

JANUARY 1956

35 CENTS

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MAGAZINE

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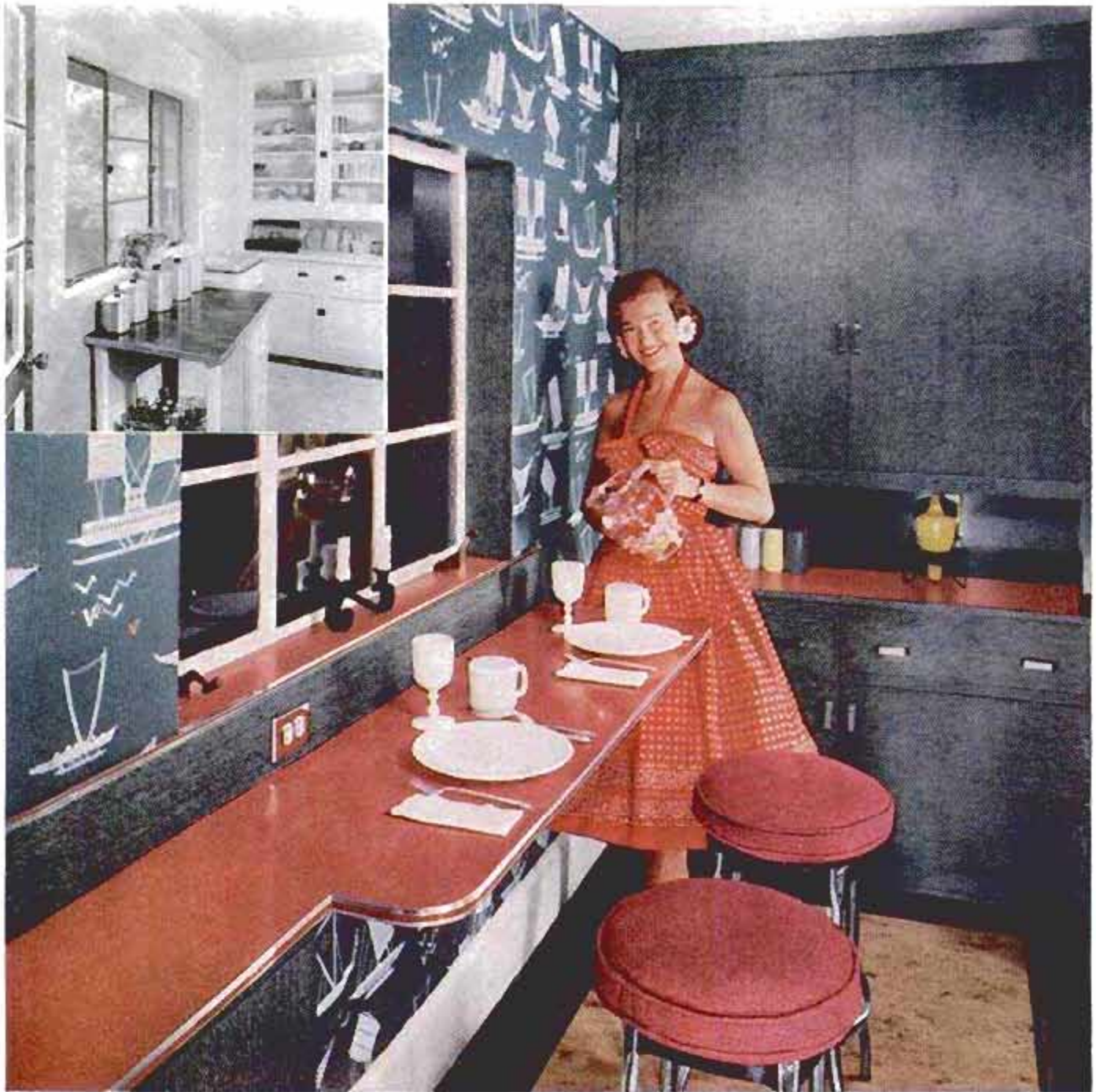
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Hot-Line Men
—Page 158

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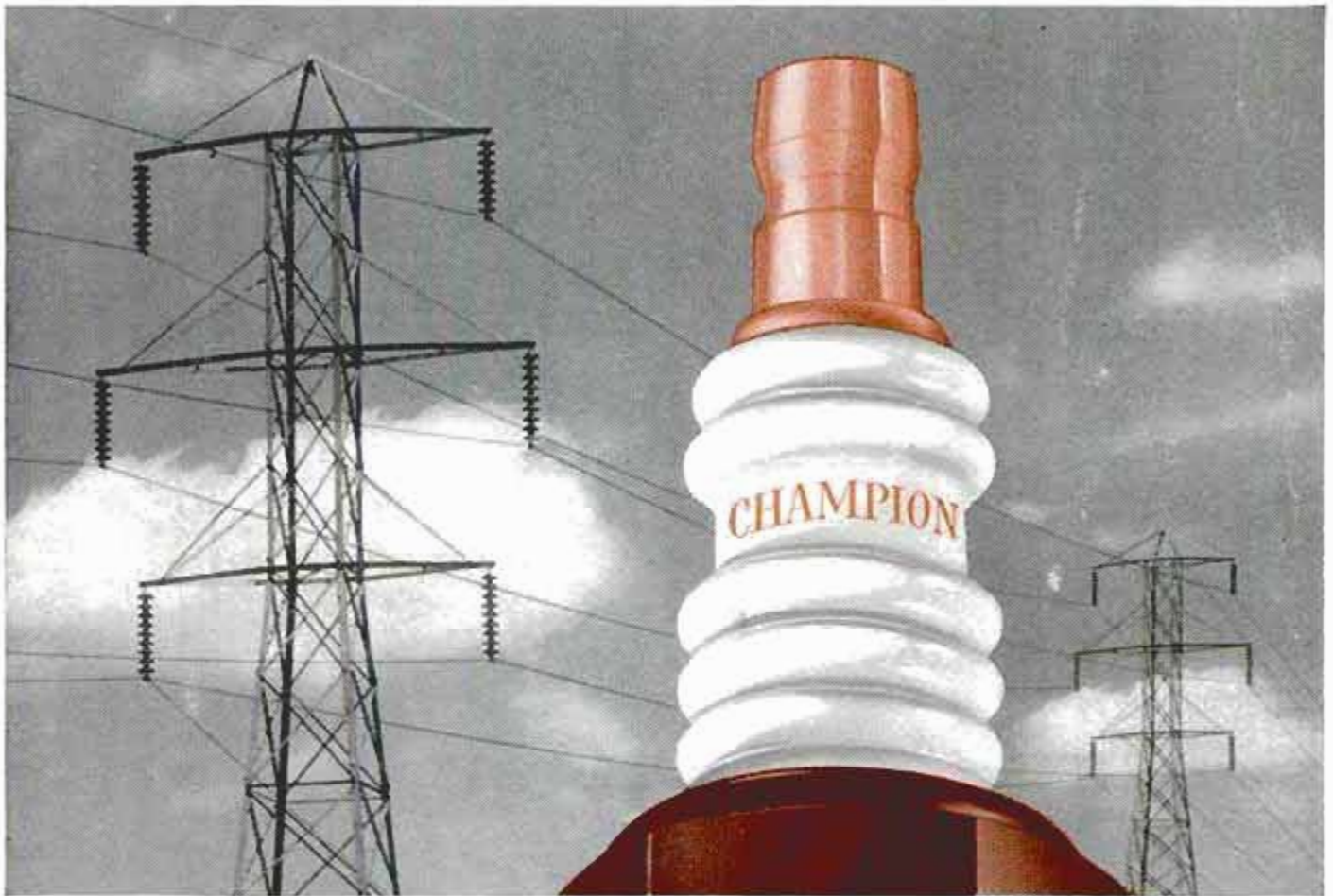
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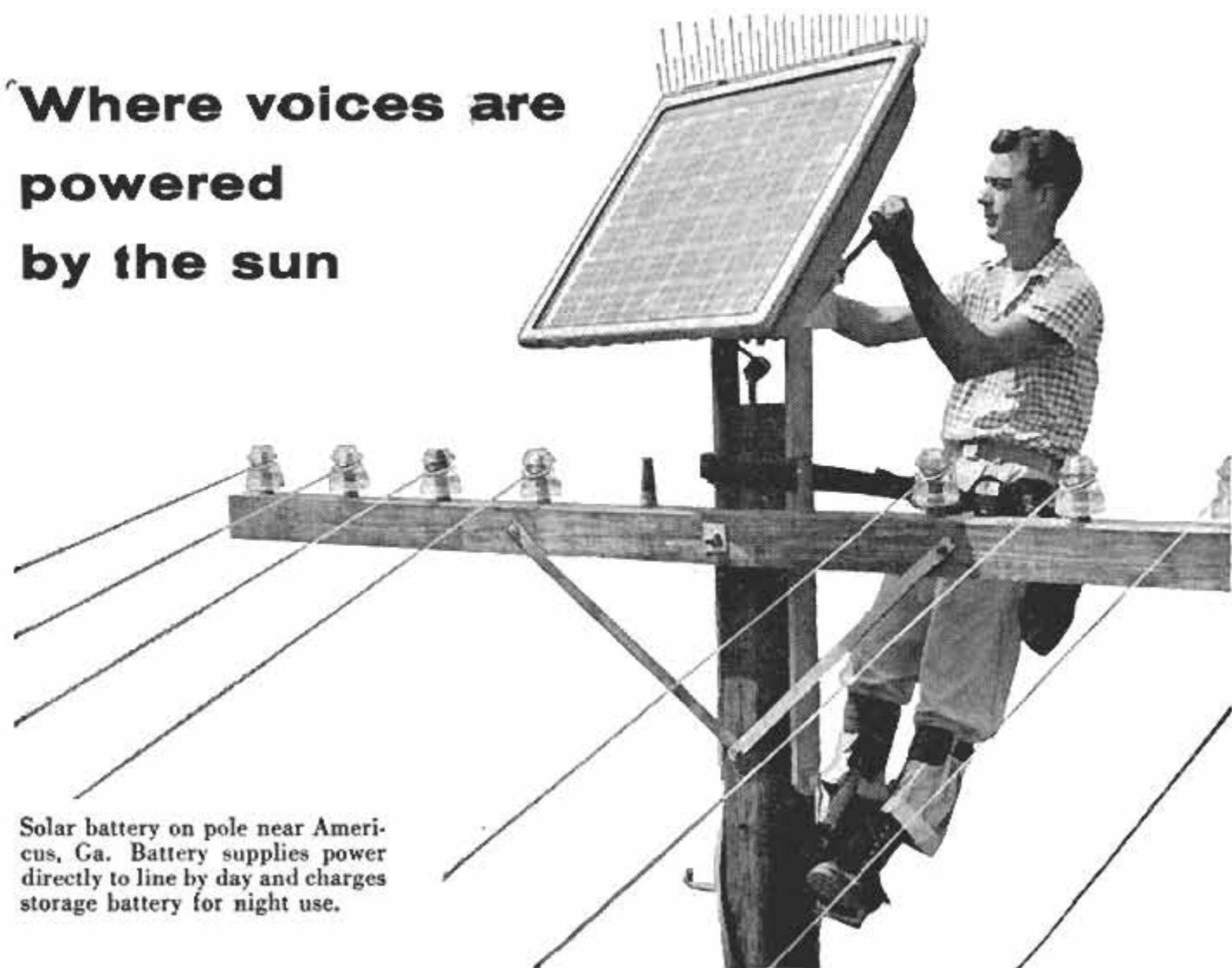
Like the multi-ribbed insulators you see every day on high-tension power lines, these 5 ribs increase the insulator length by as much as 20% over straight line insulators.

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CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

Where voices are powered by the sun



Solar battery on pole near Americus, Ga. Battery supplies power directly to line by day and charges storage battery for night use.

A new kind of telephone system developed by Bell Telephone Laboratories for rural areas is being operated experimentally by electric current derived from sunlight. Electric current is generated as sunlight falls on the Bell Solar Battery, which a lineman is seen adjusting.

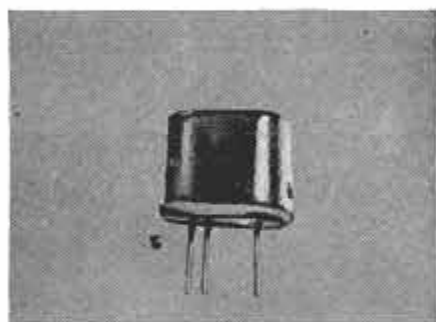
The exciting achievement is made possible by two Laboratories inventions—the solar battery and the transistor. The new system uses transistors to the complete exclusion of electron tubes. Transistors require little power and this power can be easily supplied by the solar battery.

Compact and economical, the system can carry several voices simultaneously without interference. It has proved its ruggedness by standing up to heat, cold, rain and lightning.



In sending and receiving terminals, transistors are used as oscillators, amplifiers and regulators, and for signaling.

It promises more and improved telephone service for rural areas and it typifies the Laboratories' continuing efforts to make American telephony ever better.



One of the transistors (actual size) used in the new system. The project called for new ideas, equipment, tools and methods.

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Next Month

IF YOU ARE INTERESTED in automobiles (and it's a rare bird indeed who isn't) you'll be happy with the February issue of *Popular Mechanics*. It contains our annual automobile section, 49 pages of interesting facts and photographs about the nation's most exciting business. The section provides a roundup of all the '56 cars, including specifications, prices, production figures, all in one package. But that's not all. Leading off the 49 pages is a full-color portfolio of fine paintings of 10 outstanding sports cars. Among them are (quite naturally) the well-known Jaguar XK140, above, and the lesser-known (in this country, at least) Lancia Spyder, below, plus eight more beauties, each posed on a world-famed race course



Information not listed on articles in the index, starting on page 92, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, *Popular Mechanics*, 200 E. Ontario, Chicago 11, Ill.

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for other items and manufacturers of available products

Engineer's Report:
1956 CHEVROLET

Behind Chevrolet's record-shattering Pikes Peak climb are important engineering changes

by **ED COLE**, *Chevrolet Chief Engineer*

Since Chevrolet's record-breaking run up Pikes Peak, people have asked me just what we've done to this new Chevrolet to make it the mountain-climbing champ.

Well, to begin with, our job was to produce a car that would out-perform last year's Chevy which, you'll recall, was the leading winner on the stock car tracks. That was a big order.

Our men started by making refinements in the "Super Turbo-Fire V8" engine. They raised the compression ratio to 9.25 to 1. Horsepower was boosted to 205. You can imagine what these changes did for performance!

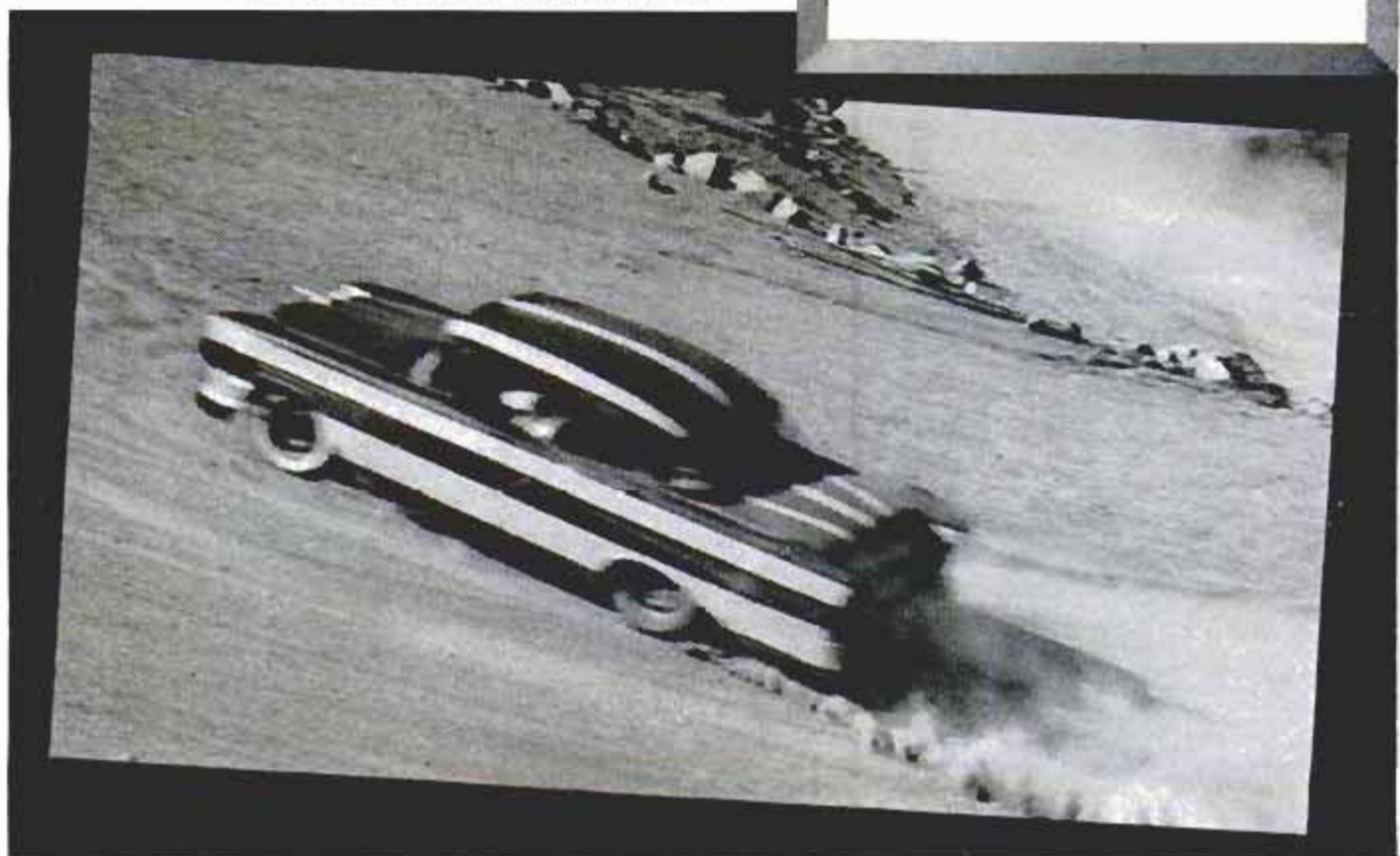
Next we went to work on the "Blue-Flame" 6. The compression ratio went up to 8 to 1. Horsepower was increased to 140. The final result of these and other improvements is the most powerful, sweetest running 6 we've ever had in a Chevrolet passenger car!

Drivers who like a full-flow oil filter will be pleased to hear that we've made provision for one on our V8 engines. And *all* engines—both 6- and 8-cylinder—are now equipped with Hydraulic-Valve lifters. This eliminates the need for periodic valve adjustments.

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Chevrolet

1956 Chevrolet setting new record for Pikes Peak climb



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ACROSS THE DESK



In the busy moments before his departure for the Antarctic, Adm. Richard E. Byrd took time to write a report for *Popular Mechanics* on this greatest assault on the South Polar area. The veteran explorer, who heads the gigantic undertaking as director of U.S. Navy Task Force 43, is now en route to the bottom of the world. His article will appear in the February issue. Don't miss it!

Pedal Pusher on Hampton Roads

Milton Morrison is a machinist with Newport News Shipbuilding and Drydock Company. Like the postman who went walking on his holiday, Morrison has built a boat. His company has turned out such



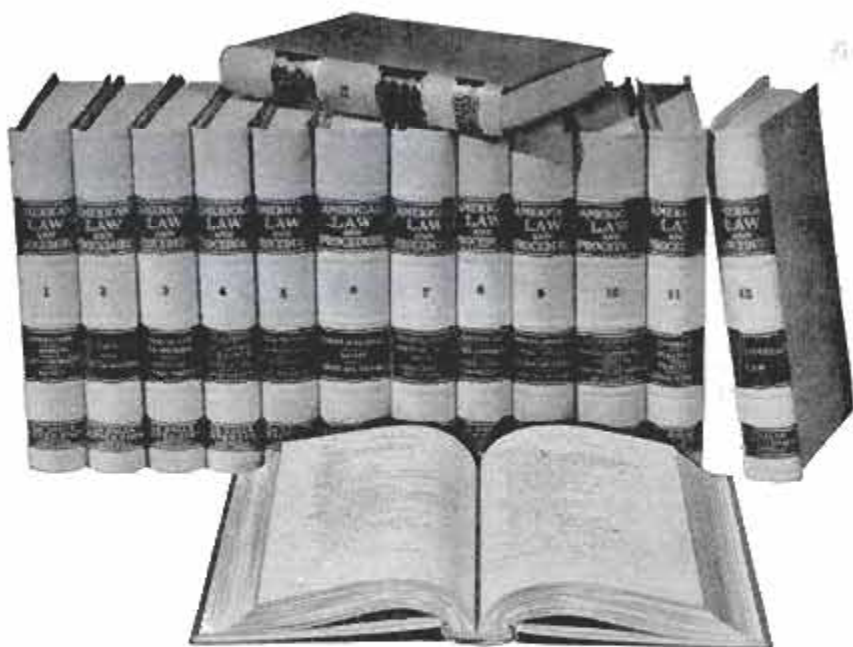
ocean-going leviathans as the *SS United States* and the *USS Forrestal*. Morrison's craft is not so big, but it creates quite a sensation when he pedals it on Hampton Roads like a jet-propelled waterbug. Using some ideas gleaned from the pages of *Popular Mechanics*, Morrison mounted a bicycle frame on a pair of eight-foot wooden pontoons; its pedals turn a pair of paddle wheels located astern between the floats. Veteran shipbuilders shook their heads when he decided to mount a wafer-thin rudder at the bow, controlled by conventional bicycle handle bars. But it works. On the shakedown cruise the trim little craft, named *Octopus*, crossed up its builder and proceeded to perform with more speed in reverse than forward. Morrison promptly beached the vessel in his workshop "dry dock" for further consultation with his cobuilder, Don Maglieri. They altered the paddle wheels slightly, giving

(Continued to page 8)

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Long Playing

(Continued from page 6)

them more power from their chain drive, added a wood covering over the stern of the pontoons to keep the backwash from kicking up too much over the framework, and hoped for the best. The result was gratifying. It performed as a pedal boat should.

Howard L. Goshorn,
Norwalk, Va.

To the Editor:

This is a short note to thank you for sending me a copy of your November issue containing my IGY article, and to congratulate you on the excellent way in which it is illustrated. The illustrations are pertinent and well presented. Someone may write to say, what is the fact, that mountains often seem to repel rather than to attract the plumb bob. The raised body of the mountains does indeed pull the plumb line toward it, but the mountain has deep roots that project down into the denser layers beneath, just as the greater part of an iceberg is under water; and so there is a tendency for this deficiency of density at deeper levels to cause the plumb line to tilt away from the mountain. This can be your answer if anyone does so write. Of course, for illustration without more than a few words of comment, it is natural to illustrate the matter as you have done it.

Dr. Sydney Chapman,
International Chairman for the
International Geophysical Year

☆☆☆



S/Sgt. James B. Gilmer, of Miami University, Oxford, Ohio, an instructor in aeronautics, drove a King Midget from Atlantic City, N. J., to San Francisco in a driving time of 4 days, 11 hours and 21 minutes. Sergeant Gilmer spent \$26.35 for all gasoline, oil and greasing on the trip,

(Continued to page 10)

How long since your last raise?

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Blueprints</p> <p><input type="checkbox"/> Sanitary Engineering</p> <p><input type="checkbox"/> Structural Engineering</p> <p><input type="checkbox"/> Surveying and Mapping</p> <p>DRAFTING</p> <p><input type="checkbox"/> Aircraft Drafting</p> <p><input type="checkbox"/> Architectural Drafting</p> <p><input type="checkbox"/> Electrical Drafting</p> <p><input type="checkbox"/> Mechanical Drafting</p> <p><input type="checkbox"/> Mine Surveying and Mapping</p> <p><input type="checkbox"/> Plumbing Drawing and Estimating</p> <p><input type="checkbox"/> Structural Drafting</p> <p>ELECTRICAL</p> <p><input type="checkbox"/> Electrical Engineering</p> <p><input type="checkbox"/> Electrical Maintenance</p> <p><input type="checkbox"/> Electrician <input type="checkbox"/> Contracting</p> <p><input type="checkbox"/> Linemen</p> <p>HIGH SCHOOL</p> <p><input type="checkbox"/> Commercial <input type="checkbox"/> Good English</p> <p><input type="checkbox"/> High School Subjects</p> <p><input type="checkbox"/> Mathematics</p>	<p>LEADERSHIP</p> <p><input type="checkbox"/> Foremanship</p> <p><input type="checkbox"/> Industrial Supervision</p> <p><input type="checkbox"/> Leadership and Organization</p> <p><input type="checkbox"/> Personnel-Labor Relations</p> <p>MECHANICAL AND SHOP</p> <p><input type="checkbox"/> Gas—Electric Welding</p> <p><input type="checkbox"/> Heat Treatment <input type="checkbox"/> Metallurgy</p> <p><input type="checkbox"/> Industrial Engineering</p> <p><input type="checkbox"/> Industrial Instrumentation</p> <p><input type="checkbox"/> Industrial Supervision</p> <p><input type="checkbox"/> Internal Combustion Engines</p> <p><input type="checkbox"/> Machine Design-Drafting</p> <p><input type="checkbox"/> Machine Shop Inspection</p> <p><input type="checkbox"/> Machine Shop Practice</p> <p><input type="checkbox"/> Mechanical Engineering</p> <p><input type="checkbox"/> Quality Control</p> <p><input type="checkbox"/> Reading Shop Blueprints</p> <p><input type="checkbox"/> Refrigeration</p> <p><input type="checkbox"/> Sheet Metal Worker</p> <p><input type="checkbox"/> Tool Design <input type="checkbox"/> Toolmaking</p> <p>RADIO, TELEVISION</p> <p><input type="checkbox"/> Industrial Electronics</p> <p><input type="checkbox"/> Practical Radio TV Eng'ng</p> <p><input type="checkbox"/> Radio and TV Servicing</p> <p><input type="checkbox"/> Radio Operating</p>	<p><input type="checkbox"/> Television Technician</p> <p>RAILROAD</p> <p><input type="checkbox"/> Air Brakes <input type="checkbox"/> Car Inspector</p> <p><input type="checkbox"/> Diesel Locomotive</p> <p><input type="checkbox"/> Locomotive Engineer</p> <p><input type="checkbox"/> Section Foreman</p> <p>STEAM AND DIESEL POWER</p> <p><input type="checkbox"/> Combustion Engineering</p> <p><input type="checkbox"/> Diesel—Elec. <input type="checkbox"/> Diesel Eng's</p> <p><input type="checkbox"/> Electric Light and Power</p> <p><input type="checkbox"/> Stationary Fireman</p> <p><input type="checkbox"/> Stationary Steam Engineering</p> <p>TEXTILE</p> <p><input type="checkbox"/> Carding and Spinning</p> <p><input type="checkbox"/> Cotton, Rayon, Woolen Mfg.</p> <p><input type="checkbox"/> Finishing and Dyeing</p> <p><input type="checkbox"/> Loom Fix'tg <input type="checkbox"/> Textile Des'ing</p> <p><input type="checkbox"/> Textile Eng'g <input type="checkbox"/> Throwing</p> <p><input type="checkbox"/> Winding and Weaving</p> <p>MISCELLANEOUS</p> <p><input type="checkbox"/> Domestic Refrigeration</p> <p><input type="checkbox"/> Marine Engineering</p> <p><input type="checkbox"/> Ocean Navigation</p> <p><input type="checkbox"/> Professional Engineering</p> <p><input type="checkbox"/> Short Story Writing</p> <p><input type="checkbox"/> Telephony</p>
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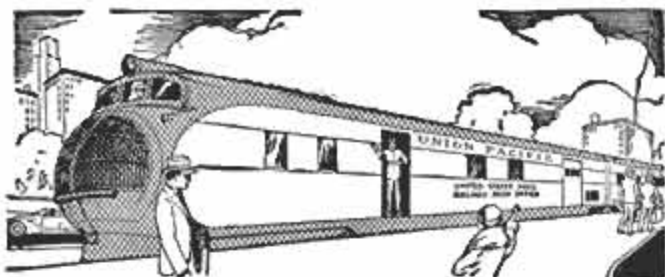
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(Continued from page 8)

and in setting this record he was forced to drive almost 600 miles per day following Route 40.

The King Midget is a one-cylinder, 8½-horsepower, air cooled, two-passenger roadster, with two-speed automatic transmission and reverse, and is manufactured in Athens, Ohio, by the Midget Motors Corporation. The cars get from 60 to 65 miles per gallon of gasoline and have a top speed of about 50 miles per hour.

To the Editor:

I wish to acknowledge tear sheets from the November issue of *Popular Mechanics* on the article by Francis Dickie entitled "On the Trail of the Whooping Crane." We appreciate receiving this article. It came at a time when interest is high with the last of the migrants leaving Canada for Aransas, Tex., and when requests are coming in from students requesting material on the whooping crane for various school projects. I have referred this article to several and feel the photographs, charts, etc., are well worth having.

The whooping-crane population is at a dangerous low and every article to attract public attention and enlist their services is all to the good. The three whooping cranes appearing on the first page of the article were photographed here two years ago by Fred Lahrman of the museum staff. This I think is one of the best, if not the best photograph ever taken of whooping cranes in their migration. They are naturally more difficult to approach when in migration than on the winter or summer nesting grounds.

Frankly I wondered why the story of the whooping crane appeared in *Popular Mechanics* and then I realized the fact that the magazine is read by so many people. I think it was a clever idea to have such an article in this well-liked magazine. Thank you again and with all good wishes.

Fred G. Bard, Director,
Saskatchewan Museum
of Natural History,
Regina, Saskatchewan

☆☆☆

You can't depend on it for a satisfying meal, but the glue on the back of United States postage stamps is somewhat nutritious and even palatable. It's made of a mixture of corn and cassava.

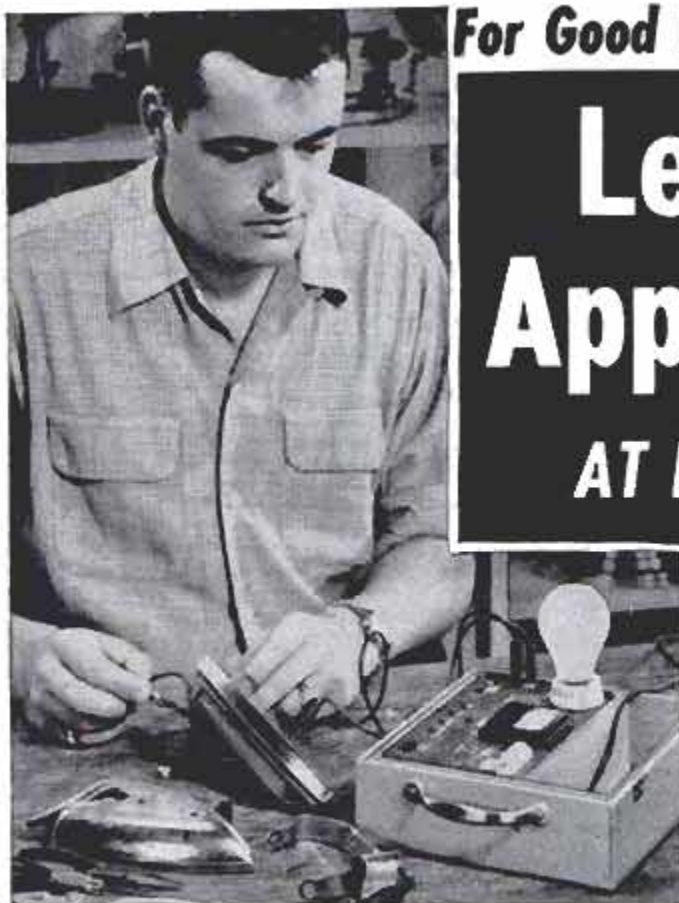
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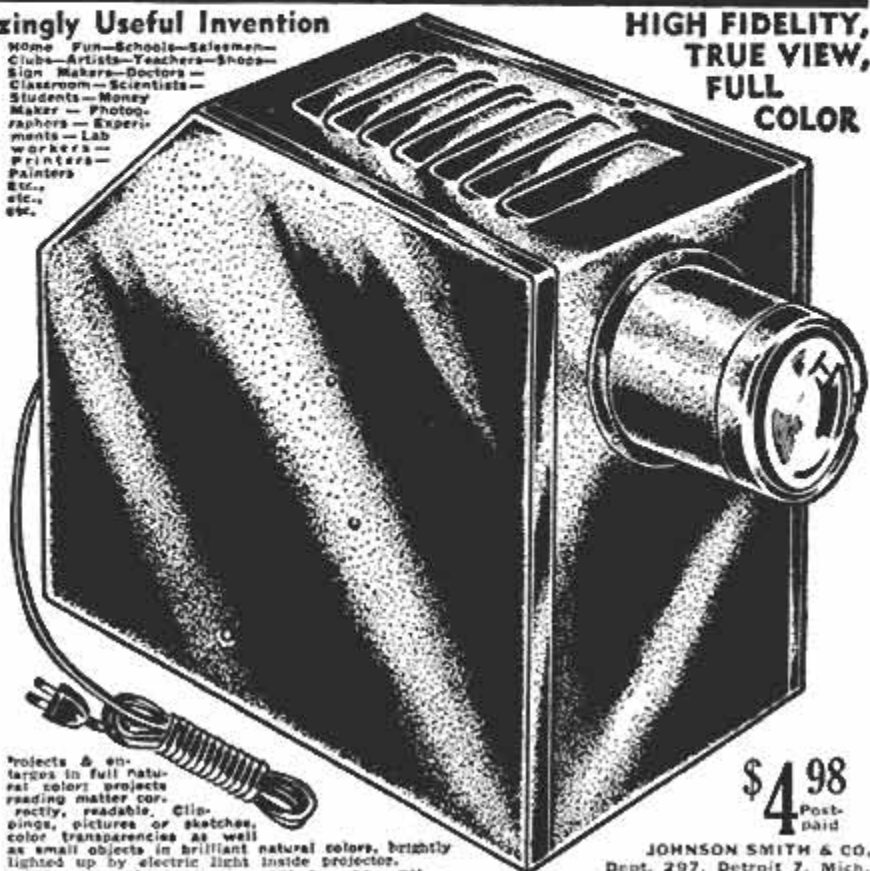
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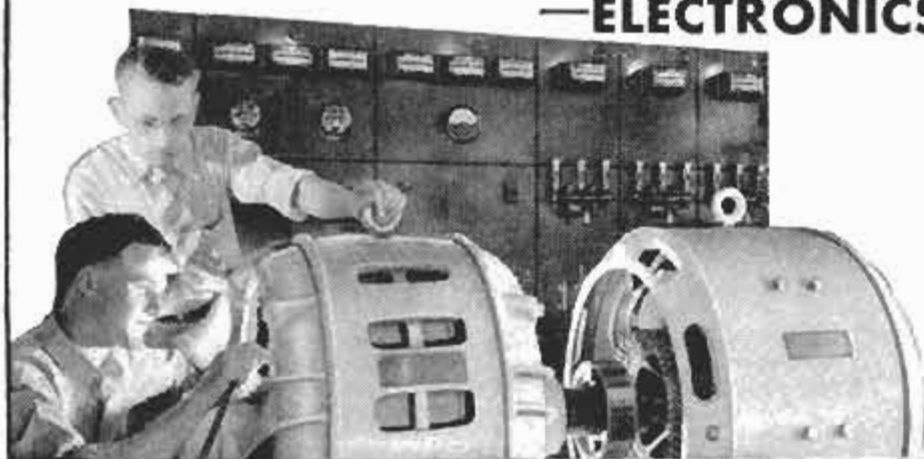
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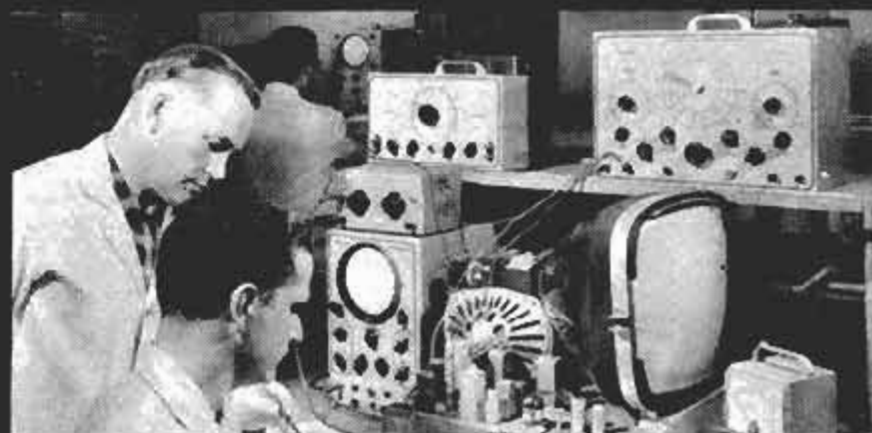
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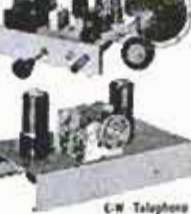
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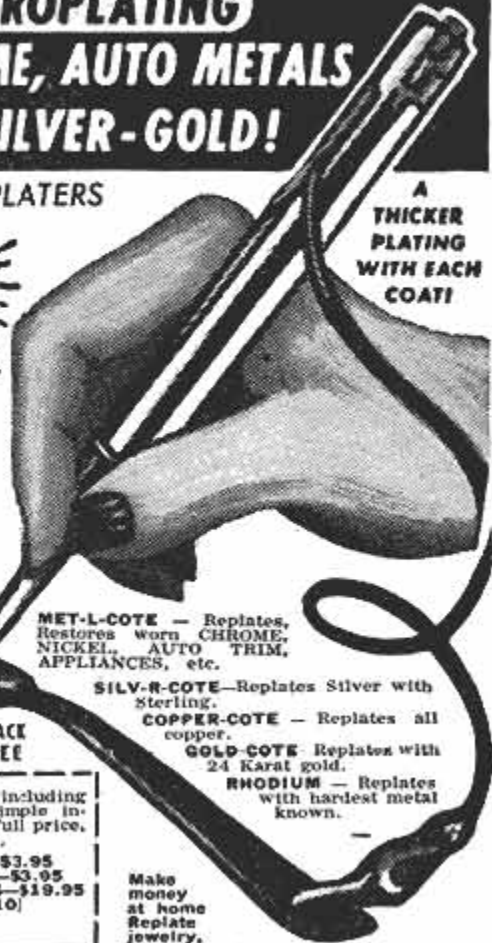


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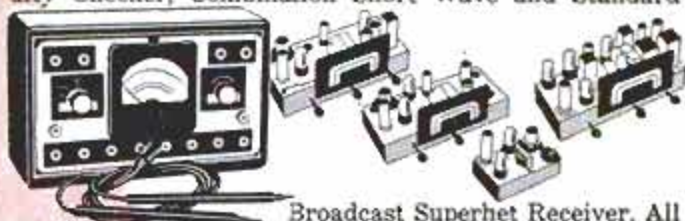
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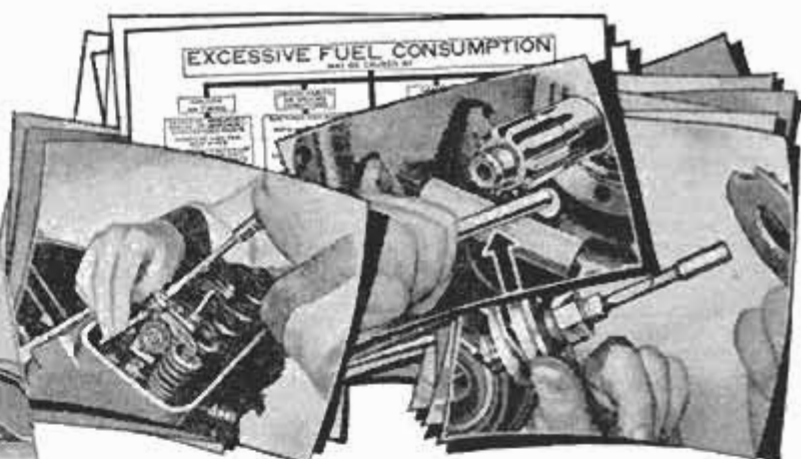
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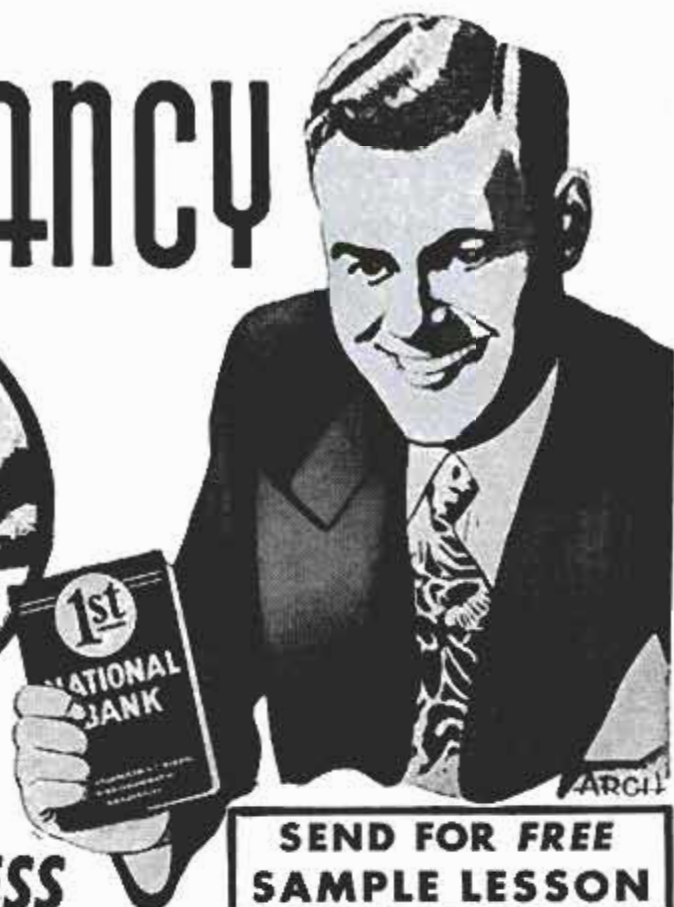
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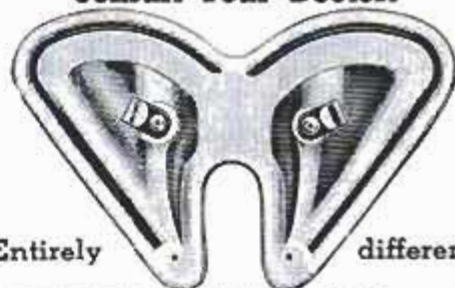
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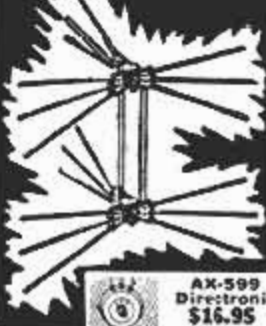
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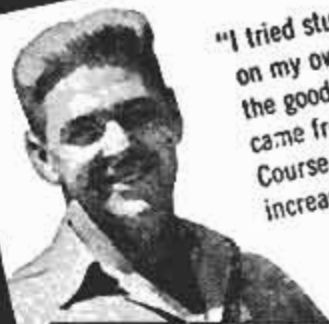
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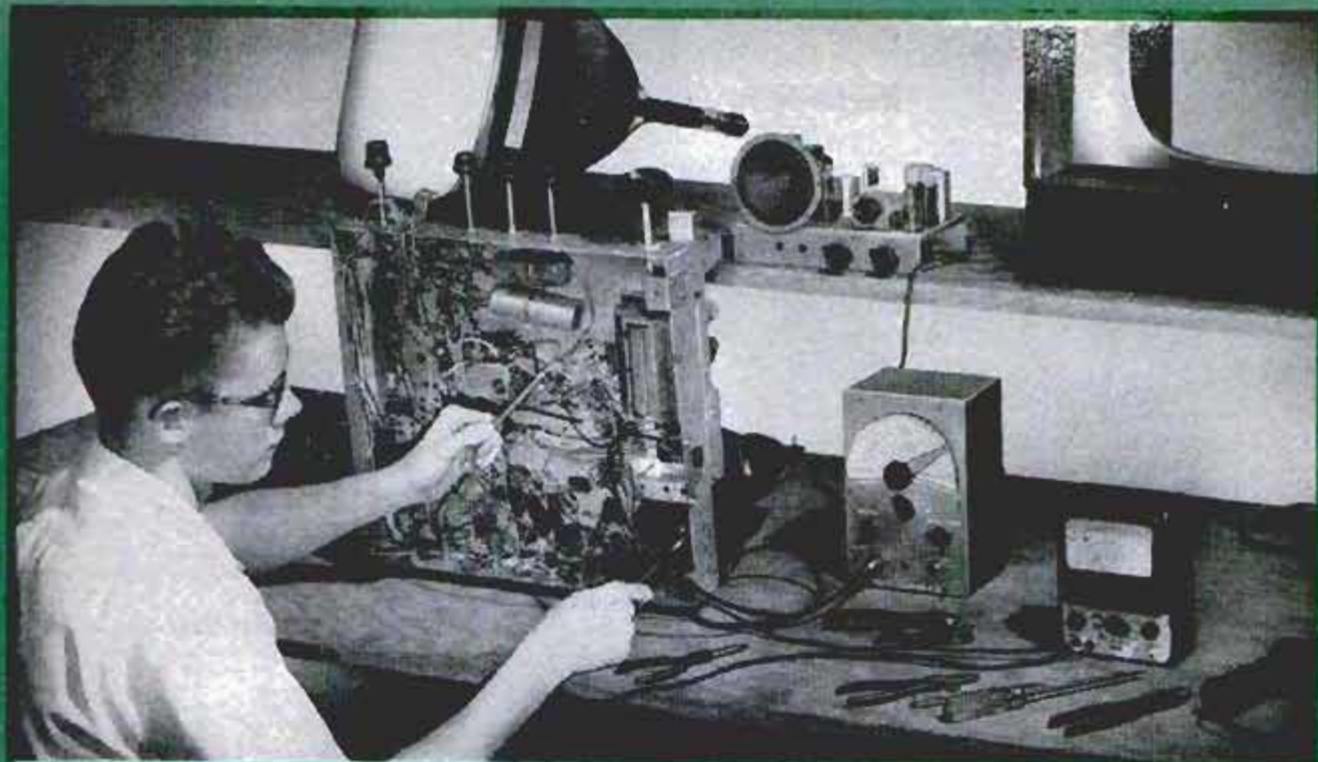
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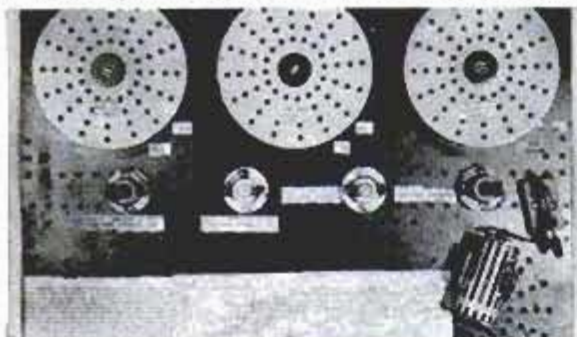


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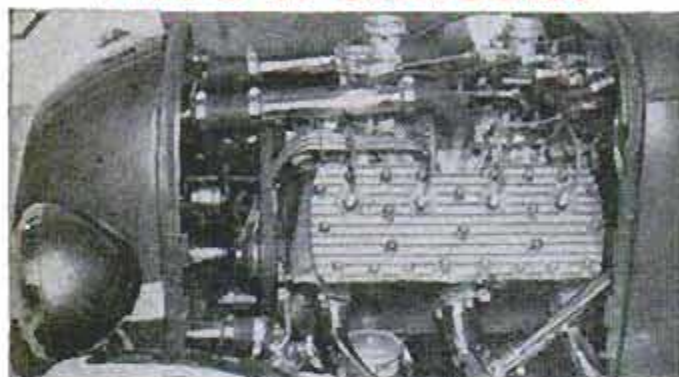
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The real-life stories of success in Mail Order read like fairy tales. If I had not personally known these people their stories would be hard to believe. Yet they are not only true, but they represent just a few of the hundreds of "little operators" who have been swept into big money by Mail Order.

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

YAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start—ended up six years later with savings of \$50,000 and an income of \$50,000.00 a year for life without further work.

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

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

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

JORGENSON. Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of \$50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

These things I have seen. These people I have helped to the realization of their dreams — these and hundreds of others. My own fortune was made in Mail Order. And now my secrets can be yours.

L. W.

Have you ever thought of running a profitable little sideline right from your home? Has it occurred to you that you are just as capable as anyone else of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on tiny investments) by innumerable small operators?

Forget about Sears and Ward's! Read about the "little fellows" . . . clerks, teachers, vets, mechanics, salesmen and others . . . who are packing Mail Order items in bedrooms, spare rooms, attics, garages, cellars . . . dumping them in the Post Office . . . and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by "little fellows" who advertise and sell just one item! The Department of Commerce of the United States says, "A number of the most successful obtain incomes as high as \$40,000 to \$50,000.00."

It's an incredible story . . . a story of a business that's wide-open for newcomers . . . with opportunities for income far-and-away greater than you can ordinarily hope to attain by holding down a job. And in Mail Order you can stay as small as you wish—run your deal as a \$50 or \$75 weekly sideline—or consider jacking it up into really big figures as a full time operation.

Glance at the examples at left. These true stories are far from unusual. Multiply them by the hundreds and you begin to get an idea of what can be done . . . what is being done . . . in the phenomenal Mail Order field.

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in this little-known, little-understood business. This is fortunate for you. If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . the L.W. Confidential Mail Order Letters.

This Survey is not a course—not a book—not a group of lessons. It is a simple guide that anyone can follow. It shows you how to pick the right product for Mail Order. It shows you exactly how to start a profitable business fast, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don't have to tie up cash in large supplies of your product. It gives you actual examples of ads and letters, analyzed to show how and why they make money. It demonstrates the months to start, the time to expand, the best way to get prospects' names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them.

Mail the coupon today, or simply send your name and address on a postcard. No salesman will call. We will mail, postage prepaid, a Free copy of "How to Become a Mail Order Millionaire" and along with it will give you complete facts about the L.W. Mail Order Survey. Read the facts. Then decide whether you would like to spend spare time or full time in a profitable, fascinating Mail Order enterprise. If you think you would like to follow the footsteps of hundreds of others who are now making good money in this way, you can get your L.W. Survey and begin at once.

Please don't decide to write us "a little later." Send your name now, before you forget. This one little act might be the first step to a future of independence and wealth.

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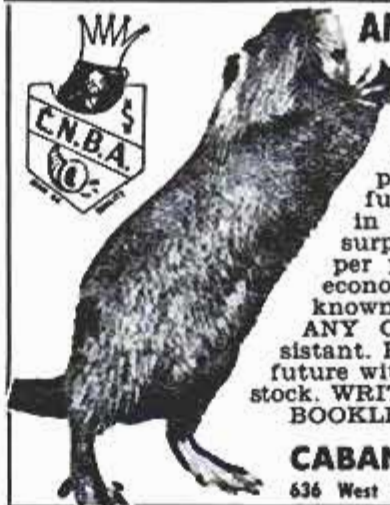
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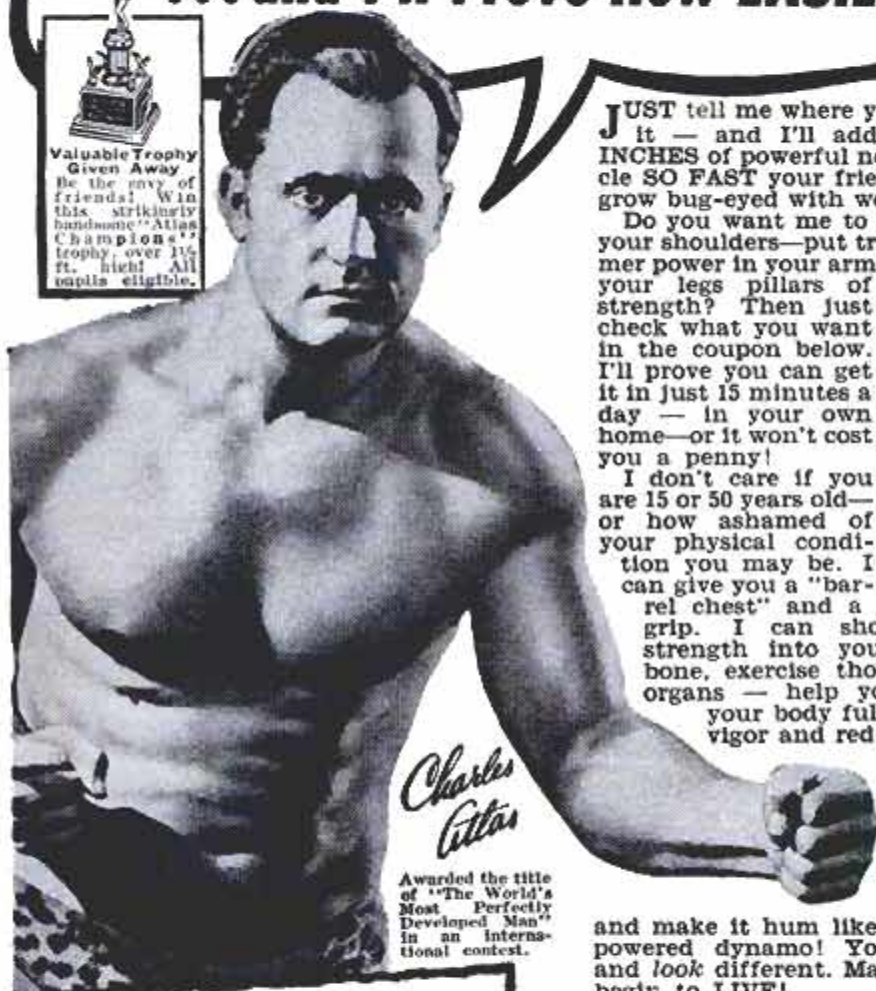
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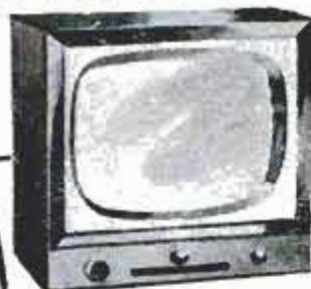
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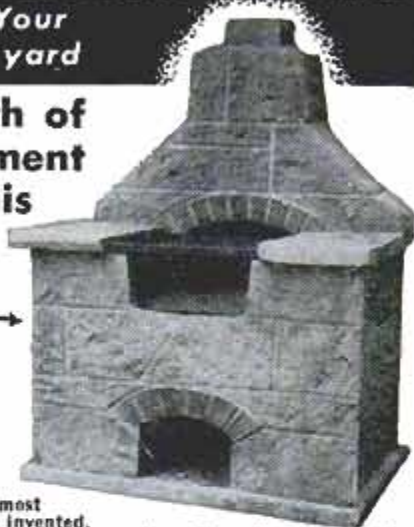
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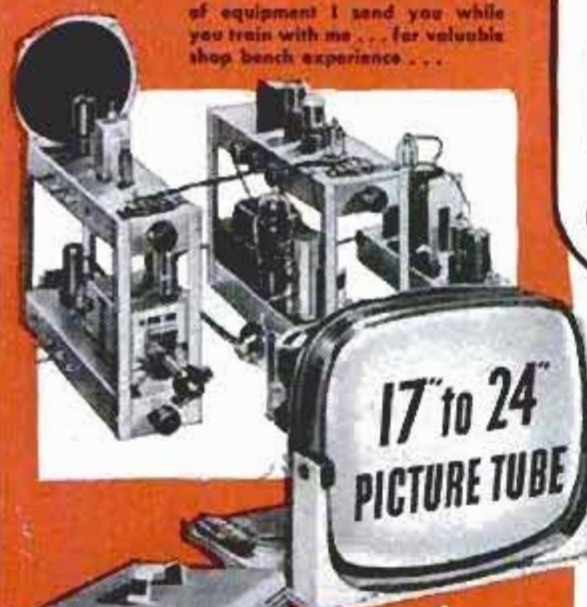
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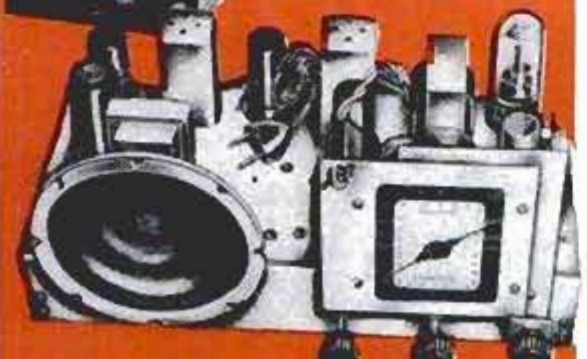


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"HOW I DOUBLED MY INCOME In Less Than A Year, As A CUSTOM UPHOLSTERER"



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MAKE UP TO \$10 AN HOUR AT HOME WITH 50¢ WORTH OF MICRO-FLUFF

HIGH COST OF LIVING GETTING YOU DOWN

Want to add an extra \$100 or more to your regular monthly pay check in a few **SPARE TIME** hours of pleasant occupation **AT HOME**? That's just the position I was in a few years ago when I ran across an Old-World formula for applying short cotton fibers to practically any surface, in such a manner that it looked and felt just like costly velvet or velour.

THIS PROCESS AMAZED ME

I spent several years experimenting until I developed what I now call the **FLOK-KRAFT MICRO-FLUFF** method. This **NEW METHOD** is far removed from the Old-World way of applying these short fibers. Also it permits the use of tiny fibers of **RAYON** and other modern materials in **MANY COLORS** in addition to cotton.

NO OVERHEAD—NO EXPENSIVE EQUIPMENT

Start in your basement, garage, attic, service porch, or even on a card table in your bedroom. With an hour's practice you can apply a few pennies worth of **FLOK-KRAFT MICRO FLUFF** to a yard or two of butcher paper, and make it look like \$15-a-yard velvet for window displays in the finest jewelry, gift, or department stores, etc. Takes only a few minutes and practically no effort.

