbooks. Big spot cash commission. Start without experience. Our tested sales kit tells you where and how to get orders. Men, women, part or fulltime. Match Corporation of America, Dept. PM-108, Chicago 32.

\$400.00 EVERY Week. Sell two duplicates a day. Print five colors each turn of the crank. Vari-Color, Box PM-31, Shawnee, Oklahoma.

MAKE Extra money. Cash commissions. Everybody buys easy-to-sell advertising book matches. Union label. All sizes. Cuts for all businesses. Powerhouse selling kit free. Steady repeat business. No experience necessary. Superior Match Co., Dept. M-1258, 7528 S. Greenwood, Chicago 19.

MAKE Money! Take big profit orders, famous fruit trees. Including sensational discovery, Starkrimson Delicious apple! Also dwarfs, shrubs, roses, vines. Sales outfit free. Stark Bro's, Desk 30169, Louisiana, Missouri.

BIG Moneymaking opportunity. Exclusive line uniforms, jackets, pants, shirts, coveralls, sportswear. Advertising embroidered. Every business prospect. Get selling outfit free! Master Co., Dept. H-10, Ligonier, Indiana.

100% PROFIT. Fast easy money! Take orders for Sweet Georgia Brown cosmetics. Colored people buy quick. Free sample. Valmor, Dept. MU, 2451 Michigan, Chicago 16.

AMAZING Opportunity. New low priced fire alarm protects homes, farms, offices, factories, etc. No wiring, hangs like picture. Pays up to \$1,100 a month. Free kit, Merlite (Alarm Div.), 114 E. 32nd St., Dept. F-668, New York 16, N. Y.

WILL You wear new suits and topcoats without one penny cost and agree to show them to friends? You can make up to \$30.00 in a day even in spare time, without canvassing. Stone-Field, 532 South Throop Street, Dept. H-926, Chicago 7, Illinois.

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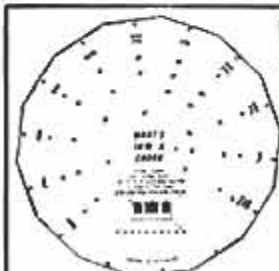
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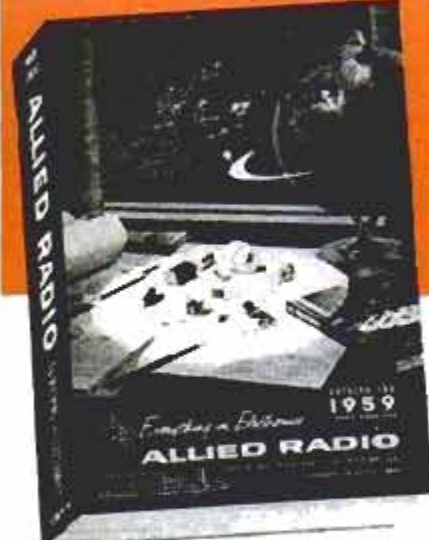
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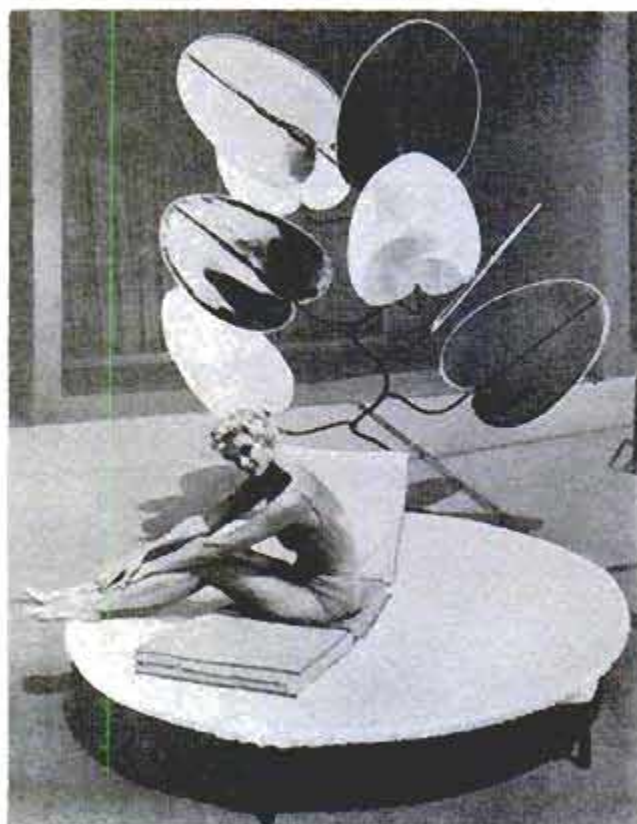
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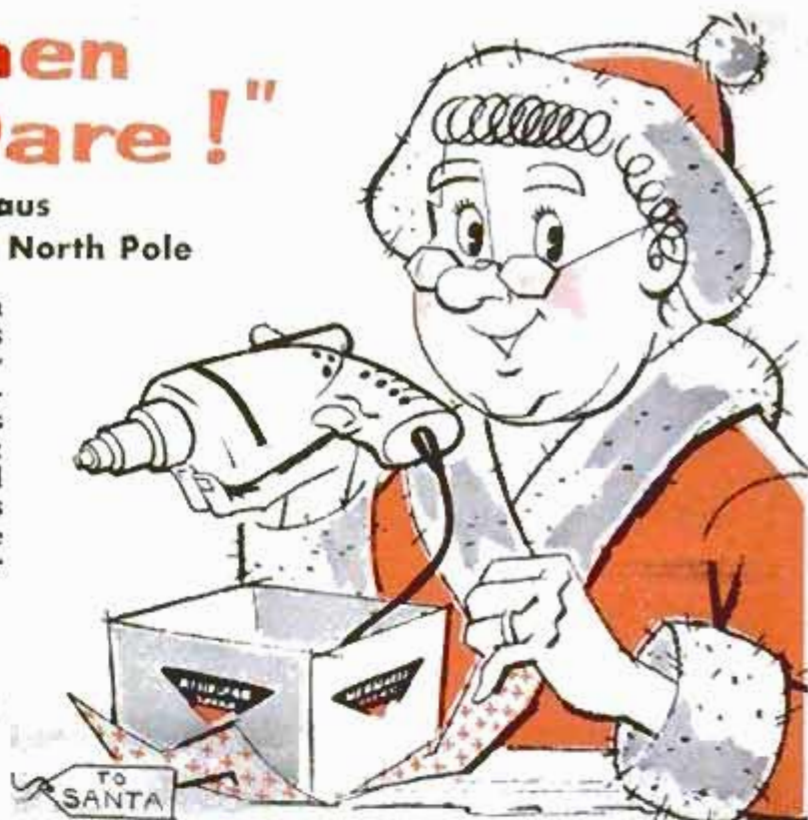
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"PM Highlights"

POPULAR MECHANICS

DECEMBER 1958

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 110 NO. 6

What We're Doing About Air Safety

An exclusive interview with Elwood R. Quesada, Administrator of the new Federal Aviation Agency, Chairman of the Airways Modernization Board, and Special Assistant on Aviation to the President



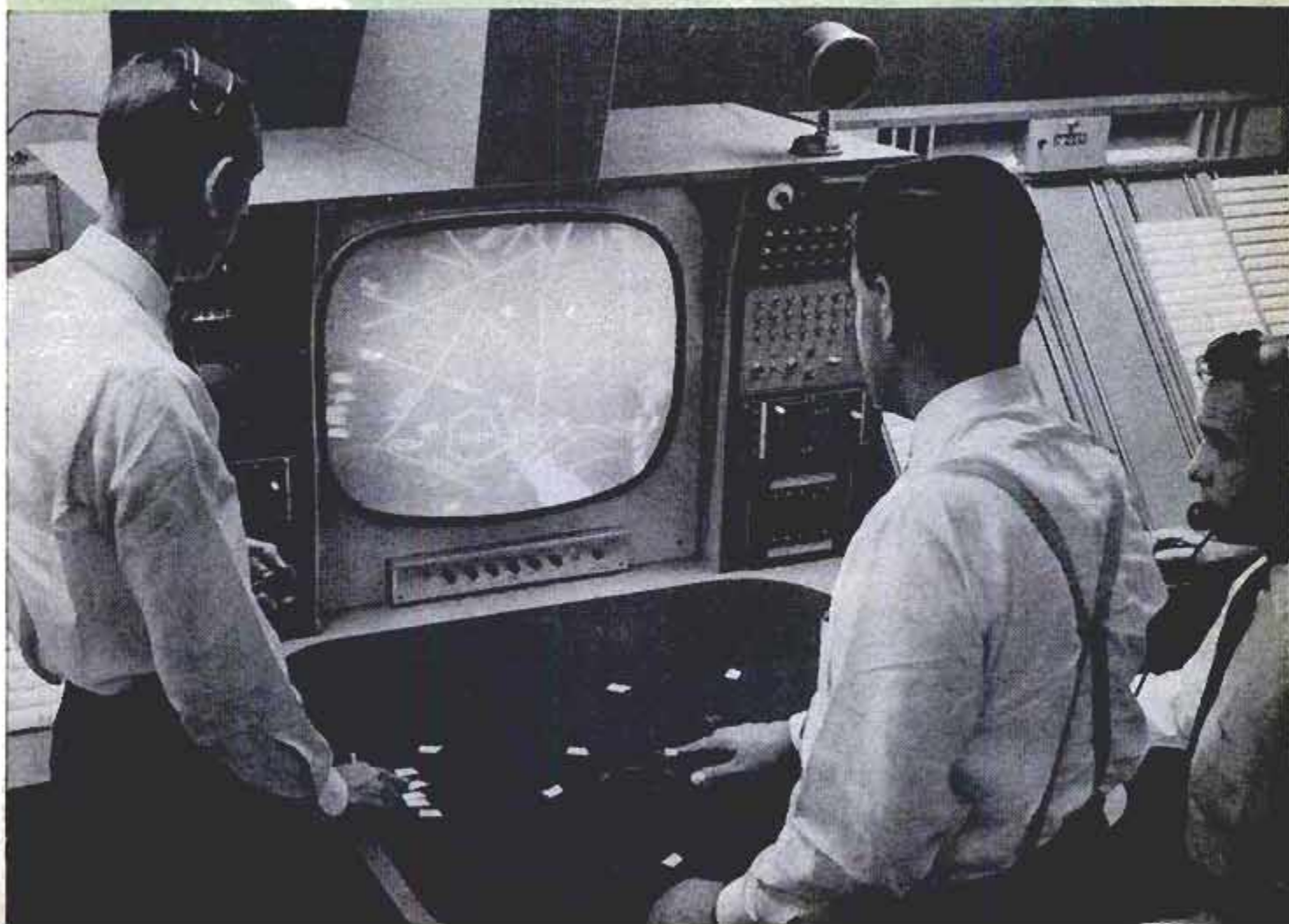
QUESTION: Mr. Quesada, is our current system of traffic control obsolete?

MR. QUESADA: It is, to a large extent. It is manual, and these days one should have at least a semiautomatic system.

Q: Does this mean, then, that it is dangerous to fly today?

MR. QUESADA: No, it is not dangerous to fly. Air

Experimental TV-type display "remembers" past track of aircraft up to 30 minutes for traffic controllers



This is what the pilot saw as he approached Washington National Airport under the old system of lighting

transportation continues to be the safest mode of transportation. The obsolescence of the system causes delays to the public more than anything else — delays in departure and in holding before arrival.

Q. What are the most frequent causes of air accidents?

MR. QUESADA: Pilot error, more than any other one cause; more than mechanical error.

Q: In other words, the shortcomings of our air-traffic-control system are not responsible for any accidents?

MR. QUESADA: I would say that the procedures of air-traffic control are not a significant or even a minor contributor to air-traffic accidents.

Q: The president of the Airline Pilots Association has stated, "The system facilities for handling air traffic are now inadequate and have been inadequate for some time." Do you care to comment on that?

MR. QUESADA: I agree with him thoroughly. The Airways Modernization Board is devoting itself to that problem and that problem alone.

Q: Are you convinced that, as of now, everything is being done that can be done to prevent further military-civilian accidents?

MR. QUESADA: I guess an absolute answer is that we are never doing everything. I guess there is always something more. We are always trying to improve, and I am afraid we will never reach the absolute. I do feel that all of the interested parties are doing their best to reduce the hazards which exist.

Q: How much correlation is there right now between the airlines and the military services on instrument-flight rule and visual-flight rule operations?

MR. QUESADA: Well, contrary to general belief, the military services conform to Civil Aeronautics Administration regulations, and that includes both instrument and visual-flight rules. However, in recent months the military has voluntarily re-

stricted itself to rules that are more stringent than the rules governing the civil operators.

Q: What is the so-called "see and be seen" concept by which pilots are currently operating while under visual-flight rules.

MR. QUESADA: The see-and-be-seen concept is one in which the pilot in a particular plane must, by the use of his own eyes, provide the necessary surveillance in that area through which his plane is going to travel. He must be able to avoid collision by the application of his own sight. Also, his plane must be visible to others in the same area. Now, with today's rapidly increasing speeds, the see-and-be-seen philosophy is in some cases outmoded.

Q: When two jets approach each other head on, how long do the two pilots have to react to avoid a collision?

MR. QUESADA: It varies with the angle at which the planes are approaching and their speeds. Also, the pilot's angular vision is a factor. Suffice to say here, the pilot has scant seconds to see the other plane, calculate whether the two planes are on a collision course, and then respond to his decision by changing course if necessary. And we just cannot count on this as a solution. There must be other solutions.

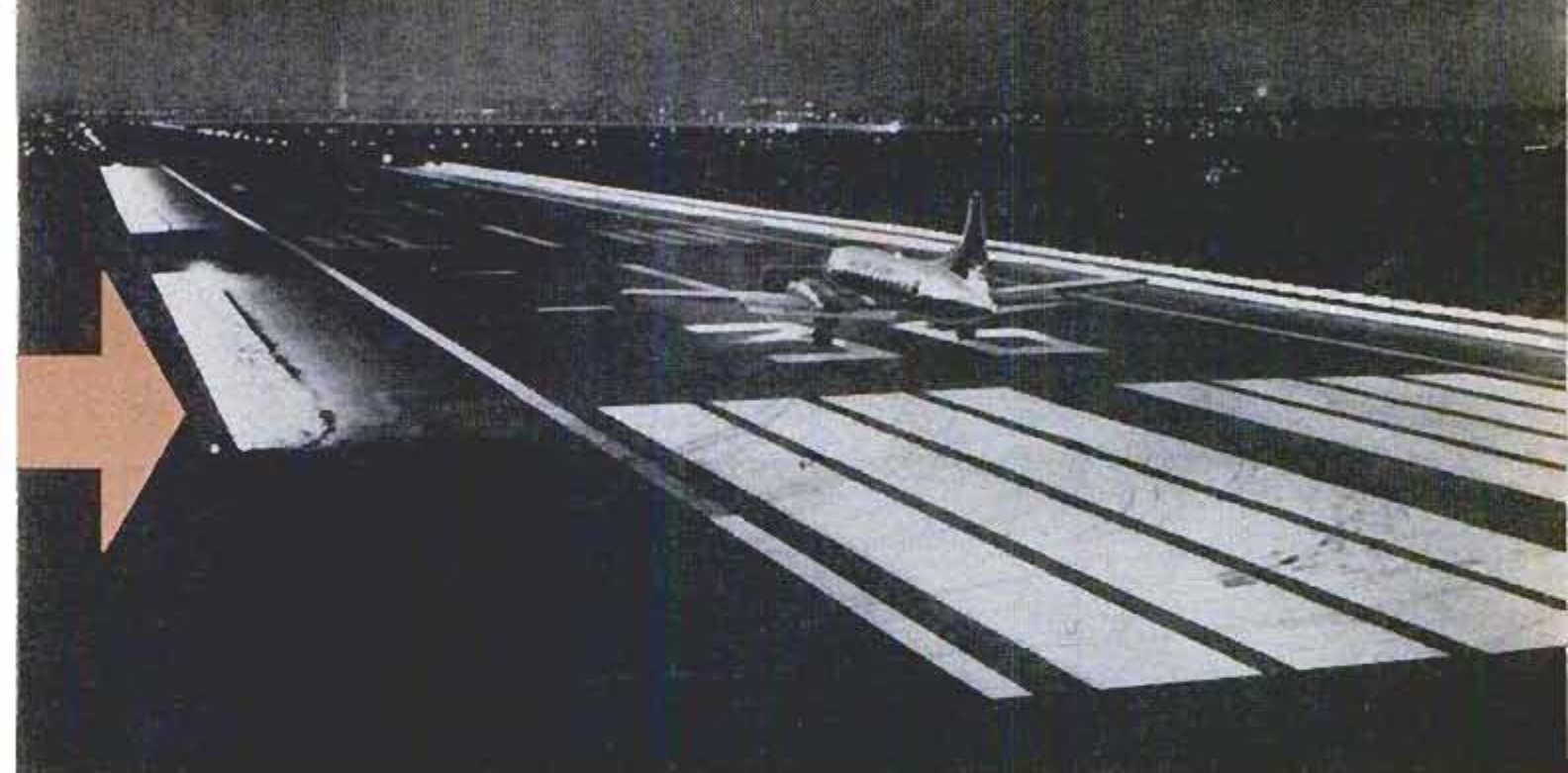
Q: Are the newly developed fluorescent paints of any value?

MR. QUESADA: The principle of enhancing the see-and-be-seen technique by the application of paints is of value. It would be a disservice if I left the impression that it was *the* solution. It is of definite value and I would forecast that it is going to be applied on an increasing scale.

Q: Do you think the airlines will use these paints?

MR. QUESADA: I think the airlines will eventually apply the fluorescent paints to their planes.

Q: Minneapolis Honeywell is reportedly testing a system that will make aircraft visible at twice the normal distance, even in the daytime. Are you familiar with it?



New lighting system has 272 very-high-output fluorescent lamps in eight-foot fixtures along the runway

MR. QUESADA: I am familiar with the effort on their part to develop a high-visibility light using the strobe principle.

Q: This light would be used even in daytime?

MR. QUESADA: Even in daytime it will be visible. The fundamental principle is that you store up a lot of energy and then expend it in a short span of time. Thus you produce a great deal of light and supposedly it will attract attention.

Q: Are there any satisfactory anticollision instruments now in existence, carried in the aircraft, which will warn the pilot of an impending collision?

MR. QUESADA: The best instrument carried by the aircraft continues to be the eyes of the crew. There is no instrument now available that warns of a collision with sufficient reliability.

Q: Is there any research under way on such an instrument?

MR. QUESADA: A great deal. We have three or four programs ourselves. Also,

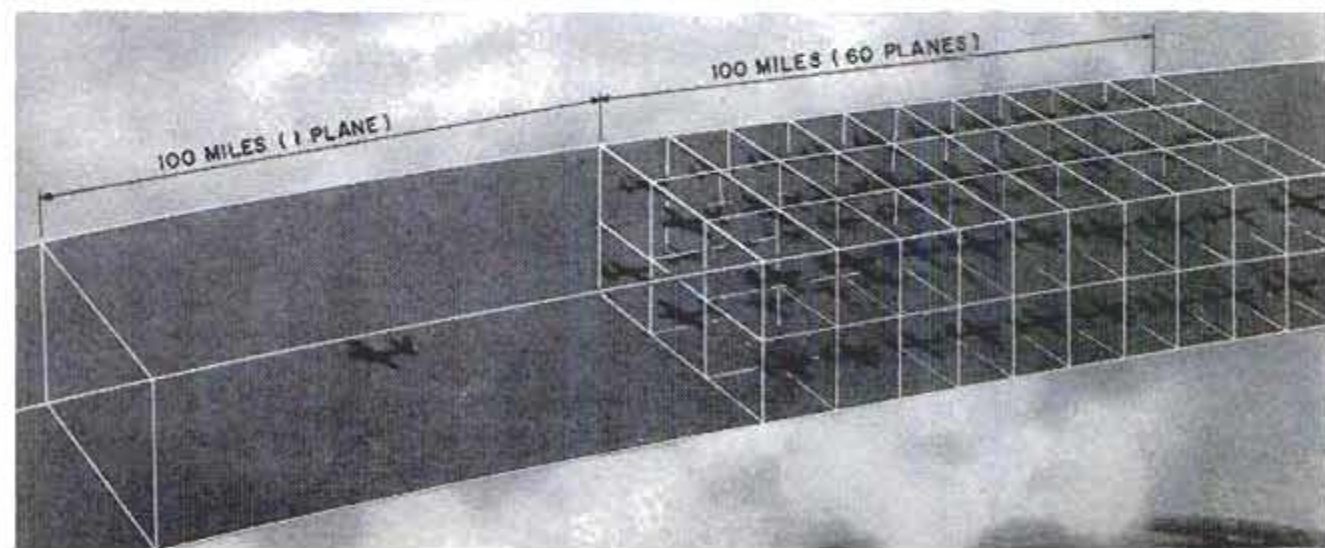
private companies are developing such equipment. Aerojet General has an infrared device that in the minds of some appears promising. The Air Transport Association—an association of all the airlines—is not only encouraging but assisting in the development of such devices.

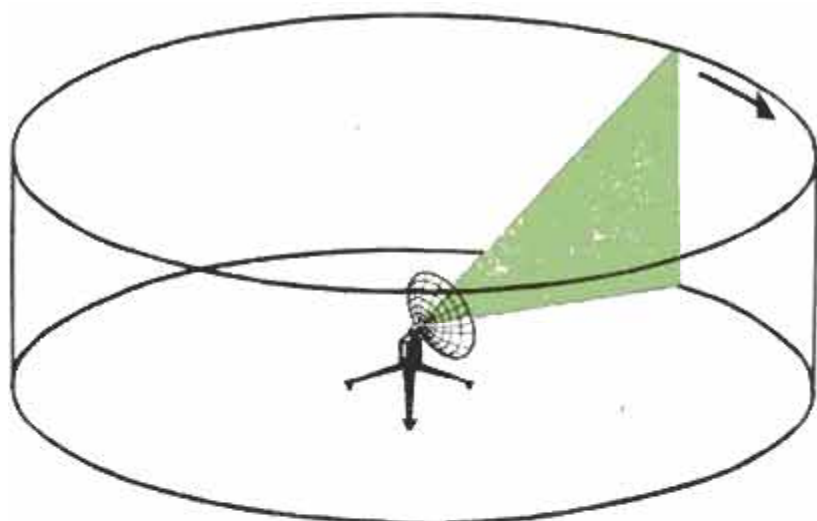
Q: Mr. Quesada, just what are the functions of the Airways Modernization Board?

MR. QUESADA: The functions of the board are described in the law. They are quite precise. First, the board is a joint military-civil activity. It is a research and development activity designed to develop devices essential to the modernization of the nation's aviation facilities. Its primary task is to develop a semiautomatic system for the management of air traffic to replace the present manual system.

Q: Congress recently passed a bill creating a Federal Aviation Agency, and the President subsequently appointed you administrator. What will be the functions of the new agency, and what will happen

At left airspace now required for one plane. HIDAN navigation system might permit 60 planes in same space





Terminal radar now in use shows only direction and distance of planes by blips on the black viewing screen

to the Airways Modernization Board?

MR. QUESADA: The new Federal Aviation Agency will absorb the Airways Modernization Board lock, stock and barrel. It will absorb the personnel, it will absorb the functions, and it will absorb the funds. The Agency will also absorb the Civil Aeronautics Administration. It will also absorb many functions that are now in the Department of Defense. The Department of Defense is performing the function of the management of air traffic essential to its own needs, and those functions will, as quickly as it is prudent to do so, be transferred to the Federal Aviation Agency. There are certain functions of the Civil Aeronautics Board that will be transferred to the Federal Aviation Agency, but the CAB will retain its own independence.

Q: What are the difficulties of developing and operating a system of air-navigation facilities for both civil and military aircraft?

MR. QUESADA: Well, I would say the primary difficulty is the technical complexity. The fact that you have radar and can "see," in effect, does not solve the problem. It only creates it. You have to take this data that the radar develops, and turn it into useful data. That requires a complex system of processing. Now, the second difficult problem is to satisfy all the users. It must be clear to you that each user is going to exaggerate and push hard for his own demands.

Q: How many flights, both civil and military, are there on a weekday?

MR. QUESADA: Estimates run from 100,000 to 200,000 per weekday.

Q: Do you foresee a time when identical traffic-control equipment will be carried on civil and military planes?

MR. QUESADA: I don't visualize identical airborne equipment, but I do feel that we can develop equipment that will be compatible with the same ground circuit.

Q: In view of the increasing speeds, then, do you see a time when all aircraft will be under ground control at all times, with the obvious exception of military aircraft on a military mission?

MR. QUESADA: Well, let me state that as far as the AMB is concerned, we intend to develop a system that is applicable to military and civil aircraft alike, in war and peace, that would permit us to eliminate airways entirely. All high-performance aircraft would be under surveillance at all times and under positive control. Hence the airways could be eliminated. However, we must make special provision for low-performance general aviation aircraft to permit them to operate with equal facility and ease.

Q: The AMB has announced as one of its goals an automatic ground-air-ground communications system. What will it do?

MR. QUESADA: As an example, take a message that would consume, say, a minute of spectrum time if it were transmitted orally. By the application of this new technique, this message is compressed to, we will say, a millisecond and put in digital form, then transmitted. Then on the receiving end it is stretched, in effect, and turned back into meaningful language. What you really save is time on any given frequency. You could have a thousand people use a frequency almost concurrently, which is one of your very, very serious problems.

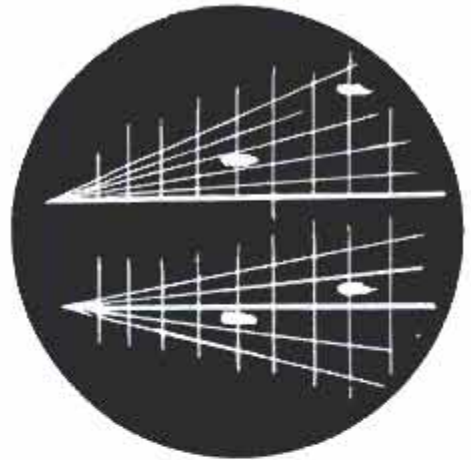
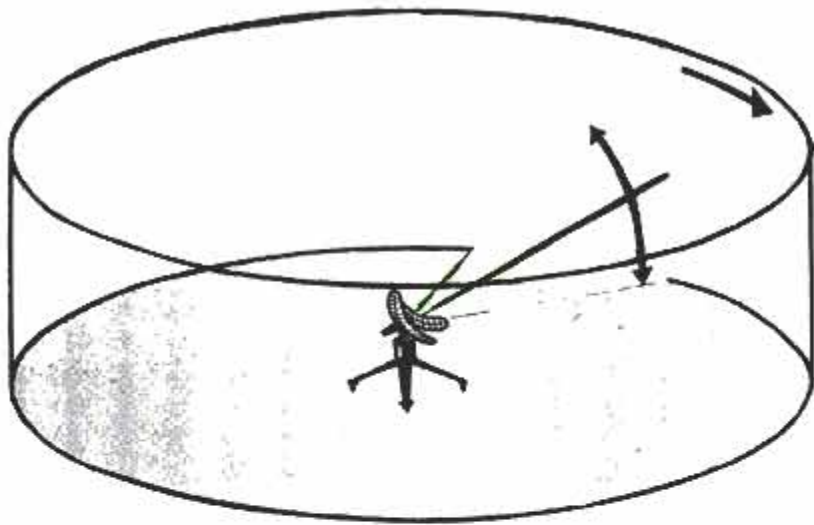
Q: This equipment would encode the information itself?

MR. QUESADA: Encode it, transmit it and decode it. It will be a real contribution if it is successful.

Q: How far along is it?

MR. QUESADA: We hope to have a working model in less than a year. It is under contract with RCA.

Q: You mentioned that it is no longer humanly possible to absorb this information and make the necessary judgments.



Three-dimension radar would oscillate up and down, showing direction, distance and altitude of each plane

This infers the use of an electronic computer?

MR. QUESADA: The electronic computer is going to be the platform upon which our whole data-processing system is based.

Q: Are computers now in use on the airways?

MR. QUESADA: They will be soon. The computer that is about to be used on the airways really serves the function of printing the traffic controller's flight strip. There is one under development that will, in addition to printing the flight strip, anticipate or "read out" conflict before it occurs. We have under development computers still more sophisticated that will store many

more bits of information. Such computers should be ready in experimental form in a couple of years. They will permit you to call out, as an example, all flights that are at 18,000 feet. They will permit you to call out all flights that are within a certain radius of a certain point. They will permit updating of flight plans from last reports without any manual input whatsoever. These techniques are not new but the application of them to this task is new.

Q: Color radar and 3-D radar have been suggested as useful instruments. Are they under development?

MR. QUESADA: We are giving some

(Continued to page 254)

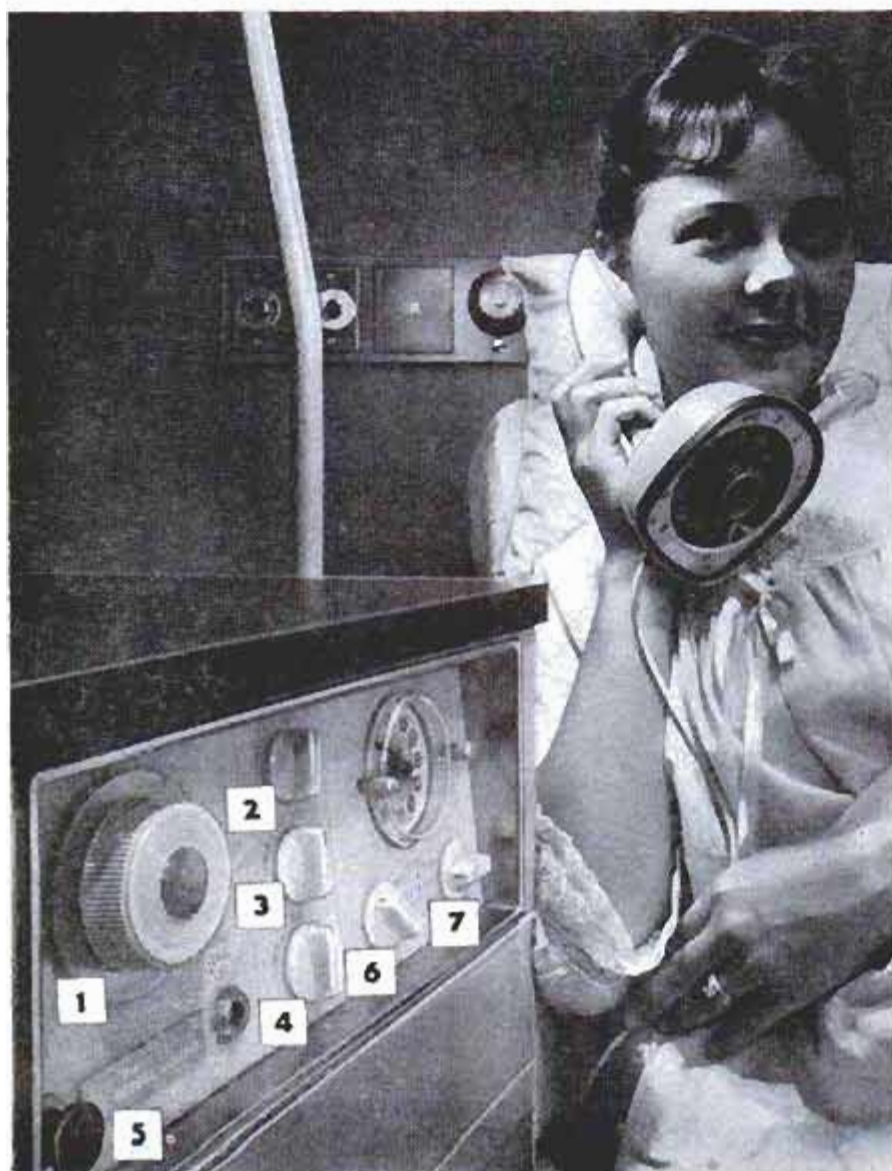
Computers may take over many duties of controllers, who now follow each plane's course with flight strips



Civil Aeronautics Administration photo



Photos courtesy Minneapolis-Honeywell Regulator Co.



Control Panel For Hospital Bed

FROM A POSITION of flat-on-the-back, a hospital patient able to reach the switches on an automatic bedside control can regulate the temperature or air conditioning (No. 1 on photograph); raise or lower the back rest (2), the knee rest (3), or the height of the bed (4); summon a nurse (5); turn the electric lights on or off (6), and open or close window drapes (7). The robot hospital helper features a self-contained one-piece telephone with the dialing section built into the base and controls which allow the patient to operate radio and television sets or an intercom link with the nurses' station. The equipment also can be used in a closed TV circuit allowing the patient to see and talk with visitors not permitted in the room.

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X-15 Pilot Scott Crossfield

Here's what it will be like to rocket more than 100 miles into the sky. The X-15, our first manned space vehicle, is scheduled for its epochal climb early in 1959

By Richard F. Dempewolf

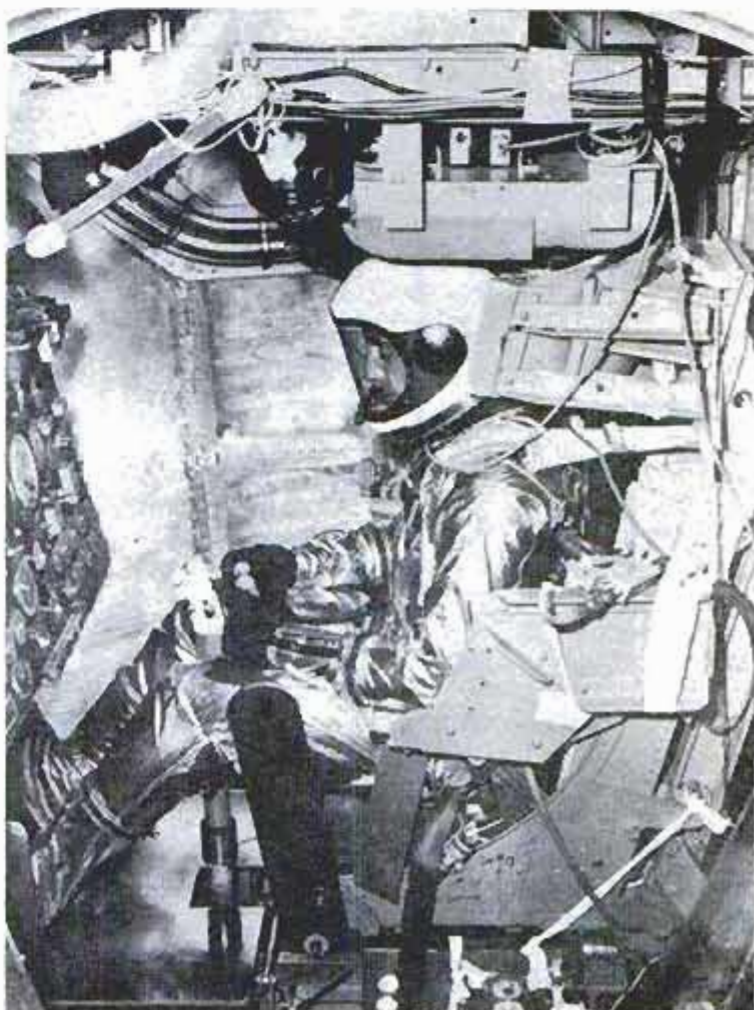
WHEN TEST PILOT Scott Crossfield of North American Aviation, buckles on the 4000-mile-per-hour X-15 "space research" plane for its first trial flight, he will be wearing the most fantastic "outer garment" ever tailored for a human being. Seen by the public for the first time a few weeks ago, when it rolled out on North American's ramps in El Segundo, Calif., the gleaming aircraft looked exactly like what it really is — a man-carrying, recoverable ballistic rocket.

More than 50 feet long, with 22-foot wingspan, the 31,275-pound ship has a unique wedge-shaped bulge along each side. Inside these sweeping finlike appendages of beryllium (to resist friction heat), are all the control cables, wires, hydraulic plumbing and lines. The fuselage itself, behind the pilot, is fully occupied by the big 60,000-pound-thrust XLR-99-RMI jet engine, capable of multiple air starting and variable thrust, and by massive tanks—one for gas-generating fuel, and two for necessary tons of explosive fuel components for the engine: Liquid oxygen and ammonia. More than half the fat fuselage (four feet across at the tail) is occupied by the massive cylinders for these liquids. Special forward-tilting, dish-shaped baffles inside them will prevent "surging," which could throw the ship off balance and send it flipping through space like a leaf in a gale.

Early in 1959, the wicked-looking vehicle is scheduled for a series of hair-raising flights. Its human pilot will be encased in an alumi-

nized-fabric "space" pressure suit and lashed to a form-fitting seat in a cramped, insulated and refrigerated cockpit. Once the X-15 is dropped from the underbelly of a B-52 some six miles in the sky, he'll flick an ignition switch and jam back into his seat as the single-barrel rocket engine behind him explodes into life and gives

For more than a year, Crossfield has made simulated flights in a giant centrifuge equipped with an X-15 control panel

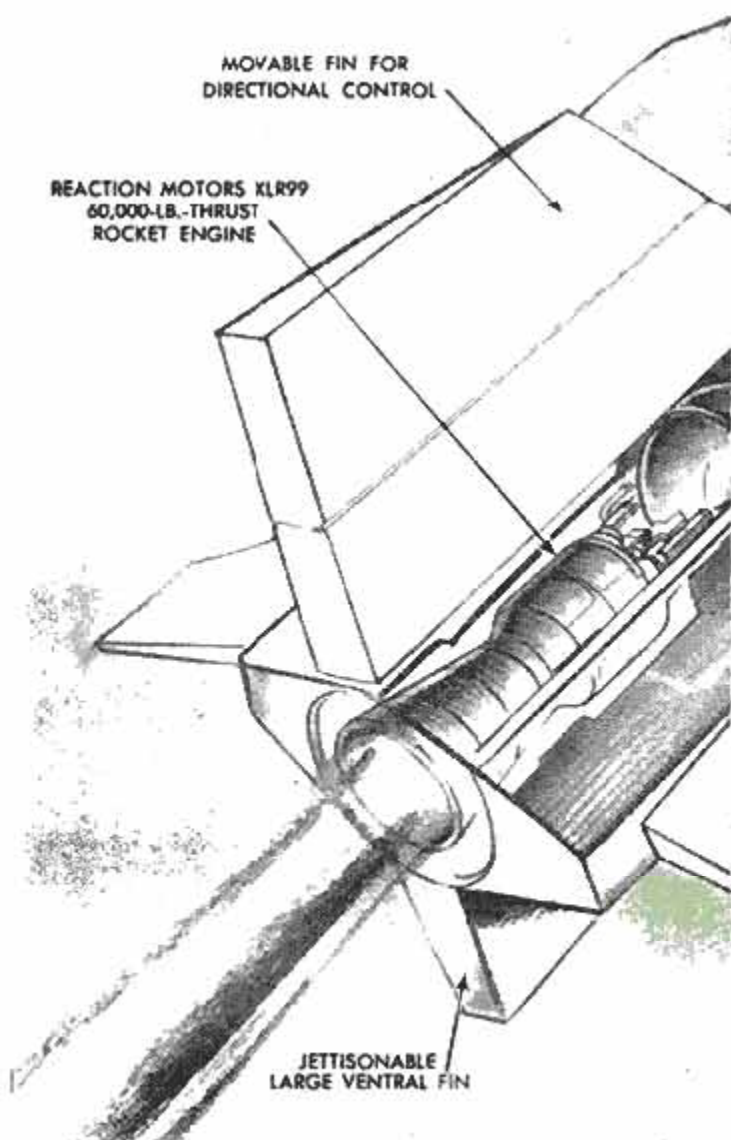
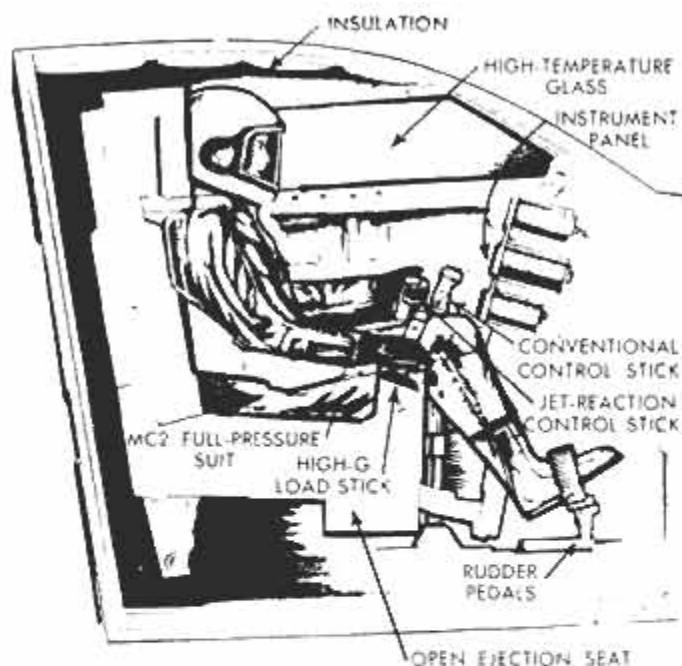


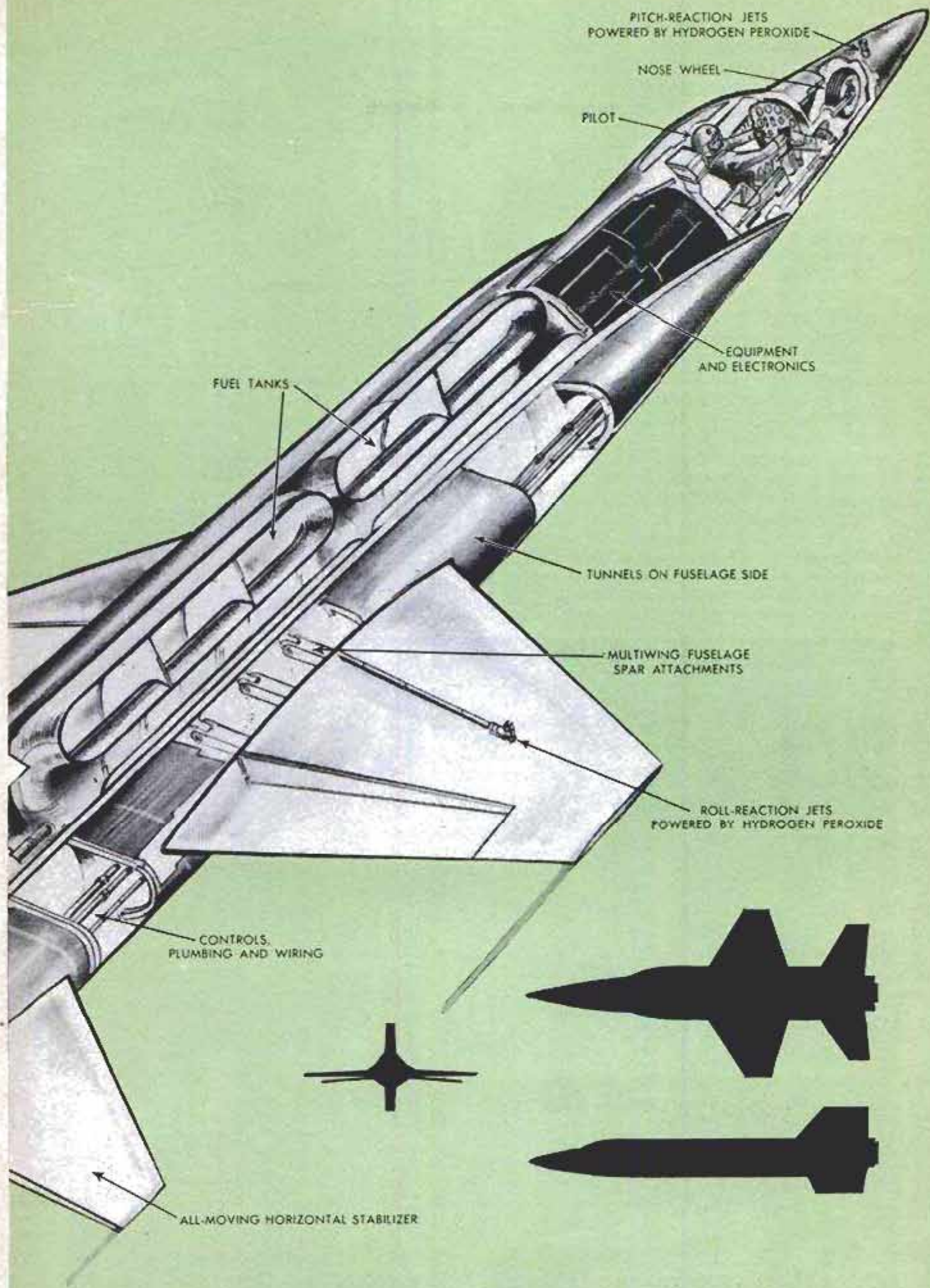
him a 60,000-pound "kick in the pants." With his face sagging and heart laboring to pump blood as heavy as molten metal, a 150-pound man like Crossfield will suddenly weigh 600 pounds as he roars vertically upward on a scorching column of blue shock waves for a total of six minutes of powered flight. At Mach 6 plus (4000 miles per hour or better), he will be rammed to an altitude of considerably more than 100 miles. Crossing the perigee tracks of the manmade satellites, he will skim the fringes of outer space in a weightless state for about five minutes as his craft arcs over into a powerless glide and plummets earthward. As he plunges back into the atmosphere, the skin of his rocket spaceship will, according to Air Force experts, "glow red like steel in a blacksmith's forge" along the leading edges of the stub wings and around the bluntly pointed nose. Skin temperatures will soar to 1000 degrees Fahrenheit. Some 500 miles after starting above Wendover Field, Utah, and 18 minutes later, the X-15 will skid to a smoky 284-mile-per-hour landing, probably on a dry lake bottom somewhere in the desert. It will land on steel shoes attached to short struts that pop out of the after-fuselage section. A conventional nose wheel will keep it from turning turtle. If all goes well, the X-15 will make many such trips under the guidance of a group of "hot" test pilots who have been training for the job for more than a year: Scott Crossfield and Alvin White for North American (builder of the plane;) Joseph Walker and Neil Armstrong, test pilots for NASA (National Aeronautics and Space Administration; formerly NACA); and captains Robert White and Robert Rushworth for the Air Force, which is supplying most of the estimated \$100,000,000 for the program.

No One Knows What Will Happen

The new research plane, along with two others like it now under construction, is our first manned space probe, a combined effort of the Air Force, Navy, NASA and U. S. industry. Its primary mission is to explore the myriad problems of spaceflight. These include things such as stability and controllability of the rocket ship. Nobody knows what will happen to a man-guided craft at hypersonic speeds within or outside the earth's atmosphere. What effect will the searing plunge into the earth's atmosphere have on ship and pilot? This will be the first time any man has been subjected to the inferno of re-entry friction. The effects of sustained weightlessness also will get a good going over.

To do its pioneering job, the X-15's design is, of necessity, a far cry from the general concept of an "airplane." Its thick

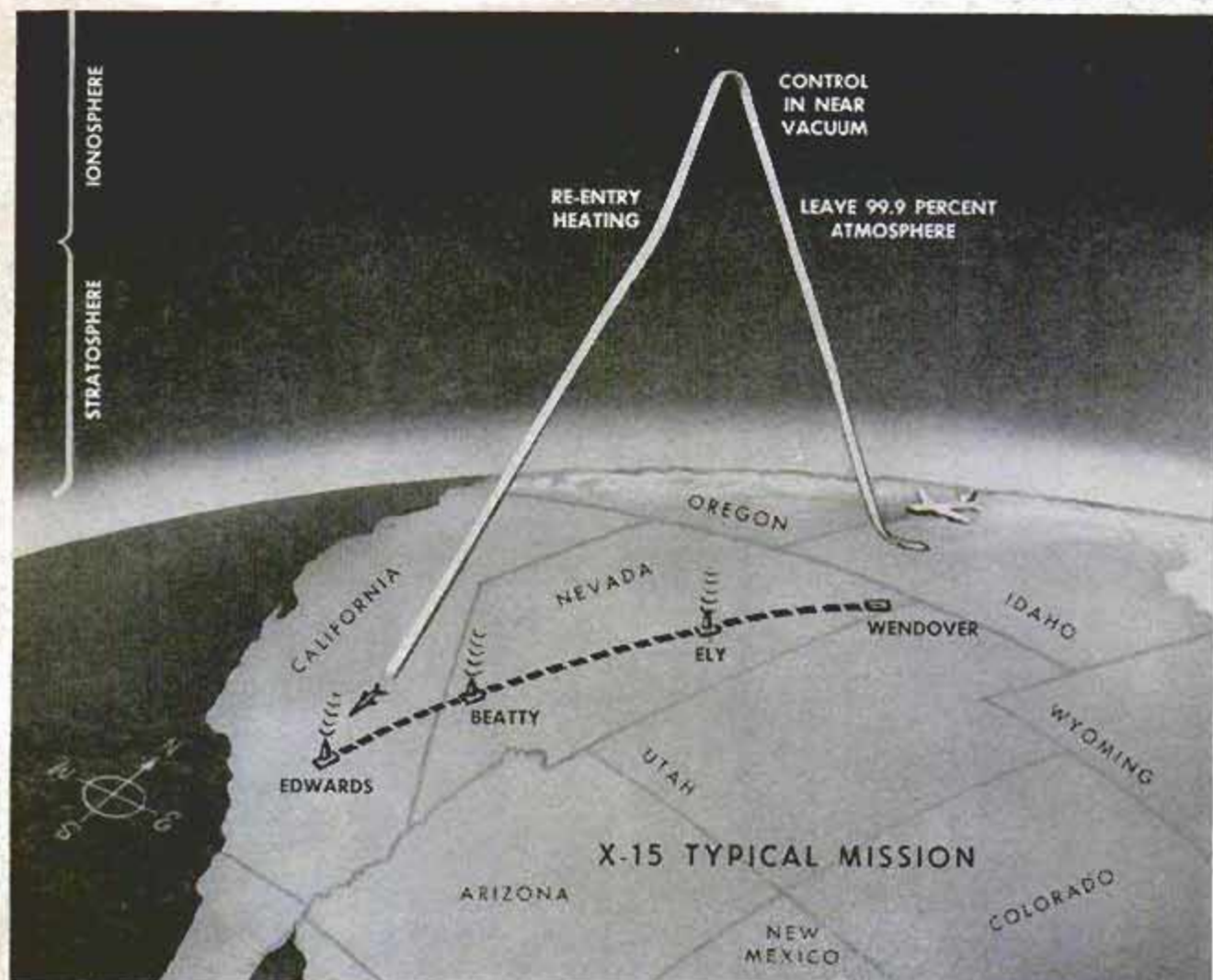




chunky wings, set far back on the fuselage, spread like a pair of goodly oak stumps in order to stay put under the incredible buffeting they'll get as the ship bursts through the atmosphere going and coming. Roots end in five A-frames that bolt solidly to the fuselage. Tail surfaces look more like thick, wedge-shaped doors for a bank safe than delicate control surfaces. Instead of a pair of horizontal stabilizers and a single vertical-rudder fin, X-15 has four tailfins—just as a good rocket should. The stabilizers slope downward like the wings of a gull taking off. The fourth member is a vertical fin jutting downward beneath the elevators. This fin will be jettisoned just before landing. The empennage is of the "flying tail" type, so-called because each tail surface (except the under fin) turns as a unit for steering in the thin upper air. This

(Continued to page 246)

Shown below is the pattern that Scott Crossfield is scheduled to fly early next year in the X-15. His plane, right, may transport him at speeds of 4000 miles per hour





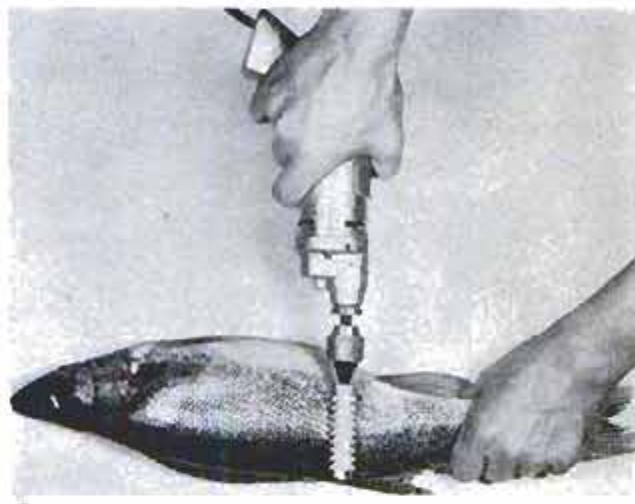
Waterborne Power Mower Clears Vegetation From Lakes

Designed for the Ohio State Division of Wildlife is a pontoon-mounted mower that cuts heavy vegetation on lakes and ponds. It can cut six feet deep and clear an aver-

age of 30 acres per day. A 10-horsepower engine turns a paddlewheel drive at the rear. The propeller-steered mower can turn around in less than its own length.

Electric Drill Scales Fish

Anglers can slip a new fish scaler into an electric drill and clean their catch in short order. Made of nylon, the scaler has 72 teeth that whisk off the scales without tearing the skin. The tool will fit any 1/4-inch drill chuck.



Counter Clips to Egg Basket

Every time a farmer puts another egg in the basket he pushes his thumb against a lever on the handle and a counter totals the eggs collected. The counting device is grooved to fit the hand and can be transferred from one basket to another.



Number, Please!

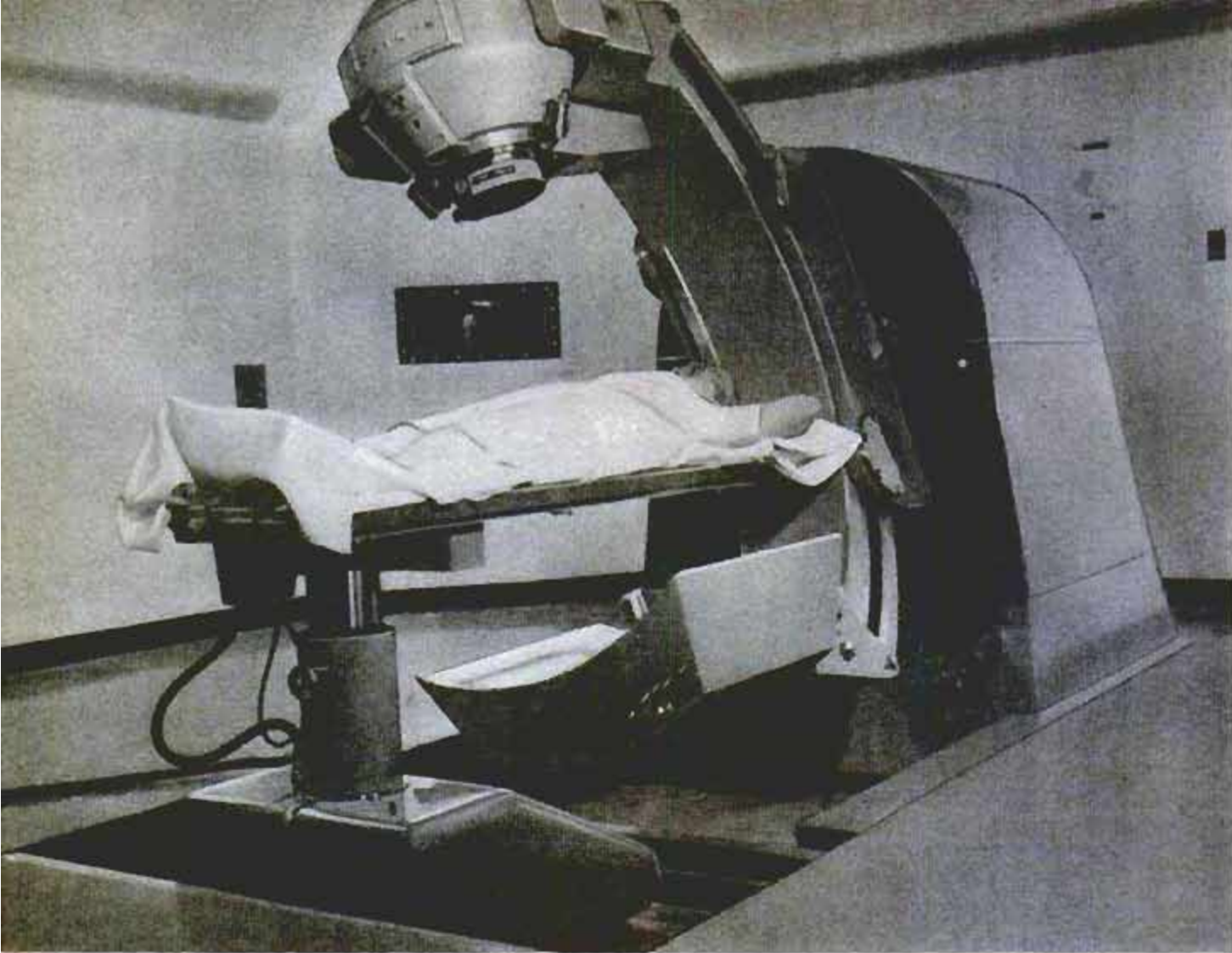
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Rotation therapy machine, energized with radioactive cobalt, is operated by nurse seen through window

MEDICINE'S NEW

Reprinted in Reader Digest
December 1958

By J. D. Ratcliff

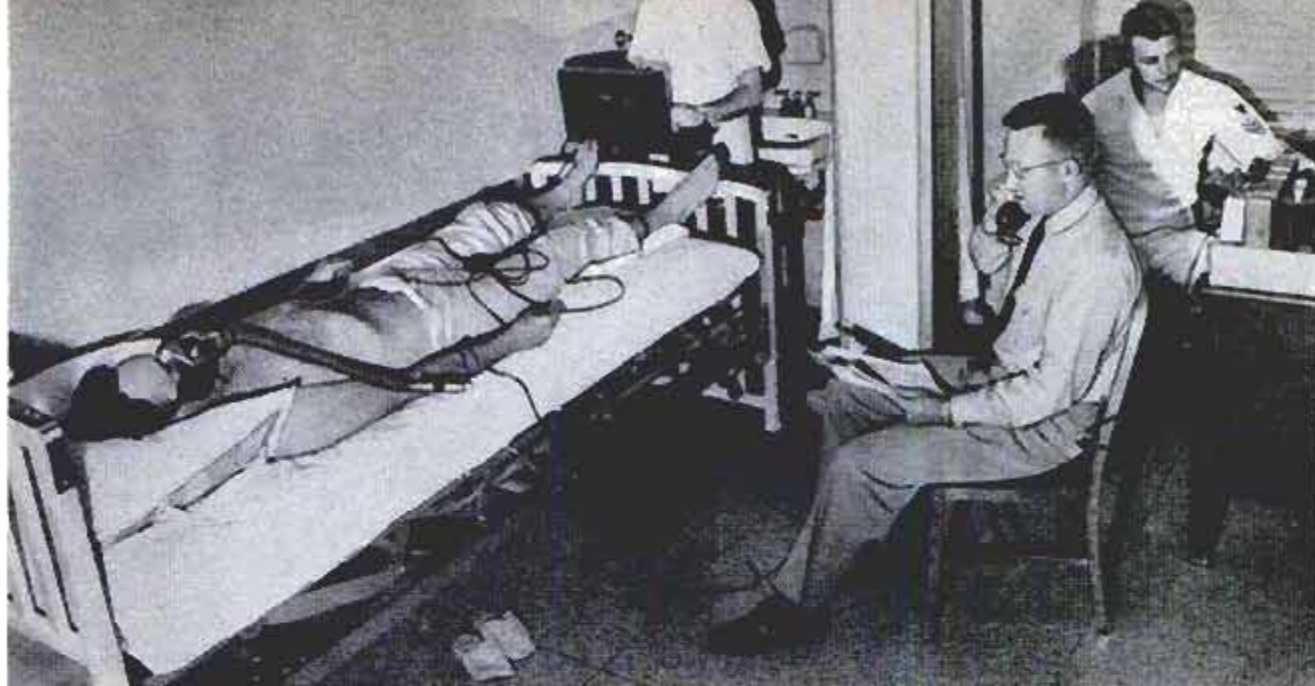
Vineyard Haven, Mass.

IT WAS PAST MIDNIGHT when a dramatic chain of events got under way in Boston's Beth Israel Hospital. The heart of a patient, who had undergone serious abdominal surgery, faltered and failed. There was no surgeon immediately available to open the chest and attempt to massage the heart back into activity. Under ordinary circumstances the case would have been concluded with a notation on hospital records: "Patient died quietly in his sleep." This time the story had a different ending.

The moment the heart stopped beating wires taped to the body announced the fact

to a machine at the bedside. Response was immediate. A bell started ringing to summon a nurse. Long before she arrived the machine was taking resuscitative measures. It began shooting 60-volt electricity at the rate of 60 bursts a minute into two wafer-sized electrodes strapped to the patient's chest with a rubber belt. Thus electrically jarred, the heart started beating again, soon picking up normal rhythm. Two weeks after this close brush with death the patient went home, fully recovered.

This machine—the automatic heart pacemaker — is a sample of the extraordinary



Electronic telemetering permits doctors 1000 miles away, below, to study patient at Navy Hospital, above

electronic devices which each year play a larger role in medicine. For years now, physicians have known that life is largely an electrical phenomenon. Heart, brain and muscles send out faint but detectable electrical messages which tell vivid stories of their functioning. Electrocardiographs, encephalographs and myographs have become standard diagnostic tools. Far wider use of electronic machines is now at hand. The pacemaker, developed by Dr. Paul M. Zoll of Boston's Beth Israel Hospital, is a dramatic example.

Recently, Mayo Clinic researchers put new electronic knowledge to work to add a new safety factor to surgery. In checking depth of anesthesia, physicians usually depend on external signs — pulse, blood pressure, eye dilation and such. Brain waves are a far more sensitive indicator. The Mayo men utilized this fact in building a virtually automatic anesthesia machine. If the patient is on the point of awakening it administers more drug or gas, if sleep is too deep it turns off valves.

Brain-wave machines are also helpful in diagnosing a number of disorders — epilepsy, tumors, injury, for example. But in borderline cases the lines are often difficult to interpret. A research project jointly conducted by the Massachusetts Institute of Technology and Boston's Massachusetts General Hospital is using an approach that may eventually lead



The electronic thermometer, demonstrated below, quickly determines a patient's temperature with high degree of accuracy





Photo courtesy Zenith Radio Corporation

X-ray-image amplifier, developed by The Rauland Corporation, allows doctors to watch heart on TV screen

to feeding tape-recorded brain waves into a computing machine which will automatically separate them into diagnostic patterns.

Many of the new electronic devices are designed to simplify burdensome laboratory procedures, save the time of overworked technicians. The sanguinometer, recently developed by the Sloan-Kettering Institute and Radio Corporation of America, is a sample. (Several other companies have developed similar devices.) In effect,

Another X-ray amplifier, developed by RCA, produces image bright enough to be viewed in lighted room



it is a closed-circuit TV system. Its job: making blood counts. The machine scans a blood sample, feeds findings into a computer. In seconds the count is completed.

This same type of machine is finding jobs elsewhere — making bacterial counts in municipal water supplies and in dairies, and checking airborne pollen. It may even play a big role in cancer detection. Cancer cells tend to be larger than normal cells — the difference is readily detected by sensitive scanning tubes. Why not use this means of detecting cancer cells shed from the lungs in sputum, from the uterus into vaginal secretions, from kidneys and bladder in urine? Potentially, this machine opens the way for quick, inexpensive screening tests that might save tens of thousands of lives each year.

Sensitive fingers of physicians palpate—feel—the exterior of the body in an attempt to locate trouble within—enlarged livers, spleens, glands, for example. Electronic fingers are infinitely more sensitive, far more penetrating. With ease they can find small brain tumors hidden in the dark recesses of the head.

Exactly locating such tumors has always been a major problem. If a surgeon cut too freely in his search he courted grave consequences—erasing memory patterns and doing other permanent brain damage. Electronic devices now pinpoint tumors.

A number of chemicals, notably arsenic, have a tendency to concentrate in tumor



Scientists show how medical information broadcast by "radio pill" inside patient is picked up with antenna

tissue. In a new procedure, radioactive arsenic is injected in the bloodstream. Within an hour it concentrates in the tumor. The radiation it showers off is picked up by scintillation counters moved about the head. Results are recorded in the form of dots on paper, and the blackest concentration is the tumor.

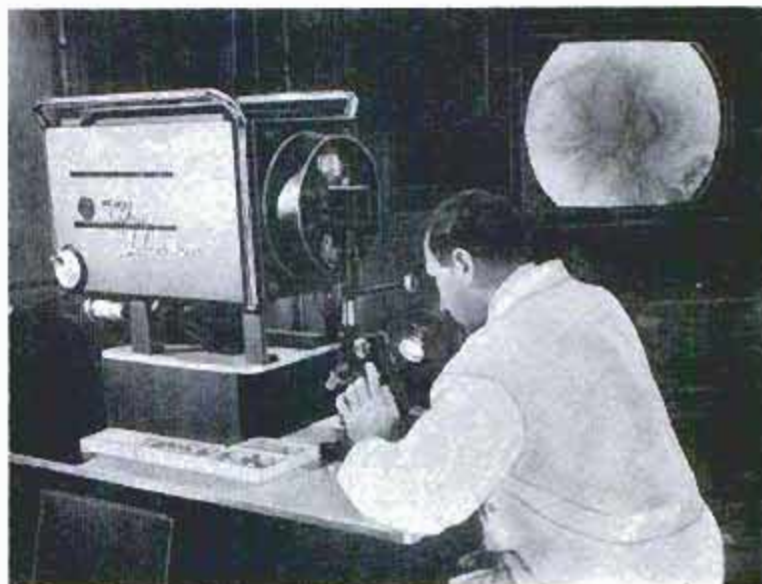
This work was done at M.I.T. Researchers at the same institution are now busy with a radical new means of treatment for brain tumors. Boron, like arsenic, has a tumor affinity. After boron injections patients are subjected to a bombardment of neutrons from an atomic pile. This causes the boron to shower off alpha particles which travel a fraction of an inch. Thus, radiation lethal to cancer cells is generated *inside* the tumor with little or no damage to surrounding tissue.

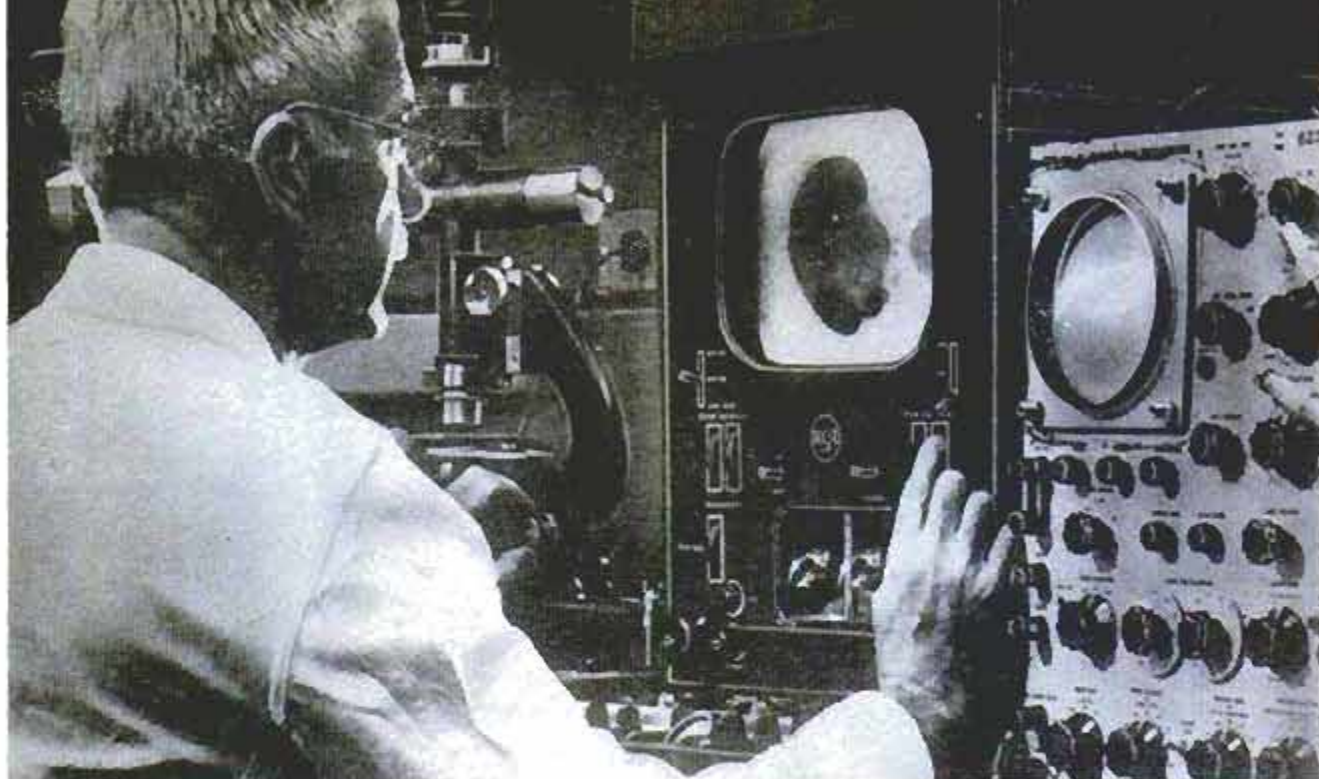
The electrocautery device has become an essential surgical tool. One touch from the tip of this instrument makes a pinpoint burn which seals off oozing capillaries that obscure surgical fields. Similarly, a "radio knife" which cuts by making a hair-line burn seals off blood vessels as it goes. It is particularly useful in highly vascular tissue such as the brain or the liver.

Another spectacular application for electronic heat is now develop-

ing. Brain injury caused by poison, accidents, disease, often results in Parkinson's disease — the shaking palsy that is often accompanied by grave personality changes. Some time ago surgeons found that if one small brain area were destroyed Parkinson's often magically vanished. Alcohol injections into the area sometimes did the job, but another method which may be far better is at hand. Through a minute drill hole in the skull, two cobweb-fine wires are introduced into the brain. When current is turned on, the area is burned out

Color television is adapted to microscopic study of tissues. Picture is transmitted to doctors or students in other rooms





Ultraviolet-sensitive TV camera enables researchers to observe chemical activity within living cells

—frequently resulting in dramatic cures.

At one time detachment of the retina, the image gatherer in the back of the eye, led almost inevitably to blindness. If caught early enough today it is 75 per cent curable — thanks largely to an electronic device. In effect, the device is an electronic spot welder. Small bolts of electricity make pinpoint burns which refasten the retina securely in place.

In ever-increasing quantity, electronic devices are finding their way into hospitals and operating rooms. The oximeter, for ex-

ample, gives anesthetists an exact measure of oxygen in the blood of sleeping patients. Supersensitive temperature measurers are coming into wide use. One, a needle-fine instrument, utilizes transistors to give instant temperature readings in any organ during surgery.

Another electronic device with fascinating possibilities is a new supersensitive stethoscope. In ultra-quiet rooms they are able to pick up heart murmurs far too faint to be heard by conventional means, thus

(Continued to page 234)

Cardiac pacemaker, developed by Dr. Paul M. Zoll of Boston's Beth Israel Hospital, guards heart beat

Laboratory technician makes quick electronic count of blood cells. TV monitor checks microscope focus





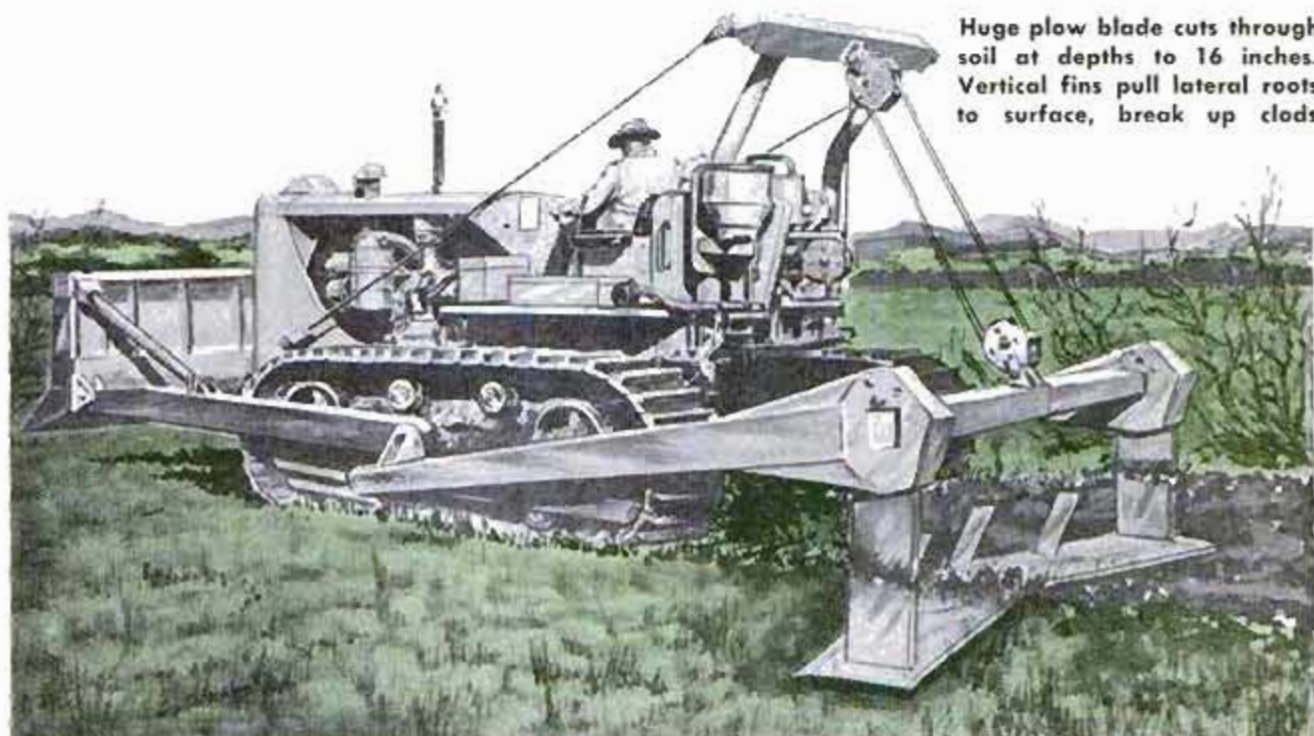
Caterpillar Tractor Co. photos

In one operation, machine destroys trash vegetation, prepares the soil for seeding and sows grass seed

Root Plowing Changes Wasteland to Grassland

DURING THE LAST 20 years, hundreds of millions of acres of once-lush grazing area in the Southwest have degenerated into arid tracts of wasteland where only mesquite, creosote bush and prickly pear will grow. Various attempts to reclaim the land had little success. Now a machine has been developed that is bringing lost acres back into production with a one-operation treatment. It consists of a huge three to five-ton plow with shares shaped like delta wings to kill the trash vegetation and break up the soil so it will retain water. As the plow prepares the soil, a blower box feeds

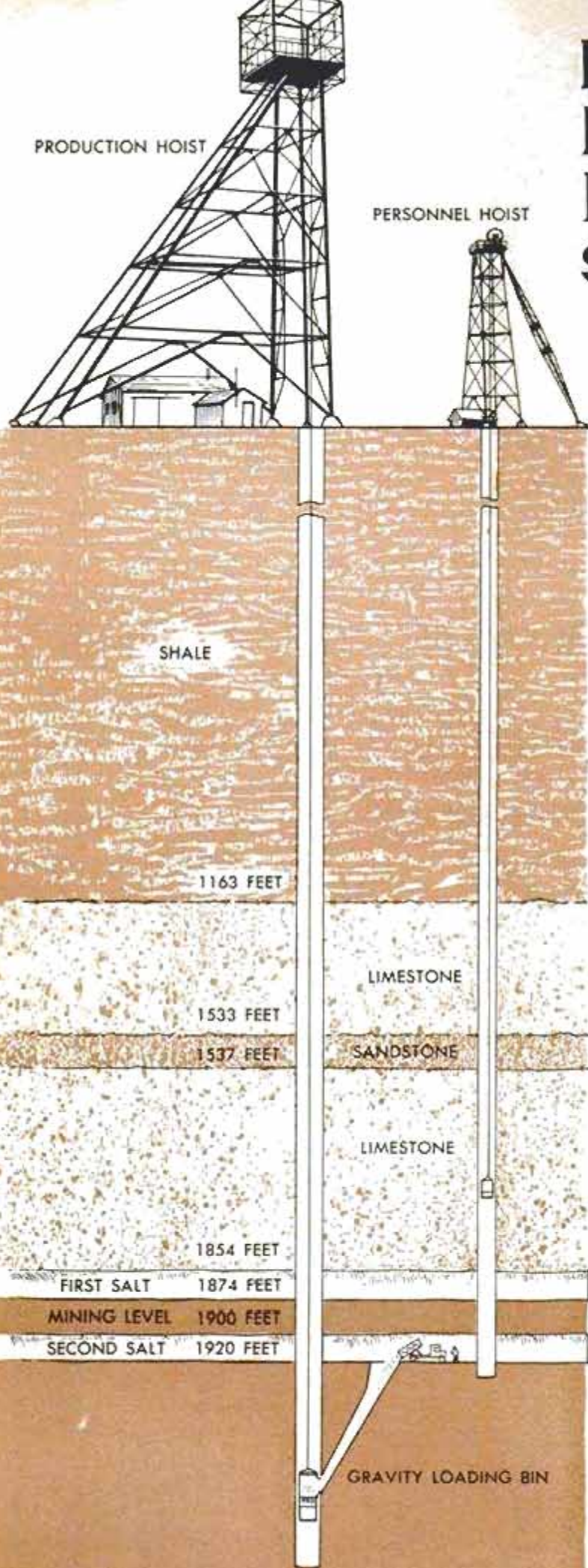
grass seed through the tractor's exhaust pipe. This technique is known commonly as "root plowing." One Texas rancher has had amazing results in root plowing 60,000 acres of land, every foot of which was arid and parched. Now it supports stirrup-high grass that has increased his per-acre beef production by 500 percent. The reconditioned soil also was able to absorb all of the abnormally heavy rainfall which pelted the area recently. The root plow is pulled through the soil at a depth of 8 to 16 inches, depending upon the kind of vegetation. The blades pull out the lateral roots.



Huge plow blade cuts through soil at depths to 16 inches. Vertical fins pull lateral roots to surface, break up clods

DOWN DEEP FOR SALT

By Austin Stevens



TWO SHAFTS lead to what is believed to be the deepest salt mine in the world near Grand River, Ohio, northeast of the city of Cleveland.

The multimillion-dollar objective of the Morton Salt Company is 1920 feet underground—a 20-foot vein of high-grade commercial salt. Much of it will find its way into the chemical industry, and for melting ice on roads and streets.

A lot of development work remains to be done before the company can begin producing the 500 tons of salt per hour which is their goal.

The production shaft at the Fairport Harbor Mine, through which the salt will be hoisted, is 16 feet in diameter and will be sunk below the level of the salt vein to allow gravity loading. A few hundred feet away is a 12-foot access shaft for personnel and equipment.

Network of "Roads"

After the salt vein is reached, the next step is to tunnel a systematic network of "roads" leading into a series of "salt rooms." Power and ventilation facilities will be added later.

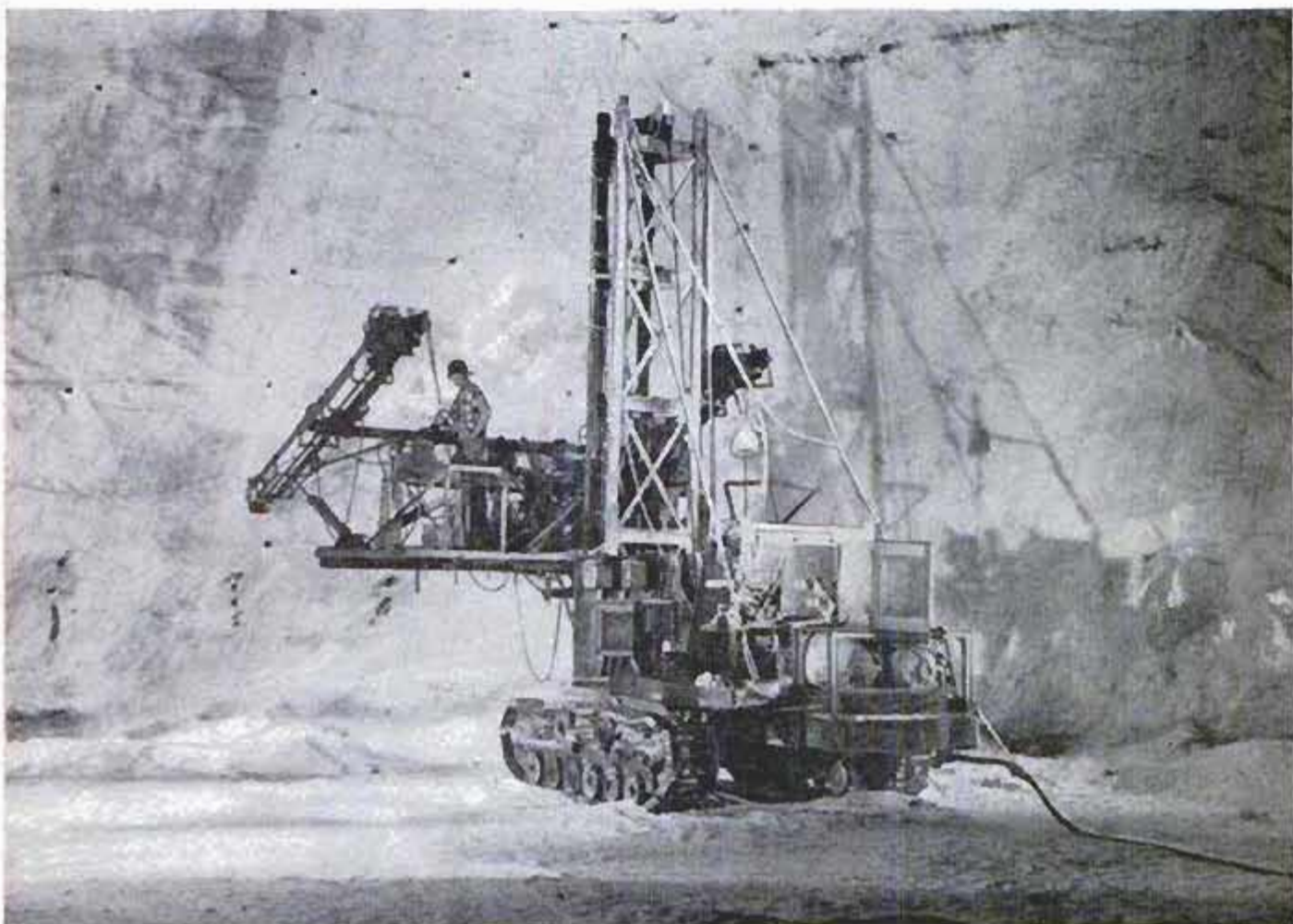
Construction crews are also building a mill and warehouse on the surface, where the salt will be crushed, screened, processed and stored for shipment.

When the mine goes into operation, diesel trucks and loading equipment will be taken underground to help carve out the great salt caverns, leaving huge pillars to support the roof. About 50 percent of the salt deposit will be left as supporting columns among the rooms, which may extend for miles from the shafts. ★ ★ ★



Tremendous rooms are carved into the salt, all connecting with this main corridor. In time, the mined area will be so vast that miners will have to be carried by underground truck to the room in which they work

Scenes in existing salt mines will be duplicated in the newest and deepest mine. Below, a self-propelled drill carriage drills a pattern of holes for dynamite charges, which will blast loose huge sections of salt

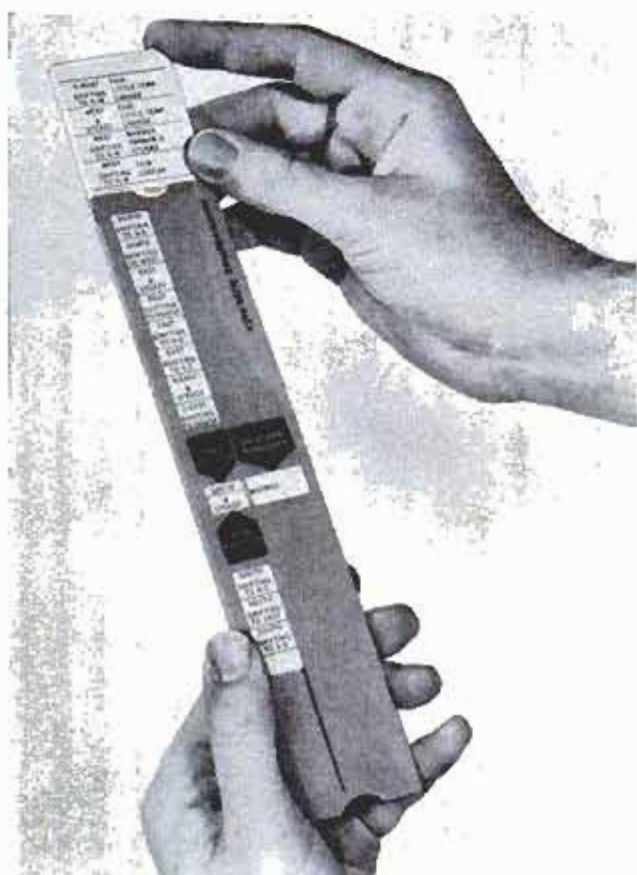




Huge Spray Tower Tests De-Icer on Helicopter

It wasn't cold enough around Bell Helicopter's plant in Fort Worth, Tex., so engineers went up to Canada to test a new

electrothermal de-icing system for helicopters. The copter was flown into a freezing spray created by an icing tower.



