

# POPULAR MECHANICS

## MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF.

*See page 88*

*In This Issue*  
The story of your Navy recruit—  
**FROM BOOT TO  
ELECTRONIC WHIZ-KID**

*For the Craftsman*  
**Stop Those Roof Leaks**



# IT'S AMERICA'S LARGEST SELLING OUTBOARD MOTOR

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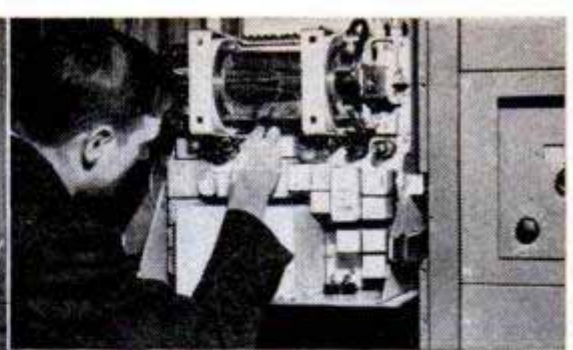


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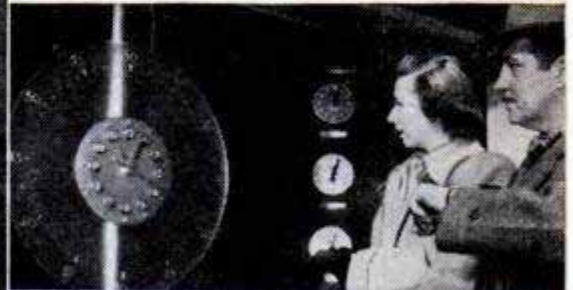




↑ Front of the new frequency-time standard at Bell Telephone Laboratories. In the rear there are 600 electron tubes and 25,000 soldered connections. Room temperature is maintained within two degrees.



Each crystal is enclosed in a cylindrical oven which holds the crystal temperature to within 1/100 of a degree.



At the A. T. & T. building at 195 Broadway, New York, passersby set watches by the world's most accurate public clock, which is controlled by the master standard.

## A vibrating crystal keeps master time



The controlling quartz crystal vibrates in vacuum at 100,000 cycles per second. The standard is powered by storage batteries, with steam turbo-generator standing by, just in case of emergency.

Ever since Galileo watched a lamp swinging in Pisa Cathedral, steady vibration has measured time. In the 1920s Bell Laboratories physicists proved that quartz crystal oscillators they developed to control electrical vibration frequency in the telephone system paced out time more accurately than ever.

Bell's latest master standard keeps an electric current vibrating at a frequency that varies only one part in a billion, keeping time to one ten-thousandth second a day.

A master oscillator governs carrier frequencies of the Bell

ship-to-shore, overseas and mobile radiotelephone services, the coaxial and *Radio-Relay* systems which carry hundreds of simultaneous conversations, or television. In northeastern states, it helps keep electric clocks on time.

The new standard also provides an independent reference for time measurements made by the U. S. Naval Observatory and the National Bureau of Standards. Thus, world science benefits from a Laboratories development originally aimed at producing more and better telephone service.

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# Popular Mechanics Magazine

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



## This month's cover

HOSE DANCING DERVISHES, the helicopters, seem to be whirling the jet planes and guided missiles right out of the spotlight these days. Time was when man dreamed he could fly like a bird. Now, thanks to the "eggbeaters," he's beaten the bird at its own game, for he can zoom straight up or down and hover motionless in the air. Recently the copter has toted thousands of casualties from danger in Korea and has air lifted Marines behind enemy lines. On page 88, noted British artist G. H. Davis presents "Helicopter Forecast From England," with complete details on big and little eggbeaters now under construction or on the drawing board. Our cover shows the huge W-85, which can carry 100 troops and has a 15-ton pay load. It very likely will be powered by twin-jet engines on each blade of a three-blade rotor. Mr. Davis also forecasts three other unique craft now in the design stage in England

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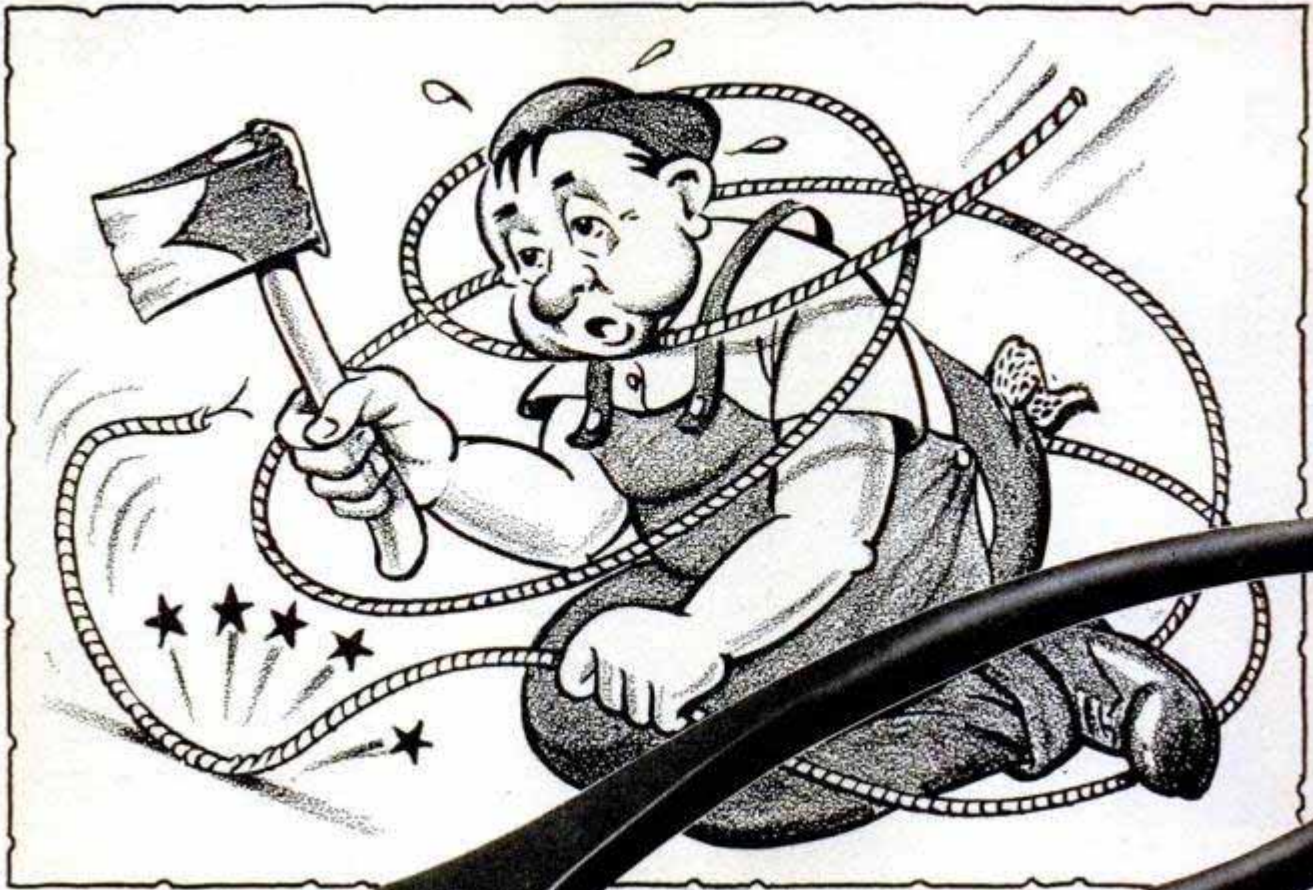
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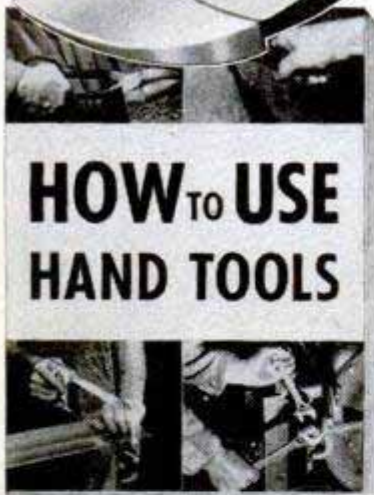
Other items, and manufacturers of available products described, are listed on pages 14, 16 and 18





## There's a CRESTOLOY PLIER for EVERY JOB

Apparently Buster has never studied the Crescent Plier display board at his hardware dealer's. If he had, or had read the Crescent book—"How to Use Hand Tools"—he would know that the right tool for this job is a pair of CRESTOLOY Heavy Diagonal Pliers. They're made of special steel, streamlined, with the right feel and cutting leverage for tough jobs. ♦ See your Hardware Dealer NOW



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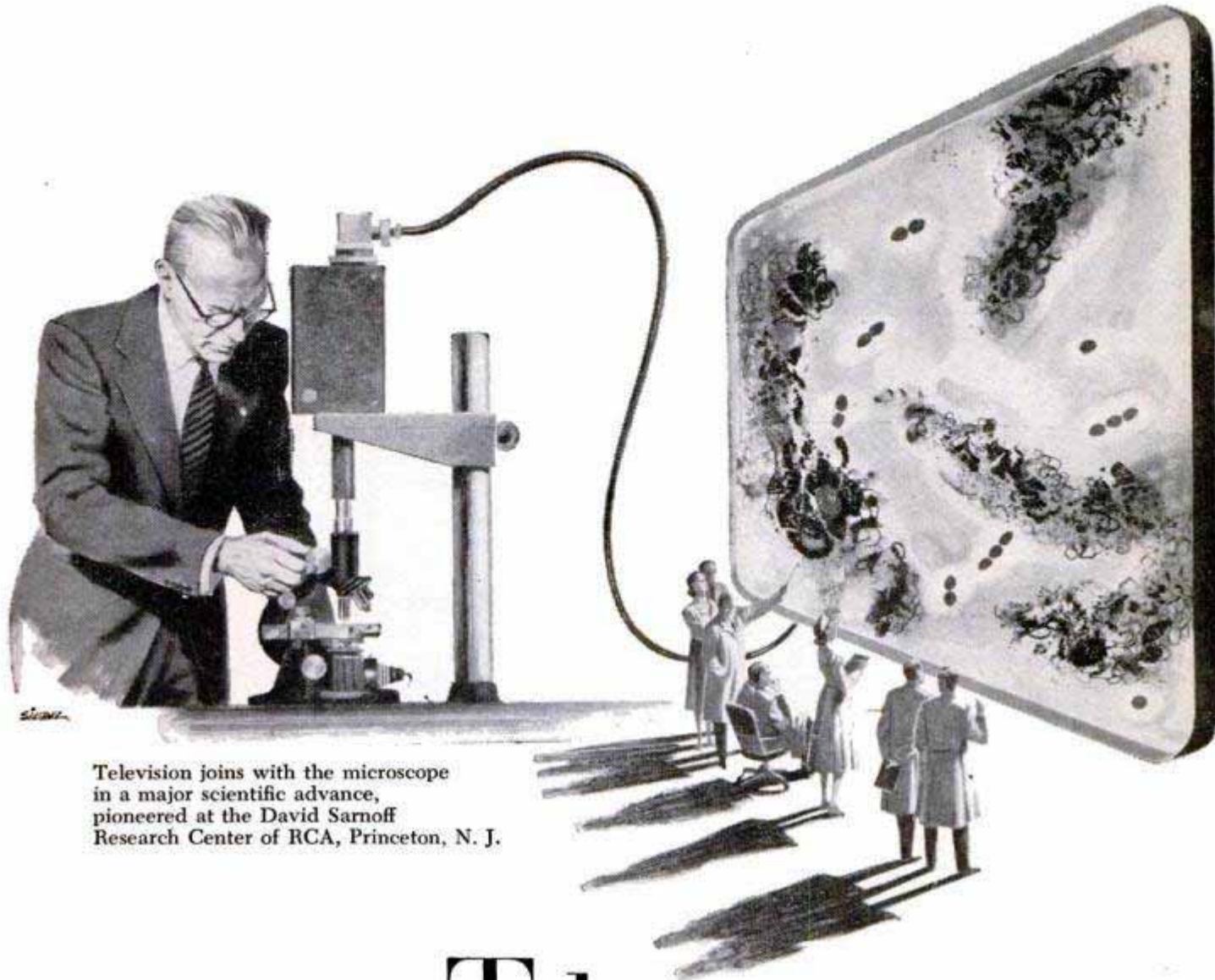
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Television joins with the microscope in a major scientific advance, pioneered at the David Sarnoff Research Center of RCA, Princeton, N. J.

# Microbes star on Television

## in war against disease!

Until very recently, scientists found it difficult to keep microbes alive for study—at high magnification—in light microscopes. Dyes used to make the microbes visible killed some. Others were destroyed by the intense light.

RCA scientists have solved this problem by making television a working partner of the microscope. “Eye” of their new system is a tiny industrial television camera built around RCA’s sensitive *vidicon* tube. No intense light is needed, since this electron tube “sees” at low light levels. And by making the tube sensitive to the red or violet bands of the spectrum, dyes and stains are eliminated.

With RCA’s new system, research men can now watch living germs or cells—immensely magnified—on the screen of a television set. Many are able to watch at a time. Students can be more easily trained. And science *learns more* about disease by watching *live* micro-organisms move about.

### How RCA Research benefits you:

Improving the microscope by teaming it with television is an example of the many paths explored by RCA Research. You benefit directly by better performance from any instrument or service trademarked RCA or RCA Victor.

\* \* \*

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# More and more car owners have the Pyroil habit

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## THE EDITORS



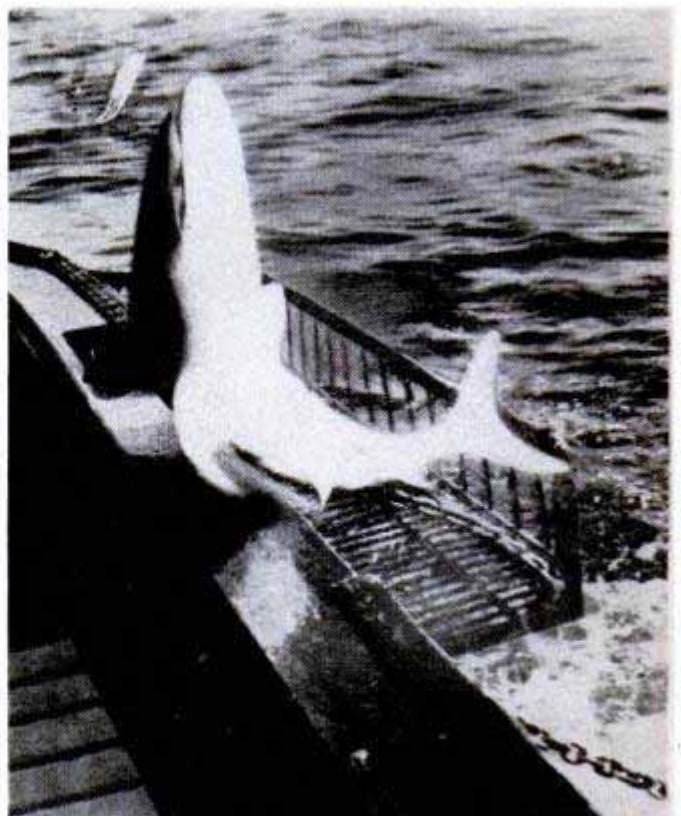
FLOYD CLYMER writes about automobiles, as every reader knows, but he is partial to airplanes when he travels to far places. On a recent flying trip to Europe to cover the foreign-car situation, he made Jules Verne look like a piker. From Milan, Italy, where he visited the Alfa-Romeo factory, Clymer made a quick side trip to Barcelona, then to Italy and to Vienna, where he landed—to his surprise—in the Russian zone. Floyd brought back scores of photographs of those fascinating European cars, and we have culled the best of them to illustrate his two-part article which begins on page 106 and will be continued in the April issue.

### Letter to the Editor

The enclosed picture entitled "Leap to Doom" was taken recently on a commercial tuna-fishing boat off the west coast of Mexico, just as the voracious 750-pound shark crashed against the boat's rail after leaping for a tuna being landed.

Sharks are a headache to commercial fishermen, as they molest and are very destructive to other fish. To get rid of them, they are, wherever possible, shot. Fishing is normally done from the suspended rack shown, but when a shark is known to be

(Continued to page 8)







How these 18 Experts can help you

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LaSalle's famous staff of Accounting authorities are helping thousands prepare for fast promotions and bigger pay. They can do the same for you!

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You see on this page a panel of experts who know Accounting from A to Z . . . all the way from simple bookkeeping, on up through advanced accounting, cost accounting, auditing, income tax, and coaching for the C.P.A. degree. These are only part of LaSalle's instruction staff. But what is most important to you . . .

... THESE C.P.A. EXPERTS KNOW HOW TO IMPART THEIR KNOWLEDGE TO OTHERS... HOW TO HELP YOU PREPARE QUICKLY YET THOROUGHLY FOR SUCCESS IN THIS VERY LUCRATIVE FIELD

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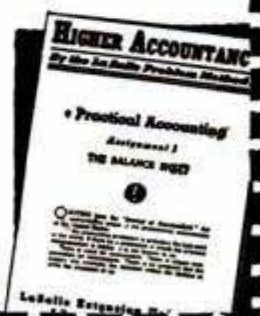
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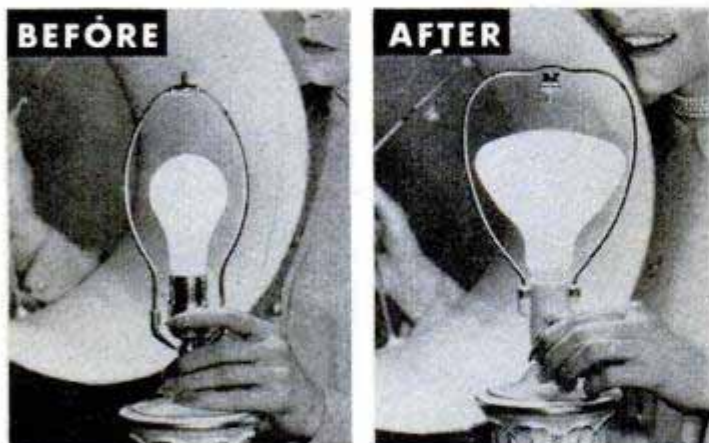
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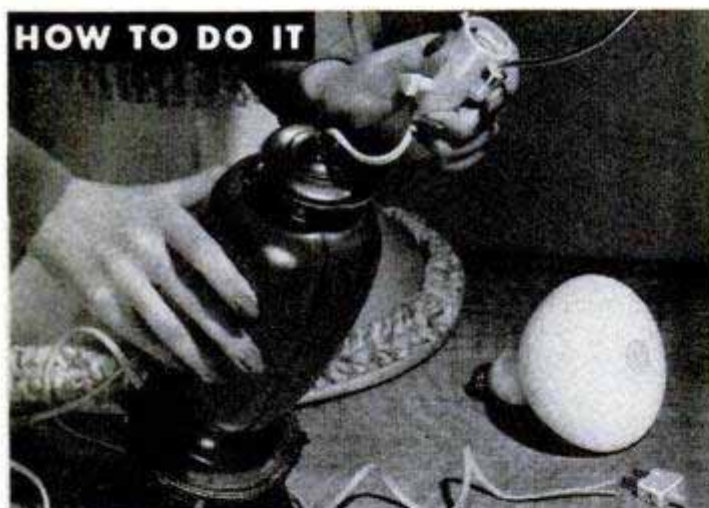




# Easy, low-cost way to have 3-way indirect lighting in your old table lamps



In just minutes, you can convert your old table lamps to give you indirect lighting with three brightness levels! General Electric's new R-40 3-lite bulb, plus Monowatt adaptor kit, transforms your lamps as shown above—gives pleasing diffused light and choice of 150, 100, and 50-watts at the flick of a switch.



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**FREE BOOKLET**—gives tips on modernizing table lamps. For your copy of "How to Wire Lamps", write to address above.



You can put your confidence in—

**GENERAL  ELECTRIC**

(Continued from page 6)

about, the crew move back on deck so the riflemen have a clear range for shooting. This had been done when this picture was taken.

Hoping to get a picture of the shooting of a shark, I was standing close to one rifleman, when suddenly the water just off the side of the boat boiled up, and this shark leaped into the air after the fish. The action was so swift and close and unexpected that I was not sure where the shark was at the time of tripping the shutter. The shark, after crashing against the rail, was carried by its momentum onto the boat's deck, with the crew scrambling for safety, and thrashed around and died—obligingly saving us the time and trouble of trying to shoot it.

Roy Whitehouse,  
San Marcos, Calif.

## Letter to the Editor

This will acknowledge the safe arrival of the citation announcing my election to *Popular Mechanics'* Half Century Hall of Fame. You know already of my appreciation of this election and this citation will serve as a continuing and visual reminder of the honor that has been accorded me.

Vannevar Bush,  
Washington, D. C.

## Letter to the Editor

I thank you very much for your kind letter and the citation [Hall of Fame]. I admired greatly the fine taste and workmanship of the script. . . .

Albert Einstein,  
Princeton, N. J.

## Letter to the Editor

The heavy pressure of work toward the close of the year, together with the holiday season, has delayed my acknowledgment of your courtesy informing me of election to the *Popular Mechanics'* Hall of Fame. To be included in the group you have selected is truly an honor. . . .

Igor I. Sikorsky,  
Bridgeport, Conn.

## Letter to the Editor

The very attractive citation in its frame came through in good shape, and I wish again to express appreciation of the honor of election to the Half Century Hall of Fame which *Popular Mechanics* has set up. You have handled the affair very graciously.

Karl T. Compton,  
Cambridge, Mass.

(Continued to page 10)



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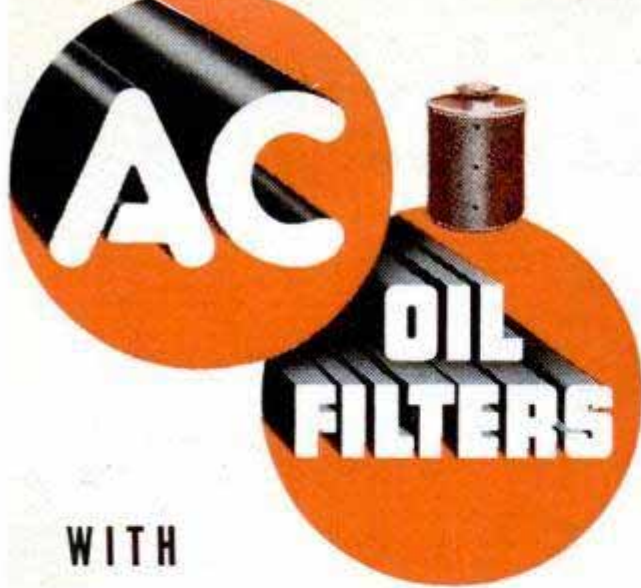
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- Industrial Metallurgy
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**Letter to the Editor**

Next month I expect to see . . . an apology to the automobile industry for the entirely erroneous figures quoted by Floyd Clymer [Clymer's report on the Hudson, December 1951] on his stockcar records. He must have been looking at the wrong book because, according to my records, he was not quoting Hudson stockcar records but records set by a supercharged 1937 Cord Super Eight. . . . No Hudson has been built yet that will clock 100 miles per hour. I'll take my "Cad" and outperform a Hornet any day of the week. . . . A 1939 Hudson Eight does hold the record for stockcars of less than 305 cubic inches at 93.88 miles per hour.

Maj. Elden D. Jones,  
Hdqrs., 15th Air Force  
March A.F.B., Calif.

Dear Major Jones:

You must have an eagle eye to have detected the error, as you are the only one who has written about it. Actually, my information came out of the A.A.A. official record book. . . . I unintentionally picked the figures from the Cord records instead of the ones from the Hudson, which were printed alongside. Therefore, the records that I mentioned in my *Popular Mechanics* article actually were the ones made by the supercharged Cord. The speeds given for Hudson, which previously had held the record, should have read as follows:

- 90.15 m.p.h. for 500 miles,
- 89.00 m.p.h. for 1000 miles,
- 87.78 m.p.h. for 2000 miles.

The Class C closed record held by the Hudson Eight for one mile is 93.88 miles per hour, and the Hudson Six made the record in Class D of 81.19 miles per hour for one mile in 1939.

Floyd Clymer.

(The editors join Floyd Clymer in apologies to Major Jones, Hudson and Cord for the error.)

**Letter to the Editor**

I've been getting *Popular Mechanics* since September 1906. . . . In the 20s I was in Troy, Mont., four miles from the village. Every month I walked the distance, both ways, to get my magazine . . . in a hurry. Could have waited for it in the mail two or more days later. Not for me. When I want something, it's now! After 45 years I'm still a more-than-satisfied customer.

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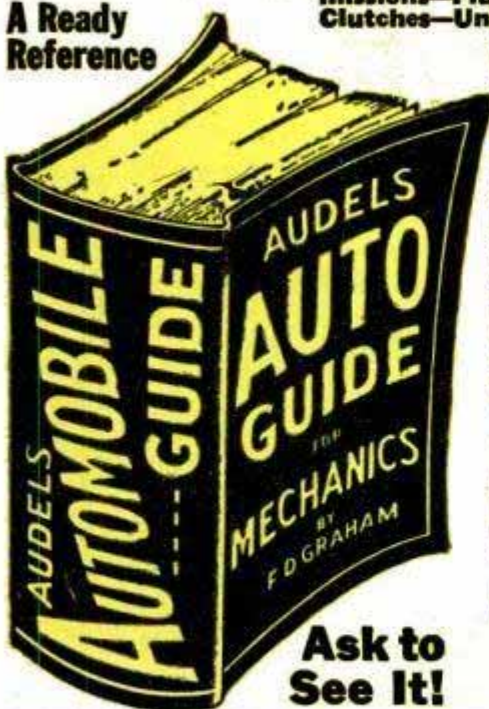
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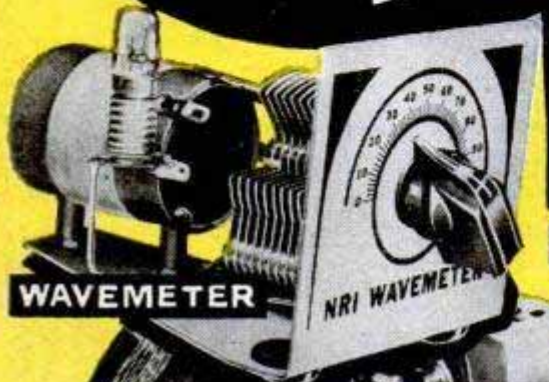
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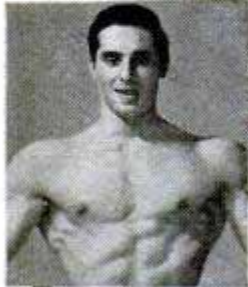
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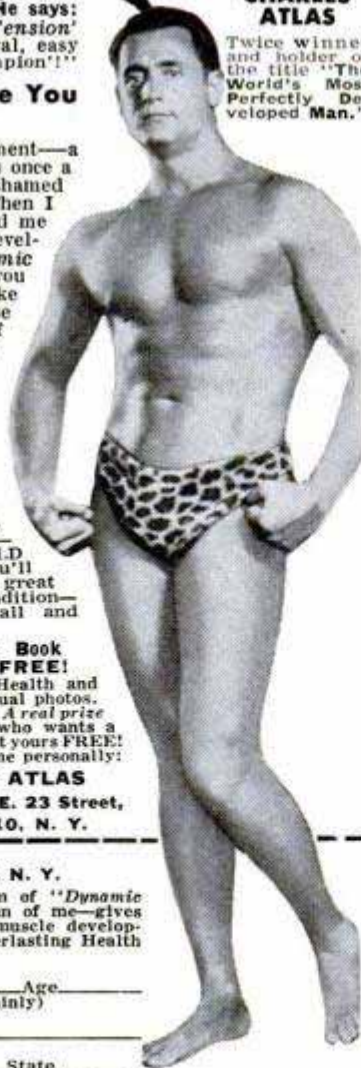
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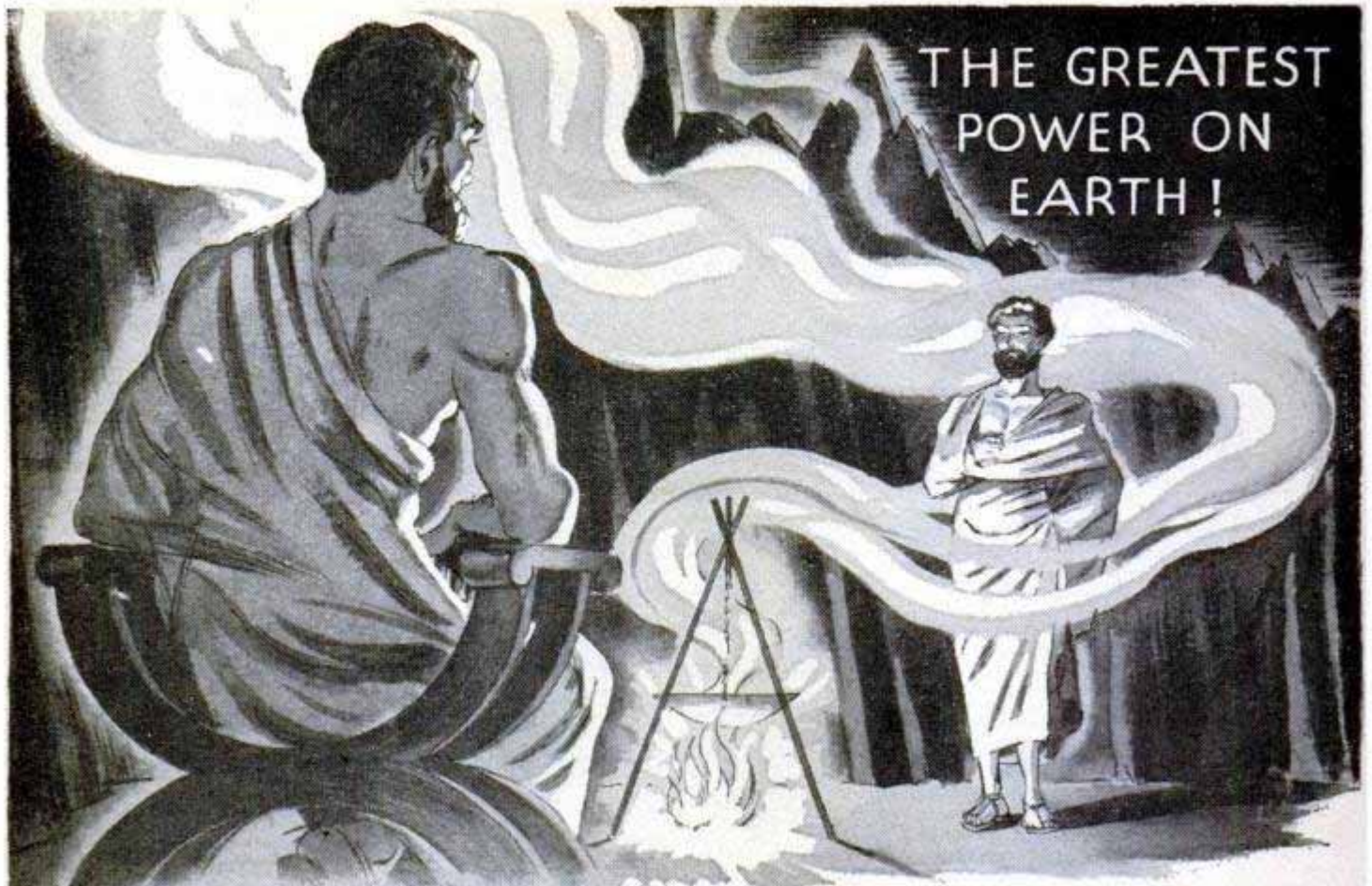
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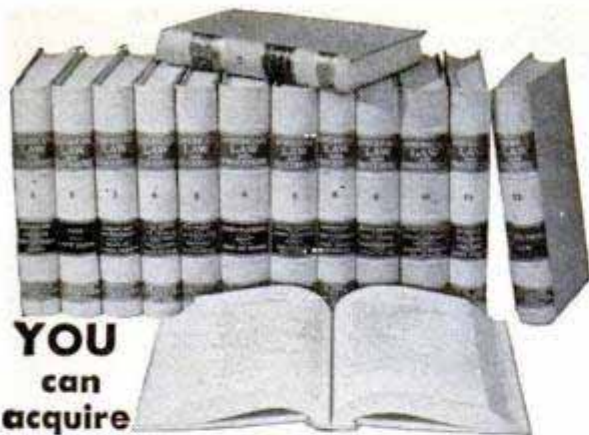
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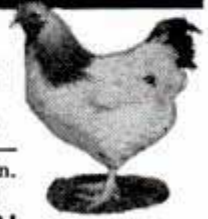
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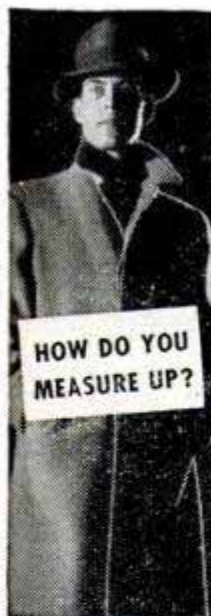
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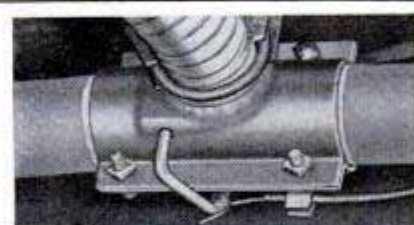
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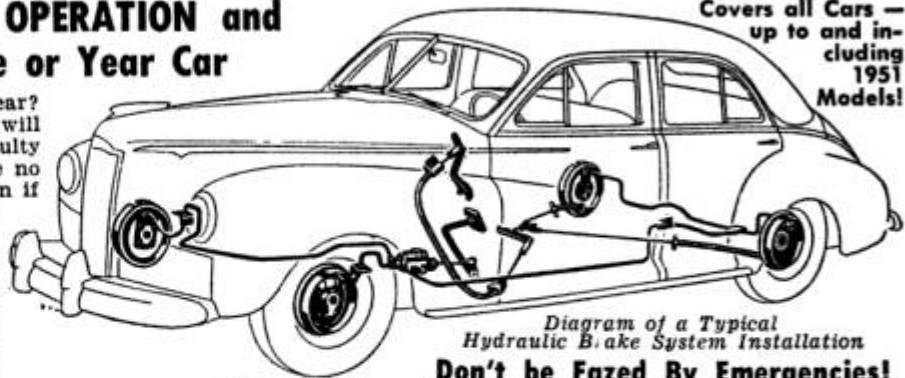


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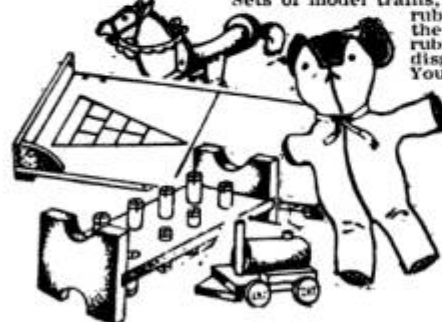
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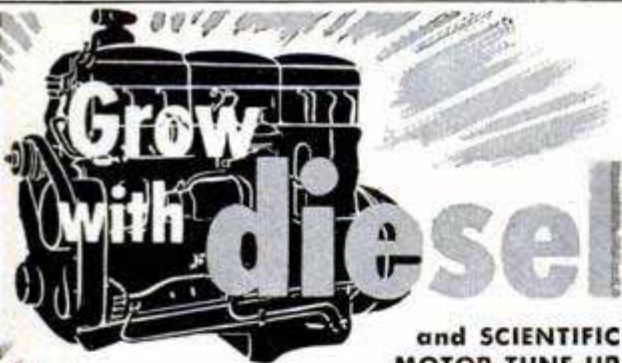
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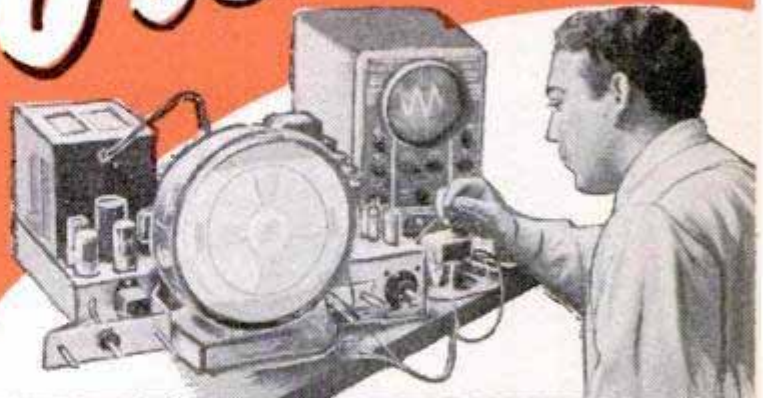
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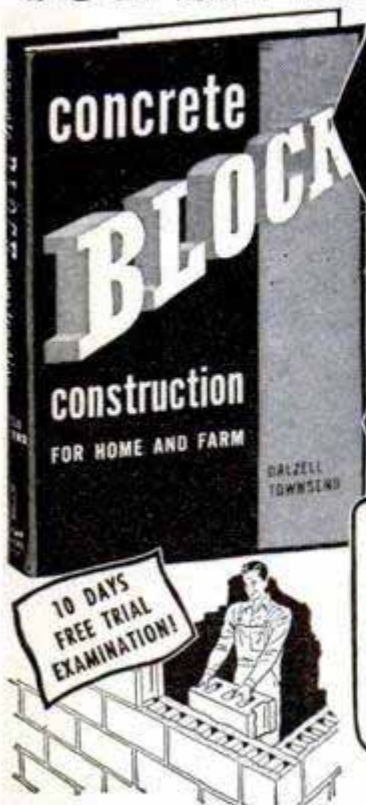
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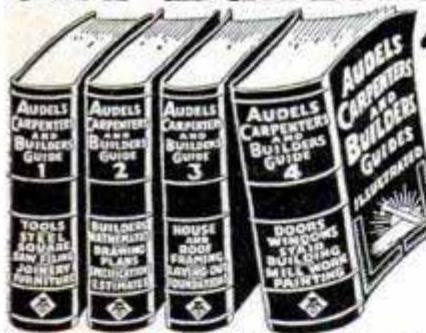
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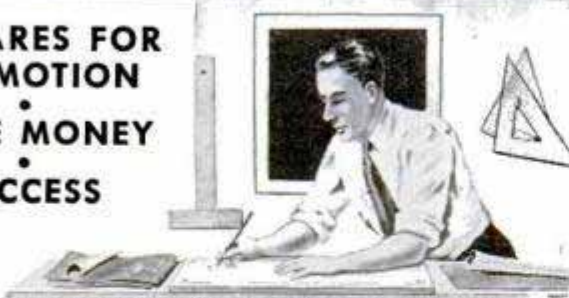


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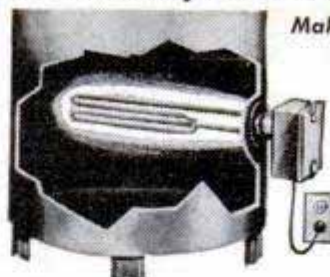
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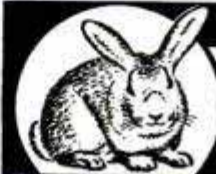
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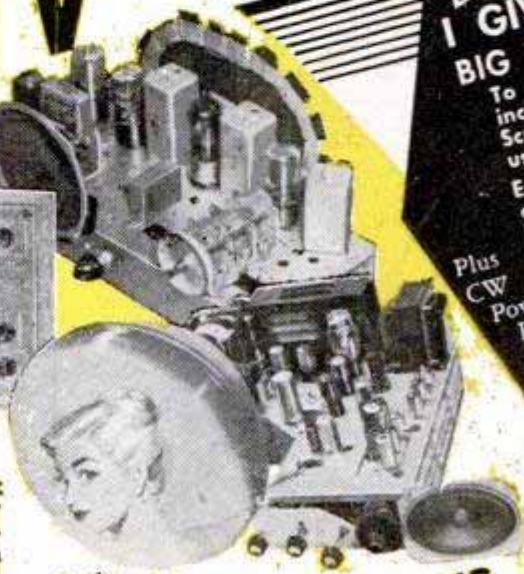
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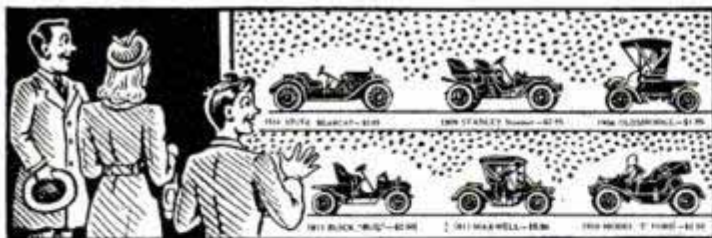
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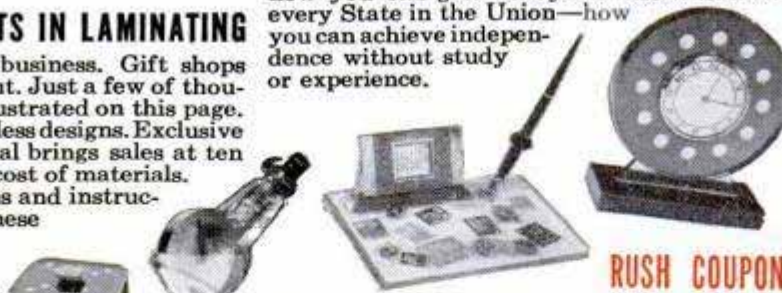
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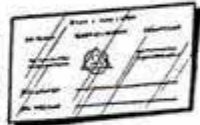
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"MAKE Perfume." Profitable mailorder business. Catalogue free. "International," 6347 Parnell-PM-3, Chicago 21, Illinois.

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**MAKE** Money calling on friends. Show nationally advertised greeting cards—New all-occasion assortment and laugh-packed barrel-of-fun. Also sensational pinafores and parasols personal notes. All three dollar sellers. Up to 50c profit for you. Big line, includes gift wrappings, stationery, gift items, etc. Get three assortments on approval. Write Wallace Brown, 225 Fifth Ave., Dept. J-4, New York 10.

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**HOTTEST 39c Item** on the market. National Sales & Service, Greenville, Penna.

**BRAND New invention**, stops backache. Sensational offer to agents. Dr. Latham Belt Company, Box 961, Lakeland, Florida.

**MEXICAN Feather pictures**, unusual novelty. \$1.00 (stamps) brings \$2.00 worth samples, refunded if unsatisfied. Aztec Art, Apartado 762, Mexico City.

**PART Time salespeople**—Men and women. Daily cash returns showing Artmoore Products, three "in demand" items. No investment in stock. Liberal no risk starting offer. Write Dept. P-3, Artmoore, 1319 North Third, Milwaukee, Wisconsin.

**ULTRA-Blue stock signs**—7c, sell 50c. 2000 slogans, 7" x 11", comedy, religious, general. 15 samples, \$1.00. Lowy, 812 Broadway, Dept. 658, New York 3.

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**GET On bandwagon** and help popularize new business method needed by every large, small industrial, commercial concern. Profits quick and tremendous. Investment small. Write for free brochure telling entire story. Kemble & Mills, Inc., 317 Third Ave., Pittsburgh 22, Penna., Dept. ACM.

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**READY To pay you biggest cutlery profits** ever known. Exclusive line made for the masses. Rush inquiry. James Industries, 25 Municipal Bldg., Skaneateles, N. Y.

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**BIG Profits selling ties**. (\$2.00 values) \$6.50 dozen. Free catalog. Empire Cravats, 648 Broadway, New York 12.

**LOOK**—Big profits, free samples. Greeting cards, personalized napkins, personalized stationery and gift items. G. M. Dunn Co., 484 Broadway, Newark, N. J.

**MEN, Women** make \$5.00, 15 min. New patent. Get protected agency your territory. Carter, 443 Seaman, Akron, Ohio.

**MEXICAN Feather pictures.** Sell on sight; 200% profit! Free details; sample 10c stamps. Sylvia PV, Apartado 9036, Mexico City.

**PRINTING**—Salesbooks, envelopes, tags. Free illustrated catalog. Ersco, Bronx 72, N. Y.

**FAST-Selling product**, earn money! Velazquez, 696-P Elton Ave., New York 55.

**WALKER'S Tooth powder**, users' favorite, can multiply your profits. Write J. Walker, 633 Plymouth Ct., Dept. 3, Chicago 5.

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**POWER Lawn mower**—\$45.00. Prepaid. Sensation. Exclusive deal. Rotacut-RP, Excelsior Springs, Mo.

**BARGAINS**—Terrific savings, job lots, close-outs! Also save up to 50% on complete lines of drygoods, clothing, hosiery, notions, drug sundries, toiletries, novelties, gifts, jewelry, television, etc. 2000 items. Send 25c for illustrated wholesale bargain catalog, closeout flyers, and special "get acquainted" offer. Valuable merchandise certificate (worth many times 25c) included free. Reliable Jobbers, 311-B N. Desplaines, Chicago 6.

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**\$50 WEEKLY** Selling finest razor blades, other items. Free details. Edisans, Box 274, Far Rockaway, N. Y.

**GUARANTEED 200,000 Mile ring, valve job!** Restores compression! Stops oil pumping! Send \$3.00 for \$6.00 package and sales offer! Nerlino, Box 7, Inglewood 5, Calif.

**SCHOOL Seniors!** A postal will bring you our wonder, Kwick-Sell Cardalog of popular graduation name cards. Biggest profits! Only firm giving free Golden Memory Book and Souvenir Chest. Don't miss out. Hurry that postal! Craftcards, Box 235L, Pittsburgh 30, Penna.

**NEED Extra cash?** Take orders for personal initialed belts and buckles, cap badges, tie holders, etc. Choice of 3000 emblems. Free sales kit. Hook-Fast, Box 1425PM, Providence, R. I.

**SCHOOL Seniors**—Earn sensational profits selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Free sample kit. Printcraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

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**AGENTS; Stamping names** on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

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

**SELL Big money-maker** to men and women. Easy handwork makes fast-selling useful articles. Sunmade Company, Brockton 64, Mass.

**GOLD Lacquered and silver sign letters**, Windows, doors, trucks. Standard sizes. Penny each. Free samples. Atlas-P, 544 West 79th, Chicago 20.

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**FLUOR-O-Signs** sell fast. Top commissions. Write Fluor-O-Signs, 106 Forsyth, New York 2, N. Y.

**PAINTS, Varnishes, roof coatings, flooring, automobile undercoating.** Sell ready-made accounts. Earn up to 30% commissions—Time, territory your own. Big season ahead. Scott Paint Co., 2948 E. 81, Cleveland, Ohio.

**BRAND-New sport shirts 50c each** and amazing money-making opportunity for you! Take orders for world's finest uniforms and work clothes. Sell to garages, service stations, factories! Earn huge profits, get new sport shirts at 50c! Write for thrilling details, free outfit. Topps, Dept. 533, Rochester, Indiana.

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**I'LL Put a "shoe store business"** in your pocket! Nation's leader trains you to make big money! Fit men, women. Free sample outfit. Write today! Consolidated Shoe System, Dept. CI-100, Chippewa Falls, Wis.

**ANYONE Can sell Hoover DuPont nylon uniforms** for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. C-100, New York 11, N. Y.

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

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1000 EMBOSSED Business cards (raised letters) \$3.95 postpaid. 2 color cards \$4.45. Samples free. All-Trades, 304 Chestnut Street, West Hempstead, N. Y.

100 8 1/2x11 HAMMERMILL Letterheads and 100 envelopes \$1.95. H. Hudson, Centredale, R. I.

5000 #6 3/4 ENVELOPES Printed \$3.10 per thousand. 1000 embossed business cards \$4.25. Free samples. Michel, Box 76, New York 16.

EMBOSSED Business cards. Free samples. Vine Ad Press, 582A Courtland Avenue, New York 51, New York.

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BUSINESS Stationery. Lowest prices. 500 8 1/2x11 letterheads \$3.55, 500 6 3/4 envelopes \$3.30, plus postage. Send 10c for ready-made samples and price list. Centro Products, LeCenter, Minn.

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QUALITY Printing. Stationery, circulars, booklets, publications. Free catalog. Adams, 30 West Washington, Chicago 2, Ill.

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125 8 1/2x11 LETTERHEADS And 125 6 3/4 envelopes \$2.00, postpaid. 250 of each \$3.50. Going Print Shop, Box 1544A, Muskogee, Oklahoma.

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MAKE Your own, self-molding, rubber printing cuts. Plexirubber, Argyle 1, Wis.

PRESSES, Type, cabinets, supplies. List for stamp. Lincoln Press Company, 220-F Hartwell, Fall River, Mass.

PRESSES, Supplies, paper. Catalog 10c. Custom, Box 211-P, Springfield, Missouri.

PRINT Your own cards, stationery, circulars, advertising. Save money. Simple rules. Print for others, nice profit. Raised printing like engraving too. Have home shop. Details free. Kelsey Presses, L-11, Meriden, Conn.

PRINTING Presses, type, supplies. Lists 3c. Turnbaugh Service, Loysville, Penna.

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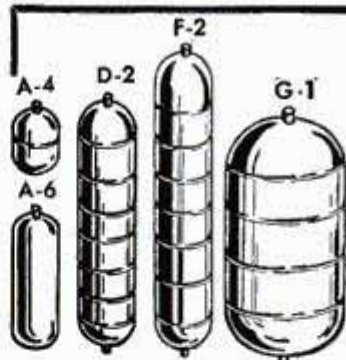
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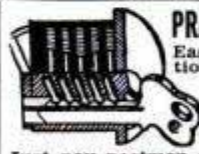


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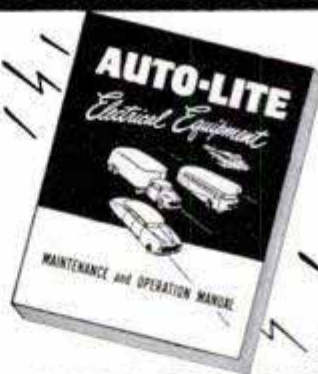


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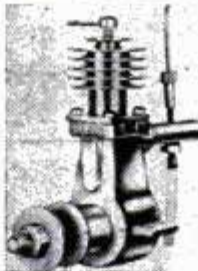
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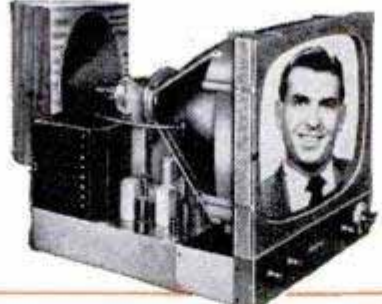
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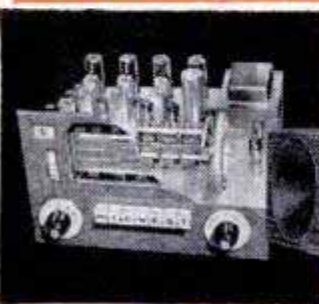
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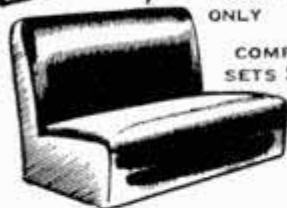
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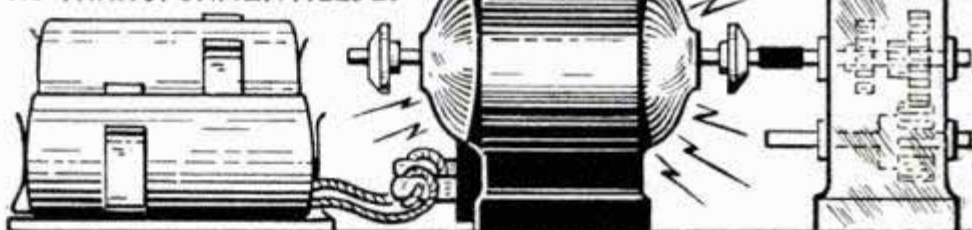
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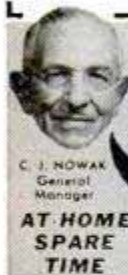
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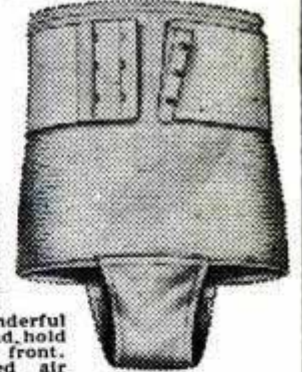
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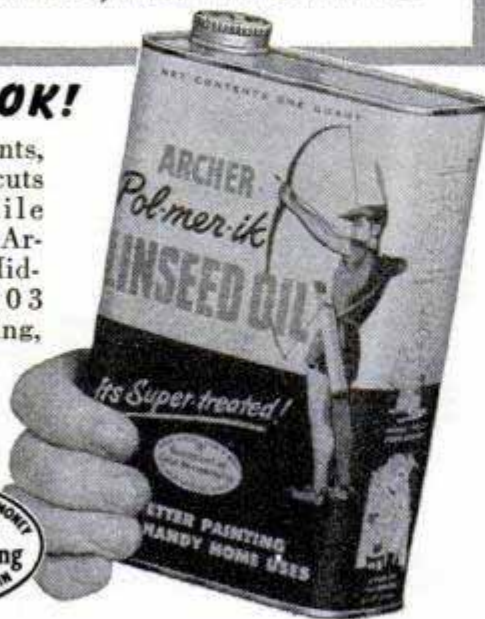
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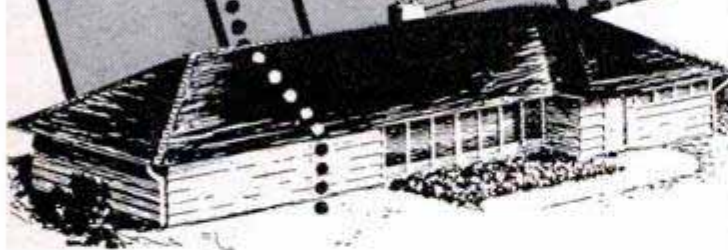
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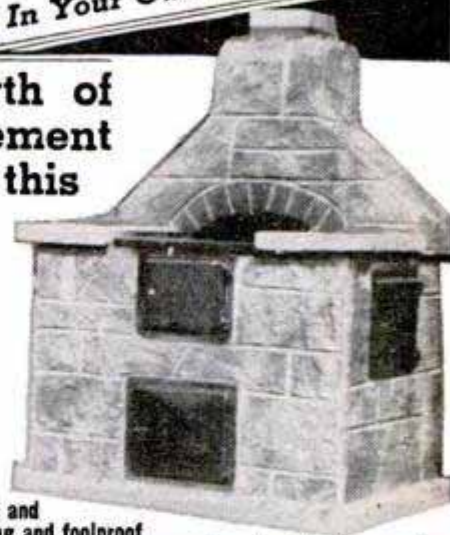
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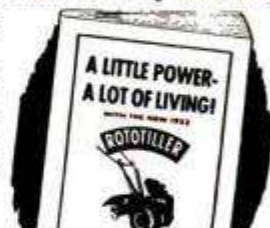
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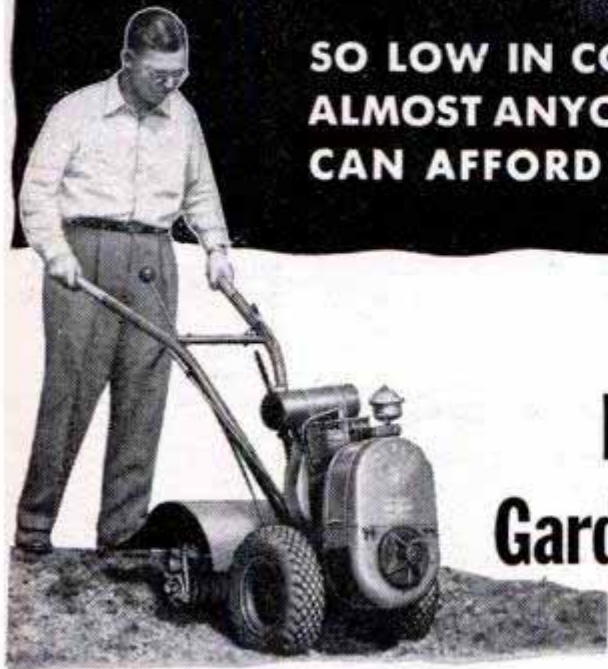
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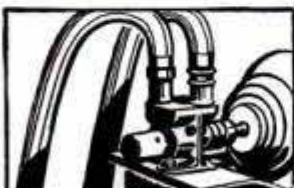
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Rebore 6 Cylinders.....	\$20.30
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Labor (including grinding valves, fitting pins, installing main and rod inserts, etc.).....	56.40

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# Perfect Circle

PISTON RINGS—NURLIZING

*The Standard of Comparison*





WITHIN THE PAST few months, chemistry—like a curious lad—has vaulted across the fence and started exploring a vast new field. Though the chemist knows little about this broad expanse, he's aware of its significance. He realizes he has leaped into a third dimension in chemistry and, dimly, he sees it's a dimension with truly staggering possibilities.

In the past the chemist's work has been divided into two broad fields—organic and inorganic chemistry. Traditionally, organic has been the more important and fascinating field, for it deals with hydrocarbons, the fuels and foods of our universe. Hydrogen and carbon eagerly combine with each other and with other elements to form a huge array of basic building blocks—from plywood and cold cuts to plastics and coal.

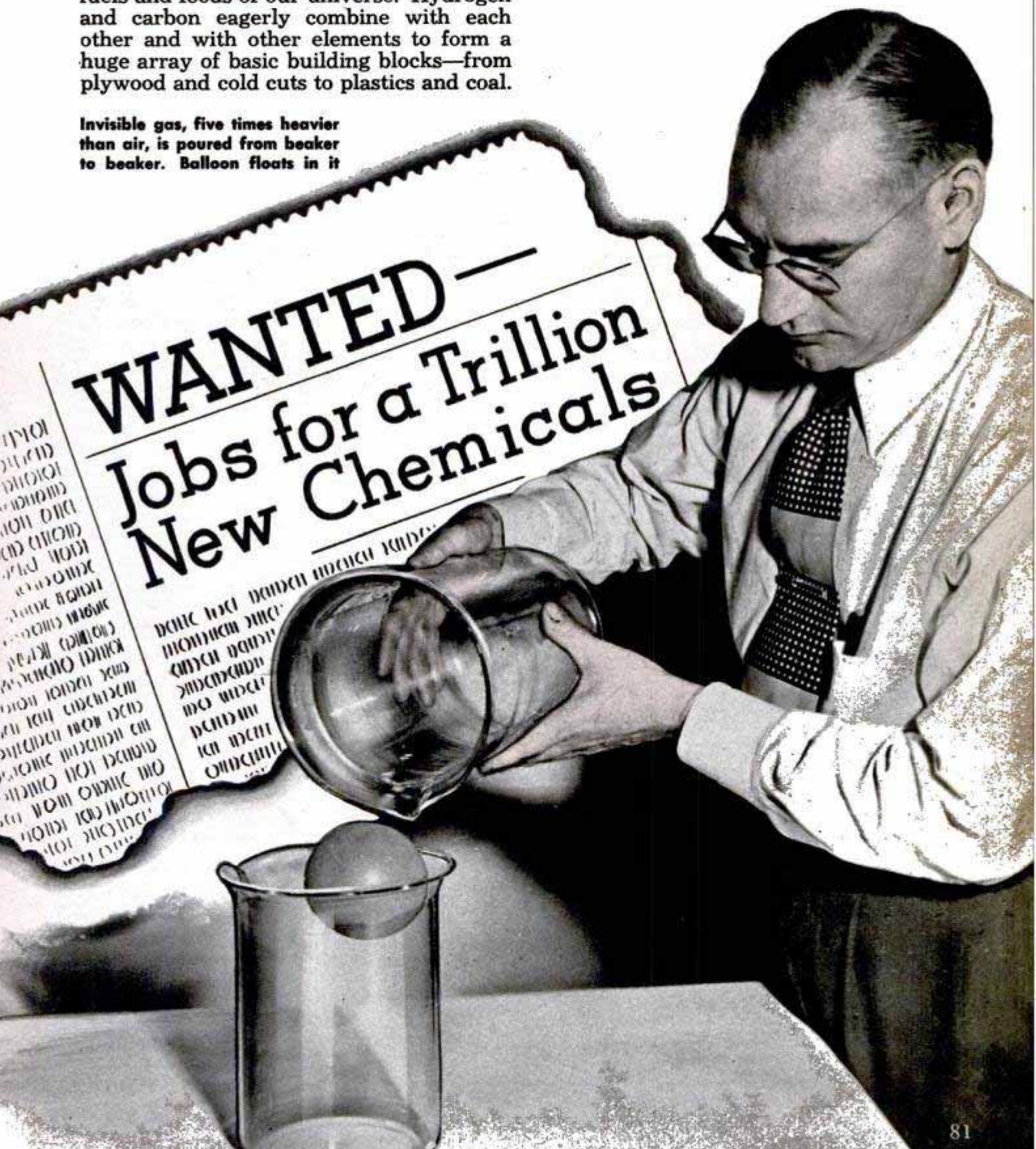
Invisible gas, five times heavier than air, is poured from beaker to beaker. Balloon floats in it

# POPULAR MECHANICS

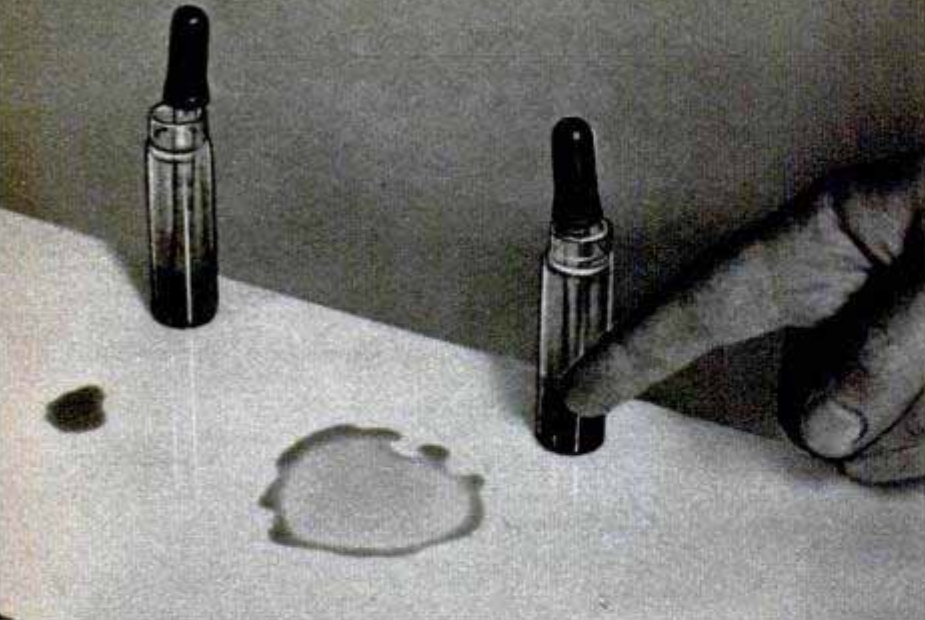
MARCH  
1952

WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 97 NO. 3

By Clifford B. Hicks







Common detergent, left, remains in drop form on smooth surface. New chemical keeps spreading until it evaporates

can bet your boots this new horde of chemical servants soon will play an important part in making your life safer and more enjoyable.

Consider, for example, the possibility of a lifetime lubricant sealed into your car engine; a house paint that just plain refuses to permit your home to burn down; pots and pans that literally push away scorched foods; detergents so effective a grease monkey's overalls will come clean in a

few swishes.

Conservative chemists remain silent when you start discussing such items, for they haven't yet been produced. But the same scientists will lecture in glowing terms on the strange and novel properties of fluorocarbons that very likely will make these products possible.

The basis of all this optimism is a single cast-iron pot, about as unimpressive as a washtub. It's virtually hidden away in one corner of a new building erected by Minnesota Mining & Manufacturing Company. This unpretentious tub, actually an electrolytic cell, is turning out an impressive array of fluorocarbon compounds, not just in test-tube lots, but by the ton.

The story of the chemicals actually is the story of reforming the most sinful of all

Now chemistry stands on the rim of a third basic field—the fluorocarbons. In a brick factory in southern Minnesota, fluorocarbons are pouring out by the ton. They promise to be every bit as versatile and useful as the vast number of hydrocarbons.

It's estimated there are about a million hydrocarbons, of which around 10,000 are available commercially. Beside the chemical symbol for each of these hydrocarbons the chemist now can insert the symbol of a corresponding fluorocarbon. But this is just the beginning. The derivatives of the new family are so numerous it's theoretically possible to produce around a trillion fluorocarbon compounds. So far only about 500 chemicals in this chain reaction have been turned out, but these show such strange and desirable personalities that you

Table shows relationship between hydrocarbons and new chemicals. Note how properties are almost opposites

	CHEMICAL COMPOUND	SYMBOL	PROPERTIES	USES AND POTENTIAL USES
HYDROCARBON	BUTANE	$C_4H_{10}$	HIGHLY COMBUSTIBLE GAS	FUEL GAS
FLUOROCARBON		$C_4F_{10}$	HEAVY, INVISIBLE, NON-FLAMMABLE GAS	FIREPROOF BLANKET FOR TANK FILLED WITH EXPLOSIVE GAS
HYDROCARBON	TRIBUTYLAMINE	$(C_4H_9)_3N$	LIQUID SOLUBLE IN WATER TO PRODUCE A COMPOUND WHICH CONDUCTS ELECTRICITY	USED AS A BASE IN MANUFACTURING OTHER COMPOUNDS
FLUOROCARBON		$(C_4F_9)_3N$	INERT FLUID, INSOLUBLE IN WATER, WHICH WON'T CONDUCT ELECTRICITY	ELECTRICAL INSULATION
HYDROCARBON	PROPANE	$C_3H_8$	HIGHLY COMBUSTIBLE GAS	FUEL
FLUOROCARBON		$C_3F_8$	NONFLAMMABLE, NONTOXIC GAS	REFRIGERANT
HYDROCARBON	ETHYL ETHER	$(C_2H_5)_2O$	HIGHLY VOLATILE AND COMBUSTIBLE LIQUID	ANESTHETIC AND SOLVENT
FLUOROCARBON		$(C_2F_5)_2O$	NONTOXIC, NONCOMBUSTIBLE GAS	FIREPROOF GAS BLANKET, GASEOUS INSULATION FOR RADAR AND TV TRANSMISSION CABLES

NOTE HOW SUBSTITUTION OF FLUORINE FOR HYDROGEN, IN THE CHEMICAL SYMBOL, COMPLETELY CHANGES THE PROPERTIES OF EACH COMPOUND



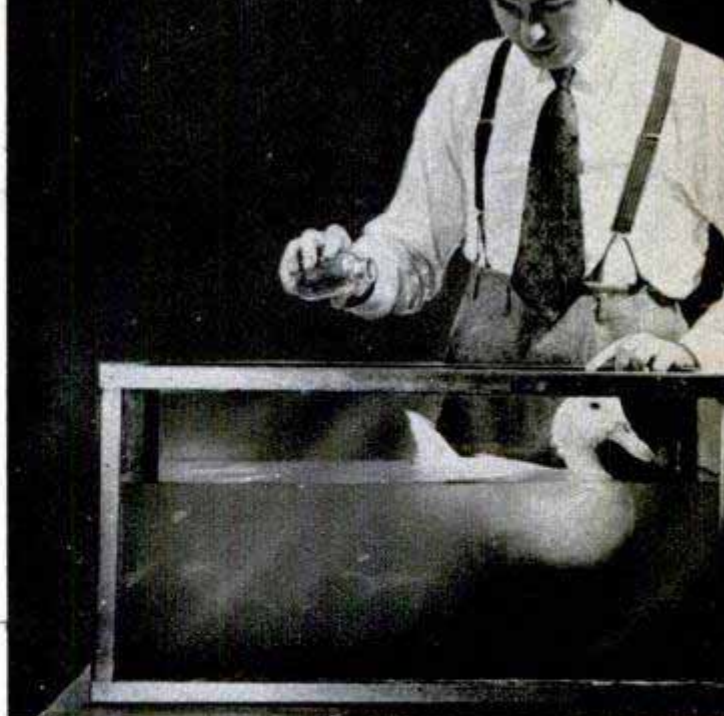
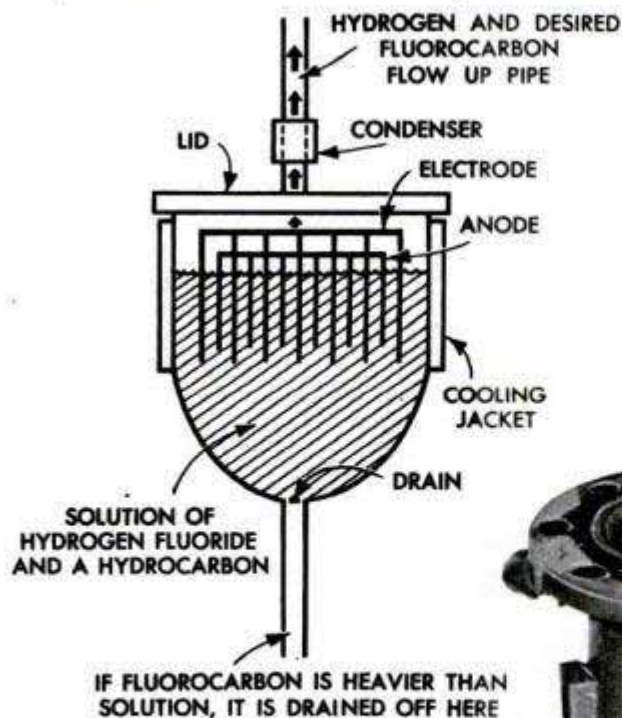
elements, fluorine. The history of this wayward gas is written in a series of violent explosions, blasts which have wrecked the few laboratories where men have been brave enough to try to tame the stuff. In pure form, fluorine is the most reactive element in nature. Metals burst into flame upon contact; glass vanishes in a puff of smoke, and asbestos melts into ashes.

The element is extremely plentiful in nature, but it's always combined with other elements. Fluorspar, the most important fluorine-containing material, occurs in big and widespread deposits. Phosphate rock also contains much fluorine. In these forms the element is as docile as a lamb.

Chemists hadn't even seen the pure gas until 1886, when a French scientist, Henri Moissan, tried twisting the tiger's tail. He electrolyzed a solution of hydrogen fluoride, obtained fluorine, and caught just a glimpse of the green gas before it exploded. The fluorine vapor almost killed Moissan, and nobody tried to pick a real argument with the tiger until the mid-30s, when it was tamed just enough to incorporate it into the Freon compounds.

The few scientists who experimented at all with fluorine became convinced that if it were combined with carbon the result would be a strange family of chemicals with properties just the opposite of the pure gas. Fluorocarbons promised to be the most stable compounds ever imagined. The problem was simply—and dangerously—to produce them.

Experimental laboratory cell, made of cast-iron pipe, can theoretically turn out a trillion new chemicals. Diagram shows simplicity of the process



Man outsmarts duck: Drops of fluorocarbon in water make it so "wet" even a duck sinks slowly to bottom

One day in 1939 Prof. J. H. Simons of Pennsylvania State College mixed hydrogen fluoride (a derivative of one of the fluorine compounds found in nature) with one of the hydrocarbons. He passed a direct current through the mixture and presto—the result was a whiff of



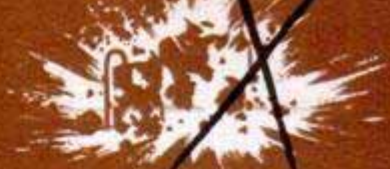




FIRE



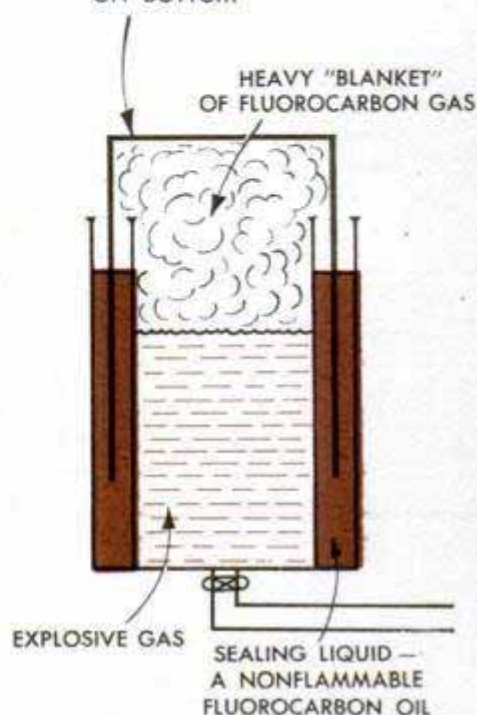
PAINT OXIDATION



EXPLOSIONS



TOP SECTION MOVES DOWN AS EXPLOSIVE GAS IS DRAWN OFF BOTTOM



EXPLOSIVE-GAS TANK PROTECTED BY FLUOROCARBONS

Doctor Taylor, behind array of fluorochemicals, demonstrates that one liquid is much heavier than water. Diagram shows how storage tank filled with explosive gas could be protected by "blanket" of fluorocarbon gas

hydrogen gas and a few cubic centimeters of fluorocarbons.

A short time later, with war flaring through Europe, a couple of government officials asked a group of industrial chemists to produce pure fluorine, not just by ounces but "maybe a million pounds of it."

The flabbergasted chemists, sworn to secrecy, went to work. They came through with free fluorine all right. They probably didn't know the fluorine was needed to produce uranium hexafluoride, which in turn was converted into the stuffing of the atom bomb. Trouble was, the uranium-fluorine combination was so corrosive it reacted with anything and everything. Metal pipes and glass tubes, sealed with grease or rubber, just melted away when exposed to the stuff.

Simons, who was acquainted with the problem, submitted a few drops of the liquid he had produced in his electrolytic cell, and tests showed it resisted the ravages of even its parent, fluorine. Fluorocarbons

eventually were used as sealants and coolants in separating the uranium isotopes.

Simons had been working on other projects for Minnesota Mining & Manufacturing Company (popularly called 3M), and in 1944 the company started sponsoring his work in fluorocarbons. The immediate result was a series of tests with the experimental cells. The ultimate result was the first big cell, which went into operation last October and now is turning out a variety of fluorocarbons in quantities large enough for wide distribution for testing. The new chemicals are seeking steady employment.

Meanwhile seven years of unpublicized research and millions of dollars have gone into the project. Dr. Nelson W. Taylor, manager of the company's Fluorochemicals Department, has a research crew of 75 scientists, mostly eager young men who know they are stalking big game. In the company's St. Paul laboratories they are tracking down one fluorocarbon after another with deceptively simple experimental cells.





ROTOR



TERRITES

The beauty of the cell method is that it by-passes free fluorine. Another big advantage is that it is a continuous process. The 3M scientists have been working around the clock to find the limits of their process. So far they're stumped. Apparently you can produce virtually any imagined combination of fluorine, carbon and other elements in the cell.

The cell itself is as simple as an automobile storage battery, which it resembles in many ways. And turning out one of the fabulous new chemicals is as easy, in theory, as mixing a pot of stew and bringing it to a boil. The chef mixes a solution of hydrogen fluoride with an organic chemical in the vat. The particular chemical he uses depends upon the fluorocarbon he desires. He drops the cell lid into place and passes an electric current of five or six volts through the cell. The current causes the fluorine to replace the hydrogen in the chemical. The displaced hydrogen goes up

(Continued to page 252)

New gas snuffs out a blaze in a split second. Army says it's superior to all other fire extinguishers

At bottom of tube is a fluorocarbon. Next comes layer of water, and at top is a layer of a hydrocarbon, heptane. Three layers won't mix, each refracts light differently (note the "steps" in the hand-held thermometer). Better film may result from fluorocarbons' remarkable optical qualities

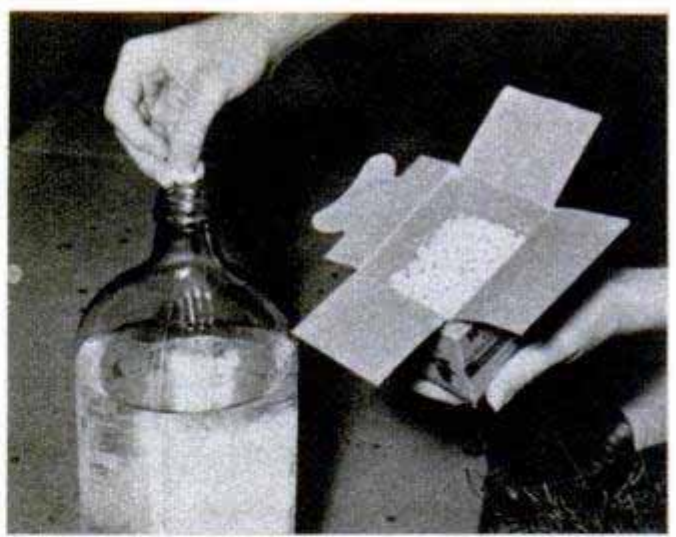




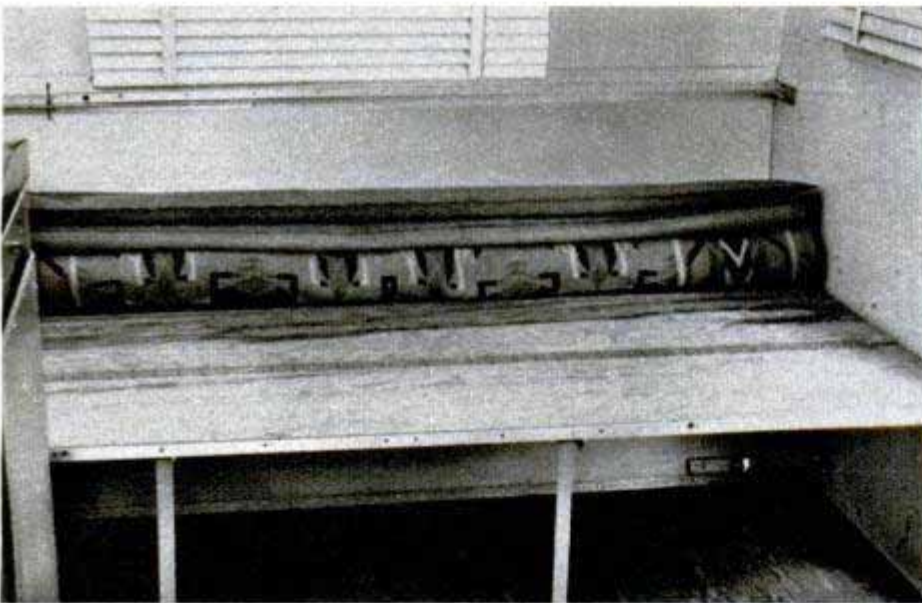


## Pills for Plants

Gardeners can feed vitamin B1 to their flowers and vegetables with a spray attachment for the hose. The attachment is a coupling which connects with the faucet. The hose then is screwed onto the coupling. From the attachment runs a small rubber tube which is dropped into a container of water. The gardener dissolves a number of



vitamin tablets in the water, then sprays his lawn. As the water comes through the hose, it draws with it a small amount of the vitamin-enriched water from the container. In planting or transplanting, a tablet can be dropped directly in with the seed or plant. It dissolves over a period of time to enrich the soil and aid the plant's growth. The vitamin complex designed for plants also is available in powdered form.



## Trailer Bed Folds Out of Way

Replacing the usual sofa bed, a compact shelf-type trailer bed folds against the wall to provide extra space for chairs and a table. Long piano hinges allow the bed to fold in two places to provide a locker compartment for the bedding. A pneumatic mattress is used with the bed, which is supported on each end by metal strips.



## Science Manufactures Two Heaviest Atoms

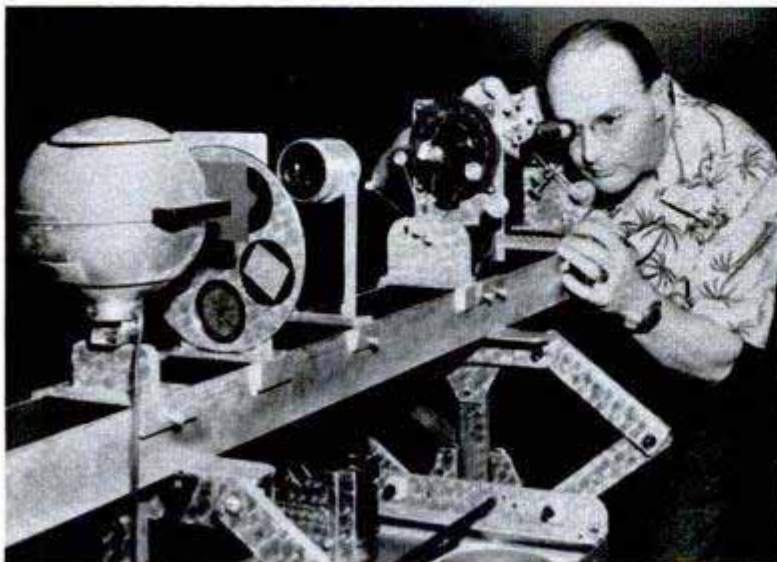
Two new isotopes, the heaviest atoms known, have been produced by atomic bombardment in the 60-inch cyclotron at the University of California. The isotopes, which are known as Berkelium-245 and Californium-246, provide two of the missing links in the pattern of radioactivity of the elements. They are new forms of elements which were discovered after World War II.





### "Inside the Camera" View

Sight-seers visiting a building high atop a cliff in San Francisco can virtually "walk inside a camera" and look at the view through the lens. Floyd Jennings devised the building to bring a magnified view of the surrounding area to several people at the same time. Visitors find themselves in a darkened, boxlike room. In the center of the room is a large oval viewing table. A turret overhead contains a 12-power lens which casts a view upon the table in brilliant natural colors. The turret moves in a 20-degree arc each minute to reveal a new view.

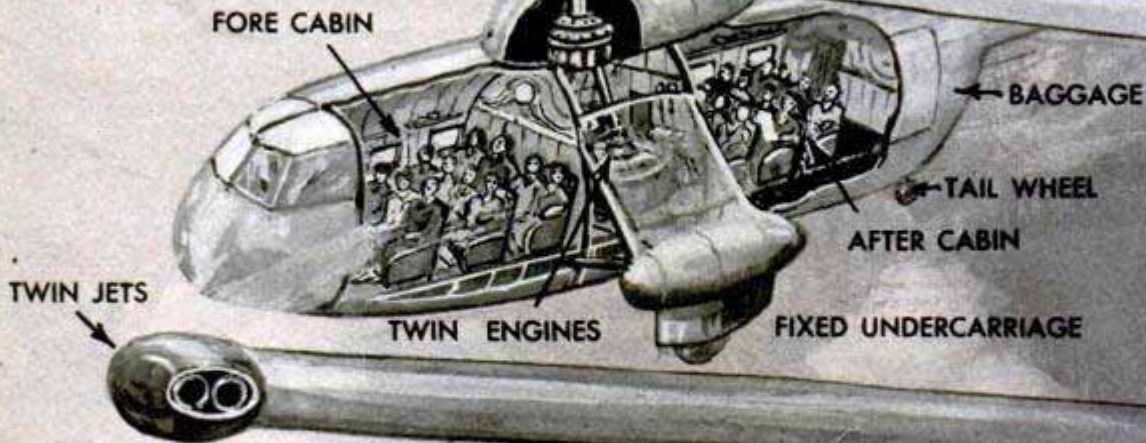


### Lens Test Bench Produces Parallel Rays

Producing parallel rays of light, a new optical bench accurately tests photographic lenses. Usually, parallel rays for testing are obtained from those distant light sources, the stars, but with the new instrument the technician can provide his own rays. Some of the tests made by the apparatus indicate the degree of resolution of a lens, coma, astigmatism, color aberration and spherical aberration. A lens' focal length may also be determined.

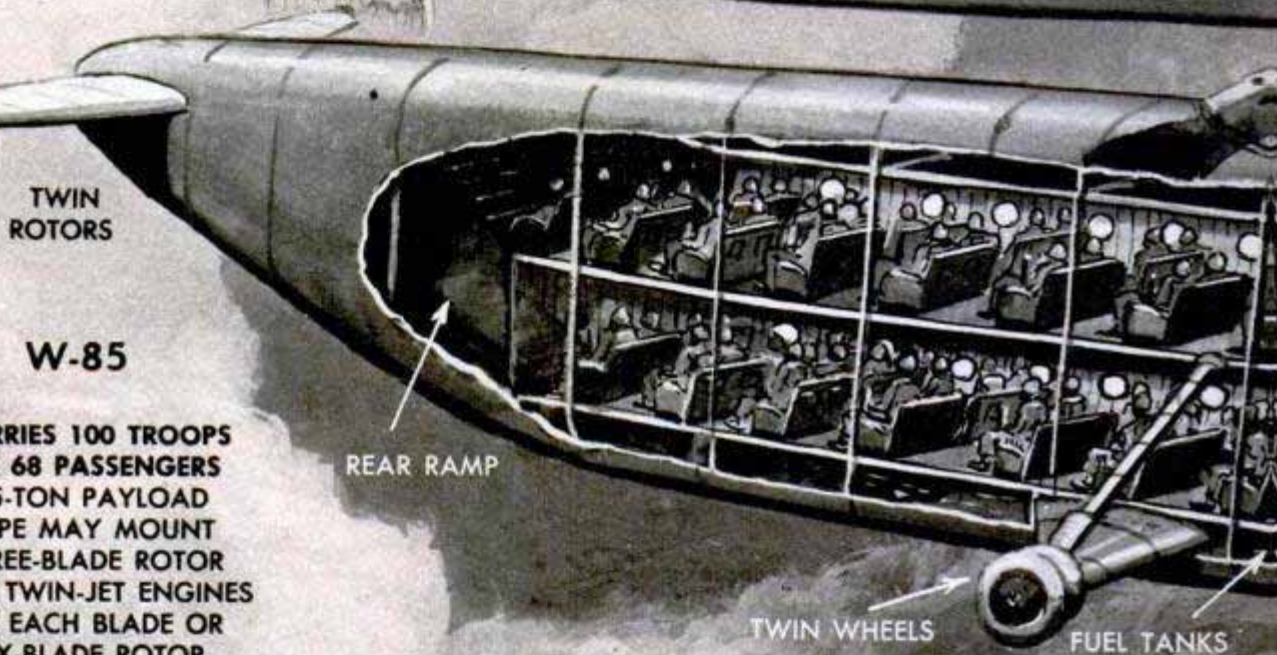


**W-80**  
20 TO 24 PASSENGERS



**W-85**

CARRIES 100 TROOPS  
OR 68 PASSENGERS  
15-TON PAYLOAD  
TYPE MAY MOUNT  
THREE-BLADE ROTOR  
WITH TWIN-JET ENGINES  
ON EACH BLADE OR  
SIX-BLADE ROTOR  
WITH SINGLE ENGINE  
ON EACH BLADE



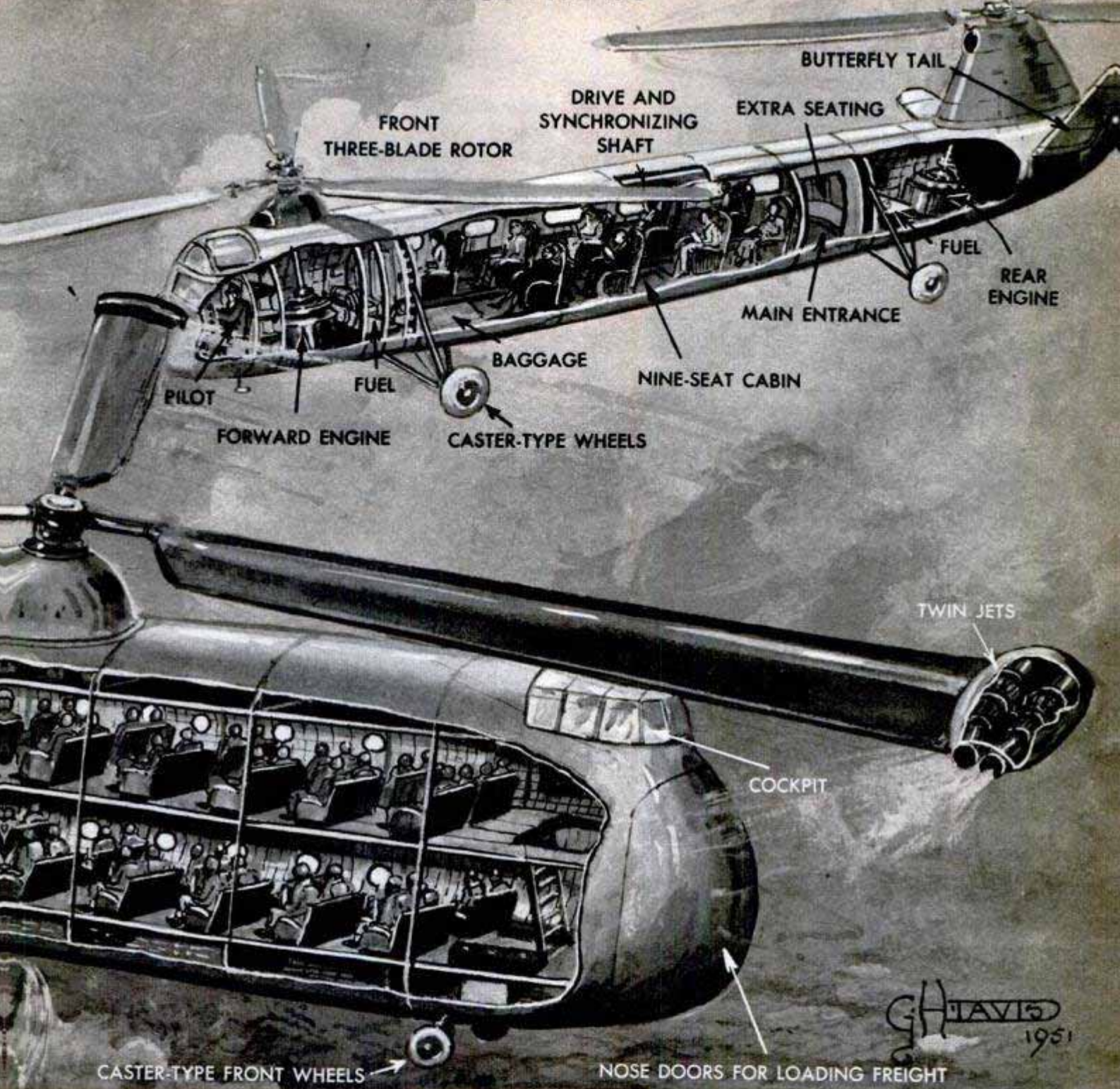
**W-81**

**W-81**



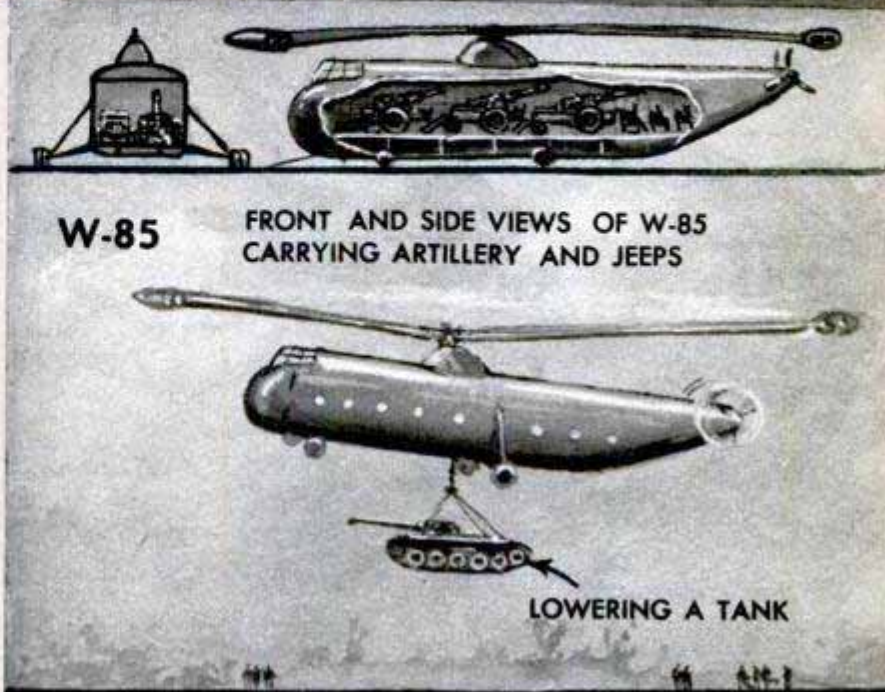
**W-81**  
32-SEATER  
SPEED 150 M.P.H.  
WITH TWIN-JET ENGINES





## Helicopter Forecast From England

Several experimental helicopters have been built in England or now are in the design stage. Type 173, shown at top of page, has two motors to power the two rotors. Should either motor fail, the other can be used to drive both rotors. The W-81, at left, has two turbojet units, placed side by side, which are expected to give the aircraft speeds up to 150 miles per hour. The huge W-85, above, is designed to airlift about 100 troops in military use



W-85

FRONT AND SIDE VIEWS OF W-85  
CARRYING ARTILLERY AND JEEPS

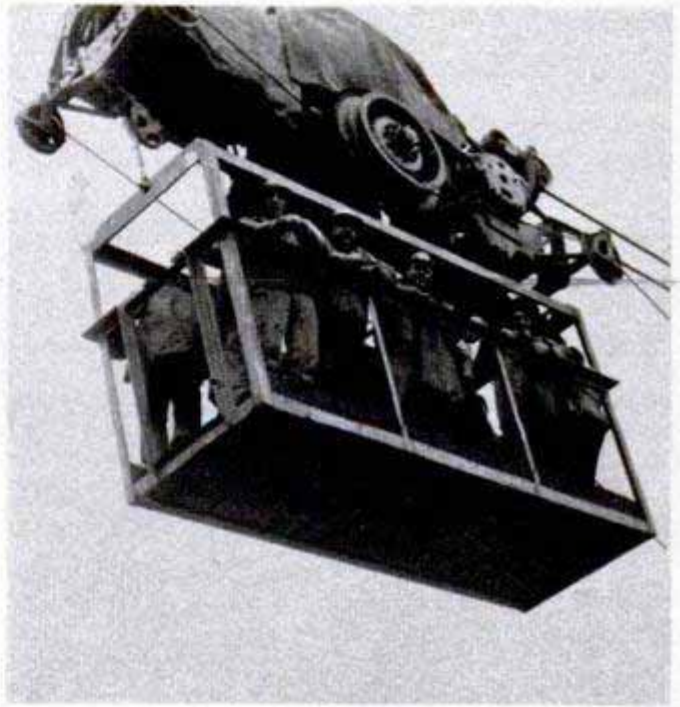
LOWERING A TANK



# AERIAL CABLE CAR PULLS ITSELF ALONG



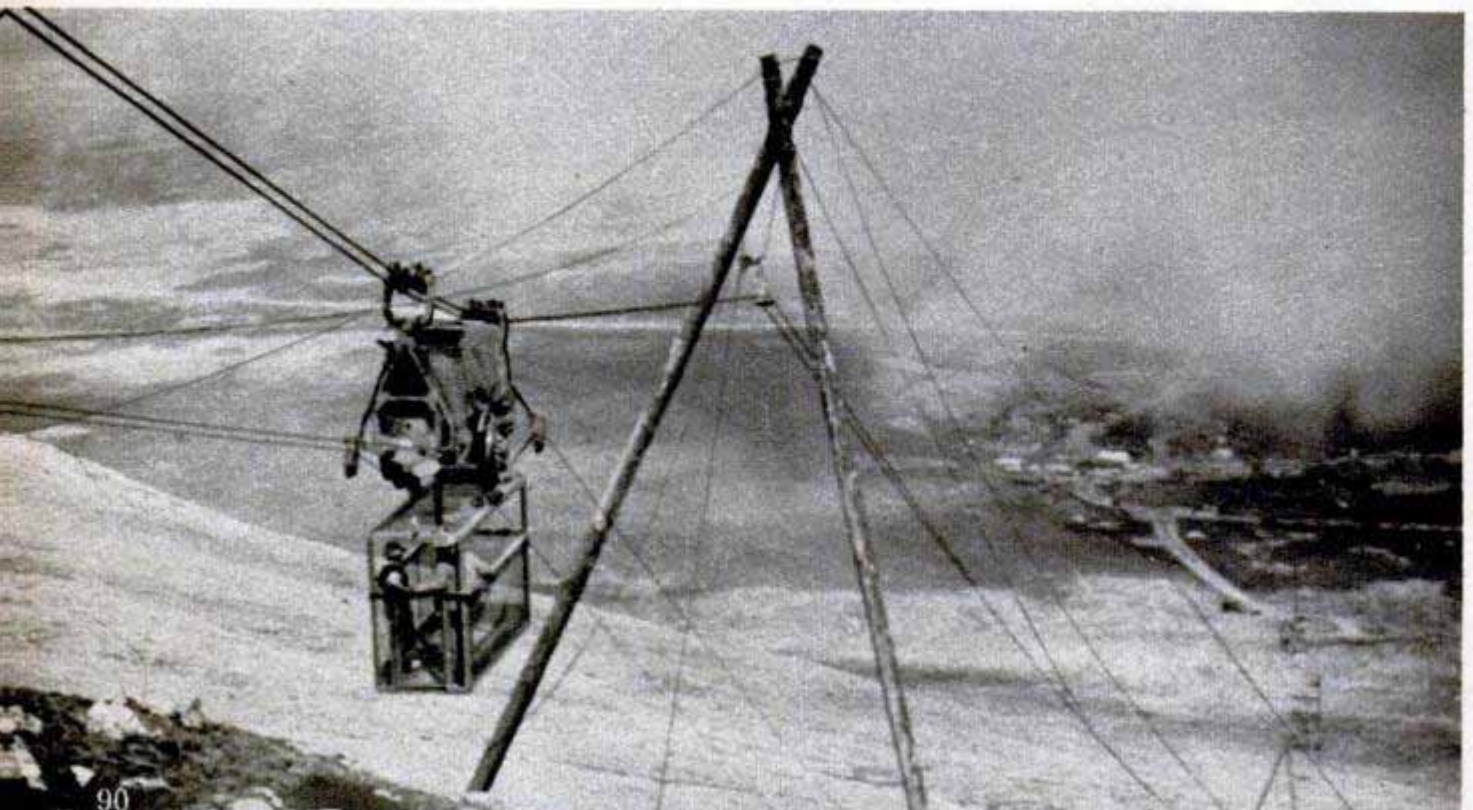
PULLING itself 5000 feet up an Alaskan mountain by winding cables around its wheels, an aerial car uses the principle proved by inventor Phil Grabinski, former Washington logger, when he drove a Model-T Ford chassis over a house to convince government officials his theory was sound.



Above, its inventor sitting on the fuel tank, the aerial car (an ancient Ford) proved it could pull itself up and over a house "by its own bootstraps"

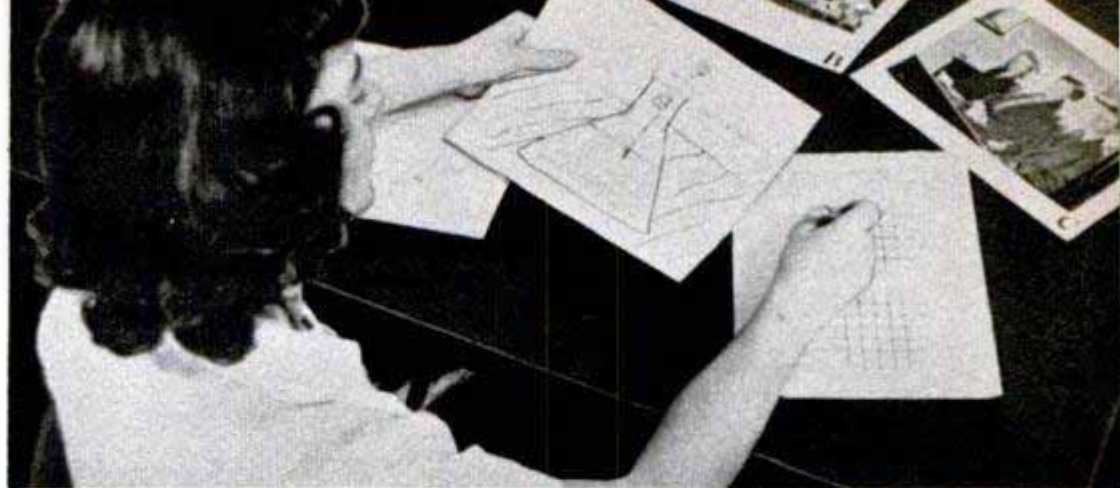
Right, using the principle proved with the Ford, a self-propelled car hauls men at an Alaskan project

Below, the tramway climbs 5000 feet of rugged mountainside. The operator sits in a cab above the cage



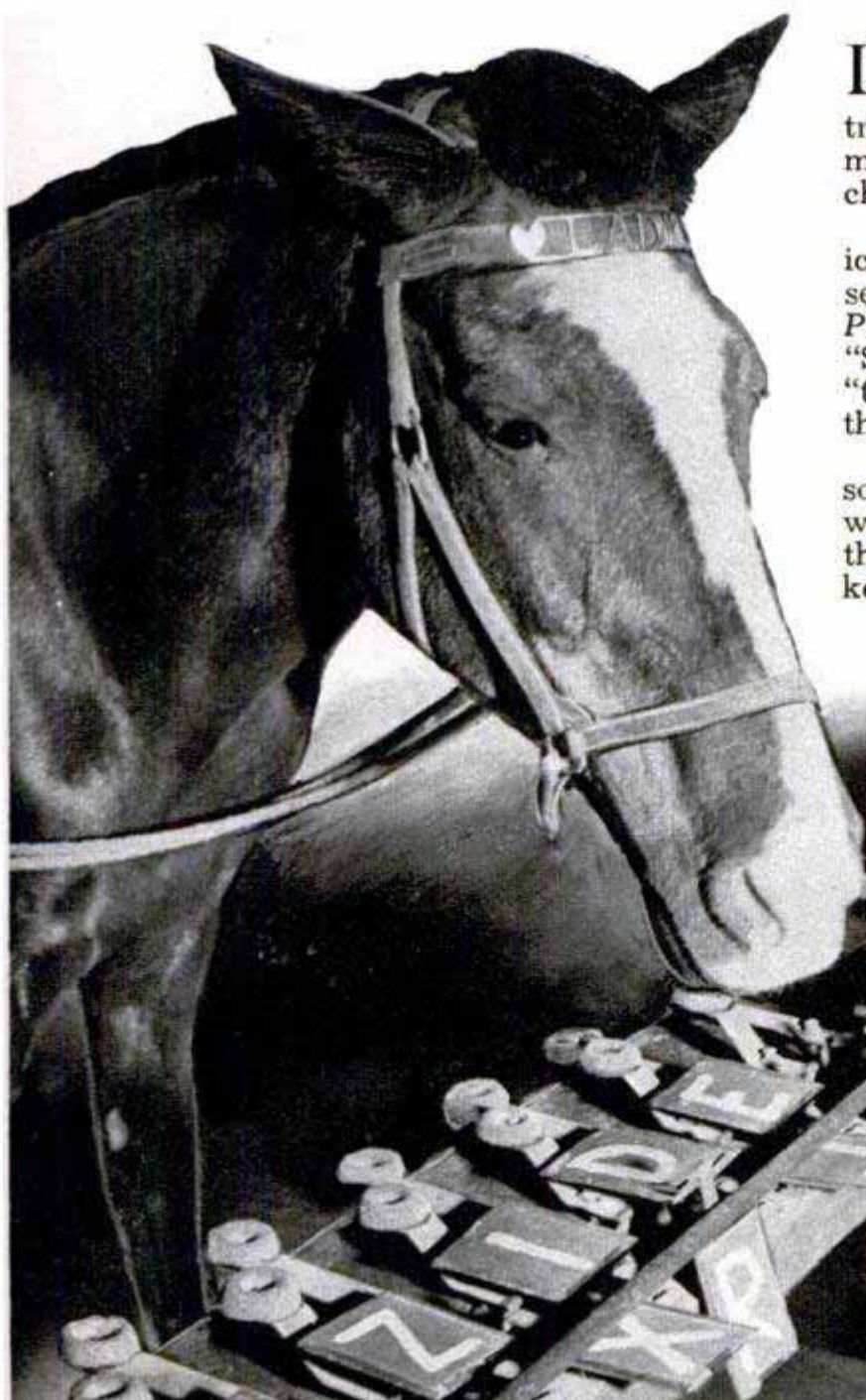


In a clairvoyance test, subject sketched a chemical flask while trying to "guess" unknown picture in sealed envelope. Original picture, shown directly above, has an identical chemical flask



# Science Tackles the "SIXTH SENSE"

By Richard F. Dempewolff



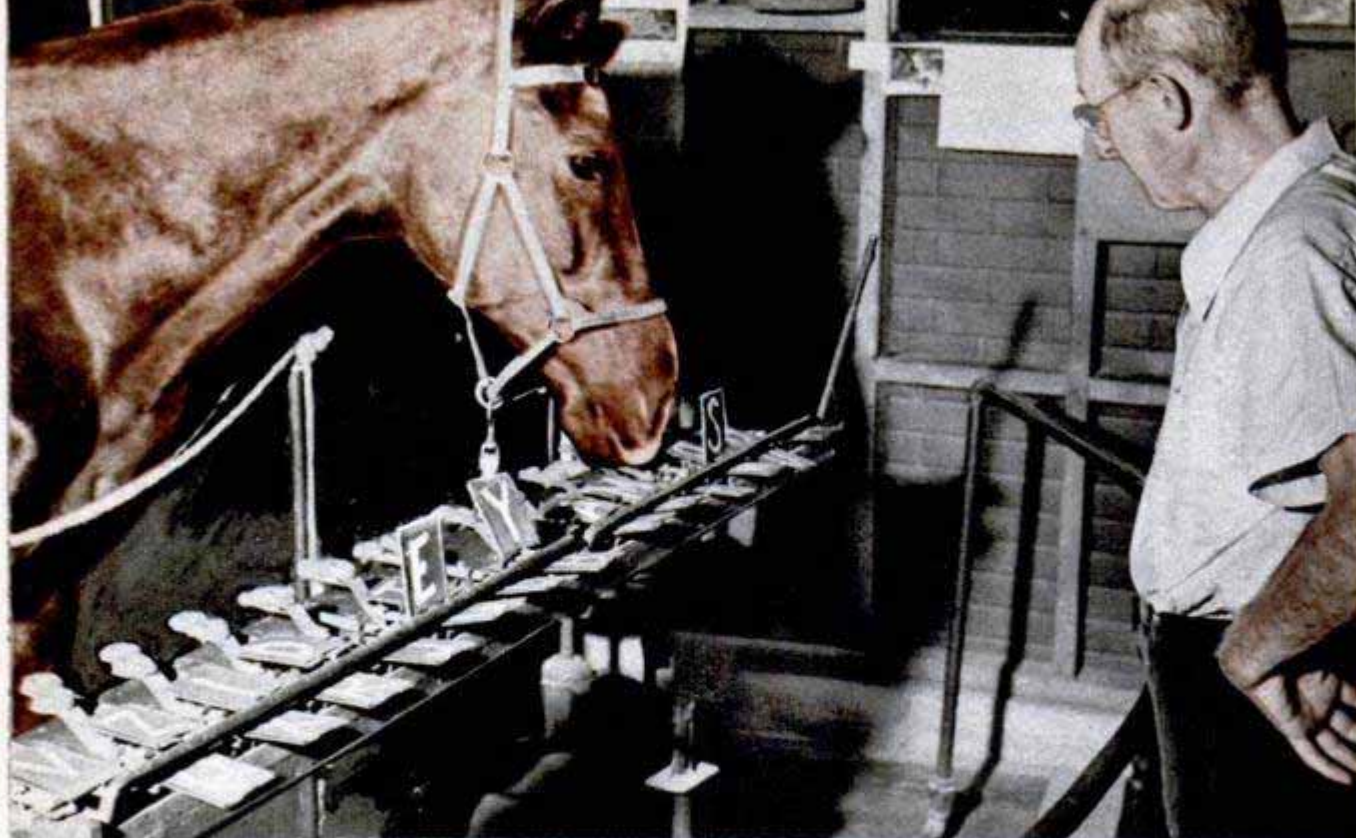
DO PEOPLE and animals have the power to peer into the future, read minds, transfer thoughts through space and even make things happen which all the laws of chance and physics say are impossible?

On my return from a recent South American article hunt, I stopped off in Florida to see Roderick Grant, my vacationing boss—*Popular Mechanics'* managing editor. "Some friends of mine," he informed me, "talked to a horse in Richmond, Va., on their way down here."

I felt his forehead, but there was no fever so I kept listening. "They asked the horse where they lived," he went on, "and it told them by spelling out letters on a sort of keyboard. The man asked what his mother's

Author asked Lady, the Talking Horse, for name of PM's managing editor. Without hesitation Lady spelled Grant by nuzzling special keyboard. Science is trying to unravel extrasensory ability of animals and humans





Lady spells "EYS" in reply to question about author's daughter, who was then about to undergo eye operation

maiden name was, and the horse got that, too. Neither the horse nor its owner had ever seen these people before. What's more, the horse also did arithmetic problems. I think you should investigate it for a story."

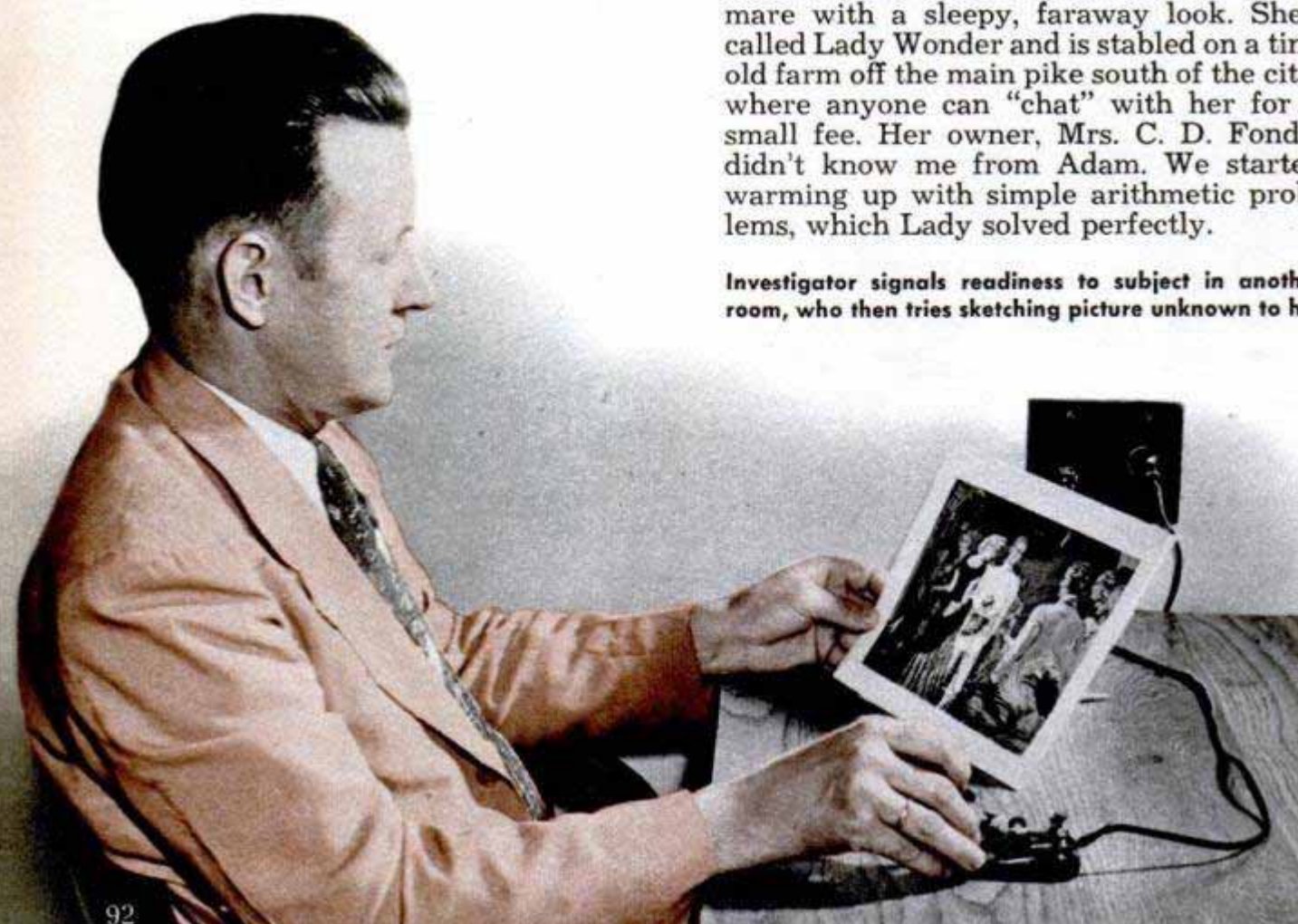
"It's a trick," I said. "But I'll tell you what. Get someone driving back that way to ask the horse: 'Who is the eastern editor of

*Popular Mechanics*?' If the horse spells 'Dempewolff,' I'll buy that story." I figured that was the last I'd hear of talking horses. Even people can't spell Dempewolff.

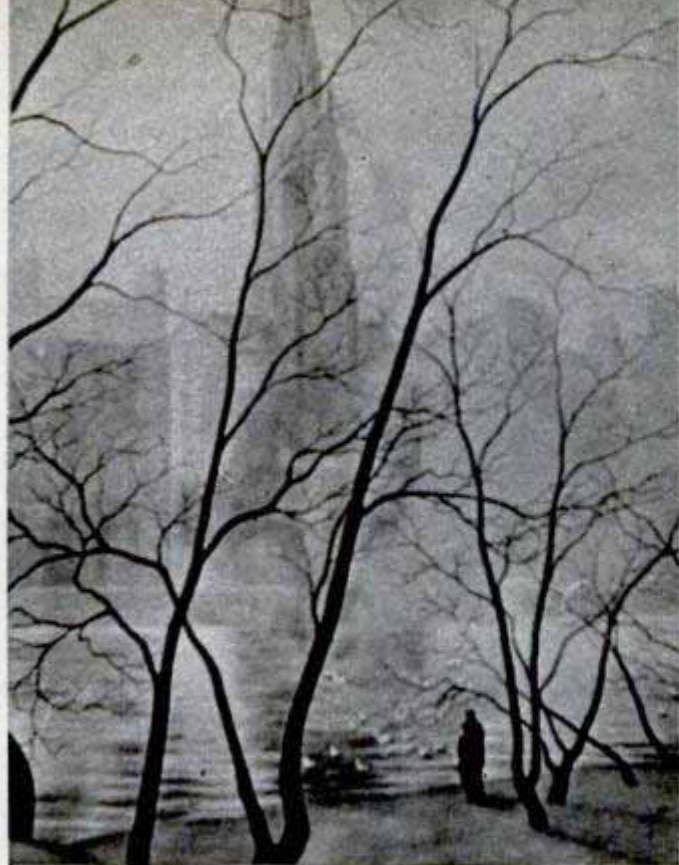
A month later I learned that the horse had done it. It took the humor out of the situation with a thud, but my curiosity zoomed and I left for Richmond.

The horse, I discovered, is a 26-year-old mare with a sleepy, faraway look. She's called Lady Wonder and is stabled on a tiny old farm off the main pike south of the city, where anyone can "chat" with her for a small fee. Her owner, Mrs. C. D. Fonda, didn't know me from Adam. We started warming up with simple arithmetic problems, which Lady solved perfectly.

Investigator signals readiness to subject in another room, who then tries sketching picture unknown to her



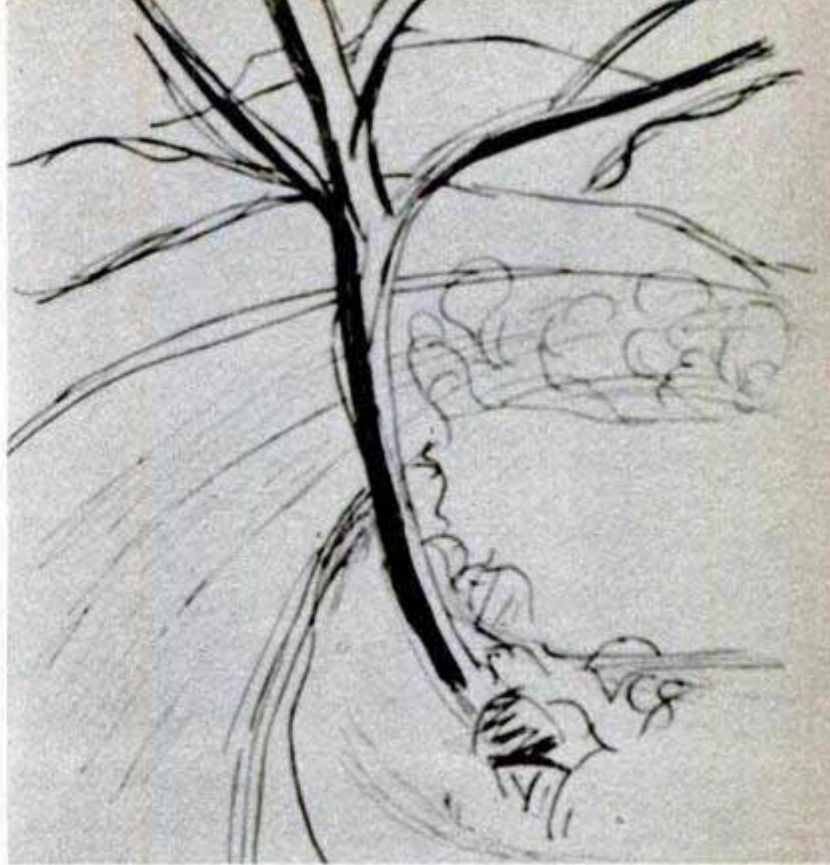




**TEST PICTURE**, never seen by subject, was sealed in opaque envelope and shuffled with other envelopes

In front of Lady is a row of levers with sponge-rubber tips. Each lever releases a catch, permitting a single metal plaque, bearing a letter on one side and a number on the other, to pop up. Lady nudges these with her chin, thus spelling out words or running up a row of figures. Mrs. Fonda announced that the horse had *not* memorized the keyboard. To prove it, she pulled the letter plaques from the holders, let me shuffle them and put them back in any order I wanted. "Lady knows the alphabet, so it doesn't matter," she said blandly.