MICRO-FLUFF IS BEAUTIFUL AND LONG WEARING

Truly the most amazing material you ever saw, **MICRO-FLUFF** comes in every color of the rainbow, is long lasting, has the **TOUCH** appeal of luxurious velvet or suede, and goes on practically any surface—paper, metal, wood, glass, plastic, plaster, rubber, even sponge-rubber. It is wonderful to line silverware or hosiery drawers, cover and line jewelry boxes, decorate lamps and lamp shades, finish the inside of auto trunks or glove compartments (to protect luggage and accessories from scratching) re-cover women's party shoes, phonograph turntables, etc. Apply to toys, figurines, wall plaques, signs, store displays and a thousand-and-one other items, new or old. **FLOK-KRAFT MICRO-FLUFF** makes old objects beautiful and salable — increases value of many new products by 500%.

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"Received the outfit and everyone that saw it is very enthused. I only had it about thirty minutes and got an order for a \$100 job."

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"Got \$52.50 for those 7 trunk interiors for about 4 hours work. \$7.50 per trunk."

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"... I have received my order and believe me, I'm very pleased and happy as as I've made myself MORE than the cost of my supplies already, and I've still got more jobs to do."

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"... pleased with your course and I'm being swamped with work to do."

W. F., Penn.



BIG-PROFIT ORDERS COME FROM NEIGHBORS, GIFT SHOPS, STORES—ALSO MAIL-ORDER

Every household has one or more items that can be saved from discard by a **FLOK-KRAFT** job. Decorate store display cases and windows (jewelers love this) and also supply them with fast-selling **FLOK-KRAFTED** gift items and other merchandise. Manufacturers are prospects for contracts to apply **FLOK-KRAFT** to furniture, instrument cases, luggage, and hundreds of other products. Every neighborhood needs a **FLOK-KRAFTER**. **HELP US FILL A HUGE DEMAND.**

Since succeeding beyond my wildest dreams in my own **FLOK-KRAFT** business, I have concentrated on helping ambitious men get started in the same way to build a successful future, free of time clocks and nagging bosses. My plan is designed to help you start at home in spare time, and build gradually toward a full-time business with employees working for you. And you can start **RIGHT NOW**. **DON'T SEND ME ANY MONEY**, just your name and address on a postcard, and I'll rush you a **FREE SAMPLE OF FLOK-KRAFT MICRO-FLUFF**, the **FLOK-KRAFT PLAN** and full **FREE** details. I'll also arrange to send you the complete **FLOK-KRAFT MICRO-FLUFF** outfit to try out right in your home, before you agree to buy anything at all. The outfit includes detailed instructions with hundreds of show-how photographs and drawings that make everything simple, right from the start. Also included is our specially designed, high-velocity Applicator and a generous supply of **FLOK-KRAFT MICRO-FLUFF**—everything you need to get going right away. You owe it to yourself to investigate. Rush me your name and address today by Airmail, and I'll show you how to start making money at once!

NELS IRWIN, Coast Industries, Dept. 21,
Los Angeles 61, California

SEND NO MONEY—MAIL COUPON NOW!

Nels Irwin—COAST INDUSTRIES, Dept. 21.
Los Angeles 61, California

Please rush me **FREE** sample, details, etc. I understand that everything you send is free and that I'll be under no obligation now or ever.

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STREET _____

CITY _____ STATE _____



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- Diesel Construction
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Be a Trained Diesel Man

Go places with DIESEL! Farms, factories and power plants, trains, ships, trucks, busses all use DIESEL POWER... all need DIESEL-trained men! You can start your DIESEL training at home, in spare time, with tested, proved U E I training. Course includes practical work on Diesel engines under skilled instructors. You learn the operation, maintenance, servicing of all types of Diesel engines. PLUS Scientific Motor Tune-up. **ACT NOW!** If you have mechanical ability, you'll like Diesel! High School diploma not necessary. Write now for FREE book, "EARNING POWER IN DIESEL." Act Today!

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"THE BLATT NAME famous in tires for 40 years." Only BLATT offers a "FREE REPLACEMENT" guarantee! Any other guarantee is USELESS where you must pay for the months service you've received. I replace **FREE** instantly ANY defective tire within 36 mos. **FOOLISH TO PAY MORE—DANGEROUS TO PAY LESS!**

CHOOSE YOUR FAVORITE BRAND GOOD YEAR FIRESTONE

These are not Recaps—not cheap grade tires. We are selling thousands in our retail store at higher prices! America's most respected "Free Replacement"

36 MONTH GUARANTEE & A FREE TUBE WITH EACH TIRE	600-16 \$5.53	670-15 \$5.43	700-20 \$9.83	600-16 (6) \$5.93
	650-16 5.83	710-15 5.43	750-20 11.83	650-16 (6) 6.83
	700-16 8.03	760-15 5.73	825-20 17.93	700-16 (6) 7.33
	640-15 4.83	800-15 5.83	900-20 17.93	700-15 (6) 7.83
	700-15 \$4.93	820-15 \$5.83	1000-20 \$17.93	700-17 \$8.83
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Send Ck. or M.O. & this ad for instant shipment. FOB Phila. I personally select your tires—as if my future depended on it. Thousands of tires shipped the world over. Road that top line again.

● If you buy 2 or more TIRES you get an extra tire FREE! **FREE TUBE!**

Give a Tire FREE FOR XMAS. This pictured tire ash tray FREE given with 2 or more tires!

SPECIAL TIRES RELEASED BY CO. ADJUSTERS!
If a tire fails in 36 months, I charge you nothing. \$7.53
Just slightly used. Any car size. World's top tire value (Whitewalls \$1 extra). Free tube with each tire!

MILITARY MUD-GRIP TIRES
AA Guar. 20 Mos. AAA 38 Mos. Months
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It's new! Amazing! At last, the secret of growing miniature (MING) trees can be yours. FULL GROWN, dwarf trees—only a few inches high. Beautiful miniature fir, orange, oak, Chinese elm, peach, pine, cypress—any kind! ALL BLOOM and even BEAR FRUIT. All perfect healthy specimens—but miniature in size! Make costly home decorations and expensive centerpieces. (SOLD FOR OVER \$1,500 EACH.) Big demand. Costs only pennies—takes only minutes per week. IT'S EASY! Fun! A new fascinating hobby—a new fabulous \$\$\$ business. Send for free secret plan details and real seed.

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Rush me **FREE PLAN** and **SEED** IMMEDIATELY!

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Make up to \$18⁰⁰ PER HOUR!



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Amazing earnings are possible with this remarkable PLASTIC SANDWICH MACHINE.

Make PLASTIC SANDWICHES that cost you less than 10c each, take only 2 to 3 minutes of your time, yet sell for 50c to \$1.00 each! That's 600% to 1200% PROFIT!

"Plastic Sandwiches" are thin sheets of plastic fused (laminated) around social security cards, photographs, driver's licences, letters, membership cards, etc. Anything you want to save permanently.

We want to introduce our Plastic Sandwich Machines from coast to coast as quickly as possible. We supply the finest quality, quicker, surer working plastic sheets at rock bottom prices.

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4,538 TROPICAL FISH
WORTH \$2,456⁶⁵!

EARN BIG PROFITS In Your Spare Time!

If you have a little space in a SPARE ROOM, PORCH, BASEMENT, GARAGE ... ANYWHERE. Investigate this "chance of a lifetime" opportunity of breeding rare tropical fish for profit. The tropical fish "BOOM" IS JUST BEGINNING and here's your opportunity to cash in on it now. Experts estimate \$780 MILLION DOLLARS will be spent on tropical fish within next ten years. Investigate now—Rush coupon below.

WOW!

—AND YOU BREED THEM IN YOUR SPARE TIME—IN YOUR HOME

YES BOB I BREED THEM IN MY BACK PORCH. THEY ALMOST SELL THEMSELVES, TOO. BELIEVE ME THE "BOOM" HAS STARTED

DID IT COST YOU MUCH TO START?

NO—ONLY A FEW DOLLARS, A LITTLE SPACE AND MY SPARE TIME AND THE LITTLE KNOWN BREEDING SECRETS ARE ALL YOU NEED TO START. IF YOU'RE INTERESTED—LEARN THE FACTS TODAY!—THE "BIG BOOM" HAS STARTED SO CASH IN ON IT **NOW!**

Join others that are saying: "Business prospects amazing." J. K., Ga. "Dealers want all I can breed." J. P., Ore. "Pays off large dividends." R. D., N. Y., etc.

IT'S EASY! Once you know the SECRETS you may breed exotic ANGEL FISH; Zebra striped DANIO; beautiful GOURAMI; majestic FIGHTING FISH; the mysterious weather predictors—and BRILLIANTLY BEAUTIFUL rare tropicals of every kind. Sell for up to \$35.00 pr. *Amazing Profits!*

SOME TROPICAL FISH LAY TO 600 EGGS AT A TIME. That's why tropical fish breeding is so profitable. Nature multiplies your \$\$.

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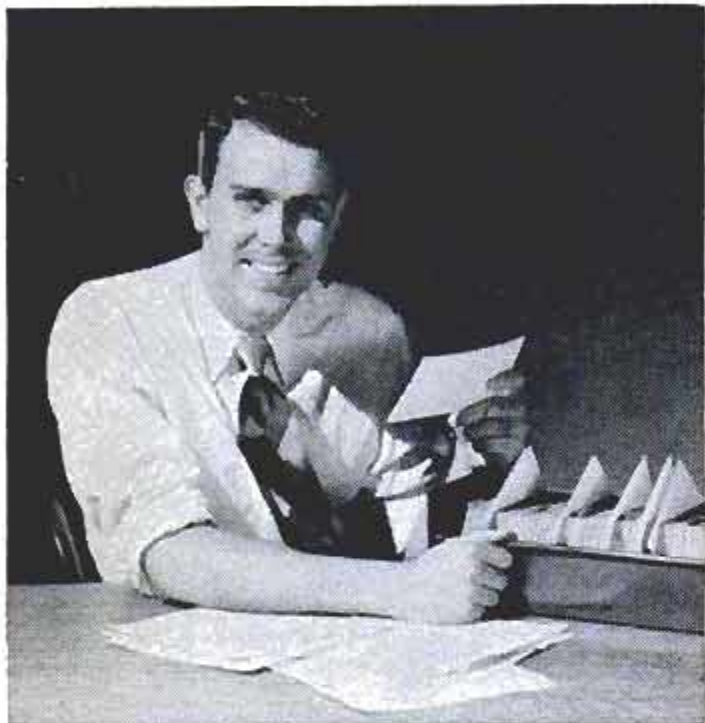
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Start a profitable manufacturing business in spare time

with your own home as your headquarters



RIGHT at this moment there is a tremendous demand for new business enterprises in a branch of the plastics industry. Fortunately, this is a type of manufacturing business that does not require heavy or expensive machinery, rented space for storage, production or sales. A portable hand machine does the work wherever electric current is available, and the working area can be in almost any part of your home.

The opportunity that is open to you today, is to meet this growing demand in a new industry by establishing yourself as the manufacturing agent in your own trading area. Several hundred of our machines are already in use in both large and small communities. Some are even being operated successfully by women whose family duties make it necessary for them to be at home during the day, but whose family income is not enough to meet rising expenses. Most are being operated by men. Many started in spare time just to pick up an extra five or ten dollars for an evening's work. They found the work so profitable that some have now given up former jobs to devote full time to a business of their own.

One of our manufacturers gets all of his business by mail. Orders and money come to him in envelopes and he sends his products out the same way. Another delivers his entire output to stores in the vicinity. An-

other does a wholesale business supplying other manufacturers who do the selling. Still another works with advertisers in the manufacture of plastic advertising novelties and specialties.

The operation of the machine is simple and easy for anyone to learn. It does not require any knowledge of chemistry, mechanics, or electricity. And what some say is best of all, a manufacturing business like this enables a person to make good money without any house to house canvassing. The machine turns out from \$5.00 to \$15.00 worth of work per hour and it can be operated for as short or long a time as you wish.

We have prepared a simple step by step instruction manual that not only tells how to operate the machine, but also tells how to get the business coming in at a profitable clip right from the start. We will lend a copy of this book to any serious minded man or woman with the

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If you are interested in a nice little home business that can bring in an extra \$60 or more for ten or twelve hours work in spare time, send your name. All information on the book and machine will be sent free, postage prepaid and no salesman will call to bother you. You read about it in the privacy of your own home without outside pressure and then decide whether you'd like to take the next step. Address your envelope to me in person. Send me the coupon below. Or, if you prefer send your name on a post card and ask for "Free information on starting a manufacturing business at home." Either way, send your name today and find out about this wonderful new fast growing money-making business.

RAYMOND E. BRANDELL

1512 Jarvis Ave., Dept. L-101, Chicago 26, Ill.

Raymond E. Brandell, 1512 Jarvis Ave., Dept. L-101, Chicago 26, Ill.

Dear Mr. Brandell: Please send information showing how I can start a profitable manufacturing business in my home in spare time. All the information you send will be mailed to me free of charge and no salesman is to call on me. I am not under any obligation to go ahead with the business and there is no charge for this information now or any other time.

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JULY Starting in January for your car, when you use our electric motor heater. No installation. Details free. Thomas, Lakeside 1, Arizona.

SIMONIZE, Polish, quickly, efficiently. No messy rags. Patent pending. 50c. Miracle Mitt, Box 276, New York City 18.

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LACHAPPELLE'S Patented treatment. Puts metal bearings on the cylinder walls for the pistons to slide on. Dan Ferns, Box 71827-B, Los Angeles 1, Calif. In Canada, Master, Box 216, Welland, Ont.

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MOTORIST, Save gasoline vacuumating overrich mixtures. For free particulars, how you install on your car for introducing write, Vacuumatic, Dept. 840, Wauwatosa, Wis. Salesmen wanted.

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BRAND New first quality tires. Tractor, truck, aircraft, passenger. Wholesale prices. Also all size army surplus used tires at tremendous savings. Duddy's, 152 No. Beacon Street, Boston, Mass.

GENUINE Motor treatment, Lachapelle's, (patented). Only \$3.00 delivered. Increases compression, power. Saves gas, oil, repairs. Money-back guarantee. You can't lose. Free circular. Write Joe Dillon, Authorized Warehouse and Agents Distributor, Box 32316, Bridgeport, Ohio. Exclusive agencies open.

JEOP Owners—V8 power. Read Jeep Owners ad, page 60.

SENSATIONAL Free trial offer! Gale Hall Mile-O-Meters (original models), advertised at \$9.75, our price only \$2.98! Compression testers, formerly \$8.50, only \$2.98! Limited supply—order today—money-back guarantee! (Add 40c postage each.) New England Surplus Sales, Dept. PM1-6, Newburyport, Mass.

FREE, illustrated, descriptive information "The Truth About Water Injection." Injector, Box 526, Burbank, California.

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ZODIAC Lucky coins—Sell on the spot to prospects everywhere! 100% profit. Complete information and sample \$1.00. Give your birthdate. Zodiac Co., 1053BD Lawrence, Chicago.

MAKE \$7 Per hour and up! Donald Wicks made \$48 in a few hours. You can too! Write for free book and amazing product sample. Theodore-Wilson Products Co., 3522 Government Way, Seattle 99, Wash.

\$3.65 PROFIT On \$3.95 sale. yet saves customer \$50. Noted specialist says "Only outstanding deal seen in 18 years." Maxson, Falls Church 17, Virginia.

IF You want to earn money fast, I'll send you free sample stocking of newest stretch DuPont nylons to sell at only \$1 a pair. American Mills, Dept. 479, Indianapolis 7, Ind.

RUN A spare-time greeting card and gift shop at home. Show friends samples of our new 1956 all-occasion greeting cards and gifts. Take their orders and earn up to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 59, Ferndale, Michigan.

GOLDMINE Of 600 money makers. Copy free. Specialty Salesman Magazine, Desk 5-B, 307 N. Michigan, Chicago 1.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience-capital needed. Supplies furnished. Write for free catalog. McGrouer Magazine Agency, Dept. 500-A, Mount Morris, Illinois.

BIG Money in valentines! Easy to earn with 4 different valentine packs. Best sellers for every occasion all year—Mother's, Father's Day, Easter, birthday, all-occasion assortments, gifts, stationery. Over 100% profit on bargain specials. Samples on approval. Midwest, 1113 Washington, Dept. 699-H, St. Louis 1, Mo.

MAKE \$60.00 Easily showing newest tall-occasion greeting cards. Religious, deluxe, 21 for \$1, notes, comic, photo cards—all tall 150 fastest sellers. Biggest profits. Samples on approval. \$1.25 prompt action gift. Cardinal, 1402 State, Cincinnati 14.

CALENDARS. Advertising novelties, matches. All styles, including religious, varnished, 12 sheet, girls. Hundreds of advertising novelties, book matches, etc. Fleming Calendar Co., Sales Division, 6539 Cottage Grove, Chicago 37, Ill.

BIBLES. Make up to \$100 a week. Selling outstanding Reference Bible. Latonia Pilgrim Hour, Box 31, Latonia, Ky.

MAKE Extra money with newest fast selling "Slim" and "Photochrome" greeting card assortments. \$1.00, \$1.25 all occasion, birthday, valentine, Easter boxes. Stationery, gift wrappings, gifts, gadgets. Experience unnecessary. Amazing profits. Bonus plan. Write today for samples on approval, free gift offer, catalog. Hedekamp, 361 Broadway, Dept. PM-39, New York City.

AGENTS-Salesmen: Sell beautiful hand-colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline. Better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

YOUR Own wholesale business with no investment. Free catalog. Jay Norris Co., 487-X Broadway, New York City.

FREE! Sunshine's petite everyday assortment—Special introductory offer to big profits available selling exclusive everyday cards, imprinted stationery, gift wraps, deluxe 21 card assortment, etc. Free catalog. Send postcard today for sample kit on approval. Sunshine Art Studios, Inc., Dept. PM-1, Springfield 1, Mass.; Pasadena 1, California. (East of Rockies address Springfield).

HOME Motorized massage. Big money! Mary Mac, 1012 Powhattan, Dallas 2, Tex.

\$1,000.00 A Month for making dramatic 3-second demonstration of amazing lightweight Presto fire extinguisher. New chemical used by airforce snuffs out fires instantly. Only \$3.98. Terrific commissions. Millions want it. Free kit. Merlite, 114 E. 32nd, Dept. 50-E, New York City 16.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, Hertel Station, Buffalo 16-A, N. Y.

FOG-Stop windshield cloth. Instantly removes blurry mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee 80, Akron, Ohio.

PROFITS To 150% selling finest everyday greeting cards. New 21 for \$1 tall cards, unusual gifts, 129 fast-sellers. Valuable gift bonuses. Assortments on approval, stationery samples free. \$1 gift free for promptness! Creative Cards, 4401 Cermak, Dept. 525-C, Chicago 23.

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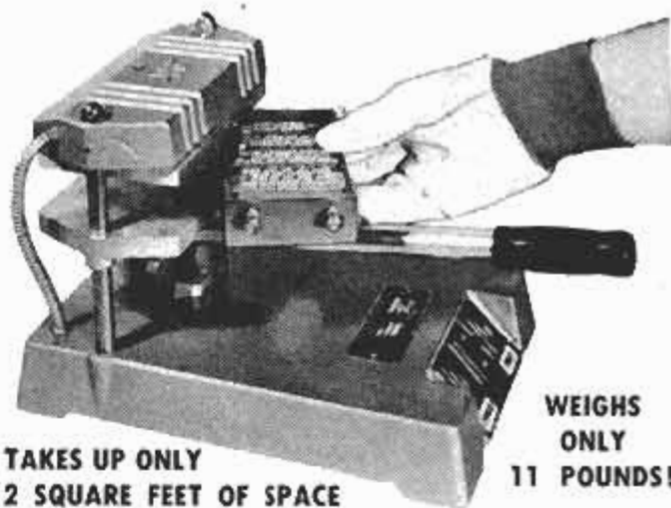
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1. This is entirely a contest of numbers, strictly a Game of Skill. Add together the numbers that make up the drawing of the Eagle and get the SUM TOTAL of the figures. The picture is made up of single digits: 2, 3, 4, 5, 7, 8 and 9. There are no sixes, no ones, no zeros. There are no double numbers like "23," etc. Just add 2 plus 3 plus 5, etc., and get the TOTAL. There are no tricks to this puzzle, just a problem in addition. It is not so easy but if you are careful you may get it exactly right. Only persons sending a \$5.00 contribution to our Scholarships Program are eligible for these Cash Prizes. No additional donation will be required at any time during the contest. Checks and Money Orders should be made payable to 'SCHOLARSHIPS, INC.' Send cash if you prefer. Write us for additional puzzle sheets if you need them.

2. If you send your contributions before the date printed on the entry blank you will qualify for the \$500 Promptness Bonus, making the total First Prize \$2000.00. The Promptness Bonus will be added to the first prize only.

3. You should check and recheck your solution carefully before mailing. Once it has been sent it may not be changed or withdrawn. A contestant may submit an additional entry in this contest with an improved score provided each such entry is accompanied by the required \$5.00 contribution. We will acknowledge receipt of your entry and contribution promptly. Read the rules carefully. Please do not write for additional infor-

mation concerning this contest since information that is not available to all other contestants cannot be given.

4. This contest is confined to persons within the continental limits of the United States. Persons directly connected with Scholarships, Inc. and members of their immediate families are ineligible. Due to the uncertainty of mail address entries are not recommended from persons in the Armed Forces. Entries will not be accepted from persons in Alaska, Canada, Hawaiian Islands and other locations outside of the United States proper.

5. Entries will be accepted from January 1 to April 10, 1956. Entries postmarked April 10 will be accepted.

6. In case of ties on this Eagle Puzzle the winners will be decided by a tiebreaker number puzzle consisting of drawing a path across a chart of numbers to arrive at a high total. The contestant's position in the winning list will be determined by the best scores submitted; the best answer will receive First Prize, the second best answer will receive Second Prize, etc. In case of ties on the tiebreaker puzzle, prizes will be reserved for the positions of tied contestants and their final order of finish determined by additional tiebreaker puzzles until a definite winner for each prize is chosen. Seven days will be allowed for working the first tiebreaker puzzle and three days for each subsequent tiebreaker. If ties remain after seven tiebreaker puzzles, duplicate prizes will be paid.

See rules and coupon on next page. —>

PRIZE CONTEST continued

7. It is permissible for any contestant to receive help from their relatives or friends but **ONLY ONE SOLUTION** may be submitted to the tie-breaker puzzle by any group working together, and any solution known to have been submitted in violation of this rule will be rejected.

8. A complete report of this contest including the names of all winners will be mailed to every contestant just as soon as the winners have been decided. The sponsors of this contest reserve the right to decide any questions that may arise during the contest and persons who enter agree to accept these decisions as final.

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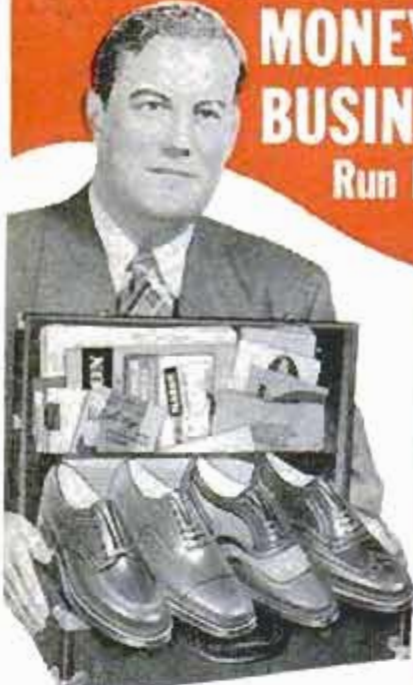
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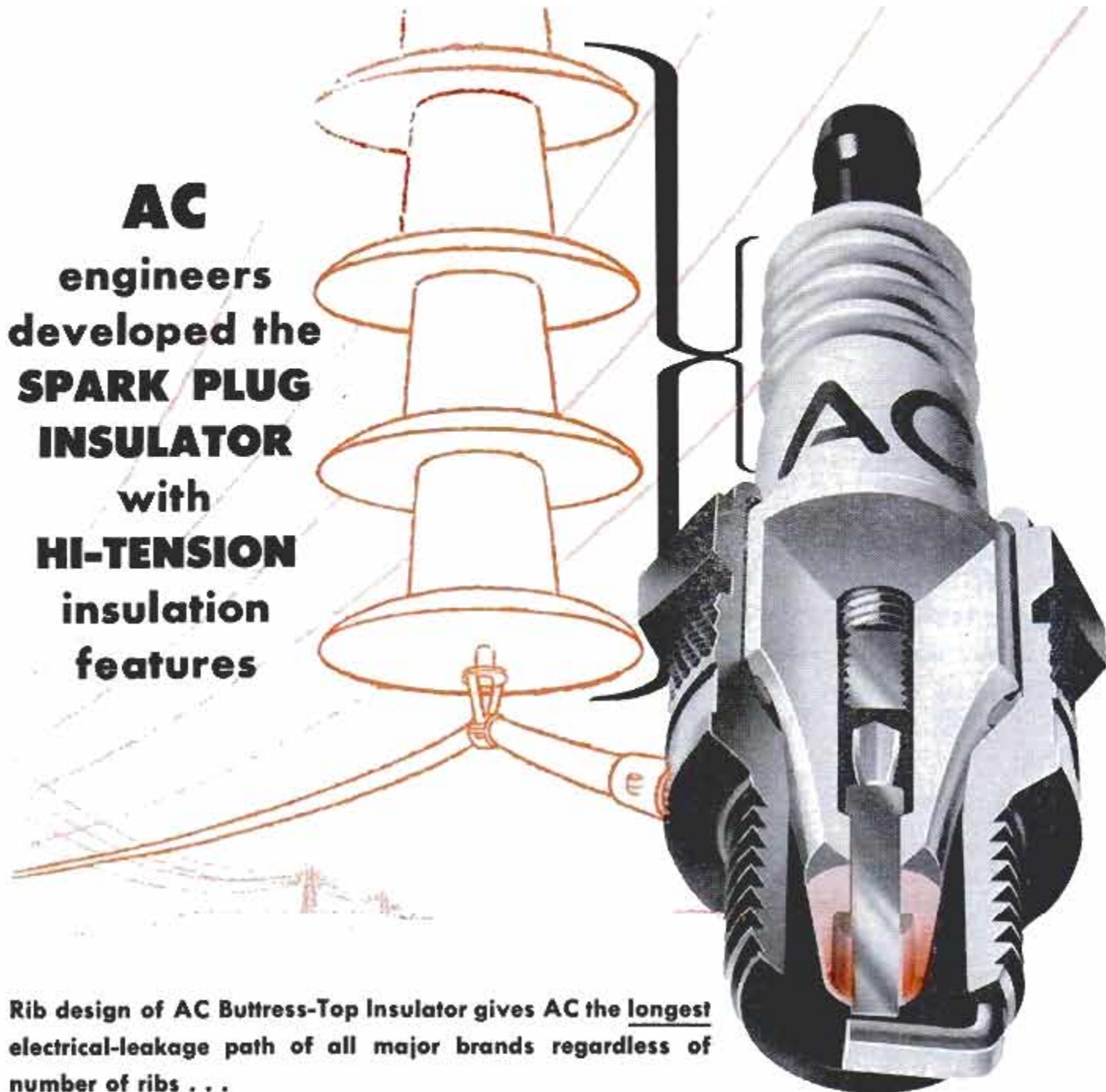
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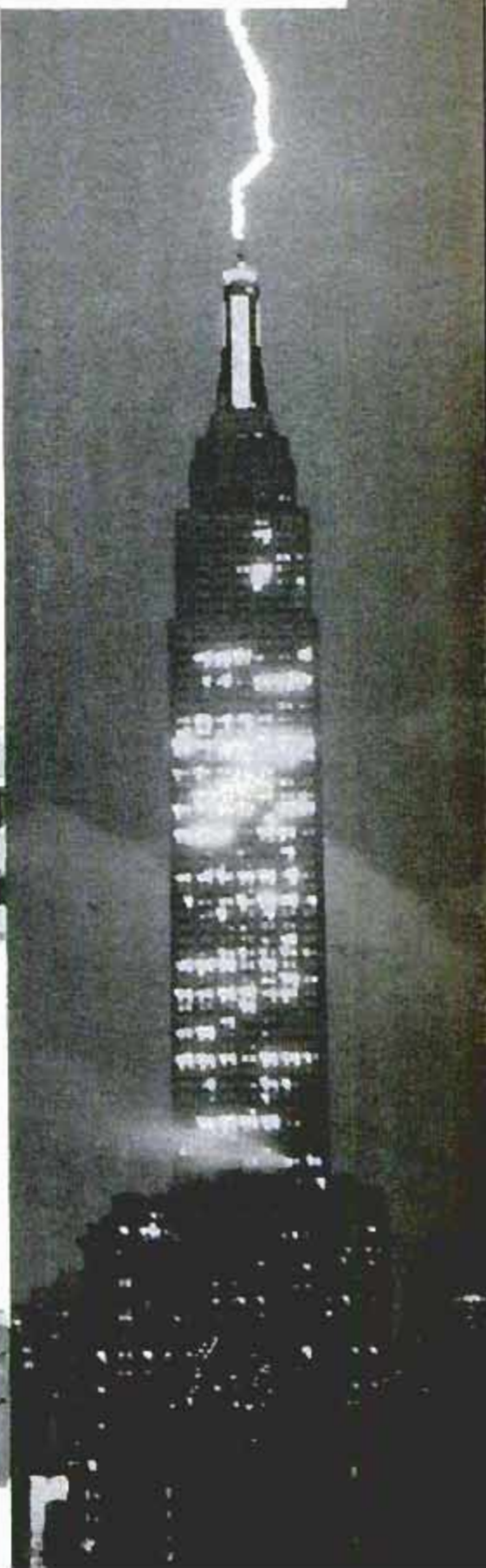
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By Paul Lee

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AFTER you have passed the Banks of Newfoundland in about the 44th degree of latitude, you will meet with nothing, till you draw near the Isle of Sables, which we commonly pass in latitude 43. Southward of this isle, the current is found to extend itself as far North as 41° 20' or 30', then it turns toward the E.S.E. or SE ¼ E.

Having passed the Isle of Sables, shape your course for the St. George's Banks, so as to pass them in about latitude 40°, because the current southward of those banks reaches as far North as 39°. The shoals of those banks lie in 41° 35'.

After having passed St. George's Banks, you must, to clear Nantucket, form your course so as to pass between the latitudes 38° 30' and 40° 45'.

The most southern part of the shoals of Nantucket lie in about 40° 45'. The northern part of the current directly to the south of Nantucket is felt in about latitude 38° 30'.

By observing these directions and keeping between the stream and the shoals, the passage from the Banks of Newfoundland to New-York, Delaware, or Virginia, may be considerably shortened; for so you will have the advantage of the eddy current, which moves contrary to the Gulph Stream. Whereas if to avoid the shoals you keep too far to the southward, and get into that stream, you will be retarded by it at the rate of 60 or 70 miles a day.

The Nantucket whale-men being extremely well acquainted with the Gulph Stream, its course, strength and extent, by their constant practice of whaling on the edges of it, from their island quite down to the Bahamas, this draft of that stream was obtained from one of them, Capt Folger, and caused to be engraved on the old chart in London, for the benefit of navigators, by

B. FRANKLIN.

Note, The Nantucket captains who are acquainted with this stream, make their voyages from England to Boston in as short a time generally as others take in going from Boston to England, viz. from 20 to 30 days.

A stranger may know when he is in the Gulph Stream, by the warmth of the water, which is much greater than that of the water on each side of it. If then he is bound to the westward, he should cross the stream to get out of it as soon as possible.

B.F.



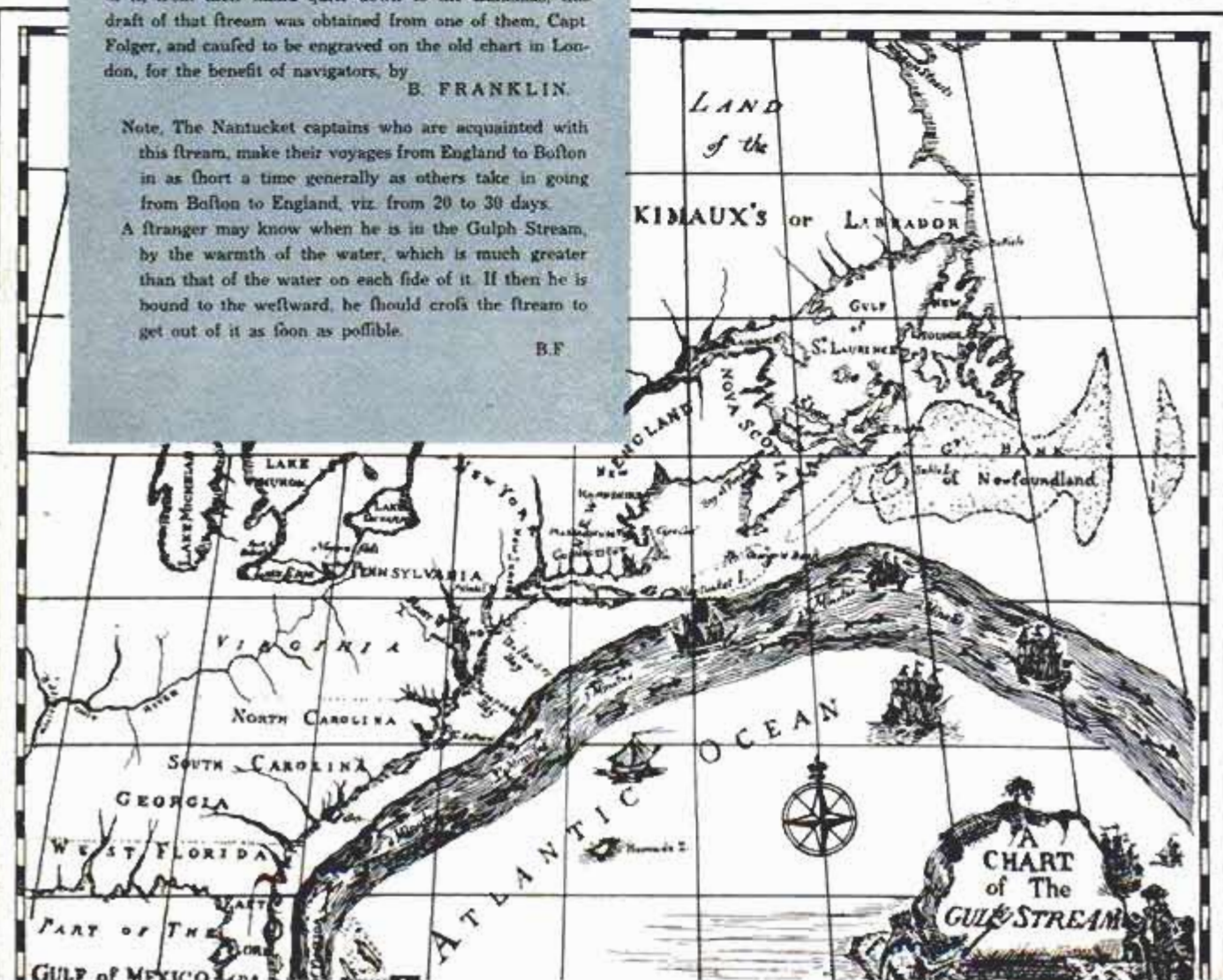
Courtesy Bausch & Lomb

Letter from Franklin describes invention of bifocals

January 17, 1956, is Benjamin Franklin's 250th birthday. Throughout the world great societies will meet to honor the man.

Many historians have pointed out that we owe even more to Franklin, the inventor and scientist, than we do to Franklin the statesman. Just one of his inventions—bifocal glasses—has had a profound and

Franklin's research to locate Gulf Stream resulted in chart and first scientific paper on this subject



personal effect on the lives of millions.

So it is our privilege, Mr. Franklin, Sir, on this, your 250th birthday, to look back across the years to your inventions and scientific studies. Much of your work is still alive after more than two centuries. A few of your developments have become profoundly important to the modern world.

Dangerous Kite Experiment

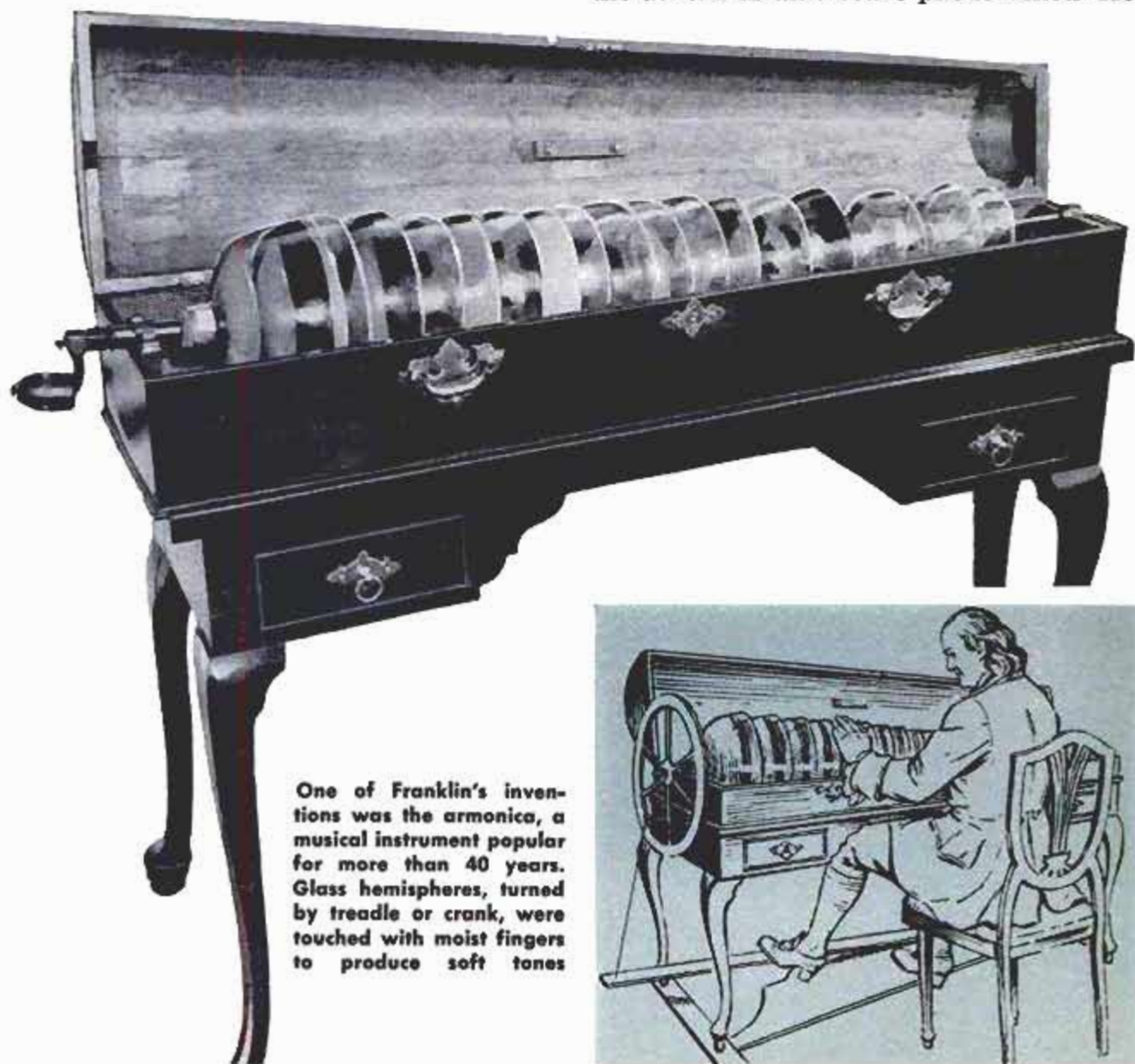
Every schoolboy knows of Franklin's dramatic proof that electricity and lightning are identical. It was a dangerous experiment; others throughout history have been killed attempting it. Franklin himself was aware of the danger. The precautions he took are not nearly as well known as the experiment itself. Though the legend has grown up that he used wire in flying the kite, he used twine. To the twine he fastened a key, and to the key he tied a piece of silk ribbon, knowing that silk would not conduct "electrical fire." He held the kite by the ribbon and stood inside a shed to keep himself dry while flying it.

In a letter describing how to perform the

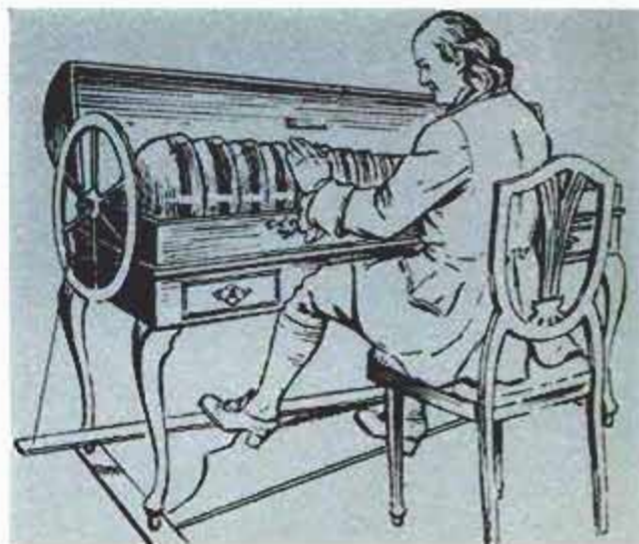
experiment he said, "As soon as any of the thunder clouds come over the kite, the pointed wire [on the kite] will draw electric fire from them, and the kite, with all the twine, will be electrified, and the loose filaments of the twine will stand out every way, and be attracted by an approaching finger. And when the rain has wet the kite and twine, so that it can conduct the electric fire freely, you will find it stream out plentifully from the key on the approach of your knuckle."

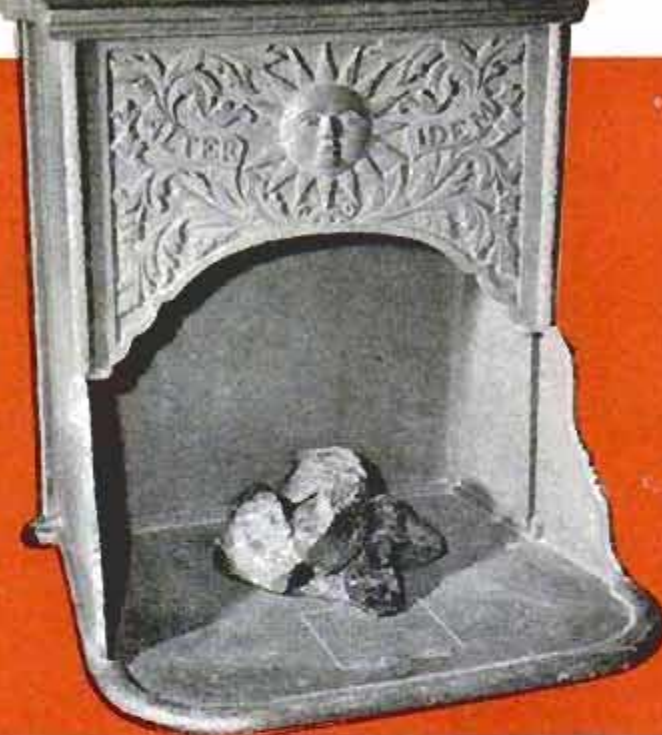
Through his lightning experiments he developed the lightning rod, an invention that, more than any of his other activities, made him famous throughout the world even while he was living. Today's big lightning arresters and insulators are direct descendants of his pointed iron rod.

Not nearly as well known are his other significant electrical experiments. He was the first to theorize that "electrical fluid" is a single form of energy existing in two states, which he called *positive* and *negative*. This theory provided one of the keys to unlock electrical research for generations. Franklin discovered electric repulsion and was the first scientist to identify the aurora as an electric phenomenon. He



One of Franklin's inventions was the armonica, a musical instrument popular for more than 40 years. Glass hemispheres, turned by treadle or crank, were touched with moist fingers to produce soft tones





SMOKE AND HOT GASES RISE, THEN ARE FORCED DOWN BACK OF FIREPLACE BEFORE THEY RISE THROUGH CHIMNEY. MEANWHILE THEY HEAT FRESH AIR IN AIR CHAMBER.

FRESH AIR MOVES UP THROUGH AIR CHAMBER IN CENTER OF FIREPLACE, IS WARMED AND THEN VENTED OUT THROUGH SIDE PLATES INTO THE ROOM.



Franklin stove trapped gases and smoke, used them to warm fresh air. Principle is used in modern fireplaces



He developed a mechanical arm to reach books on high library shelves. Grocers use similar arm today

Best known for his kite experiment, Franklin made more significant studies in his electrical laboratory

Drawing from The Bettman Archive



was also the first man to suggest the use of electricity in the treatment of paralysis, arthritis and certain diseases. His book, *Experiments and Observations on Electricity*, became a reference book throughout the world, and he introduced many expressions that have become everyday terms in the field of electricity: *Armature, charge, condenser, conductor, discharge, electrical shock, electrician* and *nonconductor*. His work was a significant stepping stone in electrical — and subsequently electronic — research.

Study of Gulf Stream

His curiously curious mind found something to question at every turn. For years the Nantucket whaling captains had known of the existence of the moving "river" of water in the Atlantic which we call the Gulf Stream. On his trips to and from Europe Franklin spent part of each day taking the temperature of the water, until finally he pinned down the Gulf Stream with sufficient precision to present a scientific report on its existence and course. Today his research lives in such modern symbols of exact knowledge as isobars and isotherms.

One of his weather observations became the cornerstone of the modern science of meteorology. He observed and reported that northeast storms originate in the southwest, that local winds reverse directions as a storm passes over a given area, and that the course of storms can be plotted.

Franklin was never too busy to satisfy his curiosity. One day in 1755 he was out riding with friends when he noticed a small whirlwind forming in the dust of the road. The others stood by and watched, one of

(Continued to page 268)



Designer-builder Ray Maker acts as engineer in his junior-sized monorail railroad in Santa Clara, Calif.

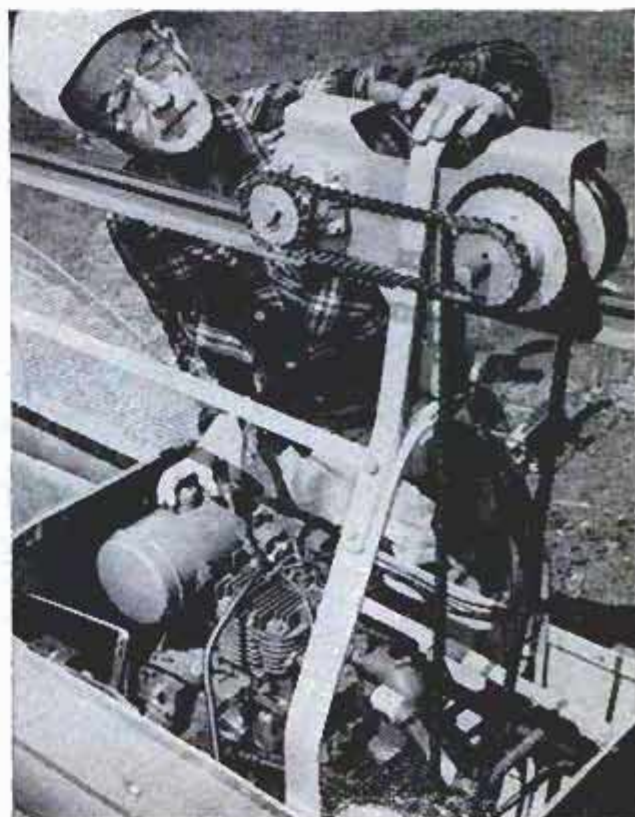
Midget Monorail

PATTERNED after the famous "Hanging Railroad" at Wuppertal, Germany, a midget monorail races around a 240-foot track in Santa Clara, Calif., where it is used as a gate attraction for an outdoor theater. Small theatergoers love to get there early

for a ride in the train, designed and built by Ray Maker. Transportation experts, wondering if a monorail could solve their problems, have traveled to Santa Clara. Maker's railroad is the only working example of a monorail outside of Germany.

To guard against accidents, the monorail passengers are protected by heavy wire mesh during the ride

Drive wheels are hard rubber coated for traction. Power is from air-cooled engine with chain drive



Air-Dropped Robot Broadcasts Weather

A ROBOT WEATHERMAN that drops from an airplane and then scrambles to its feet will help the Navy pitch camp at the South Pole.

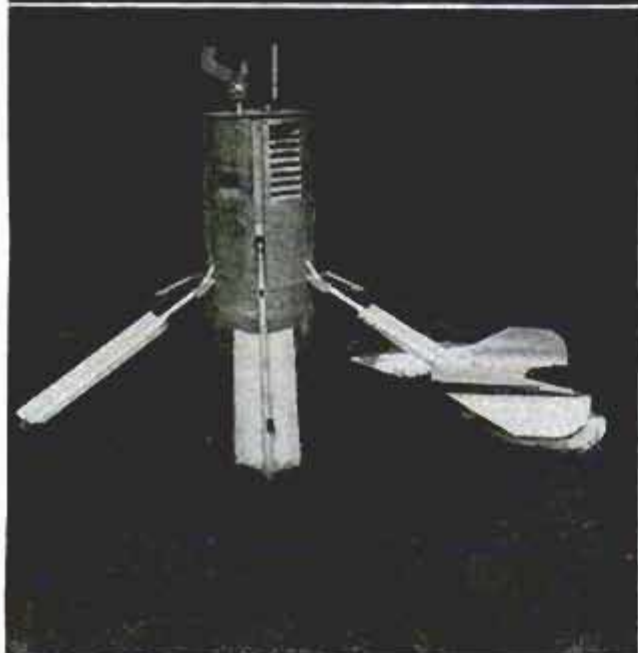
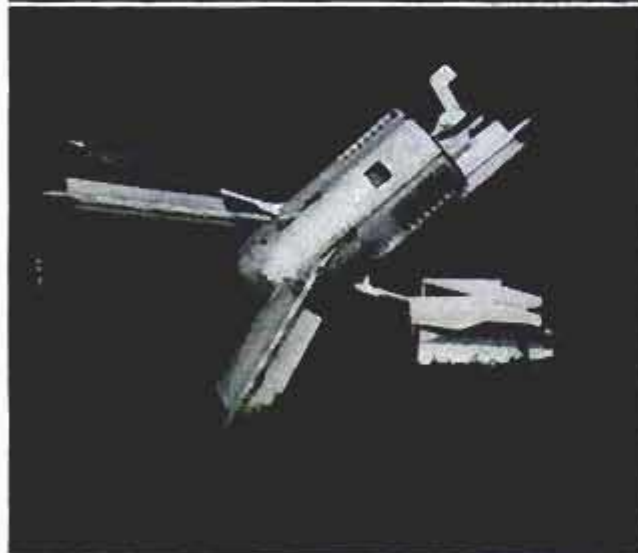
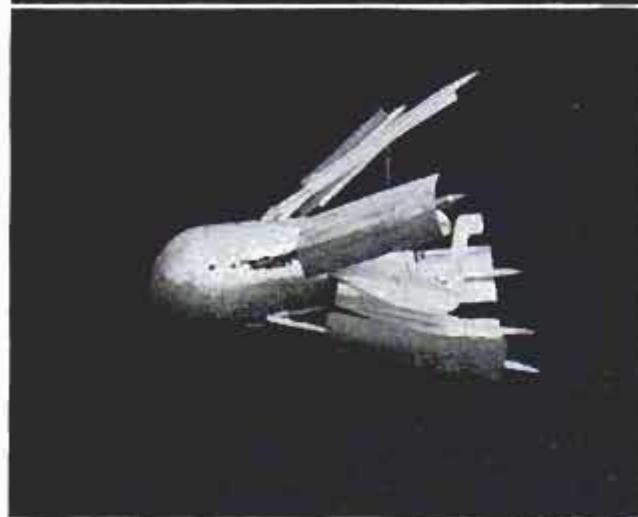
Once on its pins, the robot will stand still and broadcast wind and weather conditions every six hours in slow, easy-to-copy Morse. Its signal carries 800 miles. Its batteries are good for 60 days.

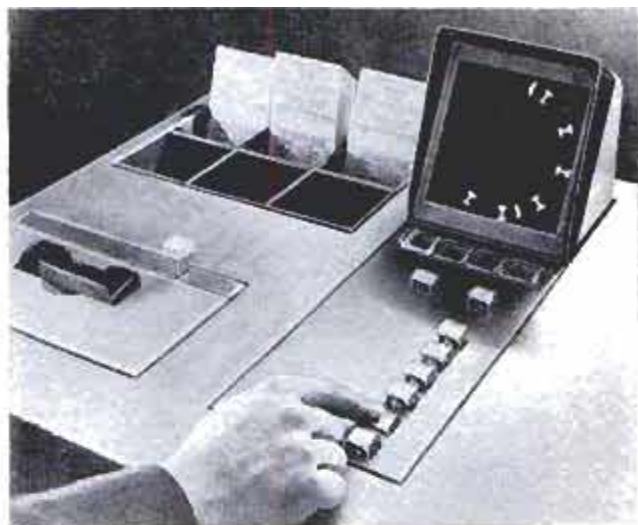
It is called the "Grasshopper" from the ungainly kicking of its six legs as it scrambles from the ground. And its compressed-air mechanism gives out a loud chirping sound as the process begins.

At the South Pole, where Navy planes will put down men and tons of supplies next winter, the Grasshopper will tell waiting transport planes hundreds of miles away when the weather is right for a polar flight.

A timing mechanism as simple as an electric toaster's unleashes air at 1500 pounds' pressure to work the legs, push out a wind vane and run up a 25-foot fish-pole antenna. Power is supplied by a 12-volt nickel-cadmium battery. The electrolyte is lye sufficiently concentrated to remain liquid at 40 degrees below zero Fahrenheit.

Air-dropped, the robot, top left, lies like a little dud bomb. But timer within is ticking. With cricket-like chirp, robot kicks out in all directions. Fins fly off. Legs flailing, robot gets two feet into position. Sturdily upright, it pops out wind gauge and starts to sprout 25-foot antenna. Weight of the unit is 150 pounds. Only two of them have been made

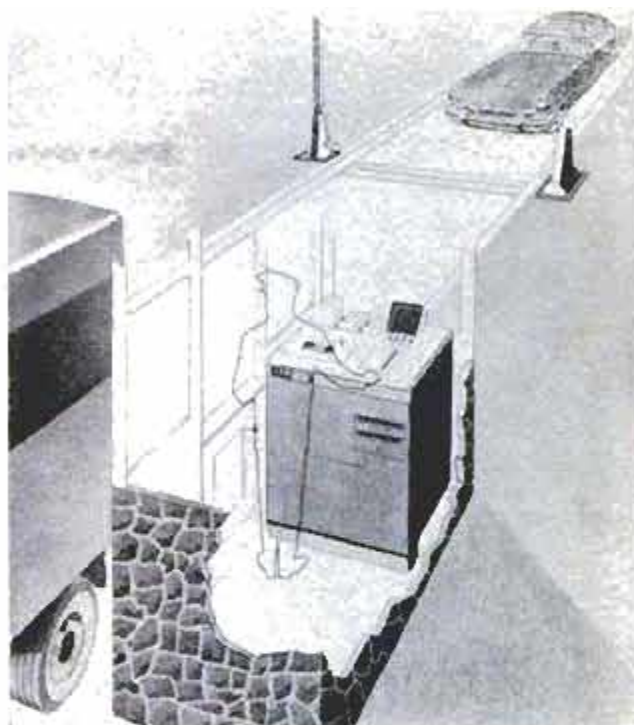




Toll Calculator on Turnpike Weighs Moving Vehicles

On the new Ohio Turnpike, toll charges are calculated automatically through a combination of photoelectric cells, built-in weighing treadles and electronic calculators. Toll rates vary according to the weight of the vehicle and the number of axles.

When a vehicle approaches the new toll booth, it crosses a weighing treadle built into the pavement, which weighs each axle separately. Meanwhile, photoelectric cells count the number of axles. The vehicle need not stop until it comes to the toll booth, where the attendant has already inserted a fare card into the recorder. He



presses a button corresponding to the number of axles, and the necessary information is recorded on the fare card. This card is presented at the other end of the turnpike. The equipment permits the processing of vehicles even when they are moving bumper to bumper.

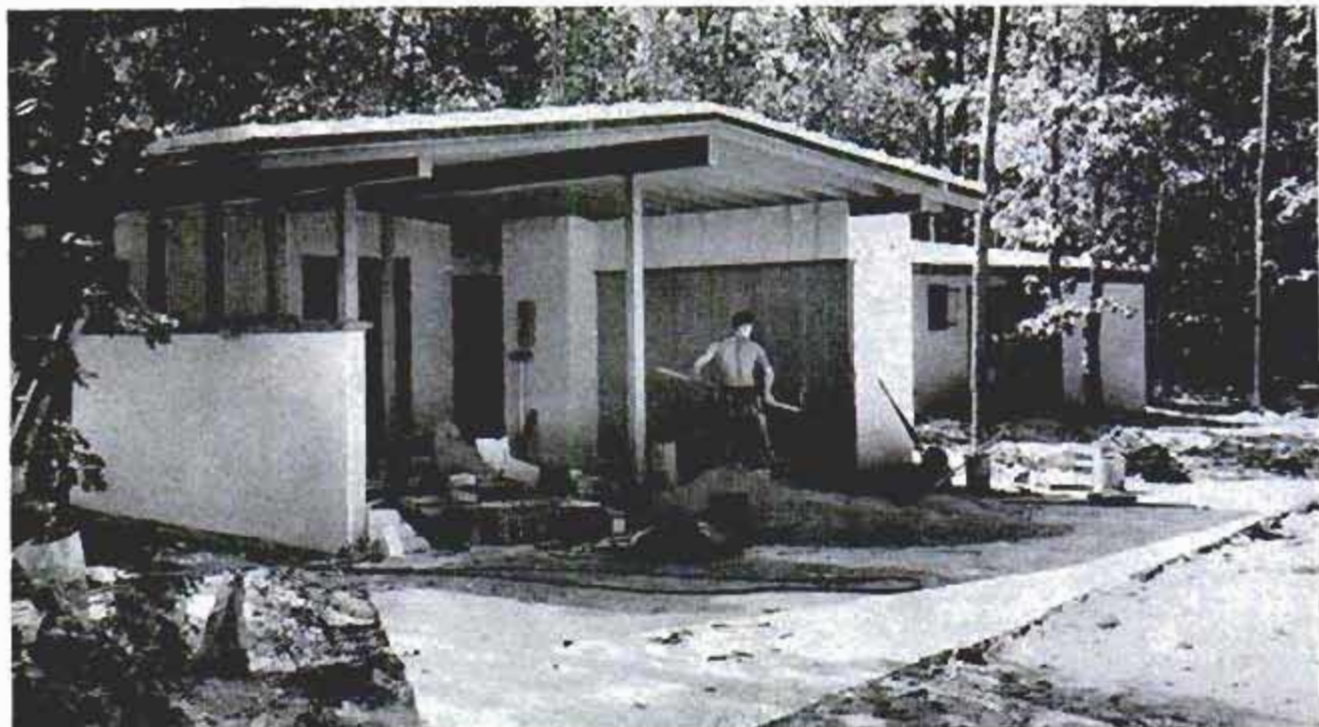
The new 241-mile expressway connects the western terminus of the Pennsylvania Turnpike with the Indiana state line. Toll for passenger cars on the route is \$3.00.