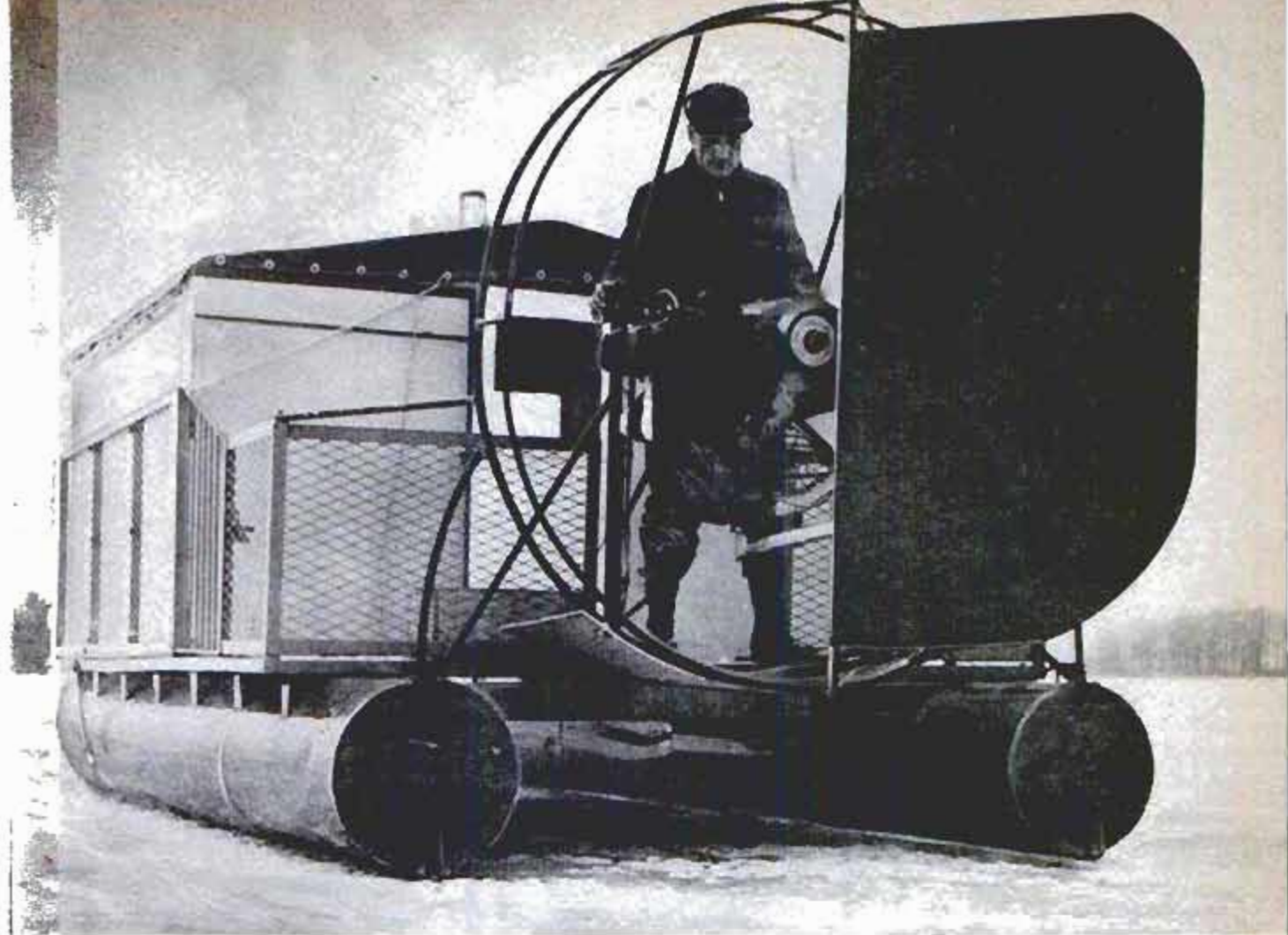
Slide Rule Predicts Weather

Designed for boaters, fishermen and hunters, a new slide rule tells what kind of weather to expect. You set the slide according to the direction and variation of the wind and read the forecast through a slot next to the wind setting.

Battery-Powered Eraser

Small enough to fit in the palm of the hand, a new portable electric eraser works on flashlight batteries. It will remove an entire line, yet has a point so small it will erase single letters without a shield.



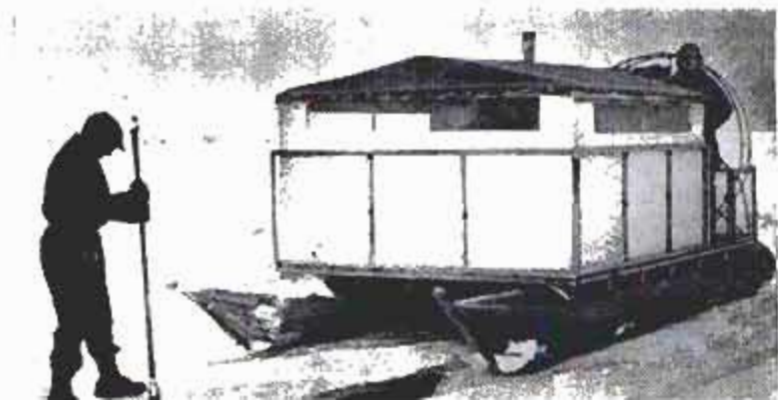


Guide Willey checks airplane engine before moving across Lake Erie ice. Below, boat crosses open water

It Moves on Ice or Water

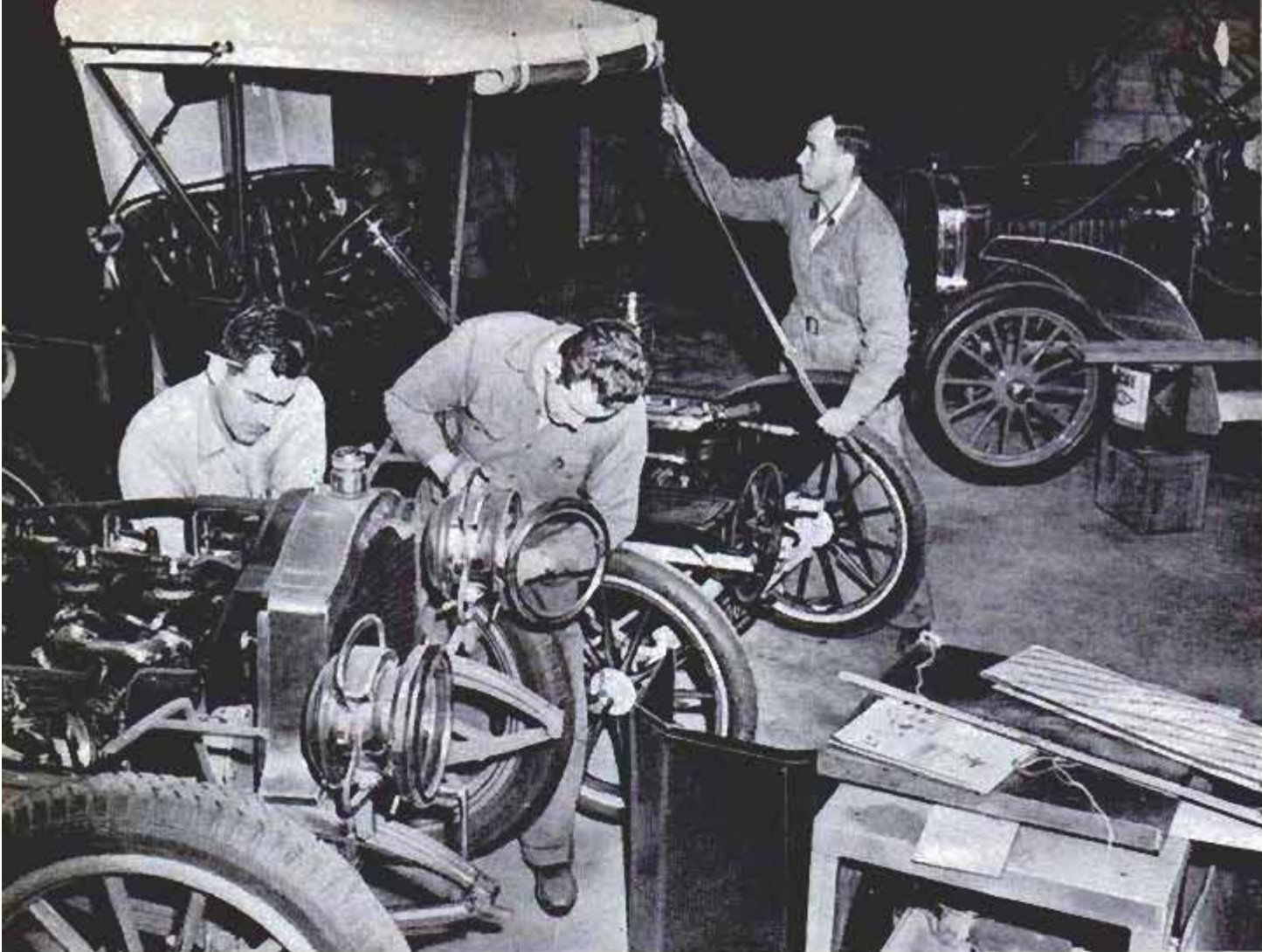
WHEN DALE WILLEY, an ice-fishing guide in the Bass Islands, wants to move to a better fishing spot, he just starts the 80-horsepower airplane engine on the stern of his shanty. The propeller on the engine will push the shanty over the ice at speeds up to 70 miles per hour. Willey's self-propelled fishing shanty also has pontoons so the fishermen and equipment won't plunge into the chilly waters of Lake Erie if the ice breaks. The eight-by-eight-foot shanty has a coal stove and four holes in the floor for ice fishing. Willey built the mobile shanty on the Ohio mainland and drove it over 12 miles of ice and water to Middle Bass Island, where he lives. Runners on the pontoons enable the craft to climb on ice from the water.

Holes are chopped in ice, then sled boat is moved above holes



Another type of sled boat powered by airplane engine has runners under metal hull





Left to right are a 1907 Thomas Flyer, 1908 Model S Ford and 1906 Type 12 Pope Toledo being restored

"They Don't Make 'em

By
Paul R. Hayes

The familiar lament of the antique-car fan put Leonard Davis in business. He started by restoring his own Model T; now he runs a busy clinic for old-timers

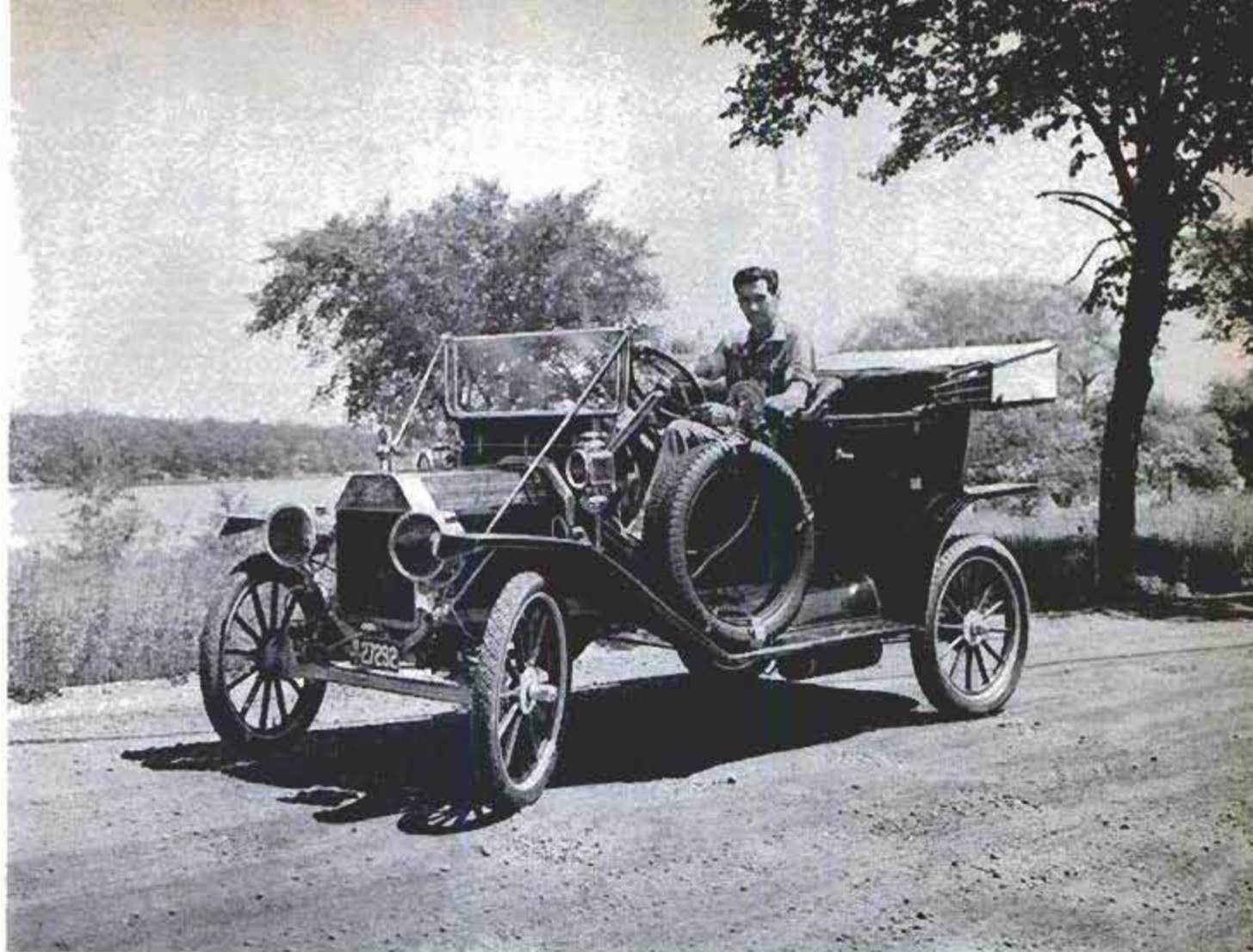


MASTER-MECHANIC Leonard Davis won't put a wrench to your Cadillac unless it's, say, a 1905 model. His shop caters only to the rarest cars in the world—the proud, brass-bound veterans dating to a half century ago.

Other garages may do an occasional antique restoration, some even as a regular sideline, but Davis' establishment at Drayton Plains, near Pontiac, Mich., is one of the few businesses in the country that exist solely on the servicing and rebuilding of old cars.

"And it all started with a Model T," Davis says.

The second of nearly a score of antique cars he has owned, the "T" was a fenderless



The old-timer that started Leonard Davis in antique-car business was this 1911 Model T; Davis is at wheel

Like They Used to...

shambles when he hauled it into his service station in 1948.

It emerged countless hours later, gleaming with a shroud of maroon enamel, but-toned red-leather upholstery in the original factory pattern and a set of four fenders Davis had painstakingly hammered from sheet steel.

Those fenders and their faithful reproduction to the last bead of "old Henry's" handiwork excited local enthusiasts and started a parade of antique-car owners seeking advice and service.

An unassuming man of 39 whose taciturnity evaporates when the conversation swings to the brass radiator and Prest-O-Lite era, Davis' talents soon won so much word-of-mouth advertising that the relics of horseless-carriage days crowded the gas-pump customers from the cash register.

"Something had to give," he recalls.

It did, four years later, when he moved into a new concrete-block building between

his home and service station and Davis and one employee set about making a living from a hobby. Since then, two other enthusiasts have joined the staff.

All mechanics extraordinary — they can spin a brass headlamp, shape a top bow or wheel spoke and hand-form an intricately curved metal panel. They also are artists with spray gun, striping brush and upholsterer's needle.

At first, the time-worn machinery Davis returned to the road came from Michigan, then Indiana and Ohio. Today it hails from as far away as Long Island and arrives on the hook of a wrecker, on trucks, trailers and railroad cars, sometimes in crates and sometimes it even shudders up the driveway under power.

That driveway is so well traveled that the customer with a bucket of antique bolts waits five or six months before Davis can begin sorting it out.

"Another 800 to 1000 hours after that,"



One of Davis' assistants, Roger Gallidan, attaches horn to steering column of a 1903 Model A Ford



Davis uses a sewing machine to fasten binding to the rear curtain of a 1906 Type 12 Pope-Toledo

Davis says, "usually gets the job done."

Those hours, however, frequently are spread over five or six months.

"Locating parts takes time," he explains. "And sometimes we wind up making them—things like gears, pistons, lamps."

That frustrating hunt for parts, combined with more pressing jobs, kept an extremely rare Paige-Daytona speedster in his shop for six years before the scars of 88,000 miles were erased. The "Thunderbird" of 1922, it was a canary yellow two-seater with drawer-type outrigger for a third passenger. Powered by a six-cylinder, L-head Continental engine, this model went into limited production after a stripped version of the Detroit-built Paige set a speed mark at Daytona Beach, Fla.

Paige-Daytonas are the exceptions, although Davis ordinarily averages only five restorations a year. This is a deceptive figure unless it is related to the constant traffic for service and repairs on "roadable" cars which gets priority, accounts for a third of the shop's time and the same percentage of the dollar volume.

Early Fords — including a 1905 Model F which is one of Davis' favorites — lead the transient parade although there are frequent visits by Buicks, Oldsmobiles, Packards, Cadillacs and occasional calls by such less well-known breeds as American Scout, Jackson, Paterson and Sears.

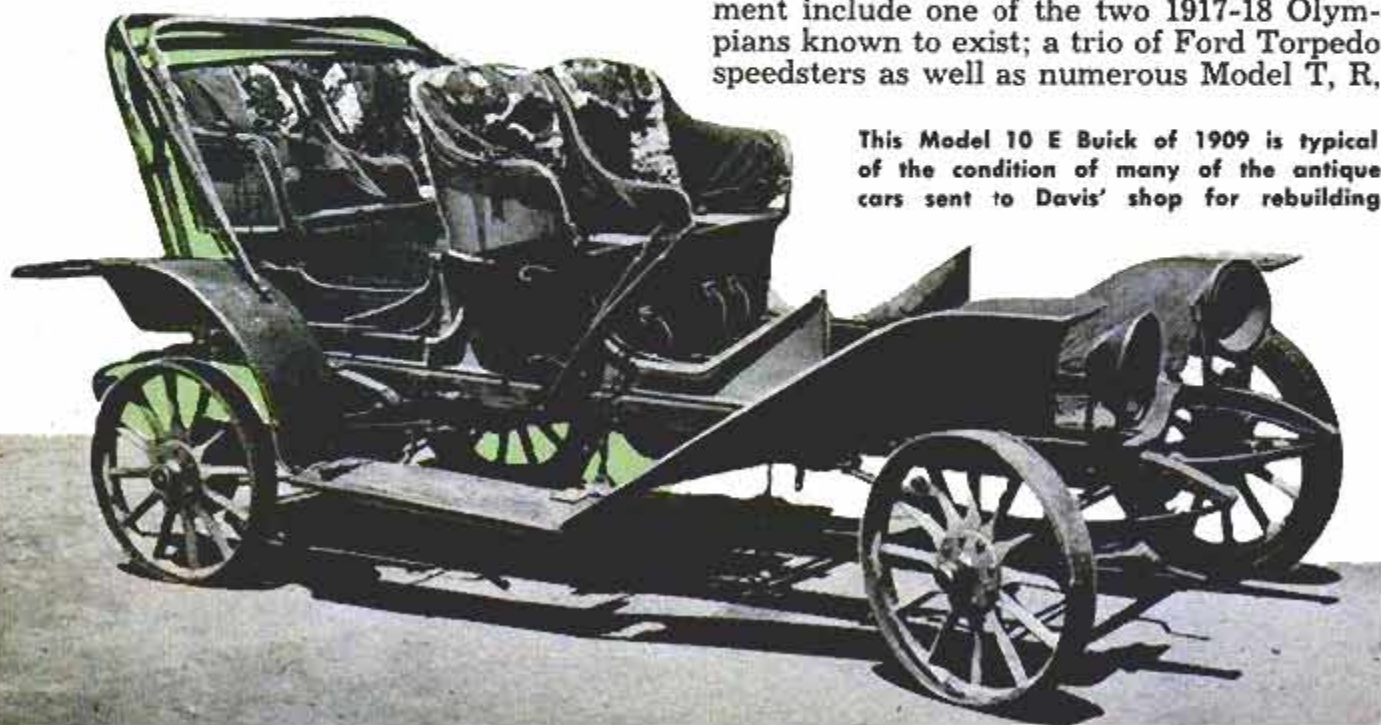
In various stages of restoration are a high-wheeled Sears Motorbuggy marketed by mail in 1908; a 1910 Paterson; a 1905 curved-dash Olds; a 1906 Type 12 Pope Toledo; a 1904 Peerless and Davis' own sturdy Thomas Flyer that is a duplicate of the famous New York-to-Paris race winner of 1908.

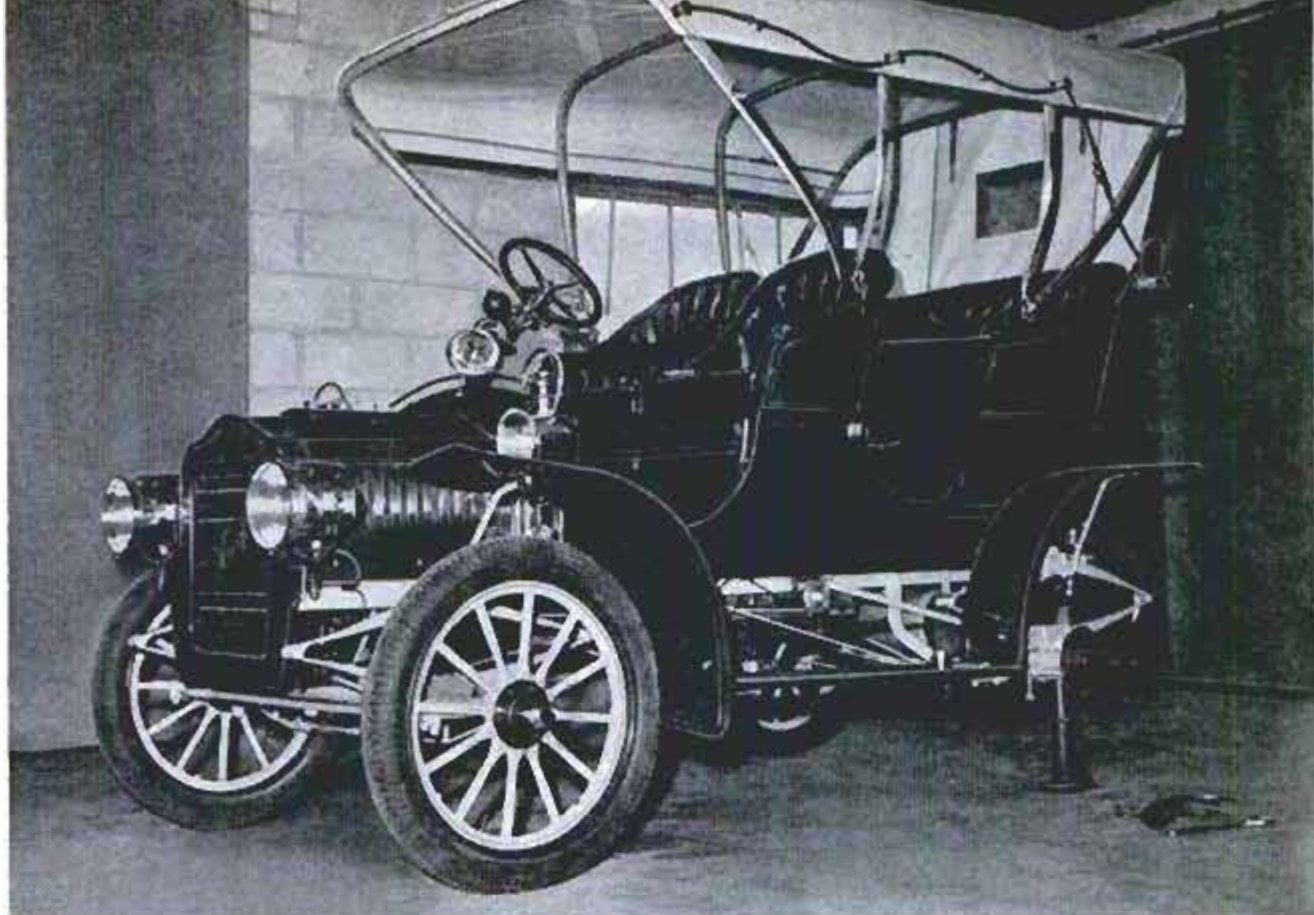
The Flyer is the first of three "greats" he wants in his own garage. The other two are the Pope-Toledo and any Pierce-Arrow.

"The Pierce," he says with reverence, "was the cleanest-engineered car made. Even the rear-axle housings were machined."

Cars that have had the full Davis treatment include one of the two 1917-18 Olympians known to exist; a trio of Ford Torpedo speedsters as well as numerous Model T, R,

This Model 10 E Buick of 1909 is typical of the condition of many of the antique cars sent to Davis' shop for rebuilding





Here is a 1905 Model F Ford awaiting a left rear wheel. Old wheel spokes are reproduced by cabinetmaker

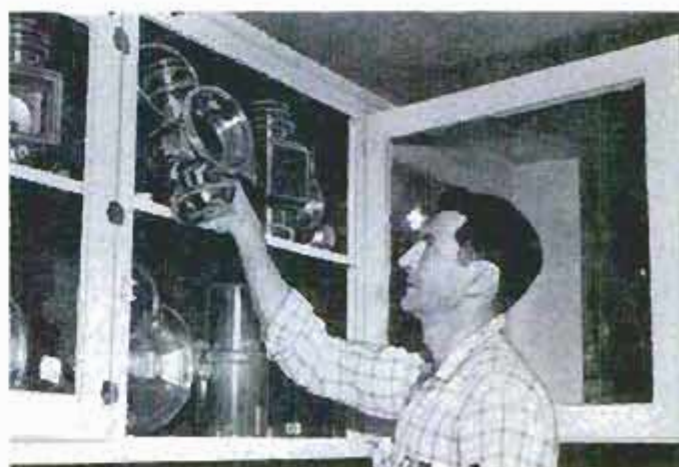
S and Ns; a couple of 1910 Buicks; a Vauxhall, vintage of 1926; the Paige-Daytona; a 1903 Cadillac and a 1910 Model 36 Pierce-Arrow.

"Then there was the 1911 Olds Limited, a service job," Davis says. "That was a monster. It had 44-inch tires and stood nine feet high with the top up. There were two steps from the running board into the tonneau. The pistons were like buckets and the six of them added up to an engine that was five feet long. And behind all that there was still twelve feet of automobile."

The Limited also was one of the most expensive cars, originally, that Davis has serviced. It delivered for \$4500 upward in 1910-12. Probably the least expensive to roll from his shop was a 1923 Ford that could be driven into the garage for about \$300.

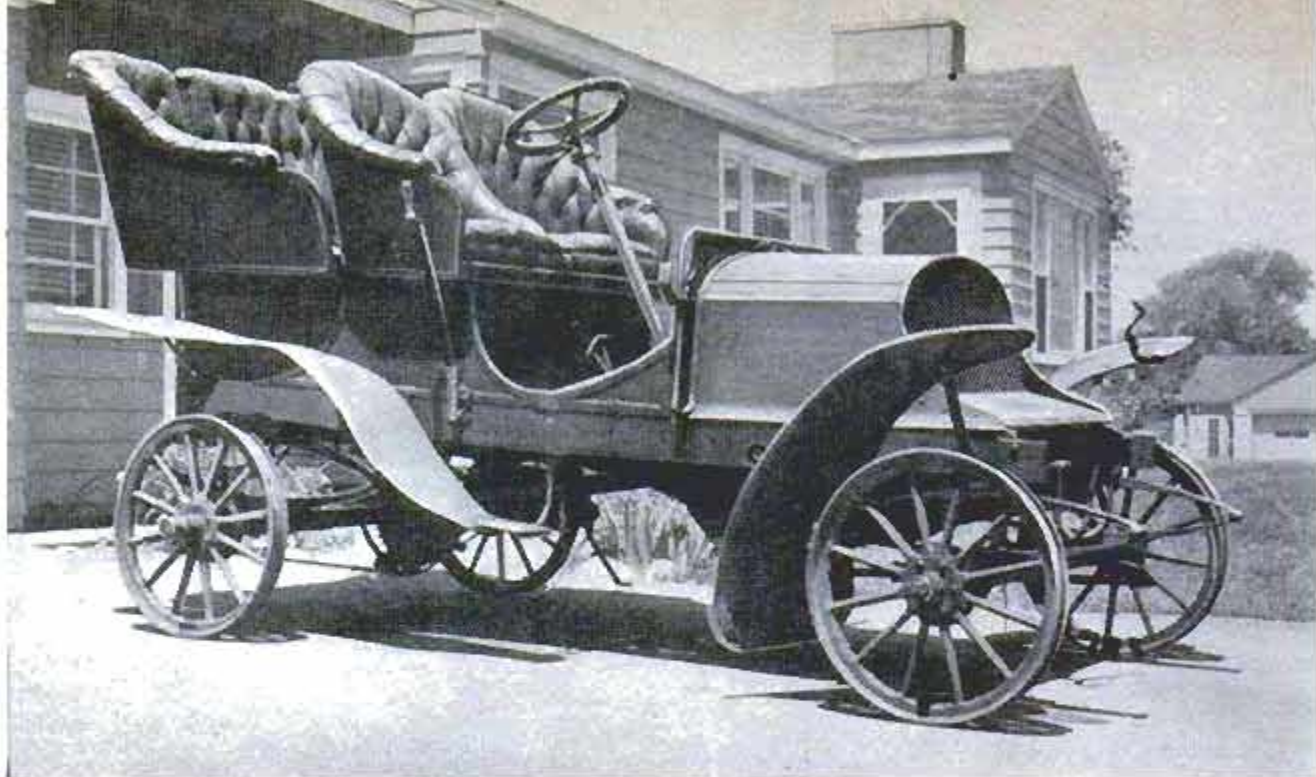
The setting for these miracles of rejuvenation is crowded when more than six cars are on the ground floor. A lathe, drill press and milling machine flank a workbench that stretches almost the full length of one wall. Hanging overhead are nearly 100 brass lamps, horns and other articles of trim awaiting refinishing. By contrast, a glass-fronted cabinet on another wall contains a few dozen

Another assistant, Theodore Tedder, works on a 1908 Model S Ford engine. This engine has twin ignition, with two spark plugs for each cylinder



Storage cabinet holds part of "inventory" of brass headlamps and fittings. About 100 more hang from ceiling





This 1905 air-cooled Franklin is in nearly original condition, despite lack of "shoes"



Flat aluminum sheet, above, is being curved into a rear fender. Below, the crankshaft is being removed from 1906 Locomobile



highly polished brass pieces ready to be replaced on some customer's prized antique.

An ell off this main workroom is used for paint spraying and a recently completed addition will house a woodworking shop.

Upstairs are two more rooms. One contains a cutting table, sewing machine and other essentials of a well-equipped upholstery shop. Until Davis mastered the knack of sewing a straight seam, his wife, Peg, held forth here fashioning tent-size tops taut enough to bounce a coin, and leather upholstery — averaging two to five hides per car.

The second room is filled with chassis, top bows, seats, wheels, springs, even engines and other bits and pieces of perhaps half a dozen automobiles that have been surveyed and found too incomplete for immediate restoration. Lamps, fenders and radiators are the most frequent victims of time but it isn't unusual for an entire body or engine to be lacking or unserviceable.

Every candidate for restoration is catalogued to see what's there and, more important, what isn't. Only then is the body lifted from the chassis and the interior carefully stripped to serve as a pattern for new upholstery. Rotted sections of the wood body framing are removed and reassembled

(Continued to page 240)

IT HAS THE quietest, smoothest, air-cooled engine ever built. That's the verdict of those who have driven the new General Motors' small car.

Three of the six-cylinder engines have been produced thus far for test. All are aluminum die castings. No cylinder liners are used. The aluminum alloy (the real secret of the engine) is the product of egg-headed research at GM's Technical Center, which is beginning to pay off handsomely on the money GM put into it.

The first test engine did very poorly, say insiders. Gloom was everywhere. Changes were made and the second version went through a 25,000-mile durability run like nothing. No problem, no wear, nothing but good news. Like new when torn down. The third engine is now undergoing a longer, more arduous durability test.

This horizontal opposed, air-cooled Six means a new era in engine design is ahead. It also pushes the still-too-expensive gas turbine into the even dimmer future. (Anyway, the turbine would be no good for around-town use and is suitable only for long-distance cars.)

For All GM Cars?

This new GM engine design can be built in sizes to power everything from the Cadillac down to the new small car. You can expect to see it in all General Motors cars within three, maybe two years. Everybody realizes that engines are too big, too heavy, too complex—the new designs will be simple.

The noise problem (supposedly inherent in air-cooled designs) has been licked. The engine is quieter, better balanced, more watch-tickish than anything you've seen. The whole project has been an engineer's delight and will prove what U. S. engineering can do when allowed to dig into something deeper than a push-button heater.

Chevrolet will build the car. Property has been bought for the new facilities. Major components (all of which are new and not shared with any other car) will be built in new plants. Actual assembly will be done in the existing Chevrolet facilities.

Production techniques for the small car could revolutionize the industry. The brains at the Tech Center have come up with some fabulous cost-cutting ideas. A whole new era is opening up here also.

The new car will be in the dealers' showrooms before the end of September 1959. It will not be called a Chevrolet, although there may be the name Chevrolet somewhere in the title (like Chevrolet Corvette). A battle currently is raging as to who is going to sell it.

Chevrolet wants it exclusively, but the



By Art Railton

other divisions, realizing how weak GM's imports, the Opel and Vauxhall, will be against this new competition, want to sell it, too.

Price is expected to be \$1900 and up. Remember now that all the foregoing is based on the existing state of affairs. If the situation changes, these plans could be changed (or even shelved). But that is unlikely—and it grows more unlikely with each passing day.

What About Foreigners?

General Motors now realizes that there is money, big, big money, in small cars. Why should the foreigners get it all?

With General Motors in, what happens to the foreign-car business? (A bigger and more important question from General Motors' viewpoint is what will happen to the used-car business?)

The new GM small car will make it necessary for foreign manufacturers to get competitive in styling and in the niceties. Owners may be willing to put up with inadequate heaters, slow windshield wipers, uninspired interiors and other minor debits to get a small, fun-to-drive car today. But when GM offers them the small car plus all the niceties we thin-blooded Americans have grown accustomed to, things may be different. In any case, the public will be the winner as competition stiffens.

Volkswagen is believed to be aware of and even getting ready for the upcoming battle. VW is rumored (just rumored) to have a new car in the works for 1960—a car especially aimed at appealing to the American market. It won't replace the present model, but is expected to augment it.

New car or not, VW is expected to have a new (and additional) engine for 1960—probably a new transmission with synchromesh first gear, too. Also rumored is that the present VW will be retained with some lessening of luxury to allow its prices to be cut so sharply that it will be far below GM's car in price.

Looks like an exciting year ahead, no?



Cargo-Carrying Helicopter Powered by Gas-Turbine Engines

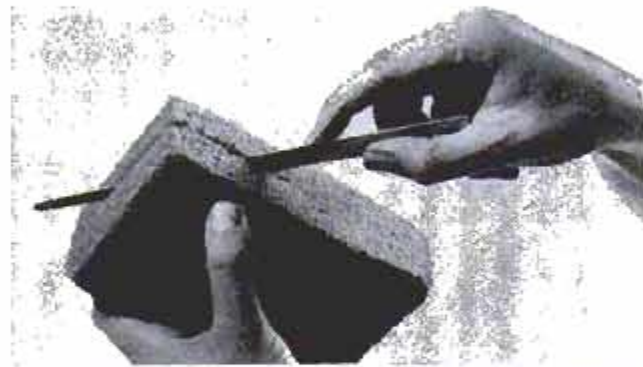
Three gas-turbine engines, mounted in parallel, power McDonnell Aircraft's new utility cargo helicopter. In the unique propulsion system, developed after seven years' experimentation, compressed air

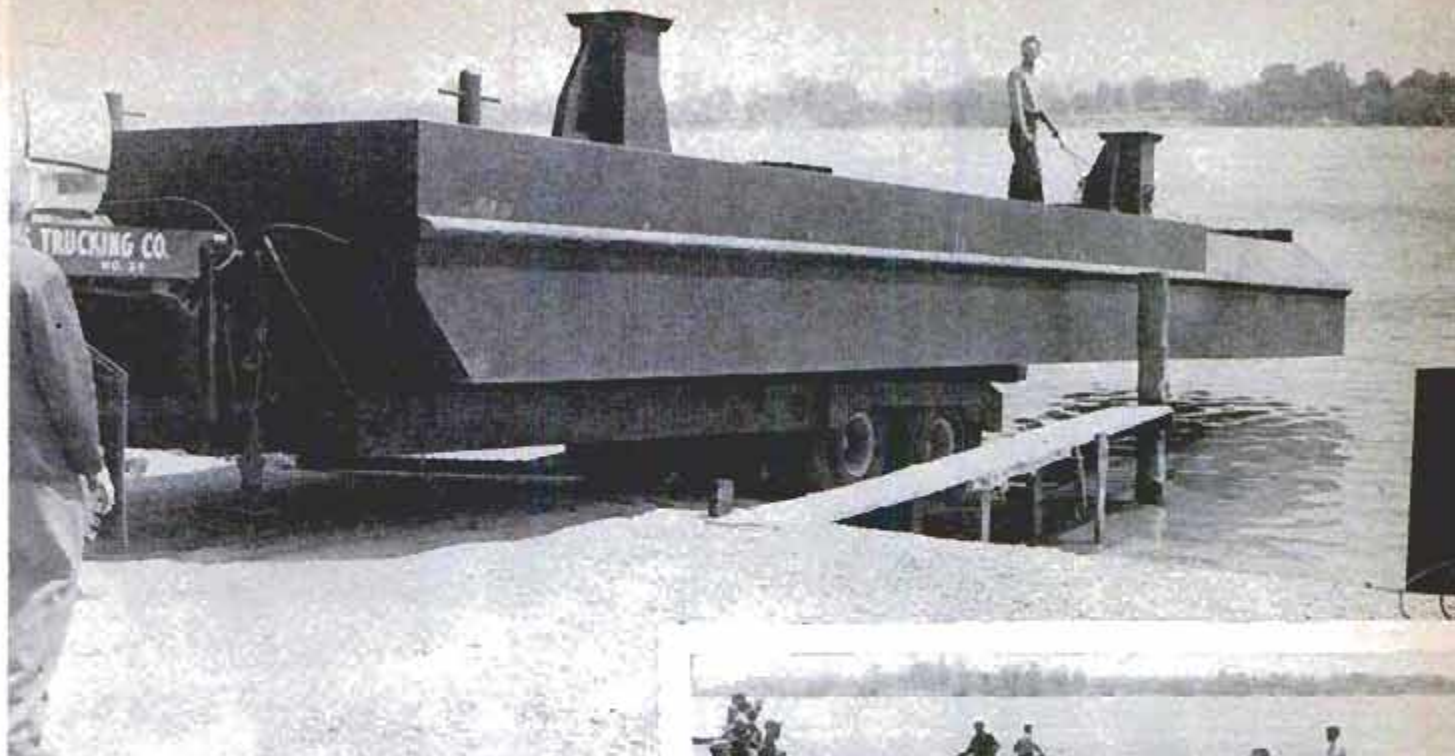
from the turbines is ducted through the rotor assembly and along the blades to burners on each blade tip. Here fuel is injected and burned to provide the power. The plane can climb 3000 feet a minute.

Foamed Silica Makes Lightweight Insulation Material

Pure silica foam is a versatile new material that is finding uses in chemistry, electronics, nuclear energy and other fields. It is produced in lightweight blocks that can be sliced with a knife and molded

or cut into various shapes. Because it can withstand temperatures from 450 degrees below zero to 2200 degrees above, it is used in high and low-temperature test chambers and blast furnaces as insulation material.





Barge Splits Into Sections For Overland Truck Trips

When the owners of a dredging firm in New Baltimore, Mich., want to move from one inland lake or waterway to another, they simply split their steel barge into two sections. Each 25,000-pound section is loaded on a truck trailer and transported overland. The barge is reassembled by dropping four piano-type-hinge pins into place between the 10-by-50-foot sections. For working directly over sunken craft, the sections can be separated to any desired distance.

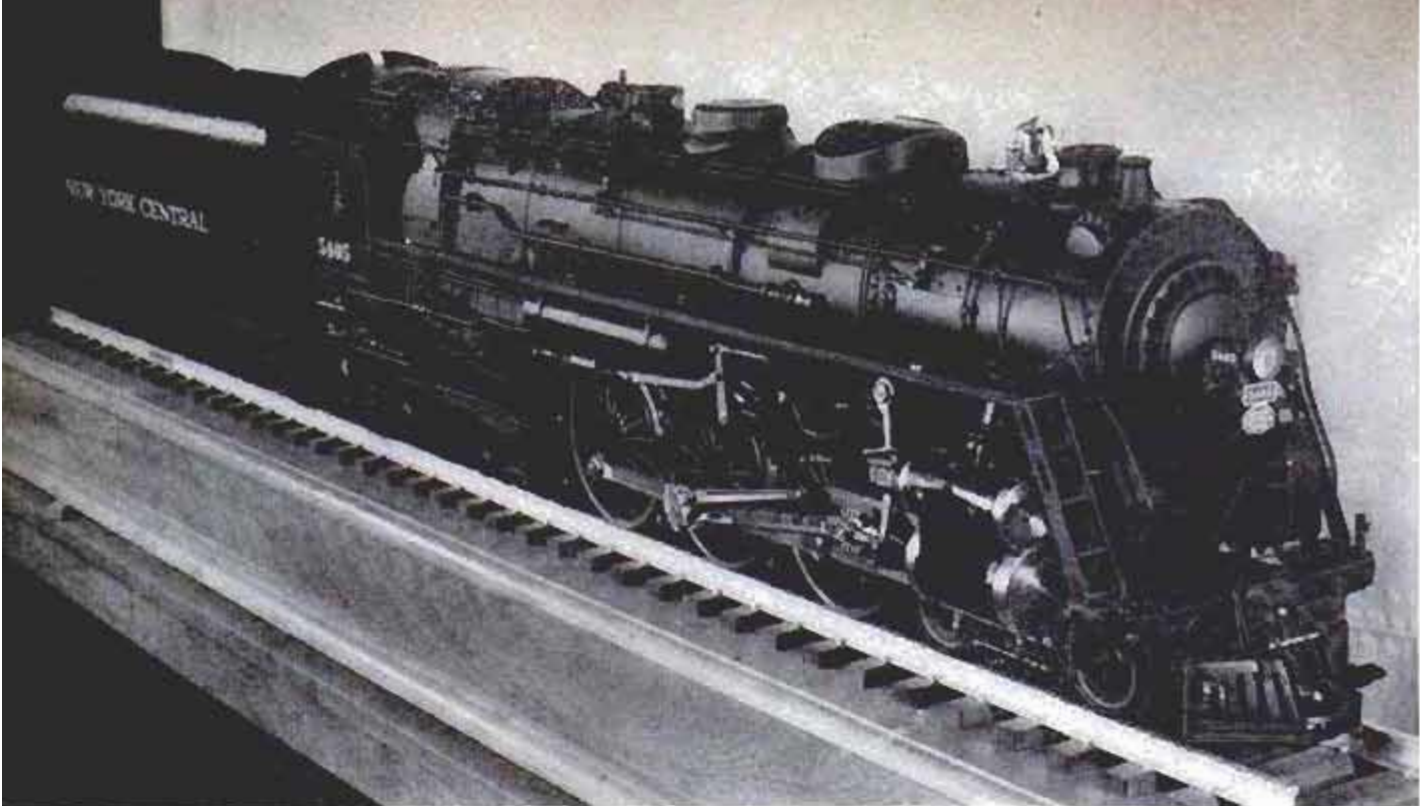


Telescoping Boom Pushes and Pulls Roller on Steep Grades

Compacting the fill on a bridge approach in California posed a problem for the contractor. Hand compaction was too expensive and a conventional road roller couldn't

be used on the steep grade. The problem finally was solved by attaching a 1500-pound roller to a telescoping boom. The boom moves the roller across the fill.





It took four years to build this six-foot, stainless-steel model of the Hudson 4-6-4 steam locomotive

IRON HORSE?

It's Stainless Steel and Handmade

By Sheldon A. Mix
PHOTOS BY JOE FLETCHER

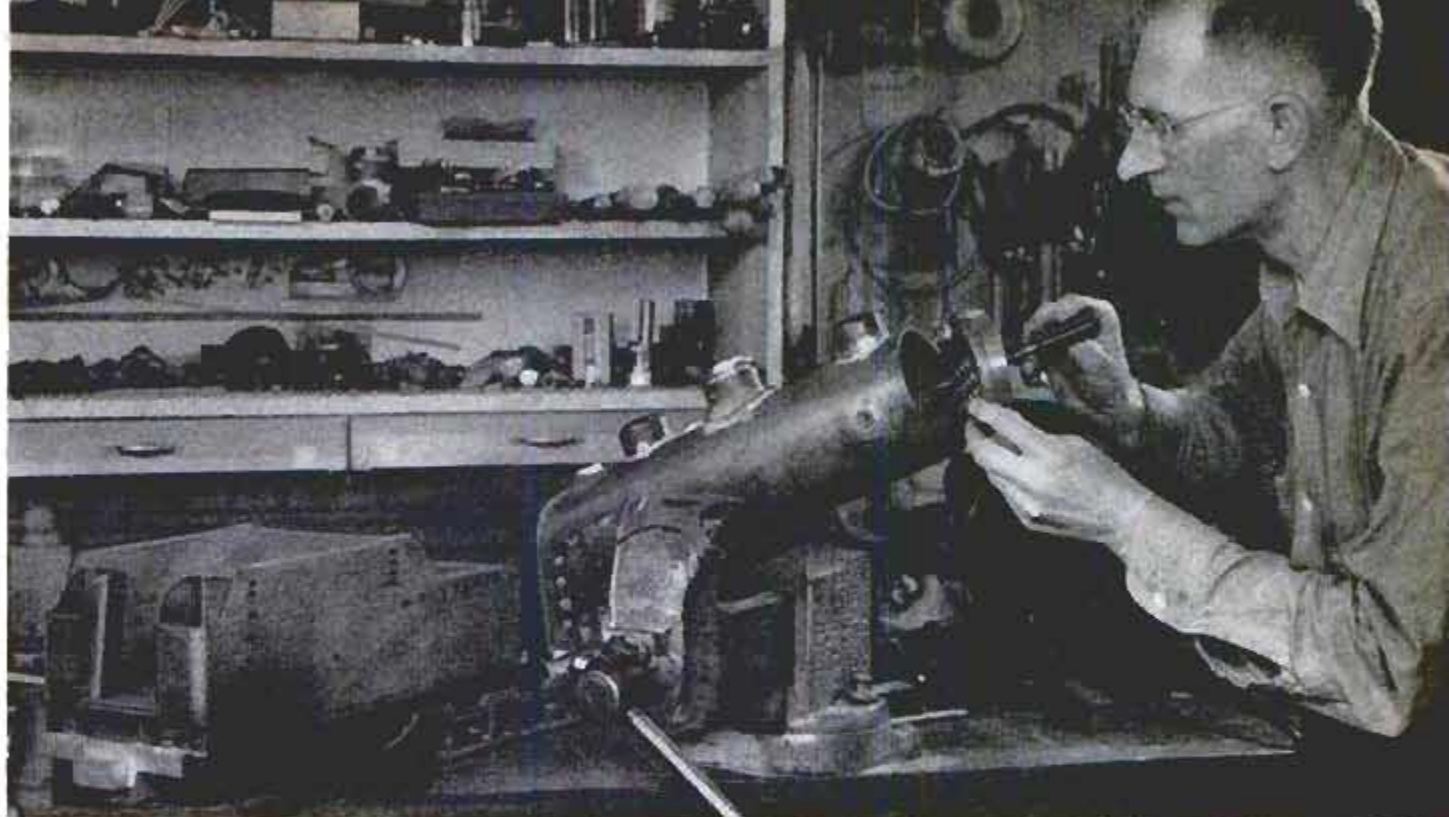
The engineer's controls have been reproduced exactly. On the firebox are workable butterfly doors



AFTER WORKING HOURS one day, Chicago machinist Clarence La Caeyse went down to his basement and started building a model of a steam locomotive. Four years or about 4000 work hours later, he was done.

But this was not an ordinary model-building project. Most locomotives constructed on the scale of La Caeyse's— $\frac{3}{4}$ inch to the foot—are made of steel or copper. La Caeyse built his mainly of stainless steel, a much harder material to work with than the other two. What's more, La Caeyse is a perfectionist. Working from plans and a photograph, he insisted on accuracy in producing his six-foot model of the New York Central's famous Hudson 4-6-4. He succeeded even down to the nonskid tread plates and the ash pan under the firebox.

La Caeyse made his own patterns for most of the castings used in constructing the engine. All the valves and fittings are handmade. So are the tiny screws. He used hundreds of them, ranging in size from 00-90 (about .030 in diameter, or three times the diameter of a human hair) to one-quarter inch. Putting rivets in place



Builder of several gas engines, Clarence La Caeyse is now at work on a switch engine he'll run outdoors

was also minute and painstaking work. Each hole was center-punched and drilled. The firebox has shaking grates made up in two sections so the grates can be operated in the front or rear part of the box.

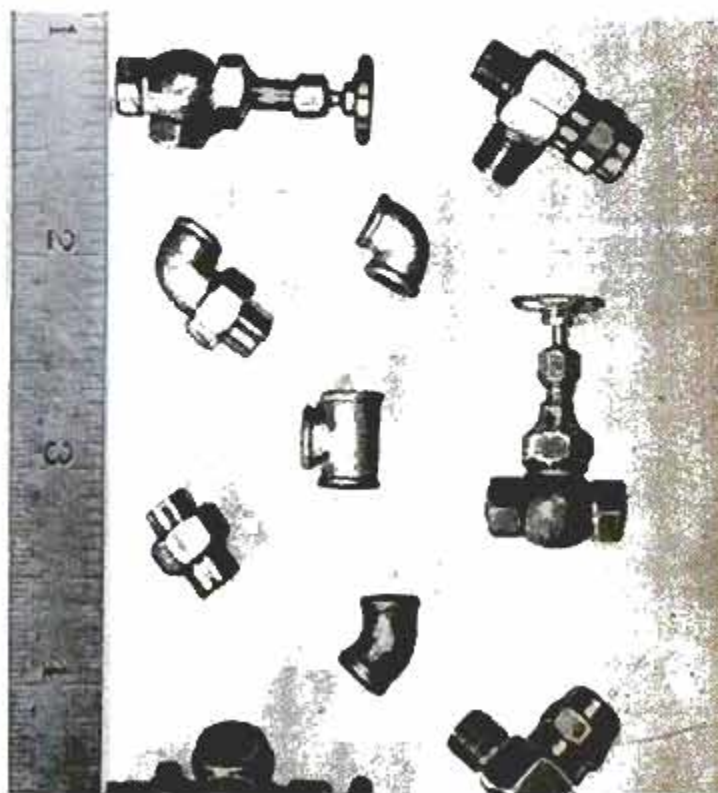
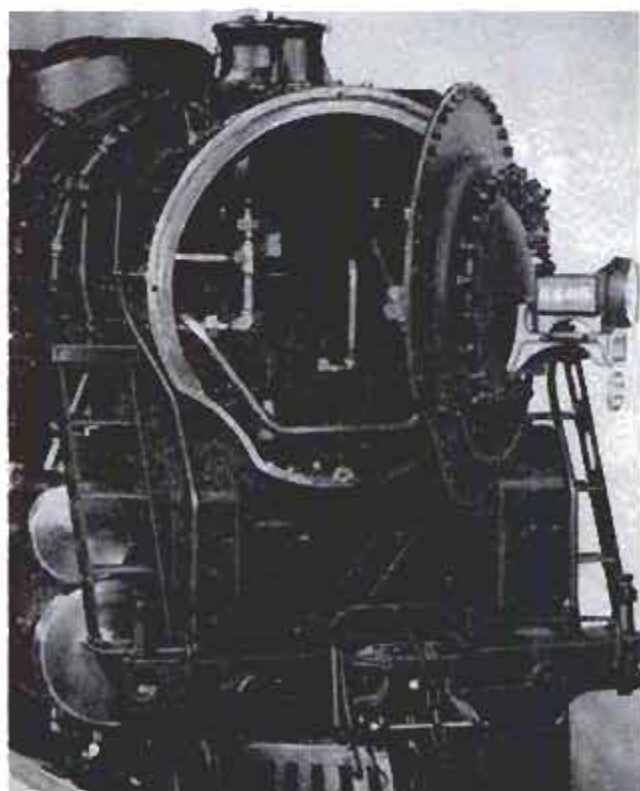
All fabrication of the locomotive and tender is either silver-soldered or welded. The wheels are suspended on leaf springs working through equalizer bars and levers. The water pump that feeds the boiler is a two-cylinder, double-action engine. Valves and cylinders are lubricated with pressure-feed oil pumps. Current for the headlight is supplied by a steam-turbine

La Caeyse spent about \$100 on the boiler and parts. All tubes and bolts are welded with stainless steel

generator that La Caeyse built himself.

Owner of a well-equipped basement workshop, La Caeyse did most of his work on his lathe, shaper, milling machine and drill press. He didn't keep a record of how much money the project cost, but knows he spent about \$100 on the boiler and parts. He has never taken his 4-6-4 out of the basement where it stands on an elevated piece of track. He has built a fire in the boiler just once—before he painted the locomotive and tender. La Caeyse is now working on a switch engine that he hopes to run outside. ★ ★ ★

All valves and fittings that went into the model Hudson 4-6-4 were patterned and made by La Caeyse





Arriving at the scene of an accident, an ambulance helicopter lands on city street

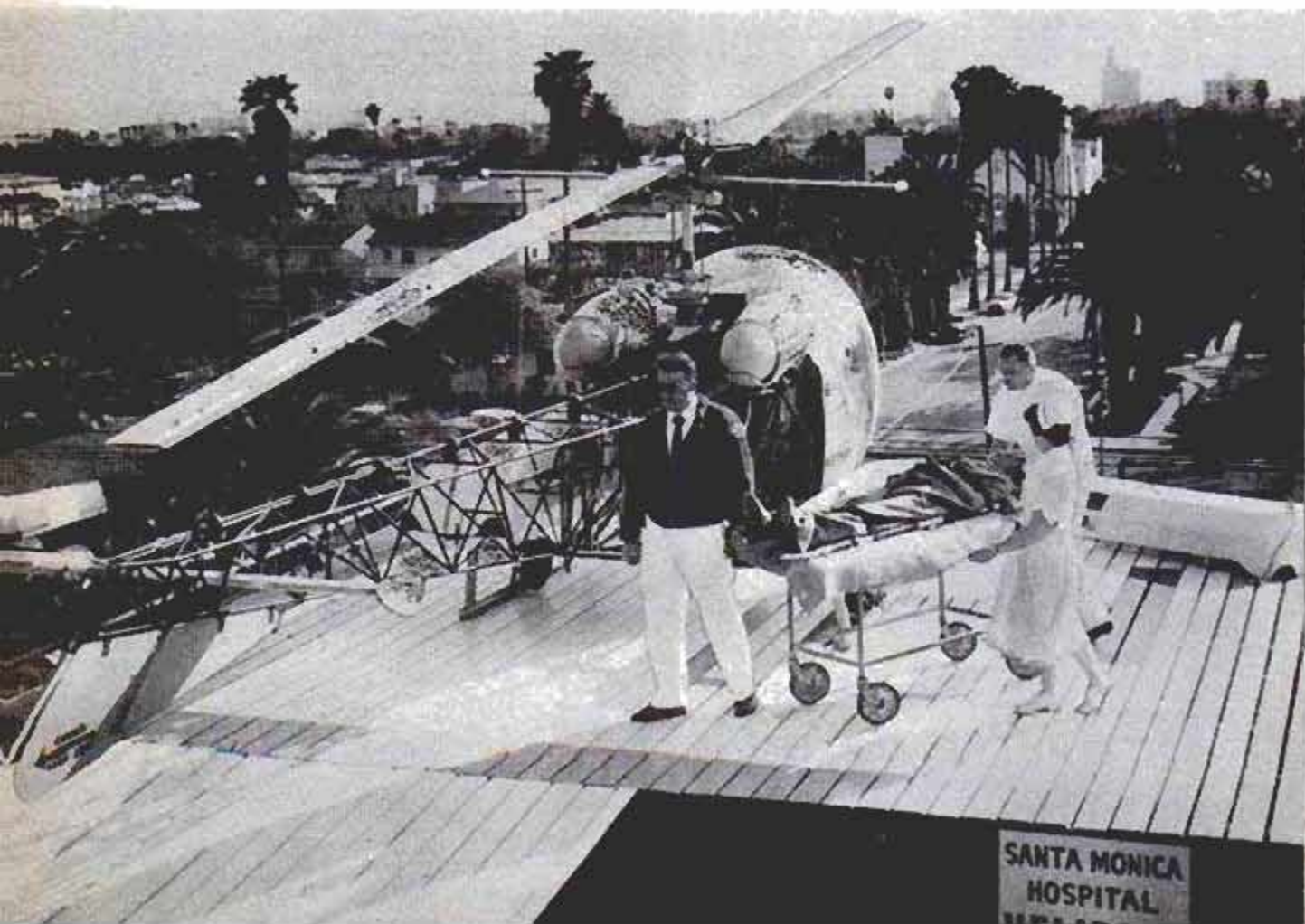


Patients are transported in compartments attached to sides of copter. Patient space is inside bubble of some helicopters

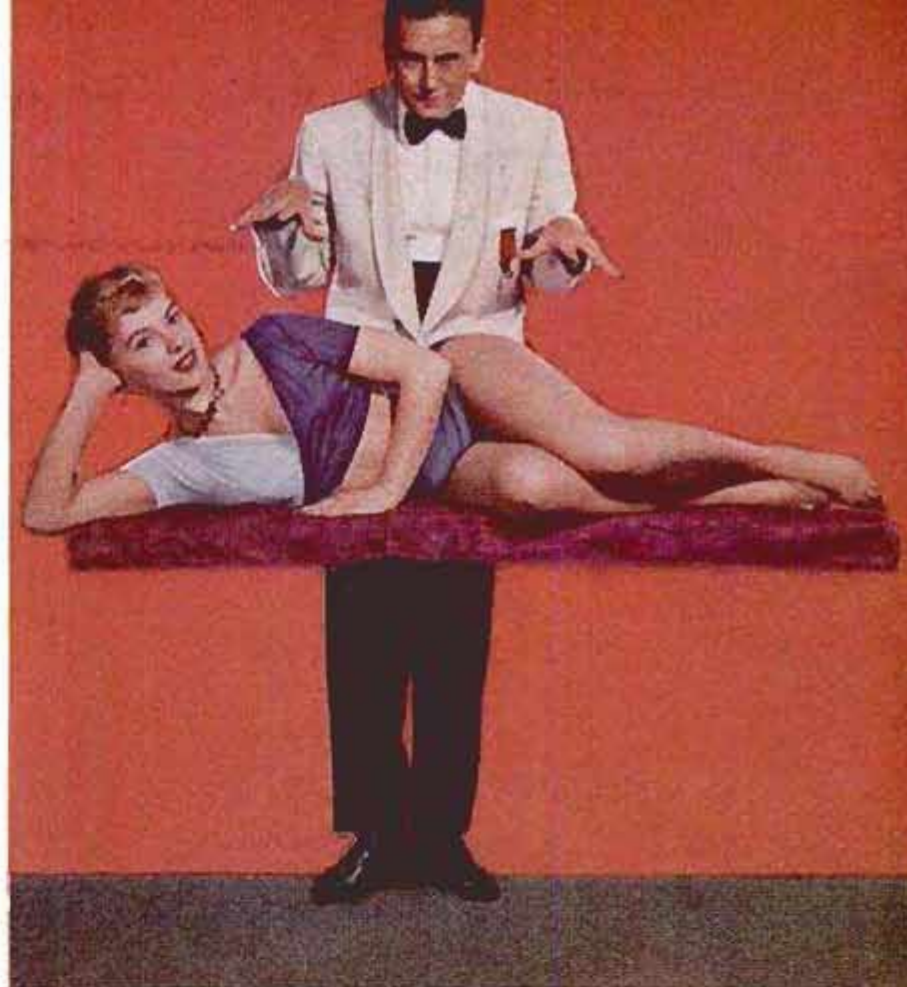
Flying Ambulance Saves Lives

WHIRLING BLADES may soon replace screaming sirens at the scene of an accident. A number of hospitals in the Los Angeles area have provided space for a helicopter landing area near the emergency entrance. Because the helicopter can take off and land vertically, a 40 by 40-foot space is sufficient for a heliport. Almost any city street is wide enough for landing. Ambulance trips that might require one or two hours on congested highways can be made in a fraction of that time by lifesaving helicopters.

The 40 by 40-foot platform on roof of Santa Monica hospital serves as heliport. Ramp leads to elevator



MILBOURNE CHRISTOPHER, shown here levitating a beautiful assistant with the greatest of ease, is acclaimed by magicians themselves to be the foremost historian of magic. His immense reference library covers 5000 years of hocus-pocus, and his Manhattan apartment is the largest museum of magic in existence. In addition, Christopher is one of the greatest of contemporary wizards and is past president of the Society of American Magicians



PART I

I Call These **THE GREATEST MAGIC ILLUSIONS OF ALL TIME**

By Milbourne Christopher

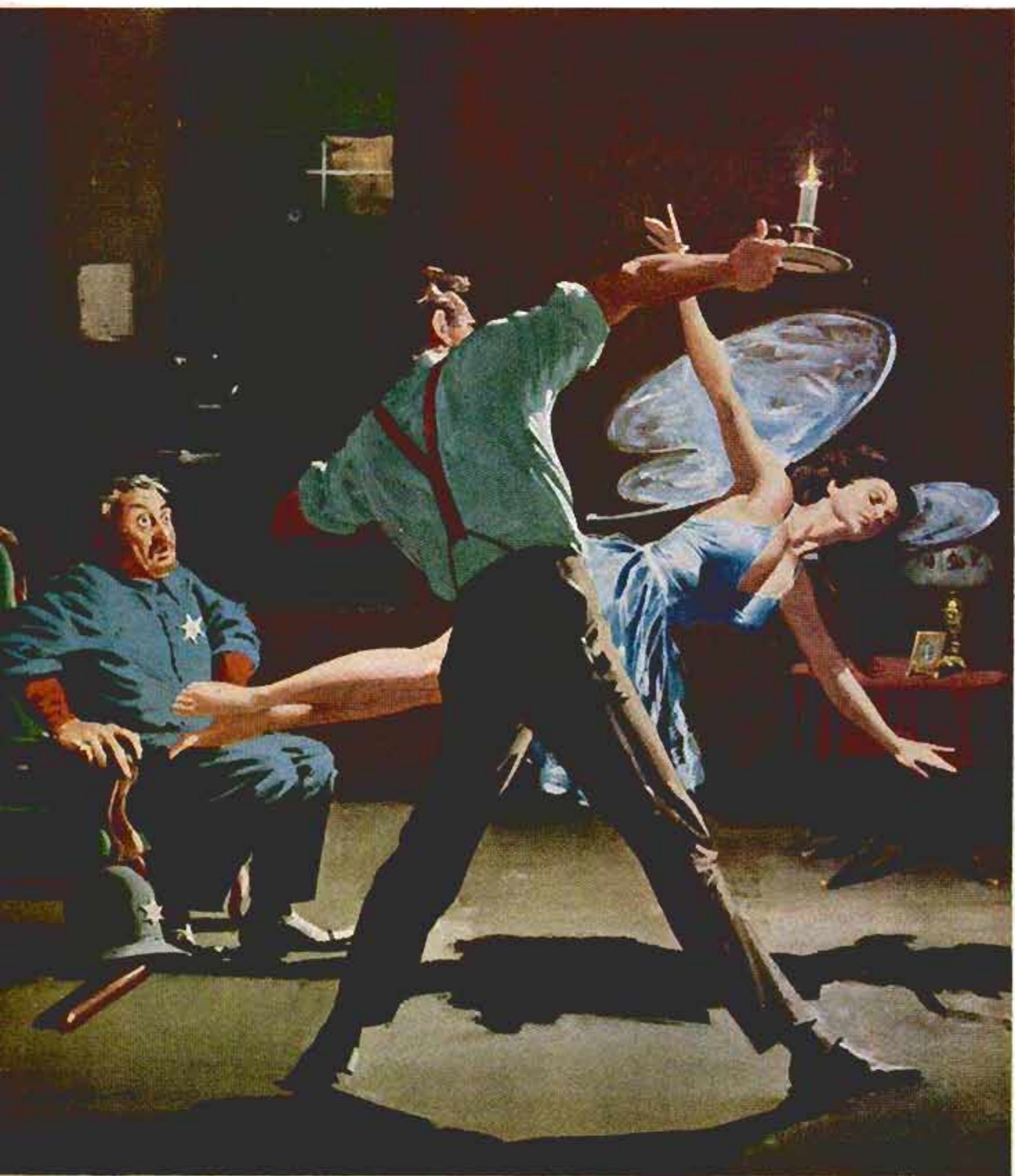
MAGICIANS ARE the scientists of show business. They perform their baffling illusions by camouflaging the principles of nature. Spectators who take for granted such 20th-century wonders as TV, atomic energy and satellites, are still flabbergasted by the seemingly incredible feats of modern Merlins.

As an historian of magic as well as a professional magician, I have frequently been asked to describe the greatest illusion of all time. I can't limit magic to a single illusion. But I will nominate *several* of the greatest illusions, with variations.

In many cases, the secrets of these illusions have endured, though their inventors

died long ago. A modern magician may still baffle us with one of the same illusions that mystified our ancestors, updated and given a personal flourish. However, the scientific or mechanical principle of the illusion may have remained the same for decades or even for centuries.

First let me define an illusion. A small trick is *not* an illusion, though it may be equally baffling. An illusion is a spectacular stage mystery involving humans, large animals or massive objects. Show a small box empty and produce a bowl of water—that's a trick. Show a huge box empty and conjure up a man on a motorcycle—that's an illusion!



Suspicious London bobby was the first spectator to see David Devant's startling illusion, "The Mascot Moth"

Here, then, are my nominations for the greatest illusions in the history of magic.

One of the most famous—and certainly one of the greatest illusions—is vivisection, or sawing a girl in two. Take a look at the absolutely baffling refinements that have been given to this well-known mystery.

The most ancient mystery of this type dates back almost 5000 years. Dedi, an

Egyptian hocus-pocus expert, astounded Cheops, the Pharaoh who built the Great Pyramid, by severing the head of an ox, then mystically reuniting the animal. Later generations of mystery men added extra interest by using humans for their deceptive decapitations. Dr. Lynn, who flourished in the late 1800s, advertised he would "cut up a man at each performance." He



Bearded DeKolts made his wife disappear in view of audience. Newspapers proved no trap doors were used

did, too, slicing off legs, arms and head. As a matter of fact, he cut up the same man for 20 years!

P. T. Selbit, the British wizard, introduced the modern version of this spine-chilling sensation in 1921. The plot was simple and sensational. A pretty girl, tied in place inside a wooden box, was sawed in half, then mysteriously restored.

The whine of the wicked saw as it ripped through the wood was first-rate theater. As soon as the saw dropped free, metal plates were inserted on each side of the cut, and the two sections of the box were pulled apart. The audience usually was too stunned to applaud until the sections had been rejoined, the girl's bonds released and she emerged smiling—in one piece.



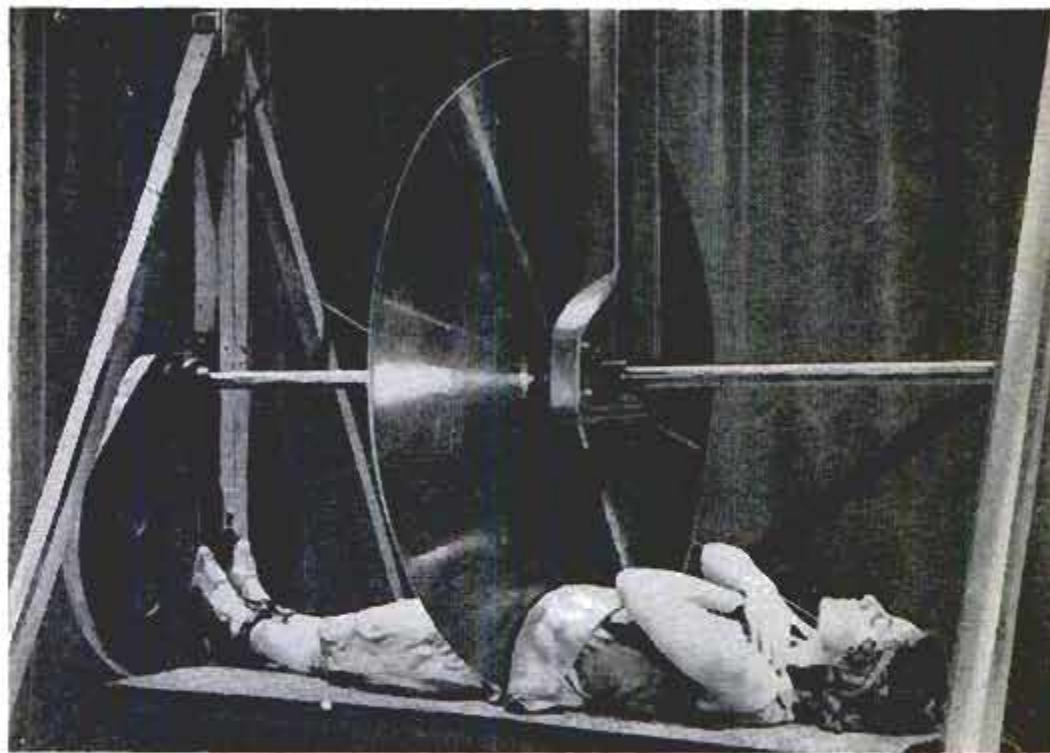
"Onaip" was a staggering illusion in which a piano and pianist revolved in midair during musical number

A few months after Selbit's triumph, Horace Goldin performed the illusion in this country—except that he used a form-fitting box, and the girl's head, hands and feet protruded through holes. The public was so eager to see this miracle of magic that Goldin soon had six magicians touring under his management. In less than a year, more than 100 illusionists were topping

theater bills as far away as Calcutta with the lure of this feat of surgical sorcery.

Goldin stirred up public interest by parking an ambulance in front of the theater. Sometimes he hired a group of men, dressed them as undertakers with white gloves and frock coats, and had them march solemnly through city traffic to the theater lobby.

Horace Goldin was a master at sawing an assistant in half, one of the most famous and spectacular of all stage illusions. All other magicians placed the girl in a closed box, but Goldin simply had her lie on a plank throughout his surgical sorcery



I imagine you believe the secret of this illusion is hidden inside the box. Well, the last time I saw Goldin perform it in London 20 years ago, he had a new version. The box simply was discarded. His beautiful assistant reclined on a plank, all of her body in full view. Goldin, ever the master showman, ran a huge power-driven saw through her midsection. As in the earlier illusion, he brought the surgery to a successful conclusion when the girl bowed from the waist and walked to the wings—still very much in one piece.

Last year I arranged for Sorcar, the Indian illusionist, to fly here from Calcutta to perform on NBC-TV's "Festival of Magic." Network officials were shocked to learn that he finished his special variation by leaving the girl in two widely separated pieces as the curtain fell—a grisly touch that seems to delight audiences in some other parts of the world. He graciously agreed to effect the usual happy ending here.

Audiences usually suspect elaborate boxes or cabinets. Everyday props used in an illusion make the mystery doubly effective. During Blackstone's evening of wizardry, a girl crawled into a row of tires held upright by a simple rack raised from the stage.

Casually, the illusionist lifted the tires one by one and rolled them to a waiting assistant on the far side of the stage. The girl was gone. Meanwhile, the assistant had stacked the tires one on top of the other. A line was let down from above. Out from the tower of tires was pulled the same girl who had vanished a moment before.

A place high on the list of the greatest

illusions must go to "Onaip." In April 1908, patrons of the New York Hippodrome rubbed their eyes in amazement when a man, seated at a piano, rose into the air. Not just the man, the piano, too! When the two were about five feet off the floor, the piano and the man turned upside down and began revolving at a speed of about 40 revolutions a minute. And, all the while, the man played lilting music.

For several years this staggering illusion toured from coast to coast in the United States. Then, in 1911, "Onaip" was presented with an East Indian setting. The wizard appeared in lavish robes and hypnotized one of his assistants. Burning incense added mysticism. After the hypnotized subject was led to the piano, he began to play. His stool was taken away. Still he played, sitting in space. Then the levitation and spinning in the air began. As the piano and player turned, a gigantic hoop was passed over them to show that no wires were employed.

To demonstrate how easily the eye can be tricked, did you notice anything familiar about the name of the illusion—"Onaip"? It's "piano" spelled backwards.

Richiardi, Jr., the young Peruvian illusionist, recently presented one of the most novel levitations ever conceived. A small boy falls asleep over the wheel of his miniature motor car. Richiardi waves his hands over the car. Slowly it rises until it is several feet in the air. A hoop is passed over the suspended car and its youthful occupant. More passes from Richiardi and the car sinks back to the stage. The youngster wakes up and drives the car offstage.

(Continued to page 214)

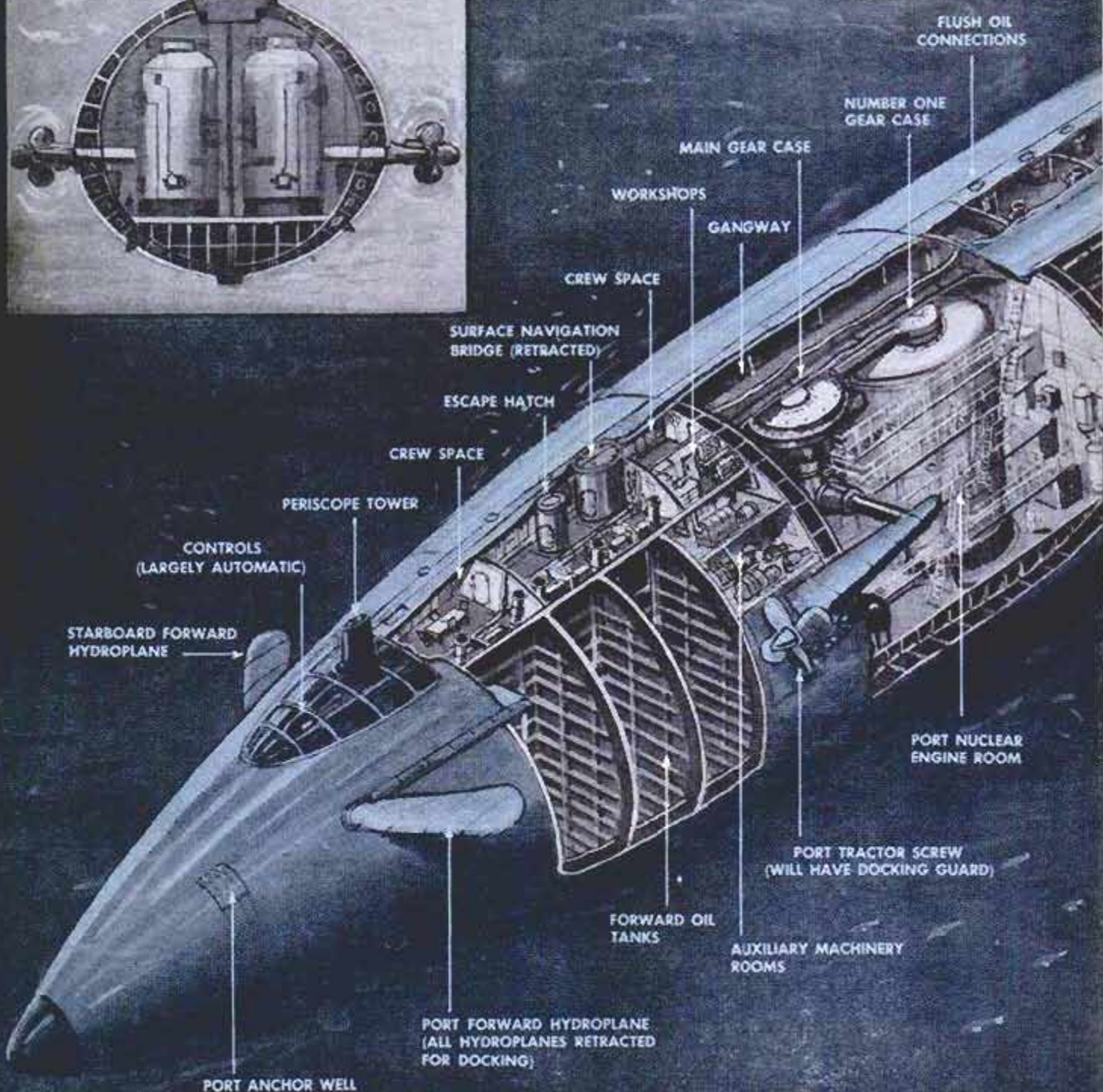
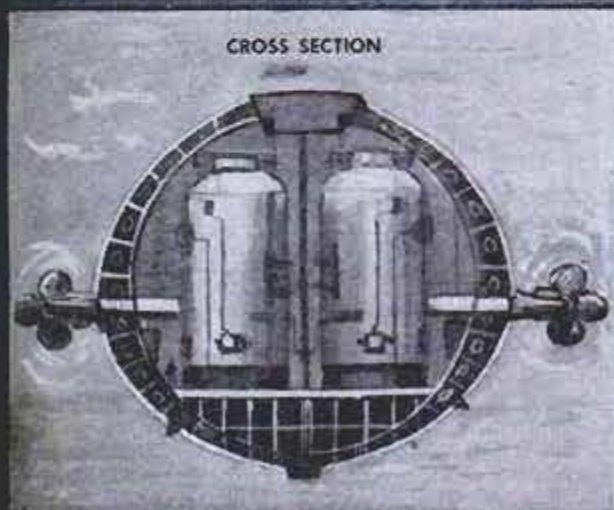
THE PROPOSED SUBMARINE TANKER COMPARED TO SCALE WITH THE U. S. SUBMARINES NAUTILUS AND TRITON



TANKER APPROXIMATELY 800 FEET

NAUTILUS 300 FEET

TRITON 447 FEET



FLUSH OIL CONNECTIONS

NUMBER ONE GEAR CASE

MAIN GEAR CASE

WORKSHOPS

GANGWAY

CREW SPACE

SURFACE NAVIGATION BRIDGE (RETRACTED)

ESCAPE HATCH

CREW SPACE

PERISCOPE TOWER

CONTROLS (LARGELY AUTOMATIC)

STARBOARD FORWARD HYDROPLANE

PORT NUCLEAR ENGINE ROOM

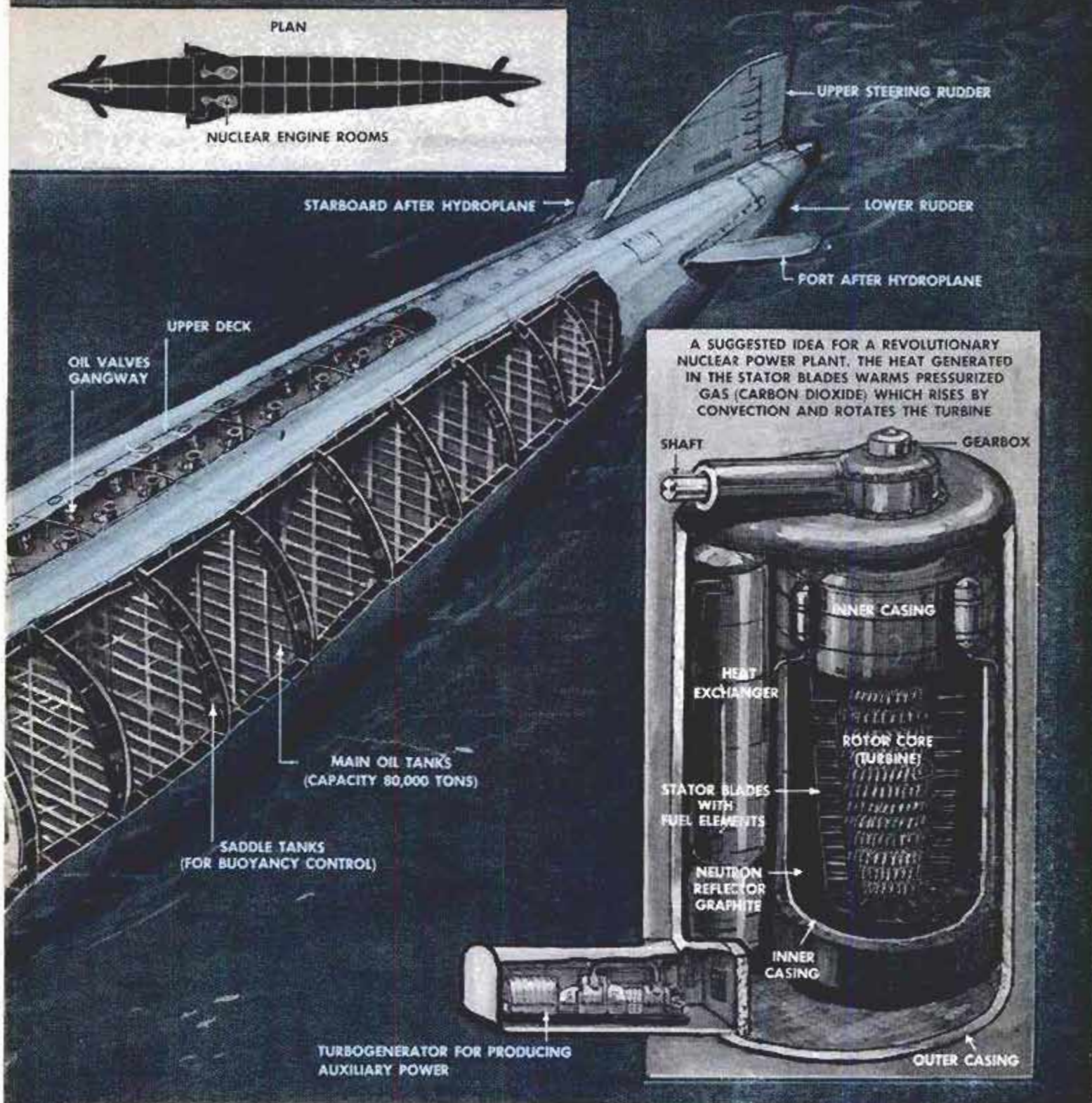
PORT TRACTOR SCREW (WILL HAVE DOCKING GUARD)

FORWARD OIL TANKS

AUXILIARY MACHINERY ROOMS

PORT FORWARD HYDROPLANE (ALL HYDROPLANES RETRACTED FOR DOCKING)

PORT ANCHOR WELL



A SUGGESTED IDEA FOR A REVOLUTIONARY NUCLEAR POWER PLANT. THE HEAT GENERATED IN THE STATOR BLADES WARMS PRESSURIZED GAS (CARBON DIOXIDE) WHICH RISES BY CONVECTION AND ROTATES THE TURBINE

GIANT ATOMIC SUB TANKER

Text and Drawing
by G. H. Davis,
Noted British Artist

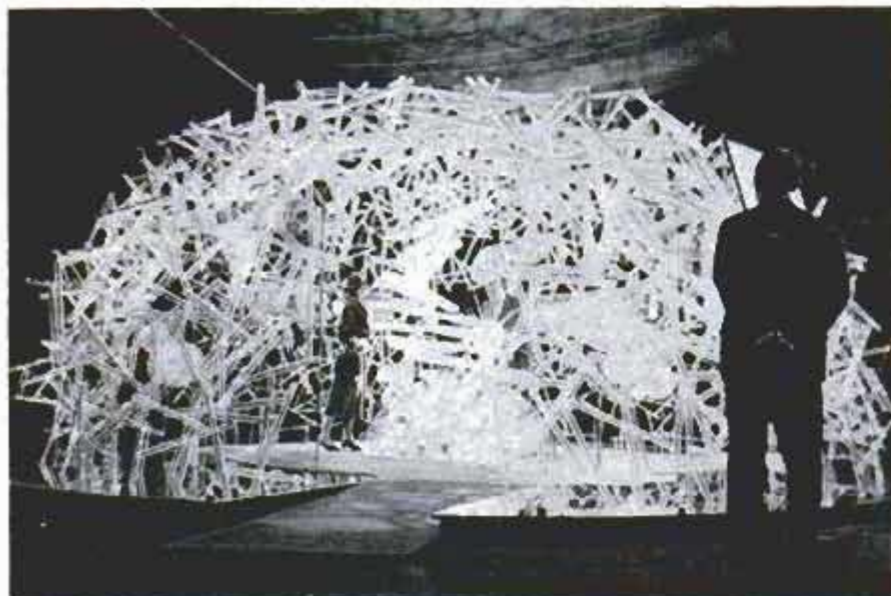
USING A NEW TYPE of nuclear power plant, a submarine tanker being designed by Britain's Mitchell Engineering Company would be capable of carrying 80,000 tons of oil at speeds far in excess of any submarine yet built. Model tests of the vessel have been made in the 600-foot experimental tank of Saunders-Roe Limited, famous aircraft and ship-builders. Details of the nuclear power plant have been a jealously guarded secret, but it will not use the present

round-about method of producing power from the atom. One suggestion is that power may be produced more directly by incorporating fuel elements in the fixed blades of a turbine engine. Heat from the blades would cause pressurized gas to rise by convection, rotating the turbine. It is believed the power plant could drive the tanker at the great speed of 40 to 50 knots. A crew of about 12 men would be sufficient as many of the controls would be automatic. ★ ★ ★



High-Level Visit To Hospital

Talk about rising to the occasion! Seven-year-old Mike Stamon of Seattle, Wash., was determined to visit his younger brother Korey, a patient in the hospital. However, hospital rules prohibit children from visiting patients. Mike persuaded his father to raise him to the third-floor level on a telescoping construction boom. The platform was maneuvered until Mike was right outside Korey's window. From this perch, Mike and his father could wave to Korey.



Human Cell Model Is 12 Feet High

More than a million times the size of a human body cell is a three-dimensional plastic model 24 feet in diameter and 12 feet high. Almost a mile of plastic tubing and a mile of electric wiring were used in building the model. The plastic tubing represents cytoplasm; yellow plastic balloons represent fat globules. Pulsation of a blue light at the base adds an appearance of "life."