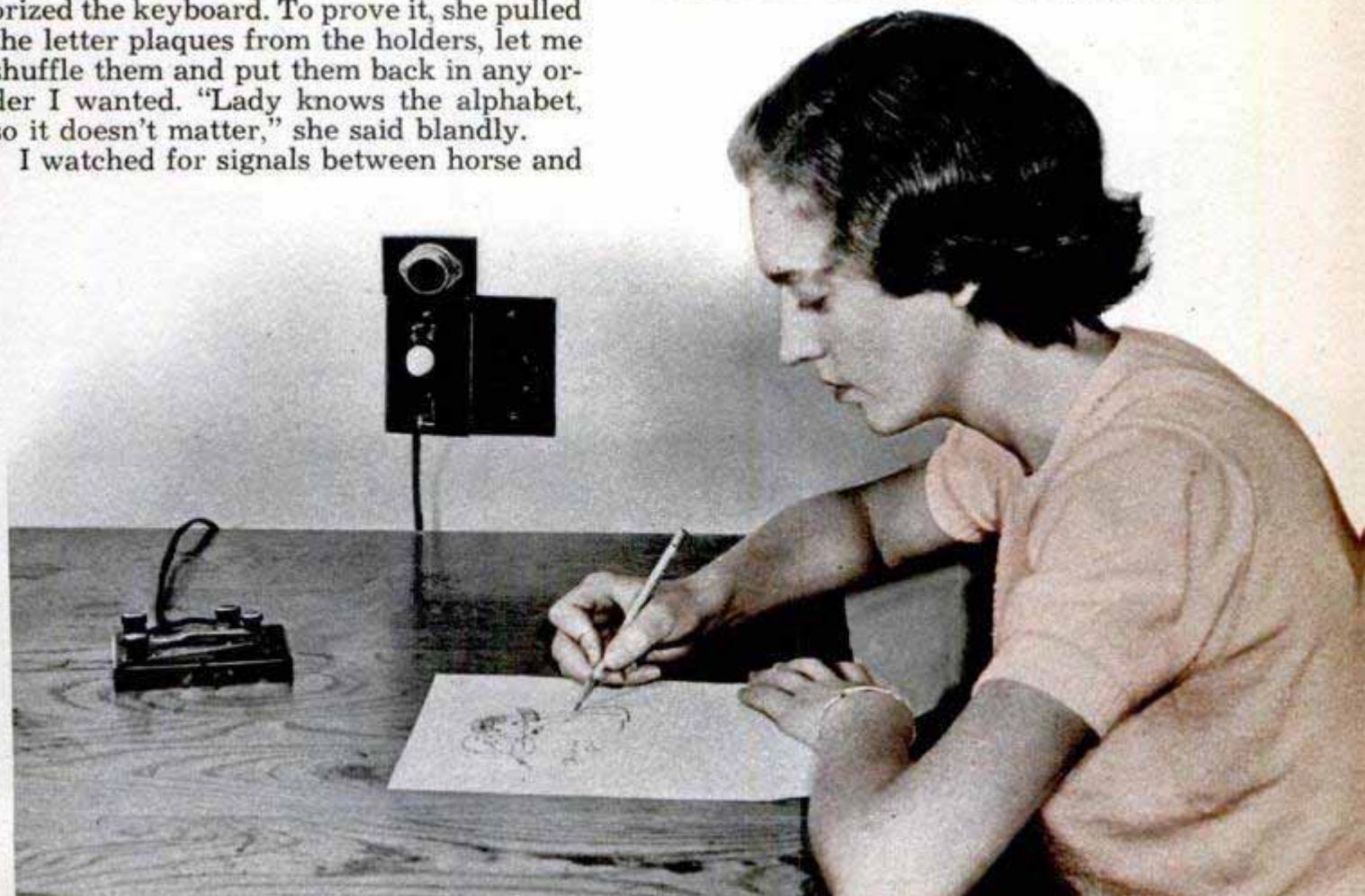
I watched for signals between horse and



**SUBJECT'S SKETCH**, which was remarkably similar, shows a tree without leaves, outlined against sky

woman, but none was visible. Mrs. Fonda stood well behind and off to one side of the horse. "What's the name of my boss?" I asked. Lady, watching me with her sleepy brown eyes, fussed among the keys, then started nudging them. "G-R-A-N-T," she punched out.

I asked her the name of my six-year-old







Colored marbles are placed at random in tray, which is covered. Subject tries duplicating pattern

According to Mrs. Fonda, she discovered the horse's talent shortly after her family bought it for a workhorse when it was a few months old. "I'd just *think* I should go feed Lady, head for the door and see her galloping in from the fields before I could call." She reports that she started teaching her to spell with wooden baby blocks. "It's hard to tell how Lady did it," says Mrs. Fonda. "I'd tell her a letter or number, and show her the right block. I taught her to nudge a

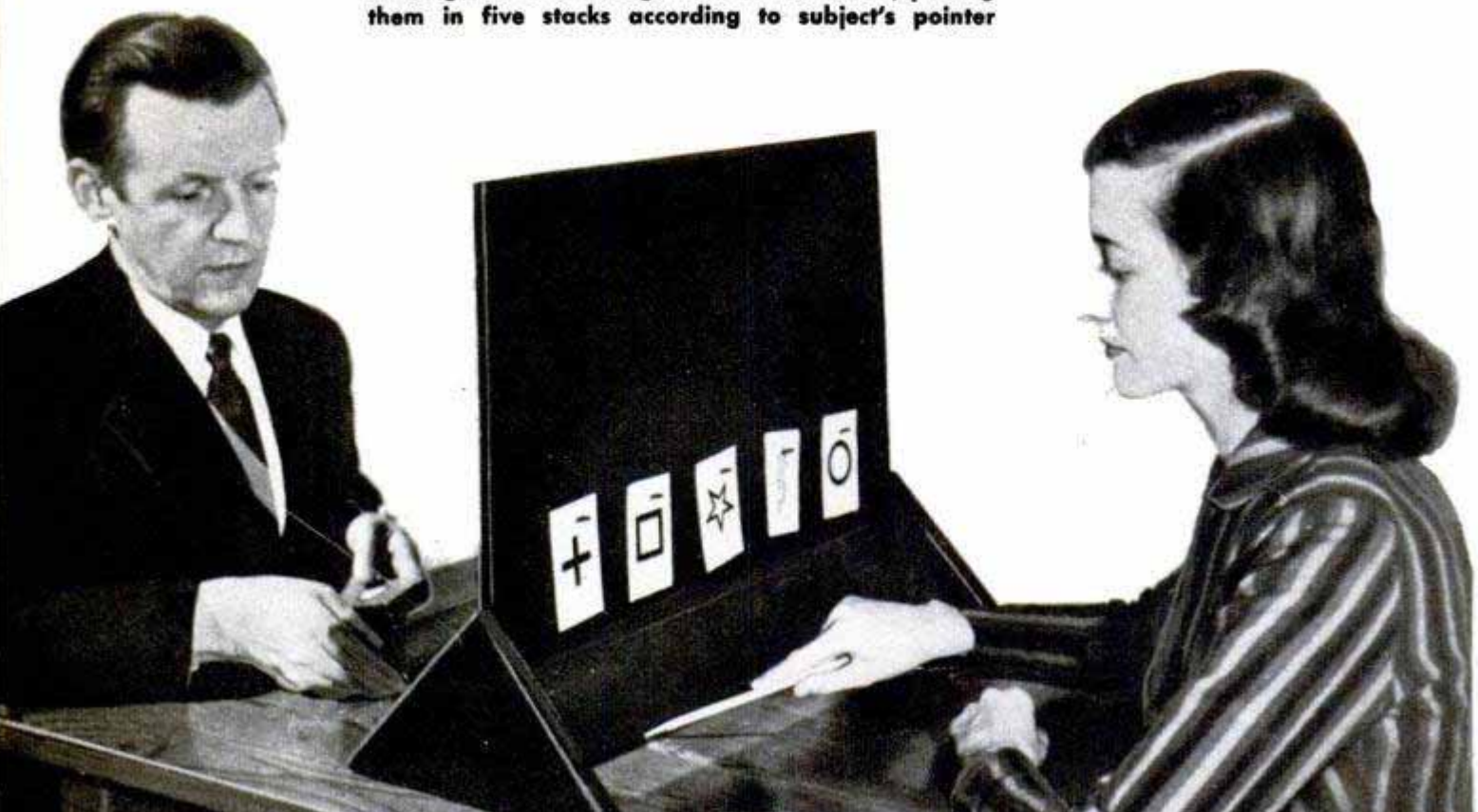
daughter, who was then scheduled to enter the hospital for an eye operation back in New York. The horse fumbled a long time and punched several wrong keys. I took a photograph of her anyway, and kept coaxing. Finally she spelled out "Judy," which is correct. Later, when the pictures were developed, I saw that the "wrong" letters she had first punched out spelled—"E-Y-S"! (The keyboard has only one E.)

Lady spelled the name of my home town, Chappaqua; told me where I worked, and my mother's maiden name. I asked her if there'd be another big war and she spelled out "Y-E-S." When? "1-9-5-2." Time will tell whether she got that right or not. Let's hope she missed.

few blocks together to spell words. We only did it a few months, a couple of hours every few days, when pretty soon Lady was spelling words I hadn't taught her."

The horse has pulled any number of uncanny tricks. Mrs. Fonda claims that in the middle of several "interviews," Lady has quit answering the customers' questions, and pegged out "Got to go." It was exactly her dinnertime on each occasion. Another time, according to the woman, Lady quit when a grocer's delivery truck came into the driveway. Even Mrs. Fonda didn't know what was being delivered, because her husband had done the ordering. But Lady, out in the barn, spelled out "bananas" on the keyboard, and wouldn't answer another

Investigator runs through deck of ESP cards, placing them in five stacks according to subject's pointer





question. She loves bananas. On investigating, Mrs. Fonda discovered that her husband had ordered a dozen bananas and, at the moment, they were being unloaded from the truck.

What's the answer? Is the horse—or the woman—endowed with psychic powers, or is it all a clever trick?

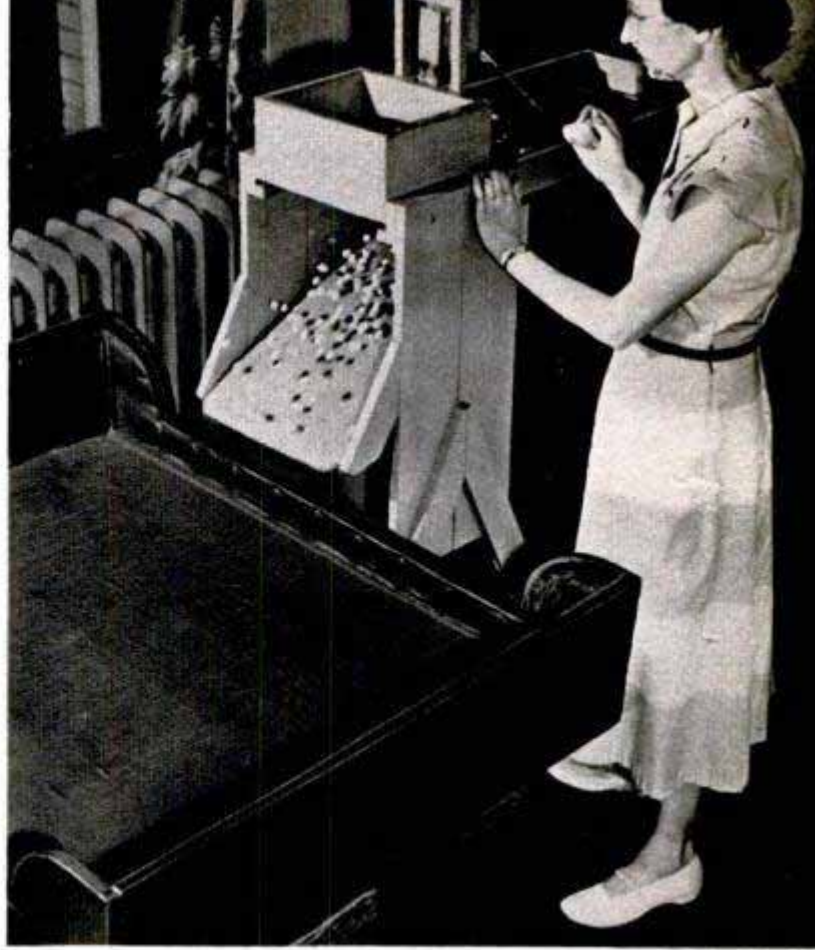
When the filly was three years old, Dr. J. B. Rhine of Duke University, famous scientific investigator of extrasensory perception, and his wife spent six full days examining Lady. "We restricted the owner, asked her to stay motionless and as far away from the horse as possible," he reported. "This did not seem to interfere. She was blindfolded and turned away from the horse. The horse still succeeded. We screened them from each other and results still were good. Even with Mrs. Fonda out of the room some results were obtained, but the filly became unmanageable."

In more recent tests, Doctor Rhine got less conclusive results. But, he says, "that didn't alter our view that the horse formerly had been responding by extrasensory perception."

Animals, Doctor Rhine explains, seem to have some kind of ability which enables them to perform remarkable feats. Whether it is actually a "sixth" sense or an amazingly keen response stemming from a known sense organ, no one knows yet, he says.

There are scores of stories of animals wandering home from points hundreds of miles away. There are dogs and cats that seem to "sense" friendliness or antagonism in a person. Might this be evidence of some telepathic ability?

Scientists have snorted "superstitious



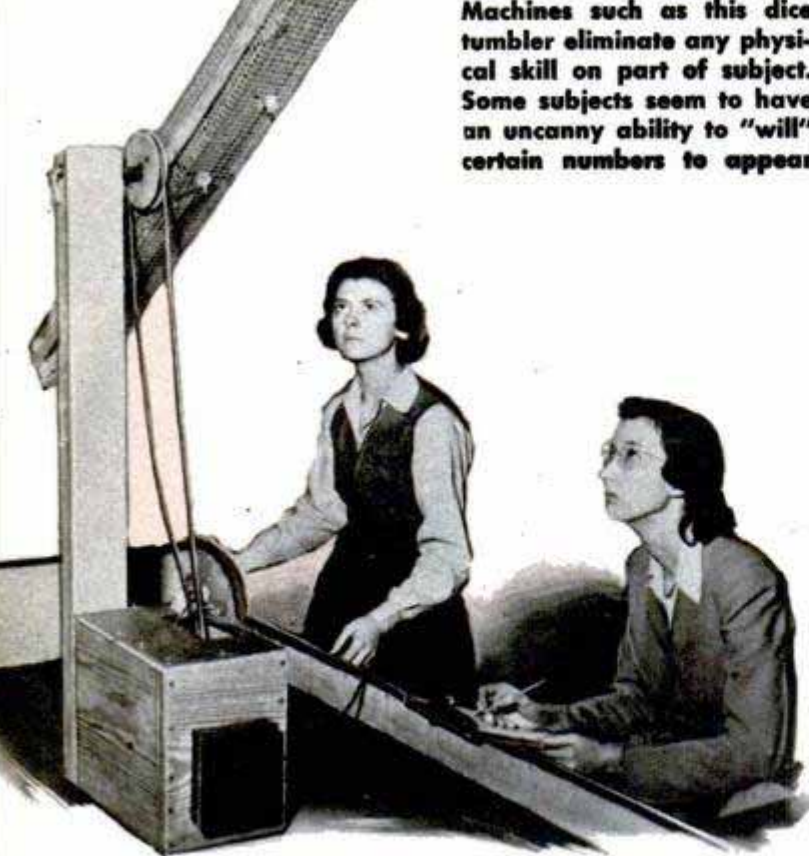
Box dumps dice on table while subject "wills" certain number to appear. Tests indicate some may control dice

After test on opposite page, cards are checked for accurate "guesses." One subject scored a perfect 25!





Machines such as this dice tumbler eliminate any physical skill on part of subject. Some subjects seem to have an uncanny ability to "will" certain numbers to appear



nonsense" at the mere mention of what today are called "psychic phenomena." Recently, however, many scientists not only have stopped sneering, but dozens of them are busy applying laboratory methods and mathematics to things such as telepathy, clairvoyance, premonition and other intangible mysteries.

By 1940, some 900,000 scientific tests of

Marked chips tumble down a snaky chute in another test to determine whether mind can influence matter

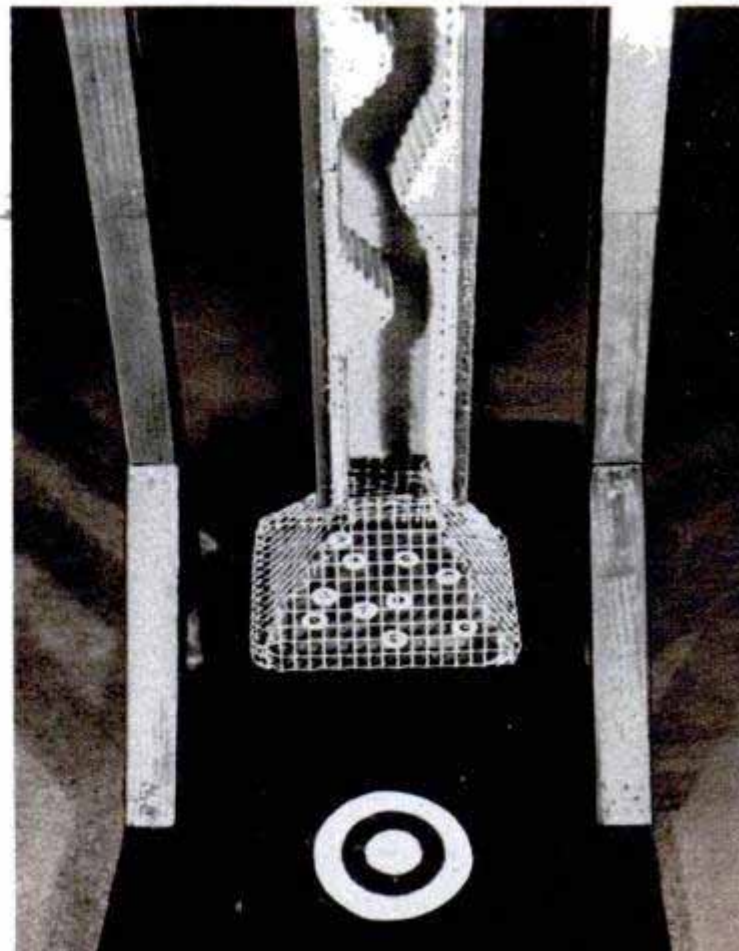


superphysical powers had been made with ordinary people like you and me. The results showed odds of billions upon billions to one better than the mathematical laws of chance that something beyond pure coincidence is at work in our "hunches" and "premonitions." Subsequent tests have sent those odds soaring to a figure so high you'd need some 500 zeros to express it.

Now, in Doctor Rhine's Parapsychology Laboratory at Duke University, Durham, N. C.—one of the best known of the psychical-research strongholds—scores of unique devices are helping to put our nebulous "sixth sense" under the microscope for study and observation. His famous, odd-looking "ESP" (extrasensory perception) playing cards swish back and forth in automatic shufflers, while ordinary subjects try to "foresee" the order in which they'll fall. Dice rattle in spinning cages or mechanical shakers and tumble down broad chutes to absolutely level table tops, where their faces are counted, recorded and compared with the "target" faces "willed" by student subjects. Lights flash, and telegraph keys tap out time signals as experimenters located in widely separated parts of the campus run telepathy and clairvoyance tests across space. Subjects play tricky "matching" games with colored marbles in a two-layered box, "copy" pictures they can't see, play a wide variety of card games, or watch a series of marked chips cascade down a long snaky runway, and "will" the tumbling

(Continued to page 262)

Subject tries to make chips land with a certain side up. Scores indicate that perhaps some people can do it!





# TREASURE HUNTING is GOOD BUSINESS



Amateur treasure hunters may not be successful, but they are scientific, as the electronic detectors testify

**By George X. Sand**

*Photographs by  
Verne O. Williams*

**T**HERE'S NO QUICKER way to start an argument in Florida these days than to mention treasure hunting. It makes no difference which side you take—pro or con—you can find someone to disagree with you anywhere from Jacksonville to Miami to Pensacola. Treasure hunting is becoming a top attraction in the "Sunshine State" and a business as well.

Tourists and natives alike are seeking the pot o' gold. Secret maps, whispered locations and dusty books are as common as roadside stands. It's easy to find someone who "knows" where treasure is buried. Persons who have found treasure are much scarcer!

Florida's treasure hunters range from the beachcombers, whose eyes are their only equipment, to the big-time operators who hire boats and deep-sea divers to go after the loot. Successful or not, this treasure hunting makes good business for the boatmen, the map

makers, the gas stations and motel keepers.

There's no denying that hidden beneath the sands and waters around Florida is treasure worth millions. History bears this out. But little of this treasure involves the mysterious trappings of pirate maps and secret codes. Most of it is gold and silver that went to the bottom in shipwrecks. But it's treasure, nonetheless, and most "scientific" treasure hunters specialize in this variety, leaving the "oaken cask under the crooked oak tree" to the romanticists!

Waiting to be salvaged within a few miles of Miami are said to be sunken riches worth



Treasure hunters should study this photo carefully. These may be the only treasures they will find—and they're in a museum





Seaplanes aren't essential for treasure hunting, but if you can afford one, it will carry you to those remote Florida Keys where loot may be awaiting you

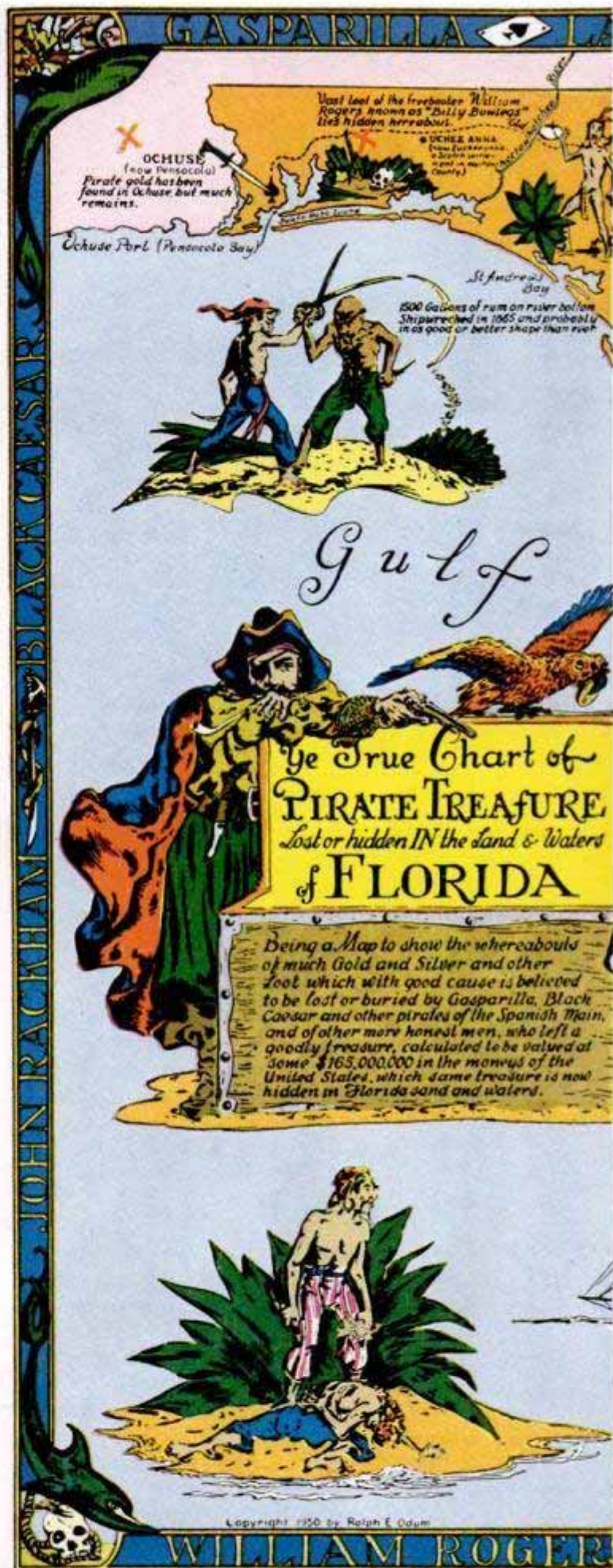
Here's the map that is a best seller in Florida. It is said to have been a major stimulant in the recent revival of interest in treasure hunts. At a dollar a copy, it has been a real treasure for its creator

at least \$64,000,000. More than 60 wrecked vessels, many of them pirate ships, are scattered around the ocean bottom near the vacation city.

Similarly, at least another \$300,000,000 lies elsewhere off Florida's sun-washed beaches. Such infamous characters as Gasparilla, Morgan and Billy Bowlegs supposedly hid untold wealth in silver, gold and jewels around the islands east of Pensacola. A British gunboat in 1840 sank a Billy Bowlegs privateer in Apalachee Bay with \$5,000,000 in bar silver aboard. Somewhere in the narrow mouth of the Steinhatchee River, a Confederate ship sank in 1862 with \$500,000 in silver. Near the mouth of the Suwanee River, a pirate ship shelled another craft until it sank, taking with it \$5,000,000 in gold and silver that was being shipped to Spain in partial payment for the purchase of Florida by the United States. A pirate ship was sent to the bottom by the British warship *Pegasus* at the entrance to Charlotte Harbor. Survivors described the cargo as including \$1,000,000 in gold and silver bars. There is no record of these riches ever having been recovered.

These are only a few of the historic "facts" that tempt the treasure hunter. Undoubtedly, they have some basis in truth. No doubt, there are other wrecks with similar treasures hidden by shifting sands and blue waters.

Seeking these rewards, the treasure hunter, like an inventor with his secret invention, moves quietly and furtively. He refuses to say where he is hunting or what he has found. He tries to act like an inno-



cent fisherman or vacationist. He may imply that he or somebody he knows has found treasure, but he won't be definite because, he says, "it's his own business."





Illustrated by Warner Saxford

Copyright R. E. Odum, 918 Tampa St., Tampa, Fla.

If you act impressed, he will, like a talkative fisherman, entertain you with stories of "big ones" that got away!  
 All the stories have one thing in common:

an utter vagueness about recovered treasure. Of course, there are a few exceptions. One such exception is a story about the treasure recovered by Arthur McKee of

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Serious treasure hunters use diving helmets to explore a reef off Long Key where there are gold, silver and gems worth \$64,000,000

Thickly coated with sea growth, a large anchor was the clue that led to the discovery of three bars of pure silver on a coral reef



Homestead City. He was searching the water off Key Largo for old Spanish cannon in 1949. He spotted a wrecked Spanish ship on a coral reef in less than 60 feet of water. A diver himself, McKee went down to look for cannon. Among the ship's ballast he found three silver ingots, coated with thick layers of coral crust. The ingots were taken to Washington where the Smithsonian Institution bought one of them. It was identified as having come from an ancient and rich silver mine in Panama that was worked by the Spanish with Indian slaves.

McKee admits finding only three ingots. However, it is unlikely that the ship was carrying only a few of them. It is more probable that others are buried near the wreck. The one he sold to the Smithsonian weighed 70 pounds and was assayed at 99.36-percent-pure silver. The price: \$1000. McKee refused to sell the other two, one weighing 60 pounds, the other 75 pounds.

He's not at all secretive about the discovery and talks about it voluntarily. He even takes tourists out to the scene of the wreck and explains how he found the ingots. He does cash in on his find though by operating a tourist attraction, the Museum of Sunken Treasure, on Plantation Key, that draws a steady stream of tourists.

Another Floridian who has found a way to make treasure hunting pay is Ralph E. Odum of Lakeland, an assistant attorney general for the state. Odum found his treasure without going on a single expedition. He and his wife made extensive research into Florida history and compiled data on lost treasures. He drew up a rough sketch of the treasure locations and showed it to Warner Sanford, a map maker in the state highway department. Sanford painted a romantic-looking map ideal for framing, on which the various treasure points were marked. Appropriate sketches of pirates and privateers decorate the map, making it suitable for hanging in a game room or

(Continued to page 236)





# Detroit Listening Post

*By Siler Freeman*

**T**HE AUTOMOBILE INDUSTRY now has its 1952 models in the field and there may or may not be some to follow. It depends on the market, and the market is something which all the manufacturers face with a good deal more than the normal amount of uncertainty.

The Ford Motor Co. has brand-new cars in all three lines. Two of them have new engines of the type which are in demand, the overhead valve in the Ford Six and the overhead-valve V-8 in the Lincoln. Bodies are new. It is the biggest change the company has made since the 1949 model was brought out.

General Motors' cars show mechanical improvements, though not too many body changes. All engines in the higher-priced ranges have been stepped up in horsepower. Cadillac's is 190, at the top of all competition. Oldsmobile 98 has one rated at 160. Buick's and Pontiac's are more powerful. Olds has a new body on the 98. Cadillac, Olds and Buick offer power steering to meet Chrysler's challenge.

Studebaker has restyled its postwar design. Nash has the first Farini-designed car to intrigue the public, and is adding another Rambler to the list.

Hudson has added the Wasp to its Hornet line. They are working strenuously to bring out a lower-priced car. Packard, with power brakes and better interiors, is set to cash in on its flashy new models.

The over-all market will get a thorough test this year. With the conventional models placed before the public, the passenger-car manufacturers are also testing the custom sports-model possibilities. General Motors' experimental Le Sabre, Buick's XP-300 and Chrysler's K-310 have been joined by Ford's Continental X-100. This has the dual purpose of meeting the competitors' challenge in the field of

supercars, or "dream boats," and at the same time offering a pattern for former buyers of Continentals. Designed by George W. Walker, who also is responsible for the 1952 Ford, Mercury and Lincoln, it was built at the behest of Henry Ford II.

Ford has been toying with the idea of reviving the Continental line, discontinued several years ago, but until now little has been done. With the new 160-horsepower V-8 engine in production, the new styling of the X-100 may induce young Ford to re-enter this field.

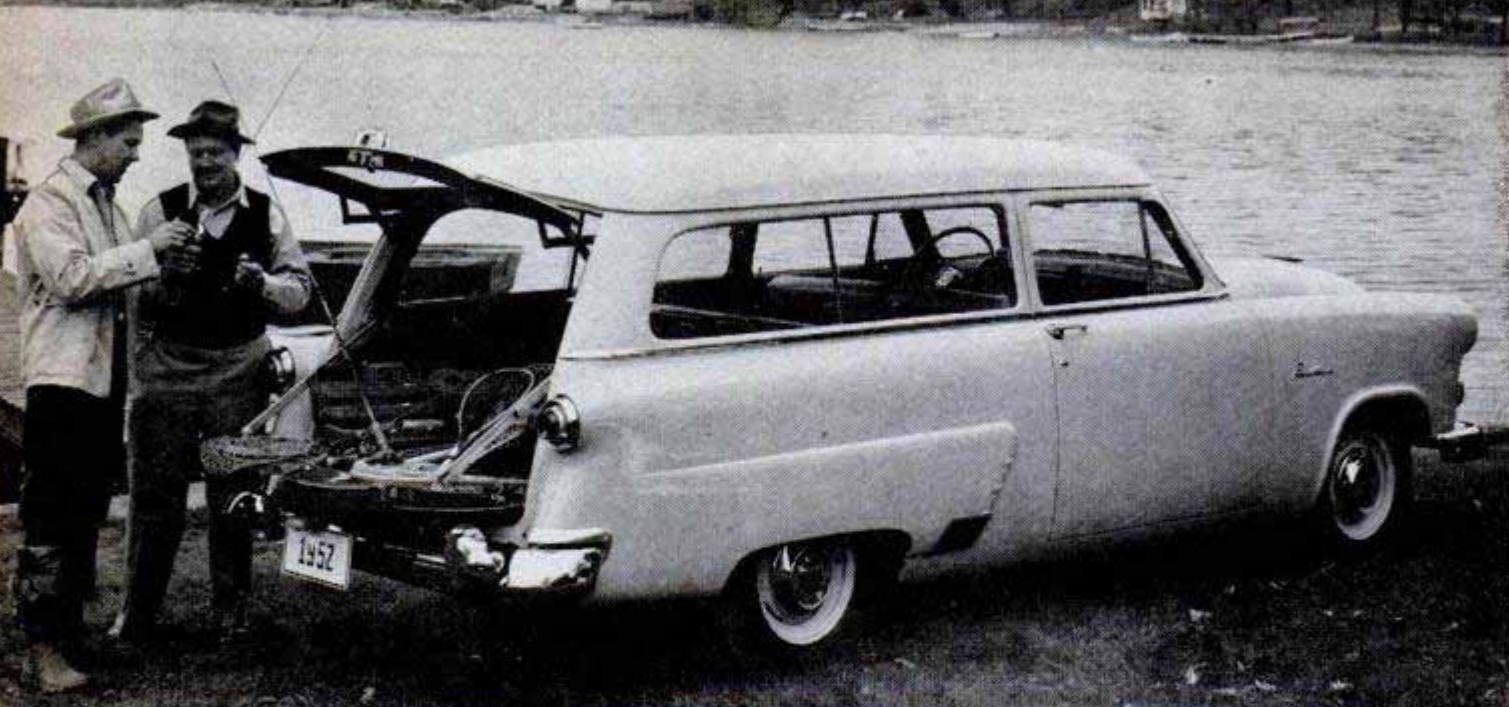
Chrysler's K-310 is causing much comment. Chrysler officials say they have, without solicitation, many orders for this sports car. The chassis and engine are Chrysler's, and the body is styled by Ghia of Turin, Italy. It would not take much to put this into the "specially built" category for the few who have the necessary bundle to purchase it.

At the same time, the economy car is being tested on the uncertain market. Nash's Rambler has been established as a leading contender. When Hudson's low-priced car reaches the market and Kaiser-Frazer's redesigned Henry J is offered, it will be a battle worth watching. The ones which may be hurt are the medium-priced cars. Emphasis this year appears to be on the top and bottom.



**This 1952 Cadillac 60 Special sedan is powered by a new 190-horsepower, V-8 high-compression engine. It has the dual-range Hydra-Matic transmission**





For business or pleasure, Ford's '52 utility car, the all-metal Mainline Ranch Wagon, seats six passengers

By  
Siler Freeman

## THE '52 FORD

THE 1952 FORD line shows a car longer and more streamlined and completely restyled. At least one model, the six cylinder, has a new engine, while the V-8 has been stepped up in horsepower, although it is still basically the same as last year's.

The wheelbase of the 1952 Ford is only an inch longer, but the car appears lower and longer because of its streamlining. The hood is low and wide and the front end centers around a triple-spinner air-scoop grille. The glass area is larger, both front

and rear, with a new curved windshield.

The Mainline is Ford's lowest-priced line. The higher-priced line is the Crestline, which includes for 1952 the Victoria, Country Squire station wagon and the Sunliner convertible.

Besides the new engine, Ford this year features a different type of brake suspension. Instead of going through the floor board, it is suspended from the top with a dash-mounted master brake cylinder, leaving the floor board clear.



Included in the Ford Crestline this year are the Sunliner convertible, Country Squire station wagon and shown below, the Victoria (hardtop)





Parked at left of the Victoria, Customline Fordor Sedan features new Ford body with curved one-piece windshield

## ROLLS OUT

Another Ford "first" is the gasoline-tank filler. Instead of coming through the fender, it is mounted under the trunk lid. The license-plate holder swings down to reveal the opening so that it can be filled easily from either side.

The trunk-lid hinges are side-mounted to prevent scuffing of luggage. Insulated body bolts dampen noises and vibrations.

The overhead-valve six is rated at 101 horsepower. It has a compression ratio of 7:1, which can be raised when higher-octane gasolines become available. The V-8 engine now offers 110-horsepower and has a compression ratio of 7.2:1. Both engines operate on standard gasolines.

The Mainline comes in the business

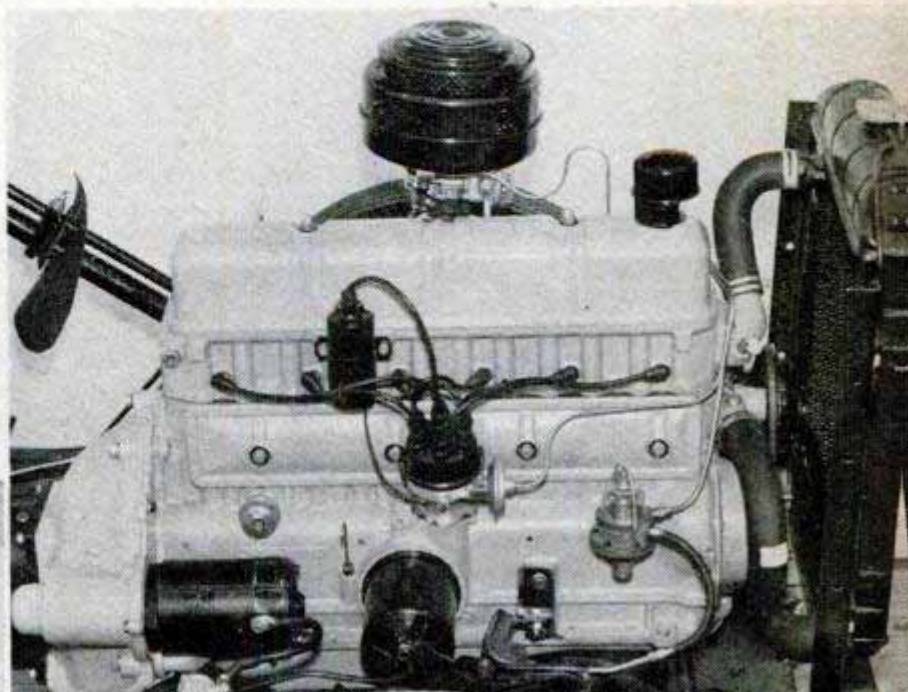
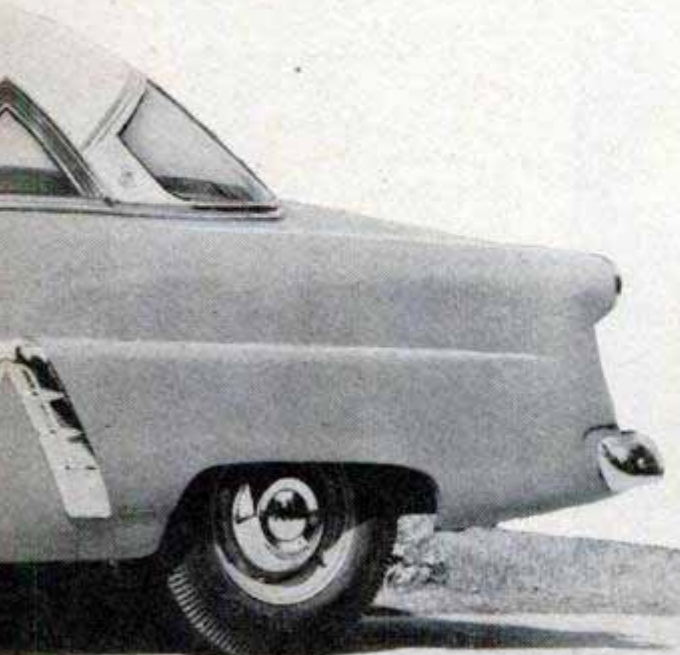
coupe, Tudor, Fordor and the new Ranch Wagon, a metal station wagon. The Customline includes the Tudor, Fordor, club coupe, and an eight-passenger, all metal Country Sedan station wagon.

Ford's big "surprise" of its 1952-model display is a car which is about 16 months away from becoming a finished product, but forecasts its thinking in the sports-car class. This is the "Car of Tomorrow" designed for Henry Ford's own use, but which will serve as a model for the Continental.

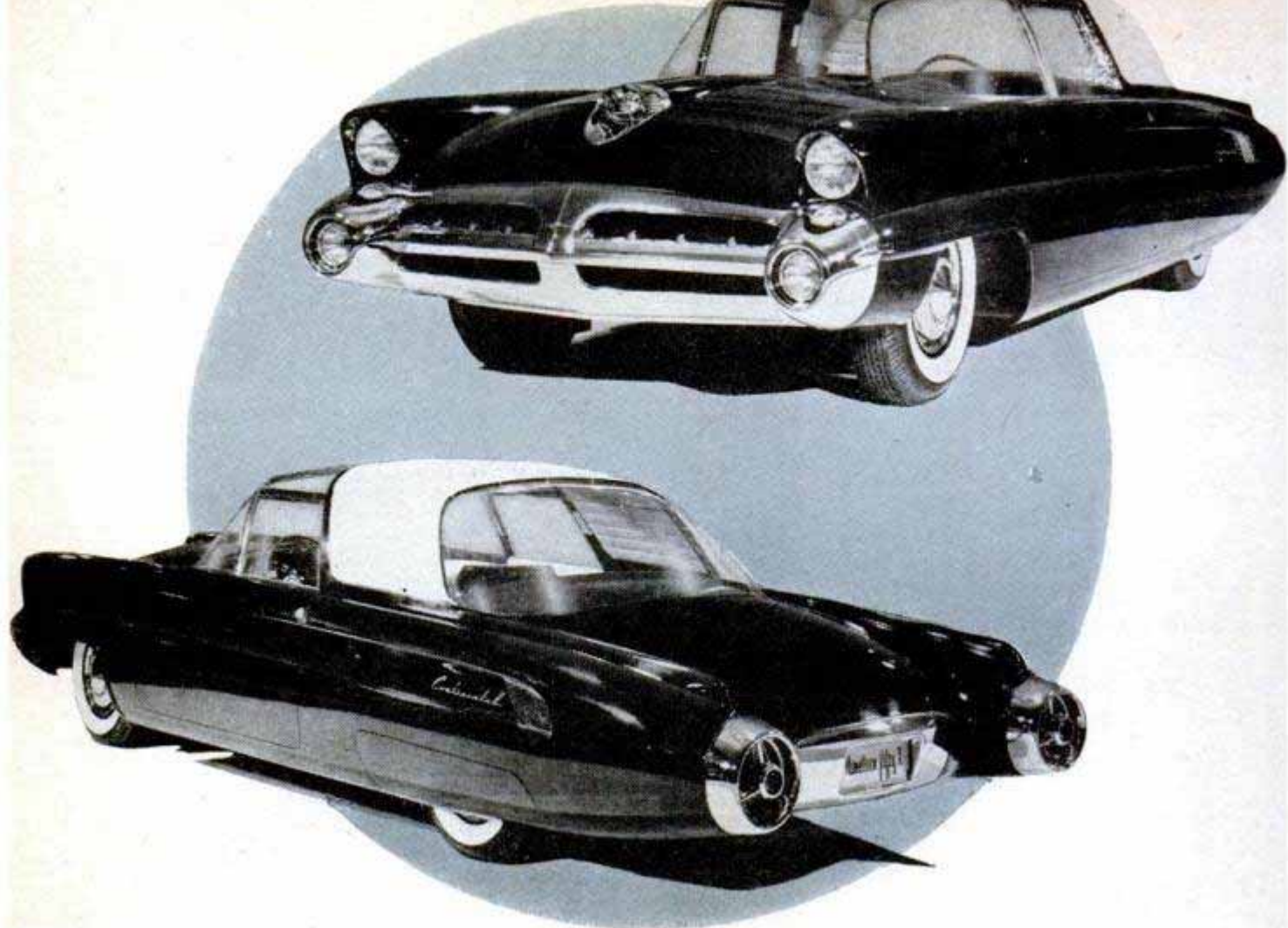
The Continental was discontinued from the Lincoln line in 1948. Henry Ford II said it will be revived when materials and machine tools become available.

The ultrastreamlined car shown was a

With a compression ratio of 7 to 1, new overhead-valve six-cylinder Ford engine is rated at 101 horsepower







Reflecting Ford's thinking in the sports-car class is the Continental 1950-X, still in laboratory stage. Car has a curved windshield which meets a clear-domed top that retracts into a leather-covered canopy

clay mockup, done to a turn. It has new styling features and makes wide use of plastics in the top. The windshield is curved to meet the clear top, which is designed to roll back into the rear portion, made of leather.

It is Ford's answer to General Motor's Le Sabre and Buick's XP-300, as well as Chrysler's more utilitarian K-310. Unlike the first two, it is in the cabriolet styling rather than the convertible and shows an obvious European flare in design.

The car, when completed, will have the new Lincoln overhead-valve V-8 engine with 160 horsepower. Ford expects to use it as the highlight of the company's golden-anniversary celebration in June 1953.

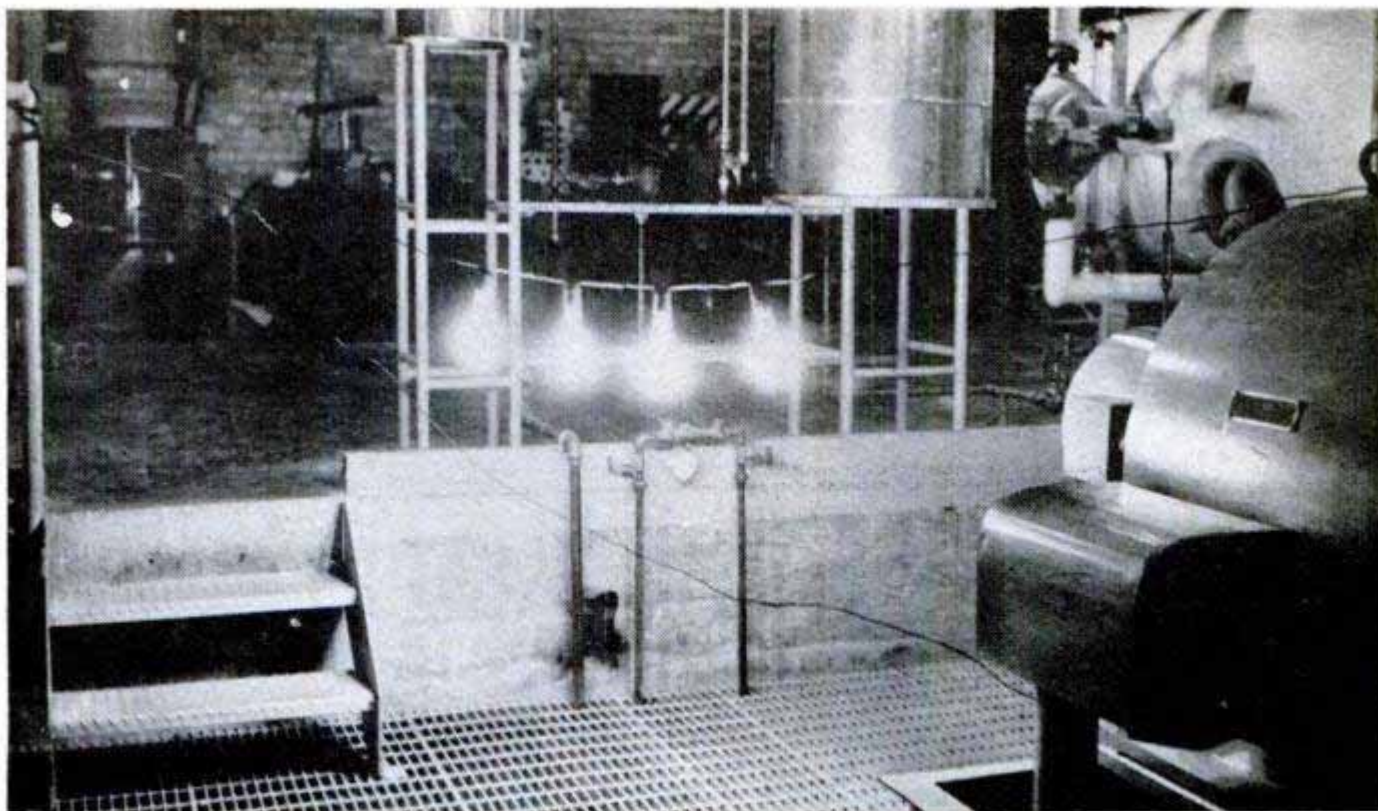
The production Continental will probably not reach the market until 1955.

Mechanical man beside driver in test area records riding qualities of new Ford models with scientific precision

104 POPULAR MECHANICS



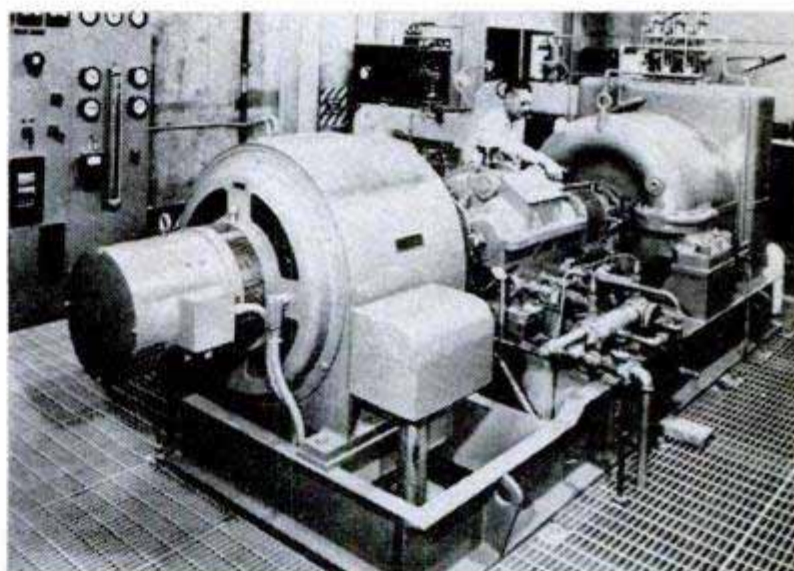




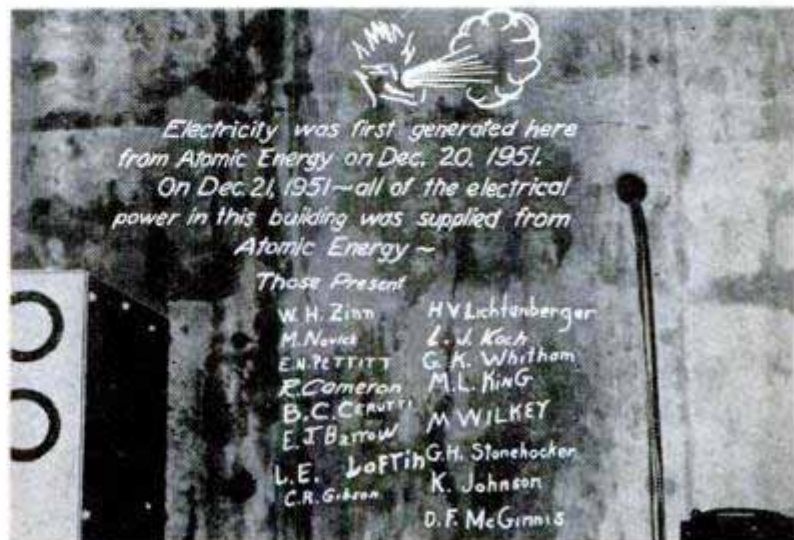
Making history are these four bulbs as they glow with the first electricity ever produced by atomic energy

## ATOMIC REACTOR MAKES ELECTRICITY

For the first time in history, useful amounts of electricity have been produced with atomic energy. The Atomic Energy Commission announced that although the power generated was only 100 kilowatts and the project was entirely experimental, the result is another milestone in the atomic age. Heat energy was removed from an experimental breeder reactor by a liquid metal of a type not revealed. Sufficient heat was transferred to generate steam for driving the turbine and generator. Power generation is an incidental part of the breeder-reactor experiments being conducted near Idaho Falls, Idaho, but it is providing data about the handling of liquid metals under radioactive conditions. The principal function of the breeder reactor is to convert nonfissionable material into fissionable material more rapidly than the nuclear fuel is consumed, a process that would contribute to expansion of our atomic program. It can never be used to generate large amounts of power, but it is providing information that will be valuable in designing atomic power plants of the future, say scientists at the Idaho laboratory.



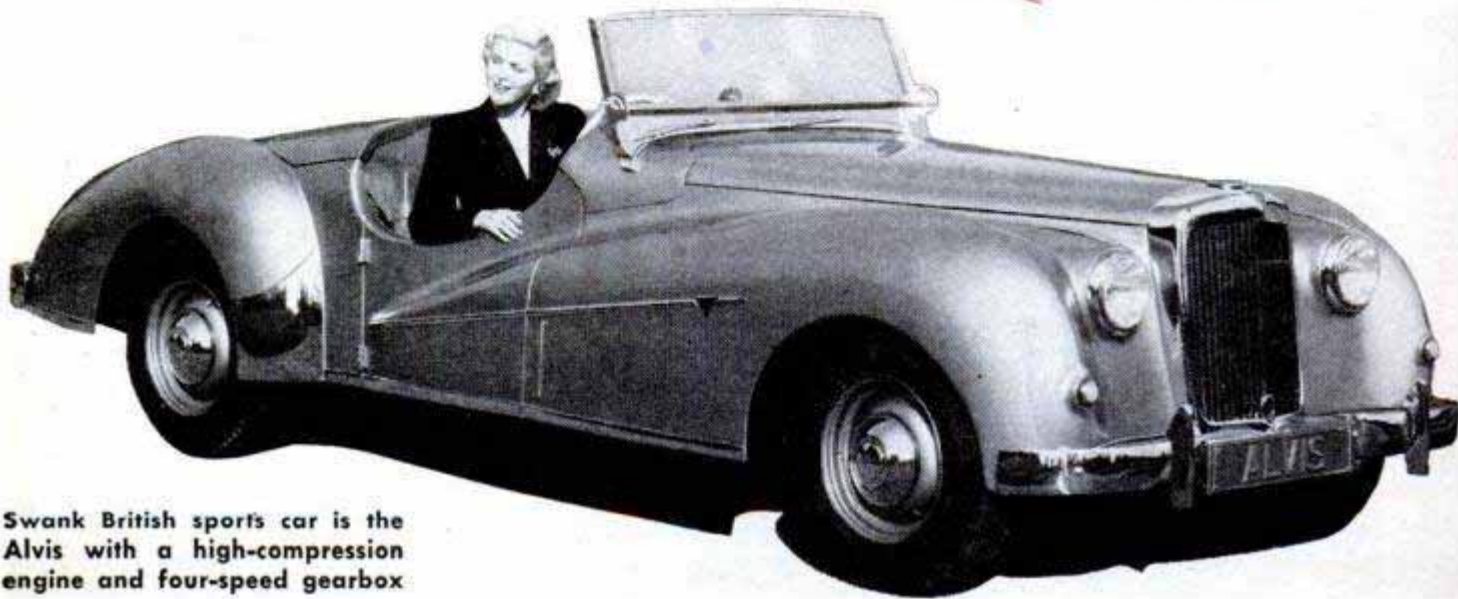
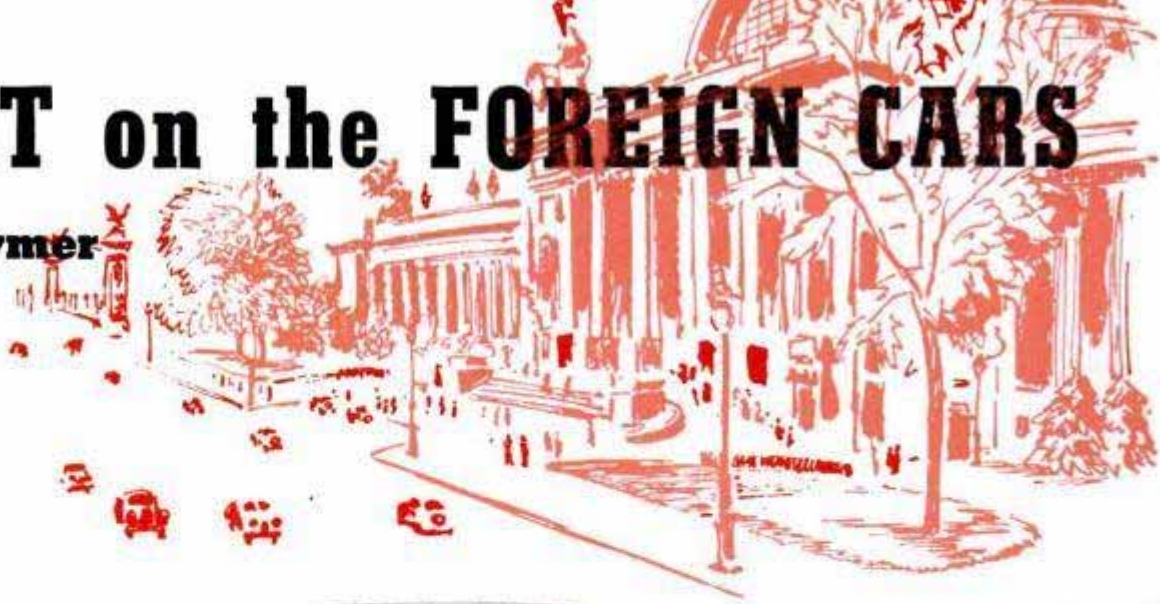
Heat from the atomic breeder reactor made the steam that spun the turbine and generator shown above. Below, the scientists and technicians recorded their feat on the power-plant wall





# REPORT on the FOREIGN CARS

By Floyd Clymer



Swank British sports car is the Alvis with a high-compression engine and four-speed gearbox

In Germany Floyd Clymer inspects the new Mercedes-Benz 300, which retains more conservative styling



## Part I

**M**ANY CAR OWNERS often have wondered why cars built in Europe have such a fascination for a certain group of Americans. Hence this story is based on a 30-day air journey to make a survey and report the highlights of the foreign-motor-car industry to *Popular Mechanics* readers.

I first flew to Paris for the exhibition in the Grand Palais. Here most of the world's cars were on display, even prototypes that have no immediate chance of production. Special custom-built bodies on many of the cars are both beautiful and fantastic in design. The new Pegaso from Spain was the center of interest. It is a V-8 of overhead-camshaft design. Ricart, former Alfa-Romeo engineer, heads this Spanish firm which builds fine trucks and buses in what was a Hispano-Suiza factory. The first 200 Pegaso sports cars now are in production.

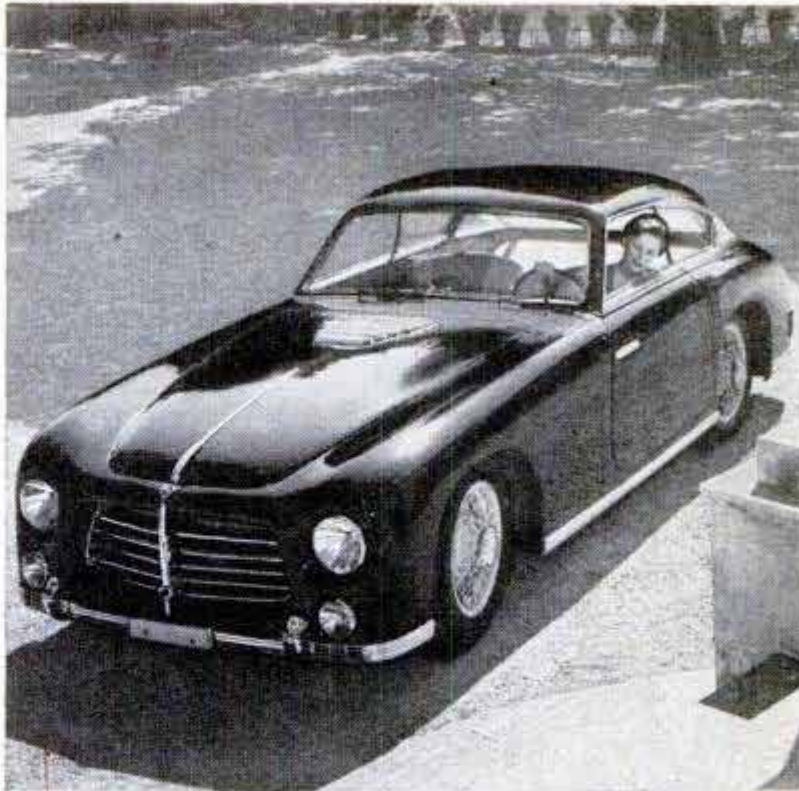
An old favorite, the Bugatti, made its appearance in a half modernistic, half prewar Bugatti design. Citroen, the second-largest car builder in France, with its front-wheel-driven cars in four and six-cylinder models, and a tiny air-cooled, two-cylinder job attracted much attention. This firm seems to



One of the big hits of the Paris show was the Pegaso, which is built in Barcelona. This fast car is powered with V-8 engine

get away with the same body lines year after year, and the French seem to like it. What these cars lack in style is made up in dependability and economy of operation.

Only Renault, with its popular four-cylinder, rear-engine job, exceeds Citroen in sales. Renault is a government-owned factory. The late Renault was accused by the French government of collaborating with the Nazis during the occupation and the plant was seized. It is the largest plant in France and is located in Billencourt, a suburb of Paris. It operates efficiently



with 33,000 employees, of which 13 percent are women. Salaries average about 150 francs (about 52 cents) an hour. Production is about 450 units per day. I found the factory which I visited to be very modern. Detroit assembly-line methods are used. They even manufacture their own bolts, nuts and pistons.

Sketch at left was made at the Paris show for PM by L. Darrow. Below, Clymer on Paris street interviews owner of a French Ford, called Comete

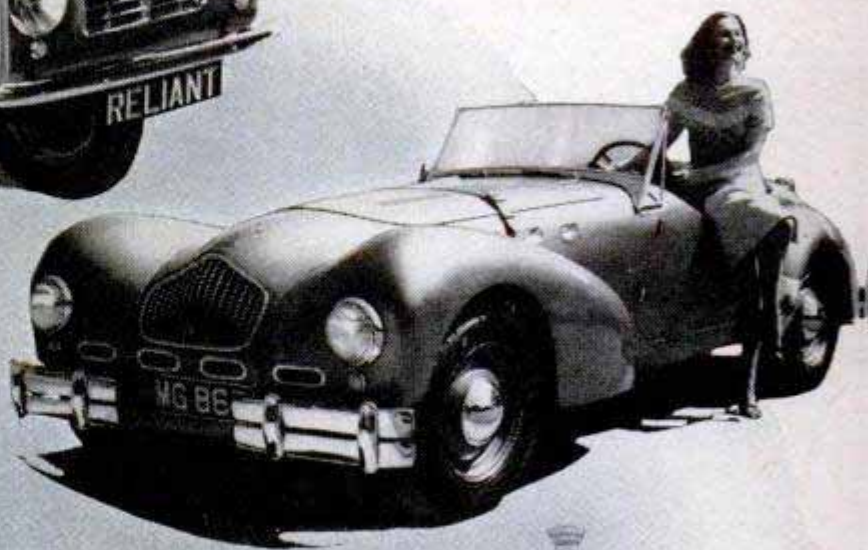




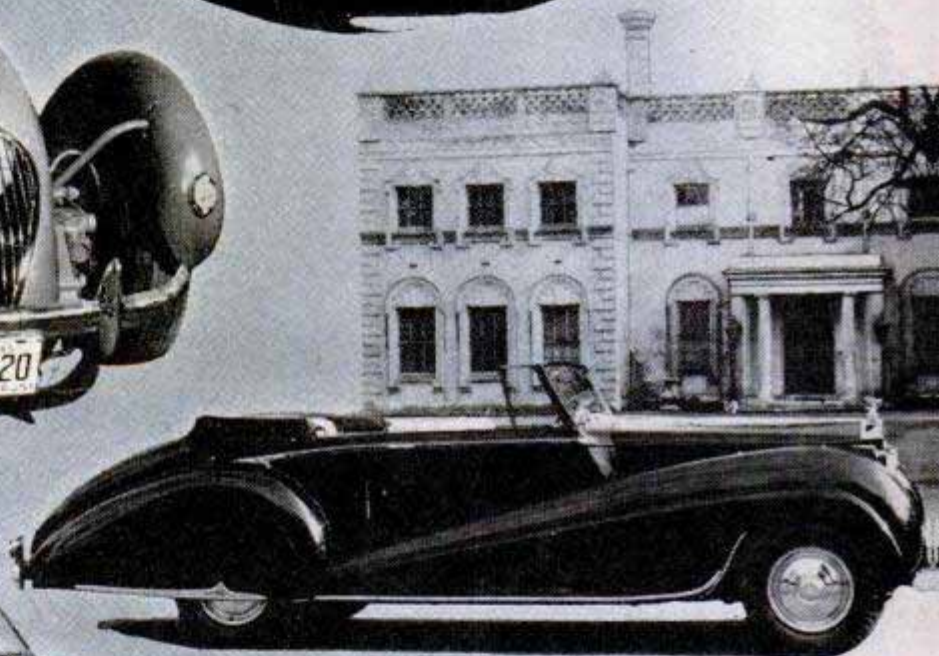


Left, British three-wheel Reliant Regal is a four-seater powered by four-cylinder engine easy on gas

Below, British Allard sports two-seater hugs the ground, has overall length of 168 inches, high speed



Above, British Healey has a four or six-cylinder engine, a top sports car



Above, Rolls Royce convertible coupe is made for export sales



Above, the six-cylinder Aston Martin convertible has a high compression ratio of 8.16 to 1

Clymer smiles from the Jaguar Mark VII sedan which he tested over Goodwood track in England







Volkswagen assembly line at Wolfsburg, Germany, is highly efficient and turns out 415 autos and 35 vans daily

and have their own make tires.

The third-largest builder in France is Peugeot. The fourth is Simca. My visit to the Simca factory in Paris was a revelation. Here is an extremely modern plant also using Detroit-type assembly methods. During the war, Simca repaired 75,000 Jeep engines for the Allies. Now it builds 300 Simcas a day in the popular Aronde model, a well-engineered, modernistic car somewhat along American lines in appearance. The price is 725,000 francs (about \$2000), quite high for a car of its size and out of the reach of most Frenchmen. Those who can afford it must wait eight to ten months for delivery. The chassis of the higher-priced sports model is built at the factory and the body is by Fastel-Metallo, famous body builders.

Simca workers average 180 francs an hour (approximately 63 cents), which is quite high for a French workman. About 7000 workers are employed here, includ-



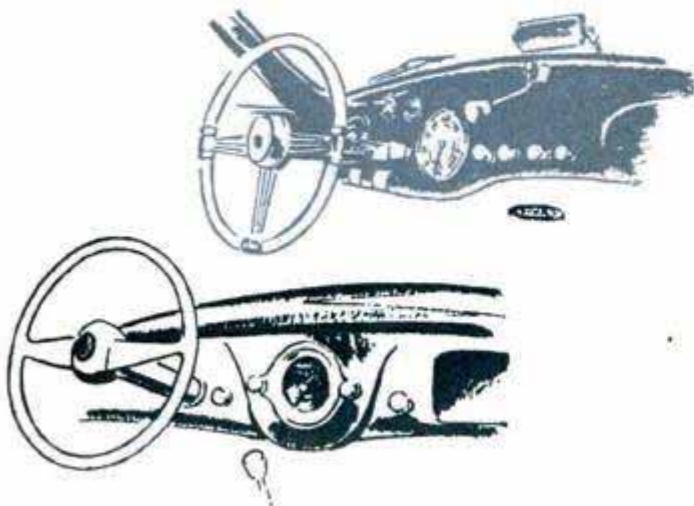
ing 300 office workers. The plant is clean and well-managed. The factory serves food to the workers on a chain-line basis. For 50 francs (18 cents) each worker gets a piece of meat, bread and fruit, and wine or coffee. Simca has a large number of homes which it builds and rents to workers, and is now building more. About 70 percent of the machinery at Simca is from the U. S., having been procured through Marshall Plan aid.

From Simca I went to Ford of France at Poisy, 30 miles from Paris. Here is a miniature replica of U. S. Ford plants. I found a new, modern and exceptionally well-managed plant which, with its 5800 employees, is France's fifth-largest automobile factory.

In France the Ford is called the Vedette, and it is powered with a 60-horsepower V-8

Below, some details of foreign cars sketched by Darrow at the Paris exhibit show simplicity in the design

Below, famous French car, Bugatti, has wire wheels and a one-piece windshield—combining old and new







Left, one of France's smartest cars, the Delahaye, stopped traffic at the Paris show. Above, Clymer drove this Swedish Volvo, popular car in Sweden

imports. For that matter, the average Briton must wait from six months to three years to secure delivery even on a British make.

During show week, the Guild of Motoring Writers held a test day at Goodwood, a speedway 60 miles from London. Three laps of a winding course were allowed each driver in the cars he selected. Here I drove everything from a Morris Minor to a Rolls Royce.

Of the sports cars I drove, I was most impressed with the Aston Martin coupe with its 120-horsepower tuned engine of double-overhead-camshaft design. Top speed of 110 miles per hour is claimed, and its acceleration is terrific. It is the best-handling sports car I've ever driven. Performances by the Allard and the new Mark VII Jaguar saloon (sedan) were commendable. The new Jaguar is an outstanding example of fine British craftsmanship and is truly a wonderful car. The Rolls Royce, of course, is Britain's finest luxury car. Its little brother, the Bentley, is an excellent performer. Daimler, the highest-priced British car which is used by royalty and many government officials, also was there. I made the trip from London to Goodwood and return in a massive seven-passenger Daimler. It performed well, but I was disappointed in the rather rough ride for a car having Daimler's reputation.

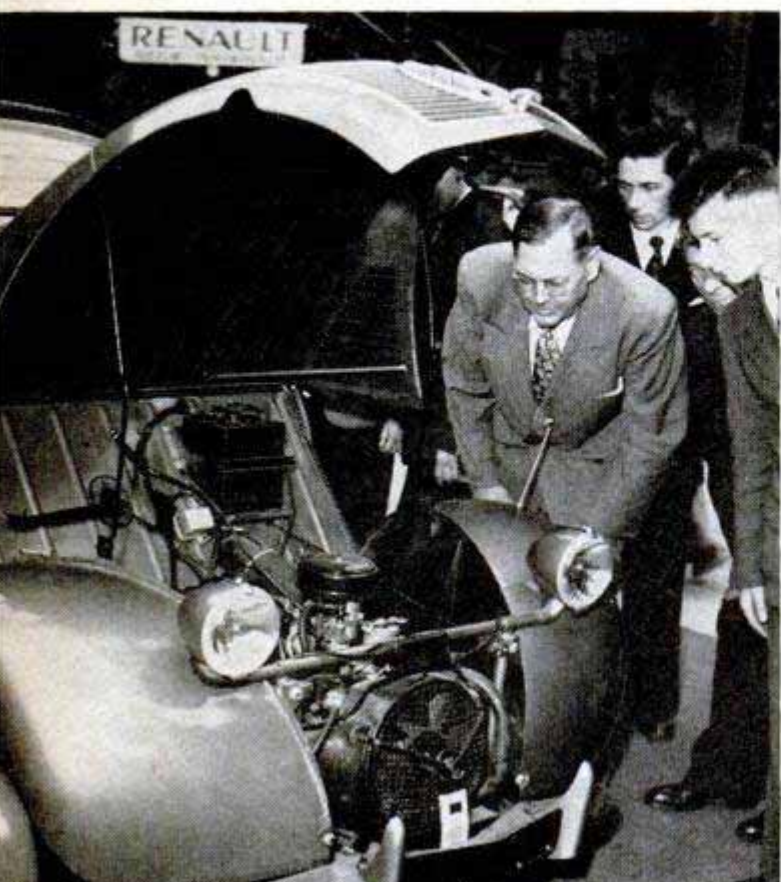
The Hillman Minx and the Austin rode very nicely, as did the British Ford four-cylinder Consul and six-cylinder Zephyr. A fine small car is the Morris Minor, which really handled as well as many larger cars. The new Austin 7, a tiny economy car, created much interest at the show but was not at Goodwood. The Healey is a fine job of

(Continued to page 286)



engine such as Ford once built in this country. It's a cross between a prewar Ford and a postwar Mercury in appearance. The newest French model is the Comete, a beautiful job with the same engine as the Vedette, but with Continental lines that appear more Italian than French.

Next I flew to London, where the annual motor show at Earls Court was in progress with cars on display from nearly every country, including U. S. makes which cannot be sold in Great Britain because of the dollar shortage and British restrictions on



Clymer takes a peek at the small opposed air-cooled engine of a tiny French Dyna Panhard at Paris show





Western girl admires nylon lariats, belts, bridles and other items made from war-surplus parachute cord

## Nylon Trappings for Cowboy Trade

WHEN Hope Hunter of High River, Alta., ex-champion calf-roper, retired from ranching in 1946, he came across some war-surplus parachute cord. Figuring nylon would make a tough lariat with just the right "give," he braided a 40-foot rope and tried it out. It was a failure. Although strong enough to resist anything on four legs, it was too soft to fall where desired. Hunter

and his wife, after two years of experiment, hit upon a chemical solution which solved this problem, and today they're turning out nylon lariats, bridles, hackamores, cinches, browbands, halters and other items. Mrs. Hunter has branched off into braided belts, and Hunter now has a contract with the Royal Canadian Mounted Police to provide lanyards.

Mrs. Hunter braids nylon belts in rainbow colors to catch the eye of cowgirls and Western tourists

Husband and wife team up to make lanyards for the Mounties. Chemical solution stiffens the nylon cord





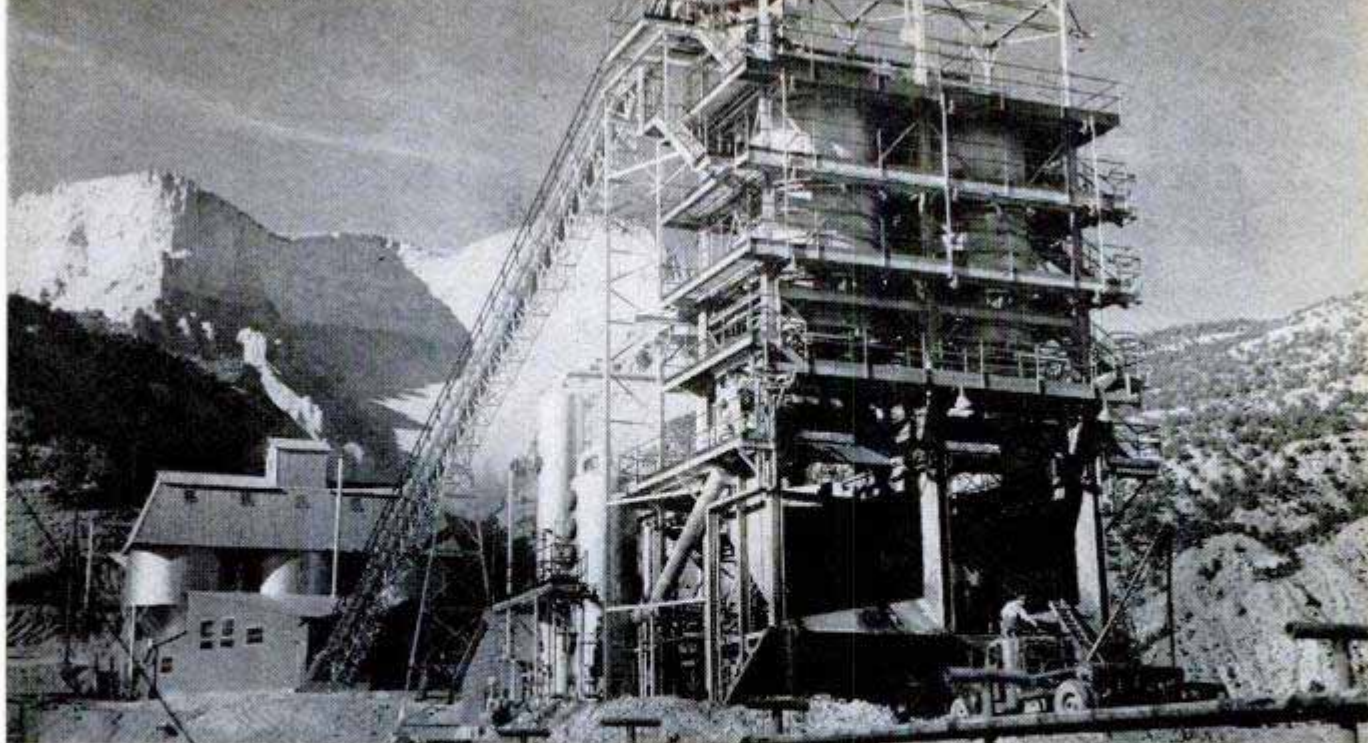


**50<sup>th</sup> ANNIVERSARY**  
FEATURE

WHAT IS HAPPENING TO OUR NATURAL RESOURCES? IN THIS TIMELY SPECIAL ARTICLE, THE U. S. SECRETARY OF THE INTERIOR TELLS HOW CLOSE WE ARE TO

# The Bottom of the Barrel





Cliffs of oil shale in background tower over the Bureau of Mines' oil-from-shale refinery at Rifle, Colo.

**FIFTY YEARS AGO**, most Americans spoke of their country as a land blessed with inexhaustible natural resources. They meant every word of it. Soil, water, timber, minerals—all seemed to be present in such abundance that the supply could never conceivably run short.

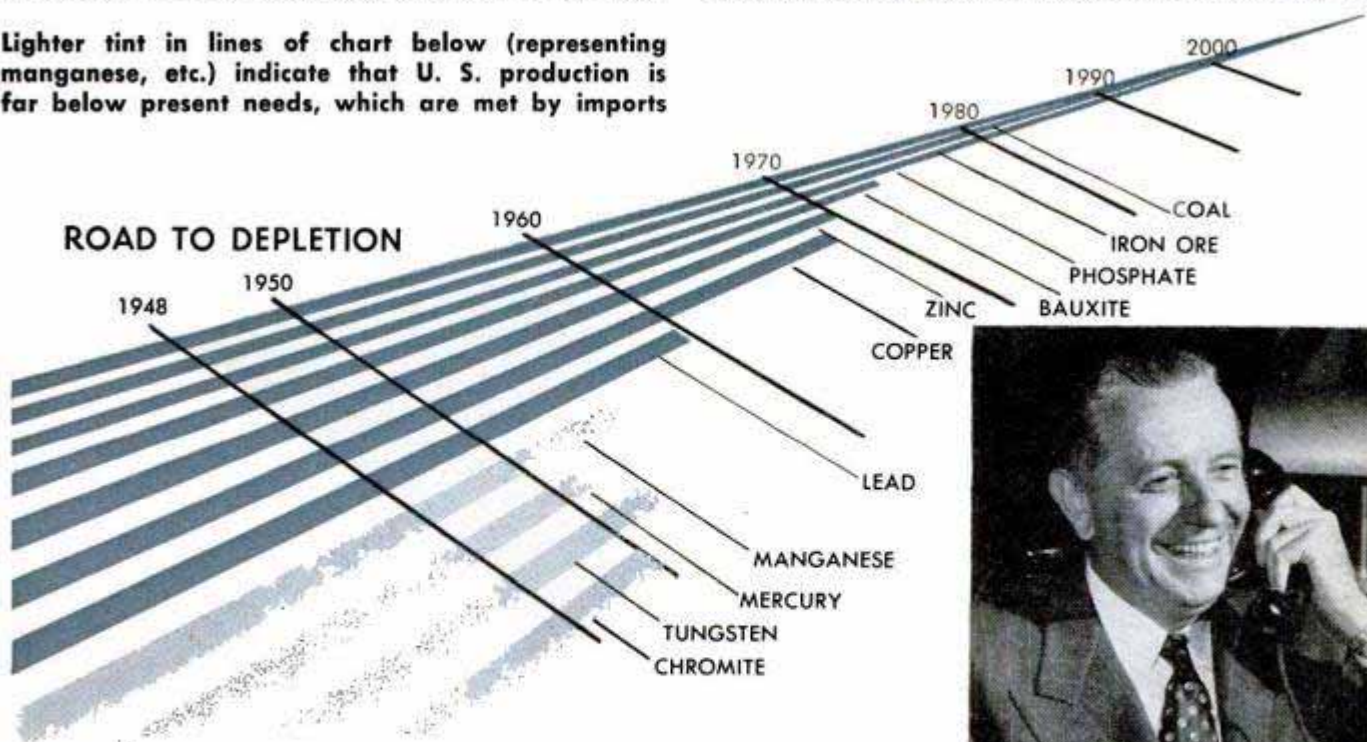
Yet even in 1902—the year *Popular Mechanics* was founded—thoughtful people could see a few danger signals. Here and there it was apparent that at least some of these resources could give out if the exploitation were ruthless enough. The idea

of conservation was beginning to take hold. Significantly, it was in 1902 that the great federal reclamation program was begun.

Looking back, we can see that this reclamation program, with its emphasis on the need for conserving our resources, came just in time.

The country was beginning an era of industrial development which was to make wholly unprecedented demands on its resources. Just when we were beginning to see that those resources were not really limitless, we entered a period in which we

Lighter tint in lines of chart below (representing manganese, etc.) indicate that U. S. production is far below present needs, which are met by imports



**By Oscar L. Chapman**  
**U. S. Secretary of the Interior**





Giant 25-foot pipe is used in Columbia irrigation project in Washington. Below, vast Mesabi iron-ore pit







had to draw upon them more extensively than ever before.

This called for a new mental attitude. We had to conserve the resources which had seemed so limitless, but we also had to get a much broader use out of them while we were conserving them. In plain English, we had to meet the rising needs of the present and at the same time to make certain that the needs of the future could also be met.

So as we look back over the past 50 years we are bound to do a certain amount of stock-taking. How well have we succeeded in this strange two-way job? Where do we stand? Have we met the challenge of the past half century at the expense of the next half century, or as we look to the future can we be reasonably satisfied that we can

**Big dams like Grand Coulee mean tremendous electric-generating capacity and, below, irrigation of crops**



**Coal flowing from Majestic Collieries in Kentucky represents one natural resource with reserves for years**







One of the big natural-resource quests of today is for oil. Here a drilling crew is working into night

continue to make some intelligent progress?

Broadly speaking, I think the answer is most encouraging. The job certainly is not nearly finished, but great progress has been made. If we go on as we have begun, we do not need to fear that our material development will presently be stopped by a failure of our natural resources.

It must be remembered, of course, that we have an extraordinarily complex society, and that some of its needs simply cannot be met from our own native resources. For some of the basic raw materials we are—in greater or lesser degree—dependent on supplies that come from beyond our shores, and as far as anyone can see that will always be the case.

But in the main, the record of the last 50 years is good; better, I suspect, than a well-informed American in 1902 might have felt entitled to anticipate. We have made tremendous use of our resources in those 50 years, but we are not becoming a "have not" nation. I do not think we are ever going to become one.

It would, of course, be a great exaggeration to say that our whole modern attitude toward the proper use of our resources came from the passage of the Reclamation Act in 1902. Much of it developed independently, both in and out of government. But passage of the Reclama-

**Wise forestry methods ended waste and ruin of woodlands and saved a natural resource**



A glance at chart shows why Secretary Chapman sees the making of oil from coal important in the future

tion Act at least symbolized the nation's growing awareness that the land's resources had to be conserved and not wasted. It wrote into law, so to speak, the decision that we would not buy today's prosperity at the expense of tomorrow's. Furthermore, it helped us to see that wise conservation does not merely mean saving natural resources, but involves a sustained effort to make all of America's basic resources continuously productive for the lasting benefit of the entire nation.

The Conservation Act, in effect, put the federal government in partnership with the West in developing land and water resources. First on the Salt River in Arizona, then on the Shoshone in Wyoming and later on many other streams in the 17 Western states, federal projects were built which turned raw desert into new farmlands.

In the very early stages of this program,





the builders of Roosevelt Dam on the Salt River had an idea which sparked a revolution in natural-resource conservation. In 1906 they installed a small generating plant in a cave in a canyon wall to provide hydroelectric power for construction work. From that moment, electricity became the paying partner of the irrigation farmer, and the true value of the potential represented by America's unharnessed streams began to be apparent.

Hence developed the idea of the multiple-purpose type of water-resource development—the project which would not only provide water for irrigation but which also would furnish hydroelectric power, flood and sedimentation control, protection for fish and wildlife and opportunities for recreational development.

Tangible results of all of this are now part of our permanent landscape all across the West. Intangible results are part of our steadily rising standard of living and our national well-being. All in all, more than a million people live on the six million acres of farms and in the scores of communities created by the 79 reclamation projects. These acres produce crops worth half a billion dollars a year, and the cumulative value of these crops is more than three times the 2½ billion dollars which have been invested in the federal reclamation program during the last 50 years. In addition, these dams have an electric-generating capacity of more than four million kilowatts.

Those figures indicate pretty clearly that the task of conserving and developing our land and water resources in the West has been pretty effectively tackled. It is, of course, far from complete. The best current estimate is that some 24,800,000 acres of land are now being irrigated, and it seems possible that as much more may eventually be reclaimed through techniques and developments similar to those now in use. Much remains to be done. But a great start has been made. The country is learning how to make the best use of its streams, and through that use is turning idle land into a productive asset.

Adequate water supply, incidentally, is not a problem for the West alone. Our use of water, in industries and in cities, has increased prodigiously in this past half century, and while the nation's water resources, all in all, appear to be remaining relatively constant, by 1950 water shortages of a local nature were appearing all over the country. It is easy to see why this has happened. Not only has our population greatly increased in the last 50 years, per capita use of water has soared from an average of something between 200 and 400 gallons per day, in 1900, to approximately 1100 gallons per day at present.

Knowledge and techniques pertaining to the nation's water resources have been developed largely in the past 50 years. Fundamental studies to determine ground-water conditions through the country have lagged. We need to continue and expand such studies, and we need also to experiment with such matters as the artificial precipitation of rainfall and the desalting of sea water. There appear to be substantial possibilities in these fields, and the pressure on our water resources is great enough now to indicate that we should find out exactly what those possibilities are and how they can be realized.

Soil and water, to be sure, are only two of our basic resources. Another resource, which is absolutely basic to our development as an industrialized nation, is our supply of minerals.

Current shortages sometimes color the view which we take of our position in regard to minerals. These shortages are perfectly genuine, but they by no means require us to don sackcloth and ashes. On the contrary, we have good reason for optimism—*provided* that we do our part properly.

Obviously, mineral deposits differ from renewable resources like forests, water and soil. They are wasting assets; there is only one crop, and when it is gone it will never be renewed. When we take a ton of ore or a barrel of oil out of the ground we cannot replace it. Clearly, the total volume of minerals in the American earth is smaller today than it was 50 years ago, and it will continue to decline as long as mining continues.

But that is only part of the story. We cannot increase our mineral deposits, but we can increase our mineral resources, and we have been doing it with a good deal of success for half a century; indeed, there is reason to believe that we have barely begun.

A mineral deposit does not become a mineral resource until it is possible to use it. To use it, we must first know how to find the deposit, then how to mine it, then how to get the element out of the waste material with which it is associated, then how to turn it into a usable raw material, and lastly how to fabricate the raw material. In addition, we must know how to do all of these things economically and with a minimum of waste.

The past half century has seen great advances in all of those steps. The search for ore bodies is now a highly organized scientific operation instead of the hit or miss venture of the lone prospector with his pick and his burro. Mining has become highly mechanized, both in open-pit mines and underground. Immense progress has been made in extracting needed minerals from complex ores, so that much that was waste rock 50 years ago is now commercial ore.

(Continued to page 282)





Above, a monitoring team checks radioactivity of a Jeep parked some distance from an atomic explosion

Left, testing radioactivity, monitor wears a skull-cap, respirator, coveralls, gloves and shoe wrappings



## THE ARMY

**... Front-line fighters team up with atomic experts on Nevada's "scorched earth" to learn how to fight with—and survive—the new "A" weapons**

**WHAT'S THE** best way to protect our own troops when we explode an atomic weapon on near-by enemy forces?

How can you warn pilots of radioactive clouds?

What should be done if the wind shifts and the fall-out from such a cloud drops on our own men?

These are some of the life-or-death questions that the armed forces are studying, to learn how to protect our forces not only from possible enemy A-bombs, but from our own as well.

A full-size A-bomb dropped deep in enemy territory is one thing; today's problems concern weapons of tactical size that would be used in a front-line battle area.







Troops watch the rising cloud from a tactical A-bomb at a safe distance several seconds after the explosion

# MEETS THE BIG "A"

By  
Thomas E. Stimson, Jr.

These have been tested already, according to Gen. J. Lawton Collins, Army chief of staff, and he adds that atomic-artillery and guided-missile battalions will replace some of the conventional heavy artillery "in the not too distant future."

Flash-blindness from one of these weapons could put a battalion out of the fight for 10 minutes or an hour, depending on proximity. From six miles away the flash can be 100 times more blinding than the sun.

The mushroom-shaped cloud produced by an atom bomb drifts away like any other cloud. Yet it remains a hazard for a long time. A pilot flying through the fresh cloud would die from the effects, and even hours later enough radioactivity would be present to deposit dangerous concentrations on leading edges and in air filters. Would a radiation meter in the plane warn the pilot of the hazard?

To learn the answers, the armed forces are taking part in the nuclear-testing program of the Atomic Energy Commission at the Yucca Flat test site in Nevada. The 640-

square-mile proving ground is in a wasteland northwest of Las Vegas and will be used for all ordinary experimental nuclear detonations in the future.

Here, it is understood, atomic bombs several times more powerful than those dropped on Japan are being tested, as well as baby bombs that represent only a part of that energy. Some of the dawn explosions have been photographed in Los Angeles, almost 300 miles away, while others were not seen, heard or felt even 70 miles from Yucca Flat.

Atomic explosions have certain characteristics in common. When a "nominal" bomb is exploded 2000 feet in the air, ignition immediately heats the surrounding atmosphere to incandescence. A luminous ball of fire 45 feet in diameter with a temperature of 300,000 degrees C. is produced. A shock wave slams out in all directions.

Within a second the ball of fire attains its maximum radius of 450 feet and its temperature falls rapidly. Nine seconds later the shock wave has radiated beyond two

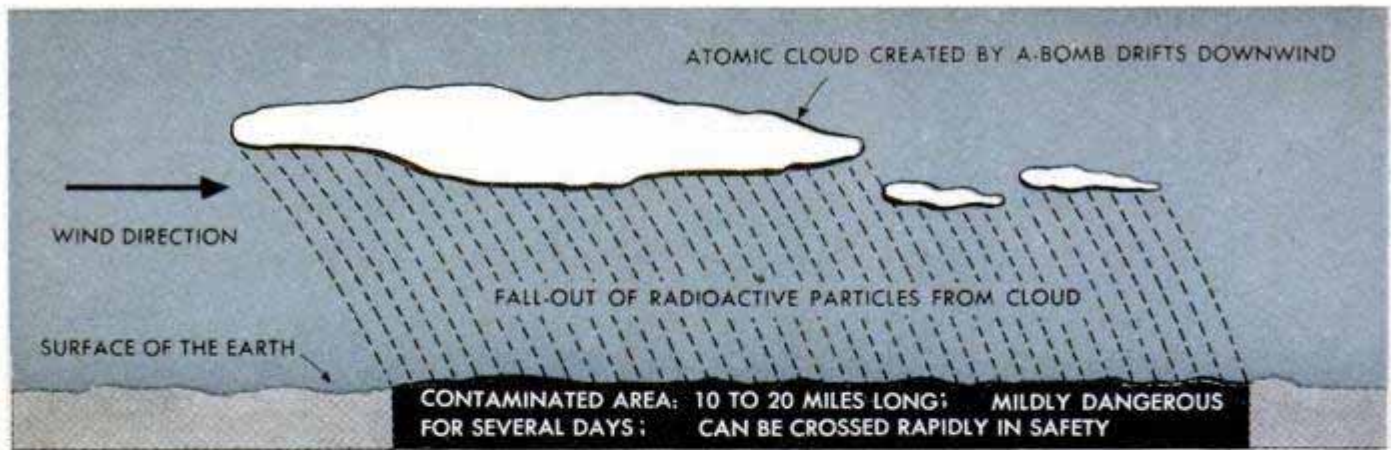
RANGE: 1000 MILES PLUS

Chart shows the relative ranges of three principal types of atomic weapons, including the atomic shell

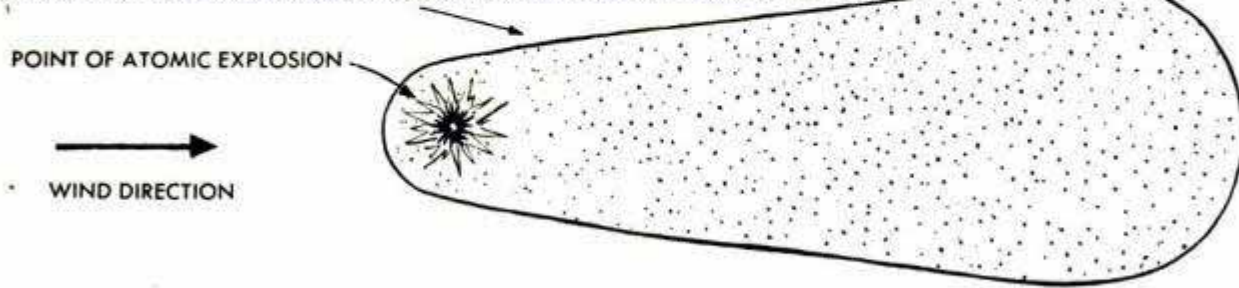
ATOMIC BOMB DELIVERED BY PLANE







GENERALLY, THE CONTAMINATED GROUND AREA WOULD BE SHAPED LIKE THIS



After an A-blast, radioactive clouds drop contaminated particles over area downwind, adding to the danger

miles and all immediate blast, heat and radiation damage is done. The ball of fire loses its luminosity.

The ignition space is now a huge bubble of hot gases and smoke that rises like a balloon. This movement contributes to the suction phase of the explosion, in which immense quantities of dust and surface debris may be drawn up into the cloud to become contaminated by fission products.

In the next several hours most of this dangerous radioactive dust settles back to

earth in a fall-out pattern determined by the height of the cloud, and the force and direction of the wind.

Cattle that were in the fall-out area of one of the first nuclear detonations developed blisterlike lesions and lost much hair though they were 10 to 15 miles away from ground zero. In the case of the plutonium bomb, the fall-out materials are likely to include plutonium particles that are poisonous in addition to being radioactive.

(Continued to page 302)

Hoses radiating from this instrument detect changes in barometric pressure when explosions take place



Recorder, being synchronized here, records changes in barometric pressure detected by device at left







U. S. Air Force photo

## Biggest-Known Jet Bomber

Bug-eyed and high-tailed, the U. S. Air Force's XB-52 is expected to be the largest jet bomber ever flown. After its engine run-up and taxiing period are concluded, the 175-ton airplane will probably fly through

the stratosphere at about 600 miles an hour. The long-range bomber, built by Boeing, has eight J-57 Pratt & Whitney jet engines and a tandem-wheeled landing gear. The only other information now approved for release about the aircraft is that its electrical system requires 200 kilowatts.

## Turborotor Helicopter

Being tested for the Navy, a new turborotor helicopter promises greater performance due to the saving in weight effected by use of the gas turbine. A normal piston-engine installation in the craft would weigh in excess of 500 pounds, whereas the turbine totals less than half that weight. Mechanical simplification and the ability to operate on low-grade fuel afford further advantages.



## Chains for Shoe Soles

During a severe winter storm two years ago, W. K. Young, a postman of Abilene, Tex., took a good many spills on the icy sidewalks. Young started working out a remedy for the problem. The result is a set of nonskid "foot chains" that slips over his shoes. Heel and sole plates are strapped to the shoes, and the chains, which are like those used for dog leashes, crisscross the plates. Now Young can walk safely on the most slippery sidewalks as the chains bite into the ice. The postman has applied for a patent on his shoe chains.

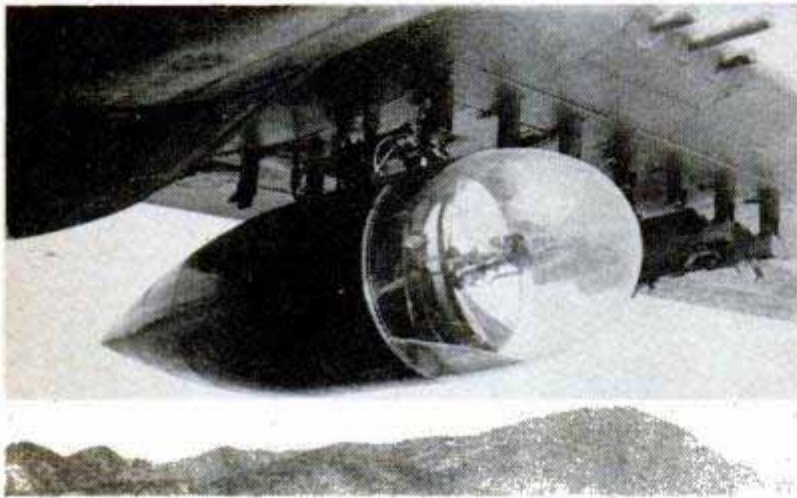
□ During 1951 the United States produced more than 100 million tons of steel, a production mark never before reached during a calendar year.





## Flying Flashlight Pinpoints Targets

Resembling a large bomb, a big flashlight beneath the wing of U. S. Air Force bombers lights the way to added destruction. Where vehicles and other objects are suspected but hidden by darkness, the carbon-arc lamp is flashed on and the entire target area is illuminated. Inside the lamp's glass dome nose is a large reflection disk that can be rotated to direct the beam.

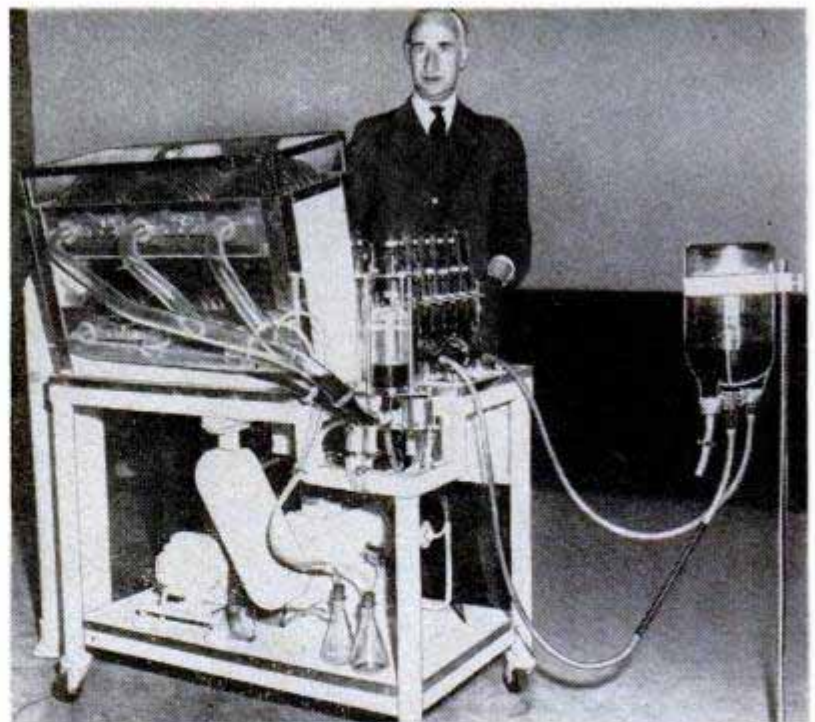


## Machine Replaces Heart or Lung

Surgeons convening at the Sorbonne in Paris were shown an intricate new machine that can take the place of a heart or lung during delicate operations. The apparatus was invented by Prof. J. Jongbloed of Holland.

## Chemical Prevents Elm-Tree Disease

Dutch elm disease, which has threatened to wipe out that popular shade tree, can be prevented in seedlings by a new chemical treatment. The treatment is effective in all but a few cases. Only five percent of the seedling elms treated with the chemical, then inoculated with the disease fungus, developed the disease. The chemical is absorbed into the tree to attack the fungus at its source. Other chemical treatments have been somewhat effective, but they had to be introduced through the soil around the tree. The new chemical can be



sprayed on the tree, a much less expensive method. Many city trees could not be given treatments through the soil because they were surrounded by pavement. The chemical is 2-methylcarboxymercaptobenzothiazole—a name to discourage any fungus.



# FROM BOOT TO ELECTRONIC WHIZ-KID

By Paul Lee

Technical trainees check  
a big gun director by  
tracking local aircraft

U. S. Navy photos



ONE DAY LAST WEEK a vaguely doubtful lad walked through the main gate at Great Lakes Naval Training Station and swapped his civvies for Navy dungarees. Though the youngster hadn't even finished high school, it's quite possible that barely a year from now he'll be responsible for servicing and repairing the most intricate electronic equipment in the U. S. Navy.

Within 14 or 15 months this same lad may be serving as father, mother, nursemaid and doctor to the Navy's gunfire-control systems, the miracle robots that can pinpoint a jet plane five miles away, train the swaying, dipping guns and blast the enemy

out of the sky. These electronic brains un-snarl complex problems in seconds.

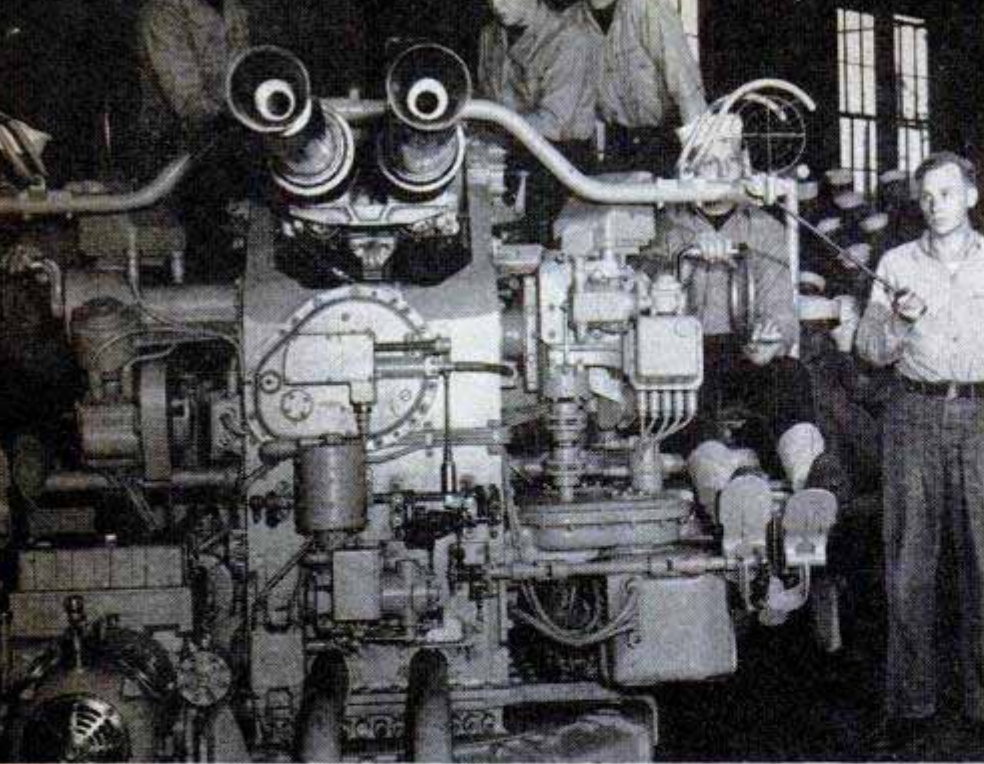
It's high tribute to the Navy's training program that this inexperienced young man can learn in a few short months to diagnose and repair breakdowns in this fantastic array of tubes and gyroscopes, condensers and radar screens. If you told

**This is the third of four articles on the training of our recruits. Next month, "Here Come the Leathernecks!"**

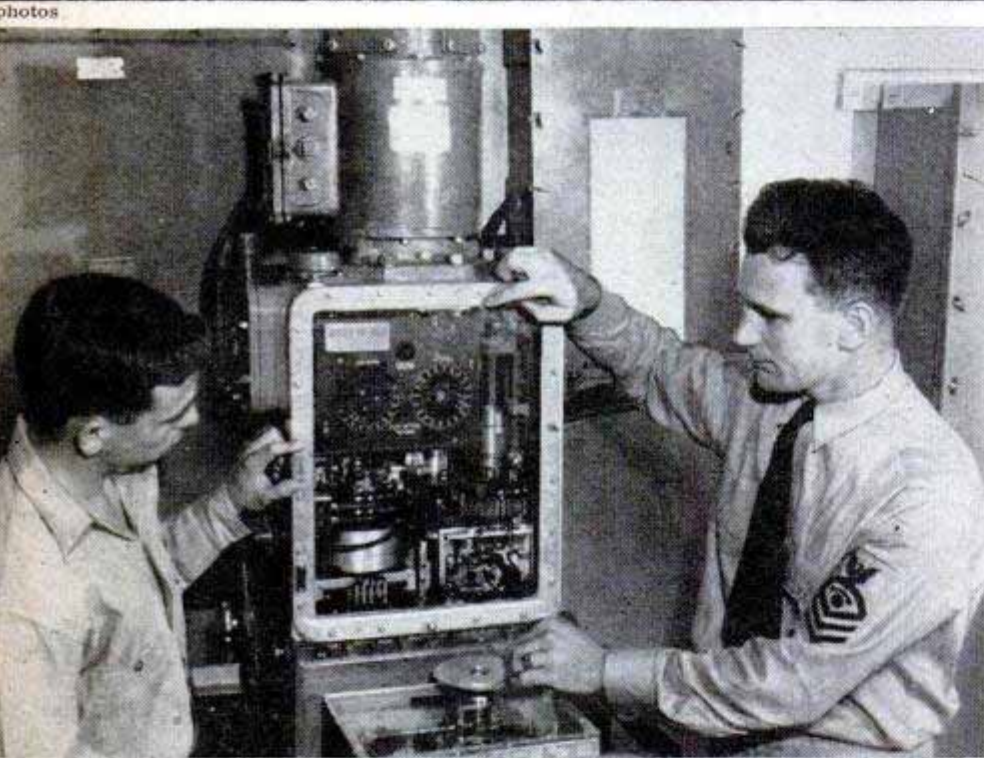
Today they're rather bewildered landlubbers. A year from now they may be servicing the Navy's miracle robots







Boots learn gunnery by manning a real 40-mm. gun. Center, technical student gets close-up of instrument which sets time fuses as shells come up loader. Bottom, boots extinguish blazing oil in mockup of a ship's compartment



the lad what was in store for him he'd label it the wildest scuttlebutt he'd ever heard.

In learning to tend these split-second mathematicians, the young man will have to survive 11 crowded weeks of boot training, then struggle through 44 weeks of vastly more difficult training at the U. S. Naval School, Fire Control Technicians Class "A," near Washington, D. C. The technical school will make him a seagoing expert in electronics, but first Great Lakes must mold him into a sailor.

Today's rookie training is a far cry from the boot camp of the old-time Navy, or even the Navy of World War II.

"I took—or rather survived—boot training back in 1923," recalls a wrinkled chief petty officer, who now drums military subjects into the recruits. "In those days we drilled, ate, drilled, slept and drilled.

"Now it's different. The boot who wades through today's recruit training soaks up civics and history as well as seamanship. He hears lectures on everything from 'The Chemistry of Fire' to 'Marriage and Family Life.' He learns by doing. He learns fire fighting by fighting fire and cargo handling by swinging a nine-foot boom himself. We instructors use any item of equipment that can help us forge a seaman from an irresponsible kid in 11 short weeks: Movies, wire recorders, intricate ship models, a full-size mockup of a destroyer bow, electric eyes





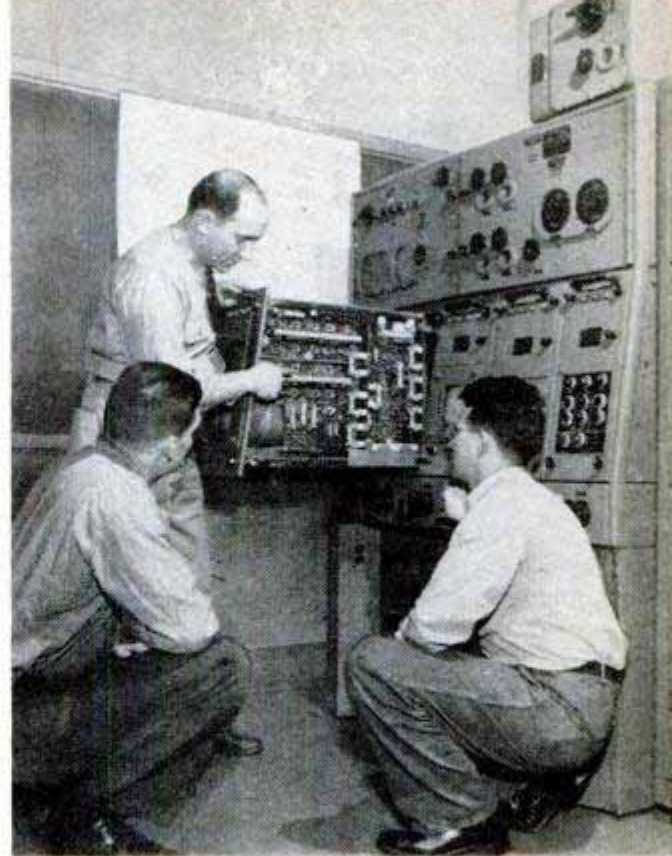
for gunnery practice, overhead projectors. The chief adds with a smile, "And, of course, the rookie still lifts 'em up and puts 'em down on the drill field."

At Great Lakes the recruit hits the deck at 0530. In the next two hours he shaves, dresses, eats and swabs down his bunk bay. By 0745 he's off for his first class, which might be anything from a "drumfire" lecture on ship's nomenclature to a back-breaking session on the rifle range. Every minute of the morning instructors continue to pound the Navy into him. At 1135 there's a break for lunch, but by 1300 he's back in class for three more hours, sputtering through a dousing in the pool to learn sea survival, or listening to a technical lecture on the basic types of naval ammunition. At 1600 he either starts washing his clothes or takes some physical drill. By the time he's finished his evening chow he's breathed the Navy through a very long day.

Driving him through those crowded hours is the harsh, barking voice of the petty officer, ripe with sarcasm and sea lingo. Naval armament may change from rifles in the rigging to atom bombs, but the old-time petty officer remains as immutable as the sea itself.

Because fire is the biggest danger aboard ship, the boot absorbs a full measure of fire fighting. At the Great Lakes fire-fighting range, concrete structures have been built to the exact shape and size of ships' compartments. Instructors fill these buildings with oil, then touch off an inferno. The recruit, teamed with his mates, must fight his way toward the roaring fire armed with a 1½-inch hose equipped with a fog nozzle. By the time he actually reaches the hatch of the compartment and puts out the fire, he's sputtering and half blind. He's learned a healthy respect for fire, but he's also gained confidence that he can meet and conquer it.

During his training the rookie endures 10

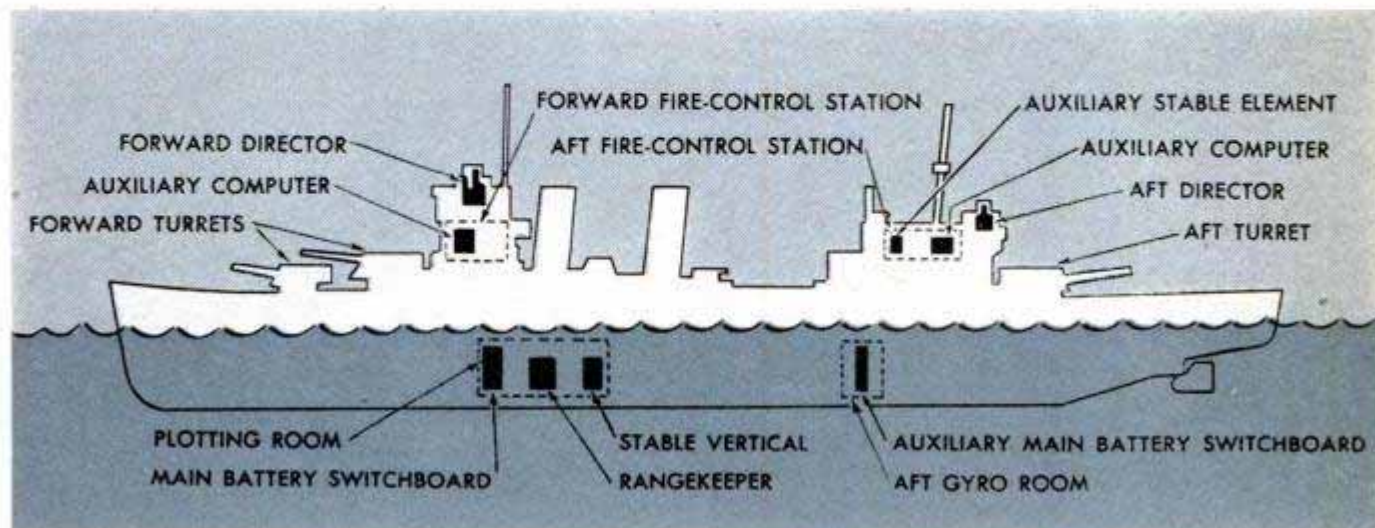


Maze of wires in pull-out drawer is traced by students learning to maintain radar of fire-control system

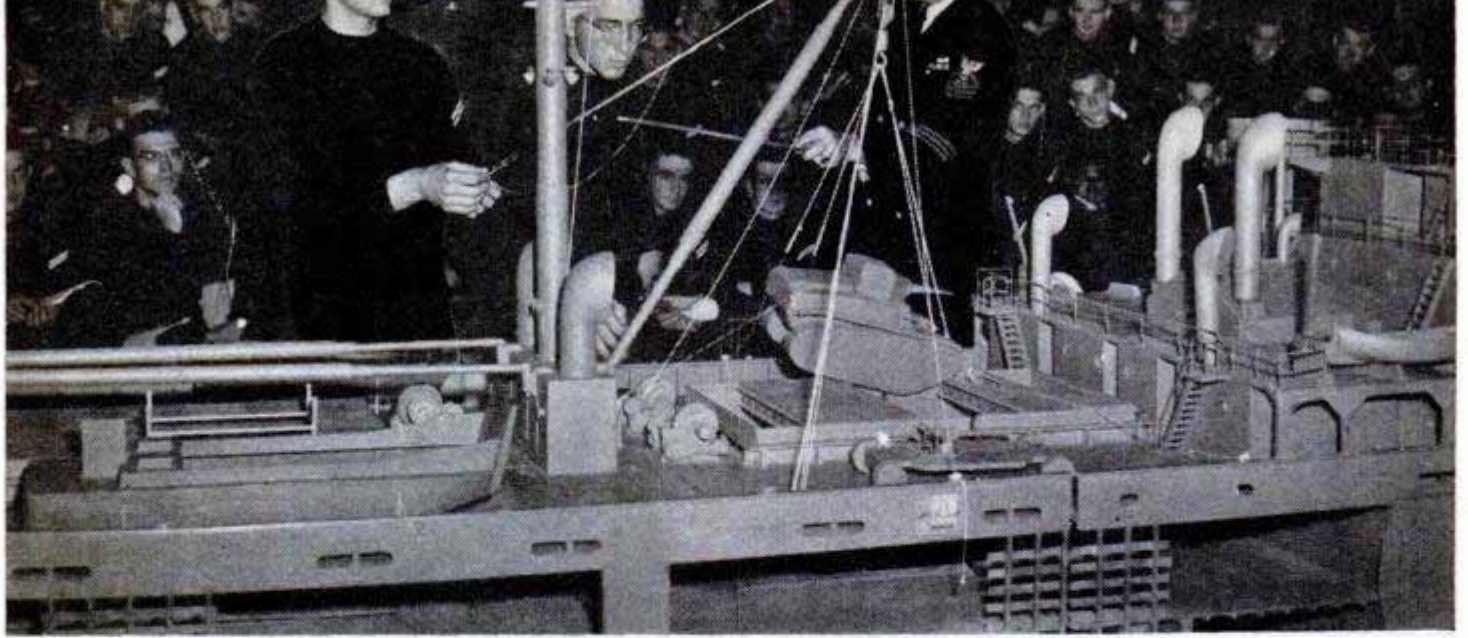
hours of swimming and sea survival, 28 hours of hammer-hard physical training including boxing, wrestling and an obstacle course that would appall an all-American halfback. Very likely, late in the training, he becomes cocky as an old "salt," and jeers at the landlubbers as they "come aboard" the base. Actually, he's only at the keel of the Navy and has a lot to learn before he'll climb into the superstructure.

When he finishes his boot training the proud new seaman can sign up for any one of 54 different service schools designed to make him a specialist in any field from lithography to photography, patternmaking to storekeeping. If he's interested in electronics, he may very well be shipped off

Diagram shows how various units of fire-control system are scattered above and below decks of typical warships







Boot learns principles of cargo loading by lowering miniature tanks and other gear into huge ship model

to the Fire Control Technicians School near Washington, one of the Advanced Technical Service Schools.

Officers at the school lament the confusion in an occasional seaman's mind over the name of the school. Sometimes a bewildered bluejacket, having tasted a whiff of smoke on the fire-fighting range, will show up at the Fire Control Technicians School expecting an easy berth while he soaks up some advance dope on fire fighting. Such a man becomes understandably perturbed when he embarks on a course in electronics tough enough to give an experienced TV serviceman the shakes.

Veteran Navy men, in true tradition, speak no word against their service to an outsider, but among themselves they'll grumble that the sailor's life isn't as simple as it was in the good old days. Most of this nostalgia stems from the fact that today's Navy couldn't exist without jet engines, radar beams and electronic calculators, which require the care of real specialists.

Consequently, today's bluejacket must be an expert on something more than swabbing decks and chipping paint. He must know how to service a jet plane, deactivate unexploded bombs or repair the brains of a fire-control system.

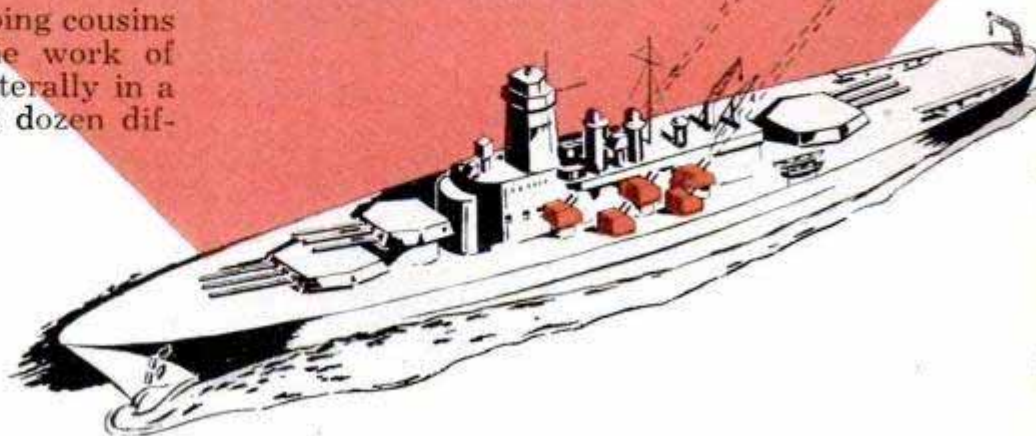
Gunfire-control system, seagoing cousins of the famous ENIAC, do the work of hundreds of mathematicians, literally in a split second. There are half a dozen dif-

ferent systems, but they perform essentially the same operations. Through radar they detect the approach of an enemy plane; locate it; estimate its range, altitude, approach angle and speed; calculate the rate of movement of the ship, and its course; learn the wind velocity. After obtaining this information they calculate when and where an antiaircraft shell of a certain velocity and trajectory will intersect the plane's course. Finally, they feed this information to the swaying guns and stabilize them in relation to the target. Theoretically, it's possible for a modern battlewagon to blast an enemy plane out of the sky without a single man above decks and without a single eye seeing the plane. Also, the fire-control system can line up and fire every battery aboard ship at the same target.