Paint Sample in Plastic Bag Lets You Try Before You Buy

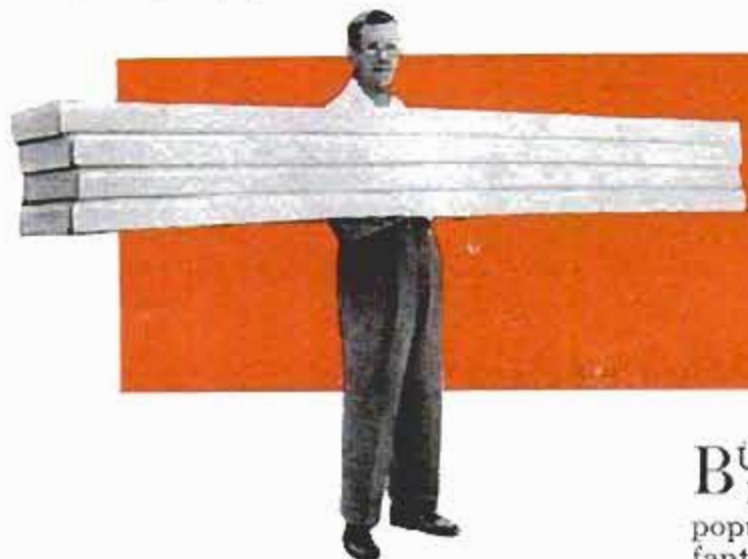
Now you can take home a sample of paint, brush it on a wall and see how it looks dry—before you buy. "Wet sampling," under test by Sears Roebuck, makes foolproof the process of color selection or matching. You are given half-ounce

samples of paint, packaged in polyethylene and cellophane bags, instead of a color card. You squeeze the contents of a package into a jar lid and apply a swatch to the walls or woodwork. When it is dry you can judge the results before you buy the paint.





Nearly completed, plastic-foam house will look conventional from outside with its stucco-cement coating



HOUSE OF FOAM

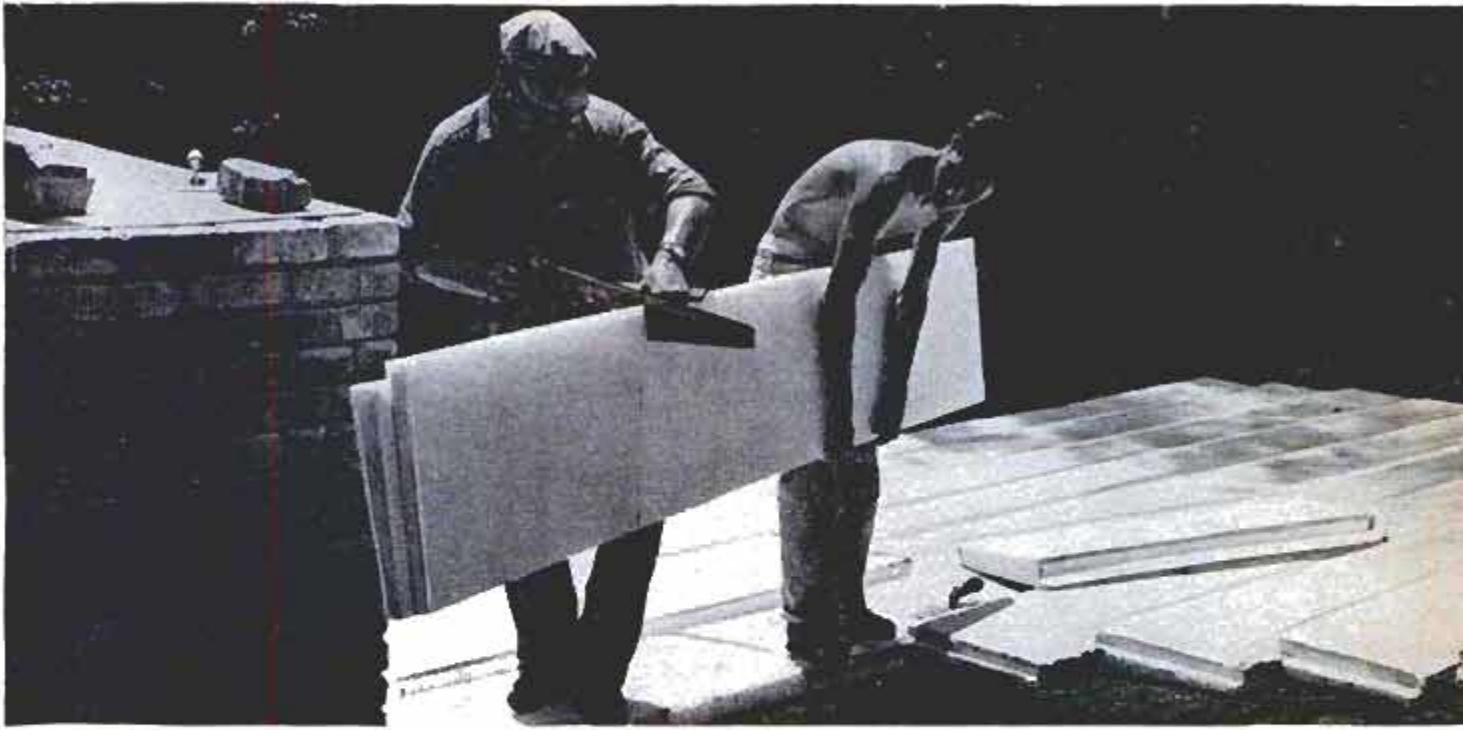
Builder Emerson holds 108 board feet that weigh only 20 pounds. Below, insides of the Styrofoam walls are covered with plaster one inch thick



BUILDING A HOUSE of Styrofoam—the lightweight, white, foamlike plastic so popular for Christmas decorations—sounds fantastic. But a man down in Houston, Tex., did just that after tests showed the plastic board could be treated to serve as load-bearing members of a house.

The builder, Dean Emerson, built his house walls of Styrofoam boards nine feet long, twelve inches wide and three inches thick. The boards were laid horizontally on the three-inch sides and pegged together with treated wood skewers. Wires were strung from ceiling to floor to compact the boards. Then they were coated with one inch of cement stucco on the outside and one inch of plaster on the inside, resulting in a five-inch-thick wall with built-in insulation. (Styrofoam's biggest use in the past has been as an insulator for the cooler-freezer field.)

The roof of Emerson's house is a conventional four-ply built-up job with Styrofoam shingles 9 feet long and 18 inches wide, overlapped and coated with $\frac{1}{4}$ inch of concrete. In one room of the house,



Huge Styrofoam shingles are easy to handle, are lightweight and can be sawed with ease or cut with knife

Styrofoam is also used as flooring covered with marble tiles. The plastic acts as an insulator to keep the marble at room temperature. Emerson reports his house is so well insulated that he can save about 50 percent in air conditioning and heating. As for strength, he says the house will withstand a 200-mile-per-hour wind.

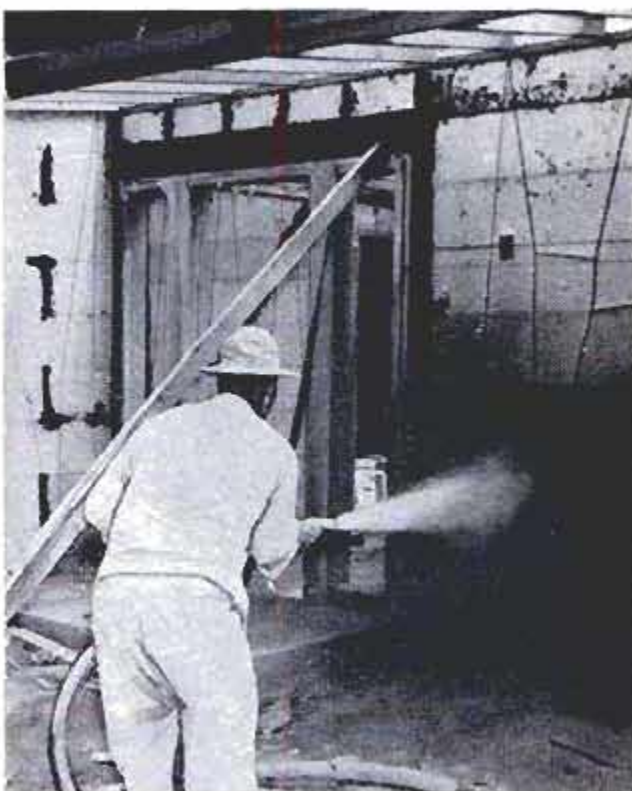
The ranch-type house, which has four bedrooms and three baths, cost \$30,000. Emerson figures it would have cost at least

\$5000 more using conventional materials. The cost of the wall was 85 cents per square foot compared with an insulated brick-veneer wall at \$1.25. The walls are resistant to water, bugs and mold.

The Dow Chemical Company, manufacturers of Styrofoam, were not sponsors of this project but they have watched it with a friendly eye looking into the future. If the lightweight plastic proves practical, a new building material has been found. ★ ★ ★

Cement is sprayed on walls at 70-pound pressure to form natural bond. Wires help hold boards together

Workmen fit top board of Styrofoam into place as the last step before side wall is wired and sprayed





Photographed at Cypress Gardens, Fla.



Water Sports Take to the Air



FROM WATER SKIING it is only a small step to the newest of water sports, hydrogliding. Equipment needed for hydrogliding is a new motorless helicopter with pontoons which is towed by a boat. Requiring only 10 horsepower to tow, the craft flies along at 20 knots and can be controlled while in the air. In addition to being used in a new sport, the little helicopter is expected to have commercial use for spotting schools of fish, and military use as a submarine spotter and radar-antenna carrier. It is being marketed in both ready-to-fly and kit form. Another version is equipped with wheels instead of pontoons.



Most important lesson learned at this Florida school for skin divers — don't panic!

THEY GRADUATE UNDER WATER

By Brett Barton

THE VICTIM of the drowning had purchased an underwater breathing device by mail. With the lung strapped to his body he had dived down to one of the beautiful coral reefs off the Florida coast. When eventually his body returned to the surface he was dead.

Reading the pitiful details in the newspapers, outraged citizens demanded that such "tricky" devices be outlawed from future use.

"These gadgets are far too dangerous for the average person," was the way one incensed observer put it. "This case is a good example. The man was healthy and strong. He'd taken the precaution of buying the best equipment available. His outfit even boasted an additional, self-inflating 'rescue pack' safety feature. He'd done everything he could."

"Not quite," countered husky Ed Townsend, a 260-pound Florida amateur skin diver and enthusiastic advocate of the exciting sport. "He obviously got panic-stricken down there and hadn't trained himself to handle such a situation."

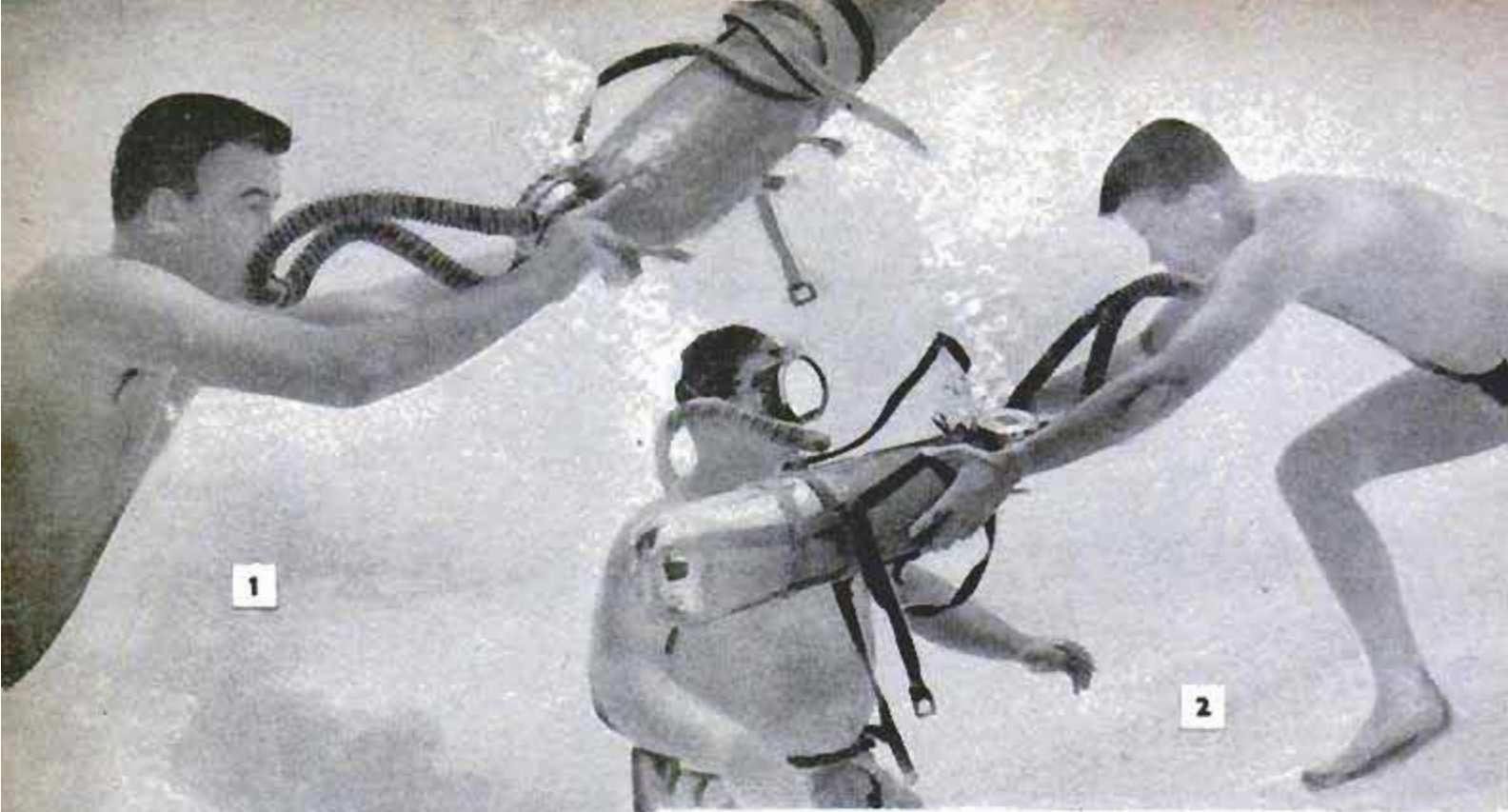
To prove his point the 40-year-old former Coast Guard skipper donned the dead man's complete outfit—even using the same mouth-piece—and, while others watched tensely, descended to the disaster reef. The equipment gave no trouble whatever.

Discussing the incident later with Henri Henri, a Hollywood, Fla., ocean-front-hotel



Townsend shows one of his prettier students how to don the diving lung properly. Below, he fills breathing apparatus with water, then demonstrates how to clear it within seconds





1

2

operator and fellow diving enthusiast, Townsend told his friend: "There is an urgent need today for a diving school in this country. Thousands of people are buying these lungs and trying to use them with no experience whatever."

The hotel man, a native of France who had witnessed in the Mediterranean a half century before the first recorded demonstration of such diving, immediately offered Townsend the use of his large swimming pool. Thus was launched three years ago Aqua Divers, Inc., what is believed to be the first such school in this country, perhaps in the world.

Since that time over 3800 enthusiastic persons

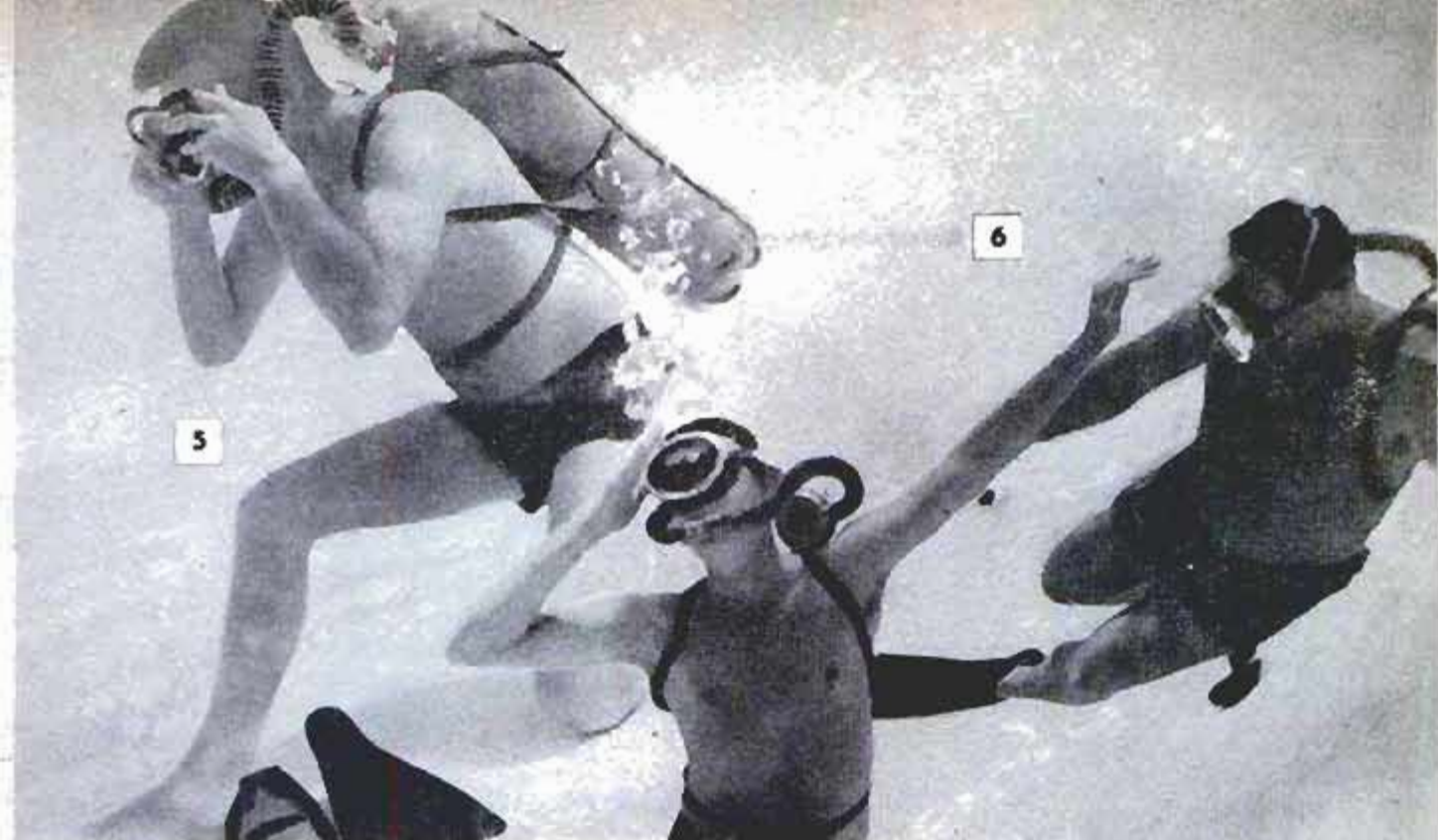
Learning to fight underwater panic: 1. Student tilts tank, blows water from clogged breathing tube; 2. Instructor watches as he opens valve from air tank; 3. Breathing again, he swings tank to his back; 4. He fastens air tank with the body strap



3



4



have been graduated; the oldest, Townsend's 67-year-old mother; the youngest, a six-year-old girl.

"And those graduates are 90 percent more advanced than many other divers who have been going down for years," says Townsend proudly. "For example, you'll find very few self-taught divers, indeed, who can deliberately remove their compressed-air outfits in the depths, letting them fill with water, then put them back on again without surfacing—and without drowning in the process."

The course, which costs \$25, consists of a complete two-hour pool "check out," after which you are ready to go ocean-reef diving. Sometimes, too,

5. Student next puts on his water-filled face mask; 6. As he starts rolling his body he snorts through nose to blow water out lower edge of mask; 7. Last step is to put on the swim fins; 8. Away he goes, breathing normally once again





Instructor loops free end of belt back through the buckle. Quick jerk then permits diver to shed equipment in an emergency. Below, Townsend shows student how to roll body to his left while submerged to clear clogged breathing system



Townsend will take his students, a dozen at a time, on week-end sailboat cruises to the nearby Bahamas (56 miles away) for supplementary diving instruction over the colorful reefs and wrecks awaiting there.

First step of the course acquaints the student with the lung and what it does for him in the water. There are at least a half dozen reputable manufacturers of such equipment, says Townsend. However, he warns against the use of lungs that have been manufactured primarily for emergency use in escaping from flooded coal mines and similar disasters.

"Some of those converted mine-safety devices will kill you!" he says bitterly. "They'll corrode and freeze up when used in salt water. To play safe, buy only recognized gear that is nationally advertised."

Fins Increase Speed

Next, you are shown how to put on rubber swim fins and glass face mask. The fins increase your underwater speed from about $\frac{1}{2}$ to $2\frac{1}{2}$ or $3\frac{1}{2}$ miles per hour.

The face mask improves your vision considerably while submerged (75 feet under favorable conditions). Townsend reminds you not to breathe through the nose, as this will cause the face mask to fog. Should you forget and do so, he demonstrates how saliva, rubbed briskly over the glass to break the oil surface there, will permit you to see clearly once more.

After you have become accustomed to the strange feeling of wearing a mask and fins, and after you've grown used to breathing via the mouth only, you are ready for the "controlled breathing" stage. That is, as you practice surface diving you are directed to remain submerged for intervals of 15 to 20 seconds until you no longer feel uncomfortable under water.

The portly Townsend now shows you how to put on the diving apparatus. The single tank, which holds clean, compressed air, is harnessed securely upon your back with chest and stomach straps. Both these straps, like the strap of the weighted belt which next goes about your waist, have their ends looped back through the

(Continued to page 282)

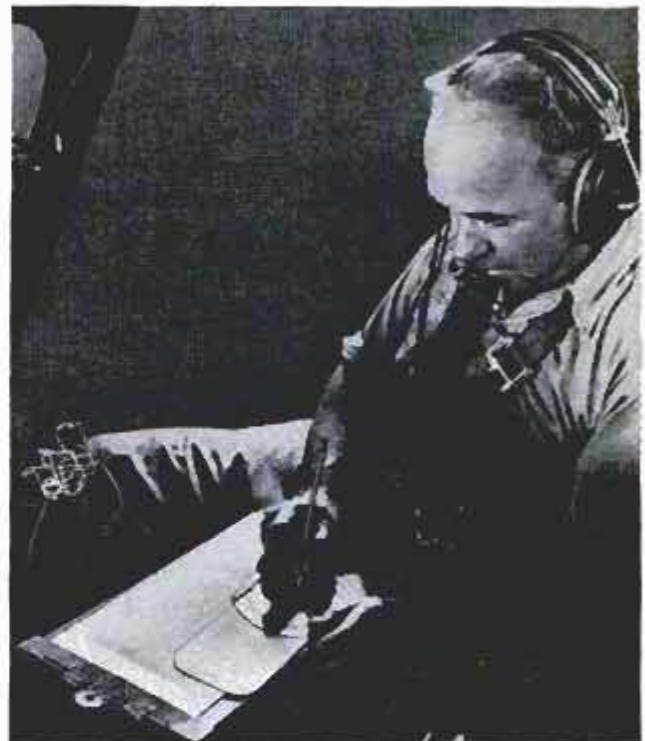


Autopilot relieves helicopter pilot for navigation and other duties. Light pattern in photo below at right shows stick movement in 15 seconds of flight



Autopilot for Helicopters

Using tiny transistors and miniature-circuit techniques, engineers have produced the first automatic pilot for use on helicopters. Four years of intensive development and flight testing were required to perfect the device, which will be available for installation during 1956. Set on manual, the autopilot will save the pilot hundreds of motions on every flight. Set on automatic, it will fly the plane as the pilot sets the controls. Variations on the basic control system will be available for large and small craft, and for civilian as well as military types of operation. As a safety feature, the system continues to operate in the event of engine failure, using only a small amount of power from the aircraft's storage battery.



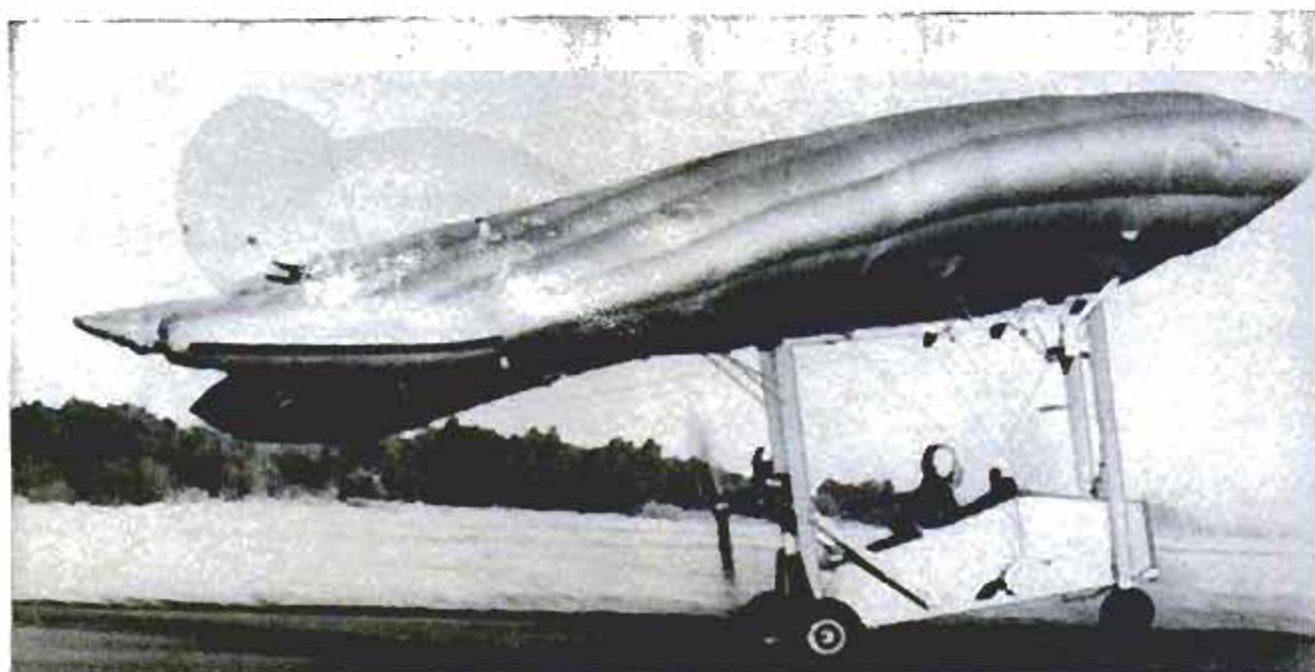
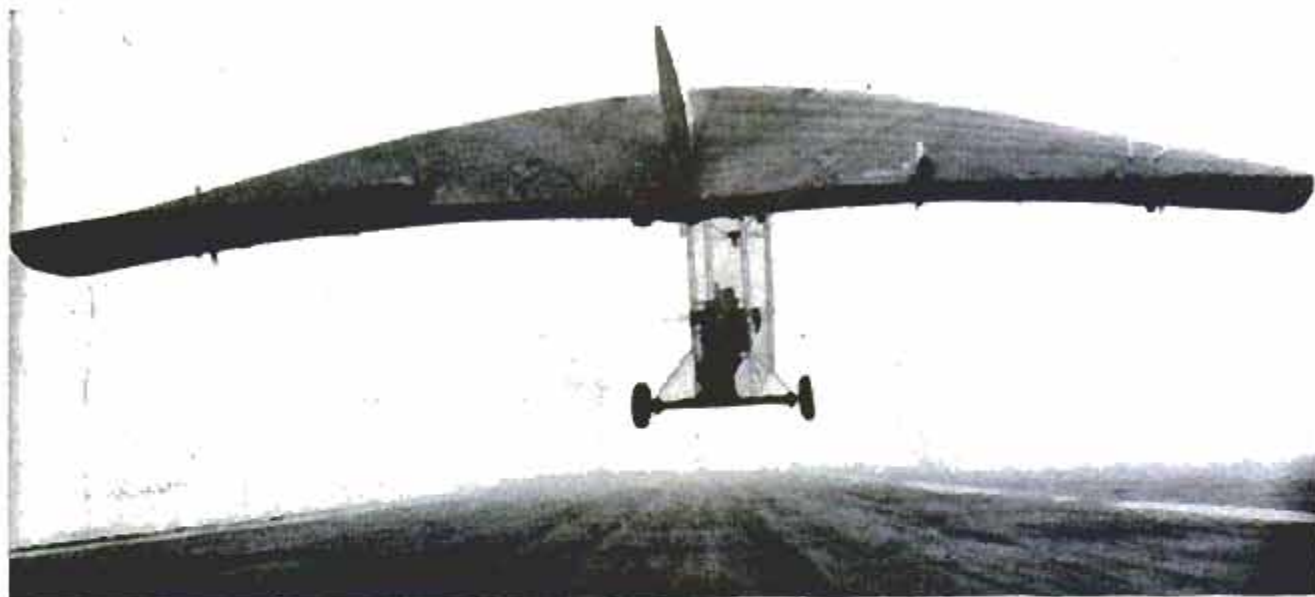
Apron for Filling-Station Hose Prevents Untidy Gasoline Drips



Latest touch of refinement at filling stations is a bib for the gasoline hose. It prevents waste gasoline from dripping down the side of the rear fender. Three permanent magnets sewn into the top edge of the cloth hold it against the side of the car so that there is no need for any form of attachment. When not in use, the bib can be snapped to the side of the gasoline pump.

Flame Burns Without Air

Flame without air has been produced at Cambridge University. Orange-red and shaped like a flat disk, it occurred when methyl-nitrate vapor was burned in a large glass tube. The new flame was where no air could reach it, well below the main flame burning at the mouth of the tube. When the main flame was blown out, the new flame continued to burn as before.



British Plane Has Inflated Wing

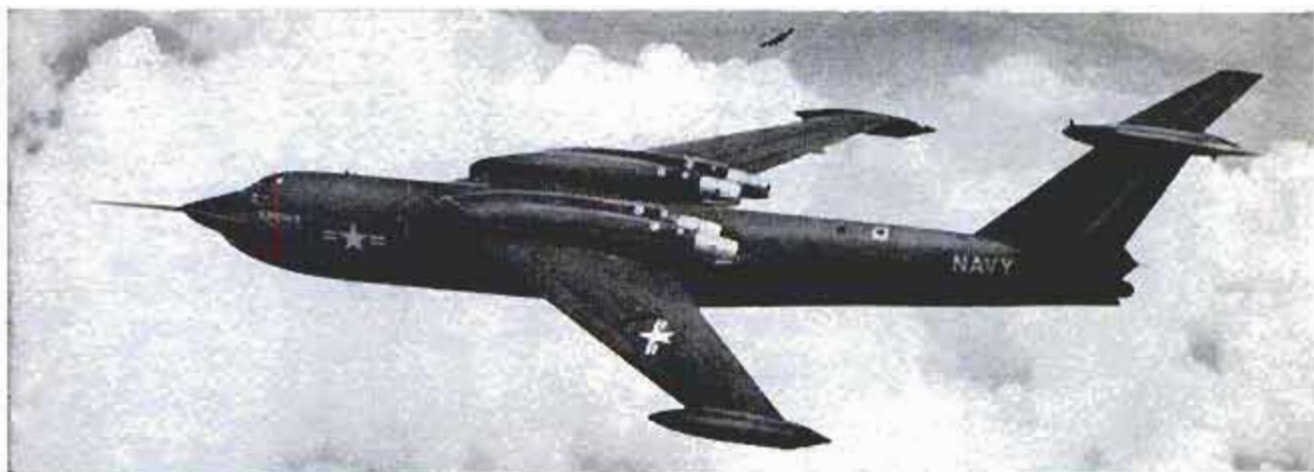
Looking like a flying machine held over from the early days of aviation, a new British utility plane features a collapsible wing which is inflated with a tire pump just before flight. The British Ministry of

Supply has placed an order for a number of these planes, described as easy and inexpensive to produce. A 65-horsepower engine gives the plane, a two-seater with a 40-foot wingspread, a range of 100 miles.



Cost-Cutting Trailer

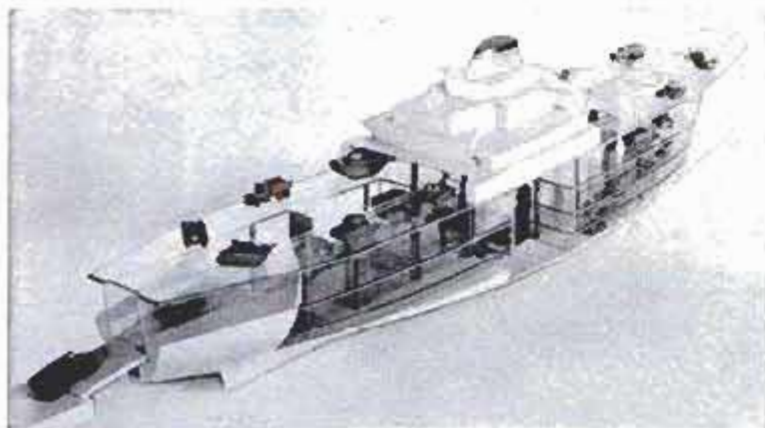
By eliminating expensive materials and streamlining, James B. Moore of Alliance, Ohio, built a comfortable trailer for \$250. The trailer is 6 feet high, 6½ feet wide and 10 feet long. The chassis is five-inch channel iron, mounted on the springs and wheel assembly from a 1938 Plymouth. Two by fours are bolted across the chassis to support the plywood floor. The framing is covered with plywood and fiberboard.



Navy Jet Seaplane's Speed Equal to Land-Based Bomber

Martin's SeaMaster, the XP6M-1, the world's first multijet seaplane is now being flight tested, and shows promise as a 600-mile-per-hour mine-laying and photo-reconnaissance plane. The SeaMaster is a radical departure in seaplane design, fea-

turing swept-down wings with plastic floats built into the tips. Power is supplied by four Allison J-71 turbojet engines with take-off afterburners. The plane is the first to fit into the Navy's new concept of mobile seaplane striking forces.



Glass model of new cargo ship shows how cars and military vehicles will be able to drive aboard, go between decks on ramps



Roll-On, Roll-Off Ship Speeds Cargo Handling

Now being built for launching late in 1956 is a new type of cargo ship designed to cut loading and unloading time from 2½ days to only four to six hours. Trucks drive right into the ship through one of five ramps, one in the stern and two in each side, to unload their cargoes. In some cases trucks and trailers will be parked on the ship for unloading at the port of destination. Designated as a T-AK 269 vehicle cargo ship, it will displace 14,084 tons, be 499 feet long, 78 feet wide, and make a speed of 18 knots. It is being built for the Navy's Military Sea Transportation Service. Seven similar vessels are planned by the Pan Atlantic Steamship Corp.



All Ramblers for '56 have four doors, like this four-door hardtop

Rambler Has Everything New—Even a Hardtop Wagon

NO BABY ANYMORE, the Rambler has grown up and taken its place as a full-size car. It is not only bigger, but it's all new in body and engine.

A first in the industry is the new four-door-hardtop station wagon that Rambler has announced. This body has the room of the regular four-door station wagon plus the styling and visibility of the four-door hardtop sedan with its pillarless construction.

If you want proof of the fact that the 1956 Rambler is a grown-up automobile, look at this comparison with the original model that came out in 1950:

The first Rambler, a two-door convertible sedan that is no longer produced, had a 100-inch wheelbase, an over-all length of 176 inches, a weight of 2500 pounds. In contrast, the 1956 Rambler has a 108-inch wheelbase, an over-all length of 191 inches, a weight of 2830 pounds.

It is still the smallest car produced in the United States. However, it has leg-room, headroom and hiproom that come within an eyelash of matching figures of the top-selling cars in the low-price field.

Headroom on the 1956 Rambler is 36 inches, a half inch greater than the average of the other three low-price cars. Yet over-all height of the Rambler is 58 inch-



Above is the newest idea in body styling for 1956: a station wagon with four-door hardtop styling. It has no center posts between the doors. Below, the regular four-door wagon, known as the Cross Country



es, almost three inches under the average. Leg-room is 43 inches, one inch less than the average. Hiproom is 59.8 inches, also one inch less than the average.

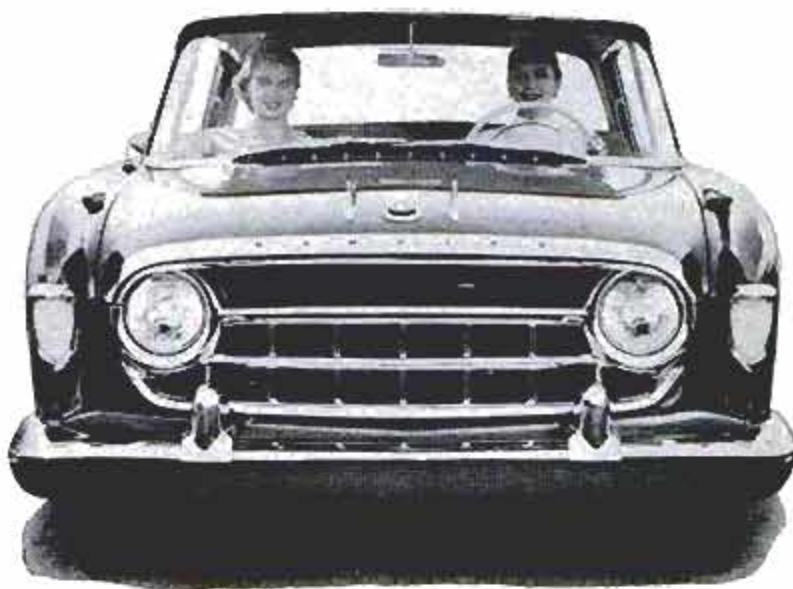
Rambler's styling has a fresh look. It is distinctively different, as they say. Most noticeable feature is the "rollbar" design of the back roof support which provides an opportunity for two-toning.

Headlights are mounted inboard in the grille, but set fairly wide nevertheless. Viewed from the front, fenders are slender and have parking lights in their leading edges. The grille consists of widely spaced vertical and horizontal bars. All wheels are uncovered for the first time in Rambler history. The original Rambler was fully skirted. Its front skirts drastically curtailed maneuverability. This year, there is no such handicap and the car is very nimble.

The six-cylinder engine is of overhead-valve design for the first time and develops 120 horsepower, up 30 from last year, providing lively performance. Displacement is still the thrifty 195.6 cubic inches that means many miles per gallon. Power brakes are standard on Custom models, optional on others. Power steering is optional on all models. ★ ★ ★

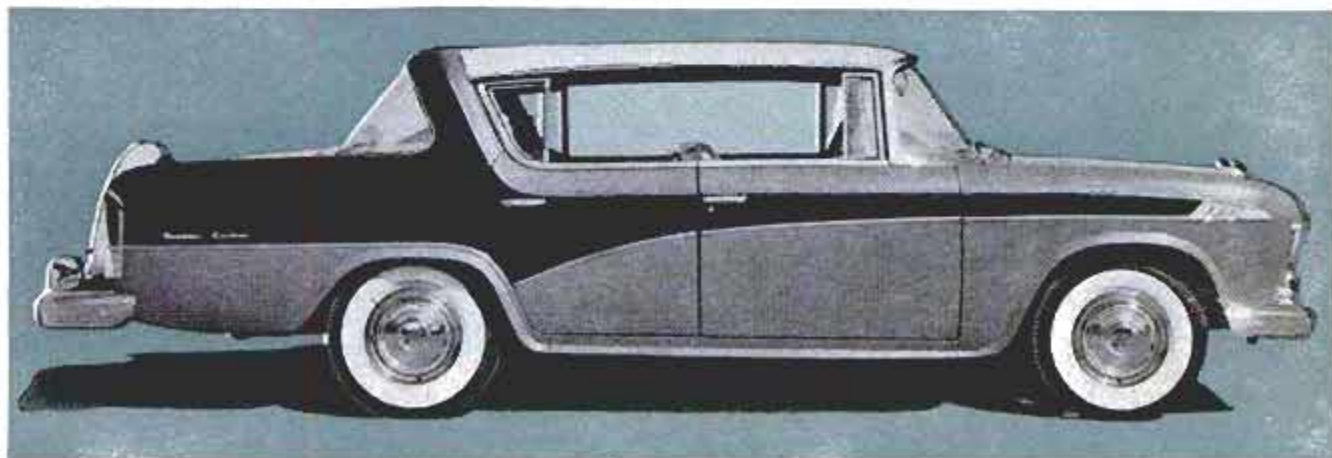


Featured on the Rambler station wagons is a crank-down rear window. It provides excellent ventilation and eliminates the transom-type top half of the door. The crank handle is outside and has a lock in it. You get an idea of the lowness of the new body here. Over-all, it is 58 inches high



From the front, the Rambler has a light, thin-roofed look. The roof panel is shallow and flat. There is 30-percent additional glass area

Style features include inboard headlights, above, and the "rollbar" design of the back roof support, below



Traffic Tunnels Under Greenland's Icecap To Supply Our Arctic Outposts

By Elliott H. McCleary

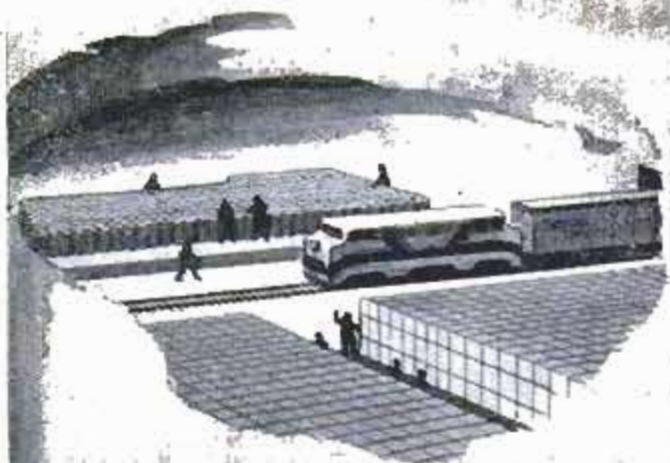
A RMY ENGINEERS are making transportation history with tunnels gouged through the crust of the Greenland icecap—tunnels that could in event of military necessity be snowy subways linking the outposts of our Arctic frontier.

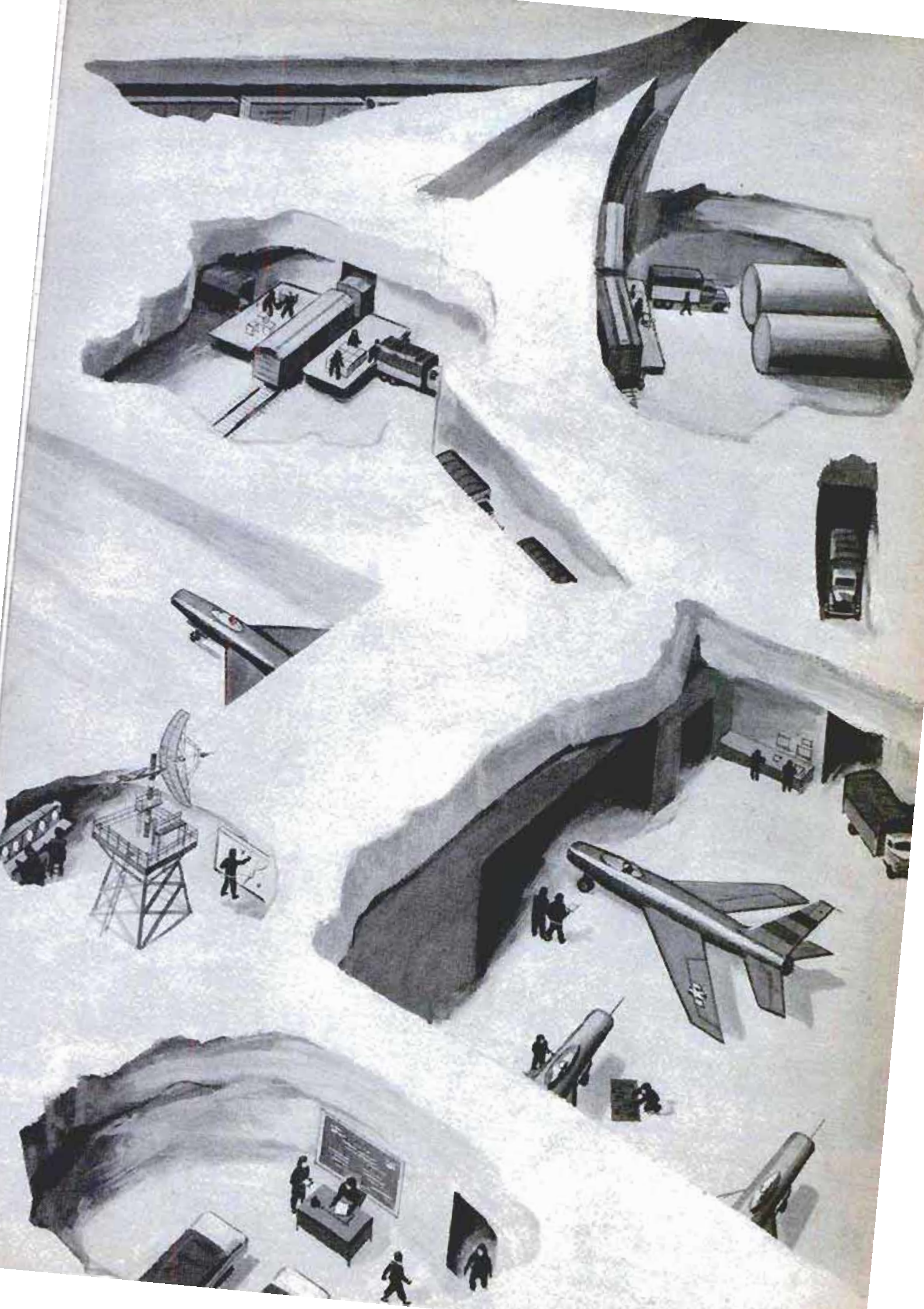
Their tool is a crawling snow eater with a massive bite. Its speed alone would never win a race, even in such forsaken country.

But as it slowly churns through the snowy frosting of the mile-thick ice sheet, its cylindrical digger whirling, its twin chutes spewing snow 20 feet into the air, it leaves a trench eight feet wide and three to five feet deep.

Three more passes with the snow eater, and the trench is 12 feet deep. Men place curved plywood forms on top of it and the forms are covered with snow.

Artist's conception shows the type of under-snow defenses which might be built far inland on top of icecap. Below, snow diggers gouge out a trench that is covered with removable forms and overlaid with layer of snow. Above and right, supply trains shunted from main railroad tunnel unload materials in under-snow storage rooms. Planes roll out of under-snow hangars to packed-snow landing field. Radar station, living quarters are also subsurface







Snow digger is type used to clear mountain passes. Painted swirls on hubs warn when rotor is in motion



Digger cuts a trench eight feet wide and three to five feet deep at each pass, blows snow out the top



Experimental tunnel dug in ice at edge of icecap is four feet wide. It was dug by hand with picks

The snow freezes to a granitelike consistency. The forms are removed, and you have a tunnel through the icecap.

What can you do with such a tunnel? The Army Engineers, who flew the massive snowplow from its native Switzerland last summer to dig experimental tunnels in the icecap 200 miles east of Thule, are cautious in their predictions.

But this is what you *could* do: Run a diesel railroad train, trucks, Jeeps and other rolling equipment through the tunnel; carry troops, jet fuel and supplies to bases of Air Force planes guarding the approaches to the North American continent.

"There are many things possible with such a tunnel when you know some of the advantages," says Robert Philippe, one of the chief engineers on the project. "It can provide a system of transport away from the chill and wind. Cold is never bad by itself. A man can stand 80 below zero in still, calm weather for quite a while. But let a 40-mile-per-hour wind blow at 20 above, and he's dead in no time. The tunnel, by the way, maintains a constant temperature of five degrees below zero winter and summer."

Gen. S. D. Sturgis, head of the Army Engineer Corps, states that the tunnel "would provide a permanent road, away from wind and cold and is cheap to build. We think it would cost about \$2000 a mile, much less than a conventional gravel road."

Wouldn't a tunnel of any length take years to build? On the contrary, say members of the Greenland expedition who refuse to be quoted. Four such machines, one behind the other, could excavate a trench at least 12 feet deep and 3 miles long every 24-hour period. With enough equipment, a tunnel stretching the width of Greenland, 600 miles, could be built in a summer.

Men following behind the diggers would place the curved plywood forms over the top of the tunnel, and another snow digger would follow alongside the trench, throwing snow on top of the forms. In a few days the tunnel roof would be hard, and crews could remove the forms and use them in tunnel work ahead.

Later, railroad tracks for a diesel train could be laid in the tunnel. Air drops and "snow trains"—long lines of sleds drawn by crawler tractors—are at present the only means of supplying points on the icecap. Sled trains are slow. The tracks left in the snow cause huge drifts on the wind-swept wastes of the icecap, a lasting mark which can be seen by searching aircraft.



Removable arched plywood forms are set in place over trench, two feet down. Snow will be blown on top



Mechanical snow blower follows alongside the trench after forms have been laid, covering them with snow

Right now, a two-man team, bundled in parkas and thick arctic clothing to shield them from temperatures which dip to minus 80 degrees Fahrenheit, is atop the ice sheet, investigating the tunnels which were dug last summer. Their report will guide the Engineers in their work and hopes for the future.

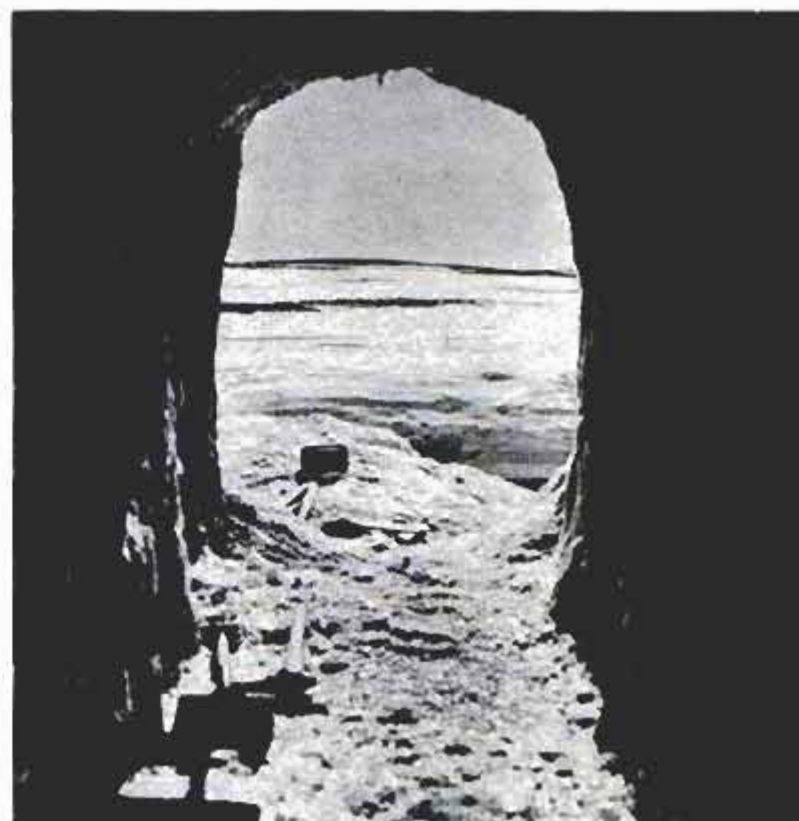
"If our expectations prove out," says Dr. Henri Bader, father of the snow-tunnel idea and chief scientist on the expedition, "the tunnels will last for years. The roof will never cave in. As more snow falls on the surface of the icecap, the tunnel top is covered with an ever-thicker load of snow. Thus, each year, the tunnel is farther below the surface. At the same time, the snow on each side of the tunnel becomes compacted. The walls of the tunnel are pushed in four inches each year, on each side, by the force of this compaction. Every so often, a machine will have to go through the tunnel to trim off the sides."

Various types of tunnel roofing were tried during the 1955 expedition, but snow was found to be the most practical, because of its economy. One method involved the use of squirrel-wire netting anchored on each side of the tunnel by stakes. Over it was placed a thin sheet of plastic, and the snow went on top of that. Another method used V-shaped wooden forms, another, blocks of snow that were cut out and placed over the tunnel.

The trench tunnels are practical over almost the entire surface of the Greenland icecap. Only on the edges of the icecap must other means be employed.

The Greenland icecap covers all but a thin margin along the coast, and reaches a depth of 9000 feet at some inland points. It is formed by snowfall of two to nine feet per year, and the top layer is just snow. But as more snow falls, the snow beneath it is compacted. The deeper you go,

(Continued to page 280)



Experimental ice tunnel is too small for vehicles. Larger one might be built with continuous-mining machine. Below, a conventional earth compactor tamps snow on top of icecap to construct a landing field



Detroit Listening Post



By Leo Donovan

AND STILL THEY COME. This month it is the 1956 Rambler, next there will be the 1956 Chrysler 300B and the 1956 Corvette. After that the season is over and we can start worrying about 1957.

Just about the time you are reading this, American Motors will start building its own V8 engines at Kenosha, Wis. Both the Hudson and Nash cars have been using Packard V8 engines and transmissions. Beginning in January, they will be available with their own V8s, in addition. The new engine will be smaller than the Packard, of course. (After all, Packard's is the biggest in the business.) And the new AM engine will come in a variety of sizes, including one small enough for the Rambler. With the new V8 engine, the Rambler should be a bomb—it's plenty peppy right now with its six.

What horsepower will the Chrysler 300B have? Informed guesses put it at around 335, up 35 from 1955. The car has run away with the stock-car racing championships in both AAA and NASCAR. What it will do in the 1956 season is hard to predict. At least one major manufacturer is going after the title with all its resources, another is after it only a little less strenuously.

Chrysler will have a surprise package to offer, according to rumor. A new transmission is expected to be announced with the 300B.

You can bet Dodge will be winning races shortly. It is planning to announce (if it hasn't by this time) a special speedster known as the "500." You'll see it on the NASCAR tracks this winter. And it should do mighty well.

What About 1957?

Next year is the year for another "complete" change. That means new body shells in most cars, new engines in many cars. But they are not properly called revolutionary changes, engineers insist. Not until the gas turbine is offered should the word "revolutionary" be used, say the slide-rule boys.

But GM will have a gas turbine in one of its passenger cars in the Motorama in New York this month. Of course, GM had two V6 engines with fuel injection last year at the Motorama and as yet there is no sign of them on the production line.

GM's turbine is ready for the highway. It could power the family car except that the rare metal used in the blades puts it out of reach pricewise. Until metal costs can be cut—and drastically—the turbine will power show cars only. It is mounted in a four-passenger body unlike the old Firebird that was shaped more like a jet plane.

So the V8 will be around for some time. There is a lot more efficiency that engineers can wring out of both the V8 and the automatic transmission before they switch to the turbine.

There is still talk of fuel injection by 1957 (see the Owners Report on the 300SL, page 140, for a first-hand story on fuel injection). That could mean the end for carburetors. But don't expect it tomorrow.

The new Lincoln, which appeared well ahead of the industry cycle, will have to offer something hot in 1957 to stay in the news and it could be the first to make fuel injection optional. It's just a guess, of course.

Strong supporters of the fuel-injection system, strangely enough, are the stylists and sales forces. With injection, the hood line could be lowered considerably. And stylists like that.

Packard's torsion-bar system has forced the rest of the industry to take a fresh look at suspensions. In the bus field, General Motors pioneered the bellows type of air suspension. Now the industry conversation includes speculation that Buick may pioneer a passenger-car version of the rubber-air suspension in its 1957 models.

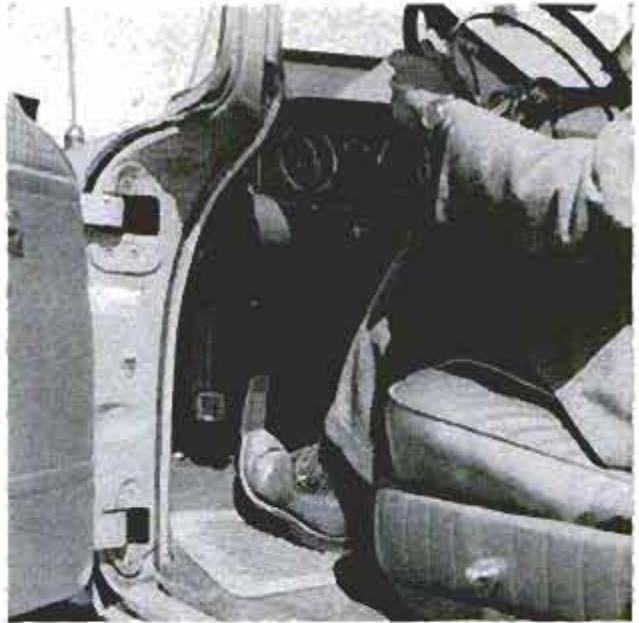
There's no doubt that 1957 cars will be lower, drastically lower. This will mean that you will find them more awkward to enter and leave, but once in the car, you will feel safer because of the lower center of gravity. Additional lowering increases the big hump in the front floor board caused by the transmission. Both GM and Chrysler are rumored to be experimenting with transmissions mounted on the rear axle. Such a move would also improve weight distribution, front and rear.