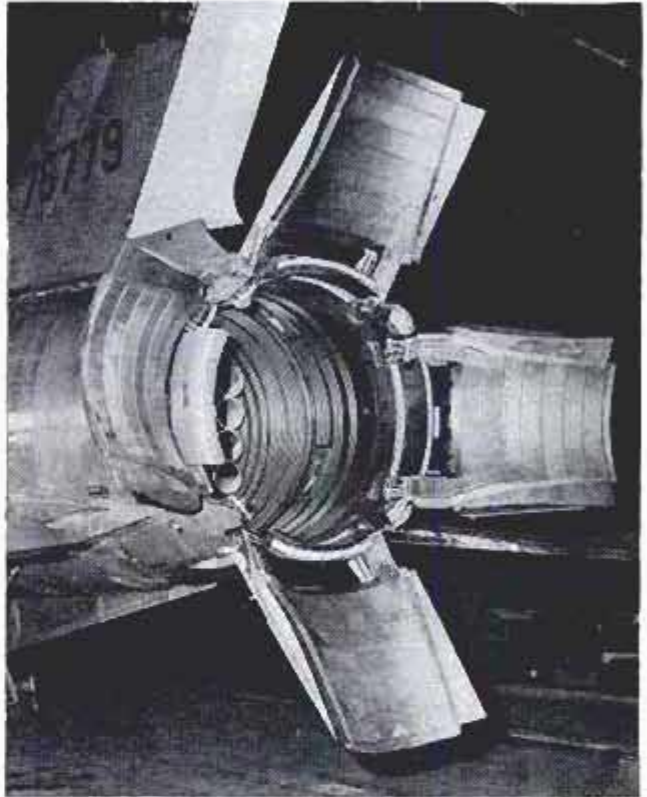
Unit "Speaks" Code On Teletype Signal

Coded information can be "spoken" by an electronic instrument. Words and phrases are prerecorded and stored on the instrument's memory drum. They are triggered when a teletypewriter operator presses certain keys. Since a coded electronic signal is simpler to transmit than voice, the instrument may solve major problems in aircraft, ground and point-to-point communications.



"Clover Leaf" Speed Brakes Fold Out of Fuselage

Republic's F-105B fighter bomber, shown taxiing with its brake chute open, is equipped with a new type of braking apparatus. This consists of "clover leaf" speed brakes located on the tail of the plane. Forming the last 36 inches of the fuselage while in flight, the brakes are in four sections and open or close to four positions. In the normal cruise position the petals of the brakes are closed; with afterburner operating, they are slightly open. As a speed brake, the two side petals remain open, while the top and bottom petals are closed. In the slow-flight position, all four petals are open. The airflow over the wing and tail surfaces is not disturbed by the open brake petals. The F-105B is powered by a 15,000-pound-thrust turbojet engine and is in the Mach 1-plus class. It is armed with a single 20-millimeter cannon.



Scoop-Bucket Has "Snapper Lip" That Automatically Opens and Closes

Operating automatically, the "snapper lip" of a scoop-bucket remains open while the bucket digs into a load, then clamps shut until the load is dumped. When the bucket dumps its load, the lip opens to a

width that can be adjusted by a tension spring. The snapper lip enables the bucket to handle a full load and at the same time prevents any of it from spilling over onto a roadway.

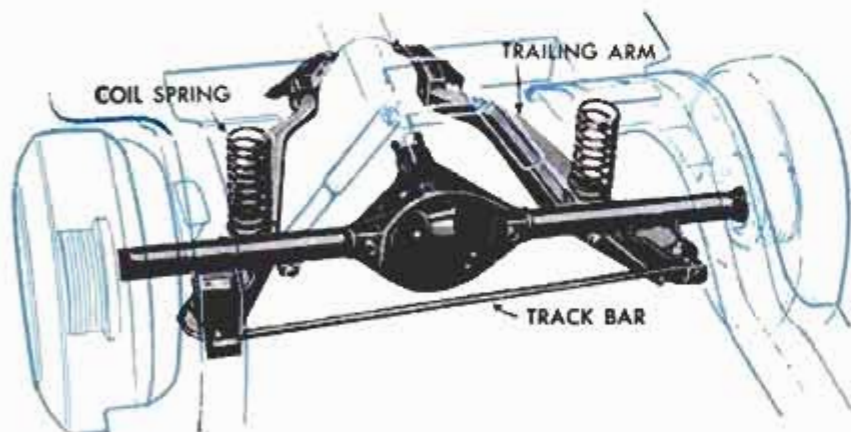




Lincoln simplified its front end by placing the diagonal headlamps in the upturned ends of U-shaped grille



Lincoln's transom. Below, major elements of the rear suspension



Continental Mark IV continues its reverse-slant, movable rear glass. Taillights look like huge push buttons



LINCOLN

LINCOLN IS SHORTER—not much, but even two inches shorter is news these days.

Any unit body has an inherent problem of noise transmission. Lincoln has licked the problem and the car is as quiet as a conventional-frame design. They tuned and dampened exhausts, weighted and balanced the prop shaft, revised the junction of rear axle and trailing arms. Reinforcing strainers now reduce sheet-metal drumming.

For rustproofing, Lincoln this year dips its bodies in primer paint all the way to the belt line. The engine, a carry-over from 1958, has been "honed and sweetened," say the engineers.

Lincoln's plush model, the Continental, is now the Mark IV. Styling changes on both are limited to front and rear transoms—the latter being Lincoln's forte.



Lower headlights, more horizontal emphasis in grille, flashier brightwork, mark 1959 Edsel Corsair hardtop

EDSEL

CHANGES? Edsel for 1959 has a barrel of them.

It now comes in one size only. The new wheelbase is 120 inches, two inches longer than last year's small Edsels, four inches shorter than the big models.

Only two series are offered, Ranger and Corsair. Three V8 engines are available, displacements being 292, 332 and 361 cubic inches. All but the biggest thrive on regular gasoline.

Also available is a six-cylinder engine (adopted from Ford). It's a "delete option." Order it, and you get a price cut of \$80 or so.

Even the push buttons in the steering wheel are gone. So is the pie-plate speedometer. Big concern is with mechanical reliability, not gimmicks. Exhausts are coated for long life, wiring clips rubberized to protect insulation and quick-disconnect plugs make electric circuits foolproof.

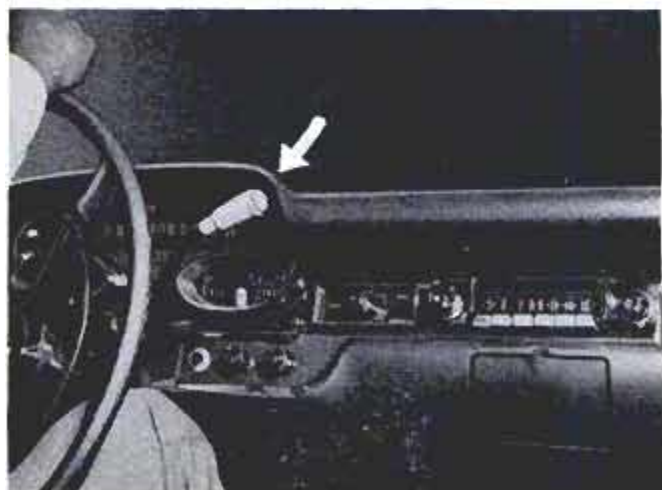


Ranger sedan is same size inside and out, but less expensive than Corsair. Differences are in trim, seat design and engine



Villager wagon comes as two or three-seat model. Weight distribution on wagons is 50-50, giving good traction on ice or snow

Push buttons are gone. Transmission control is lever (arrow). Buttons were too expensive and troublesome

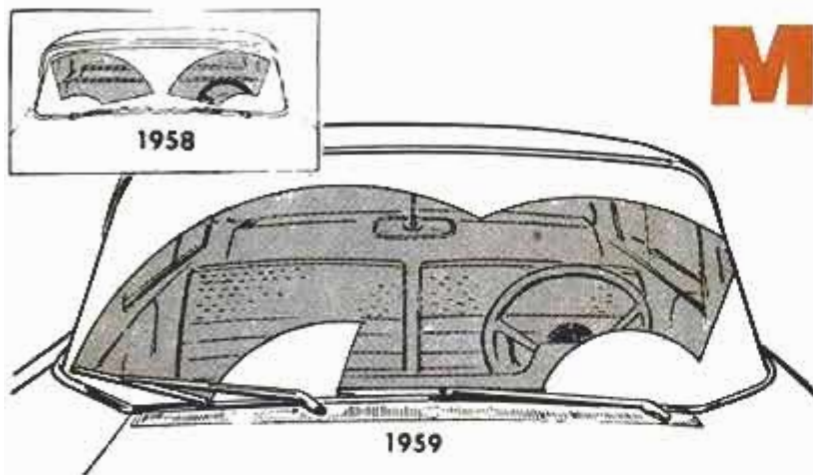


Multiple taillights are mounted lower than last year's horizontal design. Third lens is backup light





Park Lane models, like this four-door hardtop, have a distinctive "torch" mounted in rear-fender cavity



Mercury now has electric wipers that operate in unison and their sweeps overlap each other to eliminate all unwiped center area

MERCURY

MERCURY has plenty to talk about in 1959. Changes run all the way from a new frame to a different system of windshield wiping. Interiors are roomier as stylists have increased front-seat legroom as much as six inches to get rid of what the Mercury publicists euphoniously call "cockpit claustrophobia."

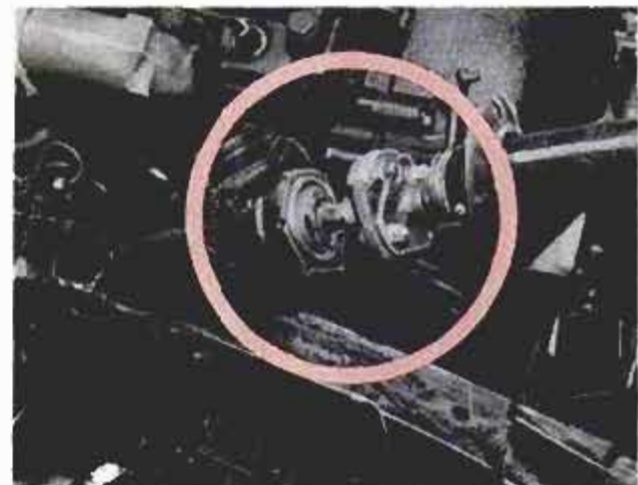
Wheelbases are now 126 inches on Monterey and Montclair (four inches longer than last year) and 128 inches on the Park Lane (three inches longer). Over-all lengths are increased by similar amounts.

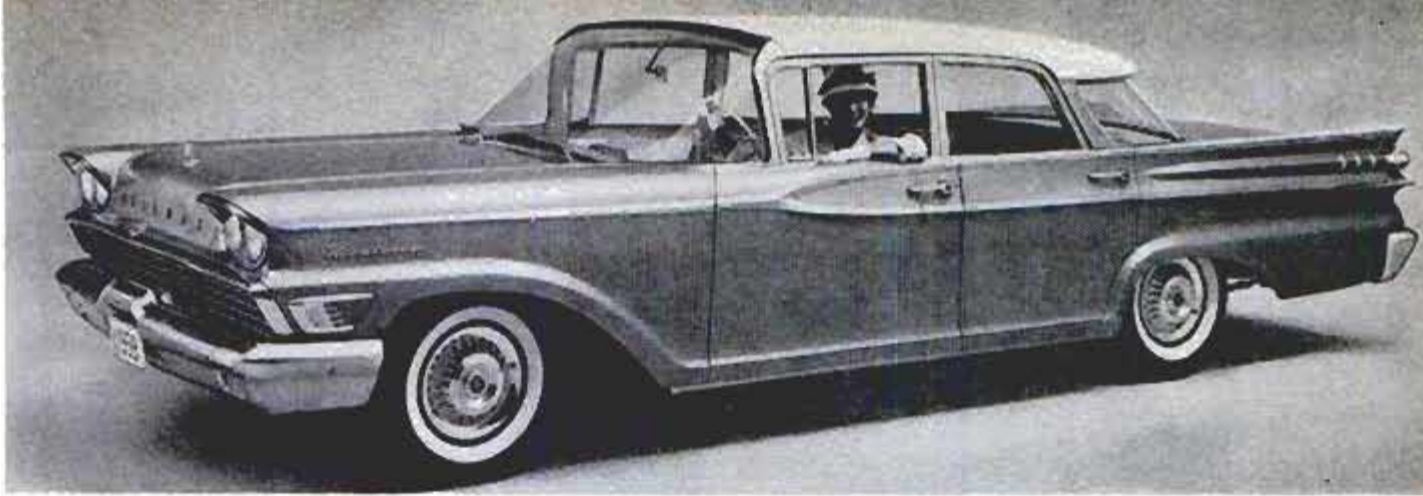
Front and rear treads are wider for greater stability. Antidive has been added to the front suspension by tilting the upper arms. It's the first time Mercury has used antidive.



Wagons have lockable storage compartment under rear floor. Below, new dash increases front-seat room

Flexible joint in steering shaft (circle) absorbs road shock and prevents binding due to misalignment





Monterey sedan has a flatter roof. Pencil-shaped "projectile" is now formed by rear-fender sheet metal

The longer frames had their "cow belly" width increased by six inches over 1958. Rebound bumpers of butyl rubber (previously natural rubber) smother the jounce without throwing the absorbed energy back, just as your fist sinks into a chunk of putty. This added damping action results in a better ride under extreme conditions.

You'll recognize these new models as Mercurys despite the all-new body shells and frames. The distinctive crisp styling theme introduced by Mercury in 1957 has been retained

Two roof styles are offered. The hardtop roof curves rearward blending smoothly into the large back window. A flatter roof on sedan models has a cantilever extension that overhangs the rear window.

By moving the dash forward and lowering the belt line of the body, stylists have added a wide-open feeling to the interior, especially for front-seat passengers. The transmission hump and rear-floor tunnel are smaller this year, increasing the passenger room and comfort. There's more room for the feet in the back seat, too, as the sill is four inches narrower providing increased flat area within the step-down cavity. Entrance room is improved by the four-inch-longer front doors on sedan models.

Windshields wrap upward into the roof and now have 60 percent more glass than before.

Mercury's projectile theme is retained on the rear quarter panels and, in fact, is enhanced by the sheet-metal sculpturing.

The new parallel-wipe blades (which operate in unison, left to right), clear a continuous area, leaving no unwiped central triangle to block vision. Electric wipers are standard.

Mufflers are aluminized inside

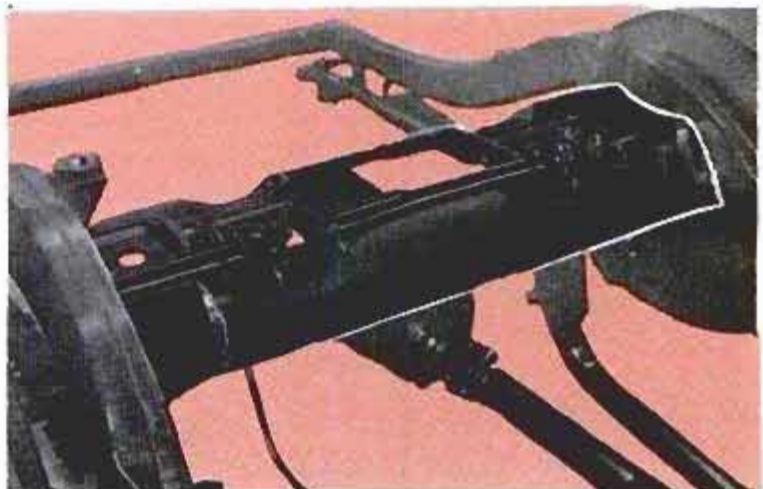
and zinc-plated outside to double expected life. Tailpipes are of heavier gauge steel.

Engines come in the following displacements: 312 cubic inches, 383 cubic inches and 430 cubic inches. The 383 engine can be ordered with an economy two-barrel carburetor. An economy automatic transmission (a two-speed design) is optional.

Push-button control of the automatic transmission has been discontinued. Power steering has reduced load and its pump is integral on the two big engines. ★ ★ ★



Spare mounts forward to increase handy-to-get-at trunk area. After all, when did you last need a spare? Below, frame cross-member over rear axle is curved heavy-gauge sheet metal instead of box girder. It is lighter, stronger, requires less height





B-52 Skims Tree Tops in Low-Level Flight Experiments

Maneuvering a half-acre of airplane below tree-top level at a speed of 600 miles per hour was part of a recent test for B-52 jet bombers. The flights were made along

the Oregon and Washington coasts to test the efficiency of equipment designed originally for high-altitude use. At times the crew flew at altitudes below 200 feet.

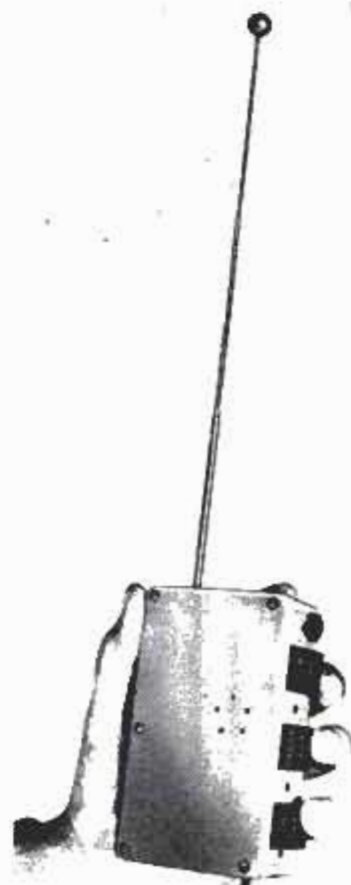


"Birdcage" Home For Fire Lookout

Lightning, porcupines and ants have caused forest fire lookouts in Idaho to abandon their wooden towers and build steel ones. Ants and porcupines attacked the wood, which was unsafe during storms.

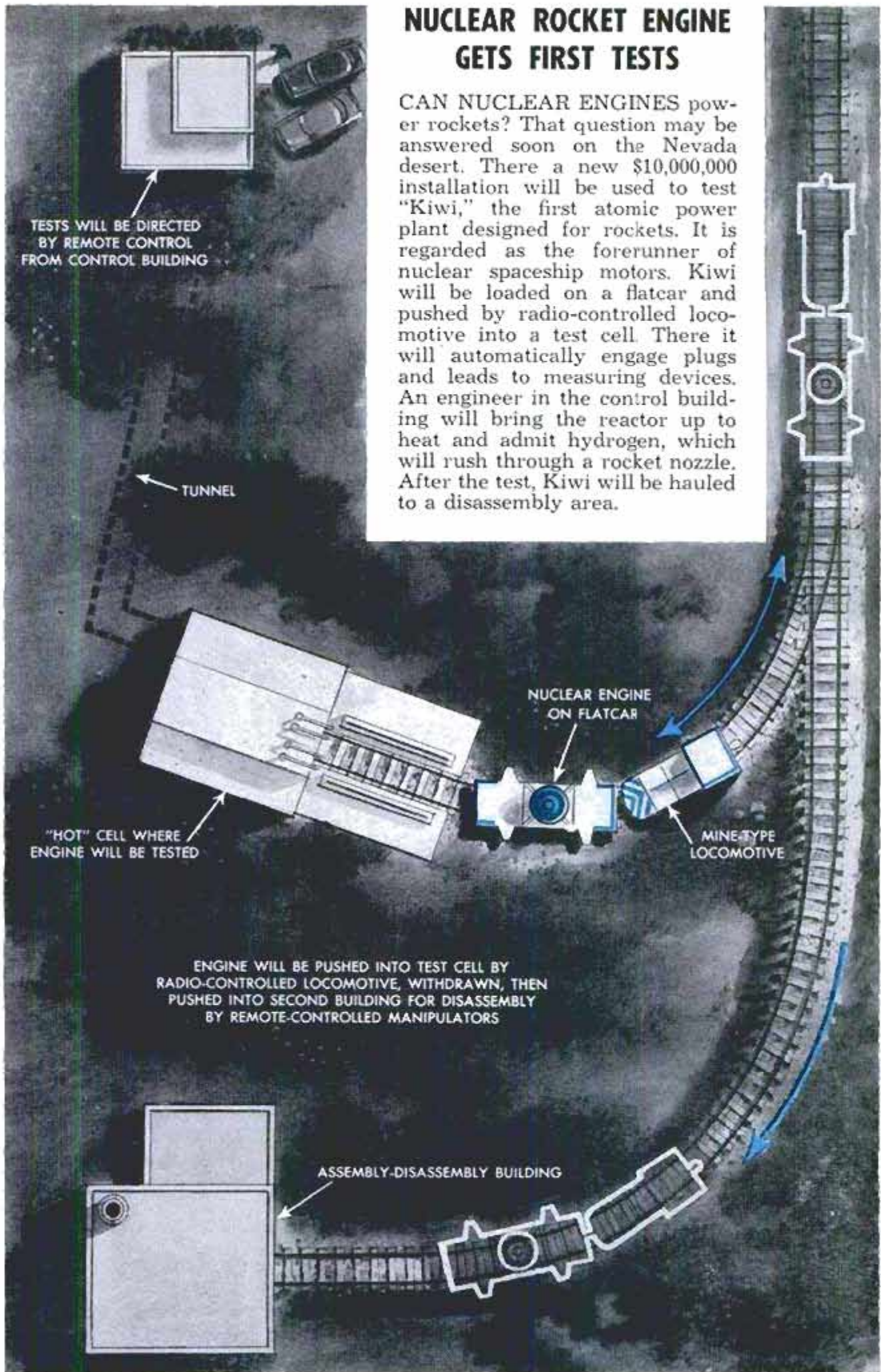
Waterproof Radio

Even after 15 hours of immersion in salt water a lightweight two-way radio will broadcast signals up to 100 miles. It's designed for air-sea rescue work. Spring-return switches on the side can be worked by a downed flier wearing heavy gloves.



NUCLEAR ROCKET ENGINE GETS FIRST TESTS

CAN NUCLEAR ENGINES power rockets? That question may be answered soon on the Nevada desert. There a new \$10,000,000 installation will be used to test "Kiwi," the first atomic power plant designed for rockets. It is regarded as the forerunner of nuclear spaceship motors. Kiwi will be loaded on a flatcar and pushed by radio-controlled locomotive into a test cell. There it will automatically engage plugs and leads to measuring devices. An engineer in the control building will bring the reactor up to heat and admit hydrogen, which will rush through a rocket nozzle. After the test, Kiwi will be hauled to a disassembly area.





In front of the Green Gables restaurant in Phoenix, Sir Launcelot and his charger bow to arriving guests

Have Dinner in

By Robert M. Hyatt

When a party's table is ready, the puppet "king's jester" announces the news from his niche at the bar



A VISIT to Phoenix's Green Gables restaurant is like flipping the pages of Sir Walter Scott. You're transported back to legendary times, when men were stalwarts in steel plate and women were glad of it. Here, in a walled medieval castle, you are introduced to a new experience in dining, built into a million-dollar business by a man with a dream and a childhood love of fairy tales.

He is Robert E. Gosnell, who 20 years ago was a \$160-a-month bank teller. Supplementing his meager income by raising vegetables at night and selling them in front of the bank before and after working hours, he bought 12 acres of land, borrowed \$20,000 and plunged into the restaurant business.

His first cafe was a frame structure he built entirely by himself. Business was so poor in the beginning that he coaxed his aunt and her sewing-circle friends to sit around the tables and pretend that business was looking up. When it actually did, its optimistic owner started dreaming bigger dreams. A few years later his present \$300,000 "castle" was opened for business.



Dressed with meticulous accuracy, some of the cast of employees wait to welcome people to the Middle Ages

the Middle Ages

The fantasy of this beautiful eating place cannot be ignored in a city famed for its Western atmosphere. Approaching it from a mile away, you can see great torches flaming on the gateposts. When you drive through them you leave the modern world behind. Sir Launcelot, in chain mail and astride a white charger, meets you and beckons with his lance. Your car is whisked away by a lad in forest green. Trumpeters announce your arrival.

Inside, stone walls and dark-beamed ceilings make an appropriate setting for a collection of armor, crossbows, broadswords and pikes. So authentic are the interior appointments—both weapons and architecture—that art directors of the Phoenix public schools list Green Gables as one of the art tours recommended for students.

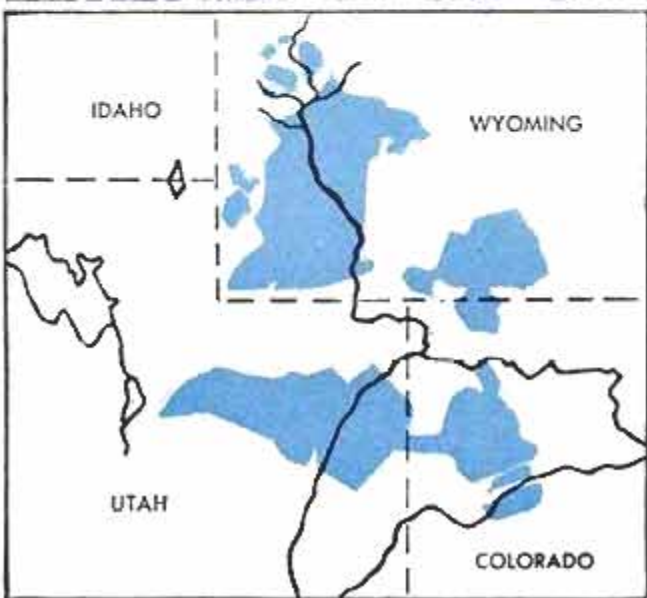
While you're enjoying a predinner cocktail, a stained-glass window opens and the "king's jester" pops out and tells you that your table is ready.

If a friend has tipped off some facts about you to the host, this puppet jester can be quite a heckler. He'll wisecrack, listen to

(Continued to page 232)

A guest gets into the Green Gables spirit by trying on a headpiece styled after the medieval fashion





Map shows some of the larger oil-shale deposits. Oil shale has been found in at least half the states. Model below shows process in which heated metal or ceramic balls "cook" oil out of the crushed shale

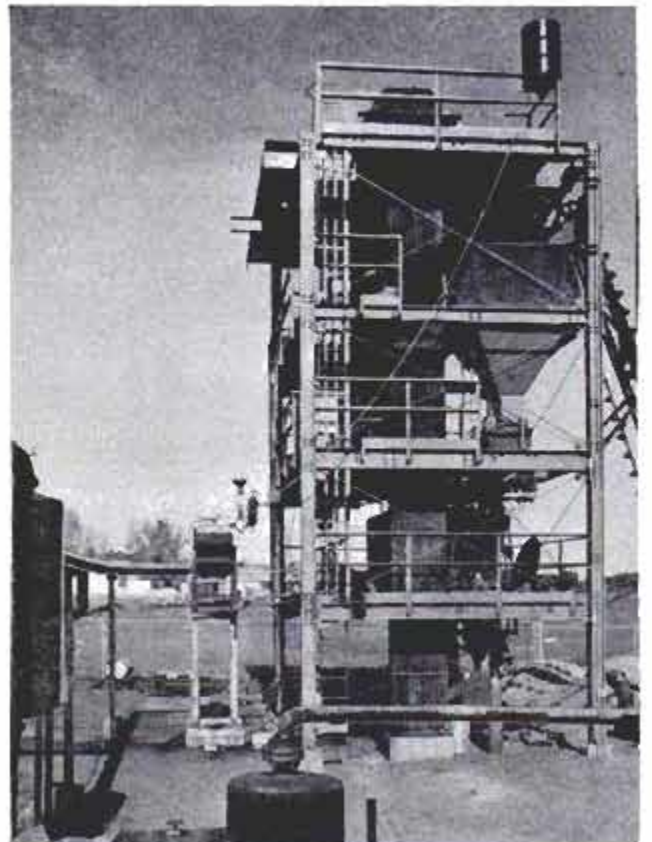
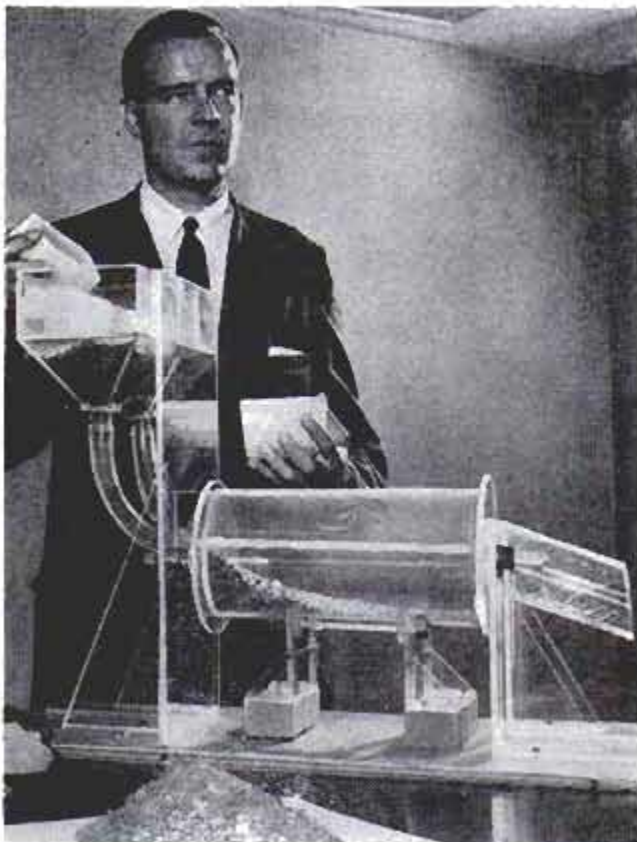


Rugged terrain of northwestern Colorado has vast deposits of shale that now can be made to yield oil

Inexpensive Oil From Shale

VAST OIL-SHALE DEPOSITS can be made to yield fuel at low cost through a process developed at the Denver Research Institute. Crushed shale is heated in a retort with hot walnut-size balls made of metal or ceramic. The heat drives off the hydrocarbons locked in the shale. Colorado alone has 1.5 trillion barrels of shale oil—50 times the nation's crude-oil reserve.

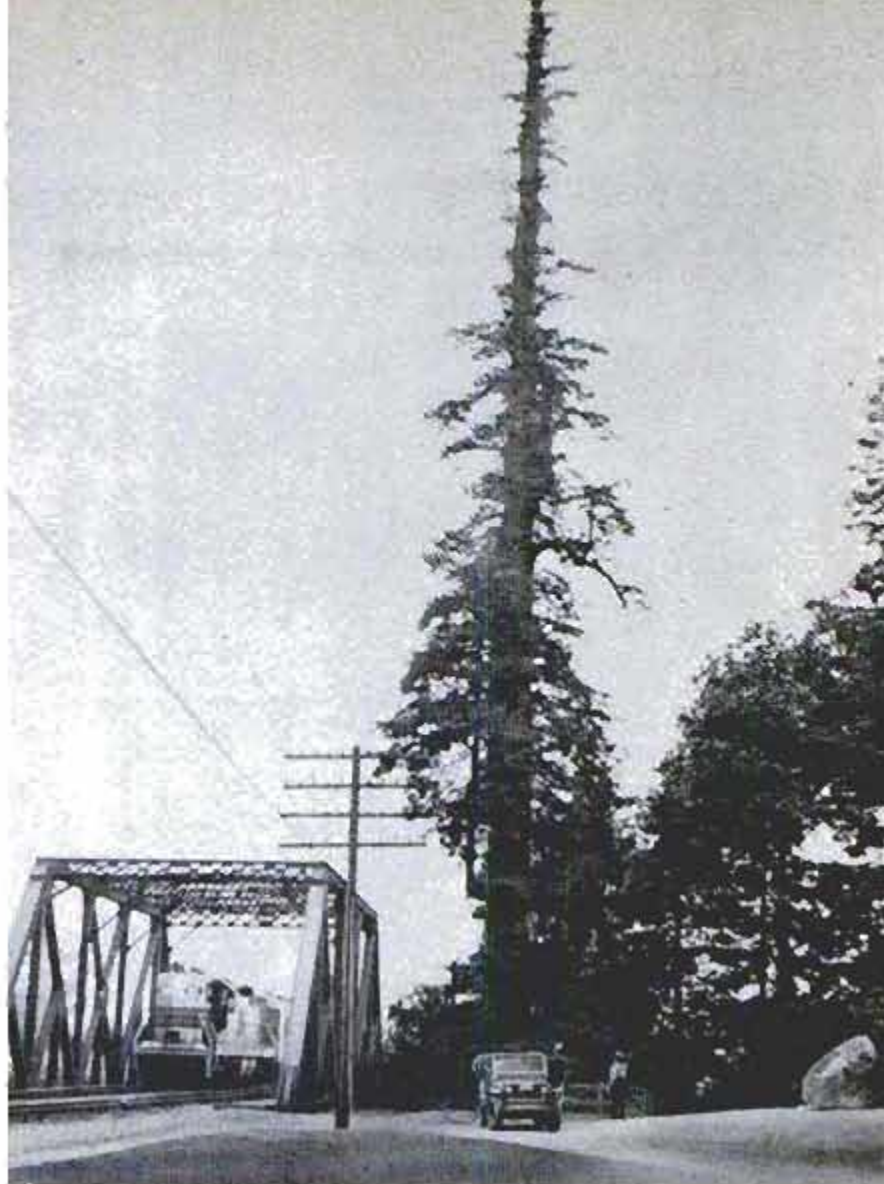
Pilot plant has been operating for nine months to prove value of process for obtaining oil at low cost



Built-in Shower Bathes Old Tree

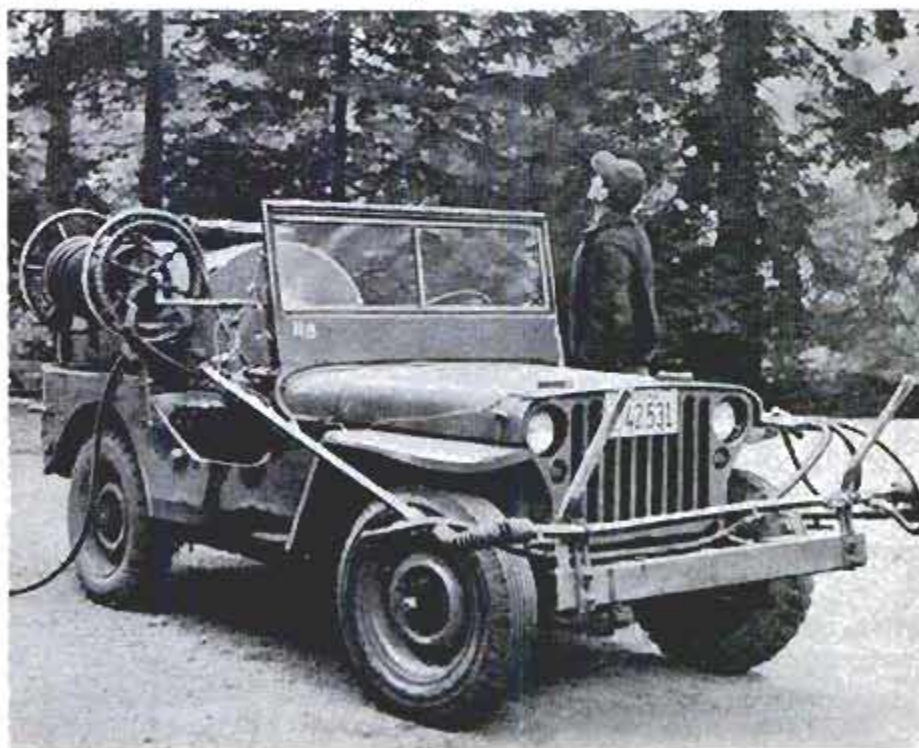
RAIN OR SHINE, a huge redwood tree in Palo Alto, Calif., gets a twice-a-month bath from its own built-in shower. The tree, 136 feet tall, is more than 1000 years old. It was California's first living landmark, appearing on maps as early as 1776. However, it has been plagued with troubles in recent years. The historic tree is out of the fog belt, its natural range. Also, the water table has steadily dropped, it has lost limbs, and part of the top fell off. Finally the Palo Alto Park Department decided to help out the old tree. A pipe was run up the trunk and a shower head installed 10 feet above the treetop. A Jeep-mounted pump sends water up the pipe for two hours twice a month. Today the tree looks better than it has in 20 years.

Pipe runs up the ancient trunk, ending in shower head



More than 1000 years old, the 136-foot tree has been a living landmark in California since 1776. A falling water table has caused recent damage.

Twice each month, a hydraulic pump mounted on a Jeep sends water up the pipe to give tree a shower bath. Special hydrant is located at base of the tree.





Chief Pilot Jim Holden "flies" the Vitannia-420 simulator, located in the basement of his parents' house

TEEN-AGE FLIERS—

*They Built Their Own Flight Simulator
To Tour the World in a Basement*

By Irving Petite

FIVE SEATTLE YOUTHS have about 700 hours of flying time to their combined credit, yet not one has a pilot's license.

They have "flown" to most of the world's airports, yet they have not been out of the basement of the L. E. Holden home near

the Seattle-Tacoma International Airport.

Holden is a Link Trainer instructor for United Air Lines pilots.

His son Jim, 18, is captain of a simulator that occupies a corner in the Holden basement and makes "training flights" possible. It was built by Jim with the aid of his



As chief flight engineer, Dick Grande occupies a compartment just behind pilots



At the *Vitannia's* entrance, Co-Pilot John Block, Dick Grande and Jim Holden, left to right, talk about their next "flight"

father and several classmates from Highline High School and is an exact model of an airplane cockpit with its instruments and controls.

It simulates a four-engine turboprop plane patterned after Great Britain's Vickers Vanguard.

"The boys have approximately \$100 worth of parts and materials in the simulator—together with uncounted hours of labor," said Holden.

Labor meant not only assembling the parts and instruments but also shopping for bargains at aircraft-surplus establishments. Many instruments were donated by pilots and mechanics.

Kept Cost Down

"We kept the cost down," Jim said. "We had to buy quite a few lights and switches, the windshield plastic and some plywood. But many parts were given to us and we bargained for others. We have B-24 throttles, a main panel and seats from a C-46, one panel from a Link Trainer and a panel from a PBV.

"Ernie Gunnison, a United Air Lines radioman, hooked up the radio microphones for us," Jim said. An airlines electrician installed vibrators, which approximate engine sounds at various speeds.

Accuracy in Procedure

After observing a flight in the simulator, a pilot said, "It is revealing to watch the accuracy with which they go through all procedures—filing a flight plan, pretake-off check, clearance with the control tower and so on through the entire flight."

The simulator had its beginnings eight

years ago when Jim Holden was 10. It began as a bomber mockup, later rebuilt as a DC-4 transport simulator.

Log Flights for Two Years

Frank Martin, who now lives in Hong Kong, where his father is a dispatcher for Pan American World Airways, helped build the simulator. They kept a log of flights for their *global* airline for two years, then the present crew rebuilt the simulator as a Vickers Vanguard.

The present crew, captain Jim Holden, copilots John Block and Randy Schmoyer, chief flight engineer Dick Grande and chief navigator Doug Downs, all plan to become pilots except for Grande, who wants to be a dispatcher.

The fliers named their simulator *Vitannia-420* because it combines Vanguard's features with a few from the Bristol Britannia.

It's Serious Business

Flying the *Vitannia-420* is a serious undertaking. "We know the importance of close attention to detail," Jim said. "We had one near accident when we ran out of fuel between Los Angeles and San Francisco. Our copilot took us on a heading of 31° instead of 310°. We made a safe emergency landing but it was a good warning to us."

The young men all know how to use computers and air charts.

They get in actual flying time, too. Jim plans to get his private pilot's license soon. Both he and Dick Grande have done glider flying with the Air Scouts, and Jim has considerable time as student in a light plane. ★ ★ ★



Simulator is a detailed replica of the DC-8 jetliner cockpit, with identical instruments and flight controls

Jet Pilots "Fly" in Simulator

Without ever leaving the ground, a jet pilot now can make a complete "flight." A jet-aircraft simulator, used by United Air Lines to train pilots, can duplicate real flights. The pilot sits in a cockpit identical

Pilot views a projected image of a runway on a TV screen. Picture changes as he maneuvers simulator

to that of the new DC-8 jetliner. As he "flies" the plane, he views the terrain and runways on a closed-circuit-TV screen. The picture in front of him changes in the way he maneuvers the simulator.

Huge relief map is scanned by television camera, which moves in response to the pilot's controls



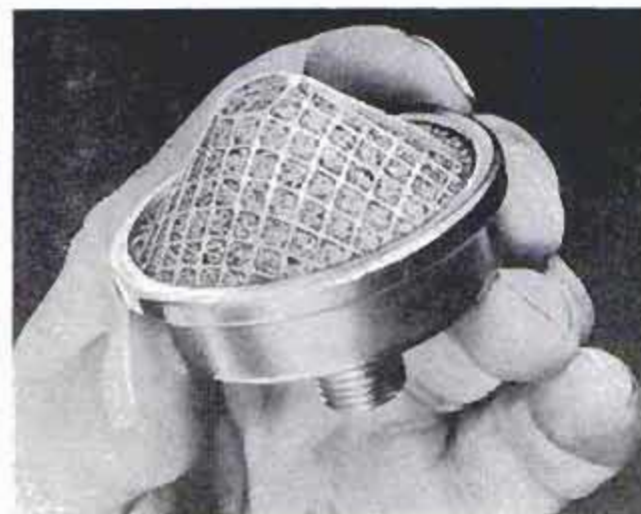


Lightweight Oxygen Set Carried on Shoulder

Hospital patients can now carry oxygen around on their shoulders. A portable set weighs just three pounds two ounces, and is easy to operate by hand. Its self-sealing cylinder can be changed quickly by unscrewing the control head.

Filter Quiets Exhausts

Air exhausts can be silenced by fitting a tiny noise filter to discharge ports or piping. Suitable for motors, vacuum pumps or pneumatic brakes, the silencer breaks up the shock waves as compressed air is exhausted into the atmosphere.



DECEMBER 1958

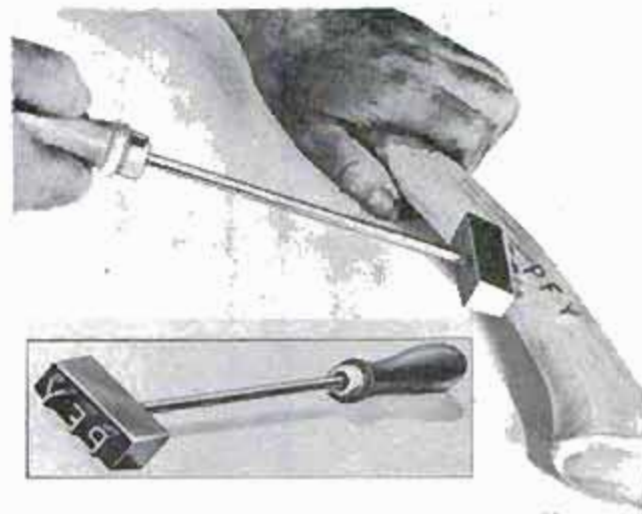


Underwater Spotlight Pressurized for 250 Feet

Safe underwater illumination is possible with a spotlight whose unified battery and case has been pressurized so it can function to depths of 250 feet. The battery power pack is leakproof and the unit has double-chrome protection of all metal parts.

Branding Iron for Tools

Brand your initials in your tools and sports equipment. A personalized branding iron contains Gothic letters $\frac{3}{8}$ inch high. They are custom cast in solid bronze. The iron's head is heated over a flame, then pressed into the material to be marked.



119



When frost threatens, mobile flame thrower ignites heaters scattered over 50 acres of California orchard

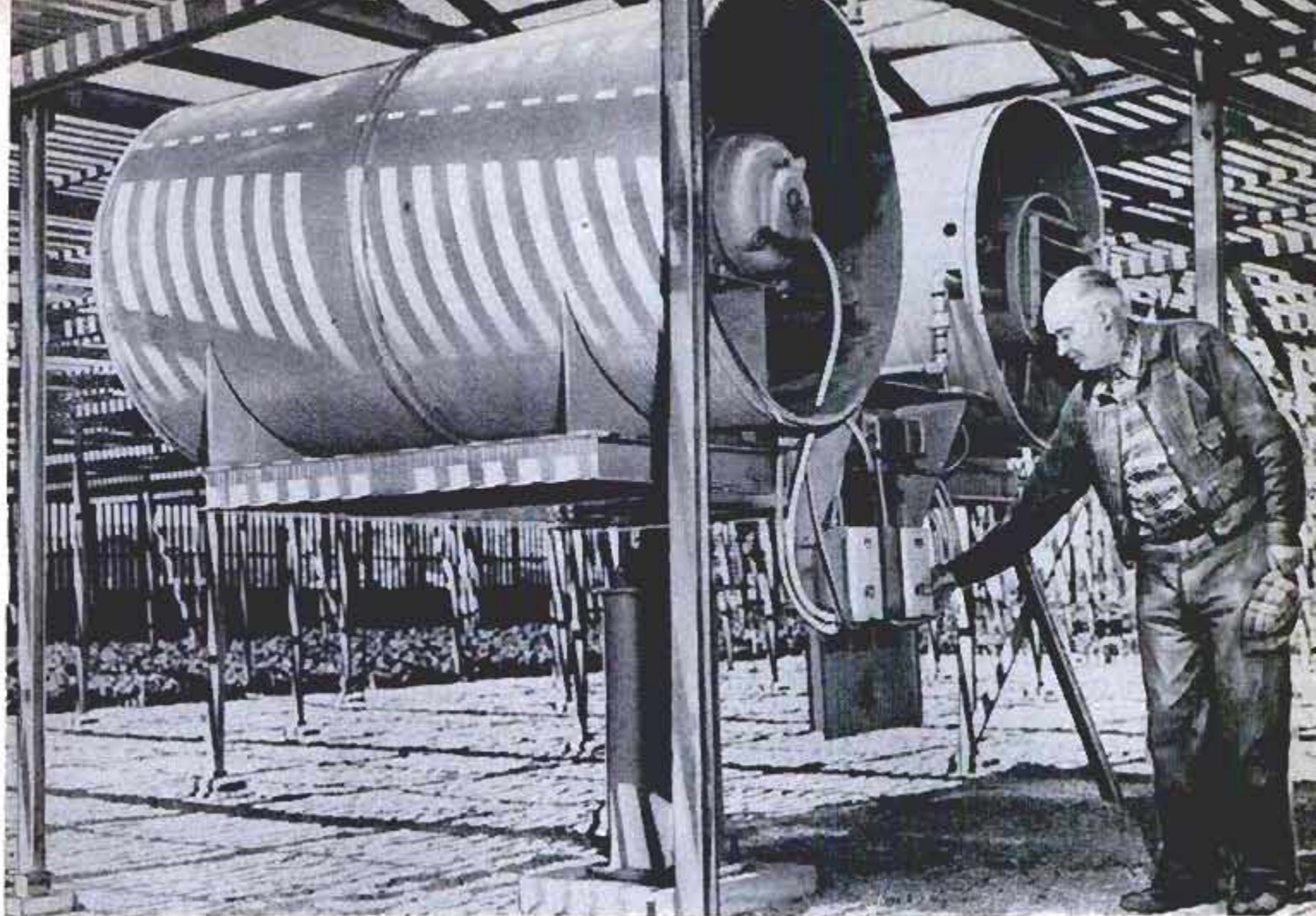
The Battle of the Orchards—

Hailstorms are controlled by small generators which consume coke impregnated with silver-iodide particles



FARMER FIGHTS FROST

By F. Leland Elam



The two heat tunnels, above, have fans that force warm air in opposite directions as unit rotates slowly

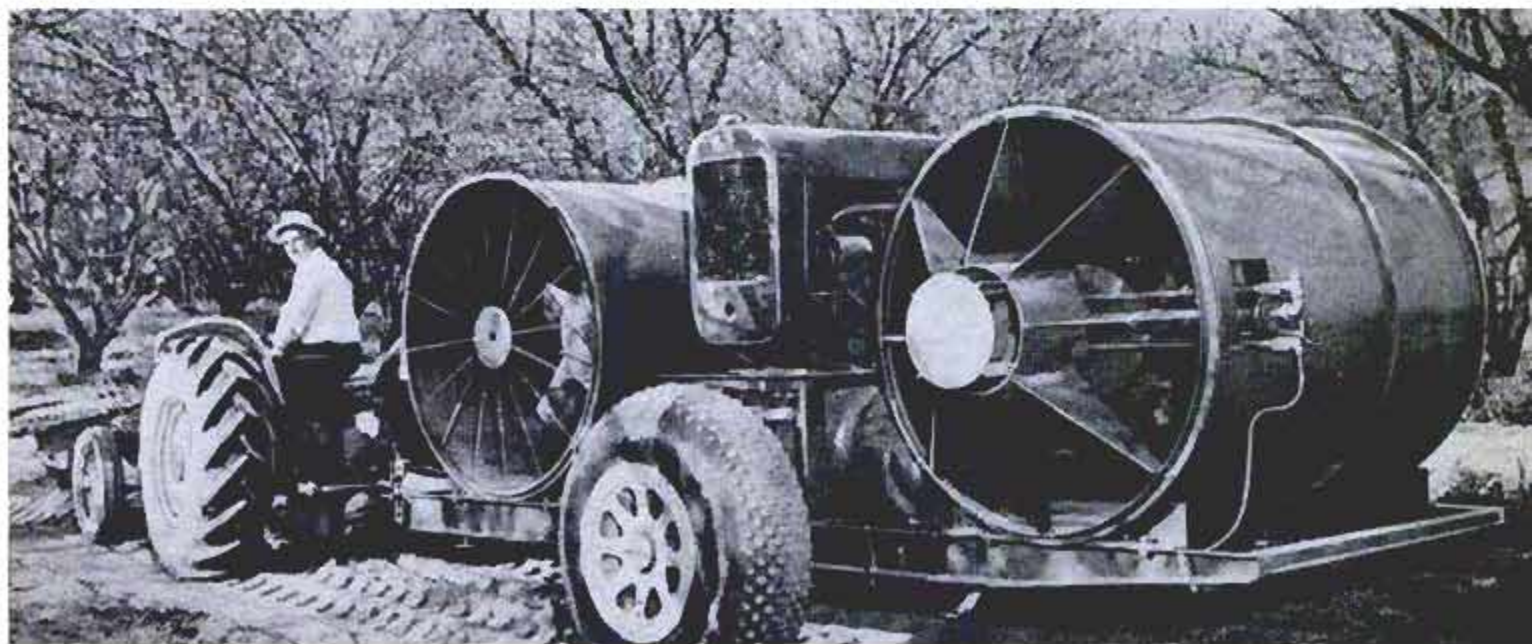
THERE'S A WAY to do it better—find it!" That was the philosophy that drove Thomas A. Edison toward immortality. That same philosophy is driving the farmer, assisted by inventive men, in his desire to find the best ways to control the weather so it will not cause billions of dollars in damage annually to crops.

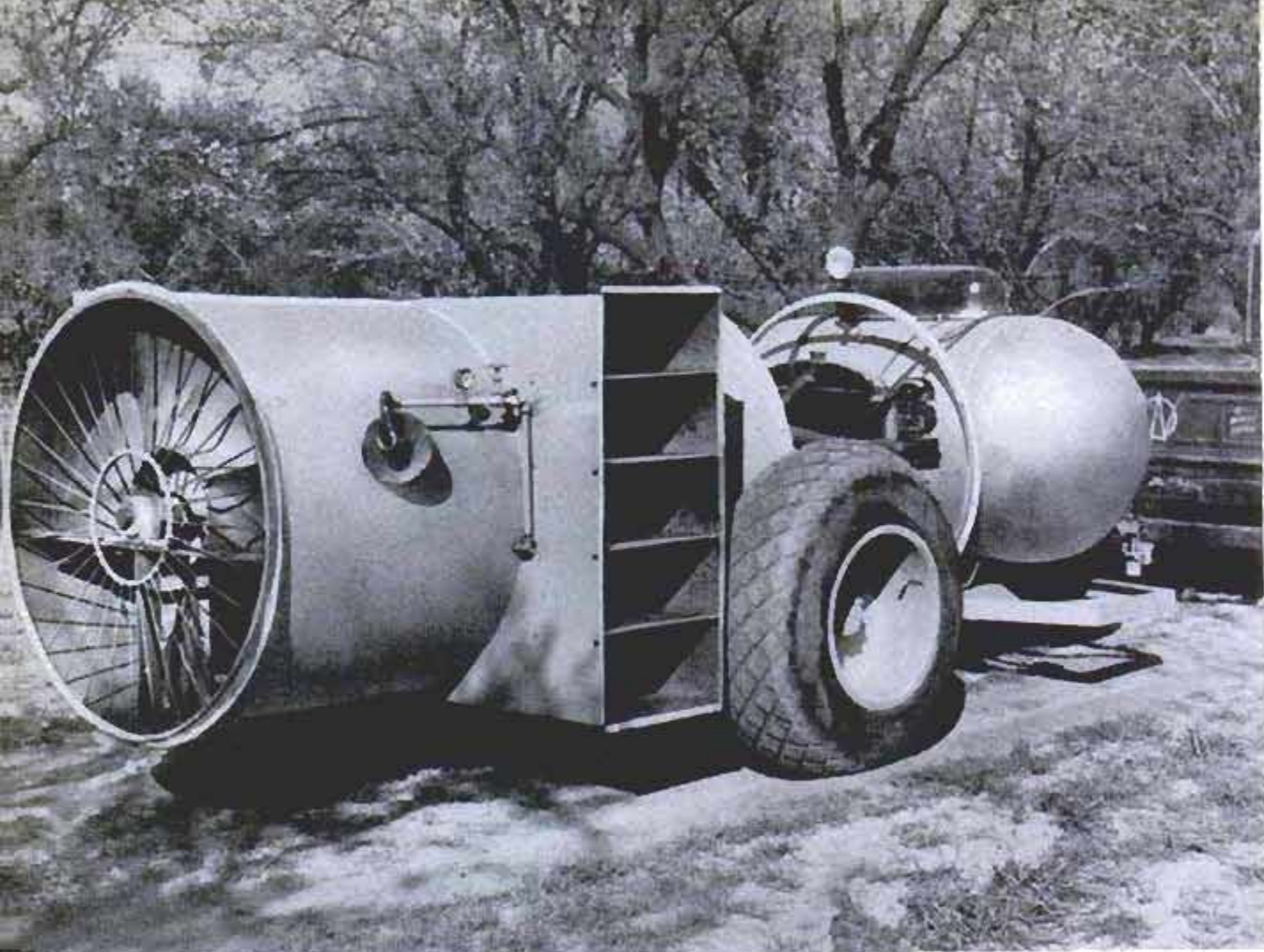
Farmers have fought the destruction created by freezing temperatures since man began to learn about the weather. For decades they have had to rely on dirty oil-

burning smudge pots, burning automobile tires and, more recently, wind machines on towers designed to move warm air from above the orchard to the freezing areas at ground level.

Science has opened up new frontiers. Now giant machines spew out hot air in massive quantities and whip it across the crops to raise the temperature to a safe level. Hailstones are destroyed before they can damage fruit, by ground generators and airplanes that send silver iodide into

Similar to the heat-tunnel unit at the top of the page is this "heatmobile" that protects 20-acre orchard





Another model of mobile heater burns butane, has fan vents on both sides, airplane tires for soft ground

Smudge pot with fan reduces smoke, uses fuel more efficiently. Fan blows toward burner in the bucket

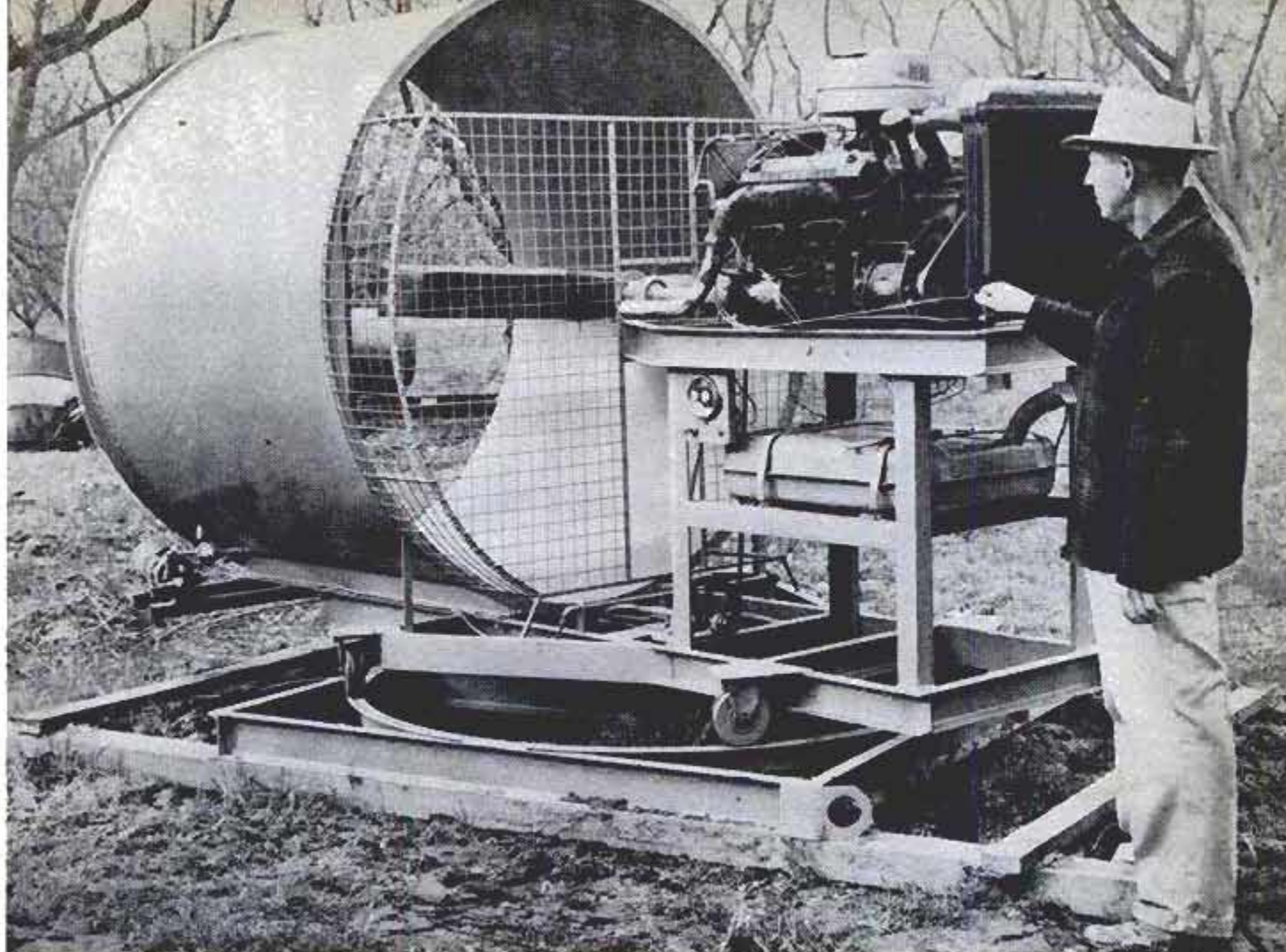


the clouds. Helicopters whip the rainwater off ripening fruit so it will not crack when the sun comes out.

Frost is probably the most destructive. It hits fast in the middle of the night over wide areas and its destruction can be total. Hail can be as damaging but its destruction is generally localized.

One of the newest machines for frost control is a portable "heatmobile," developed by M. R. Robinson of San Martin, Calif. It is pulled through orchards or fields by Jeep or tractor. It consists of two butane-burning furnaces and two four-bladed fans, set in four-foot-high tunnels at each end of the trailer. A 75-horsepower industrial engine between them develops the necessary power. The fans face in opposing directions to distribute air from both sides of the trailer, pushing out four million B.T.U.s in a per-minute volume of 160,000 cubic feet of air. They protect up to a distance of 400 feet.

When the temperature drops close to 32 degrees, normally around two a.m., the farmer climbs out of bed, lights the heaters, starts the engine, and drives into the dark orchard to continue for about five hours a course designed to give maximum protection to every tree.



This air distributor rotates on a steel track as heat is forced over 10-acre area. Unit is towed on skids

"The rate of travel brings the outfit to the same point every seven minutes when traveling at four miles per hour," Robinson explains. "It will hold the temperature in the orchard at three to four degrees above freezing."

In most important fruit and row-crop growing areas the weather bureau, working with cooperating farmers, has a frost-warning system that makes possible detailed broadcasts by radio and television, advising what frost conditions can be expected.

In an area to be serviced by such forecasts temperature and dew-point stations are set up on strategic ranches. The farmer learns how to read the instruments, record the findings and phone them to the weather bureau each day at 4:30 p.m. After this information is diagnosed and coordinated, the frost-warning expert can predict what the temperature and dew-point condition will be in the area around each station.

To eliminate the all-night vigil, the farmer places thermometers at strategic points and connects them to a warning bell which awakens him when the temperature drops close to 32 degrees.

If, like Rodney Vertrees of Wheatland,

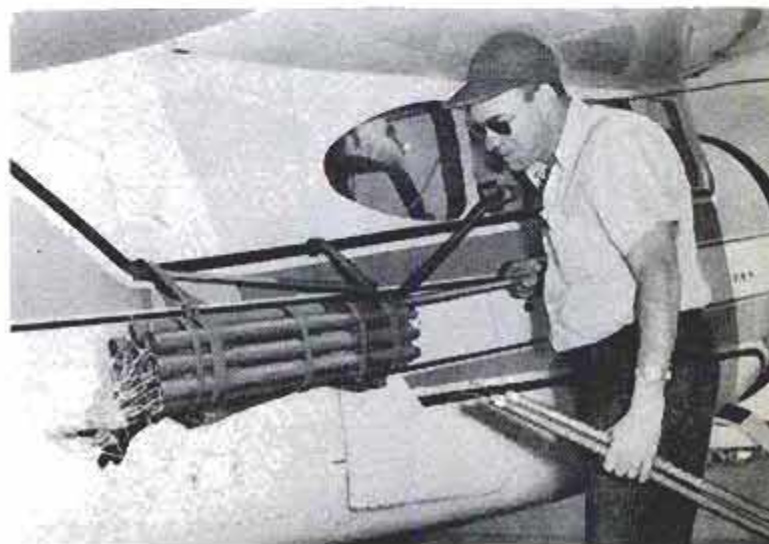
Calif., the orchardist has some frost-control device that does not have to be towed, he can start it working, then keep an eye on it from the warmth of his house.

Vertrees has developed a heated-air distributor that is mounted on skids and can be towed to an operational site. It revolves on a steel track once every five minutes to send the hot-air flow to every corner of the 10 acres that it is capable of protecting.

A steel tunnel directs the air developed from a 72-inch prop, originally designed

(Continued to page 226)

Latest method of cloud seeding employs silver-iodide fuzees which are ignited by controls in cockpit





Modular Units Enclose Porch

ABOUT TWO THIRDS of the work involved in framing and installing porch-enclosure windows can be saved by using prefabricated components. Framing of the porch in the photograph below was completed in one morning with window-and-wall components. The windows are glued and nailed to the framing members at the factory. The modular units are tilted up, one by one, nailed to the floor and to the header. The units also are joined together by corrugated fasteners on the inside and nailing on the outside.



Big Wind Tunnel Tests Jet's Wiper

Manmade rainstorms with velocities up to 200 miles per hour were generated in a wind tunnel to test a windshield-wiping system designed for the Air Force's new F-105 fighter-bombers. The system washes extremely hot air of 300 to 700 degrees Fahrenheit over the front of the cockpit canopy, literally drying the rain before it reaches the windshield. The hot air is drawn from the jet's huge engine and is fanned over the canopy by a specially designed duct-and-nozzle arrangement.



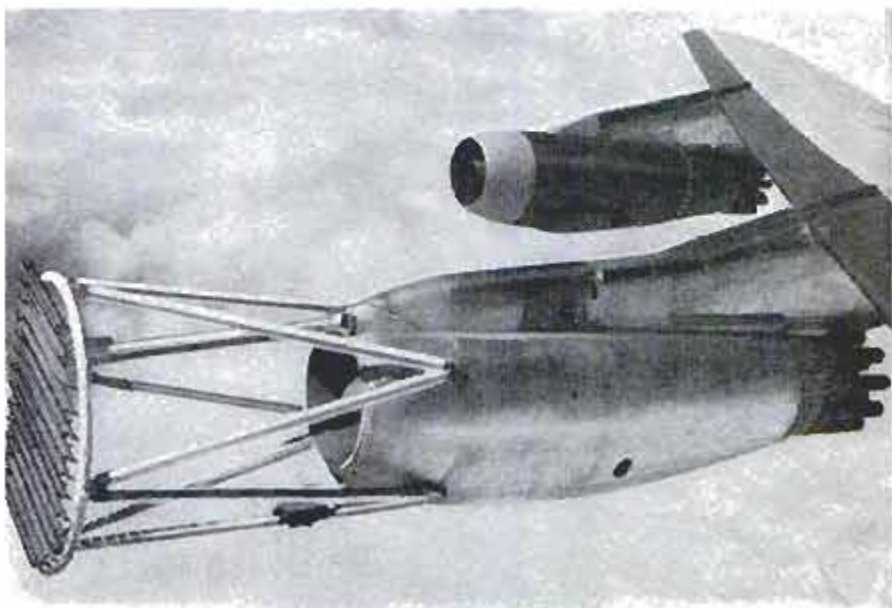
Hybrid Car Body

Attracting a lot of attention around Wethersfield, England, is a "custom" car body synthesized by a U.S. Air Force officer. Beginning with a Ford Anglia chassis, Lt. Col. Edward Risher added a cut-down Chevrolet hood, the rear windshield from an American Ford and Austin Bantam wheels. As a final touch, Col. Risher used two wing tanks from a T-33 jet trainer.



Jet Tests De-icer By Making Own Ice

To test the de-icer on Boeing's 707 jet airliner, a Venetian-blind-type water-spraying system was attached to the plane's No. 3 engine. The system's 109 nozzles shot water directly at the engine, and ice formed quickly on the cowling. The de-icing system was turned on after the ice had reached a thickness of one quarter inch. The ice disappeared in less than half a minute.





WHAT'S NEW FOR Your Home



TOLL CALL COMPUTER tells you how much those incoming and outgoing long-distance telephone calls are costing. You simply select the base rate—for three minutes—by turning the rate wheel, then set the timer for the full 15 minutes. An arrow in the rate bar points to the mounting charges while you talk
B. C. Moses, 5134 Mercer Ave., P.O. Box 6352, Houston 5, Tex.

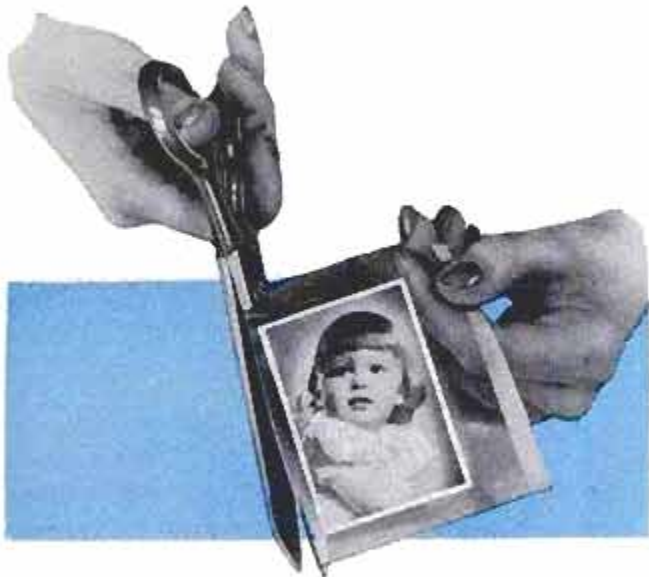


GAS HEATER, upper left, is mounted in wall or window. It uses no air or oxygen in room itself, drawing air from outside. Products of gas combustion are power-vented outdoors. Unit has temperature control and two blowers—one for circulating heat, one for carrying outside air into combustion chamber
Suburban Appliance Co., P.O. Box 206, Whippany, N. J.



ELECTRIC KNIFE SHARPENER, left center, hones blade at 7200 strokes per minute. Precision guides insure sharpening at correct angle. Operating on 115-volt, 50-60-cycle alternating current, the device is held by hand and can sharpen knives of all sizes. It has ivory plastic case and russet vinyl panels
Burgess Vibrocrafters, Inc., Graylake, Ill.

KITCHEN BROILER provides outdoor charcoal-type meat and fowl preparation inside house. Meat or fowl is held between vertical racks. Food broils on both sides simultaneously and automatically, sealing in juices and flavor. Shrinkage is cut down. Taste is similar to that of meat or fowl broiled over coals
Norge News Bureau, Merchandise Mart Plaza, Chicago 54.



ACETATE PLASTIC COVERS for protecting photos and cards against soiling and tearing can be made from do-it-yourself kits. Back of photo or card is pressed onto sheet of acetate coated with sensitive adhesive. Uncoated acetate is placed over face of card or photo, then is trimmed to size with scissors.

~~Gelanox Corp. of America, 180 Madison Ave., New York City 16.~~

*American Klear-Vue Plastics Inc.
Maspeth, New York*

ELECTRIC DRYER, upper right, takes no more space than a medicine cabinet and accommodates items often laundered in bathroom. It uses a 325-watt heating unit and four-inch suction fan. Hot air is drawn through cabinet and goes out louvers at bottom of door. Dryer can serve as auxiliary heater.

Louver Mfg. Co., 3601 Wooddale Ave., Minneapolis 16, Minn.



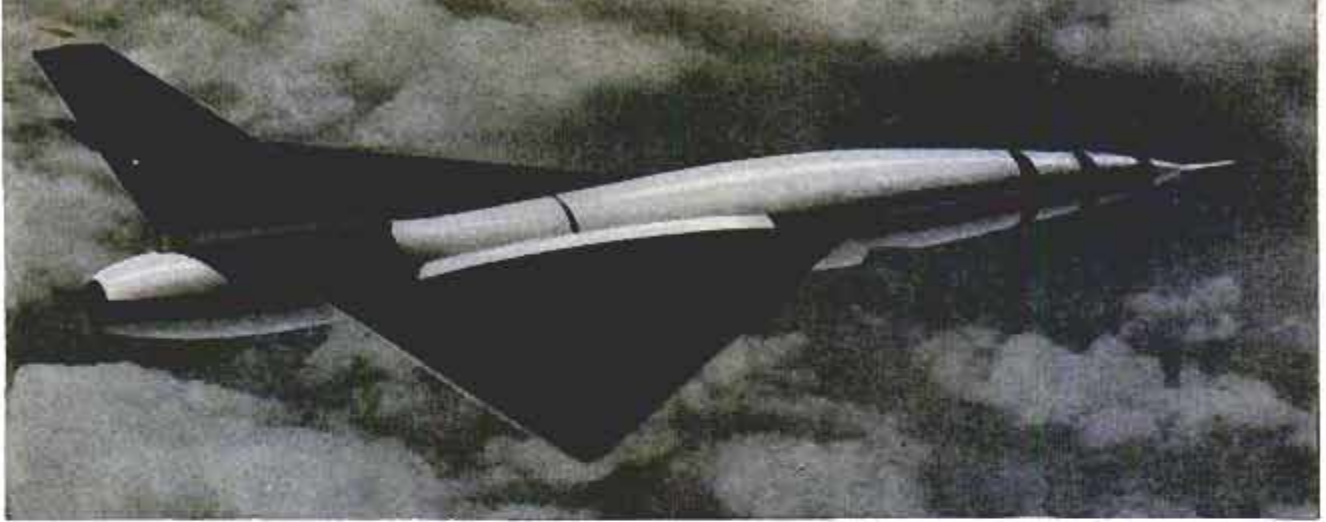
CORDLESS TIME SWITCH, right, remembers for you and makes all electrical household appliances automatic. It can be plugged into outlets over kitchen counter and workbench, or behind furniture and appliances. Portable switch has electrical rating of 120 volts and 60 cycles and a 24-hour time range.

Paragon Electric Co., Two Rivers, Wis.

METALLIC TRIM TAPE can be easily applied to shelves, ashtrays, telephones, refrigerators, automobiles, etc. Flexible as ribbon, this self-adhering tape can be cut with scissors. It is applied with slight pressure after removal of protective backing. Tape retains luster and will not tarnish, fade or rust.

Marglo, Inc., New Britain, Conn.

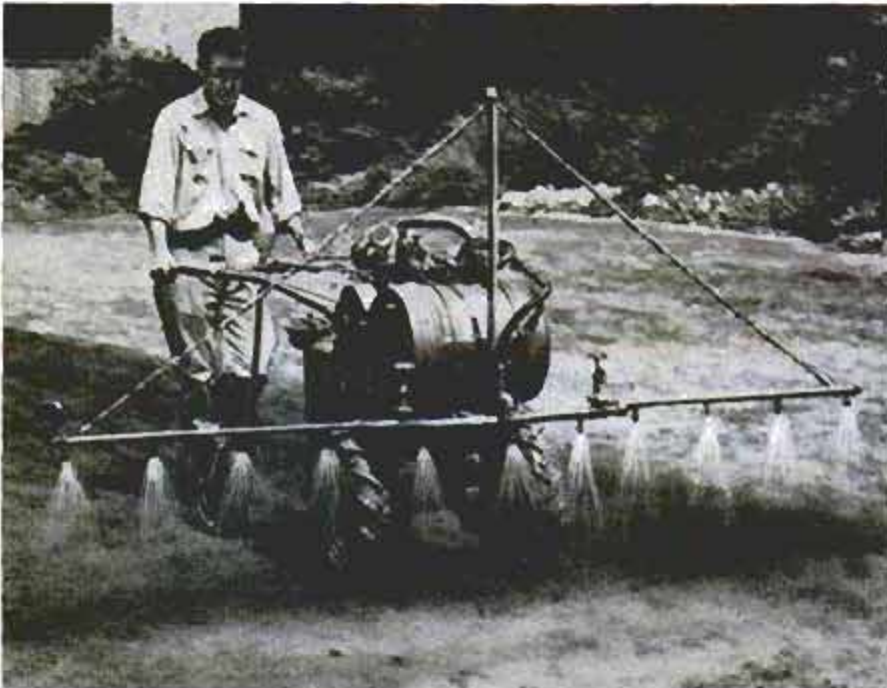




Air Force Tests Air-Breathing "Goose" Missile

One of the air-breathing missiles being added to the Air Force arsenal is called the Goose. Although its performance data and specifications remain classified, the

Goose was photographed recently on a test flight at Cape Canaveral, Fla. The Fairchild Aircraft Division is the prime contractor for the long-range missile weapon.



Green Spray Tints Lawn

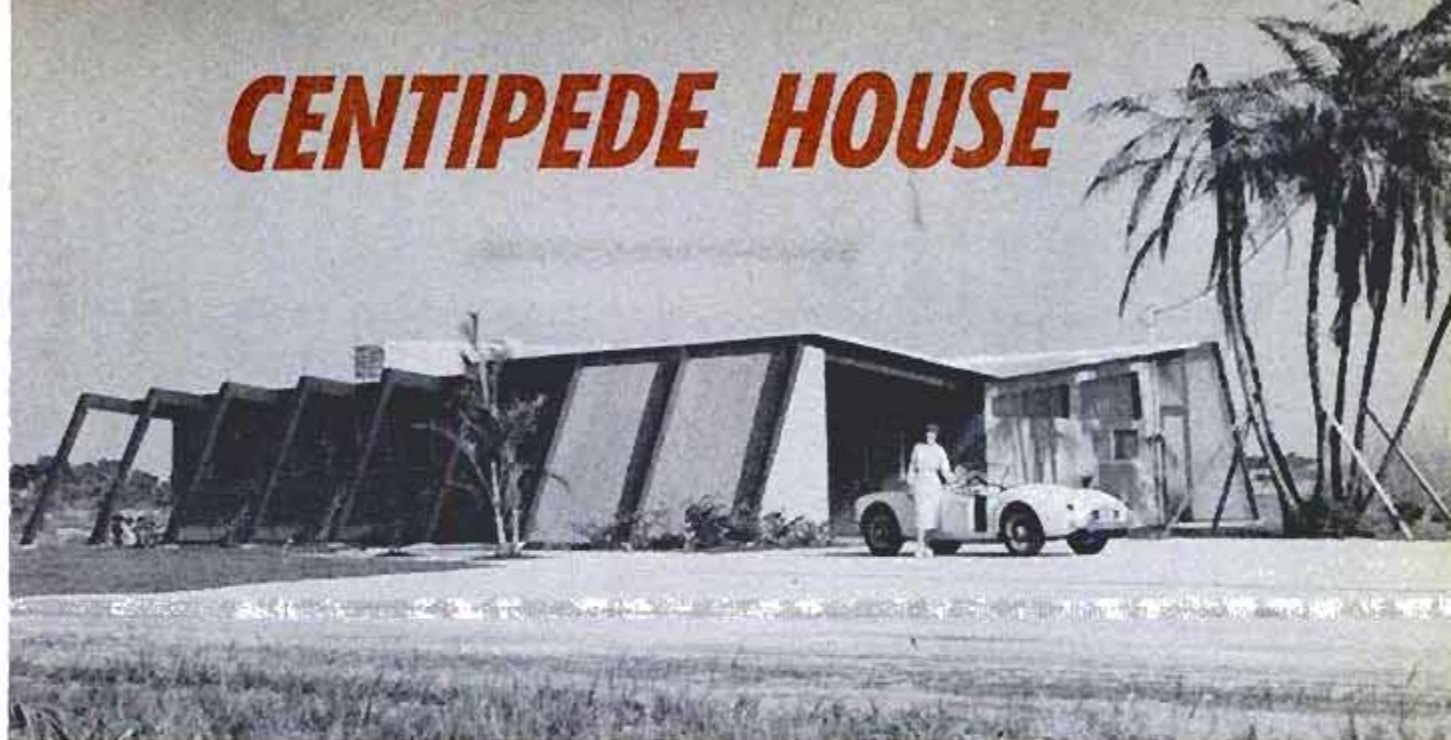
Homeowners who have been plagued by lawn grasses that turn brown in late summer can restore the natural color with a green tint. The tint is sold as a concentrate that is mixed with water and sprayed on the discolored areas. It dries in 15 minutes and does not rub off or track. The turf coloring does not damage shrubbery, trees, bordering plants or growing grass, according to the manufacturer. It does not harm children or pets.



Farm-Size Dryer Saves Wet Crops

Artificial drying can save farm crops during a wet harvest season or allow early harvesting in a normal season, while field losses are low. A portable batch-type blending dryer now available for farms produces four million B.T.U.s of heat per hour to remove excess moisture from shelled corn, sorghum, soybeans, wheat, barley and oats. The unit has a 34-inch fan.

CENTIPEDE HOUSE



Like the legs of a centipede, outriggers support roof of this unique house perched beside a Florida lagoon

By Max Hunn

FORTY-FIVE MINUTES of sketching in the wee hours of the morning led architect Nelson A. Faerber, of Naples, Fla., to develop a house design with a unique exterior and an interior tailored for informal semitropical living.

Few who see the one-bedroom, two-bath

house in the Vanderbilt Beach section of this Florida community can resist coining their own name for the residence. It has been called the "Centipede House," "Butterfly Mansion," "Lazy M," and "Spider"—each somewhat descriptive of the unusual design. The house appears to be

Glass walls made of nine-foot sliding panels, and the screened area beyond create indoor-outdoor effect



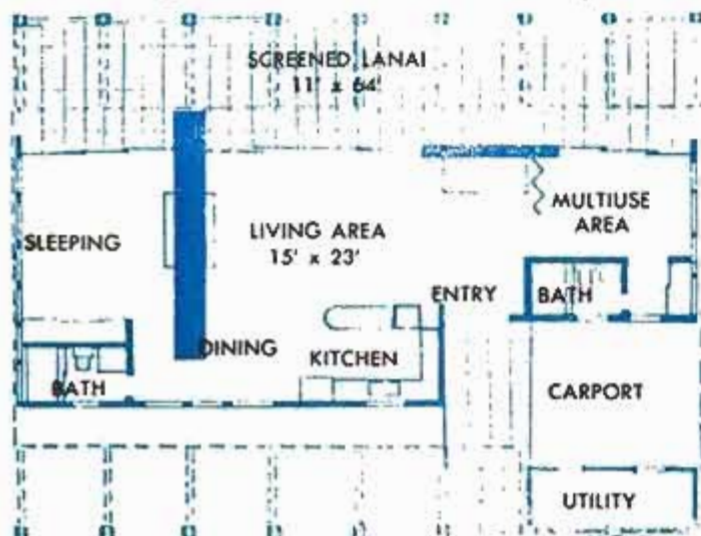


Screened outriggers across length of house provide an outdoor-living area 11 feet wide and 64 feet long

crouching on its many "legs" at the edge of a picturesque lagoon.

The design, however, is not for show but for practical reasons. The lot Mr. and Mrs. Percy Rheume, of Detroit, Mich., purchased for their winter-retreat home, had unusual dimensions: 68 feet fronting on the lagoon, 140 feet across the back, 120 feet on one side and 144 feet on the other. Basically, they desired a place for informal,

Multiuse area with adjoining second bath also can serve as guest room. There are few interior partitions



semitropical living, where they could retreat from the pressures and routine of a large city. This to architect Faerber meant lots of lounging space and maximum utilization of indoor-outdoor living areas.

Architect Faerber worked out a simple open-plan design, permitting a vast expanse of glass wall facing the lagoon. This necessitated a design which would eliminate the usual need for exterior walls bearing the weight of the roof.

Outriggers—which create the centipede appearance of the exterior—solved the problem. By suspending the center beams from 18 outriggers, he eliminated any necessity for the walls bearing the roof load. The outriggers, first prefabricated on the site and then tilted into place, are two two-by-eights with a six-inch wood block between. The roof beams and the supporting outriggers are spaced eight feet apart.

One entire side of the house is enclosed with sliding glass walls, except for two stone areas—one a background for an indoor planter at the entry, and the other a wall between the sleeping area and the rest of the house. This wall has a two-way fireplace opening into both bedroom and living areas, as well as an outdoor barbecue grill.



Breakfast bar adjoins the compact and modern kitchen area which is handy to the informal-dining section

There are 435 square feet of one-quarter-inch plate glass in the nine-foot-tall panels which are mounted in aluminum frames and are on rollers. The glass walls can be moved to provide the maximum circulation of air. This entire side of the house is screened on the outriggers, providing an outdoor-living area 11 by 64 feet.

Exterior and interior wood paneling is of red cypress, making a pleasing contrast with the rough Tennessee crab-orchard stone. Ceiling beams are exposed. Everything about this house is planned to create an atmosphere of luxurious and informal living. Although the house, which cost less than \$25,000 exclusive of the lot, landscaping and architect's fees, is considered a one-bedroom residence, a 10 by 16-foot multipurpose area may be closed off to serve as a guest room. The second bathroom is adjacent to this area.

Architect Faerber used the butterfly-roof style in

order to achieve the maximum height on the nonload-bearing exterior walls. Although designed for a warm climate, the house plan can be utilized wherever a picturesque view is available and informal living desired. Of course, double-thickness, insulating glass would be used if the house were built in a northern climate.

Faerber says he conceived the basic form for this unusual house design in 45 minutes. However, he was uncertain of his

Outriggers are enclosed beside carport to form utility room. This view also shows windows of bath and multiuse area, plus big porch





Interior wall of stone (only major wall in the house) divides living and sleeping areas and has a two-way fireplace which also opens into master bedroom. Glass wall at the right overlooks a picturesque lagoon

Outriggers shown at the back—or is it the front?—of the house are made of two by eights and support entire weight of the roof. Exterior walls here are to kitchen and dining area



clients' reaction to the unconventional approach. When they came into his office, he jokingly told them: "I've finished your design," and showed them several rough pencil sketches.

The Rheumes studied the sketches briefly, and asked: "When can the drawings be completed and construction started?"

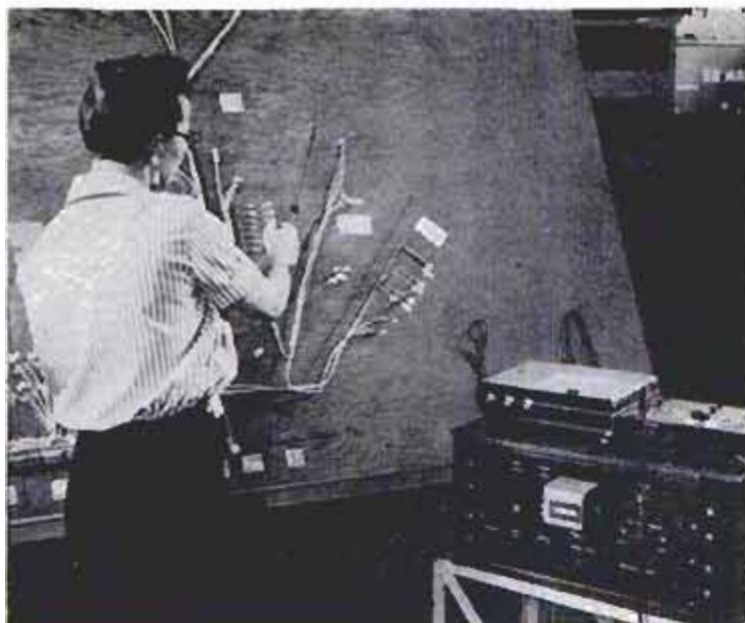
At first, Faerber thought his ears were playing tricks on him; then he realized that his clients had a full appreciation of contemporary architecture.

"I'll rush the drawings," he promised them, "and you'll be living in the house before the snow flies in Detroit. Sure you don't want to make any changes?"

"No changes," said the Rheumes.

The house was finished 120 days later.

Faerber is convinced that in architecture, as well as in the other arts, the simplest and most logical solution to a design problem frequently turns out to be the best—even if it is a bit on the revolutionary side. ★ ★ ★



Tape-Recorded Instructions Replace Assembly Diagrams

Complicated electrical-assembly work can be performed by employees without printed instructions. The step-by-step instructions are recorded on magnetic tape

and transmitted to the employee through a hearing-aid type instrument. The woman at left is wearing one of the tiny earphones. The engineer is recording instructions.