In Navy lingo, this problem of pointing a gun on a moving ship so the shell will intersect the course of a high-speed plane is known as the surface-to-air problem. A recent visitor at the Fire Control Technicians School asked an instructor if he'd solve a simple surface-to-air

(Continued to page 278)

Miracle gunfire-control system, in order to make shell intersect jet plane's course, must detect plane, estimate range, altitude, approach angle, speed; calculate movement of ship; learn wind velocity. In seconds it "solves" mathematical problem and feeds information to swaying guns, stabilized to blast the plane





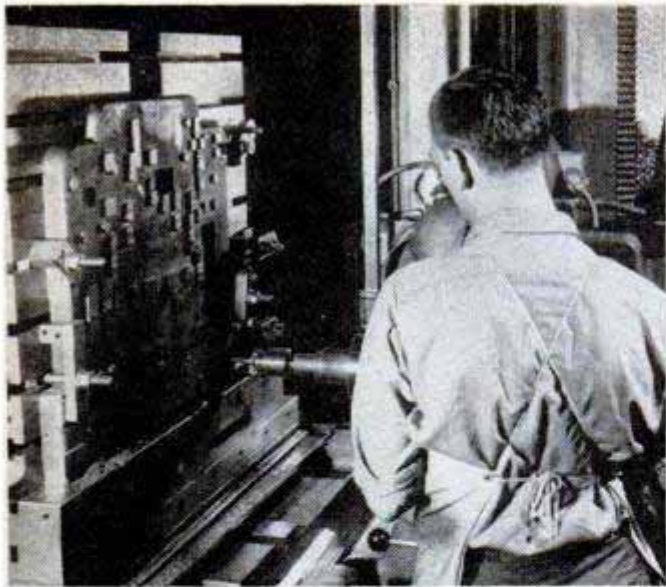


Top, roof of the school  
bristles with all kinds  
of radar antennas. Right,  
students who will service  
gear aboard ship check  
operation of gun director

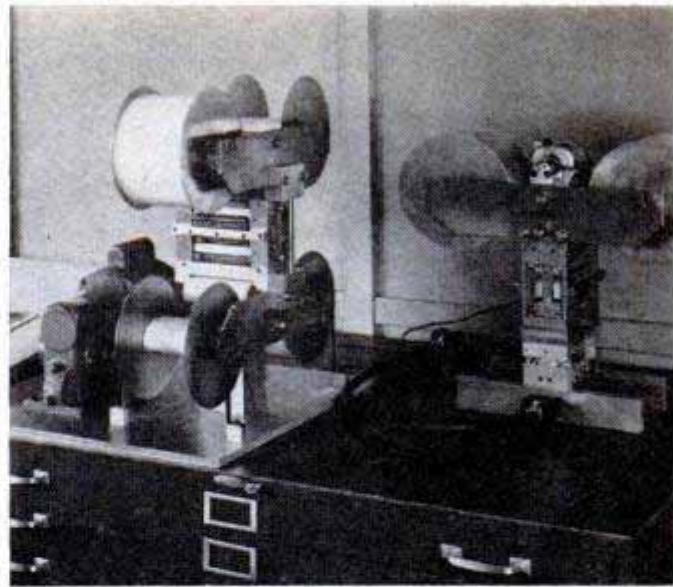
Special Devices Center built this panel to demonstrate the basic laws of physics







All the man does at this machine is load and unload the work. Tool is controlled by the perforated tape

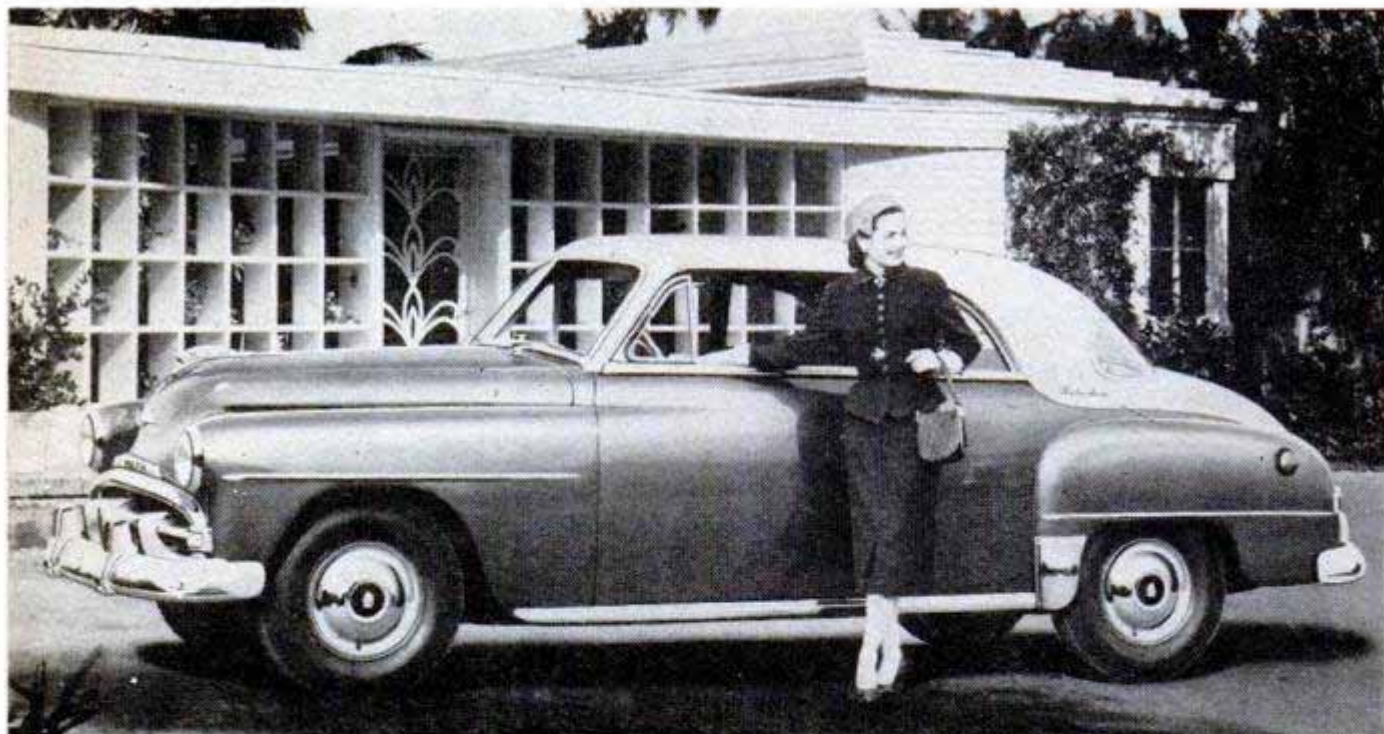


Control tape is perforated on machine, left, from blueprints. Tape then runs through "sensor," right

## Robot Machinist

Draftsmen can now "operate" lathes and other machine tools without leaving their drawing tables with a tape-operated control system that brings the day of the automatic factory much closer. Ideal for mass-production plants having repetitive runs of metal-cutting operations, the robot is controlled by a perforated tape that is cut directly from blueprints—an operation per-

formed on the drawing table. Perforations represent essential dimensions for the part to be machined. As the tape moves through the "sensor," a translating device, electrical contacts vary voltages that control movement of the tool and work. Virtually the only manpower needed is to load and unload the work at the machine. However, periodical inspections are made to be sure that tolerance limits are maintained, and to determine when tools need replacement.



## 1952 Plymouth

Pace-setter for the '52 Plymouth line, which includes 10 body types, is the Belvedere hardtop club coupe, styled in an assortment of lively two-tone colors. The 97-horsepower floating-power engine, with a 7:1 compression ratio, has a newly de-

signed combustion chamber that produces a smoother flow of power. Plymouth's ride also has been made more comfortable by improvements in springing and the Oriflow shock absorbers. Tinted safety glass is available on all cars in the line as optional equipment. Speed of the electric windshield wipers has been increased 10 percent.





## Army Unwraps Improved Rifles

Two new weapons, one a gun that shoots around corners, have been unveiled by the Army. The idea of a gun that shoots around a corner is an old one, but such a weapon has never been perfected until now, according to Army spokesmen. The new curved barrel is an attachment for the M-3 submachine gun. It deflects the .45-caliber slug 90 degrees, and can be adjusted to fire to the left, right, up or down. Tank crews



in Korea had requested such a weapon to shoot enemy infantrymen who crawled on top of the tanks. The other new weapon is a lightweight .30-caliber rifle that can be fired in bursts like a machine gun. Still in the testing stage, the new rifle is  $1\frac{3}{4}$  pounds lighter than the  $9\frac{3}{4}$ -pound M-1 now used by the infantry. It has a magazine holding 20 rounds instead of the eight in the M-1, fires a cartridge  $\frac{1}{2}$  inch shorter than the one now in use and can be fired one shot at a time or as a fully automatic gun by holding the trigger open.

## Water Heater Floats in Stock Tank

Watering tanks for livestock are kept from freezing by a heater that floats on the surface. By preventing the surface from freezing, the heater prevents ice from forming anywhere in the tank. Either natural or bottled gas, fuels now available to most stockmen, can be burned as fuel in the heater. Three inches of glass fiber and a sheet of aluminum foil deflect the heat across the surface. A thermostat controls the burner, but it also may be adjusted manually.



## North America Abounds in Harmful Insect Pests

There are 80,000 varieties of insects in North America, and these pests do \$4,000,000,000 damage annually to agricultural crops, according to Dr. Francis F. Heyroth, assistant director, Kettering Laboratory, University of Cincinnati. Insecticides, in addition to increasing the food supply by destroying these insects, also prevent the spread of such diseases as typhus fever, plague and malaria. According to Doctor Heyroth, no accidental deaths ever have been recorded that can be clearly at-

tributed to the DDT insecticides, even though DDT has some toxicity for animals and man. But, he declares, the hazards associated with the use of insecticides are far outweighed by their public-health value.

If you do not find the information you need in the index on pages 14, 16 and 18, sources of further information are available without charge from *Popular Mechanics*. Write to the Bureau of Information, 200 East Ontario St., Chicago 11, Ill.



# SPIDER-LEG CATAMARAN



Inspired by a catamaran described in July 1948 *Popular Mechanics*, above, four New Englanders built this "cat" that the writer, a yachtsman for 50 years, says is the fastest boat under canvas





## To the Editor . . .

THE WRITER is so intrigued with the well-written and beautifully illustrated article about the catamaran in your November 1951 issue that he cannot resist telling of his experience with a similar craft.

My old friend, Arthur W. Stevens of Boston and Marblehead, returned from a trip to Hawaii in 1949 fairly bursting with enthusiasm over a catamaran he had seen at Waikiki Beach, a picture and write-up of which had appeared in *Popular Mechanics* (July 1948). All he needed was a slight nudge from me to call on one of our younger and successful naval architects, Ray Hunt. The result of that visit was an interview with Selman Graves of the Marblehead Yacht Yard. Between the two of them there was built a sailing vessel beyond our wildest dreams.

Her exact dimensions are not essential. The pontoons are 42 feet long with a maximum beam on deck of about 20 inches and set about 13 feet apart. They are beautifully designed and constructed sturdily of plywood and oak timbers. Each was fitted with a centerboard slot, a winch for handling same and a good pump. If I were to repeat the experience, I think I would substitute a few watertight compartments for the pumps. It's no great trick to construct a tight hull of this kind, but in the event of a collision resulting in a puncture it would be nice to stay afloat. In the second year, we compromised by stuffing plenty of Styrofoam into these hulls to provide buoyancy if they were punctured.

The original design called for a "cat" rig—true iceboat style. The 50-foot mast was a masterpiece, teardrop design about four inches thick (hollow, of course) and about 14 inches fore and aft. It was set on a swivel or rotating base and followed the angle of the boom. I went out with the designer and Mr. Stevens on the trial run. Fortunately, it was a light day with a smooth sea. At every movement that mast rattled around overhead like a veritable seagoing sword of Damocles. After about 10 minutes of it, I told brother Hunt that I was sure his rig was an aerodynamic achievement, but a poor shipmate and that I, for one, was ready to call it off. We did. That was all for the cat rig.

Next we installed a conventional mast from a Triangle Class boat, about 10 feet shorter and stepped in a fixed position about three feet farther aft, and a jib was added. The total sail spread was changed little. It was still about 600 square feet.

One bright Sunday morning it blew hard from the northwest (an offshore breeze at

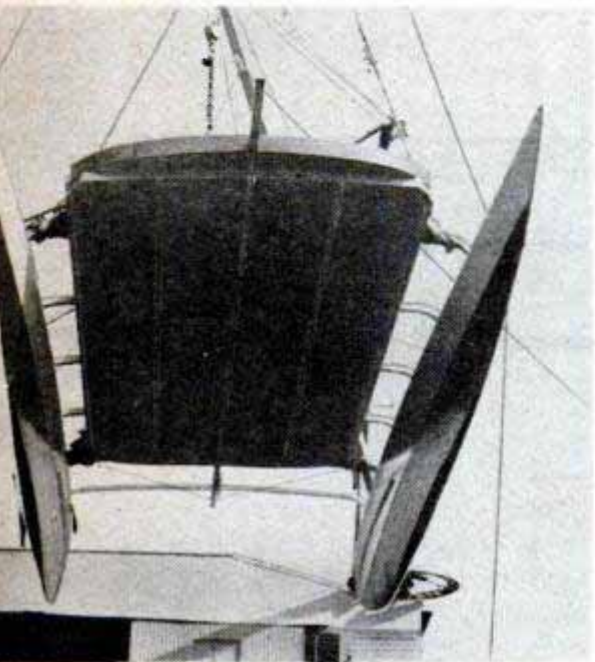
Marblehead) and I hastened to Stevens' house to suggest that we put the catamaran over the jumps. He, being 70 years old, suggested that he'd rather watch the act than take part in it. Designer Hunt suggested that he take Stevens out in his power boat, which was tested to 20 knots, and they would time us. Well, I collected three Marbleheaders, two of them airline pilots with the day off, and we went aboard, hoisted all sail and let her go for the harbor entrance.

It was a crisp 30-knot northwester with the puffs coming out of Salem running well above that—probably at least 40. The few yachts out sailing were under shortened canvas. Heading down the North Shore we had the wind on the port quarter and even before we cleared the entrance and got out from under the shelter of Fort Sewell we had pulled by the power boat which was wide open and doing her scheduled 20 knots. When the first of the puffs hit us from Salem Harbor, that catamaran lifted her twin noses into a semiplaning position and flew. A twin-crew sport fisherman down to leeward tried to hold us, but we "walked" out from under him as though he were anchored. We couldn't have been doing less than 30 knots and probably, for a short distance during the height of each puff, more than that. We had no centerboards in her that day and she carried such a hard-weather helm with that quartering breeze that I had the eight-foot tiller right across her to hold her off and drive her. That dragged the twin rudders and set up a six-foot water plume at the stern of each pontoon like a destroyer at full speed. It was so thrilling that we four found ourselves yelling at the top of our lungs like kids on their first roller-coaster ride. The moldings that were on the bows for the first 10 feet to act as water breaks were really breaking water. They were practically atomizing it with the result that we seemed to be steaming up forward as we tore through the water. Finally, we decided to return to our waiting friends who had hove to far astern. Close hauled, she seemed to go about as fast as she had downhill. In the puffs you could feel her straining in her effort to pull her windward leg out of water. However, she maintained remarkably level keel. I don't think her windward waterline came up over 10 inches, if that. Just as we pulled up alongside our motor escort, one of the weather stainless-steel shrouds parted right at the fitting and over went the mast. Then the escort earned her keep by towing us back to the yard.

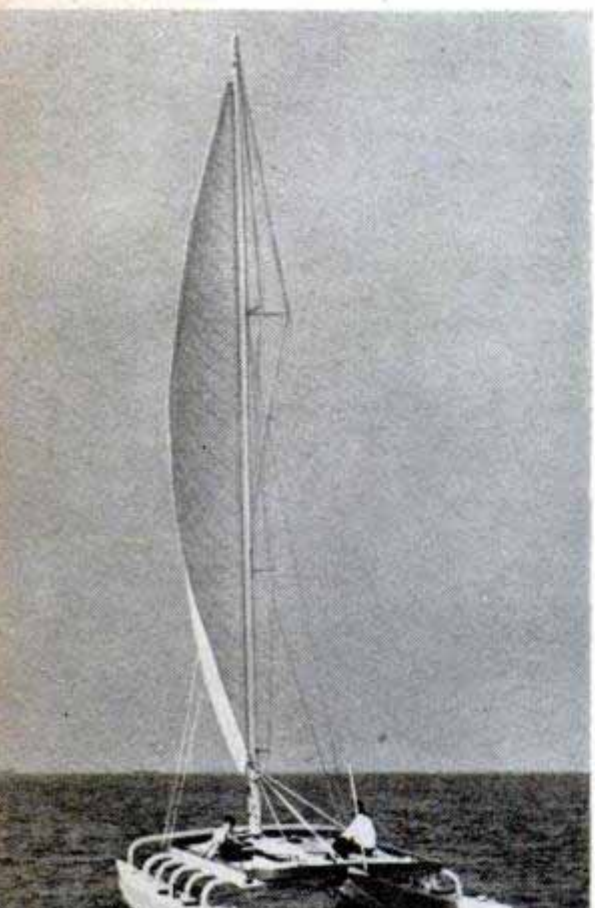




Close-up view of the catamaran shows the spider-leg design, a modification of the boat described in *Popular Mechanics*



Buoyancy is provided by two slim pontoons that cut through the water with almost no resistance. Below, the broad, high deck forms a stable platform for day sailing



I am convinced that we attained and held a higher speed on the run than has ever been attained by a sailing vessel. That may sound like a ridiculous statement because of the utter impossibility of proving it, but I base it on 50 years of sailing experience.

Within a couple of weeks we were rerigged with a tailor-made spar a little on the heavy side and with heavier wire rigging. We substituted good old-fashioned splices in the place of fittings, added a second lower shroud and another jumper stay and were ready again. We put her into the Corinthian Yacht Club Chowder Race, a handicap affair, as scratch boat. The weather conditions were about as unfavorable as possible—a moderate to strong southeaster with a nasty, confused sea and ground swell. A four-mile beat saw those long narrow pontoons plowing through the steep seas and coming out the other side. The hull strain set up was terrific and I was fully prepared to see her break up. However, she reached the first mark and reaching for the second mark we passed half a dozen craft that had started ahead of us.

With the wind and sea abeam on the last leg, the strain on the hull grew worse. We were going great guns and passing boat after boat when, without warning, there was a crash and the whole ship seemed to crumple up. The starboard cross members broke right at the curve. The starboard pontoon drifted off to one side attached only by the steering cable. The deck fell down into the water on that side. We climbed on the other pontoon and sat like sea gulls until rescued. The Coast Guard towed in the wreckage and the season was over.

During the summer of 1950, I had the cat in my home waters of Hingham Bay, which were more favorable, and my kids had a lot of fun sailing her. I am entirely sold on the possibilities of catamaran design, even if Ray Hunt's first attempt proved too weak for rough going. During the winter of 1949, Selman Graves designed and fitted  $\frac{3}{16}$ -inch steel sleeves onto these spider legs and welded them to steel saddles bolted to the hulls at each station. This added about 600 pounds of weight and set her down a couple of inches in the water, but gave her a much greater margin of security and, I think, solved the problem of holding her together. We didn't have any opportunity of testing this new gear to anything like the limit, but I'm betting on it.

This vessel has changed hands. I hope the new owner will experiment by dropping the deck right onto the pontoons even if he has to pull them together a bit to do it. He can secure the whole contraption much better that way and still have plenty of clearance between pontoons. I'm satisfied that the hulls are very fast and that a wonderful day sailer can be made out of her. As a matter of fact, I think there is a definite place in day sailing for a smaller catamaran—about 20 feet. Such a little boat could be designed to be dry, stable, safe and very fast. It would be a great platform from which to watch conventional yacht races, ranging easily ahead of the racing fleet at all times and watching them round the marks and then beating them back to the finish line.

Harold P. Cooley, Boston, Mass.





## Reclining Bicycles

Two brothers from Copenhagen, Denmark, are pedaling their way around the world—while lying down! Their bicycles are built on long, horizontal frames which

permit them to pedal while reclining. Their heads are pillowed on convenient headrests, and the bicycle handle bars pass beneath their legs. The brothers expect to finance their three-year, round-the-world trip by selling picture postcards of the odd vehicles.



Lockheed Aircraft Corp. photos

## Portable Elevator

Air-freight handling is speeded by two new loading devices that are powered by the airplane's own electrical system. With them, one man in an emergency can load an entire transport. One is a knockdown elevator that lifts 10,000 pounds 12 feet and

has flexible ramps that permit carts and hand trucks easy access. It can be stowed in the plane. The other aid is a subfloor endless chain running the length of the cabin. A device hooked into the moving chain, through a floor slot, pushes or pulls loads of up to 10,000 pounds. The conveyor is controlled by a remote on-off switch.





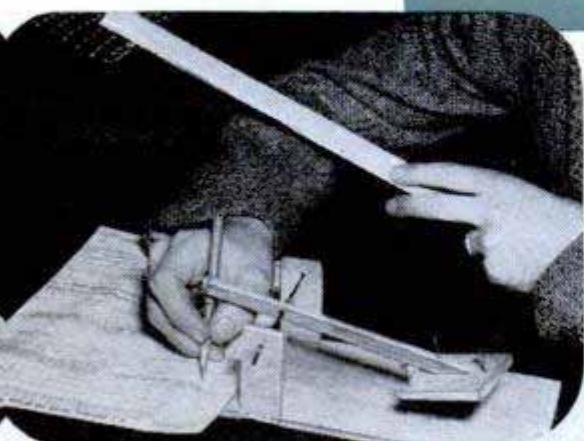
Jim McNamara inspects a Rube Goldberg lie detector with a "mechanical brain" inside robot that blows talcum powder from eye if subject lies

# I WAS THE GADGETEER FOR A TV MADHOUSE

By James Deitch

Left, fly exterminator for persons filling out income tax is attached to pencil. The swatter is a decoy

Below, climax of McNamara's alarm clock which starts on page opposite is tipping can of water over sleeper





Automatic ash sifter and distributor sifts out big particles and spreads the ashes evenly over any rug

**I WANT YOU** to make an alarm clock 20 feet long that goes off when a magnifying glass lights a firecracker. Have it ready for tomorrow's show!"

That's the kind of assignments I have had from a television performer in Hollywood. The man's name is Jim McNamara and until Uncle Sam requested his services in Korea he entertained with a Rube Goldberg television stint. My job was building many of the insane inventions he demonstrated on TV. He called these "boons to humanity."

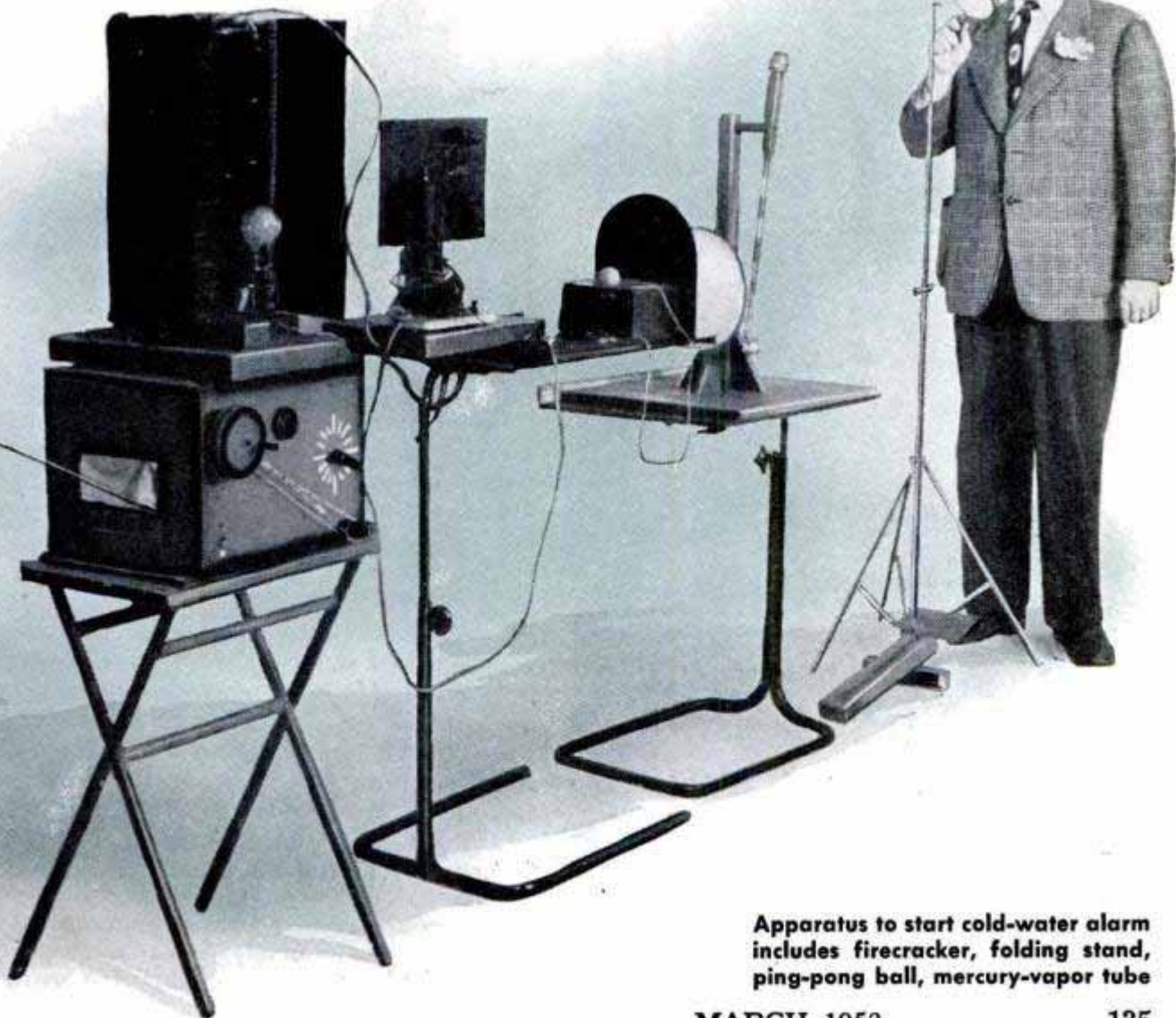
Take the alarm-clock gismo. McNamara had a particularly important show coming up and wanted something elaborate. He said that alarm clocks never went off on time, and that was why he was always late to the studio. So he wanted one that worked on something reliable—like the sun.

His idea was that the sun has always come up in the morning—as far as we know. Therefore, this useful source of illumination could be employed to set off a firecracker which in turn would start a chain of events that would eventually wake up *anybody*. Of course, as there wasn't any sunlight in the studio, he would have to



light the firecracker with a match, but the audience would get the idea.

I fastened a firecracker to a folding stand. Around the firecracker I wrapped a piece of string with a weight on the other end. When the firecracker went off, it broke the string and dropped the weight on a rocker arm, which in rocking released a piece of light rope.



Apparatus to start cold-water alarm includes firecracker, folding stand, ping-pong ball, mercury-vapor tube



McNamara demonstrates his trick fish scaler, which has delighted TV audiences. After a fish is passed through the machine all that comes out is a skeleton. Electric motor in gadget operates two moving platforms



Here McNamara is shown placing simulated fish on intake platform. Switch starts wheels and dials turning. Water spigot is at end

This in turn released a swinging lever arm with a block of wood attached to one end. The block was studded with pins, points facing outward. These broke a balloon, which in exploding tripped a trigger mechanism, setting off a mousetrap. The mousetrap shot a ping-pong ball, attached to a string, three feet into the air. When the string jerked taut, it set off another mousetrap that acted as an electrical relay—and all sorts of things began to happen.

A gong rang. A flashbulb went off. A mercury-vapor tube began flashing. Next another relay tripped, starting a fractional-horsepower electric motor that turned a gear chain which caused a hand to revolve around a large dial, and at the same time turned a small drum which wound up a length of clothesline.

The other end of the clothesline ran over a pulley and was fastened to a tin can that was attached to a mike boom by a swivel arrangement. As the clothesline wound onto the drum, the can slowly tilted.

This can was filled with water, and I lay on a cot directly under it. For some reason I never clearly understood, McNamara insisted that I wear a flowing red beard and a top hat. He was always devising weird costumes for me, sometimes a Napoleon hat, occasionally a frock coat and a derby with a television aerial sticking out the top, and once a moth-eaten bearskin with a hole cut in the middle for my head.

Anyway, as the can tilted, a stream of wa-

Dark cloth draped over umbrella prevents friends of the owner from recognizing him and wanting to share shelter. The peephole is for observing pretty girls







The author tests McNamara's detector for locating any possible "square" electrons in faulty bowling balls

ter poured on my face, theoretically awakening me. McNamara liked the idea so well that he used it several times.

A typical example of McNamara's brain typhoons was the "soup cooler." The core of this monstrosity was an automobile fuel pump. This was powered by a six-volt dry battery, with a switch in the line. I constructed a radiator out of metal from two tin cans and some scraps of wood. The output side of the pump was connected to the radiator with a piece of rubber tubing, and another piece of tubing was fitted to the intake side. The whole contrivance was carried in a black medical bag that once belonged to my great-grandfather.

You simply carried the bag to the restaurant, and while waiting for the soup, unpacked the gear and placed it on the table. When the cup of boiling soup arrived, you placed it under the radiator, and dropped the loose end of the intake hose into the bubbling broth. I provided a screen across the intake to prevent alphabet noodles getting into the machinery.

At the flip of a switch the soup was sucked out of the cup and pumped into the top of the radiator. It then cascaded over the grid and back into the cup, being effectively cooled in the process. The thing worked perfectly.

One day McNamara came into my workshop sizzling with the idea that humanity could not continue to exist in peace and happiness unless an automatic fish scaler were instantly designed. He wanted a box that would automatically slurp up a fish, go through all kinds of weird motions, and then give forth a fish skeleton. He thought

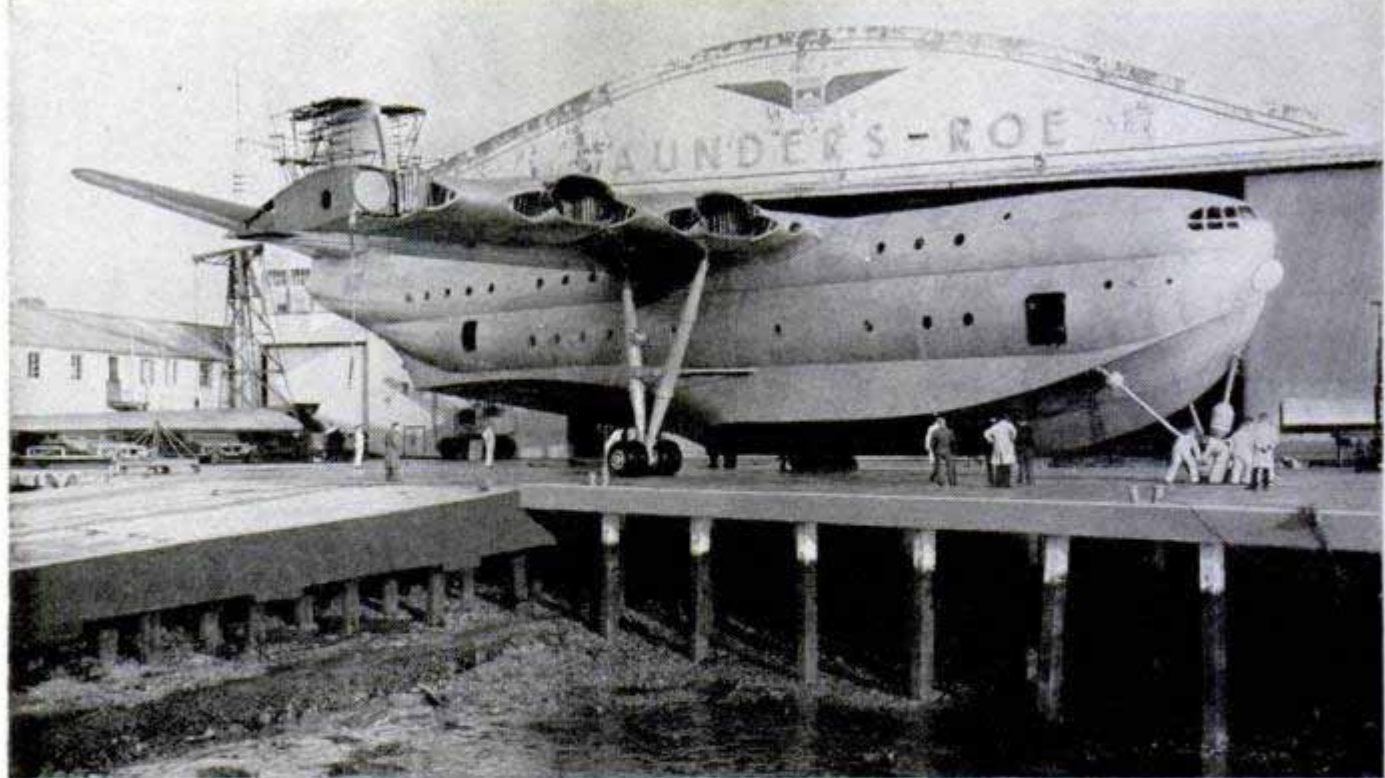
(Continued to page 258)



Soup cooler pumps hot liquid from cup to top of the radiator where it drizzles over grid and back to the cup. Below, the "grumplatch" has no known use







Great Britain's new 140-ton Princess flying boats will be the largest passenger-carrying aircraft in the world

## TEN-JET TROOP CARRIER

TWO HUNDRED MEN will be able to fly 3500 miles nonstop in the 10-jet, troop-carrier plane being readied for flight tests in Britain. The first of three being built in the Princess class, the 140-ton flying boat is expected to have a cruising speed of 330 knots (380 miles an hour). Her 10 Bristol Proteus turboprop engines will give an aggregate output of 35,000 horsepower. The wingspan of the giant craft, with floats down, is nearly 220 feet. Its over-all length is 148 feet. The hull is the largest metal structure ever built for an airplane. Four tanks in the wings, divided by baffle plates

to prevent sloshing, will carry a total of 14,500 gallons of fuel. Because of the plane's great weight and size, all the controls will be electric-hydraulic, with the pilot's movements actuating the power units. The double-bubble hull is pressurized to a differential of eight pounds per square inch at 40,000 feet. A pound compressor is located in each wing between the hull and the inboard engines. When all three Princess flying boats are in service, they will be able to carry in a year as many soldiers as would be carried by nine troopships of normal size.



Pivoted on the main landing wheels, the giant's nose is raised to lower tail enough to clear the hangar opening



# CHALK SCULPTOR



Carving and painting chalk figures like these take a sensitive touch. Resnick's large arms and hands make the tiny figures he carves appear even more delicate



**GIVE LEONARD RESNICK** a stick of chalk and an old crochet hook and in a few hours he'll sculpture a delicate figurine so tiny you'll need a magnifying glass to see the details.

Resnick, a young Baltimore engraver, has been making chalk miniatures ever since he was in grade school. His subjects range from Chinese figures to comic-strip characters. He does historical figures of Washington and Lincoln and also sculpts from live models (one of his best is a bust of his daughter).

The crochet hook, sharpened to a point, is the only tool he uses. He mounts the figurines on small bases and then paints them with water colors. A protective coating of clear lacquer is then applied.



Below left, Mrs. Resnick displays some of her husband's work. Right, he carves the chalk with a crochet hook



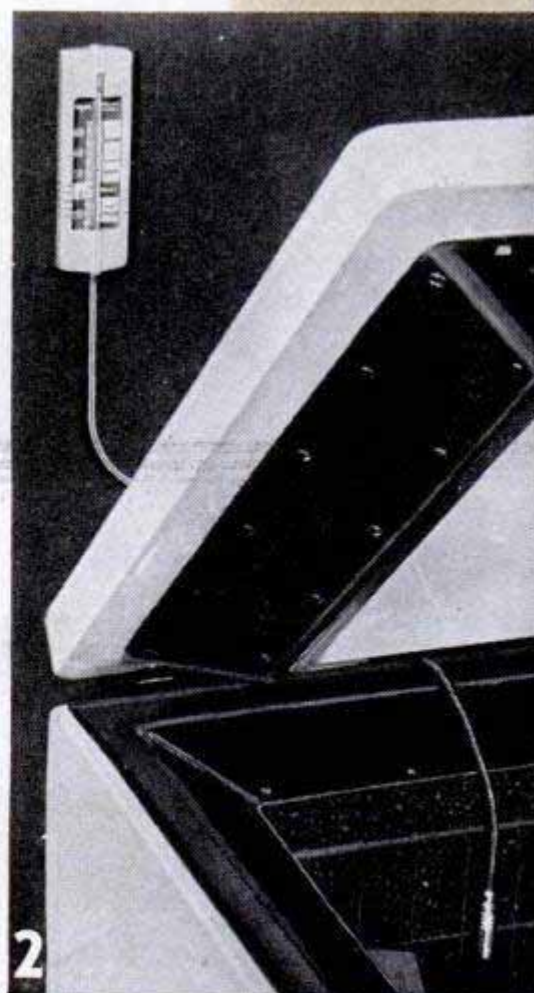
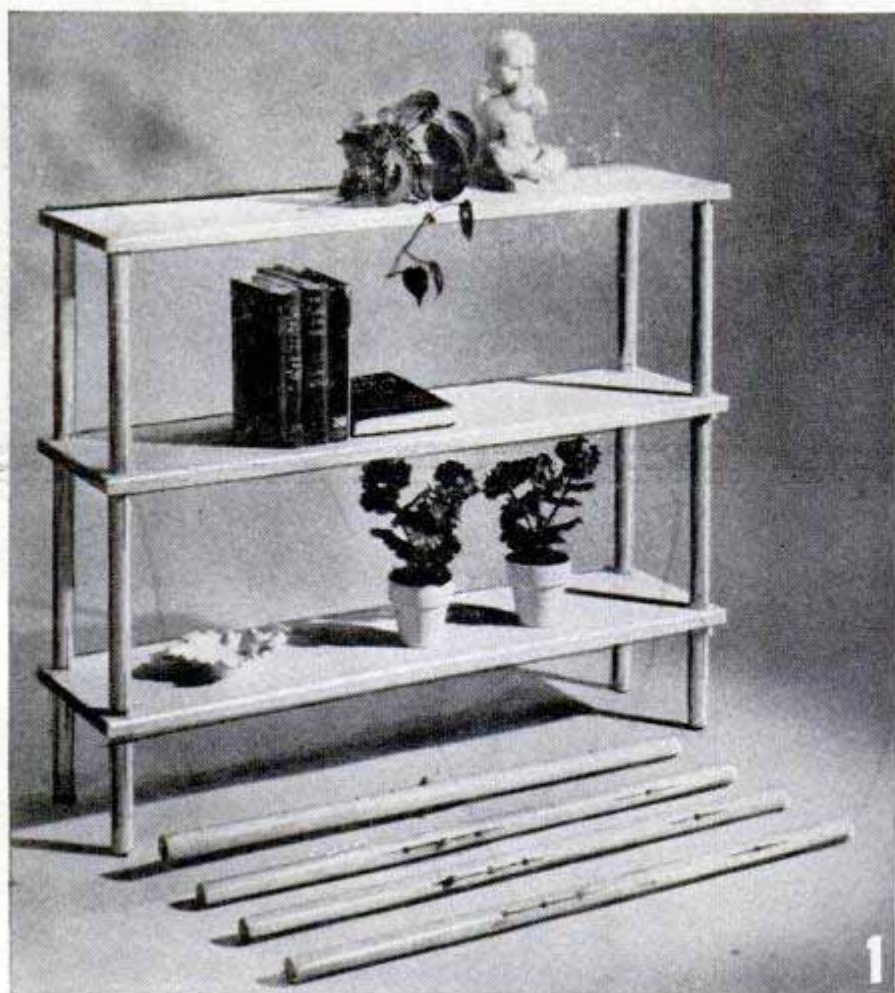


WHAT'S NEW FOR

# Your Home



**STICK-ON RULER** is printed on an adhesive tape that sticks to any surface without wetting. The tape is an acetate fiber and has yardstick markings printed on it. It is sold by the roll and can be attached anywhere by finger pressure





1. **SHELF UNIT** can be put together by a child. No nails, screws or hardware are used. Dowels serve as legs and they slip through holes in three knotty-pine shelves. Wooden pegs fit into holes in the dowels, expanding them to a snug fit in the shelf boards, which are supported by the same pegs. Available in 2 and 3-foot sizes, the unit is sold in kit form

2. **FREEZER THERMOMETER** provides a way to check inside temperature of a home freezer without opening the lid. It is mounted outside the freezer and gets its readings by means of a bulb hanging inside. Connecting the two is a slender capillary tube that does not interfere with lid closing. The thermometer scale is placed at eye level for easy reading

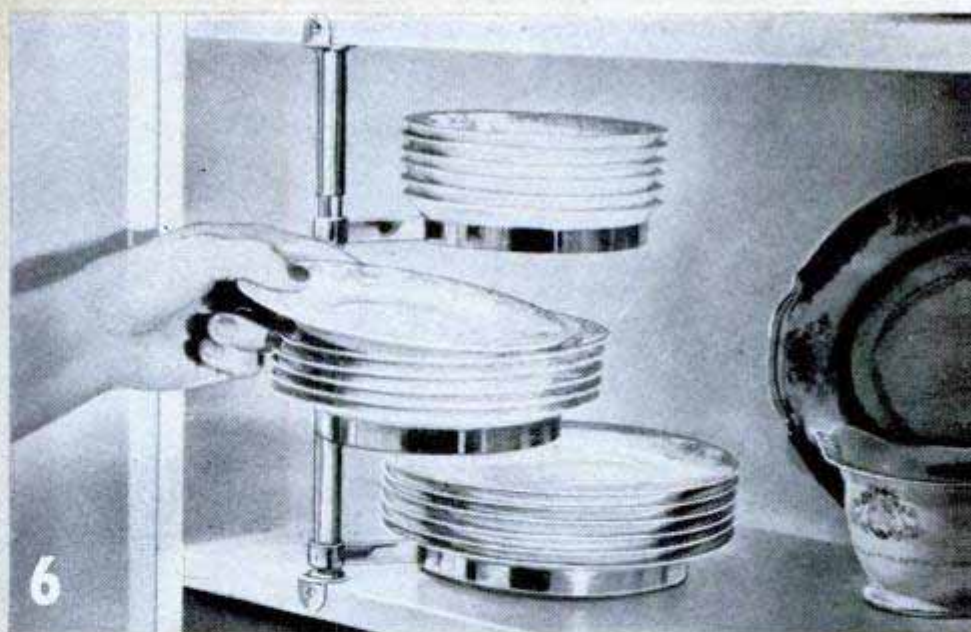
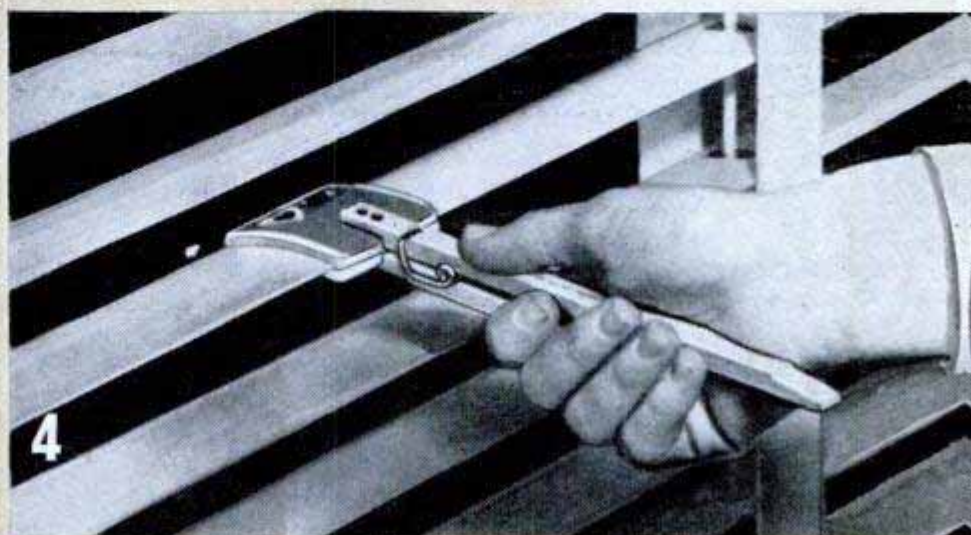
3. **CANNED-MILK DISPENSER** looks attractive on the table and conceals unsightly evaporated-milk cans. It is made of plastic and comes in a variety of colors. Inside the dispenser lid are two sharp metal points that automatically puncture the can when the lid is pressed down. The front point is formed of a tube through which the milk is poured

4. **VENETIAN BLINDS** are cleaned and polished in one quick operation with an applicator-paste combination sold as a kit. The applicator has felt pads which retain the paste, spreading it evenly over the slats. This cleans, waxes and polishes at the same time, according to the manufacturer. The applicators come flat or curved for wood or metal slats

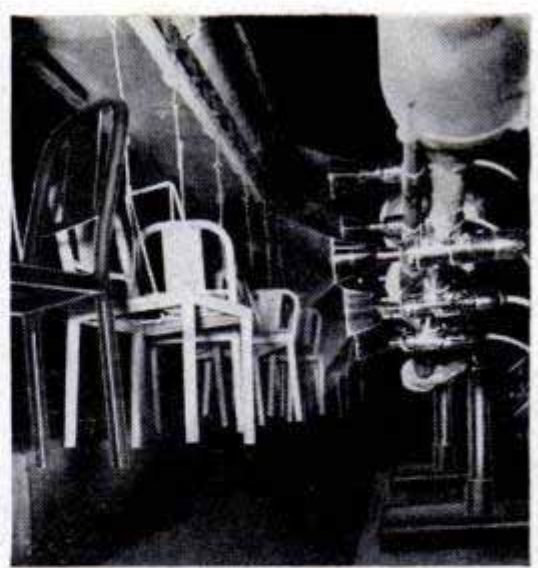
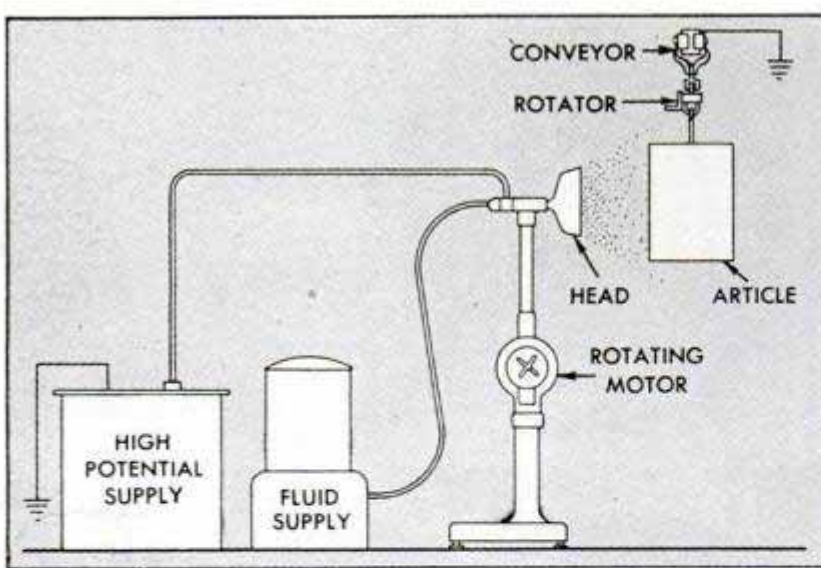
5. **CURVED TOOTHBRUSH** reaches parts of your teeth inaccessible to a standard brush. The bristles are set in a spiral around a pliable wire which is bent to any angle to clean hard-to-reach spots. It is not intended to replace a regular brush, but to be used with it. Its handle is shaped so it can be attached to the regular brush handle with rubber bands

6. **DISH RACK** mounts on any cabinet, wood or metal. Its supporting post can be adjusted to various heights. Dishes are separated by sizes and each size is stacked on a separate rack that swings in and out for easy access. Use of the rack eliminates piling various sizes of dishes on top of each other and prevents the chipping that such stacking causes

7. **PAN GRIPPER** takes the place of the hot pad beside the kitchen range. It is an all-metal tong device that grips pans, lids and bottles between its jaws. Being metal, it is easy to keep clean. With it, you can carry heavy dishes from the oven shelf to the table using only one hand. The more you squeeze the two handles, the tighter the grip on the pan







Paint is fed to a metering head, hooked to one terminal of an electrostatic potential, and attracted by the grounded article

All surfaces of these chairs are painted electrostatically as they pass the "guns"

## Automatic Paint System Uses Electrostatic "Spray"

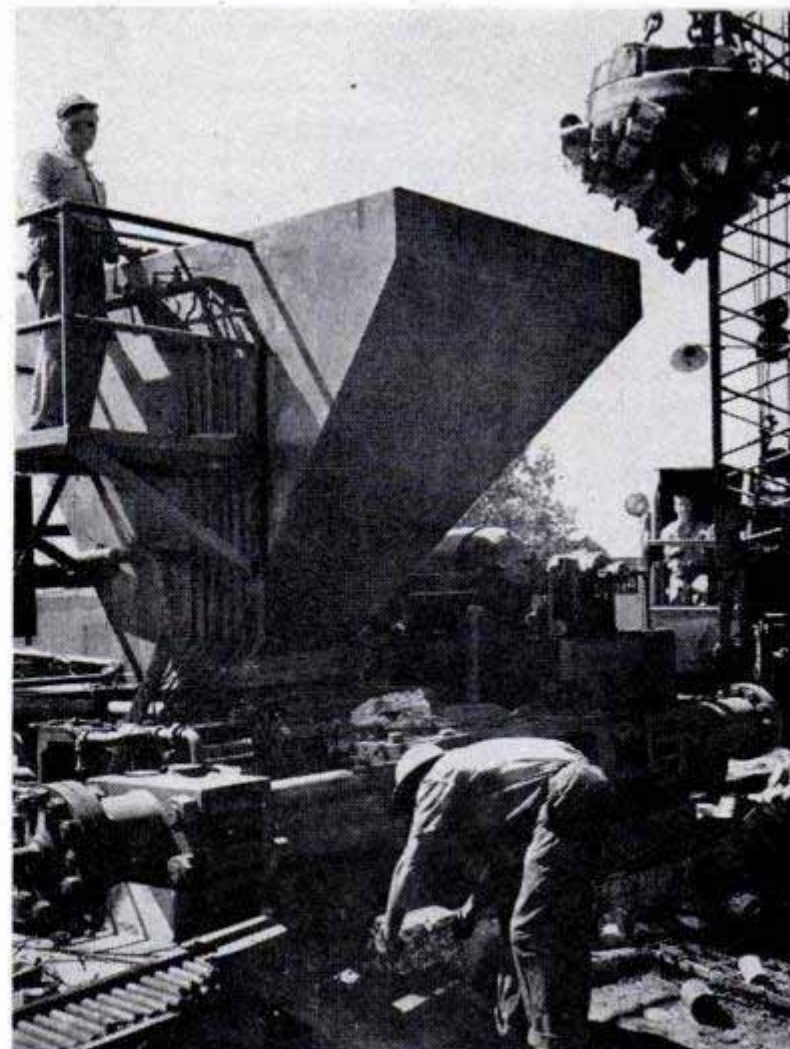
All the paint goes on the article and none is lost in overspray with an electrostatic spray system that deposits paint electrically. The article to be coated is carried by conveyor past a cone-shaped "spray gun." Actually, it is not a gun at all, but instead is a metering device that feeds paint evenly over its rotating conical surface. A high electrostatic potential, having one terminal connected to the gun and the other ground-

ed to the article to be painted, creates a strong field between the article and the gun. The force of this field transforms the paint into a spray of fine, charged particles and creates an attraction that pulls the particles to the grounded article, coating it evenly and without waste. No compressed air is used, no waterwashed walls for overspray removal are needed and paint waste is eliminated by the process.

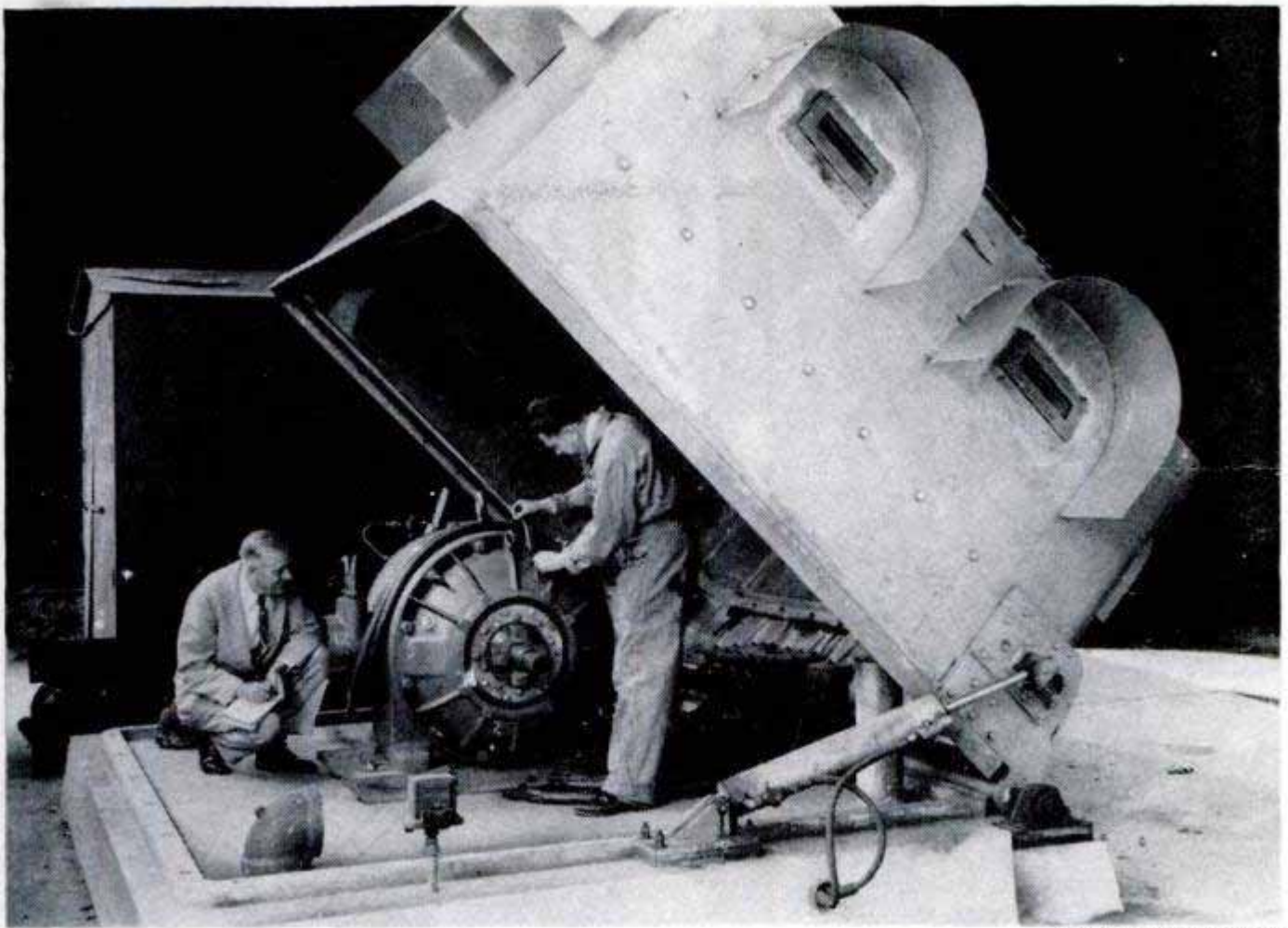
## Tin-Can Compressor

Used tin cans, which seem to add nothing to the economy except a disposal problem, can now be turned into something useful. A giant press, exerting a 2000-pound-per-square-inch punch, packs a hopper full of cans into a 30-pound block consisting of 95-percent reclaimable steel. The cans are dumped into the hopper by an electromagnet. The press squashes the cans into a uniform briquette ready for the blast furnace. The machine produces 6000 pounds of scrap steel an hour in briquette form. Impurities, including the small amount of tin in the cans, are removed during the reclamation process.

Used tin cans are smashed into the briquette, left, by press at right



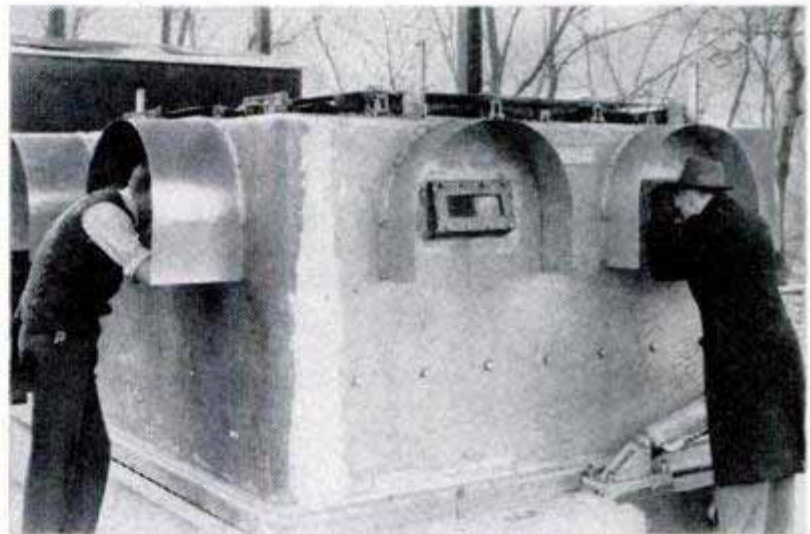




Bureau of Mines photos

## Explosion Test Chamber

Electrical equipment used in coal mines is tested for explosion hazards in a new chamber developed by the Bureau of Mines. The chamber, made of aluminum, can be tilted by hydraulic rams to permit access to the interior. The part to be tested is filled with a highly explosive mixture of gas and air. The chamber then is filled with a similar mixture, and the gas inside the test part is ignited with a spark plug. If the explosion inside the part touches off the mixture in the chamber, the part fails the test and is not given an explosionproof rating. Explosions occurring in the gas-filled cham-



ber are released harmlessly through paper diaphragms atop the structure.



## One-Piece Hooks Attached by Feel

Quickly attached—even in the dark by touch—these handy hooks cannot come apart accidentally. Made in one solid piece with no moving parts, the hooks have thin, beveled openings. Suitable for use with wire, cable, chain or rope, the hooks are attached simply by turning them at right angles and slipping one through the other. The weight of the attached cable or rope keeps the hooks aligned in a locked position so that high winds cannot dislodge them.





Near the Guatemala border, the Russells encountered happy descendants of an abandoned Aztec garrison

### By S. Robert Russell

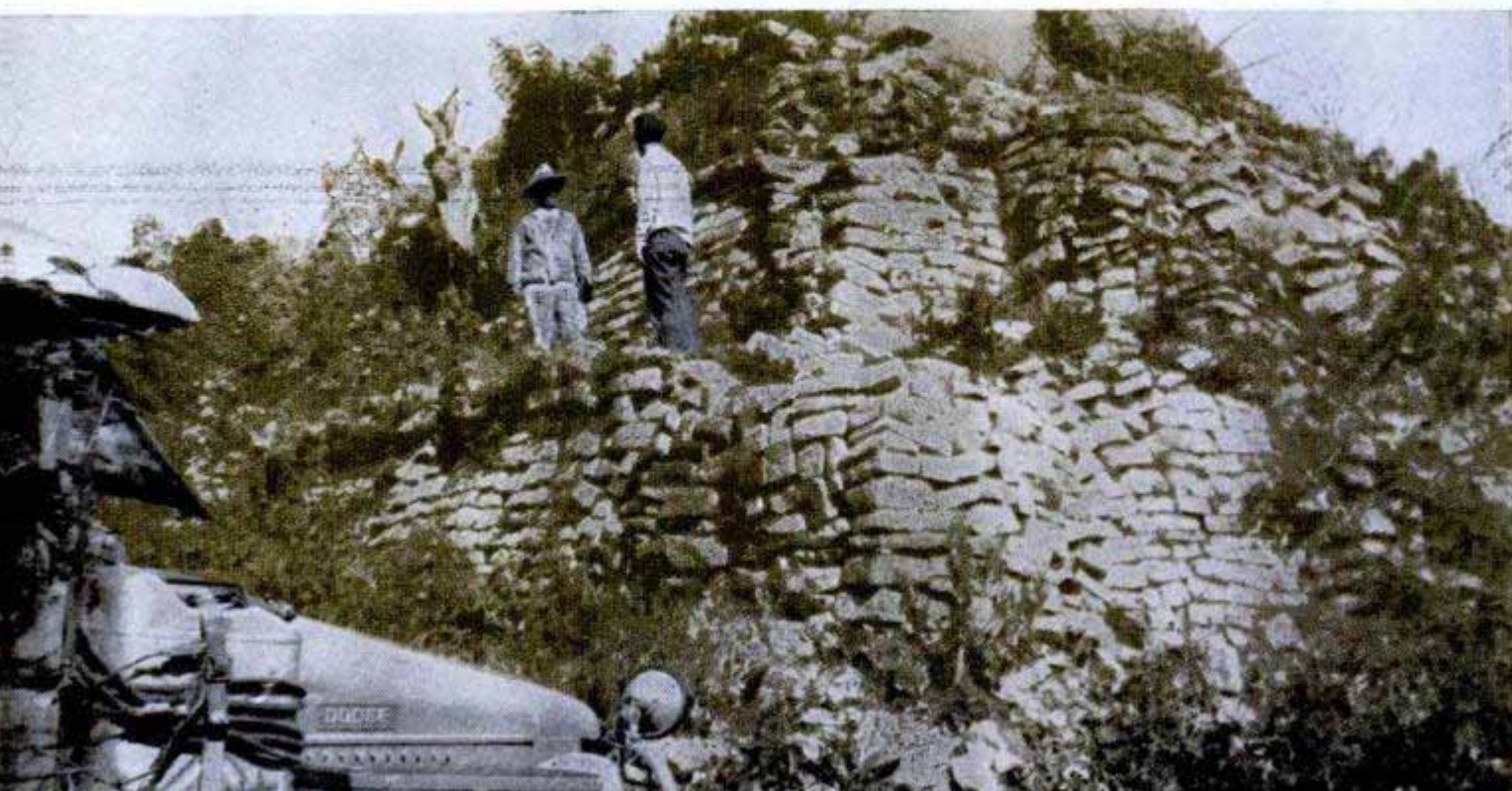
**G**REAT CIVILIZATIONS flourished in Mexico long before the Christian Era. Even the earliest of these ancients possessed an amazing knowledge of engineering, astronomy, weaving, stone carving and pottery making.

Strangely enough, nothing uncovered gives the slightest clue as to when or where they learned these things. Thousands of years must have elapsed as early cave dwellers struggled up toward the cultural level of Mexico's ruins. But nothing yet unearthed indicates that these first *Mexicanos* served their long appren-

ticeships in Mexico. Neither can their cultures be linked conclusively with those that flourished in other parts of the world.

It seems almost as though Mexico's first settlers dropped from the sky with their arts and crafts in a relatively advanced

The Russells' jungle car plowed through dense chaparral to reach remote rock ruins in southern Mexico





# MEXICAN SAFARI



It took six oxen and a power winch to pull the truck across the Grijalva River after being stuck 3½ hours

stage of development. This is one of the land's greatest mysteries.

On our 1950-51 expedition in our jungle truck, my wife and I searched for clues from a base in San Cristobal de Las Casas, in the state of Chiapas, about 100 miles from the Guatemala border. This city was built on the site of an ancient Indian town named Colet, in what was the heart of the early Mayan empire.

On its clean, paved streets can be seen Indians of more different tribes, each in his own colorful tribal costume, than can be found in any other settlement. They all speak Mayan dialects.

To us, the Zinacantecos are the most interesting. They are descendants of Aztec warriors stationed at a garrison in the area that was abandoned centuries ago.

We decided to drive to their village, Zinacantan. The road

was a narrow, rough oxcart trail that clung precariously to the sides of mountains. At one point we found a landslide had completely blocked the road with huge boulders. The thought of turning around was unattractive because the width of the road was only slightly greater than the truck's



Herminio, the guide, Mrs. Russell and native boys inspect rock with ancient markings found in Mexican cornfield





Jungle car meets with landslide on a narrow road with a drop of 200 feet on one side. It took Russell a half hour to turn back



Incense burner used by Lacandon Indians during tobacco-planting and harvest rituals has hole under head to support burning cigar

Military tread on tires was a boon to the Russells in traveling over jagged rocks which would have cut ordinary tires to shreds



wheelbase. A 200-foot drop on one side made backing up for a mile or so even less inviting. I chose turning around. It took me a half hour and required 26 cuts of the wheels before I made it.

Then there was the time we decided to ford the Grijalva River to reach the little town of Acala. The place was rumored to be the site of ruins left by a vanished and unidentified people.

We reached a point opposite the town after bouncing and grinding over 25 miles of the roughest trails. Once there, the people warned us that no truck could possibly ford the river. It had never been done. Ox carts could do it, they said, because their wheels stand very high and oxen can swim.

Our engine sat higher than that of a conventional truck, so we tried to follow an ox cart across. We would have made it, with water well up on the engine, if I hadn't dropped the front wheels into a hole.

We were stuck there for 3½ hours. The swift current undermined our tires and the heavy truck settled lower and lower. The hand crank on the truck's winch pulled the cable so tight that it sang like a fiddle string, but it could not break the wheels loose.

Our jungle home would probably be there yet if the friendly natives had not come to our rescue with oxen. It took six of the powerful beasts, plus the winch and cable, to pull us to dry land.

And so we finally drove into Acala, establishing a record as the first to do so. Once there, we found the ruins were no different from countless others of the early Mayan empire.

From a scientific viewpoint, however, this expedition was quite successful. In exploring a remote cave, we discovered a cache of hundreds of shallow mud bowls. They were extremely crude, obviously shaped by hand, and appeared to be sun-baked. Possibly they are the oldest pottery yet found in the country.

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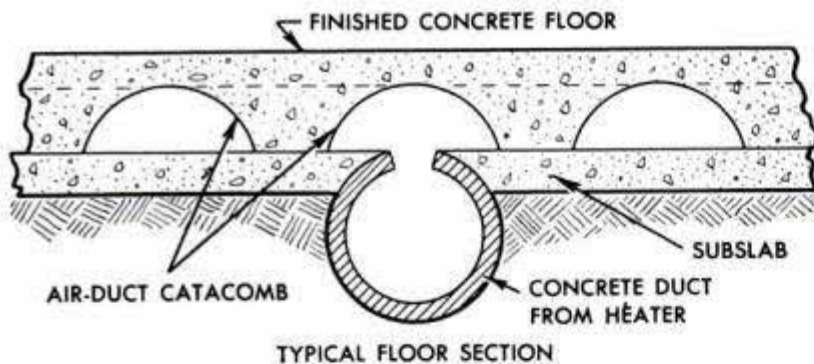




## Hot-Air Radiant Heat In Catacombed Floor

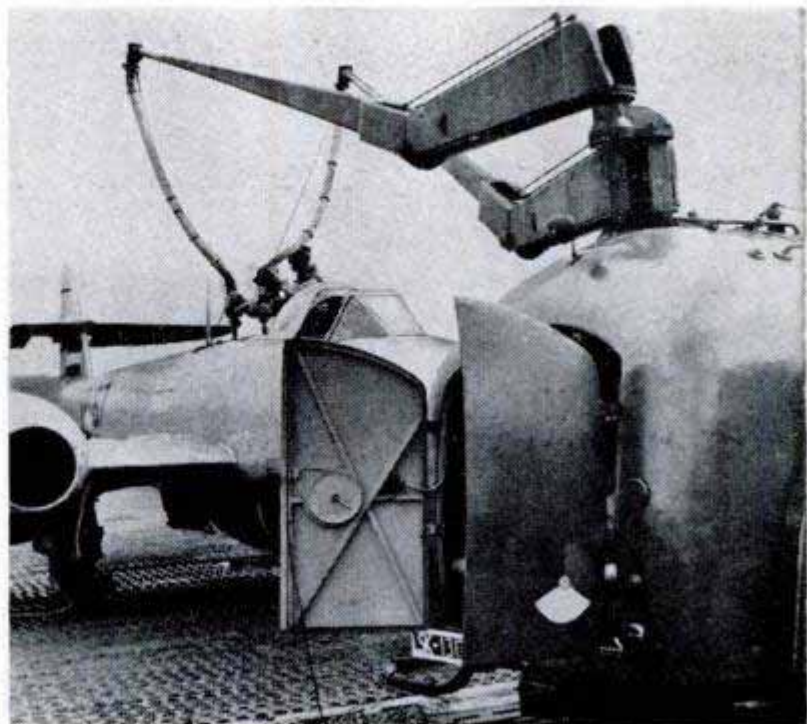
Sheet-metal forms, interconnected like miniature catacombs, make concrete floors for houses that are radiant-heated by forced hot air. The forms, flat on the bottom, are assembled directly on the subslab

and connected to a concrete supply duct from the heater. When the finished floor is poured over the forms, a series of "mushroom" columns is created to support the floor. Warm air, forced into the hollow space that honeycombs the floor, warms the concrete, creating a room-size, radiant-heat panel. The hollow space is also connected to registers which can be opened or closed to provide quicker heat when necessary. Once the floor has been heated, however, the registers are closed and the house heated entirely by radiation. The concrete supply ducts from the heat are buried below the subslab. Installation of this system is said to cost substantially less than for other types of radiant heat.



## Speedy Refueling of Jets

In 2½ minutes, a tank truck refuels a thirsty jet plane through two boom-supported hoses. The equipment, consisting of a semi-trailer tank truck with swinging fuel lines and special high-speed nozzles, was built in the Netherlands. It has been used by the R.A.F. in England. Tank capacity of the unit is 2650 gallons, and it can be driven 38 miles per hour.



Sources of available products described in this issue are listed on pages 14, 16 and 18. Sources of further information on other articles are given in the WHERE-TO-FIND-IT LIST, available from Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11



# A BEETLE FIGHTS A BATTLE

By O. A. Fitzgerald



SOME DAY a monument may rise to immortalize the goatweed beetle. It could be in California, or Oregon, or Washington, or Idaho, or Montana. In all those states, and a few others on the sundown side of the Rockies where stockmen have seen goatweed explode all over their ranges, this popular relative of the very unpopular Colorado potato beetle is chewing its way to fame.

In its quiet, persistent and dependable way the goatweed beetle is doing for present-day stockmen what the sea gulls did for the Mormon pioneers in Utah. Already the beetles have given back thousands of acres of range land to the stockmen, and the insects' real job—from the standpoint of the West's livestock industry—is just beginning.

This useful beetle looks very much like a ladybug, except for color. The goatweed eaters come in several metallic hues—dark blue, dark green, purple and greenish bronze.

Whether you want to call that weed goatweed, as is common in the Pacific Northwest; or St. Johnswort, the name the weed has carried in its westward migration across the United States; or Klamath weed, as it is known in California and Oregon, the weed has set something of a record for fast spread and destruction.

The weed's original home was somewhere around the Mediterranean. It was first reported in the eastern United States in 1600. First Pacific Coast appearance was along the Klamath river in Oregon. Ranges where goatweed was unknown 20 years ago are loaded with it today. The plants are prolific seed producers, and livestock scatter those seeds.

Some years ago a U. S. Department of Agriculture agronomist became curious to learn just how many of the tiny goatweed seeds it would take to weigh a pound. That agronomist, Clarence I. Seely, soon regretted his curiosity. After suffering eye-strain trying to count enough individual seeds to get a weighable quantity, he turned to very rough guessing. Now he is content to answer the question with a general "way up in the millions."

Dark spots are imported beetles working away at their favorite occupation—eating the destructive goatweed



Western ranges were strangling until a little bug from Australia with a voracious appetite for goatweed was imported and sent out to pasture . . .

Worst of all is that the seeds, despite their powdery fineness, have a high rate of germination. Almost every one that drops from the fleece of a migrating sheep can be expected to grow into a plant.

As the goatweed acreage zoomed, stockmen found themselves confronted with this dilemma: They couldn't afford to control the weed; yet if they expected to stay in the business of raising meat or wool they couldn't afford not to.

Goatweed goes for land that isn't worth much per acre. Several of today's chemical weed killers will knock out the weed easily but on \$1 land the expense is terrific. From the cost angle, this method of control hardly could be justified.

When the full impact of the weed was felt, many stockmen were ready to give the land back to the Indians. Then they heard about some bugs down in Australia that loved to eat goatweed, in fact wouldn't even look at anything else.

"Bring 'em up, we've got lots of goatweed," declared a Washington cowman.

The first colonies of those bugs were settled in California by the U. S. Department of Agriculture and the University of California. Getting Australian beetles to like their new home wasn't simple. For instance, Australia's winter rains were a signal to start laying eggs. Our scientists pulled a fast one by putting the bugs under light sprays every few days. Thinking it was the rainy season the beetles came across with the eggs.

Today, in California, billions of the beetles are chewing away on the goatweed on hundreds of thousands of acres of range land in 20 counties. Stockmen who once were worrying about the weed now are thinking about the best combinations of grasses they can use on the land the bugs are reclaiming for them.

Beetles from California have been flown by the hundreds of thousands to Oregon, Washington, Idaho and Montana to carry on the good work in northern ranges.

Typical of the way the beetles are handling this assignment is the story of one Idaho colony. In the spring of 1948, an entomologist from the University of Idaho dumped an ice-cream carton full of beetles—around 3000—on the ground in about a six-foot circle on a hillside in the Clearwater canyon.

"Those beetles have now increased and

(Continued to page 260)



Brought to Idaho by plane, about 3000 beetles are released to colonize a range blanketed with goatweed



Friendly Australian beetles are scooped into a paper sack to establish a new colony. Below, beetles cooperate with collectors, drop off plants at a touch



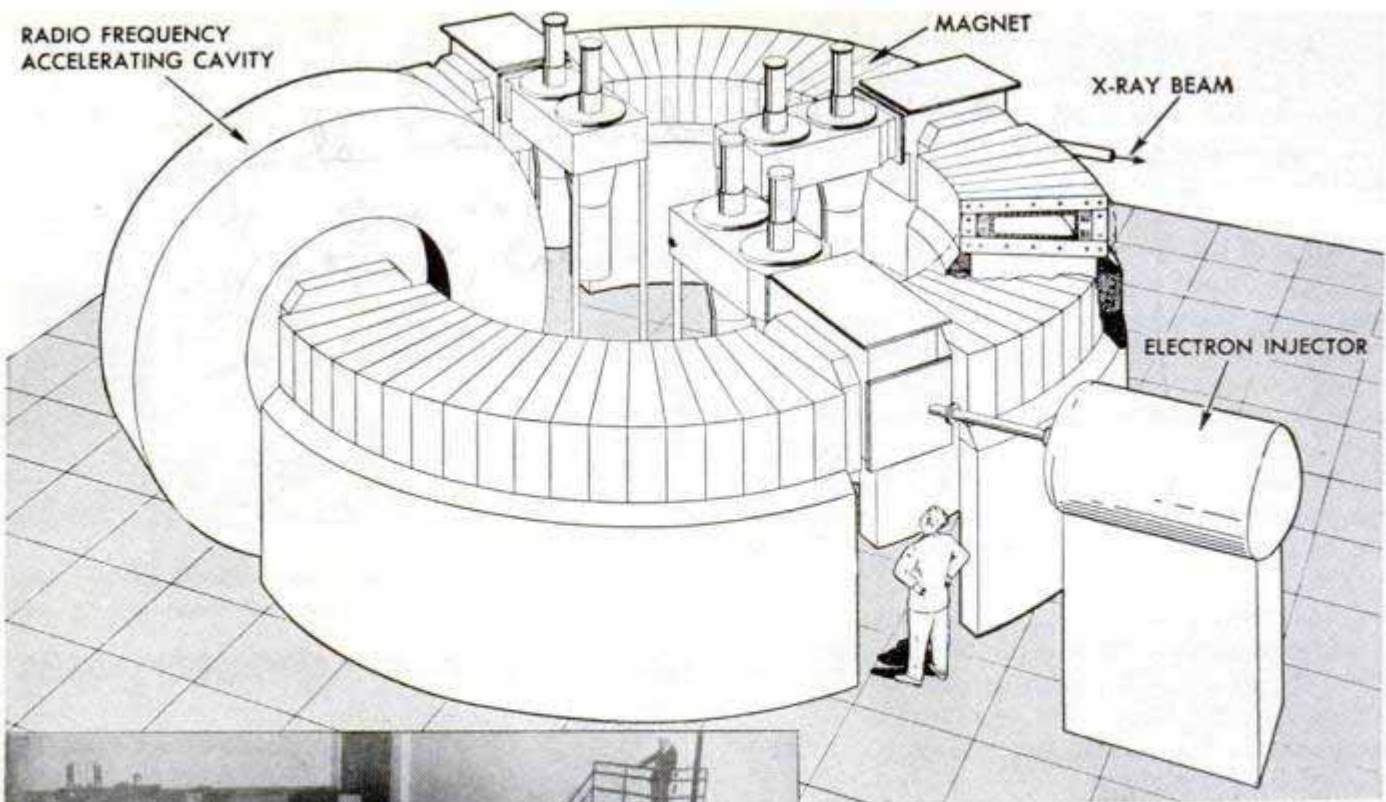


RADIO FREQUENCY  
ACCELERATING CAVITY

MAGNET

X-RAY BEAM

ELECTRON INJECTOR



Electrons from injector move through vacuum tube inside circular magnet. Radio-frequency booster imparts speed to electrons

Magnet of big synchrotron is 36 feet in diameter. Nuclear instrument may help scientists solve mystery of atomic "glue"

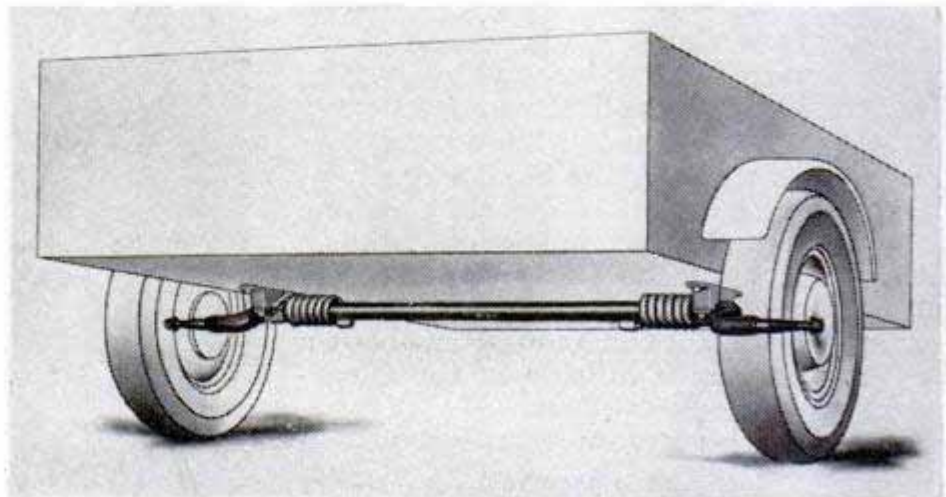
## Atomic "Race Track" Boosts Electron Speed

Electrons will travel 50,000 miles in  $\frac{1}{4}$  second around an atomic "race track" which may help scientists solve the mystery of atomic "glue," the force which holds the nuclei of atoms together. The new nuclear-research machine, called an electron synchrotron, now is under test at the California Institute of Technology. Built at a cost of \$1,250,000 and financed by the Atomic Energy Commission, the synchrotron

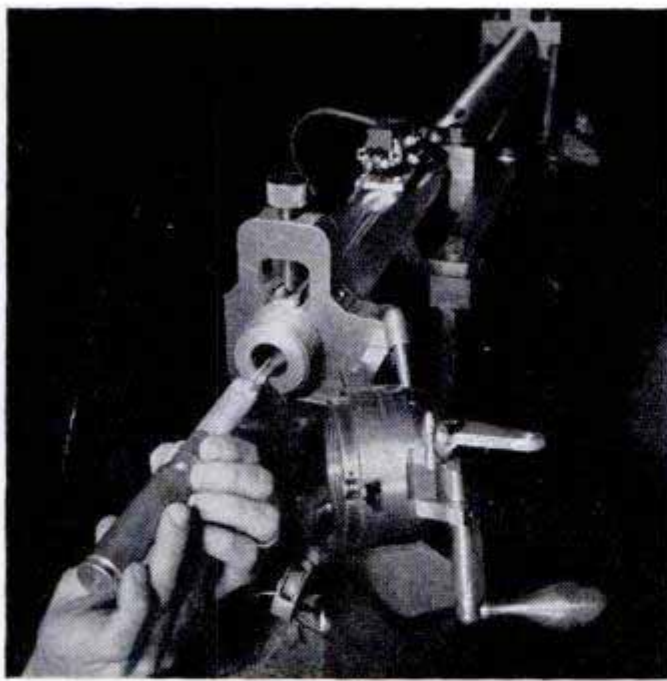
consists of a ring magnet, 36 feet in diameter, and a radio-frequency booster. The booster imparts more speed to the electrons each time they whirl around the curved vacuum tube inside the magnet. In full operation the electrons will have a peak energy of a billion volts and will travel just under the speed of light. The instrument will create X rays, mesons and other particles for nuclear studies.

## "Level Load" Trailer Axle

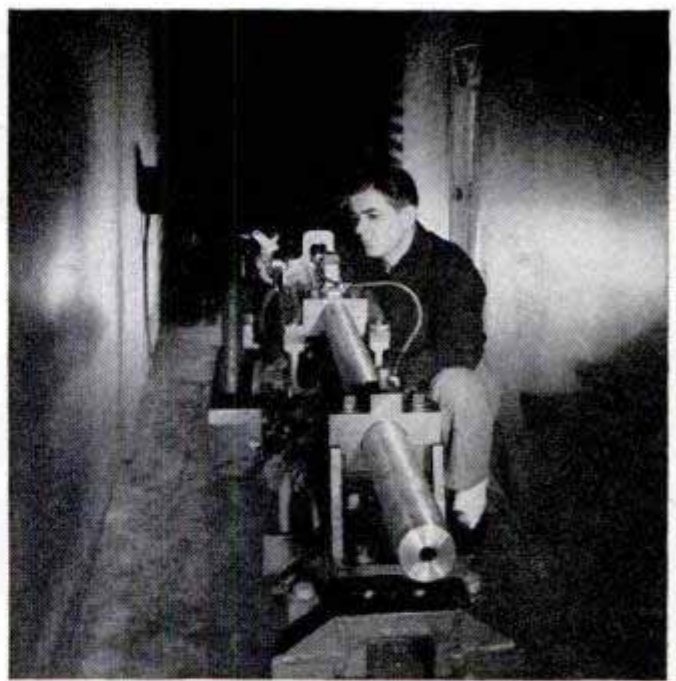
Installed individually or in tandem, an axle now available for trailers has a very low center of gravity and is designed to keep trailer bodies level even when hauling off-center loads. The unit consists of two helical torsion springs around a steel axle member which has offset wheel spindles.







Missile when loaded is housed in a plastic carrier which breaks away as the model leaves the gun muzzle

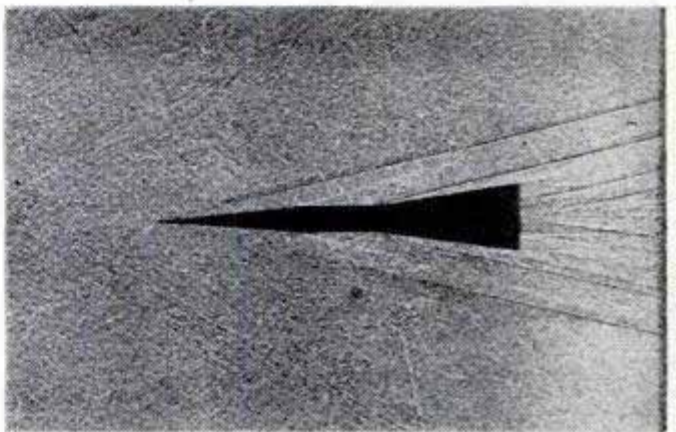


Guns of various calibers are used to fire test-shape models against supersonic air stream inside tunnel

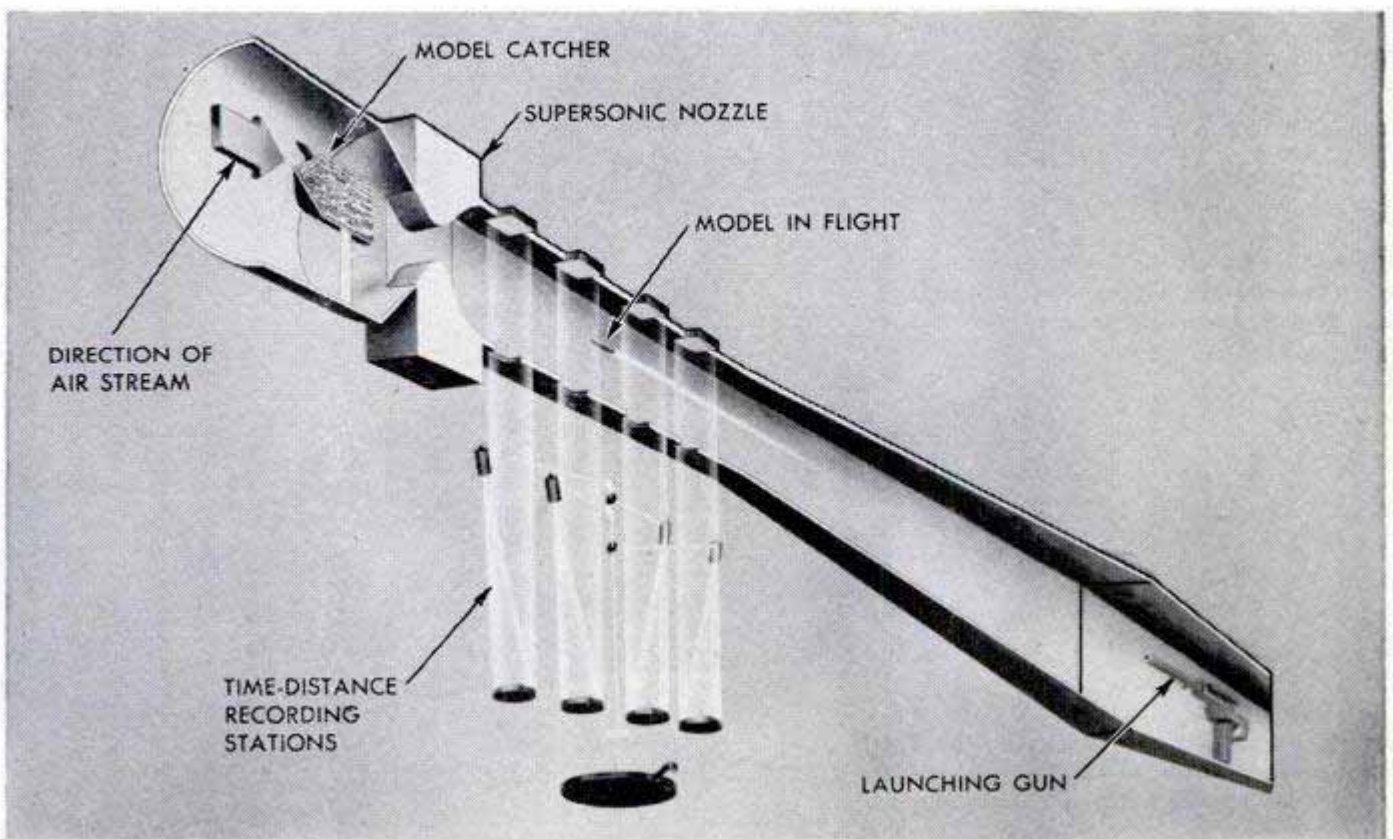
## Test Gun Fires Tiny Missiles

To test missiles of various shapes, engineers at Moffett Field, Calif., are using a gun to fire tiny models through a free-flight tunnel. The models are launched against an air stream of from two to three times the speed of sound. This, plus the velocity of the missile, produces data on aerodynamics at eight times the speed of sound. Photoelectric cells time the model in flight. The missile crashes into cotton waste.

Cutaway of the tunnel shows how speed of the model is calculated by several photoelectric-cell recorders



Shadowgraph of a missile model in flight reveals supersonic shock waves caused by the missile's shape





Novice drivers fight for position, right, as they head into bank turn at start of race at resort town of Elkhart Lake, Wis.

*Sports Car Club of America  
P.O. Box 508  
Westport, Conn.*

Taking time out from his work, machinist Richard Gent winds up his \$5000 Bandini Fiat for the first time on a closed course



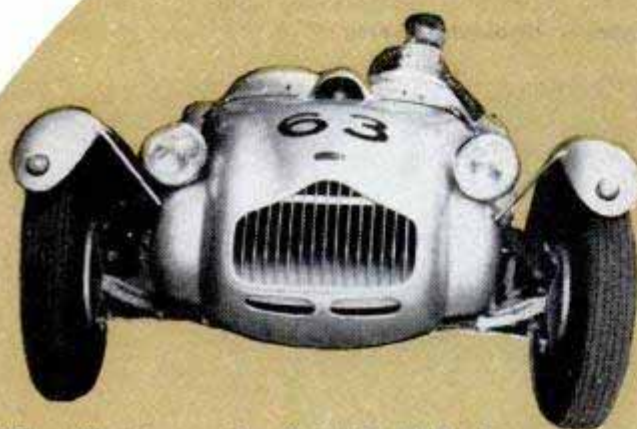
# SPORTS

*By Donald R. Brooks*

A ROARING EXHAUST catches your ear at a stoplight, and you have to look down at the driver of a low-slung, power-packed sportster alongside.

He's the proud owner of a gleaming sports car, all wrapped up in his favorite hobby — tuning, polishing and driving his cherished, precision-made machine. A member of the regional Sports Car Club of America, this hobbyist carefully plans his holidays to participate in a sport that is fast growing in popularity in this country—road racing against competition at full speed on a closed course.

Next summer, from all over the United



Cadillac-Allard, expertly piloted by Michael Graham, placed second in feature race



Argentine driver George Malbrandt is ready to send his Jaguar, No. 135, around the 6.75-mile town-and-country-road course



Turning up speeds of 100 m.p.h., the Fiat Siata uses 4.25 by 15 tires, weighs 850 pounds and is powered by a Crosley engine





## **CARS** Take Over the Town

States, hundreds of the shiny speedsters will show up at competition events staged solely for their own enjoyment. A typical example of the gala affairs was the one held at Elkhart Lake, Wis., last year.

What happens to a town of 571 population when a crowd of some 50,000 racing enthusiasts and spectators swarms into it for a day?

The quiet resort of Elkhart Lake found out one warm week end in late August as sports-car fans from all over the United States, and drivers from several foreign countries, wheeled their cars into the town for another "turn" at road racing.

After a "dress rehearsal" and attendance of 10,000 people the previous year without publicity, this was a full-scale parade of the country's most prized vehicles in the sports-car field.

A chamber of commerce official, anxious for the visitors to enjoy themselves and yet insure their safety, proudly spoke of national-guard units, local and near-by fire departments, ambulances, doctors and policemen in attendance, which were just a part of the planning that required seven

months. Even a crash boat had been ordered to stand by on the calm lake in case of an accident in that vicinity.

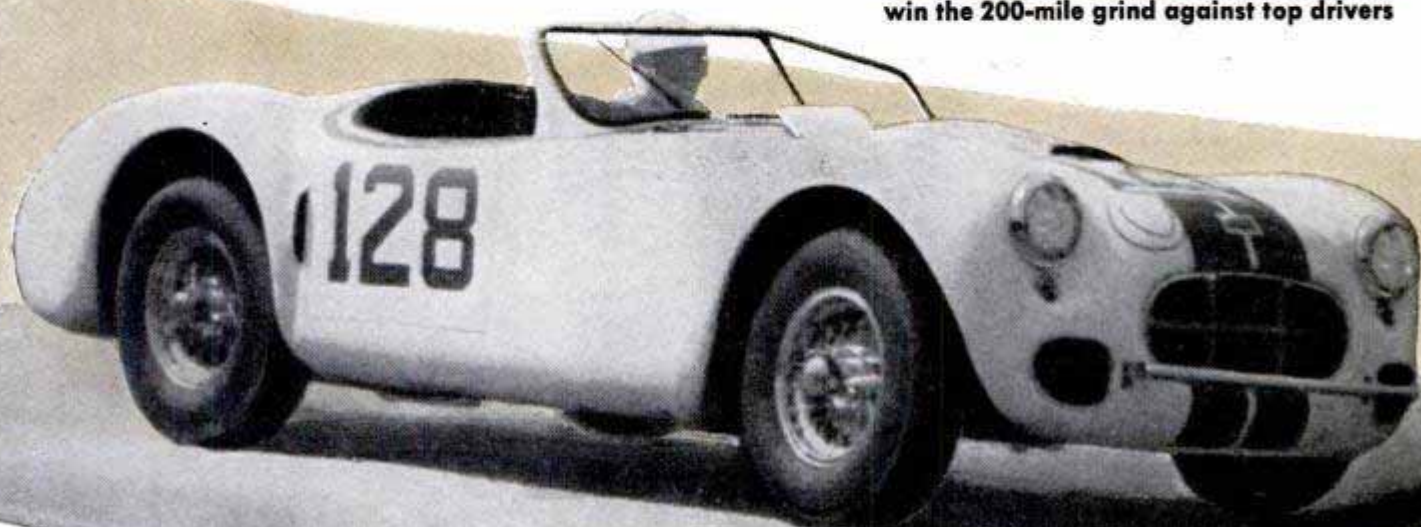
All anxious to do their bit for the colorful affair, the contented citizens of this little town graciously opened their homes to accommodate the tremendous overflow from the few hotels that were booked up months in advance of race day. As one local merchant put it, "Every citizen in the town except those on crutches has been assigned something to do."

The big holiday, planned by C. Bayard Sheldon, racing enthusiast and Chicago banker, was another activity of the S.C.C.A. Patterned after such successful events as the Watkins Glen Grand Prix, Bridgehampton and Pebble Beach races, this was a national 200-mile nonprofit affair.

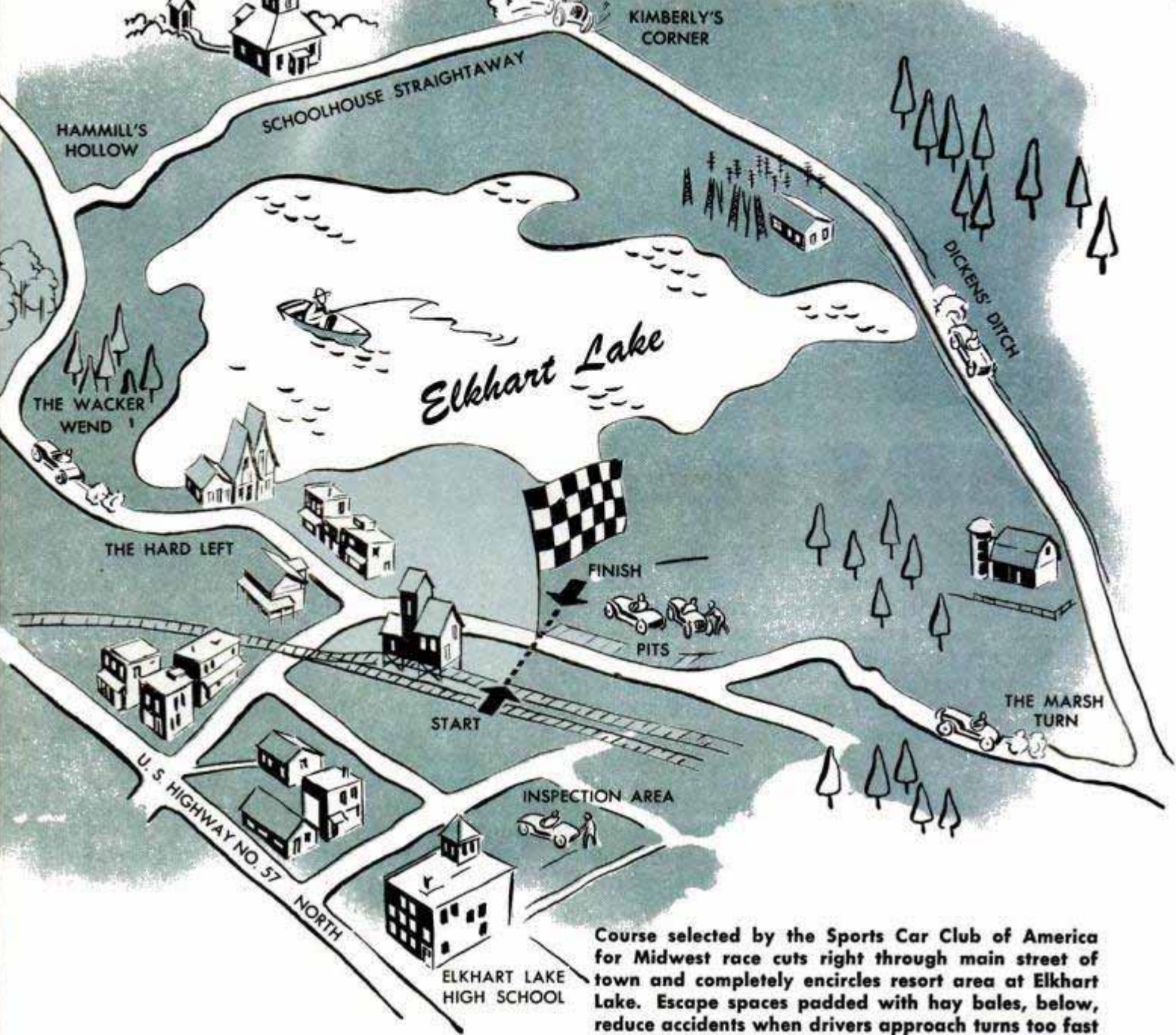
According to Sheldon, 60 percent of the Chicago S.C.C.A. membership are tremendously interested sports-car owners who earn \$5000 per year or less.

Starting their parade to Elkhart Lake two days ahead of race time, upon arrival the carefully groomed mounts are wheeled into a test line where they are required to

**In a powerful blue-and-white Cunningham, John Fitch averaged 80.82 m.p.h. to win the 200-mile grind against top drivers**







Course selected by the Sports Car Club of America for Midwest race cuts right through main street of town and completely encircles resort area at Elkhart Lake. Escape spaces padded with hay bales, below, reduce accidents when drivers approach turns too fast







Inspection of competitive cars includes a test to be sure the tank is filled with regular pump fuel

undergo examination by experts to insure proper conditioning and qualification for competition. Here the cars are checked for wheel balance and alignment, front end and steering, action of brakes, including emergency, and condition of brake lining, tires, wheel hubs, horn, mirror, headlights, taillight, stoplight, door locks, oil or gas leakage, windshield, spare tire, fenders, generator, starter, safety belt, crash helmet and goggles. A sample of fuel is taken from



Bad skid sends Bill Spear's Ferrari into the hay, off the road and almost through a barbed-wire fence

the tank and tested to be sure it's pump fuel—regulation for the race.

Drivers are also required to have an eye examination, take out necessary insurance to cover themselves and the pit crew and produce a competition license for S.C.C.A. road racing.

Entry fee for competition cars is \$10.00.

Necessary equipment for the pit crew of each competing driver includes a copy of road-racing regulations, fire extinguisher,

On one of the straightaways, Ted Boynton of Winnetka, Ill., uses all the power of his 1971-cc Frazer-Nash







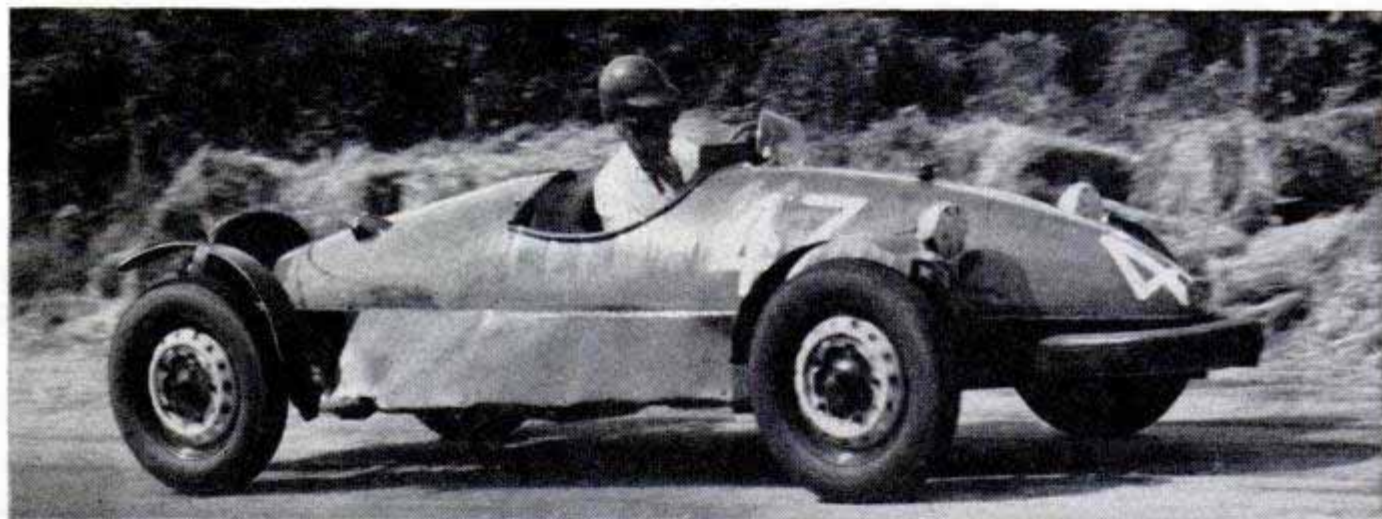
Critical wheel alignment of cars is checked by experts in the inspection area before race day

first-aid kit, tools and an ample fuel supply.

Once through inspection, drivers are free to acquaint themselves with the course, abiding by local road regulations. They continually "wind" their highly tuned cars around the course into the night to become thoroughly familiar with every curve, hill and turn of the road. Every second is a valuable one during the race and taking maximum advantage of all opportunities

for acceleration may mean closing the gap behind the leader.

Selected for convenience of club members, because of its midway location between East and West Coasts, the 6.75-mile course at Elkhart completely encircles a lake, takes in the town's main street and a pleasing number of hills, curves and square corners. In mapping such a course for sports-car competition, every effort is made



Kurt Hildebrand, above, gets lots of speed out of his German Volkswagen chassis fitted with a cut-down airplane belly-tank body. Below, Kurt quickly changes power plants in his rear-engine car along a quiet street





to keep an escape route open beyond sharp turns for use by drivers who may approach the turns too fast and feel they will be unable to bring their cars safely around them.

As time for the race approaches, cars are taken into their previously arranged and marked pit areas along the track. Here, pit crews take a last close look at the cars from grille to taillights, talk over last-minute strategy and carefully arrange equipment and tools in the pits to insure fast servicing of the cars should drivers find it necessary to pull in during the 200-mile grind.

Just as in the famed 500-mile Indianapolis classic, cars are wheeled to the starting line in rows abreast. When inspection tickets have been collected from drivers and the starter is informed that all cars in the field are in order, the anxiously awaited words, "Drivers, start your motors!" come from near-by loudspeakers.

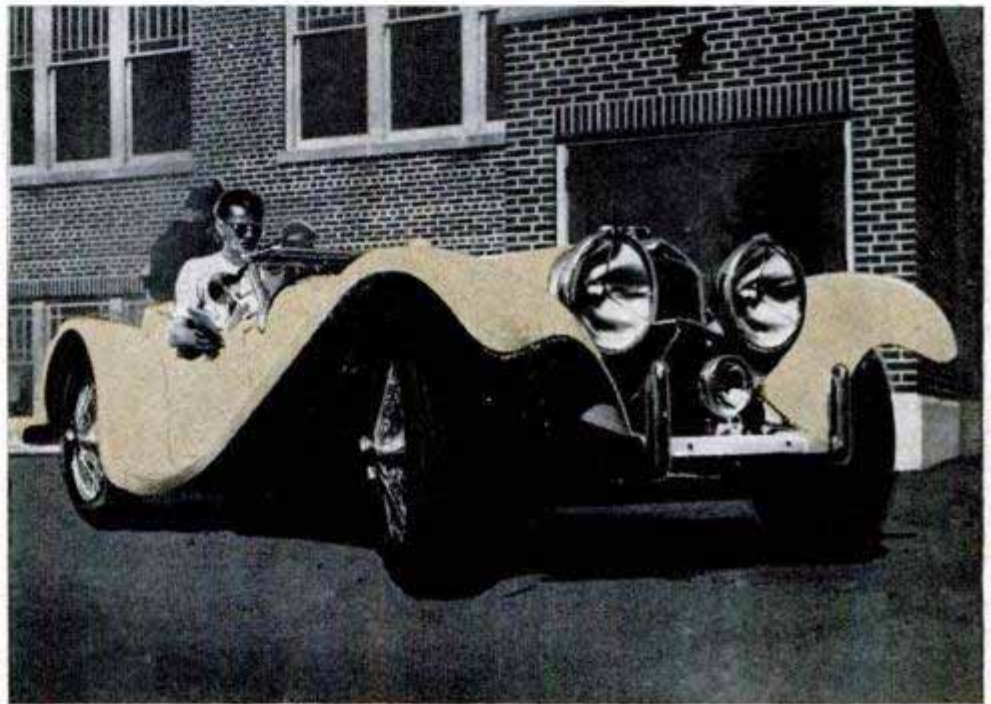
A cloud of exhaust rises from the noisy sportsters and the green flag sends drivers into roaring action on their 200-mile clockwise dash for a prized trophy and the personal satisfaction of spinning their cars around a closed course against some of the country's best competition.

Regulation signals are manned at critical points on the course, which are connected by telephone to change pace of the race quickly in case of accident. Green flags indicate the road is clear, yellow is a caution to all

(Continued to page 246)



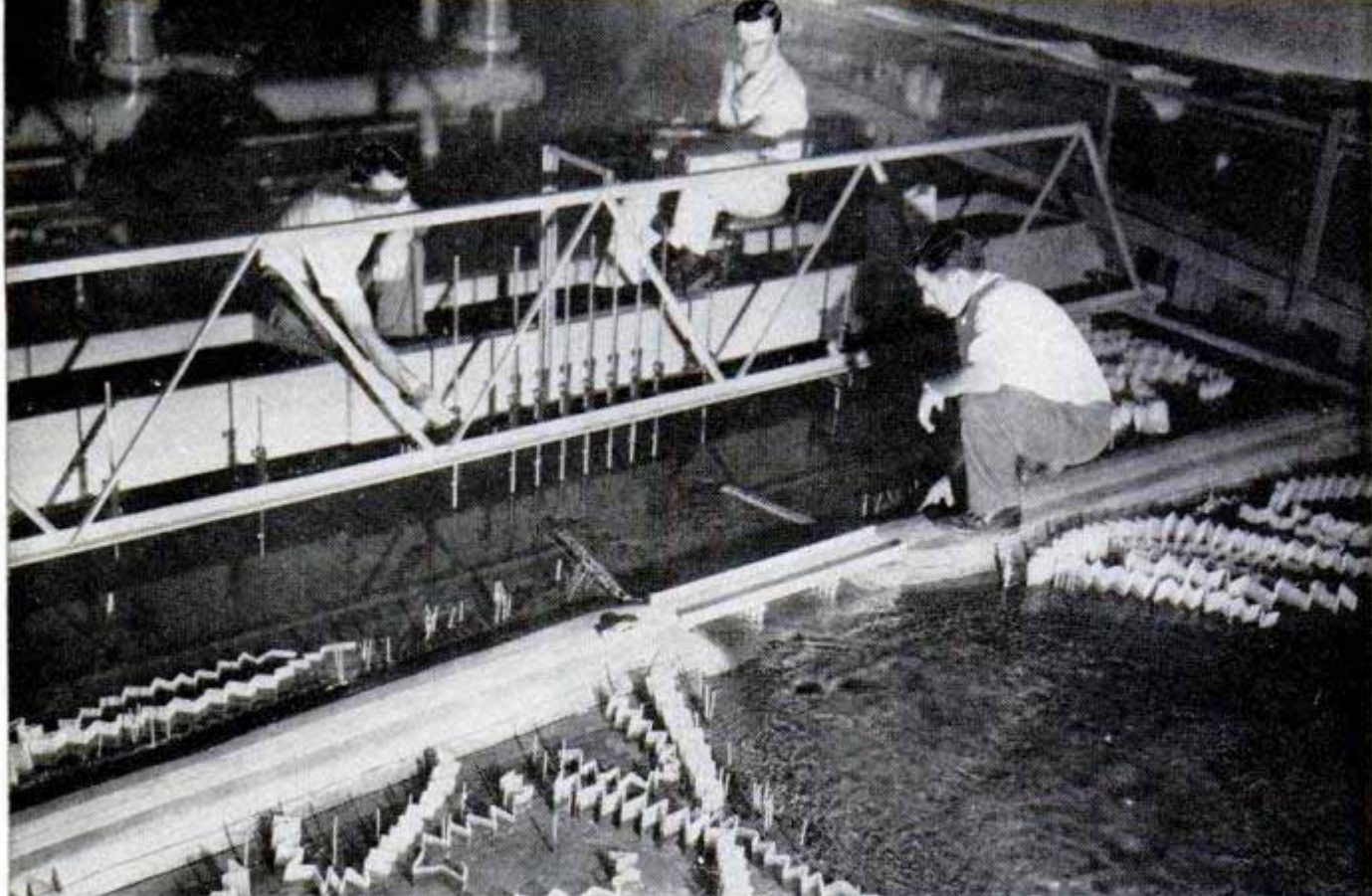
Low-slung German Veritas (1949 model) is taken through the inspection line by its owner, Ralph Knudsen. Car has only 3½-inch road clearance



Before chauffeuring Dave Garroway's Jaguar 120 to victory in the novice race, Frank Bott submits the car for inspection. Below, Jim Kimberly's highly polished, 12-cylinder Ferrari is capable of 150-m.p.h. speeds on straightaways







## Model Tames Raging River

Engineers at the University of Illinois are using a model to tame a raging river and save the state an estimated \$400,000. The Wabash River, at flood times, has cut a 40-foot hole in its channel adjacent to the piers of an important highway bridge. Though hundreds of tons of rubble have been dumped into the hole, the river continues to threaten the bridge. The engineers, in cooperation with the state's highway de-

partment, built a big model of the terrain and flowed water over it to discover what was happening. As a result of their studies, dikes will be built a distance of 100 feet upstream from the bridge, and the end of a near-by island will be cut away. The tests show that this will eliminate the big eddy causing the damage. The cost of the project will be far less than the cost of a new bridge. The model was built under the supervision of Prof. John C. Guillou over a period of two years.



## Plastic Tie Plates for Rails

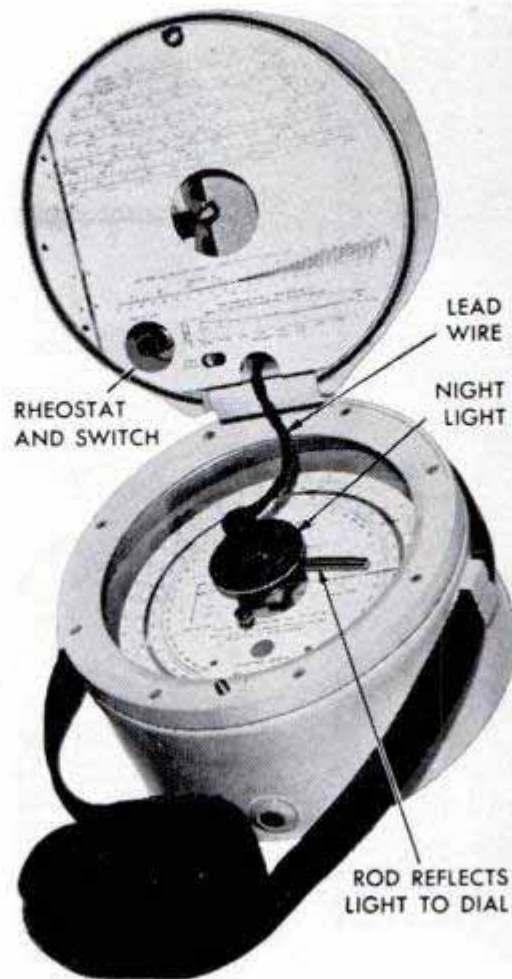
Tie plates made of plastic now are supporting railroad rails at a switching yard in Cleveland. The inventor of the new plastic, called Dynakon, says it is three times as strong as steel. The tie plates, which weigh only one fifth as much as their metal counterparts, are under test as a substitute for steel, and are unaffected by the salt water dripping from refrigerator cars, which causes deterioration of steel plates.

Information not listed on articles in the index frequently can be found in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from the Bureau of Information, *Popular Mechanics*, 200 E. Ontario St., Chicago 11, Ill.



## Altimeter Is Supersensitive

Developed by Army engineers, a new altimeter, operating on atmospheric pressure, is so sensitive it can measure the height of an ordinary table or record elevations 15,000 feet above sea level. The instrument will be used to measure ground elevations in building airfields and roads, and as an aid in photomapping work. It is equipped with a variable night light. A vacuum chamber expands or contracts in response to changes in atmospheric pressure. The instrument's mechanism, in turn, rotates the indicating hand on the dial. The instrument can be used from 1000 feet below sea level up to altitudes as high as 15,000 feet.

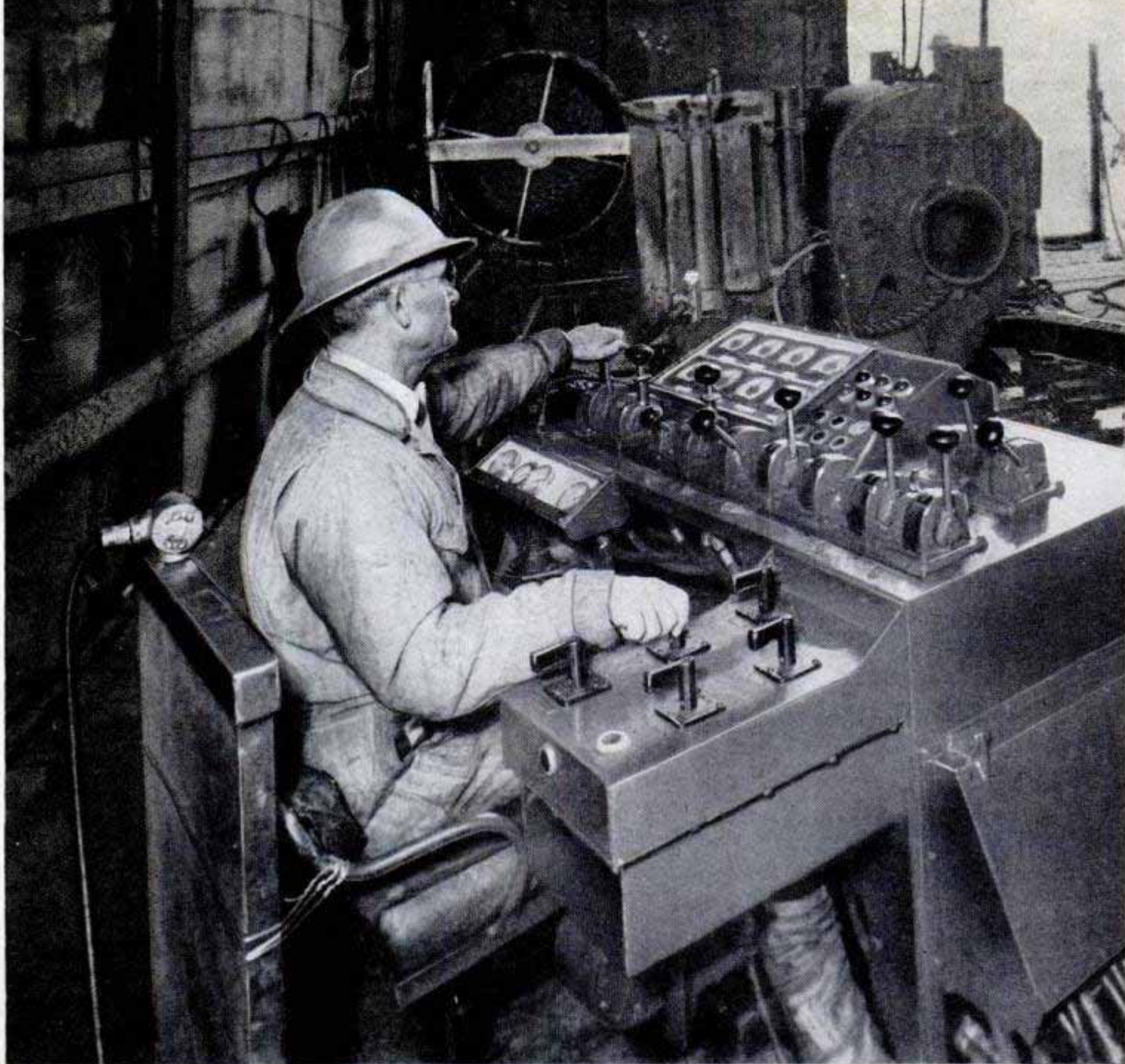


## "Yacht of Future" Is Enclosed From Deck to Trim Superstructure



Shaped with the lines of an airplane, a "yacht of the future" built in Scotland has a completely enclosed superstructure and deck. The rakish, 46-ton motor cruiser measures 81 feet long and is powered by two diesel engines. Underwater, the hull is of normal shape, but every line of the trim craft above water is a long curve. The wheelhouse is similar in appearance to the cockpit of a fighter plane. Stowed on deck is a 12-foot motor dinghy which can be hoisted by a derrick through an opening in the superstructure, normally covered by canvas. The craft has accommodations for two crew members and eight passengers. The facilities include two bathtubs with showers, a refrigerator and hot and cold water in every cabin. The futuristic yacht has a cruising range of 2000 miles.





From his "pipe organ" console, the driller controls the lowering of sections of pipe into the well, on opposite page

# "Pipe Organ" OIL DRILLER

By Andrew Hamilton

**T**AKE TWO diesel engines salvaged from a couple of Navy LSTs, three electric submarine motors, the draw works from a steam rig, a 162-foot derrick and what do you have?

Answer: One of the largest and most unusual deep-test oil-well drilling rigs ever built—one that will probe for pools of black gold four miles or more below the earth's crust.

To operate the \$400,000 giant, a driller sits at a console and "plays" on a panel of

knobs, lights and switches like the organist at Radio City Music Hall!

This revolutionary drilling rig has been tested in two southern California oil fields—Baldwin Hills and Santa Fe Springs.

When the rig with its 162-foot derrick was tested in Baldwin Hills, a Los Angeles residential section, there were complaints about the noise from near-by homeowners. Officials of the movie studios in the vicinity were unhappy because drilling sounds were picked up by their sensitive microphones.





So engineers covered the tall tower with heavy quilted canvas, filled with sound-deadening material. High walls of the same stuff were erected between the engines and the generators. Then, thousands of horsepower went back to work with only a dull drone and an occasional muted clank.

"But that derrick—it was the craziest-looking thing you ever saw," commented a driller. "It reminded me of my long-legged Aunt Minnie in her quilted bathrobe!"

This radical drilling rig is a part of Standard Oil of California's long-range program to convert the conventional steam rigs into more economical, internal-combustion engine power.

"We were aiming at three targets," said a Standard engineer recently. "First, greater portability in equipment suitable for deeper holes; second, improved operating characteristics; third, lower maintenance costs.

"We hope to use rigs of this type in the future for deep tests from 15,000 to 20,000 feet, as well as for everyday drilling of 8000 to 10,000-foot holes."

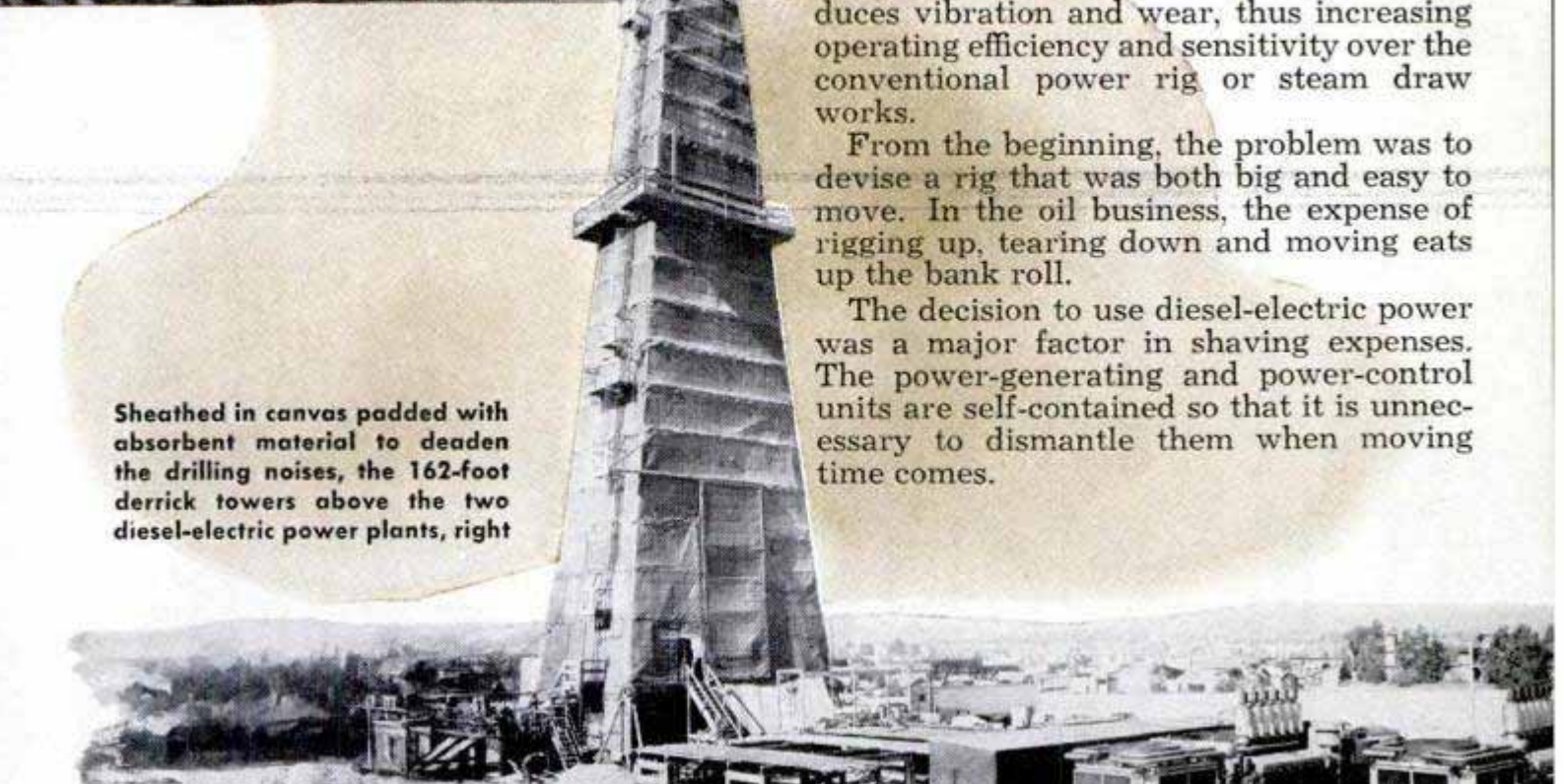
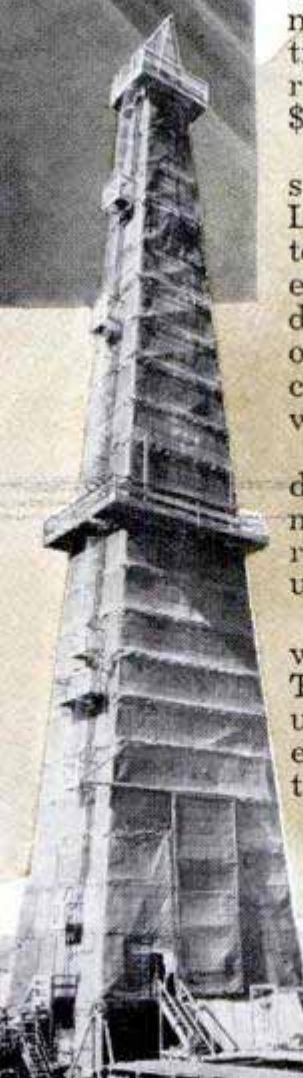
The rig's 2400 horsepower is nearly half again as much as the average heavy drilling outfit. The power is supplied by two 1200-horsepower diesel engines, the port and starboard main propulsion engines of an LST. Three electric motors, originally built for Navy submarines, are also being used. Had this material been purchased brand new instead of being salvaged and reconditioned, the cost of the new rig would have run around \$700,000, or more, instead of \$400,000.