Will there be radar-controlled brakes in 1957? Most engineers are skeptical. If offered, the brakes would have to be a very high-price option and there are still problems to be solved, engineers say. They are possible, but not likely for 1957.

More likely is the introduction of faster-stopping brakes—by Chevrolet, according to the rumor department.



Automobile equipped with the power-parking unit drives head first into a parallel-parking place

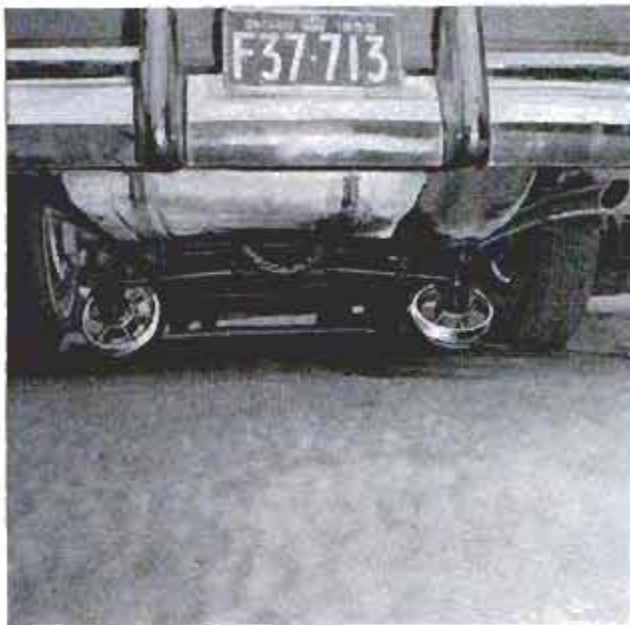


Depressing a foot pedal hydraulically lowers pair of parking wheels attached to rear-axle housing

Power Parker

Fellow motorists gape when C. P. Farr of Toronto parks his car. Farr pulls head first into a parking spot, whereupon the rear of the car rises and coasts over to a

Parking wheels lower, lifting car. Spinning right rear car wheel turns parking wheel to move car over



snug fit against the curb. Depressing a foot pedal diverts fluid from the power-steering unit to a cylinder that lowers a pair of wheels under the rear of the car. One of the oddly shaped wheels, resting against a car wheel, turns as the wheel is spun, moving the car over. The unit is homemade.

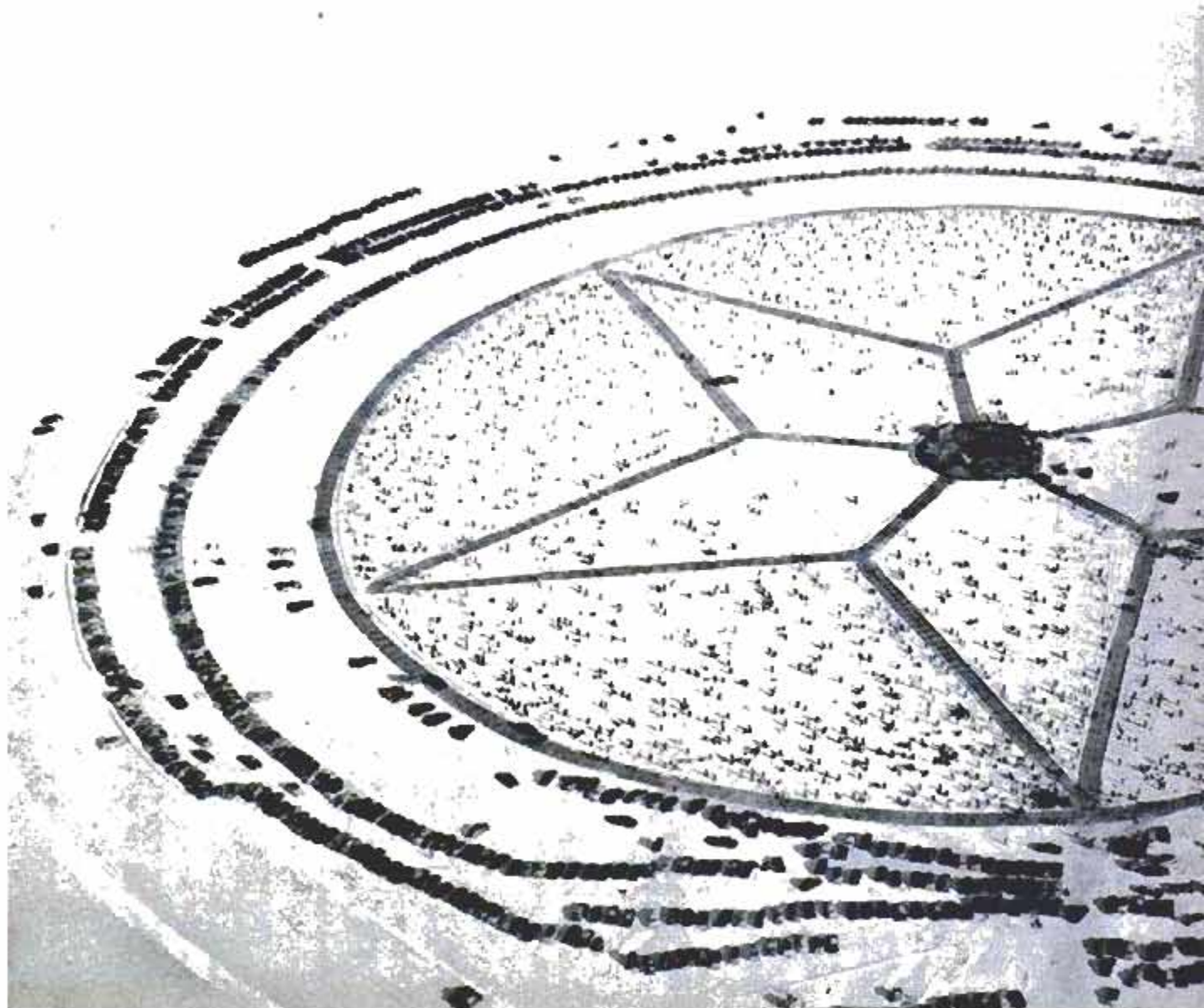
Parking unit can also be used when changing tires. No jack is needed, since unit lifts car from ground



Dried Pond Weed Beats Alfalfa Meal in Fattening Swine

Pigs fed a common pond weed, *Elodea canadensis*, gain better than those fed alfalfa meal. That's the report of scientists at Kansas State College. The mosslike weed yields 12 to 14 tons green weight to the pond acre and replaces itself in three months. Dehydrated for use, *Elodea* be-

comes a dark, alfalfalike meal with a faint fishy smell. In the Kansas State experiments, it was substituted for alfalfa meal as part of a balanced ration for 16 weanling pigs. The pigs gained 1.75 pounds per day with the new ration as compared to 1.57 pounds per day with the old.



About 8000 anglers participated in 1955 contest at White Bear Lake near St. Paul. They chopped holes in a circular area 500 yards in diameter. Roads were laid out in star pattern with cars parked outside the circle

Winter is the Best Time

By Joe Hennessy

Sports Editor, St. Paul Pioneer Press

FISH BITE BETTER in winter. That is the most important reason for the tremendous boom in ice fishing, particularly in Minnesota and western Wisconsin. The number of participants has quadrupled since World War II.

There are other factors only a shade less important:

- The development of warm footwear, after military experience in the Aleutian Islands and later in Korea, is a major one. The hardy devotees of ice fishing always had plenty of heavy clothing, but even the thrill of a good many strikes can't overcome the discomfort of cold feet.

- The ice-fishing contest, a sort of picnic on ice complete with prizes, still less than 10 years old, was another.

- Then there was a change in thinking by fish biologists on the matter of restrictions. Today the two most sought after winter species, crappies and sunfish, are open the year 'round with bag limits large enough to satisfy the most hungry of anglers.

In a game where luck supposedly plays a great part, the experts now have scientific proof that fish do bite better in winter than in summer.

Dr. John B. Moyle, Minnesota fisheries-



Walter Wettschreck photo



Real prize for the winter fisherman is a good-sized northern pike, hauled up through two feet of ice



for Fishing

research supervisor, conducted an exhaustive survey in cooperation with the federal authorities and came up with the following conclusion:

On a man-hour basis on 12 selected lakes scattered over the state, summer anglers caught 2.43 fish per trip and winter anglers brought through the ice 3.24 fish per trip.

Doctor Moyle estimated about one fourth of all those who held Minnesota fishing licenses in 1955 fished in the winter as well as the summer.

On another phase of winter fishing—spearing—done from a darkened shack,

Right center, one trick is to attach matches to willow pole. Weaving matchbook indicates interested fish. Right, tools of pan-fisherman's sport are insulated minnow bucket, chisel, spiked pole and ice scoop



Lakes near Twin Cities draw heavy load of winter anglers. Some have shacks, some pull equipment on sleds

there was an exact count. Gordon B. Wallen, assistant game and fish director, noted that spearing permits jumped from 22,528 in 1948 to 62,784 in 1954, the last full year for which records are available.

This is a more specialized form—and a highly controversial one. The spearers generally are seeking only northern pike, and the largest northern pike at that. According to fish biologists, the northern, a voracious feeder on the smaller pan fish, is necessary to keep lakes in balance. Without the big fish, the smaller ones have a tendency to propagate themselves to the point of overpopulation, resulting in stunted, underfed fish.

Plenty of Fish

Moyle said he believes it virtually impossible for fishermen, using hook and line and observing even the generous 25-fish limit, to "fish out" the pan fish.

The fish are there in great numbers. Getting them is the ice angler's problem and he is solving that in comfort today.

Basically the equipment is simple and inexpensive. During the midwinter months when ice is two feet thick on the northern lakes, anglers use either snow tires or chains and drive within a few feet of the fishing hole.

The few old-time blacksmiths left in Minnesota can't keep up with the demand for ice chisels. That's the first and most important piece of equipment. They are forged from car springs or other tempered steel and have shafts made of water pipe, frequently loaded with lead for greater heft. Most chisels run about five feet long. Even veteran ice choppers take a good five minutes to punch an 8-inch-diameter hole through ice varying from 6 inches to 30 inches thick.

An old-fashioned soup ladle, with a handle some 30 inches long, now is a standard item in all bait and tackle stores in

the north. With this the angler scoops out the chopped ice.

The line usually is strung along a 40-inch pole with a spiked end which is set in the ice. Leaders, a large hook for crappies, a very small one for sunfish, and bait complete the equipment.

If the angler is after crappies—and they made up 80.5 percent of the winter catch, according to Doctor Moyle's survey—he will put on a minnow. Some hook them just under the dorsal fin, others string them through the mouth as in summer trolling and some hook them through the tail.

Fish in Shallow Water

Desired depths vary among the ice fraternity. Most fishing is done in less than 25 feet of water, about a foot off the bottom.

By this time the angler probably has brought up a nail keg or apple box for a seat, lighted the pipe or cigarette and left the rest to the fish.

The more ambitious will be digging second holes, for most of the states in the northern Great Lakes area now have liberalized the rules to permit use of two lines. Some old-timers insist that a single line is best, for it demands constant attention.

The slightest movement on the bobber indicates fish in the neighborhood. Pan fish seem to nibble at the bait during the winter months rather than strike hard as in the summer.

Not that pan fish are the only lure to the cold-nosed of the winter-fishing breed. Walleyed pike and northern pike, which are protected for a part of the winter months, also take the bait.

Those who want to settle down for a winter of fishing in comfort have spent the fall building fishing shacks. Some shacks have runners and are towed by car to the fishing spot.



Biggest chore is cutting hole through the ice. Old-timers still use the double-bitted lumberman's ax

The spearers use a completely darkened house; the anglers use one with a window. Under a change in the Minnesota law, both must be specially licensed this year. Formerly only the "dark" house required such a license.

Comforts in Fishing Shacks

On Mille Lacs, a 100-square-mile expanse in central Minnesota and a much favored walleye lake, some fishermen even installed bunks last winter. All are equipped with stoves, and the coffee pot seldom cools.

Near Wadena, Minn., one enterprising angler even rigged up a television aerial. Many shacks are equipped with portable radios.

Such conveniences still are scoffed at by the more serious fisherman who is too busy watching his line or spearing hole. The latter is a hole at least 18 inches square chopped over comparatively shallow water.

Once the spearer's eyes are adjusted to the darkness, he has a clear picture of the lake bottom and any fish that passes beneath the hole. He usually is after a trophy-size northern pike of 15 pounds or upward.

Even for an angler, it requires patience, and many a day he will trudge home with nothing. According to Moyle's survey, the spearer averaged 0.25 fish per hour to the angler's 1.06 per hour.

But by far the greatest number of fishermen, without shacks, are standing against the winter wind. Military-surplus houses in the Twin Cities are thronged every winter by anglers in search of airmen's flight boots and the type of insulated rubber boots used in Korea.

Flight clothing, padded pants and coats are also in demand. Some prefer loose,



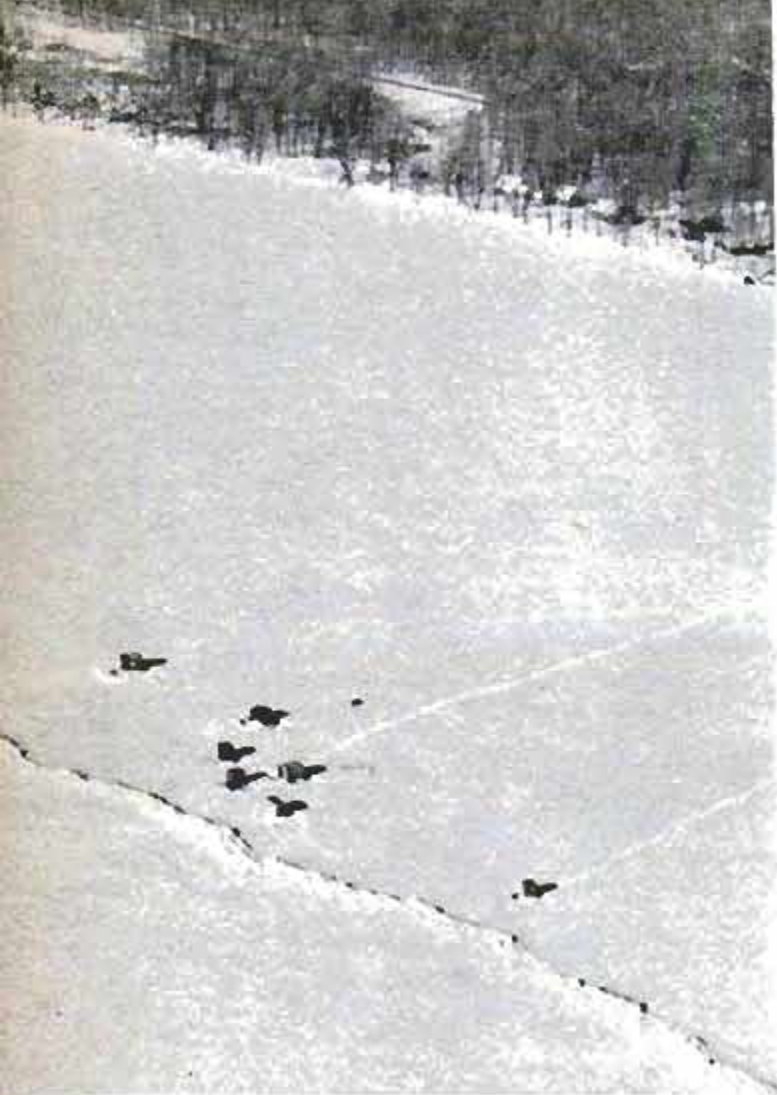
Colburn Machine & Tool photo

Enterprising anglers use power-driven posthole auger to drill hole through two-foot ice in six seconds



Drill designed for ice fishermen works like carpenter's brace. Below, heavy chisel is favorite tool





Nine-foot ice barrier bars fishermen from middle of Mille Lacs. Below, fishing from ice floes in the spring is an exciting but very dangerous sport



heavy mitts that can be dropped in a split second when the fishing bobber goes into action. Sporting-goods stores also now are offering more dressy, thermal-type, lightweight outfits.

Gaining popularity are Finnish socks of pounded felt. The newcomer who ventures out in ordinary footwear or leather hunting boots is in a hurry to get home.

Miniature Sailfish

It is common to see hundreds of properly attired anglers standing around their fishing holes with the temperature 15 degrees below zero. On such days the fish are super-quick frozen and, if a high wind comes along, the smaller ones will sail off across the slick ice.

Emil Berglund of St. Paul had a black Labrador pretty well trained along those lines, much to Emil's embarrassment. Fishing at Farm Island Lake near Aitkin, the dog retrieved a full limit of crappies from other unbemused anglers before Emil had completed chopping a hole.

First question asked by visitors from the southern areas is about the safety of the ice. There have been accidents, but they are rare and invariably have happened early or very late in the season, or on the large lakes or rivers where currents keep areas open or with only a thin shell of ice.

Most fishermen leave their car doors slightly ajar if there is the slightest possibility of danger. It is advisable to follow regular roadways over the ice. Some of these are as heavily traveled as city streets at the peak of the season.

During the 1955 St. Paul Winter Carnival, visiting members of the Cavaliers Club from San Antonio, Tex., were driven onto White Bear Lake for the annual fishing derby in three 20,000-pound city transit-system buses.

Since the road to the fishing grounds had been sanded, many of the Texans thought they were over a solid cement highway until they peered into some of the adjoining fish holes, cut over 20 feet of water but through 27-inch ice.

It was the fishing derby that brought the sport to the attention of those in the rest of the nation. Last year more than 400 fishing derbies were staged in Minnesota and western Wisconsin.

Elaborate Prizes

The contest is a family and town outing rolled into one, and usually with elaborate prizes. Last year Forest Lake sportsmen offered a trip to Mexico for two. Boats, motors and fishing equipment are the usual prizes.

The writer will have to shoulder some

(Continued to page 266)

**Buick
Cadillac
Chevrolet
Chrysler
Clipper
Continental
Corvette
De Soto
Dodge
Ford
Hudson
Imperial
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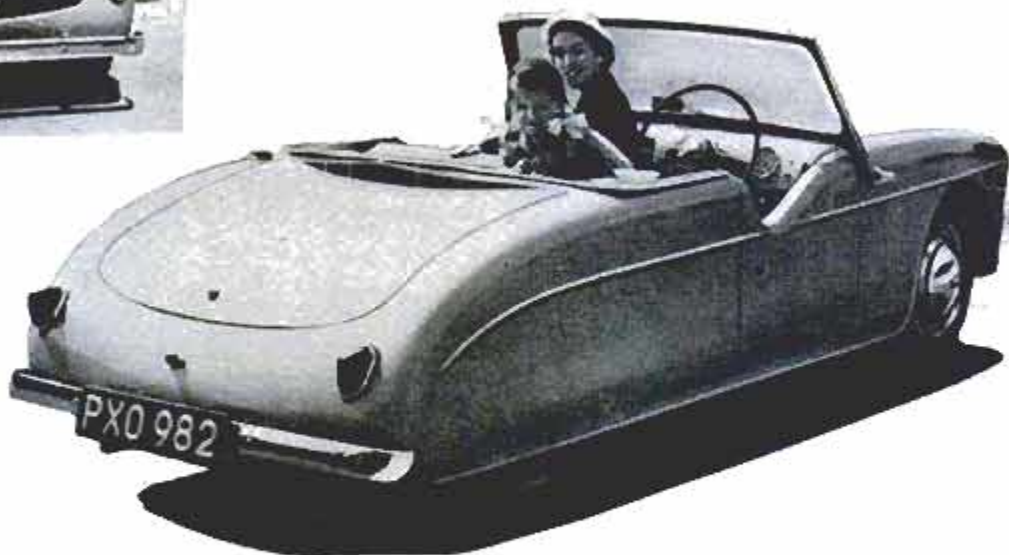
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ON THE NEWSSTANDS JANUARY 26



Small Car Still King On European Highways

Sleek three-wheeled convertible hits 65, gets 55 miles per gallon. Twin-cylinder two-stroke engine drives the single rear wheel by roller chain. Folding fabric top holds side curtains. The English "Powerdrive" has an \$885 price tag



WHILE AMERICA keeps producing bigger and heavier cars, Europe continues to turn out midgets that are easier to handle, easier on the gas and less trouble to park. They'll win no horsepower race, but that doesn't seem to bother their owners a bit.



← Family motorcycle has a three-seater sidecar that hooks onto the cycle. It is complete with sun roof, hinged windshield, glass side windows, twin windshield wipers and comfortable seats like an auto's

Baby four-wheeler from France weighs only 530 pounds, gets 80 miles per gallon and has a top speed of 35 miles per hour. It carries two people with luggage. Full hand controls for disabled are optional





We're Running Out of Airspace

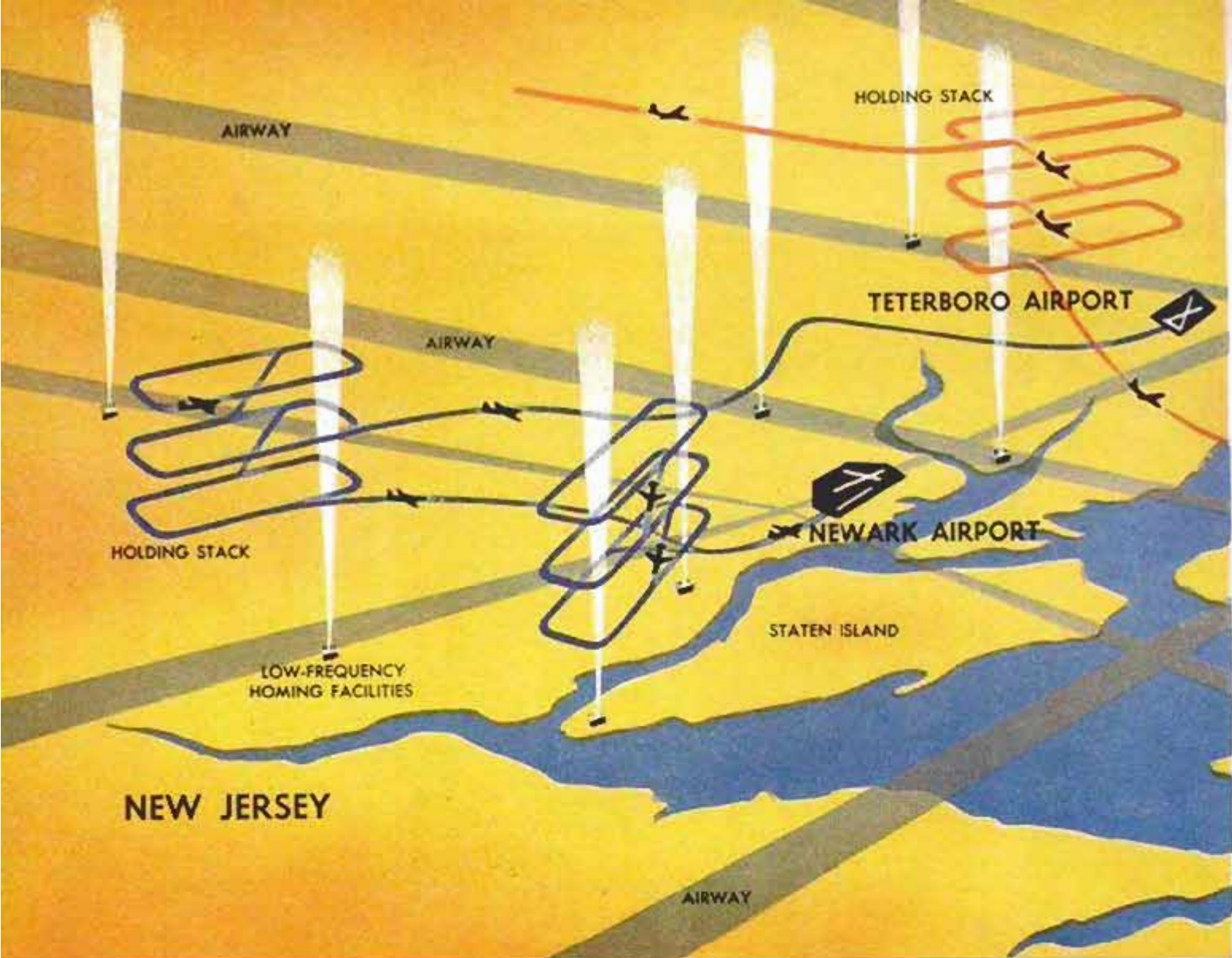
By Clifford B. Hicks

FOR A THREE-DAY period in September 1945—called “Black Friday” by the traffic controllers, who will never forget it—there was literally an air-traffic jam in the skies above New York City. Planes were stacked up in every holding pattern around the city, with more roaring in from every direction.

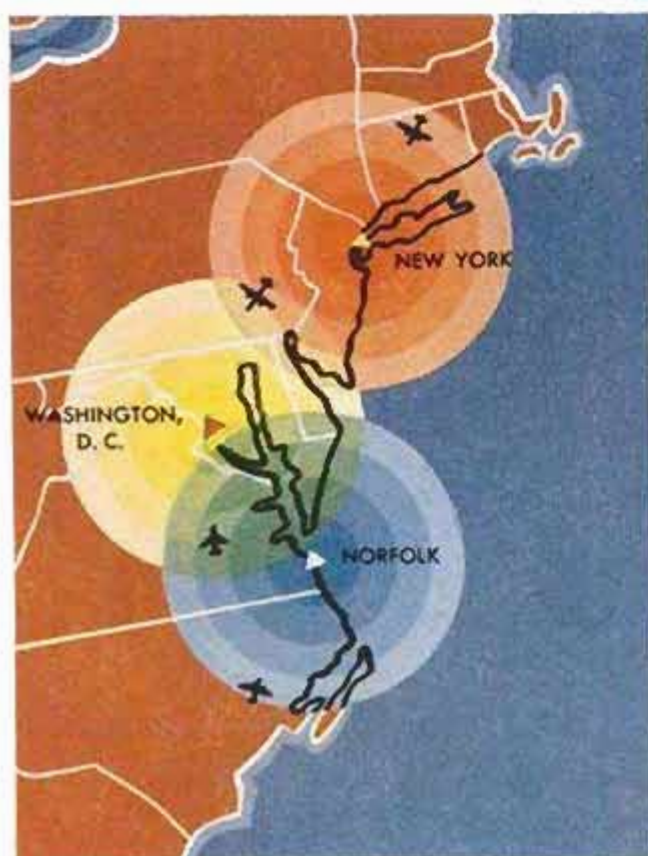
At one point for nearly an hour Civil Aeronautics Administration controllers were not accepting any flight plans whatever. Planes were backed up halfway across the country. In Chicago and Miami,

disgruntled passengers looked at clear skies and grumbled about the delay, while in New York the tense traffic controllers were sweating out the exacting job of guiding onto cleared runways all those planes that were droning through the murk overhead.

Thanks to the expert work of the controllers, every plane landed safely and every passenger waiting on the ground got into the air. The worst air-traffic jam in history finally was unsnarled without violation of a single safety rule.



Long-range radar at terminal cities (below) puts much of the East Coast area under continual surveillance

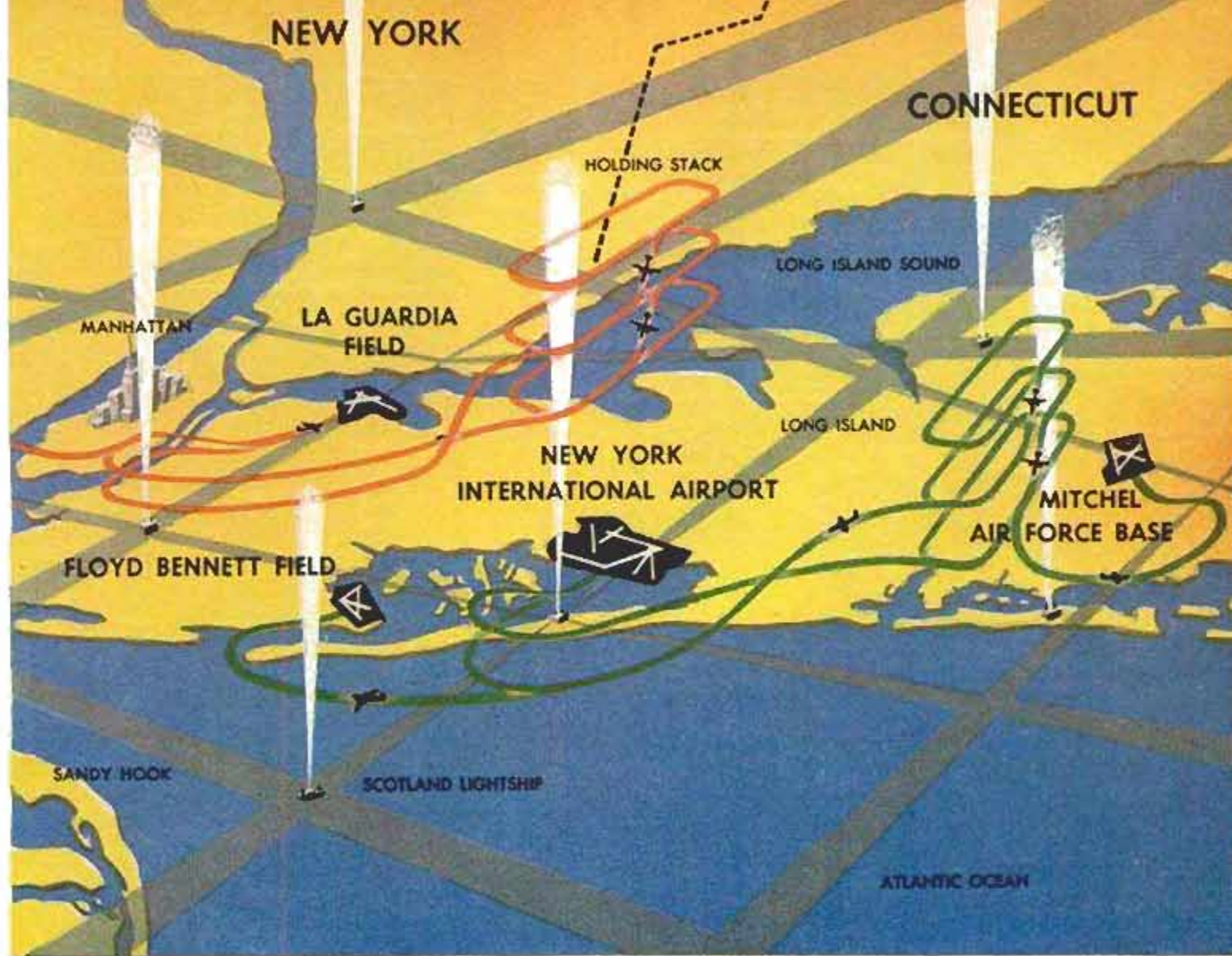


Studies of Black Friday never pinned down the precise reasons for the sudden glut of air traffic. But these studies, along with others made by the CAA, proved one thing: *in some areas of the country we're rapidly running out of airspace.*

Airspace is a nonrenewable asset. On the ground, you can build more highways and rail lines to solve traffic jams. But overhead there's a definite, limited amount of airspace. When it's gone, there is no more.

Surveying the magnificent bowl of blue sky, man tends to think his airspace is endless. Actually it's carved into a good many imaginary chunks—so many that in some areas there's nothing left to carve.

When you take a plane flight you fly along an airway, an aerial highway 10 miles wide. These highways are laid out by the CAA to provide the most direct route between airports while skirting any hazards to safe flying or safety on the ground. During instrument-flying weather, regulations require that all aircraft flying on the same airway be separated by at least 1000 feet in altitude, or by 10 minutes' flying time if two or more planes are at the same altitude. Thus a single plane oc-



Several airports and high traffic level cause air-traffic jams above New York. Changes now being made will produce the pattern diagrammed above. Gray

lines represent the airways and white vertical lines are the holding fixes. In some cases, holding stacks will serve more than one metropolitan-area airport

cupies a tremendous chunk of airspace measuring at least 1000 feet high, 10 miles wide and some 40 to 60 miles long.

Multiply this by the number of planes in the air. Traffic on scheduled air routes of the United States today is nearly three times what it was when World War II ended. During 1954, control towers handled 17,261,461 plane movements, or almost 2000 every hour, day and night.

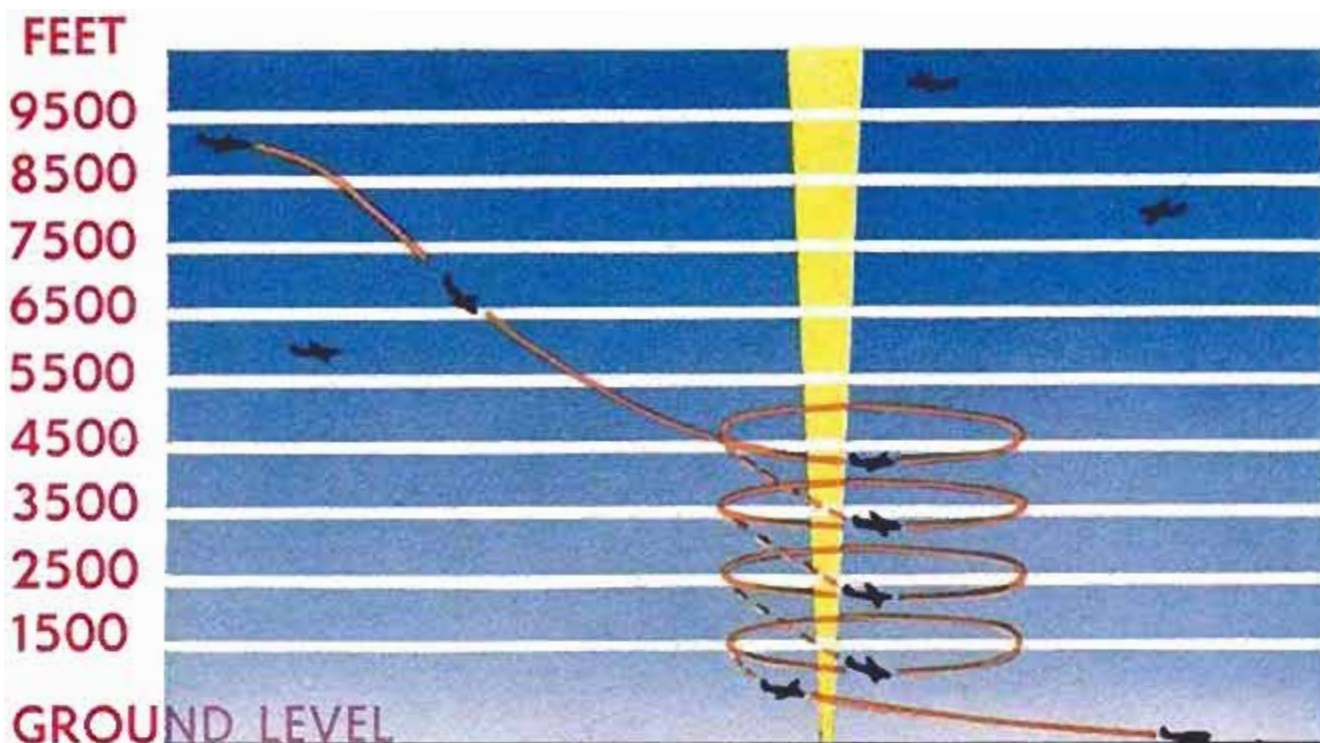
Today there are about 140,000 miles of airways. The airspace problem is not critical on most of these airways. But by their very nature, the airways converge upon metropolitan areas. Around these cities the air, except for scattered prohibited areas, is literally all airway. It is here that the airspace has been used up.

Take an example. At the Chicago Municipal Airport the daily traffic peak occurs between 5:00 and 6:00 p.m., when there is a plane landing or taking off every 20 seconds. Other trouble spots are Washington, D.C., Norfolk, Miami, Los Angeles, San Francisco and Seattle, with ominous hints of traffic jams showing up at Detroit,

Dallas, Pittsburgh, Cleveland and St. Louis.

The obvious answer—to add more airports—is probably the worst possible answer because it simply compounds the confusion. New York has the most critical airspace problem in the country, and here within 20 miles of La Guardia there are three major airports and four others capable of handling instrument approaches.

To see the problem clearly, watch what happens as you approach New York high in the air. Your flight is bound for New York International (Idlewild), one of the three major airports serving the city. As you enter the metropolitan area under instrument-flight conditions, the traffic controller must guide you unerringly through the web of New York traffic. Planes—some four of them per minute—may be taking off or coming into the various airports from every point of the compass. Your plane must bypass or pierce all the traffic around Newark Airport and much of the traffic around La Guardia to reach Idlewild. Since the weather is bad, planes are stacked up throughout the area,



Each holding stack is looped around a radio beacon. Incoming plane enters top of the stack and works its way down. Controller's big problem is to feed planes through stack and onto runways with minimum delay

and your controller directs you to one of the two holding patterns for Idlewild. This is simply a long oval where planes are stacked up like cards in a deck awaiting their turn to land.

Holding patterns are divided vertically into layers of 1000 feet. Planes are handled on a first-come, first-served basis; you enter the top of the deck and work your way down. Eventually, when you reach the bottom and the tower man gives you permission to make your approach, you pass through the "gate" (the final wave-off point if anything is wrong) and land. It takes the average plane two minutes to descend from one level to another so, un-

til recent improvements, one landing every two minutes was the maximum possible rate. CAA controllers shuffle you through this deck of planes with an expert hand. Your safety is their primary consideration. Indeed flying today, despite the traffic jams in some areas, is safer than it has been throughout its history.

But the slightest hitch can cause an aerial misdeal. For example, a Boeing 377 Stratocruiser once dropped an engine on its way into Chicago. The tower controller had to hold 42 inbound airplanes simultaneously until the cripple landed. This held up traffic for 25 minutes and compounded the problem of getting the planes down.

"We know that air-space and traffic-control problems are serious and must be solved if we are to have sound aviation," says F. B. Lee, Administrator of Civil Aeronautics. "We have no doubt they can be solved."

More Holding Patterns

What are the solutions? More holding patterns? To make room for them, you sometimes have to establish them farther from the field, thereby increasing the time necessary for the bottom plane in this stack to reach the gate and land.

Intricate network of airways controlled by high-frequency radio blankets map of East. About as many low-frequency airways (not shown) also cover area. Traffic jams occur in air above focal-point cities





In experimental setup, radarscope is projected on glass table. Controllers move markers as the blips move

The CAA is using a high level of imagination to come up with some of the answers. Men, women and some ingenious instruments are hard at work on the airspace problem at the CAA's Technical Development and Evaluation Center at Indianapolis, Ind.

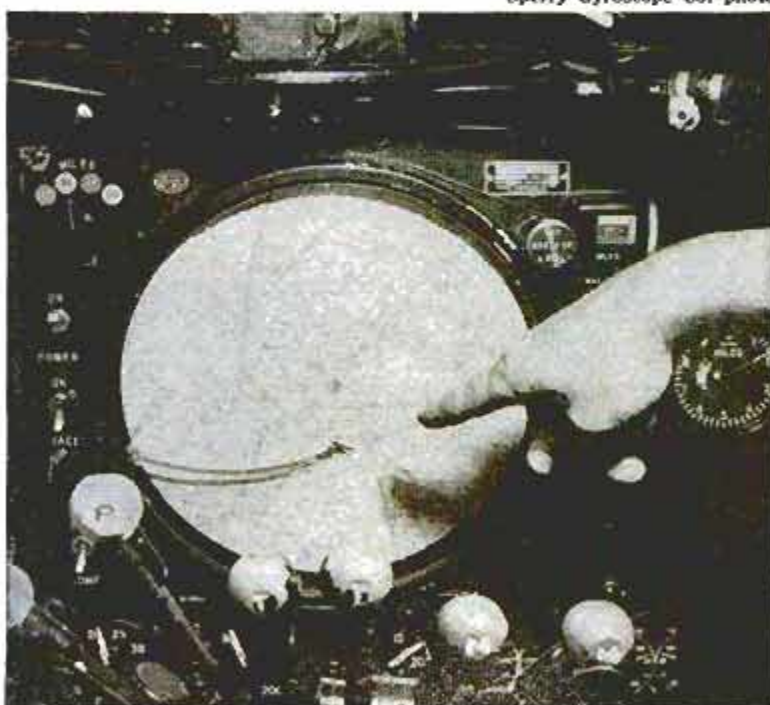
Each airspace problem is unique, and no pat formula applies to all of them. That's why a complex research tool developed at Indianapolis is so valuable. It's called the dynamic air-traffic control simulator and it combines radar, television, optical projectors, calculators and aircraft instruments. With this tool, researchers can duplicate the traffic conditions around any airport in the country, right down to the exact speed of every approaching plane.

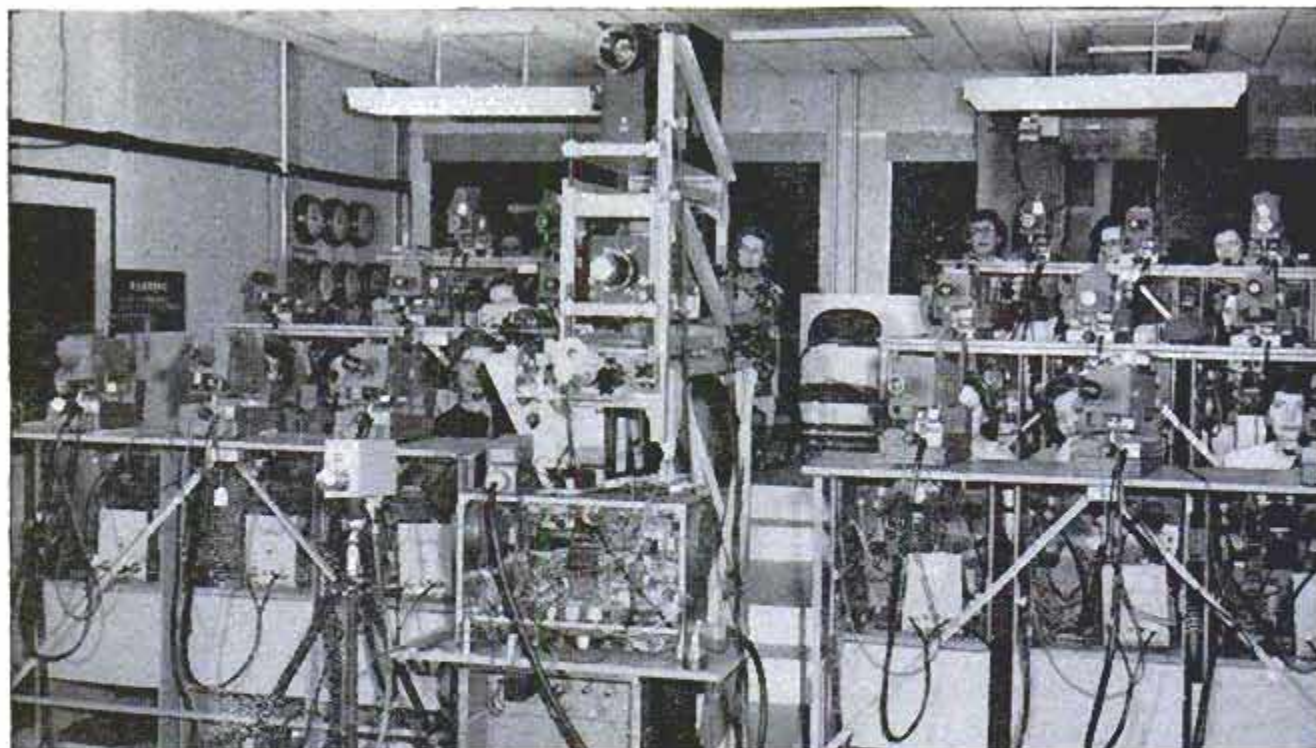
The simulator is installed in a big room at the Center. Some 18 women (wives of CAA workers) are seated at one end behind aircraft-instrument panels. Each woman serves as a pilot and has been taught to "fly" her plane in response to orders given her by radio or according to instructions on a written script. Across the room from these "cockpits" is located a large screen which is overlaid with an airways map of

the metropolitan area that is under study.

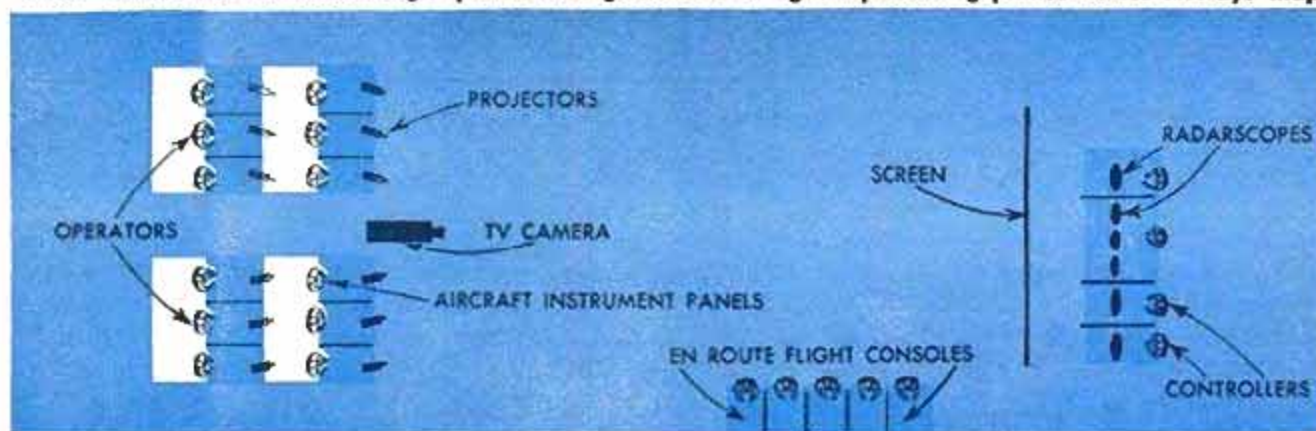
When an experiment begins, the women start flying their planes into the area, duplicating the approach courses at the real airport. As each "pilot" flies into the area, a projector in front of her, synchronized with her instruments, casts a pinpoint of light onto the screen. This spot represents

Experimental computer may help guide pilot through maze of airways. Tiny plane moves across map to show him where he is
Sperry Gyroscope Co. photo





Complex instrument shown above and in diagram below can simulate air traffic anywhere in the world. "Pilots" sit behind instrument flight panels and guide dots of light representing planes across airways map



Controllers behind the screen must unscramble the traffic and guide each plane in for a safe landing at airport



her plane as it nears the airport.

A camera televises this screen with its moving spots of light, and projects the picture onto a radar screen. CAA controllers, seated in front of the radar screen, must handle the planes safely and land them with the least possible delay. They radio instructions to the pilots, who respond exactly as regular commercial pilots. As each woman "lands" her plane, she starts piloting another into the area. For experimental purposes the area can be so saturated with planes that the system actually breaks down. (In actual practice, of course, this never happens.)

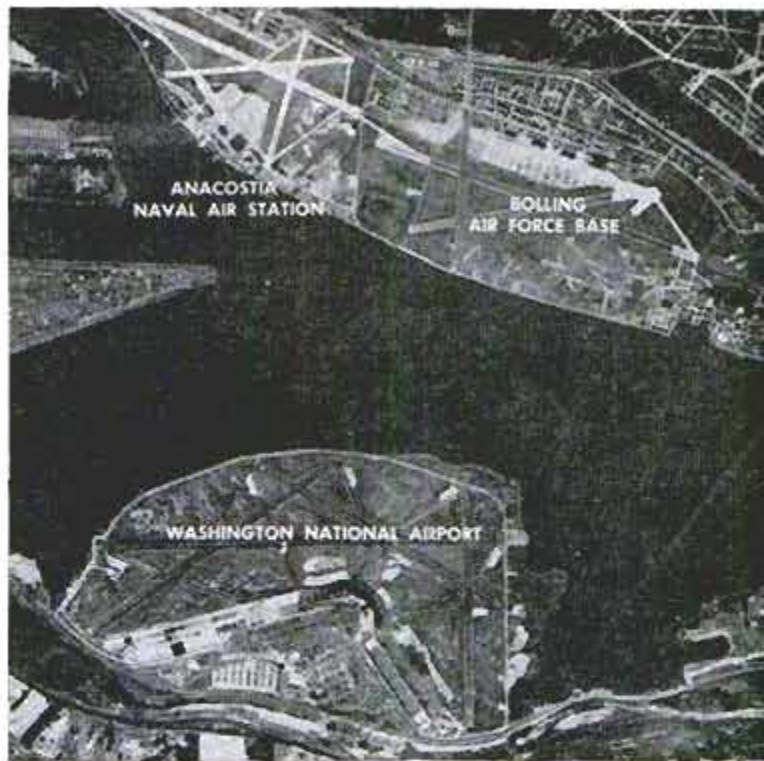
With the simulator, the controllers can try any alterations in the terminal area. They can change the course of the airways, move holding patterns or increase their numbers, decrease the distance between the bottom of the stack and the "gate," even experiment with changes in safety regulations, all without endangering the life of a single pilot or plane passenger. The simulator is made to order to solve the complicated problem of the New York area, or the unique problem at Washington, D.C., where elements of three different airfields are located within a mile of each other.

The simulator was used with excellent success in solving the traffic jam at Norfolk, where there are five different fields, military and civil, within a few miles of each other. Long experimentation with the simulator brought about a solution whereby the bulk of the traffic flows along a single course and individual planes peel off into "feeding troughs" leading to their terminal airports.

One-Way Airways

One development that has come out of the simulator is one-way airways. In many situations these prove just as efficient as one-way highways. With all traffic moving in one direction there's no need to assign specific altitude levels for two different directions, nor is there a problem of high closing speeds. With planes at their designated altitudes, conflicts can occur only when one plane overtakes another. One-way airways have led naturally to the development of aerial intersections, much like the clover-leaves of superhighways, with intricate but efficient traffic patterns for high-speed turnoffs.

Other studies show that minor changes in runways can pay off with a great in-



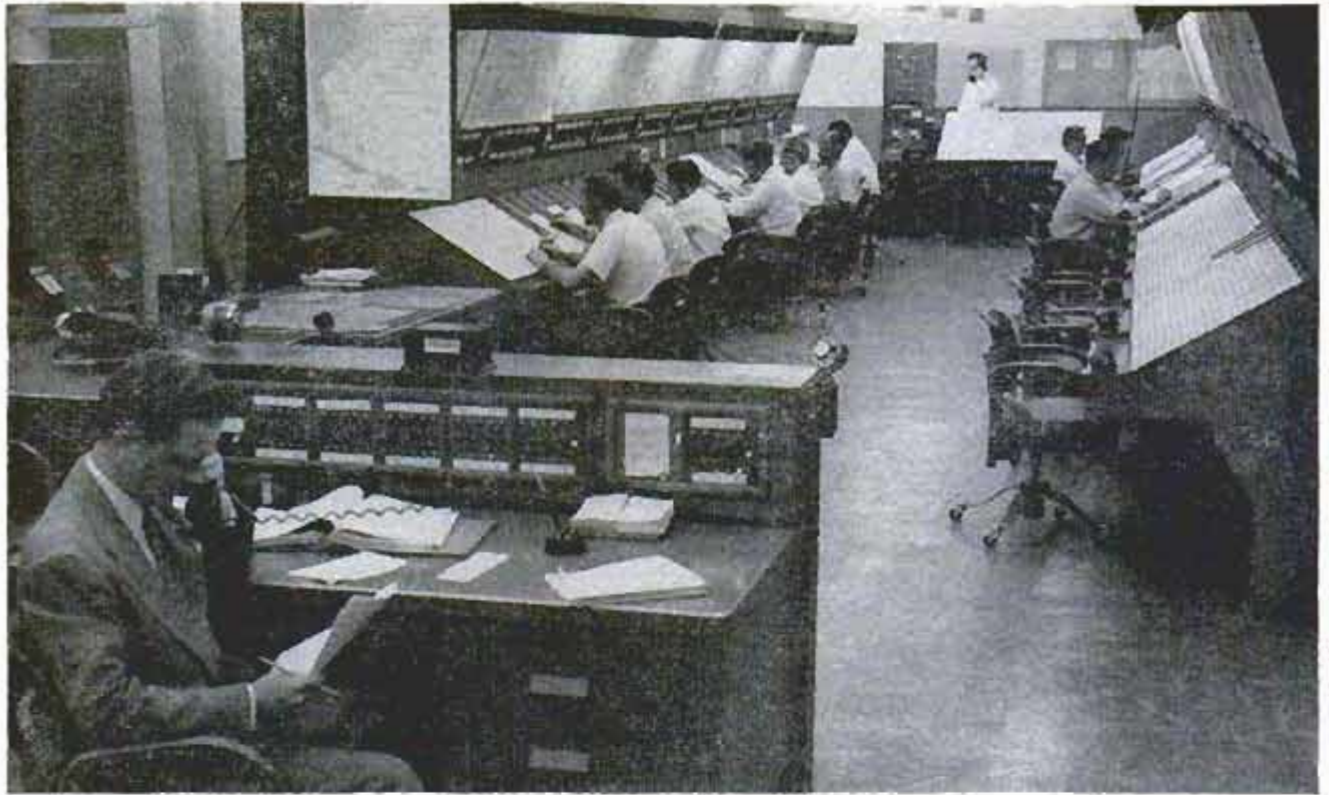
Jams have occurred at Washington where the National Airport and two service airports are located within a mile of each other

crease in an airport's traffic-handling capacity. On the average it takes a plane about 70 seconds from the time it passes the wave-off point until it lands, brakes to five miles per hour and makes a right-angle turn off the runway. Research at Indianapolis shows that a plane can safely negotiate a gradual turn off the runway at a speed of up to 30 miles per hour. If such a high-speed turnoff is available, the runway can be cleared in about 40 seconds, at which time a skillful controller will have the succeeding plane passing through the wave-off point.

Simulation studies of the New York problem have resulted in some concrete action. An Instrument Landing System has been in use on one runway at Idlewild for years. Now another is being installed. This is the first time two ILS systems have served the same airport. In addition, holding patterns have been changed, so that in most cases two different holding fixes serve each airport, giving the controller much greater flexibility in bringing in planes.

Long-Range Radar

But the biggest aid for solving the traffic jam is long-range radar. Until recently, airports had only short-range radar (about 30 miles) which was used by the tower controller as a visual check on the planes landing or waiting to land. By the time a plane was picked up, it already was approaching and virtually in the holding pattern, so radar served as a valuable safety



Men in traffic-control center know precise location of each plane, preserve a chunk of airspace around it

check but little else. Now a big new radar has been installed at Washington and another, on loan from the Air Force, now is being operated at New York by CAA personnel. Still another long-ranger already is in operation at Norfolk. This means that a plane can fly from Norfolk to Boston and be under radar surveillance virtually the entire distance.

To the controllers this is an incalculable help. When a blip appears on the scope, controllers know precisely where the plane is at any moment, and can follow it from far out. A plane under such radar surveillance can legally—and safely—approach within five miles of another plane at the same altitude. This permits control-

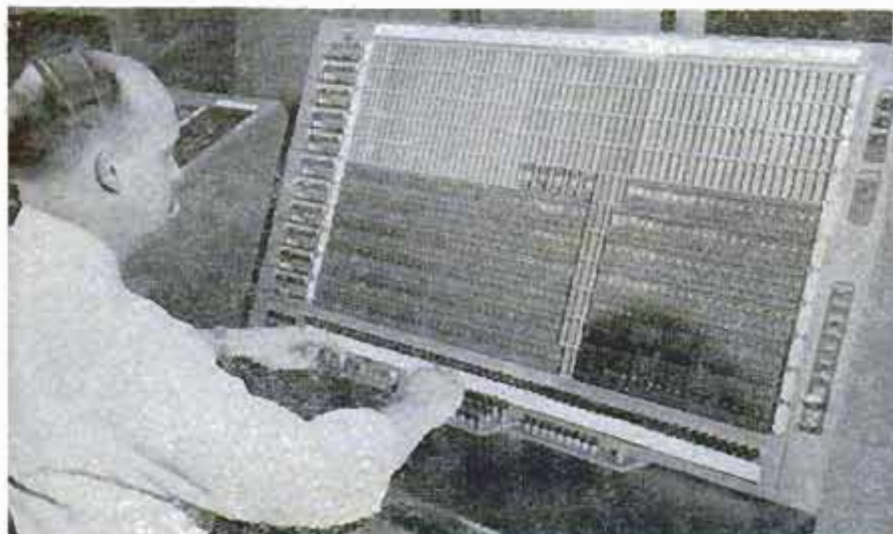
lers to bring planes into the metropolitan area much faster. They can route planes from some distance away toward one of two different holding patterns. If there are no conflicts, they can order a pilot to start his descent a long way from the airport. Often a plane at 11,000 feet is denied a normal letdown because another plane is cruising along at 9000 feet less than 10 minutes behind. The first plane is required to hold over a fix. With radar, such situations can be avoided, as the controller can actually watch both planes and warn the pilots if they approach too close for safety.