Coach Lantern Replica Helps Greet Season

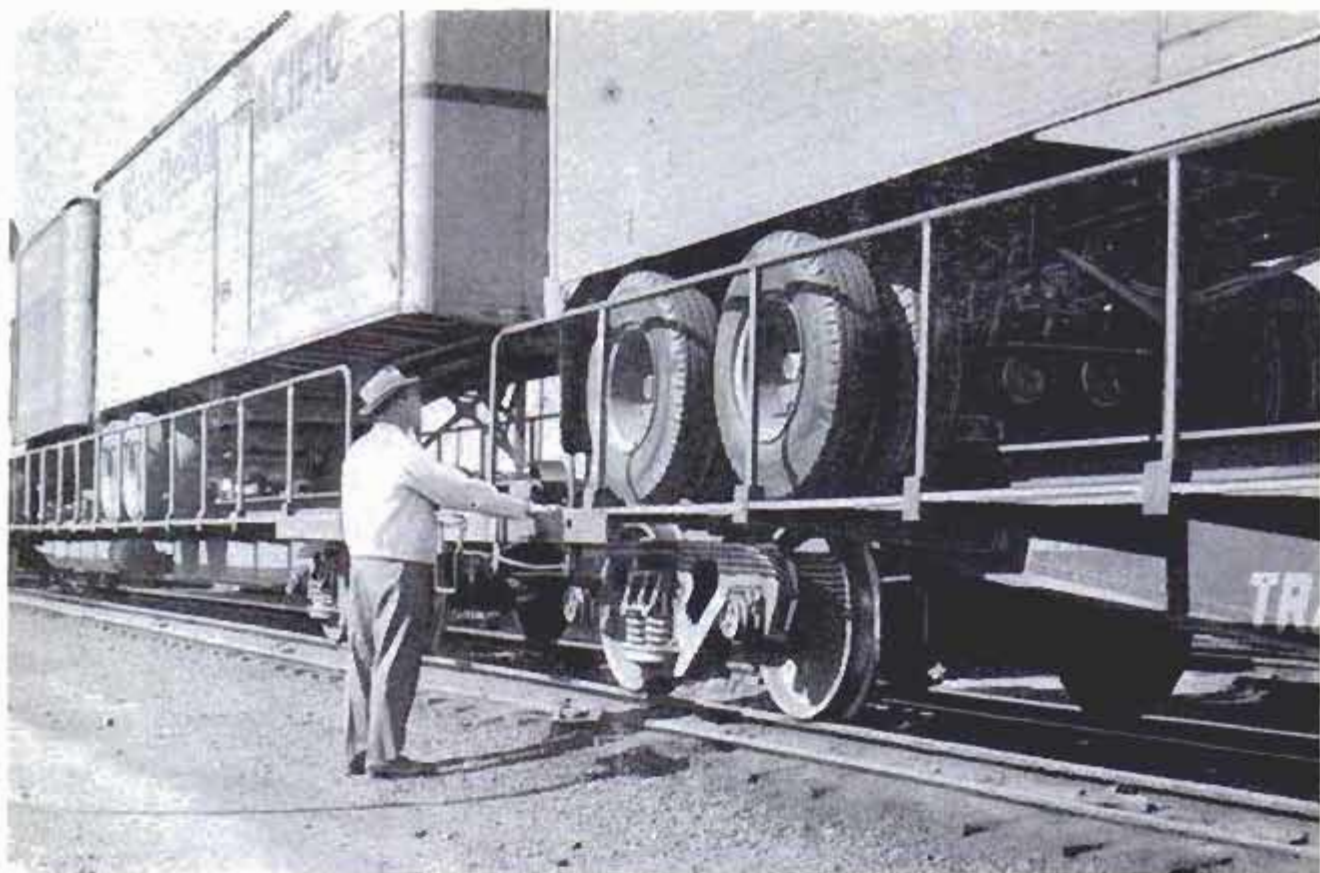
Something different in the way of Christmas lighting is a replica of an Old English coach lantern. It's 15 inches high and contains an electric lamp designed like a red candle. Use it indoors or out.



Miniature Missile Transporter Equipped With 13-Inch Rocket

Spaceminded youngsters can bring a little of the Cape Canaveral atmosphere into the home with a miniature guided-missile carrier. The carrier is a replica of the vehicles used to deliver missiles to launching pads, according to the Toy Guidance Council. It comes with a 13-inch "missile."





In Roseville, Calif., flatcars with backbones of "I" beams get checked before long haul to Los Angeles

By
Leo Rosenhouse

Piggyback Trailers

RIDING THE WESTERN rails on the piggyback freight circuit are flatcars with a new look: They are light, long, and specially designed for "trailer on flatcar" service. What sets these new piggyback cars apart from other flatcars is their distinctive "backbone"—a pair of parallel I-beams that serve as rails on which trailers ride, using their own flanged dolly wheels. The process is considered revolutionary by railroad men.

The new piggyback flatcars were developed from a French design and are now becoming familiar along the San Francisco-Los Angeles route of the Southern Pacific Coast line. This large railroad system now has 150 of the new piggybacks in operation, making it the largest fleet of its kind in the West.

When the first piggyback cars made their appearance a few years ago, it was the intention of the railroads to take truck trailers to destination points on flatcars to escape highway congestion. The program worked so well that the larger railway sys-

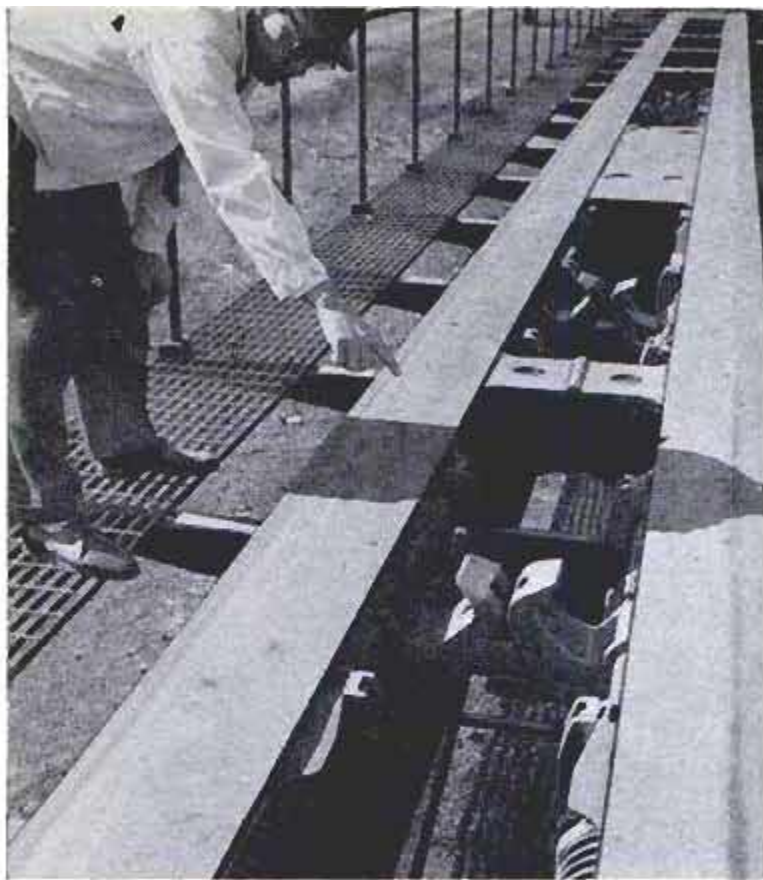
tems quickly adopted these unusual cars.

The Southern Pacific constructed a pilot model of the new piggyback flatcar at its Sacramento, Calif., shops in March, 1957. A successful tryout led to the construction

Auxiliary bars on piggyback platform enable trailers to be guided over centering device seen between bars



POPULAR MECHANICS



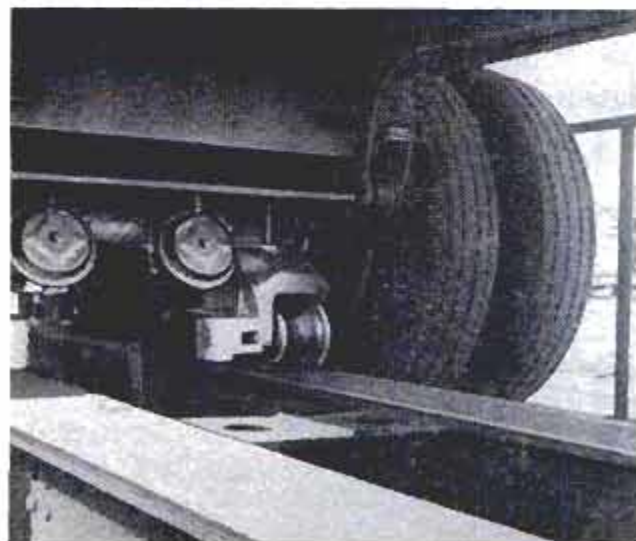
Clamps inside parallel "I" beams grip framework of trailers

Ride I-Beams

of its large piggyback fleet just a short three months later.

"Essentially, the new car is just a set of I-beams—or rails—forming the frame and wheels," explains W. G. Peoples, Southern

Trailer rides flatcar rails on small metal flanged wheels mounted inside trailer's rubber-tired wheels



Pacific vice-president in charge of freight traffic. "It is longer, lighter and easier to load, and it only takes one minute to tie down a trailer. That compares to six minutes with conventional flatcars."

Designers have given the piggyback flatcars a streamlined appearance and in so doing have virtually done a form-fitting job for the railroads. The cars are 18,000 pounds lighter than present flatcars and are 79½ feet in length, making them 26 feet longer than the typical flatcar.

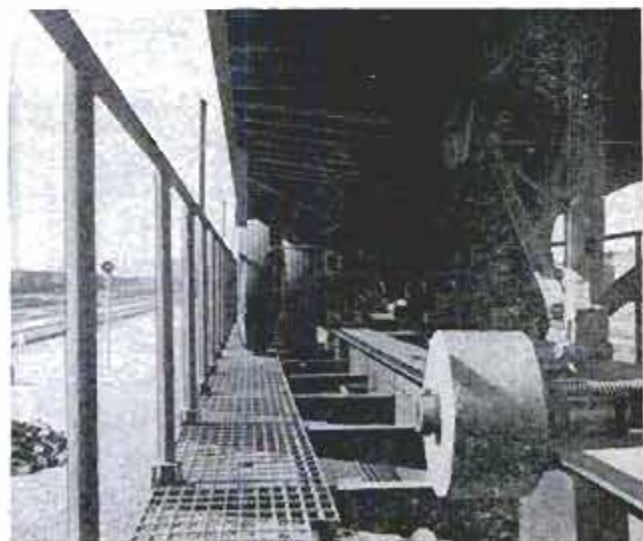
Standard cars can carry one 35-foot highway trailer, or two 24-footers," Peoples says. "The new cars are built for two 35-foot or three 24-foot trailers."

To load a trailer from road to rail, the trailer is driven to a loading ramp, where a tractor unit backs it over an automatic centering device. The trailer then rides down the piggyback flatcar on small metal wheels mounted on the inside of the rubber-tired wheels of the trailer. The tractor, which is part of the hauling unit, has the same wheel construction.

The trailer is carefully guided down the center I-beam by these wheels of metal that are flanged to keep them from leaving the I-beam. The rubber tires of the trailer do not touch the flatcar. Each trailer is made secure to the piggyback car by a hand-operated clamp

that grips the trailers' dolly wheel assembly rigidly against the I-beam. Shock to the trailer is minimized by shock-absorbing units incorporated in the piggyback flatcars. ★ ★ ★

"I" beams run length of car. Platform walk is of webbed steel and rails are lightweight construction





Partially unloaded, the big wheel starts to go up. A minimum of 70 kilowatts is needed to operate unit

Wheel is anchored to the trucks that haul it. Made almost entirely of aluminum, the wheel will handle a 12,800-pound load



Huge Ferris Wheel Goes up in Six Hours

TALK ABOUT portability! One of the world's largest Ferris wheels can be unpacked and set up, ready for business, in less than six hours. In the same length of time it can be dismantled and packed into four semitrailers.

Actually two wheels in one, the unit towers 90 feet from the ground to the highest seat pivot. It can handle 96 passengers at one time and has a total capacity of about 20,000 people a day.

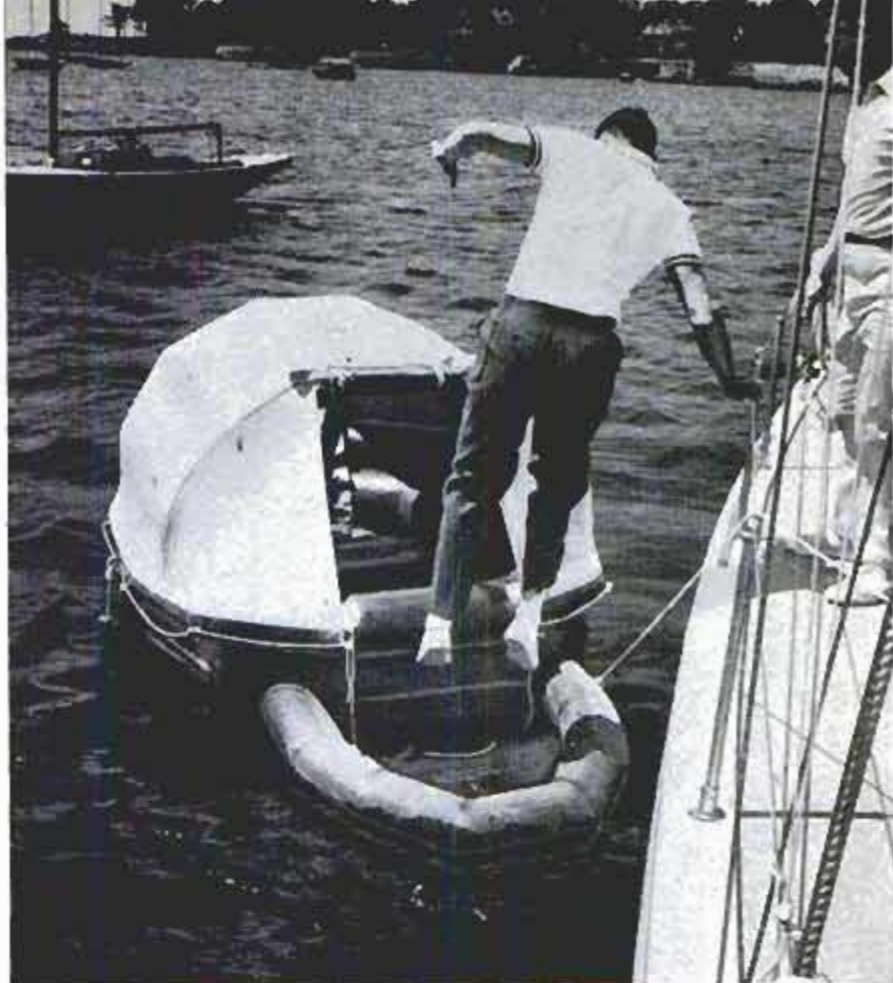
Except for the steel axles and seats, the Ferris wheel is made entirely of aluminum. More than half a mile of green and gold fluorescent tubes decorate it.

The Ferris wheel has been tested with a 400-pound load in each seat, and handled the 12,800-pound total load with ease. The rig is so designed that no stakes or guy wires are fastened to the ground. Supporting cables are attached to three trucks, and the unit itself is anchored to three trailers.

Want to buy such a Ferris wheel? This one cost \$225,000.

Quick-Inflating Raft Has Boarding Deck

Pull the lanyard of a new life raft, and 30 seconds later the raft will be fully inflated, including a special boarding platform. The raft, made by U.S. Rubber, is designed for yachts and commercial vessels. It folds into a carrying case measuring three feet long and weighing 130 pounds. When the case is tossed into the water, a tug on the lanyard starts the inflation. Complete inflation takes 30 seconds, but the raft can be boarded via the special platform within 15 seconds. A canopy gives protection from heat and cold. The raft carries 10 persons.



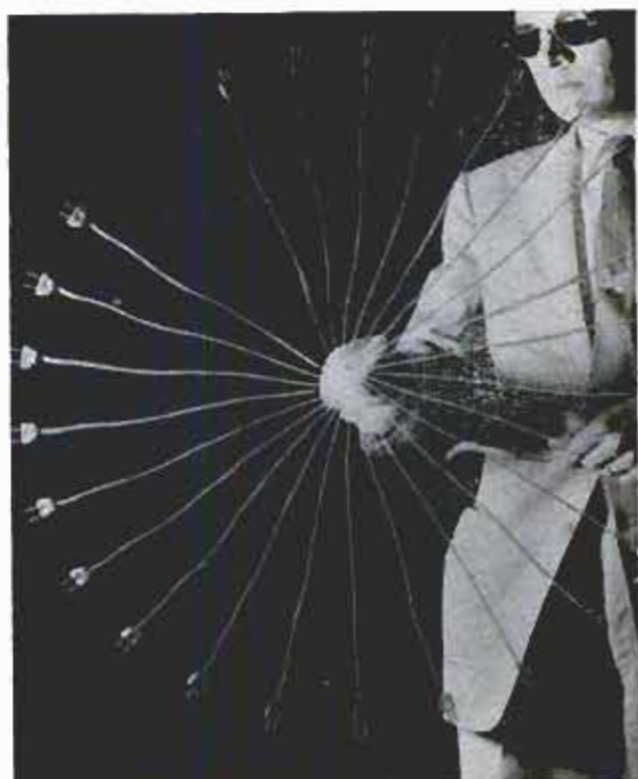
This Organ Has Cardboard Pipes

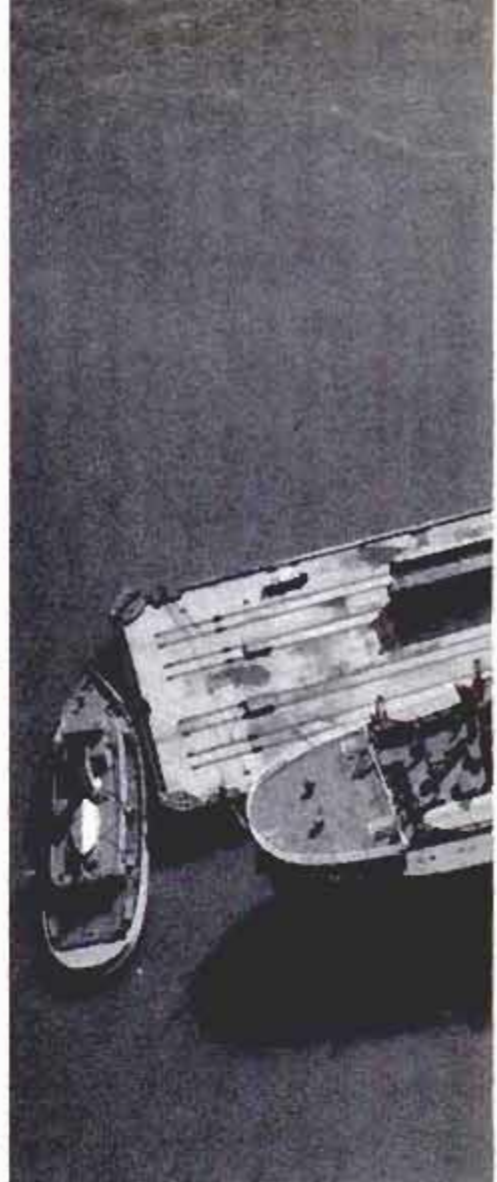
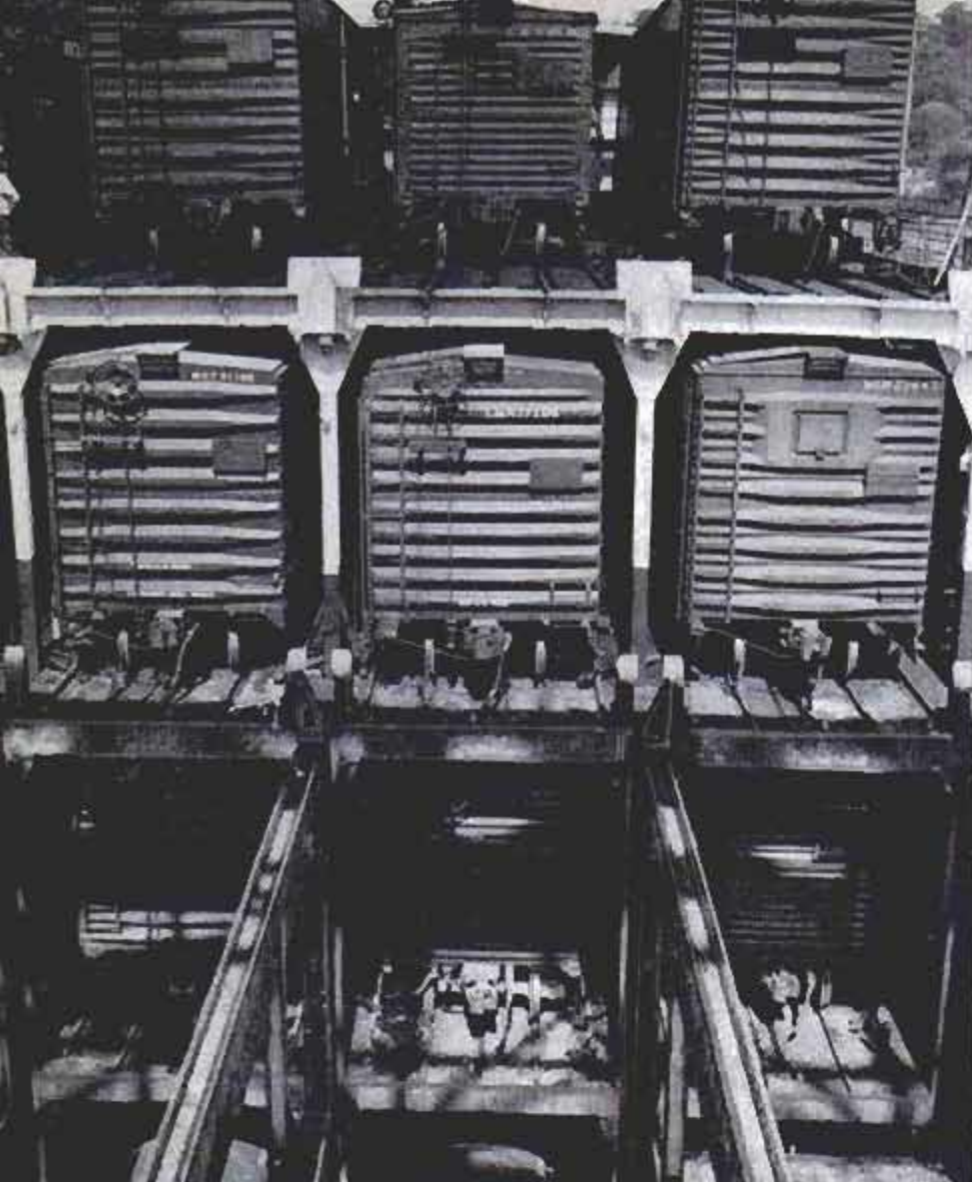
Organ pipes made of cardboard? Yes—rolled cardboard. The builder of the instrument followed plans devised by the renowned 18th century Italian organ maker, Casparini. The 20th century organ maker is a musical medic from Singen, Germany, and his patients refer to him as "The Singing Doctor."



Lamp Flashes 120 Times a Second

Because it makes 120 brief flashes each second, a new pulsed xenon arc lamp developed by General Electric can be used for stop-motion photographs. However, it was designed primarily for the printing and lithographing industries. Each flash is so brief the lamp actually is off more than it is on, but the light appears continuous.





Cross-section of the *Seatrain* hatchway shows three of the ship's four decks filled with freight cars

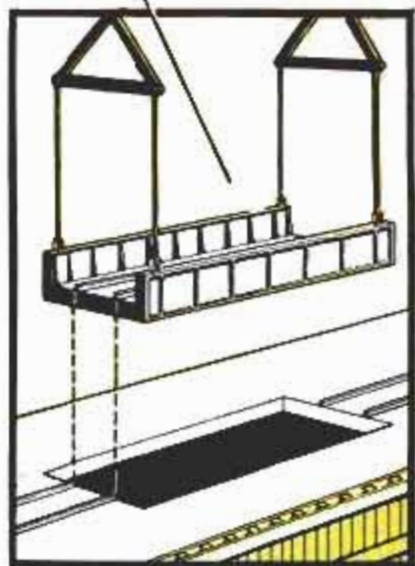
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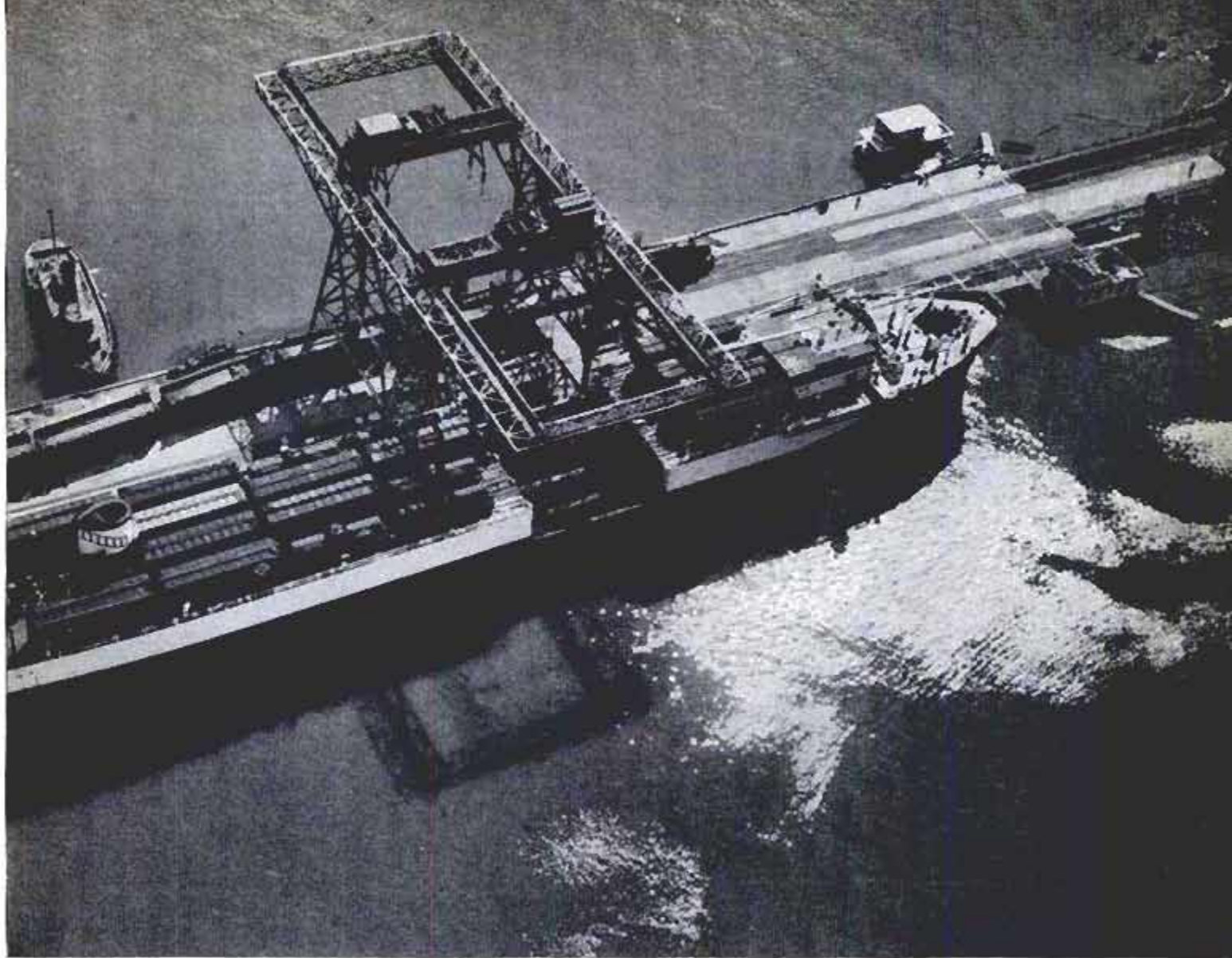
Strange Ships

By Capt. W. D. Brinckloe, USN

IN JUNE, 1942, the mechanized columns of Field Marshal Rommel's crack Afrika Corps ambushed the British Eighth Army in the Libyan Desert, smashing the greatest part of Montgomery's armor which stood between the Desert Fox and the road to Cairo. A month later a German U-boat caught a relief convoy south of Bermuda and ripped open the vitals of the freighters carrying the precious replacement tanks. Into the breach, with Rommel massing for the final drive and time running out, was thrust the seagoing train carrier SS *Seatrain Texas*. Her cavernous belly was crammed with tanks scraped by emergency Presidential order from American arsenals. Speed was her only protection against enemy wolf-packs. The coastwise car ship, built two years earlier to carry freight cars between New York and Texas, finished a harrowing 35-day trip around the Cape of Good Hope to Suez in time to throw her priceless cargo into a winning flight before El Alamein and become the heroine of the day.

LIFTING CRADLE FITS INTO RECESS IN PIER TO ALLOW CARS TO BE ROLLED ON AND OFF

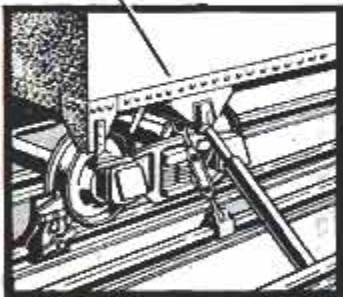




Giant crane at Edgewater, N. J., loading pier extends over hold of the Seatrain for lifting freight cars

for Strange Cargo

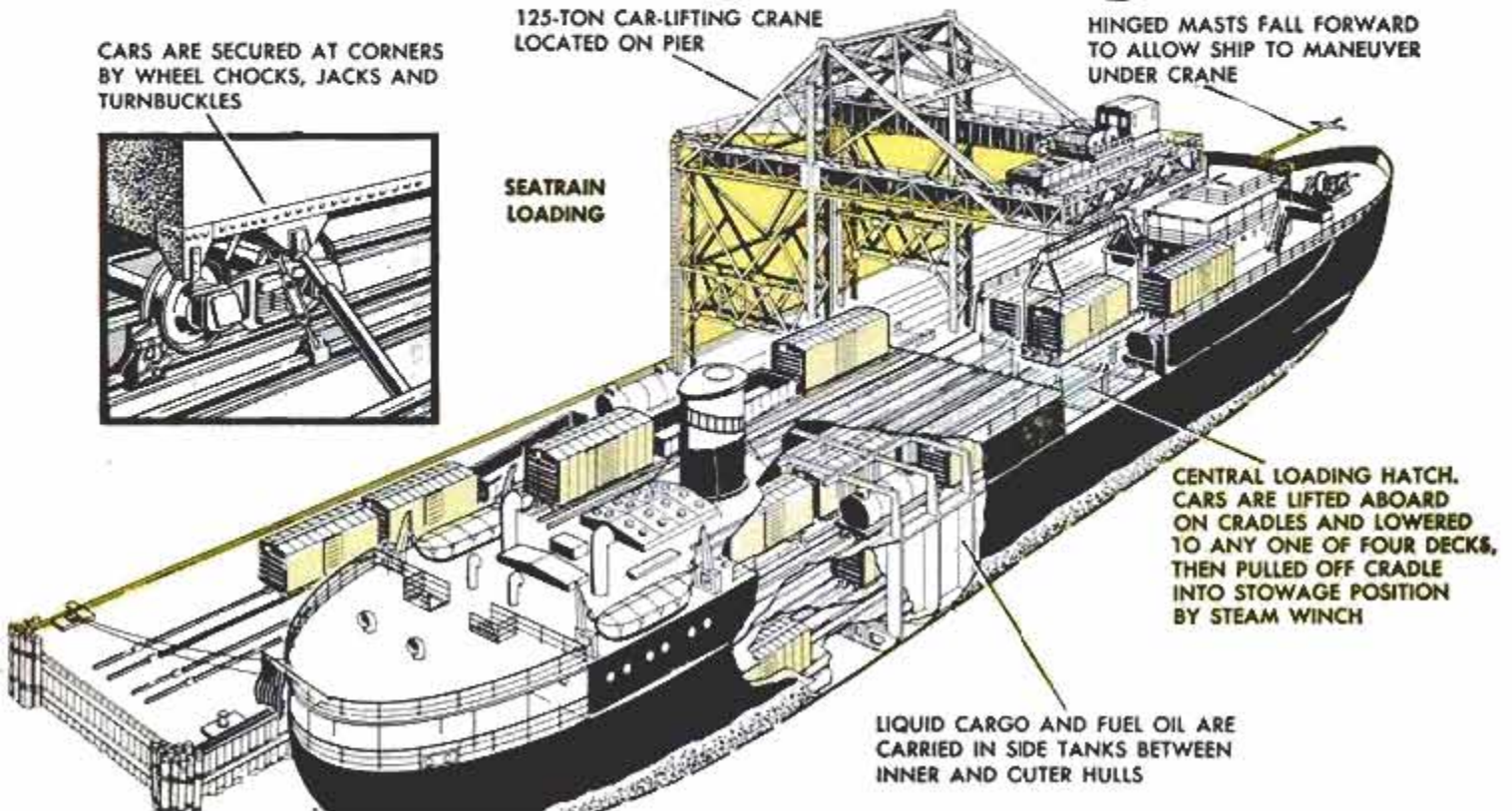
CARS ARE SECURED AT CORNERS BY WHEEL CHOCKS, JACKS AND TURNBUCKLES



125-TON CAR-LIFTING CRANE LOCATED ON PIER

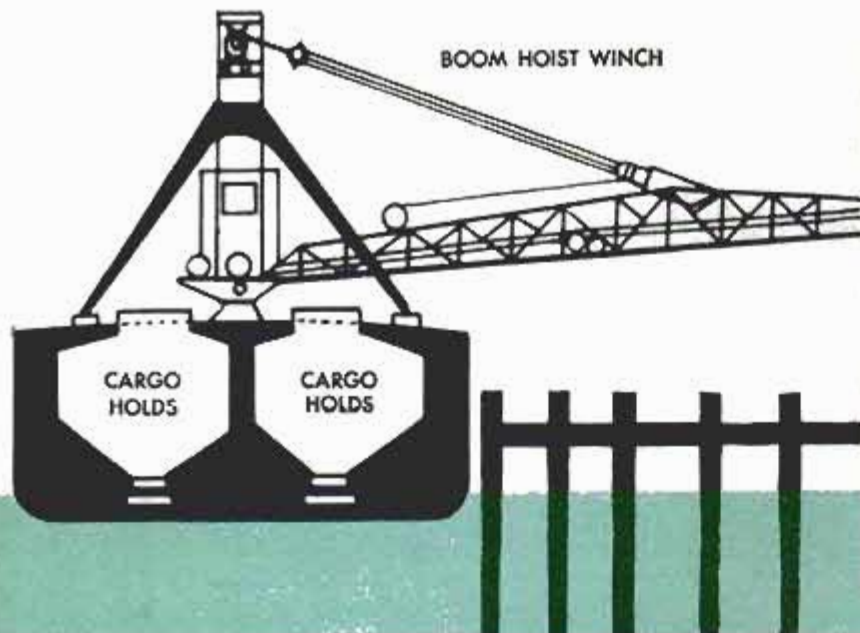
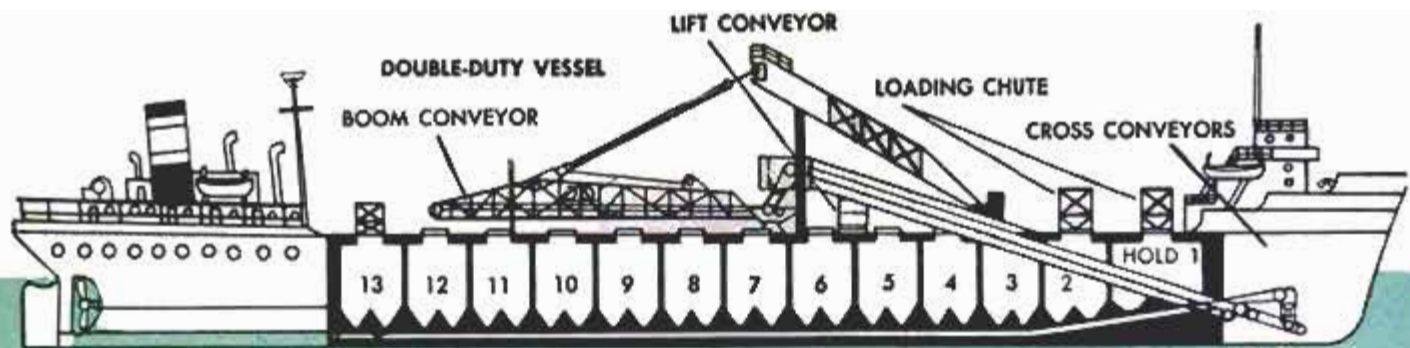
HINGED MASTS FALL FORWARD TO ALLOW SHIP TO MANEUVER UNDER CRANE

SEATRAIN LOADING



CENTRAL LOADING HATCH. CARS ARE LIFTED ABOARD ON CRADLES AND LOWERED TO ANY ONE OF FOUR DECKS, THEN PULLED OFF CRADLE INTO STOWAGE POSITION BY STEAM WINCH

LIQUID CARGO AND FUEL OIL ARE CARRIED IN SIDE TANKS BETWEEN INNER AND OUTER HULLS



Courtesy of Hewitt-Robins Rubber Co. and E. I. du Pont de Nemours & Co.

The *Sinclair Petalora*, world's first ore-oil tanker, carries 67,000 tons of ore or 447,600 barrels of oil

The desert fighting is over (we hope), six ocean-going "carfloats" of Seatrain Lines are still busy. With the help of 125-ton cranes at various terminals these ships can disgorge 100 loaded freight cars in 10 hours. Their specialized talents are always available to serve the nation in time of emergency.

The muscle-bound seatrain, easily toting cargoes too outsized for other carriers, is one of a growing sorority of seagoing ladies designed for strange cargoes.

Take the *SS Angelo Petri*, a ship that made seafaring history on her first voyage. Though never destined to bear combat arms like the redoubtable *Seatrain Texas*, she carries a cargo often more welcome than weapons to beleaguered troops. The \$7,000,000 *Angelo Petri* is America's first wine ship. The 22,000-ton ship looks from the outside like many another tanker, albeit a spotless one, but inside she is new clear through. Her 2,500,000-gallon cargo rides in 26 chromium-nickel stainless-steel vats. Every valve and pump, every foot of wine piping, is stainless. Cofferdams surround each vat on top, bottom and sides, so 26 different flavors of wine can be kept separate, with never a drop intermixed. Ships are naturals for wine transport, ac-

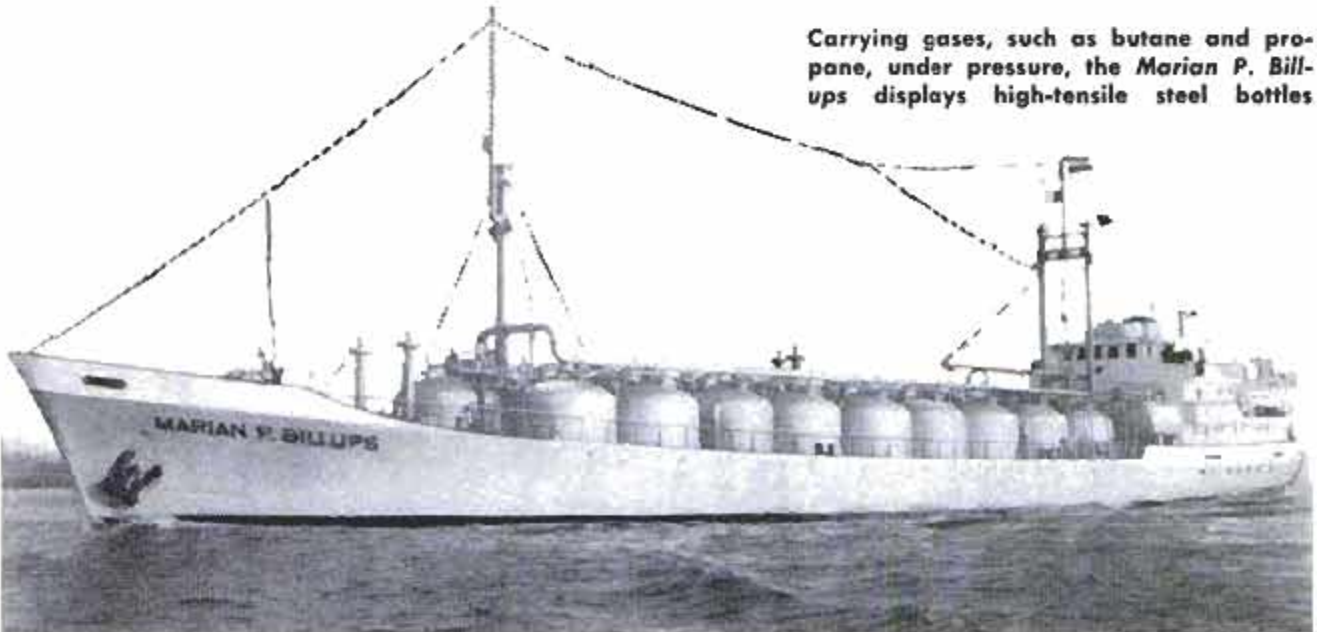
ording to president Louis Petri, because their gentle motion keeps air, the greatest enemy of wine, from mixing with the cargo. As each vat empties, a twin-nozzle device lowers into the tank and jets a high-pressure steam-and-water blast on the interior.

Fruit Industries recently placed in service the *SS Tropicana*, the world's first bulk orange-juice tanker. Ultimately she'll hold nearly 1.5 million gallons of the yellow nectar in tanks pillowed with 6½ inches of foaming glass. This insulation, plus vacuum-packing the juice at 2½ pounds below atmospheric pressure, delivers the tasty cargo at a frosty 30 degrees F. with flavor intact. She pumps 22,000 golden gallons per hour, surely the fastest anybody ever poured orange juice out of a can. The cheapest, too; her \$15,000 tab for bringing a load from Florida to New York compares with \$265,000 to do the same by refrigerated truck.

The *Marian P. Billups*, whose profile resembles a souped-up hot rod with the hood off, carries butane, propane and ammonia for the Tropical Gas Company at the unheard-of cargo-tank pressure of 250 pounds per square inch. Her belly is crammed with 18 enormous steel bottles whose domes poke up through her deck like cylinders



This 530-foot wine tanker, *Angelo Petri*, is the first ship of its kind under U. S. flag. It has 26 vats



Carrying gases, such as butane and propane, under pressure, the *Marian P. Billups* displays high-tensile steel bottles

An icebreaker hull was put on the *Alatna* so the tanker can make deliveries in Arctic to military posts





Sleek is the word for the 285,000-barrel tanker *Cities Service Baltimore* which unloads in just 15 hours

of a gigantic marine engine. The *Bil-lups* would be an economic cripple for conventional cargoes but, like the bumblebee, who flies nicely despite aerodynamic theory, this 13,000-barrel gas carrier is supremely efficient for her special purpose.

Another useful "oddball" is the 590-foot *Duncan Bay*, rated a tanker but carrying the world's oddest liquid cargo — wood pulp. Other ships bring down Canadian pulp in dry bales, but the *Duncan Bay* pumps it aboard in a watery slurry like thin quicksand. When she discharges, propeller agitators whirl away in the tanks like giant eggbeaters to keep the pulp

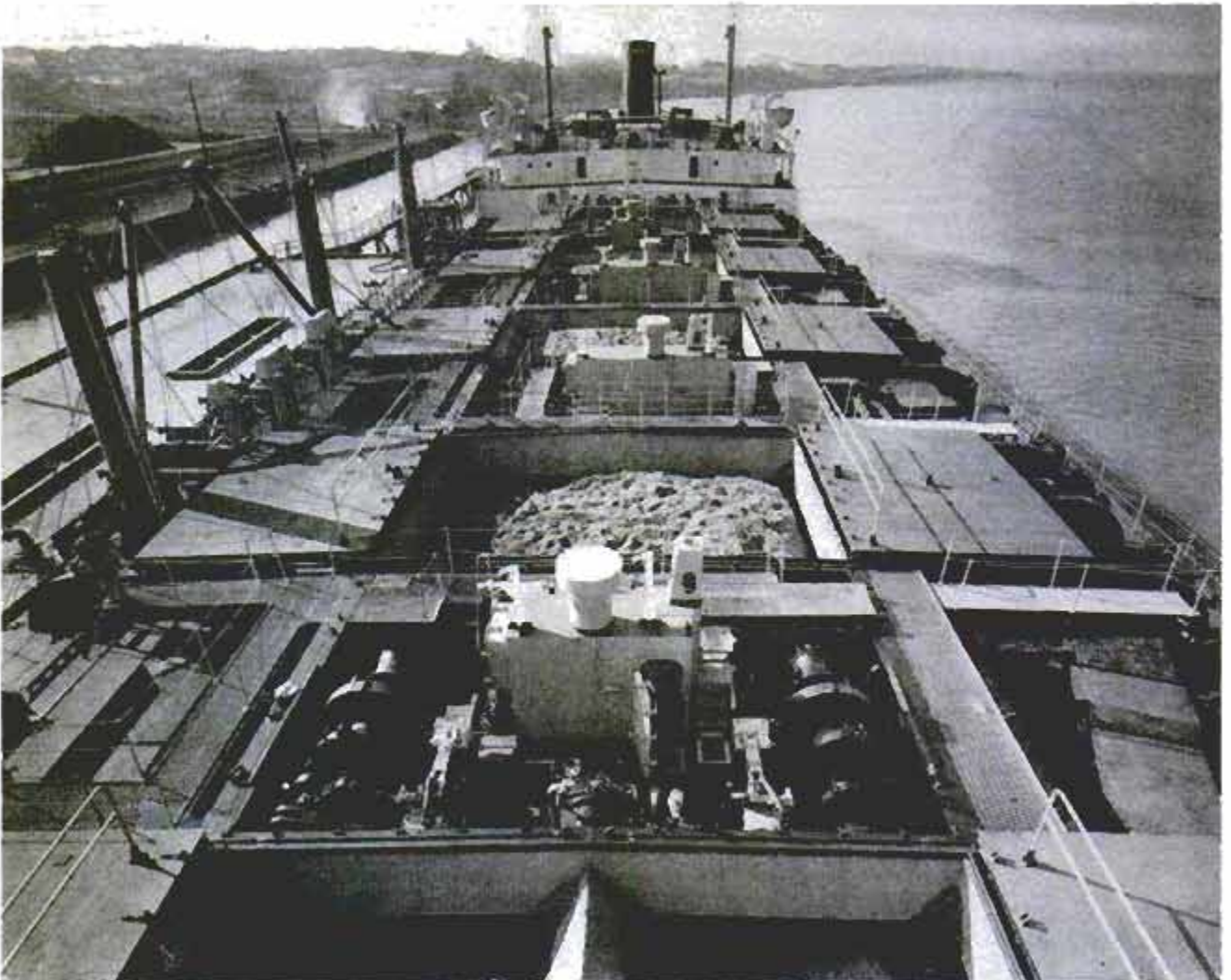
mixed. In addition to speeding cargo handling, papermen say wet pulp makes stronger paper.

Some tankers still carry oil, of course, but even among oilers there are specialists. With the new SS *Cities Service Baltimore* it's variety. No smutty black-oil workhorse she; her gleaming tanks simultaneously handle 10 grades of "clean products," two grades of lubricating oils and—just to keep her hand in—1800 tons of black. She can pump off all of these varieties separately in 15 hours.

Then there's the *Alatna*, first tanker

(Continued to page 218)

View aft on the *Duncan Bay* shows some of its nine tanks and pumphouses for unloading liquid wood pulp





Highway Cattle Train

TRUCK AND TRAILER units up to 145 feet long are used to move cattle to market from Australia's Northern Territory. The highway trains travel in pairs and each train carries up to 100 head of cattle. The entire unit has 42 wheels and each of the trailers is steered individually by a tow-bar so that it follows in the tracks of the truck, or prime mover. The truck is powered by a six-cylinder supercharged Rolls Royce diesel engine which develops 275 horsepower. The trucks have power steering and air brakes. The trains average about 15 miles per hour, including stops, on runs to Mount Isa, in Queensland.



Machines that make milk containers from rolls of coated paper are behind workers in Japanese dairy



Cost of bottles once made milk a luxury in Japan. Inexpensive distribution makes it available to all

Milk Packaged in Odd-Shaped Cartons for Japanese

LOW-COST DISTRIBUTION of milk to Japanese families has been made possible by development of plastic-coated paper containers. The polyethylene-coated paper arrives at the dairy in rolls and is sterilized by ultraviolet light. Then it is formed into a tube and the seam is heat-sealed. The

tube is filled with milk and pairs of electrically heated jaws, operating under pressure, squeeze the tubing into a chain of tetrahedrons. The four-sided containers are cut from the chain and rushed to the retailers. The consumer clips off a corner and pours the milk into a glass.

Japanese housewife opens milk tetrahedron by cutting corner. Heavy paper is coated on inner surface with polyethylene which has been sterilized

Consumer can insert a straw or pour the milk into a glass



HI-FI TRENDS

By Lothar Stern

IF YOU haven't seen it yet, chances are that you soon will. "It" is the new RCA-developed tape magazine with its contents—the equally new, prerecorded 4-track tape. Together, these two developments are likely to have as great an impact on the high-fidelity field as has the evolution of the stereo disc.

Just as it began to look as though the low-cost stereo records would drive stereo tapes right out of the competitive market, the tape industry pulled a few surprises of its own. From the laboratories came reports of new equipment capable of recording four separate tracks of information on a $\frac{1}{4}$ -in. ribbon of tape. Furthermore, it was claimed that these tapes could provide the same fidelity at a speed of only $3\frac{3}{4}$ i.p.s. as existing 2-track tapes at a speed of $7\frac{1}{2}$ i.p.s. The result—four times as much playing time for the same basic tape cost, with no compromise of quality.

Almost before this news could be properly digested, Ampex demonstrated its new equipment capable of handling 4-track tapes as well as the conventional ones. The demonstration was impressive. Even the skeptics were convinced. The 4-track, slow-speed tape used for the demonstration was, indeed, capable of high-fidelity performance.

Then RCA dropped the clincher. Almost casually, RCA officials unveiled a slim plastic container which they introduced as a newly perfected tape magazine. Simultaneously, they revealed an entirely new automatic recorder, Fig. 3, designed especially for magazine-loaded 4-track tapes. And, it was announced, RCA would soon release a large selection of magazine-loaded

(Continued to page 222)

Radio Television Electronics



Fig. 3. RCA's magazine loaded 4-track tape recorder may alter complexion of high fidelity systems. Fig. 1. Prototype version of Motorola's magazine-loaded mechanism is part of a complete hi-fi console. Trim has been removed to show location of record and playback heads. Fig. 2. Pentron's recorder plays 4-track tape magazines and can be used to record and play back regular $7\frac{1}{2}$ i.p.s. 2-track tapes



GIFT SUGGESTIONS

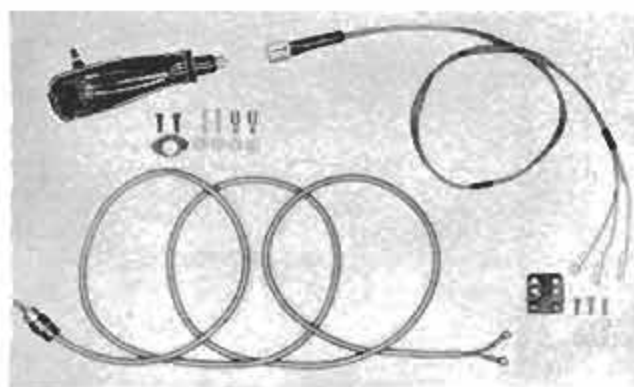
FOR THE HI-FI ENTHUSIAST



STEREOPHONIC PORTABLE, ingeniously styled, combines compactness with stereo flexibility. "Wings" housing speakers swing open or detach completely from main unit. Dual amplifier gives 20 watts power



SHELF-SIZE SPEAKER ENCLOSURE with precut mounting board for limited-space stereo installations. Available in 6 finishes, unit is designed for Sonotone 8-in. speaker with 55-15,000-cycle response



STEREO CONVERSION KIT permits rapid rewiring of popular Garard record players for stereo. Includes diagrammed instructions for screwdriver installation

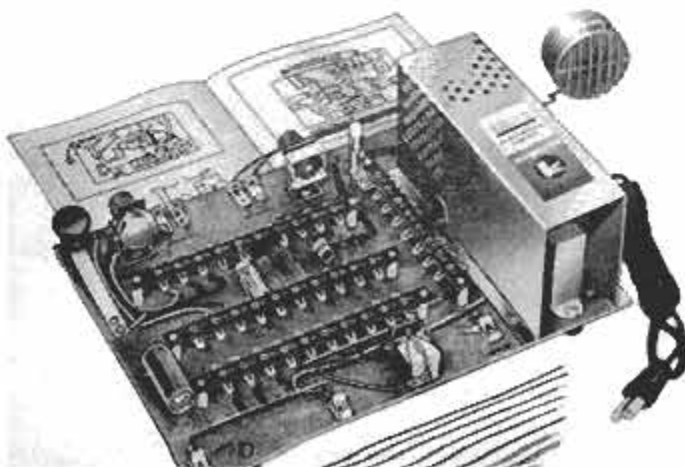


HIGH-FIDELITY TURNTABLE KIT for the do-it-yourself audio hobbyist. Designed for single-speed (33 $\frac{1}{3}$ RPM) operation. Assembly time is about 30 minutes

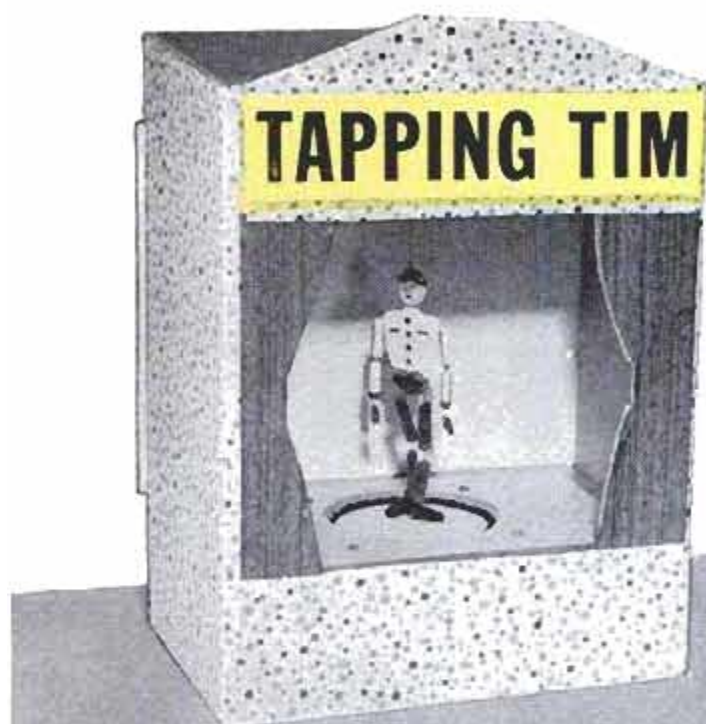
FOR THE RADIO EXPERIMENTER

NEW 12-IN-1 LAB KIT permits construction of 12 practical and instructive electronic circuits. Profusely illustrated manual describes construction and circuit theory. Safe even for children and beginners

REGENERATIVE RECEIVER KIT covers frequencies from 550 kc. to 30 mc. in four bands. Easy-to-build, 3-tube set with built-in speaker is ideal for beginning radio amateurs as well as for short-wave listeners



Build



The Electronic Tap Dancer

By E. G. Louis

TAPPING TIM, the electronic tap dancer, combines the eye-appeal of color with the romantic appeal of electronics to provide a low-cost toy with high play value. "Tim" is a colorful puppet performing an exciting tap dance in his own private theater. He dances to any type of music, whether the piece is Bach or bebop, but is at his liveliest best to music like rock and roll, which has an accentuated beat.

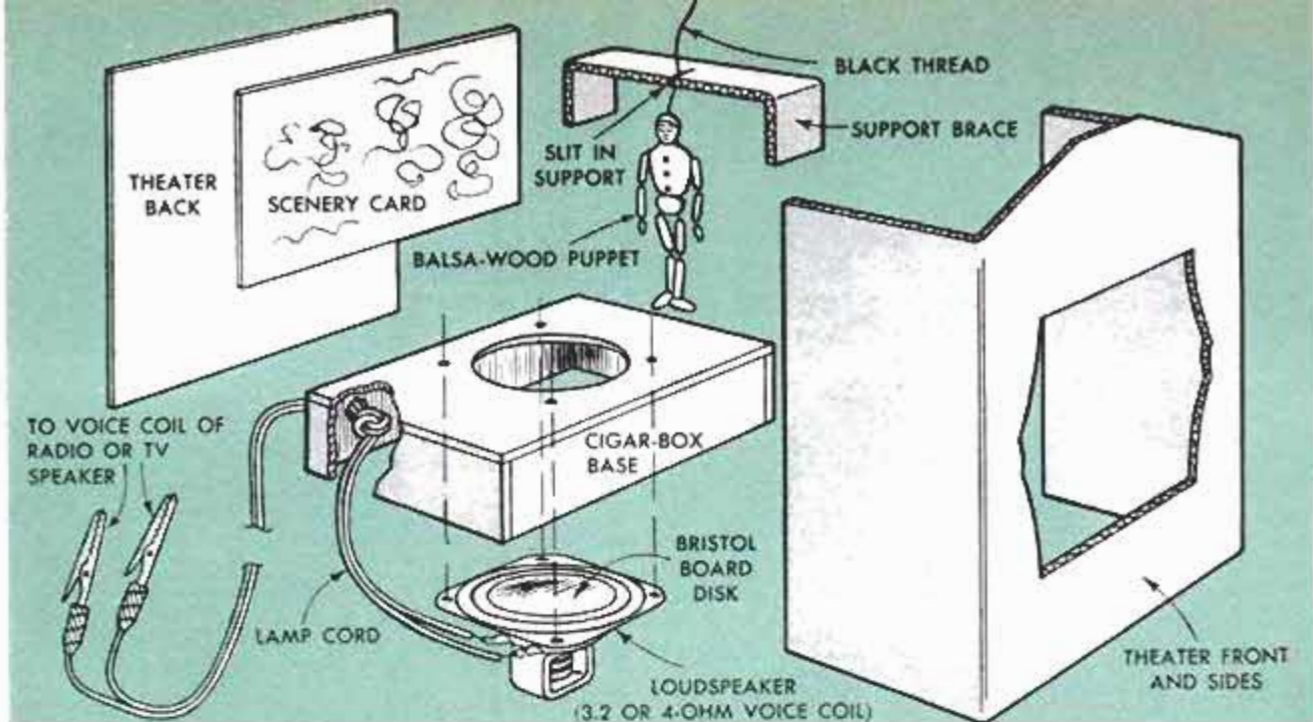
Although designed originally for a small child, Tapping Tim can provide fun and entertainment for the whole family. A three-year old, for example, will enjoy simply watching the puppet dance. An older child can participate in the "show" by making up scenery cards and stage props. A still older child may wish to try his hand at assembling his own puppets. And, of course, the child's father will find considerable pleasure in assembling the basic toy.

The dancer is made of individual pieces of light balsa wood. His theater is formed of ordinary corrugated cardboard and his stage is an inverted cigar box. A vibrating

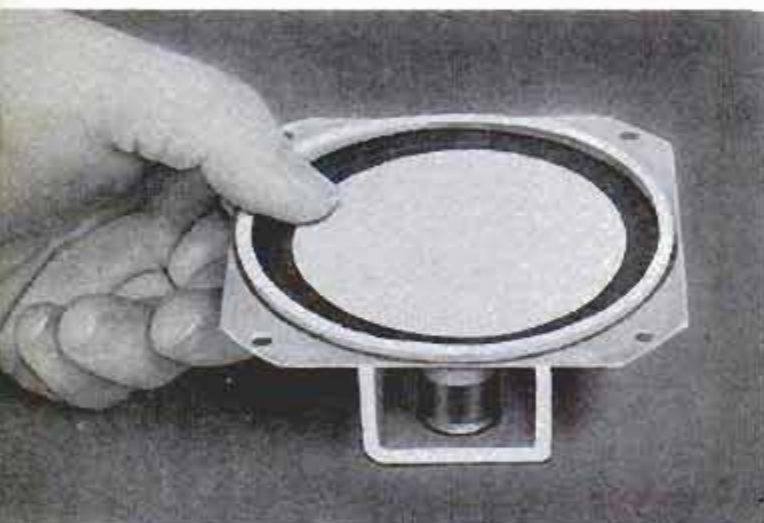
cardboard disk powered by a salvaged or bargain-priced 4 to 6-in. PM loudspeaker is his dancing platform. Motivating power is obtained from the electrical signal of a radio, phonograph or TV set which supplies the musical accompaniment.

Construction details are shown on the following page, but these need not be rigorously followed. The puppet may be anything from a hula dancer to a spaceman but keep it light in weight so that little power is needed to set it into lively action.

In operation, "Tim" is suspended from a support brace centered above the dancing platform. A piece of thread attached to the puppet's head is fitted into a narrow slot cut into the support brace with a razor blade. The height of the puppet is adjusted so that its feet rest flat but lightly on the dancing platform. A length of 2-wire lamp cord is used to connect the voice coil of the theater speaker in parallel with that of a radio, phonograph or TV speaker. Volume of the latter is then adjusted until the puppet begins its merry dance. ★ ★ ★



Exploded diagram of theater. Lamp cord clipped to voice coil of radio speaker transmits energizing signal

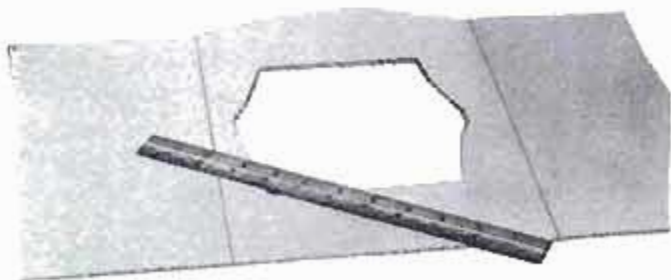
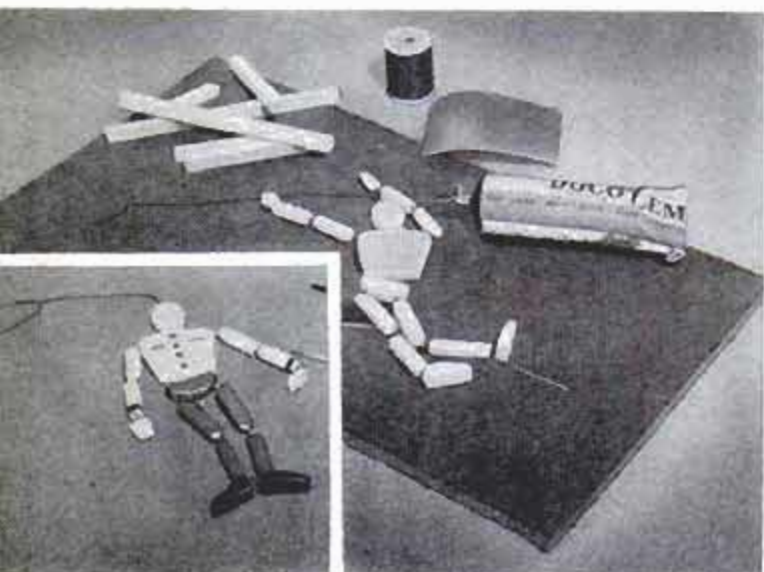


Above: Bristol-board disk is rubber-cemented to speaker cone just inside corrugated portion of cone

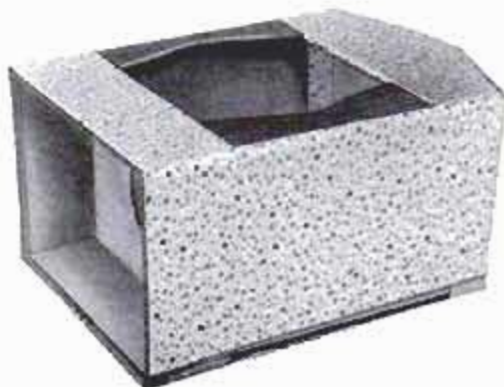


Cigar box forms theater base. Previously prepared speaker is mounted from below with screws and nuts

Below: Puppet parts are joined with short lengths of black thread inserted in cement-filled pinholes



Corrugated cardboard serves as theater front and sides. Razor blade is used for cutting and scoring



Cardboard theater can be painted or covered with adhesive-backed plastic material. Slot between side and back permits insertion of scenery cards

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SOFA GOES MODERN

By Willard Allphin

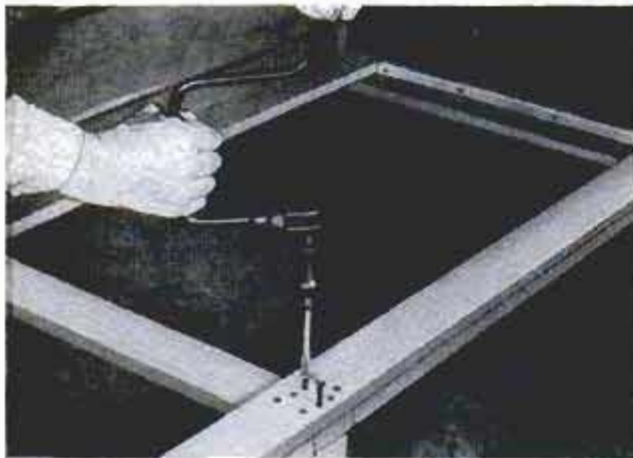
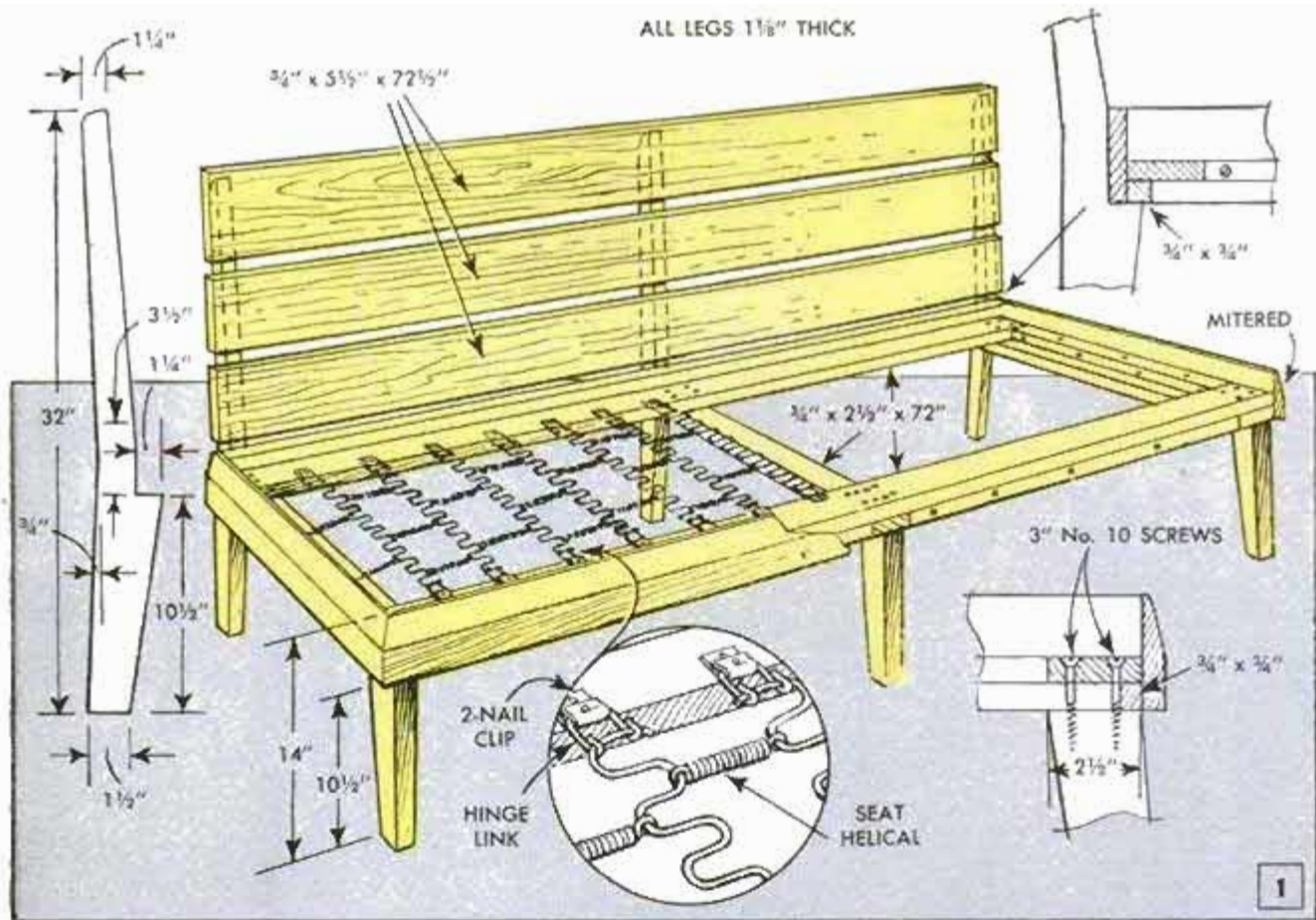
NO NEED TO PROP the cushions against a wall with this modern version of the studio couch. It has a back all its own to make it a free-standing sofa. All cushions are loose so they can be reversed for even wear, and when the back is finished like the rest of the wooden frame, the piece is presentable all around when used as a fireside sofa.

Second-grade birch was purposely selected for the original because of its dark sap streaks, but any hardwood of your choice can be used. Inner parts that are not exposed can be of the cheapest scrap stock. Fig. 1 details the complete frame. In studying its assembly, you'll notice that construction centers around a flat rectangular

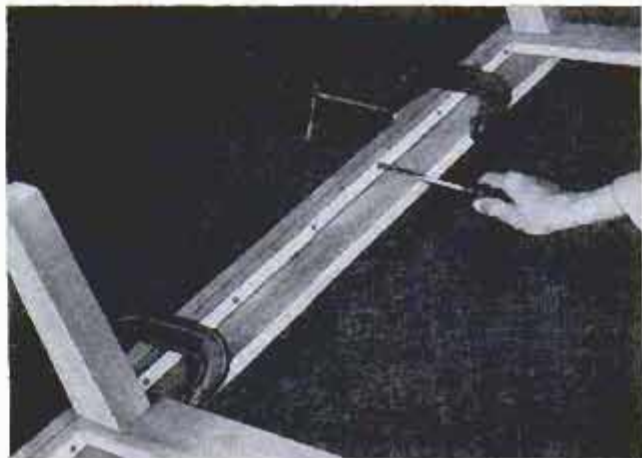


Nicely finished all around, sofa can be used away from wall and in front of fireplace, like this

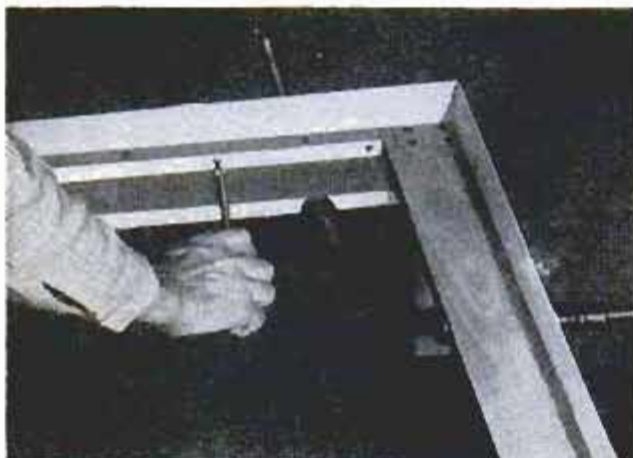
frame which supports the springs. This consists of five pieces which are lapped at the corners and the center and joined with glue and screws. Cleats are added next, keeping them flush with the outer edges of the frame. Since these cleats are provided for attaching the facing members to the four sides of the frame with screws from

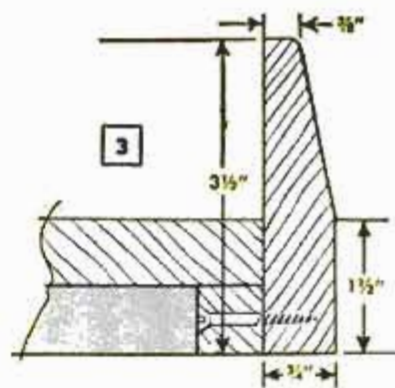
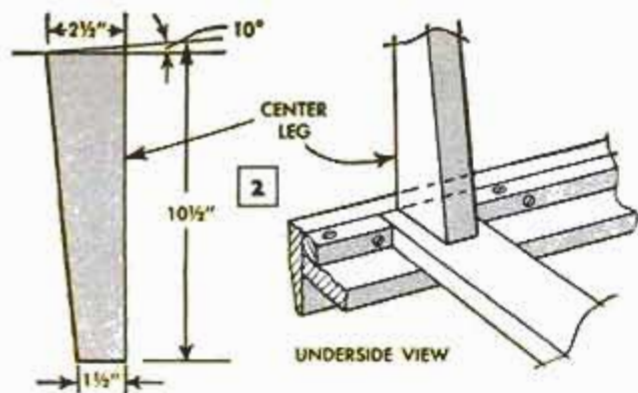


Above, glue, plus several long screws, are used to anchor front legs solidly. Below, screws through topside cleats hold end facing members to frame



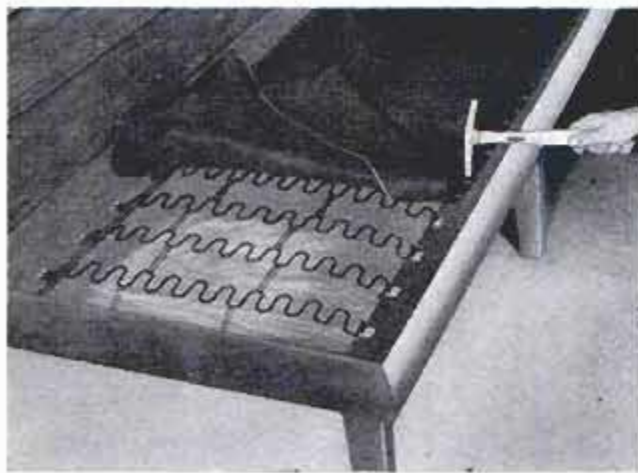
Above, screws through underside cleats hold front and back members. Below, screws holding backboards to legs are capped with plugs, trimmed flush





the inside, Fig. 3, it is best to drill screw holes through the cleats every 4 in. or so before installing.

Material for the four facing members is ripped $3\frac{1}{2}$ in. wide and then three of the pieces are beveled on the face side. This is done by tilting the saw blade the required amount and running the stock through on edge in the manner shown in the photo below Fig. 3. Only the two front corners are mitered since the end members extend past the back member and lap the side of the legs. The members are positioned even with the bottom of the cleats, coating them with glue and clamp-



Above, after frame is sprung with No-Sag springs, springs are covered with denim. Below, foam-rubber scraps, cemented together, form built-up cushion pads



ing in place before turning the screws home. Two screws, later capped with wooden screw plugs, are driven through into the end grain of the flat back member.

The back legs are dimensioned in Fig. 1. These, as well as the shorter front legs, are cut from $1\frac{1}{8}$ or $1\frac{1}{4}$ -in. stock, either laminated or solid. The notched portion of each leg fits against the flat facing member and is glued and screwed to it. These screws, as well as those which are used to hold the backboards to the legs, are also covered with wooden screw plugs, trimmed flush. The three front legs are dimensioned as in Fig. 2, and are attached to the frame with glue and several long screws driven down into the legs from the top. A couple of 3-in. dowels could be used here instead of screws, boring the holes down through into the legs from the top after gluing and clamping the legs in position.

No-Sag springs make it easy to spring the frame, following manufacturer's instructions. The springs are covered with upholsterer's denim. All the cushions are made 5 in. thick from two layers of $2\frac{1}{2}$ -in. foam rubber, cemented together. The three individual back cushions measure 18 x 24 in., while the single seat cushion is made 26 x 72 so it will lie inside the facing members of the frame. By sewing slide fasteners in the cushion covers, they can be removed for cleaning. ★ ★ ★

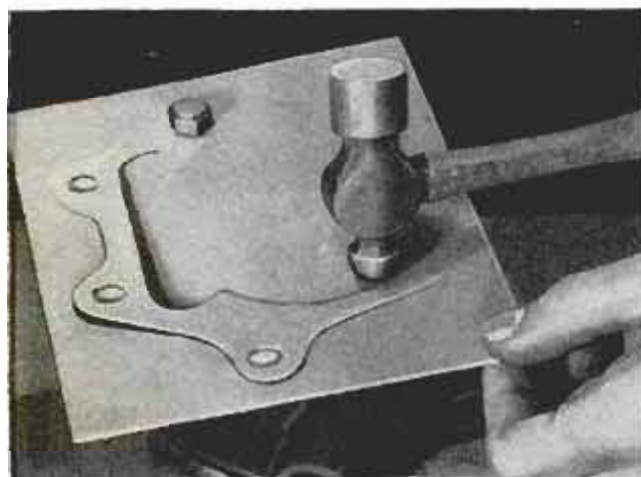


Hidden Metal in Used Lumber Detected With Aid of Magnet

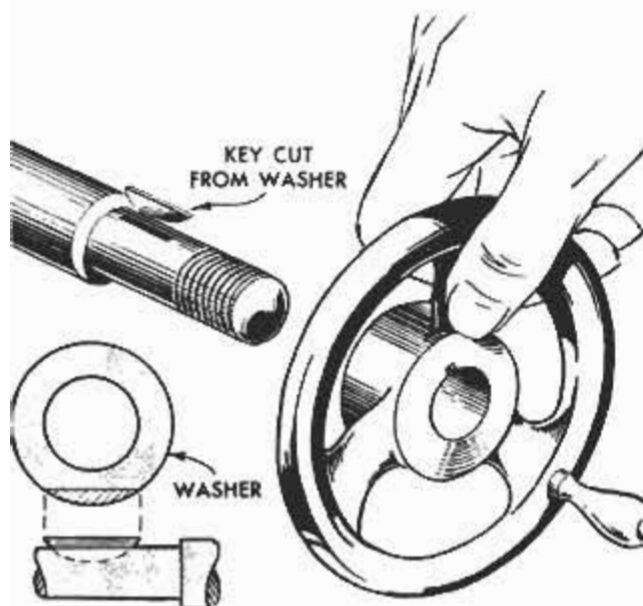
When running used lumber through a circular saw there is always the chance of damaging the blade, even though all visible nails have been removed. Some nails or other fasteners may have been broken off and are hidden below the surface of the lumber. Others may simply have been driven below the surface. To detect these hidden metal objects, suspend a small magnet on a cord and move it along the plank. When it reacts to show the presence of steel, place it on the surface of the wood to pinpoint the location.

Often, while checking lightweight oil in a warm engine, it is difficult to see the oil line on the dip stick. An easy way to correct this situation is to make a series of dents along the dip stick with a punch. The oil retained in the dents will be visible under any conditions.

Gaskets Cut to Exact Size by Using Ball-Peen Hammer



Small paper or composition gaskets can be cut quickly and accurately by placing a blank of the gasket material over the surface on which the gasket is to fit, and then tapping lightly along the edges of the metal with the ball end of a ball-peen hammer. If bolt holes are to be cut, make them first and insert a bolt or two to prevent the gasket from shifting while it is being cut. If an edge is not cut through completely, slit it with a sharp knife, rather than attempting to realign the paper on the metal. Also, avoid hammering too much on metal edges that might be damaged or distorted by the action.



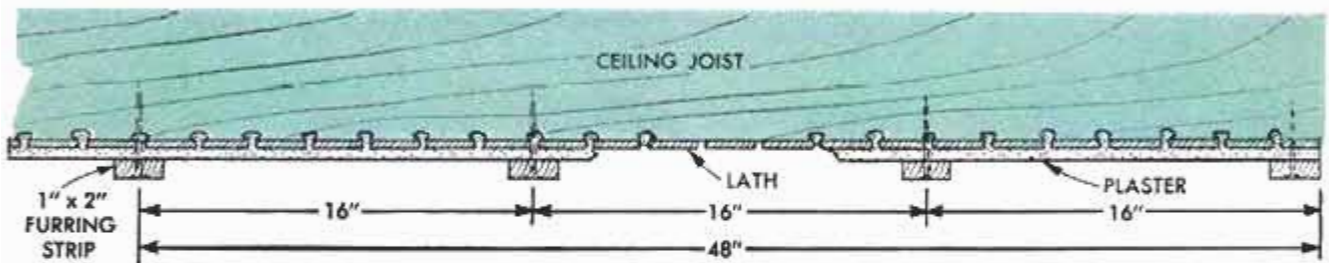
Worn Half-Moon Key Replaced With One Cut From Washer

When the half-moon key on a shaft fitted with a handwheel became badly worn, one machinist improvised a substitute key from a heavy steel washer. The key was cut from the edge of the washer, as indicated, then filed slightly to provide a tight fit in the keyway. An improvised key such as this should not be used where there is appreciable torque, as it would shear easily.

Frank LaSaracina, New York City.

☞ To maintain the natural beauty of exterior redwood surfaces, use redwood stain. Pigmented penetrating stain is good for new work as well as on old work.

Plywood Replaces Damaged Plaster on Ceiling



Loose, cracked plaster in a ceiling is not only unsightly, but can be dangerous. Falling plaster, loosened by vibration, settling or excessive moisture, can cause injury to people and property. An inexpensive method of repairing that does not involve the time and expense of replastering the ceiling completely is to cover it with 4 x 8-ft. sheets of $\frac{1}{4}$ -in. plywood. Interior-type fir plywood is used where moisture is not a problem. If a moisture condition exists, exterior-grade plywood should be used. When covering a ceiling, first knock off all loose plaster. Then nail strips of 1 x 2 furring over the entire ceiling, nailing through the plaster into the joist. The furring strips

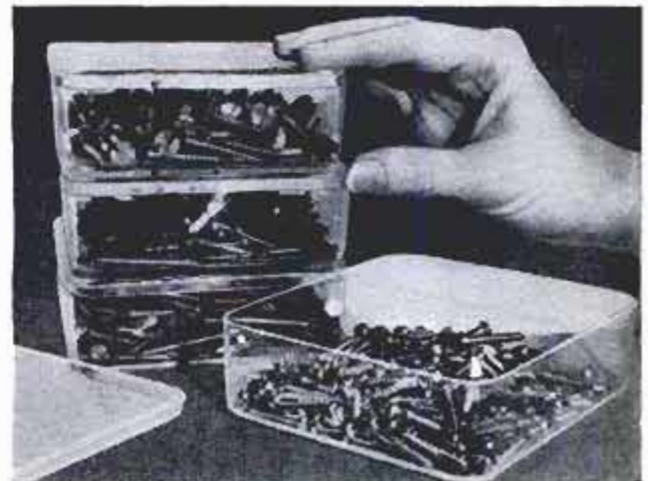
should be at right angles to the joists and on 16-in. centers. In areas where plaster has fallen away, it may be necessary to use shims under the strips. The plywood sheets now are nailed to the furring strips, using 4d finishing nails, spaced not more than 6 in. apart. The plywood can be painted with any type interior paint to match that used on the walls of the room. Or, for a plastered effect, it can be painted with a heavy coating of texture paint that then is smoothed with a flat cellulose sponge. When dry, this surface can be given a coat of paint to either match or contrast with the walls of the particular room.

Douglas Fir Plywood Association.

Clear-Plastic Sandwich Boxes Make Ideal Parts "Cabinet"

Plastic boxes, of the type used for carrying sandwiches, make ideal storage containers for nails, screws and other small parts used in a workshop. The boxes stack easily so that four or five of them require a minimum of shelf space.

☐ Noise from a leaky faucet can be silenced until repairs are made by tying an old nylon stocking around the faucet so the water can run down the stocking instead of dripping.



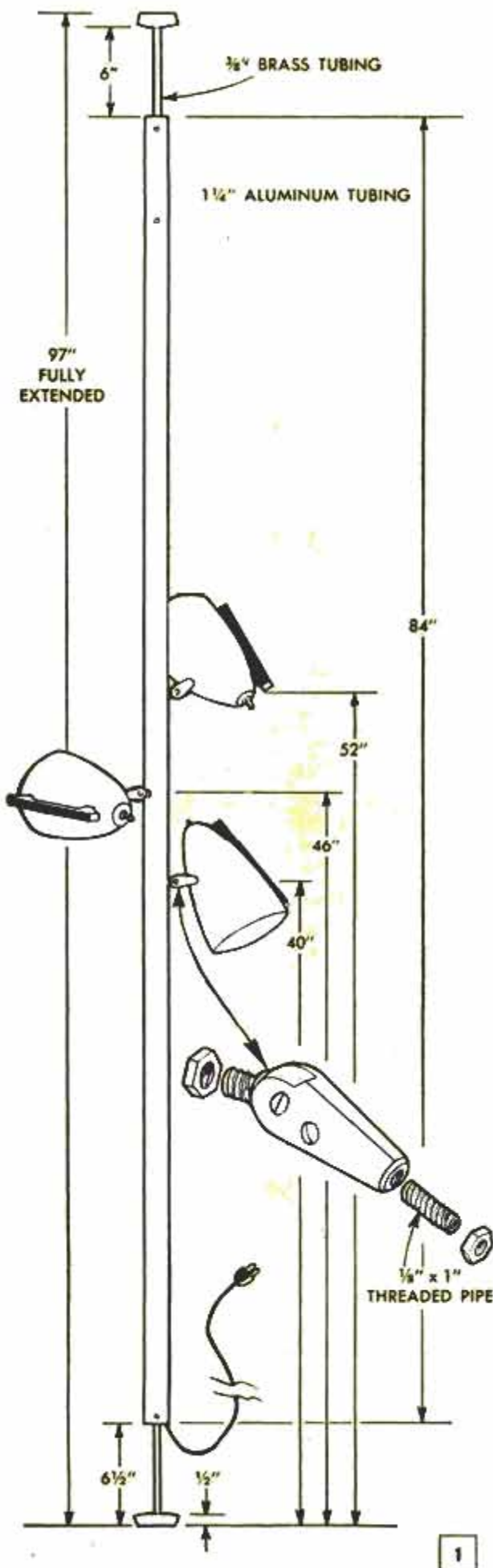
Make Your Own POLE LAMP

By Ronald L. Anderson

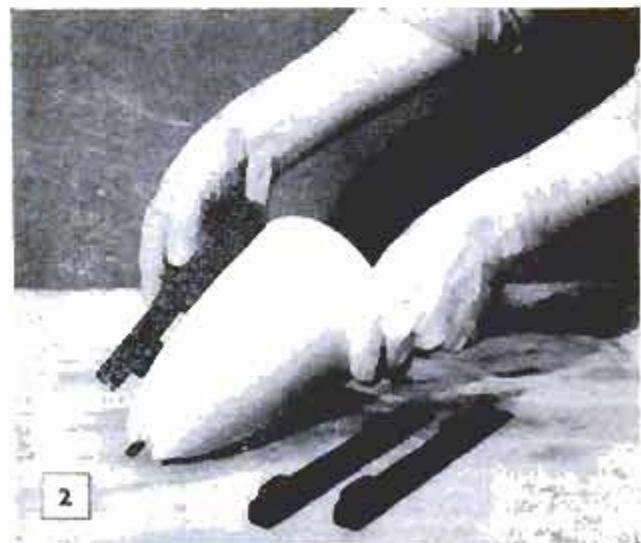
FOR EFFECTIVE HIGHLIGHTING of special areas of interest in your living-room decor, here is a pole lamp with a cluster of three spotlights that you can make in a few evenings. Except for the spotlights, which are purchased ready-made, the lamp is made from stock materials using hand tools and a portable power drill as illustrated. Aluminum tubing is used for the pole of the lamp, with extension legs made of brass tubing and dowel stock fitted in the ends. The upper leg is spring-loaded like a pogo stick, so that the lamp pole can be gently wedged between the floor and ceiling at any desired location. To move the lamp you need only pull up on the pole and swing the lower end of it to one side.