The diesel-electric setup requires no outside source of electric power. The two giant LST engines drive direct-current generators and provide electric power for the equipment. The use of electric power reduces vibration and wear, thus increasing operating efficiency and sensitivity over the conventional power rig or steam draw works.

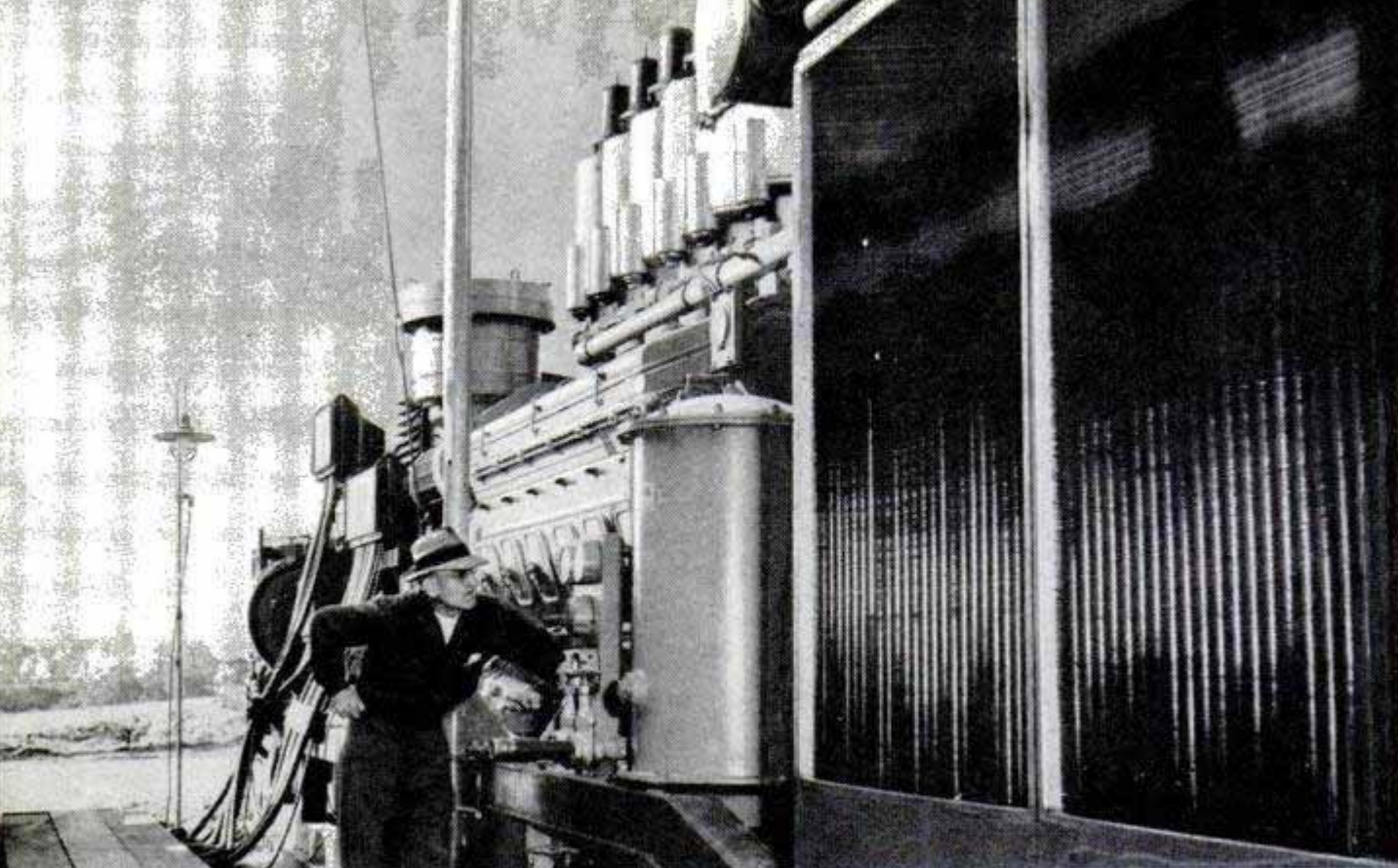
From the beginning, the problem was to devise a rig that was both big and easy to move. In the oil business, the expense of rigging up, tearing down and moving eats up the bank roll.

The decision to use diesel-electric power was a major factor in shaving expenses. The power-generating and power-control units are self-contained so that it is unnecessary to dismantle them when moving time comes.

Sheathed in canvas padded with absorbent material to deaden the drilling noises, the 162-foot derrick towers above the two diesel-electric power plants, right







Formerly on an LST, this 1200-horsepower diesel now powers the drill rig. Object at right is a radiator

A large motor-driven reel is provided for transporting the more than 3500 feet of two-inch cable used for power connections between generators, motors and control points—representing a total weight of more than seven tons. All mechanical and electric units are mounted on skids to make them easy to move around or to mount on trucks for long hauls.

When shifted from one location to another in the oil fields, the engine-generator

set will be moved as one unit. Total weight: 96,000 pounds. But when the unit is trucked over the highways, the engine-generator set breaks down into two separate packages to meet California road-width, road-height and road-weight requirements.

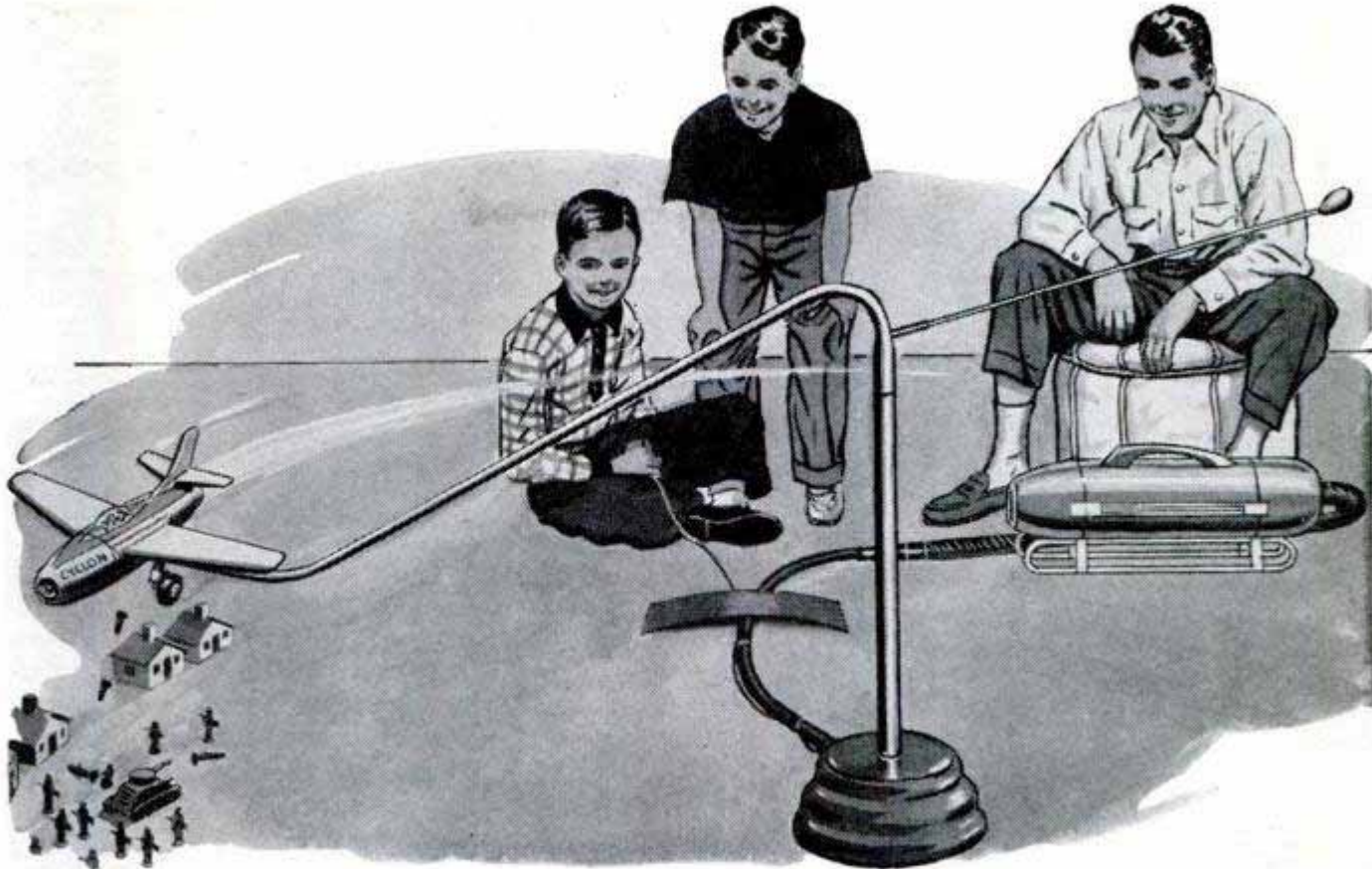
The most unusual feature of the new diesel-electric experimental rig, however, is the system of "finger tip" control. No longer does the driller stand alongside the

(Continued to page 244)

Workmen make connections on the drill's two mud pumps, right. Each unit is mounted on skids for mobility



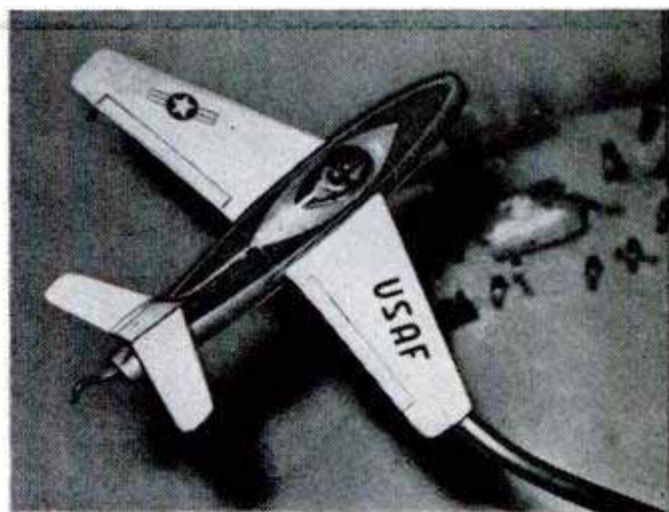




## Child's Jet Airplane Powered by Vacuum Cleaner

Mom's vacuum cleaner becomes one of the children's playthings, providing the thrust that keeps a toy plane in the air. Invented in Spain, the plane is a model of an American jet aircraft. Air is supplied to the jet "engine" of the plane through a tube that also supports the plane as it flies around a central pivot. The air is piped through a nozzle in the tail, causing the plane to fly at a height of about two feet. A small siren is built into the plane to imitate the sound of a real jet engine. Another feature of the toy is a remote-controlled bomb release. When a button is pressed, the plane drops 24 bombs in succession.

Bombs are released from the plane by remote control. The ramp over the sweeper hose allows the plane to taxi on the floor. Below, close-up of jet in flight



## Brush Cutter

Rotating like a giant egg beater, a tractor attachment driven by the power take-off clears brush up to six feet tall and three inches in diameter. A flat piece of steel, about eight inches long sharpened on the leading edge, is attached to the bottom of the rotating "gate." It cuts through the stalks and the ladderlike gate tosses the brush aside. The device was built by J. N. van Rhyn of Klapmuts, South Africa.

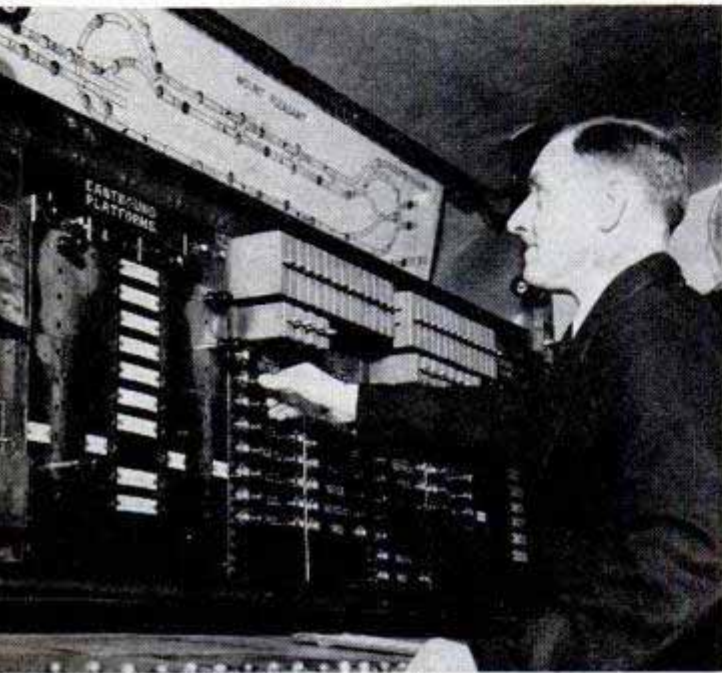


# LONDON'S POST-OFFICE RAILWAY



Photos courtesy Postmaster General, London

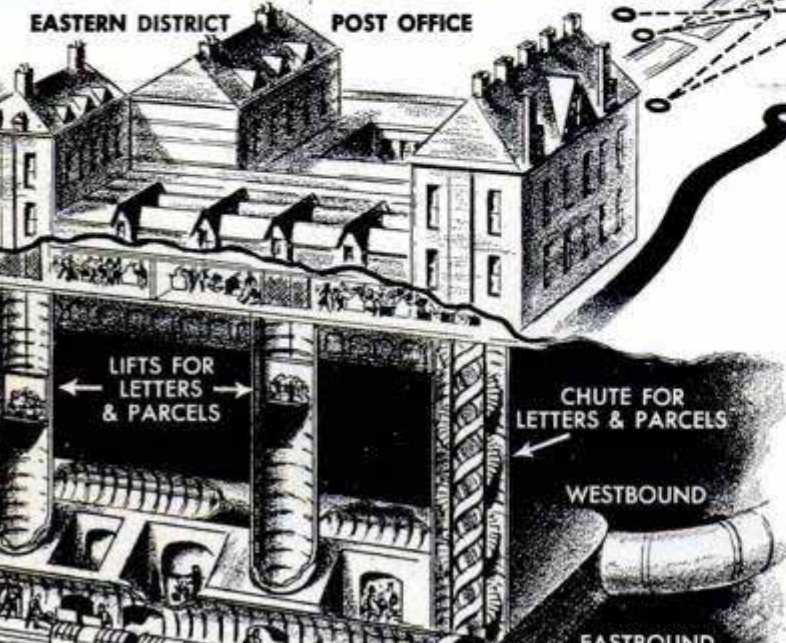
**Off-loading mail containers of London's post-office railway system, which operates 70 feet underground**



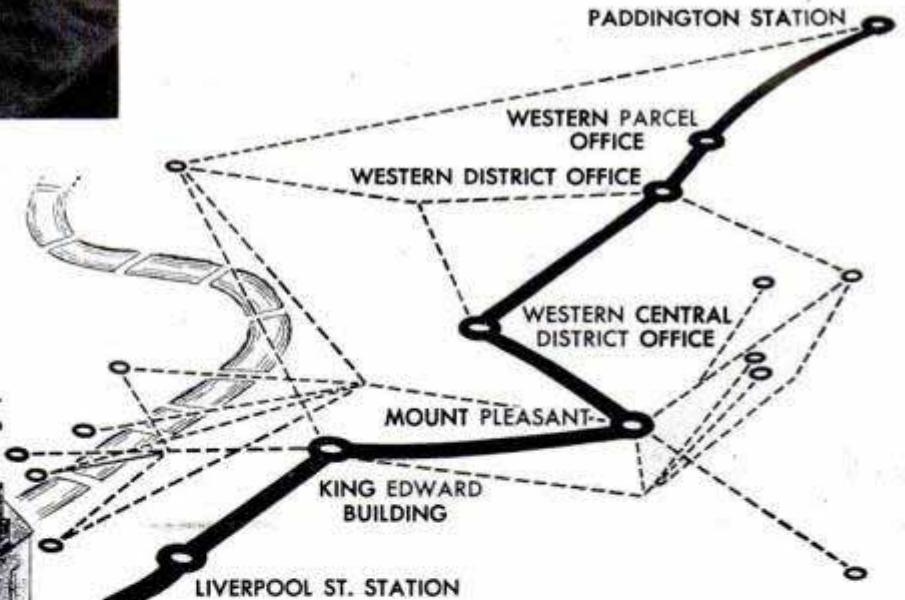
**Running at speeds up to 35 m.p.h. through 6½ miles of tunnels, driverless trains are controlled from the switch cabins, above**

**Fed by road routes, post-office stations along the underground railway move mailbags to trains by chutes and conveyors**

**PRINCIPAL ROAD ROUTES FEEDING RAILWAY LINES OPERATED**



**STILL** in use after many years of successful operation, London's post-office underground railway—only one of its kind in the world—carries a total of 11½ million letters annually. It is similar to Chicago's freight-carrying tunnel system, which may sometime be used to help speed up mail deliveries in the Loop area. The London railway operates 70 feet underground through 6½ miles of tunnels. Except at station approaches, the electric trains run in a single tunnel, reaching speeds of 35 miles per hour between stations. The driverless trains carry four mailbag containers, holding an average of 15 letter bags each. Small battery-operated "locomotives" on short sidings along the line stand by as substitutes for faulty trains.





## ADDING THE FINAL TOUCH

Does your house have eye appeal? Often, the mere addition of colorful modern shutters, or a smart door motif, is all it takes to make "just another house" rate a second look

By **Wayne C. Leekey**

IT'S A BEAUTIFUL HOME but it seems "unfinished." Perhaps you've said that yourself when driving by a particular new home in your neighborhood. You may even have said it about your own house. True, while a house may be well designed and built, nicely landscaped and newly painted, it may still lack the final touch which gives it individuality and eye appeal. That touch might be the mere addition of colorful and modern-looking shutters. In other instances, a bright-colored door entrance offset with a smart abstract motif in white may do the trick. An uninteresting, commonplace garage door is made the focal

*PM color photos by Paul T. Hutchinson*



Above, three white frames contrasting against a maroon background lend a smart panel treatment to a front entrance. Below, good example of how plain-looking garage door can be treated for eye appeal







Nine "picture frames" add the final decorative touch to this plain one-piece, upward-acting, garage door

point and assumes a "belonging" look with bright paint and a few well-placed decorative overlays. And, finally, a tier of flower boxes mounted between supporting posts, as pictured on page 167, will complement a front entrance.

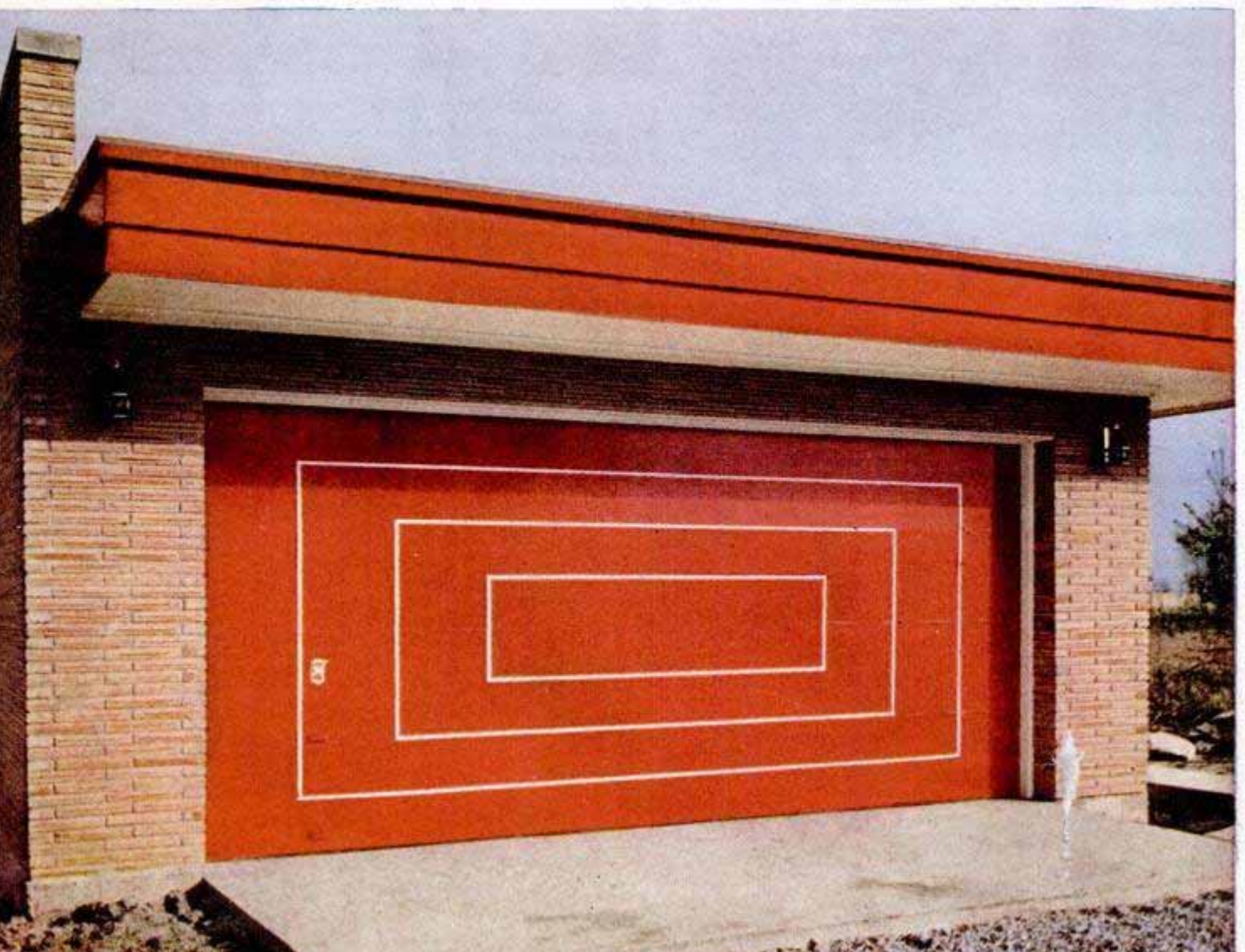
Whether the final touch is achieved with shutters or overlay door motifs, it's something that can be tackled by the average homeowner with a minimum of effort and tools, and the "lift" it will give a home will improve the appearance and increase the salability considerably. The suggestions pictured on these pages are but a few of the



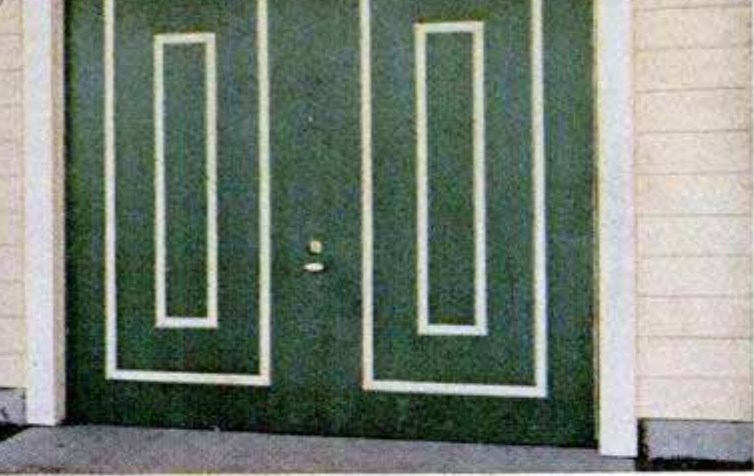
Two vertical groupings of bevel-edge blocks provide another simple and attractive garage-door treatment

many possibilities. In most cases, the work of adding overlay motifs to shutters and doors entails nothing more than making simple "picture frames" of stock molding and nailing them in place in an interesting geometric pattern. For this you'll need only a common, wooden miter box to miter the corners of the frames. If a motif of wooden blocks is desired, as pictured above, you can cut them quickly to size from common lumberyard material. If you are not too adept at handling a handsaw, many lumberyards will gladly saw the blocks to your specifications, so that all you'll have to do

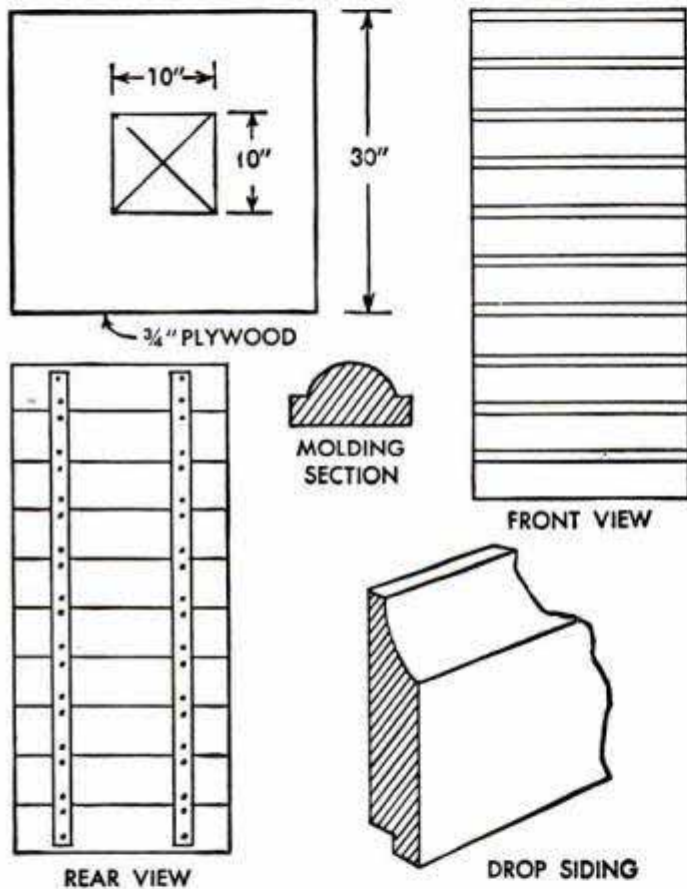
"Nested" paneling applied to daring Chinese-red door carries out striking modern design of this swank garage



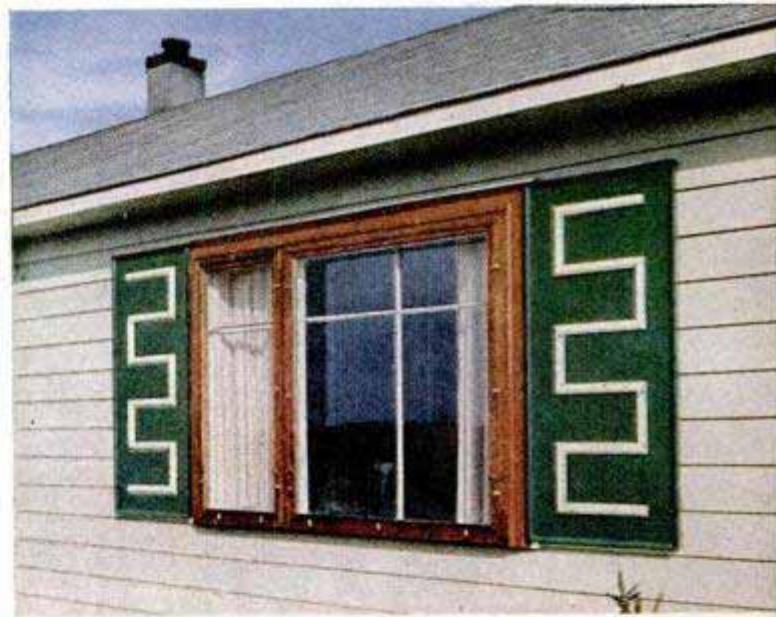




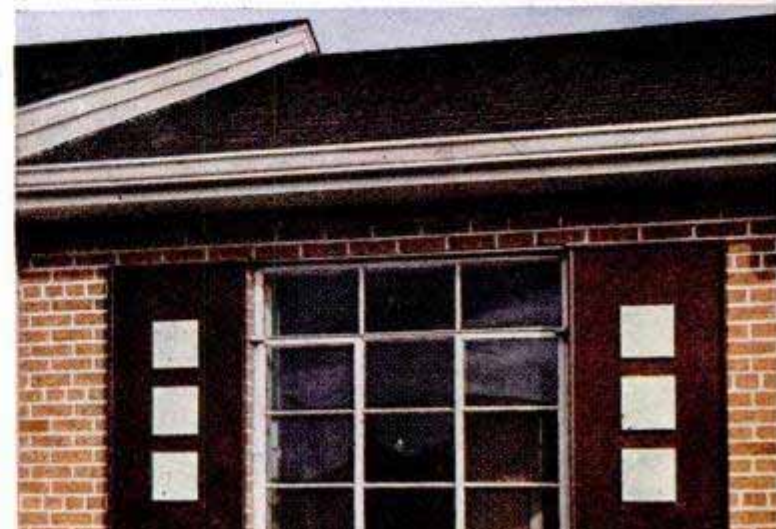
Frames within frames applied vertically provide a third effective treatment for decorating garage door



Tiered flower boxes of matching color complement a red entrance decorated with a Chinese motif. Below, same overlay design can be carried out on shutters



Below, this example shows how three white squares centered vertically on plain plywood shutters give smart eye appeal to this russet-colored brick home



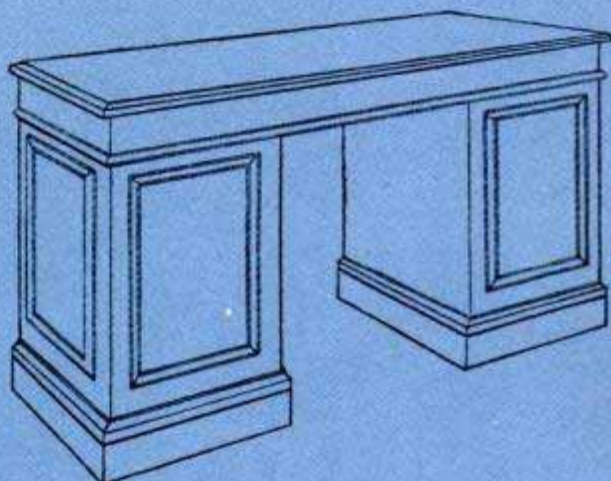
is screw them evenly and squarely in place. The most effective shutters, especially on a modern house, are plain simple ones. Rectangular panels of exterior-grade plywood make excellent shutters when well painted and decorated with a contrasting molding motif. For the popular "clerestory" window, or any other short, single-sash window, a square panel of plywood set off in the center with a pyramid-faced, contrasting square makes a most striking shutter for a modern home. Another simple way of making a good-looking shutter with little work is to use common drop siding. The siding is simply cut to the desired lengths and screwed to battens attached vertically to the rear side. The shadow lines formed by each section of the siding give a most striking effect when the shutters are exposed to strong sunlight.





Whether you work at home or just want a desk for personal correspondence and storing papers, you'll find these typewriter desks good-looking and easy to build

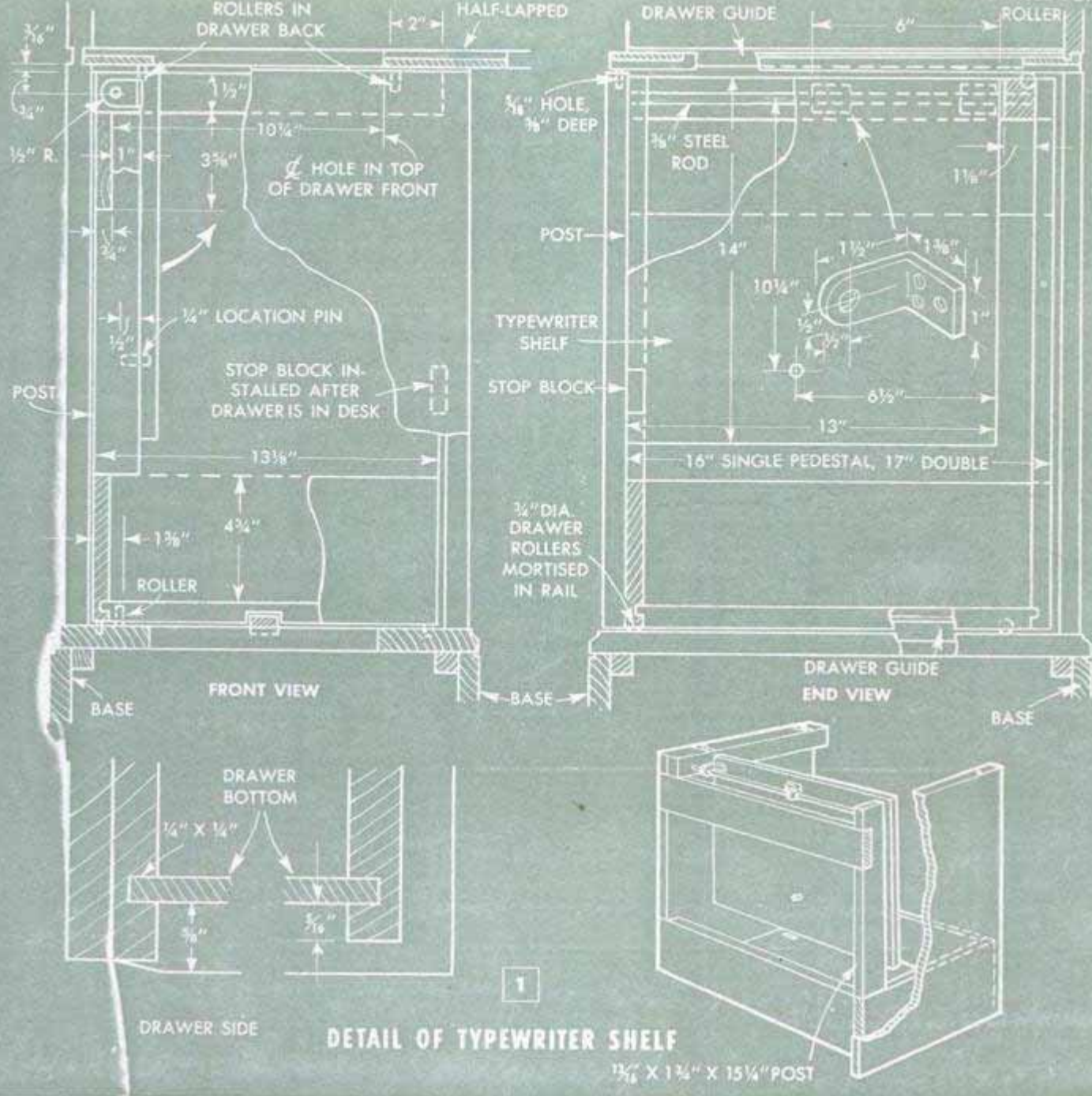
*Desks styled by John Bergen*



**BUILD A**







# DESK for your TYPEWRITER

THE TWO typewriter desks pictured on the opposite page are designed to fit in with your present furniture, whether period or modern. As illustrated, the desks will go well with traditional furniture—or, with the simple addition of modern drawer pulls and a finish in one of the popular gray or blonde tones, either desk will be right at home with your modern pieces. Both desks feature a simple pull-out typewriter shelf which is easy to build and operate, and the lower portion of the shelf frame is fitted with sides to form a utility drawer. The double-pedestal desk includes three drawers in the top section and two roomy drawers in the right-hand pedestal, the lower drawer being deep enough to serve

as a letter file. The single-pedestal desk has two top drawers in addition to the utility drawer under the typewriter shelf.

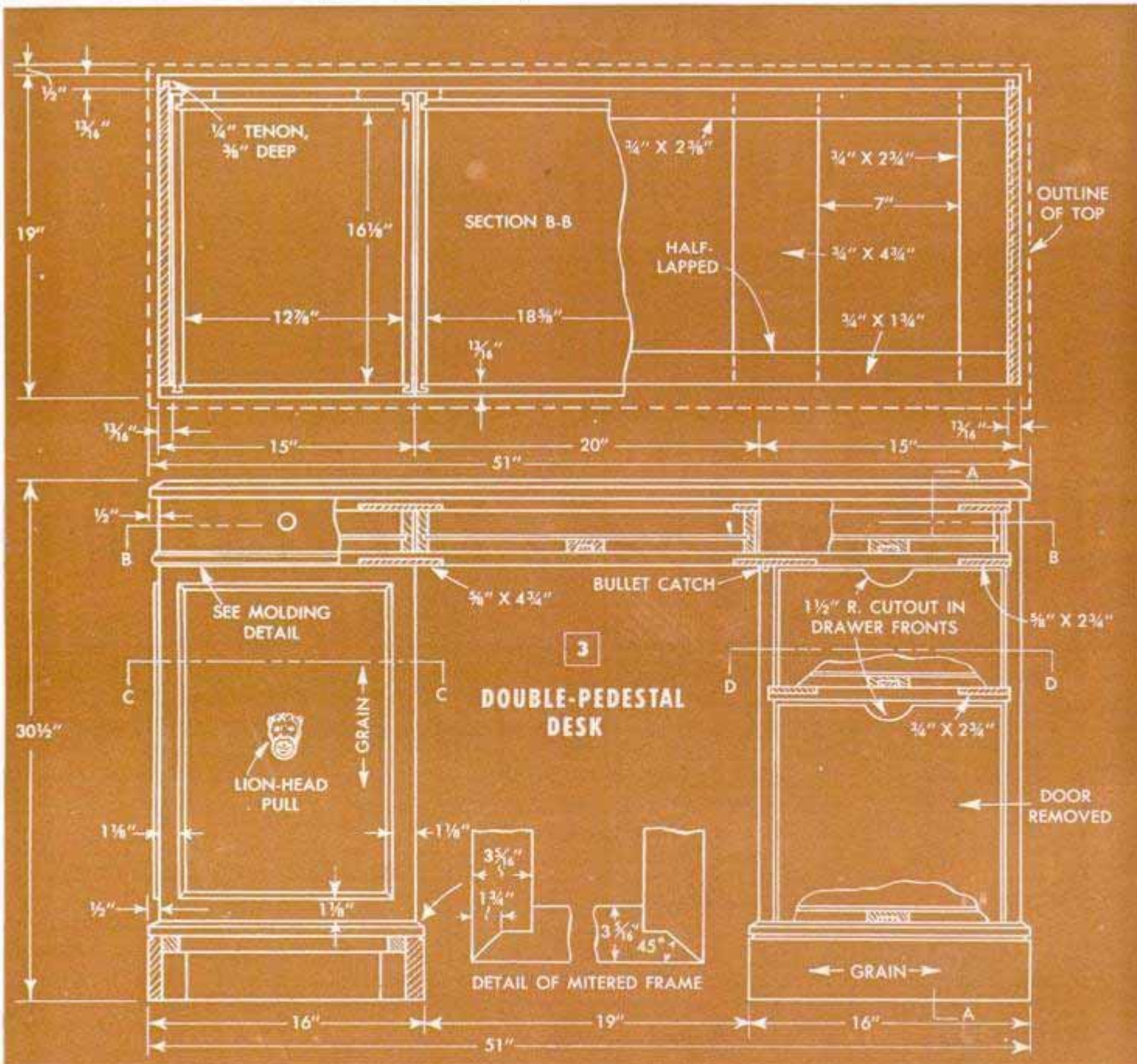
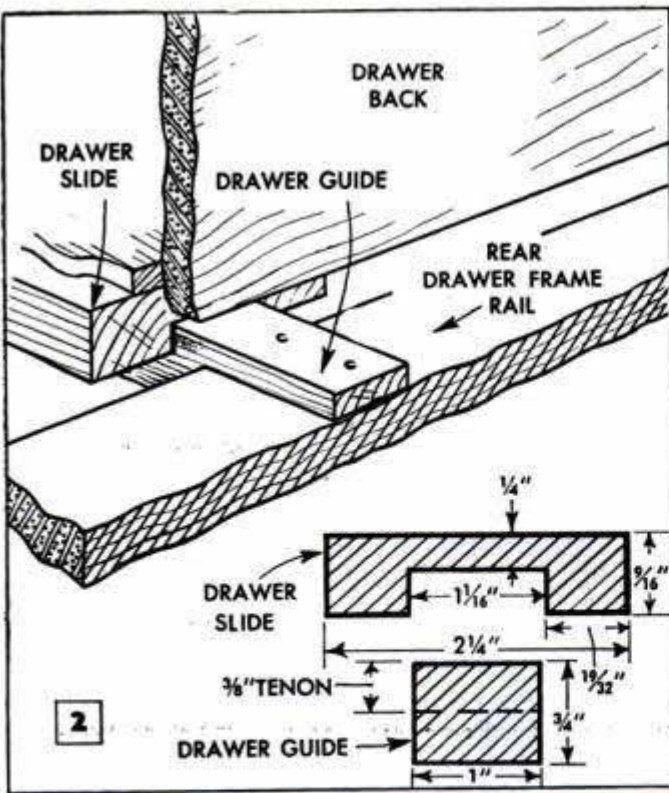
Except for mounting the pedestals on the base, the construction of both desks is much the same. The cabinets are made of  $1\frac{3}{16}$ -in. plywood, which is also used for the drawer fronts and typewriter shelf. Rails for the top section and drawers, trim moldings, etc., are made of hardwood while the drawer bottoms are of hardboard.

Construction of the double-pedestal desk is detailed in Fig. 3, and the single-pedestal unit is described in Fig. 4. Note in Fig. 3 that the side and back panels of the pedestals rest on a mitered frame which is screwed and glued to cleats fastened to the



inside of the base frame. The latter is mitered and supported by a glue block at each corner. The frame supporting the upper drawer in the right-hand pedestal is half-lapped and glued in grooves run in the plywood pedestal sides. Note in Fig. 3, section A-A, how the  $\frac{5}{8}$ -in. trim molding is fitted along the front and back of the desk. The molding on the sides of the pedestals is laid in  $\frac{1}{8}$  x  $\frac{5}{8}$ -in. grooves cut in the plywood panels, and the corners of the molding are mitered.

On the single-pedestal desk, a separate coved base molding is used. The sides and back panels of the typewriter pedestal rest directly on the mitered base members. The latter are rabbeted to form a shoulder for the ends of the panels, and cleats are glued and screwed to the base members to provide additional bearing surface. The post is made as in Fig. 4, section C-C. The base members and double panel are separated with spacers, as in the lower left-hand de-





tail. The molding at the front of the post is made to fit flush with the inside of the base member.

Drawer construction is typical, with the plywood bottom being housed in grooves cut in the side, front and back members, as shown in the lower left-hand detail of Fig. 1. However, the drawer sides at the ends of the desks are joined to the fronts with a blind dovetail, as in Fig. 4, to allow the front to close flush with the side panel of the desk. Fig. 2 dimensions the drawer guide and slide, and pictures the method of installation.

The typewriter shelf and drawer are detailed in Figs. 1, 3 and 4. To use the typewriter, the drawer is pulled out far enough to allow the typewriter shelf to be swung upward. When the shelf is raised sufficiently high to clear the drawer front, it is pulled forward, sliding on the  $\frac{3}{8}$ -in. rod, until a locating pin on the underside of the shelf engages a hole in the top edge of the

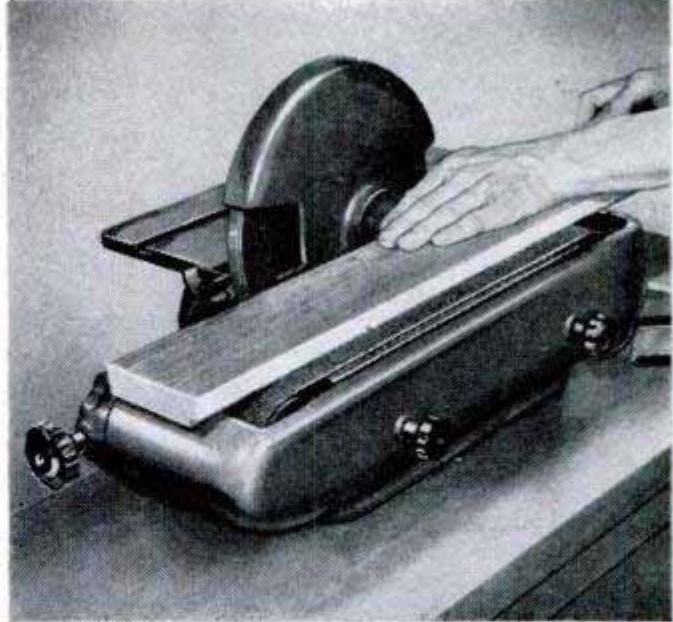
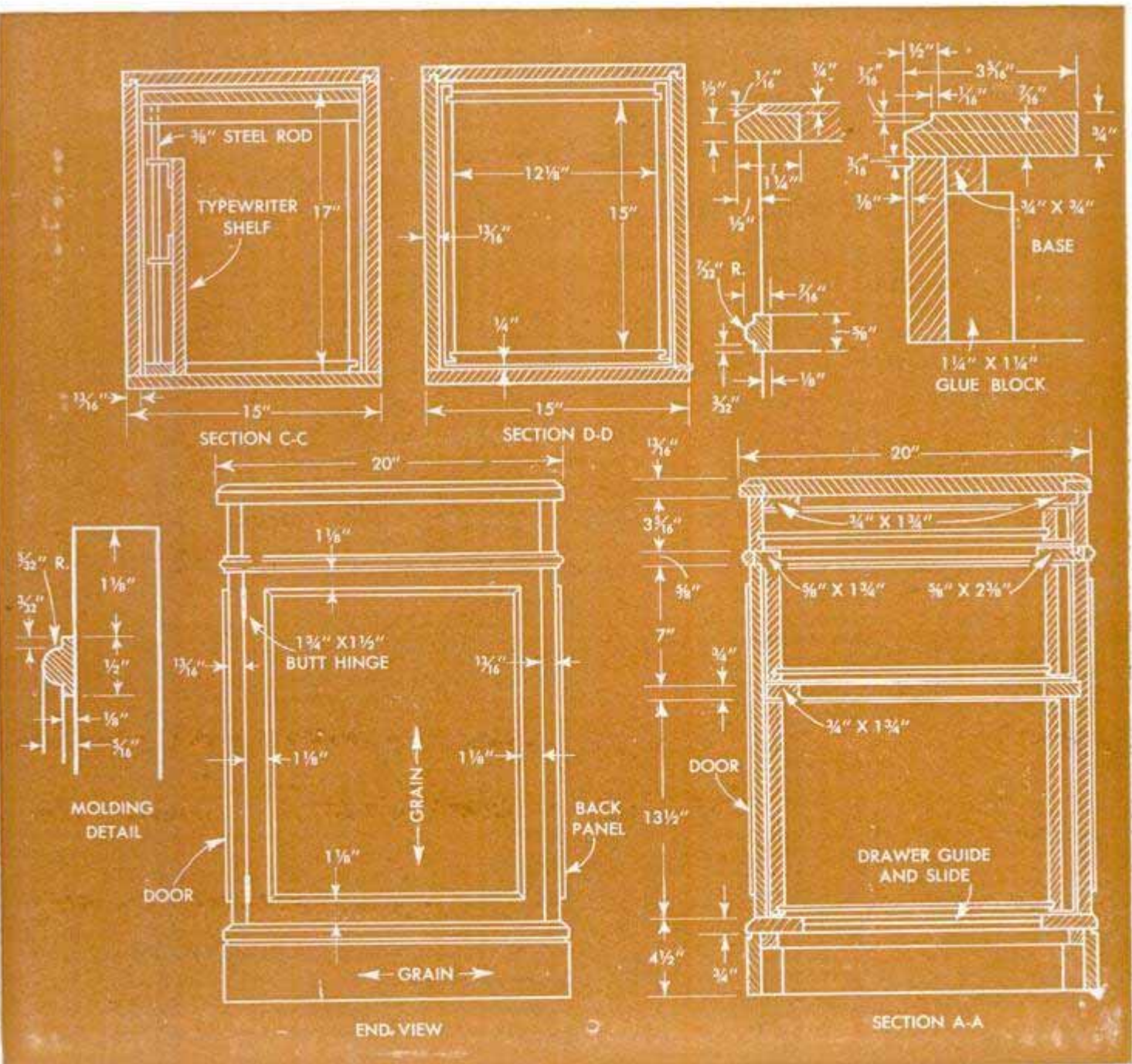


Photo above shows a combination sander being used to smooth the outer surface of one of the base members for the double-pedestal desk. Rabbet along top edge forms groove when mitered frame is assembled







## MATERIAL YOU WILL NEED

### DOUBLE-PEDESTAL DESK

#### MAHOGANY PLYWOOD

- 1 pc.  $1\frac{3}{16}$ " x 19" x 50"—Top
- 2 "  $1\frac{3}{16}$ " x  $17\frac{3}{4}$ " x  $25\frac{3}{16}$ "—Ends
- 2 "  $1\frac{3}{16}$ " x  $17\frac{3}{4}$ " x  $21\frac{1}{4}$ "—Ends
- 4 "  $1\frac{3}{16}$ " x 15" x  $21\frac{1}{4}$ "—Drawer front, door & backs
- 1 "  $1\frac{3}{16}$ " x  $3\frac{9}{16}$ " x 50"—Back
- 2 "  $1\frac{3}{16}$ " x  $3\frac{5}{16}$ " x 15"—Drawer fronts
- 1 "  $1\frac{3}{16}$ " x  $3\frac{5}{16}$ " x 20"—Drawer front
- 1 "  $1\frac{3}{16}$ " x 7" x  $14\frac{1}{8}$ "—Drawer front
- 1 "  $1\frac{3}{16}$ " x  $13\frac{1}{2}$ " x  $14\frac{1}{8}$ "—Drawer front
- 1 "  $1\frac{3}{16}$ " x 13" x 14"—Typewriter shelf

#### MAHOGANY

- 2 pc.  $\frac{3}{4}$ " x  $1\frac{1}{4}$ " x 51"—Top moldings
- 2 "  $\frac{3}{4}$ " x  $1\frac{1}{4}$ " x 20"—Top moldings
- 2 "  $\frac{7}{16}$ " x  $\frac{5}{8}$ " x  $19\frac{5}{8}$ "—Center moldings
- 2 "  $\frac{7}{16}$ " x  $\frac{5}{8}$ " x  $50\frac{5}{8}$ "—Center moldings
- 8 "  $\frac{5}{16}$ " x  $\frac{1}{2}$ " x 19"—Trim moldings
- 4 "  $\frac{5}{16}$ " x  $\frac{1}{2}$ " x  $12\frac{3}{4}$ "—Trim moldings
- 4 "  $\frac{5}{16}$ " x  $\frac{1}{2}$ " x  $15\frac{1}{8}$ "—Trim moldings
- 4 "  $\frac{3}{4}$ " x  $3\frac{5}{16}$ " x 16"—Base frame
- 4 "  $\frac{3}{4}$ " x  $3\frac{5}{16}$ " x 20"—Base frame
- 4 "  $\frac{3}{4}$ " x  $3\frac{3}{4}$ " x 16"—Base
- 4 "  $\frac{3}{4}$ " x  $3\frac{3}{4}$ " x 20"—Base

#### HARDWOOD

- 2 pc.  $\frac{3}{4}$ " x  $1\frac{3}{4}$ " x  $47\frac{7}{8}$ "—Top frame
- 2 "  $\frac{3}{4}$ " x  $2\frac{3}{4}$ " x  $17\frac{5}{8}$ "—Top frame
- 2 "  $\frac{3}{4}$ " x  $4\frac{3}{4}$ " x  $17\frac{5}{8}$ "—Top frame
- 2 "  $\frac{5}{8}$ " x  $2\frac{3}{4}$ " x  $18\frac{3}{4}$ "—Top drawer frame
- 2 "  $\frac{5}{8}$ " x  $4\frac{3}{4}$ " x  $18\frac{3}{4}$ "—Top drawer frame
- 1 "  $\frac{5}{8}$ " x  $1\frac{3}{4}$ " x  $47\frac{7}{8}$ "—Top drawer frame
- 1 "  $\frac{5}{8}$ " x  $2\frac{3}{8}$ " x  $47\frac{7}{8}$ "—Top drawer frame
- 2 "  $\frac{3}{4}$ " x  $1\frac{3}{4}$ " x  $13\frac{7}{8}$ "—Drawer frame
- 2 "  $\frac{3}{4}$ " x  $2\frac{3}{4}$ " x  $17\frac{3}{8}$ "—Drawer frame
- 6 "  $\frac{1}{2}$ " x  $2\frac{9}{16}$ " x  $17\frac{3}{8}$ "—Drawer sides
- 2 "  $\frac{1}{2}$ " x 7" x  $16\frac{3}{8}$ "—Drawer sides
- 2 "  $\frac{1}{2}$ " x  $13\frac{1}{2}$ " x  $16\frac{3}{8}$ "—Drawer sides
- 2 "  $\frac{1}{2}$ " x  $2\frac{3}{16}$ " x  $13\frac{3}{8}$ "—Drawer backs
- 1 "  $\frac{1}{2}$ " x  $2\frac{5}{16}$ " x 19"—Drawer back
- 1 "  $\frac{1}{2}$ " x  $6\frac{3}{4}$ " x  $12\frac{1}{2}$ "—Drawer back
- 1 "  $\frac{1}{2}$ " x  $13\frac{1}{4}$ " x  $12\frac{1}{2}$ "—Drawer back
- 4 "  $\frac{3}{4}$ " x 1" x  $17\frac{1}{4}$ "—Drawer guides
- 2 "  $\frac{3}{4}$ " x 1" x  $16\frac{1}{4}$ "—Drawer guides

- 3 "  $\frac{9}{16}$ " x  $2\frac{1}{4}$ " x  $16\frac{5}{8}$ "—Drawer slides
- 2 "  $\frac{9}{16}$ " x  $2\frac{1}{4}$ " x 16"—Drawer slides
- 4 "  $\frac{3}{4}$ " x  $\frac{3}{4}$ " x  $14\frac{1}{2}$ "—Base strips
- 4 "  $\frac{3}{4}$ " x  $\frac{3}{4}$ " x 17"—Base strips
- 8 "  $1\frac{1}{4}$ " x  $1\frac{1}{4}$ " x 3"—Base corner blocks
- 2 "  $\frac{3}{4}$ " x  $5\frac{1}{2}$ " x 17"—Typewriter-drawer sides
- 1 "  $\frac{3}{4}$ " x  $3\frac{5}{8}$ " x 17"—Typewriter-drawer sides
- 1 "  $\frac{3}{4}$ " x  $1\frac{3}{4}$ " x  $15\frac{1}{4}$ "—Typewriter-drawer post
- 1 "  $1\frac{1}{8}$ " x  $1\frac{1}{2}$ " x  $13\frac{1}{8}$ "—Back cleat

#### PLYWOOD

- 1 pc.  $\frac{3}{4}$ " x  $13\frac{1}{8}$ " x  $19\frac{7}{8}$ "—Typewriter-drawer back
- 1 "  $\frac{3}{4}$ " x  $12\frac{5}{8}$ " x  $16\frac{1}{4}$ "—Typewriter-drawer bottom

#### HARDBOARD

- 2 pc.  $\frac{1}{4}$ " x  $13\frac{3}{8}$ " x  $16\frac{5}{8}$ "—Drawer bottoms
- 2 "  $\frac{1}{4}$ " x  $12\frac{5}{8}$ " x  $15\frac{1}{2}$ "—Drawer bottoms
- 1 "  $\frac{1}{4}$ " x  $19\frac{1}{8}$ " x  $16\frac{5}{8}$ "—Drawer bottom

#### MISCELLANEOUS

- 3 - 1" dia. knobs
- 2 - 2 $\frac{5}{8}$ " lion-head pulls
- 1 - Bullet catch,  $\frac{3}{8}$ " dia.
- 6 - Drawer rollers,  $\frac{3}{4}$ " dia. wheels
- 1 -  $\frac{3}{8}$ " steel rod,  $16\frac{1}{4}$ " long
- 2 - Metal brackets

### SINGLE-PEDESTAL DESK

#### MAHOGANY PLYWOOD

- 1 pc.  $1\frac{3}{16}$ " x 18" x 39"—Top
- 2 "  $1\frac{3}{16}$ " x  $16\frac{3}{8}$ " x  $25\frac{15}{16}$ "—Ends
- 1 "  $1\frac{3}{16}$ " x  $16\frac{3}{8}$ " x 22"—End
- 1 "  $\frac{1}{4}$ " x  $16\frac{3}{8}$ " x 22"—End
- 1 "  $1\frac{3}{16}$ " x 15" x  $21\frac{1}{4}$ "—Drawer front
- 1 "  $1\frac{3}{16}$ " x  $3\frac{5}{16}$ " x 15"—Drawer front
- 1 "  $1\frac{3}{16}$ " x  $3\frac{5}{16}$ " x 24"—Drawer front
- 1 "  $1\frac{3}{16}$ " x  $3\frac{9}{16}$ " x 39"—Back
- 1 "  $1\frac{3}{16}$ " x 15" x 22"—Back
- 1 "  $1\frac{3}{16}$ " x 13" x 14"—Typewriter shelf

#### HARDWOOD

- 2 pc.  $\frac{3}{4}$ " x  $1\frac{3}{4}$ " x  $37\frac{7}{8}$ "—Top frame
- 1 "  $\frac{3}{4}$ " x  $1\frac{3}{4}$ " x  $16\frac{3}{8}$ "—Top frame
- 1 "  $\frac{3}{4}$ " x  $2\frac{3}{4}$ " x  $16\frac{3}{8}$ "—Top frame
- 1 "  $\frac{3}{4}$ " x  $4\frac{3}{4}$ " x  $16\frac{3}{8}$ "—Top frame
- 1 "  $\frac{5}{8}$ " x  $1\frac{3}{4}$ " x  $37\frac{7}{8}$ "—Center frame
- 1 "  $\frac{5}{8}$ " x  $2\frac{3}{8}$ " x  $37\frac{7}{8}$ "—Center frame
- 1 "  $\frac{5}{8}$ " x  $1\frac{3}{4}$ " x  $17\frac{3}{4}$ "—Center frame
- 1 "  $\frac{5}{8}$ " x  $2\frac{3}{4}$ " x  $17\frac{3}{4}$ "—Center frame
- 1 "  $\frac{5}{8}$ " x  $4\frac{3}{4}$ " x  $17\frac{3}{4}$ "—Center frame
- 2 "  $\frac{3}{4}$ " x  $5\frac{1}{2}$ " x 16"—Typewriter-drawer sides
- 1 "  $\frac{3}{4}$ " x  $3\frac{5}{8}$ " x 16"—Typewriter-drawer sides
- 1 "  $\frac{3}{4}$ " x  $1\frac{3}{4}$ " x  $15\frac{1}{4}$ "—Typewriter-drawer post
- 1 "  $1\frac{1}{8}$ " x  $1\frac{1}{2}$ " x  $13\frac{1}{8}$ "—Typewriter-drawer back cleat
- 4 "  $\frac{1}{2}$ " x  $2\frac{9}{16}$ " x  $16\frac{3}{8}$ "—Drawer sides
- 1 "  $\frac{1}{2}$ " x  $2\frac{5}{16}$ " x  $13\frac{9}{16}$ "—Drawer back
- 1 "  $\frac{1}{2}$ " x  $2\frac{5}{16}$ " x  $22\frac{9}{16}$ "—Drawer back
- 3 "  $\frac{3}{4}$ " x 1" x  $16\frac{3}{8}$ "—Drawer guides
- 2 "  $\frac{7}{16}$ " x  $2\frac{1}{4}$ " x  $15\frac{1}{2}$ "—Drawer slides
- 2 "  $\frac{3}{4}$ " x  $1\frac{5}{16}$ " x  $15\frac{1}{2}$ "—End cleats
- 1 "  $\frac{3}{4}$ " x  $1\frac{1}{2}$ " x  $17\frac{1}{2}$ "—End base cleat
- 2 "  $\frac{3}{4}$ " x  $2\frac{3}{4}$ " x  $17\frac{1}{16}$ "—Pedestal base rail
- 1 "  $\frac{3}{4}$ " x  $2\frac{3}{4}$ " x  $13\frac{3}{8}$ "—Pedestal base rail

#### MAHOGANY

- 1 pc.  $\frac{3}{4}$ " x  $2\frac{3}{4}$ " x  $13\frac{7}{8}$ "—Pedestal base rail
- 2 "  $\frac{3}{4}$ " x  $4\frac{1}{2}$ " x 16"—Base
- 2 "  $\frac{3}{4}$ " x  $4\frac{1}{4}$ " x 19"—Base
- 4 "  $\frac{3}{16}$ " x  $\frac{5}{16}$ " x  $13\frac{5}{8}$ "—Face molding
- 4 "  $\frac{3}{16}$ " x  $\frac{5}{16}$ " x  $4\frac{1}{8}$ "—Face molding
- 8 "  $\frac{3}{16}$ " x  $\frac{5}{16}$ " x  $12\frac{3}{4}$ "—Face molding
- 2 "  $\frac{1}{2}$ " x  $\frac{5}{8}$ " x  $18\frac{3}{4}$ "—Band molding
- 2 "  $\frac{1}{2}$ " x  $\frac{5}{8}$ " x  $39\frac{3}{4}$ "—Band molding
- 2 "  $\frac{3}{4}$ " x  $1\frac{1}{4}$ " x 40"—Top band molding
- 2 "  $\frac{3}{4}$ " x  $1\frac{1}{4}$ " x 19"—Top band molding
- 2 "  $1\frac{1}{4}$ " x 2" x  $22\frac{1}{8}$ "—Posts

#### HARDBOARD

- 1 pc.  $\frac{1}{4}$ " x  $13\frac{9}{16}$ " x  $15\frac{1}{2}$ "—Drawer bottom
- 1 "  $\frac{1}{4}$ " x  $15\frac{1}{2}$ " x  $22\frac{9}{16}$ "—Drawer bottom

#### PLYWOOD

- 1 pc.  $\frac{3}{4}$ " x  $12\frac{5}{8}$ " x  $15\frac{1}{4}$ "—Typewriter-drawer bottom
- 1 "  $\frac{3}{4}$ " x  $13\frac{1}{8}$ " x  $19\frac{7}{8}$ "—Typewriter-drawer back

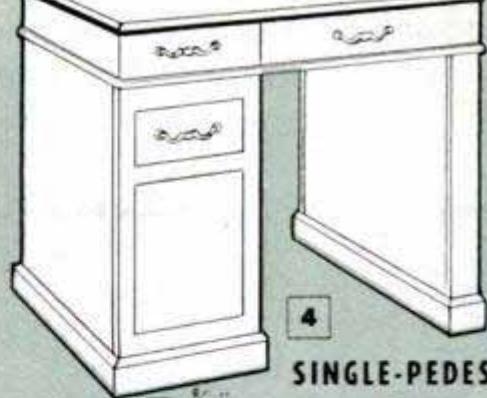
#### MISCELLANEOUS

- 3 - Drawer pulls, 3" boring
- 1 -  $\frac{3}{8}$ " dia. steel rod,  $15\frac{1}{4}$ " long
- 2 - Metal brackets
- 6 - Drawer rollers,  $\frac{3}{4}$ " dia. wheels

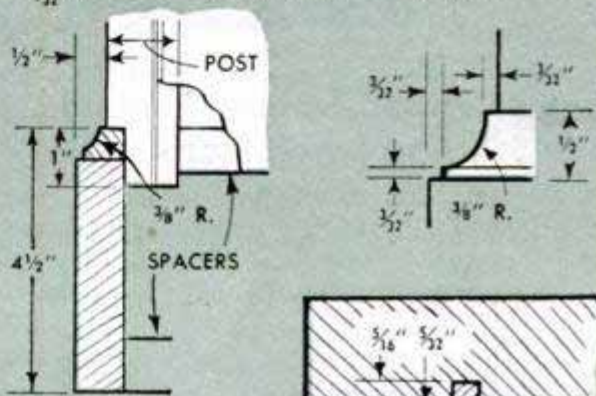
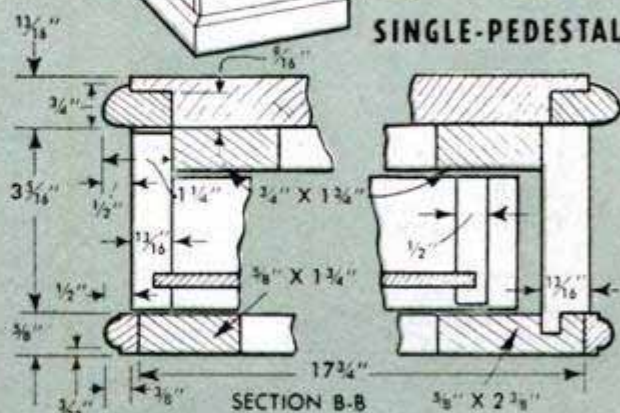


drawer front. As this drawer is quite heavy when the typewriter is installed, three pairs of rollers are used to attain easy operation. One pair is mortised into the top cleat at the rear of the drawer to roll against the crossrails of the top-section frame. Then a second pair is mortised in the drawer bottom near the back panel, and the third pair is mortised in the front rail of the pedestal so each roller will be directly in line with one of the drawer sides and under the inner front member of the drawer when it is in the closed position. Note in the upper details, Fig. 1, how the  $\frac{3}{4}$ -in.-plywood drawer bottom is rabbeted all around to form a tenon which is glued in grooves cut in the sides, back and front of the drawer. The outer drawer front should be glued and screwed to both the vertical cleat and the inner front member.

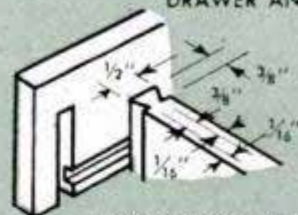
Mahogany, walnut or oak lumber, along with plywood faced with a matching veneer may be used for the exposed portions of the desks. Less-expensive hardwood and plywood, of course, may be used for the concealed members. If desired, the entire desk can be made of poplar or gum and covered with plastic veneer.



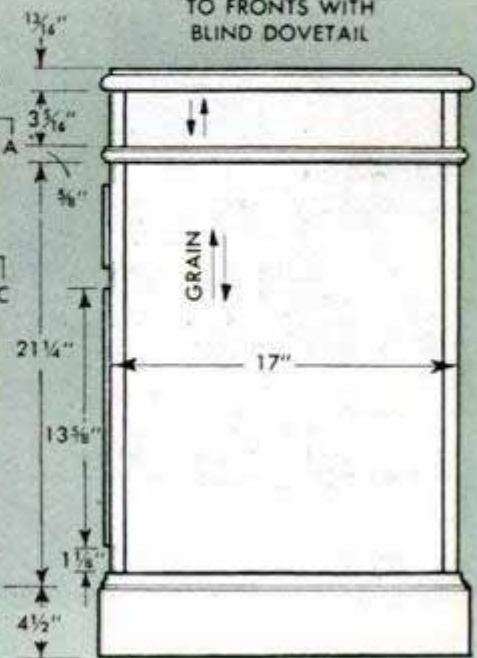
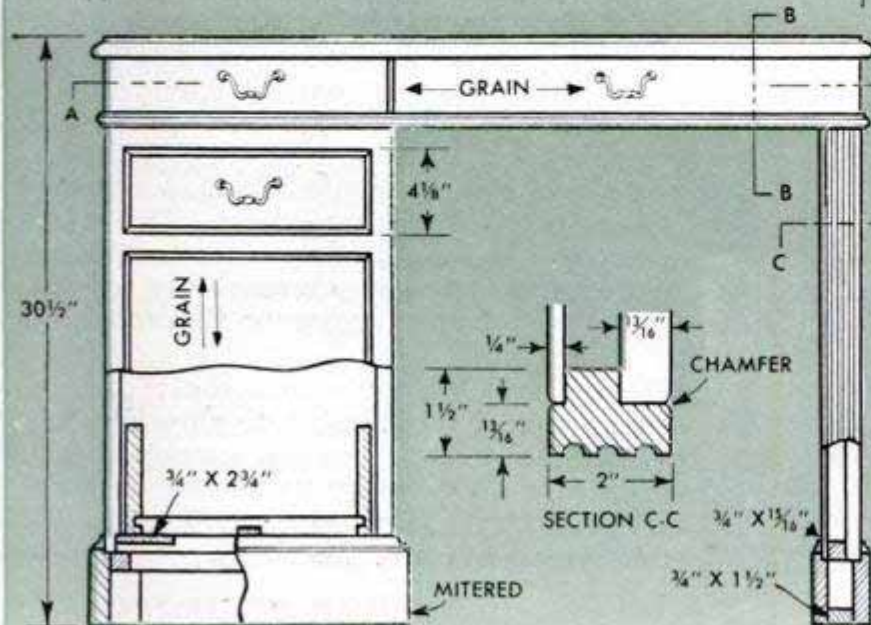
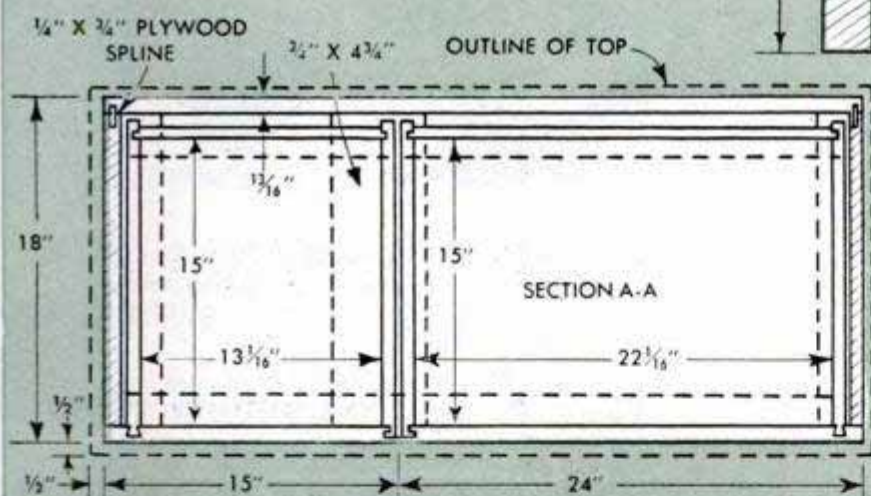
4 SINGLE-PEDESTAL DESK



DETAIL OF BEAD ON TYPEWRITER DRAWER AND BACK



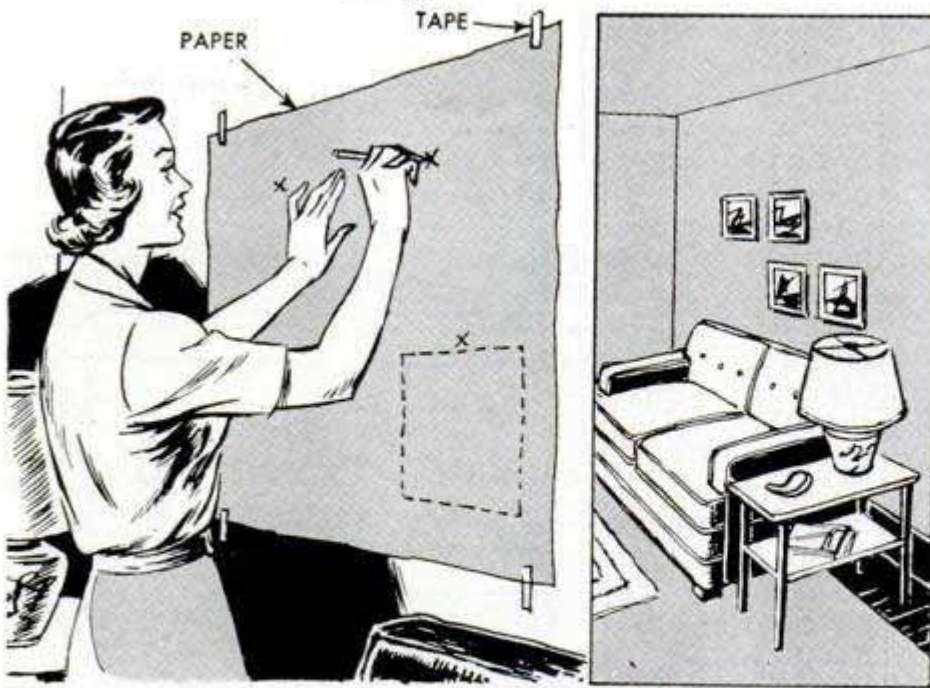
DRAWER SIDES AT ENDS OF DESK JOINED TO FRONTS WITH BLIND DOVETAIL



END VIEW



## Newspaper Guide Helps Position Pictures When Hanging Them in Pattern on Wall



Here's one way of simplifying the job of hanging several small pictures in a pattern on a wall. First, place the pictures on a large piece of wrapping paper, or several sheets of newspaper that have been pasted together, and align them in the positions desired. This done, mark the paper where picture hangers are to be secured to the wall. Now, holding the marked paper against the wall, punch through the paper with the point of a pencil to mark the wall for later insertion of the hangers. If the guide paper is difficult to handle, try taping it to the wall as shown.

## Sponge Rubber Protects Fingers While Starting Small Nails

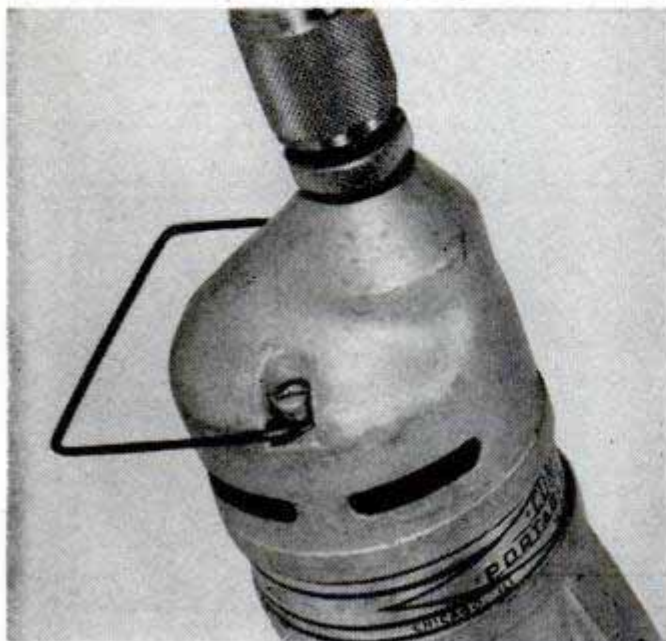
Of the various methods that have been found helpful in starting finishing nails and brads of a size difficult to hold with the fingers, one carpenter has found that a small pad of sponge rubber tops them all. Not only does the rubber serve to hold the nail for starting, but it provides a pad to protect the surface from hammer marks. The resilience and porous texture of the rubber allows the nail to be driven practically home and the pad to be lifted easily from the head of the nail before completing the nailing. In the case of a fine piece of cabinet work where it is important to avoid accidental hammer dents, it is always wise to



use a small nailset to finish driving the nail flush or below the surface of the work.

George Kapitan, Bronx, N. Y.

## Wire Stand Attached to Electric-Drill Housing Protects Bit Cutting Edges



When an electric drill is laid down on a bench temporarily there is always a possibility of damaging the cutting edges of the drill bit or other tool being used in it. To avoid this possibility, one workman uses a wire stand which is clamped over two of the assembly bolts on the drill housing. The stand can be shaped from wire such as a piece of coat-hanger wire. The stand is bent to a U-shape and eyes are formed on each end to slip over the assembly screws.

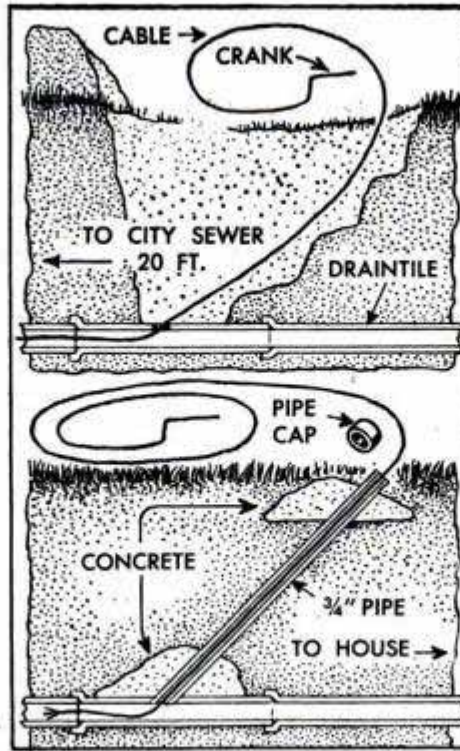
Henry Hanscom, Elmhurst, Ill.

☛ If you have been unable to find a glue or cement that will hold glass to glass, leather to metal or other unusual combinations, ignite a small quantity of shellac to burn off the alcohol. The residue will be a very effective all-purpose glue.



After digging a ditch to clean the sewer from his house, a short distance from where it empties into the main sewer, one homeowner permanently embedded a cleanout pipe in the ground to facilitate future cleaning needs. A  $\frac{3}{4}$ -in. pipe was joined to the draintile, about 20 ft. from the main sewer, and set at an angle for easy manipulation of a cleaning cable. Concrete secures the pipe to the tile and anchors the upper end. The pipe is capped where it protrudes above the ground. Steel telephone cable, frayed at one end and handle-shaped at the other, is utilized for cleaning.—R. J. Carabin, San Antonio, Tex.

## Cleanout Pipe Permanently Set in Ground Simplifies Cleaning of Residential Sewer



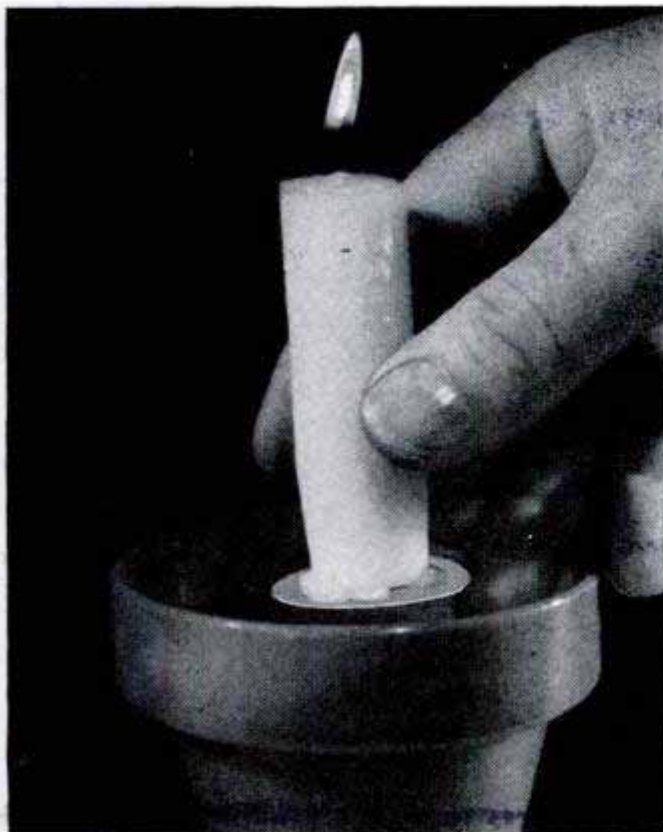
## Soiled Sun Visors Renovated by Reversing Positions

Usually identical in size and shape, stained and dirty sun visors in a car may be made to appear like new by simply interchanging them in the brackets. This will place the protected, upper side in full view on the bottom and, at the same time, place the soiled side on top, more or less hidden from view. Also, this operation usually

will check whatever drooping tendencies the visors have, because they will be made to function in the opposite direction. If they still droop, the condition may be remedied by wrapping a short strip of cellulose tape around the rods before inserting them in the brackets.

Charles P. Fitz Patrick, Philadelphia, Pa.

## Candle Placed Inside Flowerpot Produces Novel "Hurricane" Lamp

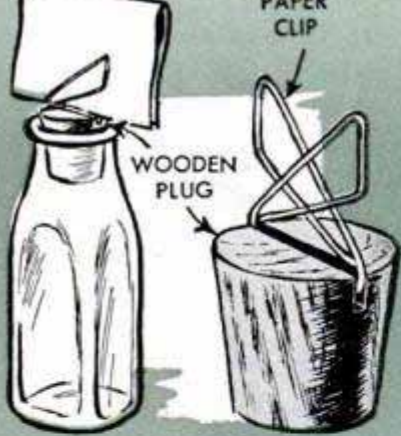


If you use lighted candles on festive occasions, a very novel and unusual effect can be produced by placing a short, lighted candle inside a plastic flowerpot. These are translucent and come in various colors. The candles can be mounted on lids cut from tin cans or any other base of suitable size. Another way of mounting a long-burning candle is to fill the pot about half full of melted wax and insert a wick in it while the wax is in the liquid form. The pot then becomes a candle in itself and still produces the same effect.

## Decals Conceal Chipped Porcelain

The appearance of a chipped porcelain cabinet or refrigerator can be improved by covering the marred spots with decalcomania transfers. In some cases, it may be desirable to apply one or two decals in addition to those covering chipped spots in order to balance the over-all effect. The decals are obtainable in numerous colors and designs.





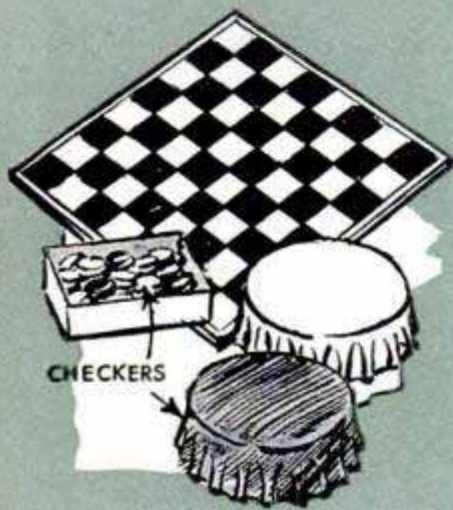
**NOTES FOR MILKMAN** are held safely on top of the bottle by a plug and paper clip set in the neck. Clip is pressed in a slot cut across top of tapered plug



**TAPE "FROG"** supports stems of cut flowers in vase having flared top. Cellulose tape, stretched crisscross over top of vase, is hidden by leaves of the flowers



**ASSORTED RUBBER BANDS** can be cut from worn-out rubber gloves. Strips from wrist portion provide larger bands, and smaller sizes are cut from the fingers

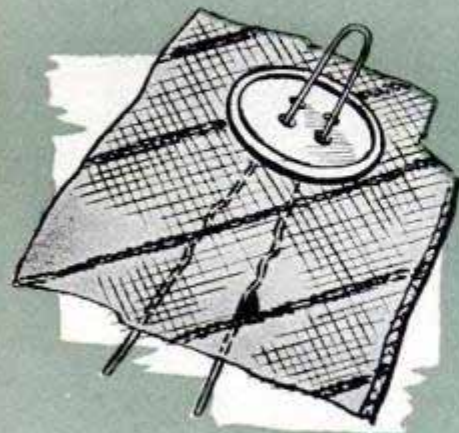


**INEXPENSIVE CHECKERS** to replace ones that are lost are improvised from beverage-bottle caps. Paint the caps red or black, or identify them by brand name

# Solving HOME PROBLEMS



**TO REMOVE LINT** from woolen garments, rub the surface with a rubber bath sponge. You will find this faster and more efficient than using a clothesbrush



**USE A HAIRPIN** to locate a button before sewing it to the garment. Press the pin through the fabric to hold the button in place while testing for proper fit

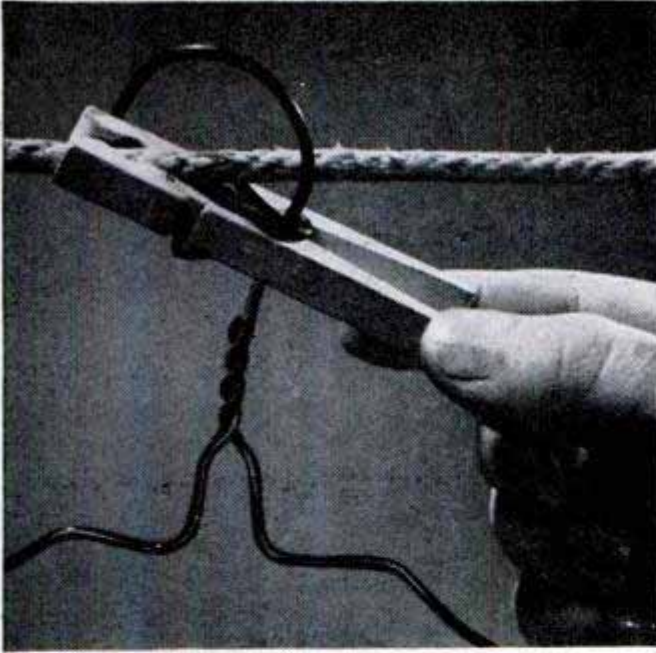


**CRACKING OF CRYSTAL** cups when filled with hot coffee or tea can be prevented by placing a silver teaspoon in the cup and pouring beverage into the spoon



**A ZIPPER WILL WORK** easily if lubricated occasionally with graphite. Rubbing an ordinary lead pencil along the teeth of the zipper coats them with graphite





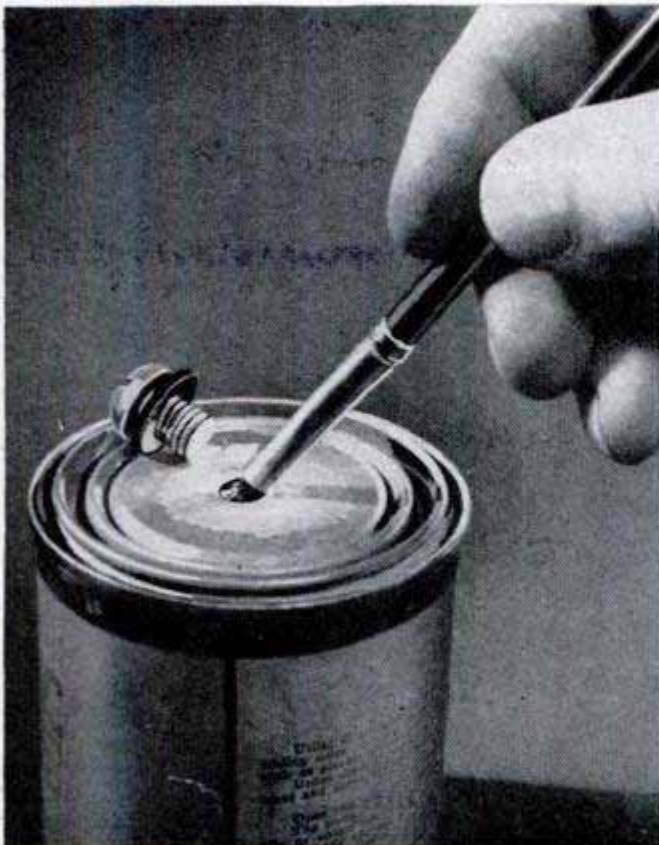
**WHEN GARMENTS ARE AIRED** on a clothesline, the coat hangers tend to slide toward the lowest part of the line. This will not happen if each hanger is clamped to the line with a spring-type clothespin



**DUSTING VENETIAN BLINDS** takes less time if a pair of socks is slipped over the hands. Less bulky than a dust cloth, socks also allow you to dust behind the tapes and under the slats with both hands

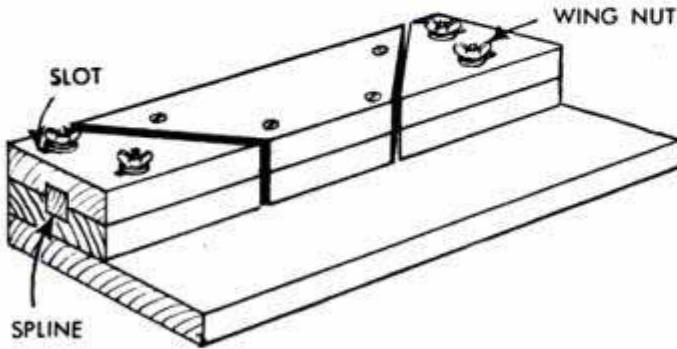
**HOLE DRILLED IN PAINT-CAN LID** permits use of artists' brush without removing lid. To seal can, cover hole with short bolt and washer or with piece of cellophane "cemented" to lid with a little paint

**SIMPLE WALL BRACKET** for flowerpot is made quickly from angle iron and bolt. Latter is inserted through hole in the bottom of the pot and the outer hole in bracket. Pot and bracket are painted the same color





## Miter Box Adjustable for Wear



If you need a common wooden miter box for repairs around the home, here's a practical one that features adjustable endpieces to permit taking up play when the slots become worn. The box consists of three boards, two of which are narrower than the third and grooved to take a  $\frac{1}{2}$ -in.-square spline snugly. All three pieces are screwed together with the spline in place, using four flat-headed wood screws placed in the positions shown. Next, the 45-deg. slots are marked. However, before the slots are cut, two  $\frac{1}{4}$ -in. holes are drilled at each end through all three pieces to take flat-headed stove bolts. When the holes are drilled, the slots can be cut down to the baseboard. The bottom piece of each end block is screwed permanently to the baseboard and the spline is glued in the groove. Then holes in the top piece of each block are elongated to permit adjustment of the upper pieces. Washers and wing nuts are fitted to the stove bolts and the sliding pieces are backed away just enough to allow the saw blade to pass freely in the slots. The wing nuts are tightened to lock the sliding pieces in place.

R. E. Hancock, Portsmouth, Va.

## Locating a Short Circuit In Home Appliances

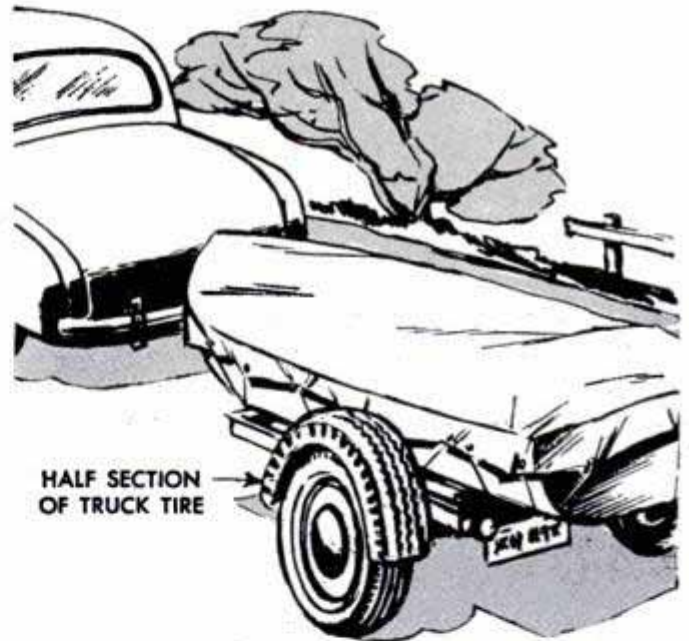
When electric fuses repeatedly blow out in the home and you suspect a short circuit in one of your lamps or appliances, try this test to locate the trouble. Turn off all wall and ceiling lights and pull the plugs of all lamps and appliances. Then, screw a 100-

watt light bulb into the socket where the fuses have blown. If the bulb lights immediately, it indicates a short somewhere in the house wiring, in which case the main switch should be thrown and an electrician called at once. However, if the bulb does not light, plug in the lamps and appliances one by one and watch the effect on the bulb. If, when a lamp is plugged in and turned on, the test bulb lights to its full brilliancy but the lamp bulb does not light at all, the short is in that lamp. If no short is present, both bulbs will light at half brilliancy. Only heavy-wattage heating units and motorized units free of shorts will become warm when subjected to this test, although the test bulb may light to full brilliancy as a result of the low resistance of the appliances.

W. H. McClay, Pasadena, Calif.

## Boat Trailer Has Fenders Made From Old Tires

A half section of an old tire casing makes an inexpensive fender for use on a boat trailer. Such fenders cost nothing and prevent the trailer wheels from throwing mud on the back end of the tow car. The tire

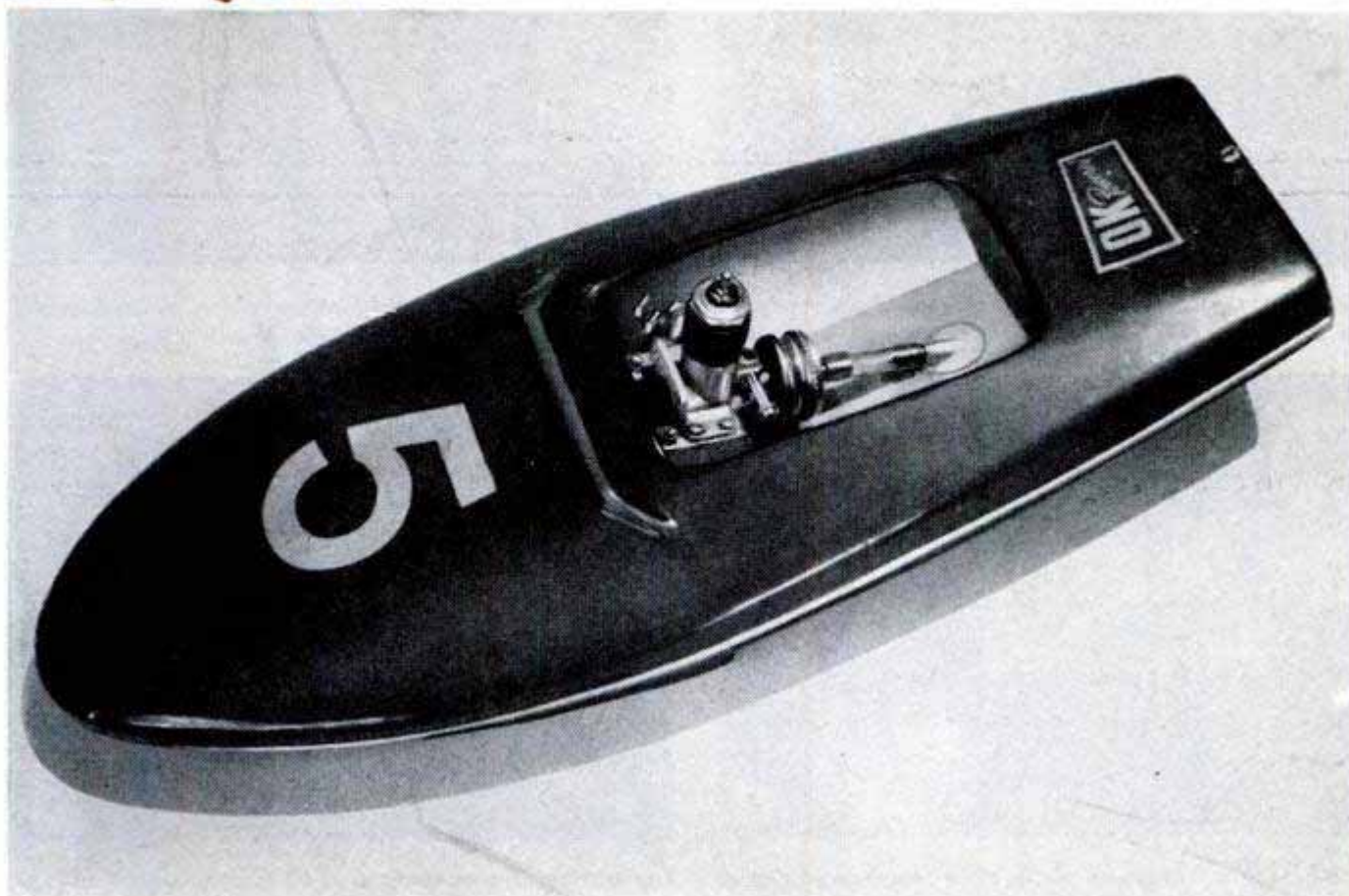


from which the sections are cut should be larger in diameter than the ones used on the trailer. A coat of aluminum paint will add to the appearance of the fenders and also help in making the trailer visible at night to approaching motorists. Mounting of the fenders will depend on your particular trailer. Suitable brackets can be shaped for this purpose or, in some cases, it may be possible to bolt the tire sections directly to the sides of the trailer.

Omer Dye, Columbia, Mo.

☞ Satisfactory remover for spots on plaster can be made by mixing a nonflammable cleaning fluid with powdered chalk.





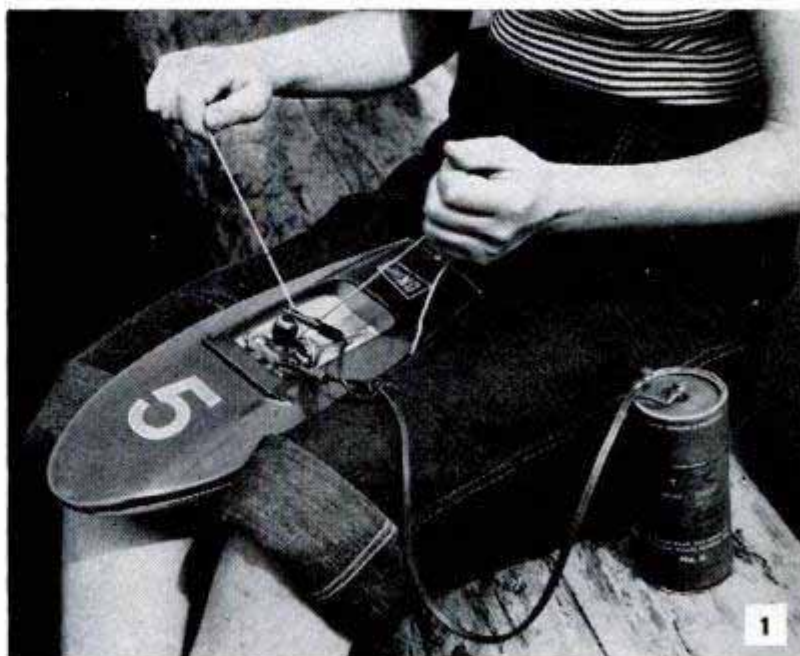
**By Jack Wilson**

**YOU'LL** get hours of fun in return for every minute spent in building Cookie. Greatly simplified methods of construction bring the assembly of its 15-in. hydroplane hull easily within the skill range and equipment of the most inexperienced modelmaker.

**Hull construction:** Proceed step by step as in Figs. 2 to 10 inclusive, beginning by cutting the bulkheads and keel from  $\frac{1}{8}$ -in. balsa wood, and assembling as in Fig. 2, using a fuel-resistant cement available from model-supply dealers. Fit hull planking as in Figs. 3 to 6 inclusive, then smooth the parts with fine sandpaper and round over the upper edges. Do not round edges of the bottom plank or the sponson projections. The sponsons are planked separately as in Fig. 7. Use rubber bands and pins to hold parts tightly together while the cement sets. In Fig. 4, clothespins serve as clamps. When planking the sponsons, Figs. 7, 8 and 10, it's important to trim off the bottom edges of the inside strips flush with the bulkheads before the bot-

tom pieces are cemented in place. Cement  $\frac{1}{16}$  x  $\frac{1}{16}$ -in. basswood moldings along the sides of the hull just below the gunwales. Cut the transom slightly oversize and glue to bulkhead No. 6 as in Fig. 9.

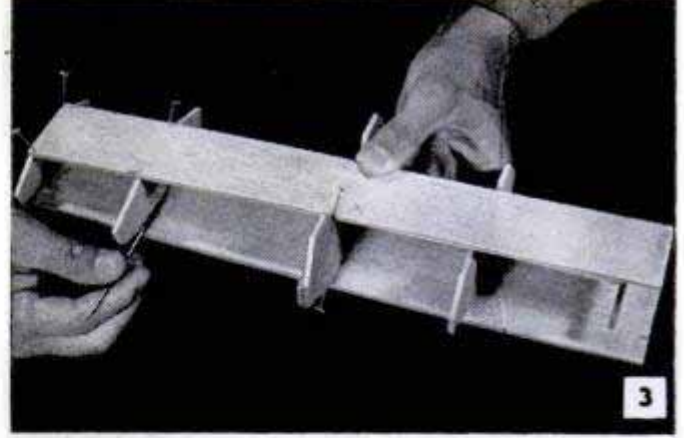
**Installing engine and propeller shaft:** On engines with beam-mounting lugs, install hardwood engine mounts against bulkhead No. 4. Engines of the radial-mounting type can be installed on a fire wall as in Fig. 14.



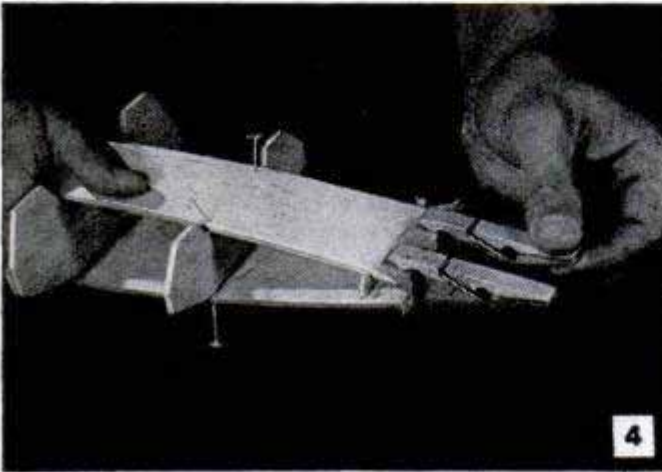




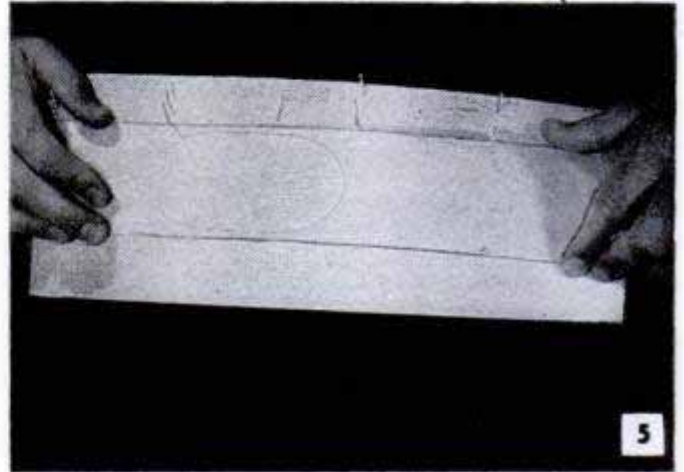
**2**  
Begin construction by cementing the bulkheads to the keel. Check alignment with a triangle or square



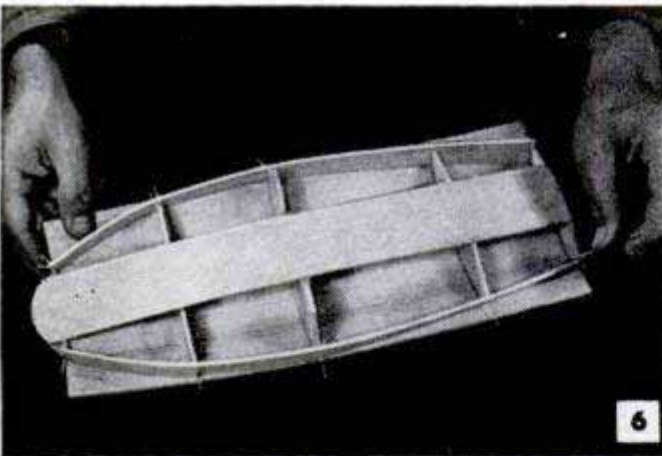
**3**  
Cement upper deck and bottom plank to bulkheads Nos. 3, 4, 5 and 6. Hold in place with pins as shown



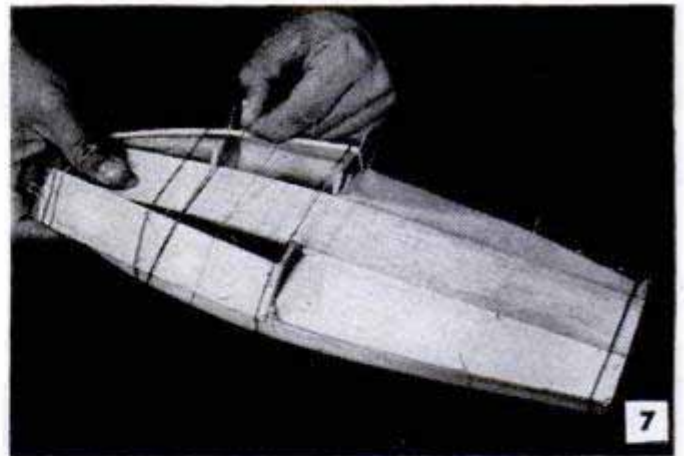
**4**  
Bevel front end of lower plank, then cement and clamp the two parts. Use balsa blocks and spring clothespins



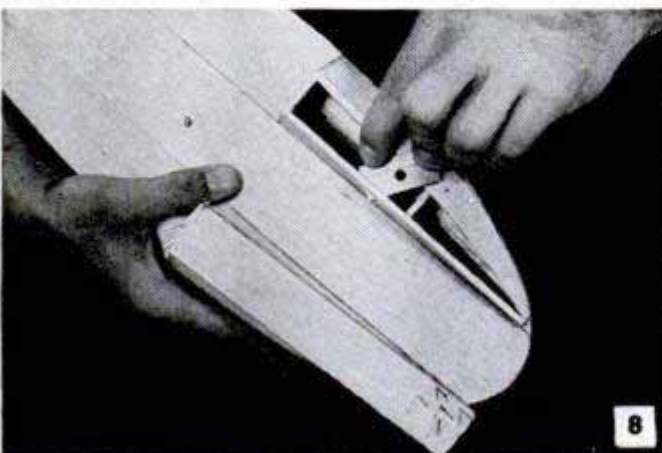
**5**  
Lay out cockpit opening and fit a coaming of balsa-wood after cutting out waste and sanding smooth



**6**  
Above, steam side planks to assure a clean bend at forward ends. Bevel edges of bulkheads for true fit. Below, trim bottom edges of sponson strips flush



**7**  
Above, use rubber bands and pins to hold sponson strips until cement sets. Below, cut transom to fit over No. 6 bulkhead, coat with cement and pin until dry



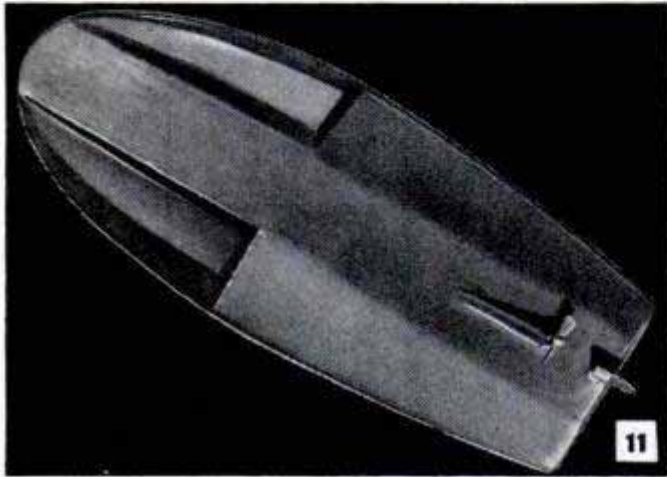




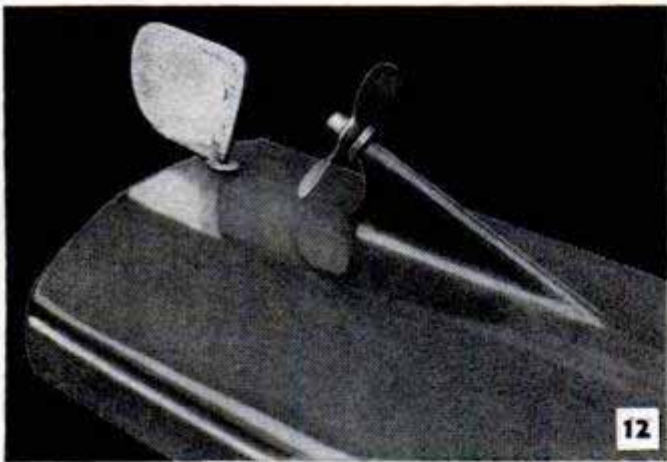




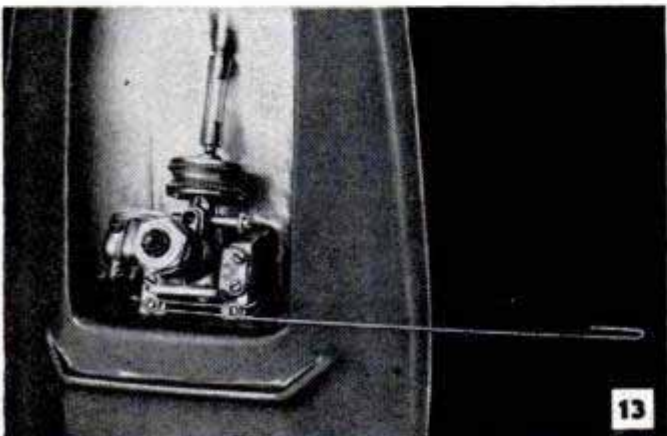
10 Fill all openings at seams with wood putty and sand entire hull, using special care to smooth the sponsons



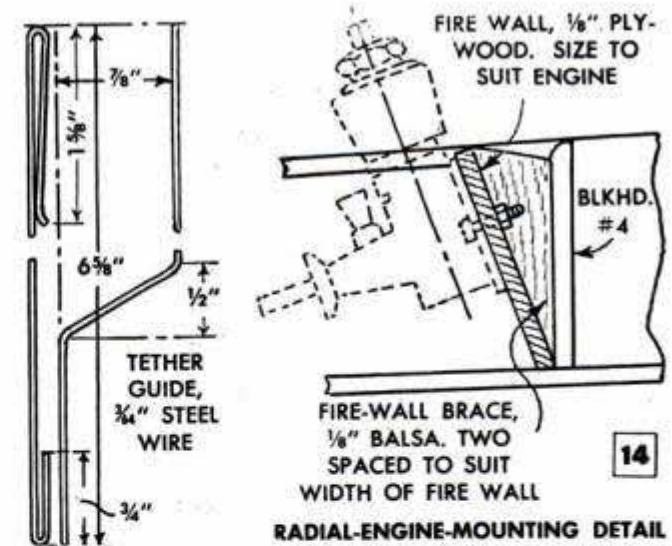
11 Bottom view of the finished hull showing the sponsons, the propeller housing and skag, and rudder in place



12 Above, special care is taken to fair the skag smoothly into the bottom lines to cut water friction to a minimum. Below, note grooved engine flywheel and tether



13



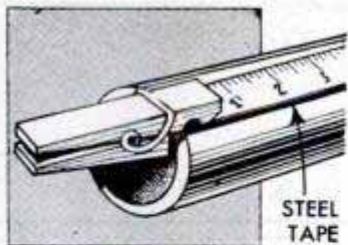
14 RADIAL-ENGINE-MOUNTING DETAIL

Before installing either type of engine, cut a hole through the bottom of the hull for the propeller-shaft housing. Mount the engine and use it as a guide to alignment of the propeller-shaft housing. When properly aligned with the engine shaft, cement the propeller-shaft housing and skag in place. Note in Fig. 13 that the engine has a grooved flywheel. The concave groove is filed or turned in the flywheel and is  $\frac{1}{4}$  in. wide and  $\frac{7}{64}$  in. deep. Thus the flywheel is made to serve as a winding drum for the starting cord, Fig. 1. As indicated on the construction details, the propeller shaft is cut from a heavy-duty bicycle spoke, utilizing the threaded end onto which the propeller hub is force-threaded. It will be necessary to extend the engine crankshaft in order to provide a projection beyond the wide-rimmed flywheel for placement of the flexible coupling. Use a 5-40 stud about 1 in. long for this purpose. In this case the extension shaft is screwed into the tapped end of the crankshaft and the flywheel is held in place with a 5-40 brass nut. A  $1\frac{1}{4}$ -in. length of clear-plastic fuel line serves as a flexible coupling from the engine to the propeller shaft, Fig. 13. The propeller and rudder are cut from 20-gauge sheet brass. The propeller blank is soldered to the hub, the blades are bent to the pitch angle given and the edges are filed sharp.

**Installing rudder post:** Drill a  $\frac{1}{8}$ -in. hole through the deck and bottom of the hull just forward of the No. 6 bulkhead, coat the holes with cement and insert the rudder-post tube. Solder a  $\frac{1}{4}$ -in. brass washer to each end of the tube. Cut the rudder post from a bicycle spoke, bend it as shown and solder the rudder in place. File the lower end of the post flat and very nearly flush with the sides of the rudder. The post is held in any desired position by means of a lock washer and nut. Figs. 11 and 12 picture the rudder and propeller in place. As final steps, provide a removable wire tether, Fig. 14, and a fuel tank of  $\frac{3}{8}$ -oz. capacity. Sand the hull ready for finishing.



## Clothespin Serves as Clamp To Hold End of Steel Tape



When using a steel tape to measure a long steel bar or length of pipe, the small hook usually provided on the end of the tape to anchor it is

likely to slip off. To avoid this, just use a spring-type clothespin to hold the clip in contact with the work.

Ronald Eyrich, Milwaukee, Wis.

## "Tooled" Pictures in Metal Foil Simulate Hammered Designs

Interesting pictures and unusual designs can be "tooled" in metal foil by using a newspaper mat as a pattern. The tooled foil simulates a skillfully hammered or routed metal relief when applied to a jewel-box top, wall plaque or other novelty. The mats, which are made of stiff paper, may be obtained from any newspaper printing plant. If a quantity of them is available, a suitable picture or design usually can be found. To tool the foil, place it over the mat and then press the metal into the depressions on the surface of the mat. Tool the metal with an orange stick or a stylus which is sufficiently blunt so that it will not break the foil. After the picture has been transferred, apply a heavy coat of casein glue or similar stiffening material to the foil while it is still in the mat so that it will retain its shape when removed. Use escutcheon pins or a suitable cement to mount the foil on the plaque or box top.

Ken Murray, Colon, Mich.



## Paper-Bag "Mittens" Aid Dressing Child

Every parent knows what an exasperating job it is to run the hands of a small child through a bulky coat or other outer garment. Invariably, the little tykes keep their fingers spread like a fan to make the job nearly impossible. This caused one impatient mother to resort to the use of small paper bags which she placed on each hand of the child. These serve as mittens to keep the outstretched fingers and thumbs from catching on the sleeve lining and make the job exceptionally easy, especially in the case of a heavy snow suit. As the bags provide gauntlets that cover the cuffs of a sweater, they also prevent the sweater sleeve from climbing up the arm of the child when running the hand through the sleeve of a coat.