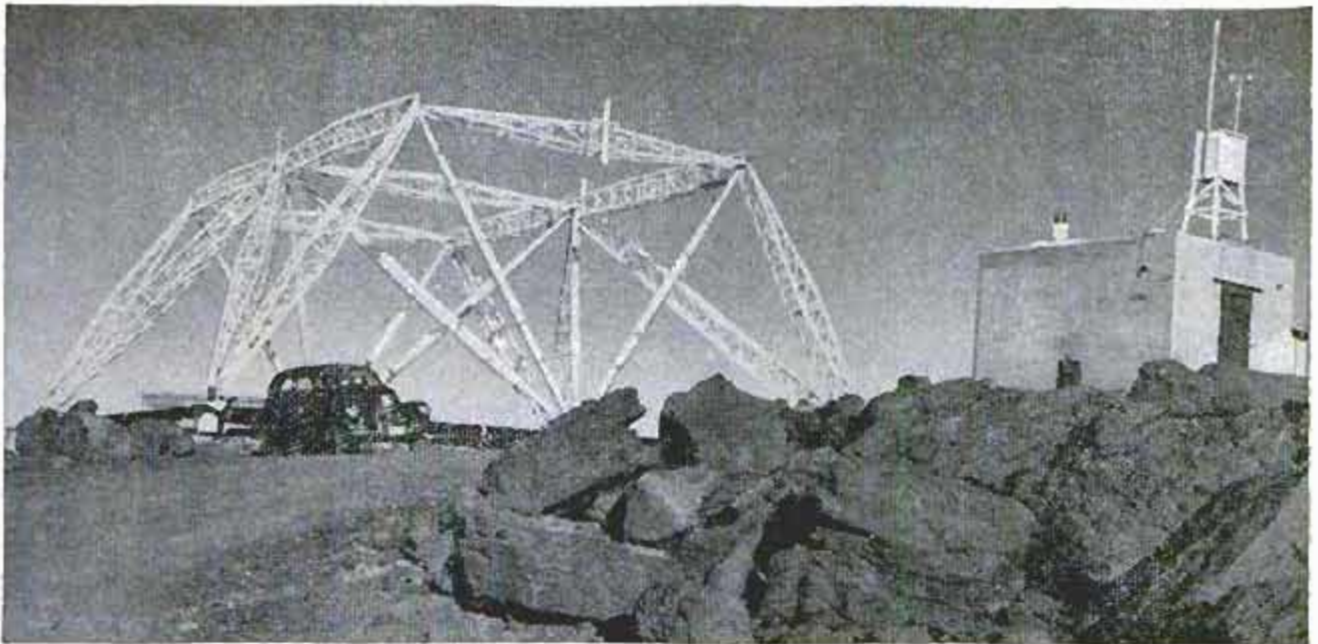
In order to make any airport function effectively during heavy traffic, planes must pass through the gate with the regularity of clockwork. There can be no big gaps. With radar, controllers can spot such impending gaps and route an incoming plane directly to the field, filling the gap without forcing the "holding" planes to wait any longer than would otherwise be necessary.

Radar will be even more important with the coming of jet transports. Jets, with their enormous fuel consumption at low altitudes, will not be able to fly a holding pattern for very long. Radar

(Continued to page 250)

Experimental instrument would aid controllers by eliminating handwriting on slips. It presents all information about planes in numbers on board





Rotating framework supports antenna which catches radiowaves that emanate from distant constellations

Instruments on Mountaintop Catch Cosmic Dust and Static

Strange effects from outer space are measured by two instruments resting on the peak of 12,000-foot Mount Haleakala on the island of Maui, Hawaii. One, a radiotelescope, has a huge framework which supports an antenna. The other instrument is no bigger than a sawhorse and catches meteoritic dust.

The radiotelescope, which rotates on a 360-degree track, catches the radiowaves emanating from distant constellations. By studying the differences in direct rays and those reflected off the surface of the ocean, radioastronomer Grote Reber hopes he will be able to pinpoint the exact origins of the "cosmic static."

The dust-collecting instrument includes a vacuum cleaner which draws air through a jet to deposit particles on a gelatin-coated film. The particles are analyzed to see if they originated from meteorites. Then they are put through experiments to determine whether meteoritic dust particles can serve as the nuclei of raindrops. Physicist Sean Twomey hopes to prove by the experiments

Dust-collecting device catches meteoritic particles



that heavy rainfall during the month of January is caused when the earth's orbit takes it through an area thick with meteors that disintegrate and fall into the earth's atmosphere as dust.



Hand-Cranked Wheel Chair

Rotating a hand crank propels a new wheel chair built for outdoor and indoor use. A lever on one arm assures positive steering. The chair is said to "float" over railroad crossings, climb four-inch curbs, go through mud or deep snow and spurt across an intersection at a speed of 10 miles per hour. It turns in its own length. The comfortable chair has foam-rubber cushions, coil springs, ball-bearing construction and a differential.

OWNERS REPORT on the MERCEDES-BENZ 300SL

Best-Liked Features:

"A more-than-wonderful experience to own and drive. A quiet machine that becomes an antelope when you want speed."

Investment banker

"I drive eight miles on a curving, crowned street twice a day and it's more fun than 18 holes of golf."

Sales manager

"What impresses me most is the way it sits down at really high speeds as though on railroad tracks."

Photographer

"Point by point, the finest piece of automotive engineering in all the world -- bar none."

Chemist

"The ultimate for high-speed cross-country driving when too much luggage does not have to be carried."

Rancher

Complaints:

"I would like roll-up windows."

Manufacturer

"Brakes are treacherous in wet weather."

Executive

"A little noisy in the indirect gears."

Cafe owner

"Being tall, I have trouble getting in and out."

Businessman



CLYMER TESTS the 300SL

By Floyd Clymer

OUR MERCEDES-BENZ 300SL had 15,500 miles on the speedometer at the start of the test. A California aviation executive, Wendell Fletcher, offered the loan of his car and we accepted.

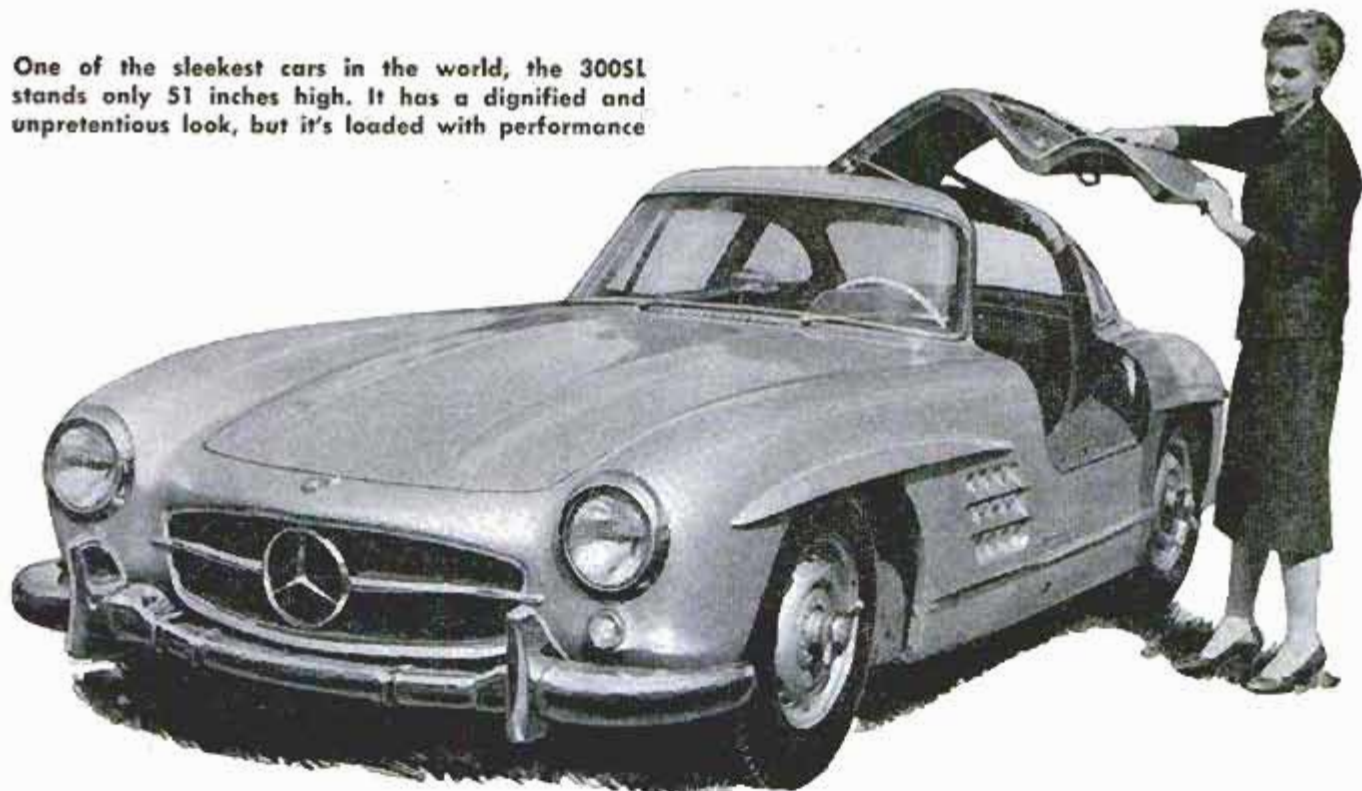
The six-cylinder fuel-injection engine develops 240 horsepower. Displacement is 182.8 cubic inches, about half the size of a Cadillac, Chrysler or Lincoln engine.

The fuel-injection unit is designed and

manufactured by the German Bosch firm which has had long experience with fuel injectors, both in the diesel and gasoline field. (German fighter planes in World War II were equipped with Bosch gasoline injectors.) The fuel is intermittently injected directly into the combustion chambers. Because of fuel injection, carburetion flat spots are eliminated and pickup is

(Continued to page 258)

One of the sleekest cars in the world, the 300SL stands only 51 inches high. It has a dignified and unpretentious look, but it's loaded with performance



By 300SL Owners

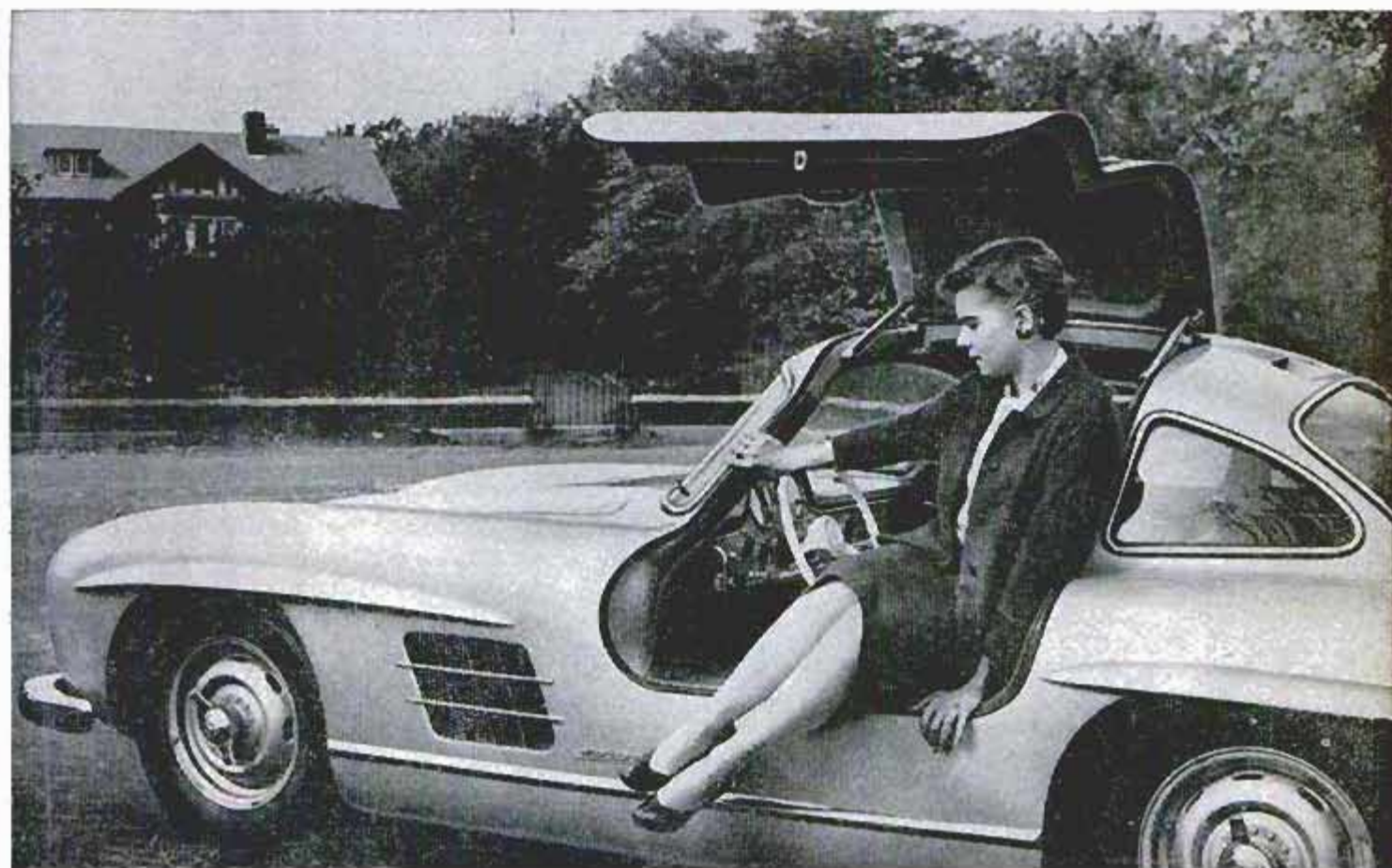
WHAT IS NEXT in engine design? Many experts say it is fuel injection—they claim the carburetor is inefficient and inadequate for today's high-performance engines. Others argue that fuel injection is too temperamental, too sensitive and too expensive for the family car.

To find out how fuel injection performs in day-by-day operation we surveyed owners of the Mercedes-Benz 300SL, a \$7500

sports car with a fuel-injection six-cylinder engine. These owners are experienced with fuel injection. They use it in all kinds of weather, under all conditions. They know its good points and its bad points. We asked them to tell us.

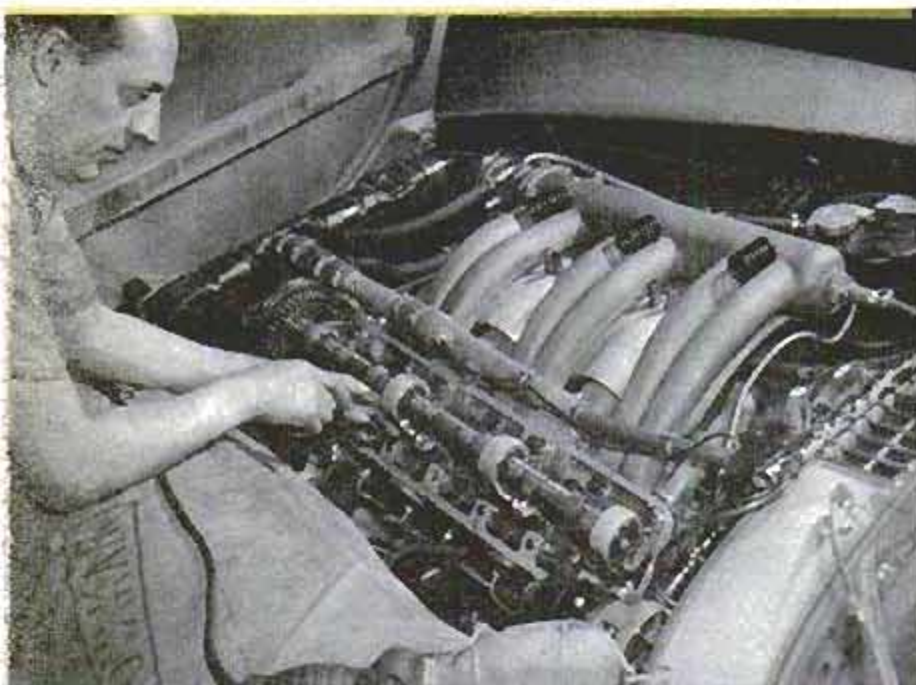
The owners are enthusiastic about the advantages of fuel injection. Almost all of them say it's practical and should be on every car. Only six percent do not believe

Doors swing up from a high sill that increases structural rigidity, but makes entry and exit a bit awkward

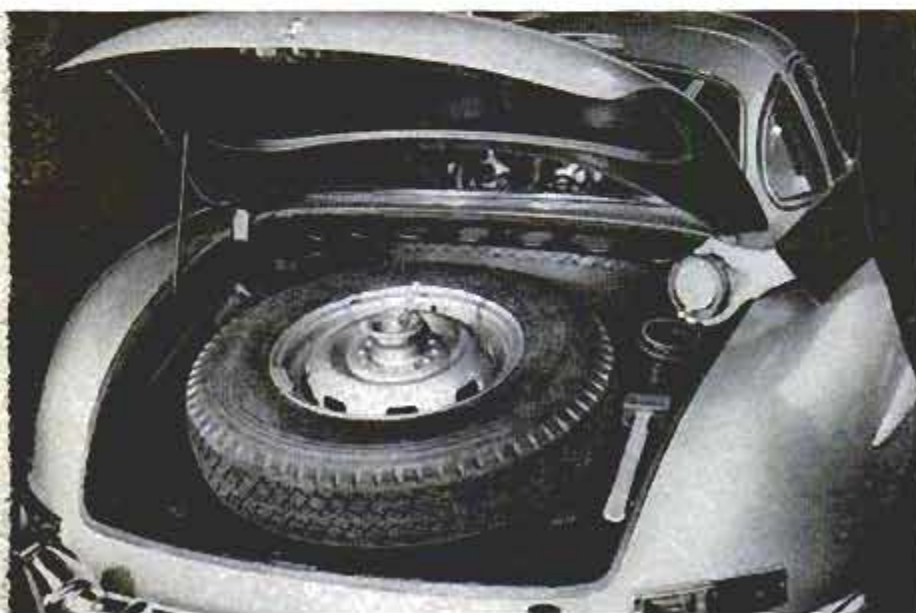




You can see why the doors are called gull wings. They open and close easily due to counterbalancing. Windows don't roll up and down, but are clamped into position from outside car



Mechanic works on overhead camshaft. "Plumbing" is part of injection system. Engine tilts to fit under low hood. Below, gas tank and tire fill trunk; hammer is for removing wheels



it is perfected enough for use on the family car at this time. But an enthusiastic 89 percent are convinced it's the best fuel system for any car, sports or family. The remaining 5 percent are undecided.

Why is fuel injection so good? Here are some of the reasons given by the owners:

Why Fuel Injection?

"Better mileage, more power, better acceleration with no flat spots. In every way fuel injection is superior to carburetion."—California car dealer (not a Mercedes-Benz dealer, incidentally).

"Excellent economy of operation. I believe that it is definitely the coming thing in this industry."—California oilman.

"Troublefree. I would like it on all my automobiles."—New Jersey manufacturer.

"Not as much tuning trouble as with carburetors. Much quicker starting in cold weather."—California owner.

"Great flexibility. Very low specific consumption. Superior to carburetors in every way except serviceability."—Pennsylvania construction man.

"Sure it's practical. I use the car every day to drive 40 miles. Have had no trouble with fuel injection."—California executive.

"Provides wonderful performance from a small engine."—Nevada businessman.

By the way, the displacement of the 300SL engine is only 182.8 cubic inches. It is smaller than the engine in any standard car built in this country—smaller than the Rambler Six, for example. Yet it develops 240 horsepower and the car will go 150 miles per hour!

What are the reasons given by owners who say fuel injection is not practical?

"Fuel filters must be cleaned too frequently."—Illinois owner.

"Temperamental. Requires nursing. Excellent in the hands of good driver."—Wisconsin attorney.

"Too few know how to repair the pump."—New Jersey retail merchant.

Some owners say the system is practical, but too expensive for the family sedan.

"Cost is main deterrent to widespread use of fuel injection."—Connecticut manufacturer.

Results of PM Poll of Mercedes-Benz 300SL Owners

Fuel-injection system

Have had some trouble.... 12%
Have had no trouble..... 88%

Fuel injection for family cars?

Yes, is practical..... 89%
No, is not practical..... 6%
Do not know..... 5%

Easy to drive in traffic?

Yes, is easy..... 84%
No, is difficult..... 7%
No answer..... 9%

Riding quality

Excellent..... 73%
Average..... 18%
Poor..... 4%
No answer..... 5%

Is entrance too awkward?

Yes, too awkward..... 25%
No, not too awkward..... 71%
No answer..... 4%

Would buy another?

Yes..... 89%
Might..... 5%
No..... 6%

OVER-ALL RATING

Excellent 99 %
Average 1 %
Poor 0 %

Have owned another sports car?

Yes..... 83%
No..... 17%

What was previous sports car?

Jaguar..... 40%
Porsche..... 17%
Aston Martin..... 10%
Mercedes-Benz 300..... 6%

Best-Liked Features

Performance..... 60%
Handling..... 35%
Roadability..... 22%
Comfort..... 20%

Quality construction..... 17%
Styling..... 17%
Quiet..... 9%
Brakes..... 9%

Most-Frequent Complaints

Difficult to enter..... 13%
Window design..... 9%
Dealer service..... 7%
Brakes when wet..... 7%
Noisy gears..... 6%
No trunk space..... 6%
Noisy tires..... 5%
Steering-wheel position..... 5%
Leaks..... 5%
Ventilation in rain..... 5%

No complaints at all..... 17%

What Should Be Changed?

Needs no changes..... 35%
Adjustable steering wheel... 11%
Improve doors..... 6%
Offer convertible top..... 5%
Dash light too bright..... 4%

"It can never be mass-produced."—California food processor.

Some of the owners have had trouble with the fuel-injection system, although in all cases the trouble was corrected. Here are troubles mentioned: pressure leaks, broken nozzle spring, broken pump, clogged nozzle and improper adjustments.

Fuel injection seems to provide fuel economy. Many of the owners report averages of around 20 miles per gallon on trips and it is a safe bet that they drive at high speeds most of the time. In city driving they report averages of about 16 miles per

gallon. See the Economy Test results shown on this page, below left.

What About the Rest of the Car?

There is more to the Mercedes-Benz 300SL than fuel injection, though, and we asked the owners to tell us what they think about this machine. Their answers are phenomenal. Almost unanimously, they described the car as excellent over-all. Only one owner in the sample failed to give it an excellent rating and he described it as average. No owners called it poor. This is the best recommendation any car has received in our five years of Owners Reports.

The single owner who described it as less than excellent had this to say about the car:

"Styling is smart. It has good getaway. Suspension is wonderful on slippery roads. Have had trouble with door locks. Oil sprays over the engine. Difficulty with wheel alignment. Brakes dangerous when a little wet. I have trouble keeping warm in winter. Many small things seem to give trouble."—New Jersey owner.

How Wonderful Can a Car Be?

It is difficult to know where to start quoting when the replies are so enthusiastic. For example, here are a few comments from owners:

"The car is fantastic!"—Arizona owner.

"I keep my 300SL very carefully, mechanically and appearance-wise. I spend some hours wiping the engine clean of even the slightest fleck of dust. I enjoy this. I enjoy the whole car. It is a revelation to own such a quiet piece of machinery which can become such an antelope when you want speed."—New York banker.

TEST DATA

Acceleration Tests

MERCEDES-BENZ 300SL

Equipped With 3.25:1 Rear-Axle Ratio

¼ mile from zero 15.2 seconds
½ mile from zero 24.8 seconds
0 to 30 m.p.h. (1st gear only) 3.7 seconds
0 to 60 m.p.h. (1st and 2nd gears) 9.1 seconds
Top speed (by speedometer) 150 m.p.h.

Actual top speed about 137 m.p.h.

Clymer's Economy Test

MERCEDES-BENZ 300SL

Miles per Gallon

At constant 30 m.p.h. - (in 3rd gear) - 22.8 m.p.g.
At constant 50 m.p.h. - 22.4 m.p.g.
At constant 60 m.p.h. - 20.3 m.p.g.
At constant 75 m.p.h. - 16.9 m.p.g.

Mileage - Cross Country

Los Angeles to Rosamond Dry Lake in Mojave Desert (via Angeles Crest winding mountain highway) 18.9 m.p.g.
Rosamond to Yuma, Ariz., via Salton Sea (246 ft. below sea level) 21.6 m.p.g.
Yuma to Los Angeles via Needles, Calif., and Lake Arrowhead 20.3 m.p.g.

Not to be confused with the 300SL, the Mercedes-Benz 190SL has a four-cylinder, overhead-camshaft engine of only 115.7 cubic inches. It does not have fuel injection, instead has two Solex carburetors. It has a top speed of about 100 miles per hour, a 0-to-60 time of about 13 seconds. Very rigid and rattlefree, it is a fine, carefully built, high-speed touring car with roll-up windows, easy-to-operate top. It costs about \$4000.



"I drive on a curving, crowned street twice a day and it's more fun than 18 holes of golf or high-school football was. And I am 47 years of age."—California owner.

"No one but an owner can conceive what a truly fine car the 300SL really is. The finest piece of automotive engineering in all the world—bar none."—Florida chemist.

Complaints

However, there are some complaints. The owners are enthusiastic, but not blind to the car's faults.

The most frequently mentioned complaint involves the gull-type doors that swing upward from roof-mounted hinges. The car is too awkward to enter and leave, say 25 percent of the owners.

"Turret doors are unnecessarily extreme and certainly poorly designed for women."—New York advertising executive.

"Getting in and out is awkward, but who cares in a sports car?"—California canner.

"A little difficult getting in and out, but once you are in and on your way you find yourself happy once again."—California investment banker.

"If you have trouble getting in, you have no business driving the car."—Wisconsin engineer.

Finally on the door subject is this comment from a woman owner: "It is not awkward. After a half hour's practice with tight skirt I find it practical, although owner should be athletic."—California owner.

Second on the complaint list was the absence of roll-down windows. Because of the door construction, there is no room for window-crank linkage. The windows are removable, but you have to be outside the car to do it.

"Windows assemble from the outside. This is inconvenient during rainstorms. They will eventually have to operate from inside."—Michigan engineer.

"Lack of a convenient and accessible place to keep the windows when removed."—Ohio real-estate man.

"Don't like window arrangement. However, there seems to be no alternative due to the frame. It's still better than side curtains."—California disk jockey.

Third most frequent complaint was the poor dealer service. There were 7 percent of the owners making this complaint.

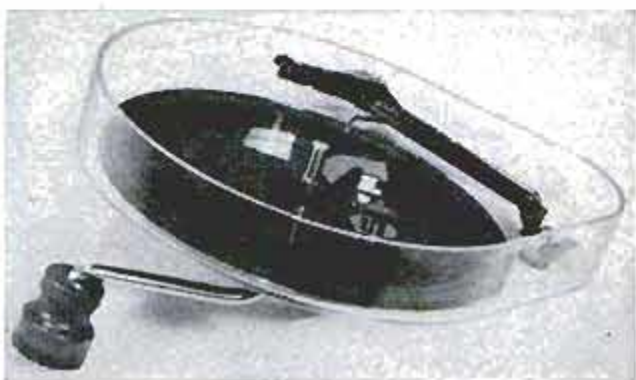
"Mercedes people seem more interested in tuning cars for racing and the resultant publicity than in repairing cars already sold. Cars will be out of service at least

(Continued to page 262)



Tiny Record Player in Toys Makes Them Talk Back

Telephones, Teddy bears and other toys now are talking back to the small fry. A miniature record player built into the toys is said to talk louder than the normal human speaking voice. The record is played by turning a crank. Up to 25 seconds of sound can be recorded. The record is still loud after more than 6700 plays.

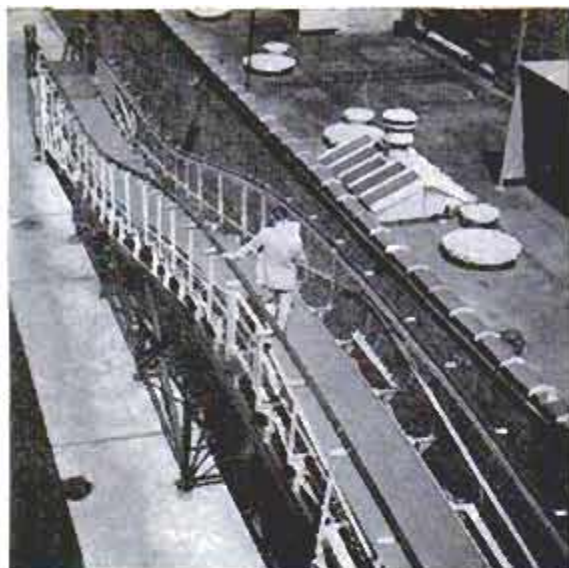


German Monorail Transports Concrete in Cars at 100 Yards per Minute

In Germany, little cars riding monorails are used to transport concrete from the mixer to the construction site. The rail can be laid, taken up or moved to a new site quickly. The little car, powered by a three-horsepower gasoline engine, moves along

the rail at 100 yards per minute and requires no driver. It carries 10 cubic feet of concrete, and a trailer can be attached to increase the load. The car can also be powered by an electric motor or even by a small diesel engine.





Moving Sidewalks Carry Pedestrians Around Turns, Up Hills

Moving sidewalks that travel at normal walking speed have been unveiled by two companies. One, built by Hewitt-Robins, Incorporated, consists of a rubber carpet mounted on a train of steel pallets that run on steel track. Electric motors drive a chain which engages dogs on the underside of each pallet. The conveyor takes

curves, loops or moderate grades in stride. Three will be installed at a new air terminal in Dallas. The second moving sidewalk, built by Otis Elevator Company, has an endless series of articulated, cleated treads, traveling on a wheel and track system, with ball-bearing "wheels." The conveyor can climb grades as steep as 14 degrees.



Robot Drives Toy Tractor Away From Obstructions

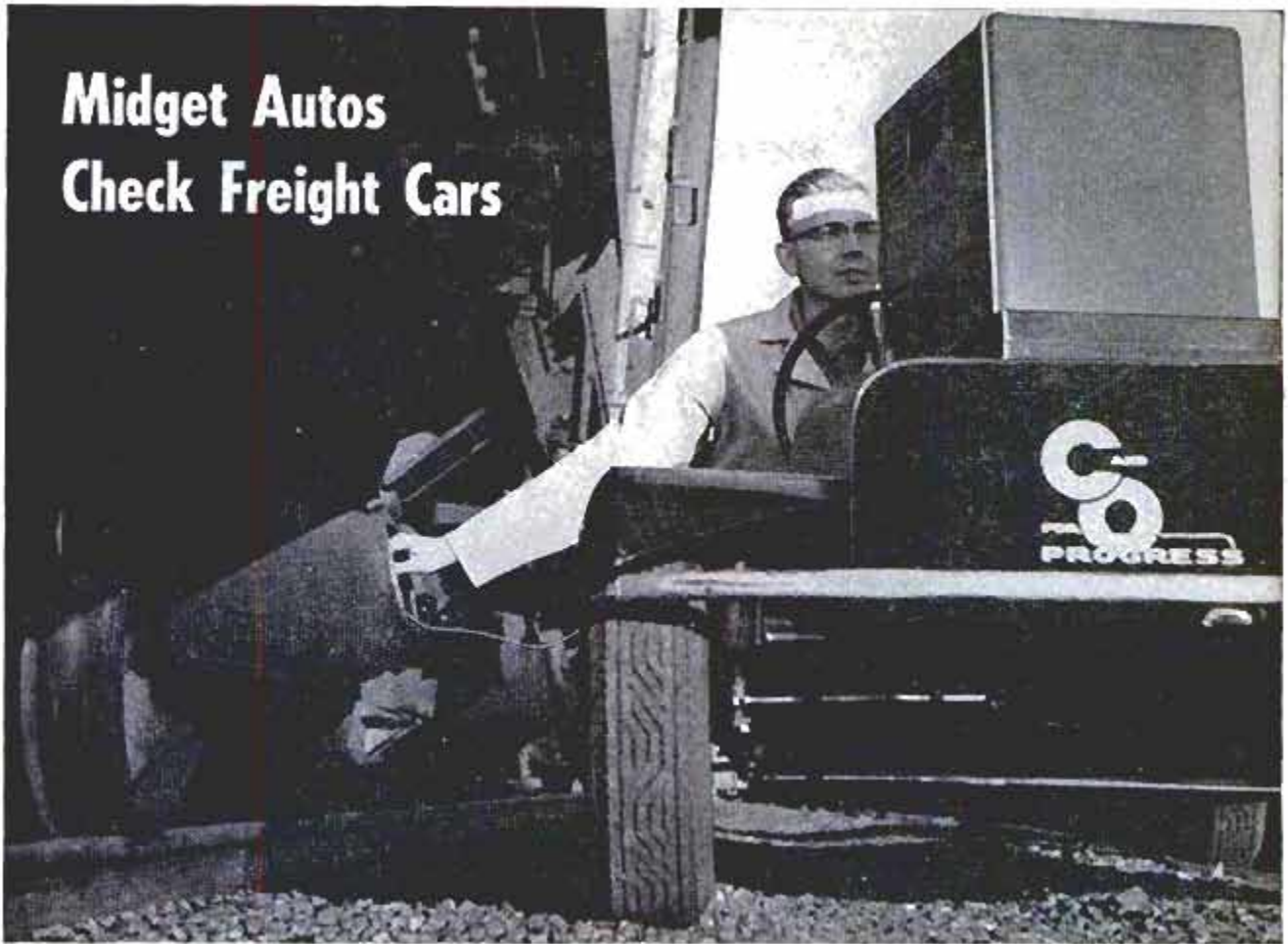
No obstruction can overcome "Marvelous Mike," a robot that operates a toy tractor. When the tractor strikes an obstruction, the robot quickly shifts gears, operates clutch pedals and backs away from the obstruction. Then it rumbles off on a new tangent. The robot's arms and legs move realistically as he operates the controls of the tractor. "Mike" and his tractor won't stop until the youngster turns off the switch. The toy is powered by a 4½-volt motor operated by three flashlight batteries in a box behind the robot.

Car Bingo Keeps Travelers Entertained ➤

Bingo has appeared in a new form for breaking the monotony of long auto trips. Included in the new game are eight plastic-coated cards with pictures of typical sights along the road. Players mark off the squares with crayons. At the end of the game, the crayon marks can be wiped off with paper tissues. The set includes four different bingo games using automobiles, traffic signs, billboards and trademarks.



Midget Autos Check Freight Cars



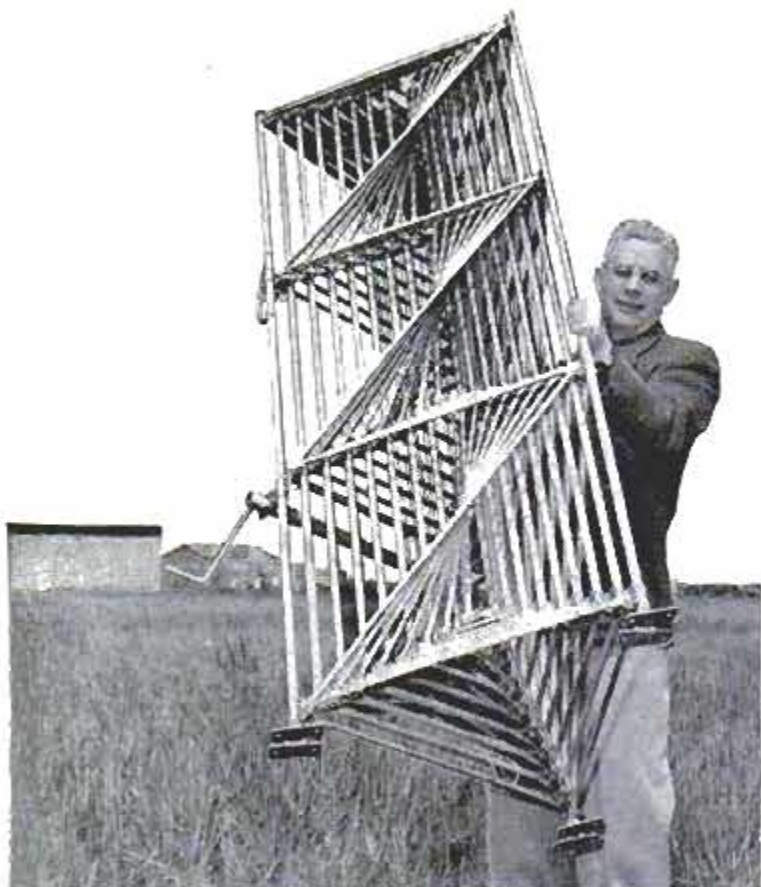
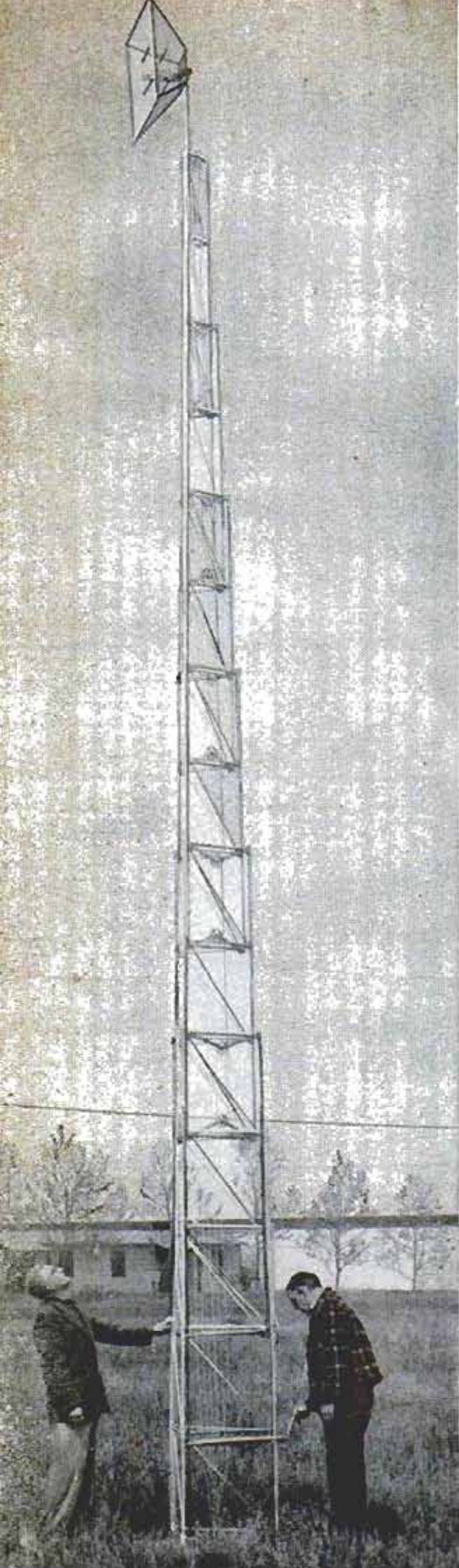
Inspecting railway axles and wheels was a tedious job until the Chesapeake and Ohio started using midget cars. The little autos roll right down the ties with the driver at just the right level to check the wheels. Built into the cars are flaw-detecting reflectoscopes which project ultrasonic waves. The waves bounce back if they strike a flaw in the wheel or axle, and show up on an oscilloscope mounted directly in front of the driver. The system eliminates the need for disassembly of the trucks during inspection.



Lawn Rake With Rubber Teeth Won't Spear Leaves or Toes



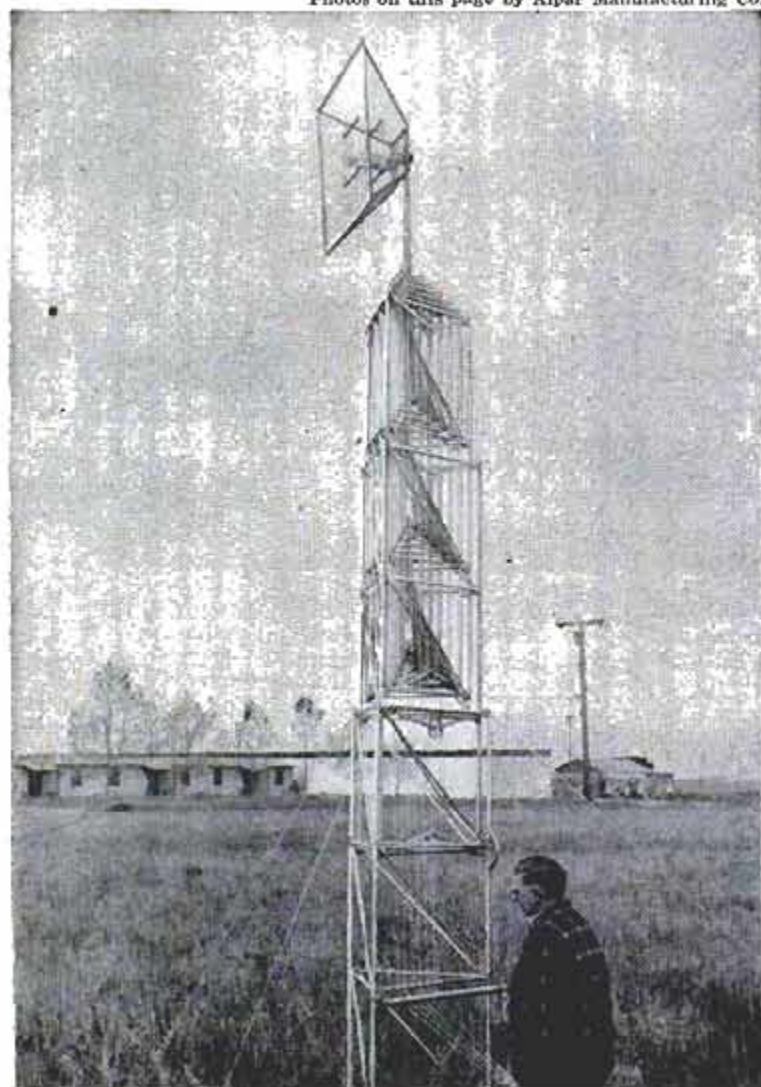
Flexible rubber teeth on a contour-hugging rake comb up leaves and cuttings but do not dig out the grass or damage roots. Because the rake does not spear the leaves, no unclogging of the teeth is necessary. If the rake is left on the lawn and someone steps on it, the rubber teeth simply flatten. There is no injury to the foot and the handle does not fly up. The rake is made in 8, 12, 16, 20, 24 and 32-inch widths.



Fifty-pound nested tower, cranked up at left to 40 feet in five minutes, is held by inventor-manufacturer C. R. Parmenter

Tower on the way up. Operator of crank holds the nylon cords that operate locking levers that anchor each section of tower

Photos on this page by Alpar Manufacturing Co.



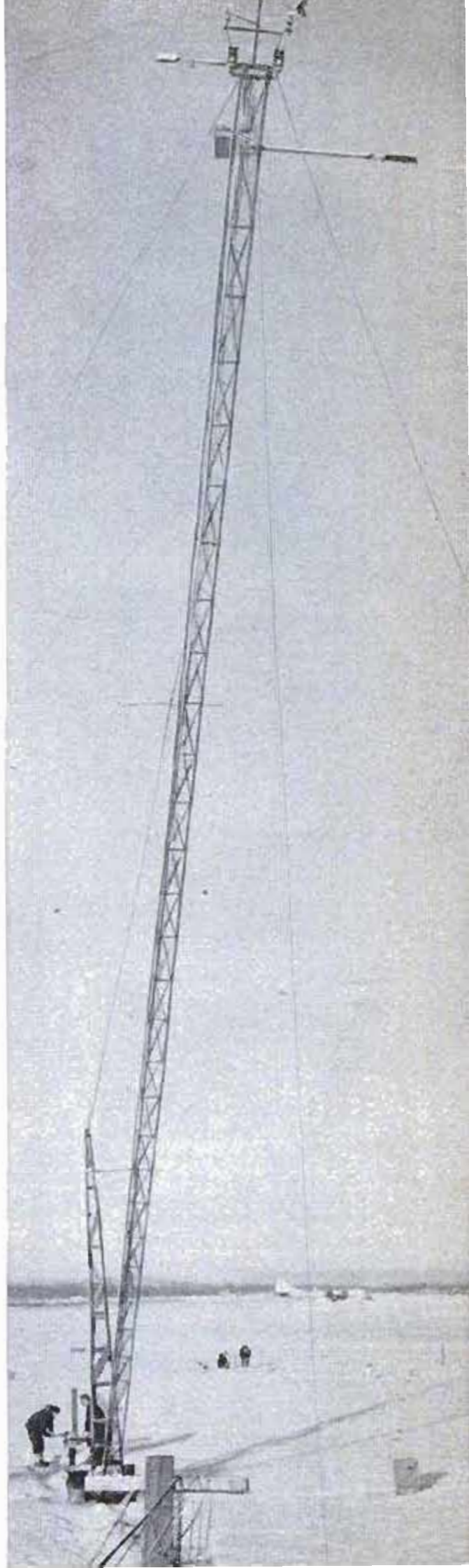
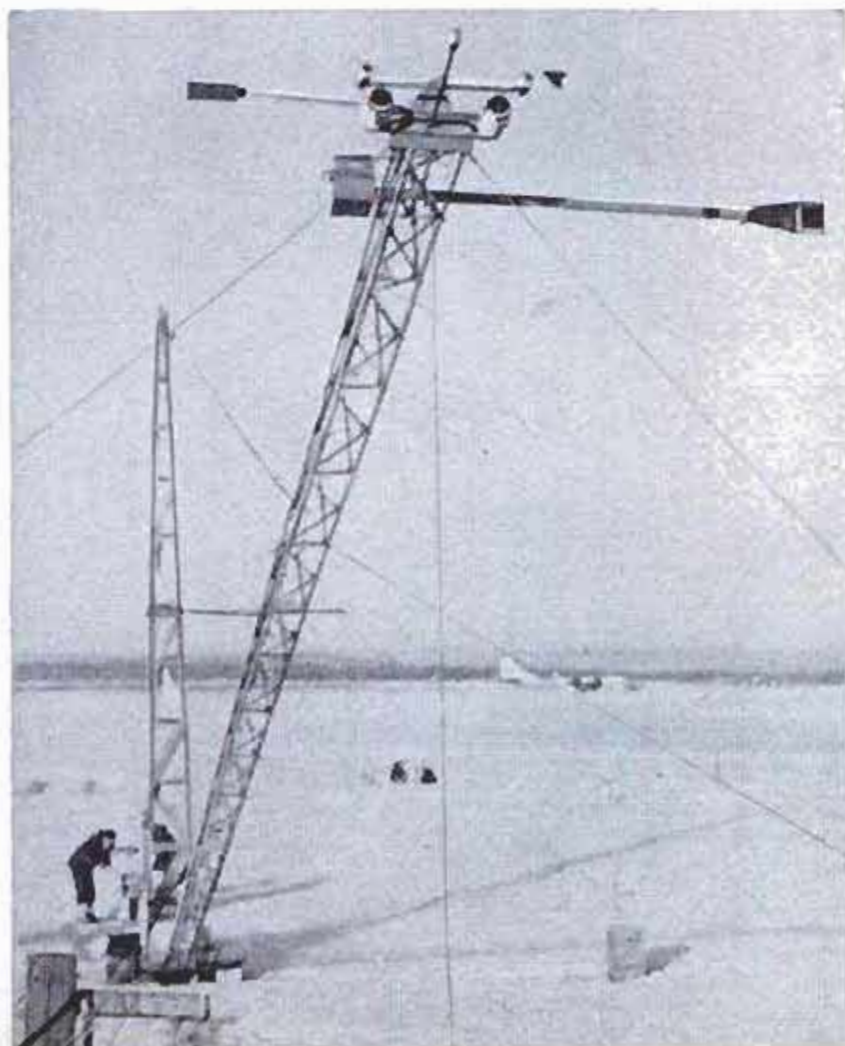
Radio Towers Crank Up To the Sky

RADIO AMATEURS and Civil Defense officials can carry a nested 40-foot radio tower in their station wagon or on top of a car, then crank it up to full height when they wish. The collapsible aluminum tower weighs 50 pounds and can be extended for use in five minutes. An ingenious system of cord-operated levers locks or unlocks each section of the tower as it is raised or lowered.

The towers are engineered to withstand 100-mile-per-hour winds when properly guyed and can be lowered at once when higher winds are expected. Among other purposes, they are used for temporary lighting stands and for public-address systems. One railroad company mounts a collapsed tower on a rail car, then erects the tower at various points along its right of way to check the signal reception of the division's radio transmitter.

Another kind of aluminum crank-up tower, 60 to over 100 feet tall, is assembled on the ground and then erected by one man in less than an hour with the aid of a short boom or spar pole. ★ ★ ★

Hundred-foot aluminum tower used by Stanford Research Institute in Arctic research is assembled on ground, then cranked into vertical position. Here, icing problems bar nested type of tower





British Railways photo

Swiveling Deck on Scottish Ferry Ends Need for Gangplank

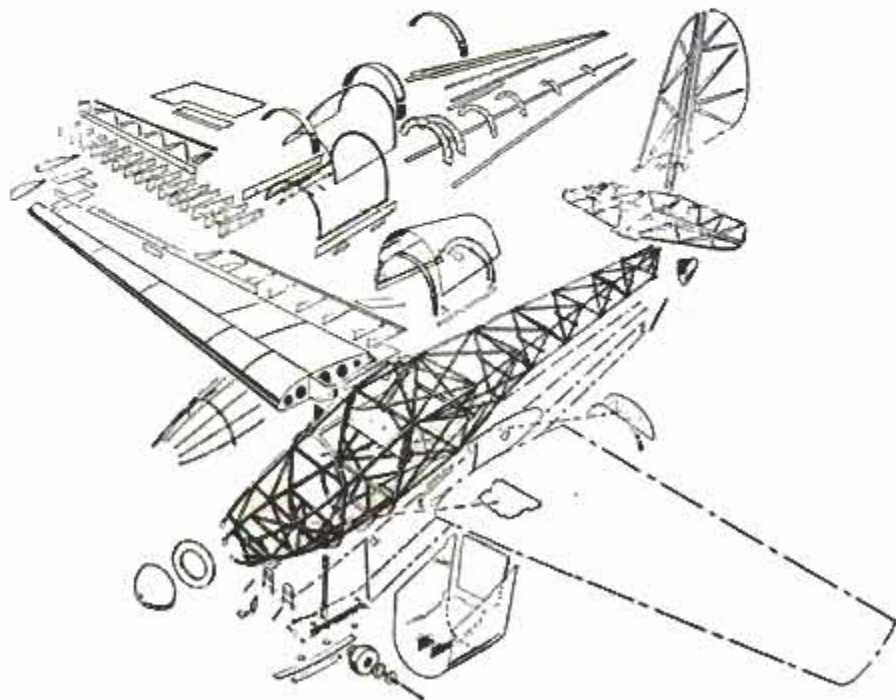
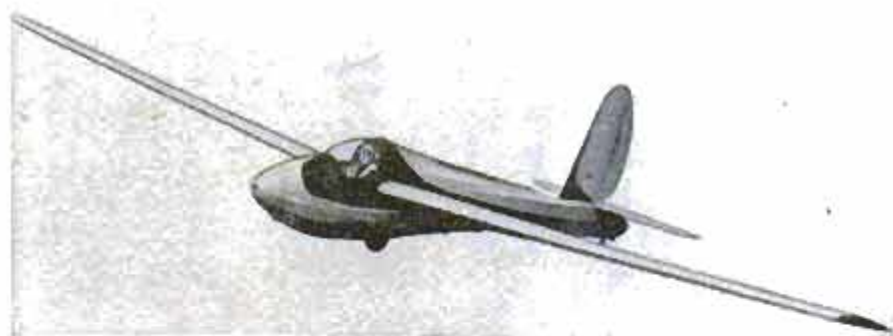
Cars and trucks are carried between the Scottish mainland and the island of Skye on a ferry boat with a swiveling deck. The boat, the *Portree*, edges up to a wharf, the

deck swivels around and vehicles are loaded or unloaded without the use of a ramp. The unique vessel is owned and operated by British Railways.

Sailplane in Kit For Glider Fans

Designed primarily for gliding clubs and home aircraft-building enthusiasts, a high-performance sailplane in kit form is being marketed by Schweitzer Aircraft Corp., internationally known glider manufacturer. The metal sailplane, called the SGS 1-26, has a wingspan of 40 feet, a length of 21 feet 3 inches and a maximum gross weight of 575 pounds. It has been granted a Civil Aeronautics Administration approved-type certificate. Performance has been proved by a prototype that flew more than 150 miles.

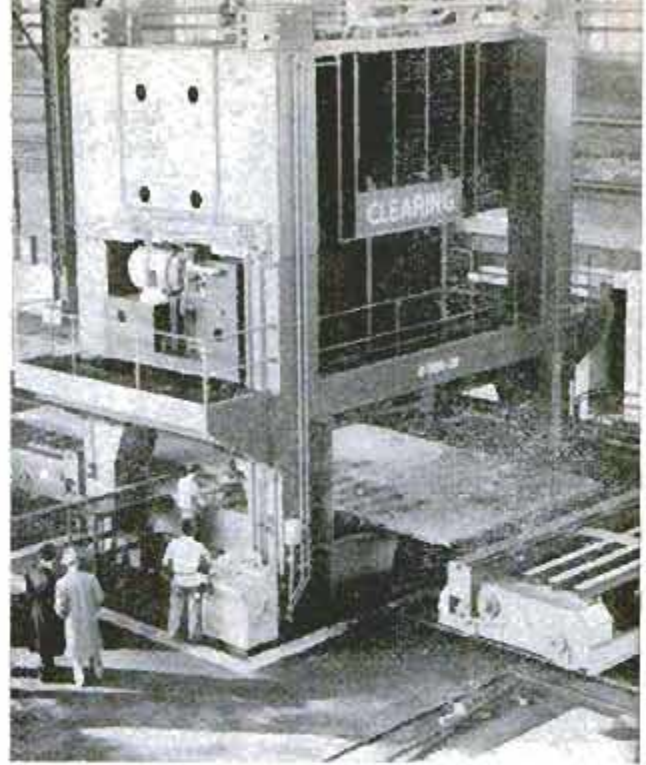
During 5000 miles of driving, an oil filter will remove a pound or more of dirt and sludge from the oil in a car, according to GM engineers.



Giant Push-Button Press Straightens 20-Inch Slab

Steel plate nearly two feet thick is straightened by a giant push-button press installed at Coatesville, Pa. A cylindrical pressing head moves from right to left a total of 13 feet to iron out the steel, which is used as armor plate for Navy ships. Two motorized cars on either side of the press can shift a slab 50 inches wide and 14 feet long forward and backward so that its entire area can be pressed. The two-story-high press can straighten steel plate 20 inches thick to within $\frac{1}{2}$ -inch tolerance. It is electrically controlled by one man from a control panel and derives its pressure from a hydraulic system.

Car on each side shifts slab back and forth.
The two-story press weighs 1,500,000 pounds



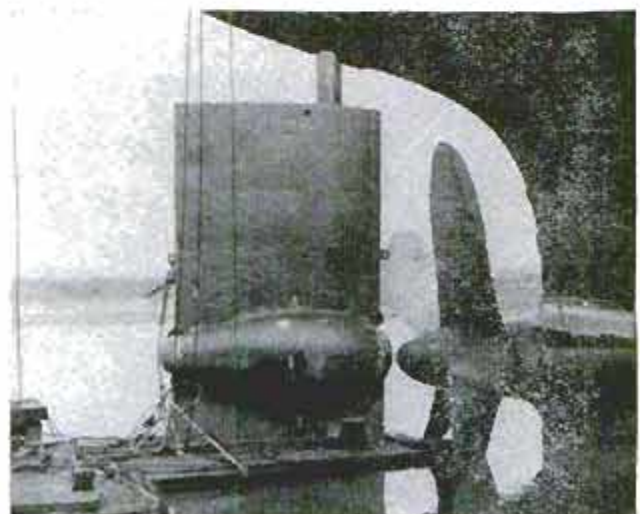
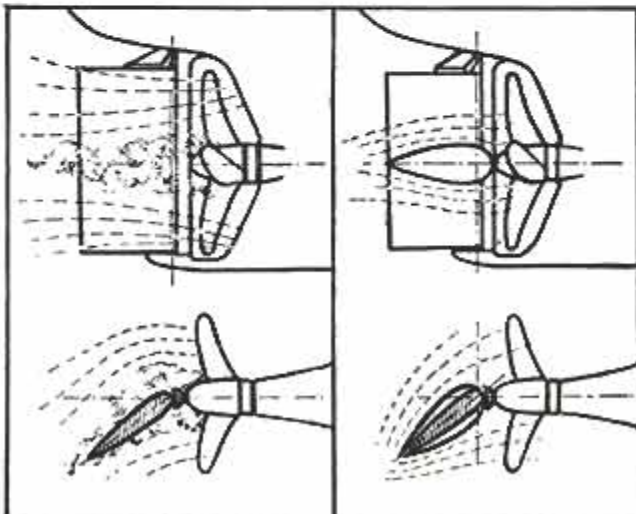
Speedy Coal Digger

Up to eight tons of coal per minute pour from the conveyor of a machine that removes the full face of the coal seam in one operation. Two boring arms spiked with breaker bits revolve at the front of the machine to cut double overlapping circles and break out the coal between. At the same time, two trim chains fitted with tungsten-carbide-tipped bits slice out the top and bottom segments.