To make the lamp, cut an 8-ft. length of 1¼-in. aluminum tubing to size and drill it to take the lights and fittings for the legs as indicated in Fig. 1. Then the upper and lower leg assemblies are made and installed in the tubing as detailed in Figs. 3 and 4. Note that the upper leg is not secured to the end dowel piece, to permit cylinderlike movement while both dowel pieces of the lower leg are secured to the pole and to the leg so that it remains in a fixed position. A 2-in. drain plug fastened to each leg end as in detail A, provides a nonslip contact with floor and ceiling. Wooden handles, shaped and cut to fit the contour and size of light shades, may be bolted to them for easier turning when hot, detail B and Fig. 2. ★ ★ ★

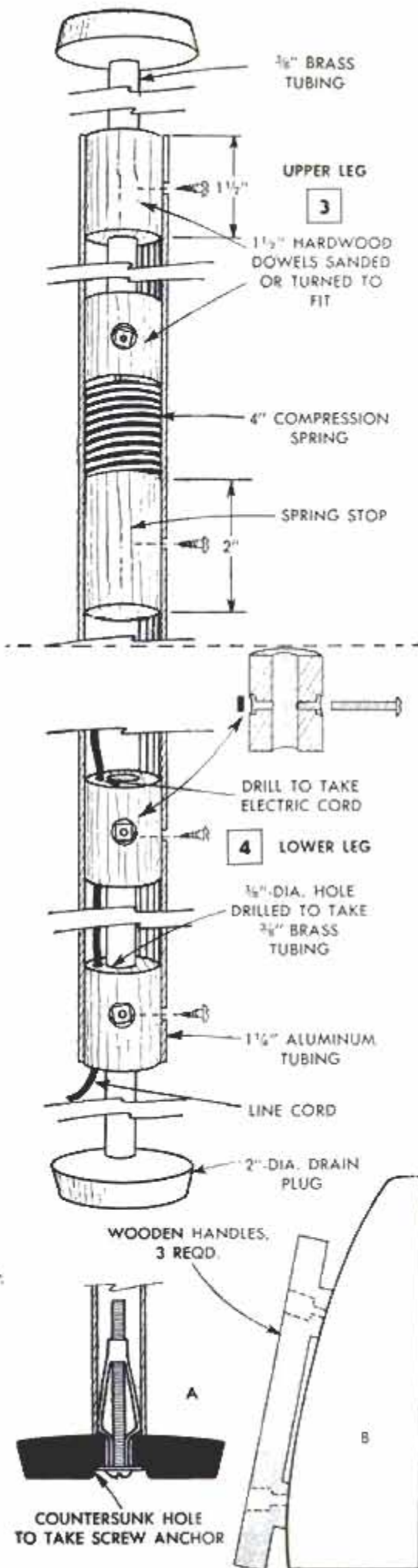
Handles for lamps are formed from walnut stock and bolted to shades with 1-in. stove bolts countersunk



1



2





Electric Fence Is Portable

Rearranging pasture area is no trick with this portable electric fence. Each post is a steel rod welded to a disk with a length of rod allowed to project below the disk. Stepping on the disk forces the rod into the ground to set the post. Insulators are bolted to each post.—A. M. Wet-tach, Mt. Pleasant, Iowa.

☐ To prevent bathroom mirrors from losing their reflective qualities more quickly than mirrors in other parts of the home, remove them from their frames and seal the backs against moisture with shellac.

Preheated Air Cleaner Speeds Starting of Car in Cold Weather

Preheating the carburetor air cleaner was the method used by one motorist as an aid to quicker starting in cold weather. The air cleaner was removed from the car the night before, taken into the house and placed on a radiator. In the morning, with the aid of gloves, the air cleaner was replaced on the carburetor and the engine started as quickly as the driver could reach

the seat. Air drawn into the carburetor was warmed by the cleaner, causing the gasoline to vaporize for quick firing. Although the cleaner quickly chilled in the cold air, the engine would be running well by then. The cleaner then was tightened onto the carburetor. Oil-bath air filters must be handled carefully to prevent spilling oil.

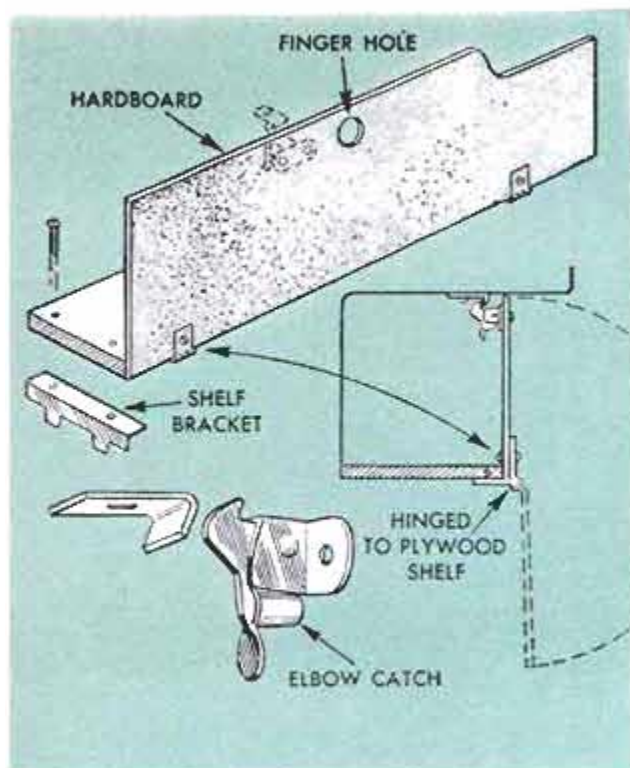
Andy Vena, Philadelphia, Pa.



Tall Corn Dusted From High Frame

To control corn borers in tall corn, one farmer mounted a tractor-type crop duster on a high frame made from welded lengths of pipe. The hitch to the tractor drawbar also was pipe, being braced on both sides with lengths of smaller-diameter pipe. The lower ends of the hoses on the duster were fastened to a steel flat attached to the duster frame with U-bolts. Loosening the U-bolts permitted the bar to be adjusted in height. The duster auger is powered through a chain-and-sprocket.

Locked Shelf in Cabinet Assures Caution



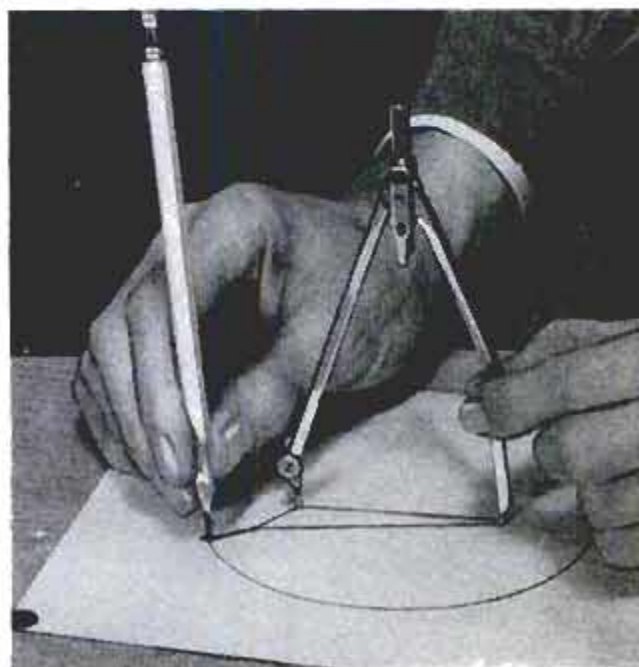
This locked shelf front effectively keeps certain items in your medicine cabinet away from inquisitive youngsters, and also prevents possible errors by inattentive adults. Yet, it can be opened quickly and easily by those who know how it works. The $\frac{1}{8}$ -in. hardboard front is hinged to a $\frac{1}{4}$ -in. plywood shelf, which is fastened to shelf brackets with small machine screws. A finger hole at the top center of the front gives an adult access to an elbow catch positioned as indicated. Because the shelf

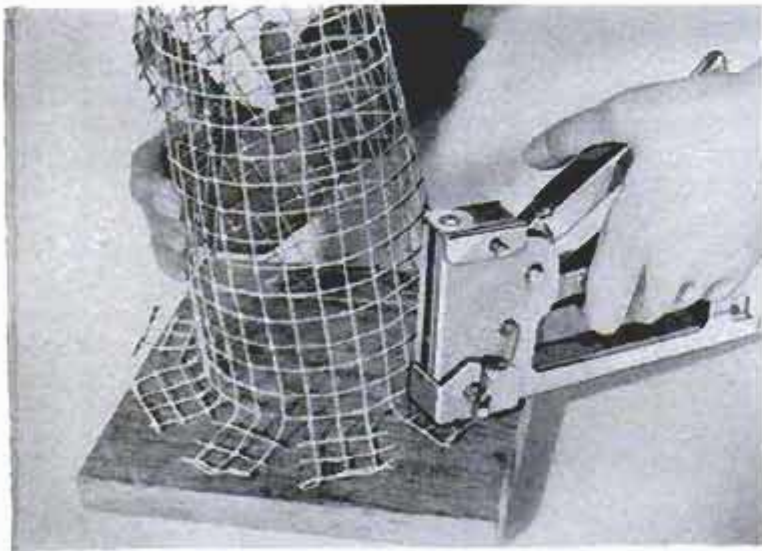
must be out of finger reach of children, it should replace the present top shelf, or be positioned above it. This location has the added advantage of permitting the elbow catch to be fastened to the inside surface of the top of the medicine cabinet. While the locked-front arrangement is generally effective for its purpose, it may not be completely tamperproof against clever, determined youngsters. Therefore, poisons should be stored elsewhere under a suitable lock, and with proper identification.

String and Modified Compass Aid in Drawing Accurate Ellipse

Drawing an ellipse by the usual method of using a string and two straight pins as points is not always completely satisfactory. The pins are difficult to press into a drawing board, and have a tendency to bend and move as the ellipse is drawn. A better method is to use a dividers or compass from a drafting set. In the latter case, the lead tip is replaced with a point, and the legs of the compass are adjusted so that each tip is vertical, providing vertical columns around which the string can pass. The compass points press easily into the board, and the instrument can be held firmly in position.

☐ A six-part wire drinking-glass carrier is a handy and attractive rack for small potted plants, and has the added advantage of permitting the plants to be carried as a group to the kitchen to be watered.





Above, hardware-cloth cone is stapled to base, Below, tree is started from the bottom, using largest branches first



BRANCHES AND TWIGS cut from the top of a Christmas tree to make it fit under a ceiling need not simply be discarded; they are ideal material for making miniature trees for other locations inside and outside a home. Perhaps you have decided, this year, not to have a full-size tree. In that case, purchase a bundle of branches from a Christmas-tree lot and make a tree of any size you desire. A small, "portable" tree can be formed by shaping a piece of $\frac{1}{2}$ -in. hardware cloth into a rough cone-shape and tacking or stapling it to a base of plywood or solid stock, as shown in the photo at the left. The ends of branches then are fitted into the openings in the cloth, beginning at the bottom of the cone. Use the largest branches at the bottom, shorter ones as you go up the tree to assure a natural shape. Any areas that look sparse can be filled in with scraps of branches and the smaller twigs. When decorating this little tree, keep in mind that proportions are important. Large ornaments and decorations will make your tree look absolutely undersize and awkward. Since there is a tendency to overdecorate a small tree be careful to avoid crowding the branches with too

YOUR OWN CHRISTMAS TREES

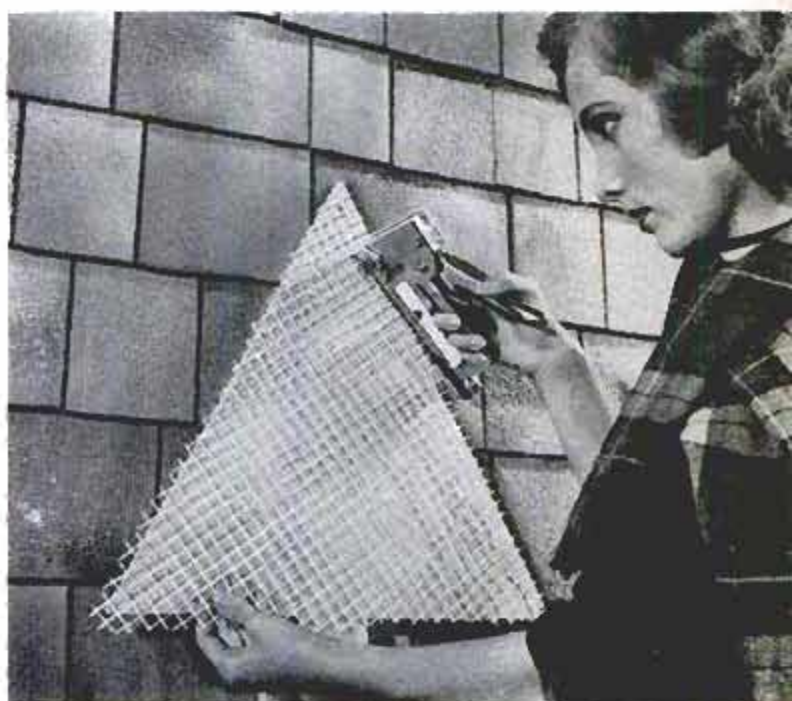


many ornaments and lights. Use small ornaments, keeping the same ratio of ornament size to tree size as with a full-size tree. Finish off the tree with a star or small angel, and perhaps a few small pine cones. Your tree now can be placed wherever you wish it to be. It will look fine as a centerpiece for a dining-room table or do just as well on a table near the front door where your guests can see it as they enter. Place it in a window where passers-by also can enjoy it. For this location, illuminate it with a string of the miniature bulbs that are wired through a transformer that causes the lights to wink on and off in a friendly fashion.

The second tree to be made of branches is based on a triangle of heavy cardboard, plywood or hardboard. Over this is stapled hardware cloth to receive the ends of the branches, in the same manner as the portable tree. For the start of this tree, use one large branch the full length of the triangle, as shown in the lower photo at right. Smaller branches and twigs then are placed around this larger branch to fill out and form the tree. This tree can be used either inside or outside a home, but looks best when fastened to an outside wall, as shown. If the triangle is made of cardboard, it should be varnished or painted when used outside. The color should be a green that will not look unnatural with the green of the tree branches. Ornaments and decorations for an outside tree also should be chosen more carefully, as anything that weathers easily would not be suitable. Interior-type lights could be used on the tree if it were protected under a porch roof or door canopy. Exterior-type Christmas-tree lights probably would be too large for this size of tree. As an alternate method of lighting, locate an outdoor spotlight so it shines on the tree. Move the light about, to determine what position provides the best effect, and then provide a base to which the light can be attached securely. ★ ★ ★



Finished miniature tree, above, is topped by tall ornament, just as though it were a full-size tree



Above, base for this type miniature Christmas tree is hardware cloth stapled to triangular-shaped cardboard, plywood or hardboard. Below, one large branch is "trunk" of tree, small branches fill out rest





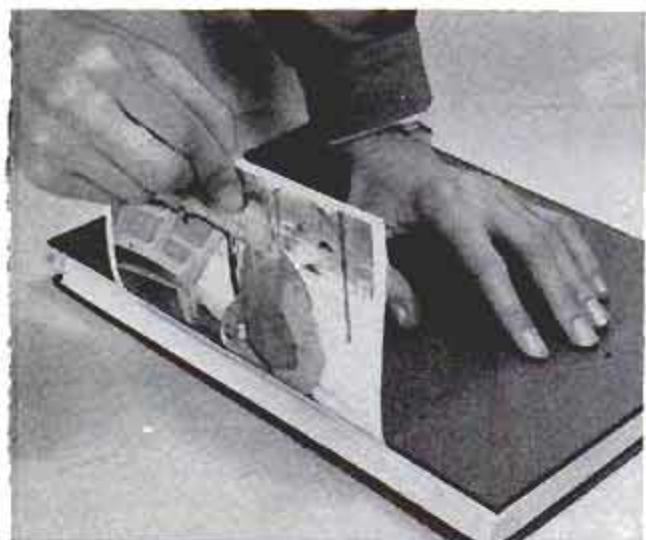
Bracket on Small Drawing Board "Clamps" It to Dictation Slide

Attaching a U-shaped length of flat steel to one end of a drawing board will permit it to be slipped over the end of the dictation slide in a desk and held at a convenient angle. If a T-square is used, which might strike the flat, set it flush with the edges of the board and countersink the screws.

Modeling Clay Aids Nailing

If you run into a situation where it is almost impossible to hold a nail while starting it, press a lump of modeling clay over the spot into which the nail is to be driven. Then press the point of the nail into the clay and start hammering. After the nail has been struck a few times the clay can be removed and the nail driven flush. The clay will adhere to any surface.

Photographic Prints Flattened With Costfree Equipment



An effective method of flattening curled photographic prints with a minimum chance of cracking the emulsion, is to place each print, emulsion-side down, between the pages of a large book. The print then is grasped at the edge and pulled out of the book at a sharp upward angle as shown, while a light pressure is exerted on the book cover. Repeat this process several times, reversing the print edge for edge, to assure that the full surface of the print is flattened. Photoprints treated in this manner compare favorably with prints straightened in a commercial print flattener and, most important for the amateur photographer, at no cost at all for equipment to do the job.



Taper-Shank Drill Chuck Is Substitute Pin Vise

When no pin vise is available, short lengths of round stock that need to be filed, drilled or worked on in any manner can be held in a regular drill chuck. The chuck is held in a vise by using two wooden blocks. The blocks first are clamped together and a hole drilled to center between them. Because the hole is undersize, the blocks "crush fit" around the chuck.

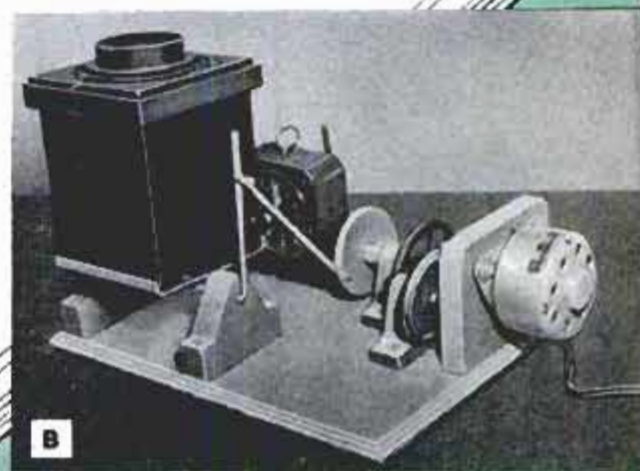
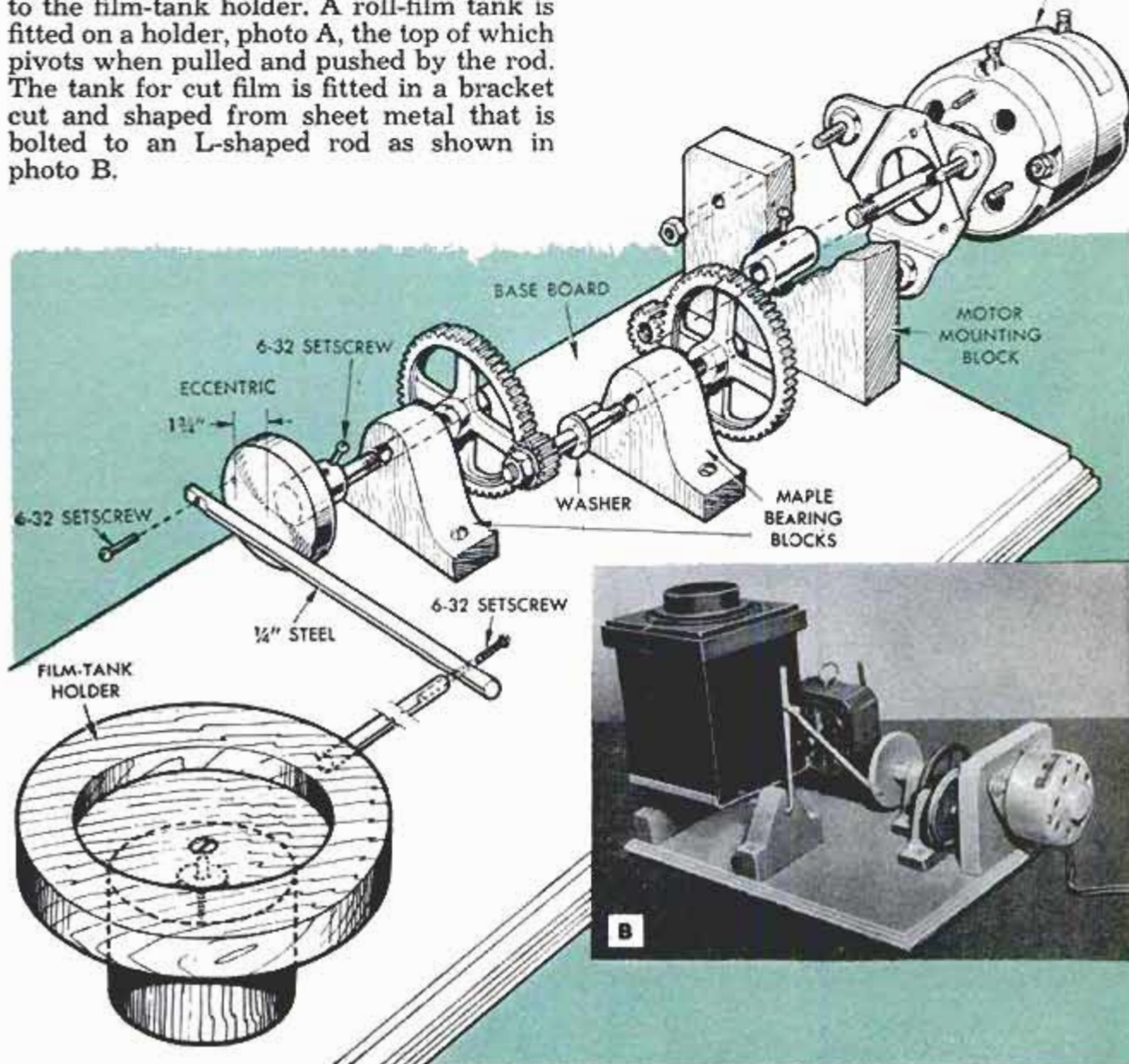
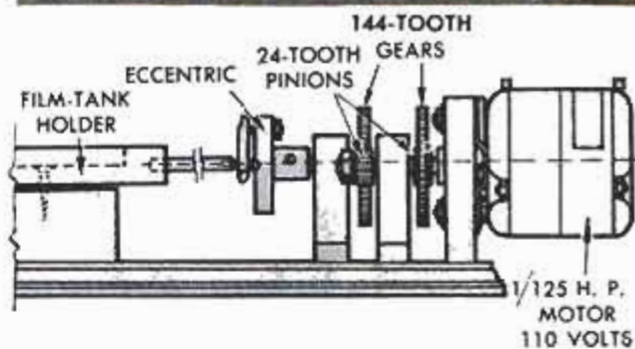
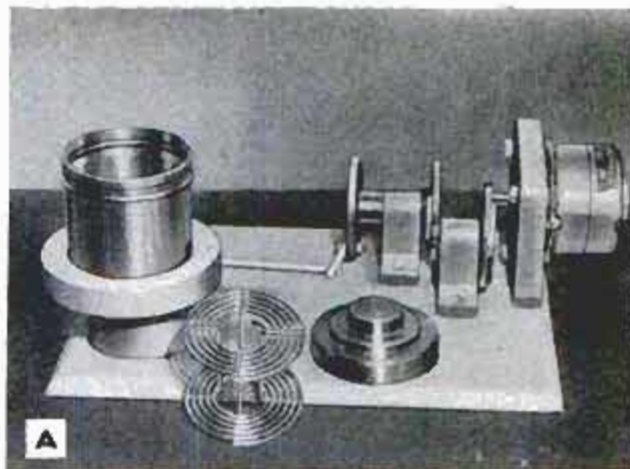
F. L. Rush, Columbus, Ohio.

When patching a plastered wall, brush the edges of the old plaster with varnish. When the varnish has dried to a tacky stage, apply the patching plaster.

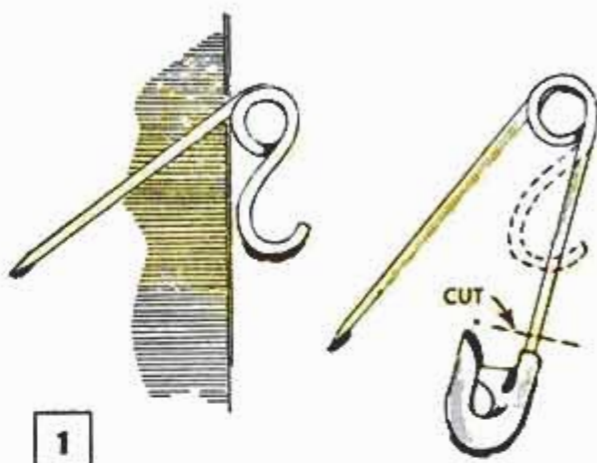
FILM AGITATOR

By L. H. Georger

AGITATION OF FILM tanks during developing no longer need be a manual operation when this powered agitator is used. Power is provided by a $\frac{1}{125}$ -hp. electric motor that runs at a constant 1550 r.p.m. on 110 volts. These motors are available at hobby shops and some toy stores. Speed reduction is taken care of by two 144-tooth metal gears and two fiber pinion gears purchased at a radio shop. The motor is bolted to a mounting block, as indicated, and the block is screwed to a wooden breadboard or suitable piece of plywood. Maple is used for the bearing blocks in which $\frac{1}{4}$ -in. steel rods rotate as shafting for the gear assemblies. An eccentric, which can be a turned shape, or simply a straight bar, is fitted on the end of the final shaft. A connecting rod cut from $\frac{1}{4}$ -in. rod runs from the eccentric to the film-tank holder. A roll-film tank is fitted on a holder, photo A, the top of which pivots when pulled and pushed by the rod. The tank for cut film is fitted in a bracket cut and shaped from sheet metal that is bolted to an L-shaped rod as shown in photo B.



Solving HOME PROBLEMS



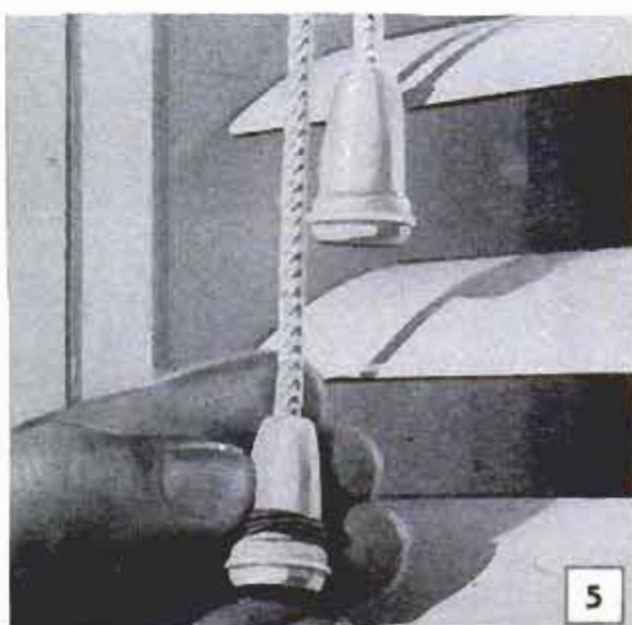
1. STRONG DRIVE-IN HOOKS for hanging both large and small wall pictures can be improvised by altering common safety pins. Cut off and bend upward as indicated to form hooks, then drive into plaster

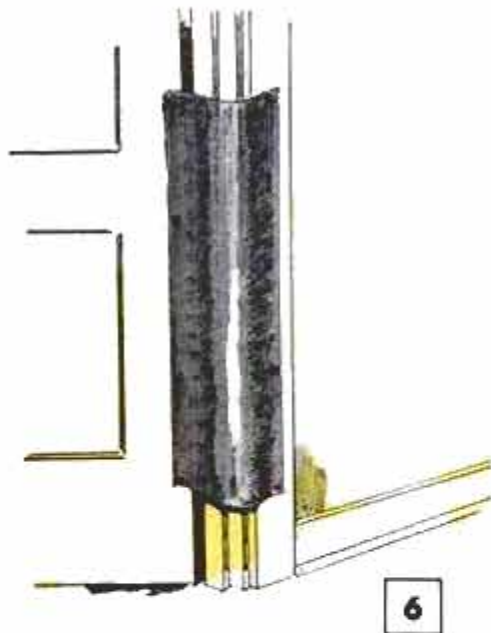
2. WHERE TO GRIP a flowerpot when painting it is no problem if a cork is pressed in the drain hole in the bottom to provide a knob. This lets you turn the pot, as well as pick it up, without touching the paint



3. SERVING TRAYS have a habit of falling down when leaned in a cupboard. This won't happen if a short section or two of rubber tubing is slitted lengthwise and then slipped over the edge of each tray

4. A RUBBER BAND is all it takes to keep the parts of a spare electrical receptacle together for future use. The band is merely stretched around the two mounting screws which in turn hold the backplate





6

5. YOU'LL KNOW AT A GLANCE which pull on a Venetian blind tilts it up and which down if one pull is identified by wrapping a rubber band around it. You can find it in a darkened room by feeling band

6. EVER-PRESENT DANGER of tiny fingers being crushed in a door is minimized by covering an area along the hinged side with two strips of inner-tube. Tack strips to opposite sides, leaving more play in one

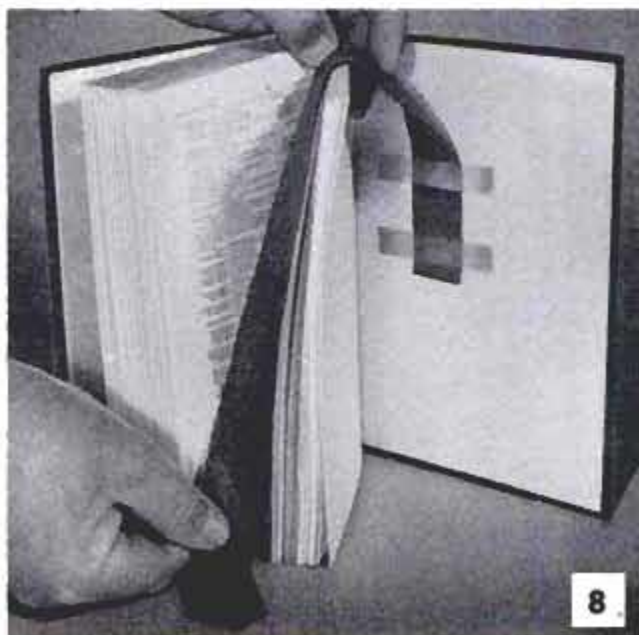


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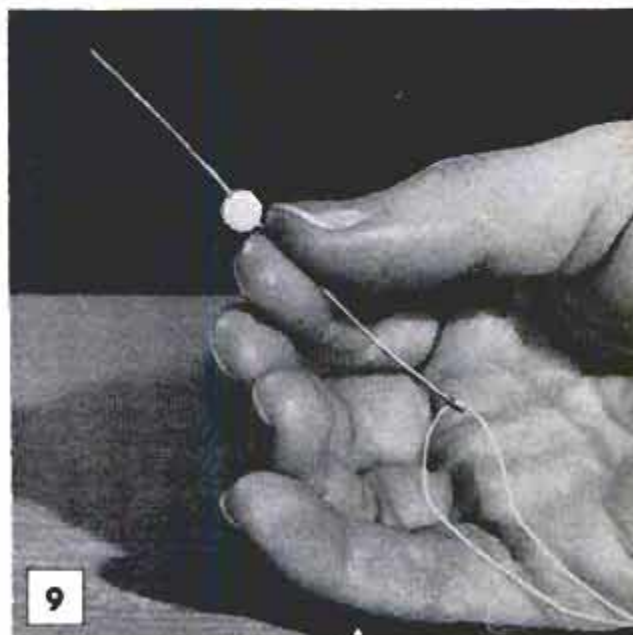
7. TEMPORARY CLOTHES ROD for hanging freshly ironed clothing consists of dowel with a screw hook in each end to engage screw eyes driven into wall and outer edge of door at a convenient height

8. BOOKMARK STAYS PUT when taped to the inside back cover. This king-size one measures 1 in. wide and 16 in. long and is cut from an old felt hat. Two strips of cellulose or adhesive tape hold it in place

9. WHEN A NEEDLE IS TOO LARGE for restringing beads, an extra-fine one can be formed from one strand of wire found in electric lamp cord. Fold strand in half, place thread between bend and twist



8



9



Charred Posts Don't Decay

Lightly charring the staple locations on new cedar fence posts is recommended by one farmer as a means of preventing decay at these places, which might result in loosening of the staples. A gasoline blowtorch used in the manner shown in the drawing at left is best for this purpose.

G. E. Hendrickson, Argyle, Wis.

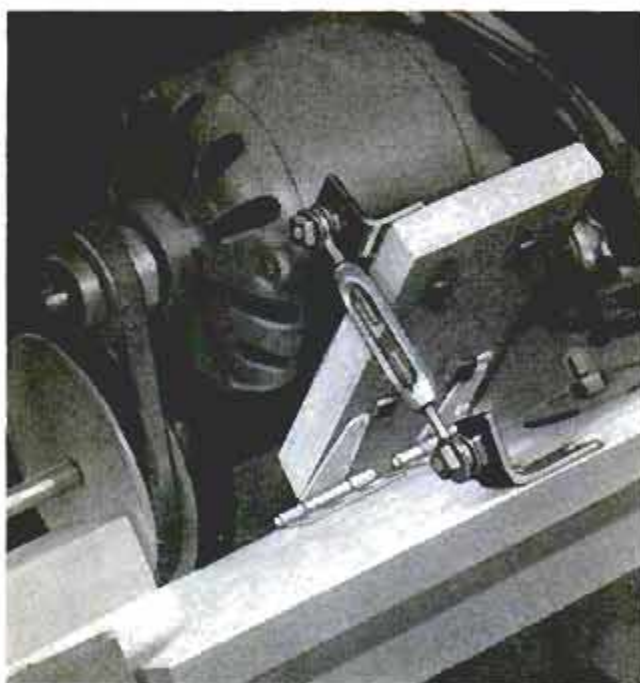
Repair Loose Joints of Door

An effective way of permanently repairing an old door that has opened at the joints is to place bar clamps across the door and close the joints to their former tightness when new. Then with the clamps still in place, drive two or three wood screws through the stiles and into the tenons, positioning them about $\frac{1}{2}$ in. from the joints. Countersink the heads of the screws and cover them with wood putty.

Livestock Chute Floor Hinged to Adjust to Various Truck Heights



To permit easier loading of livestock, one farmer added an adjustable floor section to the end of the loading chute as shown in the photo. The outboard end of this section can be raised or lowered to any one of three elevations to match the bed of the truck backed up to it. The hinge on the section consists of a series of 2-in. sections of $1\frac{1}{4}$ -in. pipe welded to lengths of flat steel that are bolted to the underside of the floor section and to the post on each side. A 1-in. steel rod with a cross rod welded to one end for a handle, is inserted in the pipe sections to serve as a pin.



Use Turnbuckle to Tighten Belt Of Platform-Mounted Motor

Belt tension for a fractional-horsepower motor is easily adjusted when the motor is mounted on a platform that swings on hinges at one end and is held in tilted position at the other end by means of a turnbuckle as in the photo at left. For larger than $\frac{1}{2}$ -hp. motors, a turnbuckle should be attached to each side of the platform for better support and to prevent vibration.

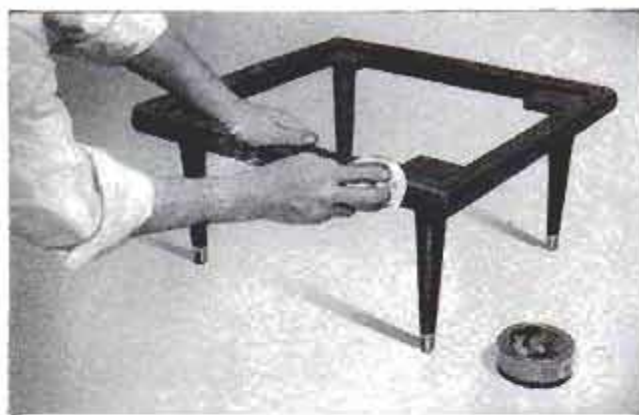
Hugh Lineback, Stillwater, Okla.

☞ When scouring with steel wool, you can avoid getting fragments of steel in your fingers by using a length of garden hose as a holder. Insert steel wool in one end of the hose and push it through the hose as it wears away.



SECTIONAL OTTOMANS

By Ronald L. Anderson



STYLED WITH A LOOK of the popular "Danish contemporary," these sectional ottomans combine their beauty with low cost and versatile utility. They can be grouped for best viewing of TV by the youngsters, then moved out of the way when not in use. At parties they simply are picked up and located where a guest wishes to sit. Their light weight will be appreciated especially by a housewife when she moves them around while cleaning. Despite their smooth, modern appearance, stock-milled lumber is used for the frames of these ottomans, and the legs are purchased ready-made. If you have some cushions left from a discarded sofa, they will cost you nothing, but even when it is necessary to buy the cushions, the finished cost of the units will be only a fraction of what they would cost if purchased. Foam-rubber cushions in many sizes are available, and can be covered with slipcovers that are fitted with zippers to permit easy removal for washing or cleaning.

The frame for each ottoman is made from handrail stock, ordinarily used for just that purpose by builders. One side of the stock is flat, which makes it simple to align and cut the mitered corners. The flat side also fits firmly against the table of a saw for cutting the 5-in.-long grooves in the ends of each frame member. Plywood

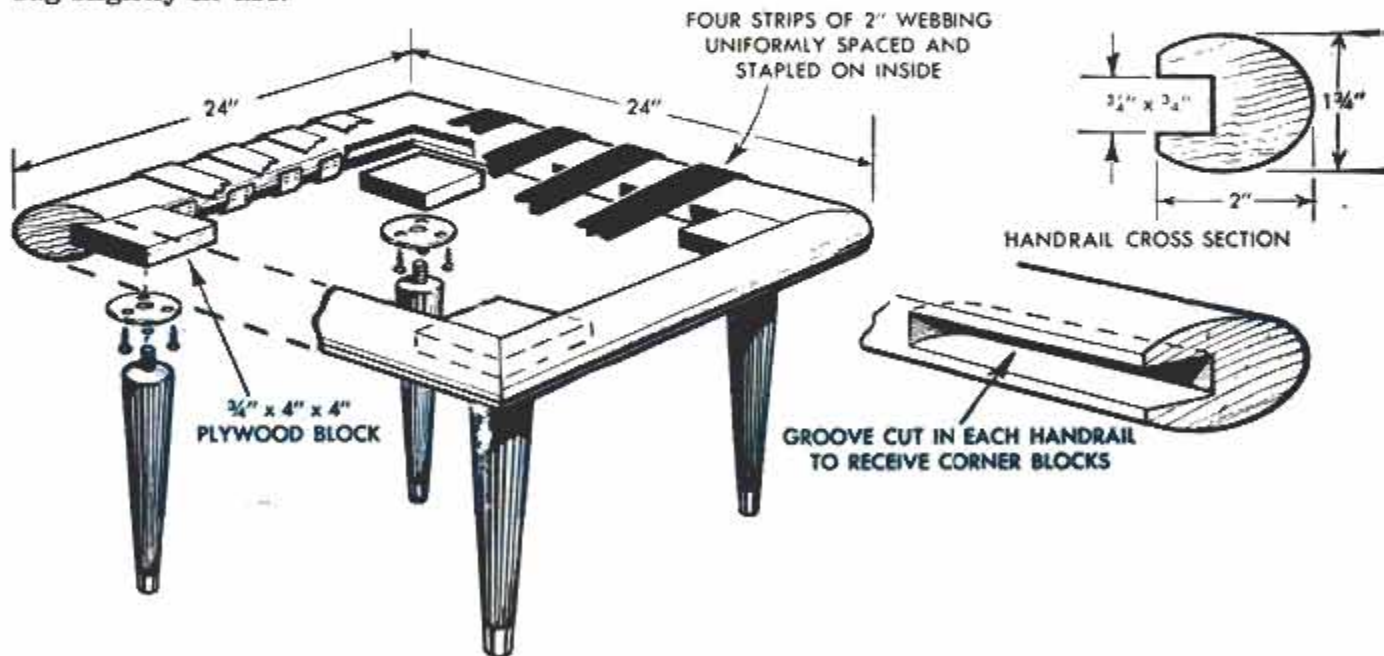
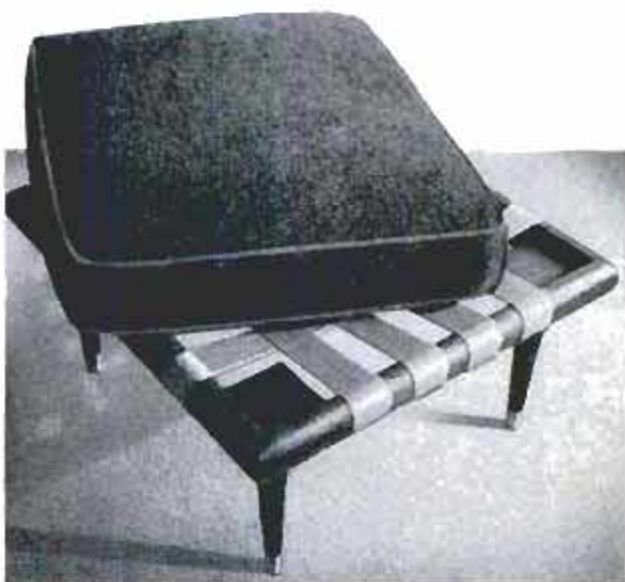
corner blocks are fitted in these grooves as shown in the detail, and glued in place. Inside dimensions of an ottoman frame should be the same as the dimensions of the cushion used. This permits the cushion to be positioned by the frame edges when the supporting webbing sags slightly under the weight of a person. Double check the sizes of sofa cushions, some are longer than they are wide.

After each frame has been glued, assembled and squared, let it stand until the glue has dried thoroughly. Any imperfections in the mitered joints now are filled with wood putty. Next, metal leg brackets are screwed to the corner blocks. Keep brackets as close to the frame members as possible, to increase the strength of the finished assembly. Now sand the frame and legs and stain to suit. In the matter of staining: Handrail is available in either oak or white pine. If a light oak finish is preferred for both legs and frame of the ottomans, use oak legs and oak handrail. For walnut, mahogany, cherry or any darker finish, white-pine handrail can be used, along with less expensive gumwood legs. The length of the legs is up to the individual builder. On the original ottomans, legs 10 in. long were used.

After the stain is well set, apply a coat of shellac that is sanded lightly when dry. Finally, apply paste wax. The final step in construction of the ottomans is to staple or tack cloth or plastic webbing to the frames. This webbing is available at most department stores, upholstery shops and mail-order houses. About 8 yd. of webbing will be required for each frame, this length allowing a little extra for doubling the ends of the webbing where it is tacked or stapled. Draw the webbing as tightly as possible, using a stretcher because it will sag slightly in use. ★ ★ ★



Above, three of the ottoman units grouped together. Below, a single unit, showing its neat construction

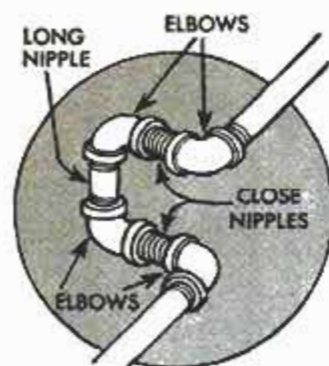


Barnyard Gate Can Be Raised to Swing Over Snowdrifts



Here is what one farmer did to eliminate a lot of backbreaking work opening a heavy gate in deep snow. Two U-shaped pieces of flat steel fitted around a 3 x 6 upright, with notches cut at selected elevations and bolted to the gate as shown, permit the gate to be raised to clear most snow depths that occur. A concrete counterweight, on the end of the lever which is pivoted on the upright, aids changing the elevation of the gate. The gate can also be raised to allow hogs to pass under it to an adjacent feedlot.—Donald K. O'Brien, Gahanna, Ohio.

Swing Joint in Pipeline Accommodates Expansion



When a long run of hot-water pipe has rigid connections at both ends, an expansion joint should be installed in one end to allow for contraction and expansion. If a manufactured expansion joint is not available

and a flexible joint is not desired, a swing joint can be improvised from elbows and nipples such as the one shown.

Hydraulic Lift on Drawbar Eases Work for Tractor Operator

Laborsaving controls installed on this tractor permit the operator to lift the drawbar hydraulically or shift it from side to side when desired. This ease of handling the drawbar is especially handy when plowing rolling land and when moving wide farm machinery through gates.

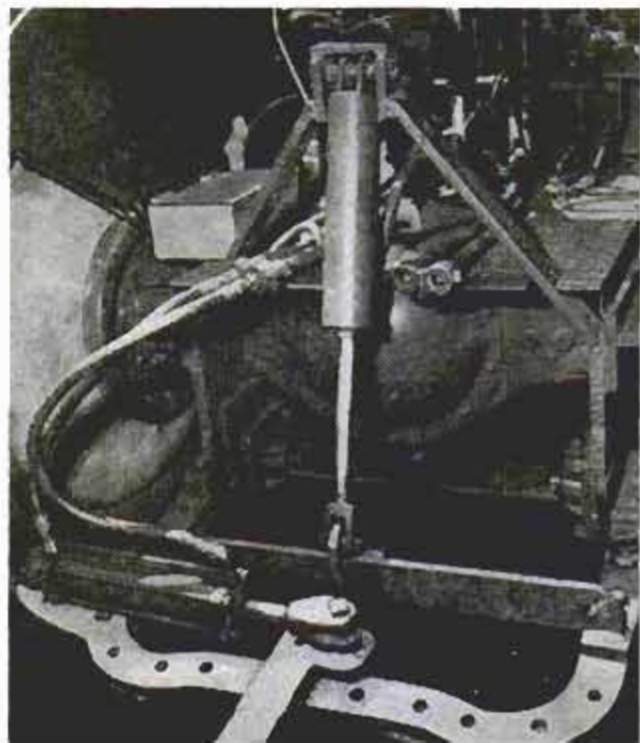
Use Bow-Tie Clip as Note Holder

If you like to have notes convenient to the work, here is a means of quickly placing them wherever desired. Simply remove the double clip from a ready-made bow tie, clamp the notes in one end and clamp the other end to the work.

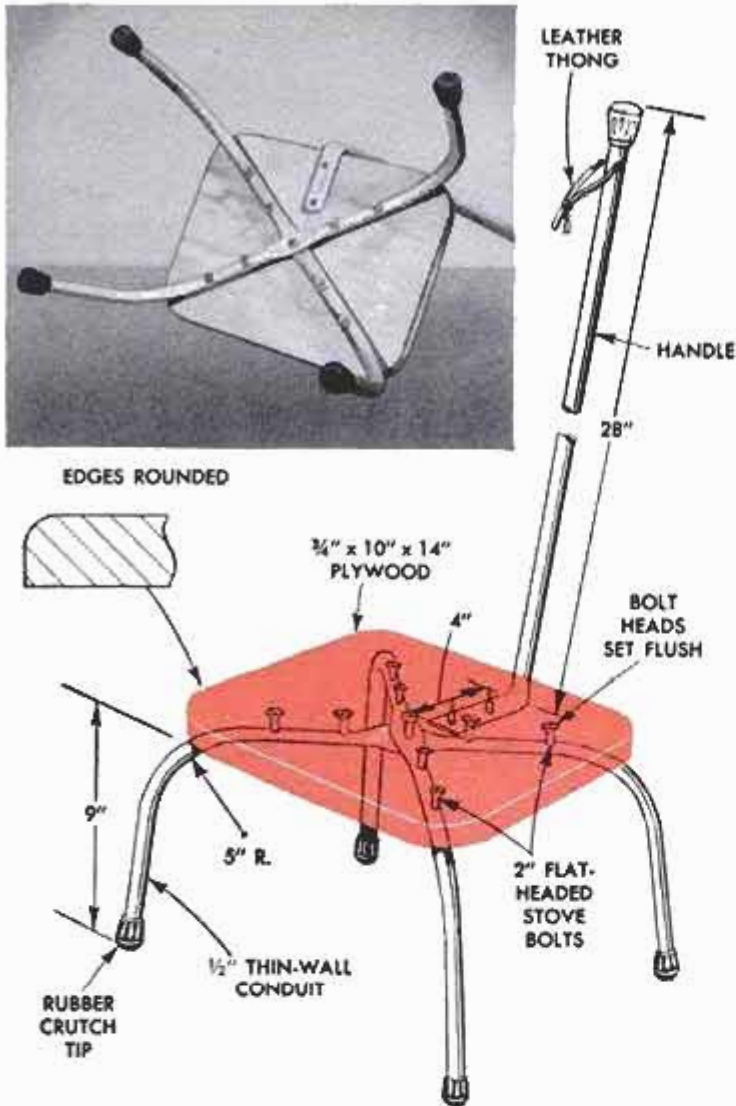
Courtney Schwertz, Madison, Wis.

C-Clamp Prevents Nails From Splitting Small Lumber

To prevent splitting the end of a small piece of lumber that is being nailed, tighten a C-clamp on it as shown in the drawing. After the nails are driven, the clamp may be removed without danger of the wood splitting. Pilot holes should be drilled before driving nails in the ends of hardwood lumber.



Stepstool With Handle Eliminates Stooping



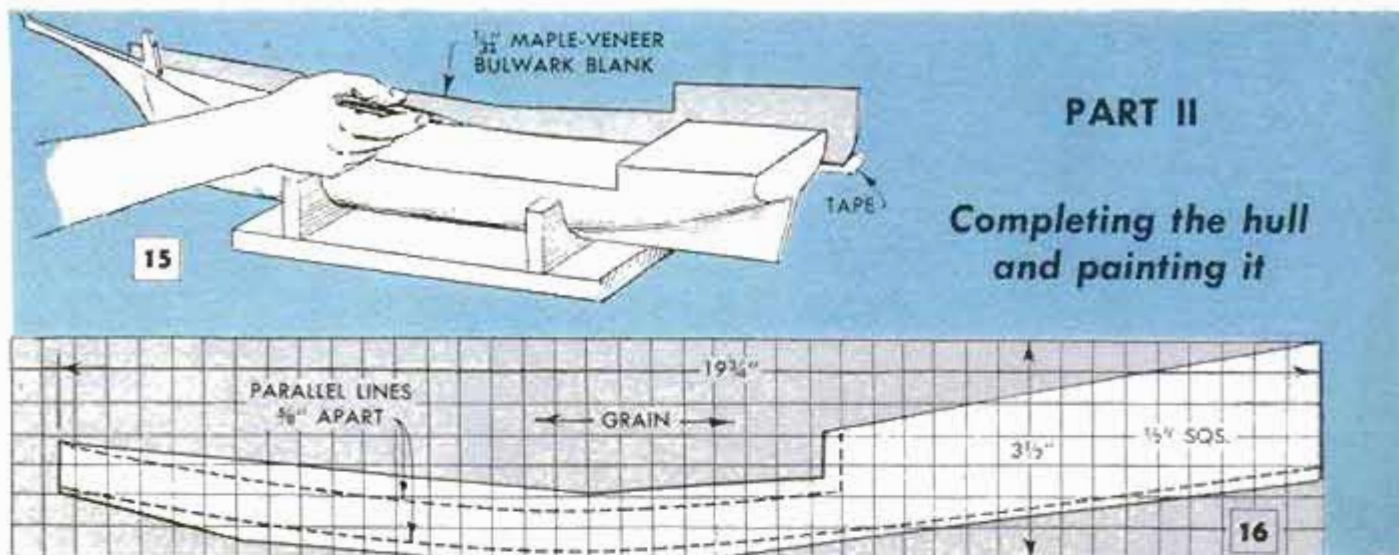
There are always a number of shelves and cabinets around the home that are just out of reach, so that a stepstool is needed. Here is such a stool, having the added advantage of a handle that eliminates the need for stooping to pick it up. A leather thong passed through a hole near the upper end of the handle permits the stool to be hung up out of the way when not needed. The top of the stool is a 10 x 14-in. piece of $\frac{3}{4}$ -in. plywood with the upper edges rounded and the corners cut to a 2-in. radius. The legs of the stool are two 41-in. lengths of $\frac{1}{2}$ -in. thin-wall electrical conduit. They are bent as indicated, using a tubing bender, which can be rented from a hardware store. After the legs are bent,

they are flattened at the center and fastened together and to the stool top with $\frac{1}{8}$ x 2-in. flat-headed stove bolts. The bolt heads are countersunk in the stool top. A 32-in. length of the conduit is used to make the handle, 4 in. of one end being flattened and drilled for two screws. The flat then is bent so it is slightly greater than at right angles to the handle and bolted to the bottom of the stool. If this handle shows signs of bending while being used, it is suggested that a short diagonal brace be fitted between it and the stool top. After the top, legs and handle are painted, a piece of rubber matting is cemented to the stool top. Crutch tips are fitted to legs and handle. Ronald L. Anderson, Minneapolis 20, Minn.

If the head of a hammer has become rounded, you will have difficulty driving a nail, as the head will slip off the nail when contact is made. To restore maximum efficiency to the hammer, clamp it in a vise and level the face with a file.

To prevent bottles and jars from tipping in the refrigerator, while standing on the wire shelves, cut pieces of plastic screening to fit the shelves and anchor them in place. The mesh in the screening gives ample circulation.

MODELING THE FRENCH



BECAUSE of continued references to station lines in building the model *Chebec* (the first installment last month) they should be marked on masking tape stuck to the deck centerline and to the keel to keep from marking the finished hull. Use a good grade of waterproof glue, applying it to bare wood but not to painted or other finished surfaces. Glued parts should be held together firmly until dry. Short sections of lill or ribbon pins ($\frac{1}{2}$ and $\frac{3}{8}$ in. long and having diameters of No. 72 and 74 drills respectively) are used for reinforcing in addition to glue. These are merely pressed gently into soft wood but pilot holes are needed in hardwood.

To make wood strips pliable for bending, use a simple steamer, such as shown in Fig. 17. In lieu of tiny twist drills you can make substitutes from needles by grinding the eye end as in Fig. 17. A pin vise is needed to hold them. Because of unavoidable slight differences between any two models made from the same plans, it's best

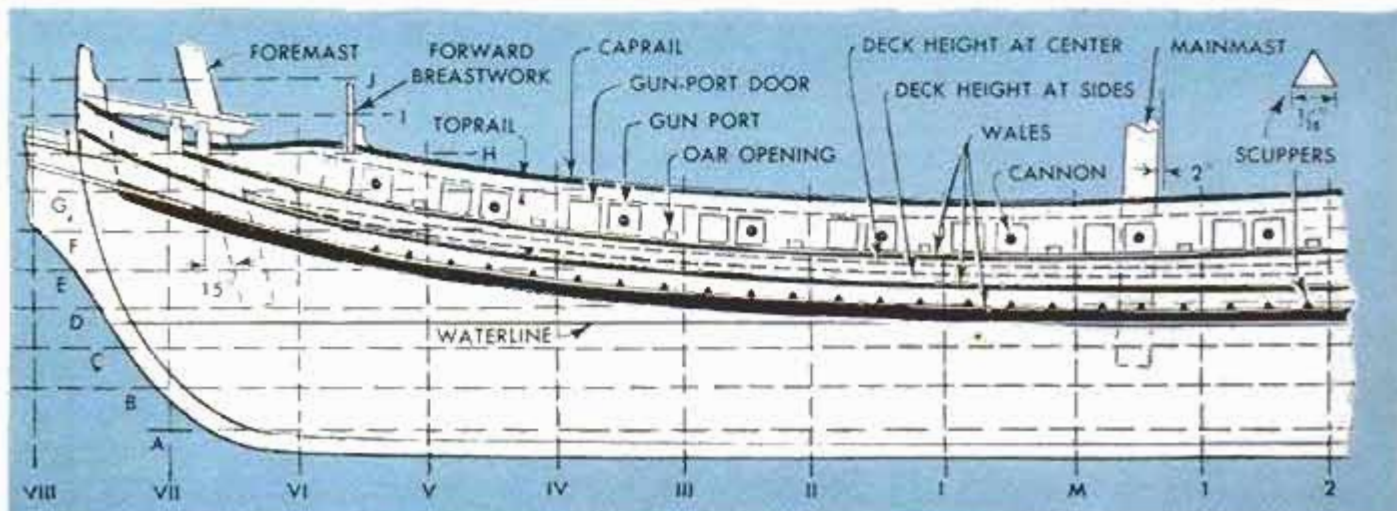
to make paper patterns of parts first so you can check for fit, and then make the parts accordingly.

Waterway Strips and Deck Finish

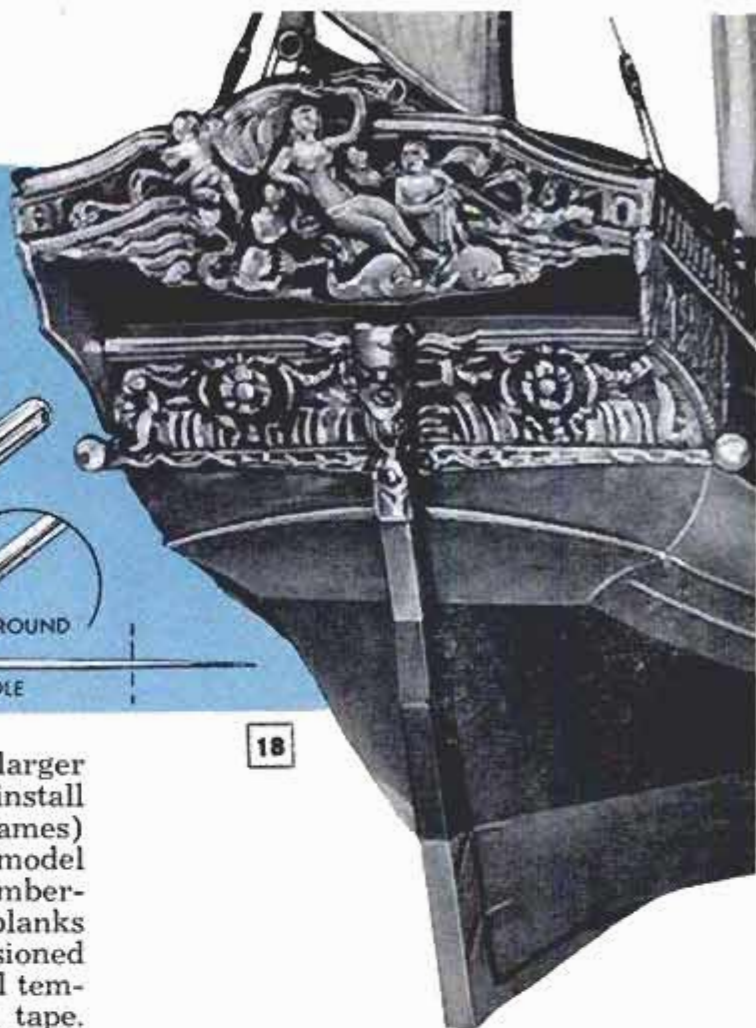
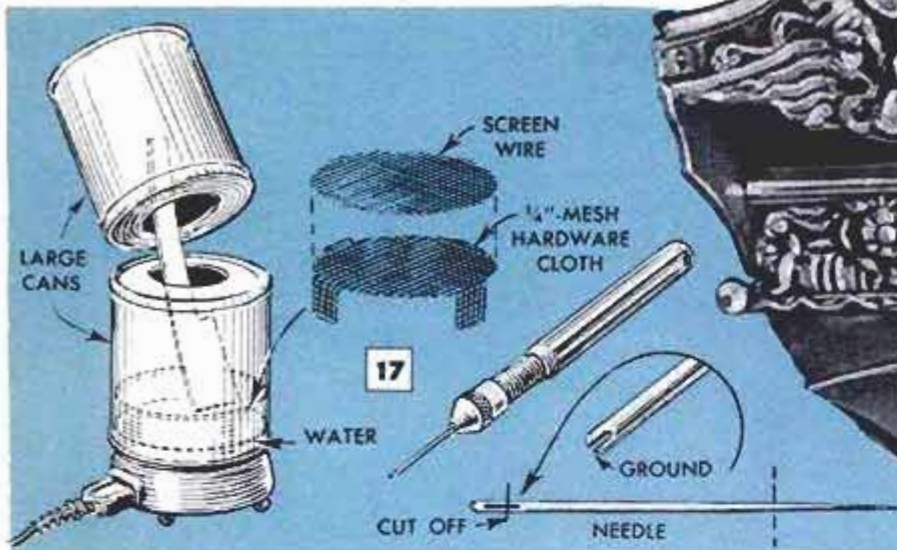
Waterway strips, as shown in Figs. 20, 21 and 22, are glued to the main deck $\frac{1}{32}$ in. from the sides, thus providing a corner to glue in the bulwarks. The waterway strips extend from station 6 to a point $\frac{9}{16}$ in. ahead of station V where the forward breastwork comes, as indicated in Figs. 14, 19 and 23. Before proceeding, clean the deck with 2-0 sandpaper and stain it a light oak. Apply a coat or two of clear varnish or lacquer, rubbing this down with fine steel wool when dry. This helps to keep the deck clean. Don't coat the waterway strips however. When you glue fittings to the finished deck later, remove some finish as necessary to assure good adhesion.

Bulwark Blanks

Bulwarks are the continuation of a



CHEBEC

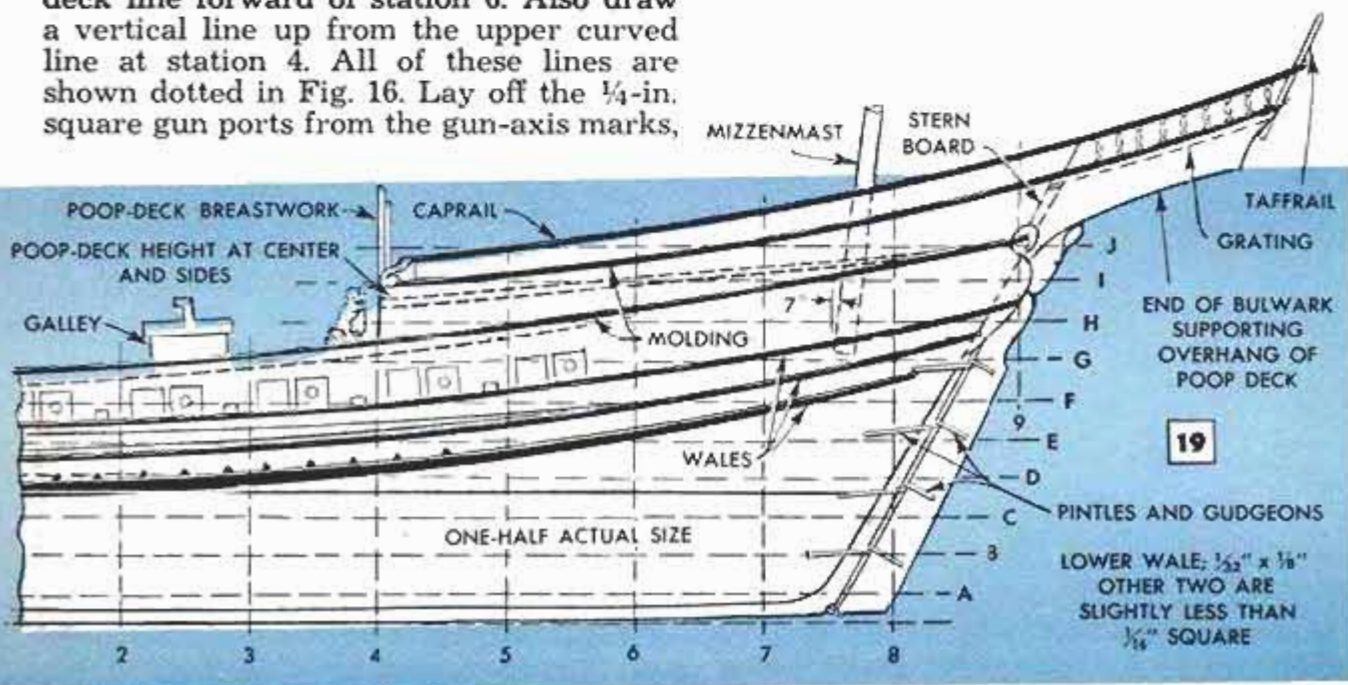


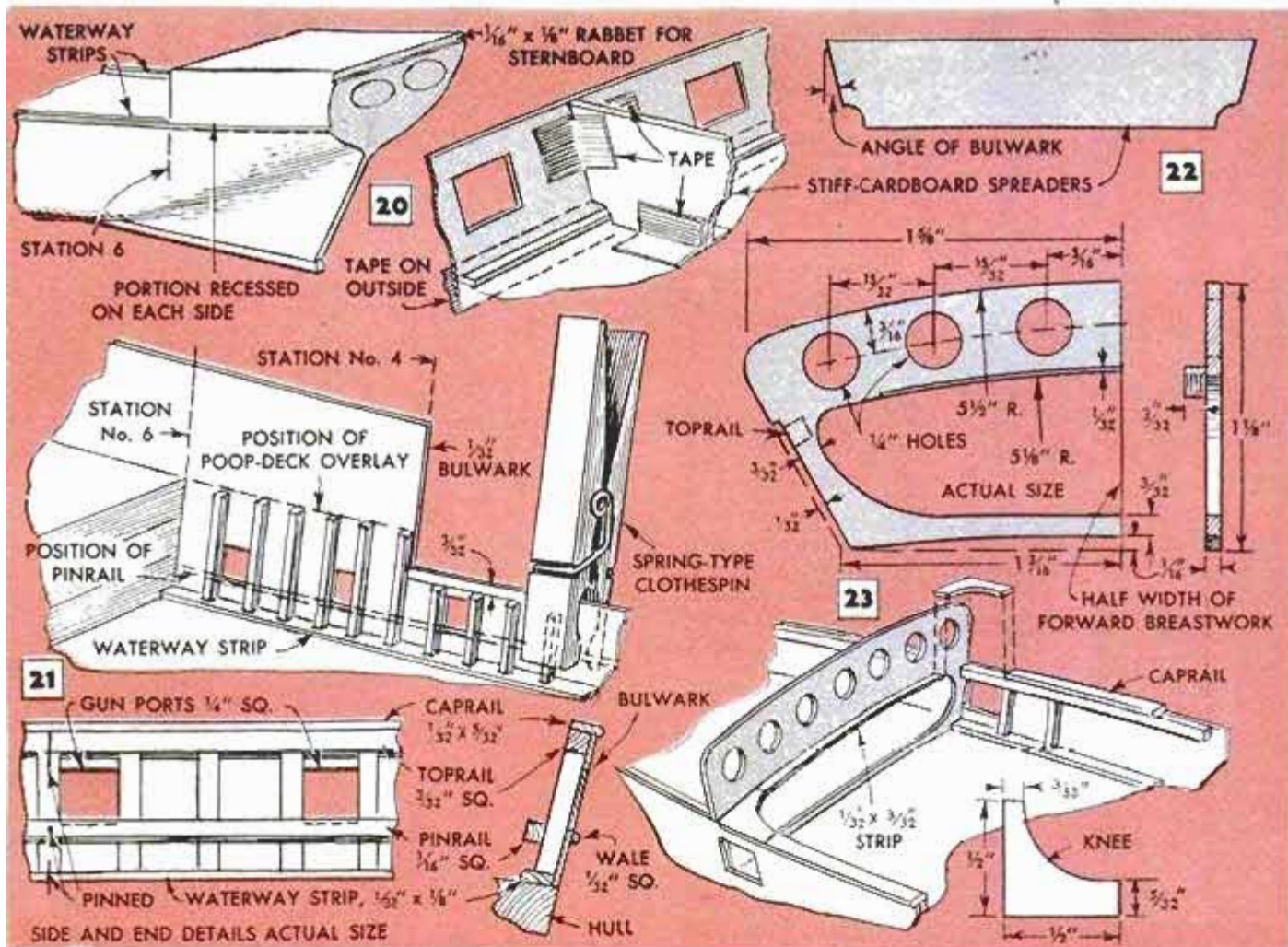
ship's side above its deck. On models larger than this one it is customary to first install timberheads (ends of the ship's frames) and then the bulwarks. But for this model the sequence is just reversed as the timberheads are so small. Cut two bulwark blanks from $\frac{1}{32}$ -in. maple veneer as dimensioned in Fig. 16, and attach these to the hull temporarily with self-adhering drafting tape. Trace the deck line with a sharply pointed pencil, Fig. 15, letting enough veneer project above it to include the finish cutting lines. Also mark the location of the gun-axis dots along the deck edges, on the bulwark blanks.

After removing the blanks, mark a continuation of the deck line aft of station 6 on them, and also a curved line parallel to this and $\frac{5}{8}$ in. or slightly more above the deck line forward of station 6. Also draw a vertical line up from the upper curved line at station 4. All of these lines are shown dotted in Fig. 16. Lay off the $\frac{1}{4}$ -in. square gun ports from the gun-axis marks,

PORTFOLIO OF PLANS

Popular Mechanics offers the serious modelmaker plans for building four other famous French ship models, namely the *La Sablaise*, a sailboat, *Jeanne D'Arc*, a training cruiser, *Marie Jeanne*, a fishing boat and the *Le Terrible*, a light cruiser. For a free descriptive brochure on these plans and their prices, write to Popular Mechanics Co., Dept. 80, 200 E. Ontario, Chicago 11.





their lower edges coming $\frac{7}{32}$ in. above the deck line and parallel to it. When cutting veneer, hold the knife against suitable straight and curved guides. Later the gun-port doors are glued on the outside of the hull as in Fig. 19.

Recessing Hull for Bulwarks

Now hold the bulwarks in position against the hull, fastening them with tape so you can make a knife cut in the hull accurately along their lower edges aft of station 6. Then remove the bulwarks and recess the area above the cut $\frac{1}{32}$ in. as in Fig. 20, checking this with the contour templates. These will have to be trimmed at the bottom to touch the keel if the ship is not removed from the cradle. Also cut a rabbet in lift J for the sternboard, Fig. 20. Glue and pin little triangular blocks on each side of the stemson as in Fig. 24, to provide gluing surface for the bulwarks.

Bulwark Flare

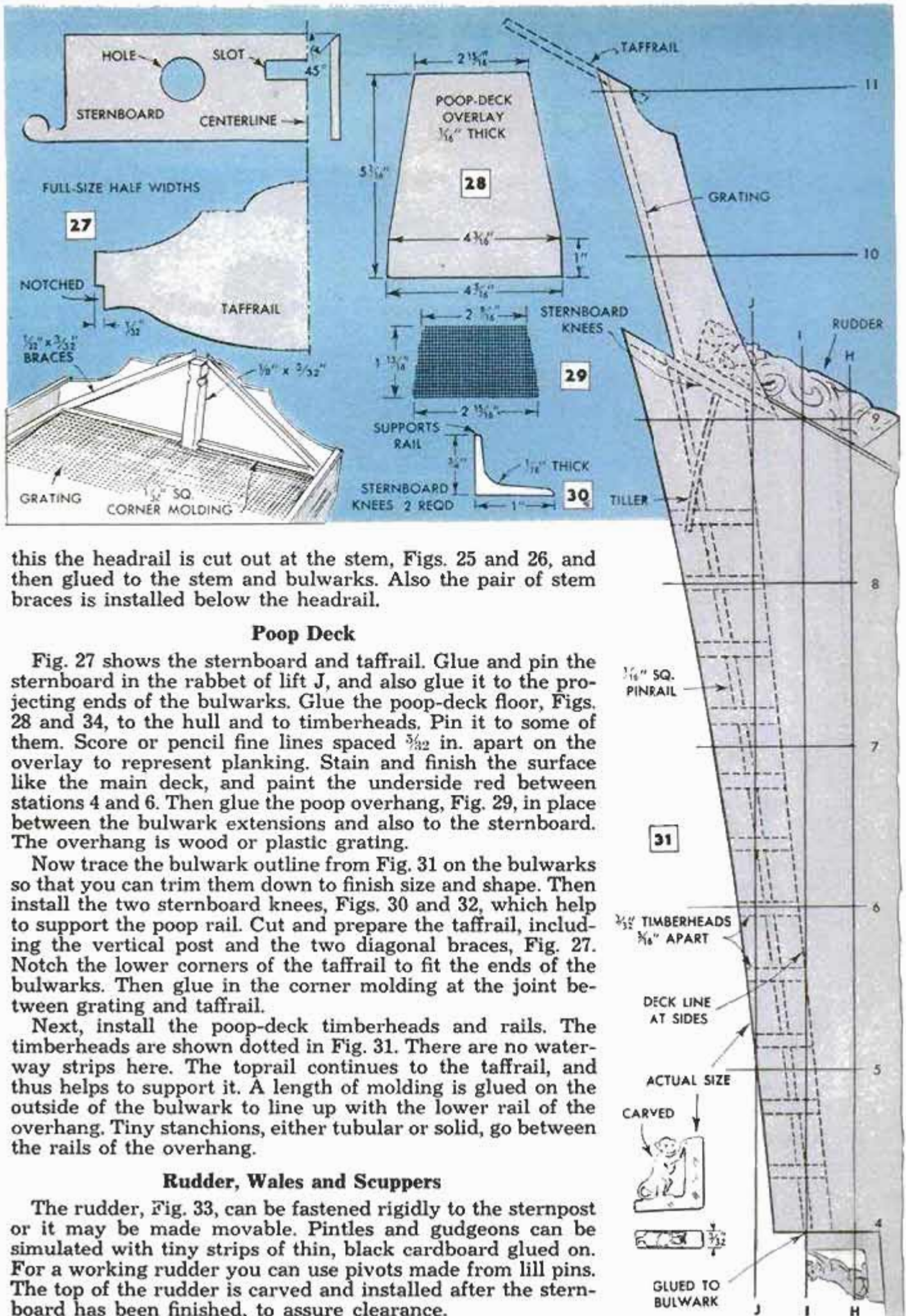
Prepare five stiff cardboard (or tempered hardboard) spreaders, Fig. 22, to hold the bulwarks temporarily at stations IV, II, M, 2 and 4, at the proper flare. The length and angle of the ends can be determined from Fig. 9 of Part I, making allowance for bulwark thickness. The for-

ward breastwork, Fig. 23, also braces the bulwarks and therefore is made at this time. First outline its shape, then drill the holes and saw the internal cutout before cutting it to shape on the outside.

Installing the Bulwarks

Replace the bulwarks and hold them in position with tape applied ahead of station 4. Glue their aft ends to the recessed areas of the hull, clamping suitably for maximum contact. Next, using a toothpick, apply glue between the bulwarks and the waterway strips. Then adjust the spreaders and tape them to deck and bulwarks as in Fig. 22 before the glue sets. The spreaders are not removed until the bulwarks are adequately braced by the timberheads. Also glue the forward breastwork to the deck and to the bulwarks, holding it in position securely with tape. If a firm contact between bulwarks and hull is not maintained at all points by the tape, use a few lill or ribbon pins. Glue the bulwarks to the stemson last. To avoid accidental breakage of the bulwark ends that project beyond the poop deck, screw a wood block to the latter temporarily to fit snugly between them, and tape together.

As shown in Fig. 21, timberheads between stations 4 and 6 extend up to the



this the headrail is cut out at the stem, Figs. 25 and 26, and then glued to the stem and bulwarks. Also the pair of stem braces is installed below the headrail.

Poop Deck

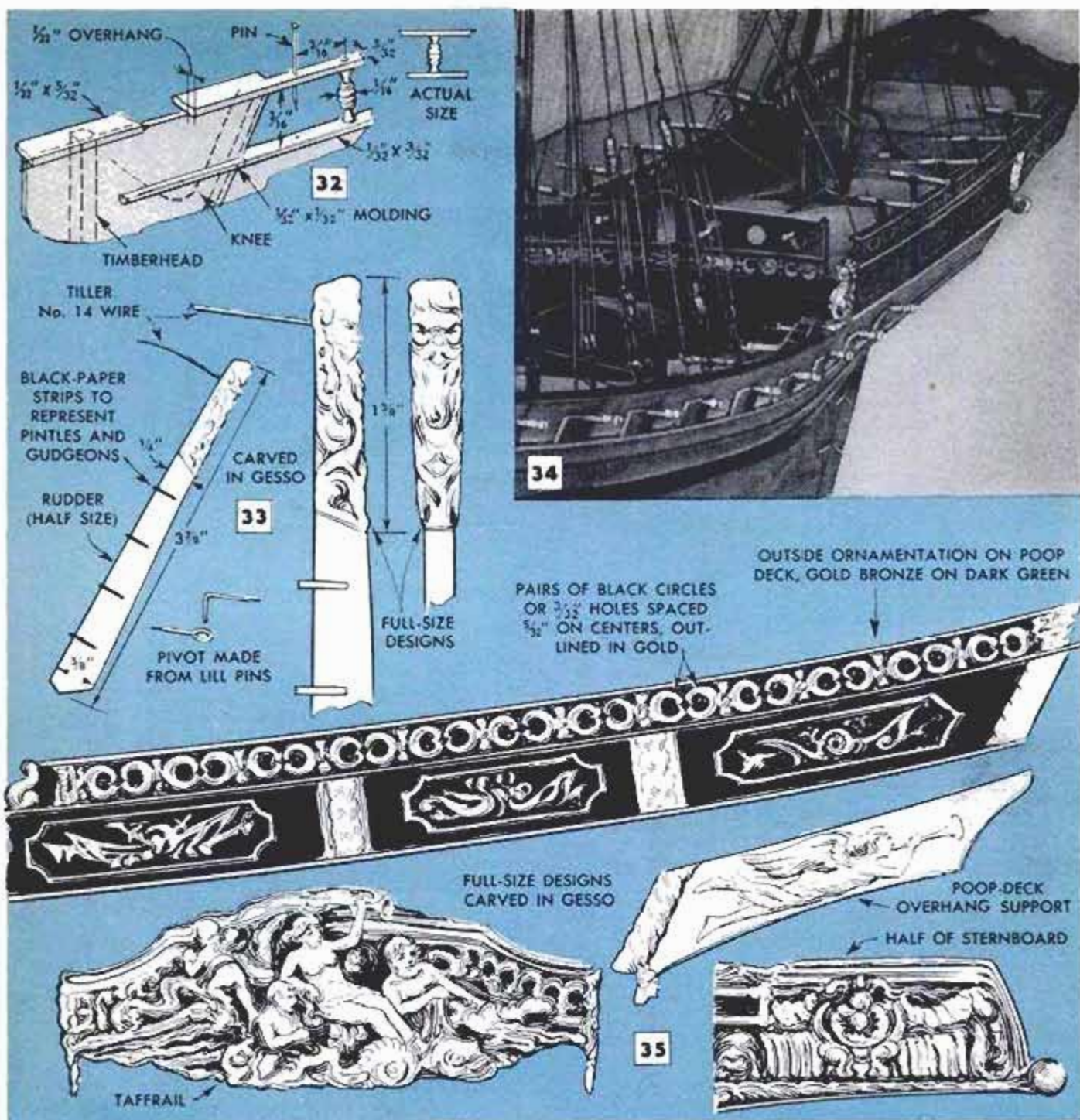
Fig. 27 shows the sternboard and taffrail. Glue and pin the sternboard in the rabbet of lift J, and also glue it to the projecting ends of the bulwarks. Glue the poop-deck floor, Figs. 28 and 34, to the hull and to timberheads. Pin it to some of them. Score or pencil fine lines spaced $\frac{3}{32}$ in. apart on the overlay to represent planking. Stain and finish the surface like the main deck, and paint the underside red between stations 4 and 6. Then glue the poop overhang, Fig. 29, in place between the bulwark extensions and also to the sternboard. The overhang is wood or plastic grating.

Now trace the bulwark outline from Fig. 31 on the bulwarks so that you can trim them down to finish size and shape. Then install the two sternboard knees, Figs. 30 and 32, which help to support the poop rail. Cut and prepare the taffrail, including the vertical post and the two diagonal braces, Fig. 27. Notch the lower corners of the taffrail to fit the ends of the bulwarks. Then glue in the corner molding at the joint between grating and taffrail.

Next, install the poop-deck timberheads and rails. The timberheads are shown dotted in Fig. 31. There are no waterway strips here. The top rail continues to the taffrail, and thus helps to support it. A length of molding is glued on the outside of the bulwark to line up with the lower rail of the overhang. Tiny stanchions, either tubular or solid, go between the rails of the overhang.

Rudder, Wales and Scuppers

The rudder, Fig. 33, can be fastened rigidly to the sternpost or it may be made movable. Pintles and gudgeons can be simulated with tiny strips of thin, black cardboard glued on. For a working rudder you can use pivots made from lill pins. The top of the rudder is carved and installed after the sternboard has been finished, to assure clearance.



In addition to the molding on the outside of the poop deck as indicated in Fig. 19, three wales are glued to the hull from stem to stern. Tiny triangular holes along the top edge of the lower wales are scuppers, which were originally used to discharge water from the deck. Gun-port doors are glued to the outside of the bulwarks after the surface of the hull has been finished.

Painting and Ornamentation

Use semigloss enamel and varnish. It's best to paint parts like the inside of the bulwarks before you add other parts as these may interfere with painting. Most fittings to be made separately are painted before installing them. Mark the waterline as given in Fig. 19, with a pencil held hori-

zontally on a block of proper height. Fill cracks, dents and gouges in the hull with wood putty before finishing it. The outside is light oak stain and black enamel, then covered with flat or satin-effect varnish. Oar openings, also indicated in Fig. 19, can be simulated by finely painted lines.

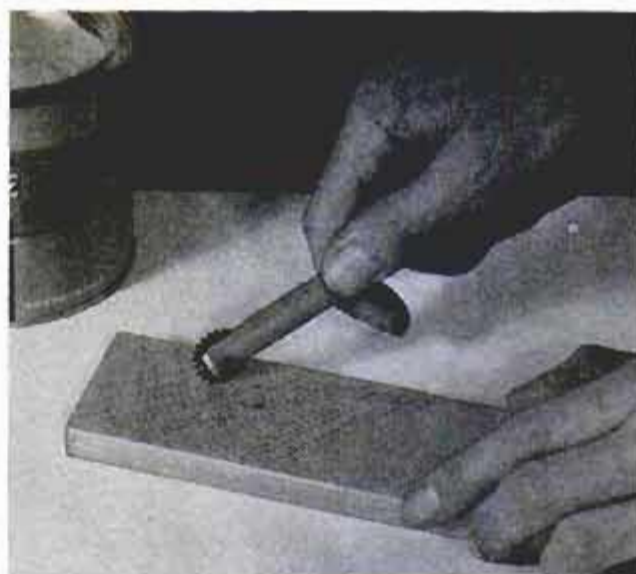
The designs on the poop deck are shown full size in Fig. 35 so that you trace them. The narrow band just below the top rail may be perforated with pairs of connecting holes, which come between the timberheads, or they can be simulated with black paint. Parts to be carved (sternboard, taffrail, poop-overhang support and top part of rudder) are first overlaid with a $\frac{1}{16}$ -in. coating of gesso, which when dry can be cut neatly. It is obtainable at paint stores.

Figs. 18 and 35 show the stern carvings. Although these can be coated simply with gold bronze, it is better to use gold leaf. This adheres to slightly tacky glue size or thinned varnish. Other carved ornaments, similarly finished, are the monkeys adjacent to the ladders to the poop deck, Fig. 31, the top of the rudder, Fig. 33, and the stem figurehead, Fig. 26, which is a monkey head.

Colors of parts already made and to be made are as follows: Chinese red: The inside of the bulwarks up to the top rails; the underside of the poop deck; the stanchion supporting the edge of the poop deck; the ladders up to their platforms; inside of the sternboard, taffrail and bulwark extensions; turned stanchions of the railing of the poop-deck overhang; forward breastwork; poop-deck breastwork above the lower ornamental band; inside of the gunport doors; gun carriages; hatchway frames; tiller; deck cleat; braces at the stem under the headrail; inside of the long boat except the well which is white. Black: Outside of the hull between the waterline and top edge of the lower wales; part of the bowsprit that comes over the stem; the stemson and the attached foremast bracing; the hawse-guide posts; bolster plates and crossrail; ladder platforms adjacent to the poop deck; all top rails of bulwarks as well as the joining knees and cross strip on the aft side of the forward breastwork; the diagonal braces inside of the taffrail; the poop spar and its guardrail; the yards of all masts; the masthead blocks and 1/2 in. sections of masts just above the decks; upper outside of the long boat to its waterline. Dark leaf green: The background of the gold-bronze designs on the sides of the poop deck and along the lower edge of the poop breastwork. Light oak stain and varnish: Decks; the outside of the hull and bulwarks below and above the black areas; most of the masts and the fore portion of the bowsprit; gratings; hatch covers; outside of the long boat below its waterline. Gold: Use extra-fine gold bronzing powder for the guns unless you are using brass guns and then just lacquer them. Also use bronzing powder for the designs on the green panels. Although this can be used on all carved parts, gold leaf is preferable for these.

(To be continued)

If you are planning to paint the varnished woodwork in your home, don't make the mistake of painting it without first applying a coat of regular undercoat. If you omit the undercoat, you run the chance of the stain bleeding through the paint, as well as having the old varnish crack or "alligator."