## Improved Grip on Drill Chuck

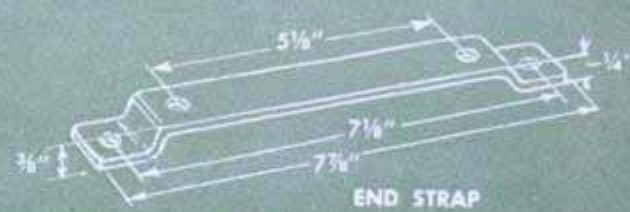
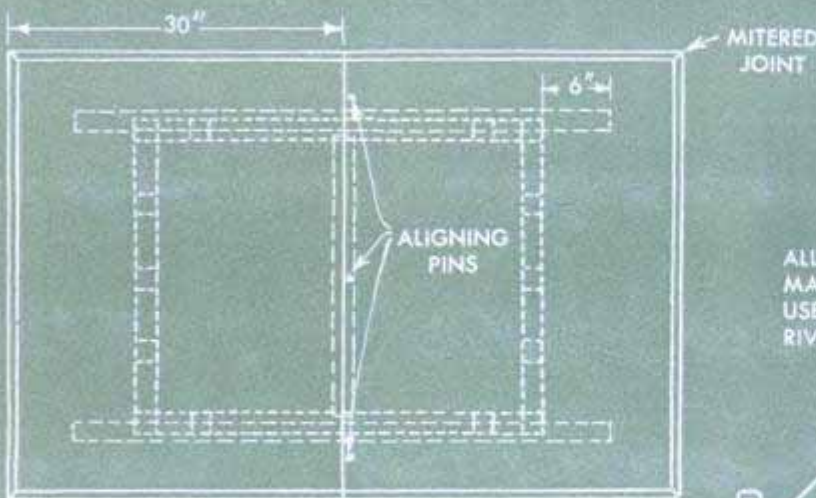
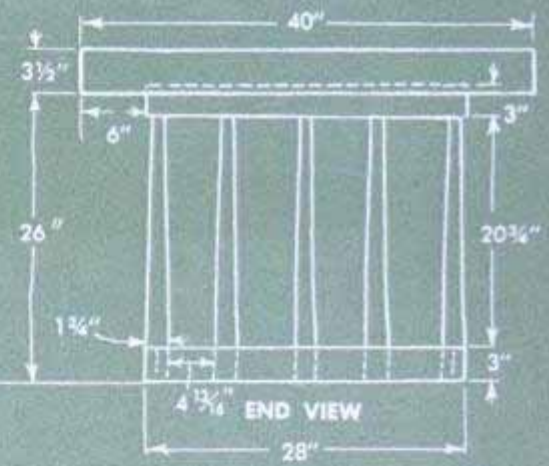
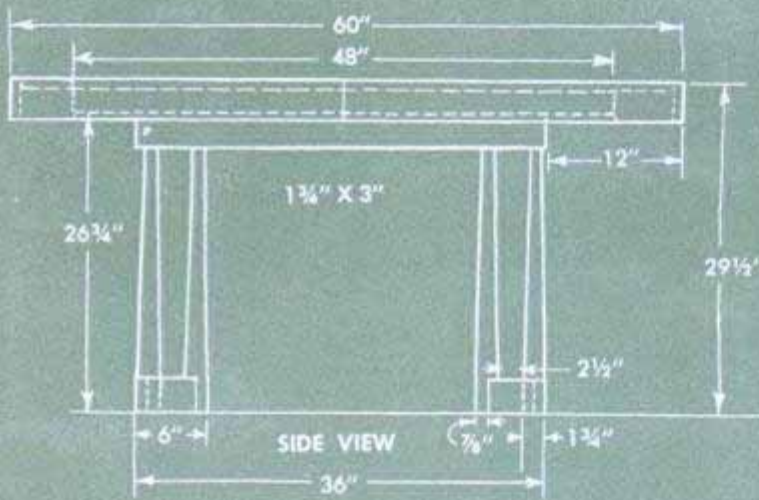
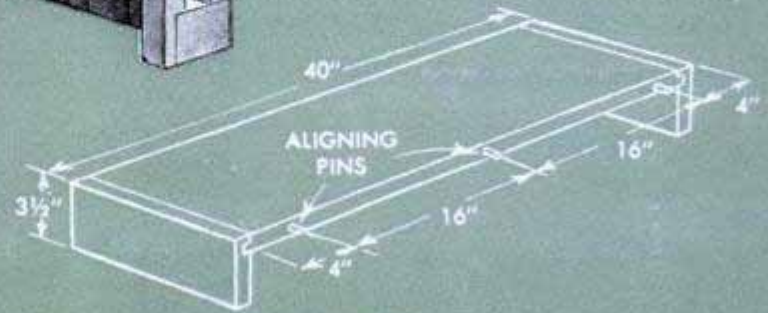
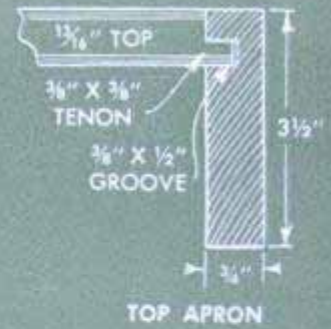
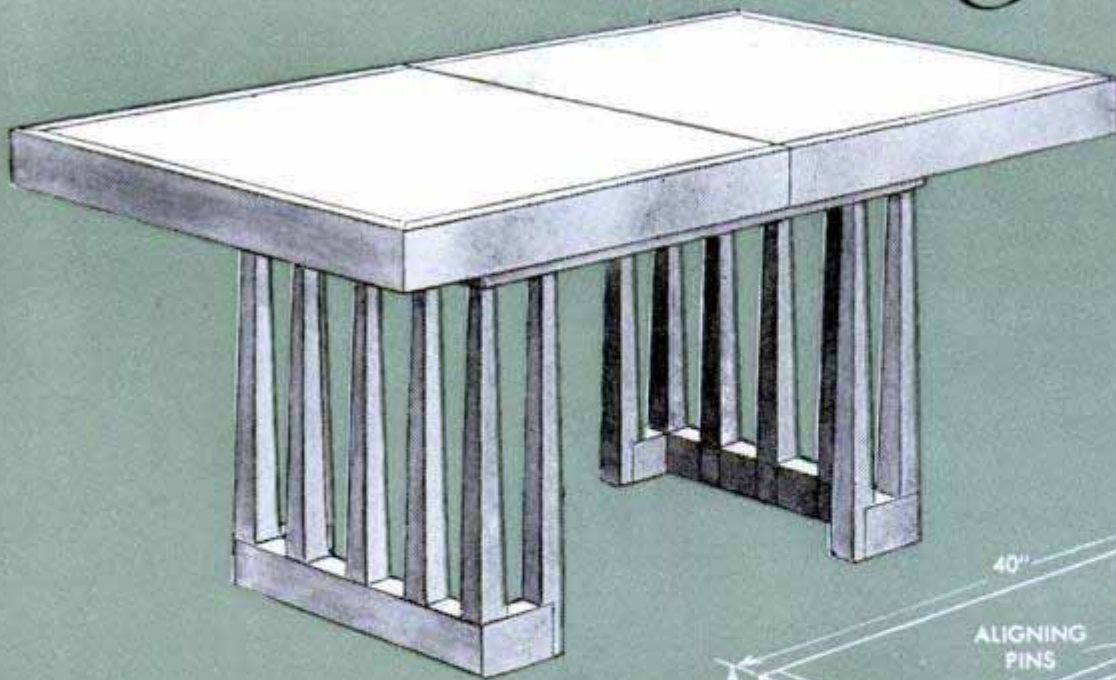
A better grip on the chuck handle of a small hand drill is possible if a split section of rubber hose is slipped over it as shown. The section may be secured to the handle with rubber cement, if desired.



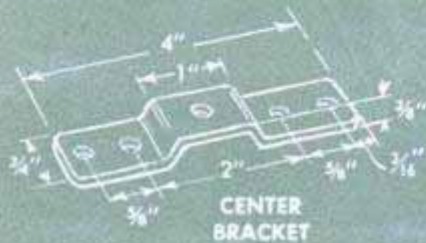
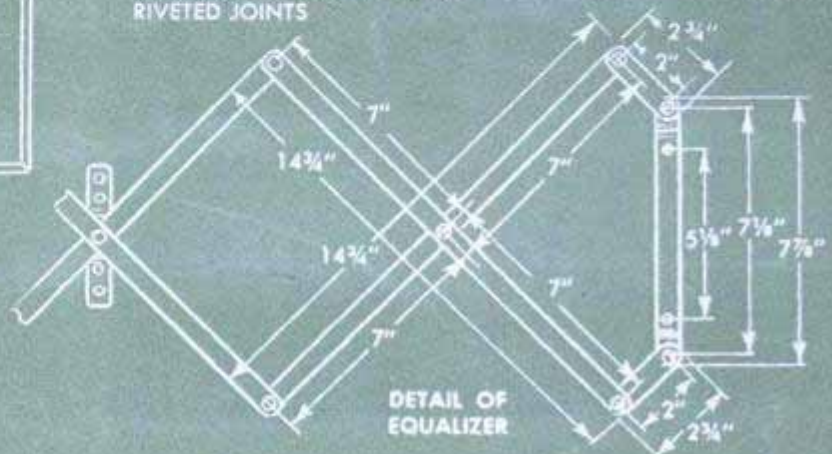
Waterproof adhesive tape can be used as an emergency repair for a leaky radiator hose. Wrapped tightly around the hose, it will stop the leak for several days.



# PLAN OF THE MONTH... *Extension*

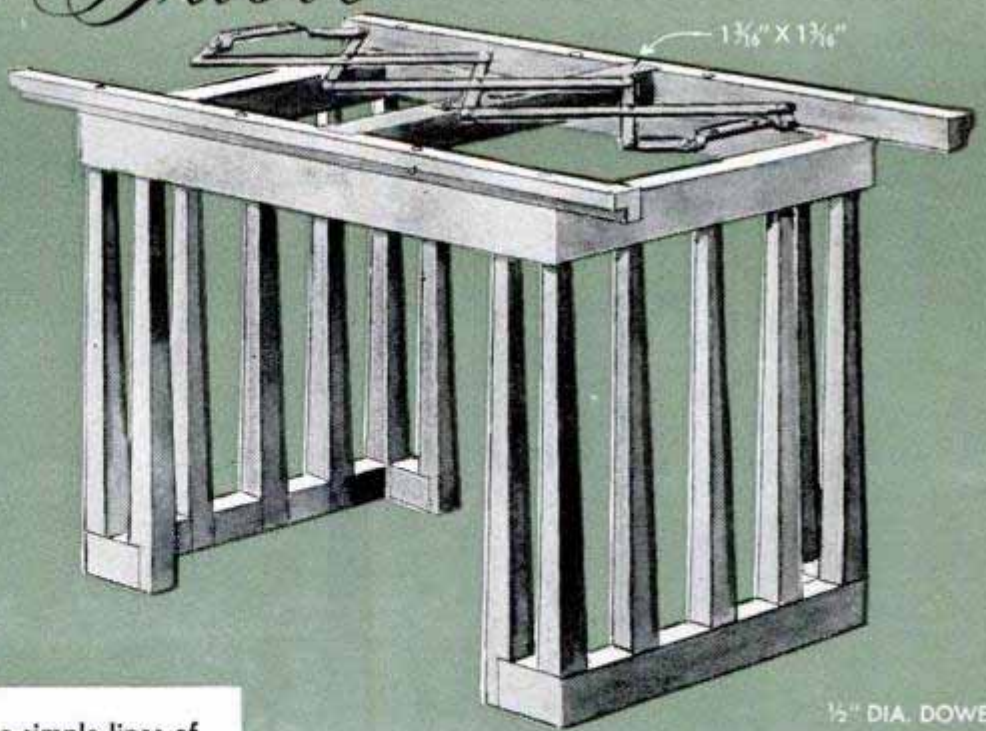
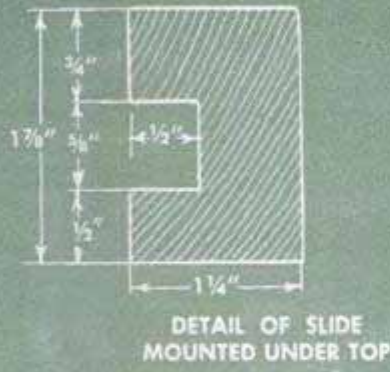


ALL PARTS OF EQUALIZER ARE MADE OF 1/4" X 3/4" FLAT STEEL. USE WASHERS AS SPACERS AT RIVETED JOINTS.





# Dining Table

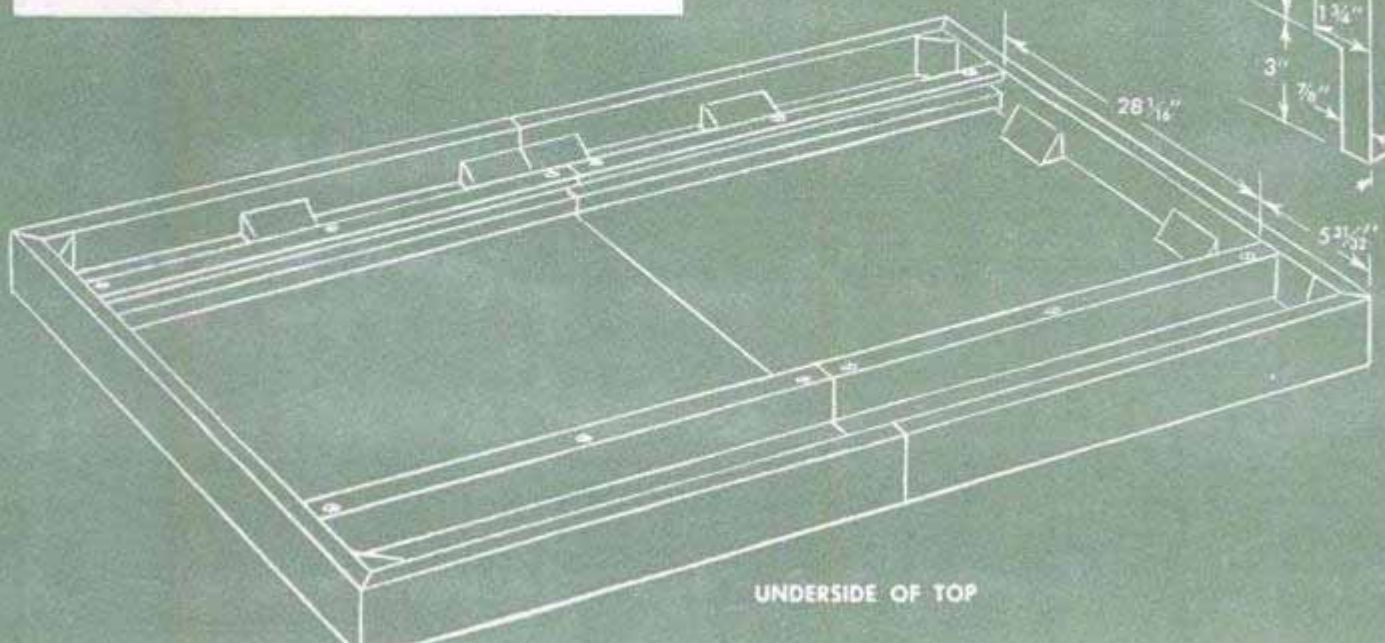
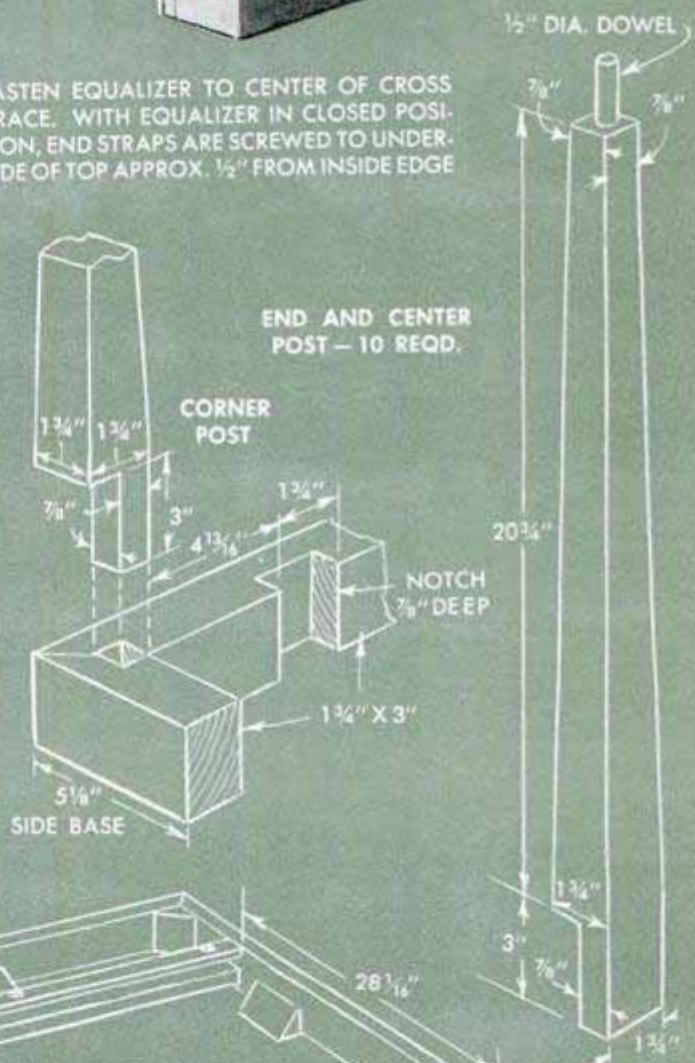


Designed to harmonize with the simple lines of modern home furnishings, this dining table has simplified construction features of special interest to craftsmen with limited equipment. Each pedestal is built up by joining seven tapered posts to a mitered base with half-lap joints. Top ends of posts are doweled to a subframe which supports the top. The latter is built up from two pieces of plywood, the aprons being strengthened by glue blocks as shown. Grooved members of the two-piece guide are attached to the underside of the top while the rabbeted members are screwed to the subframe. A parallel-arm equalizer prevents binding of the top extensions as they are opened or closed

## MATERIAL LIST

- 2 pcs.—1 3/16" x 29 5/8" x 39 1/4"—Top (plywood)
- 2 pcs.—1 3/16" x 14" x 39 1/4"—Leaves (plywood)
- 4 pcs.—3/4" x 3 1/2" x 30"—Side top rails
- 2 pcs.—3/4" x 3 1/2" x 40"—End top rails
- 4 pcs.—1 3/4" x 3" x 28"—Base end rails
- 4 pcs.—1 3/4" x 3" x 36"—Base side rails
- 2 pcs.—1 3/4" x 3" x 36"—Side base rails at top
- 14 pcs.—1 3/4" x 1 3/4" x 23 3/4"—Posts
- 4 pcs.—3/4" x 3 1/2" x 14"—Leaf aprons
- 4 pcs.—1 1/4" x 1 7/8" x 29 1/4"—Top slides (maple)
- 2 pcs.—1 3/16" x 1 7/16" x 48"—Guides (maple)
- 1 pc.—1 3/16" x 1 3/16" x 26 1/2"—Cross brace (maple)
- 10 ft.—3/4" x 1/8" flat steel for top equalizer

FASTEN EQUALIZER TO CENTER OF CROSS BRACE, WITH EQUALIZER IN CLOSED POSITION, END STRAPS ARE SCREWED TO UNDERSIDE OF TOP APPROX. 1/2" FROM INSIDE EDGE





## Trapped Water in Steam Radiator Siphoned With Syringe



A minor disadvantage of the single-pipe steam-heating system is that a certain amount of steam condenses and leaves water in the bottom of the radiators. To maintain top heating efficiency, this trapped water must be removed. This is usually done by disconnecting the radiator, tipping it on end over a shallow pan and allowing it to drain. However, there is a much easier method of doing this by simply siphoning the water with a syringe and hose. You'll need about five or six feet of  $\frac{1}{4}$ -in. rubber hose and a bulb syringe with check valves, which can be purchased at most drug-stores. The hose is connected to the intake side of the bulb and, after removing the air valve at the top of the radiator, the end of the hose is inserted in the opening until it touches the bottom of the radiator sections. Siphoning action is produced by simply squeezing the bulb, remembering to keep the end of the outlet hose below the water level in the radiator.

Charles L. Funnell, Yonkers, N. Y.

## Alarm-Clock Movement Cleaned Without Disassembling

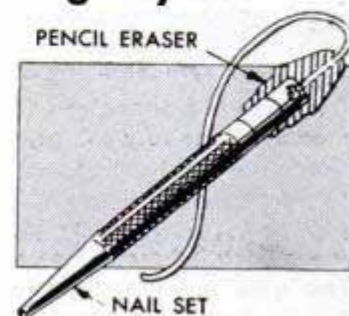
Before spending money for repairs on an alarm clock that has become undependable or stopped running altogether, try this method of cleaning it. First, take the movement out of the case and remove the hands, alarm indicator and face. Holding the movement with pliers, move it back and

forth in a quart of hot water in which a tablespoon of household lye has been dissolved. Continue for about five minutes, then rinse the movement thoroughly in clear water, after which it should be placed in a warm place to dry. To lubricate the movement, heat an ounce or two of light household oil in a container set in boiling water. Hold the movement over an empty dish and pour the oil into the wheels and bearings. Wind the springs and let the movement drain for 24 hrs. When reassembling, the proper location of the alarm indicator can be found by setting the alarm and then turning the hands of the clock slowly until it rings.

G. A. Alexander, El Cajon, Calif.

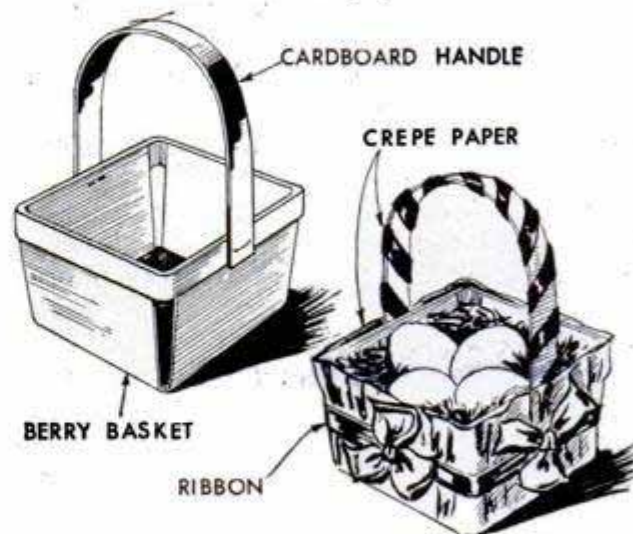
## Plumb Bob for Emergency Use

You will find that a nail set and a slip-on-type pencil eraser can be used to improvise a suitable plumb bob in an emergency. Punch a hole through the center of the eraser and run the cord through it, knotting it inside the eraser as detailed. Then just slip the eraser over the head of the set.



## Inexpensive Easter Baskets From Berry Boxes

Small boxes of the type in which fresh berries are sold can be adapted easily to make attractive Easter baskets. All that is necessary is to attach a cardboard handle, which then is wrapped with colored crepe paper. The main part of the box is decorated with ribbon and paper to harmonize.



If desired, the interior of the box can be lined before filling it with the candy, eggs and other edibles.

Victor H. Lamoy, Upper Jay, N. Y.



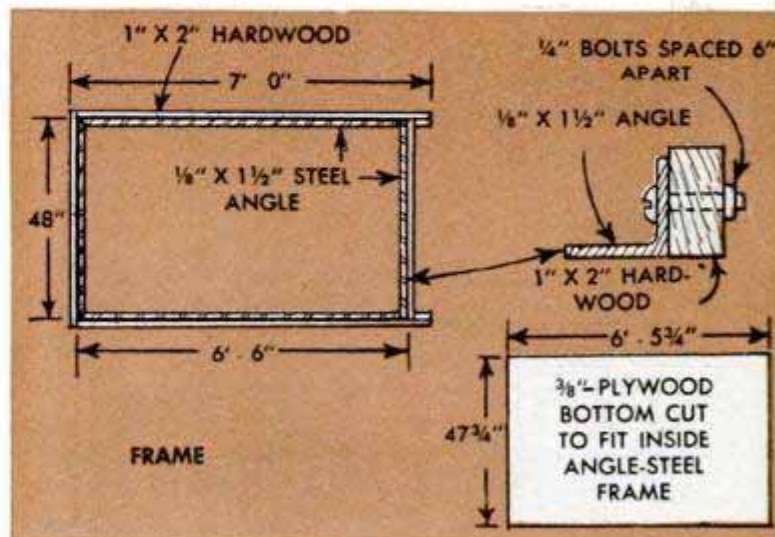


# Combination **BED-TENT** fits on car top

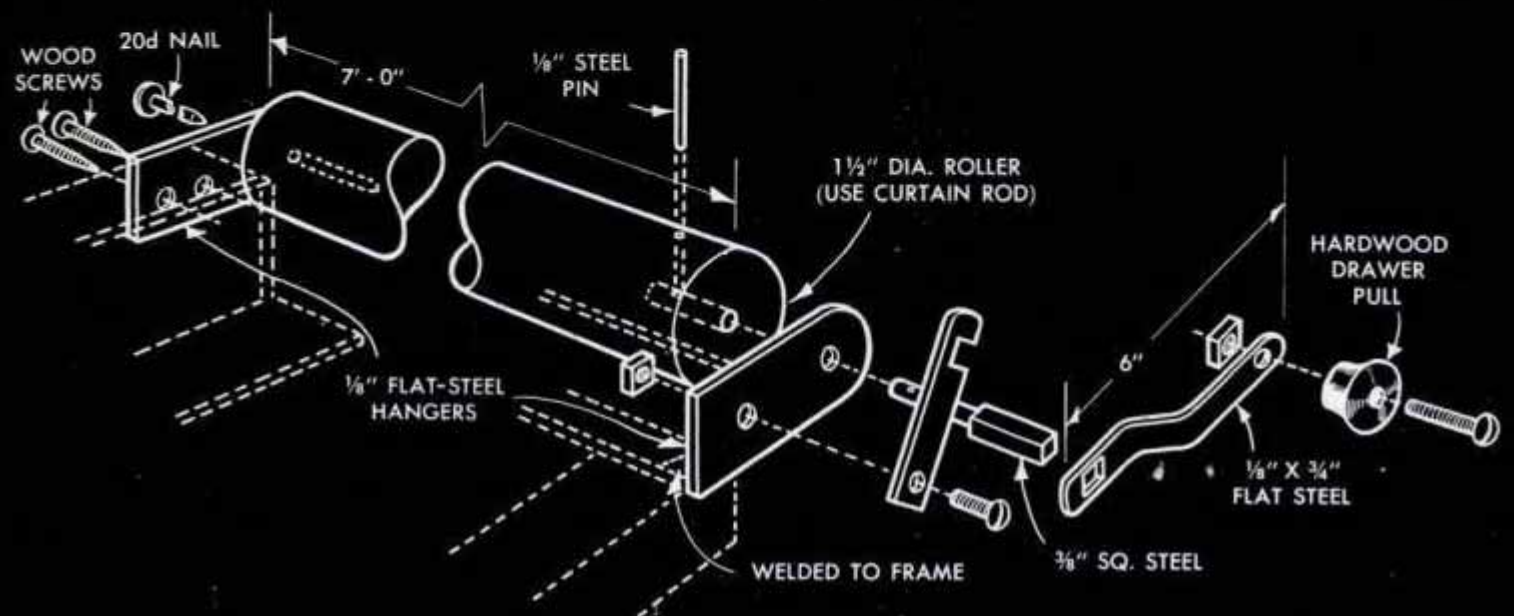
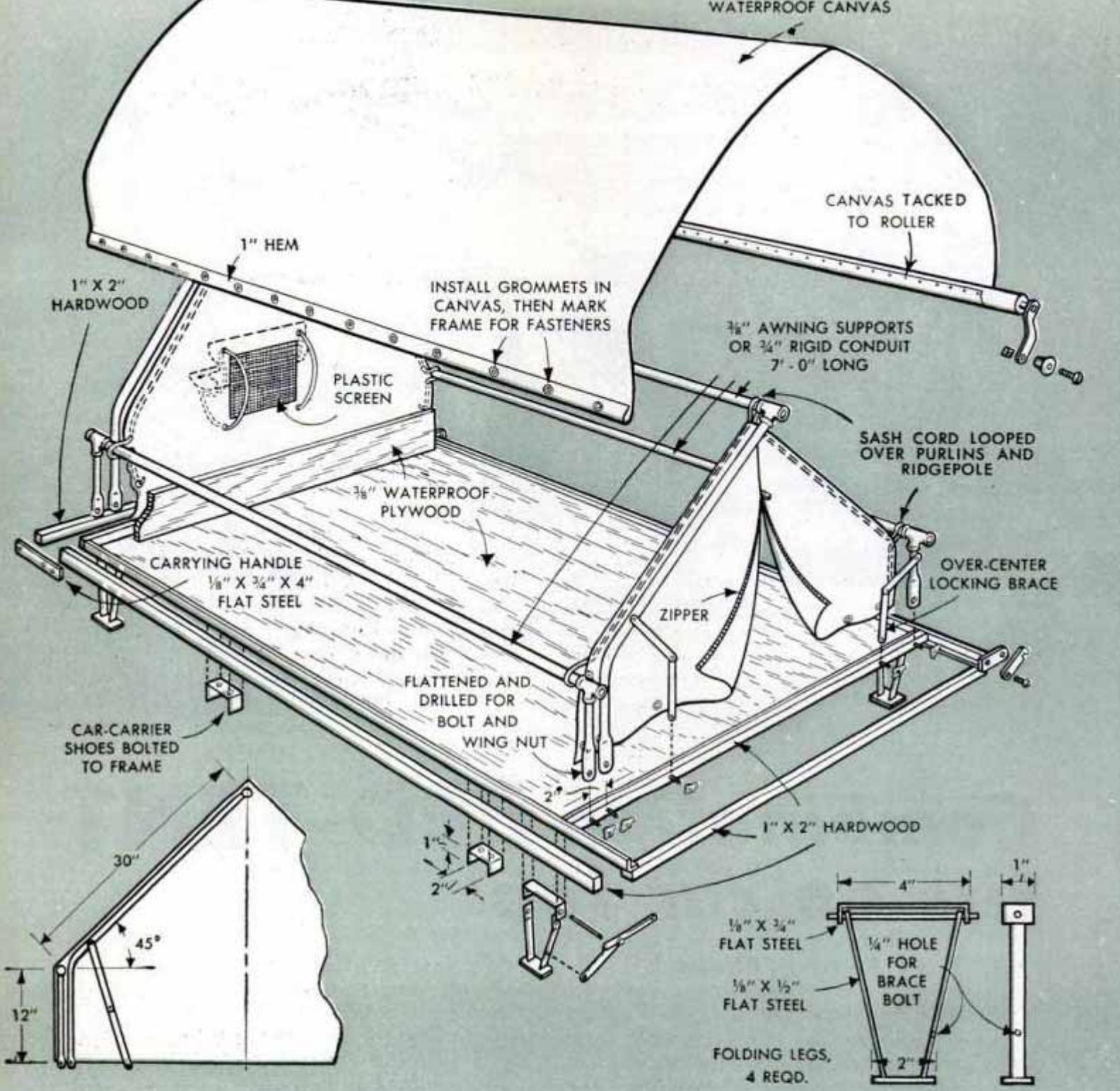
By **Austin H. Phelps**

VACATION campers, hunters and others who prefer to "go light" on both long and short trips will appreciate the compact utility of this bed-tent. It combines the weather protection of a sturdy tent and the comfort of a four-poster bed in one unit which folds into a flat bundle easily transported on any car-top carrier. The mattress and all bedding remain inside when the unit is folded for transport. Although, as dimensioned, the bed frame will accommodate an innerspring mattress of three-quarter size, most campers will prefer an air mattress, as it is much lighter, more compact, and easier to keep clean. Other bedding in addition to the mattress can be whatever the climate and season require. It takes only a few moments to ready the unit for occupancy. There are no stakes to drive and no ridgepole to string. Merely unstrap the unit and slide it from the car carrier, open the folding legs, pull up the self-locking ridgepole and there you are.

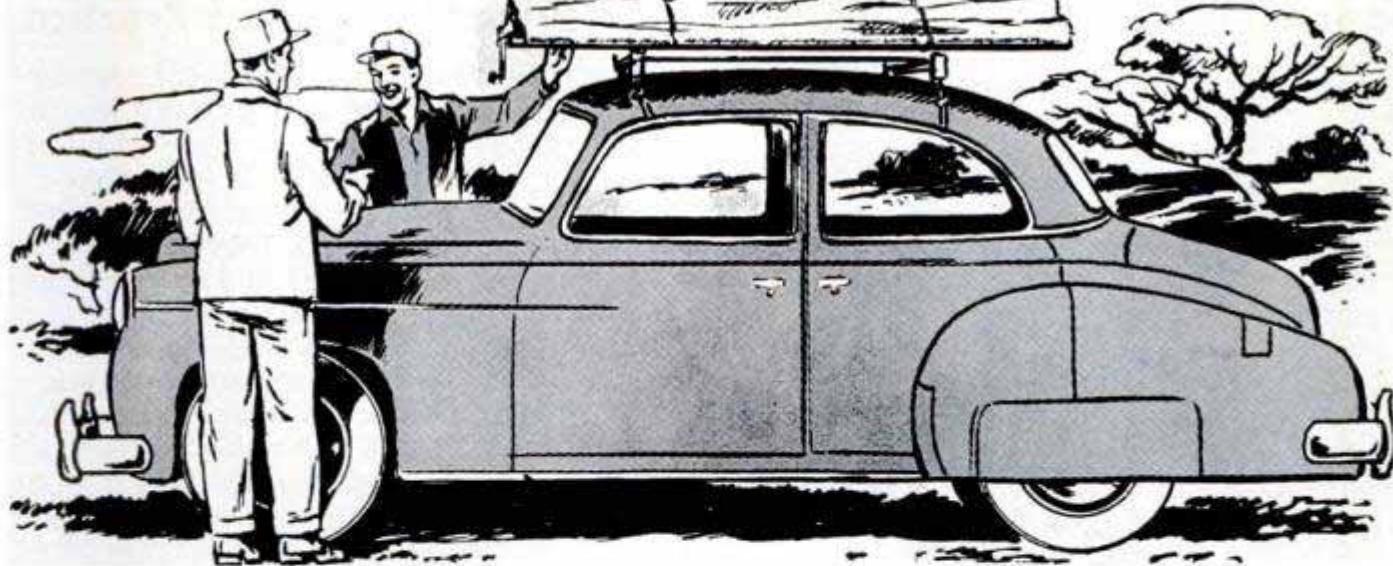
The first step in the construction is to build the angle-steel frame shown in the plan detail below. Cut the side and end-pieces to length and square the ends with a file. Position the pieces and mark and center-punch for bolt holes at the corners. Note that the frame is assembled with the angle web up on both the sides and ends. Drill











holes for the corner bolts and also drill holes in the vertical webs for screws which hold hardwood strips. The strips are attached to the angles as detailed, using short flat-headed screws. Next, cut the plywood bottom and headboard, but, before installing the bottom, make sure that the frame is square. Then attach the plywood bottom with  $\frac{1}{4}$ -in. flat-headed stove bolts with the heads countersunk in the wood and the nuts turned on from the bottom so that they bear against the steel angle.

Note in the details on the opposite page that there is a headboard cut from  $\frac{3}{8}$ -in. plywood and placed at the head of the bed inside the frame. Next, bolt on the wooden facing strips, noting that the carrying-handle brackets at the rear of the bed frame fit over the facing strips. Weld hanger brackets at the front and rear of the frame on the right-hand side to form bearing brackets for the roller as in the lower detail on the opposite page.

Note in the detail that the length of the ridgepole and the purlins is given as 7 ft., but, before cutting material, take careful measurements, as this dimension may vary. Flatten the ends of the conduit uprights in a vise, round the ends with a file and drill for  $\frac{1}{4}$ -in. bolts. Make the 45-deg. bends in the ridgepole supports. Then assemble the three units and clamp them in position on the frame so that you can locate the holes for the purlin frames, the ridgepole, and also the holes for the over-center braces. After these parts have been bolted in place—note that all bolts are provided with wing nuts—assemble the roller, or winding drum, as in the lower details on the opposite page. As will be seen from the detail, the roller is provided with a removable crank and a ratchet-type lock which permits tightening the canvas to a uniform tension and holding the adjustment.

Make four folding legs from flat steel as in the center right-hand detail on the oppo-

site page. The leg brackets are bolted to the underside of the angle-steel frame at the corners and are provided with folding braces. At this stage the bed is placed on a level floor and the purlins and ridgepole are raised so that accurate measurements can be taken for cutting the canvas covering to fit. Note that the covering is attached to the frame on the left side with grommets and fasteners and that the right-hand edge is tacked to the roller. When tacking the canvas to the roller, allowance must be made for shrinkage of the fabric. The canvas closure at the head of the bed is provided with a plastic-screened opening and a separate canvas closure which is opened and closed by means of a sash, or awning, cord as shown. A slide fastener provides a double fly for opening the front of the tent covering. Both canvas ends are fastened at the bottom with grommets and are held taut with cord looped over the purlins and ridgepole. Locate the car-carrier shoes by placing the folded unit on the car-top carrier and marking pencil lines to indicate the position of the shoes. After bending to the required size from  $\frac{1}{8}$  x 1-in. flat iron, the shoes are attached to the bottom of the bed with stove bolts. Apply two coats of spar varnish to the plywood bottom, headboard and wooden rails and enamel metal parts in whatever color desired.

### Tracing Legibly Onto Copper

Finding copper and brass too smooth to permit tracing legible designs onto them with carbon paper, one craftsman coats the metals with flat, white paint. Carbon transfers perfectly onto the paint, which is easily removed with turpentine after each design has been worked into the metal. Where a supply of such metals is kept in stock, time will be saved by coating a number of sheets in one operation, and storing them until used.



## Sponge-Rubber "Ball" Provides Realistic Drive During Golf Practice



When unable to locate any of his regular practice golf balls, one golfer found that a sponge-rubber cube will provide a more satisfactory practice "ball" than the common cotton, knitted or plastic variety. Not only are they inexpensive (several can be cut from a 10-cent sponge) and require less practice area, but it is not necessary to tee them up. The balls are cut in 1½-in. squares from a rubber bath sponge and are practically indestructible. Although square in shape, direction of flight still indicates if a ball is topped, hooked or sliced, and a well-hit ball will make a report like that of a pistol. A 9 x 9-in. rubber floor tile provides an excellent driving mat.

Edward Jenicke, Chicago.

## Tips on Enameling Woodwork

Before enameling new interior woodwork, brush on a liquid filler. Follow this with one or two coats of enamel undercoater tinted to the desired color. Then apply at least two coats of gloss or semi-gloss enamel, allowing 24 hrs. drying time between coats. Any rough spots that are found on the surface should be sanded smooth after each coat (except the final one) has dried thoroughly.

A. E. Fenn, Chicago.

## Method for Determining Location of Concealed Leak in Vertical Run of Pipe

If you are confronted with the task of locating a concealed leak in a vertical run of pipe, or a run in which the number of inches rise per lineal foot of pipe is as great or greater than the inside diameter of the pipe, try the following method: First, close a valve somewhere in the pipe line below the leak, and disconnect the pipe at a point above the leak. Completely fill the line with water and allow all of it above the leak to drain out. Then, proceed to fill the line again, this time noting the amount required. With this figure, you can determine the number of lineal feet from the disconnected end of the pipe to the leak

by figuring 1 pt. of water to the number of feet listed below for the corresponding size of pipe. If the inside diameter of the pipe is ½ in., 1 pt. of water will fill 7.9 ft. of it. If ¾ in., 4.5 ft.; 1 in., 2.78 ft.; 1¼ in., 1.6 ft.; 1½ in., 1.17 ft.; 2 in., .715 ft. or 2½ in., .5 ft. If the pipe is none of the sizes listed, multiply the inside diameter of the pipe by itself, and multiply the result by .7854. Then divide this result by the number of cubic inches of water required to refill the line and the quotient will be the distance in lineal inches from the upper end of the pipe to the leak.

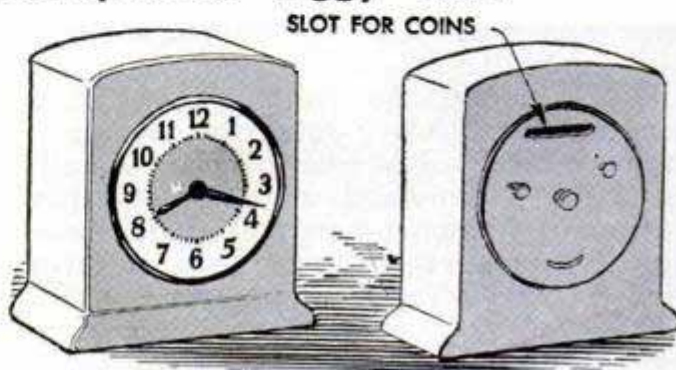
W. F. Schaphorst, Newark, N. J.

## Clock With Works Removed Makes Inconspicuous "Piggy" Bank

The possibility of having a "piggy" bank stolen by petty thieves gave one housewife the idea of using a bank that would not be obviously a container of coins. The works from an old alarm clock are removed (leaving the face and hands in place) and a slot is cut in the back for inserting the coins.

G. E. Hendrickson, Argyle, Wis.

☐ Ceramic figurines are given an attractive glossy finish by coating with white shellac.

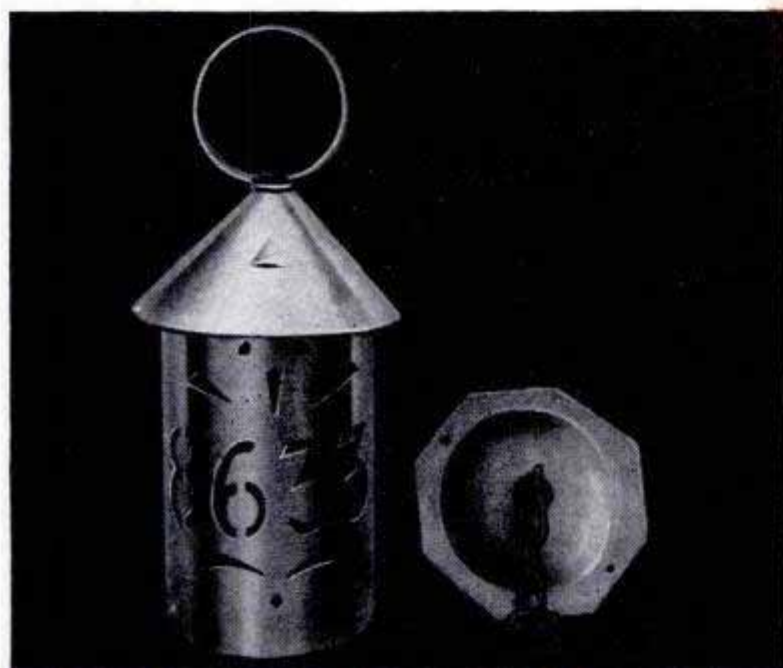
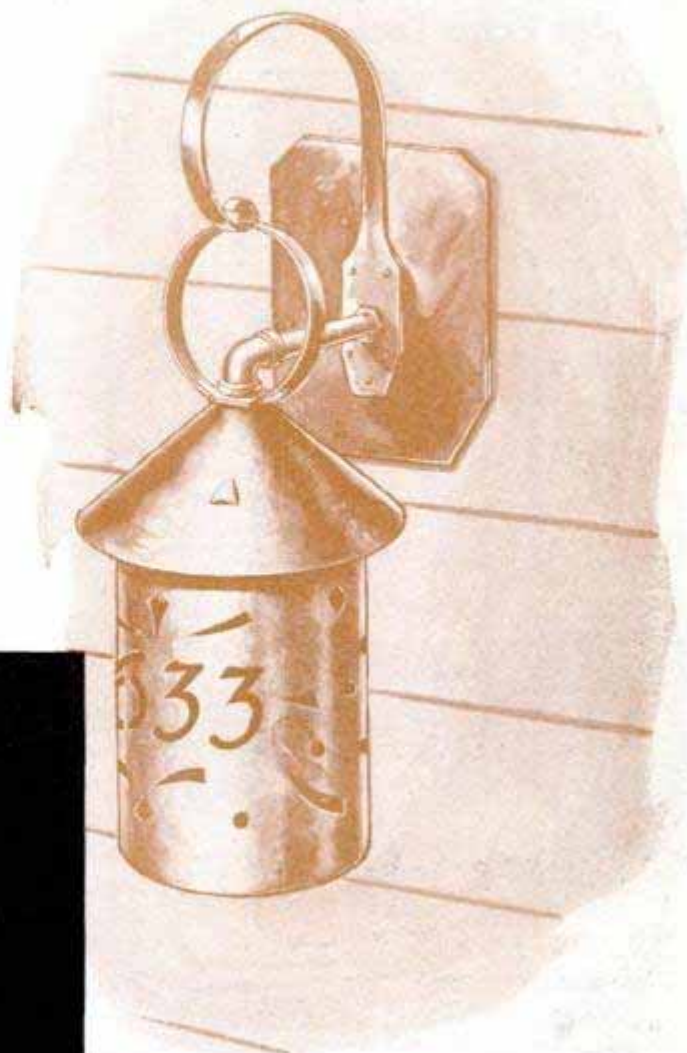




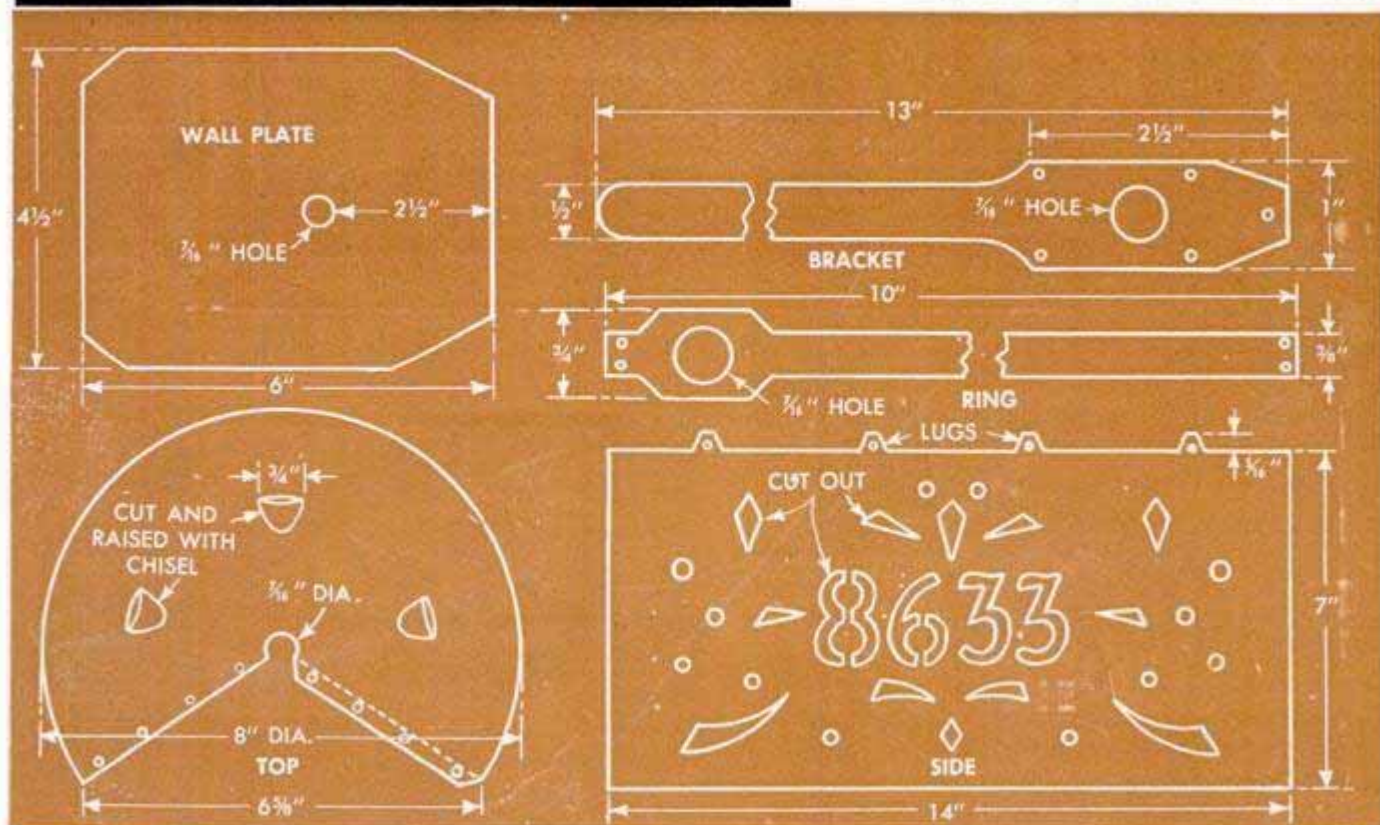
# PORCH LANTERN

By Dick Hutchinson

SUPPORTED by a wall bracket, this attractive porch lantern features an illuminated house number that is easily seen from the street at night. Lantern sections are cut from thin sheet copper and riveted together with  $\frac{1}{4}$ -in. brass escutcheon pins. Numerals and other openings are cut out with a cold chisel. An elbow and short pipe carry wires from a socket inside the lantern into the wall of the house. A ceiling canopy (shown in photo) is made by hammering out the center of a piece of copper and drilling a hole to take a brass fixture loop. Chain links are formed from  $\frac{1}{8}$ -in. copper wire.

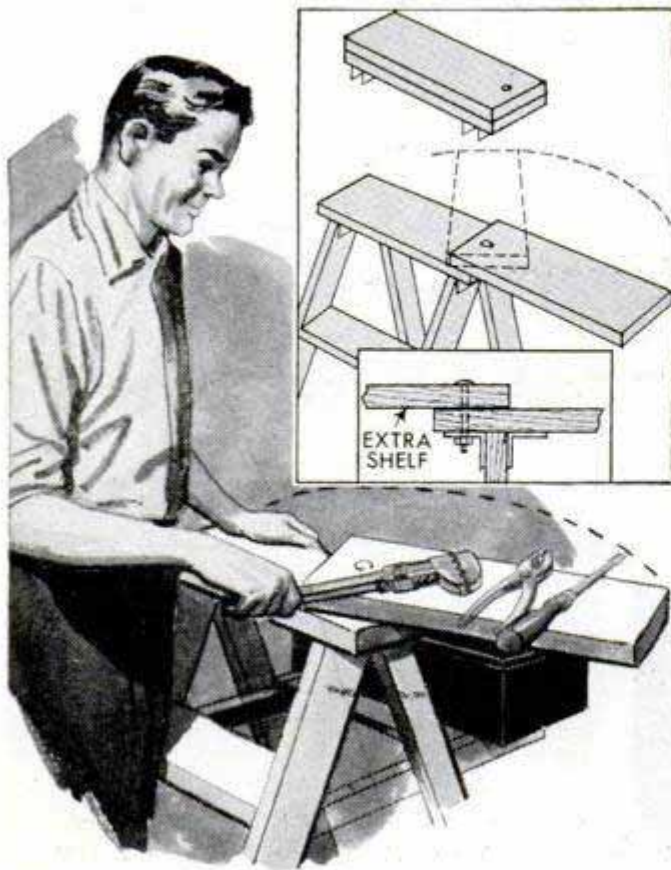


Above, lantern shown supported by wall bracket. Left, finished lantern and ceiling canopy with supporting chain attached. Chain links are formed by winding copper wire around rod or lathe mandrel and cutting into short lengths with chisel. Removed from rod, links are assembled and ends forced together



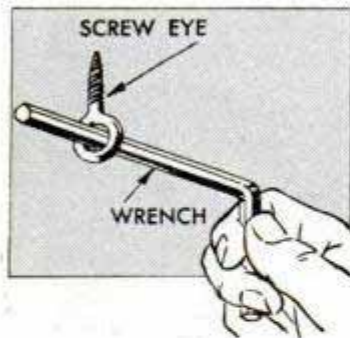


## Swinging Shelf at Top of Ladder Provides Extra Tool Space



The space on top of a stepladder, handy for holding tools and supplies while working, may be doubled in size with the addition of this shelf, which swings out of the way when not in use. Cut from a board to the size of the ladder top, the shelf is pivoted with a bolt and nut, as well as two large washers. The washers are placed between the board and the ladder top to allow it to swing freely.

## Wrench Aids in Driving Screw Eyes



The next time you have a number of screw eyes or hooks to drive, try using a socket-head setscrew wrench to speed up the job. The end of the wrench that is bent at a right angle will

serve as an ideal handle for "cranking" the screw eyes in place.

Don Brooks, Lombard, Ill.

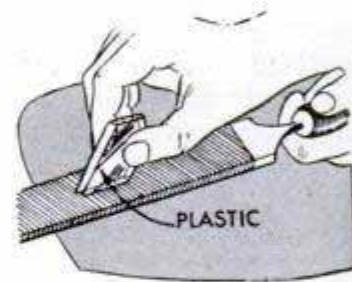
## Placing Spring on Bed Frame

Lowering a box spring on a metal double-bed frame of the type not having slats can be done easily by one man. Two boards are placed across the bed rails to keep the edge of the spring from slipping off the far rail

while it is being lowered into position. Then, the boards are carefully slipped from under the spring, one corner at a time, so that the spring comes to rest on the side rails.—Horace F. Goodwin, East Riverside, N. B., Can.

## Plastic Scraps Clean Files

Home craftsmen who work with sheet plastics will find that scraps of the material can be utilized for cleaning mill files. Broken or worn plastic objects, such as brush handles, dishes or toys, also can be used if cut into pieces of suitable size. The edge of the comparatively soft plastic quickly assumes the shape of the file teeth and cleans them thoroughly.



## Heat From Light-Bulb Clusters Speeds Seedling Growth

Hotbeds heated by clusters of 25-watt light bulbs hurry vegetables to your table 10 days to two weeks ahead of ordinary outdoor plantings, as vigorous seedlings from heated hotbeds are already well-rooted individual plants when transplanting time arrives. Using the same method of heating, certain flowering plants can be made to produce profuse blooms four weeks earlier than normal. Build the hotbed frame and the seedbed in the regular way, then construct individual heating units by attaching eight porcelain sockets to a length of 1 x 4 which will span the hotbed frame across its width. One heating unit is required for an area 3 x 6 ft. An average-size hotbed frame 6 x 6 ft. would require two units. The units are wired to a common outlet and are controlled by a bulb-type thermostat placed just below the surface of the soil. The thermostat is set to turn on the lights when the temperature in the hotbed falls below 50 deg. F.





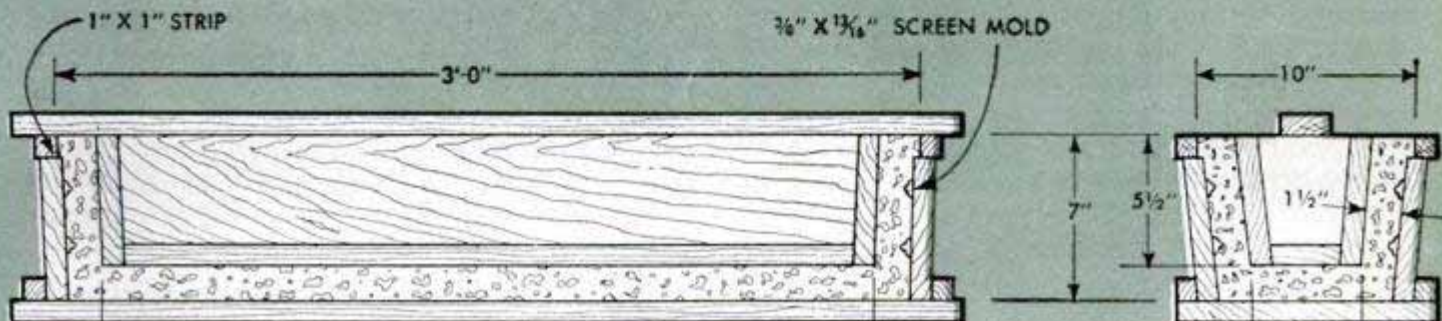
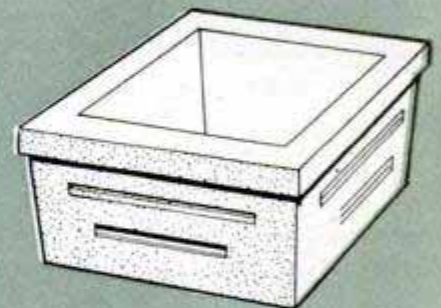
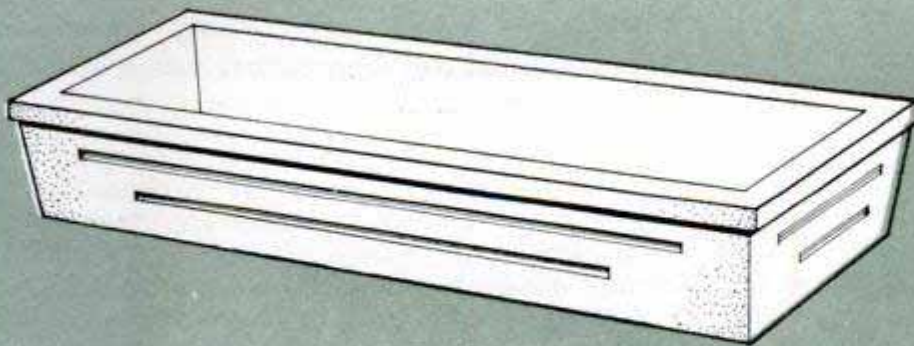


# how to build a CONCRETE FLOWER BOX

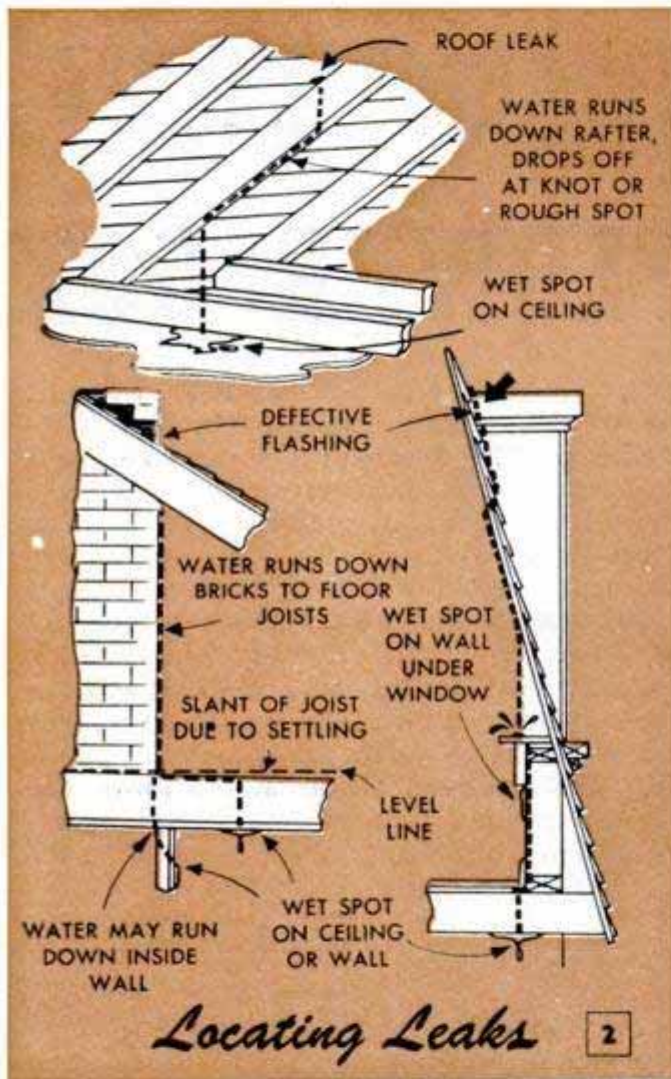
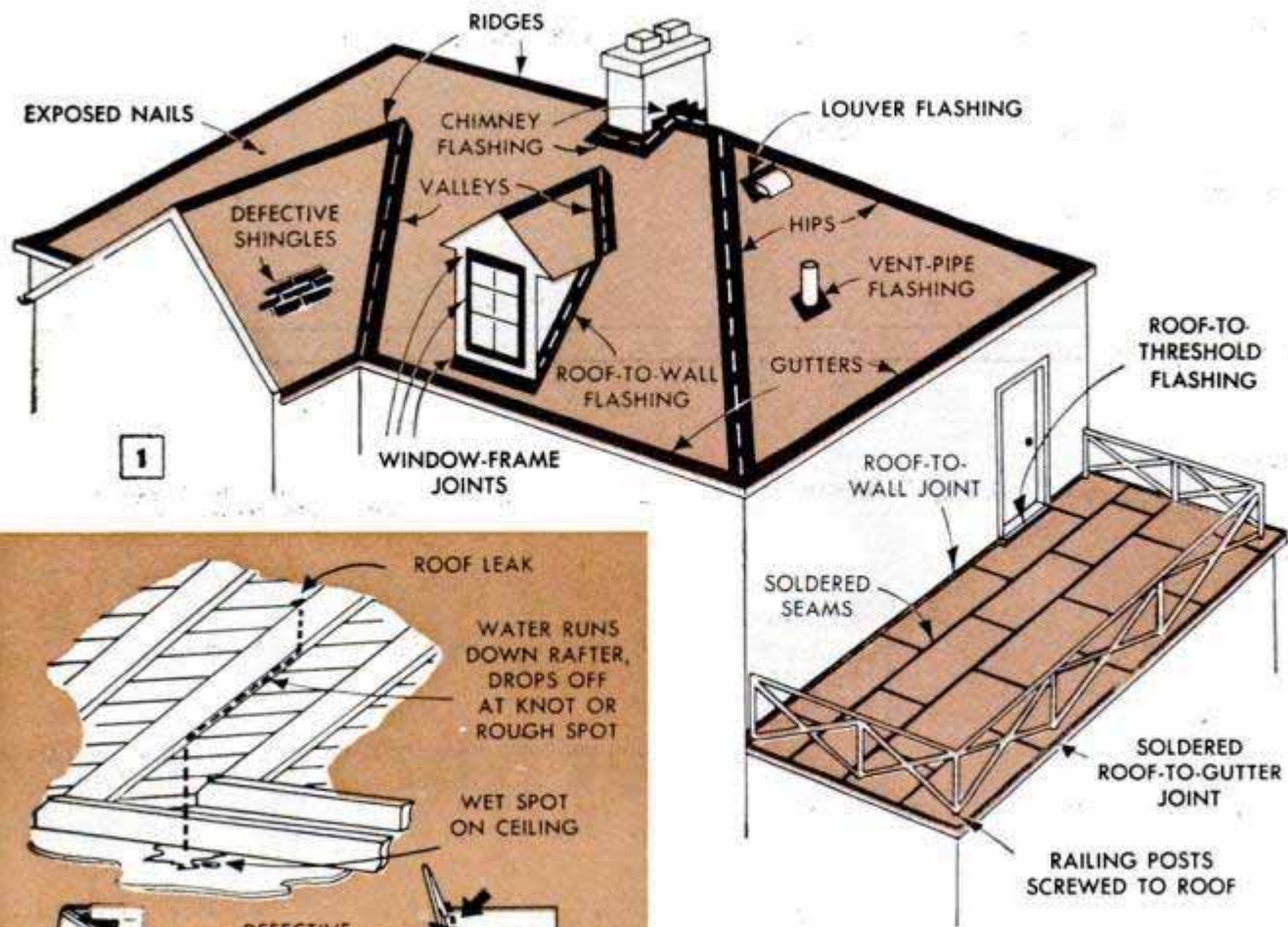
*By Raymond Schuessler*

REQUIRING only inexpensive materials and easily constructed forms, this attractive concrete flower box will provide a distinctive and durable ornament for mounting beneath a window or along the porch railing of your house. Consisting of an inside and outside form, the forms are assembled from 1-in. stock, in any length or width desired. Both forms are sanded smooth and finished with two or three coats of shellac to prevent warping. The inside form, built to provide 1½-in.-thick concrete sides and bottom, is carefully centered when set in the outside form prior to the pouring of concrete. All surfaces that will come in contact with the concrete are oiled to pre-

vent concrete from sticking to the sides of the forms as they are being removed. During the pouring operation, concrete should be tamped into all corners, as well as around any strips of molding or blocks of wood mounted inside the forms to create various decorative effects. The concrete is allowed to harden for 24 hours before the forms are removed. Following this, all voids and other irregularities are filled with a thick, creamy mixture of portland cement and water. The entire box is then coated with this mixture. When this is done, the box is permitted to cure for one week, during which time it is given a thorough wetting each day.







## FINDING and STOPPING ROOF LEAKS

To prevent serious damage and costly repairs to walls and ceilings, roof leaks should get immediate attention

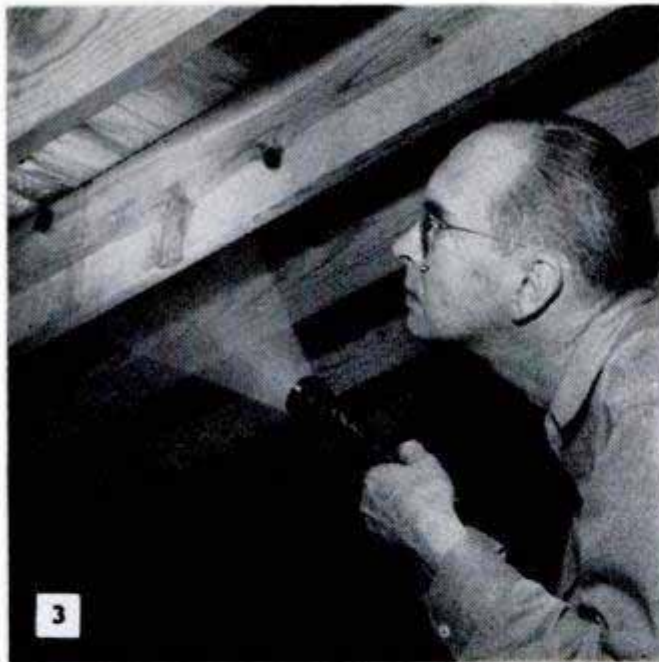
By E. R. Haan

**H**AVE YOU lately noticed discolored spots on the wallpaper, which remain damp for some time after a rainstorm, or is the paint peeling from the plaster at one or more points on the ceiling? Often these are the first warning signs of roof leaks that can cause loosening of the plaster, rotted rafters and ceiling joists and in some cases even more extensive damage. Usually it's difficult to locate a leak at the precise time it first occurs, but periodic checks of the most likely locations may avoid an expensive repair.

Where leaks commonly occur: Fig. 1

shows points on a typical house roof where leaks are most likely to occur. Frequently they can be traced to defective flashing where the roof joins a chimney, wall or dormer, or to a break in the valley flashings. Poorly soldered seams in sheet-metal roof decks may pull apart, and serious damage result. Leaks often develop around rusty roofing nails or where wooden shingles are warped or split. Exposed nailheads are potential causes of leaks and for this reason gutter hangers should always be nailed under the shingles rather than over them. Leaks through walls and ceilings also can be caused by water overflowing clogged gutters or downspouts.



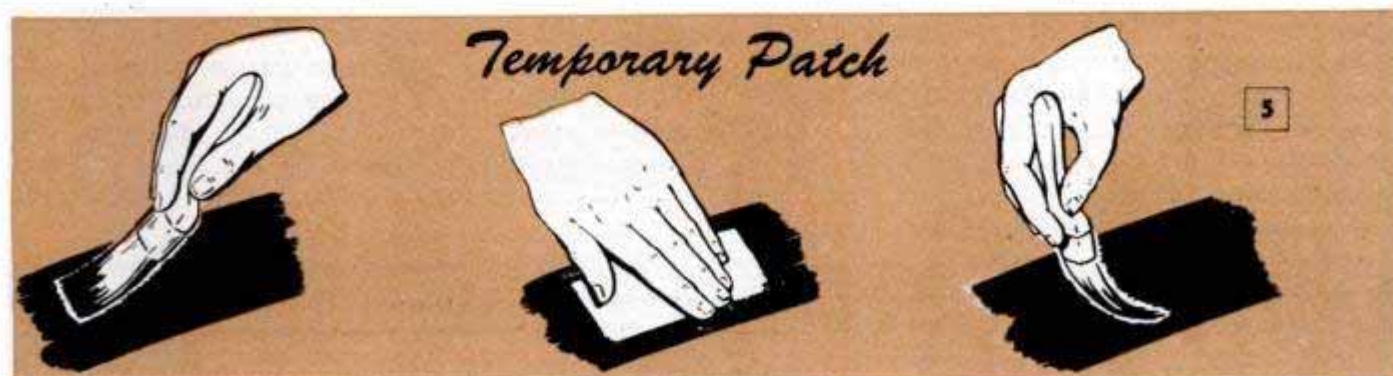


**Locating leaks:** A roof leak may be located some distance from the wet spot appearing inside the house on the wall or ceiling. Fig. 2 shows three examples. Water from the leak may run a long way down the rafter or along joists and partition plates, and even down the studs, before it soaks through the wall or ceiling. When the underside of the roof is exposed in the attic, inspection of the roof boards and rafters likely will turn up telltale discolorations of the wood caused by water. Often you can locate the leak during a heavy rainstorm. In closed attics you may be able to see pinholes in the roof by examining it carefully on a bright, sunny day. When such an opening is discovered, push a broomstraw or a length of fine wire up through the hole to serve as a marker. Where the underside of the roof is covered, carefully inspect the outside where leaks are most likely to occur, or the places which are closest to any wet spot that shows up inside the house.

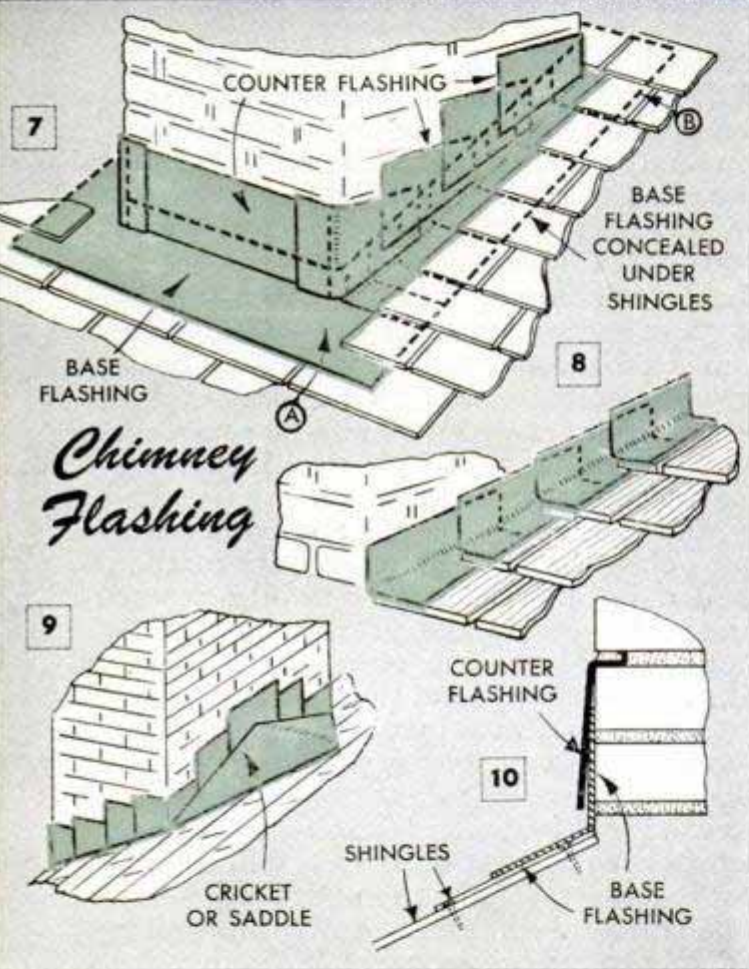
**Temporary cures:** Usually you can stop leaks temporarily with an application of roofing cement or calking compound. Spread a coating of cement over defective flashing, as in Fig. 4, to seal small holes and cracks. Work cement over and around exposed nailheads and apply it over joints in metal roofs or gutters. A relatively large break in the roofing material can be cov-

ered with a patch, as in Fig. 5. First, coat the dry, clean surface with cement, press a piece of cloth down on the fresh cement and then apply another coat of cement over the cloth. Use calking compound around window and door frames and at points where wood joins shingles, Fig. 6.

**Leaks at chimney flashings:** Metal flashing that shows signs of rust should be cleaned thoroughly and protected by coating with roofing cement. Of course, if the metal is badly rusted it should be replaced. Fig. 7 details the usual practice in placing base and counter flashing around a chimney. Large chimneys projecting from steep roofs below the ridge generally are further guarded by a "cricket," or saddle, which sheds water freely and prevents snow accumulating above the chimney. In time, leaks may occur around the saddle, permitting water to run down the sides of the chimney and may loosen plaster in rooms below. Galvanized sheet metal generally is used for saddles and flashing. Flashings of copper, zinc or stainless steel will last almost indefinitely. Leaks sometimes develop at the chimney when the counter flashing is held only by mortar as in Fig. 10. Such leaks can be stopped permanently by thoroughly cleaning all loose mortar out of the joints and repointing with a mortar consisting of portland cement, 1 part, and clean, sharp







## Chimney Flashing

sand, 2 parts. If the counter flashing requires renewal, bend the sheets as in Fig. 10, making allowance for a 3-in. lap. In applying counter flashing, coat the surface of the base flashing with roofing cement before placing the counter flashing. It's also a good idea to spread cement on the lower side of the mortar joint where the flashing enters. Base flashing extends vertically on all sides of the chimney. The lower horizontal strip of the base flashing, indicated at A in Fig. 7, extends over the shingles about 4 in., while the strips on the other three sides extend under the shingles about the same distance, as indicated at B. Flashing

may be formed in one piece to fit around the chimney, all joints being soldered, or it may be made up of long horizontal strips and somewhat shorter strips that overlap at the sloping sides. Flashing strips also may be interleaved with the shingles as in Fig. 8. To replace base flashing, adjacent shingles must be loosened or removed and then replaced. This is done as in Figs. 25 to 28 inclusive.

**Repairing valley flashings:** In roof valleys the flashing generally extends about 8 in. each way from the center. Open-valley flashings usually consist of roll roofing or flashing felt, although sheet metal also is used. Roll roofing and flashing felt should be applied in two layers, the lower one 18 to 20 in. wide and the upper one 30 to 36 in. wide, Fig. 12. These layers may be continuous or in strips laid with a 24-in. lap. The bottom layer is cemented to the roof boards, the cement being spread a few inches beyond the edges on both sides. The second layer is cemented to the first, and cement also is applied to the top surface of the upper layer where the shingles overlap it. Valley flashing that leaks at several points along its length should always be completely replaced. If it leaks at the lower end only, replace as in Fig. 14. Open valleys on wood-shingled roofs require sheet-metal flashing which usually is obtained from a sheet-metal shop in 8-ft. lengths and bent to conform to the roof pitch at the valley. An overlap of 4 in. at the ends usually is sufficient. To install flashing, the overlapping shingles should be loosened, as explained later on. When replacing shingles over flashing, drive the nails about  $\frac{1}{2}$  in. in from the edge of the flashing strips.

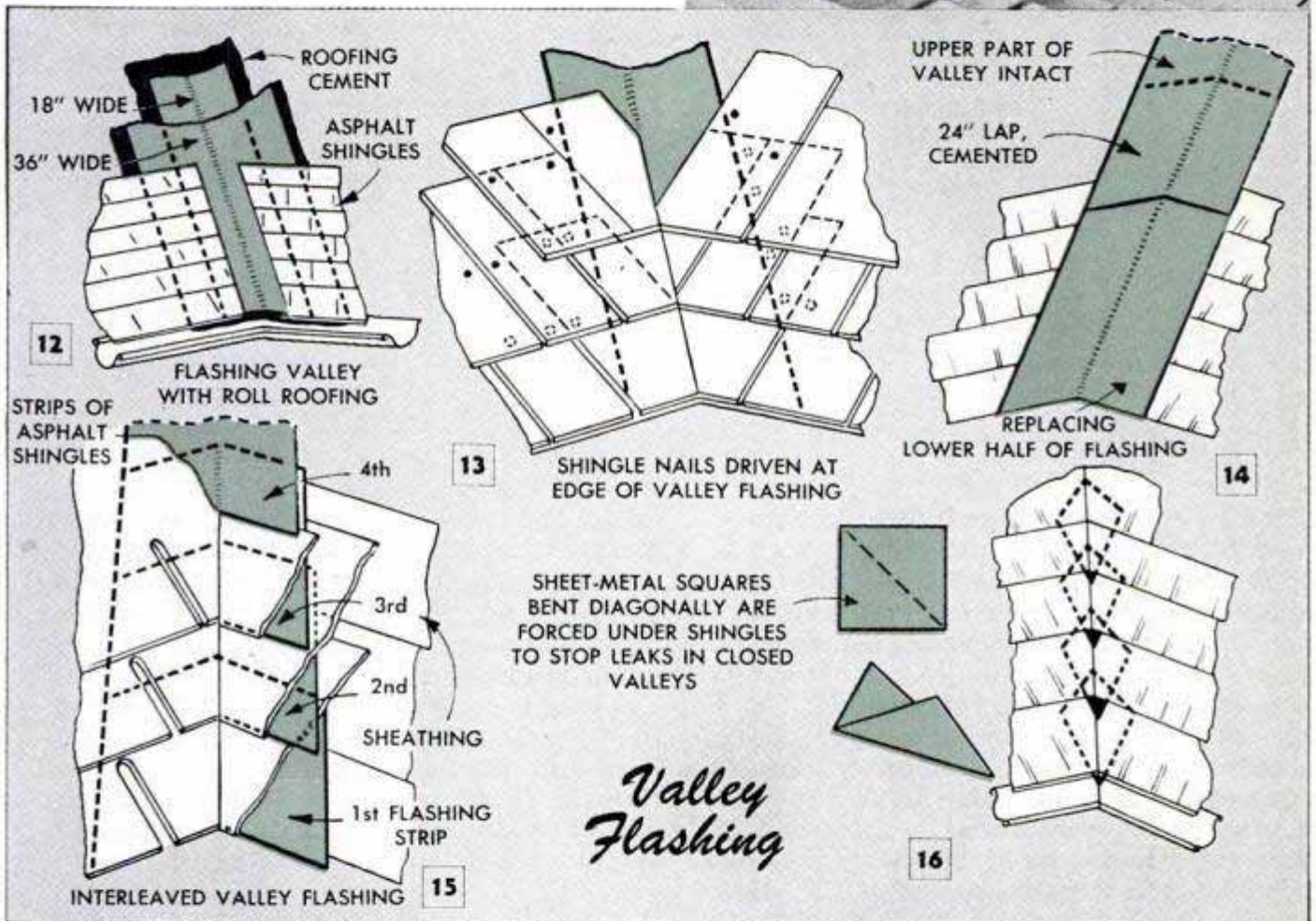
Closed valleys may have continuous flashing, or may consist of overlapping strips under the shingles, or short pieces may be interleaved with the shingles as in Fig. 15. On asphalt roofs, pieces of roll roofing or sheet metal can be used under the shingles in closed valleys. Frequently, pieces of flashing felt are inserted between shingles on each side of the joint, or the shingles may continue past the joint. To stop leaks in closed valleys insert pieces of galvanized sheet metal between shingles as in Fig. 16. Push them between the shingles and the old flashing, beginning at the bottom and working up as in Fig. 11. The top edge of each piece should project about 3 in. above the butts of the shingles of the course above.

**Other flashing repairs:** Where roofs join brick walls, flashing repairs are made in the same way as around a chimney. Flashing on walls covered with wood siding, shingles, or stucco, is installed with a lap of 4 to 6 in. as in Figs. 17 and 18. Horizontal flashing projects over the top course of



shingles and beyond the nails that hold them. Metal flashing along a sloping edge may be continuous, may consist of overlapping strips, or it may be interleaved with the shingles. When roll roofing is used it should be protected from breaking at short bends by a beveled fillet as in Fig. 19. Continuous flashing should be used under a "Boston" ridge, Fig. 20, under wooden ridge boards, Fig. 21, and also under hip ridges, Fig. 22. Vent pipes from the plumbing generally are flashed with sheet lead and rarely require renewal unless damaged in some way. If there is leakage at the window sill joining a sloping roof, new flashing can be installed as in Fig. 23.

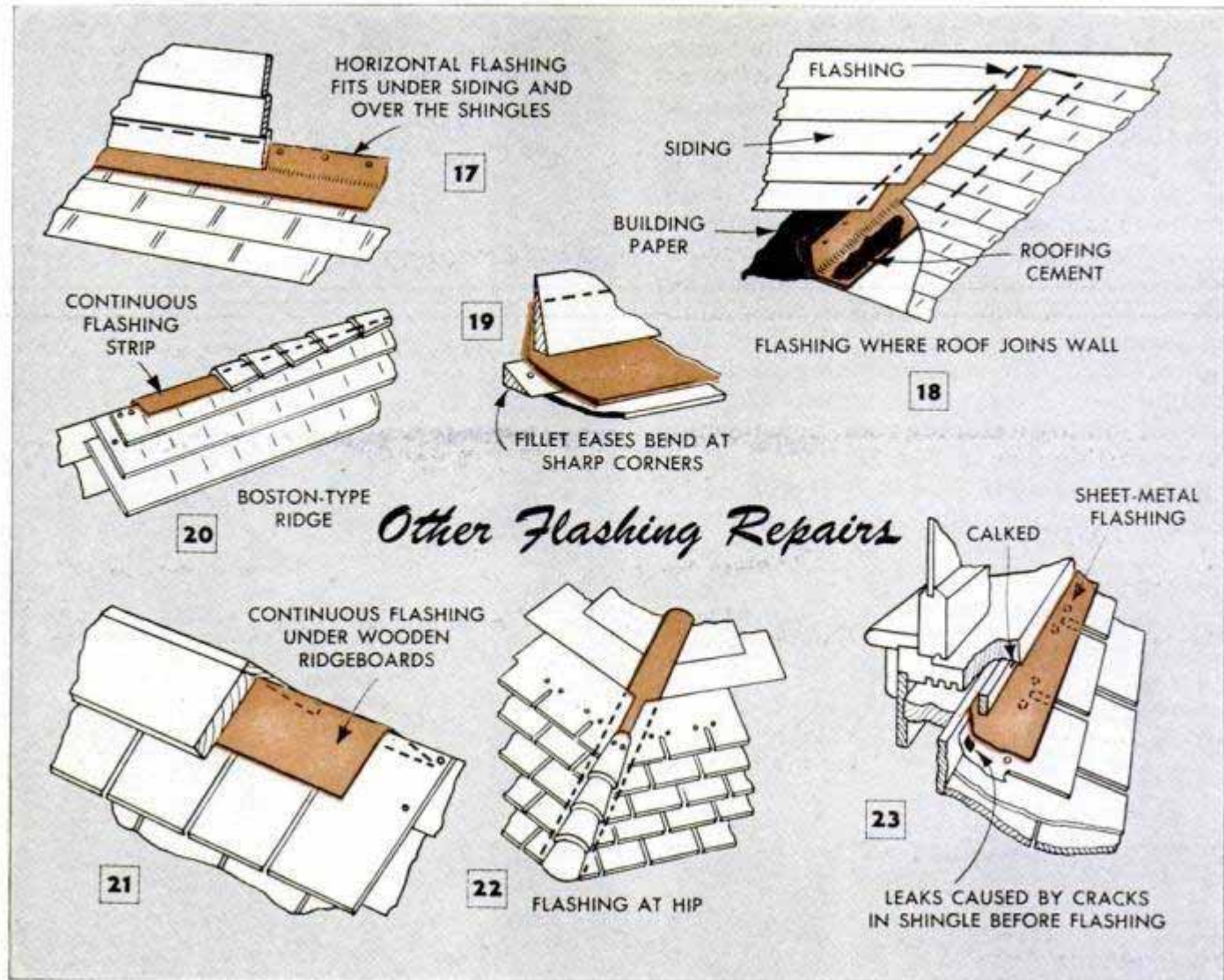
**Stopping shingle leaks:** Defective shingles often can be made leakproof simply by



slipping a piece of galvanized sheet metal under them as in Fig. 24. However, an entire strip of asphalt shingles is not difficult to replace. Keep in mind that each strip extends about 2 in. above the exposed portion of the course above and usually is held by two rows of nails. These are removed by carefully prying them up with a screwdriver as in Fig. 28. To re nail, use new galvanized nails of the type made especially for asphalt shingles. Seal all old nail holes with roofing cement. Individual asphalt shingles are removed and replaced in the same manner. When wooden shingles require replacement, the nails are cut with

a chisel improvised by grinding a beveled V-notch in a discarded file, Fig. 25. Cutting the nails with this tool will release the defective shingle and permit it to be pulled out. Before tapping the replacement shingle into position, drive two shingle nails about  $\frac{3}{4}$  in. from the edges and far enough above the butt end so that the nails will be covered by the shingles in the course above when the replacement is in position. To admit the replacement shingle with its projecting nails, loosen several shingles in the course above as in Fig. 26. After slipping the shingle in place drive down the nails by placing the nail-cutting chisel over the heads





### Other Flashing Repairs

as in Fig. 27, then tapping lightly on a hardwood block held over the shingle and directly above the nails. Loosened nails of the shingles above are driven down in the same way. In all these steps, care is necessary to prevent splitting the shingle.

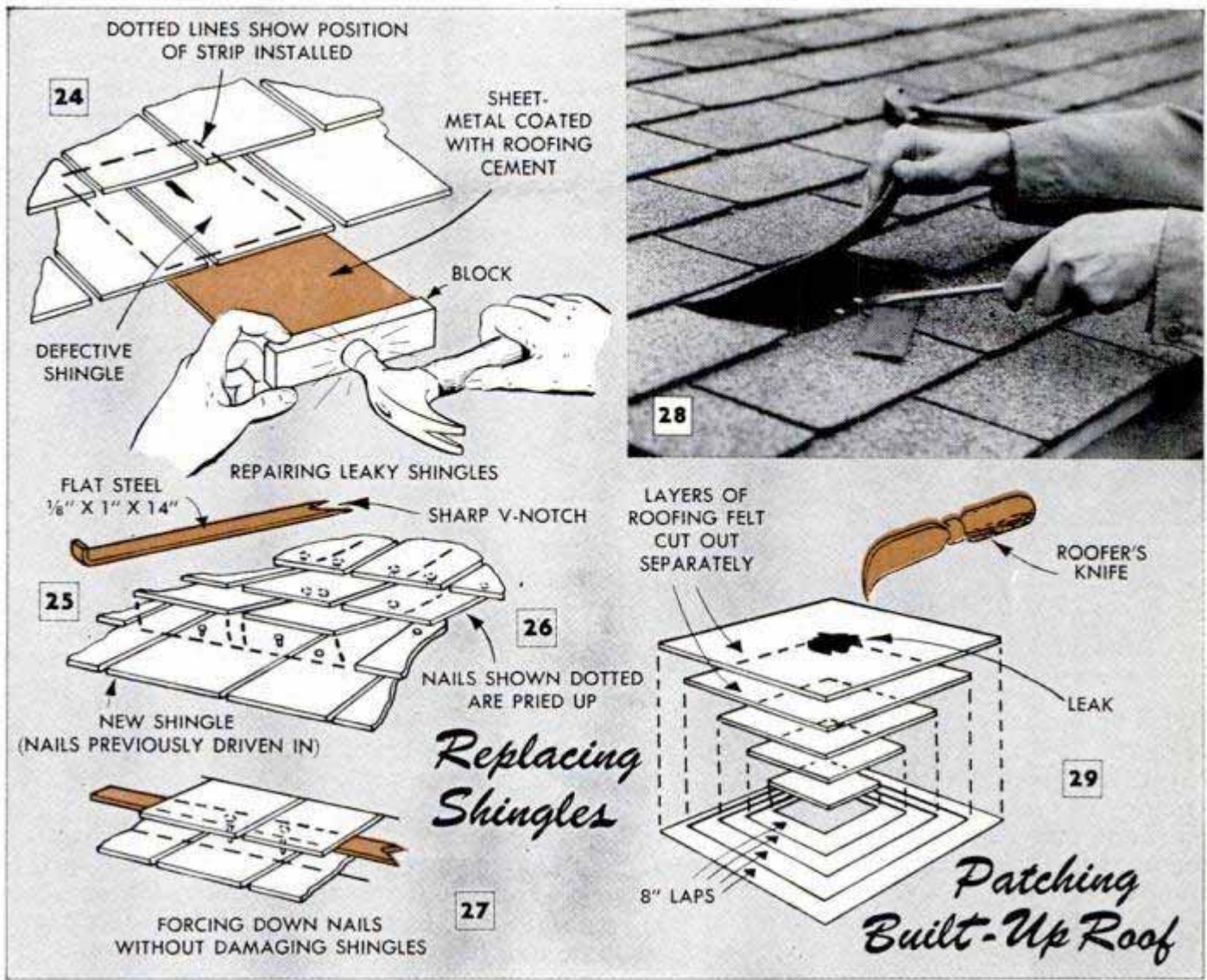
**Leaks in metal and roll roofing:** Small holes causing leaks in metal roofs can be repaired by soldering. Temporary patches cemented over large holes as in Fig. 5 are effective until permanent repairs can be made. The metal must be clean and dry and the patch must be nailed at the edges before applying cement. Defective sheet-metal roofs are sometimes repaired by covering with roofing felt and a specially made roll roofing having a selvage. First, the metal roofing is nailed securely, then asphalt lap cement is applied with a roof brush to the metal and over each piece of felt as it is applied. Finally lay the selvage roll roofing over the freshly applied cement.

**Repairing built-up flat roofs:** When leaks occur in built-up flat roofs, which consist of several layers of felt cemented together, the surest method of stopping the leak permanently is to cut out square sections from each layer as in Fig. 29. Dip the knife blade frequently in turpentine to assure that it cuts freely. The top square must be quite

large, the next one smaller to provide an 8 to 10-in. lap. Several squares are removed, each cut progressively smaller, care being taken to cut through only one layer at a time. Marking and cutting measured squares makes it easy to cut new ones to fit. These are cemented in place with lap cement, each square being tapped with a hammer and hardwood block to assure full contact. If the roof is already coated with gravel or slag, the final patch is coated liberally with cement before spreading the gravel.

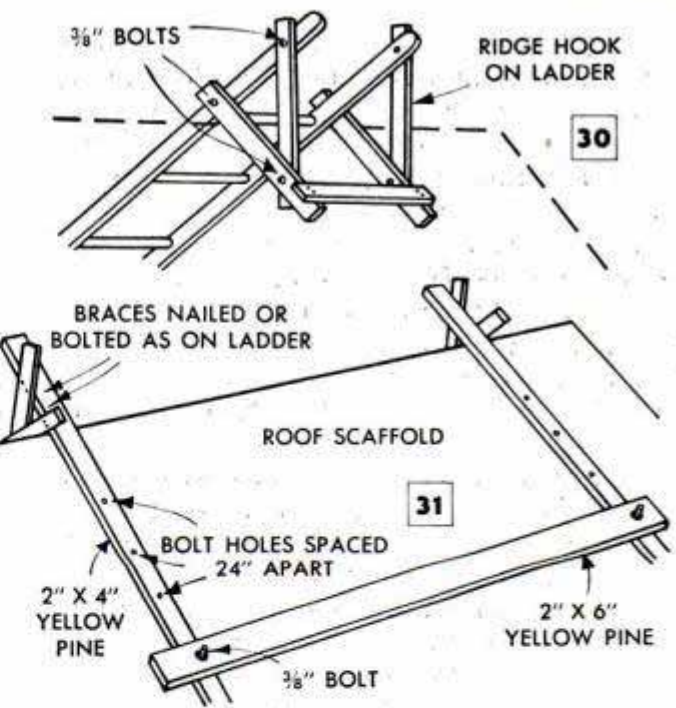
**Safety precautions:** Don't take chances when working on a roof. Wear rubber-soled shoes. Never work on a roof wet by rain, dew, or frost. Tie a rope to a post, or other solid anchor, on the opposite side of the house, throw the free end over the ridge and tie it securely around your waist when you get into working position. Then you can work on a roof of moderately steep pitch in comparative safety. On extremely steep roofs use a ladder provided with a hook that fits over the ridge as in Fig. 30. The angle between the ladder and the hook should conform closely to the roof angle at the ridge. Metal ladder hooks which clamp onto the rungs also are available. When extensive roof repairs are to be made





it's a good idea to build a scaffold of the type shown in Fig. 31. The side members have holes spaced 12 to 24 in. so that cross-pieces can be bolted at any convenient height.

**Ice dams:** On low-pitched roofs having overhanging cornices, leaks often are caused by ice dams which form over the cornice. Heat loss through the roof melts the snow at higher levels during the day and the water runs down and collects in considerable amount just above the dam, which remains frozen due to the lower temperature of that portion of the roof which extends over the walls. Water sometimes seeps under the shingles and drips onto the attic floor just inside the plate. The only way to stop such a leak at the time is to cut channels through the ice at several points along the cornice so that the water can drain away. It will be necessary to keep these channels open until the ice over the cornice melts. A good preventive measure on a roof already laid is to apply shingle-tab cement to all shingles in the first five to seven courses. The cement, properly applied, will help to prevent future leaks from this source. When laying a new roof, apply three to five widths of smooth roll roofing above the eaves, lap-



ping 5 in. and cementing the laps. In localities where the roof is exposed to high winds, leaks sometimes occur as a result of the lifting or curling of the shingle tabs by the wind. In this case the tabs should not be nailed down. Rather it is best to use a shingle-tab cement which is especially made for anchoring shingle tabs and preventing wind damage.



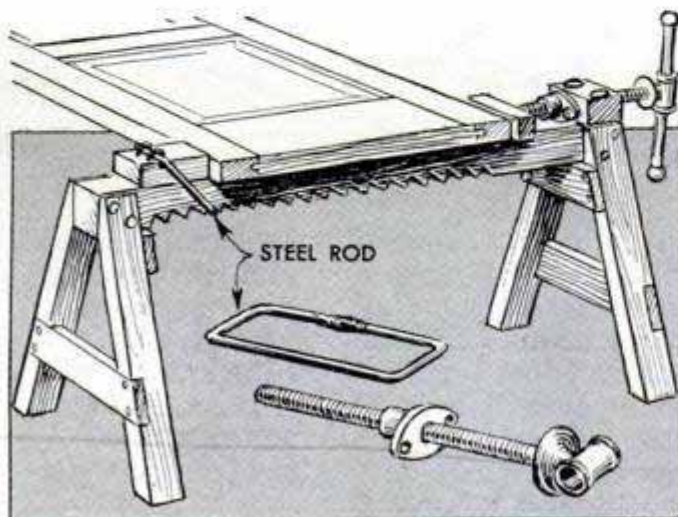
## Campfires Started Quickly With Waterproof Igniters



With an igniter such as the one shown in the detail, it is no trouble to start a campfire quickly even in a light rain. The igniter is made by placing bits of cloth or other absorbent material in a paper cup of the type used for baking small cakes and saturating them with melted paraffin. One igniter usually will start several fires.

## Bar Clamp Made Like Sawhorse

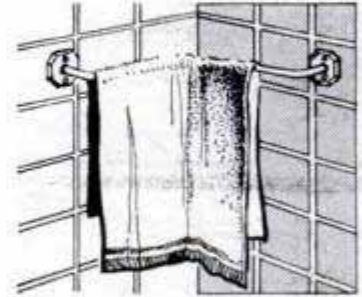
Designed by a woodworker for special work in assembling heavy doors, this sawhorse-clamp unit does double duty as a combined support and bar clamp when assembling and gluing other types of work. It is made in the same manner as an ordinary sawhorse, except that the bottom of the beam is notched, each notch having one straight and one slanting face to engage the ratchet ring attached to the sliding jaw. This permits moving the sliding jaw to any point along the beam to position it for clamping work of various widths. A hardwood block bolted to the top of the saw-



horse beam is drilled to take an ordinary vise screw in a loose fit. The threaded vise-screw pad is then bolted to the inside face of the block. The end of the vise screw is filed square so that a hardwood block placed between the end of the screw and the edge of the work will act as a jaw when tightening the clamp.

## Corner Rack for Bath Towels

Installing a towel rack in a corner of a bathroom not only creates a novel and pleasing effect but permits utilizing space which otherwise often is wasted. An ordinary towel rack can be used by just bending it at a right angle in the center and fastening it with screws to the two walls that form the corner as shown.



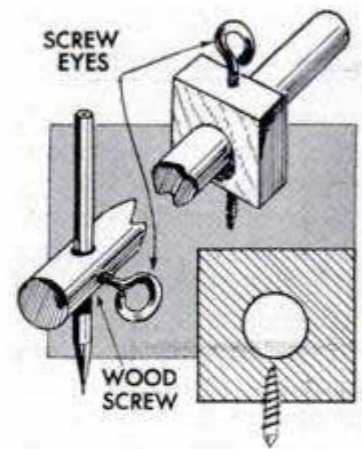
Arthur Trauffer, McClelland, Iowa.

## Painting Outdoor Furniture

Before painting outdoor furniture, apply a coat of shellac to the surface. This will keep the resin in the wood from bleeding through the paint, and the latter will retain its original color throughout the summer. If you apply weatherproofing compound to swings and lawn furniture, keep the weatherproofing from streaking or running by binding it to the wooden base with a thin undercoat of shellac.

## Beam Compass Improved From Dowel Rod

Home-workshop owners who have only occasional use for a beam compass can improvise one from a length of dowel as pictured. One end is drilled to take a lead pencil, which is held in place by means of a screw eye. The movable pivot for the compass is made from a small block of hardwood which is drilled to slide over the dowel. A wood screw driven into the underside of the block and filed to a point serves as the pivot, and a screw eye driven into the upper end locks the block into position on the dowel.



Hugh Lineback, Stillwater, Okla.



# KNOW YOUR CAR'S NERVOUS SYSTEM

## Care of the Battery

*'57 auto Repair  
Manual*

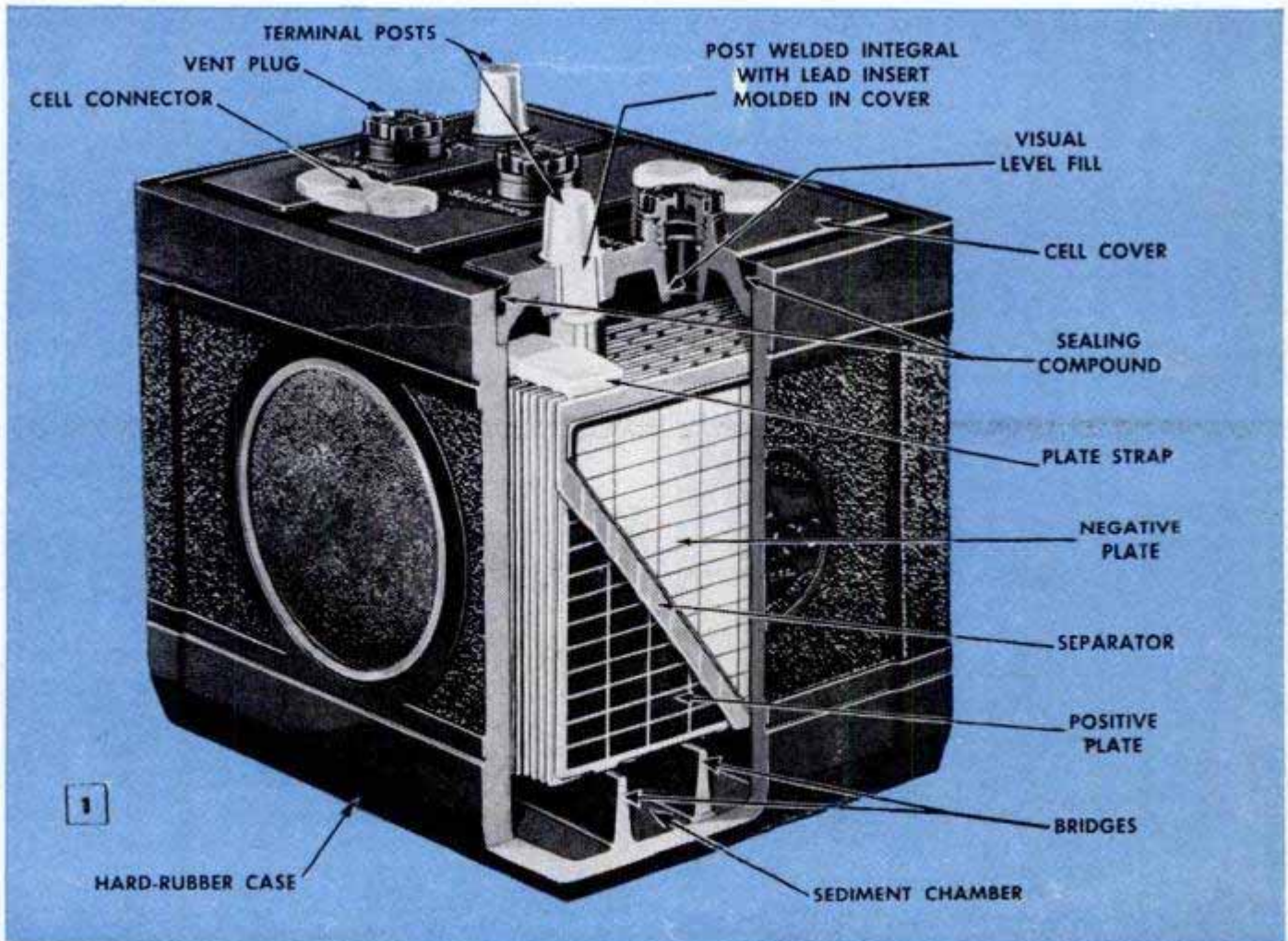
By W. K. Mitchell

**T**HE BASIC UNIT of the car electrical system, which was described last month, is the storage battery, which performs three vital functions. It supplies current for the cranking motor and ignition as the car is started. It also supplies current for lights, radio, heater and other accessories whenever the generator output drops below the demands of these devices. And, in addition, it serves as a voltage stabilizer in the electrical system. As the battery must perform each of these functions dependably, proper maintenance of the battery pays maximum dividends in carefree, economical driving.

Fig. 1 shows the various parts of a typical three-cell passenger-car battery. Each cell produces a potential of two volts and, as

the cells are connected in series, a total of six volts is available at the terminal posts. The internal assembly is illustrated in Fig. 2, the plates being made by application of special lead-oxide pastes to rectangular grids. These pastes become the active materials of the plates when the battery is complete.

Battery troubles usually signal their coming well in advance by unmistakable symptoms. One of the most common causes of premature battery failure is overcharging, and its warning is excessive use of water by the battery. Normally, a car battery will not require the addition of water more often than once a month or every 2000 miles. When ends of the cell covers







COMPLETE BATTERY ELEMENT



PLATE GRID



PLATE



PLATE STRAP

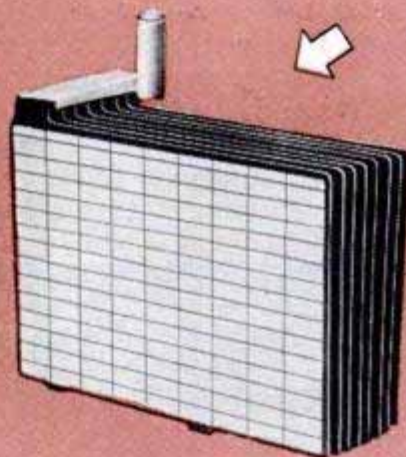
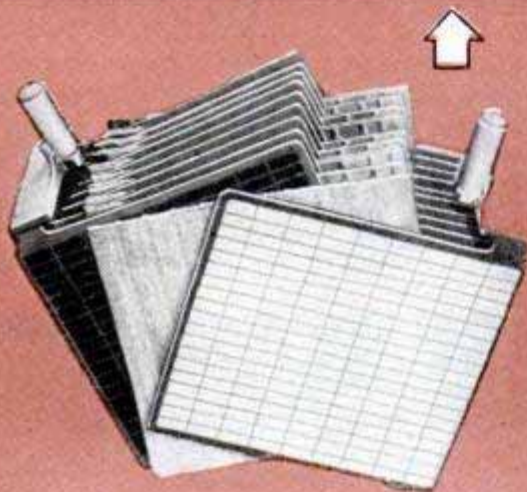


PLATE GROUP

2



POSITIVE AND NEGATIVE GROUPS WITH SEPARATORS

Battery pictured below has been damaged by overcharging. Arrows point to cell covers pushed upward



have been pushed up by the overcharging action as in the photo at the left, internal damage to the battery is well advanced. The most common causes of overcharging are too high a voltage-regulator setting or overheating of the battery because of poor ventilation, excessive engine heat or high road temperatures.

Overfilling the battery with water is a frequent cause of damage. When too much water is added to a cell, the electrolyte level is apt to reach a point where normal gas vents are closed off. This allows gas to accumulate under the cell cover until sufficient electrolyte is pushed out to uncover a vent. Not only is this electrolyte lost to the battery, but it causes excessive corrosion of the cables and carrier. Batteries overfilled repeatedly indicate their trouble by a constantly wet appearance, excessive cor-

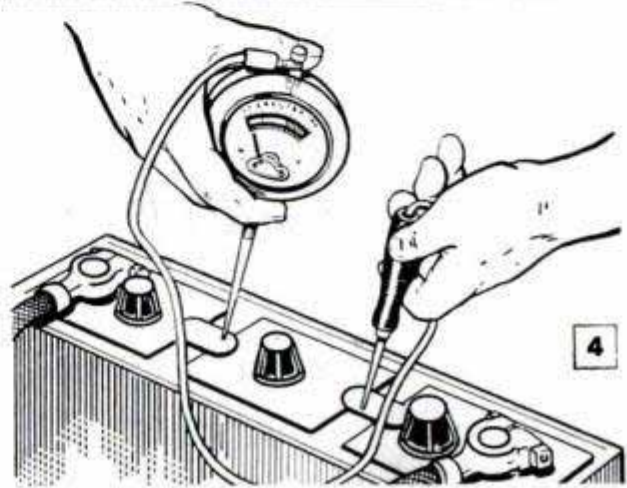
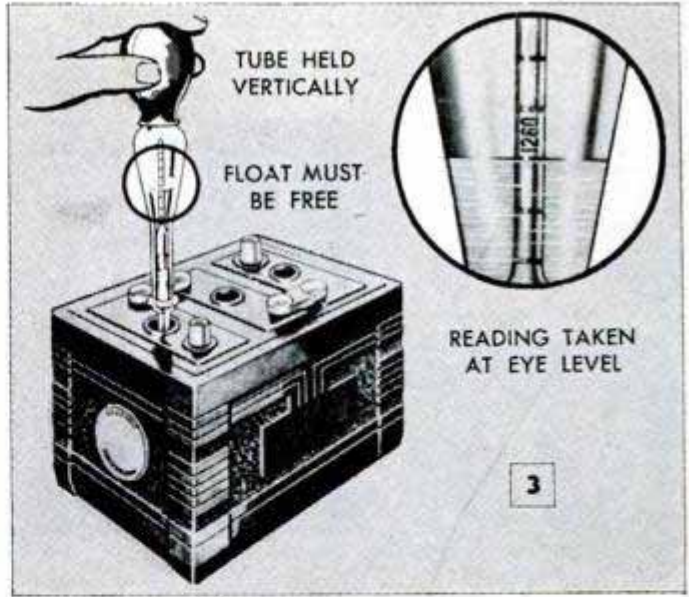


rosion and second-rate performance. The remedy, of course, is more careful filling.

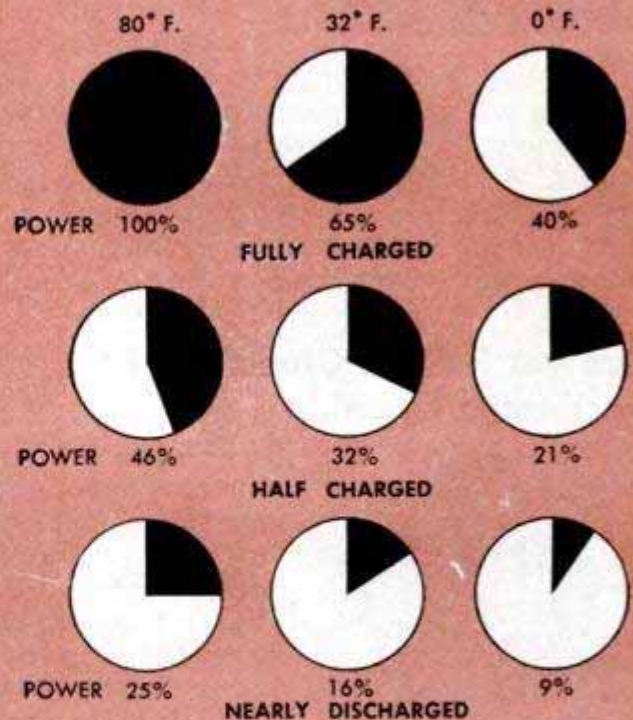
Though not so common as the first two battery troubles, excessive cycling can be equally ruinous. Cycling—repeated charging and discharging of the battery—is caused by intermittent driving, requiring an unusual number of starts per mile, or by excessive use of accessories when the generator is not charging. This action softens and loosens the positive active material in the plates, and it is washed free and circulates in the electrolyte, giving it a brownish color and weakening the battery. The cure for this trouble is to avoid long or frequent periods of battery discharge.

The hydrometer test, Fig. 3, and the cranking-load test, Fig. 4, are two simple methods of battery testing available to the home mechanic. The hydrometer test indicates the battery's state of charge by measuring the specific gravity of the electrolyte in each cell. All readings are based on a temperature of 90 deg. F., and temperature variations must be taken into consideration. Temperature corrections can be made by adding four gravity points (.004) to the reading for every 10 deg. the electrolyte is above 80 deg., and subtracting four points for every 10 deg. below. If a variation of more than .025 is noted between cells, further checking by means of the cranking-load test should be done. This test, which measures the current between cells, is taken with a simple voltmeter having two test prods. Turn off the ignition switch, and press the starter button, quickly checking the voltage of each battery cell as in Fig. 4, while the motor is being turned over. Do not operate the starting motor for more than 30 seconds without pausing to let it cool for two minutes or more. If the voltage of any of the cells falls below 1.5 during cranking, or if there is a difference of more than 0.2 volt between cells, serious trouble is indicated and the battery should be checked by a competent serviceman. In making the cranking-load test, the battery temperature should be between 70 and 90 deg. F. The specific gravity should not be less than 1.250 for batteries which are fully charged at 1.280 to 1.290. Other batteries should be proportionately charged.

In hot climates, it often is necessary to lower the setting of the generator regulator to prevent battery overcharge, while in cold weather the setting frequently must be adjusted to its maximum to obtain adequate charging. The effect of cold weather on a battery is shown by the diagrams at the right. The most important regular service a motorist can give his car battery is to see that the water level of each cell is maintained and the battery, hold-down clamps, cables and case kept clean.



#### HOW TEMPERATURE AND STATE OF CHARGE AFFECT BATTERY CRANKING POWER

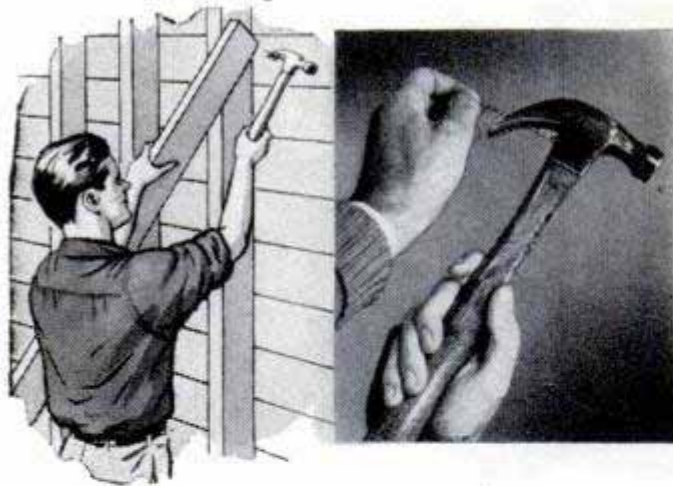


#### HOW ENGINE-OIL TEMPERATURE AFFECTS CRANKING LOAD





## Out-of-Reach Nail Started Easily When Held by Hammer Claws



Where the nature of a job makes it necessary to start a nail with only one hand, wedge it between the claws of the hammer with the head against the body of the hammer head. Held in this manner, the nail can be started in the work with one light blow, after which the hammer is removed and the nail driven in the regular way.

Richard Hanscom, Elmhurst, Ill.

## Cushion Holds Phonograph Needles



Half of a sponge-rubber ball cemented to a convenient spot on the record changer provides a handy "pincushion" for storing phonograph needles. Cut

from a ball an inch or more in diameter, the cushion will hold a plentiful supply of needles, the soft rubber protecting the delicate points. As the balls are available in a variety of colors, one can be selected which will not detract from the appearance of the phonograph.—Don Nielsen, Aurora, Neb.

## Drawer Pull on Glue-Can Lid Facilitates Opening

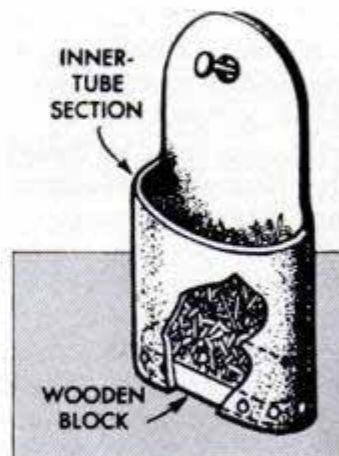


Frequent opening of a can of glue by prying the lid up with a screwdriver bends the lid so that air enters the can and dries out the glue. This is prevented and the can opened easily if a wooden or plastic drawer knob is fastened to the lid. Punch the lid for the drawer-

knob bolt and place a large washer on the underside of the lid before inserting the bolt. The washer will help retain the original shape of the lid.

## Sections of Car Inner Tube Make Bins for Small Parts

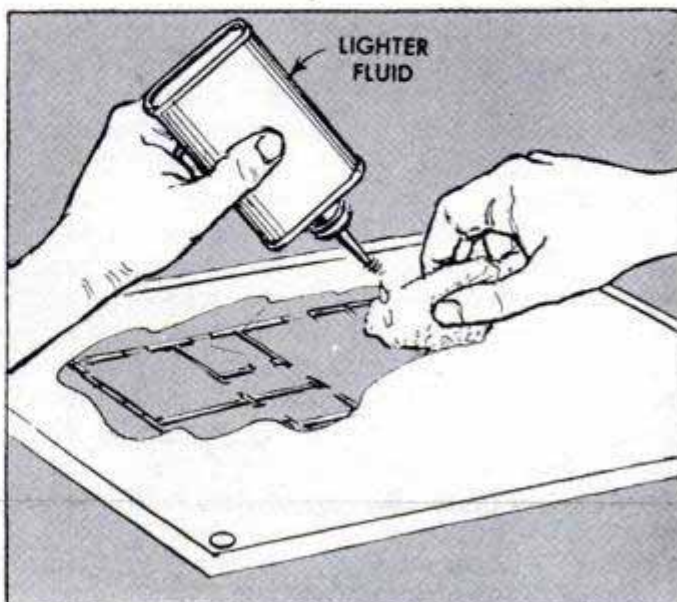
Useful bins for small nails, screws and other parts can be made from sections of a car inner tube. Make each one by cutting away the side, as illustrated, to leave a flap at one end, and then tacking a wooden block in the other end to serve as a bottom.



Punch a hole in the flap for hanging and, if desired, reinforce the hole by cementing a couple of rubber washers around it. When using a bin, parts can be poured out on the flap for easy accessibility, and can be replaced merely by tipping the bin back into a vertical position. Also, if you want to carry a bin in the tool kit or your pocket, the parts can be kept intact by folding the flap over the opening of the bin.

## Paper Coated With Lighter Fluid Made Temporarily Transparent

If you wish to trace drawings or lettering, a sheet of paper may be made temporarily transparent by sponging it with lighter fluid. Paper treated in this manner will remain transparent long enough for ordinary tracing jobs, but the fluid will eventually evaporate to leave the sheet as clean and opaque as before.





# SYNCHRONIZED FLASH

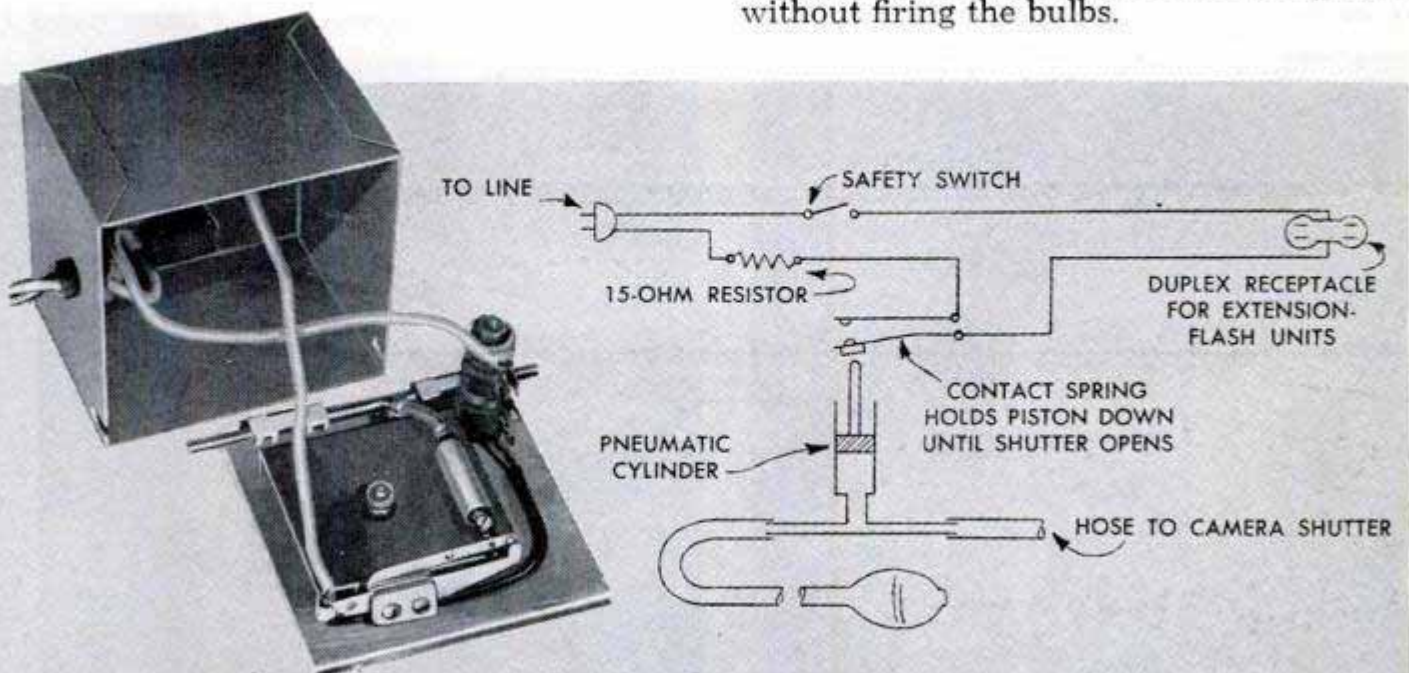
## With a Studio Shutter



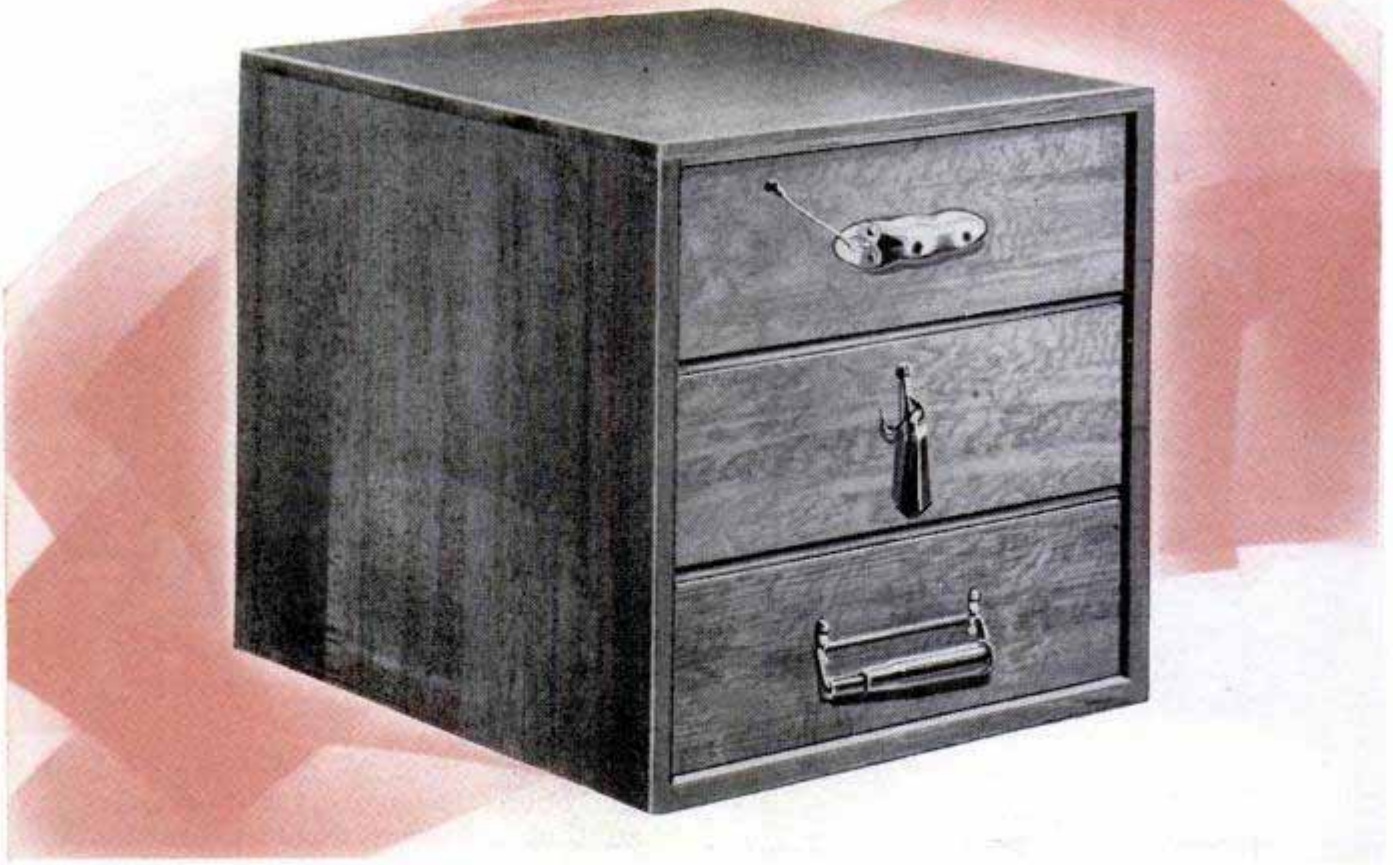
By H. F. May

FOR PHOTOGRAPHING large groups with a view camera, where a satisfactory retake is seldom possible, I made this flash synchronizer for use on a bulb-operated shutter. The photo and wiring diagram below show how the unit is assembled and how it works. To operate the contacts I used the cylinder and piston from an old pneumatic shutter. This unit is fitted into the shutter hose as shown in the wiring diagram. Suitable contacts were salvaged from a discarded telephone relay, the arm of the movable contact having just the right amount of tension. The sequence of operation is quite simple and entirely automatic. When the bulb is pressed, air is forced

through the hose to the camera shutter which opens under pressure somewhat less than that required to close the contacts. After the shutter opens, pressure builds up in the hose to the point where the resistance of the movable contact to upward movement of the pneumatic-cylinder piston is overcome. Then the contacts close the circuit and fire the flash bulbs. For convenience of operation I mounted the electrical units on a plywood base about 4 in. square. Then I made a sheet-metal cover to fit snugly over the base. Slots cut in the cover permit the hose to pass through near one side as pictured. The resistor limits current build-up to 8 amps. and prevents blowing a fuse on the 110-v. line when the bulbs are fired. A safety switch installed in the line permits the shutter to be opened without firing the bulbs.