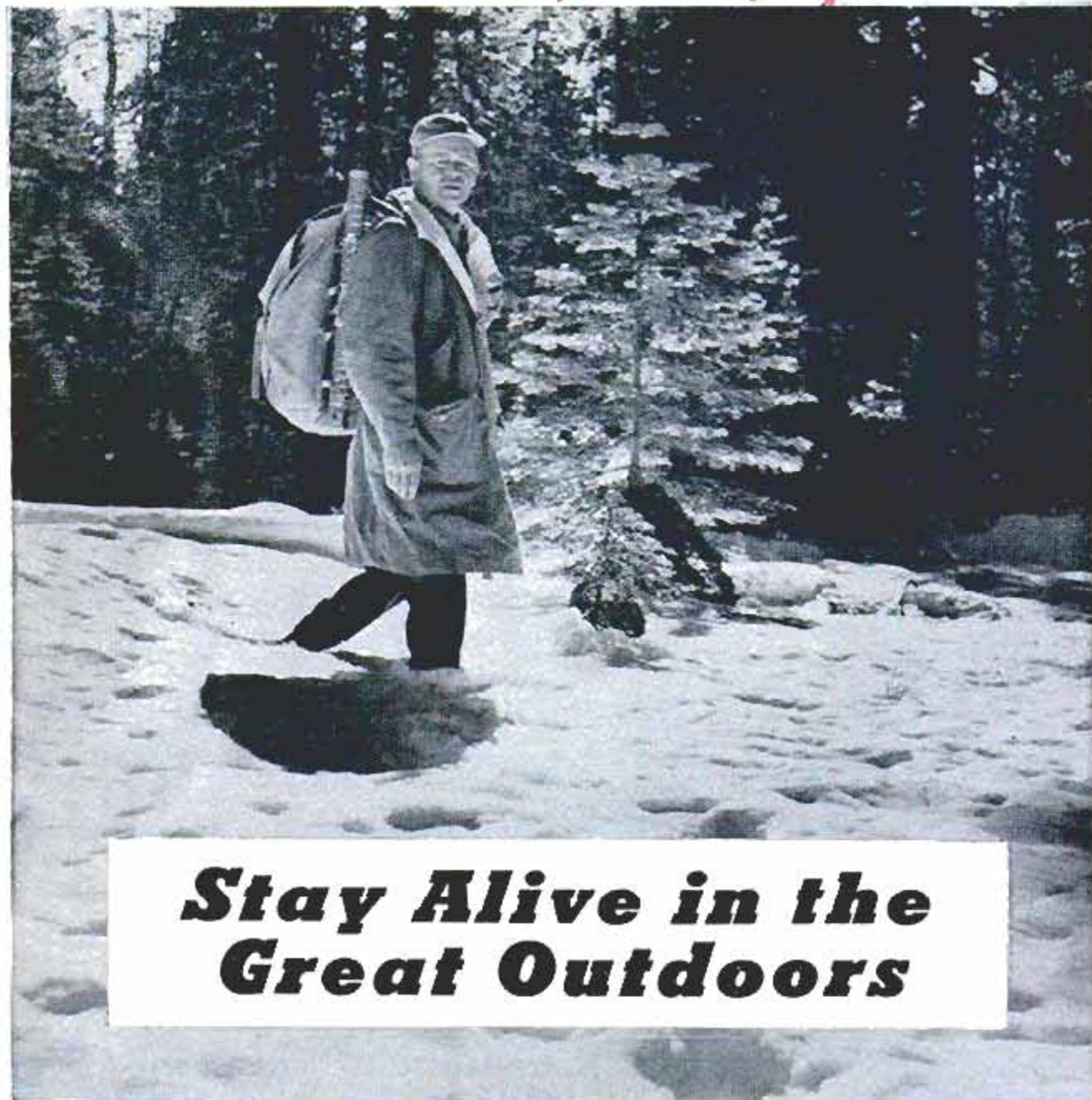
Iron Bulb Smooths Flow of Water from Ship's Propeller

Welded to the rudder immediately astern of the propeller, an iron bulb has been found to increase the speed and efficiency of maritime vessels of all kinds. The de-

vice, known as the "Costa Propulsion Bulb," smooths the flow of water around both propeller and rudder, tending to eliminate cavitation, or empty space.



Notes: Western Round-trip
8421 Melrose Ave., L.A. 48, Calif.



Stay Alive in the Great Outdoors

When lost in the snow, backtrack your own trail or glance behind to make sure you're going straight

By James Joseph

ABOUT 12,000,000 vacationers—perhaps you among them—camped in national parks and forests during 1955. Another 8,500,000 camped in other woods. Never had more Americans been recreation-minded.

Statisticians were jubilant. Somewhat less elated were our sparse-country guardians—the forest rangers.

To them, 1955 was a season of brazen tomfoolery, of nitwit misadventure and blundering.

Rangers spent sleepless nights fighting fires which carelessness had started. They snatched hundreds of would-be Edmund Hillarys from precipices. They splinted umpteen legs and broken backs. They carried out the weak and weary. They parachuted from helicopters in their never-

ending search for the lost and the strayed.

"Kinda pathetic," a district ranger concluded, "the way people get themselves into jams." He swept a hand toward a gnarled crag. We'll pull a dozen hikers out of that granite mantrap before summer's end. And 'long about November, with the first snows, we'll be going up there with ski litters after more."

Nationwide the plot's the same. Only the names are different. More and more vacationers are succumbing to the beauties—and dangers—of America's great outdoors.

Why? Because too many week-end woodsmen venture into primitive areas outfitted with every camping essential save one: common sense.

One western camper built a fire in vege-



Survival may depend on your feet. Keep your boots well oiled to make them as waterproof as possible

table rather than mineral soils—and died in his own conflagration. He kindled it in a wide, open space. Trouble was he didn't recognize the reddish-brown, dry-as-parchment soil for what it was: duff. Duff is gray-to-reddish humus, the product of mold, decayed logs and forest litter. It's as volatile as naphtha. During the night his fire literally went underground, ignited nearby brush and trapped him. Had he camped on mineral soil—heavier, flintlike decomposed rock—he'd have been safe.

Another camper soloed a canyon wall. From the river it had looked easy. Half-



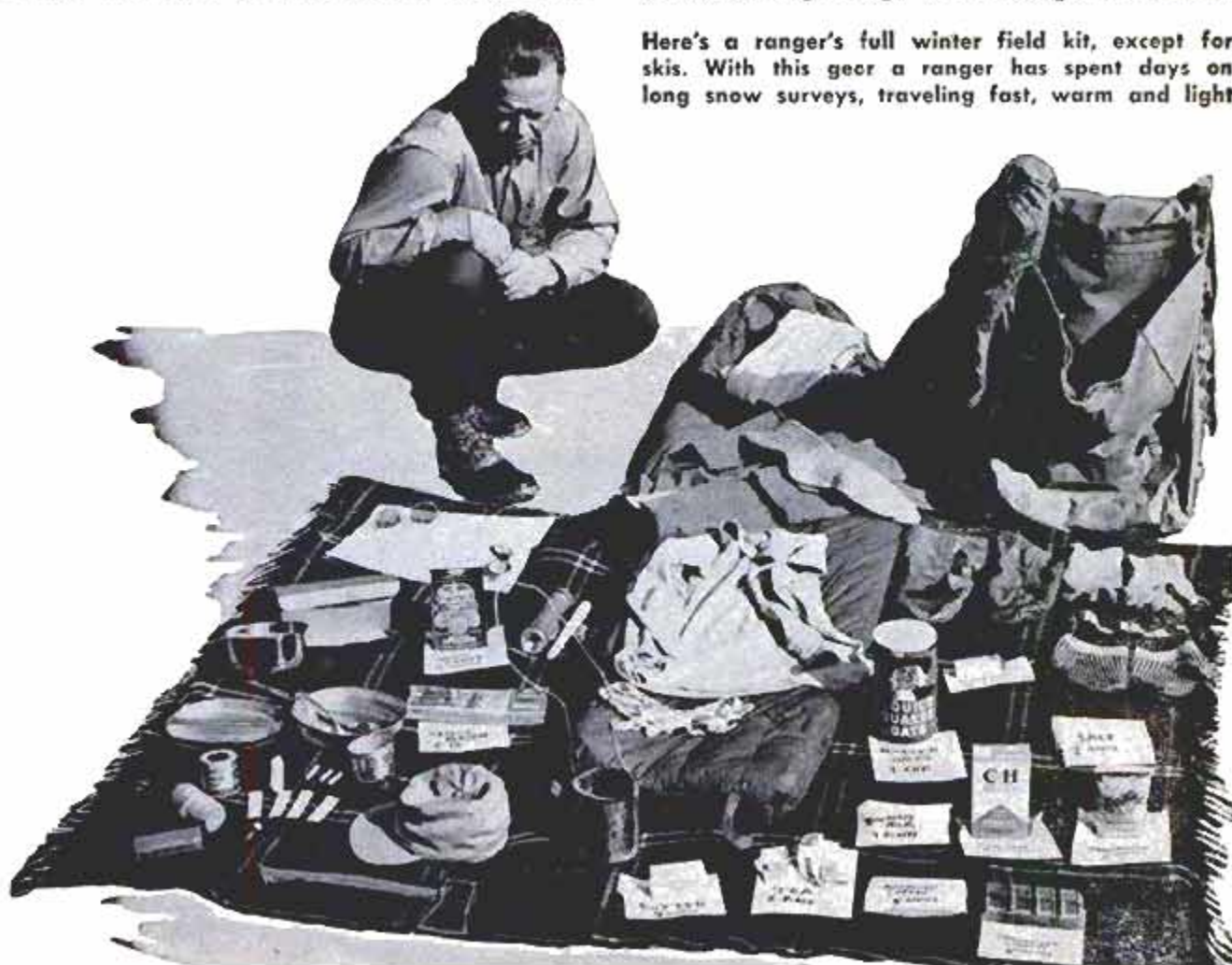
Dip a batch of matches in barely melted paraffin. In wet weather, scrape off coating for a dry match

way up, his ascent was blocked by a giant boulder. He tried backtracking. Suddenly, like a small boy caught in the fork of an apple tree, he discovered that it's far easier getting up than down. Rangers worked 24 hours extricating him.

Rescuers explain that seldom do even the most experienced woodsmen go it alone. They use the buddy system. And before scaling anything much higher than a stepladder, they survey the terrain, plotting their escape before they start.

Recently a veteran packer was crossing a narrow log bridge when he spotted a man

Here's a ranger's full winter field kit, except for skis. With this gear a ranger has spent days on long snow surveys, traveling fast, warm and light





If you find green grass along a dry stream bed, you probably can find water just beneath the surface



Ranger scoops up hatful of water from a "well" he dug. Some streams go underground during summer



Dust-dry, gray-to-reddish vegetable soils are dangerous. They can spread a campfire underground



Mineral soils are heavier than vegetable soils, feel rough and flinty. Build fires only on these soils

stumbling along the stream bed, 100 feet below. Puzzled, he hailed the pedestrian. No reply. He tried again. Remembering that a man was reported lost, he tethered his string of mules and clambered into the ravine.

When the packer finally caught his prey he asked, "Didn't you hear me yellin'?"

The camper wheeled around, gaped and collapsed in the woodsman's arms.

"Thank God," he whispered, "you found me!"

Since losing his way three days before, the camper had stumbled downstream. His whole being throbbled with but one purpose: Follow the stream.

Single-mindedly he'd pushed on, looking neither left nor right (nor overhead), so intent was his frenzied drive for survival. Yet during his bruising trek, he'd walked

blindly under four bridges, skirted a traveled highway, passed a couple of camping areas and missed a score of well-marked trails.

The packer fingered a map. "Feller," he said, "it's a good 25 miles to a downstream town. You'd never have made it."

When you realize you're lost (perhaps hours after becoming disoriented), stop. Sit down. Think. It's exhaustion born of panic, not starvation, that kills.

One hiker, lost and thirsty, stopped, sprawled atop a boulder edging the dry bed of a high-country stream, and tried to figure some way out of his plight. As he lay there he heard water trickling. He listened. The sound came from the dry stream bed. He investigated, began digging among the loose pebbles. Less than a foot below the surface he struck water.

The stream, like most in high country, especially during midsummer, was flowing beneath its wet-weather bed. Refreshed, the camper regained his wits and made camp by nightfall.

If you're lost in winter, you can often back-trail, following your own path to safety. In summer it may be tougher. If you're not too far from camp, stay put. Try to get the attention of a forest lookout tower by flashing a mirror or bright-metal object, a tin can for example. A smoky fire from green branches may bring help. Failing this, you may have no choice but to start downstream. Walk only by daylight, never at night. Senses dulled by the stream's gurglings, you might blunder over a waterfall in the darkness.

Ridges are likewise highways to safety. It's a good idea, particularly in dense, snow-covered forests, to pick out a distant tree or landmark and walk toward it. Walking tree to tree is better than kidding yourself into believing you're endowed with a God-given sense of direction.

Above all, stay alert. Except in our most primitive areas, you're bound to cross a power line (and its maintenance trail), a road or fence long before finding that downstream village.

Rangers are forever analyzing the human animal in panic. The picture is far from flattering.

"Panic," concludes one forester, "is an evil sculptor. It molds men into twisted caricatures."

Comments another, "When we're tracking a guy, we throw the book away. We

bypass the places we'd reasonably expect to find him. We begin by searching the most unlikely. And usually that's where he is."

A few years ago a party wandered off a snowbound Yosemite trail. Although it hadn't snowed for three days, the party tossed common sense into the nearest snowdrift and pushed ahead with the frenzied hysteria of the lost. Searchers caught up with them 18 hours later. How? Merely by following their well-plowed trail.

Commented one rescuer sourly, "You people were blazing a path wide enough for a bulldozer."

For the first time the hikers glanced behind them and discovered their own trodden trail. No one had thought of back-tracking to safety!

Anselmo Lewis, district ranger of California's Mount Baldy area, has seen panic at close quarters. Yet even Lewis can't explain the "case of the shell-shocked hunter."

"Reads like fiction," Lewis admits, "but it's fact."

The ranger and his crew tracked a hunter, lost for three days near Mount Baldy. They found him by following a trail littered with unfired rifle shells.

"I kept firing," the exhausted man insisted, "but nobody heard me."

Actually, he hadn't fired a shot. Instead, he'd been ejecting one shell after another.

How could shock so numb a man's senses?

"Beats me," declares ranger Lewis, "but it does. That incident proves it."

In the summer of 1952, a young husband

Caught out alone in the winter woods? You can sleep comfortably regardless of the snow on a bough bed





One Oregon hunter, caught in a snowstorm, kept himself warm—and alive—by walking around a tree all night. Below, instead of eating raw snow, which saps vitality, warm to body temperature. Add salt or cube of concentrated soup if possible



and wife hired a guide, loaded their pack animals and headed for Colorado's high country. Theirs was billed as the vacation to end all vacations. Unfortunately, it lived up to its billing.

Two blistering days later they camped on an emerald lake nestled between twin peaks at 10,000 feet. Hubby donned trunks and, heedless of the guide's warning, dived into the shattering cold water. He died moments later—victim of a heart attack.

Even in midsummer, only the surface two or three feet of a mountain lake are warm. Beneath lurks snow-cold water (veteran campers use lakes as summertime iceboxes, submerging food in watertight containers). Fatigue plus high altitude plus the water's shocking chill can be fatal.

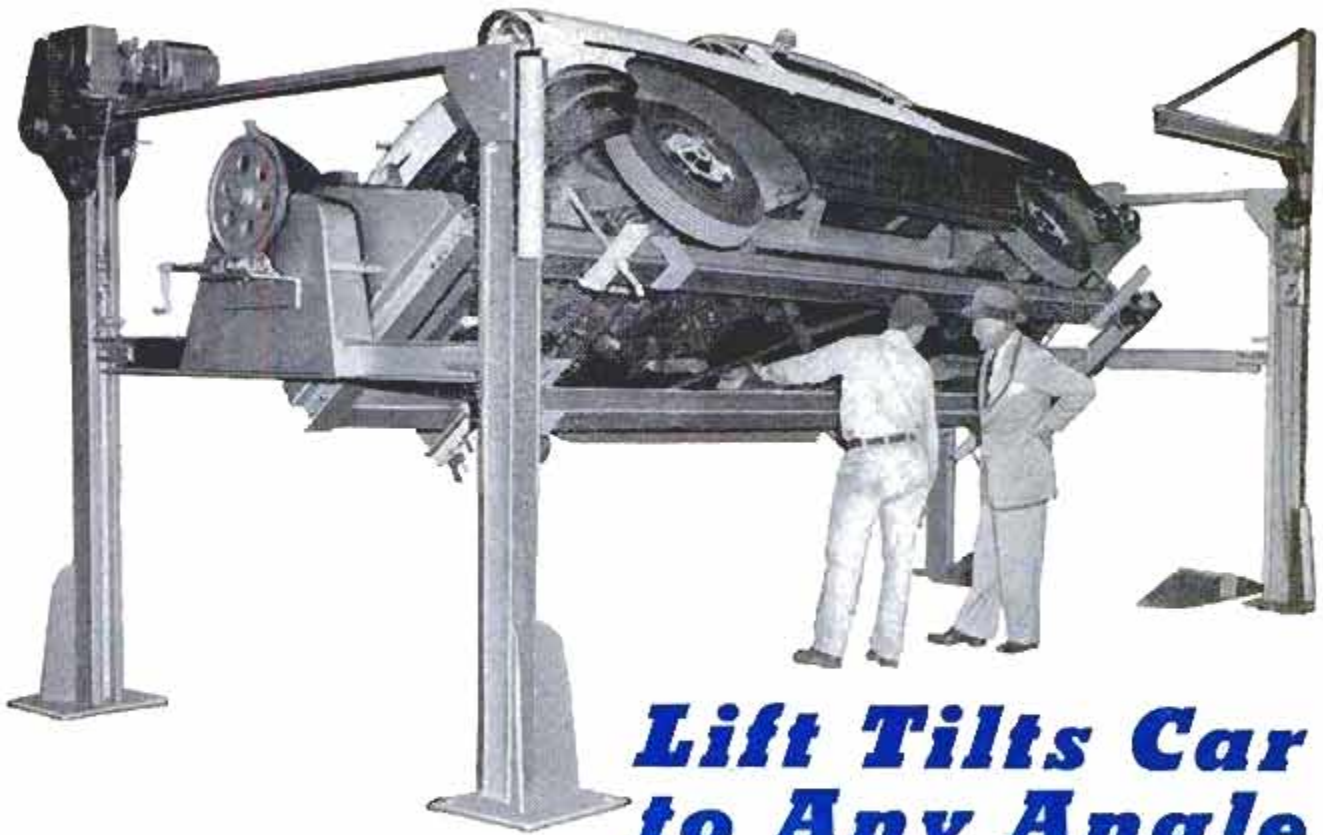
Those pondsized high-country lakes are deceiving in another way, too. You may be rated an endurance swimmer in low country, but at 10,000 feet you'll be lucky to swim 200 yards before exhaustion or cramps set in.

Although thousands blunder into trouble, many others keep their wits and survive. Consider the Oregon hunter caught out alone after dark in an early fall snowstorm. He saved himself simply by walking methodically around a tree all night. The exercise, carefully paced to avoid fatigue, kept his blood circulating and prevented frostbite. Each circling packed the snow deeper. Within a few hours he'd tramped a shallow shelter. Next morning, warmed by the sun, he made his way safely to town.

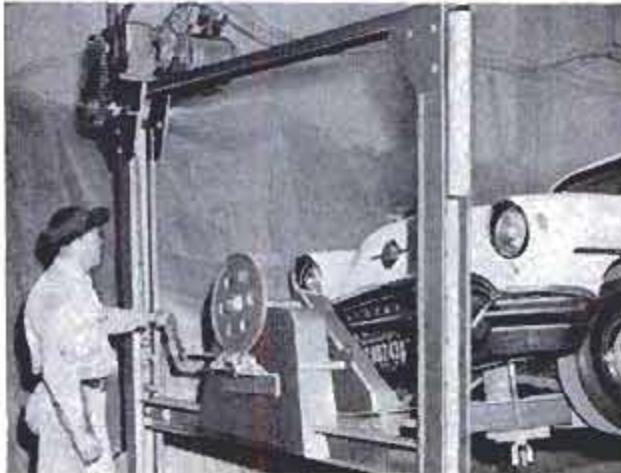
"That guy," appraises Yosemite's assistant chief ranger, Duane D. Jacobs, "had snow sense!" Jacobs should know. He has spent several thousand miles of his life on skis and snowshoes.

Seven members of Phillips Exeter Academy's mountaineering club used snow sense when caught in a thunderous avalanche on Maine's mile-high Mount Katahdin. They were swept a thousand feet down the mountain, yet they lived. They saved themselves by backstroking, like swimmers, as the snow swept over and around them. Backstroking thrust them to the slide's crest, preventing

(Continued to page 252)

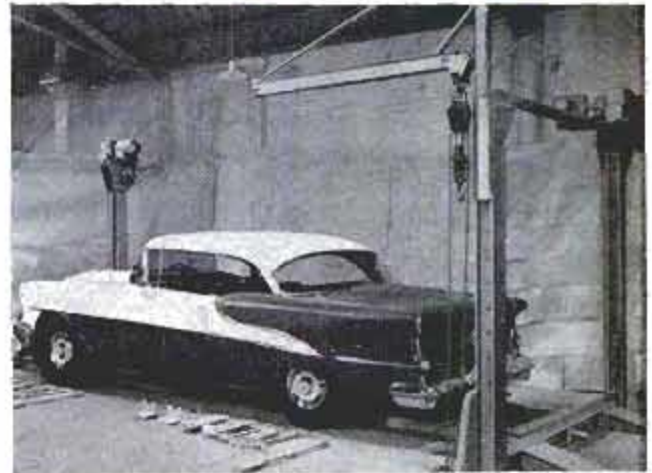


Lift Tilts Car to Any Angle



Mechanic turns a hand crank to tilt the automobile. Little effort is needed because car is balanced

Automobiles can be tilted to any angle for convenient repair work by a machine that resembles a barbecue rotisserie. A car is driven onto a pair of ramps and large clamping devices are attached to the frame. It is raised to a convenient height by hy-



Clamps beside car on ramp are fastened to frame of automobile, hold it firmly during tilting operation

draulic lift, and a hand crank is turned to tilt the car as much as 90 degrees. Because the vehicle is balanced on the center of the device, little effort is necessary to tilt it by hand. The car can be tilted either right or left to avoid gasoline or oil spillage.

Plant Fish in Salton Sea

Pan-sized Gulf croaker fish and large, gamy corbinas planted in the Salton Sea have multiplied rapidly and promise to make the California desert lake a top sport-fishing area. Dr. Boyd Walker of U.C.L.A., director of the program, has been investigating the possibility that the vast, salty body of water will support a large fish population. The corbinas were planted two years ago, the croakers in 1950-1951.

Army Diesel Locomotive

Generators and electric motors are dispensed with in a diesel locomotive built for the Army. The engine transmits power directly to the drive wheels through a mechanical-hydraulic transmission similar to an automotive torque converter. The 48-ton experimental locomotive uses a minimum of critical materials and does not require the skills needed to maintain a conventional diesel-electric locomotive.



Lineman leans 'way over to slide rubber "snake" over wire. Voltage here is 4000 volts phase-to-phase

The Hot-Line Men Never Trust to Luck

By Richard W. Emery

BEN FRANKLIN ran a kite string up into a cloud and took a thunderstorm's pulse. Electricity tingled under his fingers. Modern linemen know about Ben's efforts, but they also know that within the same year two centuries ago, a Russian scientist tried the same kite-flying experiment and got himself electrocuted.

Ben was lucky, that was all. With high voltages, you never trust to luck.

"In this game," the linemen say, "there's no second chance."

From one side of the United States to the other, high-voltage lines bring elec-

trical power from generators to substations and from substations to homes and factories.

The hardy souls who keep watch over those lines are called linemen. There are no weak knees in their fraternity. Atop poles or steel towers when the wind whistles and high-voltage whispers behind their heads, they live close to death and are unafraid.

Their job puts them into a world of their own with a vocabulary all its own. They speak of "splashovers" and relays, "pig-tail sticks," "burndowns," "rubber snakes"

and "220 KV." And in their world of high voltages the ordinary ground rules of safety don't reach far enough: They live by an exacting safety code all their own.

They work without horseplay. They never dare each other to try something foolhardy. They go by the book rules because each one of those rules had to be learned the hard way, back in the beginning of hot-line work. They keep electricity flowing and most of them live to a ripe old age.

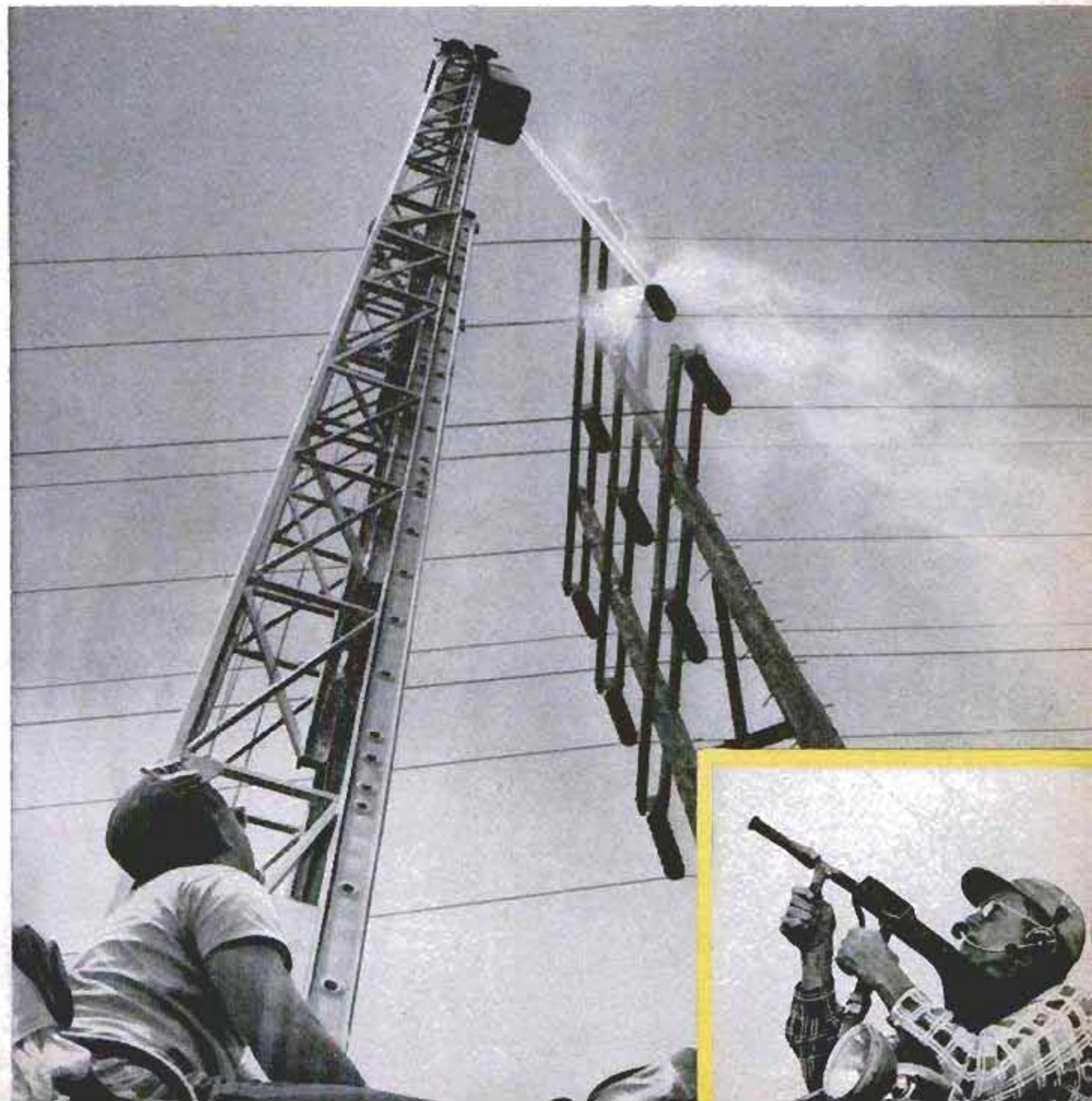
"The more hazardous the job, the fewer accidents we have. Our accidents are mostly on something routine where the man didn't have his mind on the job." That's from the safety engineer of the Southern California Edison Company, which has an outstanding safety record.

Power companies learned long ago that they could spare their linemen many a hazardous job under emergency conditions by training some of their linemen to be patrolmen and detectives.

Patrolmen patrol the lines. They travel by truck, by helicopter, or afoot where the going's toughest. They look for "anything unusual"—anything from a broken insulator to a bullet's nick in a wire, or a dead bird, or unexplained tire tracks, or a piece of steel missing from a tower. "Anything unusual" may be the only clue to threatened or existing trouble.

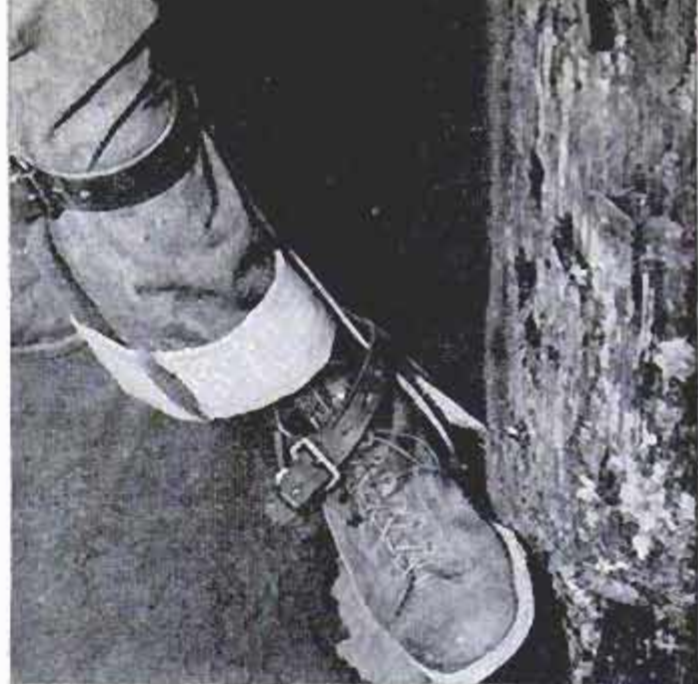
Linemen turn detectives when they are sent out to investigate a line failure. By "failure" they mean any drop of power on the line, even though the drop was only a split second long.

Lineman in bucket at top of extension tower washes insulators with spray from high-pressure water gun





Rubber hood is placed over an insulator to protect workers on power line. Rubber "snake" covers wire



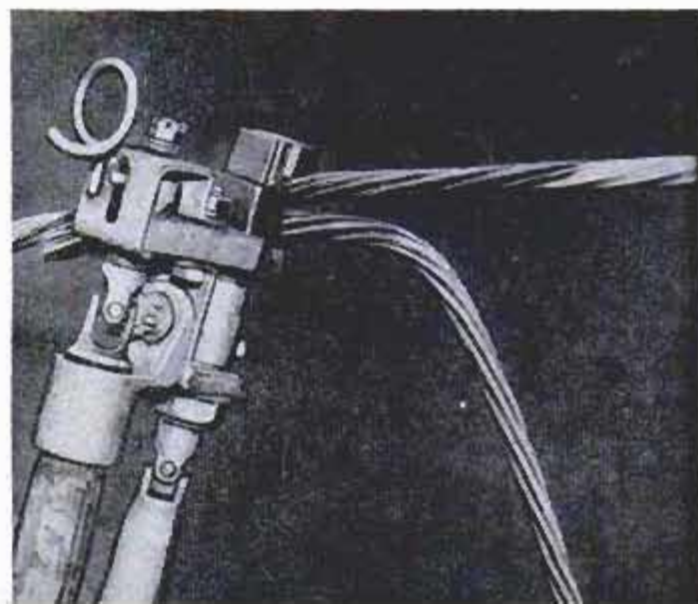
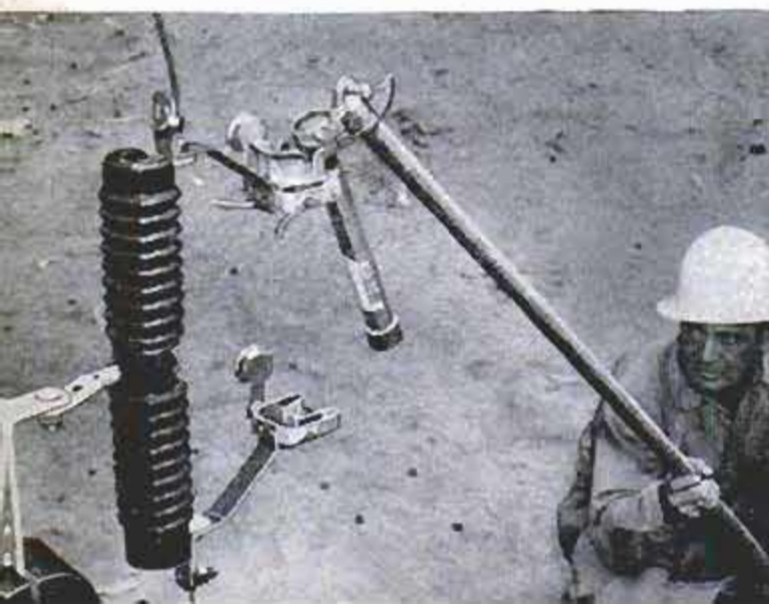
Gaffs — spikes on lineman's climbers — are kept sharp by filing. When badly worn, they are replaced



For work on a line carrying up to 7500 volts the lineman wears rubber gloves inside leather gloves. "Hot stick" is used to place fuse in top clip of holder. Other end of stick shoves it into bottom clip



Rubber glove gets its daily roll test. A pinhole could be deadly. Below, this hot stick is lineman's socket wrench, used for clamping together two cables. Sticks are rotated to grip clamp, join nut and bolt

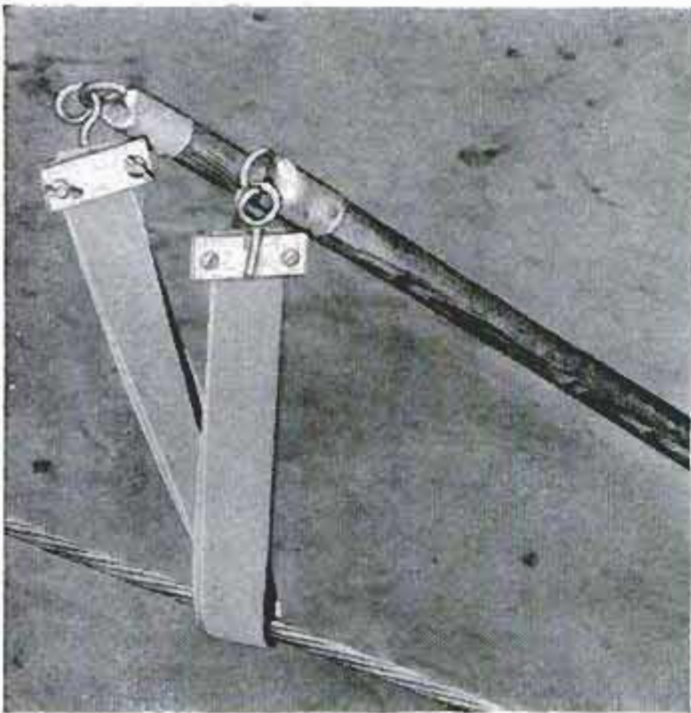




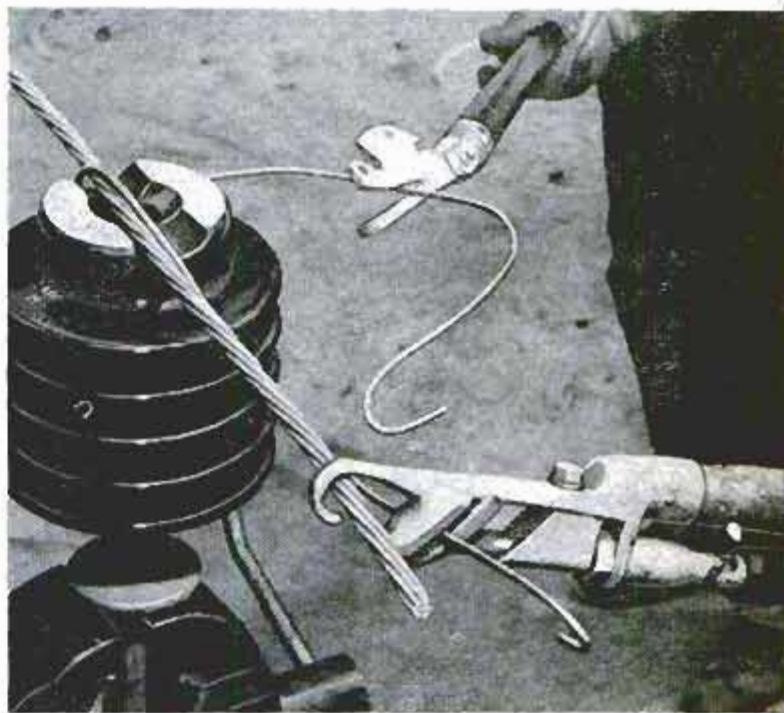
"Pigtail sticks" are used for holding, raising or moving hot 11,000-volt and 16,000-volt power lines



Hot-stick cutters can nip off heavy wire. Extremely heavy wire is usually sawed with hot-stick hacksaw



At point where connection is to be made, corrosion is polished off with abrasive cloth hung from sticks



One "mechanical hand" holds tie wire against cable while another wraps wire around cable and insulator

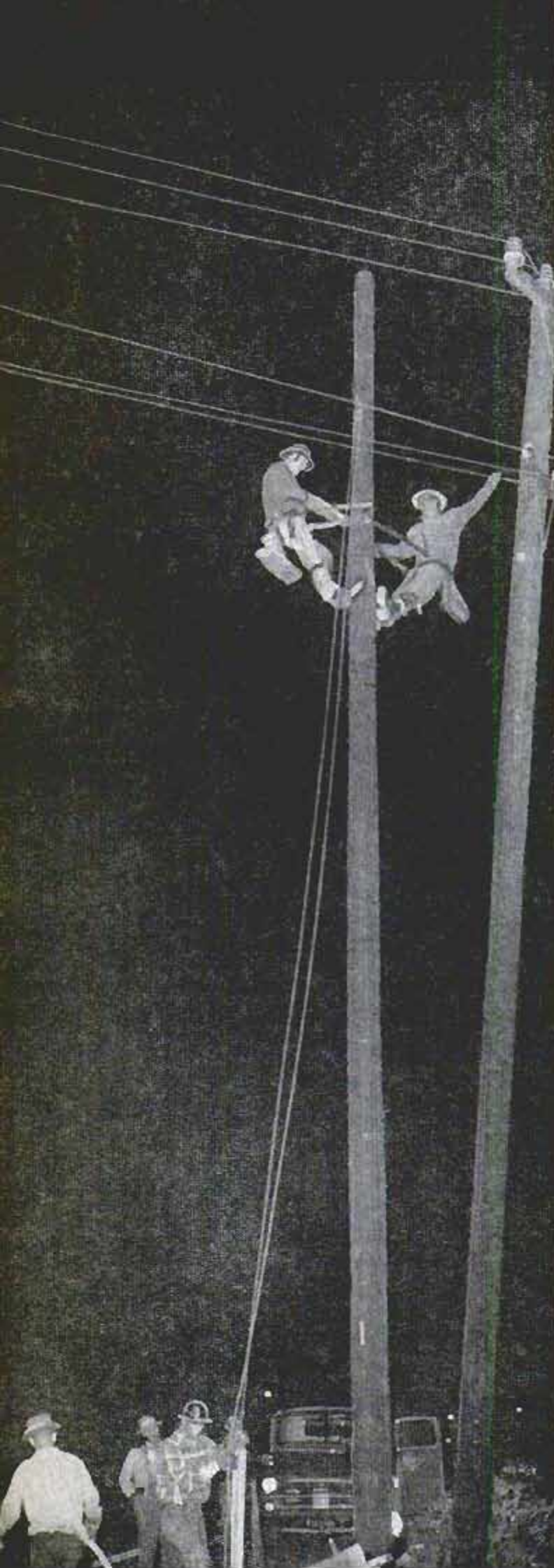
"Line failure *must* be run down! Something relayed that circuit. Find out what it was."

So the linemen-detectives start looking. Whatever happened may have burned a nick in the line; that makes a weak spot. The next time a storm or accident puts a surge on the line, it may "burn down" at that weak spot. They hunt for it and, when they find it, hours or days later, hot-line men repair the damage.

A very little thing can cause a very large disturbance when high voltage is involved. A bird's nest can cause no end of trouble. Some birds like to use fine wire as nesting material; they drop it across high-voltage lines and the fire flies! Trees, bullets and kites cause trouble. In Rosemead,

Calif., a whirlwind picked up an umbrella from a fruit stand and spun it into a maze of wires, setting off an electrical barrage that shook the town.

In dry seasons, the insulators on high-voltage lines pick up a coat of dust. To prevent splashover of current on the dirty insulators, with resulting pole fires and possible line failure, to say nothing of television interference nearby, linemen "hot wash" the insulators. The cleaning job once was done by mechanical means, by linemen who had to climb up into the poles. A nozzle was invented which breaks up water into spray, under 900-pound-per-square-inch pressure; and with water tested for high resistance the nozzle safely sprays insulators even of 220,000-volt lines.



Linemen, above and left, take on job of transferring hot lines from pole snapped off at base to new pole

Good communications reduce the lineman's hazard and speed up installation and repair jobs. On the Southern California Edison Company's thousands of miles of high-voltage lines, line crews keep in two-way contact with a central dispatcher by radio or by metallic or beamed microwave telephone.

Most of the distribution lines, which carry power from substations to consumers, are on high poles; but in some city districts the lines must go underground. If a lineman feels uneasy about high work, he is transferred to underground work, and vice versa.

"If he's scared, he's got no business being there; let him try something else. To work safely he must not be afraid."

It is a tremendous problem to kill a line while hundreds or thousands of consumers

(Continued to page 246)

With crossarm installed on new pole, the linemen place rubber snakes on one of the 4000-volt lines





New Bell X-2 will be carried to flight altitude in bay of B-50 bomber which has been redesigned for the job

Bell Aircraft's rocket-powered, supersonic X-2, the first plane designed to probe the so-called "heat barrier," will make its first powered flight this year at Edwards Air Force Base, Calif. The X-2 will be used as a flying research laboratory to investigate heat and speed problems beyond the speed of sound. It is expected to fly beyond 2000 miles per hour. To withstand the heat pro-

2000 M.P.H. ROCKET

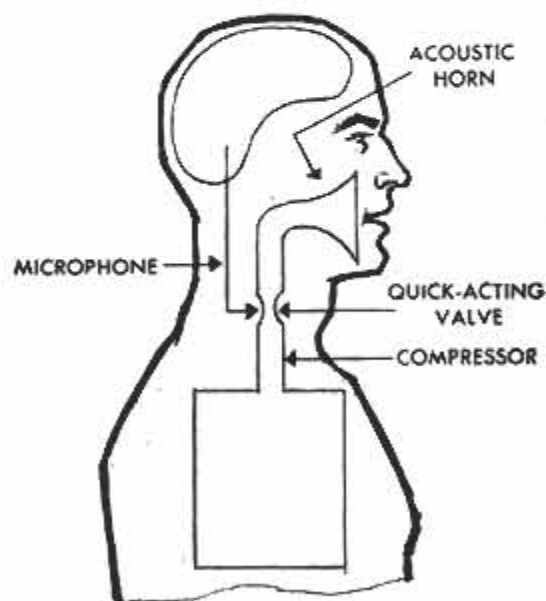
duced by such high speeds, the wings and fuselage are made of stainless steel and K-monel metal. In an emergency, explosive charges detach the entire cabin from the rest of the plane and a ribbon-type parachute carries the capsule to lower altitudes, where the pilot uses a normal parachute. Heavily tinted windshield protects the pilot from serious sunburn.

Long-Range Loudspeaker Works Like Human Speech System

Little SAM, a loudspeaker developed at the Stanford Research Institute, can shout so loudly he is heard two miles away. A bigger brother now being built has a range of four miles. SAM (Stanford Airstream Modulator) is the mechanical equivalent of human speech organs and consists of a compressor (the lungs), a quick-acting valve (the vocal cords) and an acoustic horn (the mouth).

Quick surges of high-pressure air create the powerful sound waves which dwarf those created by the vibrating diaphragm of the conventional speaker. SAM, which has long-range clarity and cannot be jammed, may be used to issue battle commands, Civil Defense instructions, and psychological messages to enemy troops. To test SAM quietly, scientists placed it in a muffler lined with glass fiber and surrounded by 12 tons of sand.

Diagram shows human equivalents of SAM's parts. Scientist by acoustic horns holds mechanical vocal cords





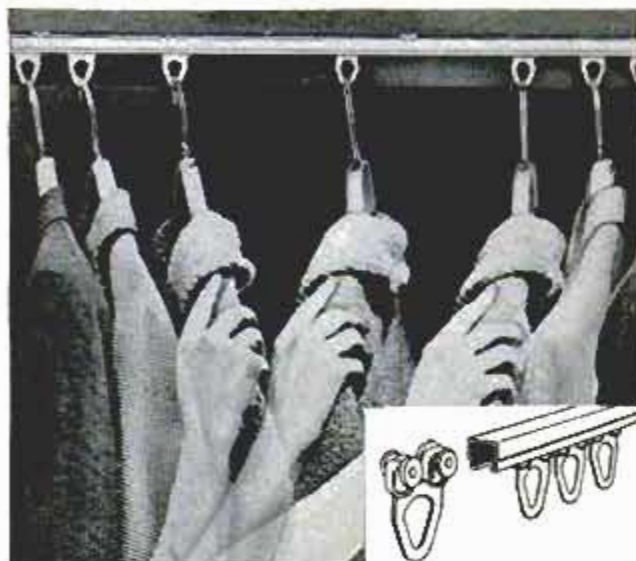
WHAT'S NEW FOR Your Home

LIFT-UP ELECTRIC RANGE, left, permits housewife to clean inside as well as out. Drip pan catches any boil-over from the burners. Similar gas range is available. Both can be built into the counter top

Chambless Ranges, 2464 N. Meridian St., Indianapolis, Ind.

CLOTHES ROD, left center, has built-in rollers that prevent crushing of clothing. Any kind of hanger can be inserted in the eye of the roller. Four wheels carry the roller smoothly along the rod, preventing clothes being jammed against each other

Hobi, 15 W. 57th St., New York City 19

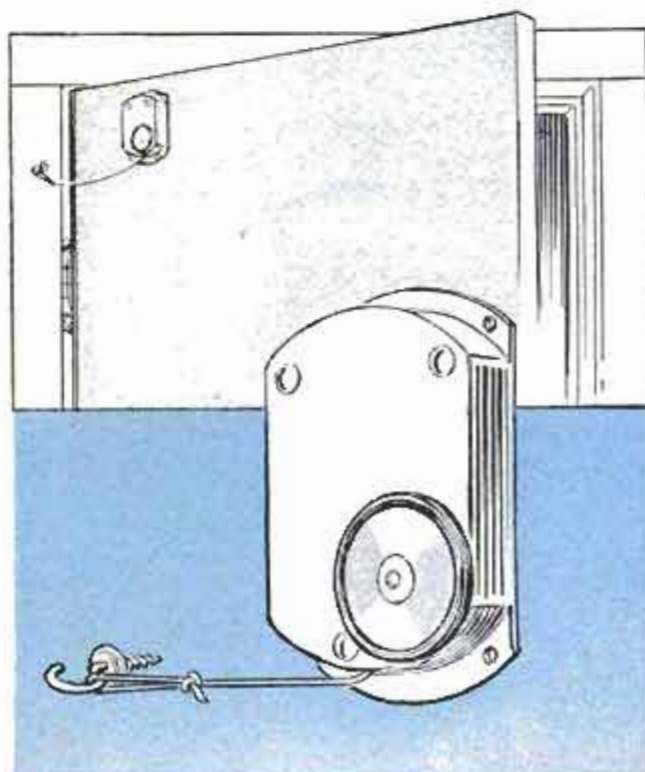


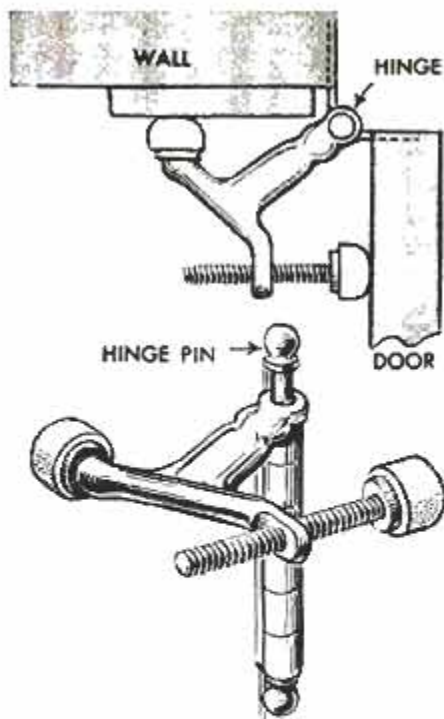
ROLLING VACUUM CLEANER, below left, has two 12-inch wheels that permit it to be towed easily across the room or up and down steps. Cleaning wand, when inserted in a special receptacle, becomes a steering handle when the cleaner is moved. Reversible head is used to clean floors as well as rugs

General Electric Co., Small Appliance Div., Bridgeport 2, Conn.

MUSIC BOX attached to door, below, greets guests with a tune as soon as the door is opened. As the door closes, the box automatically is rewound. Cord can be released and music box used only when desired. You can choose from a large selection of tunes

Walters Modern Hobby Shop, 207 French Road, Utica 4, N.Y.





ADJUSTABLE DOOR BUMPER fits the hinge pin instead of being fastened to the floor or wall. No drilling is required, and there's no problem of cleaning the floor around the bumper. Screw-type adjustment permits you to regulate the travel distance of the door. The bumper can be installed on either the top or bottom hinge. It is available in several finishes

Harry L. Gordon, Derby, Conn.



ARC-SHAPED DIAL on a new top-loading washing machine tells at a glance which phase of the washing cycle is in operation. Indicator slides across the dial from start to finish. The housewife can move it in either direction to skip, repeat, lengthen or shorten any part of the cycle. Washer has two cycles, one for regular loads, other for synthetic fabrics

Kelvinator Division, American Motors Corp., Detroit 32, Mich.

IRONING BOARD FOLDS for compact storage. It also is equipped with a drawer which slides under the board and can be used to store the electric iron, pad and cover. The board measures 36 inches long unfolded, 18 inches collapsed. Designed for college students, vacationers and trailerites, the ironing board can be used on top of a table or a dresser

Port-O-Board Mfg. Co., 617 Winston, Dallas 8, Tex.

EXTRA HAND in the laundry is provided by metal fingers which hold large sheets and blankets for folding. A corner of the sheet is slipped between the fingers and a lever pressed down, squeezing the fingers together. Flipping up the lever releases the sheet. The little mechanical hand is made of rustproof spring steel and is screwed to the wall

Kay Craft, Nashotah, Wis.





Lychees, which grow in clusters, have a rough outer skin which is peeled away to reveal the firm, juicy pulp

Lychee—Fruit With a Future

FLORIDA NOW IS PROVIDING a new taste treat—the Chinese lychee. It's a fruit, about the size of a large strawberry, harvested from a subtropical tree. Dried, the fruit becomes the lychee nut, a favorite of the Chinese. In this country the lychee is being marketed quick-frozen and eaten as a fresh delicacy. The outer skin of the ripe

Twigs and leaves are snipped off by hand before the fruit is packed for quick-freezing and marketing

fruit varies in color from bright red to purplish red and is peeled away to expose the pulp, which is white, juicy and firm. Most people find the taste difficult to describe, though it has been compared to the taste of fine grapes. A lychee tree doesn't begin to produce for three to five years, but then has a producing life of 100 years.

Lychee is a small, subtropical tree that continues to produce its tasty fruit for 100 years or more





Side-Mounted Motor Gives Canoe Speed of 10 Miles per Hour

You can mount an 18-pound English motor on the side of a conventional or folding canoe and cruise at speeds up to 10 miles per hour. The one-cylinder, two-stroke motor develops 1.3 horsepower and mounts a .6-gallon gasoline tank that supplies fuel for nearly 10 hours' running

time. The unit has a six-inch propeller, a 39-inch propeller shaft, a mounting bar and bracket, and a tilting device for raising the propeller out of the water for starting. The boat is steered by rudder. The depth of the propeller is variable to suit different canoes and loads.

"Stone" Facing on Wall Fastened With Nails

Weighing considerably less than stone but with greater strength, a "stone" finish made of plastic and cement can be attached to any kind of wall. It is held to the wall with galvanized clips and nails. After the stones are fastened, mortar is filled into the joints to conceal the nails and clips and to give a natural-stone appearance to the building. According to the manufacturer, the stone will not decay or burn and is resistant to termites. Made under high heat and pressure from portland cement, mineralized fibers, metallic hardeners and glass fiber, the stone never requires painting.



Stop Light for Blind

Blind pedestrians in Louisville, Ky., can cross the road between two institutions for the blind with the aid of a special traffic signal. Pedestrians halt traffic by pushing control buttons located at the intersection. The light changes to red, a buzzer sounds and traffic is halted for 15 seconds.



Seaquarium sprawls across a 55-acre tract on Virginia Key, reached by Rickenbacker Causeway from Miami

\$2,000,000 Fish Bowl

STAID Miami fishermen, who supposedly have grown accustomed to seeing the very latest in fishing tackle, were startled recently at the sight of a speeding porpoise being chased by a fast boat. From the bow of the craft a man hurled a strange harpoonlike device.

The "harpoon," consisting of a pair of

By **George X. Sand**

shiny semicircular Monel-metal arms, landed full upon the back of the fleeing quarry. Instantly the spring-triggered arms closed firmly yet carefully about the body of the porpoise. Then, with almost human instinct, the metal harness dropped away, leaving in its place a stout length of rope which now slid backward to fasten itself

Catching a spotted ray by its spiracles, Capt. William B. Gray, director of specimens and collecting, helps former Yale coach Herman Hickman boat fish. Rays frequent shallow bays, often hooked by rod and reel





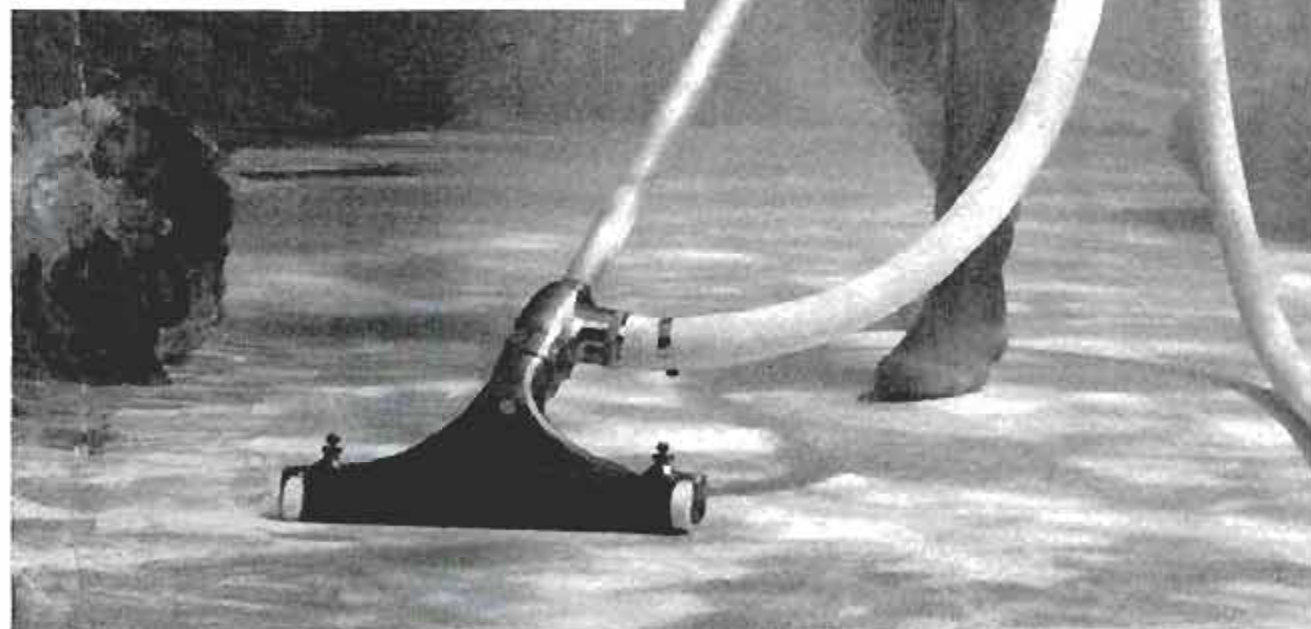
Homeward bound, specimen collectors have managed to capture a loggerhead turtle for the Seaquarium

in a secure noose about the thrashing porpoise's tail.

An air barrel was secured to the end of the rope. The captive then was released until it became exhausted from towing the floating drag. Later it was carefully hoisted aboard and wrapped inside a special rubber blanket before being placed in a tank of water containing "knockout drops." The blanket prevents the porpoise, tarpon or sailfish from injuring itself against the walls of the small tank until the anesthetic can take effect.

This corsetlike fish harpoon is but one

Here's housekeeping at aquarium. Diver operates undersea vacuum cleaner which picks up marine growth





In their eagerness to get at their dinner, big turtles sometimes attack divers who carry the food below

of several radically new mechanical features that make Miami's sparkling new Seaquarium the most up-to-date installation of its type in the world.

For example, the \$2,300,000 salt-water fish-viewing plant, recently opened to the public on a 55-acre tract at the southern tip of Virginia Key, boasts two circular steel viewing tanks of the very latest type. Each tank is three stories high and had to be installed so that it "floated" free of the surrounding buildings before the manufacturer would guarantee his unusual product against leakage. To accomplish this the huge steel shells—one 80 feet across by 240 feet in circumference (565,000-gallon capacity) and the other 50 by 150 feet (285,000 gallons)—rest upon massive concrete foundations that are in turn supported by pilings driven to bedrock. "Paraplastic," a recently developed chewing-gum-like substance acts as a flexible cushion between the tanks and the cement structures.

Tanks Have Concrete Lining

The interiors of the tanks were sprayed with concrete, which varies from two to six inches in depth. The walls were then brushed with a special paint which has a chlorinated-rubber base that is resistant to both bacteria that flourishes in the water and the acid from fish slime.

Seaquarium design engineers guarded against salt-water corrosion and leakage by prohibiting use of steel, copper, zinc or

other exposed metal surfaces. Instead, plastic pipe and glass fiber are used extensively throughout the big plant.

Both main tanks have viewing ports or "show windows of the deep" at two platform levels, thereby offering to as many as

New porpoise is laid out on "operating table" and treated with potassium permanganate for rope burns



a thousand onlookers at one time a clear view of hundreds of different fish of all sizes, shapes and colors. The background is a tropic sea-bottom setting that includes a sunken Spanish galleon. The viewing windows are made of two sheets of $\frac{3}{8}$ -inch plate glass and, to preclude the possibility of condensation forming from temperature changes, a moisture-absorbent material was inserted between the glass plates.

On the opposite side of the broad circular corridor that surrounds the biggest tank are 26 additional smaller tanks (600 gallons each), constructed of laminated glass fiber. Many weird and amusing children of the sea are housed in these smaller aquariums, including brilliant jewelfish, the frogfish that lures its prey with a tiny fishing pole on its head, the light-reflective neon gobies, high hats, four-eyes and abudefdufs.