Indented Surfaces Give Tooth To Flat Glue Joints

Roughened surfaces always make stronger glue joints than smooth surfaces since most of the glue is squeezed out when clamping pressure is applied. A good way to roughen flat surfaces that are to be glued back-to-back is to use a dressmaker's tracing wheel or a tool made by cross-pinning a clock-gear wheel in the slotted end of a dowel. Running the tool back-and-forth across the mating surfaces produces countless indentations which form pockets to trap the glue when clamping pressure is applied. Besides resulting in a stronger bond, there's less glue wasted.

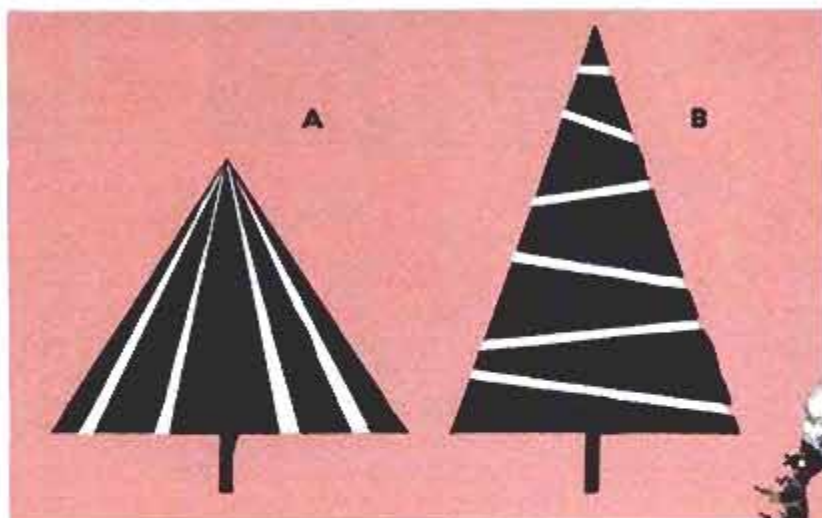
H. Hanscom, Elmhurst, Ill.

Grease-Gun Plunger Rod Locked With Pliers

When filling a grease gun having a disappearing filler ram, there is the possibility of the plunger rod becoming disengaged from its retaining slot, permitting grease to be forced from the barrel. Such an occurrence results not only in loss of grease but in a messy cleanup job. To prevent this, the plunger rod can be locked securely with locking pliers when the gun is being filled, eliminating any chance of the plunger rod being released.



Decorating Hints for a More Attractive Christmas Tree



When trimming a Christmas tree, you can utilize a fundamental rule of clothing fashion, which is to accent the opposite. If the tree is tall and slender, decorating lines should be horizontal, detail B, while a short, full tree calls for vertical accents, detail A. Trim a tree from the top down. If you start at the bottom and work up, you are in your own way and take a chance of knocking down the tree. After the star, angel or other tree-top ornament is firmly in place, string the lights. To assure an even distribution of lights and to avoid a spotty look, professionals use a formula: Tree height in feet x the width of the tree at the base x 3. As an example: A tree 6 ft. high and 4½ ft. wide at the base would use the equation $6 \times 4\frac{1}{2} \times 3$, which equals 81 lights. When the lights have been positioned, add "continuous" decorations, such as strings of popcorn. Follow with glass



ornaments, snowballs, candy canes and similar decorations. Aluminum or lead tinsel is added last, a single piece at a time. An optional finishing touch would be to spray the tree with artificial snow.

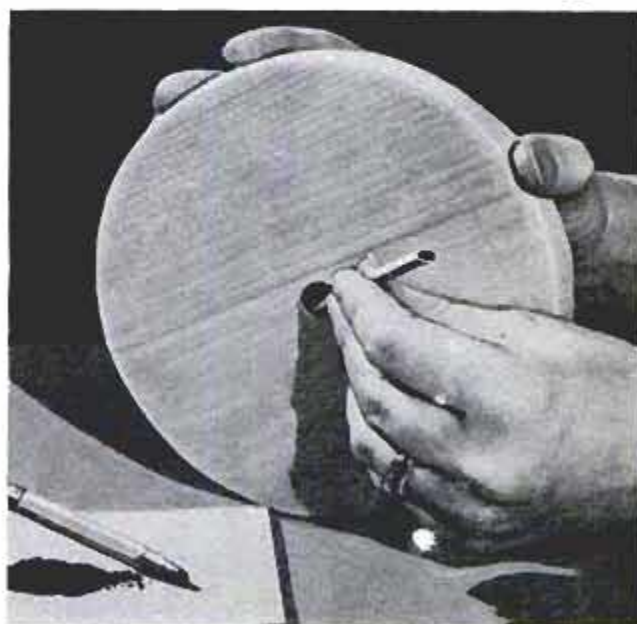
Noma Lites, Inc.

Pencil "Graphite" Quiets Wooden Wheels of Toddler's Wagon

If your youngster's wooden-wheeled wagon rolls out some earsplitting squeaks, lubricate it with a pencil. Rub the pencil on a piece of sandpaper to produce some powdered graphite, then use a sheet of rolled-up paper to apply it as shown.

Dull Plastic Surface Polished With Toothpaste and Powder

Plastic that has become dulled can be given a high polish by using dentifrices as buffing compounds. Make a paste of a small amount of tooth powder and water and rub this mixture on the plastic with a piece of felt. The powder will remove small scratches and marks from the plastic surface. Then using another piece of felt, apply toothpaste, wet it slightly and buff.



CHRISTMAS-SAFETY



Above, unlike broad-leafed trees, evergreens used for Christmas trees are easy to set on fire, even when green. Keep tree away from heat sources and away from exit door as safety precaution. Below, use sturdy stepladder when decorating large tree. Avoid using makeshift supports, such as chairs and stools



By Russ Whitaker

DURING THE RUSH of holiday preparations around the home, don't overlook the simple rules of safety. To do so may mean exposing yourself and your family to situations that are potentially dangerous, such as smoking next to an easily ignited Christmas tree or using flammable materials for a candle centerpiece as illustrated in this article. Using lights with defective wiring may result in a short circuit that could set the tree on fire. When the needles begin to drop from the tree, it is a serious fire hazard and should be removed from the house at once. An adequate base should be provided for a large tree, and in addition, the upper end should be guyed to nearby window frames or other convenient objects to prevent children from accidentally pulling it over. Be sure that toys you buy for children are safe. Playthings such as roller skates or a tricycle should be in the right size range for the child. When purchased too large, they can be a hazard. ★★ ★

Below, after Christmas presents have been opened, remove all the wrapping materials and dispose of them in incinerator. It is hazardous to burn large quantities of paper at once in an open fireplace



HINTS

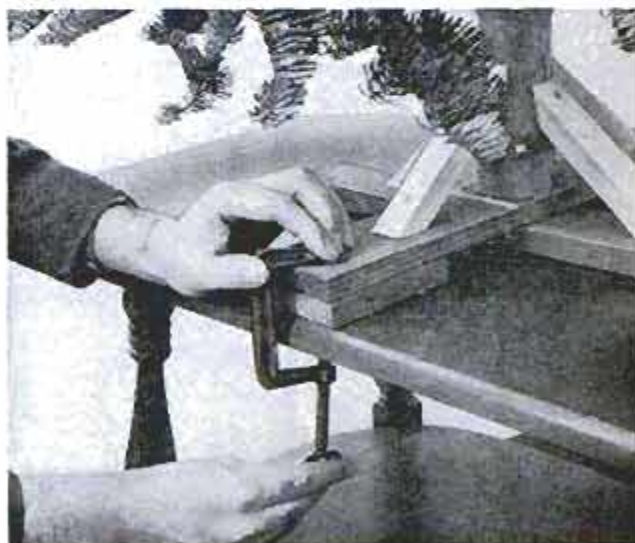


Right, spark from cigarette can easily ignite Christmas tree. Locate chairs and ashtrays a safe distance from tree and other evergreen decorations to avoid such fire hazards. Locate tree away from draperies and other easily flammable furnishings to prevent fire from rapidly spreading should it break out



Above, be sure toys that are bought for children are of safe design. Vehicular playthings, such as roller skates and tricycle, should be of proper size for the child to avoid unnecessary falling accidents. Instruct the child in proper use and care of toy to avoid injury to himself and possibly to others

Right, position and set up your Christmas tree securely so that it cannot topple over to cause an electrical short or do other damage. A small tree can be held in place on a low table by clamping one of the legs of the base with a C-clamp as shown





Above, strings of Christmas-tree lights are fine for outlining roof of house but be sure to use only outdoor type. Also, outdoor-service receptacles should be provided on outside of house for plugging in such lights and other electrical devices to be used outside (see "Protect Your Christmas Lighting," *Popular Mechanics*, December 1956, pages 192-195)



Above, candle centerpiece should not be made of materials that burn readily. A draft can easily blow the flame of low-burning candle into an arrangement such as the one shown, setting it on fire. Keep evergreens and other combustible materials well away from candles to be lighted. Below, fasten all lamps to tree limbs so they can't come in contact with foliage



Above, secure top of large tree to window frame or other moldings with guy wires to prevent it from accidental tipping

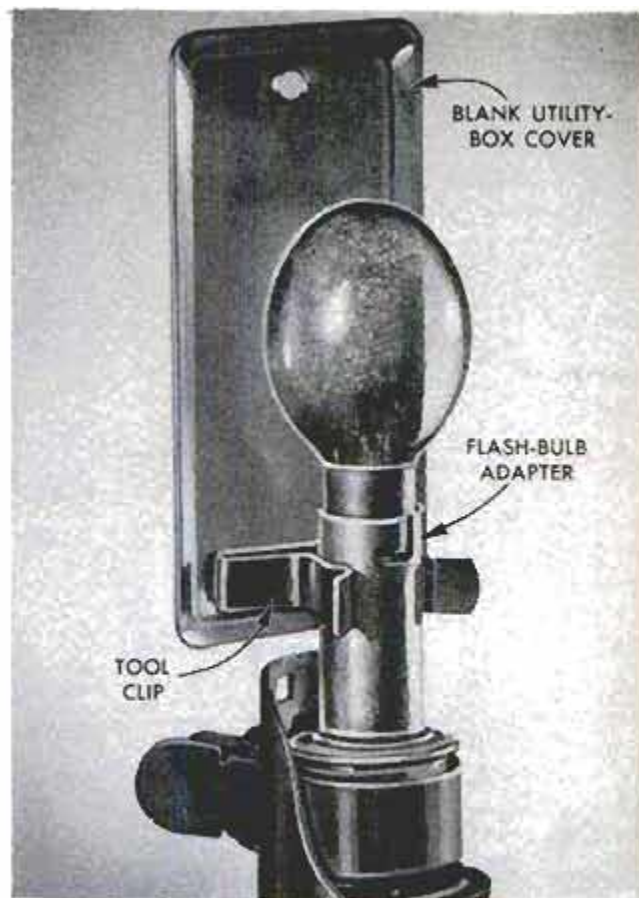
Below, before arranging lights on Christmas tree, inspect and test wiring of each string for defects that may cause short circuits. Repair defective strings or replace them



Improved Miniature Reflector For Photoflash Close-Ups

Occasionally an improvised device does a job so well that it becomes a permanent part of a hobbyist's equipment. Such is the case with this miniature photoflash reflector. The original problem that required its use was to shoot a close-up at 3 ft. with high-speed film, and a No. 5 flash bulb. This lamp-and-film combination, with a standard reflector, would require shooting at $\frac{1}{400}$ sec. at f. 46. The limit of the camera was $\frac{1}{400}$ sec. at f. 32. Less light on the subject, by using a smaller reflector was the answer. A blank utility-box cover was used as the reflector, and a tool clip was screwed to it. The clip then fitted over a flash-bulb adapter, as indicated, that was inserted in the regular flash gun. With this setup, the f. number was cut in half to .22, and the exposure was perfect. In the final print, the shadows gave the effect of multiple flash, due to the reflections from the flanged edges of the box cover. The cover was not polished, but left its natural, dull finish.

Frank P. Fritz, Bensenville, Ill.



Silicone Preparations Renew Leather on Camera Equipment

Leather cases for camera equipment, as well as the leather on cameras themselves, can be renewed and made to resist moisture, mildew and the wear of handling if treated with one of the silicone shoe preservatives. The clear liquid simply is brushed on, a single coat being sufficient, and allowed to dry overnight.

☐ Before applying paint to a wall from which wallpaper has been removed, make sure that all paste and sizing has been cleaned from the plaster so that it does not cause the paint to peel.

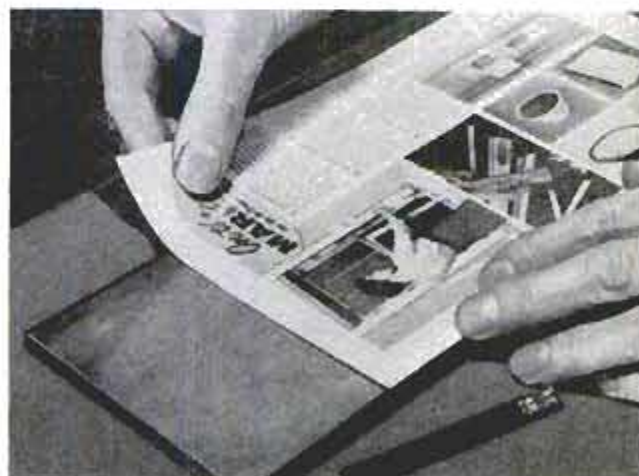


Magazine Page Substitutes for Missing Try Square

Have you ever been doing a woodworking job and discovered that your square was missing? Just pick up a magazine and tear out a page. These pages are trimmed quite accurately at right angles and if used carefully can substitute for a square. Hold one edge of the page on the edge of the work, and mark along the adjacent edge.

William Swallow, Brooklyn, N. Y.

☐ To clean battery hydrometers use a mixture of detergent, 1 tbs., and baking soda, 1 tbs., dissolved in lukewarm water, 1 pt. Draw the mixture into the hydrometer and let it stand for 30 min. Rinse with water.



HOW TO MAKE

soon will find yourself proficient enough to be able to place fancy bows on all the packages you gift wrap.

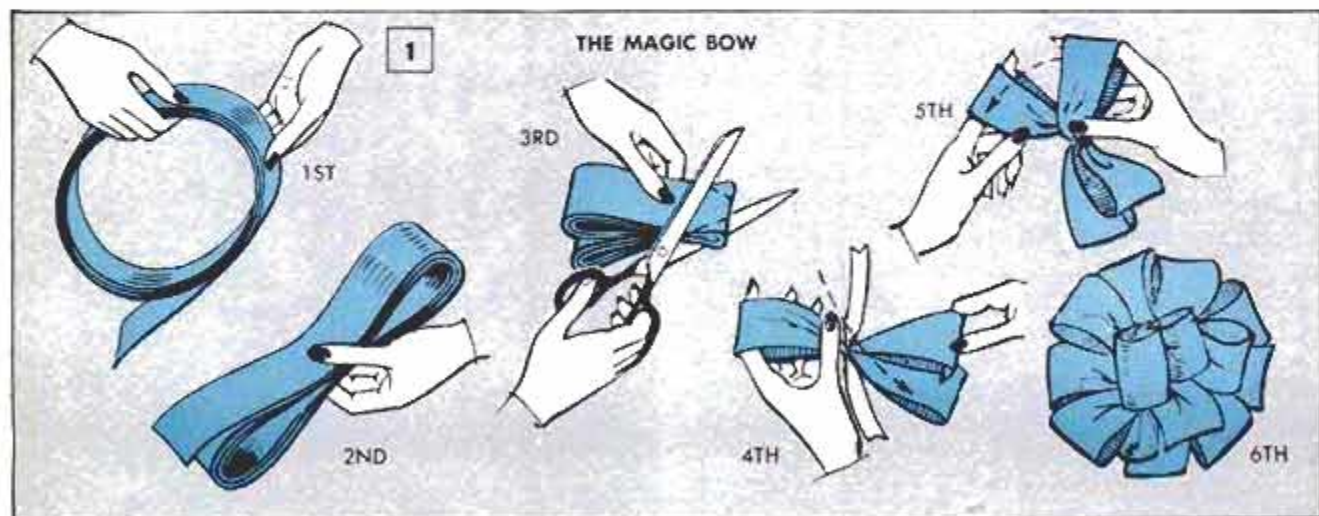
In Fig. 1 is shown the step-by-step method of making a "magic" bow. First, a length of ribbon is formed into a fairly large loop. Second, the loop is flattened in such a manner that the loose end of the ribbon is even with the end of the flattened loop. The third step requires the flattened loop to be folded in half and a diagonal cut made across each corner at the fold. A narrow ribbon or cord then is tied around the resulting V-notches when the ribbon is unfolded, as shown in the fourth step. The ribbon is refolded, and the open loops are pulled through each other for the fifth step. The pulled-through loops then are shaped with your hands and positioned to result in the flower-like bow shown in the sixth step in Fig. 1.

The French bow in Fig. 2 is formed by "piling" a number of loops one on top of the other, then tying the loops at the center with the loose ends of the ribbon. The resulting pattern of loops is pulled out to form the bow as shown in the right-hand detail. The elongated bow, shown below in Fig. 2 is started in the same manner as the French bow, but some of the loops of the bow are cut so there are a number of loose ends. The dahlia bow, lower, right-hand detail, Fig. 2 also is formed in the same way as the French bow. Then all the loops are cut diagonally at their centers to provide a leaflike appearance.

The tailored bow at the top of Fig. 3 is formed much like the French bow, with loops being piled one on the other, but each succeeding loop is made slightly shorter than the preceding one. The free ends of the ribbon are spread out as shown and the bow tied at the center with a small



YOU PROBABLY HAVE been delighted, at one time or another, to receive a gift-wrapped package that was made especially attractive by having one or more ribbon bows on it. Quite likely you wished that you, too, could tie such bows, but hesitated to try because they seemed so intricate. As with many things that seem complicated, the bows actually are fairly easy to make. They do require time and patience, and not all the first few attempts will be completely satisfactory, but you



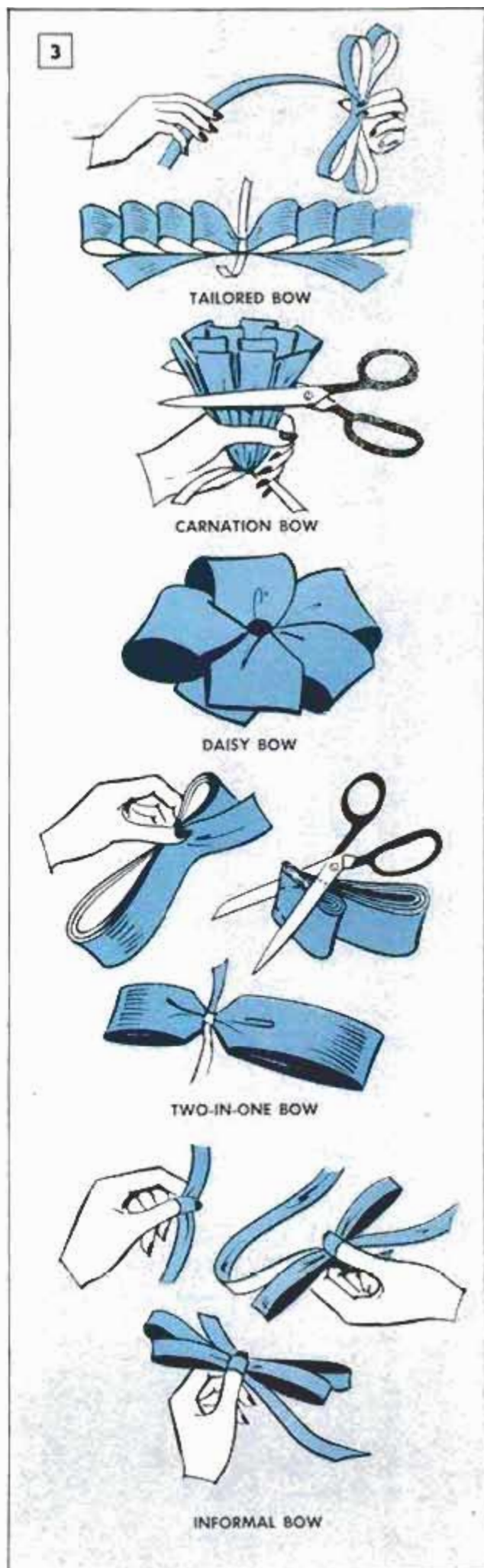
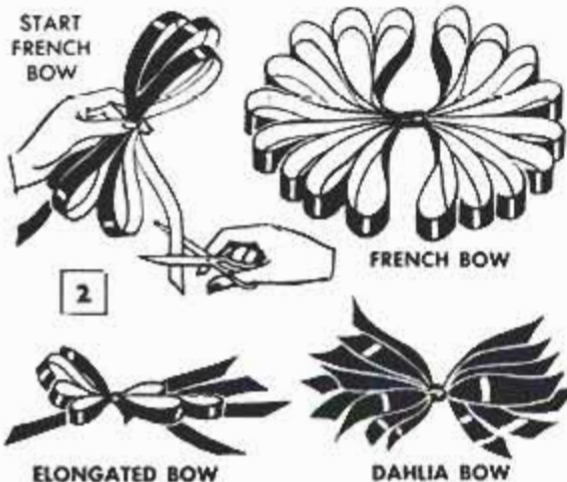
RIBBON BOWS

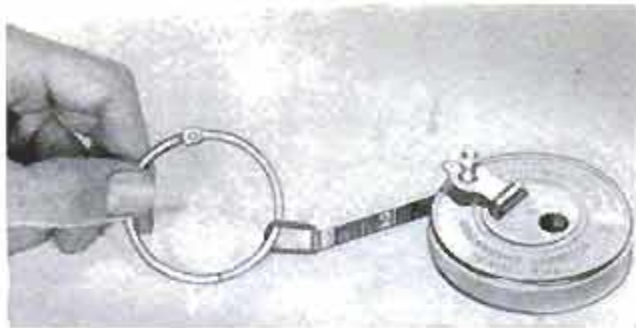
ribbon, or with a cord. The latter is available with strands of silver, gold and other colors woven into it, so it adds to the attractiveness of the bow. The carnation bow in Fig. 3 is started like the magic bow in Fig. 2. After the loops are pulled through each other they are grasped in the hand and cut with the scissors to simulate the petals of a carnation. For the daisy bow, fairly wide ribbon is used. The bow is started by piling a number of loops, which then are tied at the center. The loops are pulled through each other and the finished bow is held at the center by a thumbtack or a small hatpin. The latter is best when attaching the bow to a package. As shown in the detail, the two-in-one bow is simply a flattened roll of ribbon that then is folded off-center and cut across the corners to form V-notches, as for the magic bow. Being off-center, the notches, when tied, cause the bow to have one end longer than the other. The loops of this bow also can be pulled apart for a different effect. Tying the informal bow starts by looping the ribbon around your thumb. Loops then are formed as shown. The bow can be left loose and fastened to a package with cellulose tape, or the ends of the ribbon can be pulled through the loop formed on the thumb, and the bow tied firmly.

After you have tied a number of the bows shown here, you might design some of your own. Using two different colors of ribbon for one bow is one method of modifying the designs shown. Bows of the same type tied with narrow ribbon will appear to be different when tied with wide ribbon. Using both wide and narrow ribbon, as well as two colors also makes for different appearance.

The bows presented here were reproduced from an instruction sheet issued by Minnesota Mining and Mfg. Co. ★ ★ ★

#1





Notebook Ring on Measuring Tape Permits Easier Handling

It is a lot easier to pull out a long measuring tape when the usual small metal loop in the end is fitted with a larger notebook ring as shown. The ring also will fit over a fairly large-size stake, so the tape end will be firmly anchored while the tape is reeled out and pulled taut.

"Jammed" Plug of Power Tool Acts as Safety Precaution

If a power tool is not to be plugged in without an extra precaution, as, for example, when a switch malfunctions and stays in the "on" position, this simple stunt will be a constant reminder. Slip a short piece of insulated wire through the holes in the prongs of the plug.



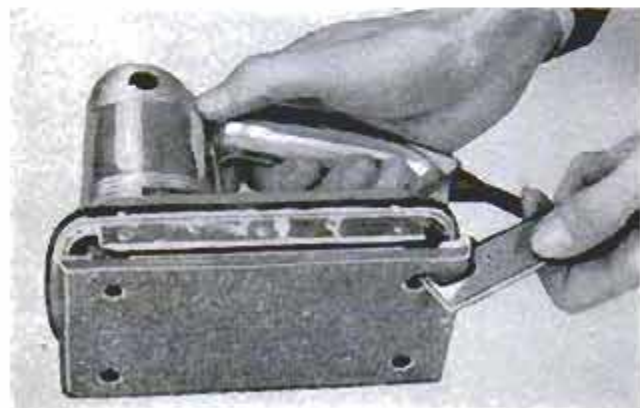
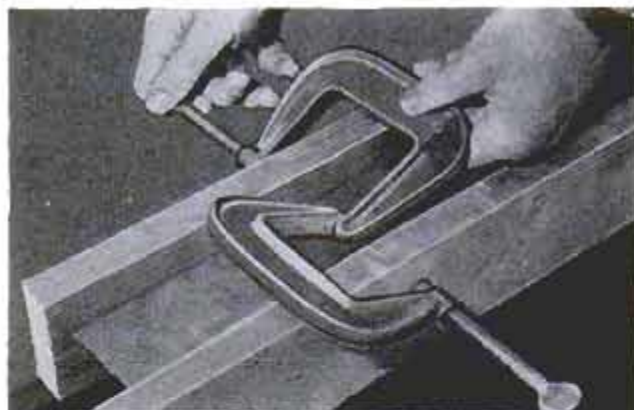
Record Size of Dry Cell Inside Flashlight Case

Dry cells should be removed from a flashlight case when they are worn out, to prevent corrosion. However if new dry cells are not purchased immediately, there is a chance that you might forget the size. To eliminate this problem, write the size on a piece of adhesive tape fitted inside the flashlight case near the end.

Two C-Clamps Hooked Together To Span Wide Workpiece

When a piece of work is too wide for one C-clamp to span, two clamps sometimes can be hooked together to do the job as shown in the photograph. The method cannot be used when extreme clamping pressure is required, although the pads can be tack-welded together temporarily for easier handling of the clamps.

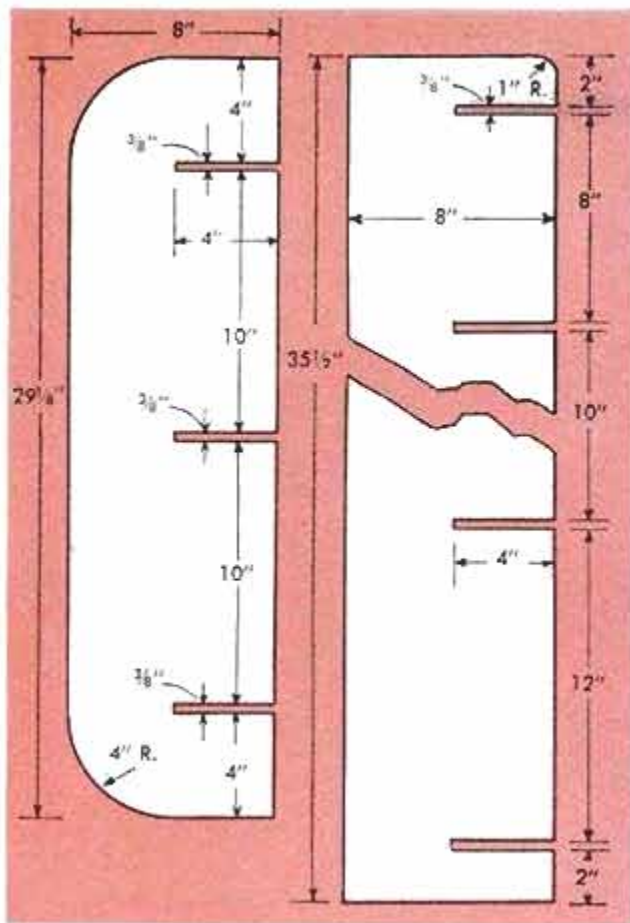
Hugh Lineback, Stillwater, Okla.



Speed Sander-Plate Changing By Punching Holes in Paper

When using a portable electric sander that has both orbital and oscillating plates, it is necessary to remove the sandpaper each time the plates are changed, because the paper covers the openings through which the screws are reached. You can reduce plate-changing time by punching holes in the paper at the locations of the screws, so the wrench can reach them without need for removing the paper.

Knockdown Bookcase Easy to Store or Transport



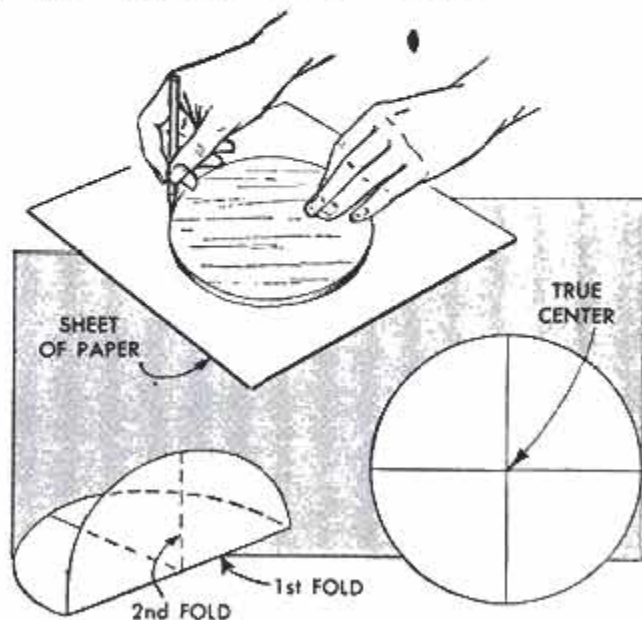
Modern in appearance, with the added advantage of being easily taken apart for transport or storage, this bookcase with "interlocking" construction will meet the needs of most students. The three vertical partitions and four shelves are cut from $\frac{3}{8}$ -in. plywood, making this an inexpensive piece of furniture. It is important that the slots cut halfway through all members of the bookcase be a uniform $\frac{3}{8}$ in., so they

fit together tightly. The fit between members should be such that a rubber mallet must be used to drive them tight or loosen them. If looseness develops from shrinkage or wear, four angle brackets screwed to the shelves and vertical partitions at the outer corners will restore rigidity. An alternate method is to nail a sheet of hardboard or plywood across the back edges of the bookcase.

Simple Method for Determining the Center of a Circle

Locating the center of a circular object when a compass is not at hand can be done with a sheet of paper and pencil. Place the circular object on a sheet of paper and trace around it with a pencil. Next, cut out the circle and fold it in half as shown. Fold the paper once more, creasing it well. Now, open the paper and spread it flat. The intersection of the creases is the center of the circle. An alternate method, slightly more accurate because the pattern is not cut out, is to trace the circle on translucent tracing paper. The pattern is folded in the same manner as when opaque paper is used, and the center is determined by the intersection of the creases. The unfolded pattern then is placed on the circular object and the center marked.

Henry Hollander, Newark, N. J.



SHOWCASE OF TOOLS

This is the third in a series of articles to aid readers in determining sizes and types of tools best suited to their needs. Tools shown are intended to give readers a "showcase" view of various units available in workshop sizes. Picturing tools in this series does not constitute approval or disapproval of them by *Popular Mechanics*.



Primary purpose of a drill press is drilling holes of various diameters in wood and metal but it is adaptable to other jobs

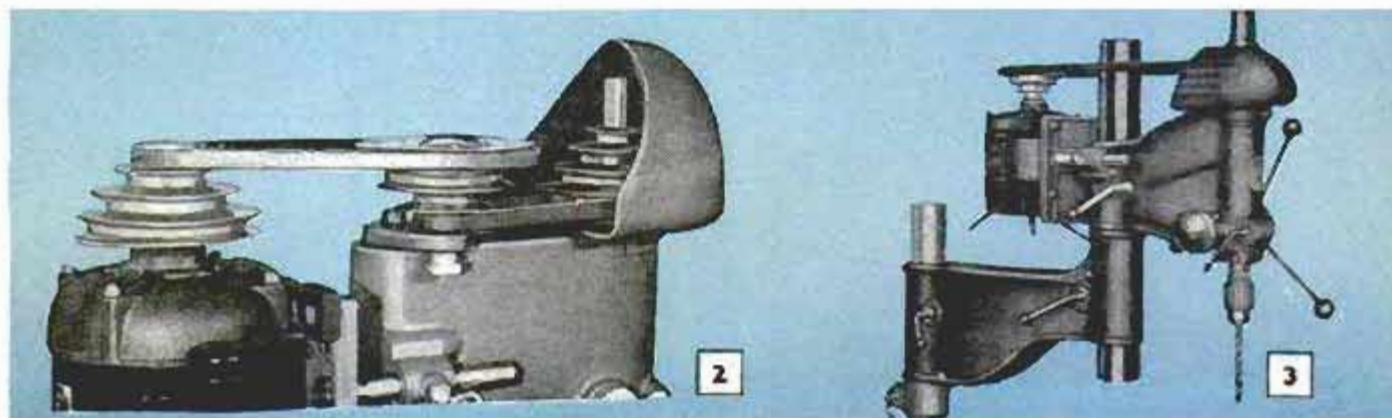
DRILL PRESSES

By E. R. Haan

A DRILL PRESS can be one of the most useful power tools in your shop. Either floor or bench type, depending on space and preference, it's a versatile tool. Besides drilling holes as in Figs. 1 and 6, it will cut round or square-end mortises, Fig. 4, do routing, rabbeting, straight and curved shaping, cut flutes, beads, plugs and dovetail joints, plane, carve and sand. In metalworking it will mill, tap, file, grind, and scratch-brush. Inexpensive accessories are available for these extra jobs.

Construction and size: A drill press consists of a rigid verti-column on a suitable

base, a worktable that clamps on the column and is adjustable for height and tilt, and the working mechanism or head attached to the top of the column. The base of most drill presses is surface-ground to provide an extra table for jobs requiring more depth than provided when using the regular table. Usually the motor is mounted on the head so it is on the opposite side of the column. This position not only serves to balance the head but also permits the use of a short V-belt. The belt runs on two cone pulleys, providing different speeds, which is highly essential in drilling. To



further increase the number of speeds, a variable-speed attachment or a counter-shaft can be added to the head as in Fig. 2.

The vital part of the head is the spindle. This is positioned vertically and rotates in bearings in a sleeve, or "quill." The quill can be moved downward by means of a feed lever to bring the drill or other tool into the work. It is automatically retracted by means of a coil spring, which usually is adjustable for tension. The quill can be locked at any point along its travel and the extent of its downward travel can be limited by means of an adjustable stop. The upper portion of the spindle is grooved or splined to fit a key or spline in the cone pulley at the top of the head. This permits the spindle to move up and down in the pulley while both are rotating.

Size of a drill press is expressed in terms of the diameter of a circle that it can drill centrally. Thus an 11-in. drill press can drill a hole in the center of an 11-in. disk; has a 5½-in. clearance between the column and the drill point. Sizes of home-workshop drill presses such as are shown on the following pages, vary from 10 to 17 in. To increase the distance between the column and the spindle of a drill press, a radial arm, Fig. 3, can be added on some machines.

Spindles and spindle adapters: Some manufacturers supply interchangeable spindles to increase the usefulness of drill presses. The kind generally furnished with a drill press may have a threaded or a tapered lower end on which the chuck fits. Some spindles have an enlarged end with a tapered or a straight sleeve. The first is designed for taper-shank drills used where extreme accuracy is desired. The second accommodates straight-shank drills, wood-boring bits, router bits and small sanding drums having shanks of the same diameter as the sleeve, and these are held securely with setscrews. Either special spindles or adapters are used for molding cutters. Adapters are fastened to a regular spindle or are held in a chuck. Similarly, spindles or adapters having a fixed and a movable collar are available to hold grinding wheels, buffers and scratch brushes.

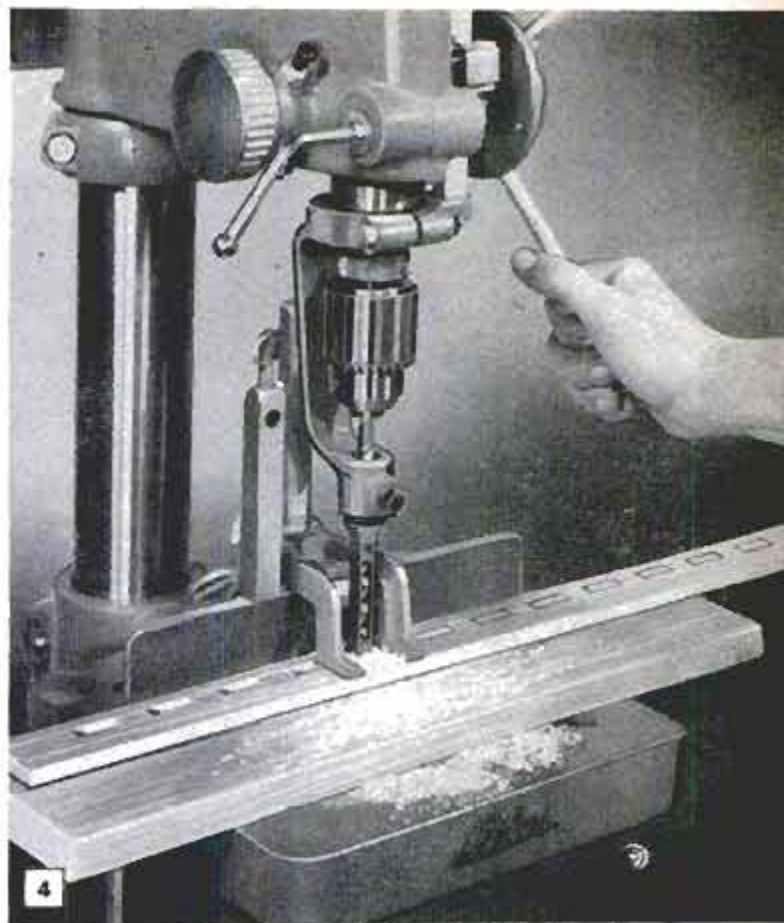
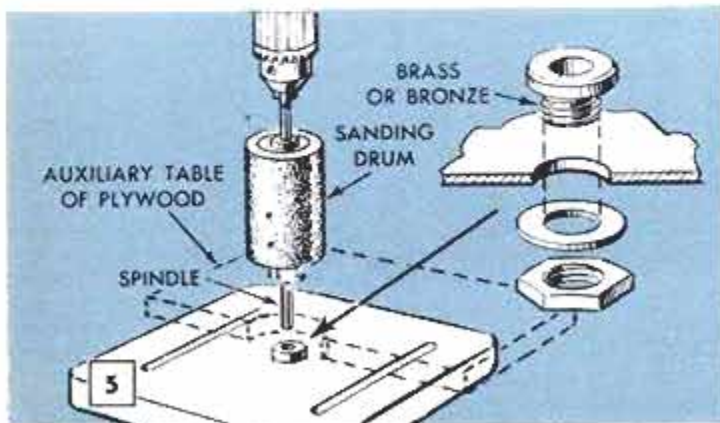


Photo courtesy Atlas Press Co.

Hollow-chisel mortising attachments for square-end mortises are supplied for all shop-size drill presses

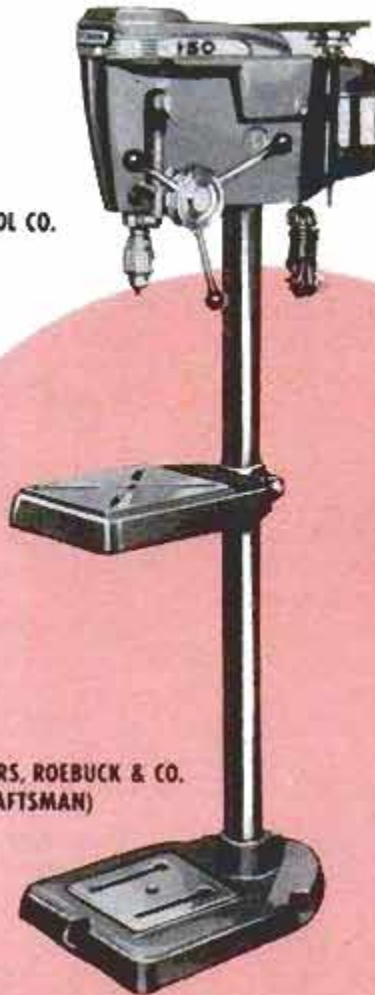
When drilling metal, especially small parts, it's always best to hold the work in drill-press vise

Photo courtesy South Bend Lathé Works





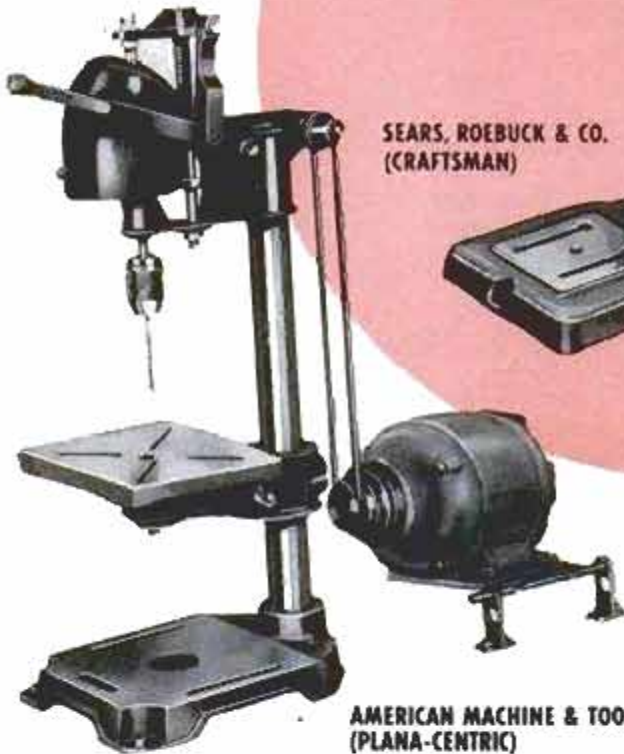
CINCINNATI LATHE & TOOL CO.



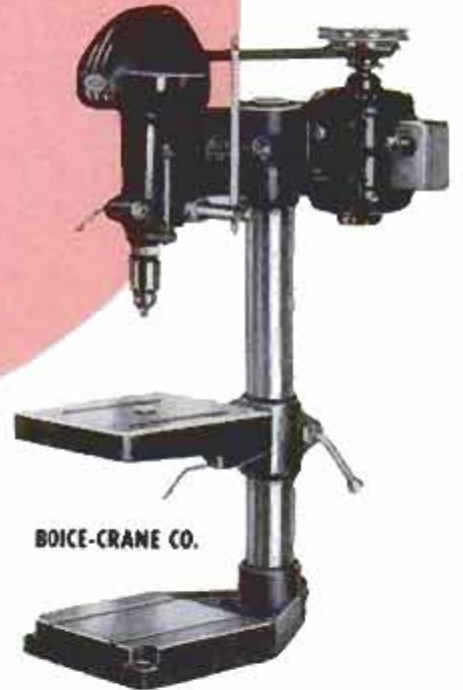
SEARS, ROEBUCK & CO.
(CRAFTSMAN)



ATLAS PRESS CO.



AMERICAN MACHINE & TOOL CO.
(PLANA-CENTRIC)



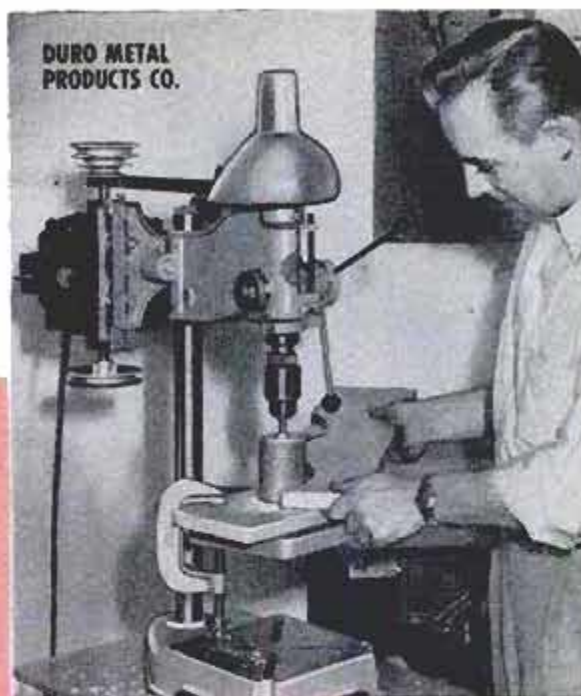
BOICE-CRANE CO.

SPECIFICATIONS		B - BENCH TYPE				F - FLOOR TYPE				HSM = HIGH-SPEED MODEL				LSM = LOW-SPEED MODEL			
TRADE NAMES AND SOURCES	ATLAS				BOICE - CRANE		CINCINNATI ROYAL		CRAFTSMAN DUNLAP		SEARS ROEBUCK (Not Shown)				DARRA - JAMES		
TYPE	B	B	B	F	B	F	B	F	B	B	F	B	F	B	F	B	
SIZE (Dia. of circle drilled centrally)	11 $\frac{1}{4}$	12 $\frac{3}{4}$	15	15	15	15	16 $\frac{1}{2}$	16 $\frac{1}{2}$	12 $\frac{1}{2}$	13 $\frac{1}{2}$	13 $\frac{1}{2}$	15 $\frac{1}{2}$	15 $\frac{1}{2}$	12	12	15	
SPEEDS (Spindle r.p.m.)	FOUR, 700 TO 4150	FOUR, 580 TO 5200	HSM—FOUR, 580 TO 5200 LSM—FIVE, 400 TO 4400		HSM—FIVE, 500 TO 5500 LSM—FIVE, 425 TO 3340		HSM—FIVE, 410 TO 4840 LSM—FIVE, 342 TO 4033		NINE, 765 TO 4000	NINE SPEEDS 610 TO 5000				TEN SPEEDS 862 5 TO 3450			
CHUCK TO TABLE, Max.	12 $\frac{3}{8}$	11	12	41	11 $\frac{1}{2}$	41	13	43 $\frac{1}{2}$	7 $\frac{1}{8}$	10	40 $\frac{1}{2}$	13 $\frac{1}{2}$	38 $\frac{1}{8}$	9 $\frac{1}{8}$	44	15	
CHUCK TO BASE, Max.	13 $\frac{1}{4}$	14 $\frac{1}{2}$	16	46	18	47 $\frac{1}{2}$	17	47 $\frac{1}{2}$	9 $\frac{1}{2}$	14	45 $\frac{1}{2}$	18	44 $\frac{1}{2}$	12 $\frac{1}{2}$	48 $\frac{1}{2}$	18	
SPINDLE TRAVEL	2 $\frac{3}{8}$	3	4	4	4	4	4 $\frac{1}{2}$	4 $\frac{1}{2}$	3	3 $\frac{1}{2}$	3 $\frac{1}{2}$	4	4	3	3		
TABLE SIZE	7 $\frac{1}{2}$ x7 $\frac{1}{2}$	8x9	10x10	10x10	10x11	10x11	10x10 $\frac{1}{2}$	10x10 $\frac{1}{2}$	7 $\frac{1}{2}$ x7 $\frac{1}{2}$	9x9	9x9	10x10	10x10	7 $\frac{1}{2}$ x8 $\frac{1}{2}$	7 $\frac{1}{2}$ x8 $\frac{1}{2}$	8 $\frac{1}{2}$ x9	
OVER-ALL DIMENSIONS	Weight	30 $\frac{3}{8}$	36	36	66	38 $\frac{1}{2}$	67 $\frac{1}{2}$	40	71 $\frac{1}{2}$	26 $\frac{3}{8}$	31 $\frac{1}{2}$	62 $\frac{3}{8}$	36	65 $\frac{1}{2}$	29	66	
	Width	9 $\frac{1}{2}$	11	13 $\frac{1}{2}$	16			16 $\frac{1}{2}$	16 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$	15	12 $\frac{1}{2}$	18 $\frac{1}{2}$	10 $\frac{1}{2}$	13	
	Depth	22	24	24 $\frac{1}{2}$	27			31 $\frac{1}{2}$	31 $\frac{1}{2}$	15 $\frac{1}{2}$	16 $\frac{1}{2}$	21 $\frac{1}{2}$	19	24	23 $\frac{1}{2}$	24	
BEARINGS	BRONZE	BALL	BALL	BALL	BALL	BALL	BALL	BALL	1 BALL, 3 BRONZE	BALL	BALL	BALL	BALL	1 THRUST AND 4 BRONZE			
COLUMN DIA.		2 $\frac{1}{2}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	3	3	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$		



DELTA POWER TOOL DIV.
ROCKWELL MFG. CO.

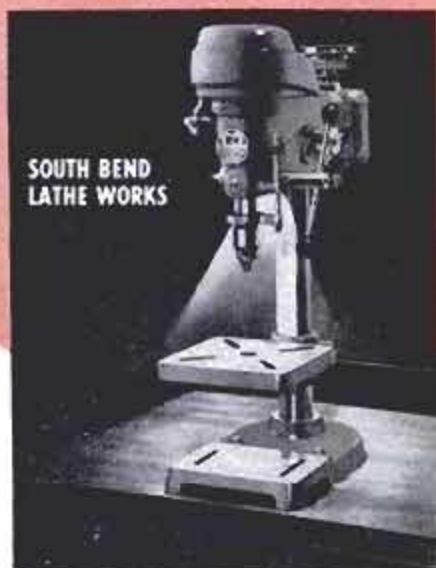
TOOL KRAFT
TOOLCRAFT CORP.
(DARRA-JAMES)



DURO METAL
PRODUCTS CO.



MAGNA POWER
TOOL CORP.



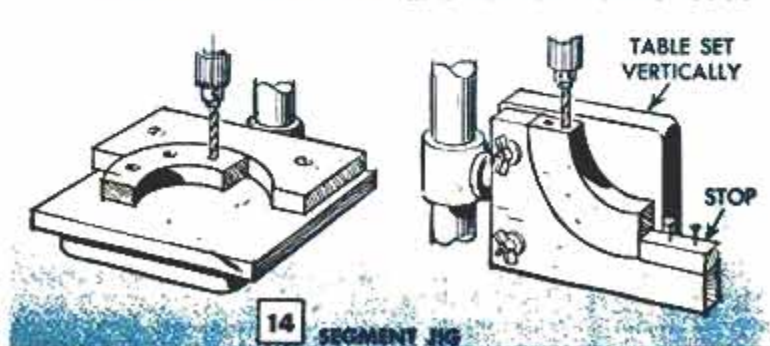
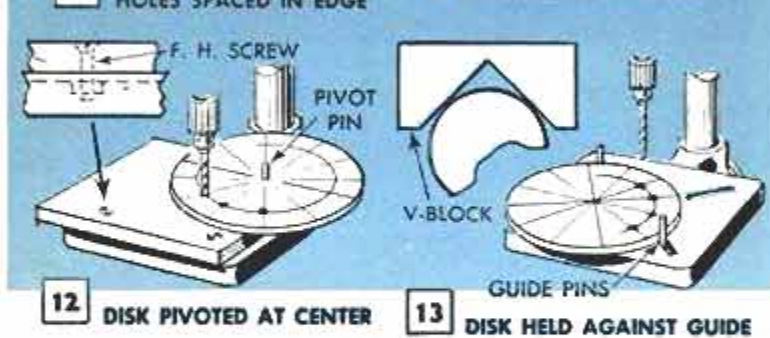
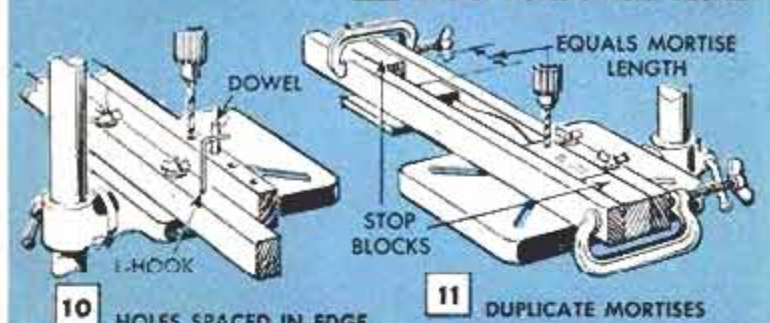
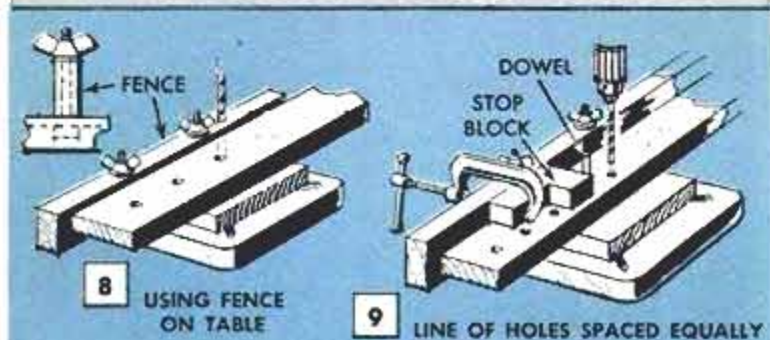
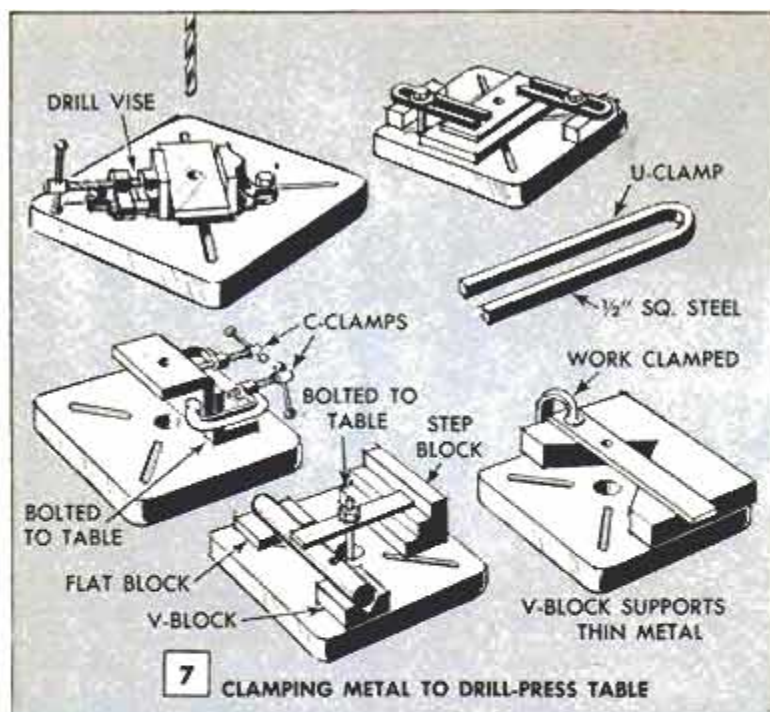
SOUTH BEND
LATHE WORKS



SPRUNGER BROS., INC.

DRILL PRESSES LISTED ARE DESIGNED FOR USE OF 1/2" CHUCKS

DELTA				DURO MASTER	MAGNA	PLANA- CENTRIC	POWR-KRAFT WARDS (Not Shown)	SOUTH BEND		SPRUNGER			
B	B	F	F	B	B	B	B	B	F	B	B	B	F
11	14	14	17	14	12 1/2	10	12 1/2	14 1/4	14 1/4	12	14	15	15
FOUR, 700 TO 4700	HSM-FOUR, 680 TO 4600 LSM-FOUR, 470 TO 1950	HSM-5, 700-4250 LSM-5, 385-2240	FOUR, 780 TO 3800				FOUR, 800 TO 3800	FOUR, 720 TO 4325		NINE SPEEDS 600 TO 5200			
11	12%	43 1/2		10%		13 1/2		11 3/4	40%	9 1/4	9 1/4	13 1/4	41 1/4
14 1/4	18%	48 1/2		13 1/4	18		18	16	45 1/4	12%	12%	18 1/4	46 1/4
3%	4 1/16	4 5/16	5	3%	3	2 1/4	3	4	4			4 1/4	4 1/4
8 1/2 x 9	10 x 10 1/2	10 x 10 1/2	11 x 12	7 1/2 x 7 1/2	10 x 10		8 x 8	10 x 10	10 x 10	7 x 8	8 x 9	9 x 9	9 x 9
33 1/2	37 1/2	68 1/2	47%	33	33	25 1/2	33			29	29	38 1/2	66 1/4
11 1/4	13%	15%	23 1/2		11 1/2		11 1/2			9%	10%	11%	15
19	24 1/4	24%	36 1/16		23		23			15	15 1/2	18	20
2 BRONZE, 1 BALL	BALL	BALL	BALL	1 BALL, 4 BRONZE	BALL	BALL AND BRONZE	BALL	4 BALL	4 BALL	1 BALL, 4 BRONZE	BALL	BALL	BALL
1%	2%	2%	3%	1%	2		2	2%	2%	2	2	2 1/4	2 1/4

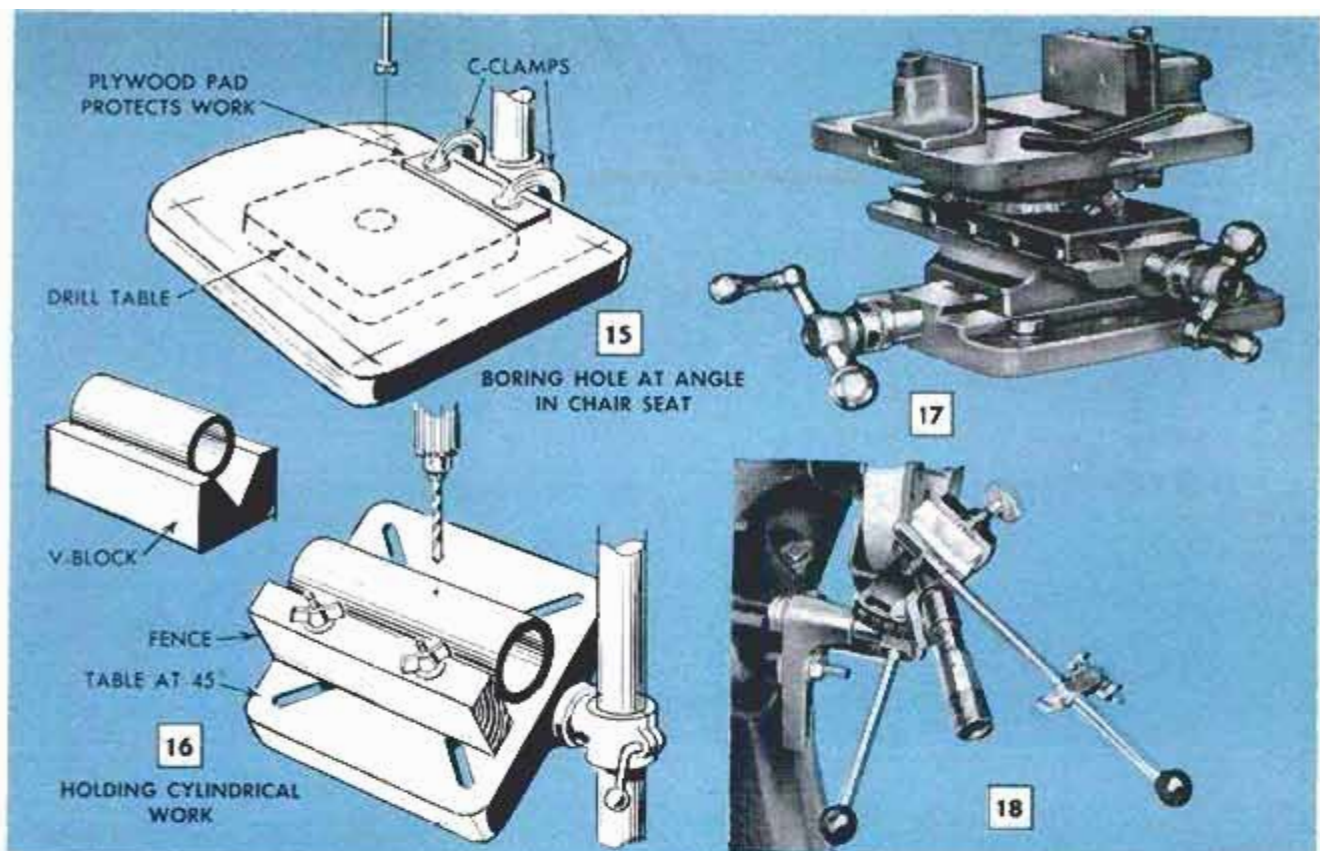


In any operations that involve side thrust between the tool and work, it is highly important to have the tool mounted either in a chuck or attached to the spindle so that it cannot loosen and cause injury. Also, on operations involving side thrust, maximum accuracy is assured, and wear on the spindle bearings can be minimized by using a spindle or an adapter that will fit a bearing attached to the drill-press table as in Fig. 5.

Accuracy of a drill press depends on the straightness of the spindle, the proper fit of a spindle in its bearings, and right-angle, spindle-to-table alignment. A bent or sprung spindle can sometimes be corrected, but generally requires replacement. Worn bearings and a spindle that permits excessive play should be replaced. Misalignment of a spindle with the table usually can be corrected by shimming the latter.

Operating hints: To avoid ragged holes from a bit breaking through wood and other soft materials, always support the work on a piece of smooth wood, plywood or hardboard of sufficient thickness. Whenever possible adjust the table so that its center hole is in alignment with the drill, or bit. This will prevent possible damage to the table in case the drill or bit penetrates the piece of wood placed under the work. A wood-boring bit used in a drill press should have a brad point rather than a screw point so that the feed can be controlled. When routing, shaping, sanding and grinding, where cutting is done on the side of a tool, the work is fed against the direction of rotation. If a larger work area is required than that furnished by the table, an auxiliary table, Fig. 5, can be made of 3/4-in. plywood, attaching it with machine screws to the regular table.

Don't attempt to drill metal without first center-punching it after making an accurate layout to required measurements. Center-punching prevents the drill from wandering. Then run the drill at approximately the required speed for its size and for the material being drilled. Some manufacturer's instruction booklets contain tables of speeds for varying size drills



Atlas Press photos

and different materials. Keep the drill tip lubricated, feeding it with rather light pressure. If a drill bit does not cut readily it generally needs sharpening. This is done by grinding and requires considerable accuracy to produce the right angles and clearances. Some manufacturers make special jigs, such as the one shown in Fig. 18, that greatly simplify accurate grinding of drill bits.

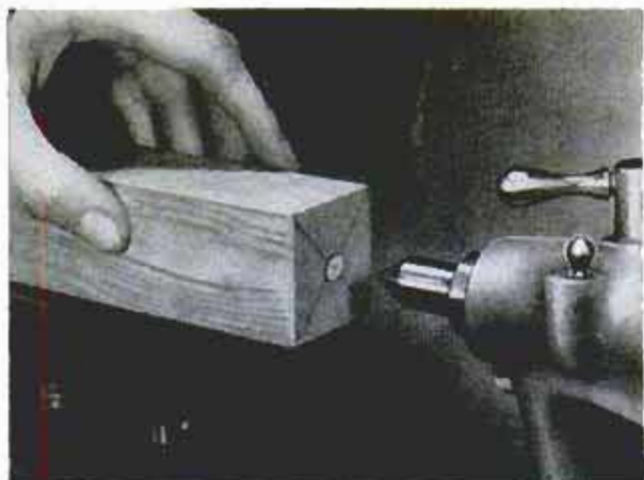
As a rule, metal to be drilled, especially small work, should be clamped securely to the table instead of holding it by hand. Although work can be held by hand when using small size drills, there is always the risk of injury that may result from the drill catching in the work, especially when it breaks through. Then the work is likely to slip out of your fingers and rotate with the drill. This happens unexpectedly and can cause a painful injury. Fig. 7 shows a number of ways of holding work securely on a drill-press table. Small parts can be held in a drill vise bolted to the table. Avoid placing thin stock on separate supports spaced widely apart. This allows the metal to spring under pressure of the drill, causing it to bind or make an elliptical hole. Mount the metal so that the supporting points will be close to the drill. This often is done conveniently by using a block having a V-shaped cutout. For accurate milling and surface-grinding operations, a universal compound vise, Fig. 17, is needed.

Work setups: For drilling holes or routing in a straight line on a piece of straight-edged stock, use a fence clamped to the

table as in Fig. 8. To space the holes equidistantly, clamp a block to the fence, Fig. 9. This serves as a stop for a dowel slipped into the hole previously drilled. For drilling equidistant holes in the edges of straight stock, the setup shown in Fig. 10 is used. For duplicating mortises in a number of similar pieces, you can use a fence with stops at both ends, Fig. 11.

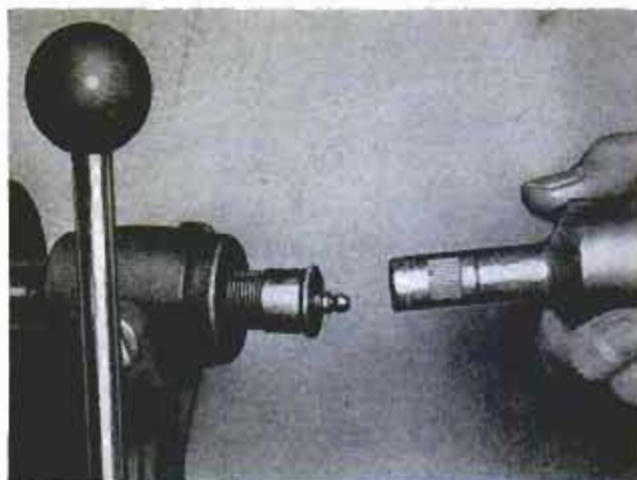
For drilling holes or routing a groove near the edge of a disk having a center hole, pivot the disk as in Fig. 12. If the disk has no center hole, rotate it against two guide pins (nails or dowels), or against a V-shaped block, Fig. 13. When so drilling or routing a segment or a circle, use a guide having a matching curve, Fig. 14. To drill radial holes into the edge of a disk, use a V-block or two pins on a block clamped to the table tilted to the vertical position. When drilling radial holes in the edge of a segment of a circle, use a rest having a matching curvature, which is clamped to the drill-press table tilted to the vertical position. For boring dowel holes in ends of such segments so they can be joined to others, use a support with a stop as in the right-hand detail, Fig. 16.

When boring holes at angles, lock the table at the required angle of tilt and clamp the work to it, Fig. 15, using a pad of plywood or hardboard to prevent marring the work with the clamps. Cylindrical work should always be mounted in a V-block, Fig. 16, or between the table and a fence, set at an angle as shown in the right-hand detail. ★ ★ ★



Hardwood Dowel in Soft Stock Provides Turning Center

When softwood stock is mounted in a lathe for turning, the dead center sometimes is forced too far into work, causing the wood to split. If it does not split, the work sometimes is thrown off-center by undue resistance between the center and the wood. To avoid this, drill a hole in the end of the stock and drive in a short hardwood dowel. The dead center now can be pressed into the hardwood which provides a bearing surface so the work can be handled as a piece of hardwood.



Gun Fitting on Grease Cup Permits Easier Filling

By screwing a pressure grease fitting into a tapped hole in the cap of a grease cup, it can be filled easily by using a standard grease gun, eliminating the usually messy job. So that the cup will be filled completely, the cap is unscrewed as far as possible before filling. If a suitable tap is not available, some of the hardened-metal fittings will cut their own threads when they are screwed into undersized holes that are drilled into the caps of the grease cups.

R. Hanscom, Elmhurst, Ill.

PM Books for Boys and Girls to help them know about Science

MR. WIZARD'S SCIENCE SECRETS, by Don Herbert. The star of the famous TV program seen coast-to-coast weekly on more than 60 stations has written this educational and entertaining book that will help in school and through a whole lifetime. The book is just like his unusual program and just as intriguing. It contains more than 150 of his television experiments, in word and picture. Answers thousands of "how" and "why" questions children ask on the human body, gravity, flight, heat and radiation, electricity, etc. It's facts with fun—so fascinating and interesting children never tire of learning.

264 pages. \$3.50

THE BOY SCIENTIST, by John Lewellen. An up-to-the-minute introduction to the exact sciences, bursting with facts every modern boy wants to know. Written and illustrated with such clarity that even complex principles are quickly grasped by the young mind. This book won for Popular Mechanics Company the 1955 award of the Thomas Alva Edison Foundation as publisher of "The Best Children's Science Book." A truly outstanding work.

264 pages. \$3.95

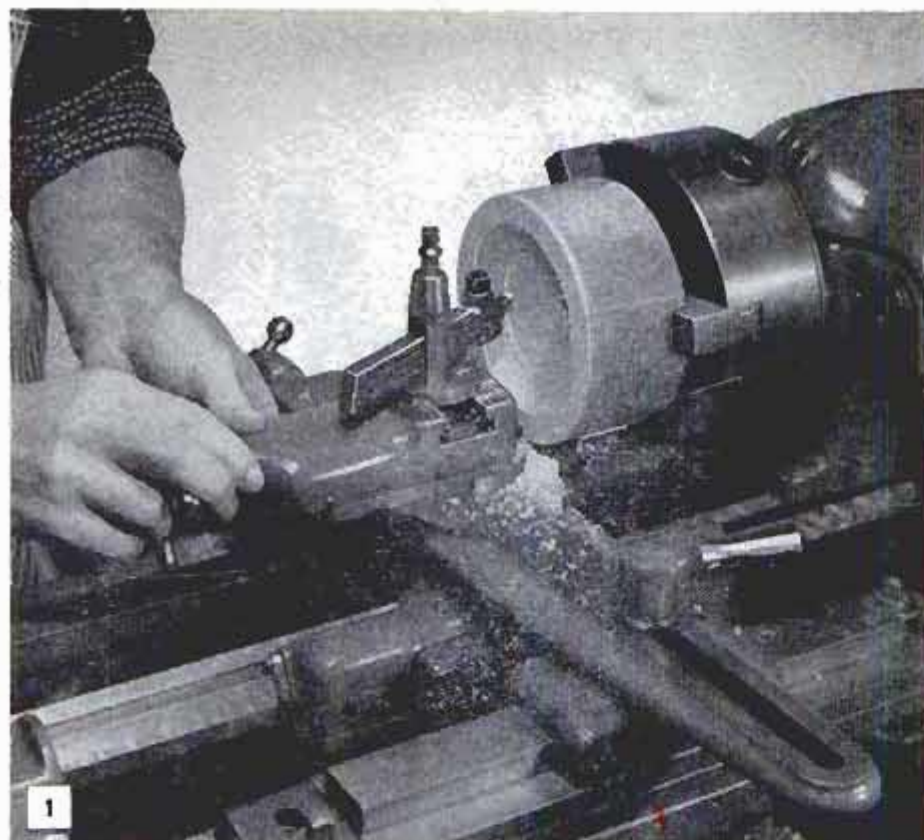
SCIENCE MILESTONES, from the *Science Digest* series. A record of the march of science which will fire the imagination, and inspire youngsters in their pursuit of scientific knowledge. Contains dramatic revelations of 60 important individuals whose contributions, from 400 B.C. to the present, are landmarks in the history of science. This book is as fascinating as fiction, as factual and revealing as a laboratory report. Beautifully illustrated and printed.

312 pages. \$5.00

The books above are ideal as birthday gifts, Christmas presents or for general reading for the scientific-minded youngster. Each is authoritative, clearly presented and illustrated, quality printed and bound, as you would expect from the publishers of Popular Mechanics Magazine. You and your children must be pleased or your money back. Send check or money order today for the books of your choice to—

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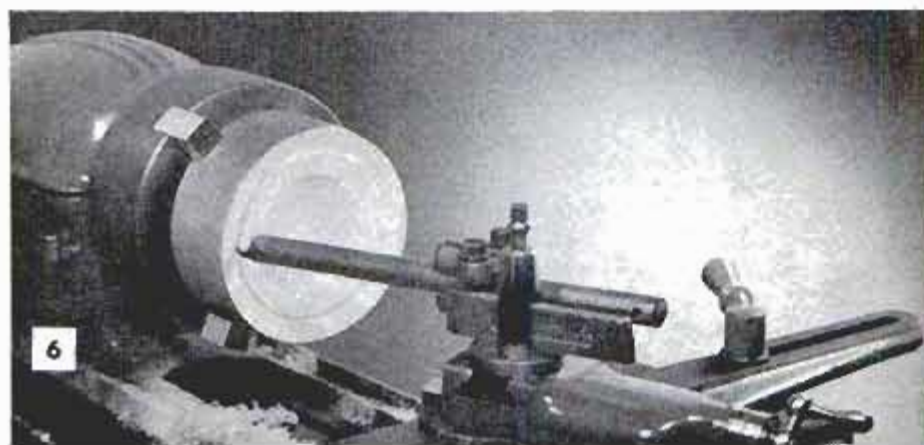
TURNING A RADIUS

By Sam Brown

YOUR METAL-TURNING LATHE shows its versatility as a machine tool when it is adapted to turnings other than the conventional between-centers, faceplate and chucking operations. Turning a radius is one of these out-of-the-ordinary jobs. There are two methods commonly used. In the first, the compound is swiveled to move the cutting tool in the required radius. The second method utilizes a radius bar to move the lathe carriage through the desired arc. The latter method is best for making matched concave and convex shapes having a shallow curvature.

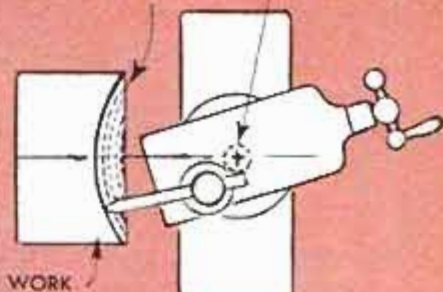
Swiveling the compound: In this method the screws or bolts holding the compound are loosened, allowing it to be rotated by hand around the compound swivel pin. Figs. 1 and 2 show how a concave curve is cut, the compound swivel pin being located at the exact center line of work. Infeed for successive cuts is done with the compound feed. The setup for a convex curve or ball shape is somewhat similar, except in this case the swivel pin must be exactly under the center of curvature of the work, Fig. 3.

Turning with the compound swivel is done with the pivot

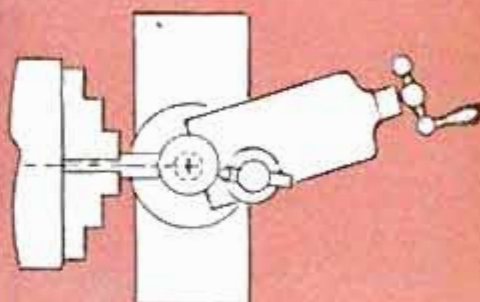


SHOP NOTES

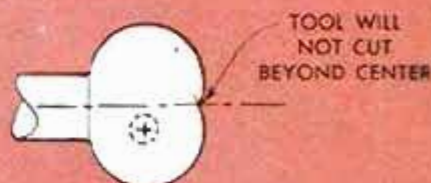
SUCCESSIVE CUTS
COMPOUND SWIVEL PIN



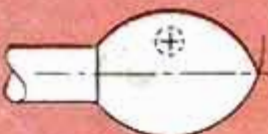
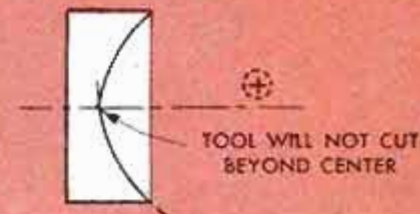
2 CONCAVE—TOOL IS AHEAD OF COMPOUND SWIVEL PIN



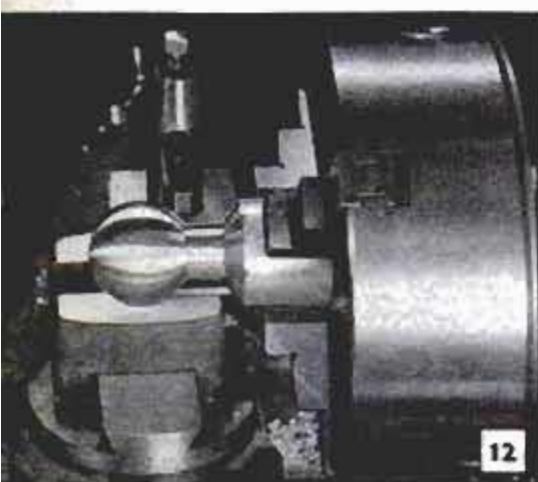
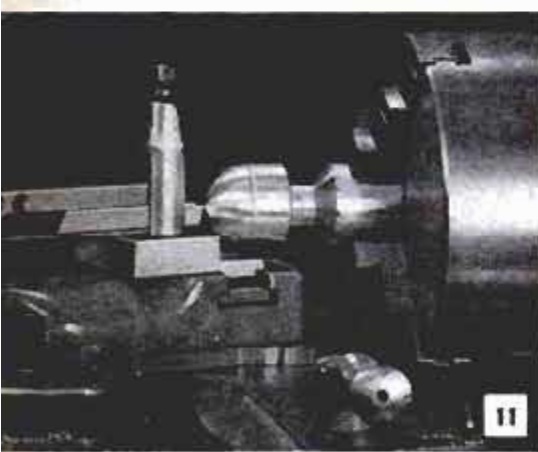
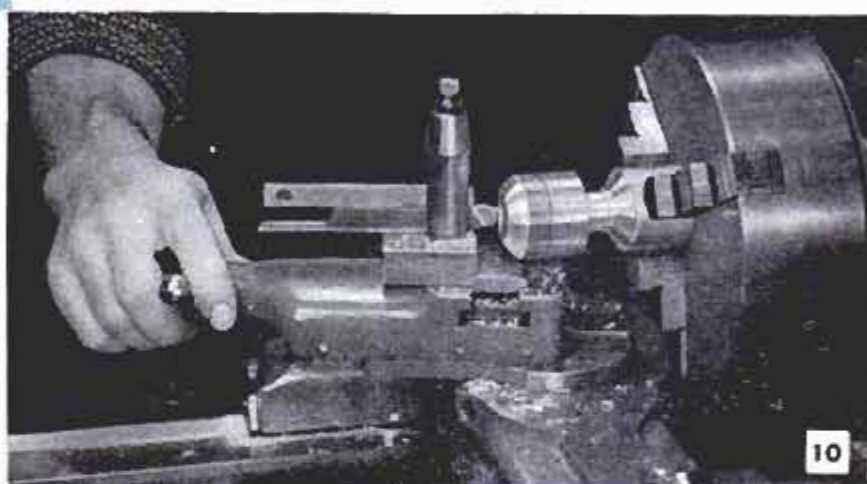
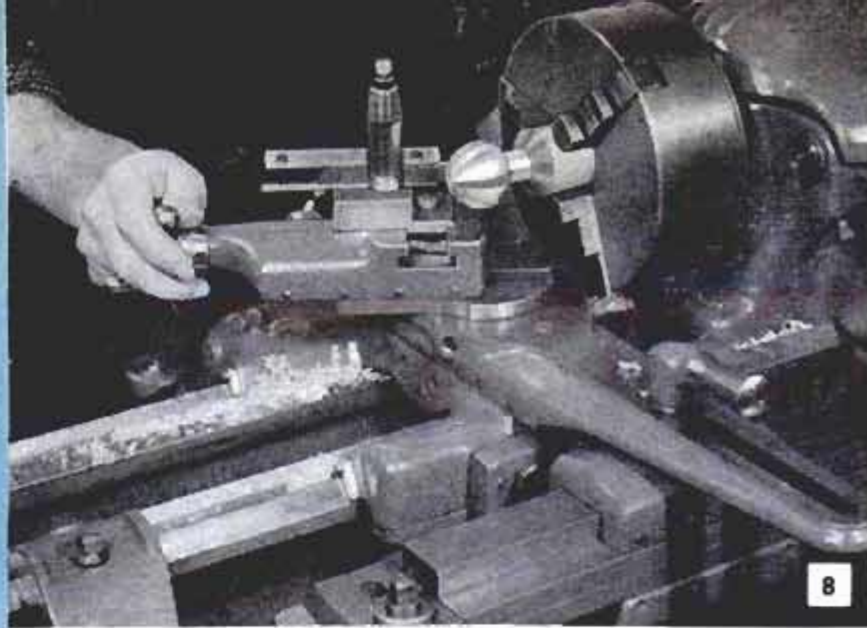
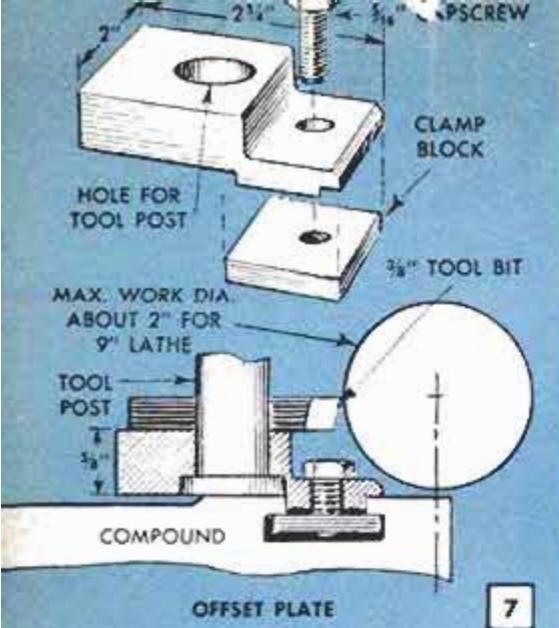
3 BALL—TOOL IS BEHIND COMPOUND SWIVEL PIN



4 PIVOT OFF CENTER TOWARD OPERATOR



5 PIVOT OFF-CENTER AWAY FROM OPERATOR

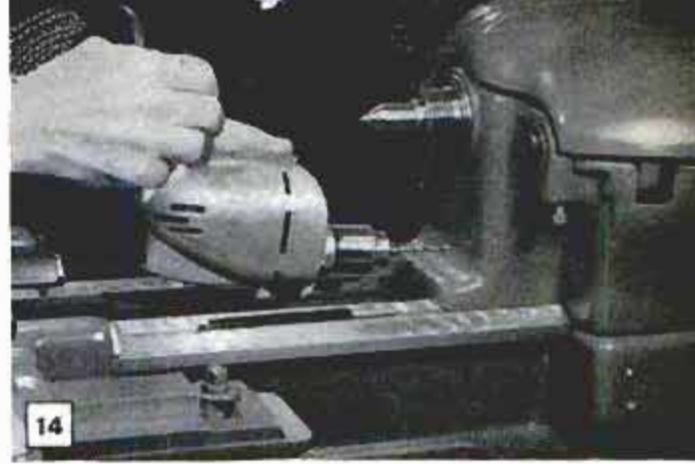
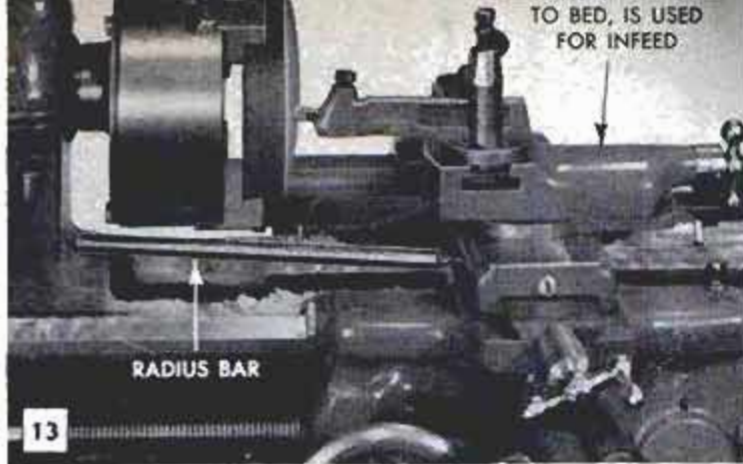


pin on the work center line but at times an off-center position is useful, Figs. 4 and 5. The position of the cross slide needed to center the compound pin should be permanently marked to avoid repetitious setup operations.

When making a concave cut, the pivot pin is centered crosswise and is located at a distance from the work equal to the desired radius of cut. The minimum radius is determined by how close you can get the compound to the work; the maximum radius is limited only by how much tool extension can be used without chatter. If the job is a turning in wood or plastic, you can get out as much as 9 or 10 in. from the work with a 5/8-in. boring bar, Fig. 6.

The most popular use of the compound-swivel technique is the turning of small balls, Fig. 8. The radius of such work depends on how much travel is available at the compound. On the 9-in. lathe pictured, balls up to about 7/8 in. diameter can be turned without extra setups or attachments. An offset plate made up as in Fig. 7 increases the work range to the maximum diameter which will swing over the compound—in this case, 2 in.