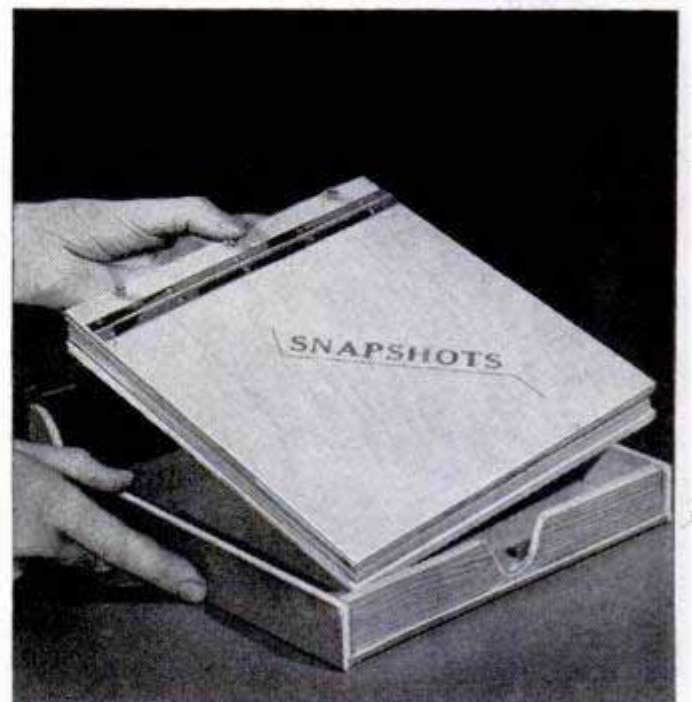
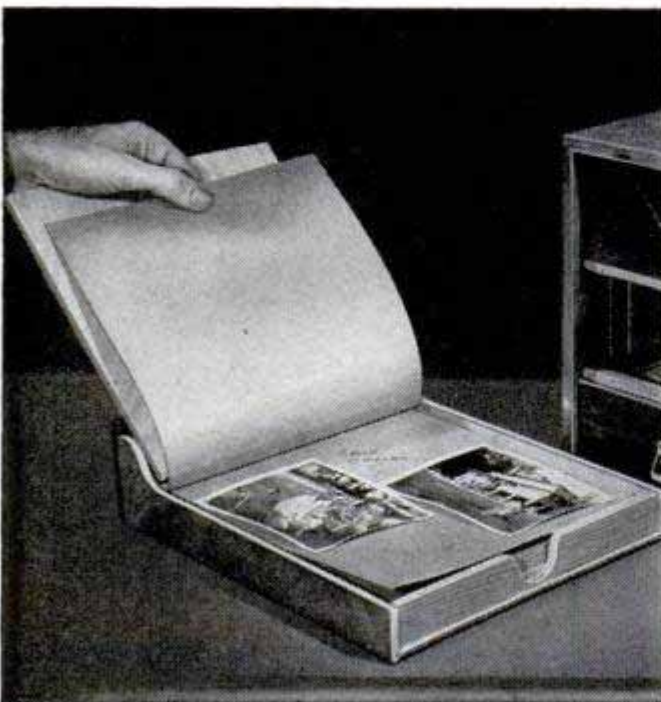
# STORAGE CABINET for Hobby Photos

By **Walter E. Burton**

**I**N TENDED primarily for storing prints and color slides, this hobby-photo cabinet keeps your prize shots right at your finger tips. With three roomy drawers, one for color slides, another for unmounted

prints up to 4 x 5 in., and a third for a large photo album, there will be no time wasted in trying to find the prints you want to show your friends. The hobby atmosphere is topped off by fitting the cabinet with appropriate drawer pulls, such as empty rifle shells, or prized fishing lures.

Photo album can be opened without removing it from special drawer. Note that sides of drawer are cut back so its depth approximates thickness of the album. Notch in drawer back facilitates turning album pages





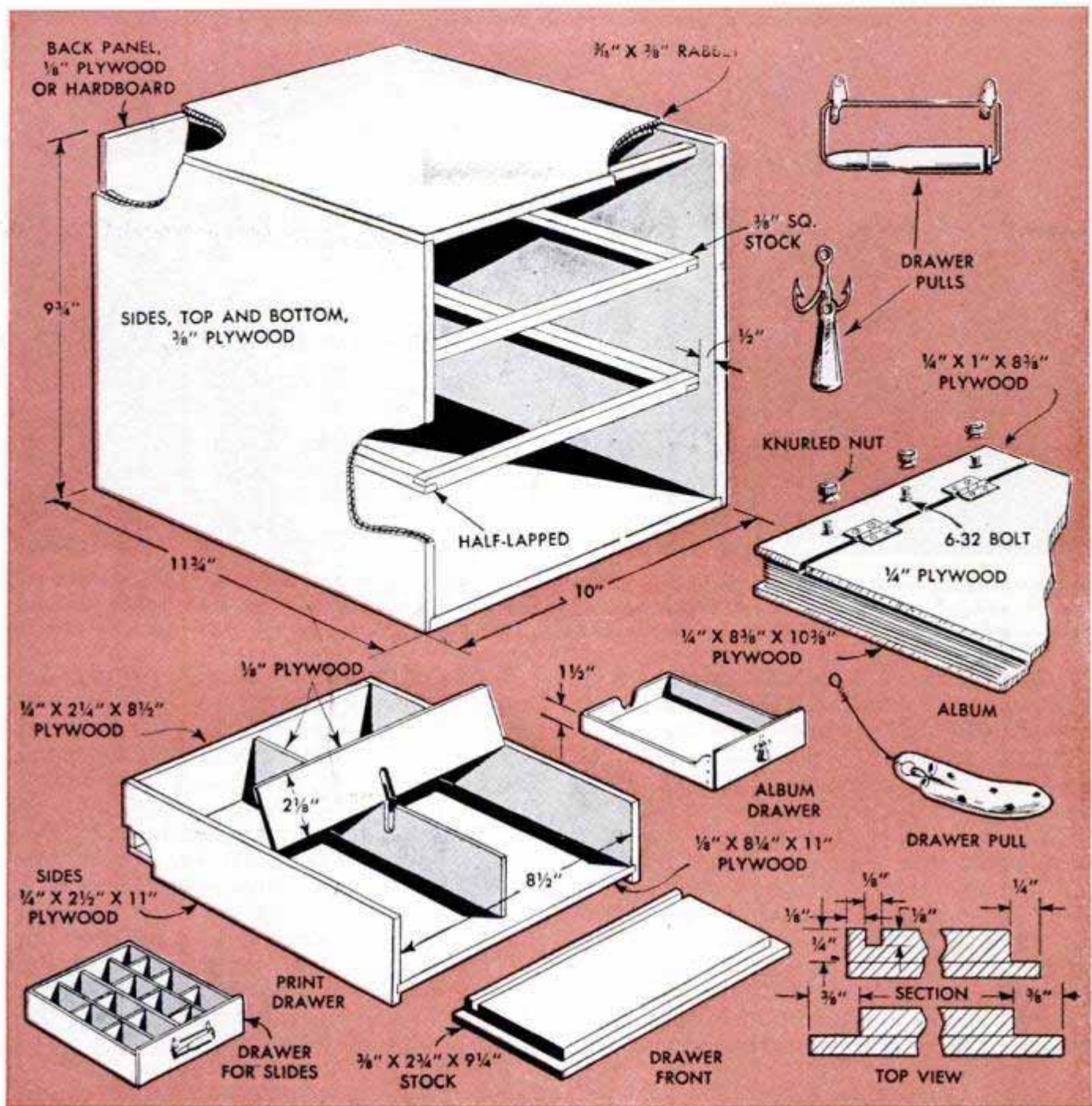
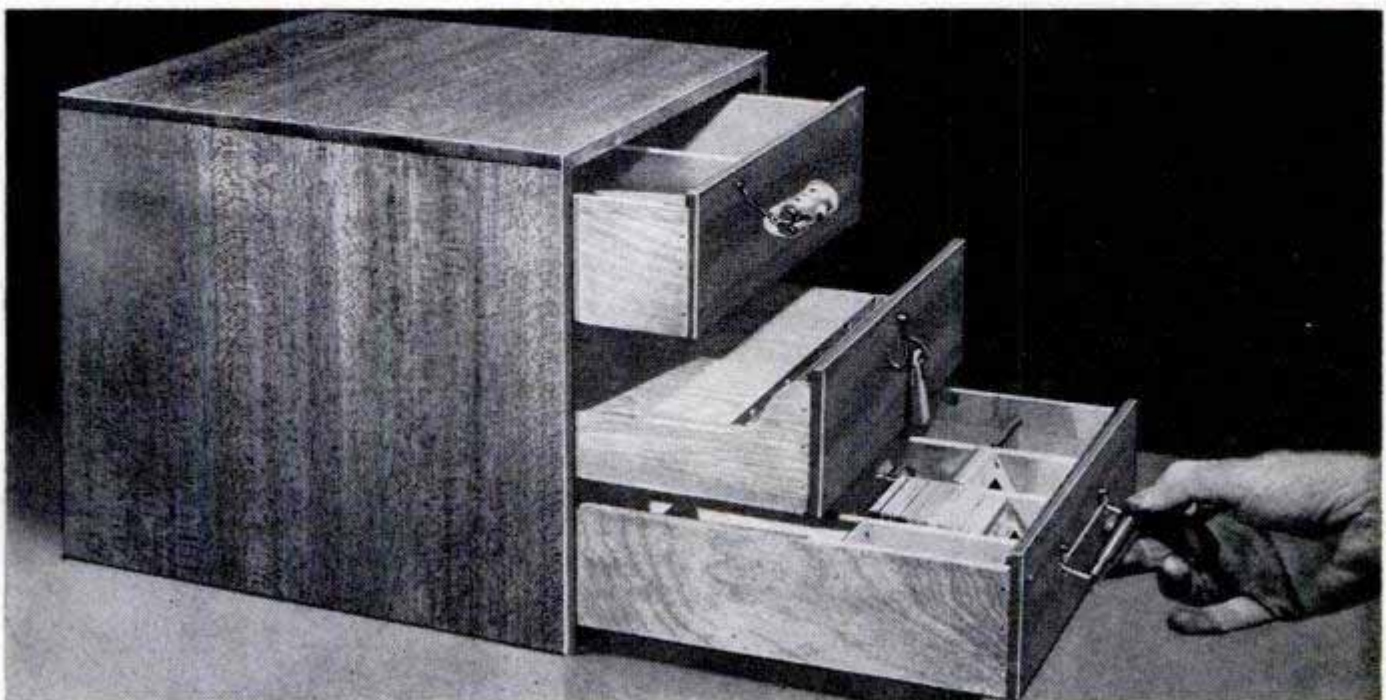
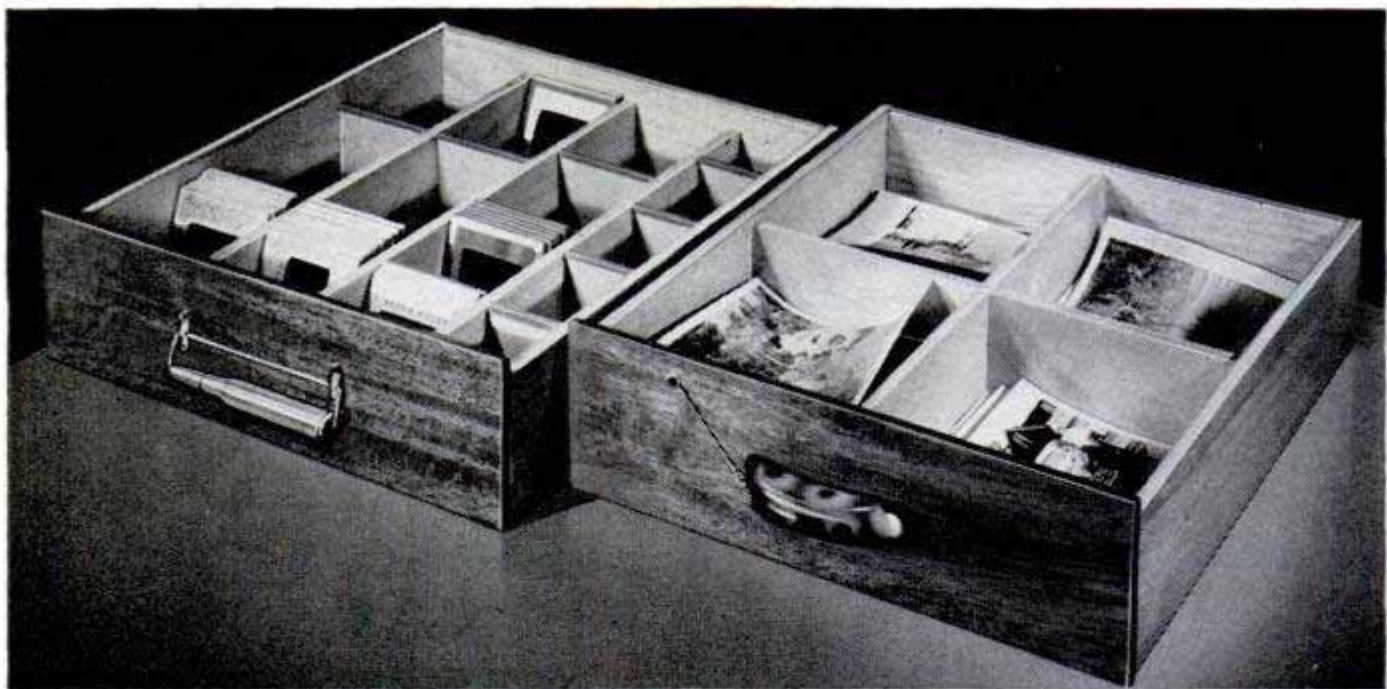


Photo below shows various drawers installed in cabinet. The drawer pulls are practical as well as novel







Empty-cartridge drawer pull on slide drawer is made by drilling the bullet and the base of the shell to receive the ends of a stiff-wire hanger. Primer cap, of course, must be removed from shell before drilling. Small sheet-metal clamps are used to fasten hanger to drawer front. Fishing lure is attached with screws

The cabinet is of simple box construction as shown in the detail on the opposite page. Note that the top is rabbeted for the edges of the side members and the sides are rabbeted to take the cabinet bottom. The rear edges of all four members are rabbeted to take the back panel. The drawers are built as indicated, the center and top drawers being supported by frames nailed and glued to the side and back panels. Note that the corners of the frames are half-lapped. The top, bottom and sides can be of  $\frac{3}{8}$  or  $\frac{1}{2}$ -in. plywood with the back of hardboard. The drawer bottoms and partitions also can be made of hardboard if preferred to plywood.

A photo album of suitable size may be purchased or, if desired, one may be custom-built from plywood, heavy paper and three brass bolts fitted with knurled nuts. The top is made in two sections which are hinged with a length of piano hinge or other small, surface-mounted hinges. The heavy-paper leaves used for the album should be folded double along the back edge and the bolts passed through both thicknesses. In addition to strengthening the leaves, this also spaces them so the book will fold flat when mounting corners are used to fasten the prints. Finish the plywood album cover with varnish.

## Roll-Film Tank Emptied Quickly by Blowing Into Filler Hole



When changing solutions in a plastic roll-film tank, you can speed up the removal of the used liquid by inserting one end of a rubber tube in the filler hole and then blowing through the other end. If the tube is too small to fit snugly in the hole, wrap it with a layer or two of adhesive tape.

## Rubber Tubing Connected to Faucet Secured With Waterproof Tape

In an emergency, rubber tubing can be connected to a faucet by wrapping several turns of waterproof tape around the tubing near the end to increase the diameter so the tube can be force fitted into the faucet. After inserting the tubing, use the tape or a length of cord to tie it to the faucet.

☐ Replace worn padding on the jaws of clamp-on photoflood lamps by wrapping the jaws with electrician's rubber tape.



## Bobby Pin Suspends Thermometer To Check Bottled Solution



Time can sometimes be saved by checking the temperature of photographic solution while in the bottle. To do this, clip a bobby pin onto the thermometer and hang it in the bottle as shown.—John J. Rea, Urbana, Ill.

## Flashlight Fitted With Filter For Darkroom Use

With its rays safely filtered by a piece of green cellophane fitted over the lens, a pocket-size flashlight may be used to locate



misplaced articles in a photo darkroom while film is being developed. If the only cellophane obtainable proves to be too thin, it may be folded into two or three thicknesses to cover the lens, after which it is attached to the flashlight barrel with cellulose tape. When searching for the missing articles, it should be remembered to keep the flashlight beam pointed downward at all times and always below the level of the table where film is being developed.—Robert Hertzberg, Jackson Heights, N. Y.

## Rubber Bands on Lightstand Arm Improve Gripping Surface



Inasmuch as the metal arm on his floodlamp stand is too smooth and narrow to permit getting a firm grip on it with a reflector clamp, one amateur photographer solves the difficulty by wrapping a couple of wide rubber bands around the arm to provide the needed friction. Rubber tape could be used for the same purpose, in which case it could be wrapped around the entire length of the arm to permit placing lights at any point desired.



## Packing Cut-Film Holders In Carrying Case

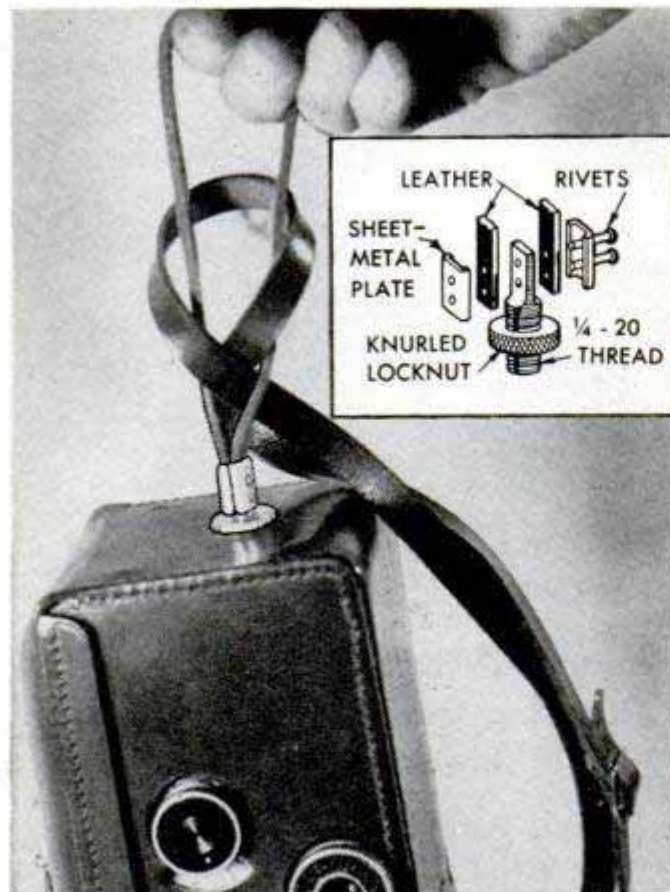
When packing cut-film holders in a camera carrying case, place each holder upside down in the case. In this way, there will be no chance of accidentally pulling the slide out of the holder when the latter is removed from the case.

## Flood-Reflector Ventilation Holes Indicate if Lamp Is Turned On



In addition to preventing a floodlamp reflector from overheating, tiny holes drilled around the socket opening will make it a simple matter to determine from a distance whether or not the lamp is turned on. This is especially helpful when using several lamps that are grouped together.





In addition to the usual shoulder strap on a camera case, provision for carrying the camera by hand, in the manner of a briefcase, is sometimes desirable. This detachable handle serves such a need and can be made at a minimum cost. Start by removing the head from a 1/4-20 brass machine screw, grinding one end flat and drilling it as shown. The detail shows the assembly in which the two ends of a short strap and two brass reinforcing plates are riveted to the screw. A hole is cut in the camera case to permit turning the screw into the tripod socket of the camera and a knurled nut is tightened against the case to prevent the handle from working loose. When carrying the camera by hand, slack in the shoulder strap can be taken up by looping it through the handle.

Walter E. Burton, Akron, Ohio.

☐ A unique way to get a child to pose for a picture is to stick a small piece of tape on his hand. The concentrated efforts of the child to remove the tape provide you with a variety of appealing poses.

## Some Time in Your Life

### You'll Need All Three of These . . .

**1. Motorist's Fix-It Book:** the most complete and compact guidebook for automobile upkeep you'll ever discover. Liberally illustrated with photographs and diagrams, it shows you how to perform every automotive job from changing a tire to servicing the generator regulator. There are chapters on motor tune-up, clutch care, brake servicing, trouble-shooting the starter and the cooling system. You'll save the price of this book many times over by following the chapters on "Getting Home on a Sick Engine," "Stretch Your Gasoline Dollar," and "Tire Care Means Long Wear." Whether you're a youngster just buying your first "jalopy" or a man with a dozen cars in your past, the "Motorist's Fix-It Book" is a year-around *must*. Garage mechanics use it, too!

**2. What to Make With Concrete.** There are two vital differences between hiring a concrete job done and doing it yourself . . . one is the price—and what a whale of a difference when you do it yourself! And the other is the satisfaction of seeing your own work take shape in concrete. Whether you're a beginner or an expert, this book has much to tell you. First of all, the fundamentals of mixing concrete that will endure, and how to use it properly. Then come detailed plans for making your own swimming pool or tennis court, concrete stairs, sidewalks, outdoor fireplace and garden pottery, and a whole section filled with uses of concrete on the farm. There's

even a chapter on building your own concrete mixer. And another tells how to make a machine to form 100 concrete building blocks per hour. Save yourself time and money by doing your own concrete work with the help of this *Popular Mechanics* book.

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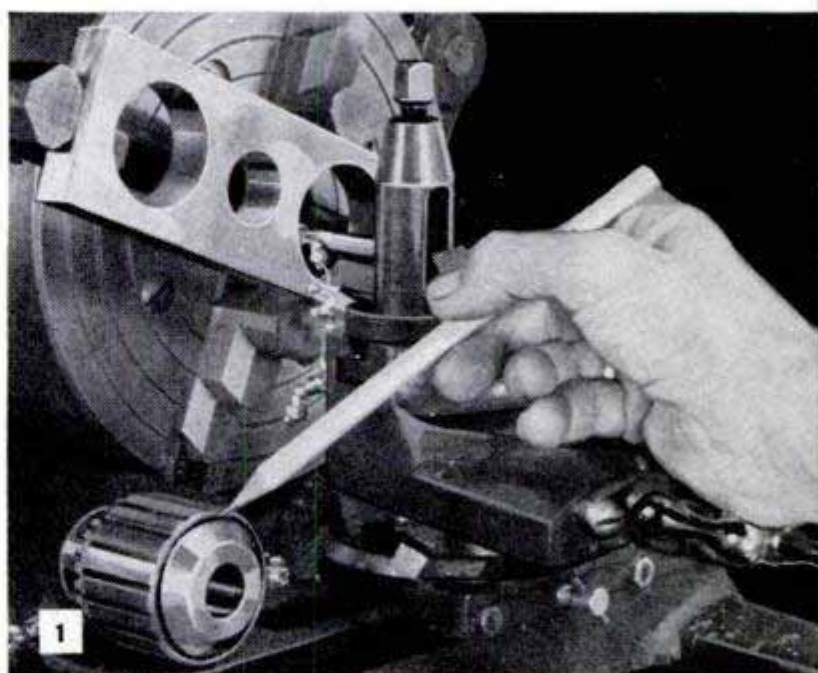


## SERVICING GEARED DRILL CHUCKS

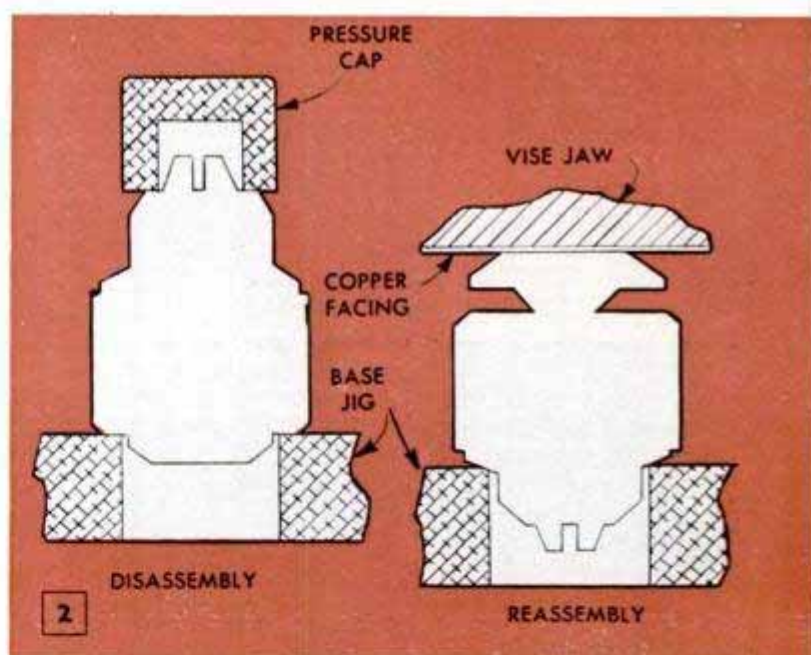
By Harry L. Truchelut

**A**FTER long periods of hard service, geared chucks on all-purpose units, such as portable electric drills and small drill presses, become clogged with an accumulation of wood and metal chips, dust, and abrasive grit which impairs the accuracy of the chuck and may even cause serious damage. Often a thorough cleaning of the chuck will restore its accuracy and save the cost of replacement. Disassembly of a geared chuck is simple when you use a two-piece jig like that shown in Figs. 2 and 6. The jig consists of a pressure plate and cap and the two members are combined in the disassembly and reassembly of the chuck as in Fig. 2, using an ordinary bench vise as a means of applying pressure as in Figs. 3 and 7. The pressure plate and cap detailed in Fig. 6 are designed to accommodate several sizes of geared chucks, but

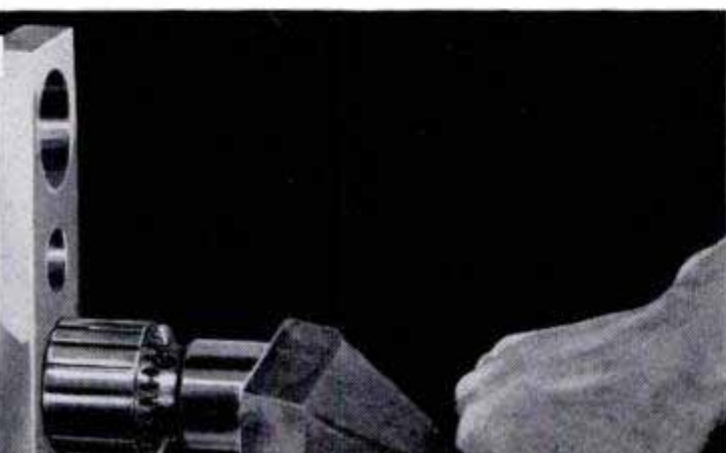
Disassembling jig consists of pressure plate and cap which are placed in vise with chuck between. Closing vise jaws forces the geared sleeve off the chuck body



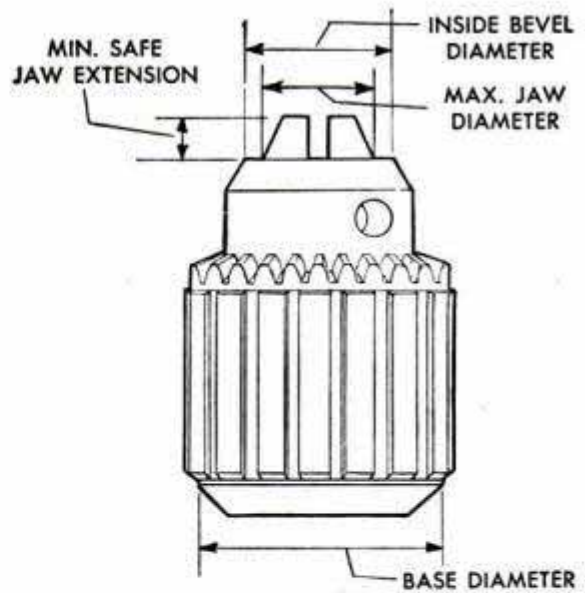
For disassembling and assembling geared drill chucks, a pressure plate, shown in lathe chuck, is necessary. Holes in plate are bored a little larger than chuck body



Clean all parts of the disassembled chuck in a clean solvent, using an old toothbrush to loosen accumulations of dirt and hardened grease from moving parts

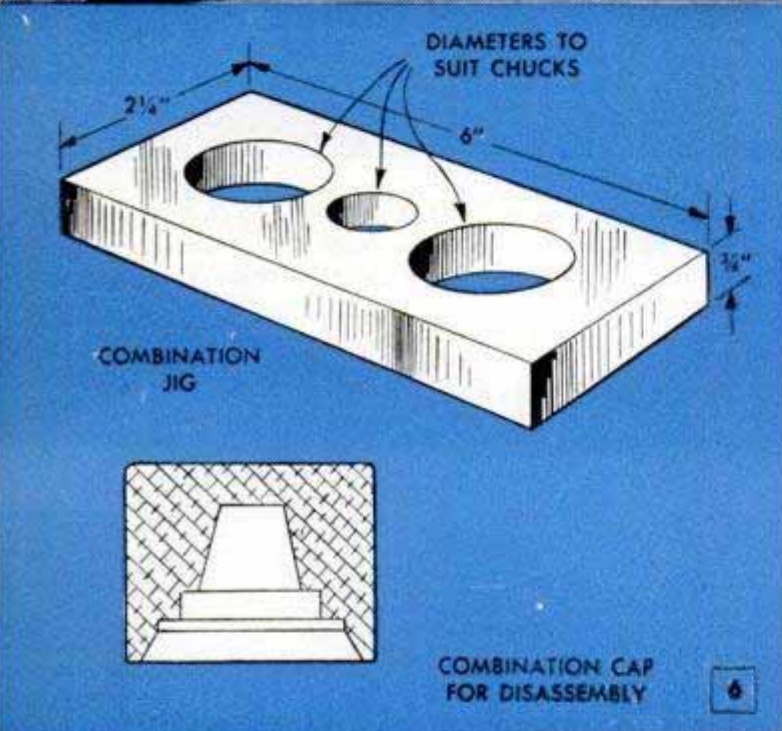






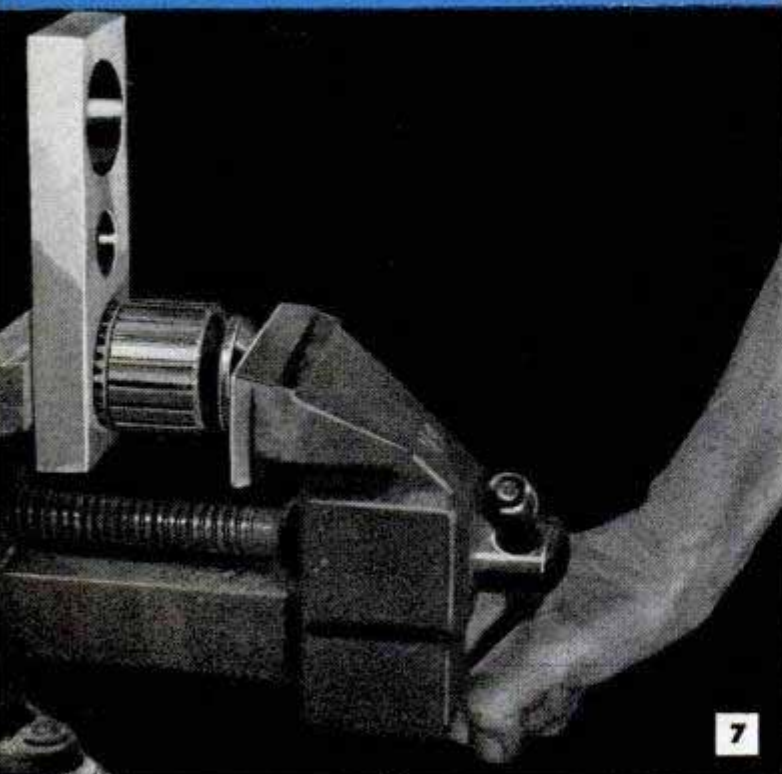
CHECK THESE DIM. BEFORE MAKING JIG

8



also can be made as separate units for each individual chuck, if desired. The units pictured were made from machining aluminum alloy, the pressure plate being set up in the lathe and bored as in Fig. 1. Before finishing the bores, check the measurements of the individual chucks at the points shown in Fig. 8, and then bore the plate and cap accordingly. Ordinarily, the holes bored in the plate should be about .005 in. larger than the diameter of the chuck body as measured just above the top end of the geared sleeve, Fig. 1.

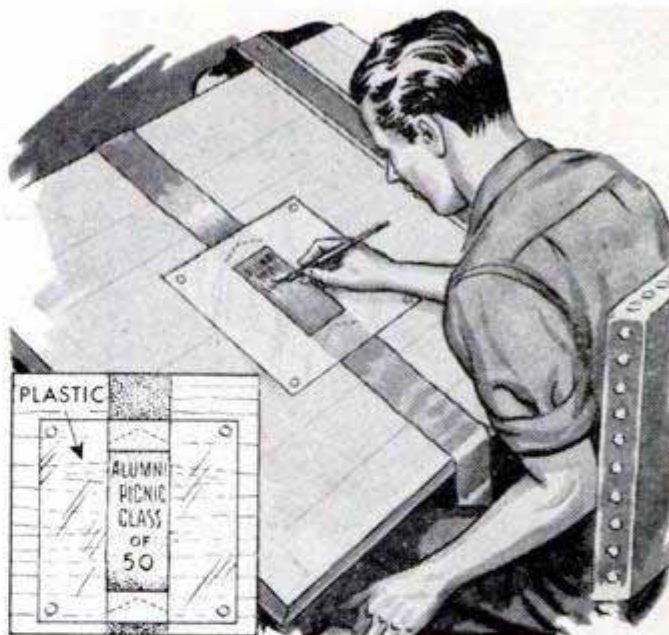
To disassemble the chuck, first detach it from the tapered spindle and run the jaws either in or out so that they are just slightly more than half closed. This is important, as otherwise the teeth on the upper ends of the jaws may not fully clear the sleeve and damage can result when the sleeve is forced off. Now, set up the jig and chuck as in Fig. 3 and tighten the vise jaws slowly until the geared sleeve is released. This exposes the chuck body so that the hardened split ring and jaws may be removed. Wash all parts thoroughly in a clean solvent, using an old toothbrush to remove hardened grease and accumulations of dirt and grit. Handle all parts carefully and take special precautions to avoid dropping them on the floor. In reassembling, after cleaning and relubricating as in Fig. 5, be sure to replace all parts in the same order and in their proper positions. Then place the pressure plate and chuck in the vise as in Fig. 7 and force the sleeve slowly back into position on the chuck body. In this operation it is advisable to use a soft-metal facing on the vise jaws to avoid burring the tapered hole in the chuck body. It should be noted that some special types of geared chucks are fitted with ball bearings and it is not recommended that these be disassembled in the manner described.



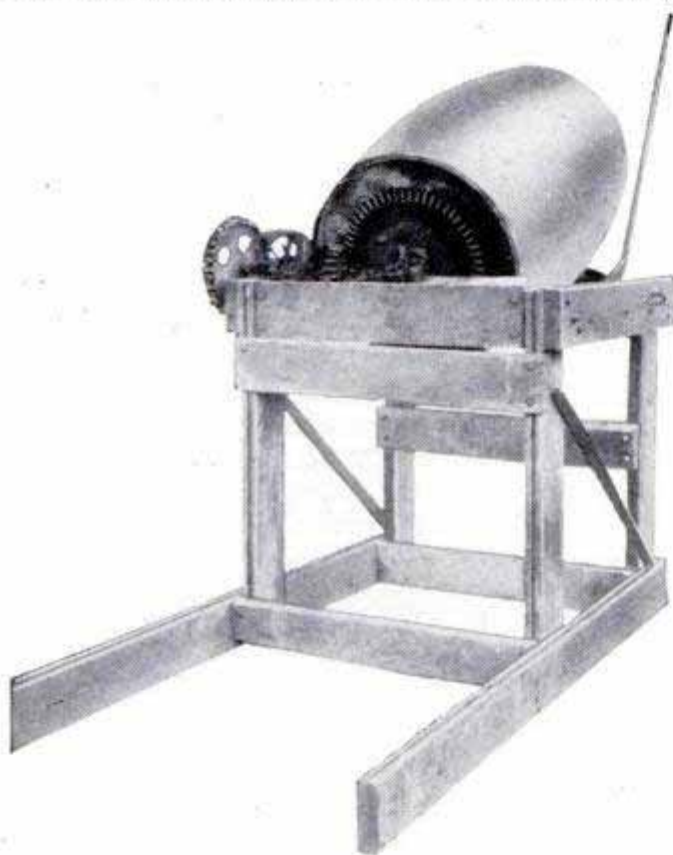


## Plastic Jig Holds Ribbon Taut For Hand-Lettering

Seeking a solution to the problem of holding narrow ribbon taut for hand-lettering with a brush, one artist came up with a simple jig, or holddown, made from thin sheet plastic, that did the trick. Two narrow slots are cut in the plastic, each one of a length slightly greater than the width of the ribbon. One slot is cut near the top edge of the plastic sheet, the other near the bottom as shown. Then the ribbon is passed through the upper slot from the underside of the sheet and pulled down through the lower slot to hold it flat and taut for lettering. After the ribbon has been inserted the plastic is fastened to the drawing board with thumbtacks.



## One Man Is Able to Load This Mixer Onto Truck or Trailer



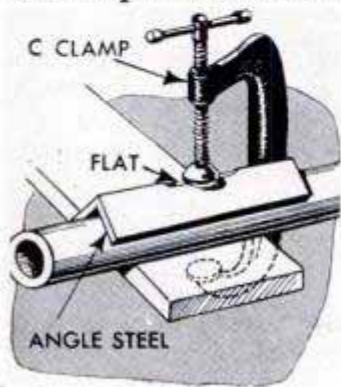
Tiring of the difficult job of loading a small concrete mixer onto a pickup truck, one contractor built a special frame for the mixer that made one-man handling simple and easy. In this case the builder used 2 x 5-in. tank staves for the frame, but any stock of similar sectional size will do. The frame is bolted together and braced for additional rigidity and is mounted on two long skids as shown. To load the unit, the truck or trailer is backed into position at the side of the mixer and the tailgate lowered. The mixer is tipped and turned so that the ends of the skids rest on the bottom of the truck bed. Then it is raised to the level position and slid forward into the truck or trailer.

## Pig Creep Built From Gates

Confronted with the problem of providing a temporary pig creep on open range without cutting new material for a permanent unit, one farmer utilized the line fence for one side and then set up three ordinary driveway gates to complete an enclosure around a conventional self-feeder. One of the gates is raised a short distance above the ground so that only the young pigs can pass underneath. Gates are wired to permanent fence posts and to heavy stakes driven into ground at corners.

## Using C-Clamp on Pipe

When clamping a piece of pipe or other round work to a flat surface, try using a C-clamp and a short length of angle steel having a flat filed on the upper edge to take the pad of the clamp screw, as shown. Considerable pressure can then be applied to the pipe without having the clamp slip out of position.



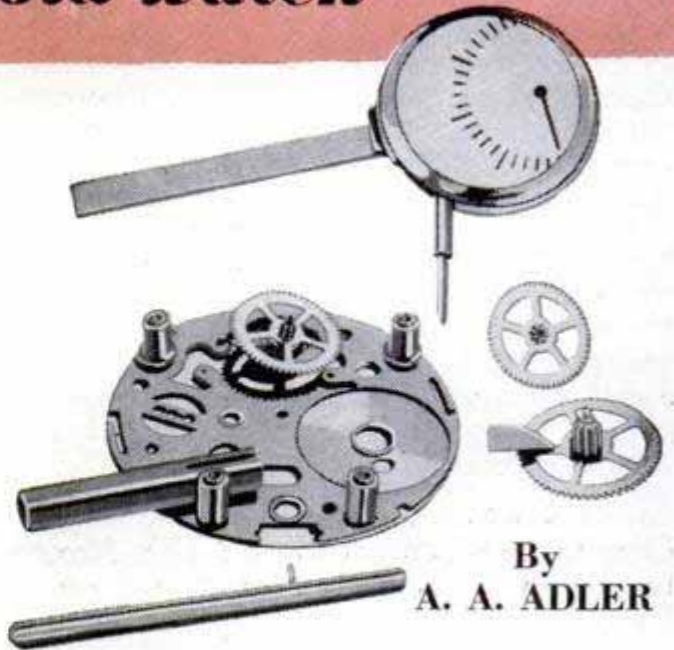


# DIAL INDICATOR

## from an old watch



Calibrate dial by clamping the instrument in tool post and setting plunger lightly against stock chucked in lathe. Move crossfeed .001 in. and mark hand movement on dial. Repeat until dial is calibrated. Hand movement can be varied by relocating pickup vane



By  
A. A. ADLER

METALWORKING craftsmen who hesitate to stand the cost of a manufactured dial indicator can make an accurate indicator from an old wrist watch or pocket watch, and the cost is negligible. First, remove all the parts from the watch case, leaving the spacer bushings intact. Save the three larger gears, hairspring, frame and case, discarding the rest of the parts. Solder a small sheet-metal pickup vane to the largest gear, as in the detail, and make the plunger and guide. Assemble the parts, as shown, and solder a mounting arm to the case back.

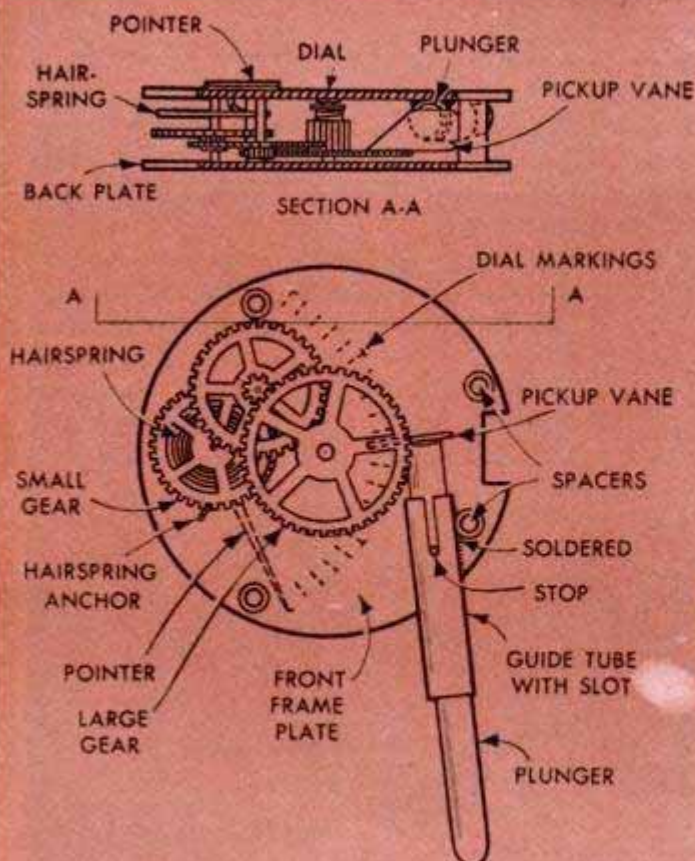
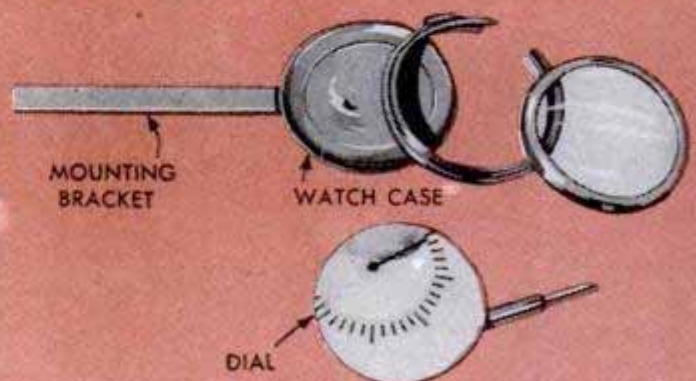
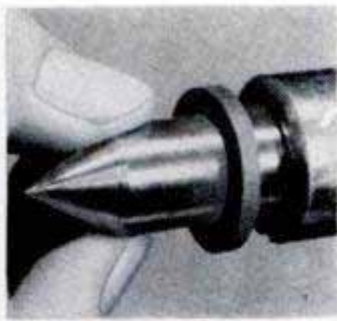


Photo above shows plunger of  $\frac{1}{8}$ -in. rod inserted in guide tube. Latter is slotted for wire stop on plunger and is soldered to plate so plunger presses against pickup vane. Dial is of heavy paper, and stiff-wire hand is soldered to shaft of small gear





## Hose Washer Protects Lathe Center



To keep the taper end of a dead center on a metal-turning lathe free of dust and grit, slip a hose washer over the center as shown and slide it against the tailstock. A guard of

this type will prove to be especially desirable when grinding or turning metal that creates a fine dust.

## Matchbox Abrasive Used as File

His car stalled, one motorist investigated and found the breaker points pitted and burned. Lacking a file of any sort, he eventually hit upon the idea of using the abrasive side of a matchbox. Just enough abrasive action was supplied to clean the points and get the car underway again.

Ed Packer, Chicago.

## Converting Lathe Dog To Safety Type

A standard lathe dog can be converted to one of the safety type by substituting a socket-head screw for the ordinary cap screw. Two screws of different lengths will furnish a choice of sizes which will permit clamping the work so that the screw will not project enough to catch in the operator's clothing.



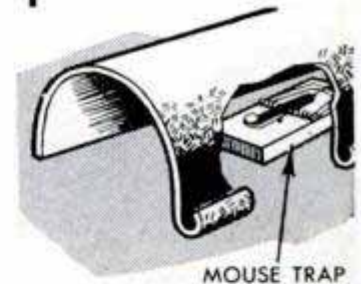
## Tire Talcum Dusted on Tube Lessens Pinching Tendencies

The possibility of an inner tube being pinched will be reduced considerably by applying tire talcum to the tube instead of dusting the tire casing in the usual manner. Spreading talcum over the entire surface of the tube greatly lessens any chance of the tube creasing when installing it in the tire, especially at the point where it contacts the wheel rim and tire beads.

John D. Bell, Los Angeles, Calif.

## Section of Eave Gutter Shields Mouse Trap

When it is necessary to set a mouse trap where it endangers poultry or small pets, invert a short section of eave gutter over the trap as shown. This will allow



mice to get at the trap but will prevent other animals or poultry from being injured. Also, the shield will increase the possibility of trapping mice, because they usually prefer to move about underneath an object, if possible.

Benton Anderson, Royal Oak, Mich.

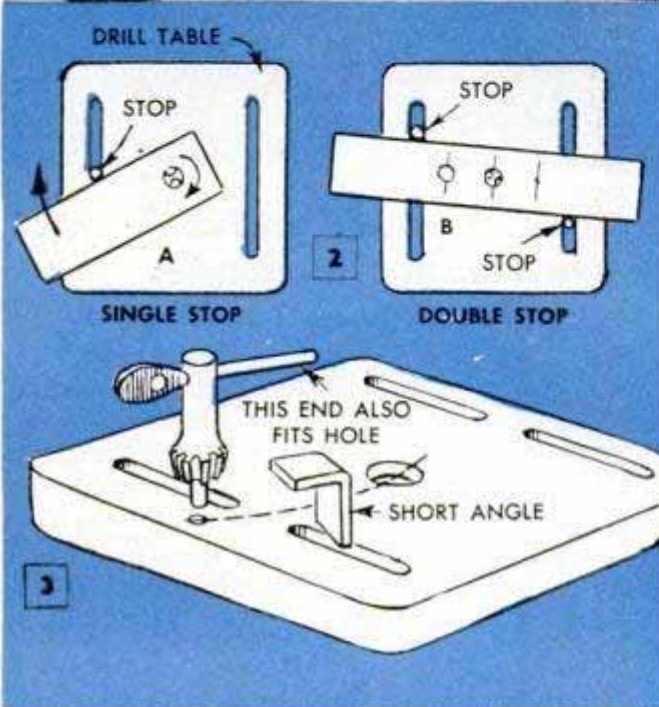
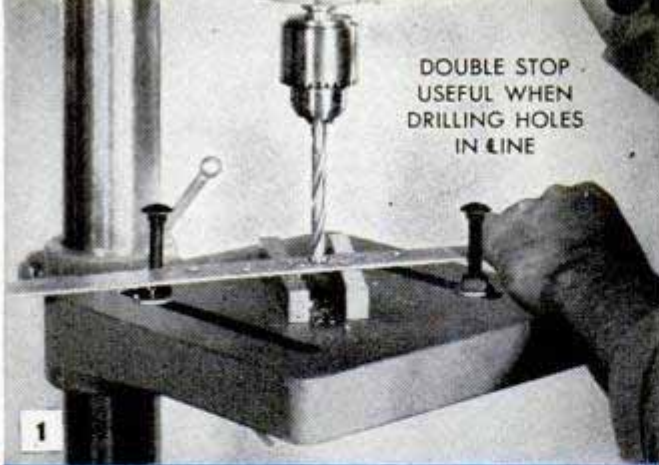
## Graphite Lubricates Drafting Tools

Applying graphite to threaded parts of drafting tools allows the adjusting nuts to spin more freely and prevents undue wear that may cause improper adjustment. The graphite can be applied simply by rubbing the threads with a pencil point. This is especially helpful in preventing "spot" wearing on the finely threaded adjustment rods of the instruments.



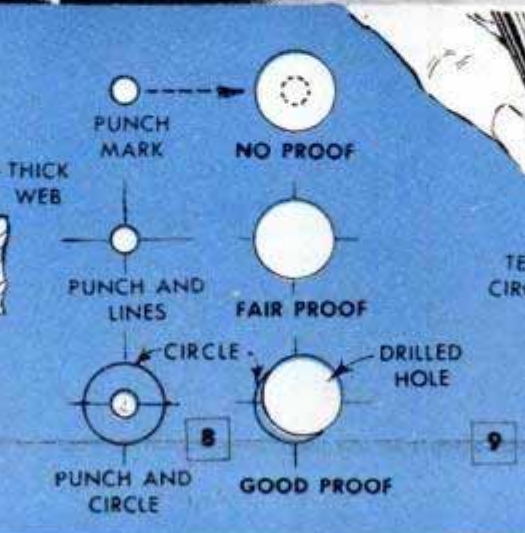
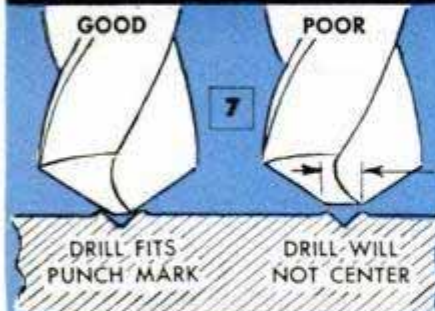
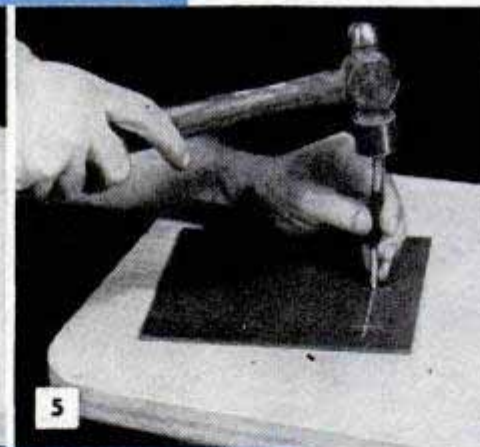
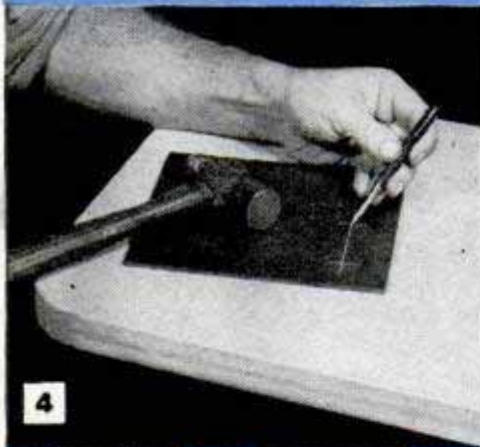
# Better METAL DRILLING

By Sam Brown



VERY LITTLE WORK can be done in metal without drilling holes. This basic operation calls for a good layout, proper mounting of the work and the use of the right drill, running at the right speed. With a knowledge of these fundamentals, you will be able to produce precision work and get the most from your drill press.

**Layout:** Drilling begins with a layout mark. A steel scriber is commonly used to draw lines marking the hole position, although a sharp pencil can be used for many jobs. The finer the scribed or penciled lines, the more accurate the layout will be. A center punch is positioned carefully at the intersection of the lines, Fig. 4, and the punch mark is then made with one hammer blow, as in Fig. 5. If a check shows the punch mark to be exactly on the intersection of the lines, it can be deepened as



Layout is usually done with a scriber. Punch mark at intersection of scribe lines centers drill and prevents walking

DRIFTING A HOLE IS EASY TO DO WITH A COLD CHISEL



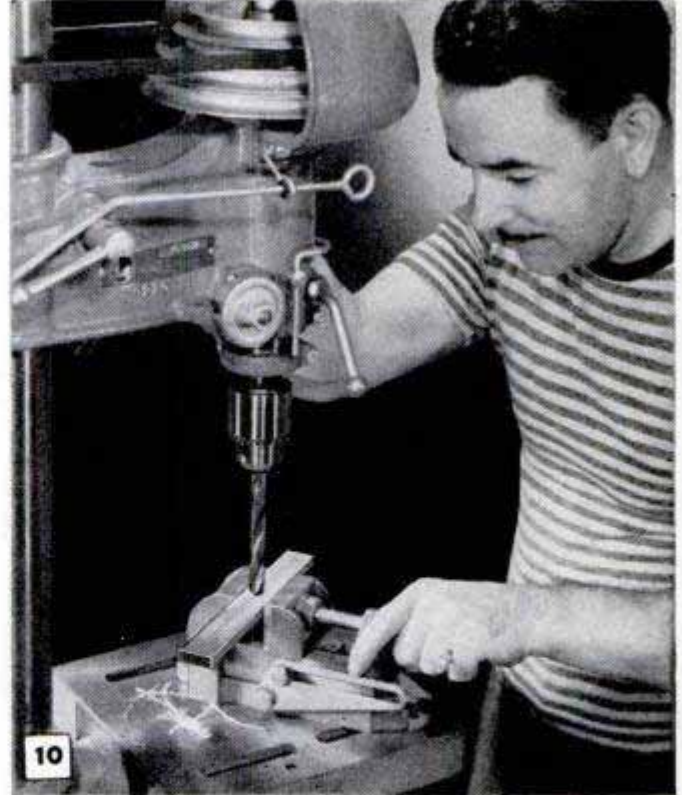
needed. If the mark is slightly off, it can be corrected by side punching, Fig. 6, finishing the job with the punch held vertically. For exacting work, a prick punch, having a 60-deg. point, is used to make the first indentation. This is followed by a center punch—one with a 90-deg. point. The punch mark must be a little larger than the web of the drill, Fig. 7, to center the drill properly and prevent walking.

Although drifting a hole is done after the drill has started to cut, it is usually considered as layout work. This is done with a cold chisel, making one or more marks in the conical recess made by the drill, as in Fig. 9. Drifting must be done before the drill starts cutting its full diameter. For accurate work, the hole diameter should be marked with dividers after prick punching, as this gives the best proof of accuracy, Fig. 8. Here you will note how easily any wander or drift can be determined merely by checking the hole with the scribed circle.

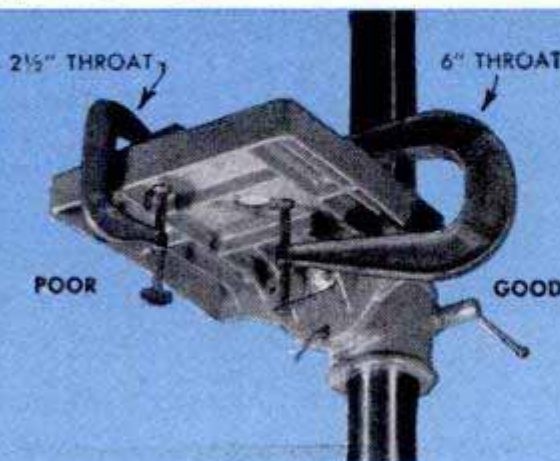
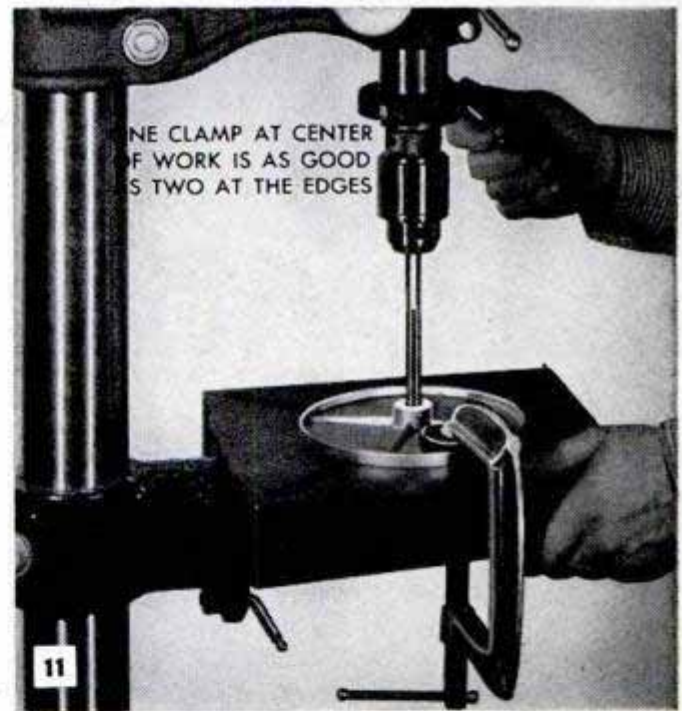
**Mounting:** The simplest mounting is the stop bolt, which has the primary function of keeping the work from rotating, Fig. 2, A. The stop is most useful when working flat bar stock. On long work, the drill column itself is often used as a stop. A double stop, Figs. 1 and 2, B, is useful for repeat work or drilling holes in line. Many gadgets are used for work stops, but nothing beats the chuck wrench itself, Fig. 3. Some drillers like a short length of angle iron, especially if the drill table has diagonal slots.

The most popular holding device is the drill-press vise. Fig. 10 and Figs. 14 to 23 show various setups for different types of work. When the work is too large for the vise, it can usually be mounted by clamping to the table. One clamp located near the drill, Fig. 11, will hold most work securely. Figs. 12 and 13 show how to attach clamps to the table for best results. Another handy device for general work is the hold-down shown in Figs. 24 and 25. The auxiliary

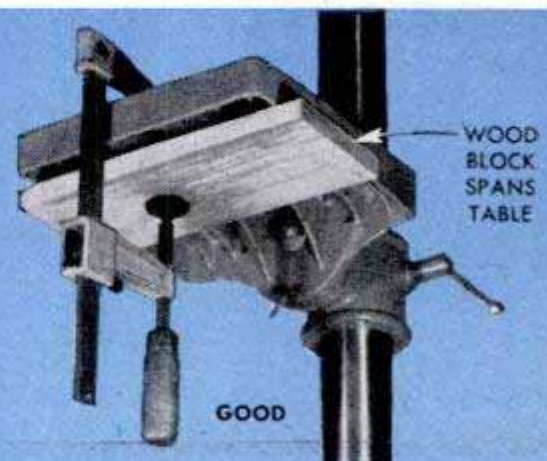
Note in photos below that clamp throat should be deep enough so jaw almost reaches center of table



Vise is handiest of work-holding devices, as weight will usually control spin of the work without stops

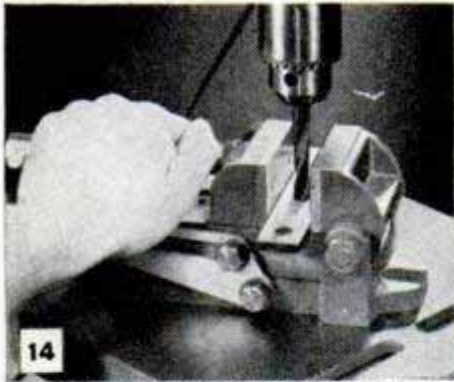


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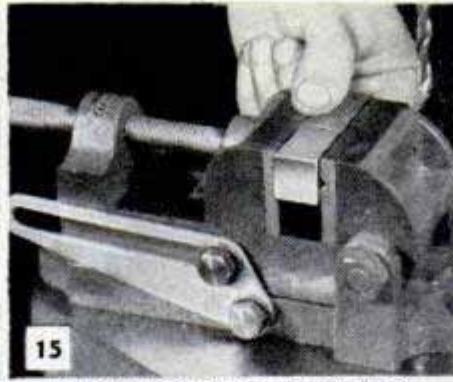


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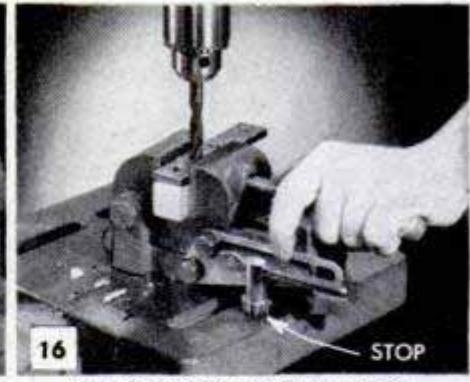




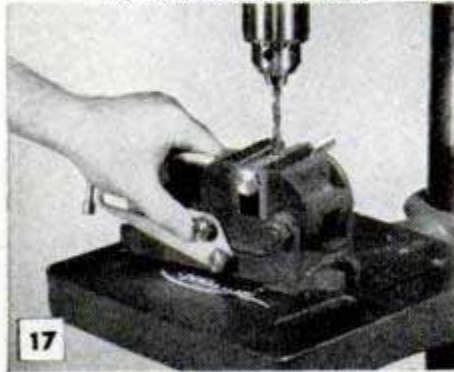
14 WORK PLACED AT BOTTOM OF VISE IS WELL SUPPORTED



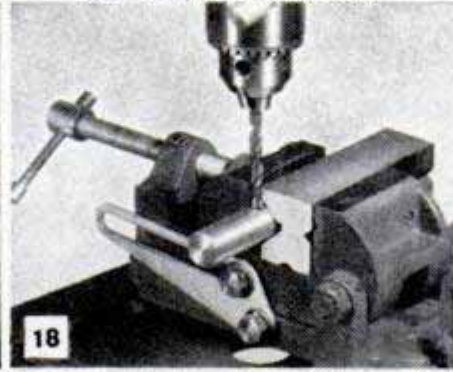
15 FLUSH MOUNTING IS EASY TO SEE—OFFERS FAIR SUPPORT



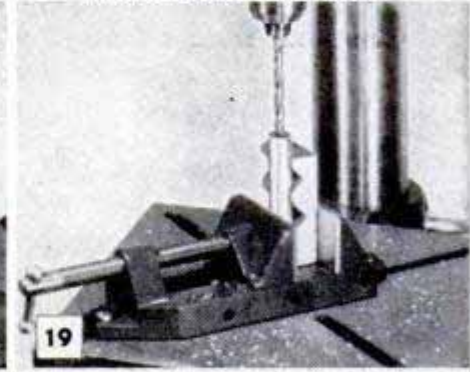
16 WOOD BLOCK PLACED UNDER WORK IS EXCELLENT SETUP



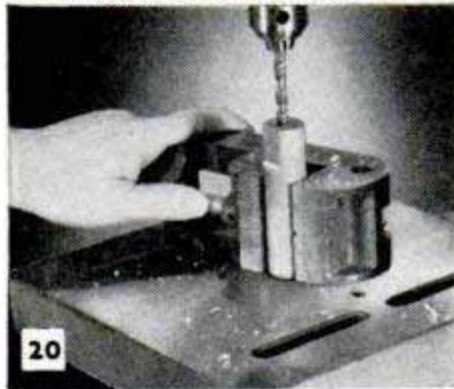
17 SMALL ROUNDS ARE GRIPPED RIGIDLY BY V IN VISE JAW



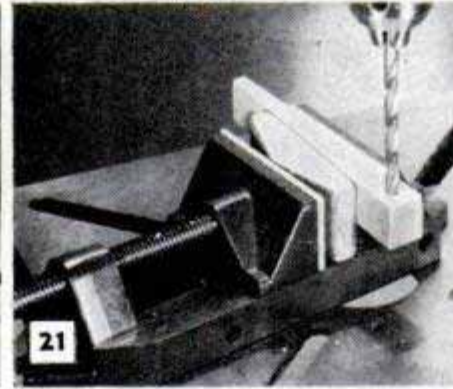
18 SEPARATE, LARGER V IN VISE IS NEEDED FOR BIG ROUNDS



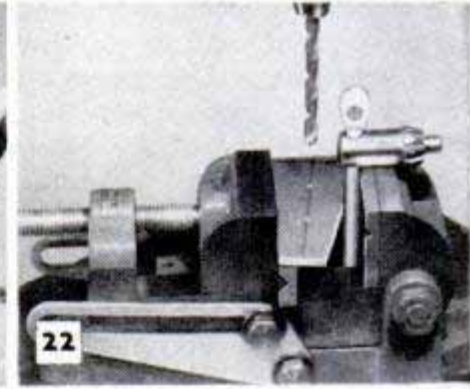
19 VISE V OR V-BLOCK IS USED FOR END DRILLING ROUND STOCK



20 PLAIN VISE CAN BE USED ON SIDE FOR HOLDING LONG WORK



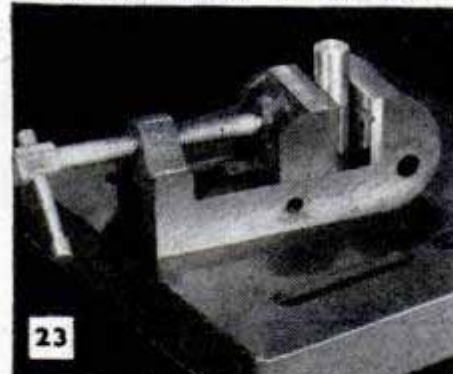
21 PIVOT JAW IS USEFUL WHEN DRILLING TAPERED OR ODD-SHAPED WORK



22 ROUND BAR IN VISE PROVIDES SAME ACTION AS PIVOT JAW

wooden table, which is favored by woodworkers, is also handy for mounting many drilling jobs in metal and, when used with a fence, as in Fig. 26, the combination is just the thing for drilling holes in line. The table is detailed in Figs. 27 and 28. Numerous other mounting methods are used, but the devices shown will handle 95 percent of all drilling jobs you are likely to encounter. With the exception of large, heavy work, which has enough weight to "stay put" by itself, every piece of metal drilled on the drill press should be held in some safe, practical manner to keep it from spinning. Never attempt to hold small work by hand. The emerging point of the bit is apt to catch suddenly and spin the work, causing painful injury. *Always clamp small work.*

**The right speed:** Use the table in Fig. 50



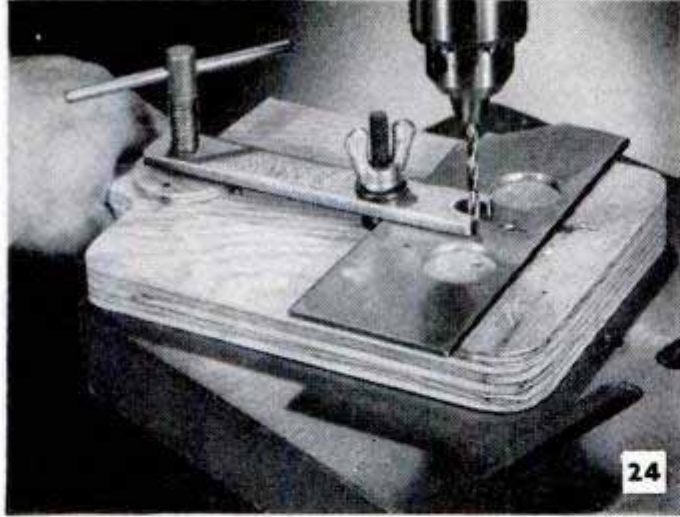
23 PLAIN VISE ALLOWS LONG WORK TO PASS THROUGH HOLE IN TABLE

to find the right speed for a particular job. The figures given are practical speeds, somewhat lower than those used in industrial practice. If you are drilling steel and do not know what type of steel it is, use the 60-f.p.m. speed listed for machine steel. This is also the best all-around drill speed for all materials. It is practical to use speeds lower than

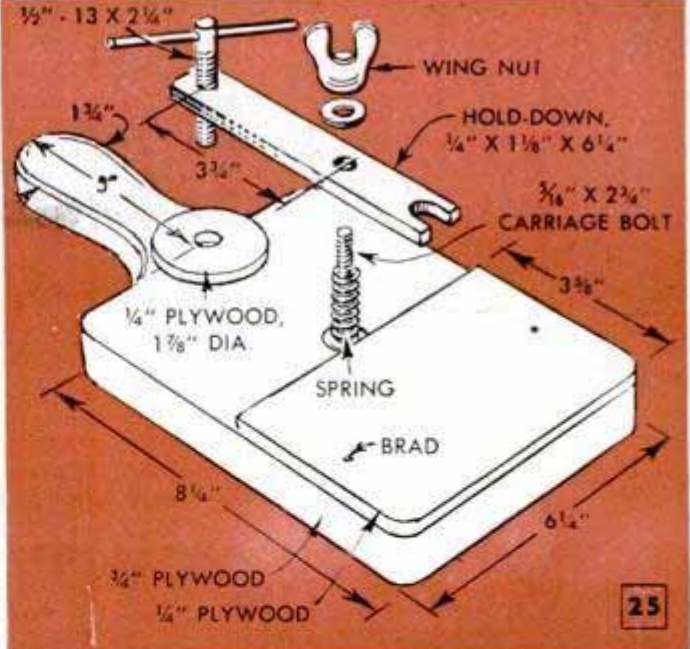
listed, provided you do not combine them with excessive pressure. Beginners frequently use a very low speed to prevent burning the drill, but then make the more serious mistake of applying too much pressure. A maximum of about 25 lbs. should be used with lever feed, but 10 to 12 lbs. of pressure is sufficient for most jobs. A pressure of 10 lbs. at the feed lever means that you are applying about 200 lbs. on the drill point.

**Best drill point:** Most work can be done





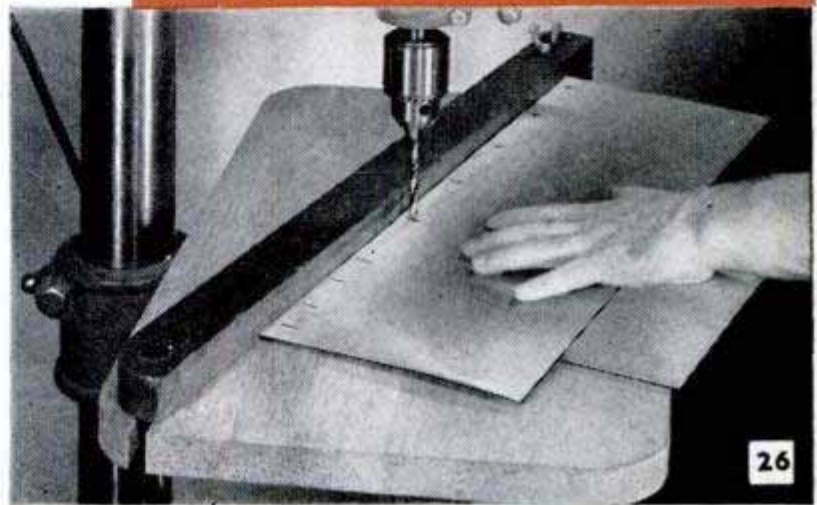
Universal hold-down, pictured above and detailed at right, takes wide variety of work. Table of  $\frac{1}{4}$ -in. plywood is pried off and replaced when worn



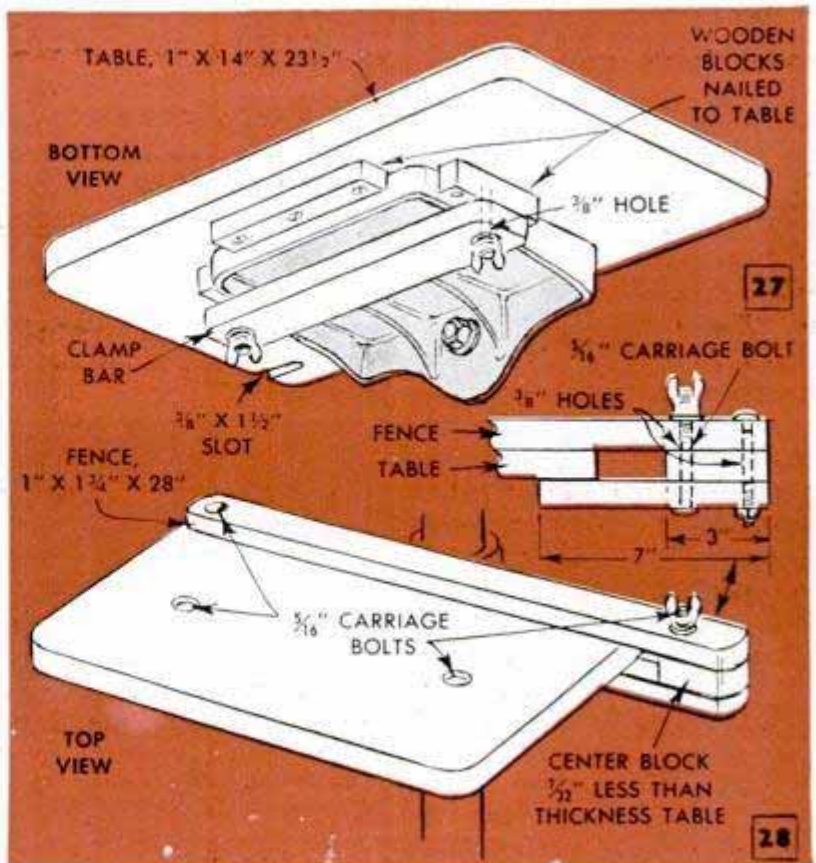
satisfactorily with the standard 118-deg. point, Fig. 51, upper left-hand detail. A noteworthy exception, however, is brass, which works better if the lips are ground to a zero rake so that they will scrape instead of cut. The other recommendations given in Fig. 51 can be used on occasion as desired. The most practical point for most sheet metal is the very blunt style shown. It results in a minimum burr on the underside of the work.

**Drilling a hole:** The actual drilling of the hole is done by one of three methods. The simplest is to go right ahead and drill with the work held freehand in some floating mount, such as a vise or a universal hold-down. A good light, preferably located behind the work, is a valuable aid. With this, you can see the drill point even when it is revolving at high speed, Fig. 52. This, of course, is of considerable help in bringing the drill and the punch mark as close together as possible. However, it is the sense of touch which actually guides the drill into the punch mark. The work should be held lightly, but allowed to float, or move freely, on the drill table until you can feel the drill enter the punch mark.

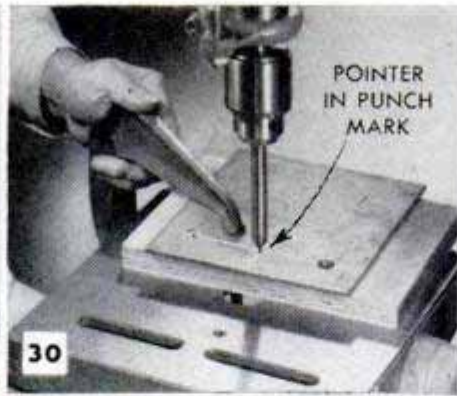
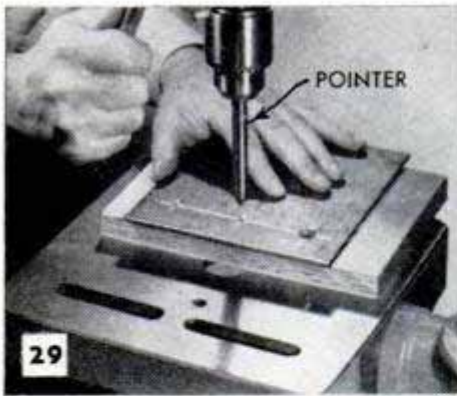
The second method is "float and clamp," as shown in Figs. 53 to 55. In this system the clamp is added after the hole has been spotted freehand by the floating method mentioned above. A third system is the pointer method, described in Figs. 29, 30 and 31. With an accurate pointer and properly ground drills, this system is very accurate.



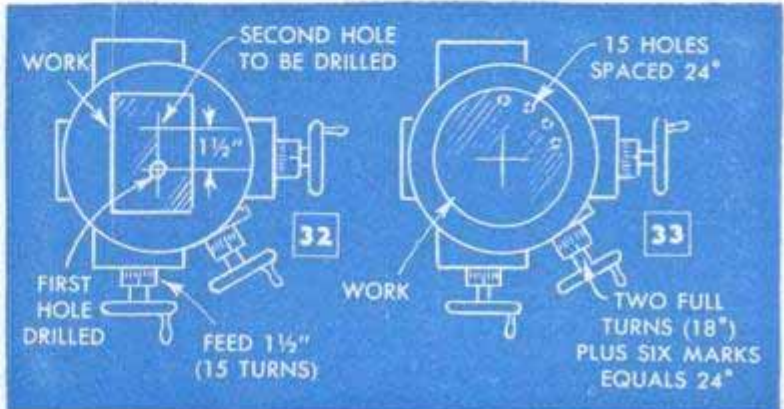
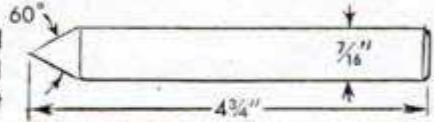
Wooden table provides a good mounting surface for many drilling jobs, as it allows support blocks to be nailed to table. Fence setup, above, is excellent for drilling holes in line







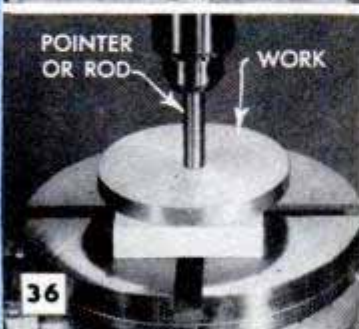
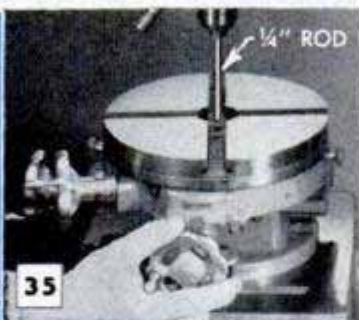
Locating bit with pointer method assures accurate work. Pointed rod is chucked in drill press, and work is positioned so point is centered in the punch mark. Work is clamped and point is replaced with bit



Bit is centered accurately to .001 in. if work is mounted on rotary table, utilizing micrometer feeds. Rotating table is especially handy for spacing series of holes on radius

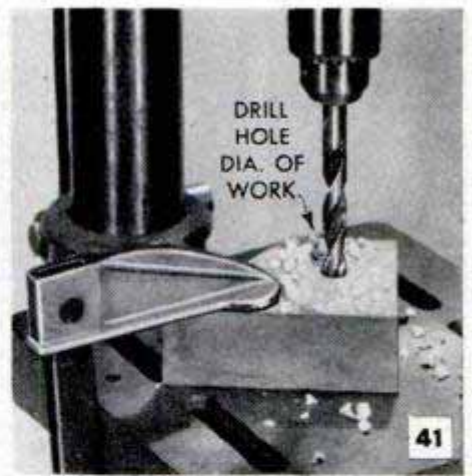
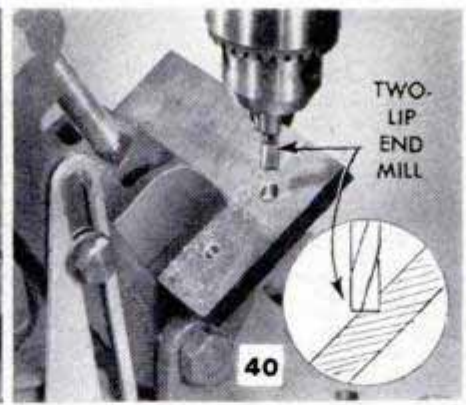
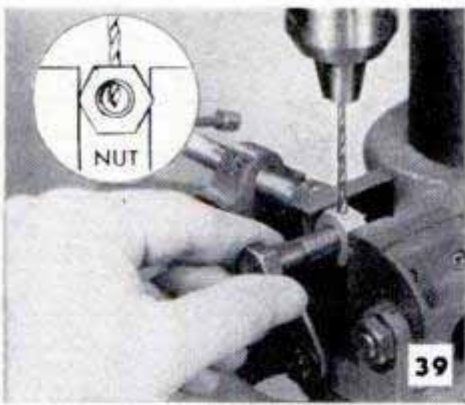
**Job pointers:** The rotary table, Fig. 34, makes an excellent mount for accurate work. Unlike other mountings, it allows the work to be clamped first and then moved to the exact position for drilling by means of micrometer feeds, as shown in Figs. 32 and 33. The rotary feature is especially useful for drilling holes around a circle, Figs. 35 to 38, as well as for circular routing or light milling. The various job setups shown in Figs. 39 to 49 are typical drilling hints which the average driller will be able to use to good advantage. Probably the most widely used technique in home-shop drilling is the double-decking of parts to be joined, as pictured in Figs. 46 and 47. An alternate to this simultaneous-drilling technique is to drill the top part alone and then clamp it to the second piece

NUMBER OF HOLES	DEGREE SPACING
3	120
4	90
5	72
6	60
7	51.43
8	45
9	40
10	36
12	30
14	25.71
15	24
16	22.5
18	20
20	18
24	15
30	12
32	11.25
36	10
40	9
45	8
48	7.5
60	6

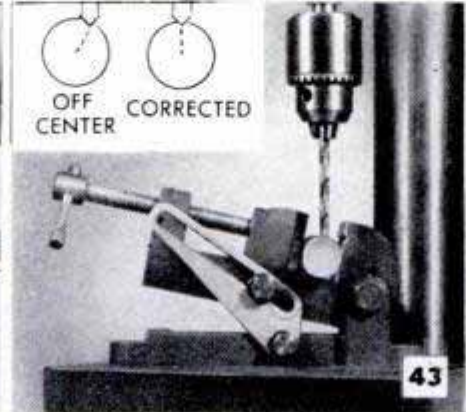


Centering work on rotary table is done by measuring from edge of table or by using pointer method. With latter method, first center table under spindle, Fig. 35. Then center work on table, using pointer or rod, Fig. 36. Clamp work, adjust table and drill

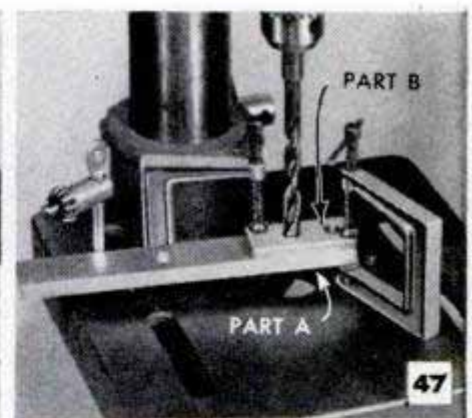
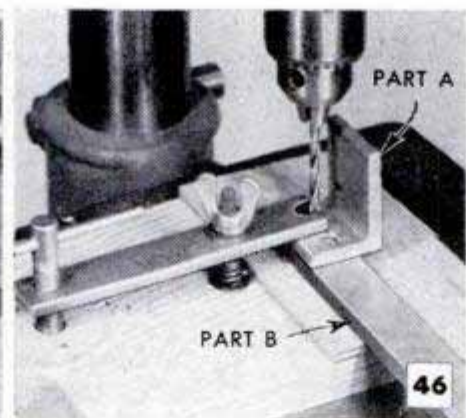
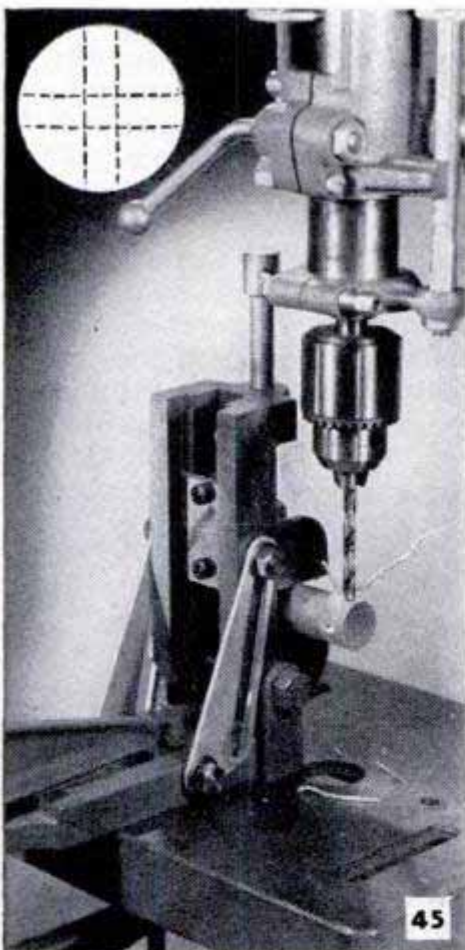




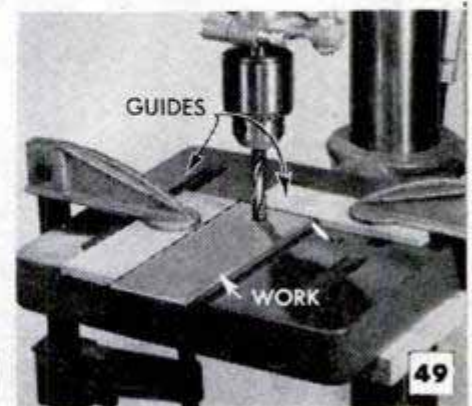
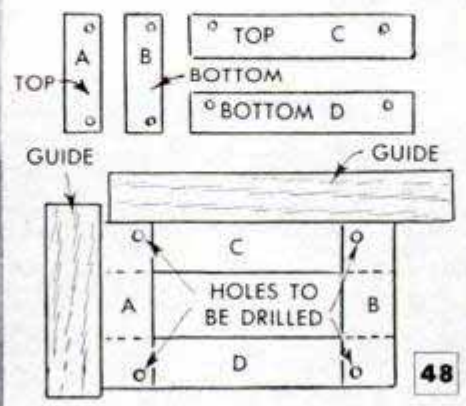
Cross drilling bolt is done easily, Fig. 39, by turning bolt into drilled nut which is clamped in vise. Bits can be started at angle without danger of runoff if a flat surface is milled on work, as in Fig. 40



Center of round work is located by sliding work under bit so surface is just scratched, Fig. 42. If angle vise is tilted slightly before drilling, runoff can be corrected by changing of angle vise, Fig. 43. Hole in end of rod is located by drilling clamped block, Fig. 41, and pressing work upright in drilled block, Fig. 44



To assure accuracy, joined parts should be drilled simultaneously whenever possible. If desired, holes can be located and drilled in top part, which is then used as guide for drilling aligning holes in bottom part

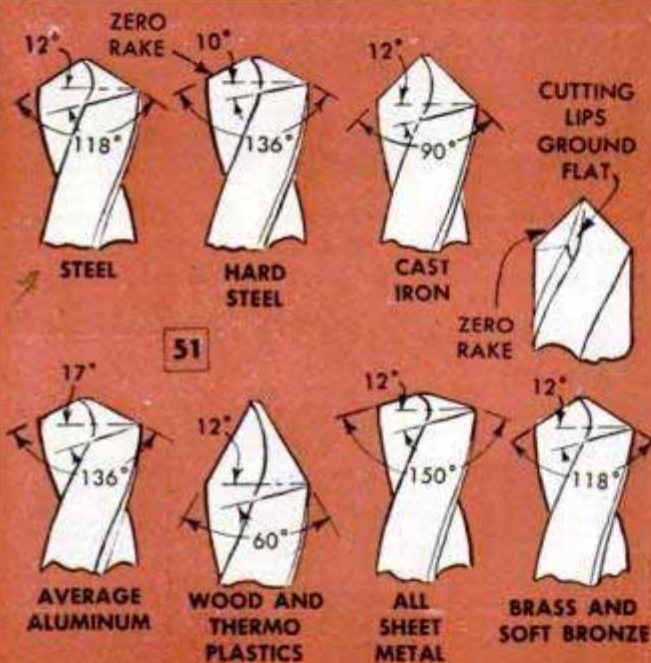


Transverse holes in round work are drilled at right angles, Fig. 45, by using scale on angle vise. Square assembly can be drilled without marking by using two guides clamped to table, Figs. 48 and 49. Parts A and B are drilled identically, as are C and D. Turning over parts B and D aligns holes for assembly



MATERIAL	FEET PER MIN.	DRILL DIAMETER											
		3/16"	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	7/8"	1"
ALUMINUM	250	15000	7600	5000	3800	3000	2500	2100	1800	1500	1200	1100	900
BRASS	200	12000	6000	4000	3000	2400	2000	1700	1500	1200	1000	875	750
CAST IRON, SOFT	110	6700	3300	2200	1700	1300	1100	900	850	675	550	475	425
CAST IRON, HARD	80	4800	2400	1600	1200	1000	825	700	600	500	400	350	300
MALLEABLE IRON	70	4200	2100	1400	1000	850	700	600	525	425	350	300	250
PLASTICS, SET	140	8400	4200	2800	2100	1700	1400	1200	1000	850	700	600	525
PLASTICS (Heat Forming)	90	5500	2700	1800	1300	1100	900	800	700	550	450	400	350
STEEL, SOFT	80	4800	2400	1600	1200	1000	825	700	600	500	400	350	300
STEEL, MACHINE	60	3600	1800	1200	900	725	600	525	450	375	300	250	225
STEEL, TOOL	50	2700	1500	1000	700	600	500	425	375	300	250	225	200
STEEL (Hard Stainless)	30	1800	900	600	450	350	300	250	225	175	150	125	125
WOOD	300	18000	9000	6000	4500	3600	3000	2600	2200	1800	1500	1300	1200

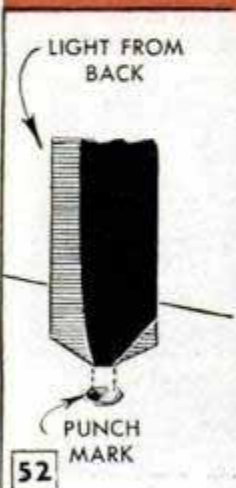
USE ONE HALF SPEED GIVEN FOR CARBON DRILLS. WHEN A LUBRICANT IS USED, SPEEDS CAN BE INCREASED ABOUT 25 PERCENT. ALWAYS USE ACTUAL DRILL SPEED NEXT UNDER FIGURE GIVEN.



These are best points for various materials, 118-deg. point being suitable for most jobs

to serve as a guide. When clamping is not practical, one of the holes in the second piece should be carefully marked and drilled, after which the two parts can be bolted together for additional drilling. Note how the chuck wrench has been used to provide a stop to prevent the work from spinning when the bit breaks through.

The use of guide jigs is just the opposite of the technique of double-deck drilling. Work drilled with guides is done singly by the piece, the guides assuring proper hole location in each part. The most common example of this work is the right-angle joint or any combination of similar joints, such as a square frame, Fig. 48. In work of this kind, pieces A and B must be the same size and pieces C and D must be the same. Then, by turning the pieces over and end-for-end, all holes can be drilled with the same guides and will align perfectly when assembled.



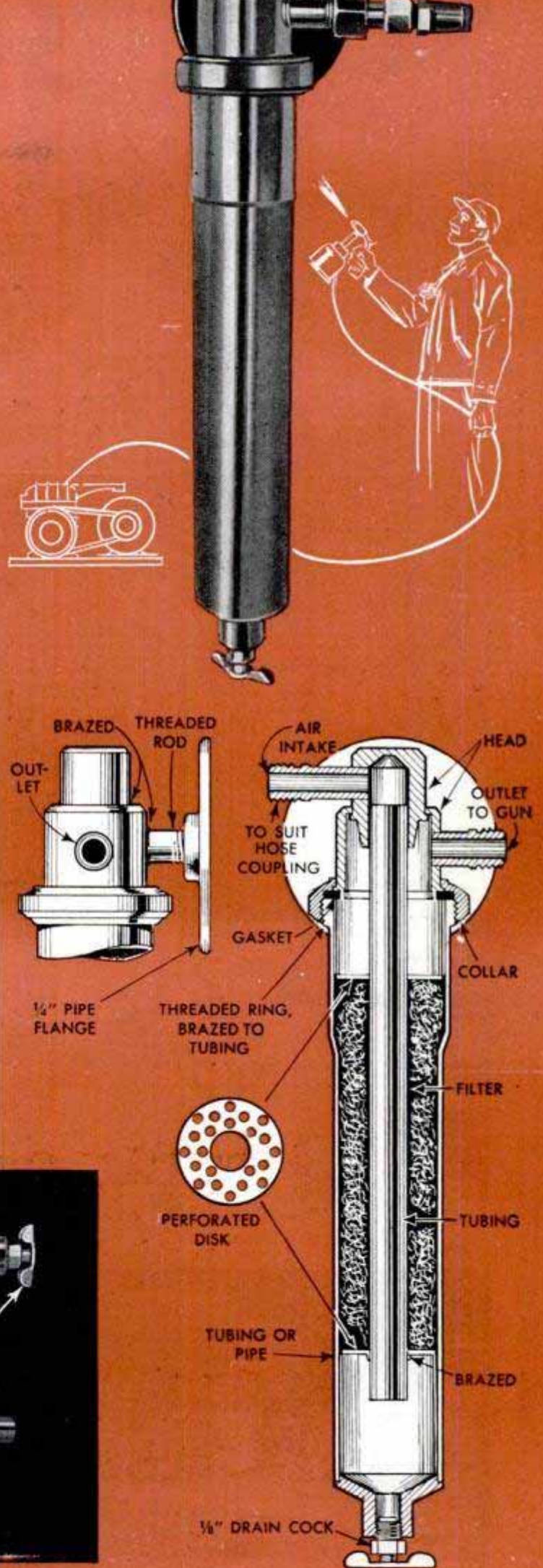
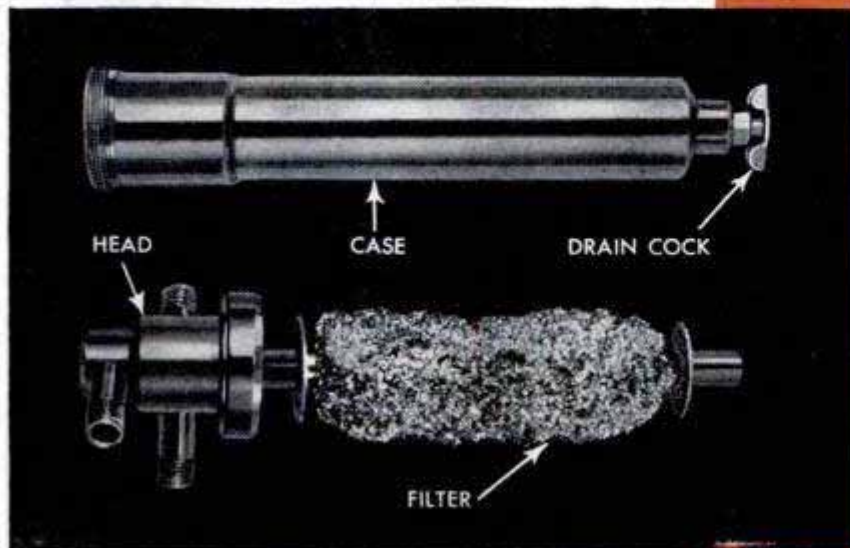
Float-and-clamp is common method of centering drill. Work is held lightly by hand, with press running, until bit finds center, Fig. 53, and then clamped to table for finish drilling, Figs. 54 and 55. Back-lighting drill aids in centering on punch mark



# SPRAY-GUN WATER TRAP

By E. J. Andrews

IF YOUR paint-spraying compressor does not include a built-in water trap, you can be sure of better finishing jobs by making this efficient water and oil extractor from odds and ends. Installed in the airline, the unit will not only trap droplets of water but the filter will condense any mist, keeping condensation in the gun to a minimum. For best results, the extractor should be installed as close to the gun as practical, as higher temperatures near the compressor will cause some water vapor to pass through the extractor and then condense in the line or gun. The extractor can be fitted with a pipe flange for convenient mounting on the shop wall, or mounted on an upright for use outdoors. The extractor consists of a head, filter and a brass case emptied by means of a drain cock at the bottom. The case can be made from a length of 1½-in. brass sink-trap tubing, which is already threaded and fitted with a compression collar and gasket, or ordinary brass tubing can be used and a collar turned to suit. Although parts of old radiator valves were used for the head of the original unit, this can be improvised from pipe fittings or turned from brass stock. Dimensions are not important, the only requirement being that the intake tube carry the air below the filter and that all joints are tight enough to prevent air leaks. The filter material is held in place around the intake tube with a perforated sheet-metal disk at each end. Brass or copper scouring pads provide excellent filters, as they do not become waterlogged and will not deteriorate. Worn nylon hosiery or cotton waste also can be used, but this material must be replaced periodically.

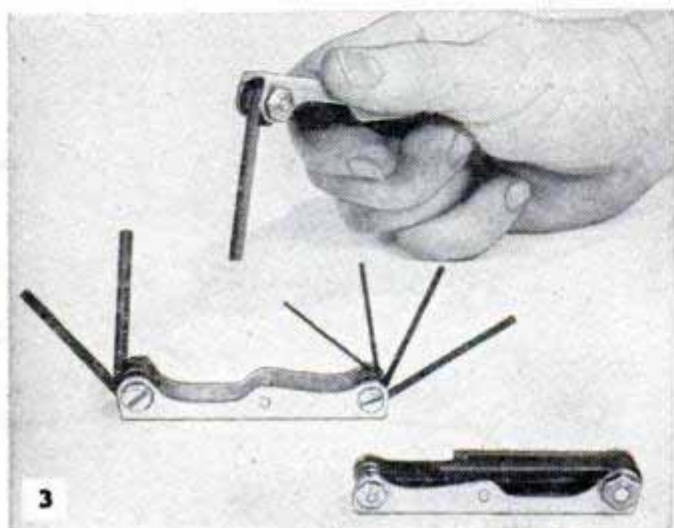




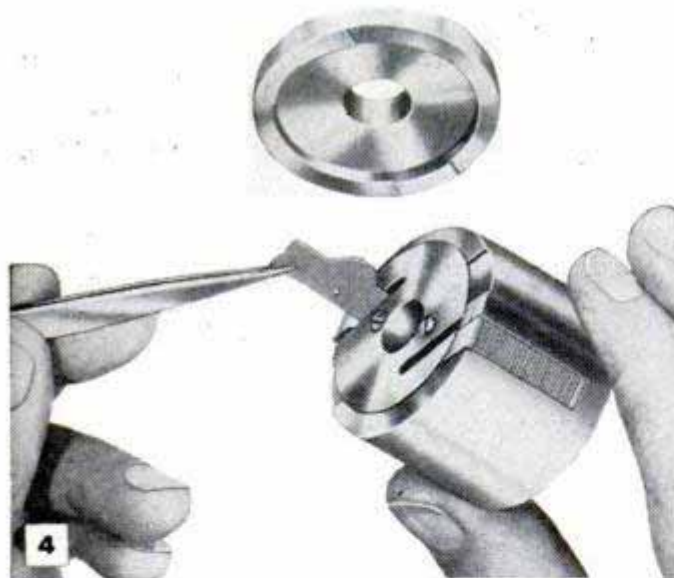
# SHOPPING



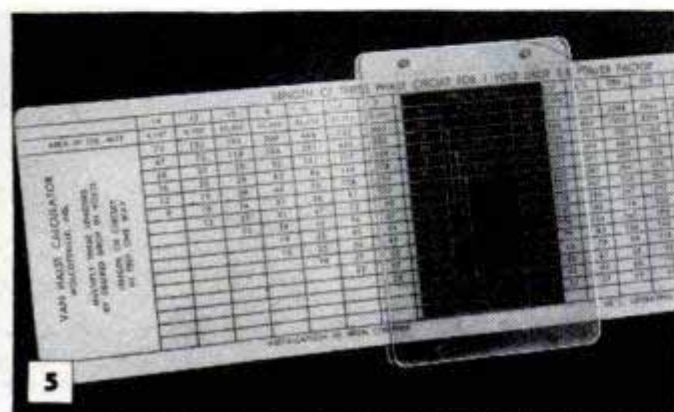
1



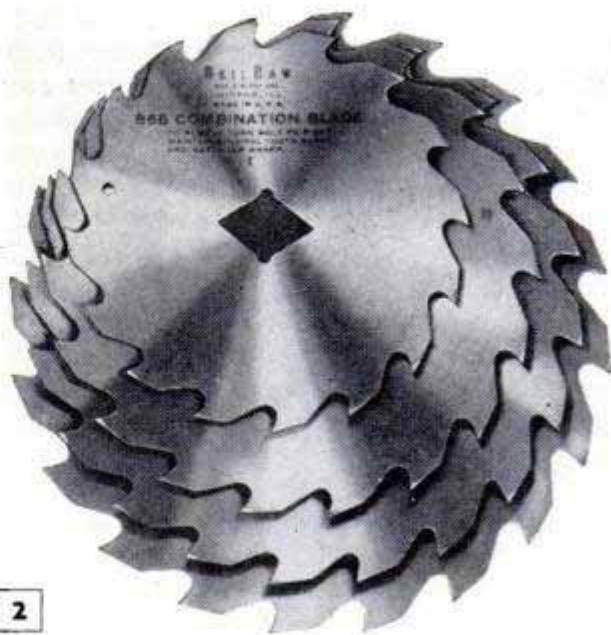
3



4



5



2

**WING-TYPE BIT** for drilling plastic at high speeds has recently been made available. Bit has a straight shank for use in drill press or portable drill. Round-bottomed grooves ground in each cutting edge break the chips uniformly, aid in quick dissipation of heat and prevent "creeping" of the cutting edges when drilling deep holes. Shallow holes are drilled with clean, sharp edges. The bit is available in a range of sizes

**CHISEL-TOOTH** circular-saw blades for use in portable electric handsaws cut clean and fast in both hard and soft woods. Special shape of the tooth gives the cutting edge sufficient backing to withstand the heaviest work and to hold a cutting edge over exceptionally long periods of time without sharpening. Blades are tensioned to stand up without danger of breakage under the heavy twisting strains of freehand operation

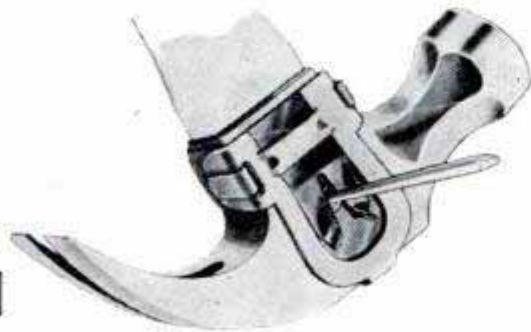
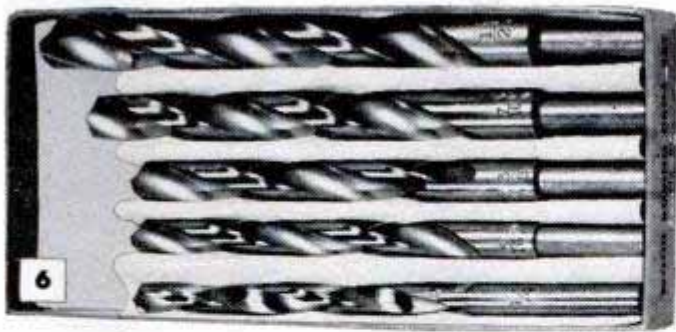
**COMBINATION WRENCH** for socket-head setscrews has the six most commonly used sizes nested in a convenient handle made sufficiently sturdy to withstand normal torque applied to the largest size wrench included in kit. As shown in the photo, the six separate wrenches are pivoted at the ends of the handle and fold down flush when not in use. Folding feature permits wrench to be used in close quarters

**SHAPER HEAD** is fitted with knives which are adjustable to conform to the desired molding contour. Each "knife" consists of a number of thin, chisel-edged cutters which are arranged side by side in a row in the special head. Each knife is set to contour of molding it is desired to duplicate and locked in head. Specially designed locking clips hold setting. After knives are locked in head, unit is placed on shaper spindle

**VOLTAGE CALCULATOR** that works in a manner similar to a slide rule has been made available by a well-known manufacturer of electrical equipment. Made pocket-size of durable materials, the calculator consists of a scale in tabular form over which a sliding plastic window may be moved to whatever position necessary in calculating values or electrical characteristics. Especially useful to electricians and assemblers



# FOR TOOLS



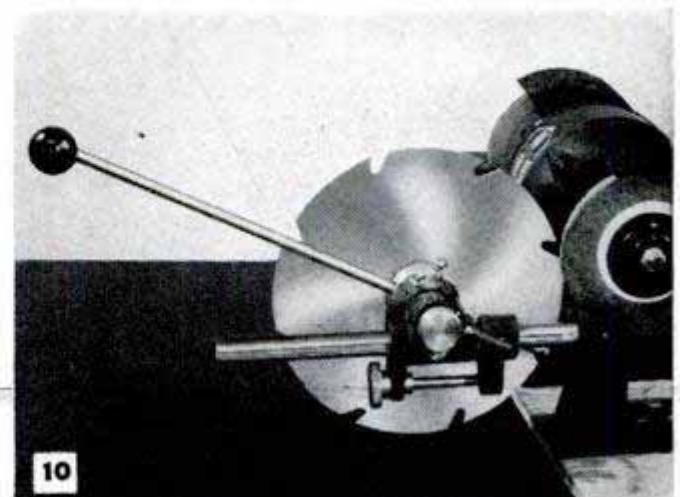
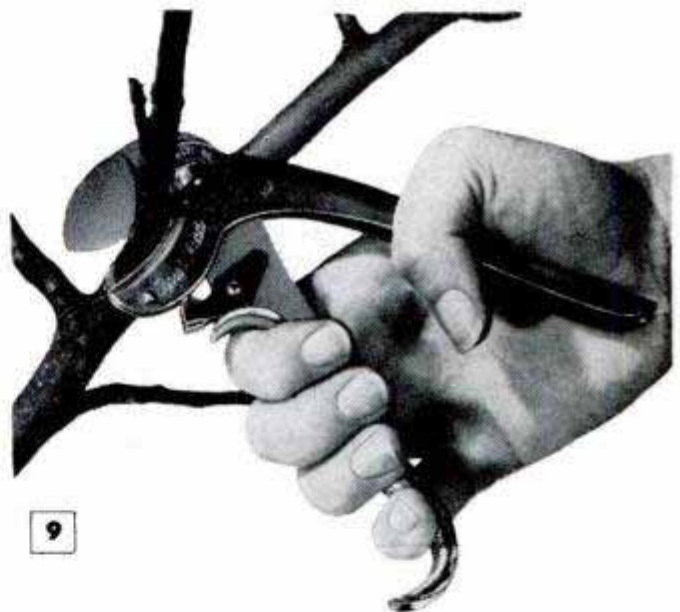
**TWIST DRILLS** made especially for use in small portable electric drills greatly extend the work range of the portable drill by making possible high-speed drilling in both hard and soft woods. Special shape of the flutes clears chips readily at high speeds and, in deep holes, eliminates tendency of ordinary drills to clog and burn wood. Supplied in kits containing five sizes ranging from  $\frac{1}{4}$  to  $\frac{1}{2}$  in. Drill sizes have  $\frac{1}{4}$ -in. shanks

**CLAW-HAMMER ATTACHMENT** permits one-hand starting of nails in hard-to-reach places. Unit is attached to the hammer eye by means of a metal strap. A V-notched spring clip holds the head of the nail firmly against the flat surface of the eye as the nail is started by a light, sidewise blow of the hammer. After the nail has been started, the hammer is detached from the nail by a slight downward movement

**EARTH-AUGER ACCESSORY** for a chain saw is now supplied as an attachment for the portable gasoline-driven units used by farmers, lumbermen and linemen. The auger comes complete with all parts necessary for bolting to the chain-saw power unit and is provided with handles for two-man operation. Forms a clean, round hole in the hardest earth in a few minutes' time. Quickly detachable from drive unit

**PARROT-HEAD PRUNER** gets its name from the unusual shape of the pruning head, which has been designed for easy operation in several positions. Angle of the cutting head with the plier-type handles gives a powerful leverage for clean cutting of large, tough twigs in dormant trees and shrubs. Lower handle is provided with curved finger stops and a return spring and lock for locking the handles in the closed position

**SHARPENING JIG** for the new "cut control" saw blades having widely spaced teeth is provided with special stops which permit accurate grinding of the blade rim to conform to the required depth below the cutting circle of the teeth. This is important as on smaller blades of this type points of the cutting teeth project only .020 in. above noncutting rim of the blade. Unit bolts to bench top at right of bench grinder







### Adjustable Outboard Ground Shoe Protects Combine in Rough Fields

To prevent damage to his combine when harvesting grain in terraced fields, one farmer fitted a wide, steel ground shoe directly under the outboard divider. Closely spaced holes in the supporting bracket permit the shoe to be adjusted for the correct height so that the sickle and divider will ride over terrace ridges and other obstructions without digging in and causing waste of grain and possible damage to the machine. The shoe is also an aid in maneuvering the machine about small fields and over grassed waterways.

### Tractor-Tire Valve Stems Protected With Sheet-Metal Guards



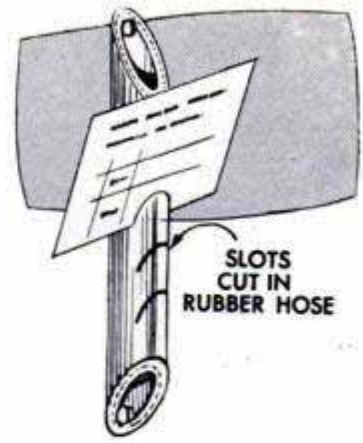
A sheet-metal guard, mounted on each wheel of a tractor or wagon, will keep the tire-valve stem from being chewed by hogs or knocked off in stubble. The removable guard is bent to fit over the valve stem, leaving enough room to insert the air-hose nozzle when inflating the tire. One end of the

guard is drilled so it can be held in place with a wheel lug, and the other end is bent to engage the wheel flange.

☐ To reflect light on a car motor for repairs, paint the underside of the hood white.

### Holder for Job Tickets

A suitable holder for job tickets in a garage or shop can be made by cutting a series of evenly spaced slits in a length of radiator hose. To make the holder easy to screw or nail on the wall, taper each end of the hose.

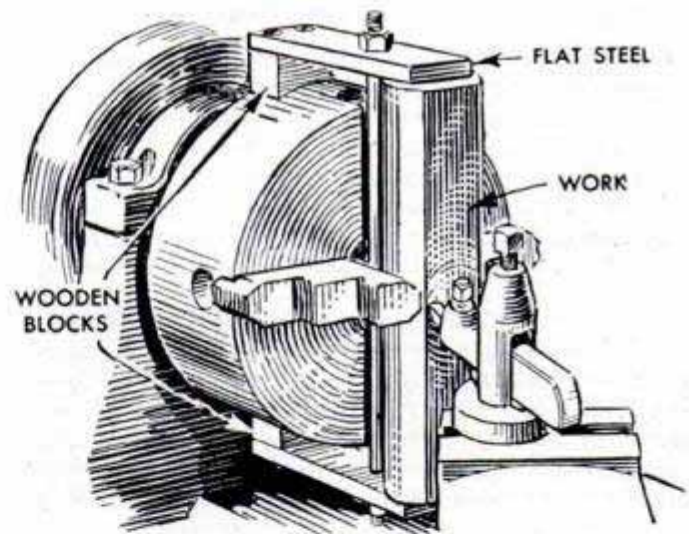


### Test Shows Polarity of Electric Wires

For determining the polarity of electric wires, stick the ends of the wires into the freshly cut side of a raw potato. Once inserted, the positive wire will have a purplish discoloration form around it, whereas clear, frothy bubbles will appear around the negative wire.

### Auxiliary Clamp on Lathe Chuck Increases Capacity

When having to face bar stock that is slightly greater in length than the capacity of a four-jaw lathe chuck, the chuck still can be used by mounting the work as



shown. Remove two opposite chuck jaws and cut two wooden blocks to fit the body of the chuck on which they rest. These blocks support two flat-steel pieces that serve as jaws to grip the work. Each jaw is drilled for a 1/4-in. clamping rod, threaded at each end to take a nut. The work is clamped in position by tightening one of the nuts, and the two chuck jaws are run in to center the work and give additional support. The maximum length of work that can be mounted in this manner is limited only by the clearance between the chuck and the lathe bed.

C. W. Woodson, Miami, Fla.



## TV-Set Data for Servicemen

KEEPING your television serviceman fully informed on TV receivers of all makes is a major operation. There are approximately 50,000 of the country's top television-service technicians who are responsible for the maintenance of the nation's millions of TV receivers. In a large measure, these technicians depend upon an organization of highly trained specialists equipped with unusual facilities to analyze electronic and electromechanical devices, such as radio and television receivers. They compile and collate their electrical and mechanical specifications, delineate the devices graphically, and finally publish complete technical information and instructional service data on each manufacturer's model. These individual "Photofact" folder sets are issued every month.

Large diagrams and pictures plus full voltage and resistance charts speed up work. Photo A shows a new TV-set model going through a thorough preliminary checking. This unique field service, that no manufacturer would care to attempt in such detail for each new model on his production line, helps him through his service organization, and independent servicemen, to keep his product in good working order.

Photos B and C show views of the laboratory and art sections of the organization which supplies this specialized data to the well-equipped TV serviceman such as the one shown in photo D.



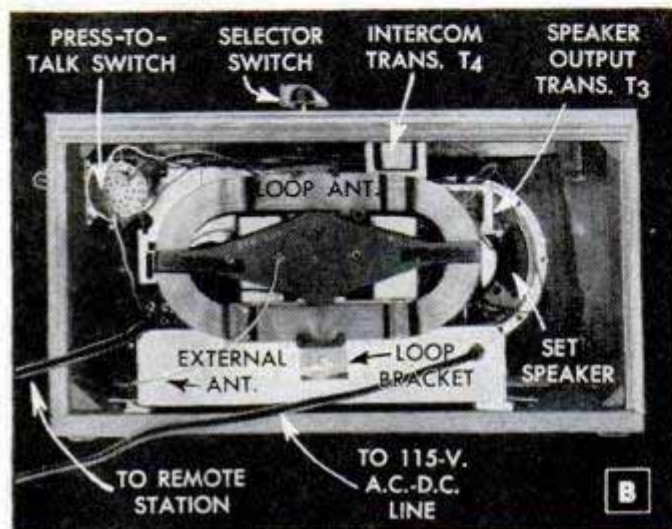


# "LITTLE GIANT" RADIO-INTERCOM

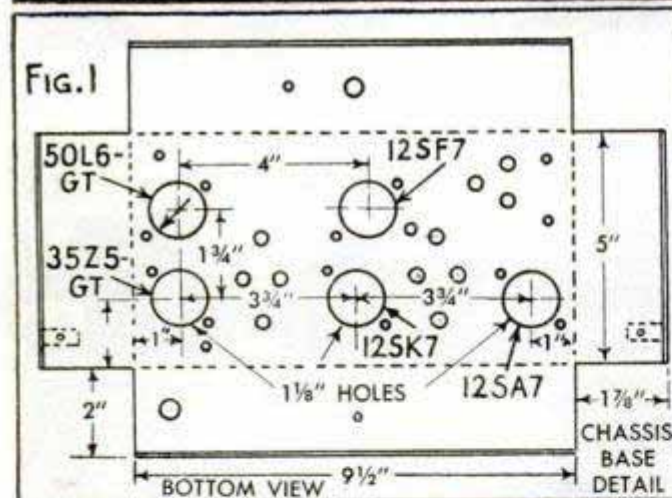
By Lothar Stern



A



B



**B**EGINNING with the March 1934 issue, a special construction article for radio students and experimenters has been the popular annual "Little Giant." This home and classroom project for March 1952 is another in the popular series that is designed for advancing students and experimenters who are looking for an unusual circuit application that will serve a useful purpose and, at the same time, test the builder's ability. It is not intended for the beginner.

This new 1952 model combines an intercom system with a favorite a.c.-d.c. five-tube superheterodyne receiver circuit. The set circuit is the standard five-tube line-up with the exception of the 12SF7 which replaces the 12SQ7 usually employed. This change was made because the 12SF7, being a diode-pentode combination, provides greater gain than is obtainable from a diode-triode tube such as the 12SQ7. The added gain is needed because the voltage output of a speaker used as a microphone is much less than the output of a second detector in a radio, thus requiring more amplification. The volume of both the radio and intercom can be controlled with the regular set volume-control potentiometer.

When an intercom system is combined with a good radio receiver it becomes an instrument of pleasure as well as a utility. If you have ever wanted your radio in two places at once so that you could go about your work in other rooms and still listen to your favorite programs without turning up the volume of your set to a point where it would disturb the neighbors, this combination unit solves the problem. Mother can send children's programs to the nursery, or listen in on their activities. It becomes an electronic baby sitter at night when the parents are playing cards or viewing television downstairs. It also provides a private line from the living room to the basement workshop or the garage.