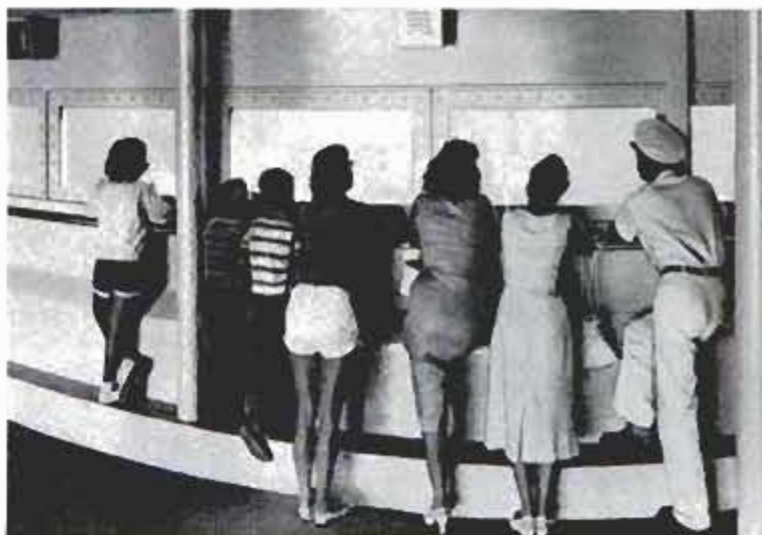
Built-in Lights

These exhibits also offer for the first time built-in lighting effects for the convenience of visitors to the Seaquarium who wish to photograph the strikingly beautiful marine specimens. To encourage photographers, particularly amateurs who heretofore have never

(Continued to page 256)



Craig Phillips, marine biologist and curator, patiently builds an authentic sea-floor setting before water and fish are admitted



Windows give visitors a fish-eye view of the three-story main tank. Inside is a sea-bottom setting including a sunken ship

Trainer Adolph Frohn gives new porpoise a 500,000-unit shot of antibiotic to guard against infection





Comparatively inexpensive, this turret camera permits quick use of wide-angle and telescopic lenses

Shutter on projector below transmits 60 percent more light than old types, fills screen five feet wide



Radiation May Save Ancient Buildings From Further Beetle Damage

For centuries the deathwatch beetle has been eating away the timbers of Westminster Abbey, St. Paul's Cathedral and other famous structures. Now the pest may be controlled by atomic energy. Experi-



Photos from Eastman Kodak Company

More compact than most 8-millimeter cameras, this one weighs a pound and a half, has an f:1.9 lens

New Home Movie Equipment

DIRECTORS AND PRODUCERS, home-grown 8-millimeter type, can count on new equipment recently introduced to help them get better home motion pictures with less trouble and at less cost. Cameras have made great progress since 1900, when George Eastman produced a camera for \$1 which was designed to be so simple even a child could operate it. But Eastman's basic idea of low cost and simple operation is being applied to the new movie equipment. For example, one of the new 8-millimeter cameras sells for well under \$100 and yet has a turret with a standard f:1.9 lens and converters to supplement it for wide-angle and telephoto use as well. Another, a bit more expensive, is a magazine-loading camera with a finder of the zoom type, parallax-allowance indicators and a focal-plane marker for accurate focusing—and yet weighs only a pound and a half. And, in spite of all the extras on the camera, it is simple to operate. Projectors are improving, too, and this newest one for 8-millimeter film will project pictures to fill a screen up to five feet wide. A new-design shutter transmits 60 percent more light than older types.

ments at the British Forest Products Laboratory indicate that low doses of radiation make the eggs of the deathwatch beetle infertile. Until now there has been no method of destroying the pest.



Guide Points on Automobile Headlights Make Alignment Easy

Headlight aligning is swift and simple in a system where three guide points cast into the lamp lens are matched with points on an inexpensive aiming device. A service-station attendant can install and correctly aim a set of the lamps in eight minutes, in broad daylight and in a space only as large

as the automobile. The lamps are standard on 1956 General Motors cars and trucks. Ordinarily, lamps are aimed by using a screen or expensive equipment. Today, it is reported, over half of all cars on the road have headlights that are not correctly aimed or adjusted.

Portable Box Seat For Football Coaches

During football games, a coach can get a better look at what his team is doing from a box seat atop a 14-foot movable tower. Made of tubular steel, the tower can be erected in a few minutes. The platform at the top is 5 by 7 feet, allowing room for the coach and several assistants, and is surrounded by a guard rail. The tower is equipped with locking-type rubber wheels and, when used during practice sessions, can be rolled about the field as needed.

Anchoring Compound

Weight-bearing nails and screws can be anchored in plaster, tile and other masonry with a new compound.



A rough hole is bored with a drill or jumper. The material is moistened, rolled into a plug and tamped into the hole. The nail or screw is then inserted in the fibrous plug, which needs no drying time.





AFRICAN IMAGES FROM AN OHIO BACK YARD

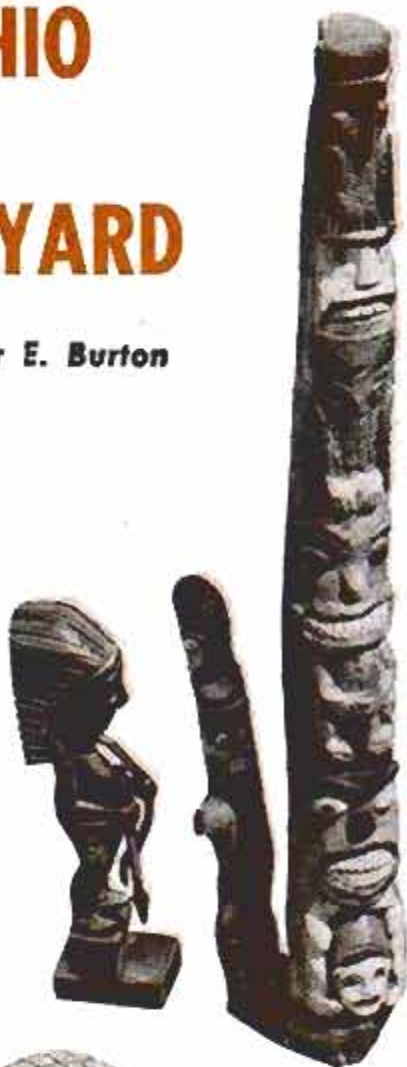
By Walter E. Burton

Parsons puts the finishing touches on his version of Ahasuerus, Biblical king. Head was carved from elm

GROTESQUE DEVIL DANCERS and pierced-nose Ubangis frozen in wooden carvings glare from the walls of a quiet Midwestern home. They are typical primitive art. But their birthplace was not the Congo; their creator has never speared a lion or brewed a voodoo potion.

C. O. Parsons, in fact, has never been far from his Akron, Ohio, home. Without ever studying primitive sculpture, without reference to books or museum displays, he has carved over 100 statuettes and heads remarkably like the work of a loin-clothed savage. Seven years of spare time went into their making.

Branching totem pole and Indian, right, are children's favorites. Below, Biblical queen and king, pierced-nose Ubangis are among larger carvings





Small figures, respectively, show Egyptian and Puritan influences. Large ones are female devil, five-eyed mate

Parsons, seated under a tree in his back yard, simply unhitches his imagination as he applies a keen pocketknife to a rough block of wood. With chisels, he roughs out the general form and makes heavy undercuts. A jigsaw removes waste wood and a power-driven cloth buffing

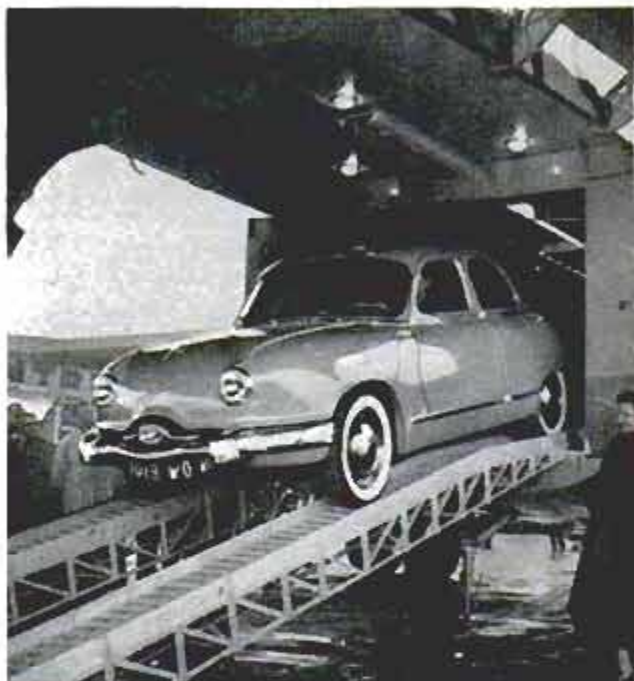
wheel works up the final finish. The dark figures are stained with black ink before the buffing. Knife cuts remain, and sometimes the grain of the wood dictates the shape of the carving. Parsons says he doesn't want his figures to have a machine-made appearance. ★ ★ ★

Musician's Practice Cabinet

That trombone or trumpet player next door can be silenced for good—by legitimate means. Just give him a new practicing cabinet that muffles all but 10 to 20 percent of his music. The cabinet, lined with sound-absorbing material, is built in different shapes to house the bell of various musical instruments. Some models, like those for the clarinet, also allow room for the player's hands and arms inside the enclosure. A feature of the cabinet is that impure sounds are not so effectively absorbed, allowing the musician to spot tone imperfections that would normally be masked by other notes.

☞ Insects preserved in amber for 60,000,000 years have been discovered in Alaska.





Automobile being driven out of Breguet's big cargo hold. Payload of giant air freighter is 10½ tons



Unique construction of fuselage permits entire lower rear section to open for access to cargo hold

French "Drive Aboard" Airliner

AIR FRANCE is now flying a double-decked passenger-cargo plane with a unique hatch and ramp in the tail which permits automobiles to be driven aboard. The entire lower rear section of the fuselage opens to give access to the main hold, and an inclined ramp facilitates loading of cars and other heavy cargo. The cargo hold is in the lower deck, which may also

be used as a passenger cabin when freight is not being carried. It can accommodate 48 tourist passengers. The upper deck is fitted out to carry 59 tourist and 48 first-class passengers. Designed and manufactured by Louis Breguet, one of France's aviation pioneers, and called the Breguet after him, the plane has a wingspread even larger than that of the Super Constellation.

Capable of carrying 155 passengers when not hauling cargo, the Breguet cruises at 230 miles per hour

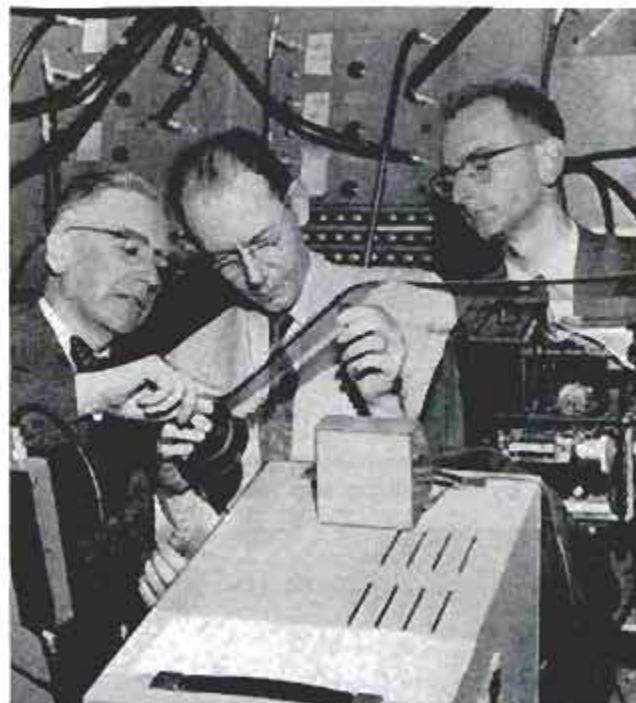


KEEPING UP WITH THE ATOM

A NEW ATOMIC PARTICLE, called the "antiproton," has been discovered by a team of radiation experts (right) using University of California's multibillion-volt bevatron. The new particle increases the prospects of releasing, in controlled fashion, vastly greater energy from the atom than is now possible by the fusion process. All natural elements, except hydrogen, are made up of protons, neutrons and electrons, the protons being needed to hold the neutrons and electrons together. The antiproton, as a negative proton, would cancel out the binding force of the proton and, with nothing to hold them, the neutrons and electrons would fly apart. Thus, the antiproton is a disintegrator of the basic building block of all matter. It cannot, however, be used as an instrument, such as a gun or a bomb, for destroying matter.

☆☆☆

Radioisotope by-products are finding more and more uses. One of the newest is to cut down by irradiation the annual loss of \$300,000,000 caused by insect infestation of grain, flour and other cereal products. Radioisotope by-products from atomic reactors can supply a low-cost source of radiation for this purpose, according to



L. E. Brownell, supervisor of Fission Products Laboratory of the University of Michigan. Taste panels have approved the flavor and baking characteristics of bread, biscuits and cakes prepared from irradiated flour. Facilities designed to treat 27 tons per hour operate for less than \$6 per ton.

☆☆☆

Ergot, extracts of which are valuable as muscle-contracting drugs, has been produced in a radioactive form in sealed greenhouses at the Argonne National Laboratory. Since none of the extracts of ergot can be synthesized in the laboratory, the first use of the radioactive material will be laboratory analysis and separation to detect concentrations of alkaloids which are beyond the reach of chemical assay methods. The "tagged" ergot can be used to make a survey for unknown or previously unidentified alkaloids in the ergot, and tracer studies of the action of the alkaloids on the nervous and muscular systems of the body now become possible.

To produce the radioactive ergot, Canadian spring rye was fed radioactive carbon dioxide during its growing period (see left). When the plants flowered they were injected with a fungus and later developed a spurlike growth at the site of the injection. Ergot is extracted from this growth and, since the rye was radioactive, the ergot extracted from the fungus growth will be radioactive also.



WHIRLYBIRDS ARE GETTING BIGGER



World's largest tandem-rotor helicopter is the Piasecki YH-16A. Each rotor is 82 feet in diameter and each is driven by an Allison shaft-turbine engine of 1800 horsepower. It can carry 40 fully equipped troops



Developed as an assault transport for the Marines and comparable in size to a DC-3, the Sikorsky XHR25-1 carries 26 troops at 150 miles per hour



Sikorsky H-34A is the Army version of the Navy's HSS-1. The tail folds for stowing on a carrier, and the Army retained this feature for economy reasons

Below is another photo of the H-34A. It carries a crew of two and 20 troops. Used for evacuation and cargo hauling, it is powered by a 1425-horsepower engine. The S-58, a civilian version, is planned for the future





Tattle Tapes

By
Celia
Webster

YOUR TAPE-RECORDING MACHINE can mix very well with daily routines if you will practice a bit of ingenuity.

Like Mrs. B., a Detroit housewife who put her recorder to task by making a tape of her children's favorite bedtime stories: When the Bs had their night out, the baby sitter turned on the recorder and the familiar voice read to the children just as Mother did every night.

When the Bs took their vacation, tapes were made before they left. On these they imposed stories the children had not heard, and a few gentle reminders and instructions. This little trick on tape helped to bring parents and children closer together each time the machine was turned on.

Another mother, Mrs. A., despaired at the scrapping and constant bickering of her two youngsters. One day, in the midst of a quarrel, she turned on her tape recorder, unknown to them. The tape, when played back to the children, caused them to realize how silly their quarrel had sounded. Now, when they have disagreements and tempers begin to flare, the mention of the recorder calms their voices and many times solves the argument.

The tape-recording machine is useful as a means of secret self-improvement.

In the case of Mr. J., his Rotary speech might not have been so well arranged without it. In preparing the speech, his

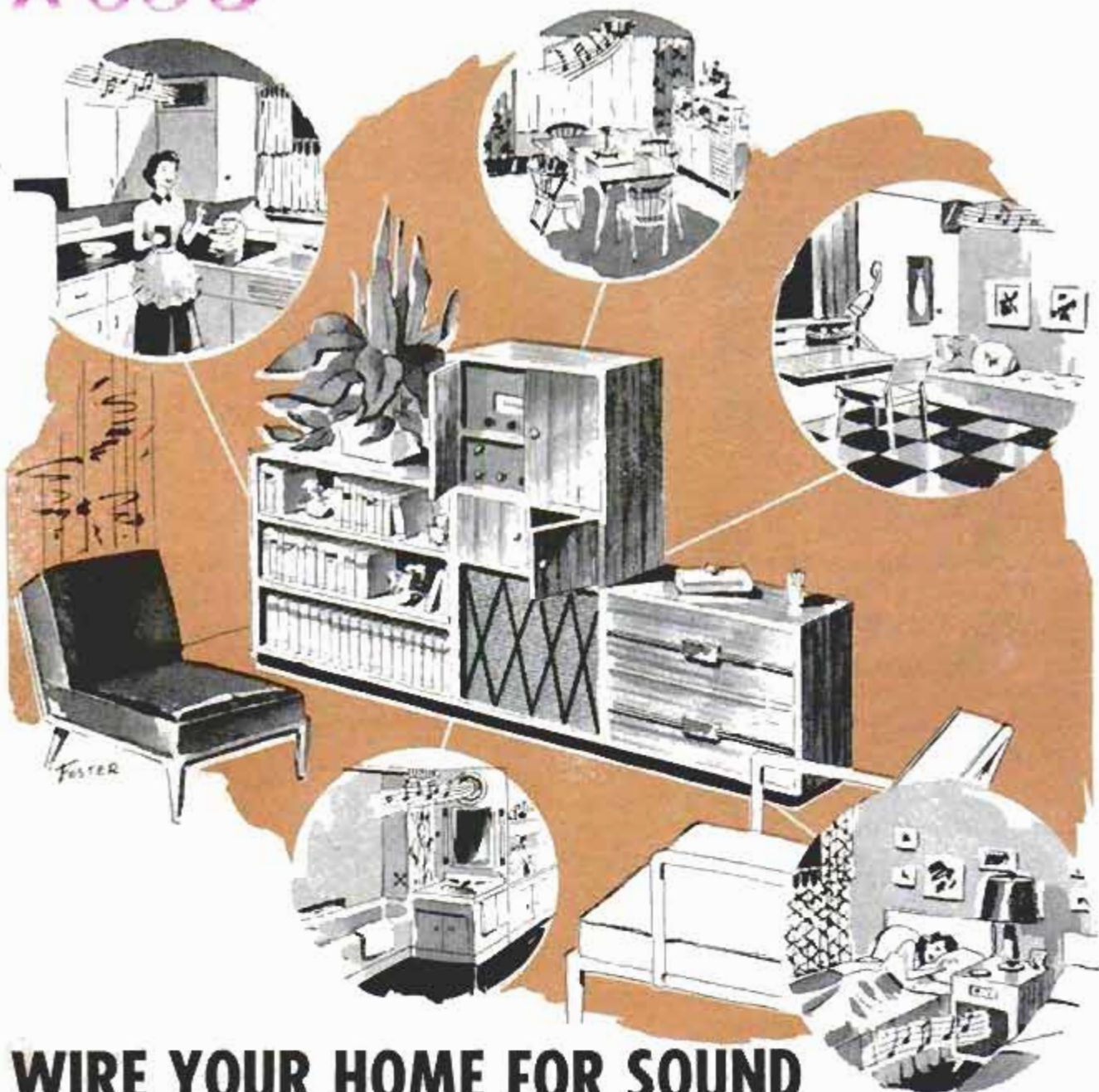
recorder was his severest critic. His editing and rearranging otherwise would not have been possible.

One Illinois housewife was recently chosen chairman of the local garden club. She suffered the pangs of fright when she was singled out to speak to a group. She enrolled in a public-speaking course, and all of her "homework" was recorded on her machine. By hearing herself in the playback, she was able to improve her voice quality, and soon her fright disappeared.

In a group of Cleveland churches, parishioners have formed small groups which meet weekly to discuss various religious problems. Since their minister is not present, they often reach an impasse which needs explanation. Many discussions are recorded and are later heard by the minister who can weave the explanations into his sermons.

In our home, the recording machine is an unlimited source of entertainment. One of the most fascinating diversions for our children is to record their assorted songs, jokes and a sales pitch or two. One particular tape has been set aside for this purpose, and the children use it only when we are close by.

These are but a few of the practical ways a recorder can be used in the home. The mixture of moppets and tape can make for a more enjoyable existence.



WIRE YOUR HOME FOR SOUND

By Dr. Richard C. Hitchcock

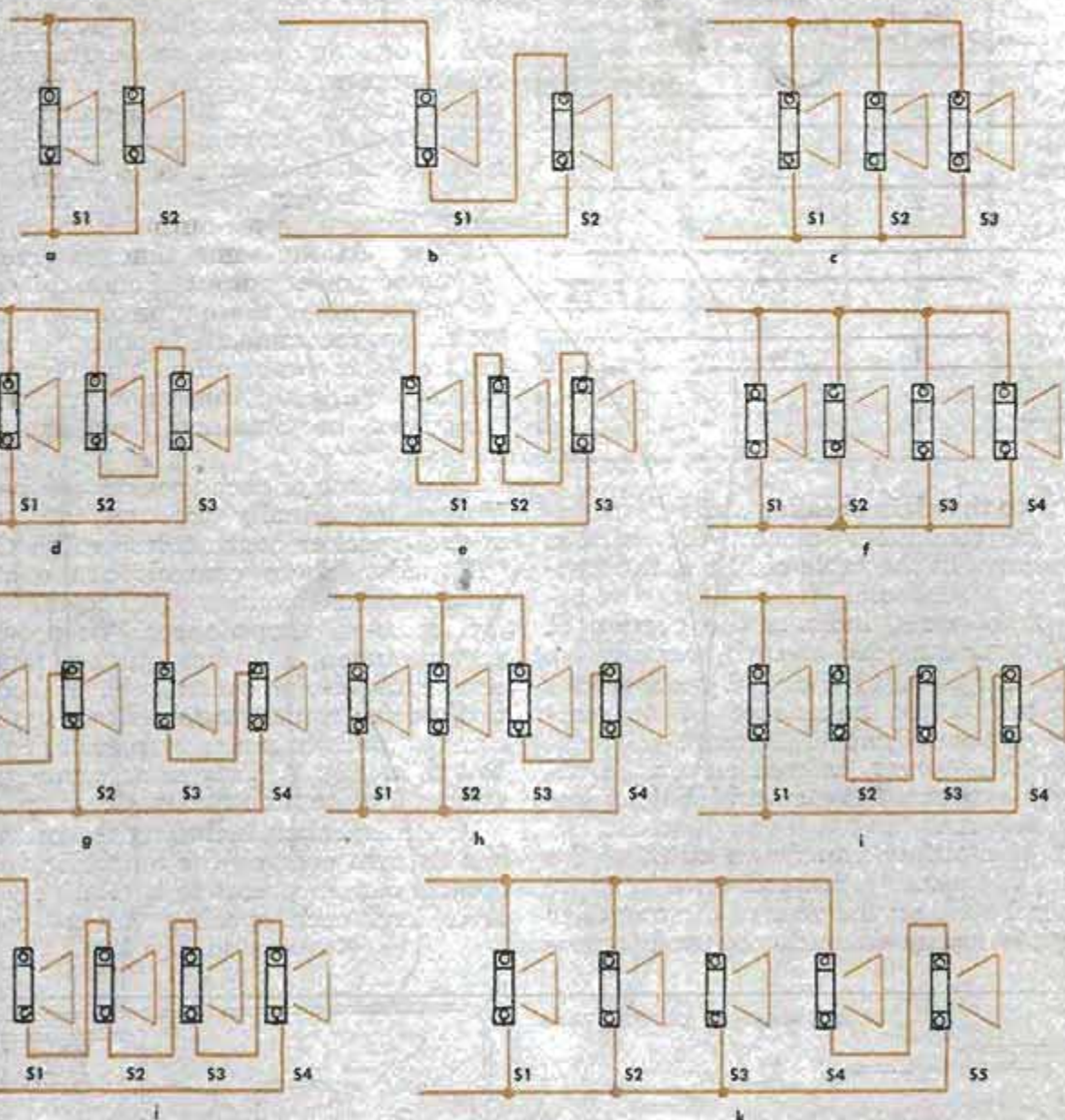
YOUR RADIO or phonograph can follow you to any room of your home without moving from its central location. Yes, through the simple installation of a series of extension speakers you can shave to the latest news, dine to the accompaniment of pleasant dinner music or raid the icebox without missing a single word of that championship fight.

To distribute the output of your music system to various points it is merely necessary to determine the maximum number of speakers that can be driven by the system and the manner of connecting these so that maximum output and fidelity can be obtained. In making the connections, it is essential that a proper match between the audio amplifier and the speakers, regardless of their number, be maintained. This can be done by carefully selecting

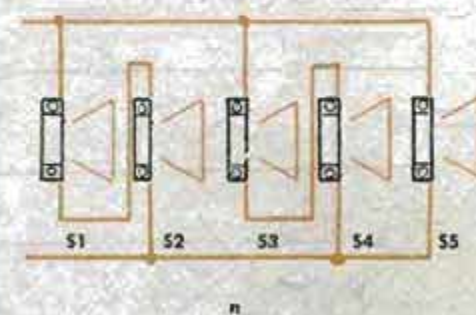
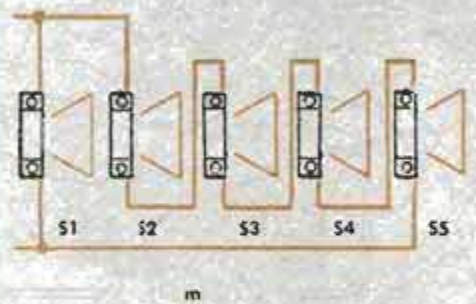
speakers with proper voice-coil impedances to provide the required total impedance.

The diagrams of Fig. 1 show various ways of connecting speakers in series, parallel, or series-parallel. The accompanying table, when matched with the indicated diagram, will tell you the required voice-coil impedance of each speaker to obtain any particular impedance match. For example, if three speakers are to provide a total of 4 ohms' impedance, the connections of diagram 1c or 1d can be used. The former requires two 16-ohm and one 8-ohm speaker, while the latter requires two 4-ohm and one 8-ohm speaker.

It is often desirable to distribute the total amplifier power unequally between the various speakers. By choosing the correct diagram and speaker impedances, it may be possible to channel most of the available



Amplifier Output Impedance	Desired No. of Speakers	Diagram	Voice Coil Impedances and Power Distribution (fractions indicate amount of total power per speaker)				
			S1	S2	S3	S4	S5
4	2	a	8 (1/2)	8 (1/2)			
		c	16 (1/4)	16 (1/4)	8 (1/2)		
	3	d	8 (1/2)	4 (1/4)	4 (1/4)		
		f	16 (1/4)	16 (1/4)	16 (1/4)	16 (1/4)	
	4	g	4 (1/4)	4 (1/4)	4 (1/4)	4 (1/4)	
		h	16 (1/4)	16 (1/4)	4 (1/4)	4 (1/4)	
		h	8 (1/2)	16 (1/4)	8 (1/2)	8 (1/2)	
	5	k	16 (1/4)	16 (1/4)	16 (1/4)	8 (1/2)	8 (1/2)
n		8 (1/2)	8 (1/2)	8 (1/2)	8 (1/2)	8 (1/2)	
8	2	a	16 (1/2)	16 (1/2)			
		b	4 (1/2)	4 (1/2)			
	3	d	16 (1/2)	8 (1/4)	8 (1/4)		
		g	8 (1/4)	8 (1/4)	8 (1/4)	8 (1/4)	
	4	i	16 (1/2)	8 (1/4)	4 (1/8)	4 (1/8)	
		m	16 (1/2)	4 (1/8)	4 (1/8)	4 (1/8)	4 (1/8)
5	n	16 (1/2)	16 (1/8)	16 (1/8)	16 (1/8)	16 (1/8)	
16	2	b	8 (1/2)	8 (1/2)			
	3	e	8 (1/2)	4 (1/4)	4 (1/4)		
	4	i	4 (1/4)	4 (1/4)	4 (1/4)	4 (1/4)	



1

Output Tube Types	No. of Output Tubes	Estimated Power Output In Watts	Maximum No. of Speakers Suggested
2A3	1	3.5	3
	2	10-15	5
6AQ5 6K6 6F6 12AQ5	1	3-4.5	3
	2	10	5
6L6	1	6-10	4
	2	15-50	5 or more
6V6	1	3-5.5	3
	2	10-14	5
50C5 50L6 50B5	1	2	2

power to the main speaker while distributing the remainder among the various extensions. In the table of Fig. 1, the fractions in parentheses, following the voice-coil impedances, indicate the portion of total power supplied to each speaker.

Most single-unit radios and phonographs have an output impedance of approximately 4 ohms. Some of the more-powerful consoles, however, as well as most high-fidelity systems, have several output impedances, including 4, 8 and 16 ohms. In cases of multiple impedance outputs, the values are usually marked on a plug or terminal strip on the rear of the amplifier chassis, and any value can be used to pro-

vide a proper match between the amplifier and speaker systems.

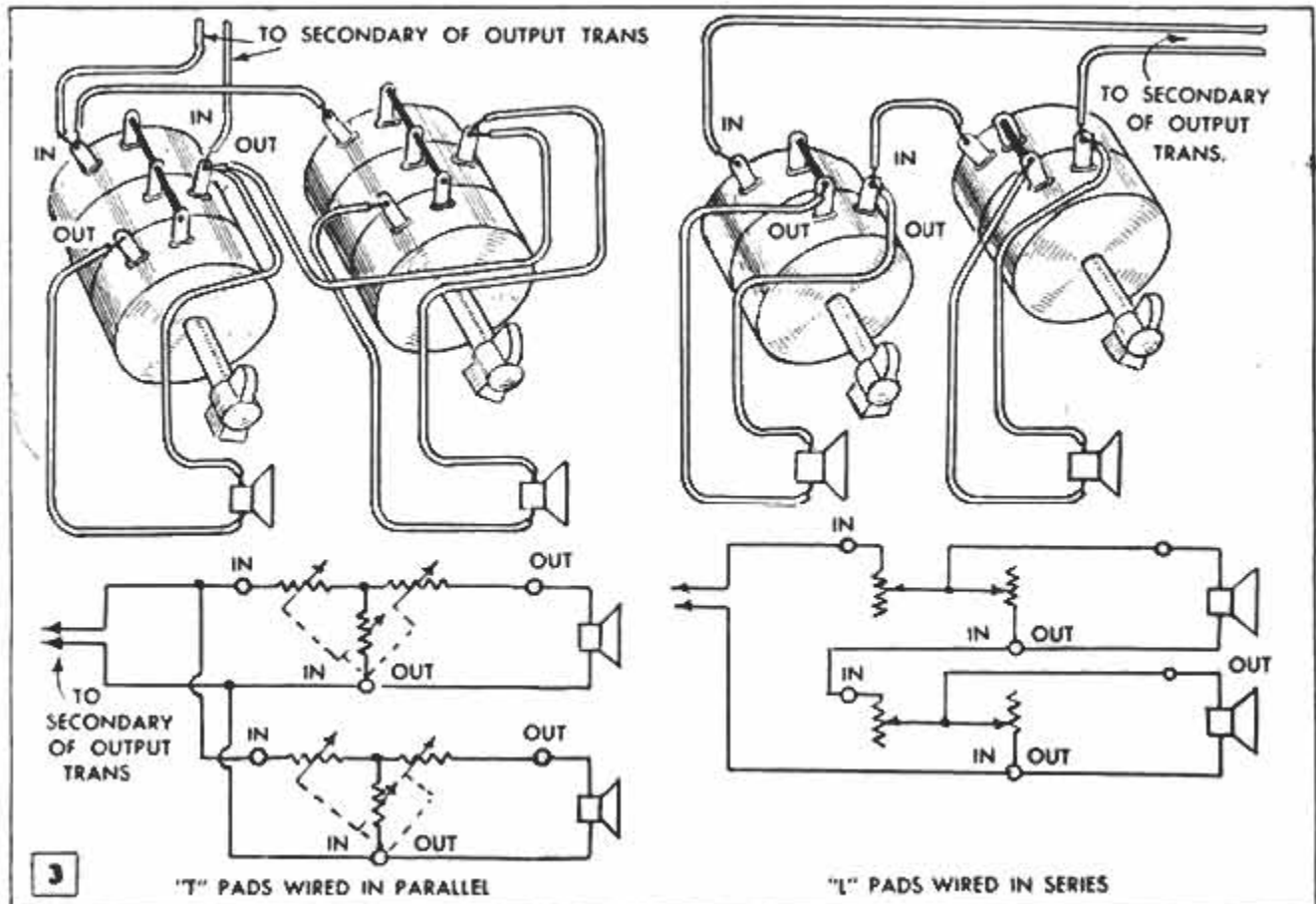
Almost any radio or phonograph is capable of driving at least one extra speaker. Many of them can supply five or more with better-than-normal listening volume. It all depends on the amount of power which the amplifier can deliver.

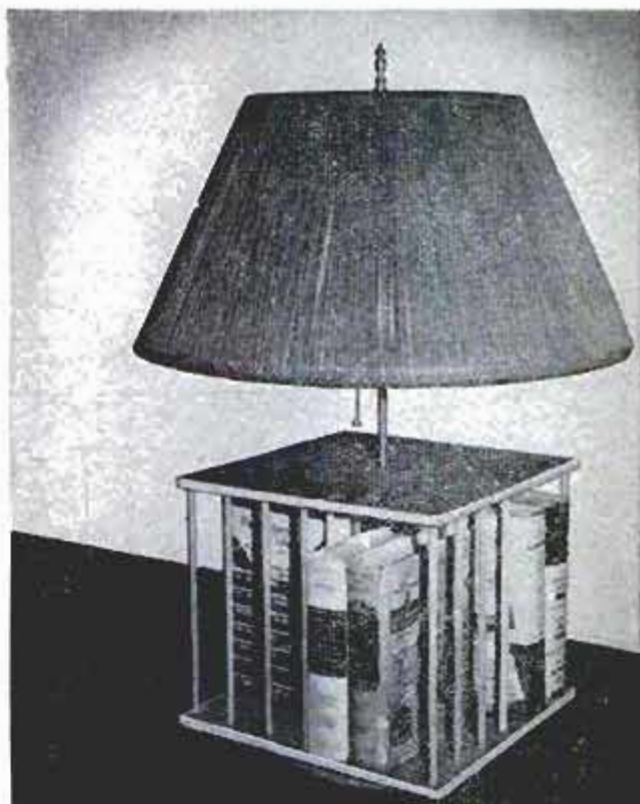
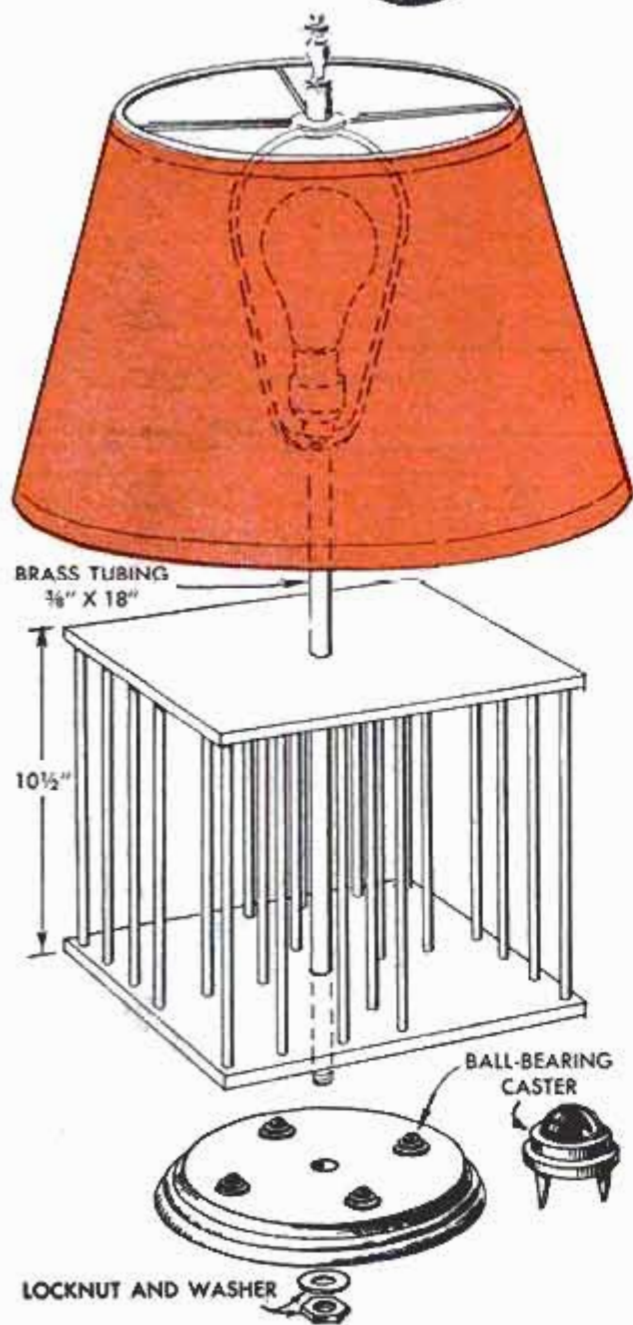
The table, Fig. 2, lists several of the most common power-output tubes in present use. At the same time, it gives the estimated power output of an amplifier using one or two of these tubes, as well as the maximum recommended number of speakers for each combination. The power-output capabilities of tubes not listed in the table can be obtained from any tube manual.

The volume of each speaker can be controlled individually through the use of special speaker controls known as "L" or "T" pads. These controls are available with resistance values equal to the standard voice-coil impedances. To provide a proper match, a 4-ohm speaker must be used with a 4-ohm control, etc. The correct method for connecting speakers with "L" and "T" pads in series or parallel is illustrated in Fig. 3. This same arrangement applies if more than two speakers are used.

If each speaker, including the main one, has its own control, the amplifier volume control can be preset to a relatively high level, and each speaker volume can be

(Continued to page 254)





LAZY-SUSAN BOOKCASE- LAMP

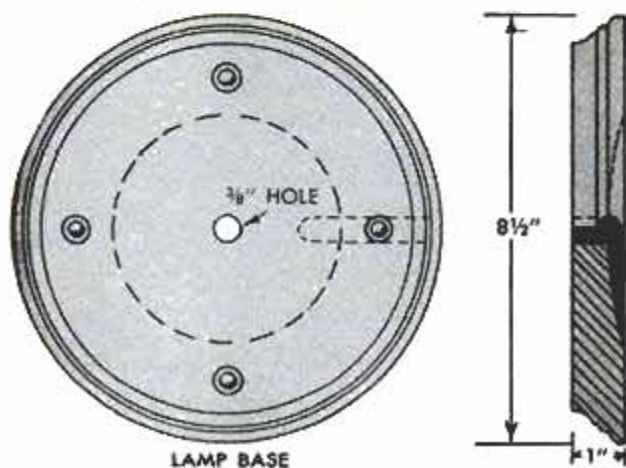
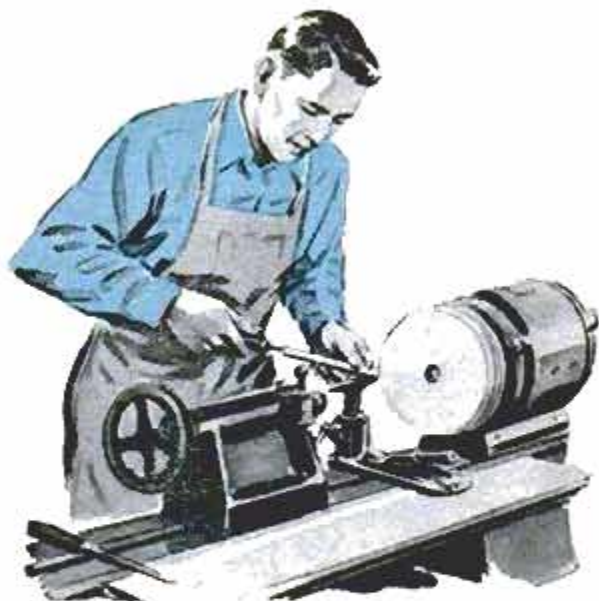
By Elmer W. Ferris

THIS BOOKCASE-LAMP combines two necessities for relaxed reading, a light and a generous supply of books. Twelve or more books will fit in the bookcase and it rotates at the touch of a finger so any book can be reached without leaving your chair.

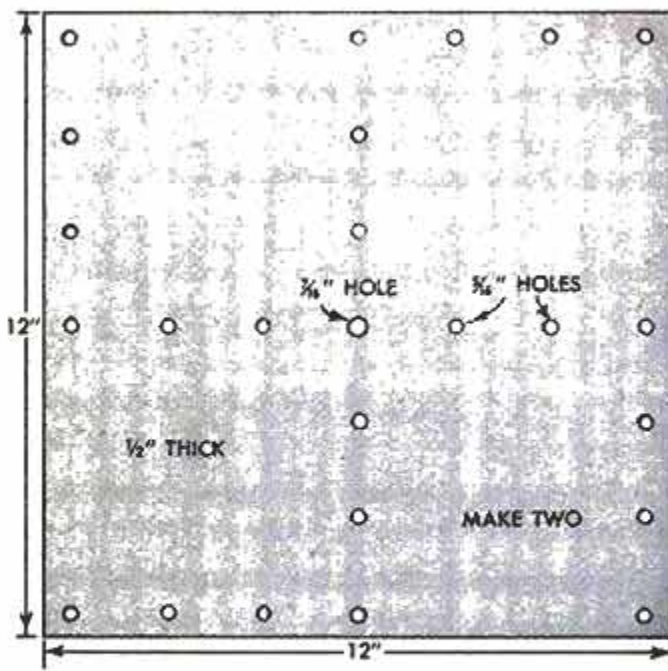
Although the details show the lamp base to be a turned disk, a square base made with hand tools would do as well. In either case, 1-in. stock should be used, preferably hardwood. A circular base should be at least 8 1/2 in. in diameter, and a square base should measure 8 1/2 in. on a side. While the round base is turned with a hollow on the underside, the square base would require

counterboring the center hole to receive the locknut and washer which fit on the lower end of the 3/8-in. brass tubing of the lamp column. Bearings on which the bookcase "floats" as it rotates on the lamp column consist of four ball-type casters, spaced equidistant on a 6-in.-dia. circle scribed in the center of the upper surface of the lamp base.

The lamp column is an 18-in. length of 3/8-in. brass electrical tubing, threaded on the upper end to receive a lamp harp and socket. Thread the lower end far enough to permit using a nut and washer against both upper and lower surfaces of the lamp base. It is not necessary to counterbore the



LAMP BASE

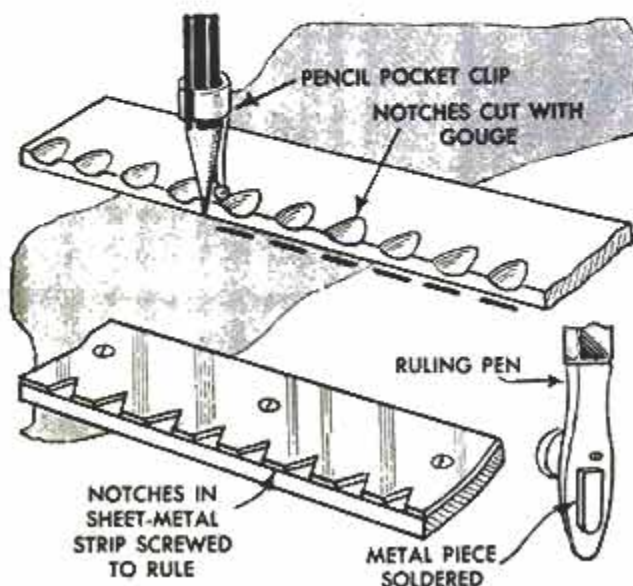


upper surface of the base for the nut and washer, since the casters provide ample clearance.

Two 12-in. squares of $\frac{1}{2}$ -in. plywood drilled with a pattern of $\frac{3}{16}$ -in. blind holes $\frac{1}{4}$ in. deep are used for the top and bottom of the bookcase. Taper the ends of 10-in. lengths of $\frac{3}{16}$ -in. dowel to aid assembly, wipe with glue and insert in the holes in top and bottom. A sheet of thin aluminum tacked to the underside of the bookcase will provide a bearing surface against which the casters will turn more easily.

Broken Lines Penciled Quickly With Modified Straightedge

Securely attached to a drawing pencil, a pencil pocket clip that is adjusted to ride on raised portions of a straightedge will enable you to produce uniformly spaced dots, dashes and other types of broken lines used in drafting. Sunken portions of the straightedge may be shallow notches cut with a gouge, or routed as in the upper



detail. Another way to provide alternate high and low spots is to notch a piece of sheet metal and screw it to the straightedge as shown in the lower detail. A third method is to drive small roundheaded brads or thumbtacks into the straightedge. A ruling pen can be used in the same manner by soldering a small block of metal to one leg. Round the lower corners of the metal block and space it above the pen-point tip according to the thickness of the straightedge.

Rubber Band Around Toy Auto Protects Furniture

A heavy rubber band stretched around a child's small auto or truck will act as a bumper to prevent dents and scratches on furniture legs, baseboards and other household objects. Bands cut from inner tubes can be used for larger mobile toys.

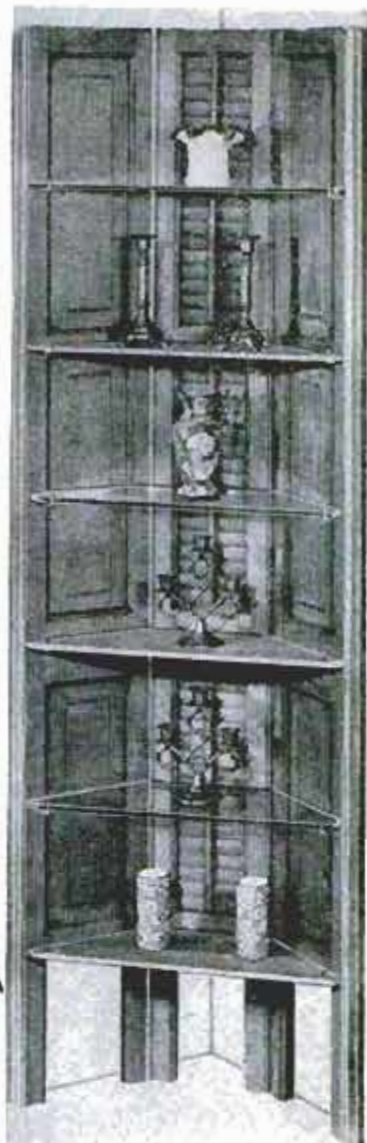
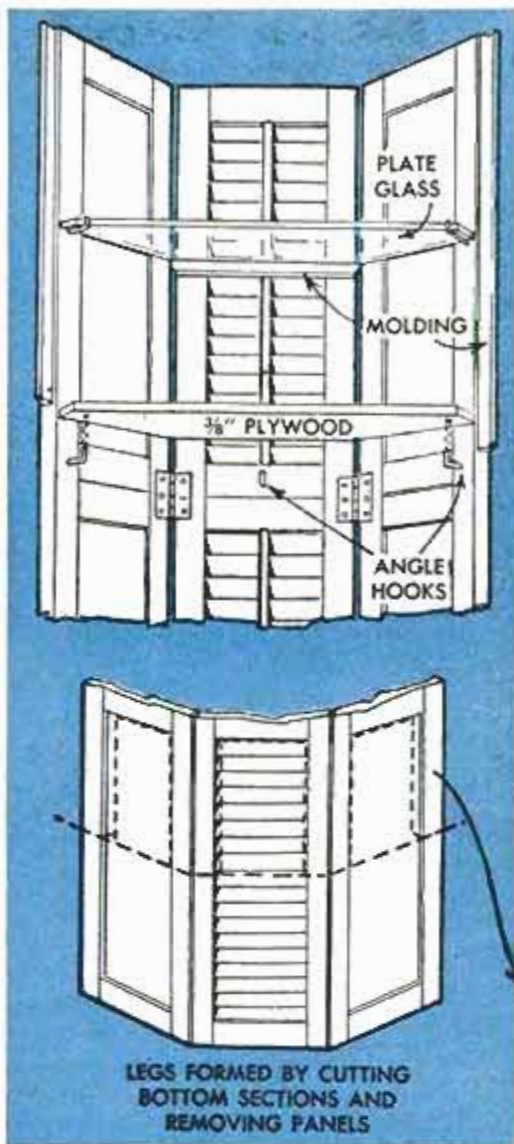
Mrs. Michael Fey, New York City.

☛ Metal and wooden kitchen trays last longer when a coat of thinned white shellac is applied to the top surface.

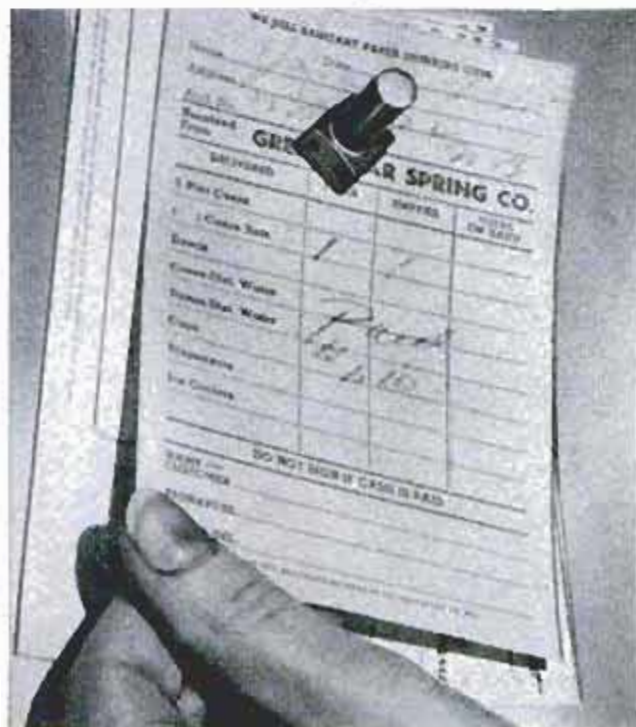
Whatnot Cabinet Made From Window Shutters

Three wooden window shutters were hinged together to form the back and sides of this cleverly designed corner whatnot cabinet. Legs for the cabinet are provided by cutting the lower shutter sections in half horizontally and removing the paneling so only the vertical rails remain. Three of the six shelves in the cabinet are cut from plate glass and three from $\frac{3}{8}$ -in. plywood. Strips of molding on the inner surface of the cabinet back support the rear edges of the glass shelves and L-hooks support the front edges. The plywood shelves are drilled to receive the vertical projection of three L-hooks, one in the center at the back and one at each front corner. The latter arrangement helps to hold the cabinet together. For a more finished appearance, the same type of molding used to support the glass shelves is nailed to the front edges of the sides.

Otto Merker, Chicago.



Magnet Holds Papers to Door of Metal Kitchen Cabinet

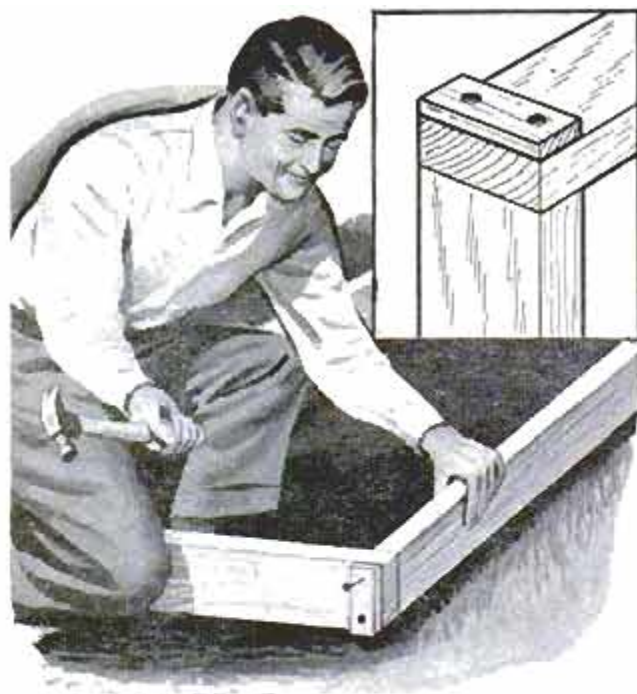


Metal kitchen-cabinet doors serve double duty as handy bulletin boards when small magnets are used to "pin" recipes, notes and bills to them. To use this method just hold papers against the metal surface and place a magnet on top of them.

Ladder Rails "Skidproofed"

To prevent a ladder from slipping when it is used on a smooth surface, attach old rubber heels to the lower ends of the rails. Use nails or screws with fairly large heads so the rubber heel is firmly held, but countersink the heads to prevent them from contacting any surface on which the ladder is placed.—Ted Fenn, Chicago.

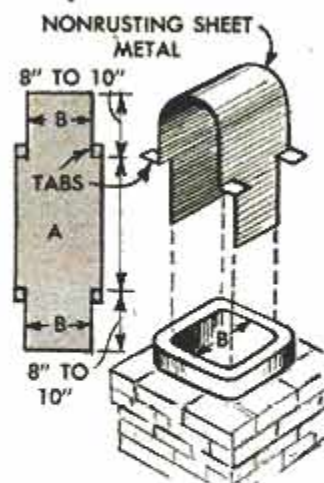




Disassembly of Wood Forms Is Easy With Lath Strips Under Nails

For temporary frames and small construction, such as concrete forms, scaffolding, barricades and animal pens, the lumber is salvaged in good condition at a later date if a piece of lath is used under the nailheads as indicated. Members of the frame are held securely yet the thin lath can be split easily to leave the nailheads projecting enough to get under them with the claws of a hammer.

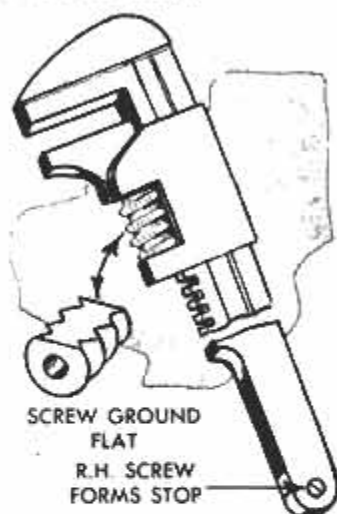
One-Piece Metal Chimney Hood Requires No Fastening Bolts



Cut and bent from a single piece of heavy-gauge sheet metal, this chimney hood will fit either square or rectangular flues. Two fins, which extend down 8 to 10 in., are cut to fit snugly inside the flue, being slightly wider than dimension B. The length of the curved portion, A, is determined by multiplying dimension B by 3.1416 and dividing the result by 2. The curve is bent so tension is provided to keep the fins forced against the sides of the flue. When the fins are forced into place inside the flue, the hood is held firmly on the chimney, but it can be quickly and easily removed by pressing the fins inward and pulling upward.

Quick-Acting Wrench Made By Grinding Flat on Screw

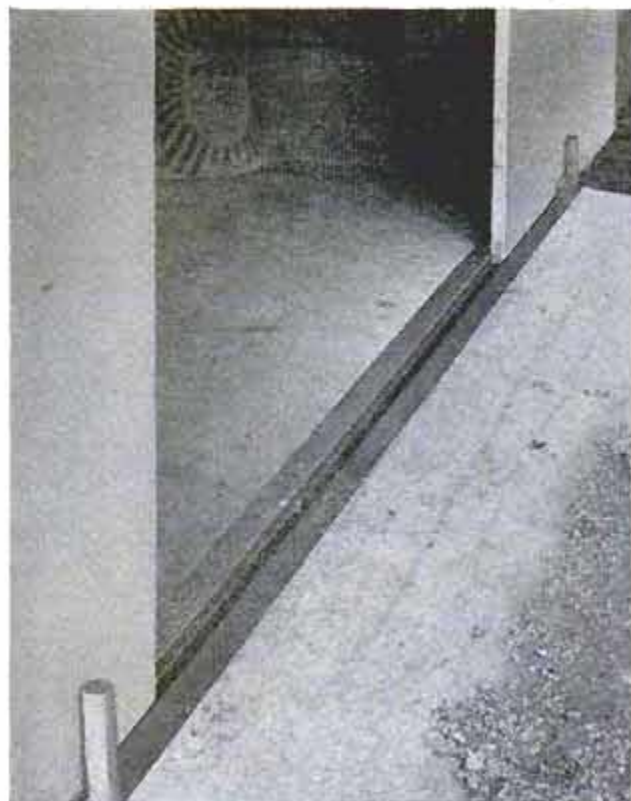
By grinding off a portion of the adjustment screw of an ordinary car or monkey wrench, it can be made quick-acting. When the flat side of the adjustment screw is turned toward the threads, the wrench jaws can be pushed together quickly over the work. Then the adjustment screw is turned to mesh



with its threads for final tightening. To prevent the movable jaw from slipping off the bottom of the handle, a small screw is driven into a tapped hole in the handle.

Angle Iron Set in Concrete Guides Farm-Building Doors

Sliding doors are held tightly against farm buildings and align perfectly when two lengths of heavy angle iron are set in concrete at a doorway to form a channel guide for the bottom of the door as shown. The metal channel also is effective for keeping rodents from entering the building by crawling under the door, a factor which would make the channels valuable for any building used as a granary.