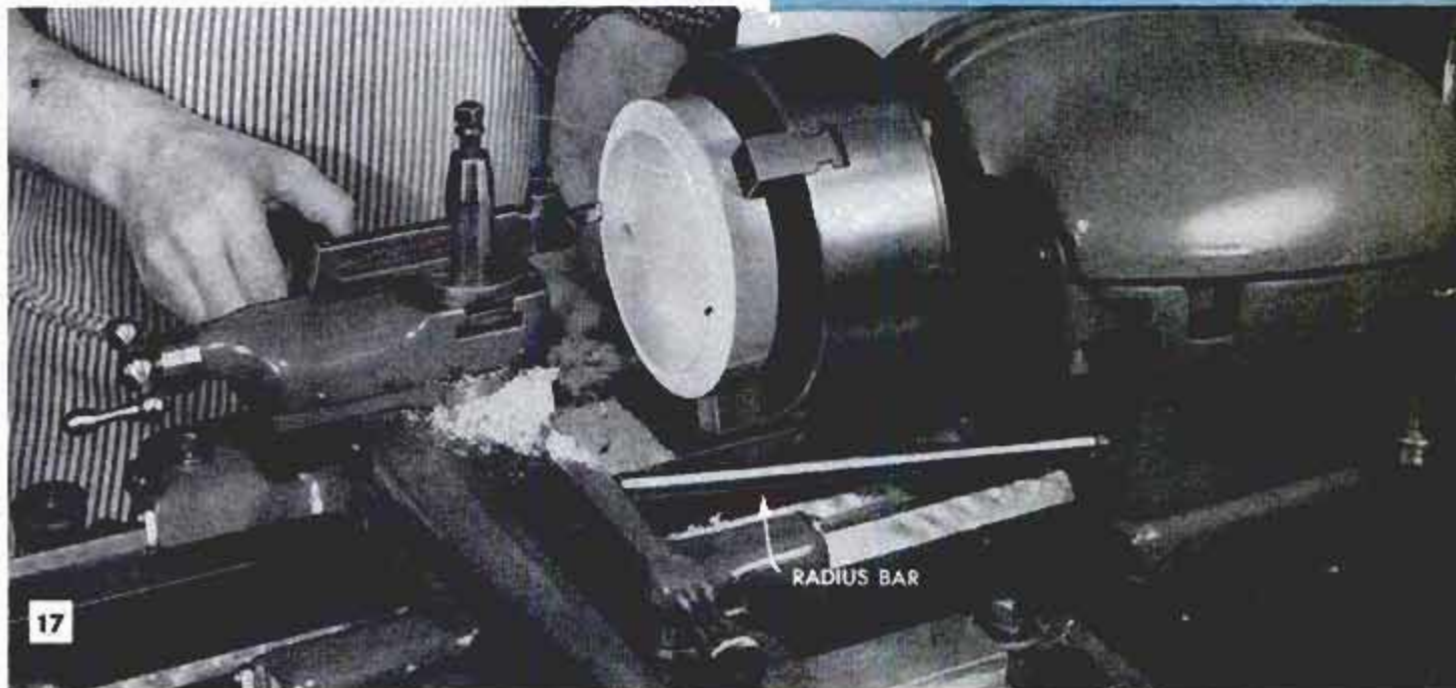
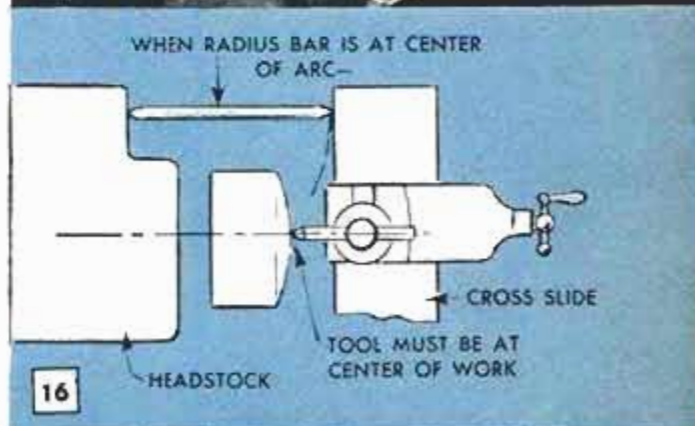
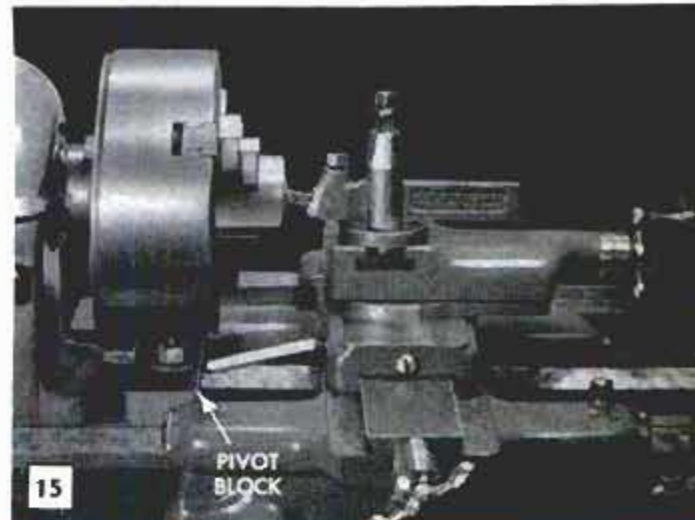
The work is first rough-turned to cylindrical shape, after which the carriage is clamped in position with the compound swivel under the work center line, Fig. 9. Ball turning then proceeds, using the compound infeed for successive cuts. On a first job, it is somewhat simpler to cut only the outer half of the ball, as shown in Figs. 10 and 11. To turn the half of the ball nearest the headstock, the tool should be moved toward the headstock and also angled toward the headstock. The second half of the ball is then

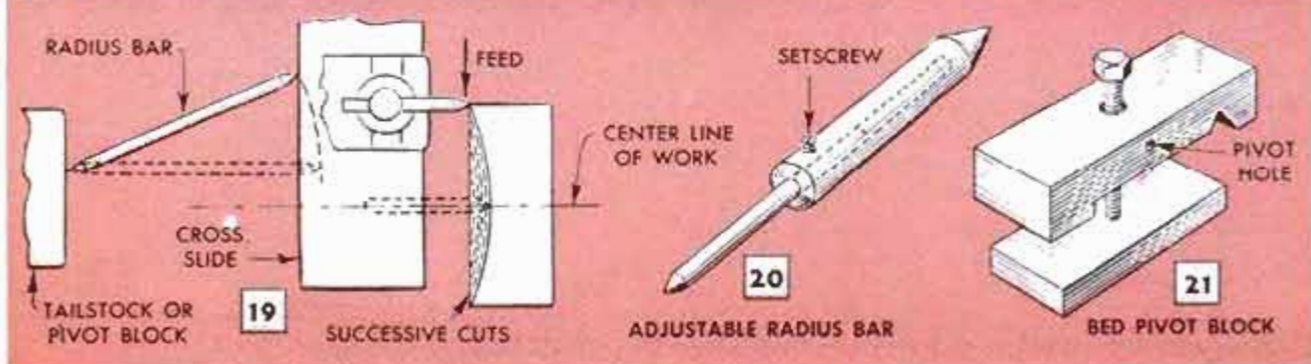
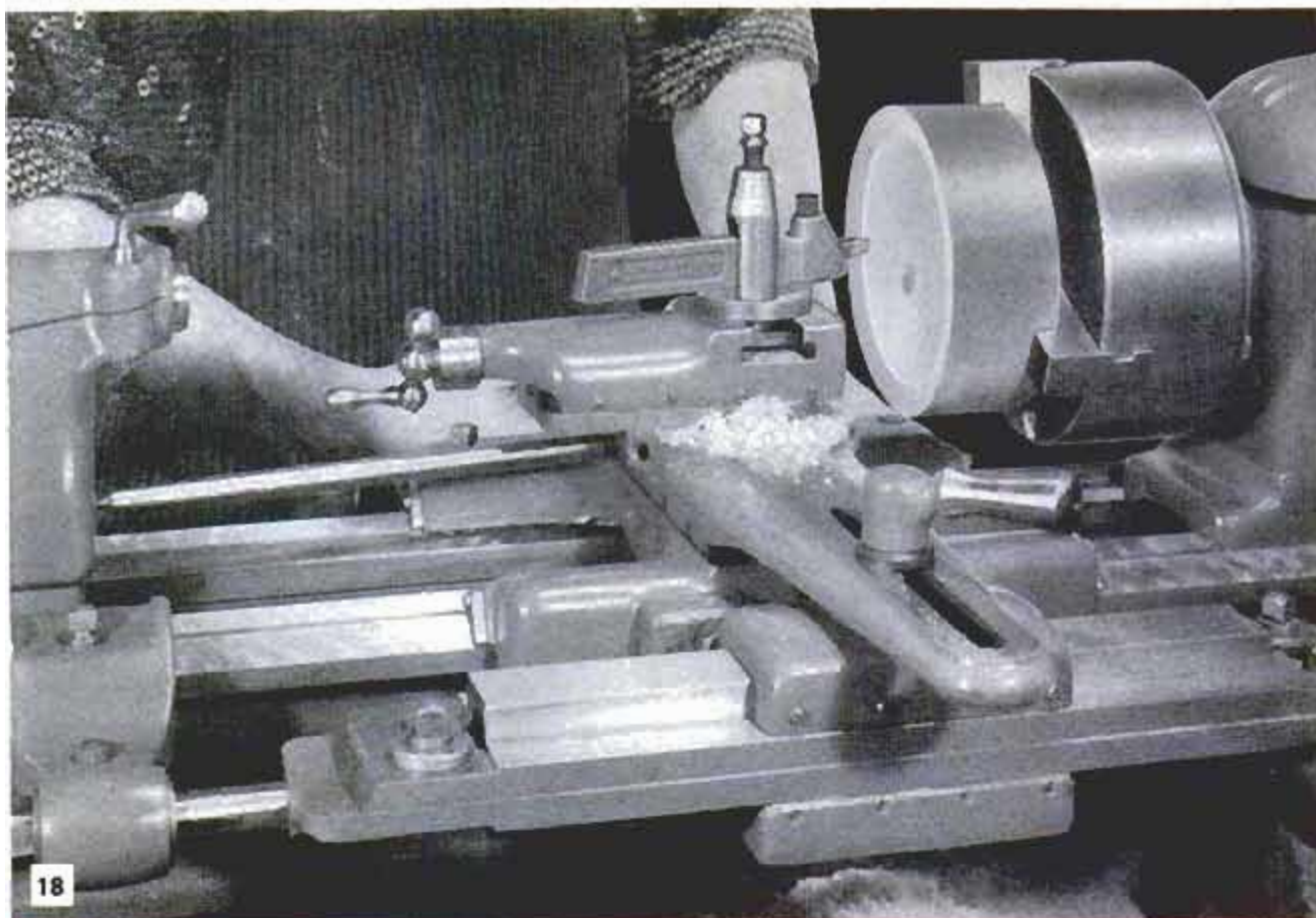


turned, Fig. 12, also Fig. 8. You can sweep around the whole surface of the ball for a final cleanup cut.

Using a radius bar: A radius bar is a pointed metal rod with a length equal to the radius you want to cut. For a convex cut, one end of the bar fits into a small hole spot-drilled in the headstock, while the other end goes into a hole spot-drilled in the cross slide, Fig. 13. Just the tip of a 1/8-in. drill is all you need for the pivot holes, Fig. 14. The compound is in the parallel position and is used for infeeding successive cuts. The work feed is done with the cross slide; as this is moved in, the radius bar forces it away from the headstock, causing the tool to follow an arc of the same radius as the length of the radius bar. The carriage should be held by light pressure on the handwheel to keep the radius bar in place.

A good minimum length for a radius bar is about 3 in. This short length will not span the distance to the headstock and needs a pivot block clamped across the lathe bed to carry the pivot hole, Fig. 15. A long radius bar permits only light cuts to be taken due to distance from the work, Fig. 13. A solution to this is to locate the pivot holes at points which will allow the tool to be placed closer to the work; Fig. 17 shows the radius bar working from an offset on the lathe headstock, allowing the tool to be placed at





a normal distance from work. An important point in using a radius bar is shown in Fig. 16: When the bar comes to the center of its arc, the tool must at the same time come to the center of the work. To obtain this relationship, the cross slide is moved to bring the radius bar parallel to the lathe bed, after which the tool is adjusted on the compound to center on the work. The radius bar itself can be in any convenient location; external pivot points entirely apart from the lathe are used for some operations requiring a long radius.

When the radius bar is pivoted from the tailstock end of the lathe, the resulting cut will be concave, Fig. 18. The use of the same radius bar produces matching surfaces. Here again the general rule of having the radius bar at the center of its arc at the same time the tool is at work center must be followed, Fig. 19.

If you make extensive use of radius bars,

an adjustable type, Fig. 20, will save time. The bed pivot block, Fig. 21, can be used for either convex or concave cuts, and the block can also be used as mounting base for arms to locate external pivot points when needed. ★ ★ ★

Loosening Paint-Locked Sash

Fresh paint that creeps between the sash frame and the stops can lock a window sash solidly and pose a real problem in loosening it without damage. If you move the sash an hour or so after painting you can easily break the paint seal and avoid trouble, but if you forget and find the sash stuck fast, here's a way to loosen it without damage: Force the blade of a putty knife between the sash and the stop all the way around the sash frame to break the paint seal.

Ted M. Fenn, Skokie, Ill.

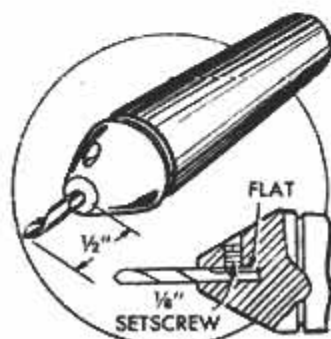
Notched Board Serves as Guide For Drilling Spaced Holes

Spacing holes equally and in line by eye alone is a neat trick—if you can do it. This notched board or strip automatically spaces the holes and at the same time keeps them in line. Determine the spacing of holes required, then cut the notches accordingly, each to a depth of approximately half the diameter of the bit to be used. Place the notched strip and the work in the bench vise and position the two so that the holes will come in the desired location. Bore the same number of holes as there are notches, then if more holes are called for, shift the work and guide.

G. E. Hendrickson, Argyle, Wis.



Drill "Chucked" in Lathe Center



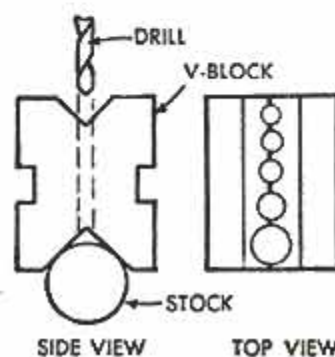
Smaller twist drills in letter and fractional sizes are easily broken and just as easily lost. One shop eliminates losses and discards by mounting broken drills in a lathe center as detailed. They are then utilized as

pilot drills in lathe work that calls for exceptional accuracy on small parts.

Emile Germain, Oswego, N. Y.

V-Block Forms Drill Guide

A practical guide for drilling transverse holes in round stock is readily made from a discarded V-block. Center a row of holes of graduated sizes through the block as detailed. To use,



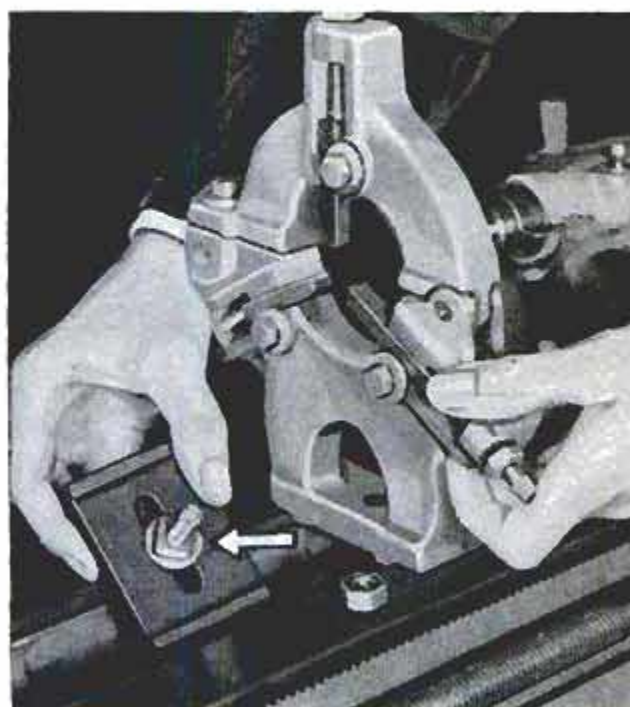
clamp the stock in two V-blocks, place the guide on top of the work and lower the drill bit into the correct hole.—Bruce D. Stewart, Winder, Ga.

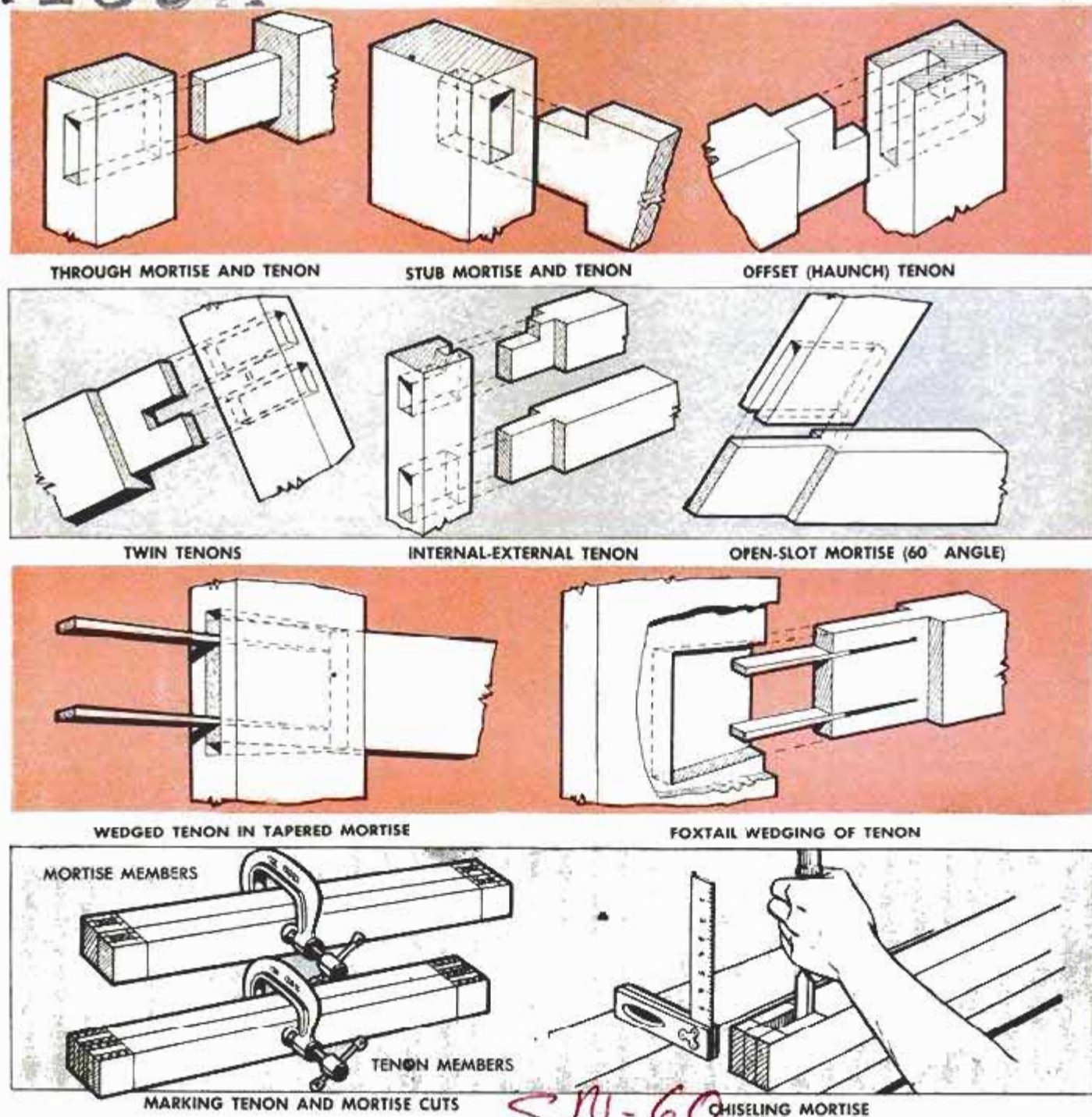
Jam Nut Holds Bolt Centered in Clamp Jaw of Lathe Steady Rest

Occasionally it becomes necessary to remove and replace a lathe steady rest without disturbing work between centers. It is then that the loose clamp bolt becomes a problem, as the nut must be removed. Also, when replacing the rest it's handy to have the bolt centered and locked in place, especially in a slotted clamp jaw. By now, of course, you know the trick—simply place a washer of suitable size over the bolt, center it in the slot and run down a jam nut. The stunt also helps to hold the clamp jaw in line when you loosen the nut to slide the rest along the lathe bed.

We Apologize

In our October issue Mr. John Yellott was inadvertently credited as the author of the article on "Solar Water Heaters." The statement in this article "Water weighs about 13 lb. per gal." should have read "A storage tank when full weighs about 13 lb. per gal. of capacity."



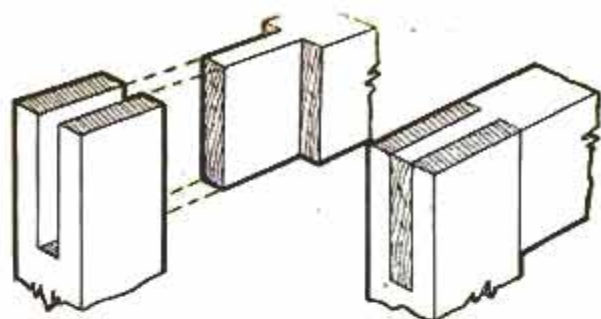


Mortise-and-Tenon Joinery

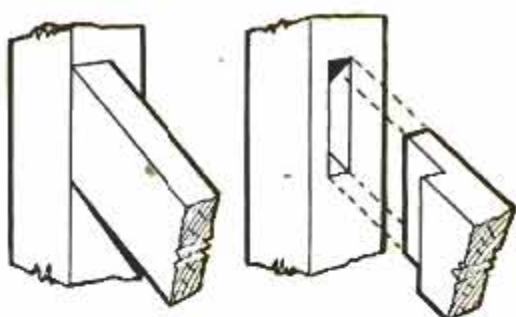
SEVERAL OF THE JOINTS detailed above and on the opposite page were used by early cabinetmakers, or joiners as they were then known, for joining rails to posts and legs in cabinet and chair framing. To simplify the handwork involved in making tenons on rails many joiners made tenons the full width of the stock as shown. Only later did it become a general practice to house the tenon fully by making cheek and shoulder cuts on both edges of the stock as well as the faces, as is common practice today. The mitered stub tenon, or housed tenon, is an example of present-day practice, as it can be made completely by machine methods, or by hand, and is

almost universally used in cabinet framing which requires mortising. Nearly all the joints detailed are used by craftsmen when making reproductions or copies where all construction details must be followed. The strength of the mortise-and-tenon joint is dependent on accurate fitting. No amount of glue will compensate for poor fitting of the parts. Craftsmen who have a drill press and a circular saw will not, of course, be interested in the hand methods detailed, but those who must make the joints by hand will be well repaid for the little extra time necessary to obtain an accurate fit of the parts.

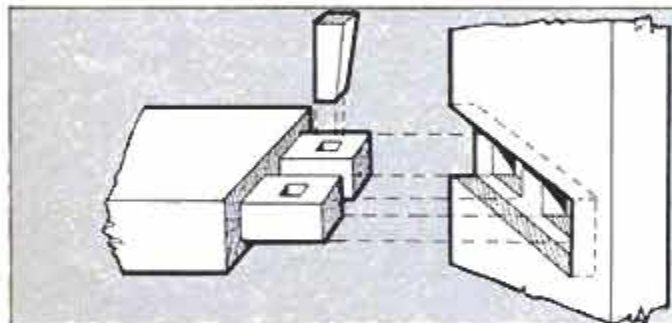
C. W. Woodson, Chicago, Ill.



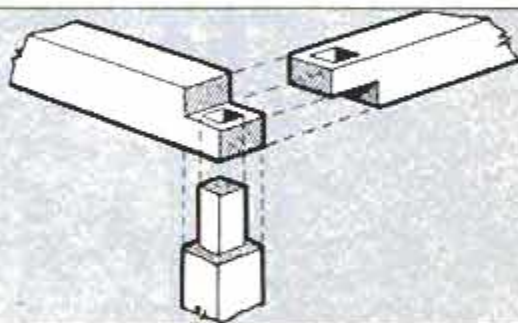
OPEN-SLOT MORTISE



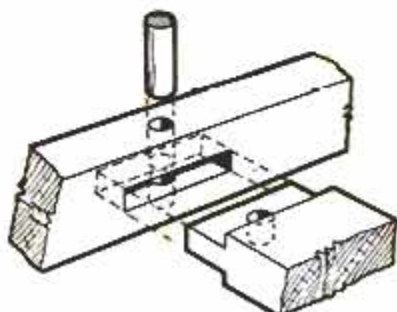
BAREFACED TENON



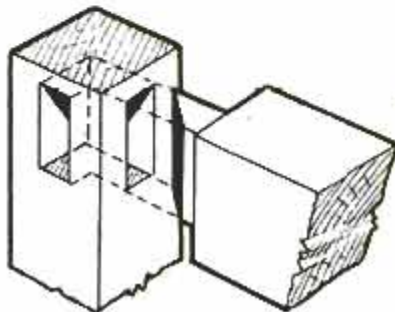
TUSK TENON WITH WEDGE



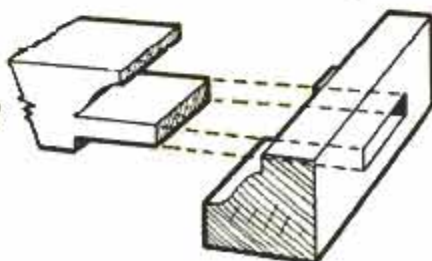
RAILS TENONED TO POST



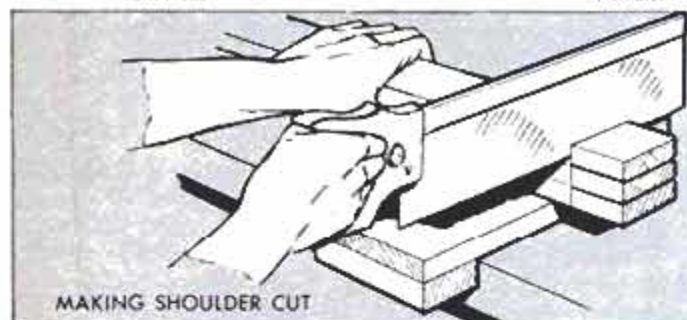
PINNED MORTISE AND TENON



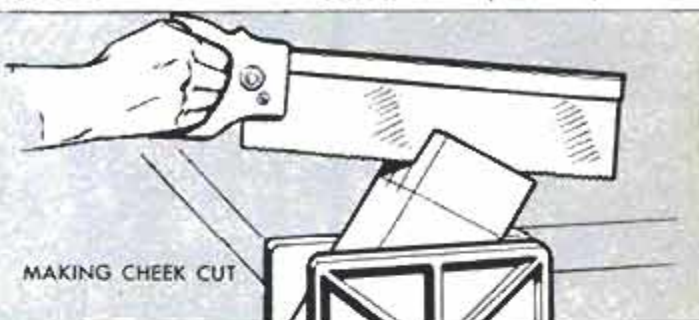
MITERED STUB TENON



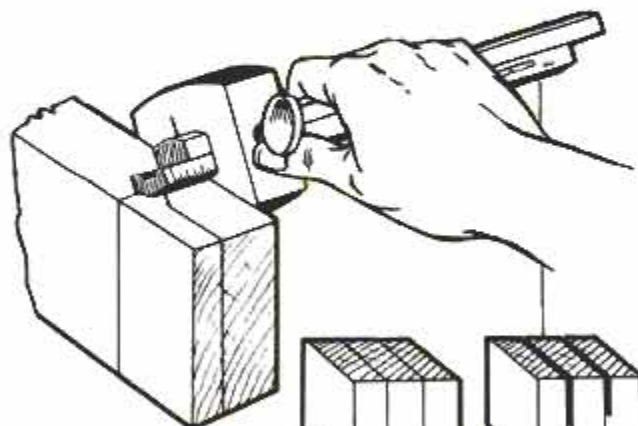
SCRIBED JOINT (TENONED)



MAKING SHOULDER CUT



MAKING CHEEK CUT



LAY OUT WITH MORTISE GAUGE



TENON LAYOUT



SAW CHEEK CUTS IN WASTE

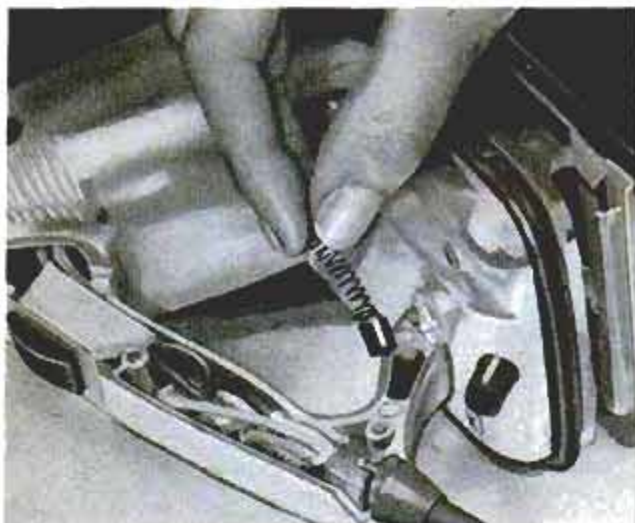




Steel Angles Cut Accurately By Sawing From Heel First

You will cut steel angles much more accurately with a hacksaw if you start at the heel of each angle, rather than cutting the webs individually as is done ordinarily. Also, because both webs are cut at the same time, fewer saw strokes are required. Because more teeth are contacting metal, the saw strokes will be smoother. When metal angles are held as shown in a machinists' vise, the jaws do not hold the angle, rather the throats of the jaws clamp the angle between them and up against the lower edge of the jaws.

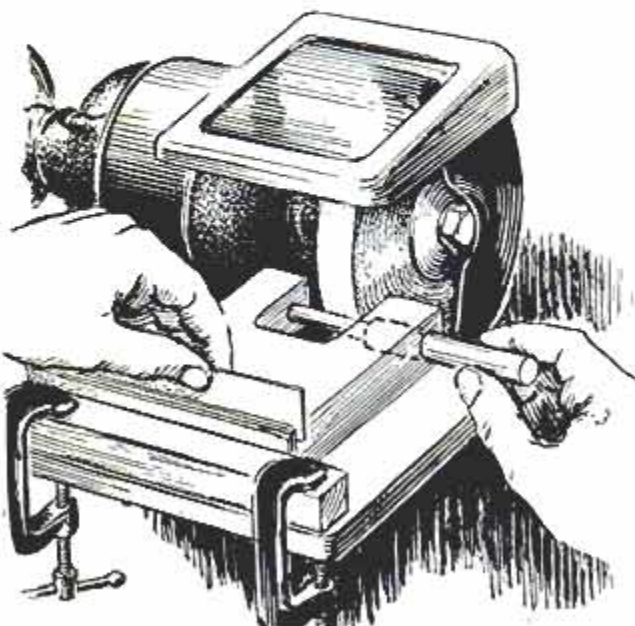
Keep the air cleaner clean on your car to assure proper engine function. Chances are that if the outside of the cleaner is dirty, so is the inside. Let the engine idle as you remove the cleaner. If the engine picks up speed as the cleaner is loosened, you can be sure that it is dirty to the point of impairing proper function.



Spare Motor Brushes are Stored In Power-Tool Handles

Spare brushes can be stored in the handle of an electric drill motor, sander or other portable power tool where they will always be on hand when needed. Remove one half the handle as shown and insert the brushes in a convenient opening. The brush springs will keep them from rattling.

☞ To repair small holes or tears in inlaid linoleum, fill them with a paste made of spar varnish and pulverized bits of the linoleum. When mixture hardens completely, sandpaper surface of the patch.



Stock Shouldered Accurately With Simple Jig on Grinder

Grinding down the end of round steel stock concentric with its axis, as when reducing the diameter of a drill-bit shank to fit a small-capacity chuck, can be done accurately with this setup. First cut a U-shaped hardwood block to hold the work. One leg of this block is bored for a sliding fit of the work, the other acts as a stop to assure shouldering the work at right angles to its axis. A stop block of $\frac{3}{4}$ -in. plywood now is clamped to the grinder tool rest. In grinding, the block holding the work is kept against the stop block, but is advanced gradually toward the grinding wheel by inserting thin cardboard strips between the stop block and workholder.



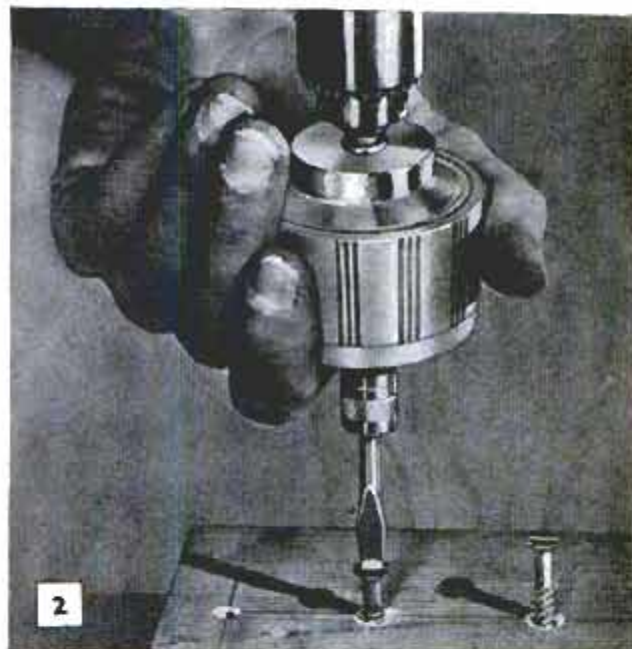
Christmas SHOPPING FOR TOOLS

1. BELT AND PAD (ORBITAL) SANDERS have wide applications in preparatory smoothing and finishing of wood, metal and plastic. These sanders, one orbital and one belt type, have several special features such as out-of-the-way cords, quick-acting abrasive tensioning and locking devices and frames designed for flush sanding. The belt sander takes 3-in. belt, the pad sander an abrasive sheet 7-1/16 x 3-5/8 in.

Stanley Electric Tools, Div. of Stanley Wks., New Britain, Conn.

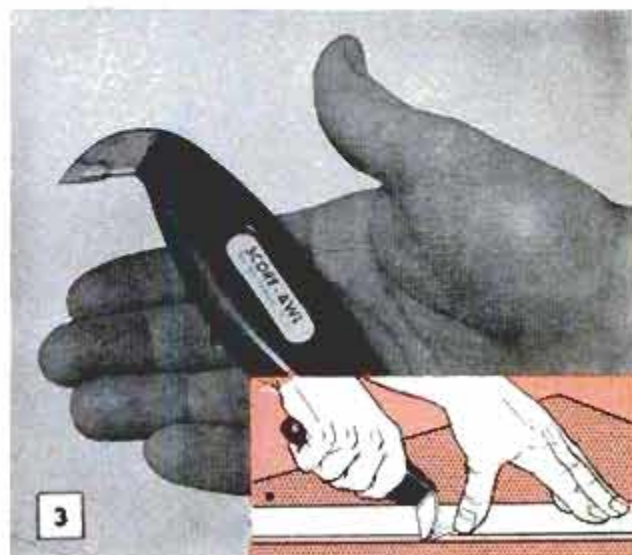
2. DRILL AND DRIVER ATTACHMENT for use with portable electric drills reduces drill speed 7 to 1 and greatly increases power through a planetary gear train enclosed in the housing. Designed primarily for driving screws the unit also can be used for heavy-duty drilling simply by replacing the driver bit with a suitable chuck. With this speed-reducing unit portable drills will handle larger bits

Supreme Products Corp., 2222 S. Calumet Ave., Chicago 16



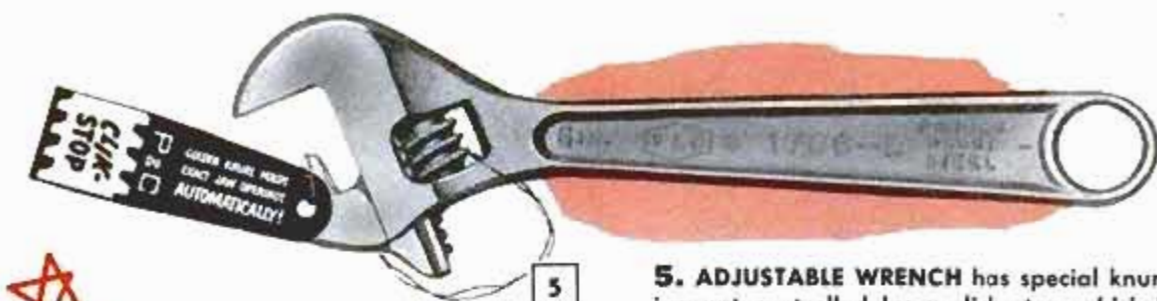
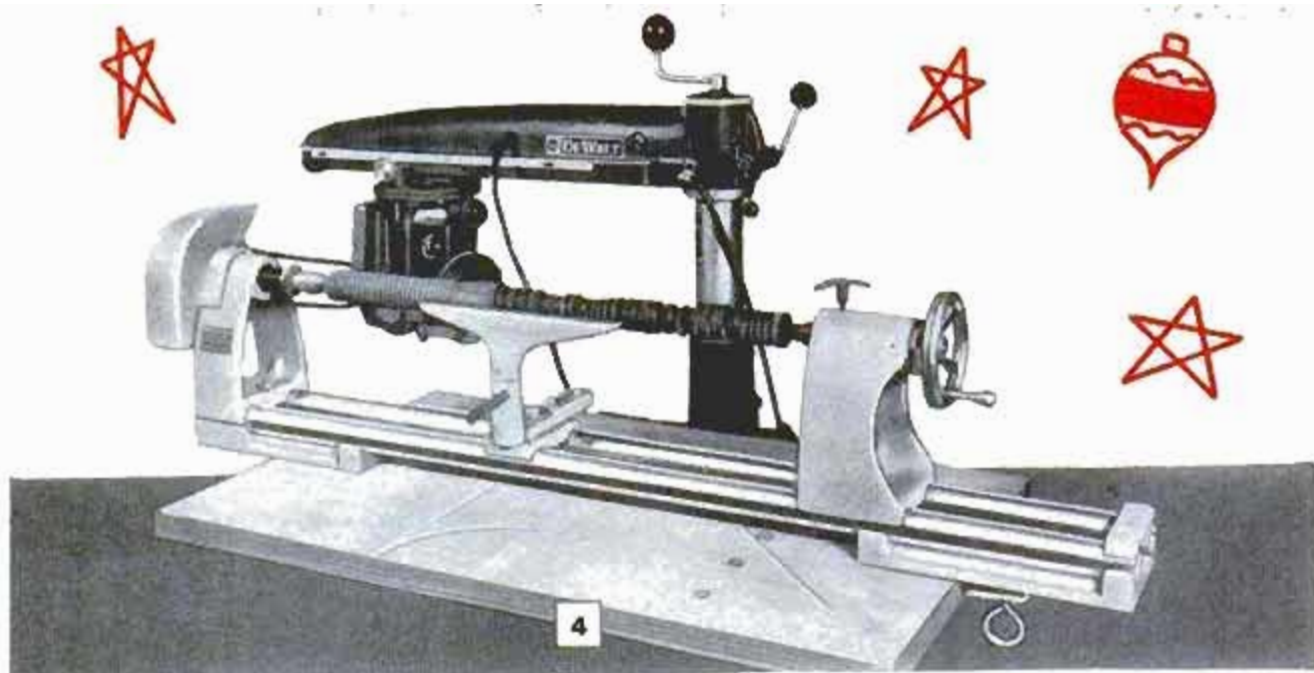
3. CARBIDE-TIPPED SCRIBER looks like a knife but it works like a scriber on plastic laminates and other similar hard, rigid materials. Specially ground tip scores deep when run along a straightedge, permits materials to be broken easily along scored line. All-metal construction with a handle shaped to fit the hand and give a firm grip for sure control when scribing. Full instructions are included with the scriber

Score-Away, Box 95, Grove City, Ohio



4. WOOD-LATHE ATTACHMENT for radial saw can be attached to the machine table and driven by belt from the saw motor as pictured, or it can be mounted individually on a bench and driven by a separate motor. In individual setup motor can be positioned back of lathe headstock or below it as desired. The lathe comes complete with V-belt, pulley for 5/8-in. motor shaft, 3 3/4-in. faceplate and tool rest

DeWalt Div., American Mach. & Foundry Co., Lancaster, Pa.



5. ADJUSTABLE WRENCH has special knurled adjusting nut controlled by a click stop which holds jaws in position once they are adjusted to fit a nut or cap screw. No slipping and no continued adjustment of the jaws when you're working in a tight place. Comes in 5 sizes ranging from 4 to 12 in. Head is extra-thin, permitting work in places most wrenches will not reach. Wrench is polished and chrome-plated

P & C Tool Co., P.O. Box 5926, Portland 22, Ore.



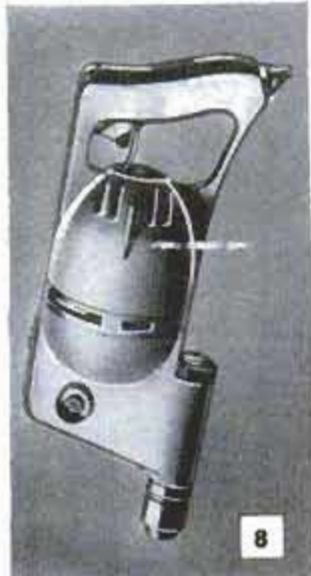
6. PORTABLE PAINT SPRAYER is specially designed for applying the new multicolor finishes on plaster, masonry, wood trim, metal and brick, on exterior as well as interior work. Piston-type compressor with direct-connected motor converts easily and quickly from low pressure for multicolor work to high pressure for spraying conventional paints. Compressor runs at motor speed, provides ample pressure steadily

Campbell-Hausfeld Co., 5082 Railroad Ave., Harrison, Ohio



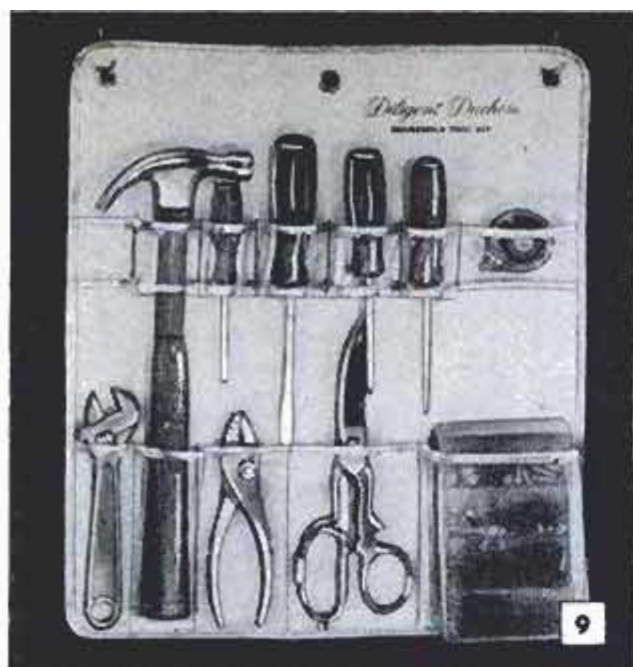
7. DRILL-BIT HOLDER comes in two sizes, No. 29 which holds a complete set of 29 drill bits from 1/16 to 1/2 in. by 64ths and No. 60 which holds a 60-piece set of number drills in sizes from 1 to 60 inclusive. Drill sizes are stamped on body of holder. A witness mark on the rotating top enables you to turn top and release drill bit of size required. Tap-drill, body-drill sizes also are stamped on holder

Keystone Ferrule and Nut Co., Box 11, Burlington, Wis.

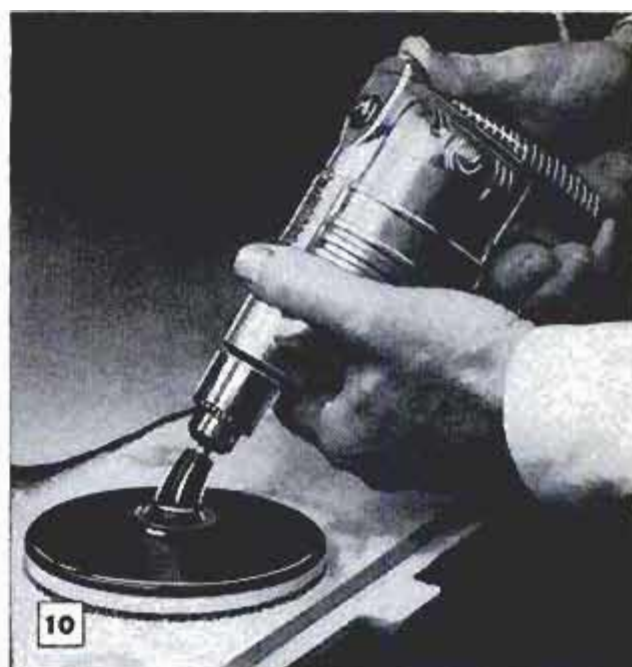


8. PORTABLE ELECTRIC HAMMER operates on an entirely new principle, is light and easily handled, weighs only 8 1/2 lb. Takes 40 different types of chisels and other tools for drilling in concrete, cutting sheet metal, driving speed nuts, removing scale from metal tanks without undue vibration or recoil. It's portable-electric-drill size which makes it easy to control and maneuver in the hard-to-get-at places

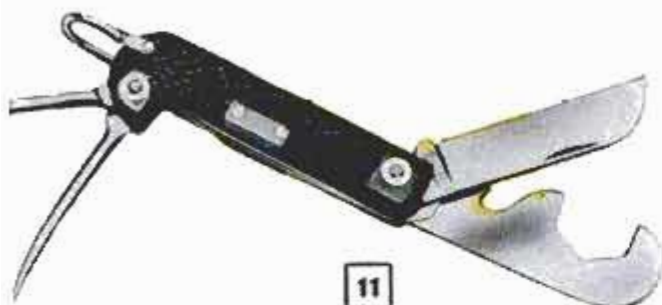
Modern Mfg. Co., Inc., 680 Davisville Rd., Willow Grove, Pa.



9



10



11

9. TAILORED FOR THE LADIES, this household toolkit is an ideal gift for the homemaker who makes some of her own minor repairs. Tools are best quality, and are chrome or gold plated. Tough plastic handles are impregnated with glitter to add a feminine touch

Pendleton Tool Industries,
2200 Santa Fe Ave., Los Angeles 54, Calif.

10. DISK SANDER designed for use with portable drills is made with a flexible shank which permits it to operate at an angle as great as 30 deg. with surface of work. Sands smooth without leaving deep circular scratches on surface or hard or soft woods

The Flexan Corp., 3949 N. Normandy Ave., Chicago 34

11. TOOLKIT IN A POCKET KNIFE features a screwdriver (blade type), a Phillips driver, a wrench, bottle decapper, etc., in addition to regular pocketknife blade. Small and lightweight, it carries easily in the pocket, or from chain or cord to prevent loss

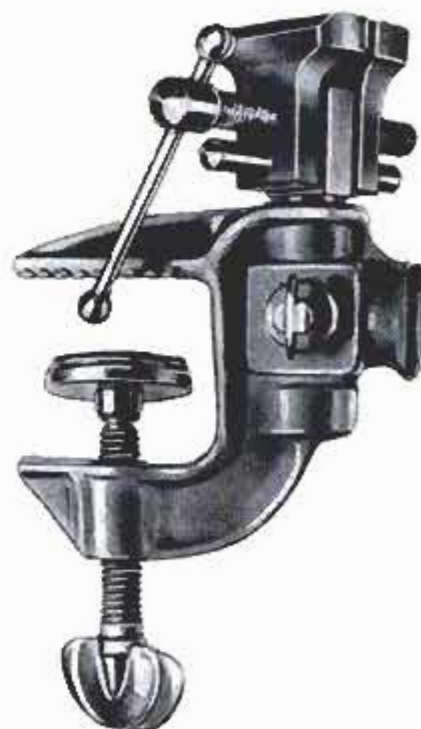
Tor Heyerdahl Co., 825 Lander St., Boise, Idaho

12. COMBINATION HAND VISE AND BENCH VISE is so designed that it can be detached from bench clamp and used as a hand vise for holding small parts securely for freehand operations. Vise jaws are 1½ in. wide, open about 3 in., swivel to any desired position

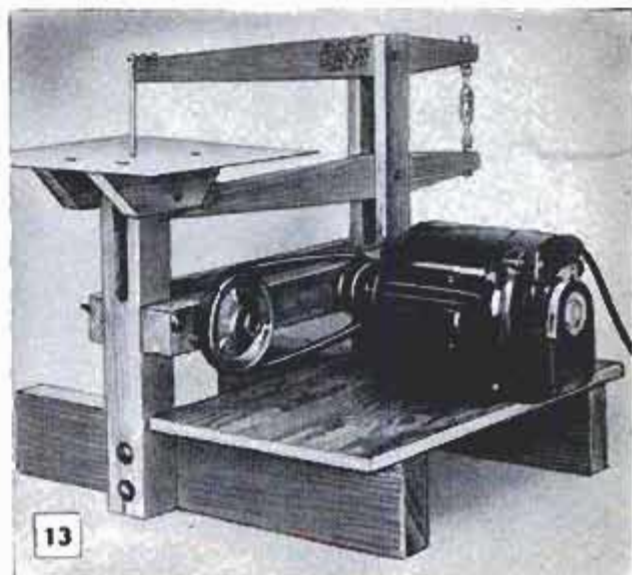
Lushington Tool & Gauge Co., Ltd., Hailsham, Sussex, England

13. JIGSAW KIT can be assembled by purchaser and driven by any ¼-hp. motor. Has a capacity of 15½ in. from blade to frame. Arms and frame are of hardwood. Metal parts are balanced for smooth operation. Length of stroke is 15/16 in., Bearings are bronze

Henlon Corp., Vestal, N. Y.



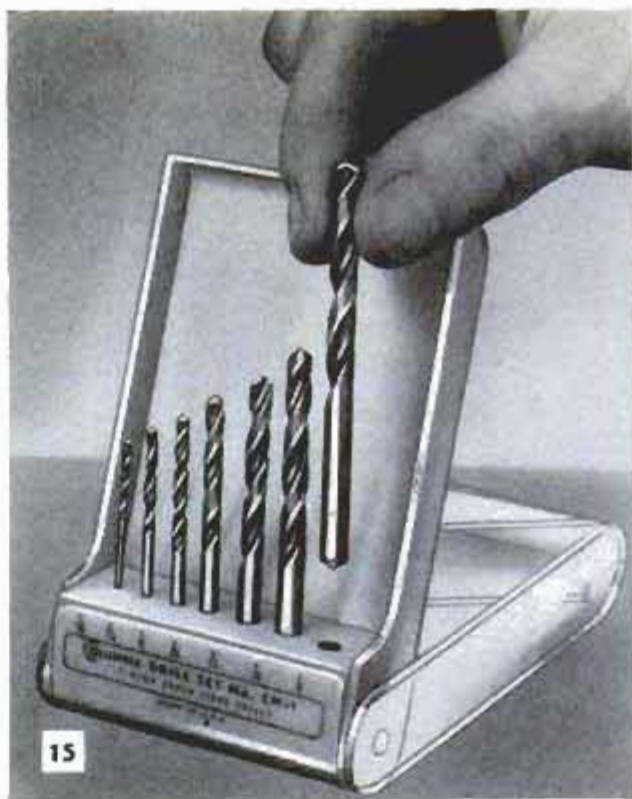
12



13



14



15

14. RULER SQUARE is fitted with a prism for drawing perpendicular lines optically. When placed over a penciled or inked line the prism shows it broken until the edge of the ruler is brought to the 90-degree position, that is, perpendicular to the line already inked. Then the inked (or penciled) line appears straight when viewed through prism. Graduated on one edge in inches, on the other in millimeters

Kiva Products, Inc., 550 Hill Ave., Glen Ellyn, Ill.

15. DRILL KIT comes in a neat, folding plastic case, or holder, that closes tightly to prevent loss of individual drill bits and damage by rust. The cover of the case pivots in such a way that when opened the case can be set up as a handy bench stand while drills are in use. Five sets of drills are offered in these unusual holders, the sets coming in assortments of seven, ten or thirteen high-speed bits

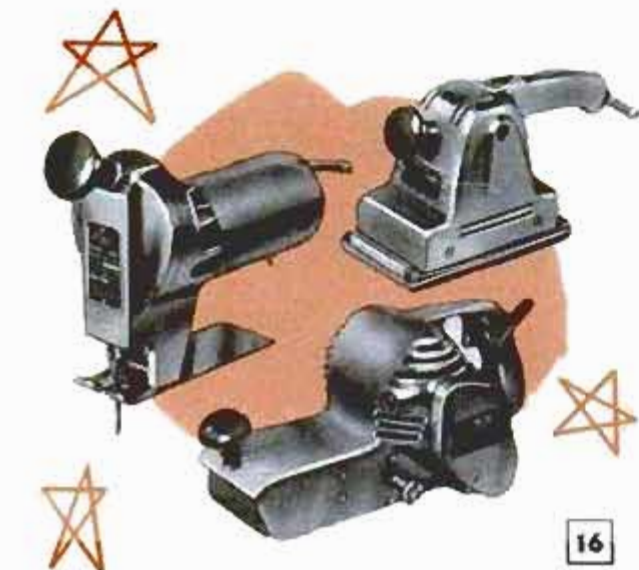
Columbia Drill Co., 123 W. Ontario St., Chicago 10

16. NEW FEATURES distinguish these three portable power tools designed for carpenters, trimmers, woodworking shops and home craftsmen. Units have been designed with special attention to balance, an important detail in power tools that are operated free-hand. Oscillating sander is direct drive, operates at 8500 r.p.m., saber saw at 4000 strokes per minute. Novel belt-changing device is feature of belt sander

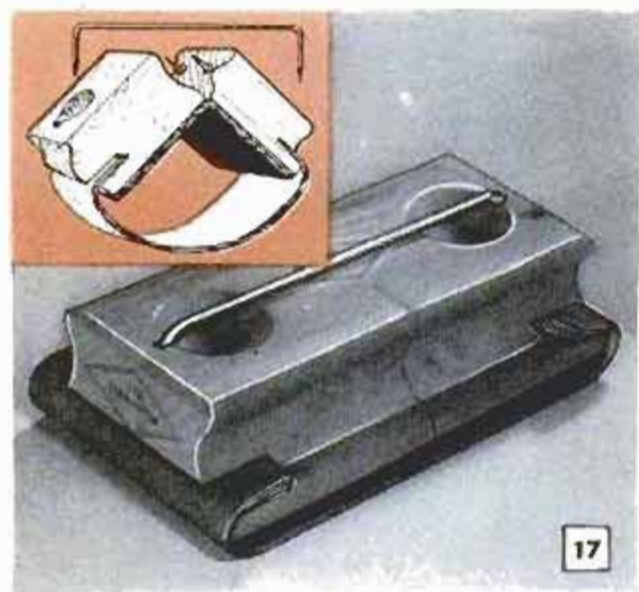
Peninsula Tool Co., Menominee, Mich.

17. SANDING BLOCK holds up to 20 sheets of abrasive, uses standard 9 x 11-in. sheets, each cut into 3 pieces of equal size. Split hardwood block folds as in inset. To load block, ends of stacked abrasive sheets are inserted in slots cut in ends of block. When straightened, halves of block are held in position by U-shaped pin, or key, sharpened ends of which pierce abrasive and hold it under tension

Peter Rain Co., 404 Elm Park Ave., Elmhurst, Ill.



16



17

HAPPY THE HOME

full of wonderful gifts like these!



The nicest gifts keep on giving

Look for
**POPULAR MECHANICS
CHRISTMAS DISPLAYS**
at dealers everywhere

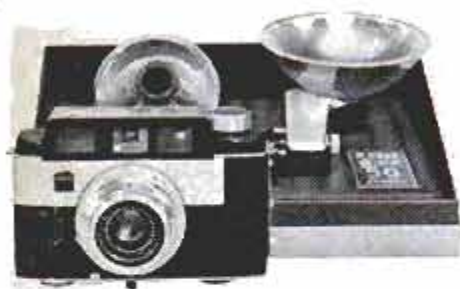
Select several
for your home
and family
from the
many exciting
pages in
this issue



Open this new Kodak Signet 80 Camera *first*, and start taking 35mm color slides. Has exposure meter, rangefinder, $f/2.8$ lens. Accepts wide-angle (\$57.50), telephoto (\$69.50) lenses, multiframe finder (\$17.50). Signet 80 Camera with $f/2.8$ lens, \$129.50.

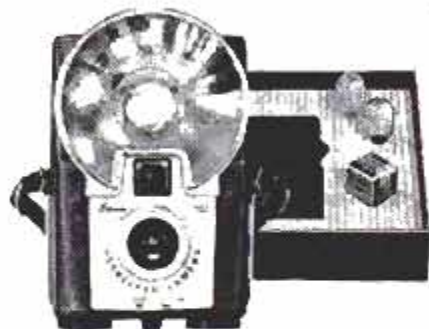
Kodak gifts say

Open me first!



Kodak Signet 50 Camera has built-in light meter, EV-linked lens-shutter, $f/2.8$ lens; with flashholder, two reflectors, \$82.50.

Brownie Starflash Outfit — for snapshots and *color slides*, too! Built-in flashholder, bulbs, batteries and film. Only \$9.95.



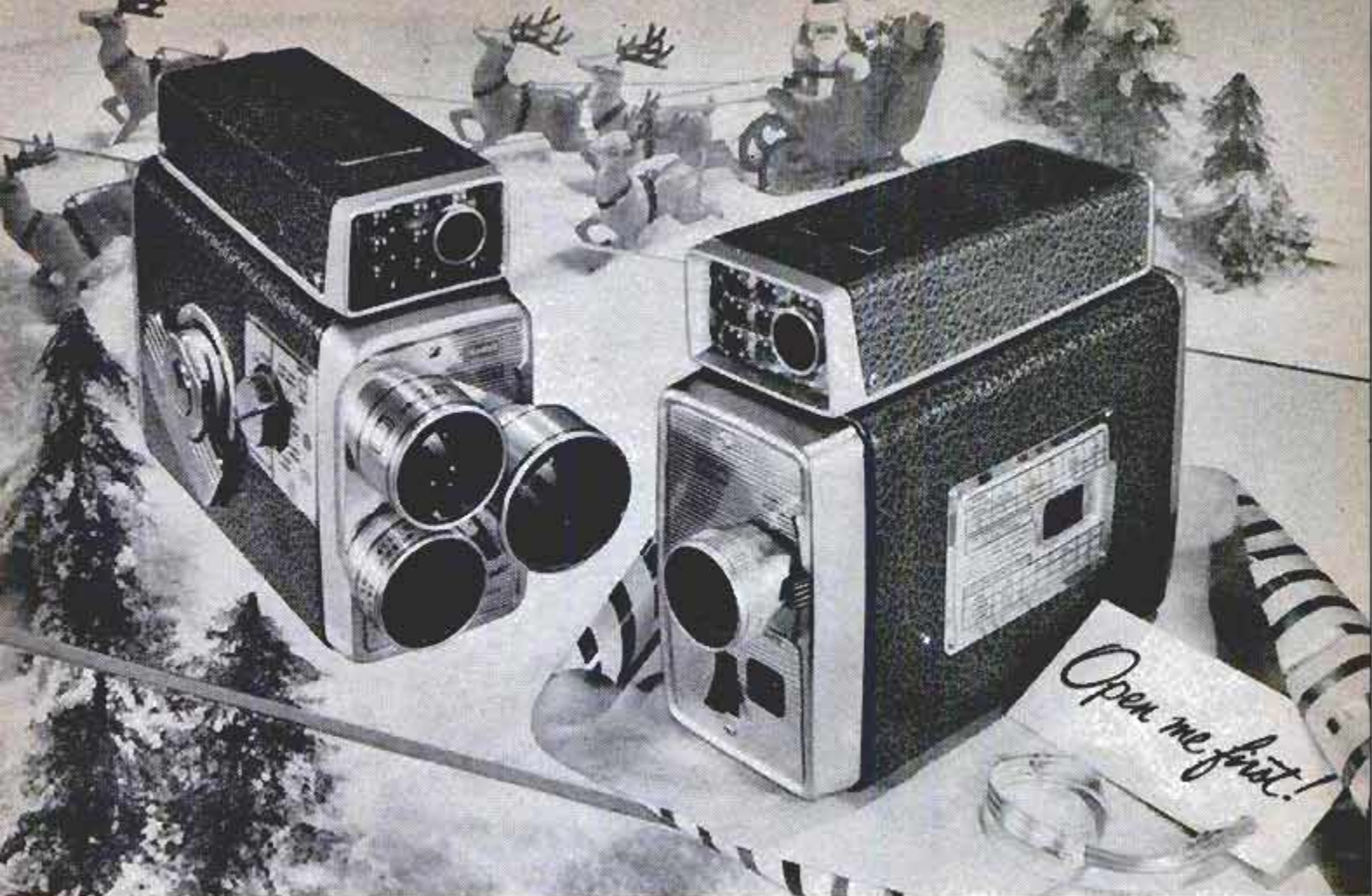
Kodak Duaflex IV Flash Outfit — everything for snapshots, indoors and out! Camera, flashholder, bulbs, batteries, film, \$24.95.



Kodak Cavalcade Projector is completely automatic! Changes slides by itself. Steel jackets protect slides. 500 watt, $f/2.8$ lens. \$149.50.

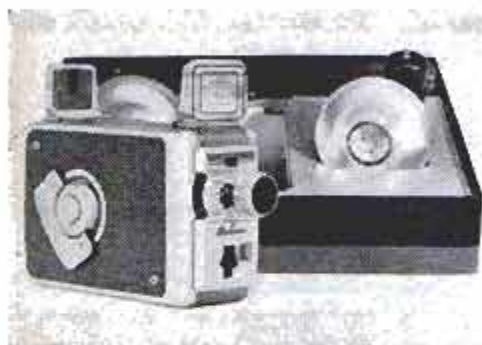


Many photo dealers offer terms as low as 10% down. Prices are list, include Federal Tax, are subject to change without notice. See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet"



Open the new Scopesight Brownie Movie Camera *first*, and capture all the action and color. Built-in exposure meter always shows you when exposure is correct. Single-lens model, \$79.50. Turret model, \$99.50.

...and save Christmas fun in pictures!

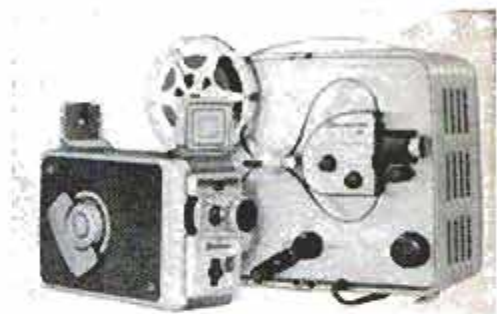


Brownie Movie Camera Kit, $f/2.3$ —8mm color movies, indoors and out, with one setting! Complete with light bar, cord, lamps, \$39.95.



Brownie 300 Movie Outfit—8mm camera with $f/2.3$ lens, and projector for showings up to 3 feet wide, reverse, "stills," too. \$97.45.

Brownie Movie Camera, Turret $f/2.3$ (8mm)—Lowest priced ever! Takes regular, wide-angle, telephoto shots. *Easy to use.* \$59.50.



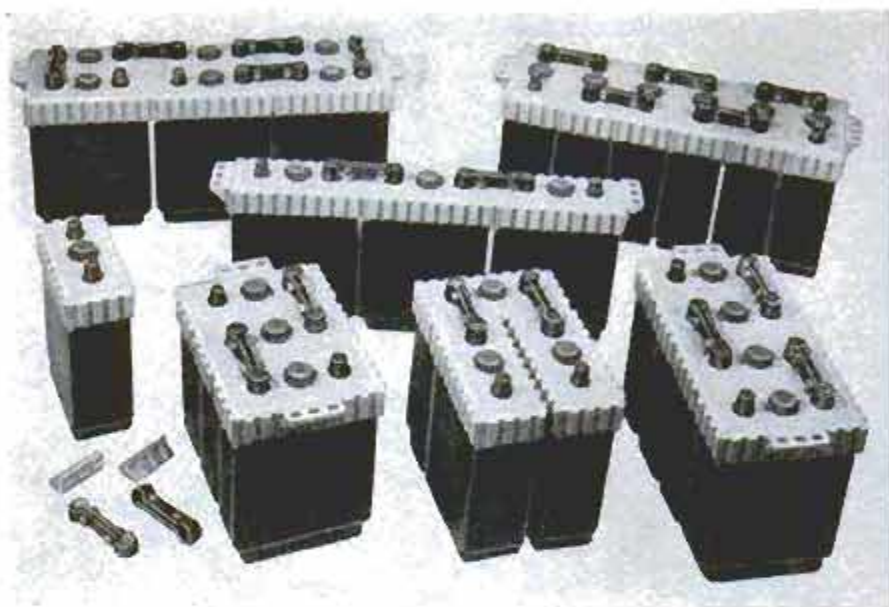
Kodak Showtime 8 Movie Projector—shows movies up to 5 feet wide! Built-in dry splicer. 750w lamp, "stills," reverse. \$174.50. 500w model, \$123.50.



EASTMAN KODAK COMPANY, Rochester 4, N.Y.

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Now you can carry a spare cell for your auto battery as you carry a spare tire. The individual cell units are available in two sizes that can be combined into 6 and 12-volt batteries to replace 19 different battery sizes now used in cars and trucks. The cells fit together with dovetail grooves on all sides, then are locked with metal bars clamped to connecting posts. It is said they eliminate replacement of entire batteries because of one cell failure.

Frozen Blood

Whole blood now can be frozen, held indefinitely, then used in transfusions. The technique may put an end to the chronic blood-supply shortage. The blood is processed in a fractionator, and a preservative—glycerol—is added. Then the blood is frozen. When it is to be reused, it is thawed and glycerol removed in wash solutions.

Flies Kill Grasshoppers

Parasitic flies that destroy grasshoppers may eventually control the agricultural pest. The female of one type of fly deposits a larva in the leg muscle of the grasshopper. The larva eats its way through the grasshopper. Entomologists report that in a limited area of California, this fly has virtually wiped out grasshoppers.

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AND SOMETHING ELSE
THIS GUY HAS GOT —

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PACKS RIGHT! SMOKES SWEET!
CAN'T BITE!

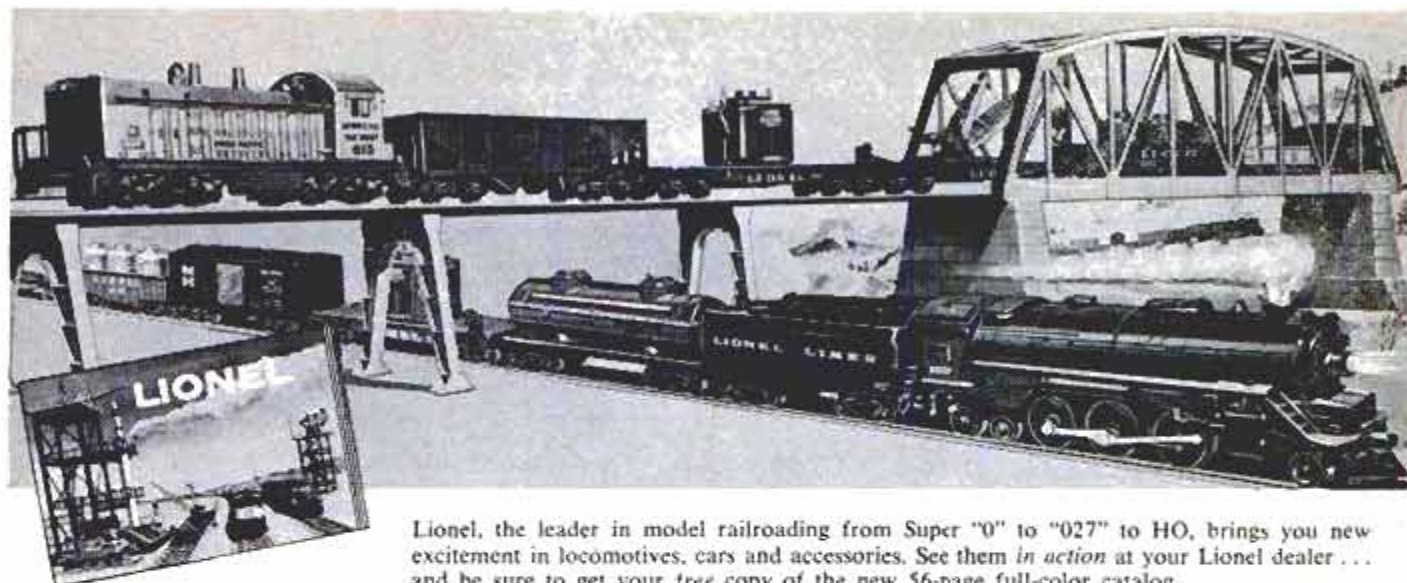
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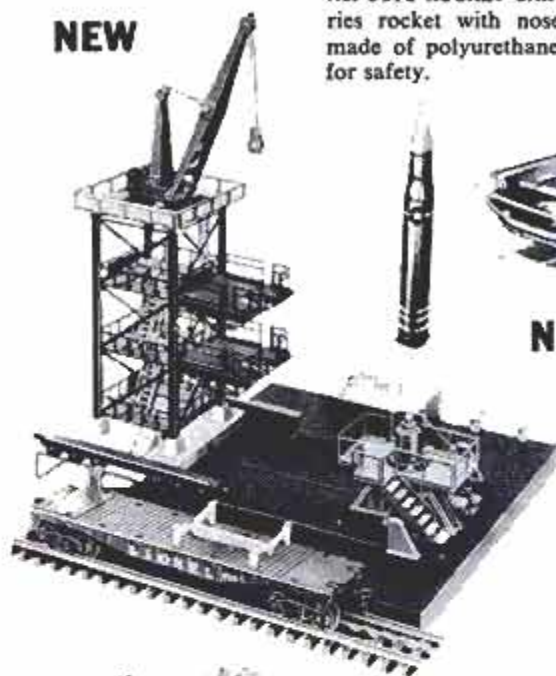
No. 2329 VIRGINIAN RECTIFIER-TYPE ELECTRIC—Here's the proudest addition to Lionel motive power! Built from actual GE blueprints of new electric locos. Lionel's model has a pantograph which can be made to operate from overhead wires, headlights on both ends, horn and Magne-Traction. \$35.00



NEW

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NEW



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NEW



NEW

No. 52 FIRE FIGHTING CAR—An exciting Lionel motorized unit! As car speeds to "fire," red light flashes on and off. When car strikes bumper or other object, it reverses direction and helmeted fireman swivels with high-pressure nozzle. \$12.95



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Noncoloring Finish

Q—How can I finish light-colored wood in its natural color without changing the appearance and detail of the grain and without darkening the wood? Clear shellac and varnish finishes darken the wood for some reason. Is there a finishing material available that won't change the color?—H.S., Md.



A—One reason ordinary clear finishes appear to darken the wood is simply because they change the light-reflecting properties of the surface. Several applications of paste wax alone on close-grained woods such as maple and birch probably will change the original color least of any. Some new finishing materials are available which are of the oilfree type and are applied in two stages from two containers, the first application forming a base for the second finishing coat. Also, special lacquers are available, known as "padding" lacquers, which are applied with a cloth pad in a manner similar to the older method of French polishing. The oilfree finishes and the padding lacquers do not darken light wood appreciably and do not yellow with age. Of course, it should be remembered that the wood itself, and particularly certain pieces of the same kind of wood, will tend to darken somewhat with age. Also, the noncoloring properties of the finish are affected to some extent by the condition of the surface over which they are applied. New wood must be sanded to a satin-smooth surface and all scratches must be removed, as the scratches made by coarse sanding absorb the finish and tend to give the effect of discoloration of the surface.

Insulating Duct

Q—I have a warm-air heating system and as I have added a small room to my five-room home, I will need to install a heating duct nearly 20 ft. long. My contractor says that insulation is not necessary but it seems to me that a wrapping of asbestos would lower heat loss. Am I right?

—W. N., Okla.



A—We assume you are referring to a forced-warm-air heating system installed in a basement. Your contractor is right in the sense that any thin, noncellular material is of little value in insulating against heat loss from warm-air ducts

(Continued to page 212)

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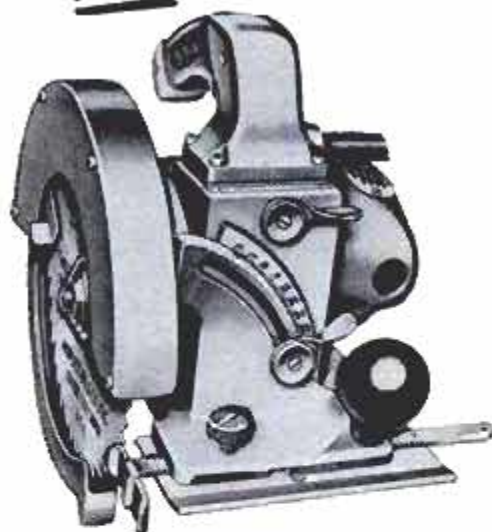


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(Continued from page 210)

in a basement. However, if the duct extends a part of the distance in the basement and then passes into a crawl space, insulation of this portion of the duct might be worthwhile if the distance it extends beyond the basement is 5 ft. or more. If less, insulation of the duct extension would hardly seem worth the labor and time involved. Warm air is forced through the ducts at comparatively high velocity and this tends to reduce loss to the minimum.



Chimney-Flue Stain

Q—I have an older home of brick with chimneys built into the end walls. In one end the flue comes down to the first floor, the other to the second floor. Recently I painted the brick walls white and now a dark stain shows along the line of both flues on the outside. How can this be corrected? —H. K., Pa.

A—Unfortunately, a solution to this problem is not always simple, especially where the structure is old and the bricks which form the flue have become permeated with stain-producing elements which are activated in the presence of moisture. You did not say whether the chimneys are in use and, of course, this makes it rather difficult for us to outline a procedure which might have a fair chance of success. In general, if the chimneys are no longer in use, then the flues should be thoroughly cleaned to remove all loose mortar and soot and capped to keep out rain and snow. In this procedure it is advisable not to cap the top end of the flue tightly, but rather use a tile chimney pot of the type that will shed water. Then clean the outside surface of the wall, covering all the stained area, with a wire brush, point up the mortar joints and finish with a coat of white asphaltum or white creosote. The reason for this suggestion is that it costs much less to carry out than the alternative which is removing the bricks which form the outside wall of the flue and bricking up solid to the ridge.

Cleaning Old Marble

Q—I have an old marble-topped chest of drawers and there are two quite dark-colored stains on the top near the center. These appear to be old and I do not know what caused them. There is a light diagonal scratch near one corner. Also, the entire top is a yellowish color. Is it possible to restore this top to something near its original appearance?—B. G., Va.

A—Often the marble tops of old pieces were waxed for protection. Probably this accounts for the yellowish color you mention. A soft cloth dampened in pure turpentine will remove the wax. Then, as a first step, scrub the marble with a mild detergent, using a fiber brush. This treatment should remove embedded dirt and possibly some of the discoloration. Wash off with clear water to remove all traces of the detergent. Usually stains on marble form some pattern on the surface and often this gives one a clue as to what caused the stain originally. However, you say you do not know what caused the stains, so perhaps it is best to treat these as simple stains and apply what marble refinishers call a "poultice." To make a poultice use about three thicknesses of blotting paper (white blotting paper), stack these and then pour about a tablespoonful or so of hydrogen peroxide (hair-bleach strength) at the center. Add a few drops of household ammonia. Place the blotters with the wetted area directly over the stain and lay a piece of glass over them. Leave in place 12 to 24 hr. Then remove and again wash with clear water. Examination will show whether it is necessary to repeat the process. If the stain is old and deeply embedded it is quite likely that more than one application will be necessary to remove it entirely. You can polish out the light scratch on the top with 8-0 abrasive paper. Use water on the surface to prevent the abrasive from clogging.

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The Greatest Magic Illusions Of All Time

(Continued from page 101)

One of the greatest illusions involving a disappearance was invented by Buatier DeKolta. The bushy-bearded Frenchman spread a newspaper on the stage to prove no trap doors were used. Upon the paper he placed a chair, and invited his wife to sit down. Then he covered her with an opaque cloth. A moment later, when he whisked away the cloth, his wife was gone. Later he added another touch. Not only did the wife vanish, but so did the cloth!

Devant Dreams an Illusion

How do magicians devise their illusions? David Devant dreamed his most popular one. The next morning his wife told him she had awakened during the night and saw him get up, light a candle and stare at it intently for several minutes. Finally he blew out the flame and crawled back in bed.

Devant didn't remember this, but he did remember a fascinating dream. He had been dashing across the stage in pursuit of a girl dressed as a moth. He carried a candle in a holder, and flickering flame drew the moth closer and closer. Suddenly the flame flashed out toward the figure, and the moth disintegrated.

The idea haunted him. He drew up plans for the apparatus to duplicate his dream, and a friend built it. The equipment was set up in a photographic studio. The only time Devant could rehearse was after his regular show. It was nearly midnight when he arrived for his first rehearsal. He rapidly went through the preliminary actions until a policeman interrupted the illusion with a knock on the door. The bobby had heard strange shouts and, peering through a window, had seen stranger actions.

The British magician allayed the man's suspicions that he might be practicing witchcraft, sat him down and made him the first spectator ever to that most baffling illusion, "The Mascot Moth."

DeKolta's Last Illusion

But for my money, one of the greatest illusions of all time was the last great illusion of the fabulous DeKolta. The "story" was simplicity in itself, which made it even more spectacular. When DeKolta walked onstage he carried a small satchel. In the satchel, he said, was his wife. He opened the satchel. Out came a die—a cube measuring only eight inches on all sides. He put the die on a thin platform, which was raised

(Continued to page 216)



Something **NEW**
for your Christmas List!

5 POWER TOOLS IN ONE DREMEL MOTO-SHOP

- 1 JIG SAW 
- 2 DISC SANDER 
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- 4 BENCH GRINDER 
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safe — even for children. Handles everything from bird-houses to full-size furniture.

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Moto-Shop is the perfect "ALL FAMILY" workshop — safe for even mom and the children. Helps build a close father-son relationship.

See Your Power Tool Dealer for a Demonstration Today!

Model 57 Moto-Shop. Includes Jig Saw with disc sander attachment only. Other attachments can be added later . . . **\$33.95**

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Division of Federal-Mogul-Bower Bearings, Inc.



from the stage so the audience could see under it. Standing at a distance, DeKolta gestured toward the cube. Immediately it expanded to 20 times its original size.

Loud applause!

DeKolta bowed slightly, then with the aid of an assistant lifted the giant die. Seated under it was his wife!

Ovation!

Most historians of magic say that DeKolta's fabulous device was destroyed after his death in 1903. Actually it now has an honored place in my apartment. DeKolta's widow took it back to her native England. The wife of Will Goldston, a noted magic dealer, purchased it and presented the illusion for a few months. When she retired, Houdini bought it. Houdini performed it at least once (I have the show-bill). He left it to his brother, Hardeen. Hardeen sold it to Edgar Pelkin, a magician in the Midwest. A few years ago I bought it from Pelkin.

The leather case Houdini made for the DeKolta equipment still holds it. Someday soon I plan to add the illusion to my show so today's audiences can see again the unbelievable mystery which astounded their grandparents.

In my opinion, several other illusions should be numbered among the greatest of all time. I'll describe them next month—and tell you why the “Indian Rope Trick” isn't Indian, isn't done with a rope, and isn't a trick!

(Continued next month)

Study of the magnetization of certain rocks shows that the North Pole used to be in a position on the earth's crust now occupied by Abyssinia.

Do You Know This Old-Timer?

(answer to quiz, page 12)



1923 Essex Coach



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CAULKING COMPOUND

Stop drafts, heat loss, water damage with DAP Caulking Compounds. Seal around windows and door frames—fill joints and cracks—for a snug, comfortable home. Get cartridges, cans or collapsible tubes at hardware, paint or building supply dealers. Ask about other famous DAP products, too.



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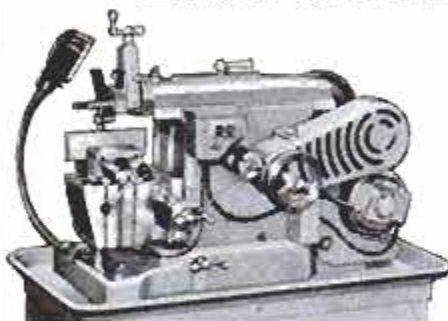
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Up to 24 months to pay.

Strange Ships for Strange Cargo

(Continued from page 142)

built from the keel up for Arctic operations. Put in service to supply far-north military outposts, this 300-foot bruiser can keep the seas under the most rigorous polar-weather conditions. Her hull is girded by a waterline armor belt of high-tensile steel, and she has the crushing bow contour and beefed-up rudder and props of an ice-breaker. Her rugged steam-de-iced cargo gear works in high winds at 65 below zero. Her lightweight aluminum lifeboats have attached runners for ice travel. She has an elevated heliport on the poop deck aft, fitting her for the increasing use of helicopters in Arctic operations. Down below she carries sleds, track-type snow vehicles, Yukon stoves and Arctic survival gear.

Pan Atlantic Steamship Company's *Ideal-X* was born a tanker, but you wouldn't know her now. Bethlehem installed a full-length upper deck on which she piggybacks 58 loaded trailer bodies, each carrying a 40,000-pound load. The company has installed special unloading equipment at New York and Houston that makes this hybrid ship highly profitable.

Mightiest of the tankers-plus, and a new idea threatening to outdate present bulk-carrier fleets, is the big SS *Sinclair Petroleum*. This 790-foot giant is an oil tanker going and an ore carrier coming, her novel design licking the empty return trip that steals bulk-carrier profits. Largest tanker afloat from her christening in November 1955 until the mammoth *Universe Leader* took that honor a year later, she remains the world's largest oil-ore carrier. She makes an oil run from the Persian Gulf to Marcus Hook, Pa., then to Venezuela to load ore for Japan, then full circle to the gulf—a 91 percent payload run compared with the usual 50 percent.

The immense Niarchos tanker building at Bethlehem Quincy Shipyard will be the world's largest. This 940-foot colossus with a 106,500-ton dead-weight will heft an unbelievable 825,000 barrels of oil and can steam nonstop around the world. She'll scrape bottom in a 50-foot channel, rendering obsolete harbors around the world and necessitating offshore lighterage at many ports—but the load of oil she totes makes it all worthwhile.

You wouldn't recognize the lowly wartime Liberty ship these days. The Maritime Commission's experimental *Thomas Nelson* had a face lifting that replaced her cargo booms with mechanical cranes that purr across the deck on geared tracks. This is the general-cargo ship's first new look in

(Continued to page 220)



Build this attractive hutch easily and economically with Western Pine Region woods

Here's a piece of furniture that will be a welcome addition to your home. You can turn it out at a reasonable cost with Western Pine Region woods. And if you want to give it an authentic antique finish...brush on a solution of potassium permanganate, singe with a blowtorch, and apply a coat of clear varnish.

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For your next remodeling or furniture job, contemporary or traditional, choose Western Pine Region woods. You'll find them in knotty or clear patterns. Talk it over with your lumber dealer. He'll be glad to give you an estimate.



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 More power, beautiful styling. New Features. Still World's Lowest Priced Car. Drive it for 75c a week. Rider agents wanted. Earn your own car.

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 King Midget Junior chassis, finely engineered, ready to run. Agents wanted. Send 25c for 32 page picture book, full details, dealers price on both cars. Or send \$1 (refunded first order) for this and Service Manual, plus Repair Manual and 15 5x7 photos of car and factory.
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No More Pushing Blade Back Into Case!

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half a century. (Incidentally, streamlining her seacow shape with a 20-foot extension and repowering with black-oil diesels raised her from a lumbering 10 knots to 17½, and gives our vast reserve Liberty fleet a new strategic value.) Another Liberty, dubbed simply *Yag 40*, has a huge "bird bath" perched 60 feet high atop a slender king post in which she collects the most elusive cargo ever manifested—radioactive dust from atomic explosions. She steams ghostlike through the test area by radio control, with no one on board. For lower-level tests she can be controlled from a watertight cubicle in the center of a flooded cargo hold (for shielding), where in the skipper can see television pictures transmitted from the engineering gauge board and from a trainable camera on the mast. The USCGC *Courier*, a Liberty turned seagoing broadcasting station and equipped with the most powerful transmitters of their kind afloat, relays the Voice of America behind the iron curtain. And Liberty *John L. Sullivan* is propelled by four Pratt and Whitney T34 airplane engines mounted on deck. This is to test the practicability of an air-propeller-driven cargo ship without vulnerable underwater propeller and rudder for use in mined or debris-laden waters.

The seas abound with other miscella-

neous freaks. There is the whale-ship, floating factory of the polar seas; her wartime sister, the Landing Ship Dock, whose capacious open stern admits, not helpless whales for the flensing, but scrappy landing craft for refit or ocean transit to an enemy beach; and the new 500-foot USNS *Comet*, a deepwater roll-on-and-off ship that carries all the rolling stock for a combatant military division. The latter is unloaded over side ramps or through her huge stern port onto offshore lighters. There is the ever-growing *Cliffs Victory* that started out 454 feet long, was lengthened to 620 feet and has just grown again to 716 feet. There is Western Pacific's *Las Plumas*, whose 225-foot stern and 150-foot bow were built separately and floated downriver to the sea for mating; her bow has a unique 60-inch steering propeller that swivels like an outboard. The Army's *John U. D. Page* is a 340-foot beach discharge lighter with tanker hull; this amphibious research project has a vertical axis propeller and a 1000-ton retractor ram. The bulk salt carrier *Cecile Erickson* has a deck that is all hatch—one giant opening nearly 200 feet long, alongside which run crawler cranes to spoon out the white cargo. And the much-publicized new roll-on-roll-off *Carib Queen* beckons the way to a possible revolution in cargo handling. ★ ★ ★

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Hi-Fi Trends

(Continued from page 145)

tapes, providing up to 1 hour of stereo music, at prices ranging from \$4.95 to \$9.95—a decrease of almost 50 percent from present costs.

The implication was unmistakable. The sizable reduction in stereo-tape prices would place them in direct competition with stereo discs and would pave the way towards mass acceptance of tape as a means for high-fidelity home entertainment. But that was only part of the story.

The tape magazine eliminated all of the inconveniences normally associated with tape-recorder operation. There were no reels to thread and no rewinding at the end of the tape run. The magazine simply plugged into its special machine, as quickly and easily as a record slips onto a turntable, and the mechanism did the rest.

As the tape within the magazine traveled in a forward direction, two of the four pre-recorded tape tracks were reproduced by stacked, quarter-track tape heads. At the end of the tape run, the mechanism automatically reversed its direction and changed the tape-head configuration. Thus, as the tape was being rewound, the second set of tape tracks was being reproduced.

This completely automatic operation could produce up to a full hour of stereo, or two hours of monaural (using all four tracks individually) playing time.

There was also a semiautomatic machine which operated in essentially the same manner. The principal difference was that with this machine the magazine had to be turned over at the end of the forward tape run in order to reproduce the information recorded in the opposite direction—just as a record must be turned over to play the other side. Both machines, however, could be used for recording stereo or monaural programs as well as for the reproduction of prerecorded tapes.