## RESISTORS

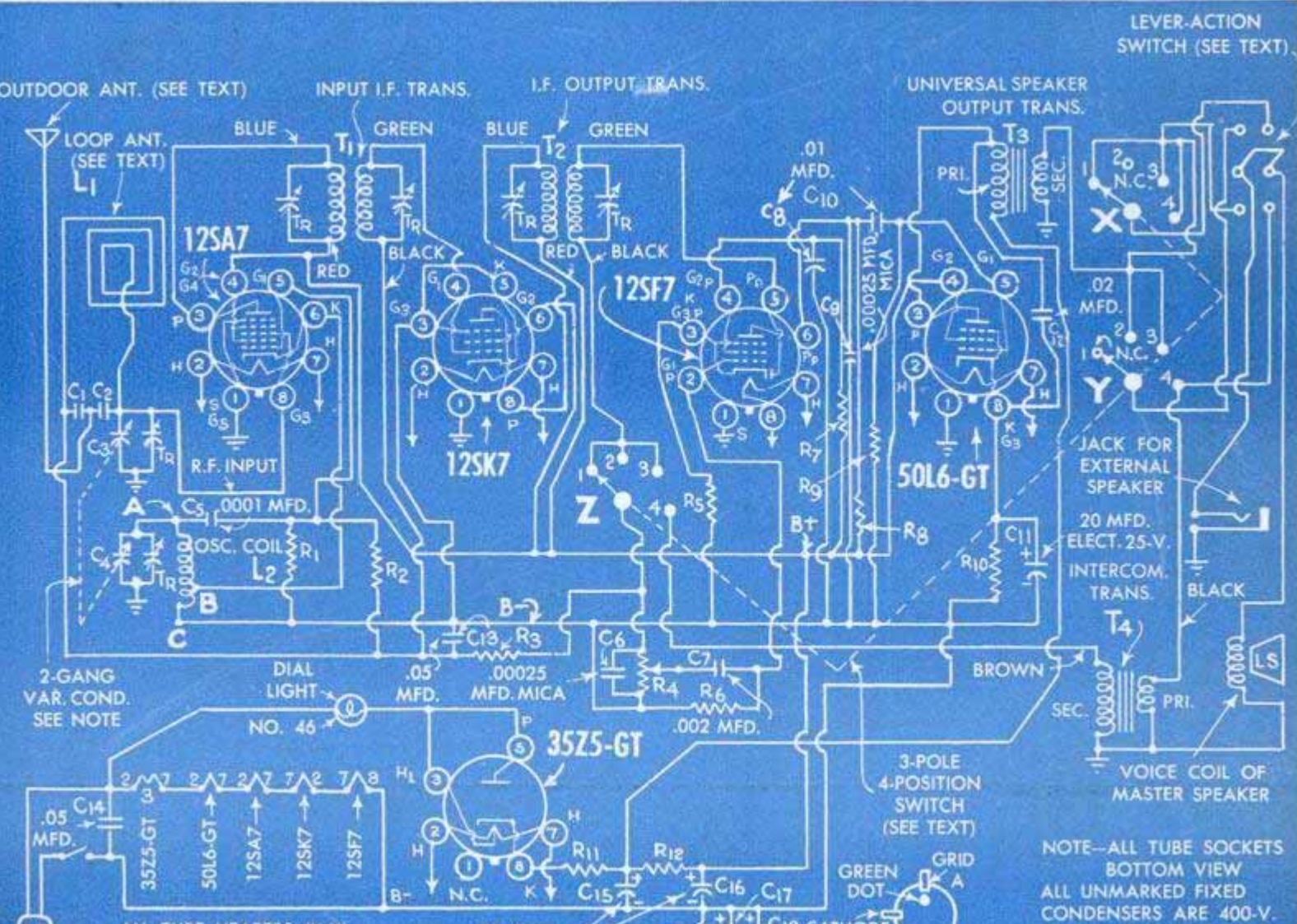
- R1=22,000-OHM, 1/2-WATT, CARBON
- R2=15 MEGOHMS, 1/2-WATT, CARBON
- R3=2.2 MEGOHMS, 1/2-WATT, CARBON
- R4=500,000-OHM VOL. CONTROL MALLORY U-48, TAPER No. 1 WITH S.P.S.T. SWITCH
- R5=3900-OHM, 1/2-WATT, CARBON
- R6=2.2 MEGOHMS, 1/2-WATT, CARBON
- R7=1-MEGOHM, 1/2-WATT, CARBON
- R8=470,000-OHM, 1/2-WATT, CARBON
- R9=470,000-OHM, 1/2-WATT, CARBON
- R10=150-OHM, 1/2-WATT, CARBON
- R11=100-OHM, 1/2-WATT, CARBON
- R12=1000-OHM, 1-WATT, CARBON
- R13=220,000-OHM, 1/2-WATT, CARBON



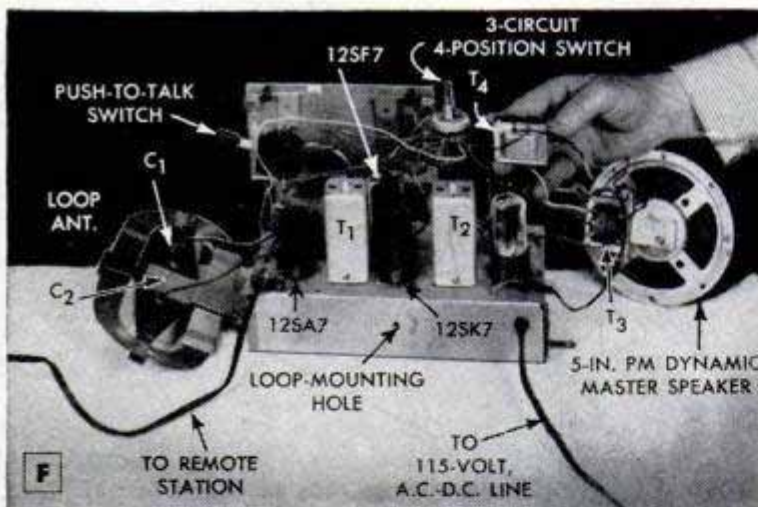
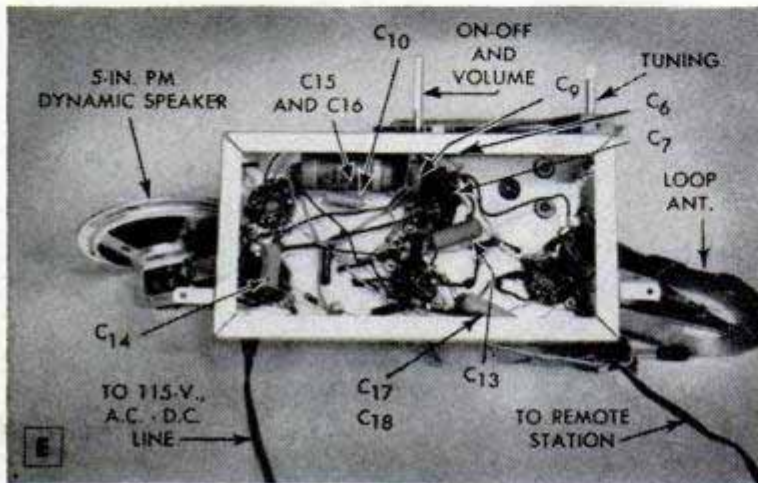
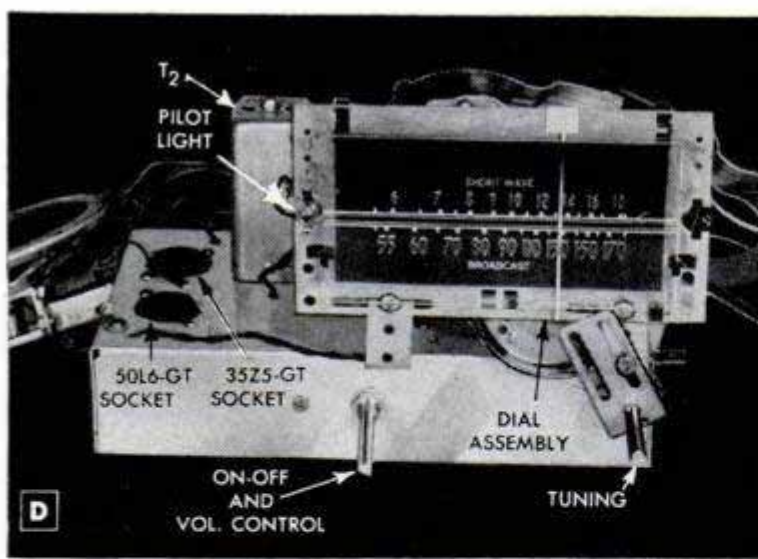
# SYSTEM FOR EXPERIMENTERS



**NOTE—**  
 C3=27-PLATE, 431 MMFD. R.F. SECTION  
 C4=19-PLATE, 170.7 MMFD. OSCILLATOR SECTION  
 TR=TRIMMERS 2-17 MMFD. (BUILT IN)  
 (THIS 2-GANG VARIABLE CONDENSER IS A STANDARD SUPERHET TYPE)  
 L2=MEISSNER OSC. COIL TYPE 14-1033  
 T1=MEISSNER INPUT I.F. TRANS. 16-5712  
 T2=MEISSNER OUTPUT I.F. TRANS. 16-5714  
 T3=STANCOR UNIVERSAL OUTPUT TRANS. A-3850  
 T4=STANCOR INTERCOM TRANS. A-4744  
 C1=10 MMFD. CERAMICON; C2=3 MMFD. CERAMICON (FOR SINGLE LOOP ANTENNA)—SEE TEXT







into a two-station intercom system, with the remote speaker acting as a microphone. By pressing the lever-action switch downward, the speaker in the set becomes a microphone and the person at the remote station can hear your voice. The speakers are both 5-in. PM dynamic types having 3.2-ohm voice coils. These list in parts-house catalogues for less than \$2.00 each. The connecting cord for the remote station is ordinary rubber-covered lamp cord, soldered to a two-lug terminal strip mounted on the rear of the set chassis, one lug being grounded on the set chassis. This grounded side of the connecting cord is common with the grounded side of the open-circuit jack mounted on the rear of the remote-station speaker case. The line, of course, terminates in an ordinary speaker plug that goes in the jack.

The complete circuit diagram appears in Fig. 2. All grounds indicated are chassis grounds. Use rosin-core wire solder for all circuit connections. Keep all grid and plate leads as short as possible and well separated to prevent feedback. The two-gang variable tuning condenser C3 and C4 is shock-mounted at three points by means of rubber grommets and fiber spacers as indicated in Fig. 4. The condenser is fastened to the chassis with 6-32 machine screws 1/2 in. long after a washer has been inserted between the head of the screw and the grommet. The frame of this variable condenser must be connected to the chassis base by means of a piece of flexible wire braid.

The loop antenna used in the model is a single loop with a condenser network so that an outdoor antenna can be attached for distant reception, if

(Continued to page 272)

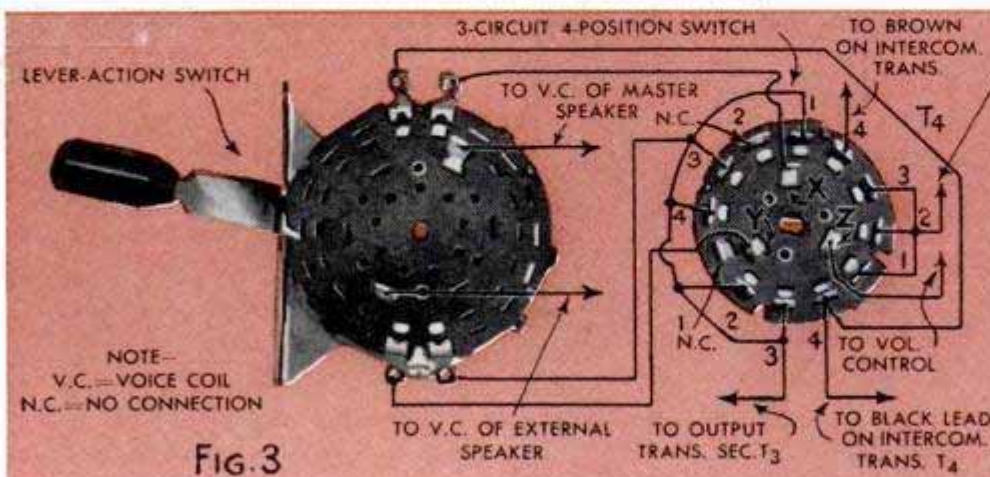


FIG. 3

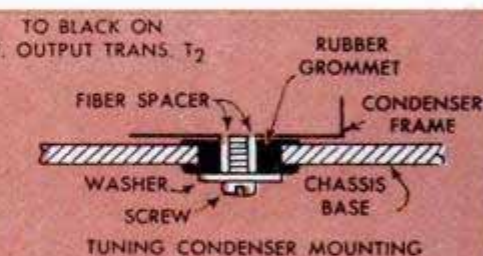


FIG. 4

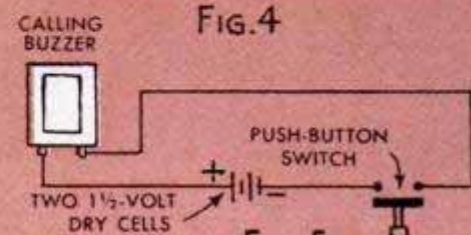


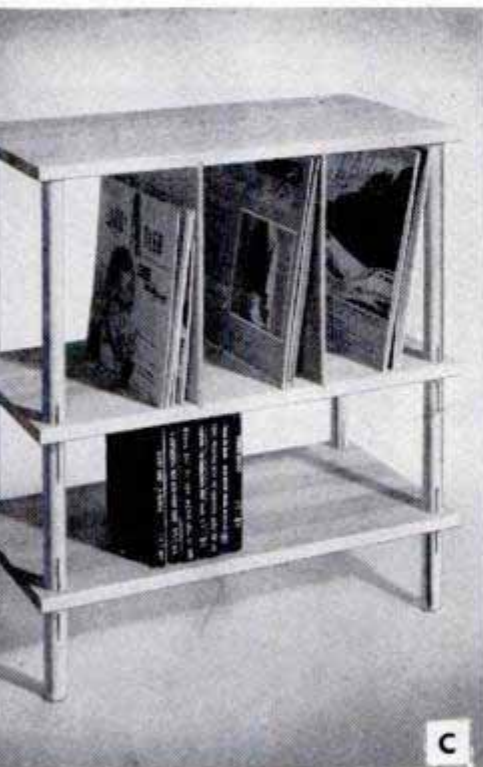
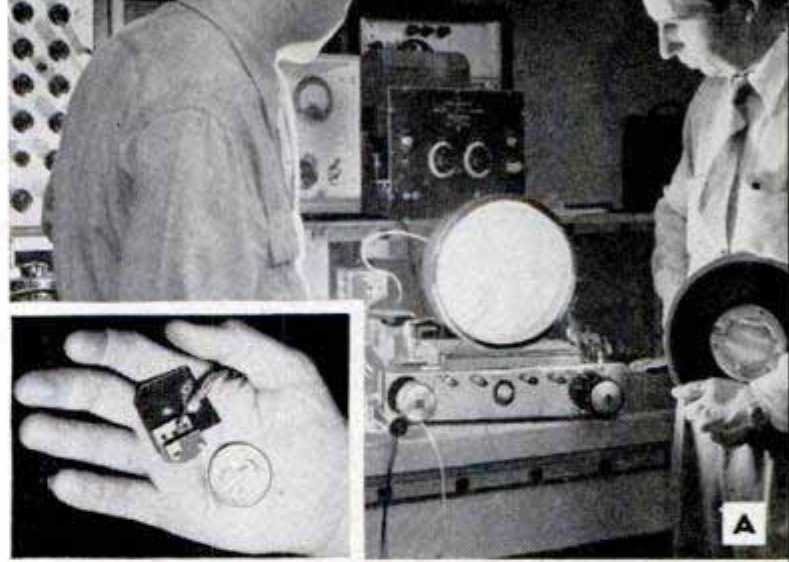
FIG. 5



# TV and Electronics Today

NOW THERE IS a device for putting moving pictures on a tape exactly like a sound recording. Wayne R. Johnson (left) and John T. Mullin, electronic engineers, photo A, are the codevelopers of this unit which is claimed to have important military applications. The inset photo shows the tiny "brain," or lens, of the device. With this new electronic marvel, air photography could be transferred directly to tape which can be instantly retransmitted to the ground and received on an ordinary TV receiver without costly delay of developing and processing film. The engineers claim that it will in time eliminate all film from the movie and television industry.

The nation's newest and largest ocean liner, the SS *United States*, will provide its passengers with meals cooked electronically by microwave energy through the use of two Radarange units in the ship's galley. One of the units is shown in photo B. Owners of record players, especially the small table types that do not provide record-storage compartments, can now assemble one of the Space-Maker record-storage units illustrated in photo C. Anyone can assemble it in about 15 minutes. The first big-screen portable television receiver employing a 14-in. picture tube to appear on the market is the Motorola 14P1. The new portable, shown in photo D, is housed in a wood cabinet covered with simulated leather, and employs either an indoor or outdoor antenna. Photo E shows a large Schmidt-type plastic lens, designed to make a giant television picture for a theater screen look as sharp as it would on a living-room TV set.



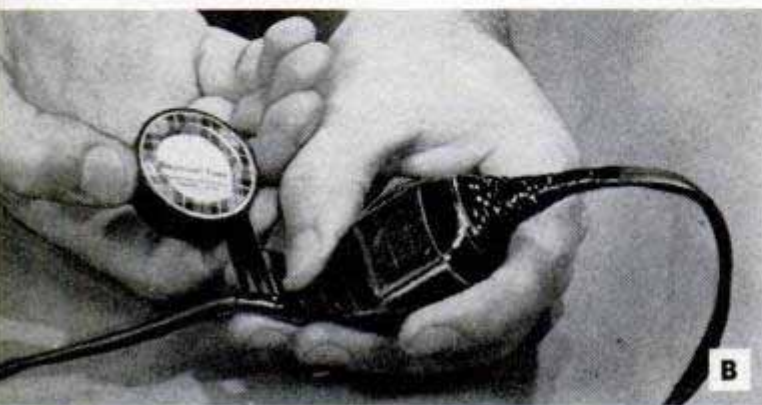


# HINTS FOR RADIO WORKERS



**A**

**A**—Civil-defense workers and others using FM two-way radiophone pack units have always faced the problem of conserving the dry batteries that are necessary for portable operation. A new flexible pack-set power-supply unit makes it possible to operate these radiophone units from either a 117-volt a.c. line, or a 6-volt d.c. primary power supply. The semifixed station application illustrated shows this compact power-supply unit mounted on the wall



**B**

**B**—No. 33 Scotch electrical tape is an approved wrap for splices in electrical wiring. It is resistant to oil and water. Its stretchiness allows it to conform well in making extension-cord splices and for insulating wear spots on switches and plugs as illustrated

**C**—A new method for marking the identification on conductors of various electrical wiring systems does away with metal and fiber tags. The compact marking machine operates like a typewriter. An electric heating unit brands a deep, permanent imprint of the characters and symbols in either black or blue



**C**

**D**—Metal detector employs two search coils. Small coil is intended for detecting smaller metal objects while the larger coil shown has greater depth range for bulky objects or deposits. It is claimed to be free from false detection from various types of vegetation, certain changes in soil conditions, as well as moisture

**E**—Modular radio cabinet, used in the Chemical Division of the General Electric Company, has as its basic module a simple rectangular case. With a change of dial knobs or other extraneous parts, the appearance of several different plastic designs can be achieved. Eight different cabinet designs result

**F**—Improved vacuum-tube voltmeter now available in kit form for radio workers and experimenters. The compact cabinet is 4½ in. deep, 4-11/16 in. wide and 7¾ in. high. Top-quality precision resistors are employed in the multiplier circuit. The unit has extremely wide coverage and calibrates on both a.c. and d.c. Scales indicate ohms, volts, and DB. It also has a zero set mark for alignment of FM radio receivers



**D**



**E**



**F**





## PERFECTIONIST . . .

A real mechanic . . . a born mechanic. To you a job that is "all right" just isn't good enough. You demand perfect workmanship in materials and tools. And you are quick to recognize the work and products of other perfectionists.

Bonney wrenches are the work of such men. That is why mechanics call Bonney wrenches America's finest — unmatched for lightness, strength, balance, and precision.

Bonney wrenches are the pride of the men who make them . . . the pride of the men who use them.



The perfectionist is exemplified in the men who build and service the planes and engines that have made such names as Consolidated, Douglas, Lockheed . . . Pratt & Whitney Aircraft, Wright . . . United, Pan



HASTINGS PISTON RINGS

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BUT OH SO

# Gentle

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**GENTLE** on cylinder walls

are *tough* on oil-pumping.

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# HASTINGS

## STEEL-VENT PISTON RINGS





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readers know that they get smoother performance and quick starts when worn-out spark plugs are replaced with

# AUTO-LITE SPARK PLUGS

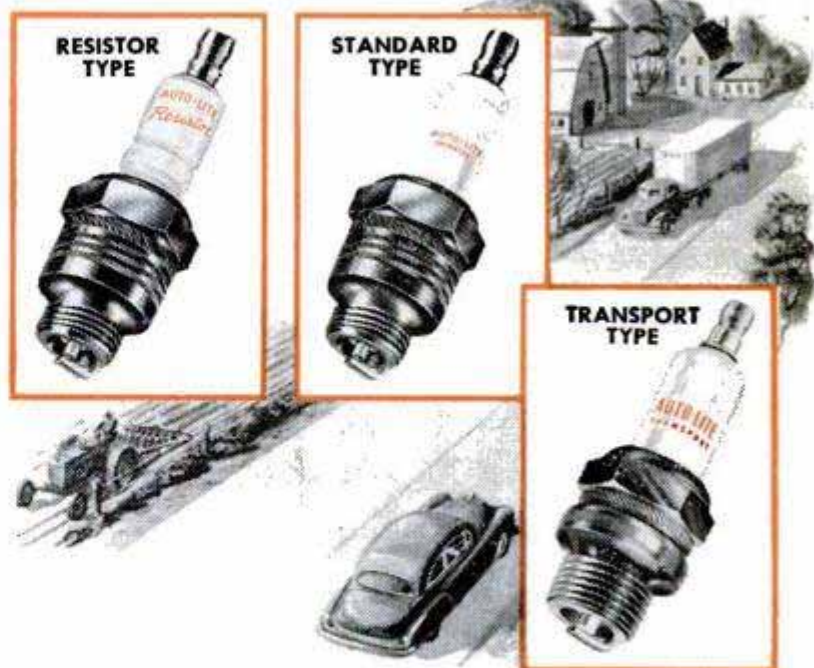
THESE three world-famous Ignition Engineered Auto-Lite Spark Plugs have been selected as original factory equipment on millions of America's finest cars, trucks and tractors.

• **Auto-Lite Resistor Spark Plugs** offer greater gas savings plus benefits found only in automotive type spark plugs with built-in resistors.

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**Modestly Priced Kodak Hobbyist Enlarger—\$44.00.** A good enlarger lets you accomplish much more than just make a big picture from a tiny negative. You can select the ideal portion of your picture . . . eliminate unwanted areas . . . make the enlargement even better than the original print. The "Hobbyist" uses "cold light" illumination—perfect protection for negatives. New integrating-sphere lamphouse assures even light distribution. Includes Kodak Enlarging Ektanon Lens, 89mm. *f*/6.3 (Lumenized), with click stops. For negatives through 2¼ x 3¼ inches.



**Easy to Set Up.** Rapid assembly of the Hobbyist Enlarger gets it into action fast. Disassembles with equal ease for convenient storage where space is limited.



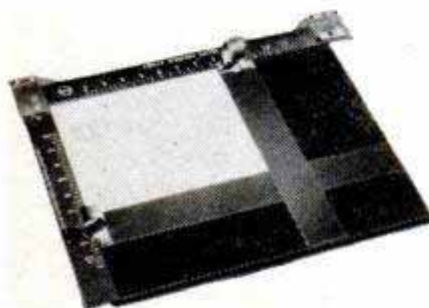
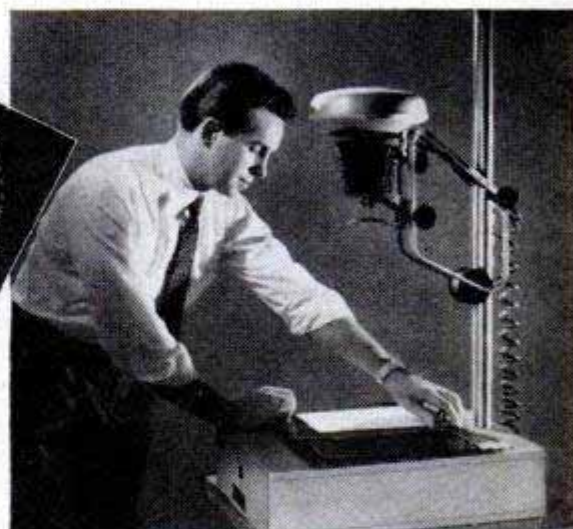
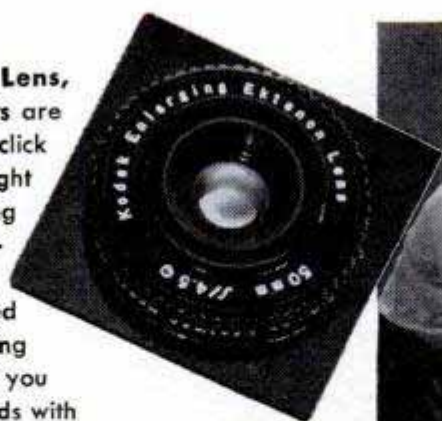
**New Negative Carrier.** Greatly simplifies loading. Circular in shape, rotates easily. Sizes for 35mm. up through 2¼ x 3¼. One comes with each enlarger. Cups extra.

# HOW TO SET UP A DARKROOM

**Taking the picture** is only half the fun. Developing and printing—and making your own enlargements—can double your rewards in photography. You can set up a darkroom on a modest budget—for as little as the price of a Kodacraft outfit (see facing page). And, for less than \$50, you can add a fine enlarger complete

with lens. On these two pages you see a wide choice of equipment, all reasonably priced. How much you spend on your darkroom is just a matter of how far you want to pursue this fascinating hobby. Why not see your Kodak dealer about it? His professional advice will help you start off right and keep within your budget.

**New Kodak Enlarging Ektanon Lens, 50mm. *f*/4.5—\$14.00.** All elements are Lumenized. Iris-type diaphragm has click stops down to *f*/16. There are eight Kodak Ektanon and Ektar Enlarging Lenses for enlargers that take negatives up to 4 x 5 inches. They are all Lumenized (hard-coated) and designed for maximum correction at close working distances. Let your Kodak dealer help you select the one best suited for your needs with the Kodak Flurolite Enlarger (see at right).



**Kodak Masking Easel, 11 x 14—\$9.60.** For use with any vertical enlarger. Will mask prints up to 11 x 14 inches. Can be adjusted for ¼- to ¾-inch margins. Spring-steel hinges facilitate adjusting print size.

**An Advanced Enlarger—The Kodak Flurolite—\$99.50** (without lens). Does much more than enlarging. With accessories the 2¼ x 3¼-inch "Flurolite" quickly converts for copying, cine-titling, slide-making, close-up photography, photomicrography, and for use as a view camera. "Cold light" protection for negatives.





**Free Your Hands with the Kodak Utility Footswitch—\$10.00.** Controls enlarger, printer, or safelight. Attaches to floor, or to vertical support for operation by knee pressure. Low-intensity neon light clearly marks its location.



**Save Paper and Time—Kodak Projection Print Scale—\$1.15.** This is a transparency divided into 10 sectors of varying density, each indicating a different printing time. Full instructions guide you in choosing best exposure time.



**For Precise Timing—Kodak Electric Time Control—\$13.50.** Plug printer or enlarger right into control for automatic timing from 1 to 57 seconds. Repeat timing possible. Continuous light for accurate focusing is provided for your convenience.



**Spring-Wound—Kodak Timer—\$6.75.** Has both minute and split-second hands. Covers all intervals from 1/2 second to 60 minutes. Can be stopped and restarted without resetting hands. An added feature is the handy tilting base.

## ON A MODEST BUDGET



**Inexpensive Printing Materials—Kodacraft Printing Kit—\$4.30.** Includes three 5 x 7 trays, printing frame, Kodak Velite Paper, graduate, Kodak Tri-Chem Pack, thermometer, stirring rod, book of instructions.



**For Developing and Printing—Kodacraft Photo-Lab Outfit—\$7.45.** Contains new Kodacraft Roll-Film Tank with 620-120, 616-116, and 127 roll-film aprons; Kodacraft Printing Frame; other accessories.



**Includes Printer—Kodacraft Advanced Photo-Lab—\$12.10.** The contents of this photo-lab can all be packed in the metal printer. The printer takes negatives up to 4 x 5 1/2 inches. Includes all other essentials.



**Washes Prints Automatically—Kodak Automatic Tray Siphon—\$4.50.** Washes films, too. Converts ordinary tray into effective washer. Attaches to water tap. Hypo-laden water is continuously siphoned off.



**You Need One of These—Kodak Darkroom Lamp—\$4.70.** Use in wall socket or from a drop cord. Includes a Kodak Safelight Filter and uses 15-watt bulb. Kodak safelight lamps screen out photographically dangerous white light and provide safe working illumination. There's a wide selection available, with prices as low as \$1.00 for the Brownie Darkroom Lamp, Model B. The Brownie Darkroom Lamp Kit, complete with Series 0, 2, and 3 safelight cups, only \$1.75.

*Prices subject to change without notice*

Your Kodak dealer will be glad to demonstrate this equipment for you. See him for all your photo needs.

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# Kodak





# Care and Feeding of Engines

BY S. P. CORP

## ABOUT AUTOMATIC CHOKES

Whenever an engine stalls during the warm-up period in cold weather, here are the checks to be made with regard to the automatic choke:

1. Automatic choke should allow a very fast idle when first started in cold weather, usually 1000 rpm or more.
2. Use manufacturer's specifications to learn correct idling speed after warm-up, usually about 500 rpm. Carburetor choke linkage is out of adjustment if these speeds are not correct, and will cause trouble.
3. Faulty operation of water thermostat will cause engine to run too cool in cold weather, wasting gas. Dash heat indicator should show 160° while driving, unless a high-opening thermostat is used.

## TYPES OF AUTOMATIC CHOKES



One make of carburetor combines a climatic control with the automatic choke. This control is affected by different grades of fuel and can be adjusted for smooth operation during warm-up. Always make adjustment with carburetor on car and engine cold.

For average driving, Index (1) should be in center. Loosen clamp and move housing one notch at a time. If engine spits during warm-up, move one notch to RICH, tighten clamp, and check engine.

Where choke is mounted on exhaust manifold, test by removing air cleaner. Choke valve should be wide open. Have someone step on starter and watch valve. It should close and stay closed till engine starts, opening slowly as engine warms up. Remember, engine will run at a fast idle until warmed up.

## IF YOUR CAR LOAFS TOO MUCH

No pep on a hill? No pick-up on the level? Get new Sealed Power Piston Rings! If it's a late-model car or truck, get a Sealed Power KromeX Ring Set. The Sealed Power MD-50, best steel oil ring ever made, controls oil even in badly tapered and out-of-round bores. A postal to Sealed Power Corp., Dept. G-3, Muskegon, Mich., will bring you the new illustrated booklet, "More Power, Less Oil, Less Gas!" It can save you real money!



(Continued from page 100)

den. It was put on sale around the state at a dollar and soon became a best seller. So many requests for copies came in that Odum turned the sales job over to the Florida Council for the Blind. Some folks say that Odum's map is responsible for the rebirth of treasure hunting in the state. Whether this is true or not, there can be no doubt that it has stimulated a tremendous amount of interest.

In addition to these two stories, there are hundreds of treasure-find tales that are vague about results. This air of mystery and the suggestion of great wealth combine to convert new treasure hunters.

About 1935, so one story goes, a fisherman known around the waterfront as "Charlie" dozed off while sailing near Pigeon Key. His unguided boat ran onto a reef. Awakening, he stepped over the side into the shallow water to push his boat free and slipped on some hard objects. He discovered he was standing on what appeared to be several barnacle-encrusted pigs of metal.

Thinking them to be ballast from some wrecked ship, he worked several of them loose and heaved them into his boat, intending to use them as ballast himself.

Two years later, in Miami, he hauled his boat out for repairs. He tossed out the ballast and was surprised to hear that the bars, striking together, failed to sound as iron should. He cut into one and decided it must be lead. Somebody suggested that he have the metal analyzed. It was pure silver!

Although he searched long for it, the fisherman was never again able to locate the treasure site. He described the reef as littered for a distance of 300 feet with similar bars! A schooner was lost off Pigeon Key in 1820 with \$5,000,000 in bar silver aboard. These bars could have been its cargo, as they have never been located. Thus the story ends in the mystery characteristic of treasure tales. Hearing about a reef littered with solid-silver bars often makes sober folks pore over charts of Pigeon Key.

In 1925, Dewey Hulsebeck, who owns 80 acres on Little Torch Key, found a broken crock on his land near a newly dug hole. He also found two gold and five silver Spanish coins near by. Later investigation disclosed that a man in Key West had apparently become wealthy all of a sudden. Hulsebeck determined to his own satisfaction that the man had discovered the crock which had been filled with gold and silver coins. He was unable to recover any of the

(Continued to page 242)



you can GO PLACES  
...with an Evinrude!



Fact is, you can wander all over the chart... with speed, comfort, minimum cost... in a snug and able cruiser powered by Big Twin! Furthermore, you can "trailer" your boat *anywhere*, to waters of your choice. Your cruising horizons are *limitless!*

Big Twin is the motor outboard cruising had been waiting for. A motor with abundant power to reel off the knots on substantial cruising hulls. A motor with *Gearsift* for neutral starting and full maneuverability, and engineered for complete remote control.

Above all, a motor with *stamina* for trouble-free performance from shove-off to home-again!

In a single season, on coastal and inland waters everywhere, Big Twin has won its place as the motor for practical, low-cost cruising. If you'd like the whole story, see *your Evinrude dealer!* You'll find his name in your phone book under "Outboard Motors." For free catalog of the complete line of Evinrude models, write EVINRUDE MOTORS, 4765 N. 27th St., Milwaukee 16, Wisconsin.

In Canada: Evinrude Motors, Peterborough, Ontario



# EVINRUDE

FIRST IN OUTBOARDS... 43rd YEAR



# Here's how for home painters



Get rid of fresh paint smells—overnight! Pour a teaspoonful of ammonia into a bowl of water in center of fresh-painted room. Relax and go to bed. Next morning the smell is gone. Of course, you can save yourself all this trouble by using Devoe Wonder Tones—leave no

painty smell, dry in 20 minutes.

**Clean-up trick for roller coater containers!** Before you start, line bottom of paint tray with two layers of newspaper. Then bend over edges and tape them down. When painting's done, just throw papers away. Containers are as clean as when you started.



**Preventing paint skin—a two-edged trick!** To prevent skin from forming in partly used can, float a little turpentine on top of the paint. Pour just enough to cover surface. Because paint thickens when it stands for long, surface turpentine can be stirred in as thinner when you're ready to paint again.

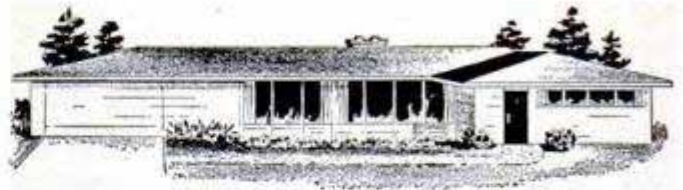
**A tip for painting drawer knobs!** Here's a handy tip: before you start painting, screw the knobs part way into a piece of cardboard—like the top of a shoe box. You can hold the knob steady while painting—and it will sit still while drying. The perfect enamel for that knob, by the way, is Devoe Mirrolac—comes in many bright colors.



You can get all the painting accessories that you need—and many more helpful tips at the sign of the Devoe Diamond. Why not stop in and see your Devoe Dealer very soon? You'll find his name listed in the Classified Phone Book.



# Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

**Dixie Lawn Supply Co.**  
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LOUISVILLE, Ky.



## Aerifying Lawn

**Q**—I have recently heard of a new method of building a good and permanent lawn by a process which I believe is known as aerifying. How is this done? Is the procedure the same as that known as spiking? My lawn is on a heavy clay soil and the grass is thin, lacks color and withers during the drier summer months. Various lawn weeds are trou-

blesome. I kill them out during one season and they are back as thick as ever the next spring. What can I do about it?—A. S., Ind.

**A**—The process known as aerifying is not to be confused with spiking, although the procedures are quite similar. Aerifying is simply a form of subsurface cultivation which has been adapted to use on lawns with good results. Although the process is not new, it has come into more general use in the past five years. Implements for both hand and power operation are now available. Power-driven units are suitable only for use on large estates and golf greens, but hand-operated aerifiers in both the push and fork types are available for use on small lawns. All units work on much the same principle. Spoon-shaped blades are forced into the turf and as they are withdrawn they remove a small core of soil. The action of the blades beneath the surface leaves an open, loose-walled cavity through which both water and fertilizer can readily enter. The result of aerifying is to make plant food and water readily available at the lower root levels, which greatly stimulates both root and top development of individual plants. On sloping lawns this type of cultivation prevents washing. The vigorous turf resulting from this treatment effectively discourages growth of common lawn weeds.

## Installing Aluminum Gutters

**Q**—My home has a low-pitched roof and wide cornices. The gutters and downspouts have rusted out beyond repair and I plan to replace them with aluminum gutters. The advice I get is rather confusing. I'm told that aluminum gutter is not desirable, that is, it will not withstand the load of snow and ice that accumulates during the winter, and that it cannot be painted. Also, some say that only half-round gutter should be used, while others advise the box-type aluminum gutter. How should I proceed, and what type gutter should I use?—T. S., Mich.

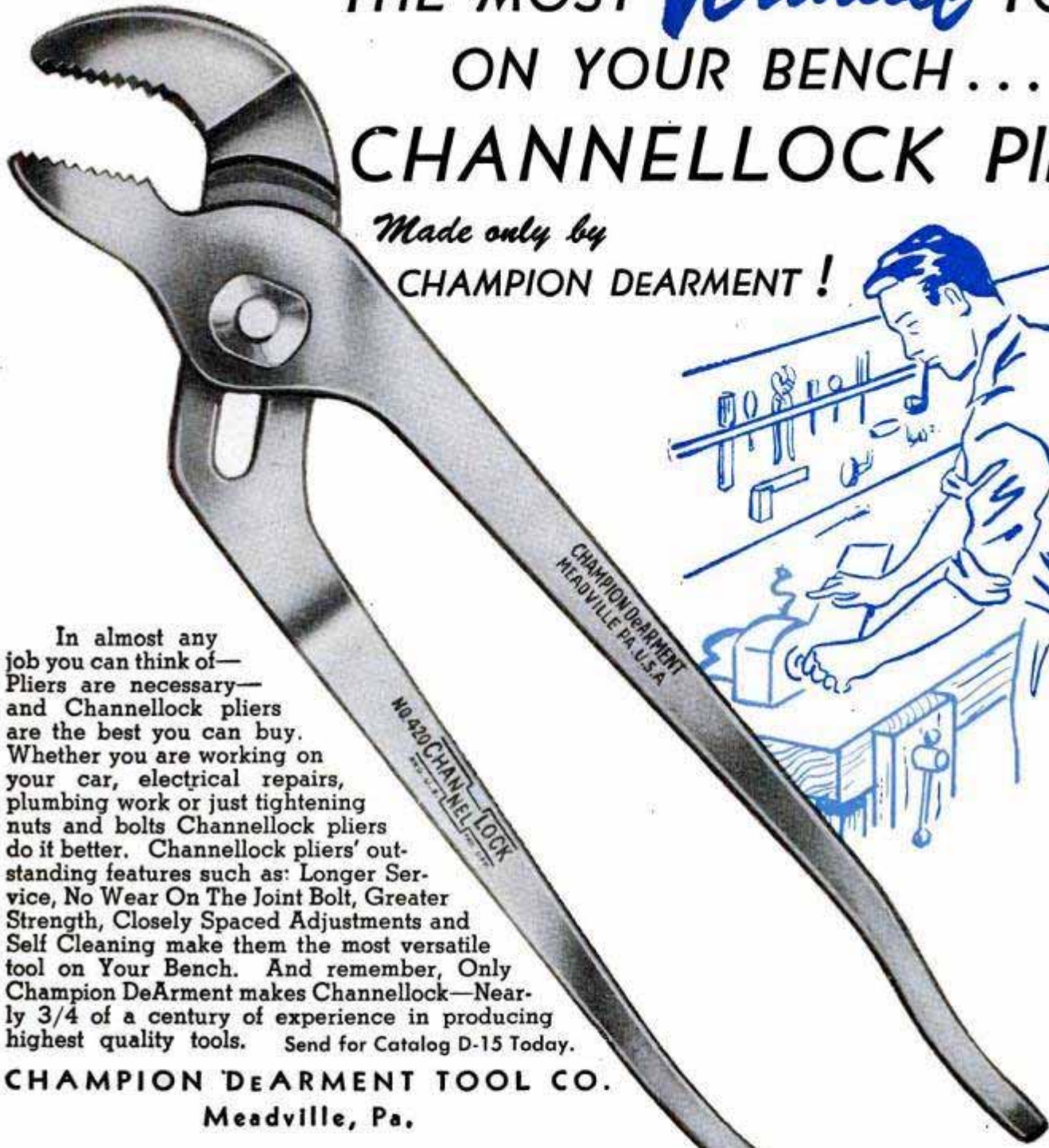
**A**—Aluminum gutter in both the box and half-round types is extremely durable. It is not subject to damage by rust or corrosion. It does discolor

(Continued to page 240)



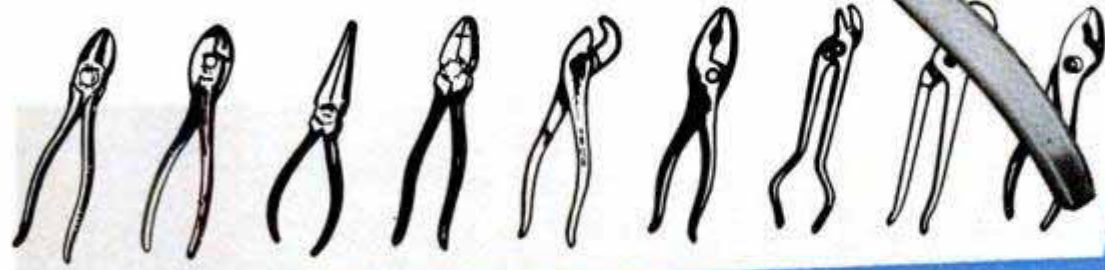
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ON YOUR BENCH...  
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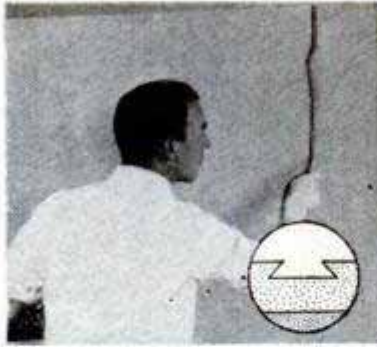


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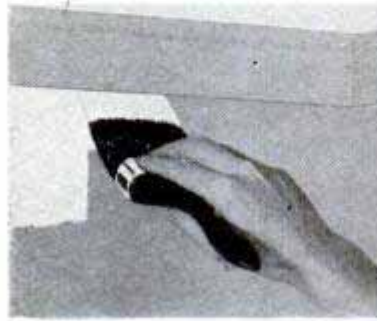


# Pointers for home painters Walls:

When replastering small areas, cut out all loose plaster. Leave indentation (see insert). Wet new edges with warm water before applying fresh plaster.



With the tip of brush, work paint up to molding. For best results use a nylon-bristled brush of the right size—one designed for the job.



Start painting in corner at molding. Work down to baseboard. Cover a space about two feet wide. Paint last strokes into area just painted to avoid overlap marks.



For overnight cleaning, pour thinner on brush. Work out paint on newspaper using stick or paint scraper to squeeze out paint. Suspend brush in thinner.

**JOB AFTER JOB** you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles paint smoother . . . are clean and sanitary . . . never get brittle . . . don't break off even under the roughest treatment. And nylon bristles last from 3 to 5 times longer than ordinary bristles. Leading manufacturers make nylon paint brushes in all types and sizes. Look for the name **NYLON** on the handle. Be sure to pick the size brush designed for the job . . . and demand Du Pont nylon bristles.



Better Things for Better Living  
... through Chemistry

The best brushes have  
**DU PONT NYLON  
BRISTLES**

(Continued from page 238)  
somewhat with age because of the oxides which form on the surface of the metal. It can be painted at any time, although a general recommendation is that it be exposed to weathering for a period of three to six months before painting. When new, the metal is very smooth and does not provide a suitable surface, or "tooth," for foundation coats of paint. Generally, manufacturers' specifications for hanging aluminum gutters of either type will call for hangers to be spaced every 30 in. throughout the length. In new installations the hangers should be nailed directly to the roof boards before the shingles are laid. Otherwise, the shingles should be lifted at the eaves and the ends of the hangers inserted underneath the shingle butts and nailed. Always use aluminum nails for attaching aluminum hangers.

*See backy book*

## Shingle-Tab Cement

**Q**—The shingle butts on the roof of our new home have been turned up by high winds. So far they have not leveled again as I thought they would. The irregularly raised butts give the roof a very unsightly appearance and I'm afraid that leaks will develop during heavy rainstorms. Is there anything that can be done to remedy this condition?

—G. S., Neb.



**A**—If the tabs have been merely turned upward and have not been broken it is possible to repair the damage by use of a new product which has recently been made available and is known as shingle-tab cement. If it is applied in accordance with the manufacturer's instructions, it produces a fairly satisfactory and permanent job. However, in most cases it is advisable to make the repair only during warm weather when the temperature is 70 deg. F. or more. The higher the temperature the better, as then the shingle tabs can be bent back and flattened into their original position without danger of breakage or buckling. When making the repair, begin at the ridge and work down. Usually it is best to apply the cement to all the tabs in each shingle course, even though only a few of them may have been raised.

## Kick Plate Tarnishes

**Q**—I have a polished-brass kick plate on my front door and I find that it takes constant rubbing with a polishing compound to keep it smooth and bright. The metal seems to darken and discolor irregularly although it is protected during the winter months by a tight-fitting storm door. Isn't there some way of preventing the discoloration of the polished surface?

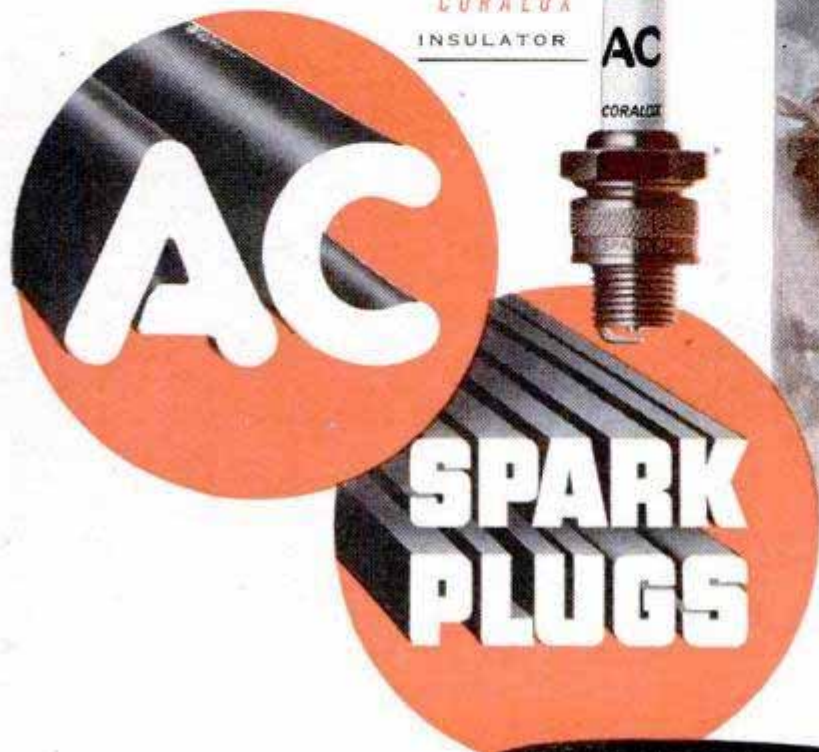
—B. M., N. Y.



**A**—Remove the plate from the door and polish it in the regular way. Then wash it thoroughly with a solvent to remove all traces of oil and polishing compound. Next, go over the surface lightly with fine steel wool (No. 000 or finer) rubbing in a straight back-and-forth stroke, rather than a curved or circular movement. Wash the plate again with a lacquer solvent and, when the solvent has evaporated, pick up all traces of dust and lint with a painter's tack rag. Now apply a coat of clear metal lacquer, following the directions on the container in all details. This lacquer dries quickly and forms a smooth film that prevents tarnishing of the metal for long periods of time. When renewal is necessary, wash off the old coating with lacquer solvent and apply a fresh coating of lacquer.



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money from the man, who denied finding it. On the beach at Naples, Fla., in 1945, a tourist couple is said to have found numerous stained doubloons. It is possible that these coins were washed ashore from a near-by wreck. However, nobody knows who the tourists were, nor does there seem to be any record of the discovery. John W. Prince of Naples says he has found gold and silver "nuggets" on the beach himself, as well as other treasure, but he would "prefer not to go into detail on this."

Hilsebeck also learned from an old Key resident, Leonard Lowe, that almost 100 years ago Lowe's father had seen a small boat come ashore from a sailing vessel. Two men carried a large chest from the boat into the woods. When they returned to the boat, they did not have the chest. Although many searches were made in the area, the box was not discovered until recently, says Hilsebeck. The persons who found the box are unknown, but Hilsebeck and others did find remains of the box in a deep hole that appeared to have been dug several years earlier. The box was constructed of heavy hardwood planks fastened together with handmade iron spikes.

But, as in most stories, nobody admits finding the loot.

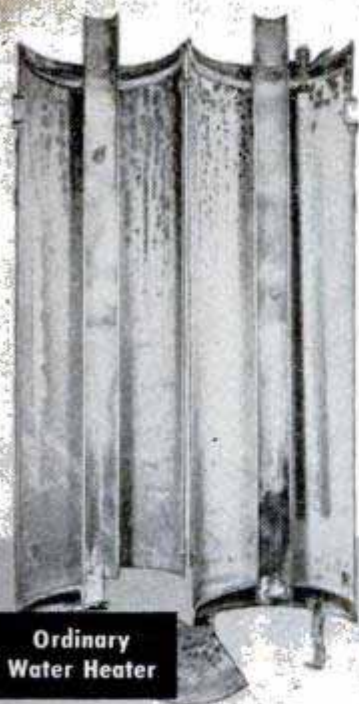
Some stories are based on discoveries said to have been made years ago. W. T. Cash, state librarian of Florida, went on a treasure hunt near the mouth of the Steinhatchee River. He was seeking a treasure said to have been located by two young men shortly after the Civil War. These men were fishing in the river and noticed an iron chain extending into the water from the branch of an oak tree. They pulled on the chain until an iron chest came to the surface. The chain had almost rusted through, and the weight of the chest as it came out of water broke one weakened link. The chest sank in about 30 feet of water. They were unable to raise it again despite repeated attempts. When they returned with more equipment, they were unable to locate the chest at all.

Cash went looking for the spot, but he, too, was unable to find any sign of the chest, although he doesn't doubt that it is there waiting for some lucky discoverer.

Several hundred expeditions have gone to lonely Cocos Island off the coast of Panama, where the famous "Loot of Lima" is supposedly cached — untold millions in church treasure removed from the city before the advancing forces of Simon Bolivar in the 1820s. The government of Costa Rica, which owns the island, charges a fee for exploration. Thus far, it is the only agency to make any money from the treasure hunt!

(Continued to page 244)

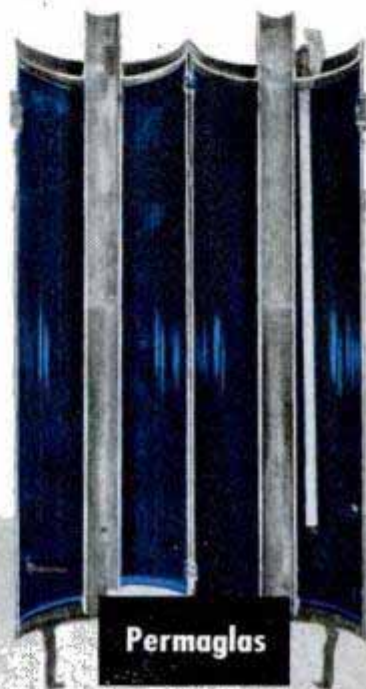




Ordinary  
Water Heater

← **ORDINARY** galvanized water heater tank interior after one year of service in a corrosive water area. The left half has deposits of water-borne minerals. The right half has been cleaned to reveal actual surface. **NOTE NUMEROUS DEEP RUST PITS**, indicating penetration of galvanized surface and rapid destruction of the water heater tank by corrosion.

**PERMAGLAS.** Glass-surfaced steel tank interior after the same year of service in the same city as the galvanized tank. The left half shows deposits of water-borne minerals. The right half has been cleaned. **NOTE ORIGINAL GLASS SURFACE**, still smooth and effective against corrosive attack . . . no rust . . . your assurance of many more years of service.



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water heaters in two  
to prove to you

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**Exclusive** *Permaglas* features provide lasting service. They comprise: 1) glass-surfaced steel tank, 2) removal of dissimilar metals from contact with water, 3) shielding of

fittings from electrolytic action, and 4) "Neutrolizer" standby protection against attacks by corrosive waters.

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AUTOMATIC WATER HEATERS





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## Glue That's Stronger than Wood



To make things or fix things, use Weldwood Glue for all wood-to-wood bonds. Makes joints stronger than the wood itself. Mixes easily with water. Stain-free, rot-proof... highly water-resistant!

### WELDWOOD® PLASTIC RESIN GLUE

## A MUST for Finishing Fir Plywood



Tame that wild grain with FIRZITE. Virtually prevents grain raise or checking... readies the surface satin-smooth for paint, stain or enamel. (For blond, pickled, or tinted effects on soft or hard woods, use White Firzite).

### FIRZITE\*

\*Trade Marks

United States Plywood Corporation,  
Dept. 392, 55 West 44th St., New York 18, N.Y.  
Send me free leaflets on Weldwood Glue, Firzite  
and Satinlac.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

Some of the most exciting treasure stories come from people who sell detector equipment for locating treasure. Quite naturally, they are interested in making people treasure conscious.

If you decide to make a try at treasure hunting, it will be wise to remember that the odds are against you. Don't go all out for a story—others have, to their regret. Confine your activities to a small scale. Study the history of Florida, and become interested in tales of pirate days. Then, even if you never get any closer to a treasure chest than a story book, you'll at least enjoy the excitement of the chase.

If you keep your expenses light and don't lose your head, you'll have plenty of fun and get lots of fresh air and sunshine—both of which are real Florida treasures!

## "Pipe Organ" Oil Driller

(Continued from page 162)

draw works, hauling on long levers, stamping on foot pedals, getting dust in his eyes and a crick in his back. Now he sits comfortably on a foam-rubber chair at one corner of the drilling floor and operates a bank of knobbed levers in a console before him. Dials and winking lights give him instant information and warning on every drilling procedure.

Using levers alone or in combination, he applies power in any desired range—speeding up or slowing down the blocks, motors, pumps and generators. He can instantly summon hundreds of horsepower to brake the descent of tons of pipe into the hole or to control pressures and the flow of mud.

One of the drillers operating the new rig has been with Standard more than 40 years. He's worked with everything from the early rickety steam rigs to the latest experimental model.

When asked how he was getting along, he pushed back his hat, grinned and said:

"Well, I'll tell you. I can't even play a mouth organ—but here I am playing a pipe organ."

Since then, hard-boiled drilling crews have called the new console "the pipe organ." Compact and skid-mounted, the console can be moved to any convenient place on the derrick floor. Every one of the various controllers has an infinite number of speeds from zero to full both in forward and reverse.

Automatic devices, developed by General Electric and called amplidynes, give exact and instant response. They protect motors against power beyond their capacity or unevenly balanced loads on moving

(Continued to page 246)



# Belanger 99... 1951's "Winningest" Car Used Champions Exclusively!



Murrell Belanger with his Belanger Special and his pit crew of outstanding race car technicians.



Owner of 1951's "winningest" car, Mr. Murrell Belanger.

*"When Lee Wallard won the 1951 Indianapolis 500 mile race at the record speed of 126.244 M.P.H. average, it was the first time the race had been run under four hours. That's a terrific test of car, engine, tires, brakes and spark plugs. After Wallard's injury, Tony Bettenhausen took over, winning eight of the remaining races. This brought the total for the Belanger Special to nine wins out of fifteen AAA Championship events—a record for any one car in one season. Tony, my head mechanic and myself really know the meaning of that word dependability and in my book, it's a synonym for Champion Spark Plugs. They're built to live up to their name and they do."*

Murrell Belanger



Lee Wallard, winner of the 1951 Indianapolis Race at the record breaking speed of 126.244 m.p.h. average.



Tony Bettenhausen, 1951 AAA Champion Race Driver, with eight wins out of fifteen championship events.



**FOLLOW THE EXPERTS**

DEMAND CHAMPION SPARK PLUGS FOR YOUR CAR

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO



**BEST  
INVESTMENT  
I EVER MADE!**



**You  
can really**

**take it easy** when there's a smooth-running Worcester Shear Master in the family. So effortless to operate that even the gals like to use it! Sharp-cutting "Sta-Temp" blades that stay sharp longer. Clutch and speed controls right at your finger tips. Totally enclosed chain and sprocket. Easy-to-get-at oil cups. Genuine Timken roller bearings. Big, traction-grip tires. And a dependable 1.6 h.p., 4-cycle Briggs & Stratton engine. You'll get years and years of faithful service out of this fine power mower, backed by Worcester's *half-century* reputation as makers of America's finest lawn mowers. Write today for illustrated literature.

# Worcester

## 21-INCH SHEAR MASTER

**FREE!** An attractive, fully illustrated folder describing in detail the many outstanding features of this great power mower and the other fine Worcester lawn mowers. Write today to Worcester Lawn Mower Co., Division of Savage Arms Corporation, 84 Broadway, Chicopee Falls, Mass.

**WORCESTER MAKES A MOWER  
FOR EVERY LAWN, EVERY BUDGET**

Ask your dealer to help you select the Worcester hand or power mower best suited to your needs.

parts or generators. Without such controls, operations would have to be slowed down considerably, lest engines, generators and moving parts wreck one another.

Although the new diesel-electric drilling rig is designed to bore 20,000 feet or more into the earth, it was not built with any thought of beating the world's record of 20,524 feet set by the Superior Oil Company in Wyoming's Green River basin two years ago.

Instead, Standard is more interested in having an efficient new tool to work with, one that will dig test holes speedily and cheaply—thus exploring new frontiers for oil in deep formations or in those that have been exhausted by shallow drilling.

## Sports Cars Take Over the Town

*(Continued from page 157)*

drivers to maintain position (no passing) and keep their cars under control at speeds not in excess of 50 miles per hour. A red flag means the race is halted and all cars must pull off to the side of the road.

Drawing by classes, with larger displacement classes in front, put Briggs Cunningham in the front-row, outside position. Piloting a sleek, powerful sports car of his own design, Cunningham was trailed by two more of his expertly assembled cars chauffeured by Phil Walters and John Fitch, well-known drivers in Eastern racing circles.

The Cunningham cars are composites of American auto parts from Fords, Dodges (truck), Chryslers, Cadillacs and Oldsmobiles. Powered by souped-up Chrysler Fire-Power engines capable of delivering 260 horsepower, the big cars are equipped with special Indianapolis-type racing wheels and tires, luxurious interiors and roomy aluminum racing bodies especially designed for the comfort and safety of drivers.

Now in limited production in a West Palm Beach, Fla., plant, the Cunningham sells for around \$12,000.

Also included in the lineup were several of the famous 12-cylinder Ferraris driven by Jim Kimberly of Chicago and Bill Spear of Southport, Conn. These 285-horsepower cars are capable of 150 miles per hour and consistently are strong competition in such races. Kimberly, unfortunately, was forced to retire his blue "power house" from the race because of clutch trouble, although mechanics had worked on it the night before.

Running strong at all times was a Cadillac-Allard, No. 63, owned by Jim Chapman of Los Angeles and expertly piloted by

*(Continued to page 248)*



# 1 ounce = 44 lbs!



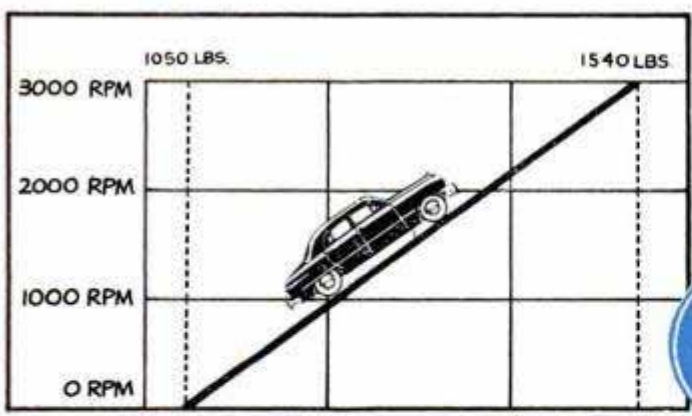
THAT'S WHY FORD IS SO CAREFUL TO BUILD CLUTCHES IN PERFECT BALANCE—WHY YOU SHOULD NEVER SETTLE FOR LESS THAN A GENUINE FORD CLUTCH. ANOTHER FORD ADVANTAGE!



ONE OUNCE OF UNBALANCE IN YOUR CLUTCH BECOMES 18 POUNDS OF UNBALANCE AT 3000 RPM, 44 POUNDS AT 5000. THE RESULTING VIBRATION CAN MAKE A RATTLETRAP OUT OF A GOOD CAR.



THESE ARE BUT A FEW REASONS WHY THIS CLUTCH, LIKE ALL GENUINE FORD PARTS WORKS BETTER—WHY IT SAVES YOU DOLLARS THROUGH QUICKER INSTALLATION AND PROTECTION AGAINST SLIP.



STANDING STILL, A GENUINE FORD CLUTCH GRIPS WITH 1050 POUNDS PRESSURE. AS THE ENGINE SPEEDS UP THE CLUTCH HOLDS TIGHTER. AT 3000 RPM THIS PRESSURE INCREASES TO 1540 LBS.



AVAILABLE WHERE YOU SEE THIS SIGN... AT ALL FORD DEALERS AND SELECTED INDEPENDENTS.

*ALWAYS INSIST ON THE PARTS THAT ARE MADE RIGHT TO FIT RIGHT TO LAST LONGER!*



## KEEP YOUR FORD ALL FORD!





# Stop RADIATOR TROUBLE Now!

★ Unless you are asking for trouble—your radiator deserves a *thorough* spring cleaning! Get rid of winter's accumulated rust and dirt the easy, effective way—with these three Bowes radiator conditioners. Then you can enjoy care-free spring and summer motoring.



## BOWES RADIATOR KLEN-ZUR

Quickly removes rust and scale . . . contains no harmful acid . . . makes cooling system like new.

## BOWES RADIATOR RUST-ROUT

Protects the cooling system, prevents accumulation of more rust . . . lubricates water pump, too.

## BOWES RADIATOR STOP-LEAK

Effectively seals any existing leaks and helps prevent new leaks.

**DRIVE IN WHERE YOU SEE THIS EMBLEM**



★ It takes so little time to condition your cooling system for spring and summer driving . . . yet it can be so costly and troublesome to neglect it. Don't delay—prepare NOW for spring and summer with Bowes Cooling System Chemicals.

BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, INDIANA

horsepower Allard originally cost \$5000, but Chapman refuses to say how much more he has put into the car.

From his position in the pits, Chapman constantly flashed signals to Mike during the last laps to "Get 128"—a Cunningham driven by the pace-setting Fitch. Slowly closing the gap behind the leader, Graham was forced to make a brief pit stop for fuel, but managed a quick getaway and crossed the finish line in second place.

Studded with a good assortment of MGs and Jaguars, the colorful field of cars, which actually compete against their own class, also included a German Veritas, built especially for racing. Owned and driven by Ralph Knudsen, a Milwaukee development engineer, the high-powered car, made in 1949, has only 3½ inches of road clearance. According to Knudsen, this feature of the \$7500 car has caused him some trouble. Specifically, during competition at a Watkins Glen event when he ripped off the pan. Reported to be the only car of its kind in this country, the Veritas was also forced out of the race during early laps because of clutch trouble.

After driving his sleek little Bandini Fiat in a preliminary novice race, Richard Gent of Lindhurst, Ohio, turned the wheel of his No. 103 over to George Weaver. It was the first closed-course event for the four-cylinder, 65-horsepower car in this country, and Gent was well pleased with its performance and ability to turn up speeds in excess of 100 miles per hour. Being a machinist, he purchased the car in a run-down condition solely on the recommendation of a New York sports-car dealer who had seen it perform in Italy. After competitive driving in the car, which he has now put in top running condition, Gent is happy with his \$5000 bargain.

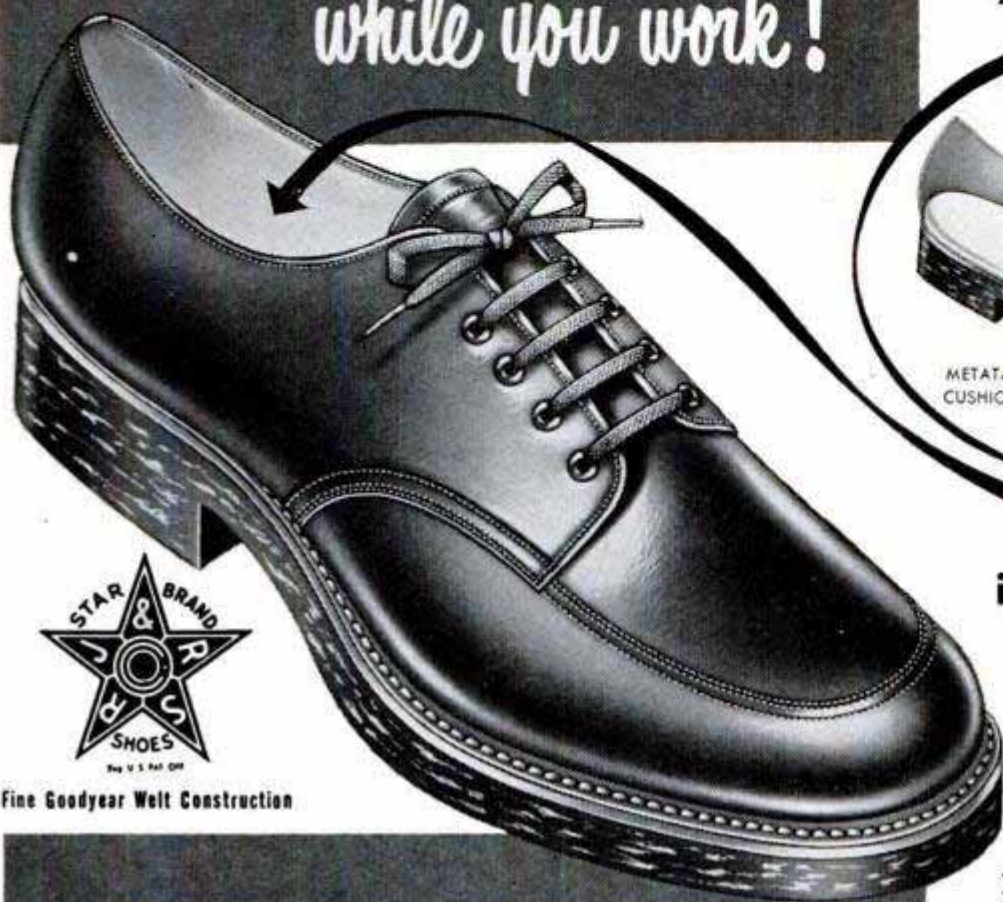
Taking time out from his routine as salesman for a Chicago auto firm, Kurt Hildebrand had his share of anxious moments with a car of his own design. A standard Volkswagen chassis was fitted with a special racing body fashioned from an aircraft belly tank. Equipped with spring-mounted fenders, the body design (with engine in rear) lends itself nicely to carrying a spare tire flat under the front of the car, ahead of the wheels.

After passing technical inspection the day before the race, Hildebrand headed for the course to "wind up." With only a few turns around the track, he threw a flywheel on the flat, four-cylinder Volkswagen engine, which he had specially tuned and fitted with two Amal (special motorcycle) carburetors. Working feverishly during the

(Continued to page 250)



Your entire foot  
**RESTS IN COMFORT**  
 while you work!

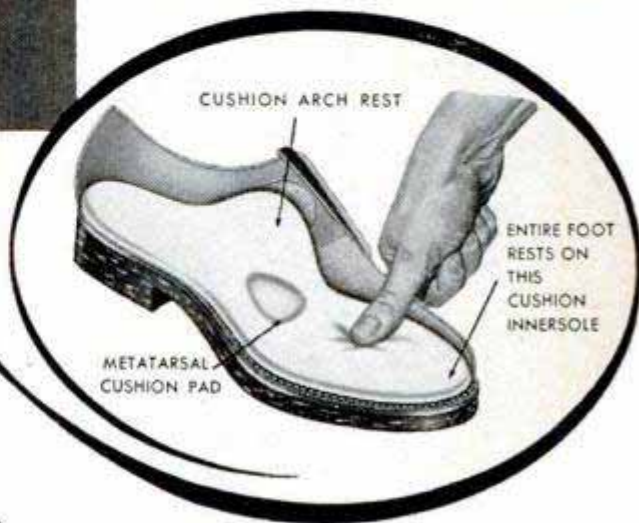


Fine Goodyear Welt Construction

**STAR BRAND**  
*Cush-N-Bilt*  
**WORK SHOE No. 286**

Here's how the  
*Cush-N-Bilt* innersole  
 rests your feet while you work

Resilient innersole, made of a molded cushion of extra soft sponge rubber is covered with a walking surface of genuine cowhide leather. It rises on the inside, gives snug support and comfort to the arch. Metatarsal pad massages and relaxes busy muscles. Your entire foot rests in comfort while you work!



it's new! it's different!  
*cushion innersoles*  
*of sponge rubber*  
 absorb work shock  
 reduce foot-fatigue

If you do the kind of work that's hard on the feet . . . you'll really appreciate this amazing new shoe. Specially designed to reduce foot fatigue, it has extra-soft cushion innersoles that give you the feel of pillowed comfort! Its built-in steel shank, metatarsal and "cookie" arch pads both support and rest your feet while you work. Uppers are made of pliable genuine cowhide leather; corded soles and heels are non-slip and oil-resistant. Looks like a dress shoe . . . but it's specially constructed for rare comfort, extra duty and extra long wear!

EXPERTLY FITTED by your local Star Brand shoe dealer!

- ✓ **OIL-RESISTANT, NON-SKID CORDED SOLES AND HEELS**
- ✓ **GENUINE COWHIDE LEATHER UPPERS** (cordovan colored)
- ✓ **Built in STEEL SHANK ARCH SUPPORT** braces the arch, holds down foot-fatigue!

built for the man  
 who works on  
**HARD CONCRETE**  
**or OILY SURFACED**  
 floors, pavements, etc.

FOR DEALER NEAREST YOU, WRITE: Roberts, Johnson & Rand, DIV. OF INTERNATIONAL SHOE COMPANY - ST. LOUIS 3, MO.



# 3 Ways to Handsome Hair! *Right Now!*



*Fights  
Dandruff!*



*Relieves  
Dryness  
and Itching!*



*Grooms  
Hair  
Perfectly!*

Lucky Tiger grooms your hair perfectly. But it does a lot more besides. Lucky Tiger kills on contact the dandruff germ, *pytosporum ovale*, removes loose dandruff and gives your scalp a clean, wide-awake tingle. Treat your hair to all this, plus natural, greaseless grooming. Ask your barber, he knows.

## LUCKY TIGER 3-PURPOSE Hair Tonic



Sold at all toilet goods counters.

night to repair the damage without success, he finally removed the engine entirely and replaced it with a stock engine from a passenger car of the same make. Sliding into the lineup at the last minute, Kurt fanned his No. 47 around the grueling "200" without mishap.

Receiving much attention before and during the race was a shiny blue Fiat Siata, entered by Tony Pompeo of New York City. Weighing only 850 pounds, the well-polished little car, costing \$2500, is powered by a Crosley engine. Turning up speeds over 100 miles per hour, the Siata demonstrated outstanding road-holding ability for its weight.

Victorious in the race was John Fitch, chauffeuring the powerful white-and-blue Cunningham, No. 128. He set the pace all the way with the exception of two laps when his teammate, Walters, led the field. At an average speed of 80.82 miles per hour, Fitch completed the race in 2 hours and 30 minutes. During his run, Fitch turned one lap at an average speed of 101.2 miles an hour, and two other laps at over 100 miles per hour, three of the fastest road-racing laps on record, according to the S.C.C.A.

Come August this year, and time for the hundreds of S.C.C.A. members to stage another national competition in the Midwest, the residents of Elkhart Lake and their neighbors may have to take up positions a few hours earlier to get a clear view of America's top sports cars displaying their amazing speed and beauty.

## Mexican Safari

*(Continued from page 146)*

In another place we located what we believe are the ruins of a pre-Stone Age city. They cover some 20 to 30 acres, and once boasted roughly paved streets and crude rock buildings. Today the loftiest ruin is hardly over three feet high.

Days of painstaking search there failed to locate a single arrowhead or artifact of stone. The people who built that lost city had not mastered the art of carving or working rock. They were pre-Stone Age pottery makers, for the ground is carpeted with shards (fragments of earthen vessels).

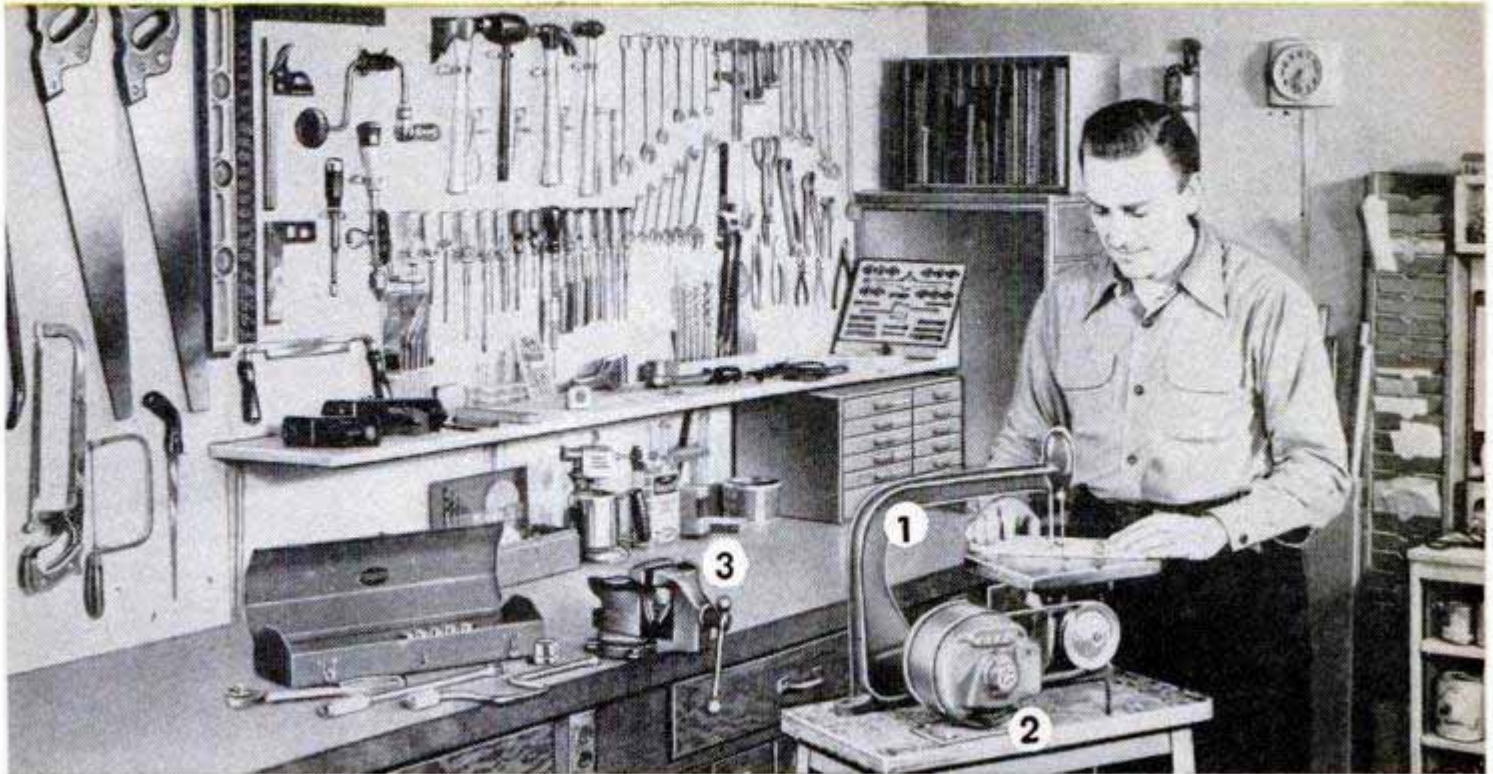
Our discovery of cave dwellings and this ancient city may be the first proof that some of Mexico's earliest cultures evolved right in the land instead of dropping from the sky. Further research should clarify the picture and date the ruins. We suspect that they may be 10,000 years old.

Of the many improvements incorporated in the 1950 version of our jungle home,

*(Continued to page 252)*



# You Don't Have To Be A Tool Expert To See Why Experts Choose Guaranteed Westcraft Tools!



Just one visit to Western Auto will prove to you that famous, professional-quality Westcraft Tools give you the same lasting accuracy of other brands costing far more. Every West-

craft Tool is precision-built, fully-guaranteed . . . the kind of tool you'll be proud to own. And they're yours on easy Western Auto terms. See, try and compare Westcraft this week!

① **Tilt Table Jig Saw** does accurate jig, scroll, sabre sawing in wood and plastics to 1" thick. Scotch yoke, oil-lite bearings. 5" blade, adjustable guides. . . . (2H1102) **\$19<sup>35</sup>**

② **1/4 HP Electric Motor**, 1725 rpm, 115 volt, 60 cycle AC. Split phase. GE guaranteed for 1 year. Use with jig saw, washer, churn, paint sprayer, etc. . . . (2H1600) **\$17<sup>25</sup>**

③ **Mechanic's Vise**, 3 1/2" jaws open to 4 1/2". Removable pipe jaws and face plates. 180° swivel base. 5/8" acme threaded feed screw. Weighs 17 lbs. . . . (4HR4836) **\$6<sup>25</sup>**



**Soldering Iron**, 100 watt. Many home uses. Fast-heating nickel chrome sealed-in element lasts longer. 6-ft. heavy duty cord. Only. (4HR4816) **\$2<sup>00</sup>**



**"Loc-Grip" Plier**. 1500-lb. grip. Use with ratchet action or as lock-on handle. Narrow steel jaws, hardened and tempered. Only (HR1205) **\$1<sup>98</sup>**



**Screwdriver**, alloy steel, chrome-plated. 4" sq. blade. Extra long, positive-grip handle. Professional quality. Yours for (HR1361) **85¢**



**1/2" Electric Drill**, 115 volt. Alloy steel gears for greater power. Cutler-Hammer trigger switch. Polished aluminum alloy housing. . . . (2H1380) **\$33<sup>95</sup>**

Professional Quality—Wizards of Performance

## WESTCRAFT TOOLS

**WESTERN AUTO STORES & ASSOCIATE STORES**

Sold Only By

Sold by the largest group of associated tool departments in America

NOTE: Western Auto Associate dealers own their own stores and set their own prices, terms and conditions. Prices may vary due to differences in local conditions. If you do not know the location of your nearest Western Auto Store, write Western Auto Supply Co., 2107 Grand, Kansas City, Missouri © 1952 (PM32)



# Here's Money to Live On . . .

When You're Sick or Hurt  
and Can't Work



*Mutual of Omaha has  
Paid me over \$8000  
during the 3½ Years  
I've been Sick*

— HARRY F. HECK,  
101 Taylor St., California, Mo.

**UP TO \$300 A MONTH!** That's what your Mutual of Omaha Sickness and Accident Insurance can pay you whenever you are totally disabled by accident or confining sickness.

## HERE'S HOW IT WORKS:

- Pays up to \$300 a month
- Pays from the *first day* you see your doctor
- Pays as long as you are totally disabled, whether a few days, weeks, months, or even for *life*
- Pays you whether you're in the hospital or at home
- You use the benefit money for any purpose you like
- Liberal benefits for nonconfining sickness
- No medical examination required for membership
- Cost is amazingly low

**YOU CAN BE SURE** when you insure with Mutual of Omaha, *world's largest* exclusive health and accident company. It has paid more than \$400,000,000 in benefits. Licensed in all 48 states, District of Columbia, Canada, Alaska and Hawaii.

**SEND COUPON** TODAY FOR FULL INFORMATION  
NO COST . . . NO OBLIGATION

**JUST PASTE ON POSTCARD IF YOU LIKE**

Gentlemen:

I would like full information without cost or obligation on Mutual of Omaha Sickness and Accident Insurance which pays up to \$300 a month.

Name \_\_\_\_\_ Age \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

**Mutual**  
**OF OMAHA**



**MUTUAL BENEFIT HEALTH & ACCIDENT ASSOCIATION**  
OMAHA, NEBRASKA

Dr. C. C. Criss, Chairman of the Board  
V. J. Skutt, President

Canadian Head Office: Toronto

PM 352

two proved outstanding. The power winch was invaluable in dragging the truck over oxcart trails so deeply rutted that both differentials went aground.

We were surprised when our military-tread tires paid off the best, not in mud, but on arid stretches solidly carpeted with sharp rocks. There the rubber knobs geared our wheels to the rocks. By using the extremely low gear ratio, available since we installed the two-speed transfer case taken from a half track, the truck literally crawled over obstructions. There was no wheel spinning which, on a knife-edge rock, can quickly cut a tire through to the fabric. We simply left the clutch engaged and regulated the "speed" from almost nothing with the engine idling to a top of three or four miles an hour.

It was rough on the tires, but we got through at the speed of a crippled snail. We were 6½ hours covering one five-mile stretch. On it a solid mat of brush and trees had grown up between the rocks. Indians told us it would stop a horseman. But a horse cannot push over trees. Our truck could, and did. "El Jeep Casita" performed to our complete satisfaction.

## Wanted: Jobs for a Trillion New Chemicals

(Continued from page 85)

an escape hatch, and the resulting fluorocarbon either moves through the hatch too, or simply is drained off the bottom, depending upon whether it is heavier or lighter than the solution in the tank. Fluorocarbons can be gases, liquids or solids.

The operation of the cell is as deceptive as it is simple. Why should five or six volts of electricity cause fluorine atoms to jump to attention, push hydrogen atoms out of the way and grab hold of the carbon atoms? It's a question even the experts can't answer, at least just now.

"Just how this process works is still a mystery," says Professor Simons, "but the important thing is that it does work, and in a highly efficient manner."

The chief value of the fluorocarbons lies in their stability, according to Dr. Hugh Bryce, the brilliant young scientist in charge of finding new fluorochemical applications. The carbon atoms form a skeleton inside the compound, and the fluorine atoms wrap themselves around carbon like a skin. They refuse to let anything penetrate to the skeleton.

Compared to hydrocarbons, the new chemicals are as hard as diamonds. Part of the value of the age-old hydrocarbons is

(Continued to page 254)



# MARFAK

# -S-T-R-E-T-C-H-E-S-

## -HOLDS TOGETHER

Big  
reason  
why  
MARFAK  
Chassis  
Lubrication  
lasts  
longer!



To prove how *Marfak* holds together, clings and stretches, this famous "Stretch Test" is the clincher. An ordinary lubricant would fall apart. This test shows that tough, tenacious *Marfak* won't work out of bearings. It stays put, protecting points of wear and friction far longer. As a result, *Marfak* chassis lubrication lasts for 1,000 miles or more — gives you "cushiony" driving from one lubrication job to the next. Drive in for *Marfak* lubrication today! See your Texaco Dealer, *the best friend your car ever had.*



## THE TEXAS COMPANY

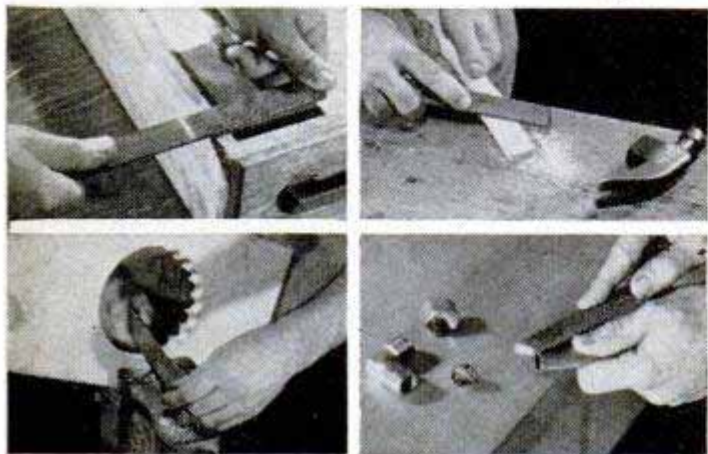
### TEXACO DEALERS IN ALL 48 STATES

*Texaco Products are also distributed in Canada and in Latin America*



**TUNE IN . . . TEXACO STAR THEATER** starring MILTON BERLE on television every Tuesday night.  
**METROPOLITAN OPERA** radio broadcasts every Saturday afternoon. See newspaper for time and station.





## The rasp that outgrew its name

It was originally designed for shoemakers. And it's still called a "Shoe" Rasp. But with its four types of cutting surfaces, users have found it "as versatile as a multi-blade jackknife." You can use it on hundreds of jobs—on wood, metal, plastics, leather, etc. On flat, concave, or convex surfaces. It's practically—

**FOUR FILES IN ONE.** . . . One side is half *Flat file*, half *Flat rasp*; other side is half *Round file*, half *Round rasp*. Just the thing for use around the house, farm, garage, workshop, or boat yard!

Ask your hardwareman for the handy Nicholson "Shoe" Rasp. Excellent, long-lasting quality. Also write us for **FREE BOOK**, "*File Philosophy*," showing this and many other Nicholson files—plus valuable information on use and care of files.



**NICHOLSON FILE COMPANY**  
22 Acorn Street, Providence 1, R. I.  
(In Canada, Port Hope, Ont.)



# NICHOLSON FILES

FOR EVERY PURPOSE

that they are "soft"—that is, they readily, often eagerly, react with oxygen, thus enabling us to burn food in our bodies, obtain heat from coal, rip the sky in jet planes and blast stumps with TNT. But the hydrocarbons also are our principal building materials, and here oxidation costs us billions of dollars each year.

If you painted your house last summer, chances are it will need another coat in about three years. Oxidation. The rubber sidewalls of your tires may be getting hard and crumbly. Oxidation. In 1950, fires cost this country an estimated \$649,000,000. Fire is oxidation at a rapid pace.

Most fluorocarbons, on the other hand, simply won't oxidize. You can't burn them, no matter how hot a flame you apply. A few are so stable they probably would be the hardest materials in the world to get rid of.

Take butane as an example of the relationship between the old and new compounds. Butane, a hydrocarbon with the chemical symbol  $C_4H_{10}$ , oxidizes so readily it is used as a fuel. Taylor and his staff have substituted fluorine for the hydrogen, making  $C_4F_{10}$ , which they call perfluorobutane. This strange gas is noncombustible and four times as heavy as butane. It would make an ideal fireproof, sparkproof blanket across the top of a gas tank.

The familiar hydrocarbons also can be attacked by decay and fungi. On the other hand, bacteria and insects can't use fluorocarbons for food, so substances made from these compounds—or protected by them—are completely free from decay and termite damage. This is big news in the field of paints, polishes and other coatings.

Other unique personalities show up among the offspring of the fluorine-carbon marriage. "Take N-octadecylheptafluorobutyramide or trifluorobromomethane, for example," says Doctor Taylor with a twinkle in his eye. "The latter chemical has some remarkable properties." He picks up an apparently empty beaker and very carefully pours nothing into another beaker. As you begin to think Doctor Taylor has been working too hard on N-octadecylheptafluorobutyramide, you notice something very perturbing. A small inflated balloon, which was resting on the bottom of the second beaker, slowly begins to rise. By the time Doctor Taylor has emptied the first beaker, the balloon floats atop the second, supported by several cubic inches of space.

"You probably have guessed the answer," says Doctor Taylor. "The first beaker was filled with trifluorobromomethane, a colorless, odorless gas. It's five times heavier than air, so you actually can pour it, and

(Continued to page 276)





OUR WALLS  
MADE ME  
WAIL!



UNTIL I  
DISCOVERED  
GOLD BOND  
COLOR  
TEXTURE!



YES, WE HAD DRAB,  
DULL, DINGY  
OLD WALLS!



I ASKED MY NEIGHBORHOOD DEALER  
WHAT TO DO. HE TOLD ME ABOUT  
AMAZING GOLD BOND COLOR  
TEXTURE...IN EIGHT NEW COLORS!



I JUST MIXED  
IT WITH TAP  
WATER...



... AND BRUSHED  
IT ON. IT DECORATES  
LIKE PAINT  
AND COVERS  
LIKE PLASTER



THEN I USED  
A SPONGE TO  
GET A DISTINC-  
TIVE SWIRL FINISH



OR A ROLLER  
DOES DOUBLE  
DUTY. COVERS  
AND TEXTURES IN  
ONE OPERATION.



YOU CAN GET ENOUGH COLOR  
TEXTURE FOR AN AVERAGE  
ROOM FOR ABOUT **\$4.85!**



AVAILABLE AT  
YOUR LOCAL  
GOLD BOND  
LUMBER AND  
BUILDING  
MATERIAL DEALER  
OR PAINT STORE

You'll build or  
remodel better with  
**Gold Bond**

NATIONAL GYPSUM COMPANY  
BUFFALO 2, NEW YORK

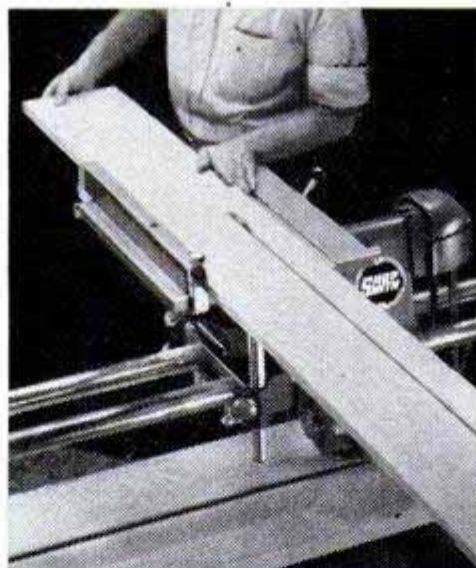


**"You can't beat SHOPSMITH**

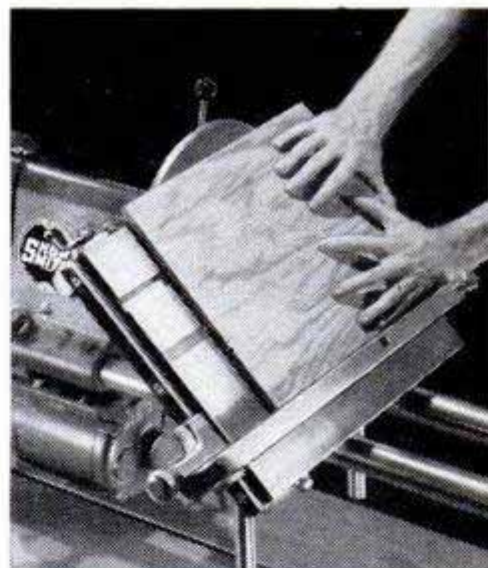
*Kitchen designed and built by A. A. Myrus, Oneonta, N. Y.*



**1 "FULL-SIZE PLYWOOD PANELS** are hard to handle on the average table saw. But not on SHOPSMITH. The SHOPSMITH table extension gives you plenty of working surface — up to 48" between blade and fence. Not many saws can match that!"



**2 "HAIRLINE CUTS.** Another thing I like about SHOPSMITH is its extremely accurate blade-to-fence setting. You make your fine adjustments by changing the position of the blade with the quill feed lever. It's faster and more accurate than shifting the fence."



**3 "BEAUTIFUL BEVEL.** Plywood is difficult to bevel with a plane or shaper. It chips and splinters. But I was able to get perfect results with SHOPSMITH set up as a disc sander and the table tilted 45°. Sander was also used to butt-sand drawer fronts and framing members."

SEE SHOPSMITH DEMONSTRATED AT LEADING HARDWARE AND DEPARTMENT STORES OR ANY MONTGOMERY WARD STORE. WRITE FOR FREE CATALOG!

**SHOPSMITH is a complete power workshop . . .**

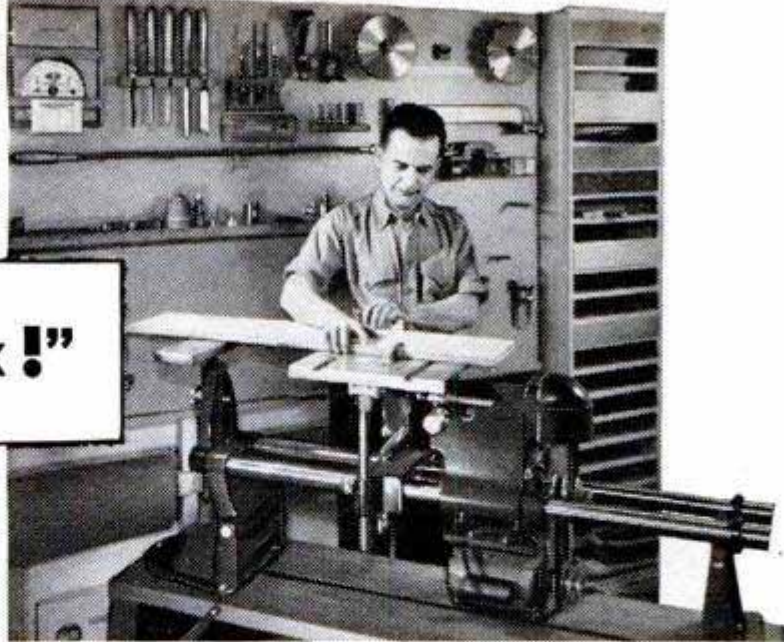
8" circular saw • 12" disc sander  
33" wood lathe • 15" drill press  
Horizontal drill

**SHOPSMITH complete except for \$189.50**

\*Special 1/2-hp., capacitor-type 120-volt, 60-cycle motor, \$34.50



## for cabinetwork!"

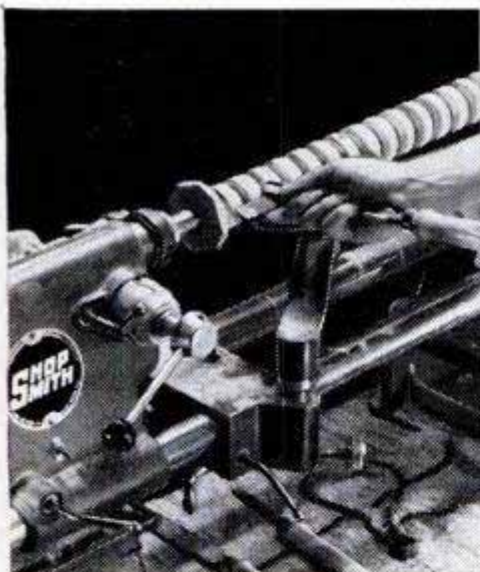


"I'm remodeling our entire kitchen. It's a big job. But, thanks to SHOPS MITH, I'm saving time and money and having the time of my life.

"Take the cabinetwork, for instance. There's where SHOPS MITH really showed me what it could do. I was able to cut 4' x 8' plywood panels easily and accurately. For 'right-on-the-button' saw blade to fence settings, I used the micro-quill adjustment—only SHOPS MITH has it. I beveled the edges of the cabinet doors with the disc sander. And I switched to the horizontal drill for doweling the maple chopping block.

"What especially impresses me is the accuracy of the work SHOPS MITH turns out. Every part fits perfectly. Corners are absolutely square. Dimensions check to the fraction of an inch. One reason for that is the fact that you can use the rip fence and miter gauge as jigs in almost every setup. Another reason is that SHOPS MITH is one integral unit. It can't get out of line.

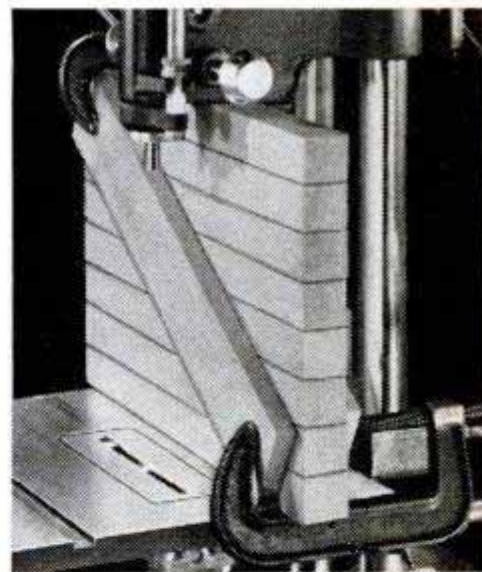
"And when you add it all up—compactness, ruggedness, flexibility, extra features—it's easy to see why SHOPS MITH is America's most popular power tool."



**4 "KNOBS** for the drawers and cupboard doors were turned fifteen at a time with SHOPS MITH in the lathe position. The SHOPS MITH tool rest slides parallel to work making it faster and easier to turn long pieces. Speeds can be varied from 800 to 3600 rpm."



**5 "HORIZONTAL DRILLING** surely saves time and headaches. I used it to drill maple boards for a doweled chopping block. Table and rip fence served as jigs, made it easier to position holes accurately. The SHOPS MITH spindle floats on four ball bearings, has a 4" quill feed."



**6 "GLUE PRESS.** There's almost no limit to the things you can do with SHOPS MITH. After the maple chopping block was glued, I clamped it to the tubular steel ways of the SHOPS MITH, let the weight of the headstock (about 100 pounds) act as a press until glue was set."



**MAGNA ENGINEERING CORPORATION**  
Dept. 196-B  
at factory nearest you:  
12819 Coit Road, Cleveland 8, Ohio, OR  
Menlo Park, California

Please send me the free 16-page SHOPS MITH catalog.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



# I Was the Gadgeteer for a TV Madhouse

(Continued from page 137)

that the fish coming out in skeleton form ought to get a laugh—which it did.

I sprayed a paper carton with gray lacquer until, as far as the television camera was concerned, it looked as swish as something out of Buck Rogers. Then I installed an electric motor inside the carton. The motor operated two moving platforms, one for the fish going in and one for the skeleton coming out. The motor also turned a number of wheels and dials. Finally, just to mystify everybody, I attached a hose bib to one side of the box and built a miniature television aerial which I fastened to the top.

The fish skeleton was the worst problem. I finally soldered together some lengths of brazing rod and cut a fish head and tail out of sheet copper. I sprayed the skeleton white; it was a complete success.

Sometimes McNamara built his own inventions. Once he constructed an automatic ash tray, sifter, dispenser and armrest which he was certain would revolutionize American smoking habits. He based the contrivance on the theory that ashes were good for the rugs, but if you merely flicked the ashes off the end of your cigar, the little piles of ash would make the rug bumpy.

So he built an elaborate affair, which he wore around his neck, that combined an armrest and an ash tray. When the tray became full, the contents were dumped through a screen, automatically straining the ashes and spreading them evenly over the floor.

Another of the gadgets he turned out was a device for killing flies that annoy you while making out your income-tax form. In one hand he held a fly swatter to baffle the flies, as it is well known to science that flies never go near a fly swatter. In the other hand he held a pen or pencil, using it to complete the income-tax blank.

But the pen or pencil was attached to a lever-arm arrangement through which he could instantly squash any fly which—lulled into security by the fly swatter—dared to nibble at the flybait which you had previously put out. All of this could be done without your looking up from the income tax form.

The last invention I built for McNamara was a little device which I think really has a future. It is an exploding-cigar detector. After long and involved research, I discovered that exploding cigars have gone through a process of radical evolution during the last 25 years. In the old days they were detonated by explosive caps buried

(Continued to page 260)



"Well... Claude has *one* good habit... he uses *non-alcoholic* Wildroot Cream-Oil!"



"Little dandruff, heh? Better try Wildroot Cream-Oil!"



"OK, OK! You're still *my* best friend... but Wildroot Cream-Oil is *my hair's* best friend!"

BEAMER KELLER

**YOUR HAIR'S  
BEST FRIEND**

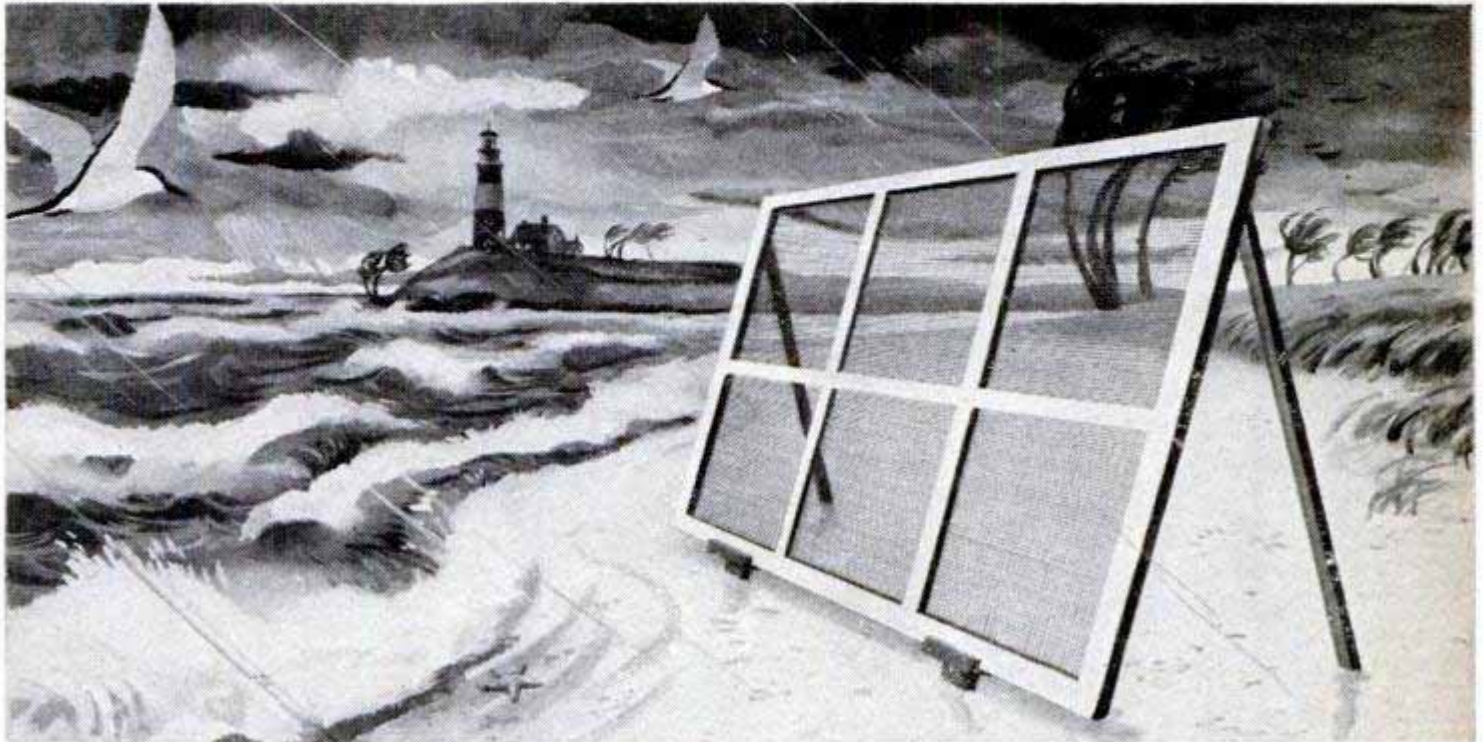
America's  
Favorite  
Hair Tonic!





# Longest Lasting Screening You Can Buy!

Here's proof that  
**LUMITE\*** Screening  
outlasts all other kinds!



**Can't be beat for durability!** In actual comparison tests under the worst exposure conditions, LUMITE saran screening resisted the effects of weather outdoors *better than ALL other kinds of screening!* LUMITE is unharmed by salt air, humidity, city soot and acid smoke. Further tests proved LUMITE has the strength to take harder blows without bulging or breaking than ALL other kinds of screening!

**SAVE WORK,  
MONEY, THESE  
3 WAYS!**



**1. No painting or varnishing** needed to preserve LUMITE because weather outdoors has practically no effect on LUMITE. Ideal for every exterior use.



**2. No ugly stains** caused by screen rust or other corrosion because LUMITE screening is made, not of metal, but of rustproof, corrosion-proof saran.



**3. Fewer repairs, fewer replacements** over the years, because LUMITE lasts longer and is actually more resistant than ALL other kinds of screening.

**RUSTPROOF  
CORROSION-PROOF**



Free sample and folder. Write: Dept. PM-23, Lumite Division, Chicopee Mfg. Corp. of Georgia, 40 Worth St., N. Y. 13, N. Y.

# LUMITE\*

**SARAN SCREENING**

\*Registered trade-mark



# SELF-CONTROL STARTS HERE



in the stogies. Modern "exploding" cigars have a piece of spring steel buried in the cigar, kept under tension by a length of string. When the string burns through, the spring snaps open and rips the cigar apart.

I painted a short piece of  $\frac{3}{16}$ -inch dowel in bright colors and embedded a small Alnico 5 magnet in one end. When a friend hands you a cigar, you simply go over it carefully with the magnet end of the dowel. If the cigar sticks to the magnet, you know that there is steel in it. You then hand the cigar back to your friend, and, if possible, hold a gun on him and make *him* smoke it.

Building inventions for a TV madman may seem like a queer type of work, but I found it a lot of fun. It was a constant challenge and involved all sorts of interesting shopwork. Am I right, Mr. Goldberg?

## A Beetle Fights a Battle

(Continued from page 149)

spread  $\frac{3}{4}$  of a mile in all directions," reports Dr. William F. Barr of the university's entomology department. "A cleanup of goatweed from this area is well under way."

So far a general policy of secrecy has surrounded the location of the test colonies in the Pacific Northwest. California had plenty of trouble from beetle pirates. Stockmen who had lots of the weed slipped in and got themselves a few thousand. Snitching the beetles was bad enough. Trampling the colony area was worse, for more were killed than were carried away. The secrecy was to protect the beetles until a colony could hold its own against grazing and against thieving visitors.

But now the secrecy lid is being lifted. With beetles multiplying so rapidly, there's already a "come and get 'em" sign on some of the colonies in California. Free beetles are in prospect for Pacific Northwest ranchers.

"When our Idaho colonies reach the stage where they can provide surplus beetles for new plantings we will hold open houses at which ranchers and landowners with goatweed-covered ranges will be given an opportunity to bring their pots and pans and collect a few thousand beetles to take home," Doctor Barr explains. About 3000 beetles are sufficient for a foundation.

All that's needed in goatweed control with beetles, it seems, is to find the right species of beetle for the locality. Goatweed has a tremendous range of adaptability in elevation, soil and climatic conditions. But the beetle appears equal to this challenge. Somewhere in its lineup of species is one that can do well just about anywhere goatweed thrives.

(Continued to page 262)

and to restore

**CAR PERFORMANCE**

## OIL-CONTROL STARTS HERE

To stop oil-pumping, replace worn engine connecting rod bearings

Lost control usually spells trouble. This is especially true when applied to oil flow in your car, truck or tractor engine.

When the connecting rod and main bearings are worn, they lose control of oil flow. They no longer meter exact amounts of oil for proper engine lubrication. Excess oil reaches combustion chambers, burns to performance-stealing carbon on spark plugs, valves, pistons and rings. Performance goes up in smoke!

Give new piston rings a chance to do their own job—replace worn engine bearings, too! Genuine Federal-Mogul bearings are engineered for the job of oil control. Ask your mechanic!

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(Division of Federal-Mogul Corporation)  
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CONTROL OIL-PUMPING

WHERE IT STARTS—REPLACE WITH

**FEDERAL-MOGUL**

**BEARINGS**

OIL CONTROL





**SEARS**  
ROEBUCK AND CO.

# DUNLAP 8-in. TILTING-ARBOR Bench Saw

REG. U.S. PAT. OFF.

## YOURS FOR ONLY



# \$46<sup>95</sup>

Cash

Complete with blade, miter gauge, rip fence, machine pulley, and V-belt.

ONLY \$5.00 DOWN

COMPLETE OUTFIT AS SHOWN

# \$110<sup>00</sup>

Cash

Complete Bench Saw with motor, motor pulley, two side table extensions, power tool bench, tool light, and Power Panel.

ONLY \$11.00 DOWN ON EASY TERMS



Table stays level, work lies flat at any angle of cut. Blade and guard tilt up to 45°

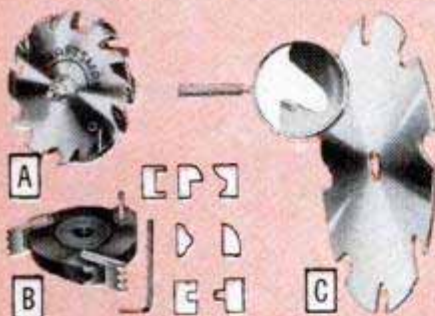


Double-row ball bearings form unit with arbor, prevent misalignment; need no oil



Floating motor mount makes tilting easier, keeps proper belt tension. Motor dismounts

These Accessories make your saw much more useful



**A CRAFTSMAN 6-inch Dado Set.** Dados, rabbets, grooves, etc. with 1/2 or 3/8-inch-arbor bench saws. \$9.50 per set.

**B CRAFTSMAN Molding Cutter Head.** Fits most bench saws with 1/2 or 3/8-inch arbors. 4-inch diam. With Allen wrench. \$4.50. Cutter bits for above head. 1-in. wide bits cut styles as shown. Styles \$2.95 per set, and up.

**C CRAFTSMAN Carbide-tipped Saws.** New! Safer—8-tooth design eliminates kickback. Teeth project only .020 in. above non-cutting edge. Rips, crosscuts, miters—lasts 20 times longer than ordinary blades. 5/8 to 10-in. diameters, all arbor sizes. \$10.85 and up.

### Compare the features! Compare Price! One of our best power tool values . . . ever!

We compared this 8-inch DUNLAP to many other saws of the same type and price, and we know of *none* that equal it in work-saving features, performance, or price! *Only \$5.00 down puts this saw in your shop.*

**Tilting arbor** lets you cut any angle up to 45° while the work itself stays level. You can work faster, easier, and more accurately.

**Floating-drive motor mount** supports motor behind saw . . . smothers vibration . . . makes tilting easier . . . lets you remove motor for use with other tools.

**Super-lubricated precision ball bearings** NEVER need further lubrication, NEVER get out of line. (They form integral unit with arbor shaft.)

**Improved fence design** accurately squares fence directly against front of table. Can be used on either side of blade. Easily removed.

**17x14-in. table** of cast semi-steel; top and sides machined. 8-inch combination blade (1/2-in. bore) gives up to 2 1/4-in. depth of cut. (Use at least 1/2-H.P. motor: 3450 R.P.M., 2 1/2-in. pulley, 40-in. belt; or 1750 R.P.M., 5-in. pulley, 44-in. belt.)

**Complete outfit** (as shown) includes CRAFTSMAN 1/2-H.P. 3450 R.P.M. ball-bearing capacitor motor (110-120 volt, 60-cycle AC), 2 1/2-in. motor pulley, 2 side table extensions, 40-in. belt, adjustable steel power tool bench, tool light, and Power Panel (remote control for light, motor, etc.).

See this great DUNLAP saw value today at your nearest Sears Retail Store!

Your nearest Sears Retail Store will furnish you with exact selling prices which will not exceed ceiling prices under applicable price regulation of O. P. S.

## CRAFTSMAN and DUNLAP Tools by SEARS, ROEBUCK and CO.

REG. U.S. PAT. OFF.

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### Famous for fine quality . . . precision performance . . . low price!



A few stockmen still shy at the idea of encouraging the propagation of bugs by the billions. Sure, they will eat the goatweed. But couldn't they prove to be a pest worse than the weed? Nothing to fear there, say the entomologists.

"The beetles eat only goatweed," Doctor Barr declares. "Not a thing else. If their food isn't available they will crawl or fly until they find some. Migrations up to five miles have been reported. If the beetles can't find goatweed anywhere they just give up and die."

## Science Tackles the "Sixth Sense"

(Continued from page 96)

chips to fall with a certain side uppermost.

Sitting in his laboratory, surrounded by dice cages, card shufflers and other mechanical devices, Doctor Rhine can relate stories of psychic phenomena until your hair stands on end.

He tells about one little boy who disappeared. Two days later a woman in the same village had a sort of daydream in which she visualized herself looking into a hole between some familiar rocks. She saw the legs and feet of a child half covered with dirt, wedged in the bottom. Frightened, she led some friends to the spot and they found the missing boy, dead. This, Rhine

points out, could have been a vivid case of clairvoyance.

Even more dramatic is the alleged clairvoyant experience of a 10-year-old girl who was walking down a road reading a book when, suddenly, her surroundings seemed to fade and she visualized her mother lying on the floor of an unused room at home, a lace handkerchief beside her. She ran to the near-by office of a doctor and sobbed her story. The doctor, more to allay her fears than anything else, took her home and was shocked to find the mother in the exact room described by the youngster, lying on the floor with the lace handkerchief beside her. She was suffering from a heart attack.

"Distance doesn't seem to matter in these cases," Doctor Rhine says. In one case, a man in Java said he dreamed in accurate detail about his mother's funeral at the time it was occurring in South Carolina. Even more significant is the account of a woman who was in Switzerland when her sister died in Chicago. Somehow, she knew it, and had her husband write down the date and hour when she first felt it. Later they learned that the sister died at the exact time they had marked down.

Psychic phenomena seem to have as little respect for time as for space, according to Doctor Rhine. When they leap the gap of

(Continued to page 264)

# DO IT TODAY! SWITCH TO

## MILD

# KENTUCKY CLUB

Notice how much better your pipe tastes—how much fresher your mouth feels when you switch to Kentucky Club.

Look for the blue tin with the picture of the red-coated rider. Send for free catalog showing fine pipes and how to get them at big savings. Mail Pouch Tobacco Co., Wheeling, West Va. Dept. 91



"Look! Another man switched to Kentucky Club—the thoroughbred of pipe tobaccos."



# IMPROVE YOUR WOODWORKING!

## with the NEW DURO 12" BAND SAW

The most practical power tool addition to your workshop. Enables you to "cut corners" on many woodworking operations! Versatile, convenient and dependable, will increase workshop efficiency and improve work quality. Has many features ordinarily found on higher priced tools: ball bearing blade guides above and below table keep blade running truer and smoother; double trunnion table supports; balanced disc wheels; roller type bearings. Work table tilts to 45°. One piece guard covers both wheels, has provision for built in light, unlocks easily, allows operator to check blade tension and tracking quickly, safely. Also permits easier blade changing. Can be used for metal cutting with special converter. There's a Duro Band Saw for every purpose in 10", 12", 15" and 16" models.

### A NEW KIND OF PROJECT MAGAZINE

A treasure of project ideas. Prepared by a practical craftsman. Refreshingly new material — with photographs, plan drawings, step by step instructions, that even a beginner can follow easily. Send 25c for sample copy, or you can save 1/3 and get 6 issues for \$1. Either way we'll refund your money if not delighted.



### Write Today!

For full details and specifications on the Duro 10", 12", 15" and 16" Band Saws and full story on the complete line of Duro power tools.

#### DURO METAL PRODUCTS CO.

2668 No. Kildare Ave., Chicago 39, Ill.

Please send me full details about the new Duro Band Saws.

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2668 N. KILDARE AVE. CHICAGO 39, ILL.  
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### SUCCESSFUL HOUSE WASHER CLEANS

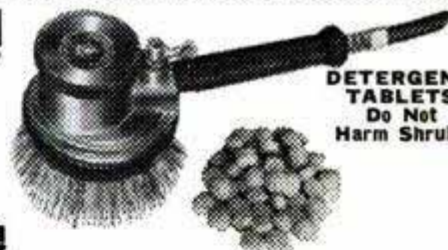
### LIKE NEW PAINT JOB!

### Cleans Porch and Basement Floors

### SAVES PAINT AND MONEY — EASY TO USE!

Seven foot light extension hose on handle attached to garden hose — valve controls soap, scrub and rinse operation. Has 3 ft. Telescope handle which opens to 6 ft. long. GUARANTEED not to leak.

Supplied complete with sufficient detergent tablets to wash average two story home at only \$14.95 POSTPAID. Short handle model pictured above, only \$11.95. Aluminum quota reduced 65%, making early orders advisable. ORDER DIRECT or write for details.



**DETERGENT TABLETS**  
Do Not Harm Shrubs

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### DRAINS Cellars, Wash Trays; CIRCULATES Oil; IRRIGATES Gardens!

ORIGINAL "Type P" Pump has 1,001 year "round uses — home, shop, garden, farm. DRAINS cellars, cisterns, wash tubs, ditches, pools. IRRIGATES gardens, lawns, truck patches. SPRAYS crops, orchards. CIRCULATES oil, coolant. SUPPLIES water to elevated tanks from wells as deep as 25 feet. 2400 gals. per hr. capacity. 360 GPH 75' high. 1500 GPH from 25' well. 1" suction and 3/4" discharge ports fitted for hose. Use 1/2 to 1-1/2 HP motor or engine. 1/2" Stainless Shaft. Oil-less Bearing. DOES NOT CLOG OR RUST!

ONLY \$6.95



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Easy to Assemble!  
Easy to Use!



### TYPE C-4

Direct drive. Ideal for plumbing fixtures below sewer line. Complete with 1/2 HP motor, \$25.95. Without motor, only \$11.25.

**LITTLE GUSHER** Irrigates, drains, waters livestock, fights fires! Pumps 2000 GPH 25' high or 360 GPH 75' high. 2 HP engine with 3" power take-off V-pulley. Adjustable from 1700 to 4500 RPM. Portable. Dollar for dollar, pound for pound, the best pump. \$69.00 complete with valve at... 1 1/2" Bronze Foot Valve, 1 1/2" suction hose, \$1.25 per foot. 1 1/4" discharge hose, \$1.00 per foot.

**BIG GUSHER** Pumps 7000 GPH. Complete with 3' of 2" suction hose and 2" foot valve, only \$89.00. 1 1/2" suction hose, \$1.75 per foot. 1 1/2" discharge hose, \$1.25 per foot.

### Low-Cost Accessories

All Bronze Foot Valve for 1" hose, \$3.45  
1" Suction Hose, per foot, \$ .38  
3/4" Discharge Hose, per foot, \$ .22

### Money Back Guarantee

All prices POSTPAID if money order or check with order. West of Mississippi & Canada, add 50c for Type P; \$1.00 for other models.

**LABAWCO PUMPS, Belle Mead 22, New Jersey**



**TYPE D-3** Cleans 40' well or cesspool quickly! Drains. Irrigates, etc. Operates in any position. 400 GPH 40' high; 1400 GPH 20' high. Complete with 1/2 HP motor, \$32.95. Without motor, only \$12.85.

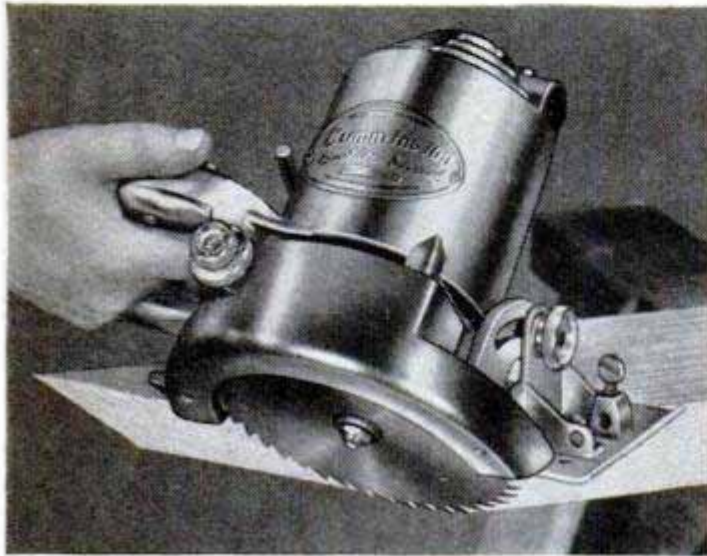
**TYPE D-4** Drains cellars, pools, boats. 1500 GPH 5' high; 600 GPH 13' high. Same as D-3 except with 1/4 HP motor \$27.45. Without motor, \$12.85.

**AUTOMATIC SWITCH** for 24" sump, fits D-3 and D-4. \$4.60.



# magic pivot DOES IT!

**\$ for \$ and lb. for lb.  
cuts deeper at 45°**



**Here's why you haven't seen the best 'till  
you see the CUMMINS 700**

**magic pivot** does it! Yes, with this amazing new exclusive CUMMINS feature, the CUMMINS 700 noses the blade down deeper into the work at 45°—where other saws lose cutting depth. The CUMMINS 700 actually cuts deeper at 45° with a 6 $\frac{3}{8}$  in. blade than any 7-in. saw and most 7 $\frac{1}{4}$ -in. saws that cost up to twice as much, weigh 15 to 20 lbs. The CUMMINS 700 weighs 10 lbs.—yet it puts more power at the cutting edge, cuts faster. It cuts full dressed 2-in. lumber at 45° with blade to spare—something no 7-in. saw will do.

The CUMMINS 700 with **magic pivot** is your king size saw buy! Price only \$69.50—yet it outperforms the field at lower cost, with more power, and a 50% savings in weight to save your muscles.

In addition, Cummins STUB RADIUS blades last twice as long. Because they have so much extra blade to spare at 45°, you get twice as many sharpenings and still hold full-through-cut at 45°. **magic pivot** is the first basic improvement in portable electric saws in almost 25 years! Don't buy any saw until you see the **magic pivot** CUMMINS 700—it is heavy duty, all-ball-bearing industrial quality—best there is! See it at your hardware store now.

Let us give you all the facts on this amazing development—send for Cummins Portable Power Saw Pamphlet today.

# Cummins

**PORTABLE TOOLS**

**Cummins-Chicago Corp.**

4740 N. Ravenswood Ave. Chicago 40

time, they become what he calls "precognitive" or prophetic. A specially strong hunch might be a mild form of precognition. One of the most striking examples is the famous case of John W. Dunne, brilliant engineer who designed England's first military airplane. In 1913, he dreamed he was on a railroad embankment near the Firth of Forth bridge in Scotland. Looking down, in his dream, he saw that a northbound train had just tumbled from the tracks, huge stones still rolling after it. Crushed, mangled cars lay in a smoking heap on a broad green field where people walked about. In his dream he knew this was happening in the spring of 1915. He told the dream to his sister, who recalled that he mentioned "probably March" as the time. On April 14, 1915, a crack train, *The Flying Scotsman*, leaped the tracks near the Firth of Forth bridge and crashed to a golf course 20 feet below the tracks.

Very often, when people report ESP cases to the Parapsychology Lab, they tell of physical effects that accompany them. "People tell of being near a dying friend and hearing loud knocks on a door when no one is near," Rhine reports. "I've heard of clocks that haven't worked for years suddenly striking; of piano keys being struck when no one is in a room. Such cases may be hallucination. They may not." He tells of one friend who reported that when his wife's father died of a sudden heart attack, a radio that had been blaring in the room suddenly stopped—and so did two others in the separate homes of the man's two daughters. None was in need of repair, nor was the program interrupted, it later turned out.

Doctor Rhine feels such occurrences might well be psychokinetic, or PK—the influence of mind over matter.

All these cases are exciting; some are highly documented. But to the scientist, no one's word is enough to prove that a thing as nebulous as telepathy or clairvoyance is a fact, rather than a coincidence, or even a lie from a fertile imagination.

At the Duke Parapsychology Laboratory, Drs. J. B. Rhine and Louisa Rhine (his wife) and their serious-minded assistants view the documented accounts as interesting historical data and that's all. To provide a scientific hook that will snag the intangible psychical phenomenon in action, and haul it in for study and mathematical analysis, they have devised unique instruments, games and techniques.

Students sit at tables separated from experimenters by plywood baffles, playing "guessing" games with Rhine's ESP cards. This is a deck of 25 cards, each marked with one of five vivid symbols—a cross, a star, a

(Continued to page 266)



SAVE AT GROBAN'S ON THESE BRAND NEW

# WAR SURPLUS Bargains

GUARANTEED UNCONDITIONALLY

## HEAVY DUTY AIRCRAFT QUALITY HYDRAULIC EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.



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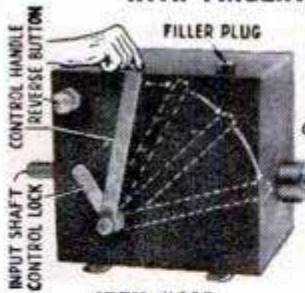


**ITEM #103**—Double acting hydraulic cylinder. 2 1/2" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1 1/4" diam. shaft, 3/8" tubing thread ports. Overall length closed 28". Ship. wt. 11 lbs. **21.50** F.O.B. Chicago.

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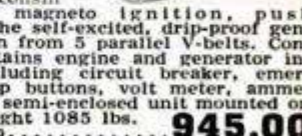
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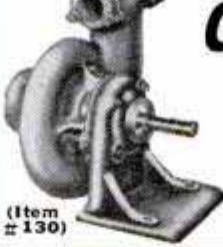
**Item #201**—PE 95-G—10 KW—110/120 Volt—60 Cycle A.C.—Single Phase. Totally enclosed. Onan generator direct coupled to Willys Jeep, 4 cylinder, water cooled engine, push button start. Instrument panel with engine and generator instruments, circuit breaker, controls, etc. Uses 6 volt car battery. Battery not incl.) Skid mounted. Ship. wt. **1295.00** 1500 lbs. F.O.B. Chicago.



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circle, a square, or three wavy lines. In clairvoyance tests, cards are spun in an automatic shuffler—a long black box lined with wavy walls and suspended on an axle—and then placed in a closed box. The subject tries to name the top card. Or perhaps he'll go right on down through the pack. Later the cards are removed and compared with his "guesses." Since no one knows the order of the cards, the subject could get consistently correct answers only through clairvoyance.

"Five out of 25 cards is what the mathematical laws of chance say should be predicted in such a game," Rhine explains. "When we come up with subjects who hit six and seven in thousands of runs, and consistently give scores with odds of 10,000 to one better than chance, which we do, we know that something more than pure chance is at work."

Any doubt that investigators were on the track of something startling vanished when one man named Lingmayer scored a succession of nine hits in a row, then named 15 cards right. Then another subject named Pearce called all 25 for a perfect score. The odds against such a performance occurring by pure chance are so astronomical that this page wouldn't be wide enough to accommodate the figures.

Other perfect scores have been made since then. Rhine tells about a nine-year-old orphan named Lillian, who made excellent scores. One day the experimenter promised her 50 cents if she got all the cards right. At the next test, Lillian said, "Don't say anything. I'm going to try something." She closed her eyes for a moment, went to the table and kept moving her lips all through the performance—"wishing all the while I would get 25," she told the experimenter later. And she did!

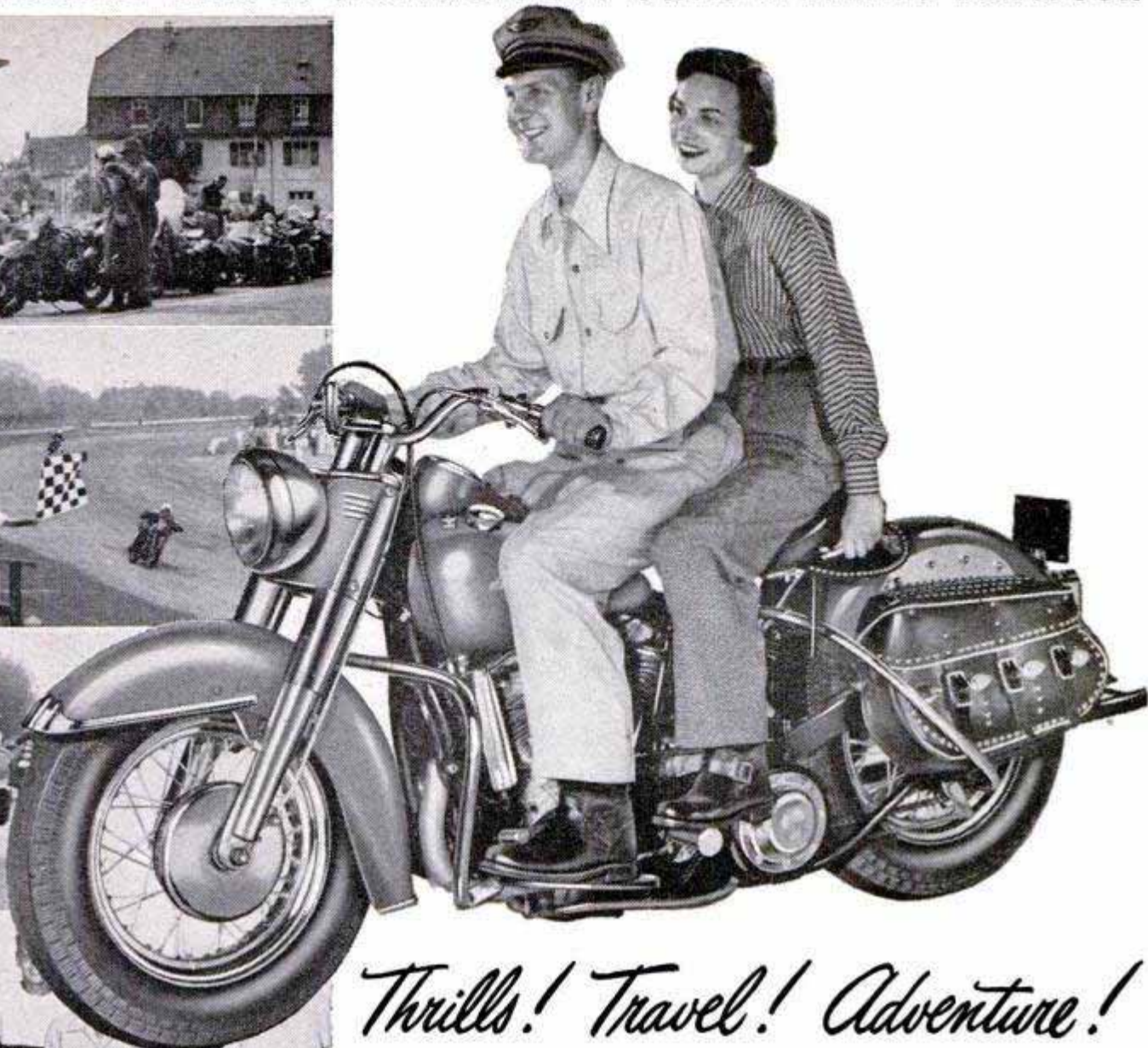
Rhine explains that the girl's attitude was ideal because of the promise of reward.

In telepathy, instead of using the cards themselves, the tester simply thinks of one of the symbols while the person being tested tries to match his thought. In precognition tests with the cards, the subject predicts in what order the cards will come from the automatic shuffler *before* they are shuffled. In one set of 4500 such tests at Duke, scores averaged 400,000 to one that something beyond mathematical chance was operating.

In one room, clairvoyance testers use a tray of 25 colored marbles in sockets. Another tray with empty sockets fits on top of it and locks in place. The subject, who has never seen the marble arrangement in the bottom tray, dips in a bag of marbles and tries to match colors with those under-

(Continued to page 268)





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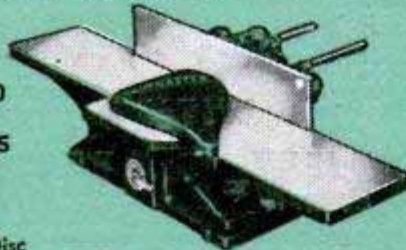
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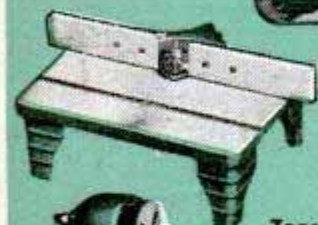
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neath. Here again, the mathematical laws of chance call for five proper matches out of 25, yet at Duke the scores in hundreds of tries fell far above that chance average.

Most startling are the tests with pictures which the subject tries to "copy" without seeing what he's "copying." In GESP tests, which may involve either clairvoyance or telepathy or both, the experimenter in another room looks at the picture, signals the subject that he's ready by telegraph key, and the subject tries to draw what he thinks the other person is looking at. In clairvoyance tests, the pictures are put in sealed opaque envelopes, and shuffled so no one knows which is which. Then one envelope is picked out and the subject tries to draw what he thinks is inside. He has never seen any of the pictures before, of course.

Some results give you the cold shudders. One man drew a chemical flask and test tube on a laboratory table. The picture in the other room showed a doctor, with an identical flask in front of him, filling a hypodermic needle.

Such dramatic evidences of clairvoyance and telepathy occur frequently enough to go far beyond the realm of coincidence, Doctor Rhine has determined.

Toughest nut to crack scientifically was PK. Rhine had documented accounts of a famous professor of religion whose inkwell split in two with a sharp report when a student asked him for evidence of the spiritual world; of a wooden table top rent asunder with a loud crack when no one was near it. He has a photograph of the four pieces of a steel bread knife that shattered with very similar sound effects at the same time. How do you get at the strange force, if it exists at all in a person, that might make such things happen?

A young gambler provided the answer. Many people, he told Rhine, believed they could influence the roll of dice. Wasn't that the same thing? Rhine thought it might be. Today, in his laboratory, subjects roll dice under rigid controls on specially prepared surfaces. A target number is chosen and the thrower tries to make it come up as often as possible. He may use two dice, rolled from a cup, or turned in a cage by motor. In new and bigger apparatus, dozens of dice jiggle in automatic shakers, tumble down a perfect inclined plane and spread across a level table. Target hits are noted and recorded. Here's how it works. If the subject is throwing for single faces such as a "three," for instance, pure chance says that one "three" can be expected in every six die-throws.

Though there has never been anything to compare with the perfect scores in the

(Continued to page 270)



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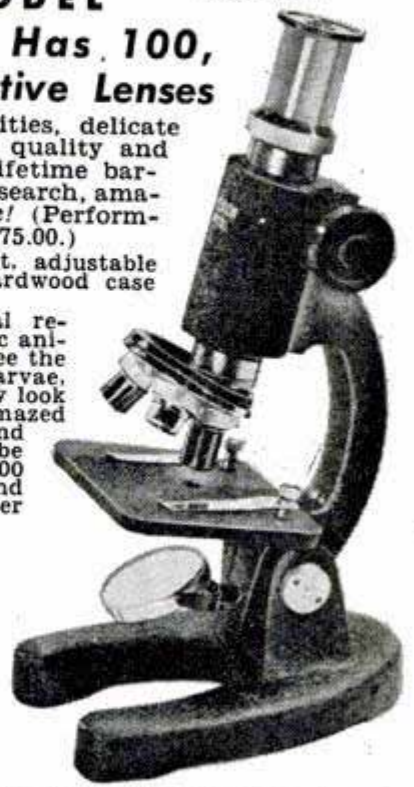
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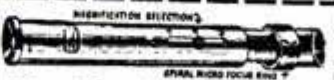
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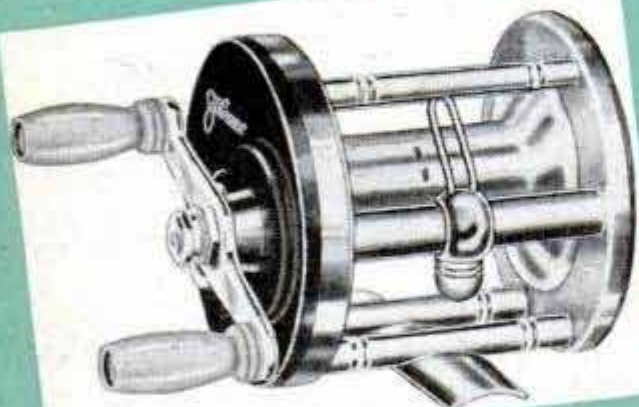
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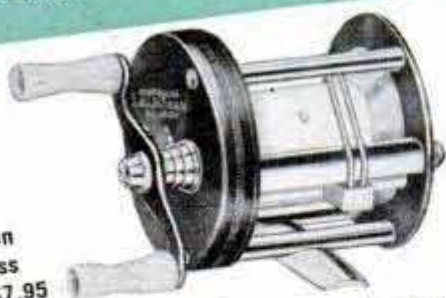
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ESP card tests, PK dice experiments average well above chance. So do the scores on a weird gadget, hung on a swivel, in which chips, marked with a bull's-eye on one side and a plus sign on the other, cascade down a snaky chute to a flared bottom. Subjects try to influence one side of the chips to come up more often than the other.

To see if distance might affect their results, the group at Duke, and other parapsychology centers have tried their experiments by remote control. At distances up to hundreds of yards, Pearce, the perfect-score man, averaged eight hits per run during hundreds of tests with ESP cards. One woman hit 19, 16 and 16 on three successive days from a point 250 miles from Duke.

Men like Doctor Rhine are goaded in their search by an occasional performer who leaves them gasping—like the British photographer Basil Shackleton, who was being studied by English scientists. After Shackleton had run a series of terrible scores in GESP tests with a deck of cards, the experimenters suddenly discovered to their amazement that the man was naming not the card the experimenter was looking at, but the *next one*, which the experimenters hadn't even seen yet. His scores were consistently high. They checked him with cards depicting animal pictures, in which he'd name the animal. He did the same thing. They checked him in a separate room. He still did it.

Those who have been working in it know that ESP is a slippery business, which eludes time and space. But by probing deeper and deeper in the dark corridors of the subconscious mind, explorers such as Rhine hope to find exactly where human personality belongs in the scheme of things. If their premonitory hunch is right, they may well change our entire concept of the physical laws of the universe.

## Tougher Base For Movie Film

Home-movie fans will be happy to learn that a new base for motion-picture film promises to wear three or four times longer than present film. It also has twice the tear resistance of standard acetate or nitrate-base film. Developed by Du Pont research, the film base is a polyester and is chemically related to Dacron polyester fiber, the newest of Du Pont's synthetic fibers. Because of its toughness and stiffness, it is believed that the new film will make it possible to reduce the thickness of film by at least 20 percent, with a resultant increase in footage per reel. The new film will soon be produced on a pilot-plant basis by Du Pont.





## D.C. GENERATORS

Finest aircraft quality . . . heavy duty . . . lifetime grease-sealed ball bearings. Terrific for truck and marine use, for welders, plating, D. C. Appliances, lights, etc. Type P-1 Mfd. by Ford, General Electric, Westinghouse & Delco-Remy. Rated 200 Amps., 28 Volts; 2500 RPM., can be "revved" up to 300 Amps. Shpg. Wt. 53 lbs. Approx. Govt. Cost \$350 . . . New to you . . . **\$21.50**

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Made for U. S. Ordnance Dept. to rigid specifications. Portable steel hand carrying unit is a self-contained trouble shooting device for making a complete and rapid check of the generator battery circuit, including any circuit and voltage regulators. Battery voltage, regulators, cut-out settings and generator performance can be easily determined. A terrific testing unit for garages, mechanics, truck fleet owners, boat and marine mechanics. Can be used on any 6 or 12 volt system. Govt. cost approx. \$175. **NEW—complete with instruction book—only \$32.50.** Shipping weight, 20 lbs.



## WILLARD WET PLATE BATTERY

Extra-long life, rechargeable battery. 2 V., 20 Amps. Great for portable radios, mobile units, bell circuits, alarm systems, rural telephones, Strobe bulbs, etc. Only 5" high. Visible ball float hydrometer built in Lucite case. Shipped dry (wt. 3 1/2 lbs.) . . . any battery service will supply standard battery electrolyte. Used singly or in multiples. **ALL NEW! Now only \$1.95 ea.**



## PORTABLE WELDER



Will weld, broze, solder and cut all metals up to 3/16". No experience needed, full instructions included. Weld iron, steel, brass, aluminum and other metals. Plug into any 110 Volt A.C. or D.C. line. Save hundreds of hours and money doing repair work for yourself and others. A great item for any mechanic or hobbyist, etc. Not a toy. Comes complete with electrode and carbon holders and an ample supply of electrodes, carbons, flux and necessary components to do a thorough welding job of any type. This unit cannot be duplicated for many times its price. **NEW—price \$12.00.**

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**ULTRA PRECISION—0.6" in .001 graduations.** Quick, accurate depth, inside, outside measurements, line engraving. Extra heavy rule, hand-fitted sliding head, no side play. Rockwell C.60, lapped measuring surfaces. For the extra particular mechanic who must have the best—used and recommended by most critical experimental & research machinists at Lockheed, Douglas, Bendix, GM, RCA, General Electric. Save 80%! A \$37.50 value—only **\$14.75**, leather case incl. Also a standard grade Mauser Design Caliper made in Germany. For the production machinist, 0.6" in thousandth, the most accurate caliper of this type on the market, 1000's of satisfied users. Only **\$10.95**, leather case incl. These Calipers are of acceptable quality for precision aircraft work. Both are guaranteed buys, money back if not entirely satisfied. Order now! New low price due to lower import duty!

## CUNO OIL FILTER, permanent type.



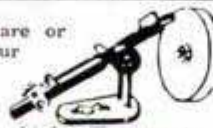
This is the maximum capacity unit (not the small type) that gives greatest protection to your pump, boat, midget racer or engine. It's the perfect filter to keep motor oil or hyd. fluid clean at all times. Just turn handle and element is clean. Inlet & outlet ports take 3/4" pipe. Accommodates 16 GPM at 30 PSI. Mtg. bracket. Wt. 4 lbs. Approx. Govt. cost \$35. Cost to you, **NEW, \$3.75.**

## FLEXIBLE SHAFT MAGNET

For picking up cotter pins, nuts, wrenches, etc. from inaccessible places. Removes Bobbie Pins, etc. from drains. Lifetime Magnetism Guarantee. Highly polished magnet and handle. **\$2.00 postpaid.**

## DRILL GRINDER Sharpens round, square or tapered drills up to 6" long.

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Inlaid Wolfram Vanadium duckbill blades cut straight, circular or irregular forms . . . guaranteed to hold edge under constant severe use on heavy gauge metals. Handy spring opening handles for better leverage. **NEW, 10" size, \$2.45 ea.—12" size, \$2.95 ea.**

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This'll save you money because it protects fuel pump & carburetor . . . removes foreign particles, water, prevents sludge formation . . . for all cars, trucks, tractors & boats. Will handle aromatic fuels & light oils. Easy to connect to gas line in few minutes. Design allows for use either right or left-handed without changes. Stainless steel filter screen easy to remove to clean or replace. 3/4" pipe inlet & outlet ports. Quick opening drain cock. Capacity up to 60 GPH., 2 mtg ports. Wt. 2 3/4 lbs. Made to Air Corps specs. type C2C. Approx. Govt. Cost \$27.50. **NEW! Now only \$3.75.**

## MICROSWITCH



Type Z—2" x 1". Used open or closed. For automatic contacting . . . light, sound, model train systems, chimes, etc. **NEW! 5 for \$2.** Aluminum Spring Actuator to fit above Microswitch—5 for \$2.

## THOR PNEUMATIC SQUEEZE RIVETER



"C" Yoke Head. Size PRS-1. Model 4520. Shpg. Wt. 20 lbs. Approx. Govt. Cost \$250. Like new—guaranteed perfect! Just **\$35.00.**

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Chrome plated, precision engineered, carefully tooled to give long life. All new 0.1" capacity—**\$2.25 ea** 1.2" capacity—**\$3.50.**



## HIGH SPEED DRILLS



All new Fractional & numbered Orig value \$18 Nationally known brand. Assorted sizes. Set of 30, **\$3.50**

## WOODWORKERS DRILLS



From 1/8" to 1/2" with 1/4" shanks. A \$12.50 value—**NEW—just \$2.50** for complete set!

## HIGH SPEED STRAIGHT SHANK DRILLS

10 different size H.S. Straight Shank Jobber Length Drills, 1/4" to 1/2" (shank same diameter as drill) \$25 value. **NEW—\$3.50.**



## HIGH SPEED DRILLS

SET from 1/4" to 3/64", 5 sizes with 1/4" shanks—**NEW—get this, \$3.00** takes this set!

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This U.S. Gauge Altimeter is terrific for auto or airplane. Tells ALTITUDE . . . accurately, guaranteed! It's **NEW!** Approx. Govt. Cost \$175. **NEW to you, only \$9.95.**

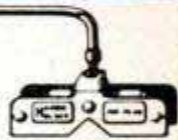
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Pays its way in just 1 day! Saves 100's of hrs., cuts any desired angle . . . just a "click" of the hand for precision mitre every time. Made of heavy gauge stainless steel . . . rugged construction. Handles hard and soft wood mouldings, plastic trim, base shoe, laminated materials. rubber extrusions, etc. Hand Mitre's a **MUST at \$9.95** ppd.

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For all types of dial indicators with guaranteed lifetime ALNICO magnets. V-slotted base has a 45 to 50 lbs. pull, permits immediate application without clamps or special attachments and mountings can be made on cylindrical surfaces. For machinists, tool-makers and inspectors. Base 3 1/2" long by 1 1/4" wide. **NEW. \$3.50 ea.**



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Has worm gear drive in 6 to 1 ratio. Thrust shaft and 9/16" dia. and travels 12", forward or reverse on Acme Worm Thread. Drive shafts on either side of housing are 3/8" dia. with 16 splines. Overall length 25", width 4". Ideal for pushing, pulling or lifting. Sealed, self-lubricating chamber. Shpg. Wt. 5 lbs. Govt. Cost \$150. **NEW \$4.95 ea.**

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## "Little Giant" Radio-Intercom System For Experimenters

(Continued from page 230)

required in remote locations. Many commercial loops have a second winding for this purpose and do not have the condenser network. Both types are suitable.

A standard wooden cabinet, the inside



dimensions of which are  $6\frac{7}{8} \times 7\frac{3}{8} \times 14\frac{3}{4}$  in., is necessary to house the completed unit. The cabinet used was number 98-929 listed in the Allied Radio catalogue. It is priced at \$5.69. Any similar-size wood cabinet may be used. The tuning dial is a "Croflex" type 231. It requires a cabinet cutout  $1\frac{7}{8}$  in. wide by  $4\frac{3}{8}$  in. long. Remember the cabinet holes for the dial face, the volume-control shaft and the tuning shaft must coincide exactly with the component as mounted on the chassis. Dial-cord-stringing directions are furnished with the dial.

The next step is the assembly of the switches and the parts to be fastened to the inside of the cabinet. The switch connections are clearly shown pictorially in Fig. 3. As no provision is made for the remote station to signal the master station if the set is not turned on and in the intercom position, No. 4, a separate buzzer circuit is employed. This is shown in Fig. 5. Ordinary bell wire can be used for this circuit between the two locations. Notice that some of the leads on the output transformer and the rotary switch are connected to components underneath the chassis base through holes drilled for this purpose. Make sure that these leads are long enough so that they need not be stretched tightly

(Continued to page 274)

# STOP THAT OIL EATER!

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● Piston Seal — the amazing compound that forms a self expanding, pliable lubricating seal around pistons that compensates for wear. Eliminates oil burning, restores power and compression. Can be applied in a few minutes without dismantling the engine. Guaranteed in writing not to harm the finest engine.

**GOOD FOR 10,000 MILES**



### READ WHAT SATISFIED USERS SAY ABOUT PISTON SEAL!

I installed a tube of Piston Seal in my 1940 Packard convertible which prior to the use of Piston Seal was using a quart of oil to every 65 to 75 miles. Now the same car is using oil at the rate of less than one quart every 800 miles.

Thanking you for saving us a great amount of time, effort and money.

N. E. P. — LYNN, MASSACHUSETTS

On October 22, 1950, I had a tube of Piston Seal installed in my 1941 Hudson. Prior to the installation of Piston Seal, my car was using a quart of oil every 100 miles. Now, after having driven 225 miles, my oil checks full.

H. G. J. — LYNN, MASSACHUSETTS

Have received one tube and it is doing a good job. Enclosed find check for another tube of Piston Seal.

S. C. S. — LAFAYETTE, RHODE ISLAND



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Fence slides smoothly to position you want — has Vernier control for exact setting.

**T**HE FENCE alone makes Atlas the saw to see before you buy, and in an Atlas you'll find a host of other advanced features that will be of great importance to you in your work. It has the capacity to build a garage, a house, or remodel a room — the accuracy for "factory-quality" work on fine cabinets and furniture, cupboards.

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when the parts are mounted on the inside of the cabinet. The output transformer is mounted on the master-set speaker. It is difficult to mount the parts inside the cabinet with the chassis in place. Keep the chassis outside the cabinet, but close to it.

With all wiring completed, and the set chassis outside the cabinet, you are ready



to align the receiver. This can be done with the rotary switch in the No. 1 position as shown by the round four-position dial plate on top of the cabinet. The sound will come through the master-set speaker. The i.f. transformers are factory aligned and require only slight trimmer (tr.) adjustments. Allow the set to warm up, and then tune in a station and make these adjustments for maximum volume if necessary. In order to obtain proper tracking, close the tuning condenser completely, and then open it slowly until the first station is heard. Determine the frequency of the station and then position the tuning-dial pointer so that it coincides with this frequency on the tuning dial. Now tune in a station at the high end of the band. If the pointer does not indicate the correct frequency of this station, continue to rotate the tuning condenser until the pointer coincides with the frequency of the station just heard. (The station may not be heard at this point.) Then adjust the oscillator-section trimmer condenser across C4 until the same station is again heard. Finally adjust the trimmer on the r.f. section across C3 for maximum volume. Detailed student material list R-408 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

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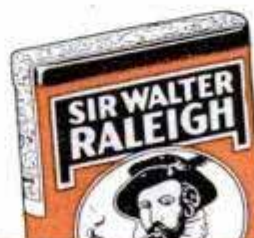
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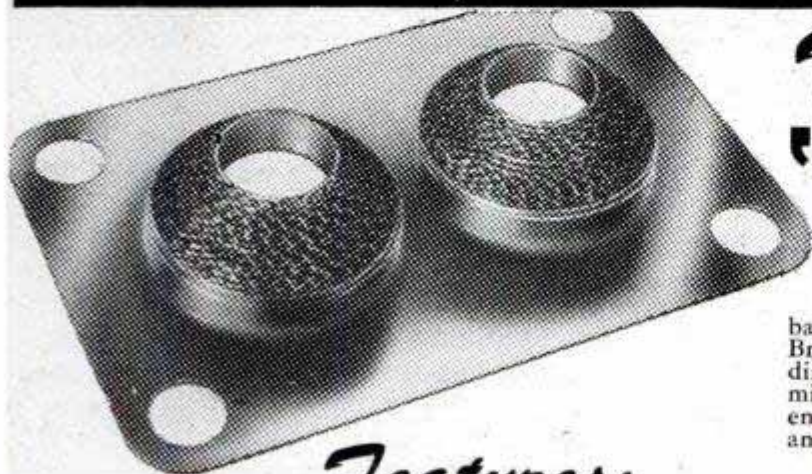


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# BRITISH WARTIME DISCOVERY MADE AVAILABLE IN THE U.S.



## Vokes "GASMASTER"

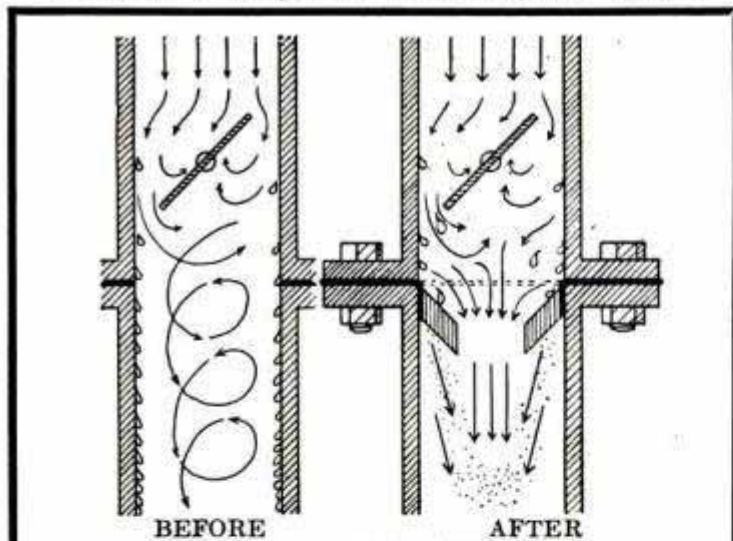
(Distribution Rectifier)

The principles of the sensational "Gasmaster" are based on those of the distribution rectifier designed by British engineers during the last war, to improve fuel distribution on internal combustion gasoline engines for military aircraft. The "Gasmaster" gives astonishing engine performance improvement, gasoline economy, and quicker starts.

### Features:

- ★ Improved Engine Performance
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- ★ Quick Starts

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When air passes through the carburetor it is mixed with fuel in a ratio fixed by the engine manufacturers, and then distributed to the cylinders. However, distribution of the air-gas mixture to the cylinders is imperfect in all engines, in fact, the gasoline engine with perfect distribution has yet to be made. After leaving the carburetor some of the mixture still contains liquid gasoline and is not of uniform consistency. The butterfly valve induces swirls and eddies and the shape of the intake and the number of cylinders also has an effect. In designing the "Gasmaster" all these factors were carefully

analyzed. Here's how the "Gasmaster" overcomes them as shown in the diagram on the right:

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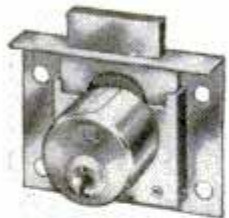


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the air-filled balloon floats in it. We've found it to be an extremely effective fire-extinguishing agent, at least twice as effective as carbon tetrachloride, and many times more effective under winter conditions. The Army Engineer Corps reports that it is superior to all other fire extinguishers now in use. Another point is that many chemical fire extinguishers form toxic gases. For example, some actually produce phosgene, a war gas. Not this stuff. Its toxicity can scarcely be measured."

Doctor Bryce describes some of the other properties of the chemicals.

"Many of the liquids have extremely low surface tension, making them good wetting agents. They'll strike like lightning through cloth. You can imagine what they could do for a dye. This wetting ability of the fluorocarbons also may be important in the field of detergents. Water, on an arbitrary scale, has a wetting ability rated at around 75. The best soaps and detergents reduce this to about 30—they make the water more than twice as wet. A one-percent solution of fluorocarbon in water cuts even this figure in half, to around 15. You can see what this might mean to the cleaning industry."

The penetrating power of fluorocarbons probably will make them important in the medical field, too. Most medicines become effective only after they are absorbed into the body. Fluorocarbons, being nontoxic and having great penetrating power, could have startling effects on the body processes.

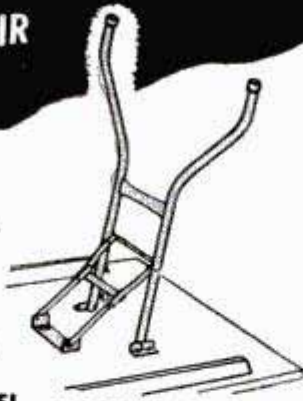
Here are just a few of the other possible uses for the magic compounds: Fireproof plastics; polishes that positively repel grease as well as water; paints and varnishes that resist weathering; cooling fluids and gases wherever high temperatures are produced; electrical insulations (fluorocarbons won't conduct electricity); nontoxic insecticides; better photofilms with unique optical qualities; refrigerants; permanent hydraulic fluids; crease-resistant clothing; anesthetics with no aftereffects. One chemist states there is a fluorochemical that destroys adhesion—eliminates it so effectively that it may be possible to treat airplane wings to prevent ice formation.

Even Taylor, Bryce and the other experts don't pretend to know how fluorocarbons will fit into the industrial pattern. All they know is that they've tweaked the tail of something big, and from here on the industrial chemists will take over. For that reason most of the current output is flowing to industrial laboratories all over the country. While Taylor and his associates turn out a growing flood of fluorocarbons, the second team is working to capitalize on the unique offspring of nature's most violent element.



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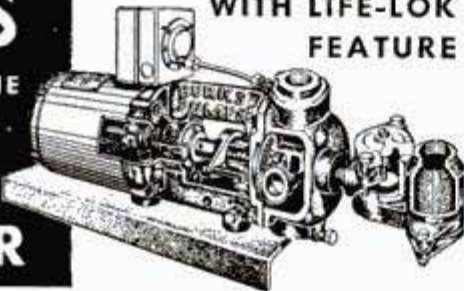
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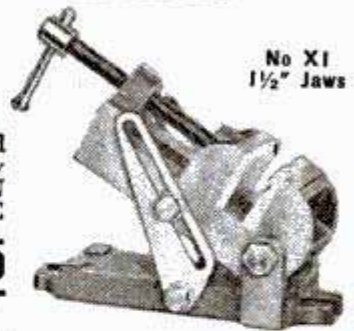


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**ADJUSTABLE ANGLE PLATE**

Every Hobbyist should have one for jobs difficult to hold in vise. No delay, less spoilage on complicated angles in drilling, milling, grinding or layout work. No. 256 B has 6" x 6" surface plate, 8 bolt slots. Adjustable to full 90°. Accurate graduations. Swivel Base. Only .....

**\$14.35**

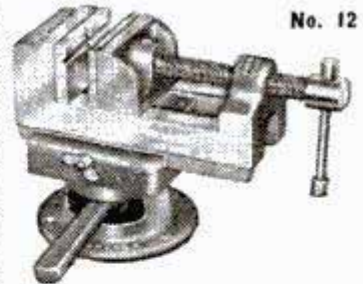


No. 256B

**BENCH DRILL PRESS VISE**

A fine "Hobb-E" tool. Base bolts to work bench for general work. Vise is dovetailed and removable for use on drill press by loosening thumb screw. Unit rotates 360° horizontally. Adapter has steel jib which locks vise in position. No. 12 Removable Jaws 2¼" wide. 1 Plain 1 Grooved. Only.....

**\$12.95**

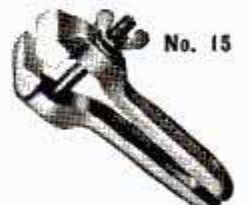


No. 12

**ALL PURPOSE ALUMINUM HAND VISE**

This "Hobb-E" tool grips small pieces for grinding, buffing and 101 other uses. Safe-guards hands and fingers. Small parts easier and faster to handle with better results. No. 15 Jaws 1½" accurately machined, can't mar work. Only.....

**\$2.15**



No. 15

**ORDER NOW! SEND COUPON TODAY!**

**CHICAGO TOOL & ENGINEERING CO.,**  
8376 South Chicago Ave., Chicago 17, Ill.

Enclosed find \_\_\_\_\_ for items checked below.  
 PALMGREN "Hobb-E" ANGLE VISE.  PALMGREN "Hobb-E" ANGLE PLATE.  PALMGREN "Hobb-E" MILLING TABLE.  PALMGREN "Hobb-E" HAND VISE.  PALMGREN "Hobb-E" BENCH DRILL PRESS VISE.  Send Circular.

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## Make every job easier...

### ...USE A SARGENT PARALLEL-ACTION PLIER

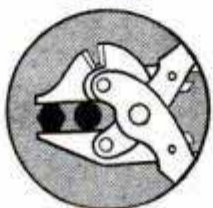
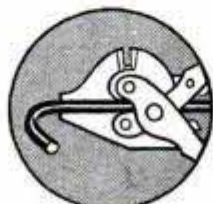
The one above, for example, is a PLIER, a CUTTER and a WRENCH with the NON-SLIP JAWS OF A VISE...

And here's what you get:

- **Extreme Gripping Power** developed through compound leverage... parallel jaws hold like the jaws of a vise.
- **Outside Cutter Blades**—even cut wire which lies tight against a flat surface.
- **Open Throat** allows wire to run between the parallel jaws from either end.

4½" size is the fisherman's favorite. In the larger sizes...5½", 6½", 8"...it's an ideal household and sportsman tool.

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**SARGENT**  
of New Haven

The Tops in Tools  
The Latest in Locks

Builders Hardware and Fine Tools since 1864

## From Boot to Electronic Whiz-Kid

(Continued from page 126)

problem mathematically. The expert disappeared for several hours, then returned bearing a dazed look and seven sheets of paper covered with algebraic symbols representing the 87 steps necessary to solve the "simple" problem.

Aboard a battlegon or cruiser, elements of the fire-control system are scattered all over the ship. They consist of radar antennas, scopes and compact steel boxes which contain a bewildering array of glowing vacuum tubes and miles of fine wire. It's a scholastic miracle that a man with a high-school education, or less, can be trained to diagnose and repair the troubles that beset these mathematical monsters. Yet it's being done, and in 44 weeks, at the Fire Control Technicians School, Class A.

The officer in charge of the school is Lt. Comdr. B. E. Toon, a slight, soft-voiced man with a college major in education. Every four weeks 30 new students show up at his school to start the course.

The average age of these men is 18 years, and many have had no training in advanced mathematics. Take a Chicago seaman we'll call Millard P. Strom. He's 19 years old, and already has served 14 months in the Navy. He's had nothing beyond high-school algebra, but at the end of boot camp he decided he wanted to get into electronics—"Seemed the best thing, with television and all." After 39 weeks of training Strom stands at the top of his class.

"The school's tough, all right," says Strom, "but the surprising thing is, a guy with average intelligence can make the grade. I figure television will be a snap if I decide to go back into civvies."

Two things make it possible to give a man like Strom the ability to service a Mark 56 fire-control system, which costs about \$250,000.

The first factor is the equipment itself. All the latest electronic gear is designed in units. If anything goes haywire aboard ship, Strom will make a series of tests to isolate the unit causing the trouble. If there's a replacement unit aboard ship, he'll make the switch, similar to replacing an entire television chassis. If he has no replacement, he'll have to make further tests—within clearly defined limits—to determine exactly which of the tubes, condensers or wires is the villain.

The other factor is the training program, which Toon constantly revises to conquer ever more complicated pieces of equipment. Toon's training program navigates a course along basic lines—there's no need

(Continued to page 280)



# "Do-it-yourself" with New PABCO LINOLEUM TILE!



9-inch squares. Many lovely colors. 3 qualities. Starting at **12¢** per tile!

## ONLY PABCO gives you all these:

- New Exclusive "Calitone" design, related colors.
- Resilience—gives you quiet comfort underfoot.
- "Precision-Cut" 9-inch squares for instant laying.
- "Soil-Sealed" quality for easiest cleaning.
- Free Simple Instruction Sheets—at all dealers.



**PABCO PRODUCTS INC.**  
475 Brannan Street  
San Francisco, Calif.



Complete the picture with  
**"Do-it-yourself"**  
**WALL COVERING**  
in related colors...

## "PABCOWALL"

— pastes over any wall surface. Made in 54" rolls, 14 colors, 3 styles, with base & cap strips. Rivals expensive individual tile, but costs only about

**15¢** per sq. ft.

# NOW! Upper Cylinder Lubrication That Resists "RED HOT" Temperatures

Upper cylinder areas in today's engines operate under excessive heat because combustion chamber temperatures may reach 2,500°. Since ordinary oil breaks down at 550° or less, valves, rings and other parts may operate without lubrication. Result: Excessive wear . . . loss of power . . . eventual engine failure.

Miracle Power used in the gas assures upper cylinder lubrication because it deposits colloidal synthetic graphite on vital surfaces. This special graphite lubricates effectively at temperatures higher than ever found in any automotive engine.

And in your oil, Miracle Power prevents DRY STARTING damage to other engine parts. That means smoother performance . . . and more power with less gas.

Try Miracle Power next time you get gas.

Miracle Power Division  
**THE AP PARTS CORPORATION**  
756 AP BUILDING, TOLEDO 1, OHIO

At better service stations,  
garages and car dealers,  
use this coupon for intro-  
ductory offer.



**THE AP PARTS CORPORATION**  
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Enclosed find \$.....for which please send me *postpaid*:

..... trial cans of Miracle Power at 75c each (1 for gas, 1 for oil)  
Please send me free literature on making my car last longer.

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# MODERNIZE YOUR WALLS WITH BEAUTIFUL, THRIFTY

# CONGOWALL

TRADE-MARK ®



**Looks—cleans—feels like tile!**  
**Easy as A-B-C to apply!**

Why waste your time on wall treatments that will soon need refinishing? Gold Seal Congowall is not only easy to apply and inexpensive, but durable, too.

Congowall's baked enamel surface simulates ceramic tile, even to the mortar lines! . . . costs only about 15¢ a square foot . . . yet rivals the performance of wall materials costing several times as much.

Be sure you get the genuine—with the patented duplex backing that's proved successful in over 3,000,000 home installations! The Gold Seal *guarantees* you satisfaction or your money back!



Look for the back-marking that identifies the genuine Gold Seal Congowall!



Half the depth of the backing is moisture resistant—half will absorb the paste. Paste becomes part of Congowall, locks it to the wall!

## MAIL THIS COUPON!

Congoleum-Nairn Inc.  
Kearny 1, New Jersey

Please send me the free Congowall color guide and instruction folder.

Name .....

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City ..... Zone ..... State .....

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for a man to understand the calculus involved in solving the surface-to-air problem as long as he understands enough mathematics to use his test instruments.

During his first 12 weeks at the school Strom waded through a course in basic electricity, electronics and radar fundamentals. He learned to build simple radio receivers (homemade radios are a dime a dozen on the base). He built involved circuits on practice panels. By the time he had survived the basic course he had absorbed the equivalent of a trade-school education.

Through the next eight weeks, Strom wrestled with his first fire-control system, the Mark 63, one of the least complicated. He pushed deep into radar, and studied the two automatic gunsights which permit the gunner to track the target visually.

All the latest computers, range keepers and electronic testing equipment are laid out and disassembled on workbenches so students can see how they tick. Strom learned to repair casualties to the equipment by watching experts do the work.

He spent two weeks on another system of gunfire control, mostly studying the differences between it and the basic Mark 63. Then came a three-week break in the electronic work, during which he analyzed the power drive, the whirring mechanical system which points the gun mounts. Another 15 weeks was allotted the Mark 37 system—including the mathematical computer, the basic fire-control mechanism, the radar and the stable element (the gyroscope instrument which calculates the roll and pitch of the ship and transmits a signal to the gun mount to overcome this movement).

To polish off the course, the students are subjected to a week of battery alignment—the system by which every gun on the ship can be simultaneously aimed at one target.

If he had faltered anywhere along the course, Strom would have been required to take two hours of extra instruction per day. A shipping student once marched into Toon's office, stood at rigid attention, and made the classic request that one of his shipmates take his extra instruction that night because he himself had a date.

Strom is the first to admit he doesn't understand how the gunfire-control system makes its lightning calculations. But he does have confidence he can maintain and help repair such a system once he reaches the fleet. If he goes to a battlewagon or cruiser, it's likely he'll be working as a striker (apprentice). On the other hand, he might land on a smaller ship where even the skipper would be at a loss if anything happened to the gunfire-control equipment. This gives Strom a feeling of being a vital cog in the world's best navy—which he is.





***It's a fact!—***

**THIS  
DELTA  
20-A  
RADIAL SAW**

***will Perform  
Most of the  
Operations  
in Your Shop***

Just look at the astonishing number of operations you can do with this one-saw shop . . .

- |                    |                     |                     |                         |
|--------------------|---------------------|---------------------|-------------------------|
| <b>circle rout</b> | <b>tenon</b>        | <b>groove</b>       | <b>grind</b>            |
| <b>bevel rip</b>   | <b>rafter notch</b> | <b>raise panels</b> | <b>radial drill</b>     |
| <b>sand</b>        | <b>mortise</b>      | <b>plough gain</b>  | <b>size and joint</b>   |
| <b>shape</b>       | <b>cove cut</b>     | <b>rabbet</b>       | <b>saw horizontally</b> |
- compound miter . . . and many others**

—in addition to regular cross-cutting, ripping, beveling and mitering.

It's compact, safe to operate. All its controls are right up front. You work from above—layout marks are easy to follow.

Check this remarkable saw against all-comers—and you'll know it as *the saw you want*.

Talk to your Delta dealer about it—or ask us for his name. Use the coupon.

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**'DUCO' CEMENT!**"

## Fix it for keeps WITH **DU PONT DUCO CEMENT**

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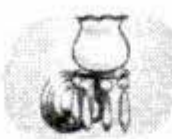
**CHIPPED KEYS**  
strike a sour note  
in a piano's  
appearance. Mend  
broken keys with  
"Duco" Cement.



**TORN WALL-  
PAPER** needn't be  
a household  
catastrophe. Just  
mend it like new  
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**NAMEPLATES IN  
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prevent mixups in  
the school coatroom.  
Put them in with  
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**REPAIR CHIPPED  
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Cement's trans-  
parency makes the re-  
pair simple and neat  
—almost invisible.

**STRONG, TRANSPARENT  
FLEXIBLE, WATERPROOF**



REG. U.S. PAT. OFF.

**BETTER THINGS FOR BETTER LIVING  
... THROUGH CHEMISTRY**

## The Bottom of the Barrel

(Continued from page 117)

There is still a long way to go. We have yet, for instance, to learn how to extract and use economically more than a few of the minerals known to be locked in the coarse rocks called pegmatites. But efforts to solve such problems are going ahead, and there is no reason to suppose that the pattern of producing better and better end products from leaner and leaner ores, which has characterized our mineral industries from the very start, will not be continued.

Our mineral resources have also been vastly expanded by the development of new materials. Perhaps the most obvious example is aluminum, which was a rare metal half a century ago and which today is one of the mainstays of our defense program and of our peace-time industry. Equally striking are the alloy steels, which are so much stronger and better than the carbon steels of the turn of the century that the weight of metal required to serve a given purpose has been greatly reduced. Ductile titanium, just coming into commercial production, is a new structural metal of possibilities still unfathomed, which may stand now just where aluminum stood 50 years ago. Ductile zirconium, still in the demonstration-plant stage and very expensive, is another new structural metal which appears to have great possibilities in specialized uses.

Meanwhile, there has been a tremendous rise in the use of more familiar metals—particularly iron and steel. Fifty years ago, steel was relatively a luxury item, with production totaling only about 15 million tons a year. Today we produce close to 100 million tons annually, with an expansion in capacity under way. Our iron-ore production in 1901 was 29 million gross tons; in 1950, it was 98 million tons. In the last half century we have produced 2.9 billion tons of iron ore, of which the Lake Superior region supplied 2.6 million tons.

This, of course, has meant a tremendous drain on our reserves. Our country has by no means come close to exhausting these reserves, but it does threaten to exhaust the most easily obtained high-grade ores. Fortunately, much work has been done on the lower-grade ores, and the trend recently has been toward the liberation of finer iron particles from the gangue material. Intensive laboratory and pilot-plant experimentation has developed several methods of agglomerating the fine concentrates into a suitable physical structure, and large-scale investigation now seeks the most economic of these. Progress has been such that

(Continued to page 284)



CHOOSE THE MODEL BEST FOR YOU!

# Two DREMEL Electric SANDERS with STRAIGHT LINE Action for Guaranteed SCRATCH-FREE Surfaces

## OUTSTANDING PERFORMANCE FEATURES

(In both models) Only 2 moving parts; 14,400 strokes per min., easy one-hand operation; dustproof—foolproof; 10-second paper change; 110-120 V., 60 cycle A.C. PLUS mirror-smooth, straight-line sanding action.

### MODEL 2000 FOR HEAVY DUTY CRAFT AND WOODWORKING PROJECTS —

Fastest seller in the field for rugged power and smoothest finishes at lowest cost. Ample power for furniture and cabinet making, boat building or refinishing, resurfacing large areas. Great for building operations—woodwork, stairs, dry-wall joints, siding, etc. Does a superb polishing job! Weighs 5 lbs.; 21 sq. in. of sanding surface; overall size 3 1/8" x 4 1/2" x 7".

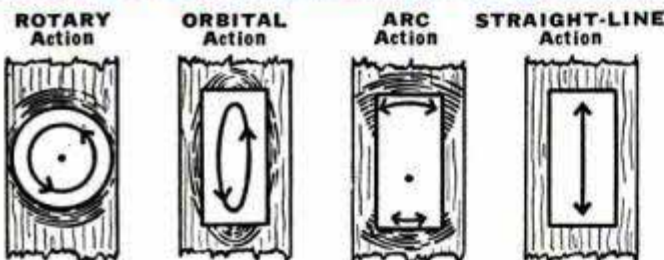
### MODEL "A" FOR HOBBIES, REFINISHING, REDECORATING—

Finest sander ever offered housewives, home-owners, hobbyists. A lighter-capacity model for woodwork, unfinished furniture, hobby shop projects, etc. Wonderful for polishing waxed surfaces. Also a soothing massager! Weighs only 2 1/2 lbs. Sanding pad 2 1/4" x 5 1/2".

### ONLY STRAIGHT-LINE ACTION SANDS WITH THE GRAIN NEVER MARS OR SCRATCHES —

Don't just take our word for it. Ask any professional woodworker about sanding action. He will tell you that only straight-line, with-the-grain sanding can produce a flaw-less finish.

### BEFORE YOU BUY ANY SANDER . . . COMPARE!



14,400  
SANDING STROKES  
PER MIN.



MODEL 2000  
**\$24.50**

Price includes all-steel storage case, 25 asstd. abrasives, and sheepskin pad.

MODEL "A"  
**\$14.85**

Price includes 6 sandpapers, 1 sheepskin, 1 felt pad.

## DREMEL Electric COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS



BLADE  
FACES  
4 WAYS

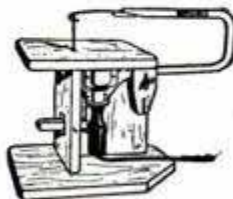
Only  
**\$5.85**  
with 3 saw blades

MAKE  
YOUR OWN  
JIG SAW  
PLANS FREE!

JUST  
GUIDE IT!

### SAFE! AS A HANDSAW

For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—delivers 7,200 strokes per minute smoothly, effortlessly. Saws through 3/4" medium-hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Only 2 moving parts, never needs oiling. Uses 110-120 V., A.C. Free plans, packed with each saw, for six useful woodworking projects and for making your own jig saw.



## GRINDS • CARVES • ENGRAVES DRILLS • ROUTS • SHARPENS DREMEL Electric MOTO-TOOL

FASTEST MOST POWERFUL TOOL  
in its class—Approx. 27,000 r.p.m.

Most practical tool a man can own—more powerful than any similar tool you can buy. Works well in wood, plastics, and metal. For home maintenance jobs you'll wonder how you got along without it. For model making it's a must. And for general shop operations it saves time and money. Compare it, try it, buy it. You be the judge!

### Check These Important Features

- Oilless sealed bearings
- Dynamically balanced armature
- Shockproof, Bakelite housing
- Dust-filtered air cooling system
- Sturdy 110-120 V., A.C.-D.C. motor
- Wt. only 13 oz.
- A precision tool widely used in industry for many years.



MOTO-TOOL No. 2  
(with 1 emery wheel point)

**\$16.50**

MOTO-TOOL KIT No. 2  
With 23 Accessories  
(High-Speed Steel Cutters,  
Grinding Wheels, Polishers)

**\$23.50**

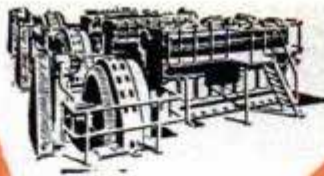
YOU BE THE JUDGE OF DREMEL PRODUCTS—Our reputation has been built on results rather than sensational claims. We invite comparison of Dremel tools with any similar products made. Then you'll know why we guarantee the most for your money!



WHERE TO BUY—If your dealer doesn't carry, remit in full for postpaid shipment. Or send only \$2 now, pay postman balance plus postage and COD fee. Five-day trial, money-back guarantee!

DREMEL MFG. CO., Dept. 112-C, Racine, Wis.





Great basic invention—the dynamo. Its power turns our wheels, operates our factories, provides the speed required to run our modern world.

**SPEED**



The Plumb Hammer is the pace-maker on any job. Scientific design and perfect balance make it much faster, easier to use.

The special analysis steel heads are scientifically tempered with four separate zones of hardness. Hard striking faces . . . Sturdy claws for prying . . . Hard-biting, long-wearing nail splits . . . Tough yielding mid-sections.

Handles are turned from resilient, second growth hickory.

Use a Plumb Hammer—it's the modern hand tool for modern craftsmen—first choice over all others.

The black head with the red handle — exclusively **PLUMB**

**Quality Comes FIRST**  
**PLUMB**  
**is FIRST in Quality**

**PLUMB**®

HAMMERS • HATCHETS • AXES • FILES

magnetic taconite, a hard rock occurring largely in Minnesota containing finely disseminated magnetic iron oxides, is expected eventually to become the source of 25 million tons of high-grade ore per year.

Facilities for treatment of this ore will require much time and money. Since our requirements for iron ore are expanding so rapidly, we will need large tonnages of imported ore. Canada promises to become a large supplier when the Quebec-Labrador deposits are developed—in which connection the prospective opening of the St. Lawrence Seaway is important.

It seems likely that aluminum will become the second-largest-tonnage metal in the future, next to iron. In 1900, aluminum was produced at a rate of less than 2000 tons a year; 1951 production will probably exceed one million tons, and by 1954 we should be producing more than 1.5 million tons. The limiting factor in determining capacity of aluminum is low-cost electric power; it is worth noticing that all of the reduction plants in the United States are in the Pacific Northwest, the Tennessee Valley, the Texas Gulf and other areas where electric power is relatively cheap.

Some of the greatest changes of the half century have been in the field of mineral fuels. Fifty years ago, coal was the unchallenged king, with petroleum useful chiefly as a source of kerosene and lubricants. Coal is still our most important single source of fuel energy, but in 1950 it provided only a fraction over 41 percent of the nation's total fuel energy, compared with 90 percent in 1900. To a large extent, this change reflects the rise in importance of petroleum.

Yet in the future the relative importance of coal is likely to rise. We possess enormous reserves of coal—the latest estimate is that about 2.4 trillion tons remain in the ground, half of it recoverable on the basis of historic mining losses—and we are finding new ways to use it. Although this country still produces more than half the world's output of oil, demand has outstripped domestic production and we are now a net importer. Hence it is fortunate that we are now in position to count on gasoline and oil made from coal as an economic source of liquid fuels in the near future. In addition, experimentation has shown that we shall be able to produce vast quantities of gasoline from oil shale, and it becomes evident that in the second half of this century we shall see the birth of a new liquid-fuels industry, based on coal and oil shale.

It should not be inferred from this that we have solved all of the problems which arise in connection with our minerals supply. In the main, the story of the last 50

(Continued to page 286)



## HIGH SPEED MORSE TAPER SHANK DRILLS



Reconditioned and sharpened—ready to go! Many drills with extra lengths of flute. Immediate delivery. These drills are priced as low as 25% of your present cost and shipped post paid to you.

Size in in.	Twist Lgth.	Price	Size in in.	Twist Lgth.	Price
37/64	6 1/4	\$1.00	1 1/8	8 1/2	\$4.00
37/64	20	4.00	1-5/32	6 1/2	3.76
19/32	4 1/4	1.00	1-11/64	7 3/4	3.95
39/64	6 1/4	1.06	1-3/16	7 1/2	3.95
21/32	6	1.19	1-7/32	8 1/2	4.14
11/16	4 1/2	1.31	1-15/64	7 1/2	4.51
23/32	5	1.44	1-21/64	8 1/2	5.38
47/64	5	1.57	1-11/32	9 1/2	5.38
31/32	5	1.87	1-15/32	7	6.13
49/64	4 1/2	1.84	1-19/32	7	7.16
51/64	5 1/2	1.85	1-9/16	10 1/2	7.50
13/16	4	1.82	1 5/8	10 1/2	8.50
13/16	22	8.00	1-11/16	12	9.13
27/32	5 1/2	1.91	1 3/4	5	6.00
55/64	4 1/2	2.02	1 7/8	9	11.56
7/8	5 1/4	2.02	1-15/16	11	12.95
57/64	5 1/4	2.12	2 1/8	10	15.00
15/16	5 1/4	2.20	2-7/32	11	16.50
15/16	9 3/4	4.00	2 1/4	10 3/4	17.50
61/64	4 1/4	2.42	2-9/32	7 1/4	18.00
31/32	4 3/4	2.42	2-5/16	7	18.25
63/64	5	2.50	2 3/8	9	18.00
1-1/32	6	2.76	2 3/4	24	27.50
1-3/64	8	2.82	2-7/16	11	21.50
1-1/16	7 1/4	2.82	2-15/32	13	23.50
1-5/64	7 3/4	3.33	2 1/2	11	25.00
1-3/32	6	3.33	2-13/16	14 1/2	27.50
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1-7/64	18 1/2	8.50	4	9	34.50

Large quantities available in every size. 5% DISCOUNT ON PURCHASES OF \$50 OR MORE. 10% DISCOUNT ON PURCHASES OF \$100 OR MORE.

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Never before offered at these ridiculous prices. Used drills, but all sharp and ready to go.

1/4" to 1/2" by 64ths: 17 drills. New cost approximately \$26.00. Only \$8.95 PPD  
 3/8" to 1" by 64ths: 32 drills. New cost approximately \$175.00. Only \$49.95 PPD  
 1" to 1 3/8" by 64ths: 25 drills. New cost approximately \$300.00. Only \$79.50 PPD

## HIGH SPEED HAND TAPS

**SET 1Y** 8 different size H. S. Standard Thread Hand Taps up to 5/8", including 2 Std. H. S. Pipe Taps. PPD ..... \$2.95

**SET 40Y** 16 same as above. PPD \$4.80



## HIGH SPEED DRILLS

1/4" to 1/2" with 1/4" Shanks  
 1/2" to 1" with 1/2" Shanks



For the first time at these low prices! HIGH SPEED DRILL BITS UP TO 1/2" FOR YOUR 1/4" DRILL AND HIGH SPEED DRILL BITS UP TO 1-3/16" FOR YOUR 1/2" DRILL. The Tungsten steel content of these drills means they will outlast carbon and regular steel drills many, many times! Drills are used surplus; have plenty of flute length, are sharpened and ready for your drill.

### DRILLS UP TO 1/2" FOR YOUR 1/4" DRILLS!

Will Fit Any Size Chuck 1/4" and Larger	SIZE	PRICE EA.	SIZE	PRICE EA.
1/4	\$0.30	25/64	\$0.50	
17/64	.45	13/32	.60	
9/32	.45	27/64	.65	
19/64	.48	7/16	.65	
5/16	.48	29/64	.73	
21/64	.50	15/32	.73	
11/32	.50	31/64	.75	
23/64	.55	33/64	.90	
3/8	.55	17/32	.90	

### DRILLS UP TO 1-3/16" FOR YOUR 1/2" DRILLS!

Will Fit Any Size Chuck 1/2" and Larger	SIZE	PRICE EA.	SIZE	PRICE EA.
33/64	\$0.91	55/64	\$2.25	
17/32	.91	7/8	2.25	
37/64	1.24	57/64	2.25	
19/32	1.24	59/64	2.40	
39/64	1.30	15/16	2.43	
41/64	1.43	31/32	2.50	
21/32	1.43	1-1/32	2.80	
43/64	1.55	1-1/16	3.05	
23/32	1.70	1-5/64	3.56	
47/64	1.80	1-3/32	3.60	
49/64	1.80	1-7/64	3.60	
3/4	1.80	1-1/8	3.98	
25/32	1.86	1-5/32	3.98	
51/64	2.05	1-11/64	3.98	
13/16	2.05	1-3/16	4.10	
53/64	2.15			

Large quantities available in every size with special discounts for quantities. We can furnish drills from 1" up, with any size shank. Write us your special needs. Post paid

## H. S. TAPER SHANK CHUCKING REAMERS



**SET 15** Different Size High Speed Morse Taper Shank Chucking Reamers up to 1 1/2" with No. 1 and 2 tapers. New and used. Priced at only ..... \$6.95

**SET 8** Different Size High Speed Morse Taper Shank Chucking Reamers from 1/4" to 1". New and used. Priced at only ..... \$4.95

**SET 10** Different Size High Speed Morse Taper Shank Chucking Reamers from 1/2" to 1 1/8". New and used. \$65.00 value. Priced at only ..... \$9.95

**SET 5** different size H. S. Morse Taper Shank Chucking Reamers from 1" to 2 3/4". New and used. Priced at only ..... \$11.95

## HIGH SPEED WOODRUFF KEY SEAT CUTTER

**SET 5** Different Size Cutters. Can be used as mounted milling 4Y cutter or circular saw. All with 3/8" and 1/2" shanks, widths up to 1 1/4", dia. up to 1". New and used. Priced at only ..... \$3.95 PPD



## 6 SLITTING SAWS WITH MANDREL

**SET 6** Different Size High Speed Slitting Saws, 2 3/4" dia. x 1" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" elec. drill. \$25 Value. PPD. Only ..... \$4.95



7 selected, sharp H. S. Slitting Saws as above to use on your own mandrel or milling machine. New and used. PPD. A bargain at ..... \$4.95

**SEMI-H. S. SAW BLADES:** 5 3/4" x 1 3/32" x 1/2" arbor. Fine tooth. Fits above mandrel. 2 for ..... \$1.29 PPD  
 NOTE: Mandrel only ..... 30c

## NEW HIGH SPEED COMBINATION DRILL AND COUNTERSINKS

**SET 8** selected sizes from A1 to F2 (3/64" drill x 1 1/2" body to 3/16" drill x 7/16" body) 60° angle of countersink. New cost on these countersinks 75c to \$2.50 ea. Priced to you PPD at only ..... \$3.98



## Bargain Tool & Shop Mixes!—PPD

**SPRING MIX:** 300 new springs, compression, tension and torsion types up to 6" in length, only ..... \$1.79

**HAND REAMER MIX:** 8 different size hand reamers up to 5/8" including 3 taper pin reamers. Majority of reamers in new condition. .... \$3.69

**MILLING CUTTER MIX:** Assortment of 4 various size H. S. milling cutters, all with 1" arbors; up to 3" dia. only. .... \$3.98

**NEW ROTARY FILE MIX:** 7 different size H. S. files, 1/4" shanks. New cost as high as \$2.00 ea. Only ..... \$4.49

**DRILL BIT MIX:** Over 300 pcs. (2 lbs.) of used H. S. drill bits up to 1/4". Most require sharpening. Ideal for pin punches, drift pins, etc. Less than 1c ea. at ..... \$2.98

**FILE MIX—BRAND NEW:** Set of 12 different files, lengths 6, 8, 10, 12 in. Half rounds, bastards, knife, mills, etc. First line Nichols, Heller and other brands. .... \$3.49

**DOUBLE-END END MILL MIX:** 4 right hand twist H. S. 7/16" straight-shank end mills, size 5/16" to 7/16". New and used. .... \$3.95

## SURPRISE MIX!

Over 50 pcs. for your 1/4" electric drill including rotary files, drills, bits, reamers, grinding wheels and arbors for our customers who like pleasant surprises. Your money back if you aren't satisfied. .... \$2.98

Money Back Guarantee—All Mdse. Mixture of New and Reconditioned Unless Specified New. All Items (Except Those Specified Post Paid) Will Be Shipped F.O.B. Tulsa—Or, Add 10% and We Will Ship Your Mdse. PPD.

Write For Free Catalog Describing Thousands Of Bargain Cutting Tools.

## NEW 360° SWIVEL TYPE TOOL HOLDER AND BORING BAR



Here is a tool that will do the work of a left, right and straight tool holder, plus a boring bar, all for a fraction of its original cost. Post paid to you

**TOOL A** takes a 5/16" sq. bit or 5/16" dia. boring tool. Shank size 9/16"x1"x4 3/4". PPD. Only ..... \$3.29

**TOOL B** takes a 3/8" sq. bit or 3/8" dia. boring tool. Shank size 5/8"x1-3/16"x5 3/4". PPD. Only ..... \$3.95

**TOOL BIT SPECIAL:** 1 doz. H.S. 3/16" sq. x 2 1/2" new tool bits. PPD. \$2.95

## THREE-SPEED TRANSMISSION

Contains 7 assorted spur and beveled gears. Has auxiliary power take-off driven from main drive. Three separate gear ratios are 16:1, 12:1 and 3 1/2:1. Contains 10 1/2" dia. ring gear, 5", 2 1/2" and 1 1/2" dia. beveled gears; 3 1/4", 4" and 2 1/4" dia. spur gears. All mounted on precision ball-bearings. Main drive has throw-in hand clutch. Auxiliary drive can be engaged or disengaged. Excellent for transmission, winch and many other uses. Wt. 30 lbs. .... \$14.98



## 90° HEAVY DUTY GEAR BOX

Ball-bearing throughout with 1/2" drive spline. 1:1 gear ratio which can be changed by different size pulleys or gears. Wt. 5 1/4 lbs. Length 11". Beveled gears. Excellent for hot rods, power mowers, etc. Only ..... \$5.95

**10 TO 1 GEAR BOX:** Worm gear drive, throwout type clutch, ball-bearing throughout. 1/2" drive spline, 3/4" output gear. Wt. 6 lbs. Rated up to 6 H.P. Only ..... \$6.95

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Pump has 1" connections, built-in relief valve, adjustable up to 1500 lbs. Max. capacity 6 GPM. 1 1/2 H.P., 24-volt motor, 4000 RPM. Can be used on 12 or 36 volts. 500 units available at quantity discounts. CLOSE OUT AT ..... \$9.98



## HYDRAULIC CYLINDER

Bore 2", shaft 7/8", stroke 12 1/2", double action, double-end shaft can be mounted stationary allowing cylinder to slide. Wt. 14 3/4 lbs. Post paid to you at only ..... \$12.95



## 1500-lb. Vickers Pump or Motor

Positive displacement, angle piston, 2 1/2 GPM at 3000 RPM at 1500 PSI. 1/2" drive spline, can be used as a hydraulic motor. Factory cost over \$200. Ppd. Only \$19.50



## NEW MASTER HYDRAULIC CONTROL VALVE

For controlling two single or double action cylinders separately or simultaneously. Valve is close center type. 1500 PSI rating, only ..... \$9.98

## HYDRAULIC HOSE

12-in. 250-lb. test with 7/16" tubing conn. 6 pcs. PPD. .... \$1.49  
 2-ft. 1000-lb. test, 7/16" tubing conn. 4 pcs. PPD. .... \$1.95  
 10-ft. 1500-lb. test, 1/4" female & 1/2" male pipe conn. PPD. .... \$3.49  
 15-ft. 1000-lb. test, 7/16" tubing conn. PPD. .... \$3.49



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# SIMONDS SI-CLONE

...the new line of Popular-Priced, Top-Quality Saws for Home Workshops

Look for this bright red package ... and look at the precision cutting tool that's inside it! Now you can do smoother sawing and better work than ever. And it costs so little you'll be amazed. Yes, in many cases it costs less to buy a new Simonds SI-CLONE than to sharpen your old saw. And still you get famed Simonds quality ... special edge-holding steel, milled teeth, extra smooth finish ... fully guaranteed. All types, in all diameters to 12", with any type of centre-hole ... for use on any table, radial arm, or electric handsaw machine. So breeze into your hardware dealer today and tell him: "Let's see those new Simonds SI-CLONE Saws."



**SIMONDS  
SAW AND STEEL CO.**

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years is the story of the continuing struggle between the forces which deplete our mineral resources and those that replenish them. We have many problems yet to solve; in the case of some minerals, we shall undoubtedly have to rely increasingly on foreign supplies. Yet in the main we have plenty of reason for optimism.

With minerals as with other things, we have learned much about the proper way to use our resources while we conserve them. We can no longer afford to be prodigal or wasteful; we can see at last that neither we nor any other people have "inexhaustible" resources at our disposal. But we are beginning to see how to make a far better use of these resources than we have made in the past. Our progress has hardly more than begun. If the last 50 years have taught us anything—and I believe they have taught us much—they have shown that we can continue to develop an economy of abundance, with a constantly rising standard of living, provided that we go on making every effort to use our resources wisely, scientifically and economically.

## Report on the Foreign Cars

(Continued from page 110)

engineering and a favorite of many sports-car enthusiasts.

The Jowett Javelin is unique with its opposed four-cylinder air-cooled engine. The Lagonda, Lanchester, Lea-Francis, Morgan, Alvis, Riley, Rover, Allard, Singer, Sunbeam-Talbot, Triumph and Wolseley are other makes which suit the tastes of certain types of drivers. The new Vauxhall (G. M.'s British make) made a hit with new styling in the 35-horsepower Wyvern and 58-horsepower Velox models.

Next I flew to Copenhagen and Stockholm. Both Swedish automobile factories, Saab and Volvo, were closed for the holidays but I drove both makes. They are well built and suitable for Europe's buyers who like light, economical cars. From Stockholm I flew to Hamburg, where a driver from the Volkswagen Werke was waiting. He drove me 125 miles to Wolfsburg, Germany's largest producer of cars and the youngest town in Germany. The new Volkswagen plant seemed almost unbelievable in its operation. All of the profits are used for improvements. The company builds houses for its workers, which they can rent or buy. Eleven million marks (about \$2,750,000) have been spent for dwellings. The largest swimming pool in Germany is available for the use of workers and residents of the city. The plant also supplies gas for the city of Wolfsburg.

(Continued to page 288)



# THIS ONE-TWO PUNCH

adds power—pep—miles  
in auto performance!

- K.O.'s top-cylinder wear
- Frees sticky valves
- Defeats gum formations
- Provides ring seal

## 1 MARVEL INVERSE OILER

Tested and proven through years of scientific research. Now available in one quart model. Visible oil reservoir feeds oil automatically in proportion to engine needs direct to upper cylinder area. Install a Marvel Inverse Oiler for better motor performance, longer engine life . . . more engine-hours per dollar!

## 2 MARVEL MYSTERY OIL

A specially developed top cylinder oil for today's high compression engines. Ideal for use with hydraulic valves. Contains no ingredients or graphites harmful to engines. All-around lubricating action insures smoother, carefree driving . . . protects and adds years to the life of your car.

Be engine wise . . .  
Marvelize NOW!



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DEPT. 115, 242 West 69th St.,  
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# Save \$89.50

on this combination!

**STARTS**

as a ROUTER



Router Complete with base and motor—\$49.50



**BECOMES**

a PLANE



By adding Plane Attachment — \$25.00

**THEN**

a SHAPER



By adding Shaper Table — \$24.00



**Interchangeable Motor powers 3 tools . . . saves cost of 2 motors!**

## All 3 Tools for only \$98.50

For expert woodworking, build your home workshop around this Guild Tool combination — production tools used by Builders — and save \$89.50!

**As a ROUTER**—you can tongue, groove, rabbet, dovetail, do scrollwork, cut contours and beaded edges on wood, composition or plastic.

**As a PLANE**—you can shave off wood at high speed — taking cuts from  $\frac{1}{64}$ " to  $\frac{3}{32}$ " deep — without a wave or ripple! Attachment for sharpening right on the job.

**As a SHAPER**—you can edge irregular pieces; joint strips accurately, even narrow and short pieces; make hundreds of fancy cuts for cabinets, furniture, trim, toys, picture framing, molding, etc.

Purchased separately, all tools complete with motors would cost you \$188.00. But, with one Interchangeable Motor mounted in the proper attachments, you get all 3 tools for only \$98.50 — a saving of \$89.50!

See this great money-saving combination at your Guild dealer's. Or mail coupon today for full details.

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6163 N. Salina St., Syracuse 8, N. Y.  
Send me full information about Guild Router, Plane and Shaper Combination . . . also name of nearest Guild dealer.

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**Manufacturers of SPEEDMATIC and GUILD Electric Tools**  
In Canada write: Strongridge, Ltd., London, Ont.

Eighty-four percent of Wolfsburg's adult population of 28,000 works for Volkswagen. A population of 50,000 is predicted for 1956. The factory is modern, with new machinery, and production-line capacity is 415 passenger cars and 35 delivery vans a day. It could produce 40 percent more cars but for shortages of rolled sheet steel and coal. The production is sold out for eight months in advance. The firm has 70,000 orders on its books, of which 8000 were taken at the Paris motor show. A German buyer must wait eight to ten months for delivery.

At present, 15,000 men work two shifts. There is no fixed time for lunch; workers may eat when they wish on company time. Two thousand women work in offices, machine shops and company kitchens. About 34 percent of Volkswagen production is for export.

Practically all units for the entire car, including all castings, are made in Volkswagen's own foundries. No Marshall Plan aid was needed by Volkswagen to resume car production.

The Volkswagen originally was designed for Hitler as the "People's Car" by the late Dr. Ferdinand Porsche, long a famous German engineer. The Hitler regime collected about 280,000,000 prewar marks from 300,000 Germans, promising each a People's Car. The one-story factory was planned to be three times its present size, which is about  $\frac{3}{4}$  of a mile long. The money paid in before the war by Germans desiring cars was on deposit in Berlin. When the Russians entered the city they seized the funds and never returned them. Thus 300,000 Germans were left holding paper receipts for their savings. All money appears to have been lost, although the case now is pending before the highest court in West Germany.

I rode from Hamburg to Wolfsburg and from Wolfsburg to Bremen, about 250 miles, in a Volkswagen. It is a sturdily built small car (1554 pounds) with a unique opposed four-cylinder air-cooled engine of 69.014 cubic inches mounted in the rear. Horsepower is 24 at 2400 revolutions per minute. Compression ratio is 8.5:1. It rides exceptionally well for a car of its size because of good weight distribution and independent rear-wheel suspension. The car runs about 35 miles on a gallon of low-grade gas. This makes it a popular car in Europe, where gas sells in various countries from 45 cents to \$1 a gallon. It is stable at top speed (65 to 85 miles per hour), has good hydraulic brakes, a four-speed gearbox, and it corners well. A duplicate of the Volkswagen, but somewhat larger, probably would sell well in the U. S.

(To be continued next month)





# Preferred at Famous Fishing Spots

**LAKE PEND OREILLE, IDAHO.** This famous fishing spot—produces rainbow trout which are literally out of this world. These rainbows reach the whopping weight of 37 lbs. (world record for rainbow trout, 1937). One of the largest rainbows from Lake Pend Oreille—33 pounds—was caught in 1949 on H-I tackle by Tom E. Kocher of Spokane, Washington.

In other famous fishing spots . . . everywhere and anywhere that fishermen fish and catch 'em—you'll find H-I tackle preferred for its quality, dependability and value. Buy H-I—the preferred line for every fisherman and every kind of fishing—at your dealer's. Horrocks-Ibbotson Company, Utica, N.Y. Manufacturers of the largest line of fishing tackle in the world.

Take your pick from a complete line of tubular and solid H-I POWER GLASS RODS for fly, bait casting, spinning and salt water. Compare their lithe, live action and "fishin' feel" with any rods—of any material—you've ever used. Compare them for VALUE, too.

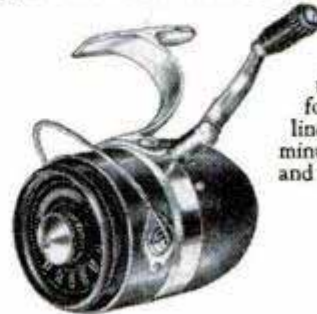
# Power Glass Rods



### SPINNING RODS

**GOLDEN ROD**—2-piece, tubular, H-I Power Glass. Length: 6½'—Weight: 4½ oz. \$20.00. (Also available with fly rod reel seat below cork grip. \$21.50.)

**HUDSON**—1-piece, tubular, H-I Power Glass. Length: 6½'; Weight: 5½ oz. \$16.00.



**BRADCO SPINNER**—Finest, strongest spinning reel on the market, with greatest capacity for holding 5 to 18 lb. test Nylon line. Anti-friction bearings. Aluminum body and spool for strength and lightness. \$17.00.

OLD HI SAYS—"As one fisherman to another, better buy H-I." Write for my free books: "Fishing for the Millions," "Salt Water Sports Fishing" or "Pacific Coastal Fishing." Horrocks-Ibbotson Co., Utica, New York, Dept. 23.



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New Dayton 1/2 H.P. Induction Type 3450 RPM 110 V. 60 cy. 1 ph. A. C. Motor. #GEH-5. Fob. . . . . \$18.50

#DH-5-2. Same 220V Fob. Only . . . . . \$15.00

New General Electric 1/2 H.P. Cap/Ind. Ball Brg. 1750 RPM, double 1/2" shaft. 110 V. 60 cy. #GE-17. Fob. . . . . \$29.75

New General Electric 3/4 H.P. Cap/Ind. Ball Brg. 1750 RPM, double 1/2" shaft. 110 V. 60 Cy. 1 Ph. A. C. Motor. #GE-75. Fob. . . . . \$34.50

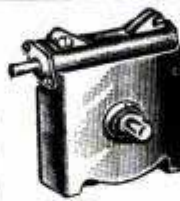
New Dayton 1 H.P. Heavy Duty, Cap or Repulsion Induction, 3450 RPM, 110/220 V. 60 Cy., 1 Ph. A. C. Motor. #EH-1. Fob. . . . . \$52.00

Same as above, 2 H.P. 220-V. 3450 RPM #EH-20. . . . . only . . . . . \$75.00

Same as above 3 H.P. 220-V. 3450 RPM, #EH-30. . . . . Only . . . . . \$97.00

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- FAN BLADES TO FIT THE ABOVE RESPECTIVELY
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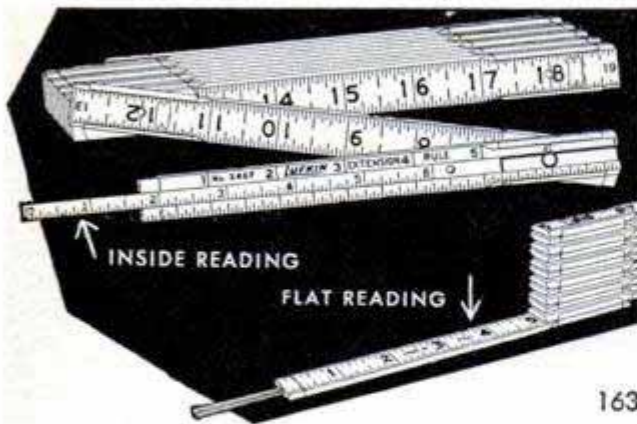
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**NOW... LUFKIN NEW X46F**  
**EXTENSION RULE Gives You**  
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Measuring begins at extension end of rule on both sides of this new extension rule. One side allows rule to be used flat against work. The sliding brass extension permits accurate inside measurements. A sturdy, rigid, accurate rule. LUFKIN "RED END" quality throughout. See this new rule at your dealer's!

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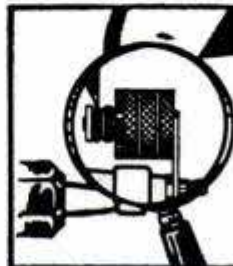
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**HIGH POWER TELESCOPE**  
**60 POWER—ALUMINUM TUBES—OPENS TO 33"**

Variable Power Adjustable to 15X, 30X, and 60X.

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Leather Case Included

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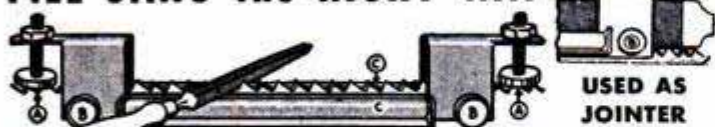
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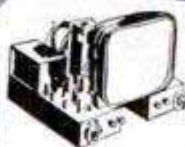
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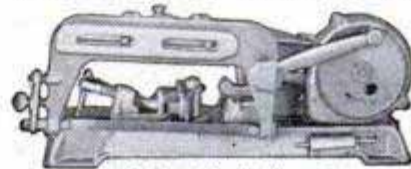


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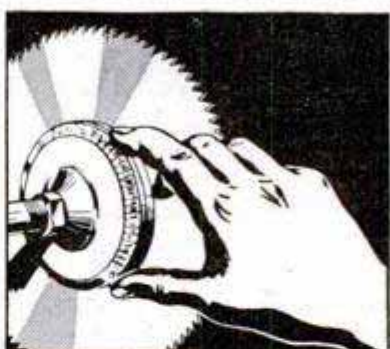
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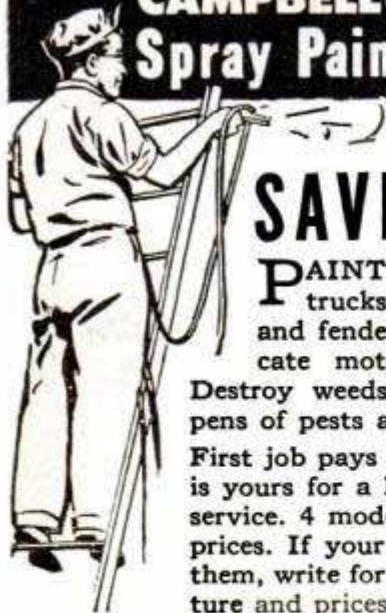
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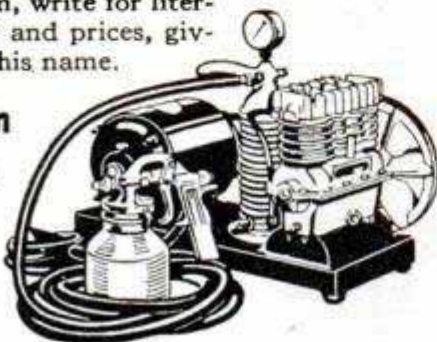
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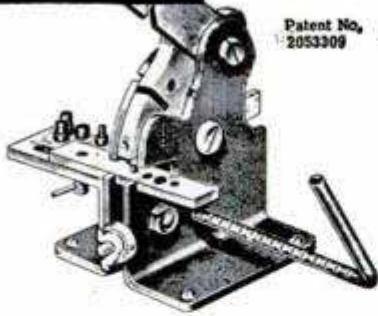


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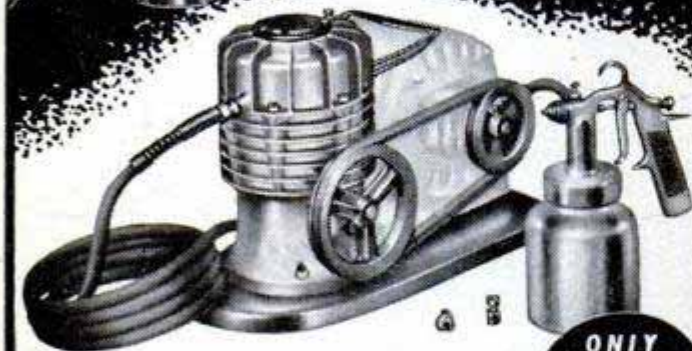
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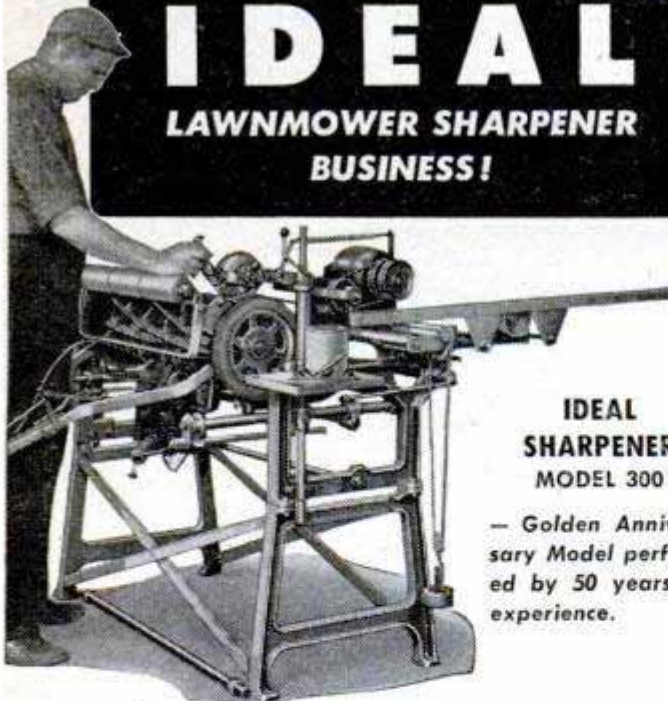
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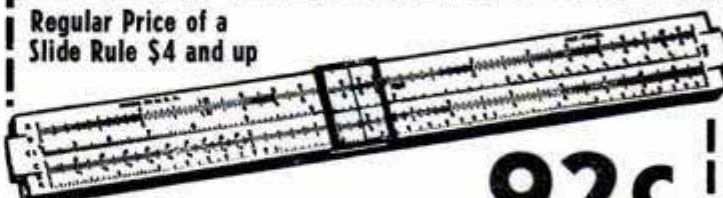


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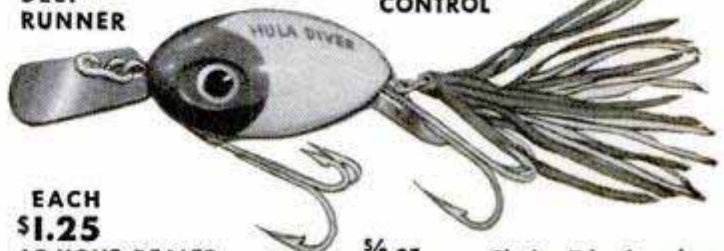
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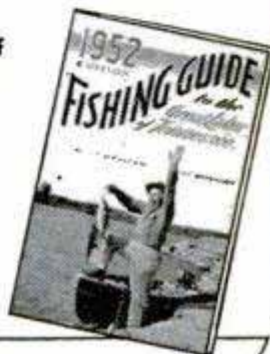
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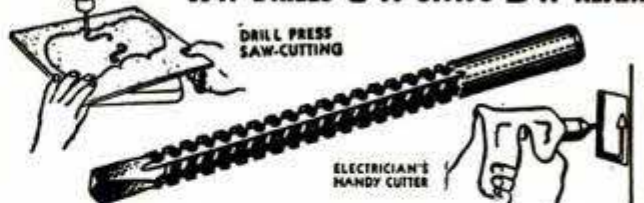
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(Continued from page 120)



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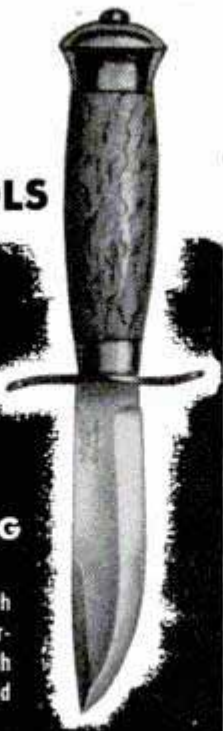
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Right now the Army thinks that the best time to drop a tactical bomb is when the wind happens to be blowing toward the enemy. If fall-out materials should blow back onto friendly territory, two things are important. First, troops should not remain in the area for periods longer than the safe times indicated by radiation meters. Second, personnel and equipment leaving the area should be decontaminated by washing to remove the fall-out materials. The area will remain contaminated for several days.

The cloud remains radioactive until it finally dissipates, although the degree of activity diminishes rapidly. In moist air, the cloud may become part of a rain-producing front, with the result that radioactive rain would fall from it.

Aside from the dangers of flying through such a cloud, the Air Force has the special problem of preventing flash-blindness in the air. Today the members of a flight crew wear dark glasses while they drop a bomb, a safety measure not practical in war. The Special Weapons Command is testing filter panels that screen out all excessive light. These could be used on all the windows of military aircraft if successful.

The A.E.C. detonations program is basically for pure science, providing information in many fields aside from the development of atomic artillery shells, guided missiles, atomic depth charges and new varieties of bombs. Precise measurements are made of blast, heat, light, radiation, seismic effects and other phenomena.

Several hundred technicians are busy for days ahead of time in preparation for a blast, preparing and installing instruments and cameras at points that in some cases are more than 100 miles away. About 99 percent of the instruments at the site itself are remotely controlled to minimize hazard to personnel. All instruments are placed in operation by master switches inside the nuclear-blast-control center, a windowless blockhouse that overlooks the principal test area and has superstrength-concrete walls and roof.

Picked groups of ground-force troops were indoctrinated in atomic warfare this past winter as part of the blast program. They became familiar with the effects of the new weapon. They laid out typical front-line emplacements before one blast at various distances from ground zero. The men set up machine-gun positions, dug fox holes, erected command posts, strung wire and parked vehicles at points where they might be stationed in actual combat. Ammunition,

(Continued to page 304)





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field rations and other supplies were placed where they would be in combat.

Next, the A.E.C. installed measuring and recording instruments in and around the positions to measure actual effects. Instruments were placed outside and inside a tank to measure the amounts of heat and blast. The resulting information may contribute to new designs of tanks built to withstand atomic warfare.

The men were stationed five miles away from the blast and received instructions via loudspeakers.

"About face!" they were commanded. "Sit down!"

The voice told them that they could swing around for a look three seconds after the flash. They would be temporarily blinded by the light if they turned any earlier. Anyone who stood up too soon would be knocked down by the hot blast wave.

After the tremendous explosion, they returned to the emplacement area to find out what had happened to their weapons and equipment. They were preceded by monitors with radiation meters who marked off the "hot" areas and tested the radioactivity of guns and vehicles. Members of the monitoring teams wore coveralls, gloves, skull-caps and cloth wrappings around their shoes, as well as respirators. This protective clothing prevented radioactive dust from coming in contact with their bodies. Monitoring teams will be part of any military group in areas in which nuclear weapons are used.

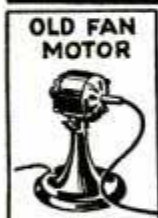
When the men inspected their battle area, they found several surprising things. Nothing was left in the immediate vicinity, of course, yet experimental animals that had been placed in fox holes and deep dugouts no more than a mile from ground zero were dazed but unhurt. Shelter in the form of several feet of earth appeared to be good protection against heat, blast and radiation. Some of the men concluded that they would be safe in deep fox holes even though a tactical A-bomb blasted an enemy area no more than half a mile away.

This provides ample safety margin for atomic artillery of the type shown to Congress in January. No details were released on the weapon, but it is believed that the caliber and length of tube must be greater than in any existing Army weapon. Despite great progress in reducing the size of atomic explosives, it is doubtful that they are yet small enough for standard artillery tubes. The Army's largest mobile gun is a 240-mm. howitzer. That is a bore of slightly under 10 inches. Double this size and you still have a mobile weapon that could toss an atomic shell well beyond the required margin of safety.

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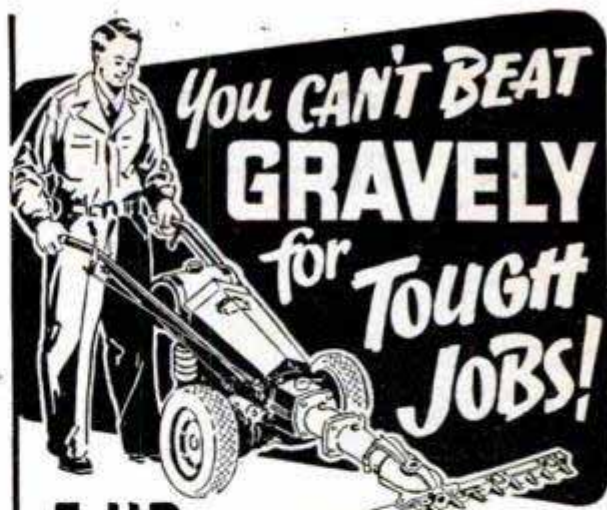
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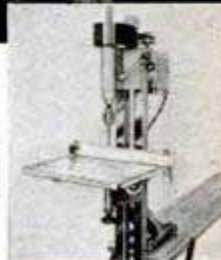
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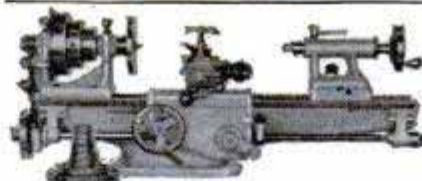
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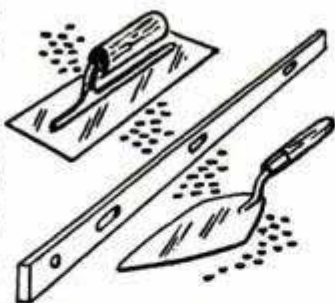
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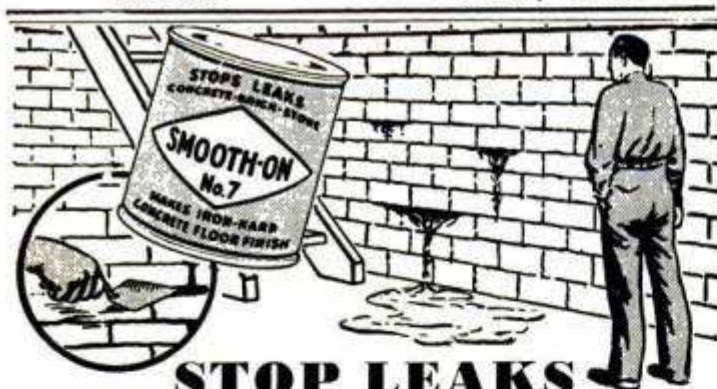
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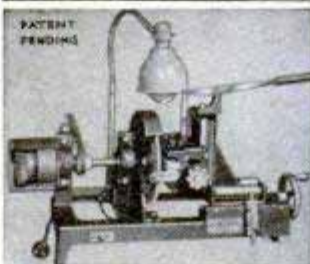


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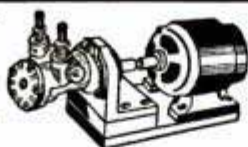


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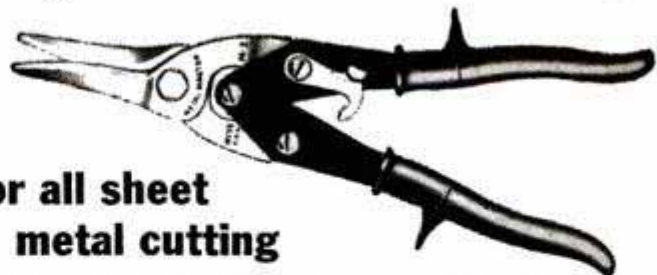
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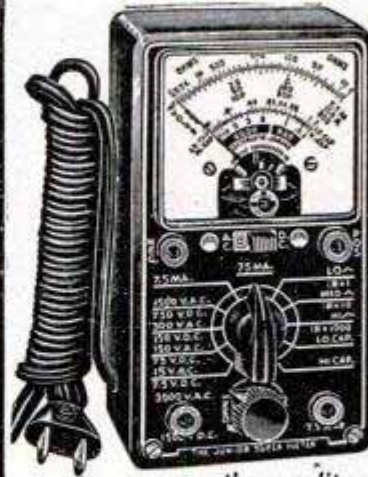
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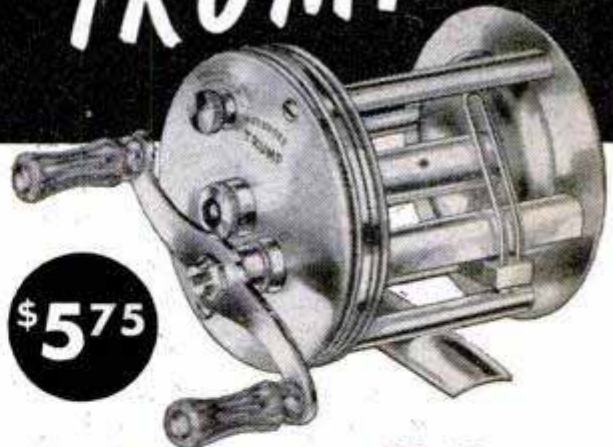
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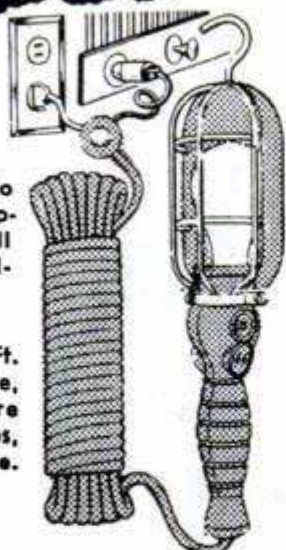
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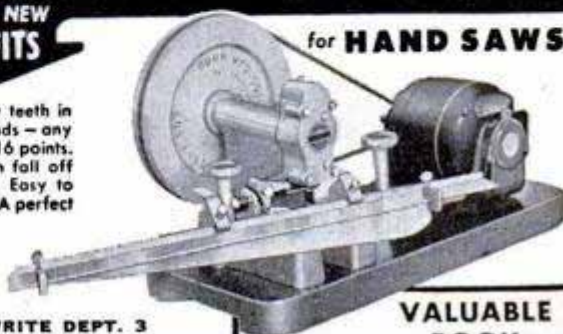
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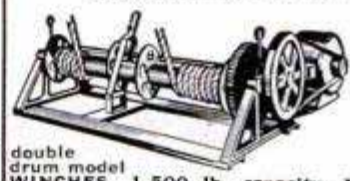
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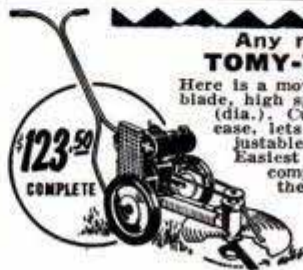
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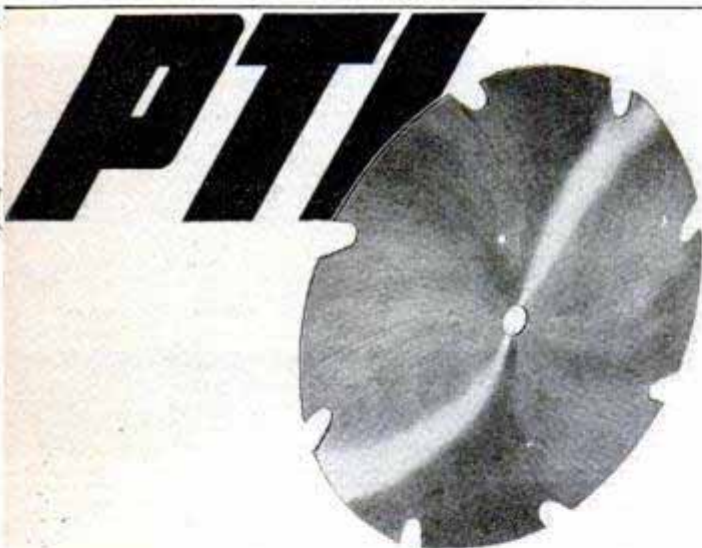
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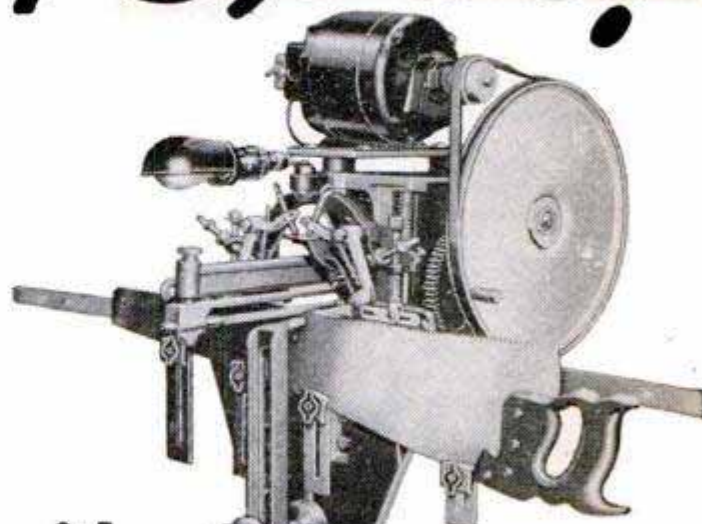


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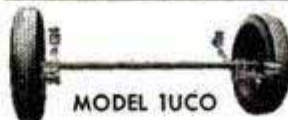
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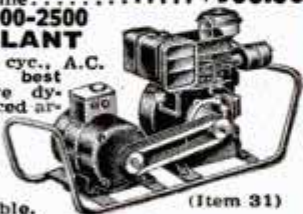
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**PUSH BUTTON START**  
500-700 watts 110-120 v. - 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1 3/4 hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. Be prepared if war or storm knocks out power lines.

(Item 24) etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. Be prepared if war or storm knocks out power lines.  
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Drive it with your engine or tractor.  
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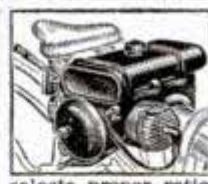
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**TERRIFIC VALUES!**

Included. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil. Save more than 60%. (Inside Diam.) 1" 1 1/4" 1 1/2" 1 3/4" 2" Length 10 ft. 25 ft. 50 ft. 100 ft. 30 ft. Price 5.95 9.25 24.75 49.95 14.75 If specified we will send special hose for gas or oil at same prices.



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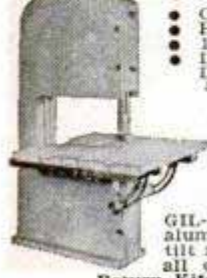


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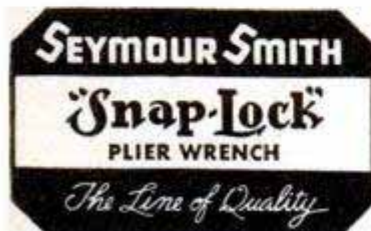
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• Thousands of uses in Home, Shop, Industry: Makes Auto Interiors Clean & New, Lines drawers, Marproofs lamp bases, Refinishes any object. All in colorful Flock. Etch & Frost windows, glassware, etc. Removes Paint & Rust from Autos, Tools. Guaranteed! Send \$24.75 or write for free information. Flocking supplies!  
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YOU CAN MAKE UP TO \$40 a DAY sharpening and setting circular saws for factories, builders, lumber yards—with **LIFE-TIME SECURITY YOUR OWN BUSINESS**  
**NEW BELSAW COMPLETE CIRCULAR SAW SHOP. Low Cost, only \$15 down, sharpens 4 to 5 saws an hour. No experience needed!** Instructions Furnished. Send Postcard Today for **FREE BOOK.**  
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GEIGER COUNTERS for Uranium. METAL DETECTORS for gold, silver and buried treasure. 5 models from which to choose. We have one in your price range. No finer instruments available anywhere. **FREE ILLUSTRATED FOLDERS.**

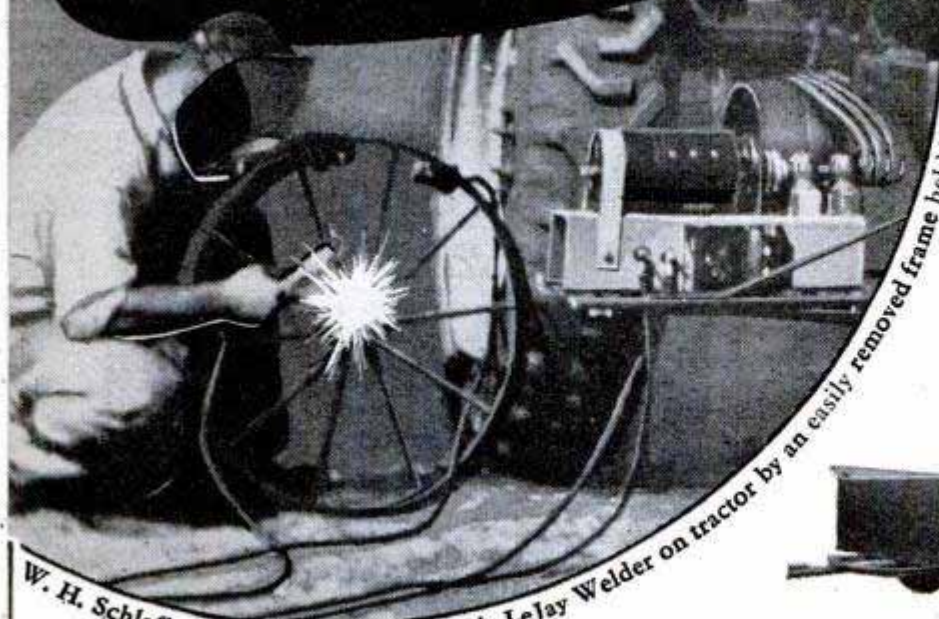


THE *Detectron* CO. Model DG-7

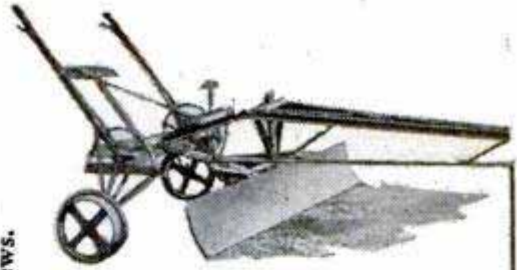
5631 CAHUENGA, NO. HOLLYWOOD, CALIF.



**DO YOUR OWN WELDING  
EARN  
WHILE YOU SAVE ON REPAIRS!**



W. H. Schlafke, Jewell, Iowa, mounts his LeJay Welder on tractor by an easily removed frame held by set screws.



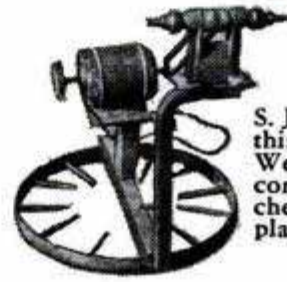
T. F. Waller, Circle, Mont., won first prize in our recent welders' contest with this grader and terracer made at "very low cost" with a Model 200 LeJay Welder.



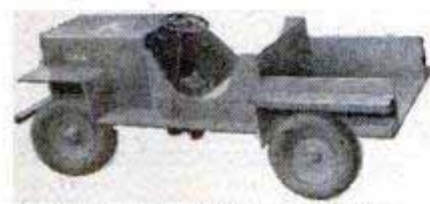
Wilfrid Wassenberg, Marysville, Kansas, loads up to 240 bales hourly with this bale loader. His LeJay Welder is driven by a Model A Ford engine.



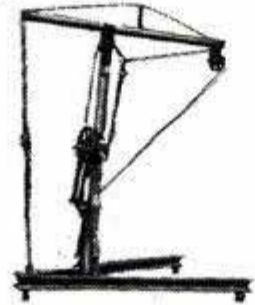
Robert Anderson, Winnebago, Minn., fabricated this steel trailer with his LeJay Welder. "I have welded car fenders, cast iron, steel, aluminum, bronze . . . have used it continuously all day . . . with very little amperage drop."



S. J. Sedlacek, Barnes, Kansas, built this portable grinder with his LeJay Welder for "on the job" use. According to Sedlacek, ". . . it's the cheapest piece of machinery on the place."



Ray Burton, Chicago Heights, Ill., built this Army "Jeep" with his portable LeJay Welder. A Clinton 2.9 H.P. motor propels it at 10 M.P.H. in third gear.

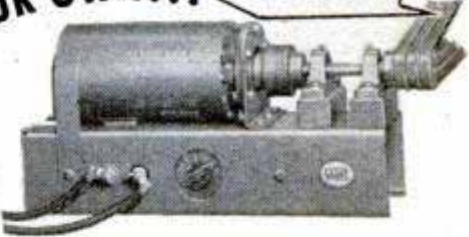


Heavy duty utility hoist also made by Wassenberg with his LeJay Welder. Capacity is 1500 lbs.

**COMPARE THIS!! 250 AMP. D.C. WELDER KIT—\$39.95 ASSEMBLE YOUR OWN...**

**PAY FOR YOUR WELDER...  
BY WELDING FOR OTHERS!**

**SAVE  
HALF!**



NOW, at a fraction of its original cost, you can make your own welder using any aircraft generator. You can not only save money, but a few repair jobs for your friends will quickly pay for your welder. Only a pair of pliers and a few minutes are needed to assemble this kit into a sturdy welder giving you many years of useful service—with satisfaction guaranteed.

**HERE'S WHAT YOU GET:**

- No. AW5-Kit includes these ten parts: (1) special hook-up leads (2) amperage control with leads (3) Hi-Lo switch (4) mounting plate (5) pillow bearings (6) bearing supports (7) shaft extension (8) flexible coupling splined to fit your generator (9) triple groove "B" type pulley (10) complete assembly plan. No. AW5-Kit Complete..... \$39.95
- No. AW6-Kit includes AW5-Kit above plus Arc Stabilizer..... \$49.95
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**EXTRA! A \$15.95 Accessory Kit Complete for only \$12.95! Includes: (1) Welding Helmet (2) Electrode Holder (3) 5 Lbs. Ass't. Rods (4) Two 10-Ft. Welding Leads with Terminals and Ground Clip. Plus (5) Audel's Welding Guide.**

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**PLANS 35¢—LeJay's proven plan for building your own welder using aircraft generator. Catalog included.**

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**LEJAY MFG. CO., INC.**

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MINNEAPOLIS 8, MINNESOTA**

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# A JEWEL OF A TOOL FOR SPRING CLEAN-UP



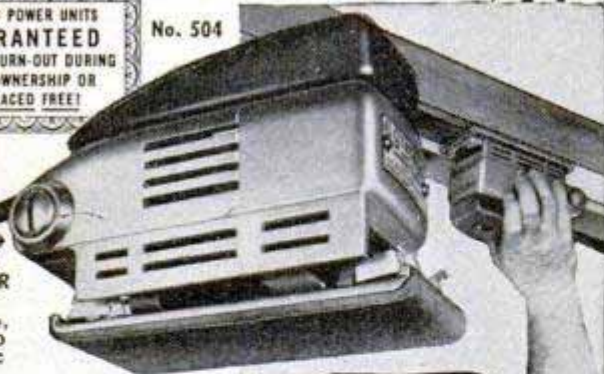
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AGAINST BURN-OUT DURING  
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**DOUBLE ARC MOTION**  
*Doubles*  
**SANDING ACTION!**

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With  
Metal  
Case

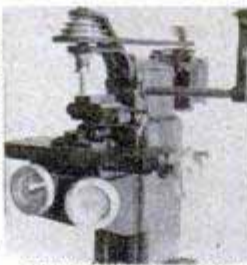
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## DOUBLE DUTY MIL-LATHE

Save 100% by assembling this new Mil-Lathe yourself. The Mil-Lathe is a vertical mill with protruding arm to hold bracket for center to turn the work on centers. All parts machined—easily assembled in 6 hours. Takes 1 1/2" 8 thread chuck. Price \$220.00 f.o.b. L.A. Does not include vise, motor or chuck. Write today for folder. Satisfaction guaranteed.



**TURNING LATHE**  
surface grinding, drilling,  
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**J. C. GRANT**  
Machine Works  
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\$2.95

\$4.95  
Extra  
Strong  
2 1/2"  
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Or Build A New One

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All parts available—Kit or separately.

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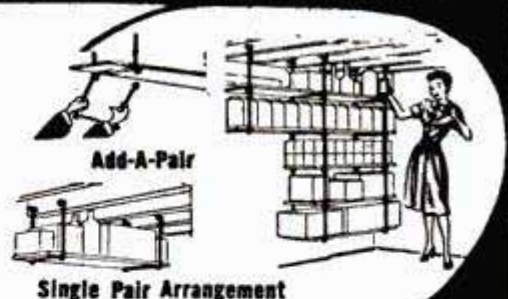
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#### ONE YEAR GUARANTEE

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2½"x2". 2.55 to 4.80 c.f.m. up to 150 lb. pressure. Operates with ¼-½-¾ HP motor. **\$27.95**  
Special Price...  
Shipping wt. 24 lbs.



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2 cylinder 2½"x2". 5.10 to 8.50 c.f.m. up to 150 lbs. pressure. Operates with ½-¾-1-1½ HP motor. **\$54.50**  
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¼" Air Regulator, Gauge and filter. Wt. 5 lbs. **\$8.95**  
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Regulator and Gauge only **\$5.95**  
½" Klidde Regulator & gauge. **\$12.50**  
\$18.00 List



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PRICE **\$12.45**  
TANK ONLY **\$6.25**  
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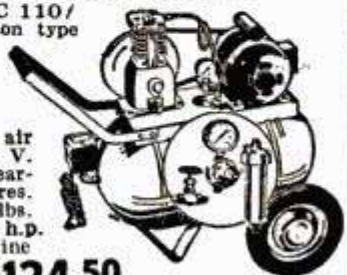


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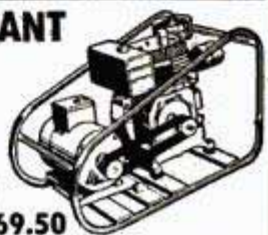
### AUTOMATIC COMPRESSOR UNIT

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110 v., 60 cy. A.C., takes starting overload up to 5000 watts. Floating Base for Automatic Belt Adjusting, 2-Groove Engine Pulleys, V-Belts, Bolts, etc. 5 H.P. Wisconsin or Briggs & Stratton Model 14 Engine. Voltmeter, 2 plug-in receptacles. Portable Tubular Steel Skid Type Carrier. Dim: L 34½" x W 17" x H 20". Wt. 180 lbs. **\$299.50**  
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Quiet operating. Double wheel inlet; double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13¼"x11¾"; inlet 8¾". Height 19". Width 18". Depth 16½". C.F.M., ¼" S.P. 1600; outlet vel. 1575. Wt. 45 lbs. **\$27.50**  
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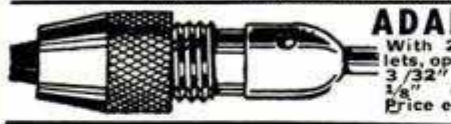
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**SHEET METAL BRAKES**  
 Forms angles, flanges and Pittsburgh locks. 26 gauge steel, heavier aluminum. Cam locking. Portable, can be bolted to bench, or clamped to edge of truck. All steel, reinforced. Shipped Exp. Coll. 30" size. Wt. 54 lbs., \$26.50. 36", Wt. 66 lbs. \$31.00. 48", Wt. 100 lbs. \$45.00. Floor mountings, portable, 32" high, 30 lbs. \$7.00 12" BRAKE. Fits in vise to form difficult compound bends, up to 20 gauge steel. Not illustrated..... \$12.50 PP.  
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 IRON BENDER. Forms hooks, angles, eyelets, etc. without heating. Capacity, 1/4x2", 5/16x1 1/2". 10 parts all steel. .... \$10.00 Pre. P.  
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Size 2 1/4" x 6"  
 Pumps approx. one gallon per min.

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**1995**

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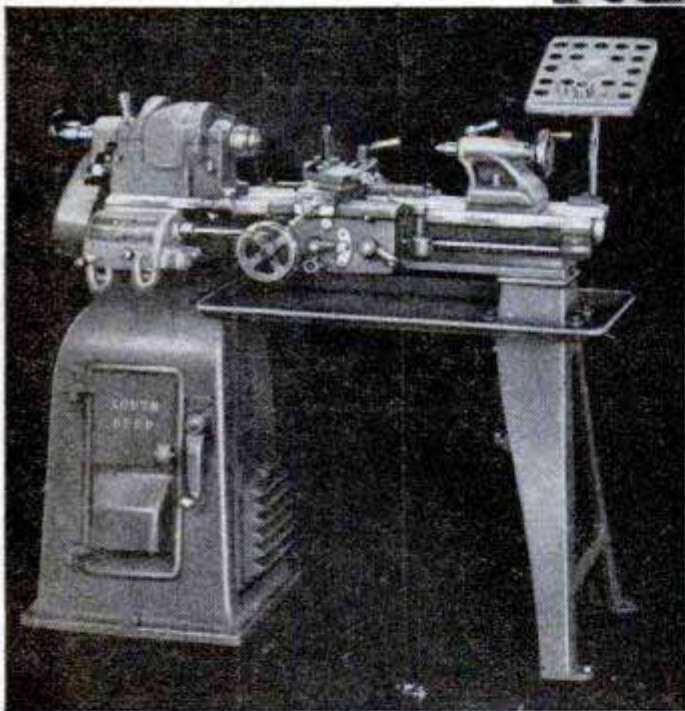
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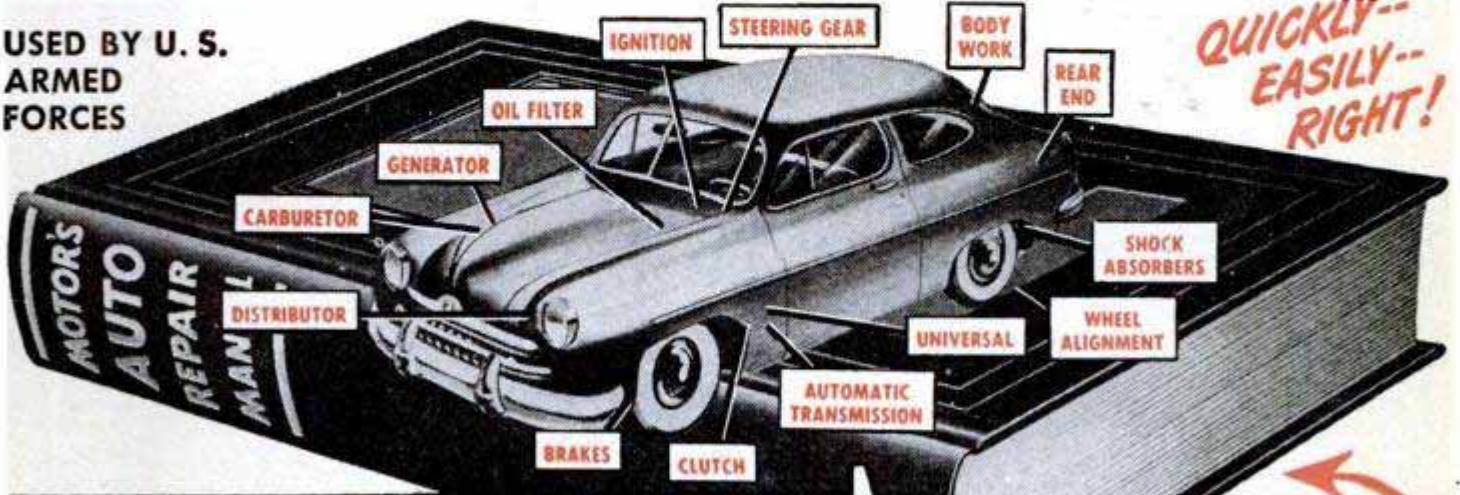


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