Several months prior to this demonstration, it was revealed, RCA had released specifications and technical data for the tape magazine to other interested manufacturers. The results of this became almost immediately apparent. In close succession, Motorola, Inc., and the Pentron Corp. exhibited their versions of the magazine-type recorders, see Figs. 1 and 2. The Pentron unit, in addition to being able to play 4-track stereo tape magazines, could also record and play back in the conventional 2-track, 7½ i.p.s. mode. Pentron also announced that all of its open-reel recorders produced later than mid-August would

(Continued to page 224)

News about the Carter Automotive Training Program



If you qualify, you can attend
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Trained auto mechanics are in short supply, and each year the shortage grows. That can mean steady work at good pay, because if you are a Carter School graduate you will have a thorough training in engine tune-up, fuel systems and auto electrics. Complete intensive training course includes carburetion, circuits, trouble diagnosis.

To qualify for a school in your area you should now be regularly employed in automotive service work, or in an establishment offering engine tune-up service.

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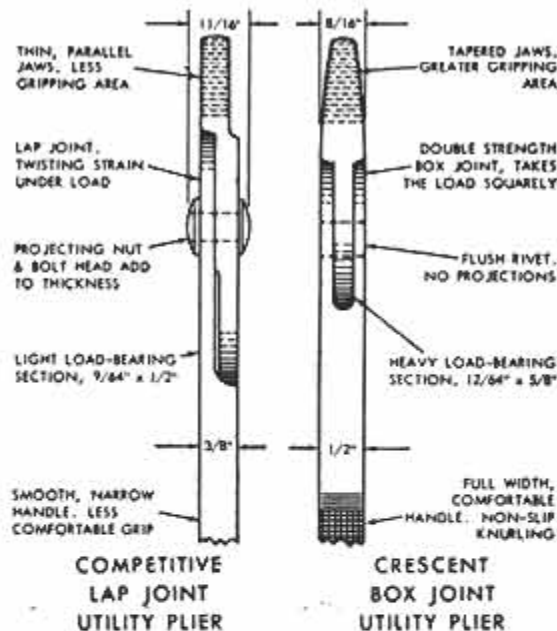
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reproduce 4-track prerecorded tapes as well as the regular 2-track recordings.

Clearly, the tape-recorder industry was preparing for the change. By mid-September, at the Chicago High Fidelity Show, more than a half-dozen manufacturers exhibited new equipment capable of 4-track tape reproduction. There were tape-transport mechanisms and complete recorders, but all of them were of the open-reel variety which, like the pace-setting Ampex, were compatible with present-day 2-track tapes.

Simplicity vs. Compatibility

The trend is apparent. It seems that we will have two new types of tape recorders—the open-reel, 4-track-play, 2-track-play/record units and the magazine-loaded, 4-track-play/record kind. Both have obvious advantages and disadvantages, but both are likely to be with us until the laboratory claim of equal fidelity for 4-track tapes has been substantiated or refuted by actual field experience.

But where are the new 4-track stereo tapes? At the time of this writing, the initial delivery date for the first of RCA's stereo magazines has been postponed. While RCA still hopes to deliver the magazines and magazine-loaded recorders in time for Christmas, other sources predict that they will not be available in quantity until some time next year. By then, there should be a sufficient number of compatible open-reel players in use to give 4-track tapes a real quality test. If they prove to be as good as their 7 $\frac{1}{2}$ i.p.s. predecessors, their rapid and enthusiastic acceptance is a foregone conclusion.

This means that present equipment will have to be converted to 4-track operation. Ampex, in anticipation, has already announced a conversion kit for its 2-track equipment. Other manufacturers are certain to follow suit. The converted recorders won't handle the tape magazines, but they will prevent obsolescence of present tape libraries.

How great an effect the new tapes and tape magazines will have on the over-all hi-fi picture is hard to predict. Certainly the competitively priced stereo tapes will secure the position of the tape recorder as a major component of high-fidelity systems. The operating simplicity of magazine-type equipment and the possibility of recording off-the-air and live programs will appeal to nontechnical hi-fi fans who have not previously considered the inclusion of tape recorders. All indications are that the stereo record, far from replacing stereo tape, will be hard-pressed to hold its own. ★ ★ ★

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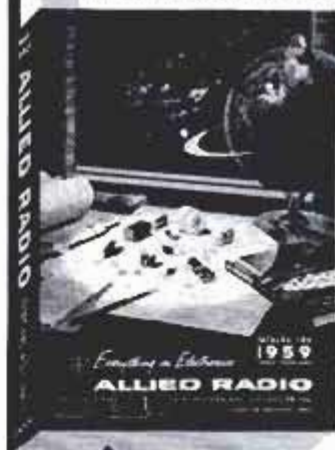
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Farmer Fights Frost

(Continued from page 123)

for use on ice boats and swamp buggies. A 120-horsepower industrial engine supplies the power. A giant fin "straightens out" the air, eliminating undesirable swirling. Maximum directional concentration of air is the result.

"Heat is a must," Vertrees says. "Mounted at the tunnel exit there are two butane burners, each with a five-million-B.T.U. capacity. This heat will raise the orchard temperature at least three degrees and protect about 900 trees."

The Hiller Helicopter Co. of Palo Alto, Calif., has designed a helicopter that offers frost protection. It is a ramjet-powered machine which cruises orchard tops and blows hot air from the ramjets on the tips of the rotor blade down into the trees.

Smudge-Pot Era Ending

They have also introduced an efficient groundbound ramjet blade that sits atop a 35-foot steel pylon. It turns 360 degrees every eight minutes and handles 15 acres.

The frost-protection system on the John Stinson farm, at Delhi, Calif., uses 27 fan-blown smudge pots, each mounted in a seven-foot-high tower. A two-cycle power-mower engine turns a fan blade mounted above a smudge pot and topped off by a deflector plate. The fan causes better combustion of fuel and less smoke. One unit can produce a four-degree rise in temperature, and two to four units are used to the acre.

The days of the old smudge pot and burning automobile tires to create heat in a cold orchard are nearing their end. The giant clouds of black smoke that darken the sky and hide the sun; the soot that settles on everything and even creeps into homes eventually will be in the past. It will take time, however, for many farmers still like the heat that comes from the smudge pot. The more progressive ones are using heaters that do not spew as much smoke and radiate heat more efficiently.

"While they do an efficient job, the heaters, like the smudge pot, are time consuming and tedious to service and keep operating," says Ben Gage, a Durham, Calif., farmer. "They must be burning within 30 minutes after the lowest safe temperature is reached. It takes 10 men to accomplish this on 50 acres."

One Man Does Job of Ten

The task has been reduced to a minimum by the lighting device developed by Gage. Riding on a tractor moving at about 20

(Continued to page 228)

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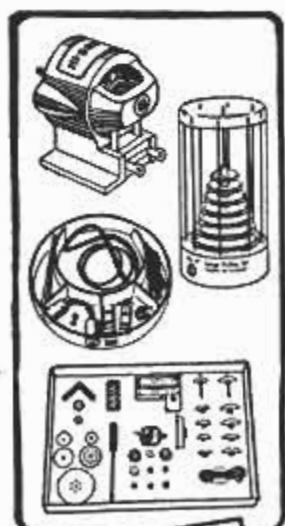
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one part of gasoline. Air pressure forces
it out a hose to a torch that has a tip similar
to that of an acetylene cutting torch. On
its outer end is a cup where burning igniter
fuel is maintained. Pressure on the torch
trigger sends a flaming jet of fuel into the
open door of the heater, lighting the oil in
its base.

The art of hail suppression is still new
with much to be learned about it, and
methods of control to be developed. Specialists
in this work contract with fruit
growers to seed clouds to prevent hail
damage in a given target area. One of the
most successful operators of such programs
is the Water Resources Development Cor-
poration of Denver, headed by Dr. Irving
Krick.

Attack Hail From Ground

"Storms that may produce hail are seed-
ed both from the ground and from air-
planes," explains meteorologist Richard
Clark of the Water Resources office in
Sacramento, Calif. "Hail forms in mois-
ture-laden, cooled clouds which have very
few particles on which moisture can con-
dense. When conditions are right these
particles collect moisture which freezes
and forms hailstones. The fewer the par-
ticles the larger the hailstones become."

To prevent the formation of large hail-
stones, the weather modifiers introduce
millions of tiny particles of silver iodide
into the atmosphere. Each attracts drop-
lets of moisture which fall as snow or soft
hail; or if the temperature near the earth
is above freezing, they turn to rain. Fruit
damage is eliminated.

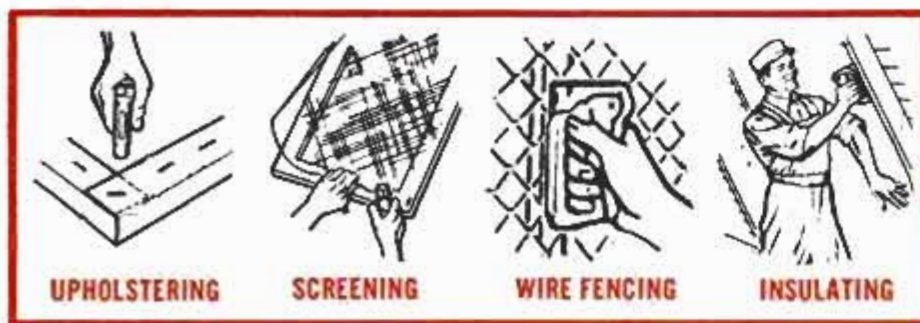
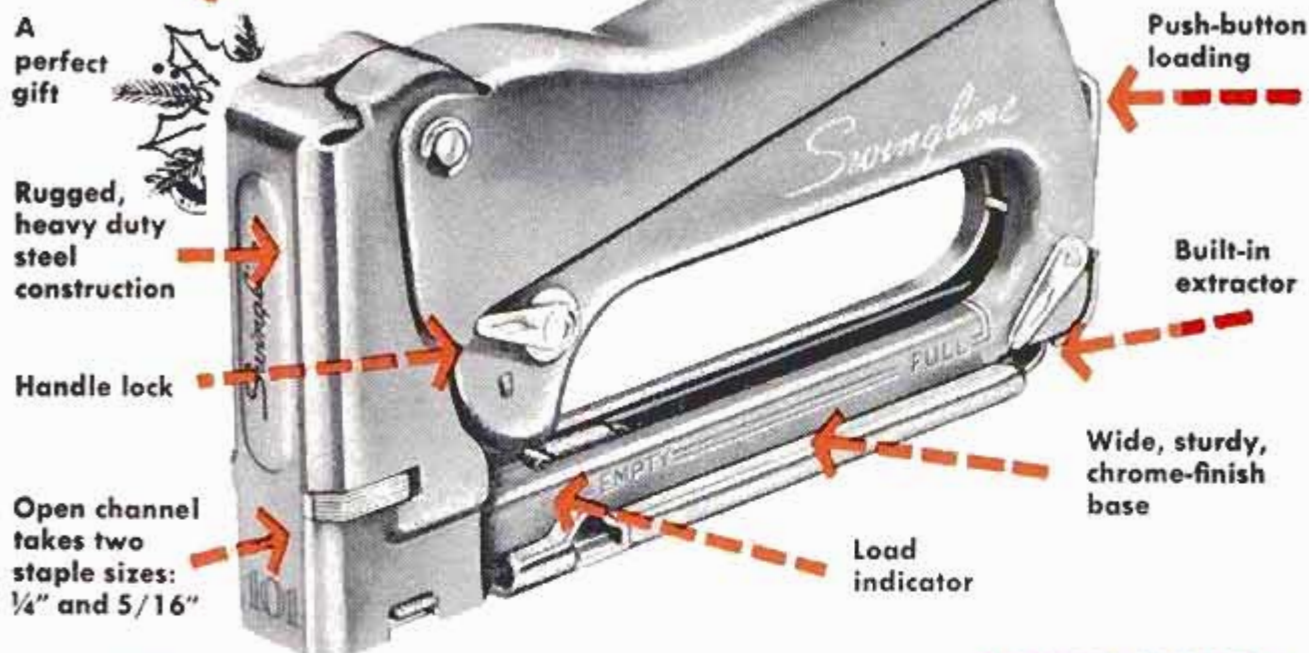
The ground-level attack is from gener-
ators which are capable of directing silver-
iodide particles into the atmosphere. Gen-
erators are located at strategic places in
and around the target areas, with outlying
ones being as much as 60 miles away so
clouds can be attacked systematically be-
fore they reach the protected area. In
California the fruit areas of adjacent Sacra-
mento, Placer and El Dorado counties re-
quire 97 generators to protect them.

Generators are operated by persons who
must always be present, with a telephone
available. They may be ranchers, store
keepers, service-station operators, or
housewives.

To set the generator working the opera-
tor pours special small-sized coke impreg-
nated with silver iodide into a hopper.

(Continued to page 230)

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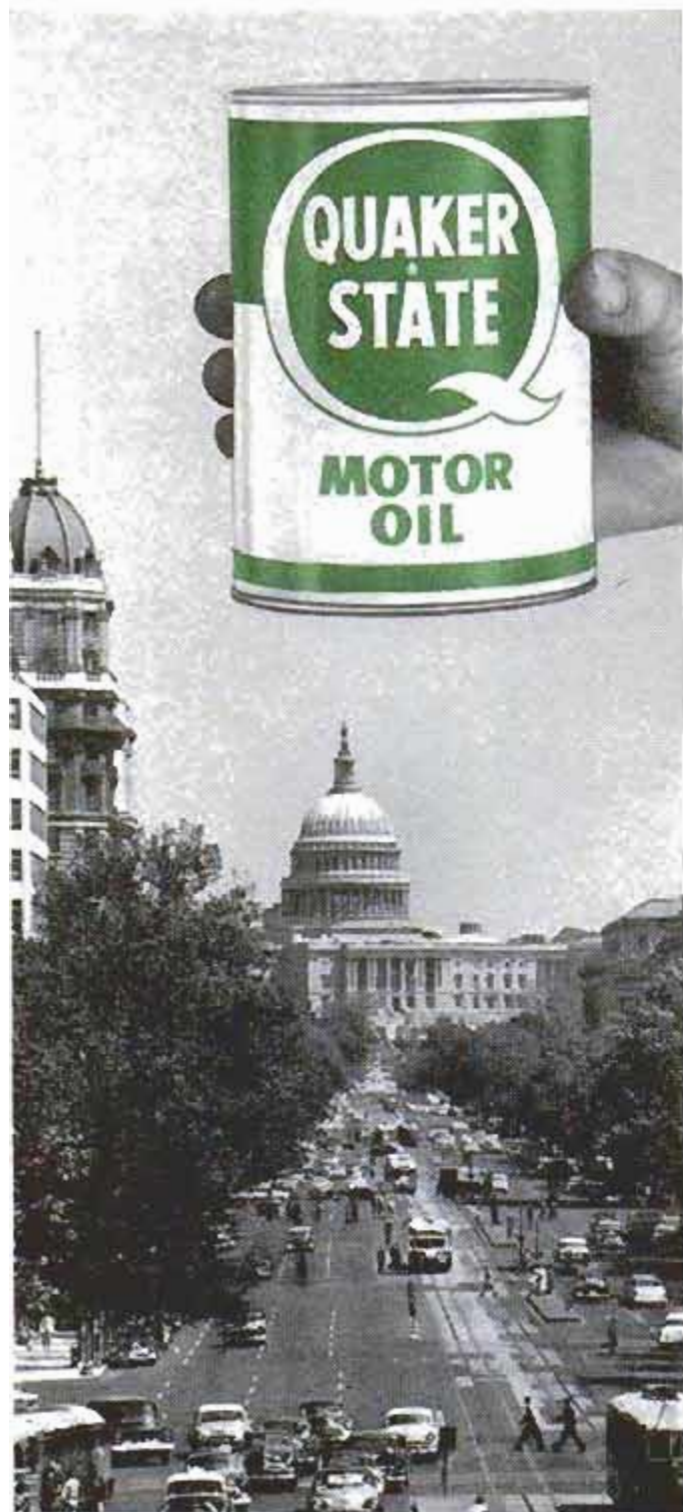
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Fuzee Replaces Many Generators

Airplanes go aloft to add silver iodide to clouds. Generators are used in planes but recent development of a 21-inch fuzee impregnated with the silver iodide and capable of releasing as many particles as 400 generators, is proving more efficient.

The fuzees are placed in groups of 10 in a battery of tubes mounted on each side of the plane. One, all, or any combination can be ignited electrically from the cockpit. Each will burn 20 minutes. They can be spread out over nearly seven hours of seeding time.

"To get hail control, it is not just a matter of looking at the clouds and deciding to turn on the generators," Clark explains. "The entire weather picture must have the attention of experienced meteorologists."

The weather is watched minutely through reports coming in constantly over teletypewriter machines, both from national and local weather stations. A storm is followed from the first day it appears on the weather charts and it is studied as it progresses. By the time it reaches the project area the meteorologist knows almost everything there is to know about it—the intensity, water content, air circulation, how much precipitation is resulting from its passage and, finally, where it will go next. If necessary, generators are put to work.

Hail Control Pays Off

Reports from all the areas protected in California, Oregon and Washington in the last three years reveal that crops valued at many millions of dollars have been saved from hail damage. The period has been one of extra-heavy storm activity in which hail has been a predominant feature outside the protected target areas, giving an indication of what could have happened inside the crop area.

The farmer is looking forward to the time when rain-making methods are perfected so he can say to cloud seeders, "I need 25 percent more rain this month," and they will go out and get him what he wants.

In the meantime they are keeping in mind the quip by Mark Twain that "everybody talks about the weather but nobody does anything about it." They are proving that today the quip would be incorrect.

★ ★ ★

1. Open the foldout page

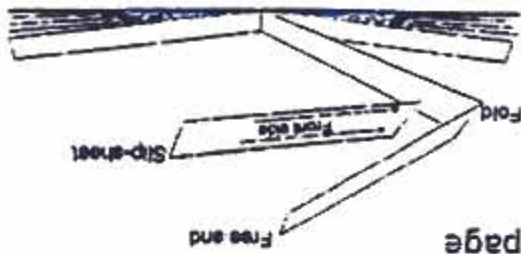
2. Insert this sheet with

1. Front side touching the free page

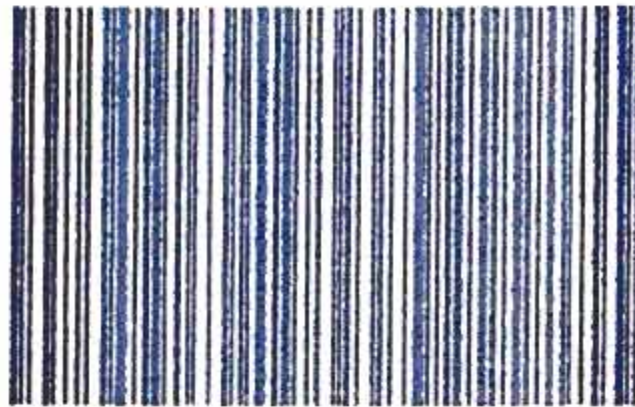
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3. Slice the folded edge

4. Close the page and slip-sheet



Inverted Foldout slip-sheet



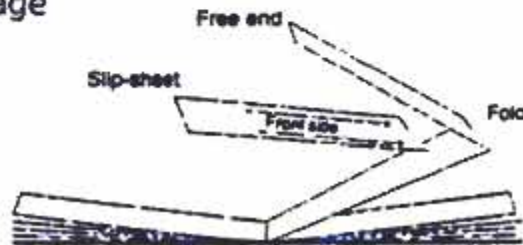
GbsSlipSheet-001



Folded edge of the page

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side



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ately built with a
stamina necessary
tained, demanding
attachments. Use
with any of Black

Black P

SEE R
MONEY

Have Dinner in the Middle Ages

(Continued from page 113)

your replies and answer back. Sometimes he gets into a verbal hassle with the entertainer. It's all done by a public-address system that synchronizes his mouth with syllables.

Throughout the restaurant, the perfection of detail, from the coats of arms set in the terrazzo floor to the gleaming weapons and authentic costumes worn by the employees, is the result of Gosnell's early love of fairy tales and ancient history.

Perhaps the real secret of Gosnell's success is hard work, meticulous attention to detail and a theory that the public likes to be romanced while dining.

He is 100 percent a do-it-yourself man. He built his restaurant entirely from a sketch he made himself. He personally laid more than 500 tons of stone. All art work and other interior decorations were executed from his original drawings. Many mechanical innovations of his have gone into Green Gables.

Gosnell built expensively, but with an eye toward keeping operation and maintenance costs low. His 50 employees, mostly men, have been on the payroll almost since he started. They include the musicians, all of whom he hired individually, according

to their special talents. Gosnell, who can take over on the fiddle or piano when the need arises, coaches his musicians in intricate tunes seldom heard by moderns. As a result they can strike up strange ballads heard in the 15th century, as well as currently popular numbers.

Ever since it opened, Green Gables has staged unique private parties, often for celebrities of screen, stage and TV, political figures and top industrialists.

As a fillip to many of these affairs, Robin Hood and his men "raid" the party, lifting money and valuables. Often there are photographers who record every phase of the clambake. Later, each guest is presented with an album containing photos, guest list, script of the play, the honored person's life history and other mementos.

Such parties are lavish, and when given *carte blanche* on cost, Gosnell spares no expense to make them headline affairs. His prop department is almost as well stocked as a movie studio's. No party-giver ever knows just what is going to happen.

Gosnell has proved that the average person has a love of the make-believe, that his childhood enjoyment of fairy tales and folklore can be recalled when he dines. "It's the inherent desire in all of us to be children again, if only for a moment," he believes. ★ ★ ★

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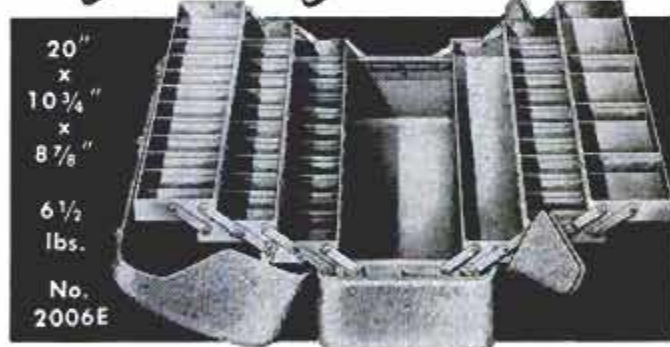
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Here's a unique new way to watch weather—“LOOKOUT” by Honeywell, world's largest control manufacturer. Outside, a precisely calibrated mercury tube senses exact outdoor temperatures; inside, a spiral bi-metal gives accurate indoor readings. Sturdily constructed of lifetime plastic. Factory sealed to insure accuracy, resist dirt and dust. Designed by Henry Dreyfuss to harmonize with any decor. Easy to install; easy to read.



\$6.95 GIFT PACKAGED AT BETTER
DEALERS EVERYWHERE

pull the trigger...

spray paint

7 times faster than brushing!



Speedy Sprayer ONLY
\$32.00
less motor

Paints anything from a house to a toy. Saves its cost on the first major job! Speedy Sprayer does in minutes what brushing takes hours. Finish is smooth, flawless. Uses any 1/4 h.p. motor with 1/2" shaft. No. 780 Outfit—10 ft. air hose, tire chuck, quart gun, less motor, only \$32.00. Every workshop should have it. At leading stores.

Free! Write for "How To Spray" Booklet and folder.

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Specialists in Portable Paint Sprayers for Over 37 Years
2635 N. NORMANDY AVENUE, CHICAGO 35, ILL.



True blood pressure is measured by inserting pressure transducer, at catheter end, into blood stream

Medicine's New Electronic Wizardry

(Continued from page 80)

detecting heart disease in its earliest stages.

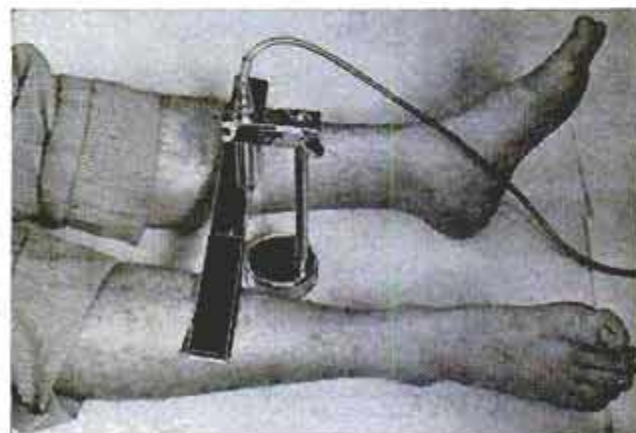
A further use for the new stethoscope is on the horizon. During birth a baby is in imminent peril of oxygen starvation. Its heart must beat rapidly to get maximum benefit from its meager supply. The new stethoscope monitors the infant heartbeat during delivery. If the heart fails, quick surgery can save a life.

A foreign-body locator has developed from wartime mine detectors. Moved over the body, it exactly locates safety pins swallowed by children, metal fragments from industrial accidents and such.

One of the most promising applications of electronics is in the research field. Cytologists (students of cells) are hampered in their work by the fact that these basic fragments of life are transparent. To be visible at all, cells must be stained, and staining usually kills them. Scientists at the Rockefeller Institute for Medical Research and RCA engineers at the David Sarnoff Research Laboratory have developed apparatus which makes living cells clearly visible. Invisible ultraviolet light of three

(Continued to page 236)

Metal bar on legs detects forces of heart action, sends electronic signal proportional to the forces



makes shopping for men
so **EASY**...



Look no further! Acclaimed by millions as the world's most useful hand tool, Vise-Grip—handsomely boxed for Christmas—is one tool he'll use every time! For home repairs, shop work, the outdoors! It's a whole tool kit by itself: Super-pliers, all-purpose wrench, clamp, hand vise, and wire cutter! Only

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NOW CUT HOLES & DISCS IN SECONDS!



"ARCO HOLE-SAW" with New Automatic "SLUG-EJECTOR"

Exclusive "Slug-Ejector" pops out discs immediately—therefore works 3-times faster than other hole saws selling for twice as much. 4-shatterproof blades easily exchanged to cut 1", 1 1/2", 2" & 2 1/2" holes thru 3/4" stock. **\$5.95**

No. 650 HOLE-SAW as above but with 7 blades to cut 1", 1 1/4", 1 1/2", 1 3/4", 2", 2 1/4" & 2 1/2" holes. **\$7.95**

At your dealer or order direct on our **20-DAY MONEY BACK GUARANTEE**. Send check, M.O., ppd., COD + post.

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ASSORTMENTS 12" & 36" Length

NO. 1—Cold Rolled Steel ROUNDS: 3/16"; 1/4"; 5/16"; 1/2"; 3/4" diameters. Ideal for shafting & machining.
NO. 2—Steel CHANNELS: 1" x 1/2" x 1/8"; 2" x 1" x 1/2". Steel ANGLES: 1/2" x 1/2" x 1/8"; 1" x 1" x 1/2". Steel FLATS: 1/2" x 1/4"; 1" x 1/2"; 2" x 1/2". Fine for fabrication.
NO. 3—BRASS ROUNDS: 3/16"; 1/4"; 1/2" diameters. ALUMINUM ROUNDS: 3/16"; 1/4"; 3/8"; 1/2" dia.
NO. 4—VANADIUM TOOL STEEL Annealed: 1/4" Sq.; 1/2"; 3/8"; 1/2"; 3/4" dia. Used to make your own cutting tools, punches, etc.
NO. 5—Soft BRASS SHIM & SHEETS: .002"; .003"; .008"; 1/64"; 1/32"; 1/16" Thick. 6" width x 6" or 12"
NO. 6—Bright STAINLESS STEEL SHEETS: 1/64"; .025"; 1/32"; 3/64" Thick. 6" width x 6" or 12".
CASE HARDENING COMPOUND: Hardens mild steel. In 1 lb. can, with instructions.

L-5 METALS, BOX 6544, Cleveland 1, Ohio

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- CASE HARDEN COMPOUND — \$3.95**

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The Parker model you want, saws easier, holds blades more rigidly, and fits your pocketbook. Unconditionally Guaranteed.

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DIAL ANY DADO WIDTH... IN SECONDS

FOR PROFESSIONAL PRECISION...only with a COMET QUICK-SET DADO! Cut to a maximum depth of $\frac{3}{4}$ ". Dial the exact width (from $\frac{1}{4}$ " to $\frac{13}{16}$ "), without removing the tool from the arbor. Watch the balanced, tool-steel COMET blades cut perfect dados, rabbets and ploughs...on any table or radial arm saw. Use COMET for quick, professional precision... stays sharp 5 times longer! If not at your local dealer, order direct by check or money order. 19.95 PREPAID

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2033 Santa Fe Avenue, Los Angeles 21, California
a division of The Siegler Corporation



Faster and more accurate than the eye, blood counter tabulates equivalent of 100 samples in 25 seconds

wavelengths illuminates the cells under a microscope. Specially built TV tubes then translate the ultraviolet into visible red, blue, green. Thus, living cells stand out in brilliant color. For the first time it is possible to see intricate life processes at work.

The same group not long ago came up with another promising development — a "radio pill." In effect, the pill is a tiny broadcasting station — less than an inch long and $\frac{3}{8}$ inch in diameter. Attached to a string, swallowed, and allowed to pass through the digestive tract, it gathers and broadcasts pressure readings. It is expected to shed new light on the body's basic physiology, and to be helpful in diagnosing a number of diseases.

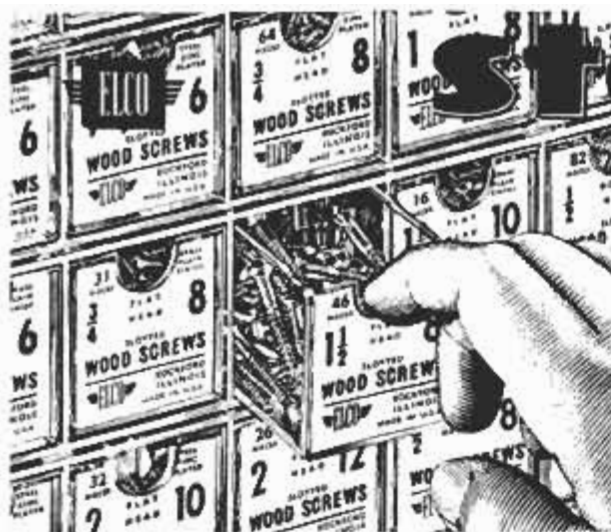
Electronic "Vision"?

In one possibly prophetic experiment in the field of ophthalmology, a phototube was hooked to the visual cortex of the brain of a woman totally blind for 18 years. When a light was flashed in front of the tube it fed a minute electric current into the brain. The woman "saw" the flash of light. Whether this apparatus can be refined to produce exact images remains to be seen.

One of the most promising and potentially far-reaching developments now under way is the work of a French research man, Dr. Francois Paycha of Paris. Diagnosis of many diseases has become a matter complex enough to baffle even the most gifted physicians. Paycha's solution: Use an electronic computer. Symptoms are punched on a card which the machine matches with coded stored knowledge.

Paycha tried his idea with remarkable success on diseases of the cornea, the normally transparent covering of the eye's pupil. As a starter he gave the computer a

(Continued to page 238)



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 GENEROUS QUANTITIES IN CLEAR PLASTIC BOXES — 59¢ PER BOX.
 USE DRAWER RACKS — 59¢ EACH — FOR NEAT HANDY SHOP STORAGE.
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The ONLY complete shop-in-one, with built-in work bench, hoist for heavy mowers, and lightning-fast bed grinder for sharpening bed knives in mower. Lapping attachment and narrow grinding head to hollow grind reel blades. The famous BALTRAK for rotary blades. Write and experienced shopmen will answer.

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5 ton
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No. M-710 (Wt. 53 oz.) Has pull of 225 lbs. on steel block	\$18.00
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No. M-300 Kit of Flat Bars 5 Pairs (10 Magnets)	\$3.00
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No. M-47 Hot Pad Magnets, 10 for \$1.00	\$0 for \$4.87
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SUDS, SCRUBS
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Deluxe Replacement Unit—
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Dish-Quik makes quick work of dishes and a dozen other kitchen tasks! Even scrubs out the sink—yet your hands never touch hot, soapy water! To spray-rinse with hottest water, just press the thumb lever; or, tap the button for an instant flow of rich, foamy suds. Uses any good liquid detergent; holds two-day supply. Rugged, all-nylon brush gets dishes, pots and pans really clean! Fully guaranteed.

DO YOU HAVE A SPRAY THAT CAN BE REPLACED WITH DISH-QUIK?



The answer is "yes", if your spray has a thumb control. Almost all sink sprays do have thumb controls. These sprays come in many shapes; but they are all known as "automatic sprays", so-called because they spray automatically when the thumb control is pressed.



Anyone can replace any automatic spray. Simply unscrew the old spray, then...



attach Dish-Quik to the same hose.

Now it's easy to repair or replace any automatic (thumb-control) spray! Dish-Quik is one of the new, official replacements, standardized to replace any old or worn-out automatic spray. In addition to Dish-Quik, the deluxe replacement, you can also choose Rinse-Quik, the standard replacement, for rinsing only. Replacement hoses and accessories also available. If you do not have a thumb-control spray, you cannot use these replacements. You can, however, install a new kitchen faucet equipped with your choice of Dish-Quik or Rinse-Quik.

Ask for Dish-Quik and Rinse-Quik
Wherever Plumbing Goods Are Sold

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Please send free 16-page booklet telling how to repair and maintain automatic sprays and how to install new kitchen faucets that are equipped with these sprays.

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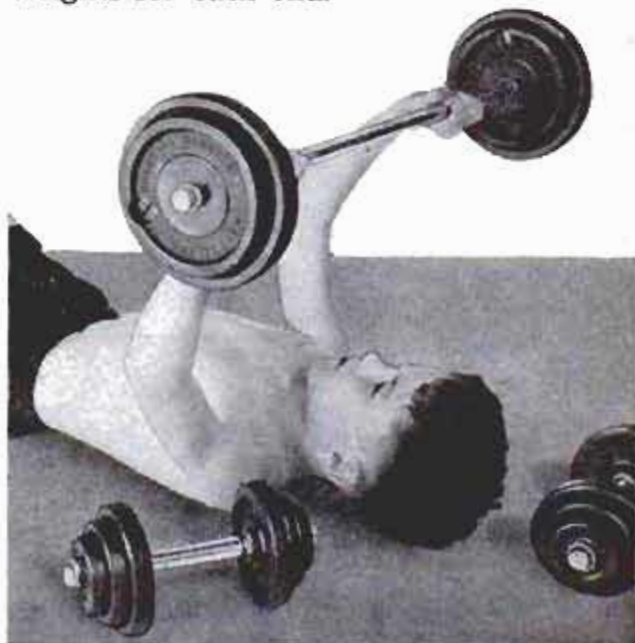
basic store of knowledge — 800 specific symptoms of cornea disease. In one trial Dr. Andre Dubois-Poulsen, a top French ophthalmologist, fed the machine symptoms of a particular patient. Back came five possible diagnoses. "One," he said, "was my original diagnosis, but there were others of rare diseases which I should have considered, but which had not occurred to me."

Says Paycha: "The machine will not replace the doctor's memory. But it will supply him with a priceless supplementary electronic memory." He sees no reason why more elaborate card systems should not be developed to diagnose all disease. International Business Machines scientists tend to agree. Dr. V. K. Zworykin of RCA foresees the possibility of big diagnostic centers with giant computers. Physicians facing difficult problems would send in symptoms by wire and could have replies back in a matter of minutes.

The mating of electrical science with medicine may well be one of the significant accomplishments of our day. Results so far achieved have been great—more exact diagnosis, better surgery, greater research opportunity. Impressive as these accomplishments are, they will almost surely be dwarfed by things that lie ahead. ★ ★ ★

Polyethylene Bar Bells Have Sand-Filled Weights

Bar bells with hollow weights made of polyethylene are now available for muscle-building programs. The weights can be filled with water, or dry or wet sand to adjust lifting weight anywhere from 2 to 20 pounds. The basic bar bell consists of a 32-inch aluminum bar with two large 8-inch weights and four smaller 5 $\frac{3}{8}$ -inch weights for each end.



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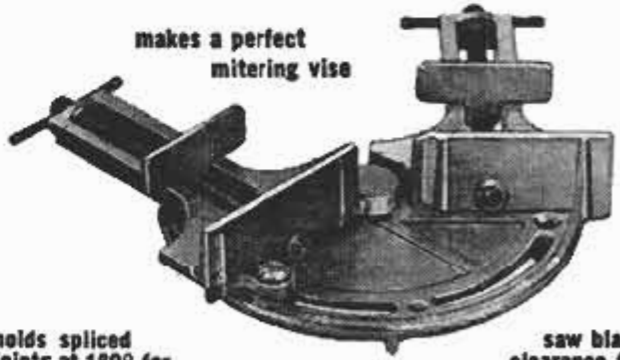
Heavy duty compressor for continuous operation, with G.E. or equal B.B. Motor, 110 V., A.C., rated 1/10 h.p., develops up to 3/4 h.p. 1-Quart. Pressure type gun with round, fan and ceiling spray nozzles. Line filter, air gauge, 20 ft. cord & plug, 20 ft. air hose. Sprays paint, lacquer, enamel, insecticides, etc. Paints house, auto, ANYTHING. Operates gun continuously. Instructions furnished. NOTHING ELSE TO BUY. Wt. 80 lbs.



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holds spliced joints at 180° for gluing or nailing. adjusts to any angle. correcting mitre cuts

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This clamp can hold, at any angle, frames, screens, shadow boxes, storm windows, trim, mitre or butt joints for nailing, stapling, gluing or splicing. Clamp consists of two screw clamps attached to a metal base. One clamp is stationary, the other swings a full 180°. Unlike obsolete clamps which cover corners; this corner clamp fully exposes the top and side of two pieces so that nails or screws can be easily driven into joint. Screw clamps open to 3" to hold different widths and thicknesses at same time. Two countersunk holes provided if fastening clamp to work bench is desired. Precision-cast, made of highly polished special aluminum alloy, lightweight and strong. Each \$1.75 Price of two for joining two corners at once... **\$3.35** Order by mail. Satisfaction guaranteed. We pay delivery. Write for free catalog of fine tools.

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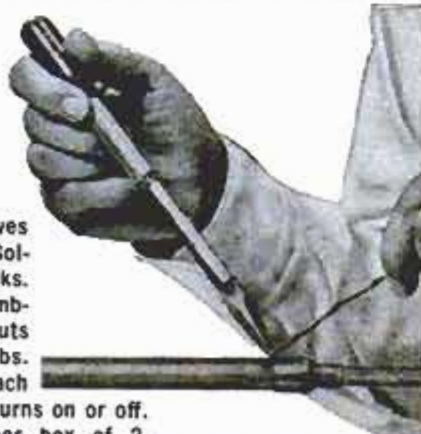
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5 Magnifications 18X-35X-65X-85X-150X
 Brings the Moon, Planets, Stars, Satellites, People
 150 times Closer, Clearer, Sharper

Never before has an ACHROMATIC 150X telescope with range finder and tripod sold for anywhere near this amazing low price! Now you can not only explore the heavens and bring the moon, planets, stars, satellites 150 times closer, but you can observe all distant objects, people, ships too, because all pictures are erect, not upside down as in all astronomical telescopes. The kind of needle-sharp color-free viewing only a genuine achromatic lens can bring you. Ready for immediate use. 5 precision lenses bring you viewing at 18X-35X-65X-85X-150X. Tubes extend to 43" made of bakelite, finished in camera bellows black, trimmed with gleaming brass. 4 power finder scope (30mm Lens) mounted on main tube is feature usually found on more expensive telescopes—brings difficult objects on target before observing with main scope. For extra stability 5 ft. hardwood folding tripod is equipped with heavy cast iron head fitted with Criterion's famous 360 degree all aluminum mount that locks instantly in any position. Obtainable only from Criterion Co. shipped prepaid. 4 famous gifts—273 page book "Handbook of the Heavens," Magic star finder dial that aids in locating stars ANYWHERE at ANYTIME of the year. 220X & 400X eyepiece lenses included free for experiments. You must be completely satisfied with this super offer or your money back in full. Shipped Complete, nothing else to buy at amazingly low price of **\$18.95**. Without tripod **\$14.95**. Send Cash, Check, or Money Order today
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\$1.95
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Butane gas blow torch gives intense 3500° flame. Solders, brazes, fixes leaks. Perfect for wiring, plumbing, loosening frozen nuts and bolts, 1001 odd jobs. Carry in your pocket. Each

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MONEY BACK GUARANTEE

**They Don't Make 'em Like
 They Used To**

(Continued from page 90)

as a pattern for new cut by a Pontiac cabinet maker who also turns out top bows, dashboards, seat frames and wheel spokes. With new framing in place, rusted-out body panels are replaced by new ones hand-formed of aluminum or sheet steel.

Chassis are sandblasted and repainted; engines and drive trains disassembled and checked for wear. Cracked cylinder heads and water jackets will have been brazed,



Holes are drilled in flat aluminum sheet that will become new rear fender for 1906 model Pope-Toledo

broken gears replaced and, where necessary, parts cast from virgin metal when the engine is buttoned up again.

Wheels, often with only the hub and rim salvable, are respoked and finished off with the delicate striping that makes them works of art. Tires pose less of a problem than formerly, now being available from Firestone and the Gehrig Tire Company of Fort Wayne in the original tread design for nearly all antiques.

Intuitive Sense of "Feel"

Although most veteran cars were of straightforward and uncomplicated design, reassembly calls for that intuitive sense of "feel" for manufacturers' specifications rarely are available. One exception turned up last year, however, when a Baby Fiat was in the shop.

(Continued to page 242)

Sale! This Outstanding **ENCYCLOPEDIA** Every Child Will Treasure

and Use—for Over **60% OFF!**



12 Beautiful Volumes—3,072 Informative Pages—Over 5,000 Pictures, Photos, Charts, Diagrams—Hundreds of Subjects and Projects Children Want to Know About and Do!

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We need the warehouse space, giving you the bargain opportunity of many a year! On a first come, first served basis, you can have for your children a wealth of information they will treasure and use for years to come—and which will be invaluable throughout a lifetime. Advertised previously in Popular Mechanics for \$19.95, you can obtain this set now at a \$13.00 saving!

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Popular Mechanics Junior Encyclopedia is a compilation—in 12 beautifully bound volumes—of everything that active, curious boys and girls want to know about. Packed into more than 3,000 pages are fascinating ideas for games, crafts, sports, practice in elementary electricity and electronics, mechanical devices, outdoor and indoor equipment and a vast number of other "do-it-yourself" ideas. More than 5,000 pictures, charts, diagrams and tables provide unending hours of interest and creativity, with complete detailed information for carrying out every imaginable project from simple sewing or taxidermy to complex power-driven equipment.

How It Benefits Your Children

Here is basic training in personal resourcefulness that will prove so valuable in later years. Your children learn the best way of all—by doing it themselves—and every project is fun to build and

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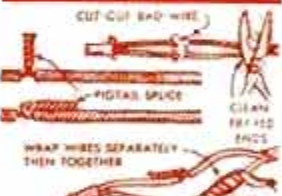
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pp. 271-289



From Volume 3
"DRIVING YOUR CAR"—
pp. 342-387



From Volume 3
"ELECTRICAL REPAIRS"—
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"SEWING"—
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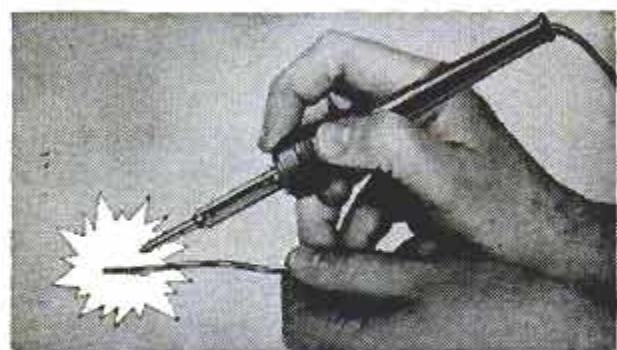
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"We had a complete factory manual, a beautiful job," Davis recalls with a wry grin. "Only it wasn't much help. It was printed in Italian."

Pictures, past experience, careful charting in taking the vehicle apart and common sense guide Davis and his crew in fitting the old monarchs together. On those rare occasions when all else fails and a problem develops, a note to a "helper"—any one of the thousands of fellow members in the Veteran Motor Car Club, the Antique Automobile Club of America or the Horseless Carriage Club—brings a tide of information and the latest owner improvisa-



New aluminum fender is clamped into position on antique car. Some fenders are shaped from sheet steel

tions. This clan, one of the most closely knit in the world, also is the mine in which needed parts often are found.

Then, too, it is not uncommon for enthusiasts who own tool and machine shops, foundries and plating concerns, to put their facilities at the disposal of a fellow member. Davis concedes a couple of cars probably never would have left his shop under power if two antique car fanciers in Detroit had not come to his rescue.

One Car Rebuilt Twice

Davis, too, has been the rescuer. Last year, in reply to an SOS from a western museum, he dismantled the engine of his 1903 Rambler and shipped off its single cylinder to be used as a pattern for casting a new one so the institution could effect its own restoration.

The 1911 Model T that changed his life now has its second set of Davis-made fenders; the car was rebuilt a second time after

(Continued to page 244)



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being virtually demolished in a collision while on an antique-car tour. In reproducing fenders, Davis cuts the blank from sheet metal, puts in the bead and welds on stiffening edges. Forty to fifty hours labor has been invested by the time the fenders are ready for the enamel. And "Henry" would swear the set of four had been stamped at his own Highland Park plant unless the bill was attached.

The casual visitor who innocently consigns all old automobiles to the junkyard finds no rusting iron, no abandoned bodies staring at the sky at the Davis shop. Skeletons awaiting "inventory" and consignment to the loft or restoration are wrapped in tarpaulins behind the shop. Even Davis' ranch home, just across the drive, contains priceless tonnage — some of it owned by customers, more by Davis himself.

Fans Include Women

A 1930 Austin and a 1939 American-Bantam roadster, a 1910 Paterson and a 1905 air-cooled Franklin fill the garage; the breezeway shelters two or three more vintage pieces, including a Brush, while a basement garage houses the remains of the Rambler, parts of the 1908 Maxwell his wife is restoring as her own antique car and, under dust covers, Davis' maroon Ford.

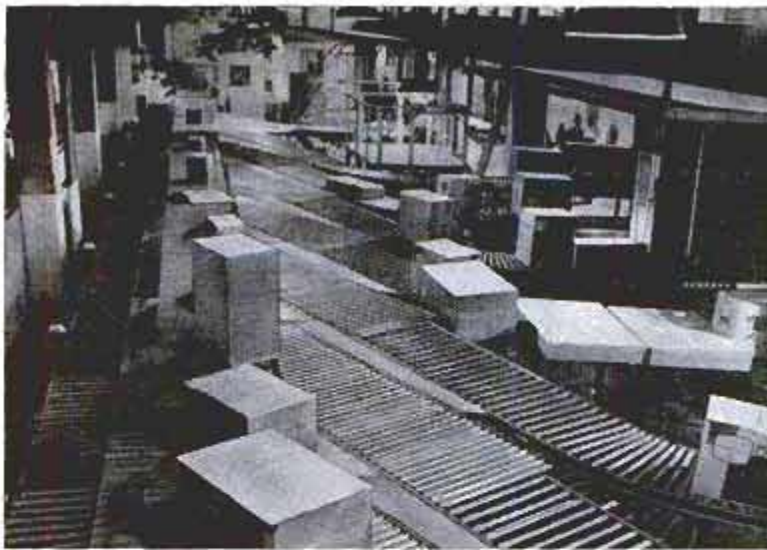
Although all charges for rebuilding and repair are based on time and material — parts being billed at cost—the luxury of owning an antique car really isn't restricted to the wealthy, as one young woman from Pontiac can attest.

Delivers Cadillac in Pieces

She had a yen for a Cadillac but, unlike many young things, hers was for a 1903 model she delivered in pieces to Davis. Her take-home pay as an employee of a spark-plug plant wasn't enough to finance the full treatment. Yet eight months later she drove away in her Cadillac, as good as the day it first left Henry Leland's assembly line.

Davis worked out a deal whereby she did much of the work herself to hold down the cost. She spent her weekends sanding and cleaning woodwork and stripping those components she could handle physically. In addition, she logged more than 5000 miles of travel to locate missing parts, helped in the reassembly and probably knew more about the innards of a Cadillac, 1903 model at least, than any other woman in America.

More important, to Davis, there was another bonafide member of an ever-growing fraternity that owns and loves some of the most romantic machinery ever to roll down the pike. ***



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photoelectric cells measures the length of the package. The information is relayed to a synchrotimer. At a synchronized time, as the package reaches the proper distribution line, a number of steel fingers guide the package to the line. The photograph at the left shows the boxes being guided along to the distribution lines. In the photograph at the right, an operator pushes keys corresponding to marks on the packages.



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Six-Minute Ride Into Space

(Continued from page 74)

is in place of the small rudder and elevator sections you find on a conventional plane.

Guiding the X-15 through the fringes of the earth's atmospheric blanket will be no picnic for the pilot. Under the pressure of four or five g's, his arms will be like lead weights. He'd have trouble just lifting them, let alone making them move controls. So, while the ship thunders through its six-minute phase of incredible acceleration, the pilot won't need to use his arms at all. They'll be anchored by acceleration forces in form-fitting grooves on the armrests of his seat. He will manipulate aerodynamic controls of the ship by means of a "high-g stick" just off the end of his right armrest. Using only finger and wrist motion, he'll be able to guide the craft. A conventional stick for normal flight inside the atmosphere is in the usual center position. Outside the earth's atmosphere, even the "flying tail" will be useless, since there will be nothing for a rudder or elevator to "bite." Actually, once the ship moves into the near-vacuum of space, it will follow a true ballistic curve. But to keep it from tumbling end-over-end, or spinning around the X-15 has a unique system of small control jets.

A Fingertip Operation

Up forward, on the top and underside of the nose, one set of jets will counteract any tendency of the craft to pitch (up-and-down nose movement). Rolling will be controlled by upward-pointing jets in each wingtip. The tiny jets, fueled by hydrogen peroxide and a chemical catalyst that produces an explosively expanding vapor, will be controlled by means of finger switches perched atop a third stick off the pilot's left armrest.

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Actually, the pilot will have little time for earth-gazing. He'll be too busy watching instruments, making mental and visual observations as he thunders through sound barrier, thermal "thicket" and controllability barrier (region of hypersonic flight

(Continued to page 248)

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in which a plane's controls refuse to function normally and the aircraft may drop like a high-speed bullet). His control of fuel flow will be limited, to prevent him from accidentally exceeding human tolerance of thrust. Since most altitude and navigational instruments are useless at the speeds and heights that X-15 will pierce, the ship will carry inertial navigation: A triple-gyro stabilized platform that constantly maintains its position in space. Hooked to an electronic brain, this instrument will have cockpit "read out" dials that will tell the pilot at any instant of flight exactly where he is, the attitude of the ship, and his speed.

Strung along the flight course down on earth, a chain of radar stations dubbed "Project High Range" will telemeter every second of the flight. Instruments in the plane will tell ground observers where the flight is, how fast it's moving, whether it is flipping end-over-end, skidding sidewise or upside down. It will collect continuous temperature readings from 90 different parts of the ship, and keep tab of the pilot's breathing, heart action and pulse.

Protect Pilot From Heat

Aerodynamic heating, as the ship rockets through the earth's air envelope, has had plenty of attention from the X-15 designers—for protection of craft as well as pilot. The ship's skin and frame consist of the highest heat-resistant metals: Titanium, stainless steel and Inconel-X, a nickel alloy. Aluminum appears only where parts will not be subjected to the searing blast. More than 65 percent of the X-15 is welded; only 35 percent is riveted or bolt-fastened. All skins and sheets in the structure are chemically milled or "sculptured"—a new weight-saving method of using acid to remove excess metal from nonstressed members, giving it the appearance of broadloom carved in a free-form pattern.

"The X-15," according to North American's chief engineer, Harrison Storms, "will get as hot as an ordinary bedroom would with 80 floor-furnaces going full blast." Not only will the pilot's cabin be insulated against this heat, but liquid nitrogen, at 300 degrees below zero Fahrenheit, will circulate through the walls, and cool the electronic gear. The same frigid fluid will circulate through the pilot's suit, and pressurize it. Oxygen, supplied separately to the helmet, will be sealed off from the liquid frost.

Air Force experts point out that, in all probability, X-15's plunge through the thermal "reef" in the sky will be something like "passing your finger through a candle

flame." So quickly will the ship pass through this phase that metal-melting heat will have no time to work its softening destruction. But if anything should foul up—a too steep, too shallow, or off-kilter dive into the thermal barrier—the ship could start tumbling. If it did, at the scorching re-entry speed that X-15 will be traveling, the fantastic deceleration and the wildly flaying and whipping forces brought to bear would tear it to shreds in one explosive instant.

It'll Be Like Stone-Skipping

Current plans call for a "skip re-entry" in which the pilot will repeatedly bounce his craft off the top layers of atmosphere—like a flat stone skimmed across a pond—until its speed has diminished enough for a "cool" transit. But some experts believe the ship would build up far more sustained heat this way, which could not be dissipated during the bounces into space. The plane would get hotter and hotter on each successive dip.

There's no escape capsule in the X-15. Experts believe that the ship itself is a better protection to the pilot. Once powered flight ceases, the craft will be outside the atmosphere on a preordained trajectory. If he popped out in a capsule, the detached pilot would simply be in another vehicle following a similar path through space—in an even higher arc. Hence, X-15's pilot will just hang on until the ship has entered the atmosphere, where he can eject his seat at lower speeds that won't tear him apart. The X-15's ejection seat is equipped with stabilizing fins that tend to hold it upright and counteract rotational forces until the chute can be released. The pilot's suit is blastproof.

Can They Take It?

Can human beings take the kind of punishment that the X-15 will dish out? For more than a year, Crossfield, the 36-year-old former Navy flight instructor and father of five, and the other test pilots who'll follow him, have actually been "flying" the X-15 under startlingly realistic conditions in the Navy's human centrifuge at Johnsville, Pa.

There, on the end of a 50-foot arm, in a steel capsule fitted out exactly like the cockpit of the actual plane, each of these men has been whirled on dozens of flights into "space." The gigantic merry-go-round is spun by a 4000-horsepower motor. Dynamic controls, picking up pilot responses from the cockpit, change the speed, attitude or direction of the capsule on the end of the great arm, programming it through

(Continued to page 250)



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the entire flight profile that X-15 will follow on its reach into space.

Wearing the complete pressurized suit they'll don for the real thing, the men manipulate the same controls and watch the same instruments that the actual ship will have. They're subjected to the tremendous forces of takeoff acceleration, feel the haymaker punch in the midriff they'll get at rocket burnout, the quiet soaring through the silence of outer space, and the frightening oscillations they'll encounter on re-entering the atmosphere.

Pilots Can Black Out

In some of the tests, pilot error and sometimes emergency aircraft "malfunction" programmed into the "flight"—have led to exceeding human or aircraft tolerances, and the make-believe X-15 has "crashed," according to the computer, without harm to the pilot. On a few occasions pilots have blacked out under excessive g's.

Such simulated flights have led to important changes in the instrumentation and control structure of the actual plane. More important, according to one Navy official, X-15 pilots behind the controls on an actual flight will have the comfortable feeling that they're been there before.

What the real ship will prove, nobody knows yet. With few changes, according to the Air Force, X-15 could be put into orbit with a human crew—making it a true manned earth satellite. The Department of Defense has officially stated that the X-15 research vehicle is, indeed, one of several projects investigating manned space flight toward an ultimate goal—the highly secretive Project Dyna-Soar. This program, a contraction of "dynamic soaring," is a joint Air Force-industry project to develop a manned vehicle capable of circling the globe in two hours. It will be designed for use as a weapons system, bomber or reconnaissance vehicle. Circumnavigating earth in a true satellite orbit in outer space, it will be capable of coming back home at any time the crew decides its mission is accomplished. ★★

Enzyme Removes Hair From Animal Hides

Hair can be removed quickly from animal hides through use of an enzyme, according to the U.S. Department of Agriculture. The hides, after pretreatment in salt water, are soaked in an enzyme solution. This seems to affect a layer in the hide which helps to anchor the hair.



Pocket-Size Radar Alarm

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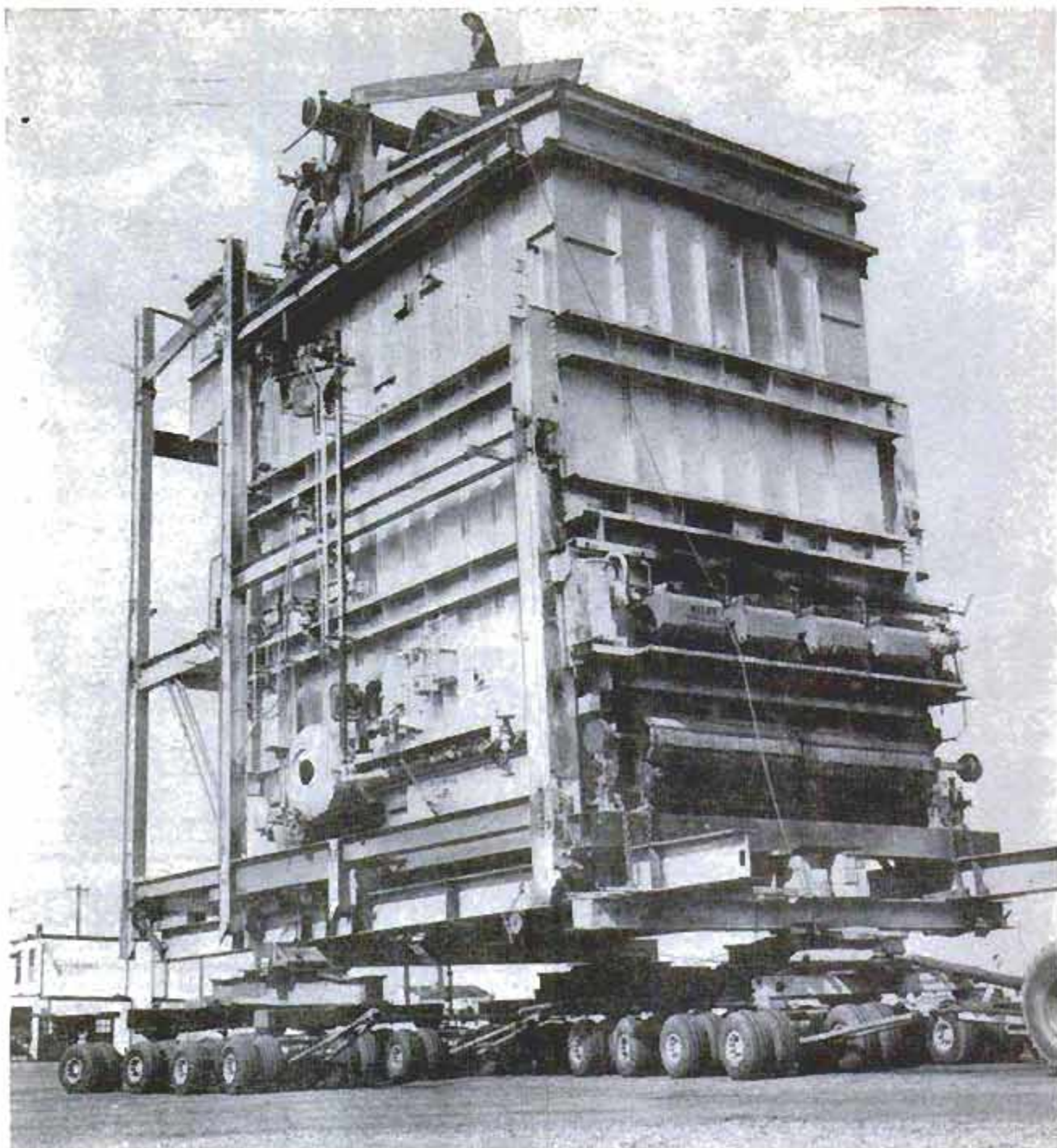
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200-Ton Boiler Moved 26 Miles in One Piece

They said it couldn't be done—but engineers decided to try anyway, and succeeded in transporting the largest boiler ever moved in one piece. The boiler weighs 200 tons and was moved on 96 tires. As high as a three-story building and heavier than

100 automobiles, it was rolled 26 miles from one production area to another at the Atomic Energy Commission's plant at Hanford, Wash. Large boilers such as this are usually moved in pieces. The maneuver saved taxpayers \$200,000.

Three-Mile Hole in Sea Floor Will Show Earth's History

Scientists are planning to bore a three-mile hole in the ocean's floor to get a history of the earth from its very beginning. The drilling is to be done from an ocean-going vessel and is to penetrate through several layers of sediment, the basalt layer

and finally into the upper mantle. Study of samples obtained from the bore hole will replace speculation with facts about the earth's density, radioactivity, age, isotopic makeup and composition, bulk and mineral phases.



Snake River Dam Harnesses 360,000 Kilowatts

ELECTRICITY now streams into the Pacific Northwest from Brownlee Dam, a 360,000-kilowatt hydro project in the Hell's Canyon reach of the Snake River. The rock-fill embankment is at center, flanked

on the Idaho side, left, by a powerhouse and on the Oregon side by a concrete spillway. Upstream are costly migrant-fish facilities, first of their kind to conserve salmon and steelhead fingerling runs.

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What We're Doing About Air Safety

(Continued from page 69)

consideration to the application of color radar. However, I'd rather focus on the other part of the question, specifically 3-D radar. 3-D radar is one of our highest priority programs. Unless we can develop 3-D radar for application to the terminal problem — the airport problem — the possibilities of solving that problem are very dim. 3-D radar is a must to us. The military establishment has spent a vast sum of money on the development of 3-D radar, with modest success. When I say modest success, I mean that as a compliment, because the technical complexities of 3-D radar are terrific. The military's effort in the development of 3-D radar has been focused on surveillance at extreme ranges up to 200 to 300 miles. Our requirement is up to 50 to 75 miles. Right away when you reduce the range requirement from 300 to 75 miles, you reduce the complexities to about one tenth of those that confront the military establishment. Hence our problem is going to be materially easier. We hope that we can develop one of their programs, or conceivably two, to a conclusion to solve our problem.

Q: Why is the development of 3-D radar so vital?

MR. QUESADA: Radar now gives us only range and azimuth. This is really of little use to us. There are so many targets in the terminal area that the data which radar now gives us adds to the confusion rather than solving it, at least to some extent. We very often, for example, assume that there is a conflict between two planes because they are on the same azimuth and appear to be on the same range, when in fact they may be 10,000 feet apart. One could be at 10,000 feet altitude and the other at 20,000 feet, and there is no conflict at all. But we cannot determine that with existing radar. So, as I said before, this adds to the confusion. 3-D radar in the terminal area would give you the range, azimuth and altitude thus permitting you to solve the problems of air-traffic management intelligently rather than intuitively.

Q: What is the recently announced HIDAN system?

MR. QUESADA: HIDAN, developed by General Precision Laboratory, is airborne equipment. As a matter of fact, I have flown an aircraft equipped with it. I was very pleased with its potential. Its fundamental purpose is to give you an accurate reading at all times of the speed at which you are traveling, how far you have progressed along your track, your position in respect

(Continued to page 256)

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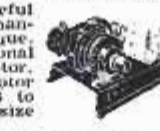
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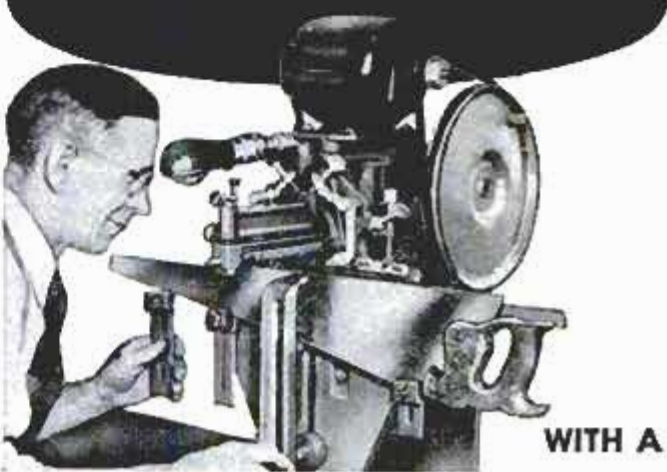
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to a track that you have predetermined as desirable.

Q: Does the equipment automatically transmit this information to the ground?

MR. QUESADA: No, it doesn't. It is information that would be airborne; it could be transmitted to the ground but the equipment as I observed it did not include a communications system between air and ground.

Q: You think this may well be a valuable piece of equipment?

MR. QUESADA: It offers a great deal of promise.

Q: The CAA recently announced three superairways. How are they working out?

MR. QUESADA: Oh, I understand they are working out quite well.

Q: Does this mean, then, that we will have more of these superairways?

MR. QUESADA: It is definitely planned that this philosophy will be extended to other areas and particularly on the north-to-south traffic arteries. The application of so-called "express highways" is an immediate solution and an immediate help to our current problems. I would like to make it clear that I would visualize a system that would eventually permit us to abolish airways completely. It won't happen for at least 10 years.

Q: What are the new jets going to mean in terms of the airport itself? Must runways be longer?

MR. QUESADA: The runway requirement for jets is somewhat over the existing runway requirements. However, most of the cities where jet operations are contemplated in the immediate future have runways able to accommodate jet transports. There are some other problems that are equally as pressing and please don't think that the runway problem is not a pressing one. But there are others, too. Ground handling equipment is one. There is just no doubt but that certain communities, which logic says should be served by jets, must expand their airport facilities. But the major hubs now are adequate for them.

Q: Are you doing any work on the noise problems of jet airports?

MR. QUESADA: No, we are not. The National Advisory Committee for Aeronautics has a very extensive program in this area. I guess their program runs into many millions of dollars. It is not our intention to duplicate it even if we could. But at the present time we could never compete with their skill in this area. Likewise the various companies, Boeing and Douglas to my certain knowledge, are spending a great deal of money, all of which is their own, and a great deal of time, in

noise-abatement programs on the ground. They know they must do something in order to sell their product. They are having some success.

Q: Getting back to runways for a moment, what are high-speed turnoffs? Are they of help? Are they safe?

MR. QUESADA: The high-speed turnoff program was one of the AMB's first programs with tangible results. High-speed turnoffs are essential to modern airport operations. If you can get the airplane off the runway in 20 to 40 seconds, it is clear that it is a vast improvement over getting the airplane off the runway in 60 to 70 seconds.

Q: It is a clear runway, and not a clear "gate" that counts?

MR. QUESADA: It is getting the airplane off the runway in order that another airplane can use it. Now you must understand that much of our stacking in the vicinity of the airport is because we can't bring in the planes fast enough. If we can reduce the time on the runway of any one plane, it is clear then that we can increase the speed at which we can bring them in and we then reduce the stacking. The high-speed turnoff is not dangerous, certainly, unless it is misapplied. We have made actual measurements that will indicate at what speeds certain planes can turn off. For example, according to our calculations based on the Boeing KC-135 measurements, that aircraft should be able to turn off the runway at 4900 feet from the touchdown spot and at speed of 60 miles per hour, under typical, average flight conditions. The results of the high-speed program are now being applied at Idlewild.

Q: What other AMB research is in the works?

MR. QUESADA: We are in the act of purchasing a TV-type runway simulator as a means of developing visual aids, and it will go into our experimental center within a matter of months. It will permit us to simulate and test various configurations of approach and runway lighting, runway marking, things like that.

Q: Speaking of lighting, are there any new developments there?

MR. QUESADA: Yes. A great deal of effort has gone into runway lighting. The Washington airport has one of the most advanced runway-lighting systems in the country if not the world. I understand it is turning out to be quite successful. There are several other programs under way. As a matter of fact, a couple of men from the AMB are going to Europe to look at some systems over there. We ourselves have developed a device that offers some promise.

(Continued to page 258)



Colorado A & M College photo

Funnel Dispenses Poison Bait

Farmers and stockmen on Western range lands have a new weapon in their fight against pocket gophers. A new funnel-shaped container dispenses poison bait into gopher tunnels. The operator thrusts a probe on the container into the ground near a fresh mound until it drops into a tunnel.

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VERTICAL DRILL PRESS

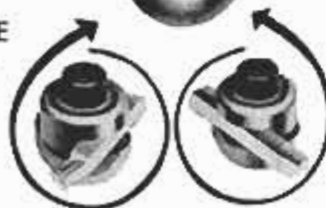
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AA-8858

MAXWELL INDUSTRIES, INC.
 493 East 5th Avenue • Ashtabula, Ohio

It is quite simple and quite inexpensive. It consists of a flat light that is easily attached to a runway and permits the airplane to run over it.

Q: Run over the light?

MR. QUESADA: Run right over the light without damage to it. However, I don't want to appear to be too optimistic on this. Only tests will prove whether this is applicable. The CAA system as applied to Washington has certainly proved to be helpful.

Q: Looking a little bit into the future, what in your estimation would be the best possible system of traffic control? Will EVERY plane be under control? If so, what type of equipment can we look for?

MR. QUESADA: I think that it is within the state of the art to provide a traffic control system that will be applicable to the vast majority of our aircraft and will eventually permit takeoff at random and control thereafter in an automatic or semi-automatic manner. It will be conflict-free and will permit an aircraft to fly to its destination on the shortest possible course and while en route be reasonably assured that other aircraft which are likewise flying from point to point on the shortest possible course, are managed in a manner that permits each to proceed without interruption to the other. However, it is clear that a system such as this will require all aircraft—all users of our airspace—to cooperate and respond to directions.

Q: This applies to private planes?

MR. QUESADA: Including private planes. When conflict occurs, the system will solve it by giving or directing a new course to one of the aircraft in conflict, or both. I visualize that the terminal area will eventually reach a degree of sophistication that permits semiautomatic approaches to touchdown in a very, very rapid order. It will eliminate, if not completely, almost completely, any necessity for delays or stacking.

Q: Does this presuppose that humans are NOT involved in giving the necessary orders?

MR. QUESADA: Humans will be involved. The power of decision will be theirs.

Q: You think this is important?

MR. QUESADA: Highly important.

Q: The system could not be operated satisfactorily without human intervention?

MR. QUESADA: No it couldn't. ★ ★ ★

Ⓢ Synthetic lubricant to be used by the airlines in jet operations costs two dollars per quart, and 8.4 gallons of it will ride from New York to Paris on a four-engined, 575-mile-per-hour Boeing 707 Jet Clipper.

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Model A-2 — 1350 watt — \$ 99.50
Model A-3 — 2500 watt — \$129.50



FAMOUS NAVY MK14 AIR COMPRESSOR

Great for tree, termite, airbrush & paint spraying; filling tires, aquariums, etc. Dual & remote control electric receptacles. 115v 80 cycle AC, heavy duty HP. Westinghouse Motor. Direct drive. Water & explosion-proof. Built-in air filter, adjustable pressure setting up to 47 lbs. 3 cu. ft. per min. Self-contained switch. Mounting brackets. These units made under license of Sperry Gyroscope Co. Wt. 66 lbs. gross. Approx. GOVT. COST \$585. Like NEW. \$21.95.

With portable steel hand cart (shown), rubber wheels, specially constructed for mounting this unit. Incl. 25' rubber air hose, 6' extension cord with plug & fittings. Wt. 76 lbs. Complete with cart—\$26.95.

With new internal pressure spray gun with 3 adjustable spray tips. 1 qt. cap. \$33.95 complete.

"DELUXE 11" ARC WELDING KIT

Consists of 160-250 AMP Gen., voltage reg., ammeter, shunt, adjustable helmet, electrode holder, pr. welder's gloves, 30' welding cable, reactor coil, giant toggle switch, rheostat. Approx. GOVT. COST \$650. All units guaranteed pre-tested. \$34.95 complete.



"SUPER 9" 200 AMP WELDING KIT

With Deluxe accessories consisting of one 200 AMP Gen., adjustable helmet, electrode holder, 30' welding cable, rheostat, giant toggle switch, voltmeter, voltage reg., 1 pr. heavy-duty welder's gloves. All units guaranteed pre-tested. Approx. GOVT. COST \$500. Most items new—all perfect. \$26.00.



WELDING CABLE DOUBLE-O, heavy duty, neoprene jacket, fiberglass insulation. NEW. Approx. GOVT. COST \$40. Will handle 400 amps. or better. 50' lengths \$14.50. 100' lengths \$26.00.

NEW! Welding Reactor for above kits. 200 Amp. cap. or better. NEW. \$7.95.

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Wrenches snap onto T-bar in 3 different positions. The only wrenches for hard-to-get-to places. Mfd. by Plomb Tool Co. for U.S. Armed Forces. Finest case hardened tool steel. No shop mechanic should be without this set. Approx. GOVT. COST \$47. NEW. \$5.95 ppd.

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Tremendous power package. Can be used as a portable or stationary unit. Makes terrific welder. 30D-1A Lawrence, 24V. 2 Cylinder opposed 4 cycle 10 1/2 H.P. Complete with various generators. Net wt. 180 lbs. Gross wt. 250 lbs. Like NEW. With 140 Amp, 24 V. Gen. — \$125. With 200 Amp. Gen. — \$137.50. With AC-DC NEAs, DC side 24 V., 200 Amps; AC side 10.5 Amps. 800 cycle — \$142.50. 300 Amp. Gen. — \$142.50. Engine only \$127.50.

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Use wherever fluid pumping required. Excellent for hydraulic installations. Has 3/4" pipe connections. Built-in relief valve adjustable up to 1500 lbs. Max. cap. 6 GPM. 1 1/2 H.P., 24 V. motor. Use on 12 to 36 V. Approx. GOVT. COST \$30. NEW \$10.95.



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Black crackle finish frame. Easy-to-read graduations in .001. NEW. 0-1" cap. \$2.69 ppd. 1-2" cap. \$3.79 ppd.

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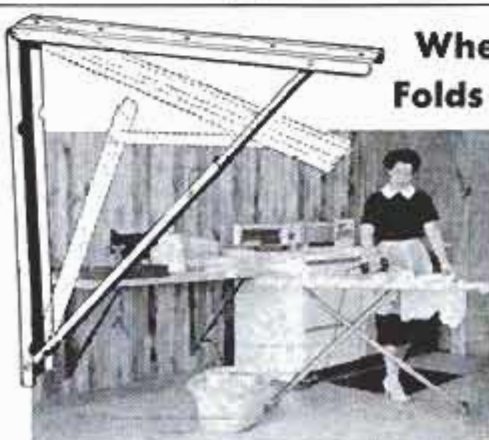


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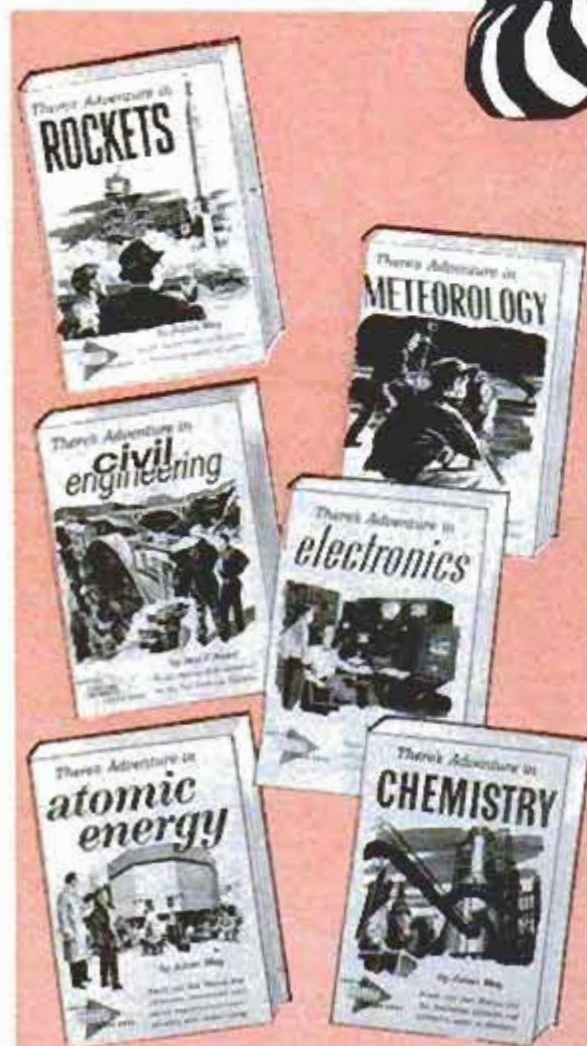
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For Buffing & Sanding! Buffs at 1/2 Drill Speed Sands at Double the Drill Speed!!

Slip into drill Chuck and it's ready to use. Convert any elect. drill into a right angle buffer & sander. Has steel gears, self lubricating lifetime bearings, left or right large handle. Includes 5" rubber head & adapter, 5 1/2" wool polisher, 6 sand discs.

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9 tools in one! A Jack Knife, Scissors, Saw, Can Opener, Screwdriver (Phillips head), Awl, Bottle Opener, standard Screwdriver and a Paring Knife. Finest, rugged steel blades. Easy-to-open. **SAVE**

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Rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has adjustable (0 to 6") rip fence. Safety trigger switch on handle. Full 1/2 HP Universal AC-DC, 110-120 V., 60 cycle motor. Weighs only 6-1/2 pounds. A \$49.50 VALUE.

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Heart Beats Via Telephone Aid Medics' Consultations

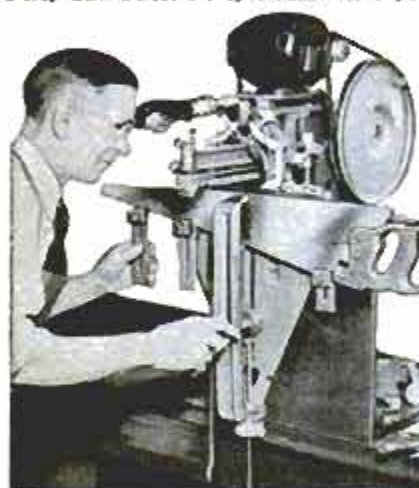
Human heart sounds and electrocardiograph readings can be transmitted accurately over the telephone for consultations between specialists by a device developed at the University of Kansas Medical Center. A five-pound transistorized unit is attached directly to the patient by standard lead wires and placed next to the telephone mouthpiece. No wires connect the electrocardiograph and phone.

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If Antarctica's supercold temperatures are not enough for you, try the air above that icy continent. Russia's Sovietskaya base has reported a record ground temperature of 124.1 degrees below zero Fahrenheit; the base is 12,000 feet above sea level. On July 16, 1958, a U. S. Weather Bureau balloon soaring 13 miles above the South Pole radioed a temperature of 135.4 degrees below zero,

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2000 lb. CAPACITY. A fortunate purchase from the Air Force enables us to offer these powerful 2000 lb. electric cable hoists at a fraction of their value. Perfect for material handling, hoist hoists, elevators, lifting on assembly lines, etc. Two separate 22 ft. lift cables with independent controls permit leveling the load and controlling it perfectly. Rugged ball bearing motors of geared down design 110 volts. Available for A.C. or D.C. Please specify. Makes a terrific portable hoist with our #273 D.C. light plant at \$197.75. Offered at less than 33% of regular cost (hook not included). Wt. 145 lbs. A.C. Model, item #47A... **\$149.50**
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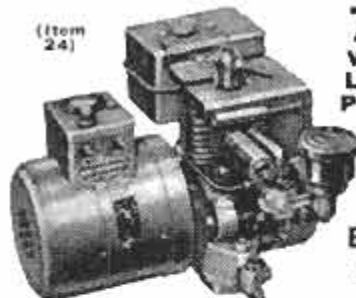


HEAVY DUTY model same as above but with big Industrial Clutch... **\$169.50**
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SPECIAL DEALS

MINE DETECTOR for detecting buried pipes, wires, sewers, etc. Carrying case and fresh batteries included... **\$49.50**
AIR HAMMER for hammering dents out of auto bodies. Complete with 2 different shaped arms and 5 pumping cycles. Hammer can also be used without arm for chiselling and drilling, etc. Uses 4 cfm at 60 psi... **\$39.50**
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Special Price
HYDRAULIC PRESS, 9 ton press for pushing, bending, straightening, etc... **\$69.50**
SCREW PRESS, 9 ton capacity with 21" throat. Complete with adjustable table... **\$49.50**
EXTENSION CORD, 2 cond. #14, Neoprene—100 ft... **\$6.95**
2 cond. #12, Neoprene covered—100 ft. **\$7.95**
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20" fan only... **\$19.50**
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115 v. 60 cyc. AC Powered by a rugged 2.2 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... **\$143.50**
Regular \$275.00 value...
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We make every type and size of light plants. Write giving us your requirements!

Double Acting Hydraulic Cylinder



A powerful retractor unit, by Massey Harris which develops both a pushing and a pulling action. Will push 8,100 lbs., with a 1000 PSI pump pressure. Cylinder is 3 3/8" O.D. with 6 1/2" stroke—standard heavy duty clevises on both ends. Has standard 1/2" pipe thread openings. Can be used for lifting buckets or blades, raising or lowering implements, hydraulic presses, etc. Can also be used as an air cylinder. (Item 802) Wt. 17 lbs. Reg. \$68 value. Special... **\$14.95**

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24" stroke—3" bore... **47.50**
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We have all sizes of cylinders available.
HYDRAULIC CONTROL VALVE—4 way open center valve with built-in adjustable relief. Controls 1 double or 2 single acting cylinders. Equalizing feature permits easy control even under heavy loads. 3/4" pipe thread on inlet & outlet. 1/2" on cylinder outlets. Easily mounted, finger tip control. Wt. 16 lbs. (Item 822)... **\$21.95**

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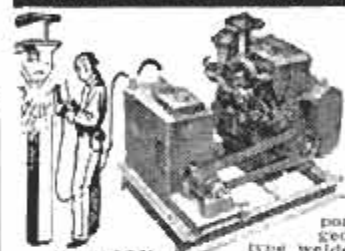
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1 1/2"x50'	24.95	2"x50'	47.50
1 1/2"x100'	49.95	2 1/2"x10'	21.75*
1 1/2"x10'	10.95	2 1/2"x17'	37.50
1 1/2"x25'	14.75	3"x10'	28.50*
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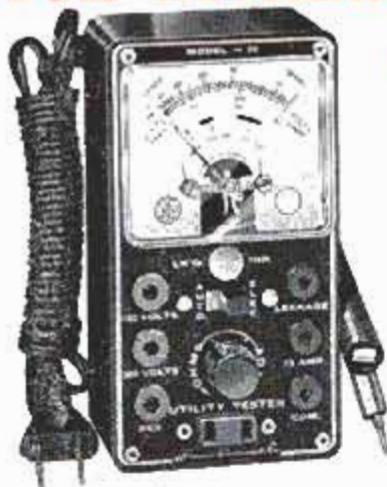
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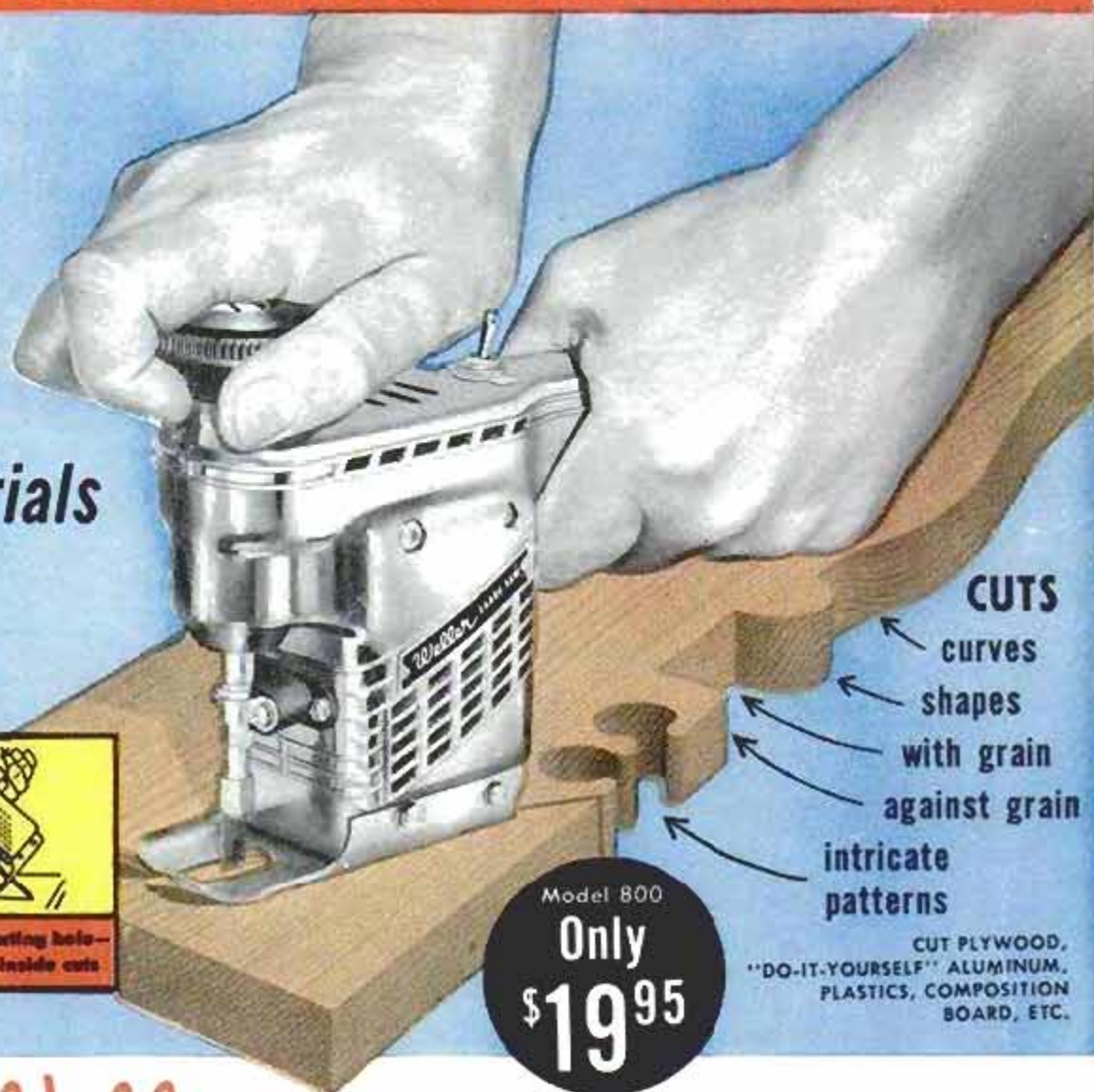
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