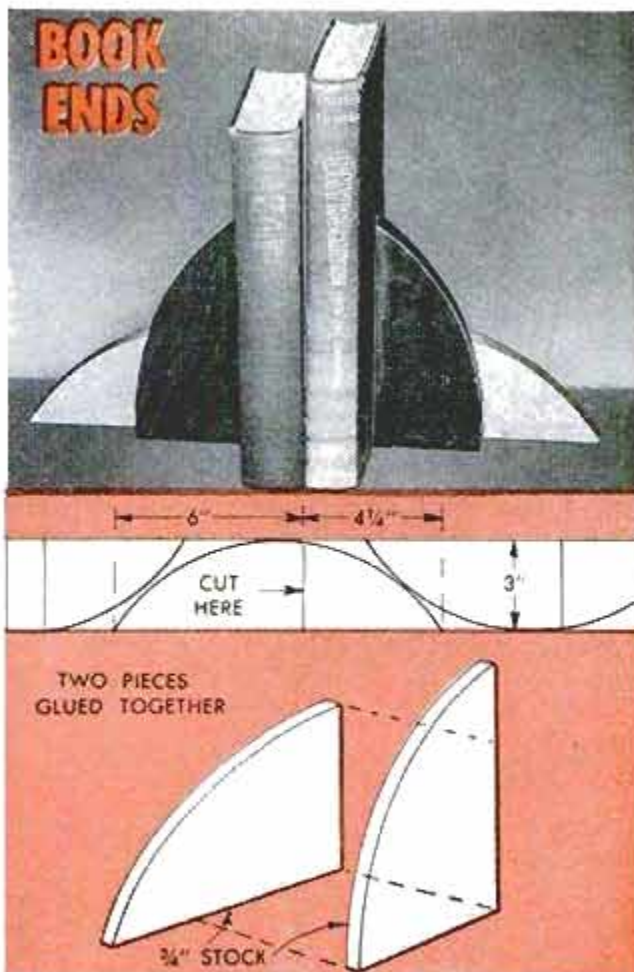




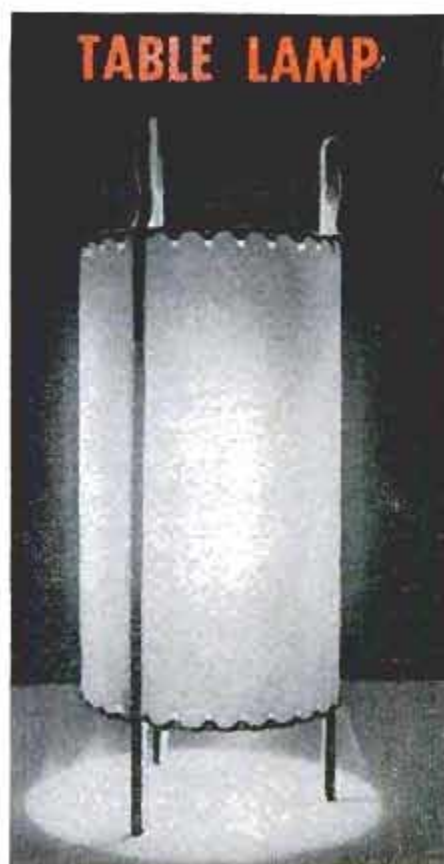
ONE-EVENING PROJECTS

ANY ONE OF THESE eight projects affords the craftsman a full evening of relaxation in the workshop. Most of the work can be done with the jigsaw, or with a coping saw if you don't have power tools. Several of the projects have been purposely designed to utilize small pieces of wood of contrasting color and attractive graining, such as the four pieces used in assembling the book ends pictured at the right. The humidor-pipe rack and the cigarette server can be made from contrasting woods or of a single variety of wood as desired.

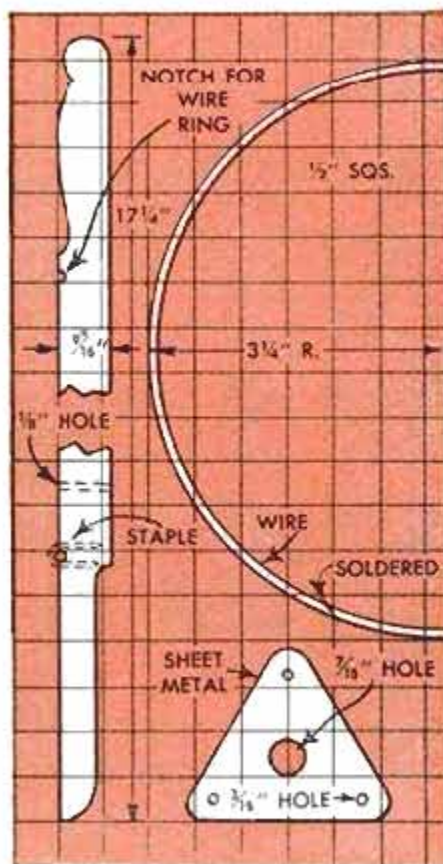
Each unit of the book ends consists of two pieces, one of walnut and one of maple or ash, cut in the manner indicated in the detail and face-glued with the horizontal

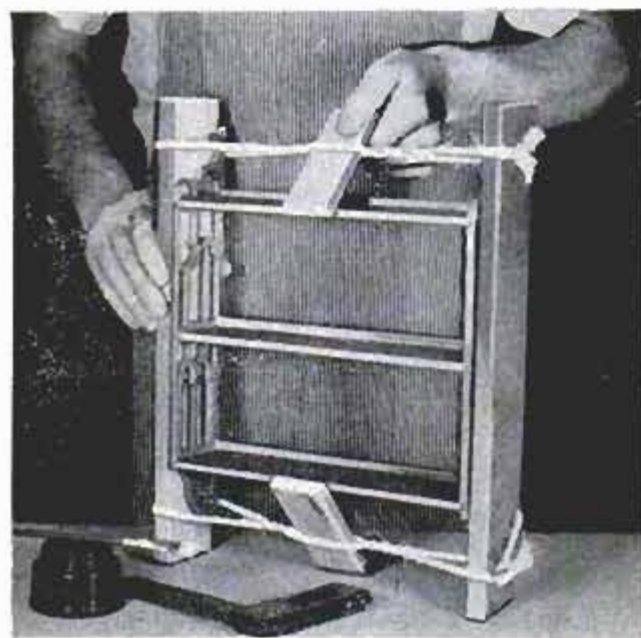
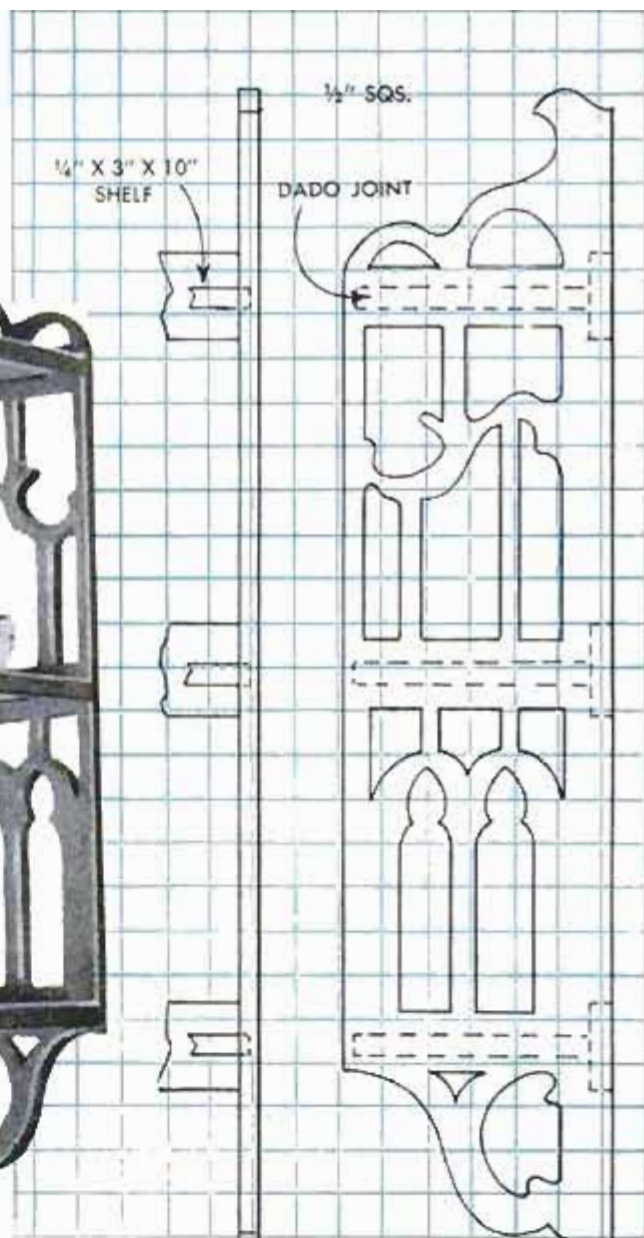
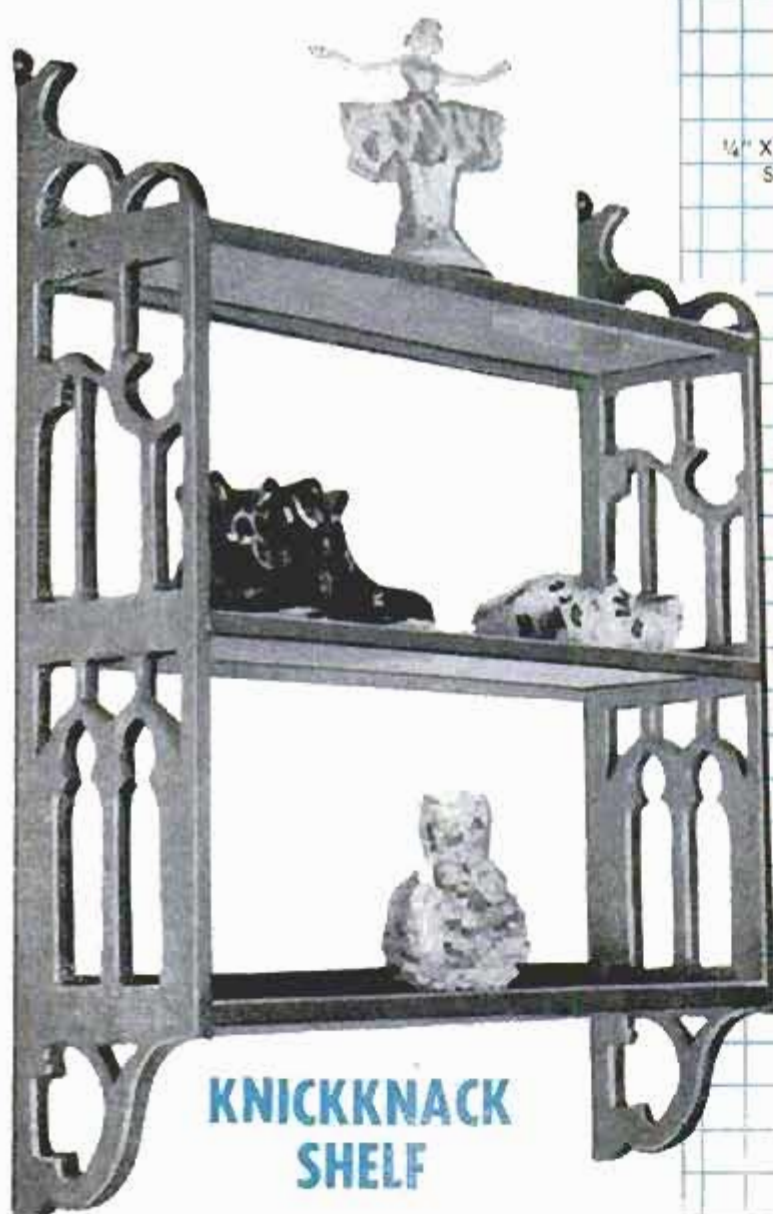


Above, book ends pictured are not only attractive and useful, they can be made with a coping saw and several pieces of sandpaper. Just cut four pieces, two from dark wood and two from light wood, glue together and you have the pair. Below, construction of the lamp is clearly shown in details and pictures



JANUARY 1956





End panels of knickknack shelf are cut by stack-sawing, resulting in two identical parts. Lower photo shows method of assembling with improvised clamp

and vertical edges flush. After sanding smooth, finish with pale varnish or water-white lacquer and polish with very fine steel wool.

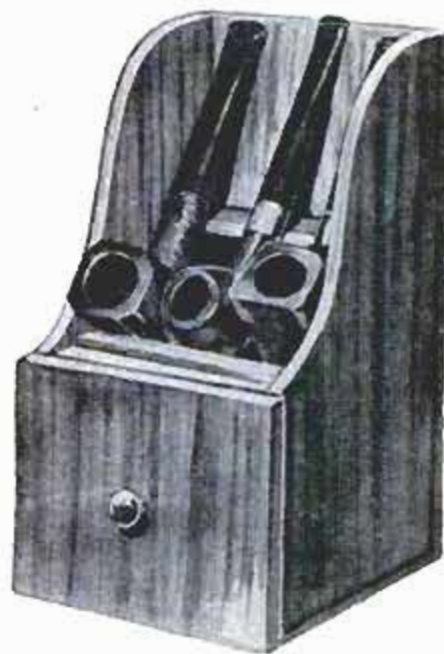
With the materials at hand you can have the table lamp ready for service in the recreation room or TV room in an hour or so. Note the scroll cuts at the ends of the three strips which form legs and frame of the lamp, also the round-bottom notches which take the wire rings. The ends of the wires which form the rings are filed at an angle and soldered. Be sure that both rings are the same diameter before soldering. Join the rings to the uprights with small staples, as indicated in the detail. Then fit the "spider" which supports the lamp socket and you're ready to install the parchment shade. Finishing the exposed ends of the wooden uprights is necessary only if the wood is to be stained or painted to match other furnishings. Otherwise leave the wood unfinished.

Collectors of miniatures have found that an attractive and orderly display of a col-

TOOTHBRUSH HOLDER



You can put any face you like on this toothbrush holder. Cut to pattern from $\frac{1}{4}$ -in. plywood, paint face in flesh tone, add eyes, nose, mouth, ears in black. Hair is dark orange color. Two L-hooks hold brushes

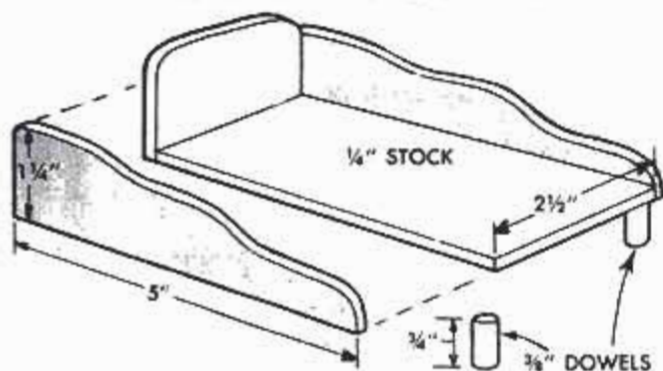


lection adds much to the pleasure of ownership. For this purpose the knickknack-shelf unit pictured is much more effective than a cabinet. Scrolled endpieces are stacked, fastened with brads and the pattern layout made on the top piece. Then saw through both pieces in one operation on the jigsaw and you have two identical parts. Ordinarily, the dados are cut before jigsawing.

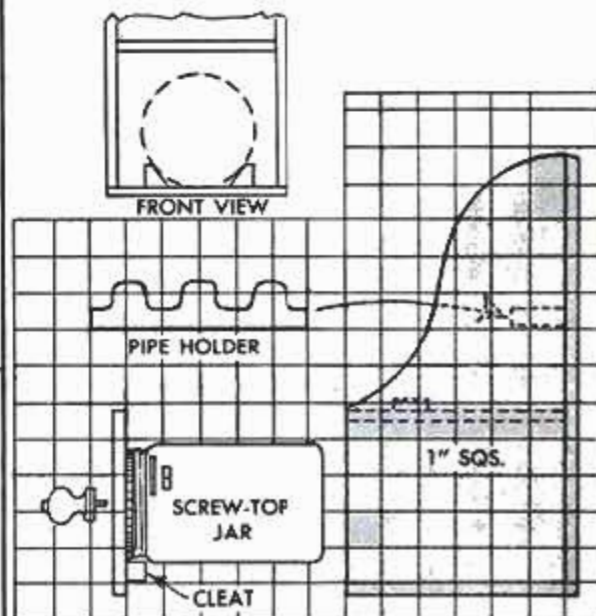
In making the toothbrush holder, humidor-pipe rack and cigarette server, most of the parts are jigsawed to the patterns which are laid out on thin stock. Cut edges



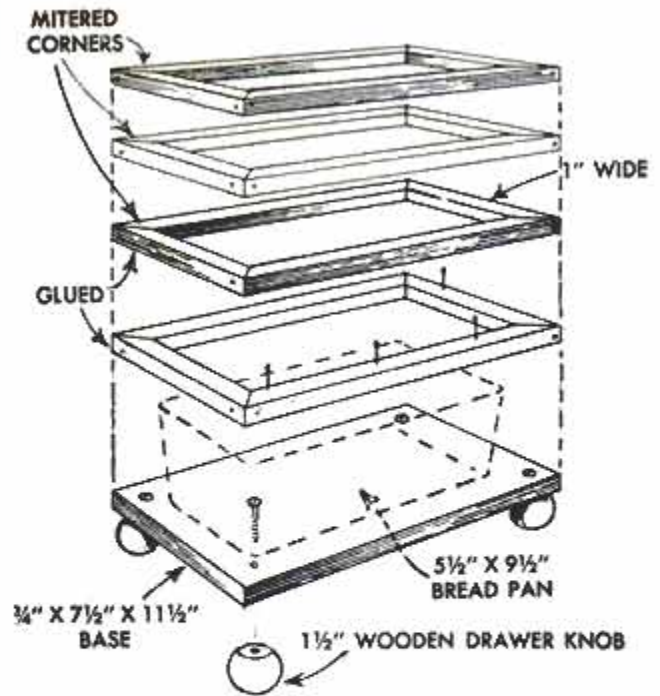
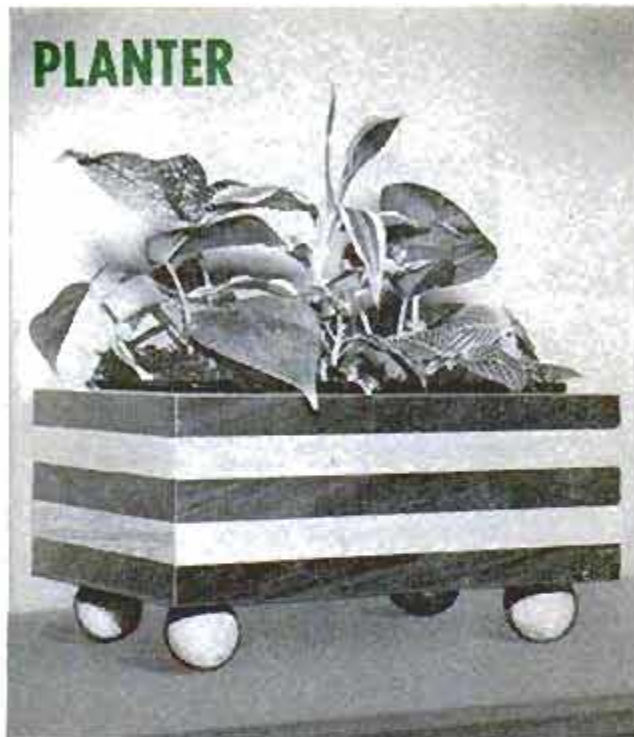
CIGARETTE SERVER



HUMIDOR-PIPE RACK



Pipe rack and cigarette server should be made from choice cabinet woods and finished in the natural color to bring out the grain. Note novel tobacco humidor made from a screw-top glass jar attached to the inside face of "drawer" front. Rack-humidor unit, also cigarette server and book ends are especially adapted to mass production in a small workshop and should be of interest to craftsmen desiring to turn out items for sale at a profit. Stack-sawing and jig assembly of parts reduce costs per unit



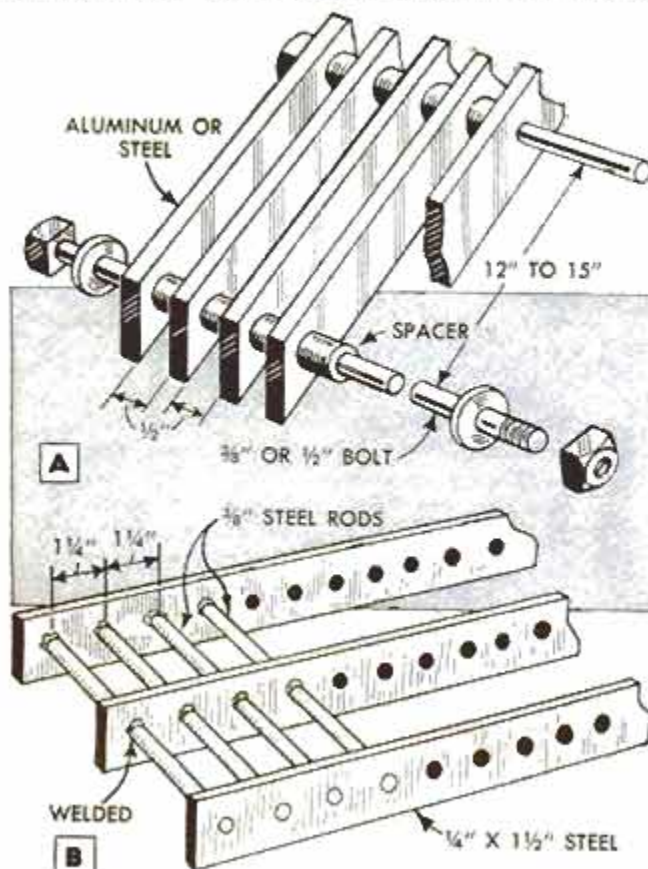
Attractive and unusual appearance of this planter results from use of two contrasting woods. Base and two frames are dark wood, two other frames are light. Waterproof liner in planter is bread pan

should be finished by sanding to remove saw marks. Use $\frac{1}{4}$ -in. plywood for the painted toothbrush holder and choice pieces of solid stock for the pipe rack and cigarette server. Sand thoroughly and finish in the natural color of the wood with pale varnish or water-white lacquer.

The planter consists of four frames made

with mitered corners, two frames cut from a dark-colored wood such as walnut and two from a light, contrasting wood such as maple. The frames are stacked as pictured and then glued to a base piece. Sand after assembly and finish in the natural color of the wood to obtain the most pleasing contrast. ★ ★ ★

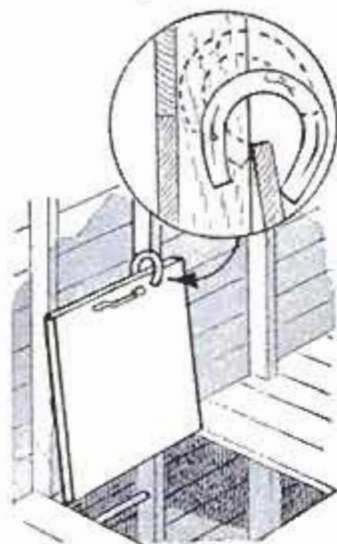
Bolted or Welded Assemblies Used for Window-Well Gratings



Metal gratings, which should be fitted across open window wells to prevent possible injury by persons falling into them, can be made with either a welded or bolted assembly. Detail A in the drawing illustrates a grating assembled from flats, rods, spacers and nuts. The flats can be either steel or aluminum. Aluminum is preferred for a grating that will be removed and replaced often, such as over a coal-bin window. The flats are drilled to receive $\frac{3}{8}$ or $\frac{1}{2}$ -in. bolts or steel rounds, long enough to span the window well. Spacers, which can be short lengths of pipe or large nuts, are fitted between the flats that are assembled on the bolts. Detail B shows a grating made from steel flats drilled to receive $\frac{3}{8}$ -in. steel rods. The rods are welded to the flats. With either type, if the window well is not recessed to receive a grating, hang the grating from the well edges with hooks.

When the cap or stopper is lost from a bottle or other container, an airtight cover can be made by fitting a child's balloon over the top.

Horseshoe Serves as Latch For Trap Door in Barn Loft

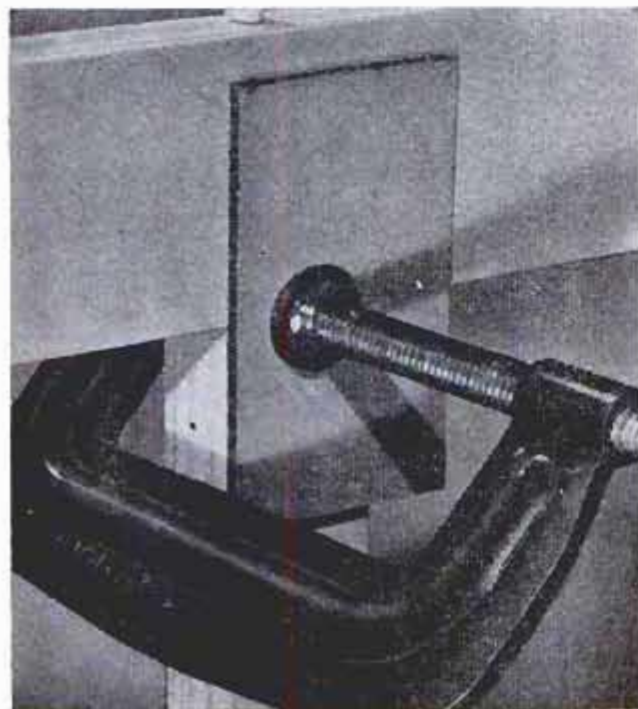


One farmer uses a discarded horseshoe as an automatic latch on the trap door to his barn loft to prevent accidental dropping of the door when opened from below. The shoe is attached to one of the barn studs so that when the trap door is opened against it, the shoe pivots to engage the edge of the door securely.

The weight of the shoe is sufficient to hold an average-sized door. For heavier doors, the shoe should be tightened against the stud so that it does not pivot as easily, or the door should be held with a hook.

C-Clamp Helps Align Butt Joint

When fastening simple butt joints together, it isn't easy to hold them in proper alignment while drilling pilot holes or during assembly. To minimize this trouble hold the joint with a C-clamp as shown. Bits of scrap wood under the clamp members prevent pressure marks as well as keeping the parts in alignment.



Resin will not "bleed" through when finishing knotty pine if the knots are sealed with one or two coats of white shellac.



Small Window Greenhouse Utilizes Storm Sash

A window greenhouse which utilizes the present storm sash can be built in a couple of hours and at a nominal cost. First, the storm sash should be hung on hook-and-eye hangers at the top. The bottom of the sash is extended and a platform of 1-in. stock is fitted between it and the window sill as shown. Hooks hold the platform against the sill to prevent entry from the outside. Two triangular-shaped pieces of $\frac{3}{4}$ -in. exterior plywood form the sides of the greenhouse. Glue and wood screws are used throughout the assembly. Weather stripping is nailed to the window frame so it covers the opening between the top of the storm sash and the frame.

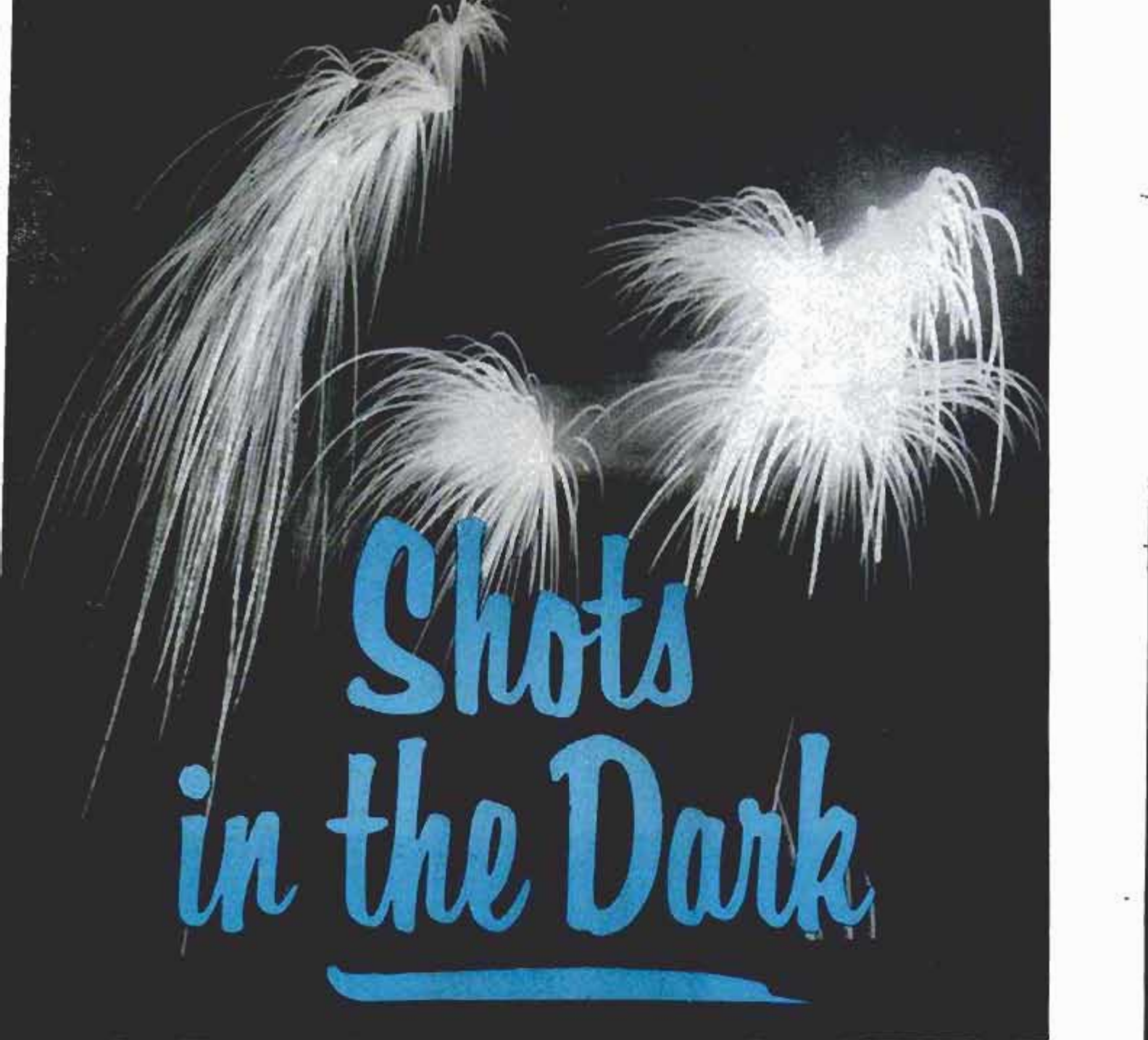
Outlining Designs on Wood With Shellac and Stain

For an interesting decoration in natural wood, outline a selected design on the finished surface of a square of wood and cover the scribed design with thinned shellac.



When the shellac is dry, the surrounding area of the wood can be stained in a color of your choice, leaving a design which will hold its natural-wood appearance.

Ted Otsu, Vancouver 4, B. C., Can.



Shots in the Dark

By Shep Shepherd

Architectural subjects, lighted only from within, or, as in this case, by exterior floodlights as well, are ideal subjects for the alert nighttime photographer



Startling fireworks photos are fun to make. This one is three different shots superimposed on one negative

AMATEUR PHOTOGRAPHERS who cannot find interesting subjects during the day in their locality may make the mistake of putting away their cameras at nightfall. A city or countryside has an entirely different appearance by night and offers numerous challenges to a photographer seeking unusual and striking effects.

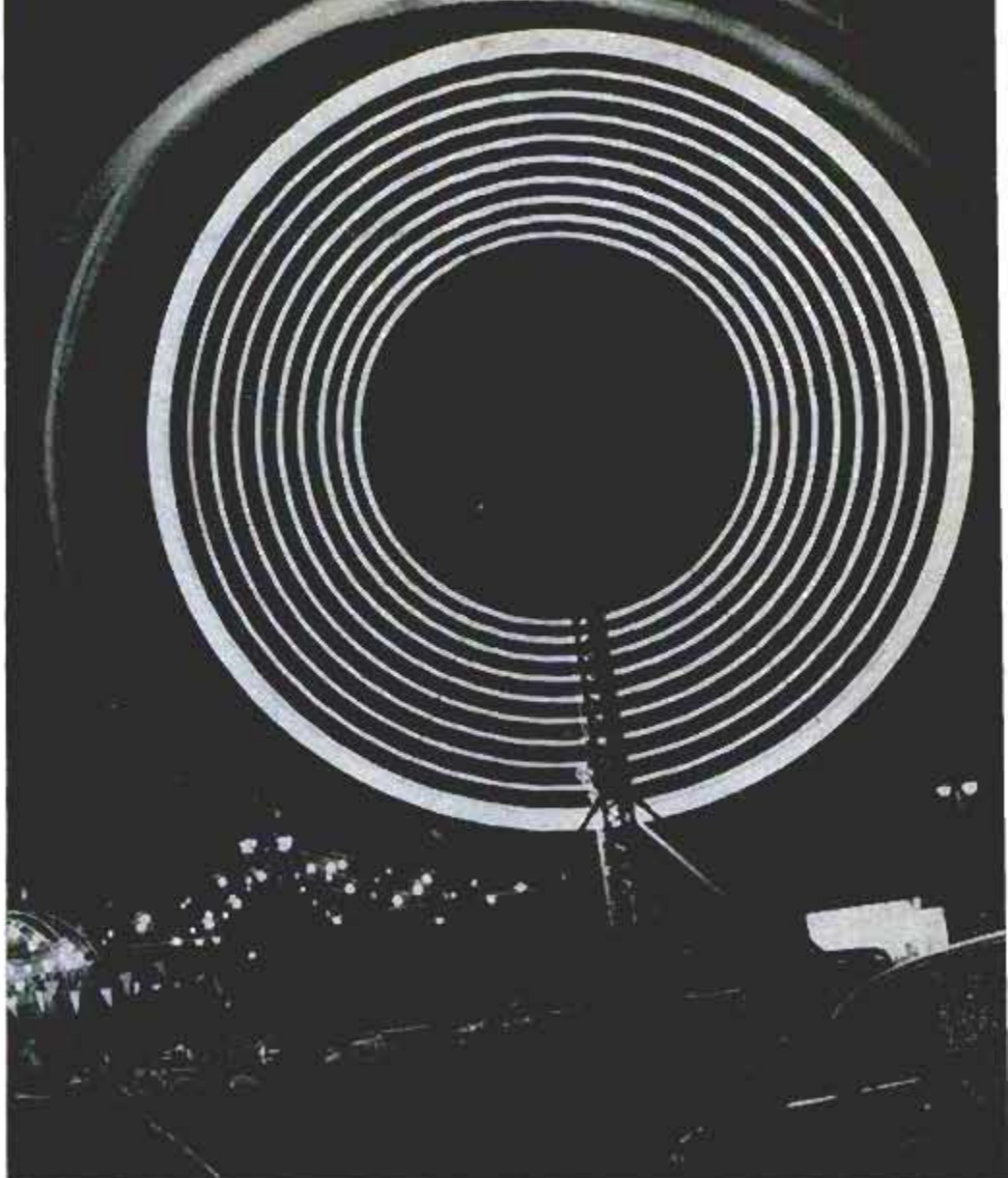
Night photography does not require expensive equipment. Even a box camera can be used with good results. The primary requisite is a rigid tripod, or lacking that, any solid support that will hold the camera steady. Lighted buildings and other structures often have stairways, low walls or ornamental projections that will provide suitable rests.

After-dark pictures require a medium-speed panchromatic film, such as Kodak

Plus X. If color film is used, it should be indoor type, since all pictures will be taken with artificial light.

Because of the unusual lighting conditions encountered in nighttime photography, the use of an exposure meter is not recommended. Instead, use a colored neon light as a gauge, increasing or decreasing exposure time and lens aperture for lights which are brighter or dimmer than the neon. A colored neon light requires an 8-sec. exposure with an $f:11$ lens-aperture setting. Cameras with no diaphragm adjustments are usually compromised at a setting of $f:8$. Since $f:8$ admits twice as much light as $f:11$, reduce exposure time by half.

When photographing night subjects with an exposure of 8 sec. or more, do not worry about people walking between the camera and the subject. They will not register on the film unless they stop in the field of view of the lens. However, any light moving into the picture will register. Therefore, when



Ferris wheel in motion forms unusual light pattern. Eight seconds at $f:11$ was used on medium-speed film. Scene was tilted in printing for effect

Lights reflected on water result in eye-catching shots, such as this building "supported" on light columns





To make this shot, 16 exposures of approximately 1 second were required. Camera shutter was kept open, but covered, until fountain sprayed upward

photographing an object in surroundings where cars may pass between it and the camera, simply close the shutter before the car lights appear in the field of view, and open it after they have passed. Count the time the shutter actually is open to compute exposure time. A camera equipped with a safety lock to prevent double exposures does not permit opening and closing the shutter, so keep the latter open and hold your hand or some object in front of the lens to keep out the unwanted light. The same method can be used to photograph signs that are illuminated for a few seconds at a time, then darkened; for fountains which spray intermittently, or for any objects that are lighted or in action only part of the time.

Because only that portion of the film receiving light is exposed, it is possible in night photography to place several images on one negative by locating each succeeding image on a different portion of the film. The shot of the exploding fireworks

Auto headlights on busy highway intersection should be shot from elevated position for complete pattern



at the beginning of this article is an example of this technique.

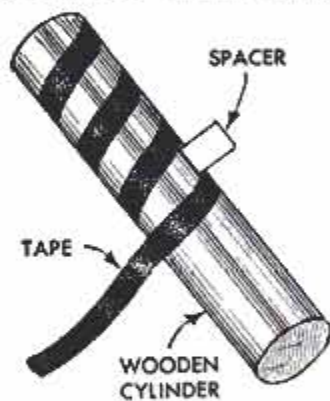
Moving lights make excellent nighttime shots, since they register as paths of light. Lights on amusement-park rides, lights on airplanes landing or taking off, and auto headlights at a busy intersection make interesting patterns. In the latter situation, if one road is more heavily traveled than the other, it may be necessary to block the lens against lights on that road for a while, and open the lens only for the lights on the less busy road. The result will be a more balanced pattern.

Fireworks are the most intriguing of all night subjects, especially those spectacular displays put on for a community. No tripod is used for these shots, since the camera must follow the paths of the soaring rockets to the point where they explode. Keep the shutter open but covered with one hand. As soon as the ground lights are out of the camera view as the rocket is tracked upward, uncover the lens and hold the camera as steady as possible while the explosion flares and dies out. Fireworks are ideal for nighttime color shots. Use indoor film with an aperture of $f:5.6$.

When developing films of nighttime shots, agitate the developing solution frequently to insure good contrast. Printing most night pictures requires a 2-min. development time in standard developer.

The scope of pictures taken at night is limited only by the need for a light source in the darkness. You may soon find that the pictures which please you most, and cause the most reaction, are those taken after sundown. ★ ★ ★

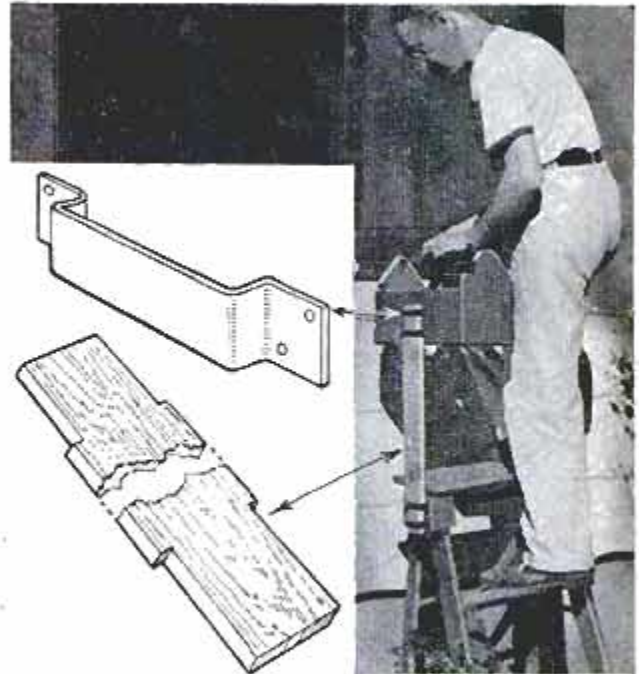
Accurate Helices on Cylinders Marked With Masking Tape



When making helical candlesticks, lamp bases or other objects, or for merely marking off a helix on a cylinder for decorative purposes, you will find masking or other detachable tape handy. It can be pulled off and readjusted to suit.

After making one complete turn of the tape around a cylinder at the desired pitch, measure the distance between the tape strips and cut a cardboard spacer to equal the distance. Use the spacer for making subsequent turns. After the helix is completely taped off, score along the edge of the tape with a knife or scroll saw.

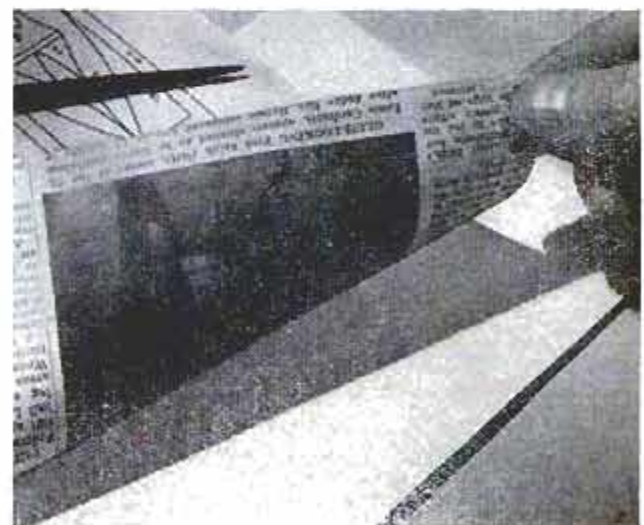
Tools Held at Convenient Level When Working From Stepladder

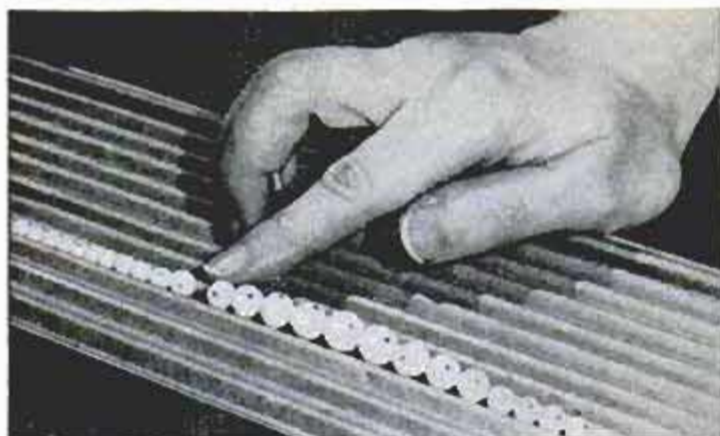


A toolbox can be held at a convenient height while working on a stepladder by means of sheet-metal brackets bent to the shape shown in the illustration. Two brackets are fastened to the side of the toolbox, and two are secured to the ladder. The wooden extension arm, notched at each end to fit into the brackets, is inserted to support the toolbox. The extension arm should fit snugly into the brackets to hold the toolbox steady.

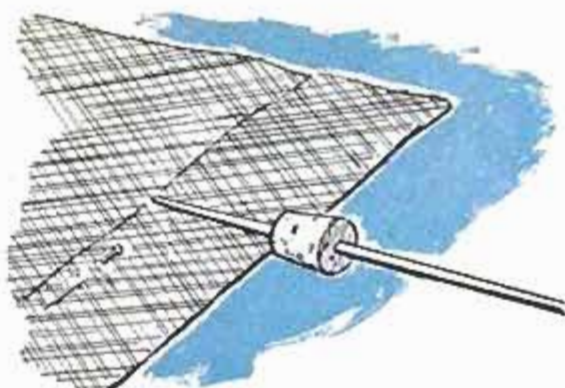
Dark Newspaper Picture Used For Emergency Tracing Paper

When you wish to make a tracing of a sketch or drawing and carbon paper is not available select a dark halftone picture from a recent newspaper and use it as a carbon. Although the result will not be quite as dark as if regular tracing carbon had been used, it will be legible.





CORRUGATED CARDBOARD MAKES AN IDEAL "JIG" for restringing beads. Beads are aligned in correct order in one corrugation groove for stringing the necklace by picking up the beads individually on the end of a needle. Jig is useful for stringing necklaces with beads of graduated sizes

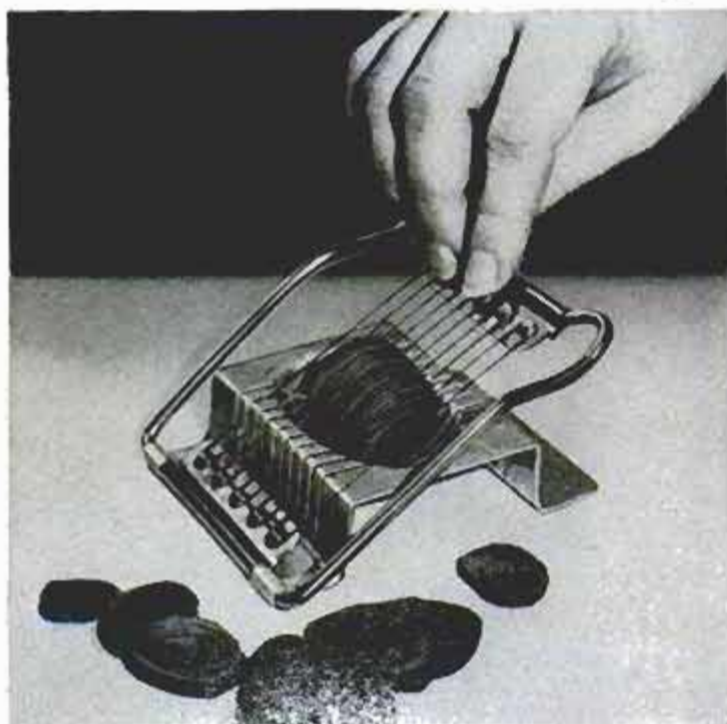


INSTEAD OF USING NOTCHED PIECES of cardboard to serve as gauges when turning hems on garments, force a small knitting needle through a cork to provide an adjustable gauge. Cork slides easily, yet stays put

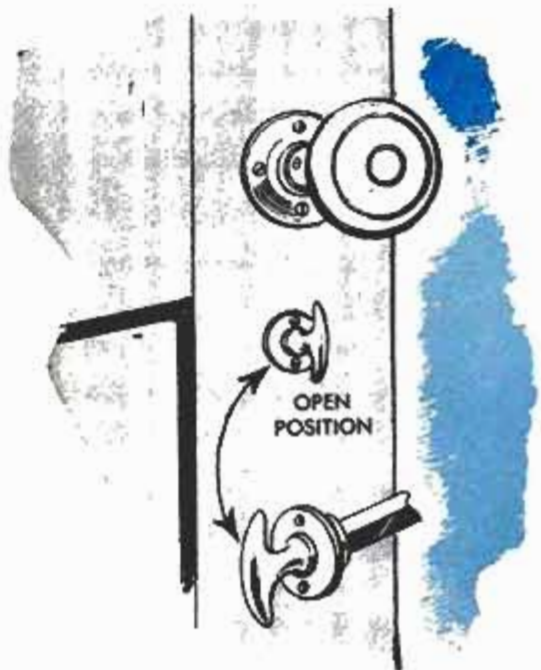
Solving

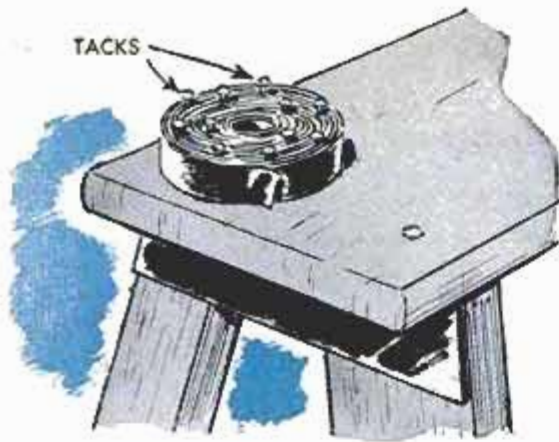
HOME PROBLEMS

IF YOU LIKE PICKLED-BEET SLICES in a salad, but don't prepare them often because of the task of cutting into uniform slices, try using an ordinary egg slicer. Simply place the beet in the hollow of the slicer as you would a hard-boiled egg and cut in the same manner. If a beet is too large for the slicer, cut it in half with a knife before slicing it

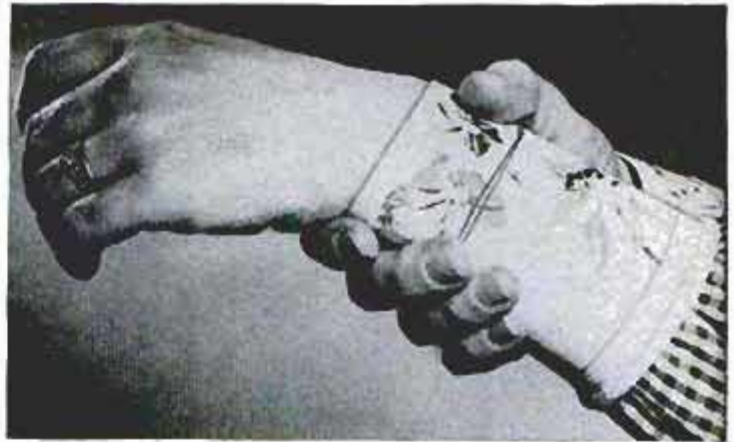


WHEN INSTALLING DOOR LOCKS of the type having a turnpiece, or handle, for bolting from the inside, insert the square shank so that the handle is in the vertical position when the door is unbolted. Position of handle then serves as an indicator, also a reminder





KEEP A SUPPLY OF TACKS HANDY when working on a stepladder by simply inserting the points of the tacks into the side of a roll of friction tape. The roll of tape itself will not slide easily because of its sticky surface

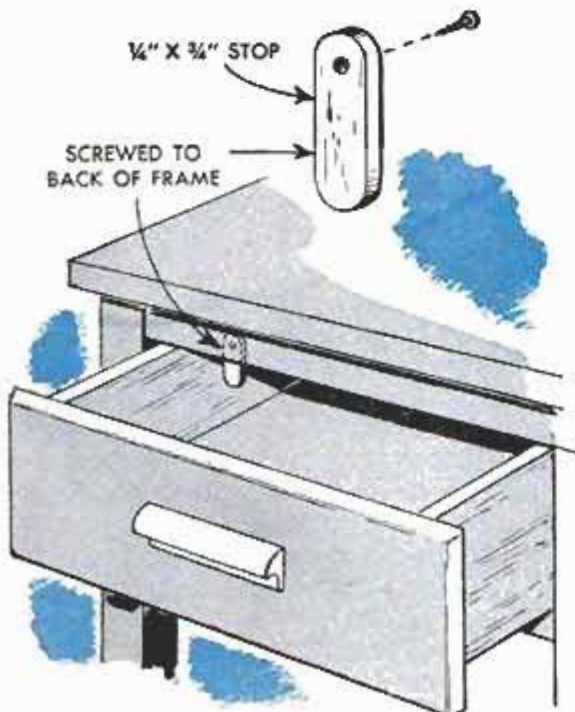


IF YOU HAVE SOME AFTER-THEATER OR PARTY COOKING to do while dressed in a long-sleeved garment, protect the sleeves by wearing a pair of neat cuffs made from paper cups. Remove the cup bottoms, slit the cups lengthwise and slide them over your wrists. Hold in place with rubber bands

NO TIME WILL BE WASTED LOOKING through a jewelry box or drawer for an elusive earring to complete the pair you want to wear if each pair is clipped to a bobby pin when put away. Cuff links, shirt studs and other jewelry worn in sets also can be "filed" this way



DRAWER STOPS cut from tempered hardboard and pivoted on screws driven into the inside of chest, cabinet or desk will prevent pulling drawers all the way out accidentally. Swinging the stops up permits removing drawers



CRUSHING AN ASPIRIN OR OTHER MEDICINAL TABLET to powder, so it can be dissolved in water and taken by a person who has difficulty swallowing tablets, can be done neatly by using two spoons. The tablet is placed in the bowl of one spoon and crushed by the bowl of the other





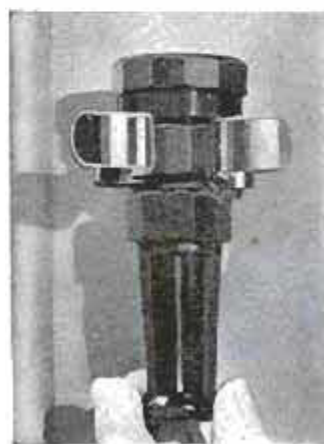
Horseshoes Serve as Handles To Carry Cement Blocks

Handling or carrying rough cement blocks is easier when a horseshoe is used as a handle. The horseshoe handle will provide a more comfortable grip if a short length of rubber hose is slit open at one side and slipped over one side. A large-size shoe, with its wide clearance between the open ends, will serve this purpose better than a small one.

Blotter Predetermines Paint Color

The color of a rubber-base paint when thoroughly dried can be determined by applying a smooth coating of the paint to a clean, white blotter. The blotter absorbs the liquid vehicle of the paint in a few minutes, leaving only the dry pigment on the surface, which shows the color the paint will be when dry.

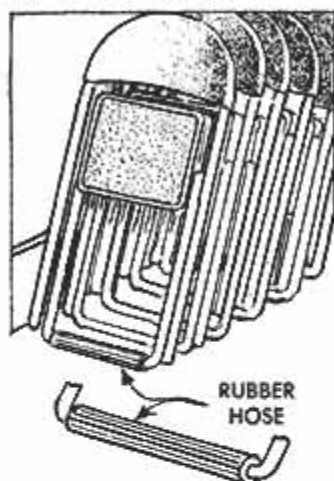
Broom Clip Is Handy Holder For Garden-Hose Nozzle



A broom clip fastened in a convenient location on the house provides an excellent holder for the garden-hose nozzle when it is removed from the hose. Located at shoulder height the nozzle will be located above the reach of curious youngsters.

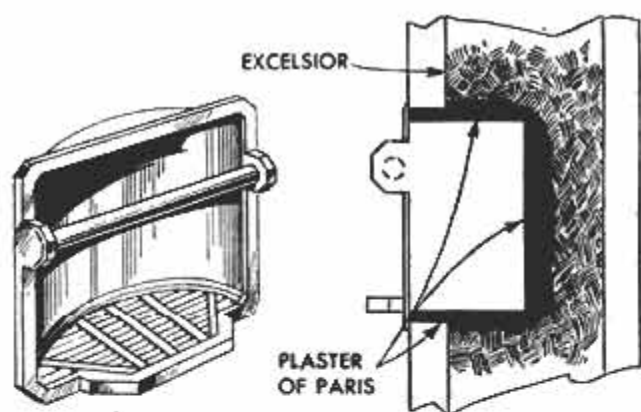
Folding Chairs Stacked Upright Kept From Sliding With Hose

When folded and stacked in rows, metal folding chairs of the type shown have a tendency to slide on slippery floors and the whole row collapses. To prevent this, slit a length of rubber hose and fit it over the horizontal "foot" of one chair. Place this chair at the end of a stacked row. Its "skidproof" foot will keep the chair from sliding, and it in turn will hold the other chairs in place.



Installing Recessed Fixtures In Bathroom Wall

Installing recessed bathroom fixtures, such as a soap dish over a tub, is not as difficult a job as it might seem. Locate an area of the wall that is between the studs and cut a hole about $\frac{1}{8}$ in. larger than the recessed portion of the fixture. Stuff excelsior tightly into the wall to form a bedding

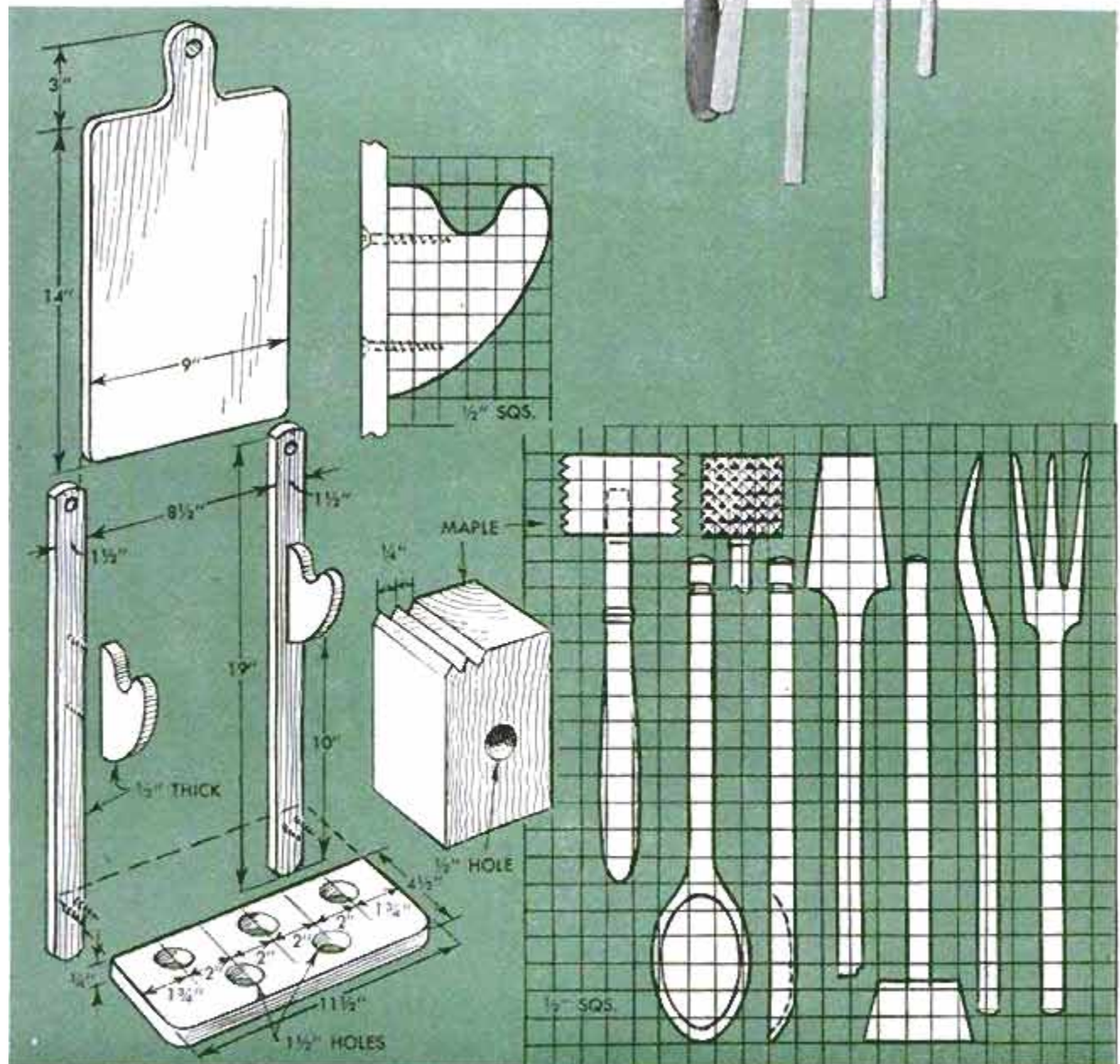
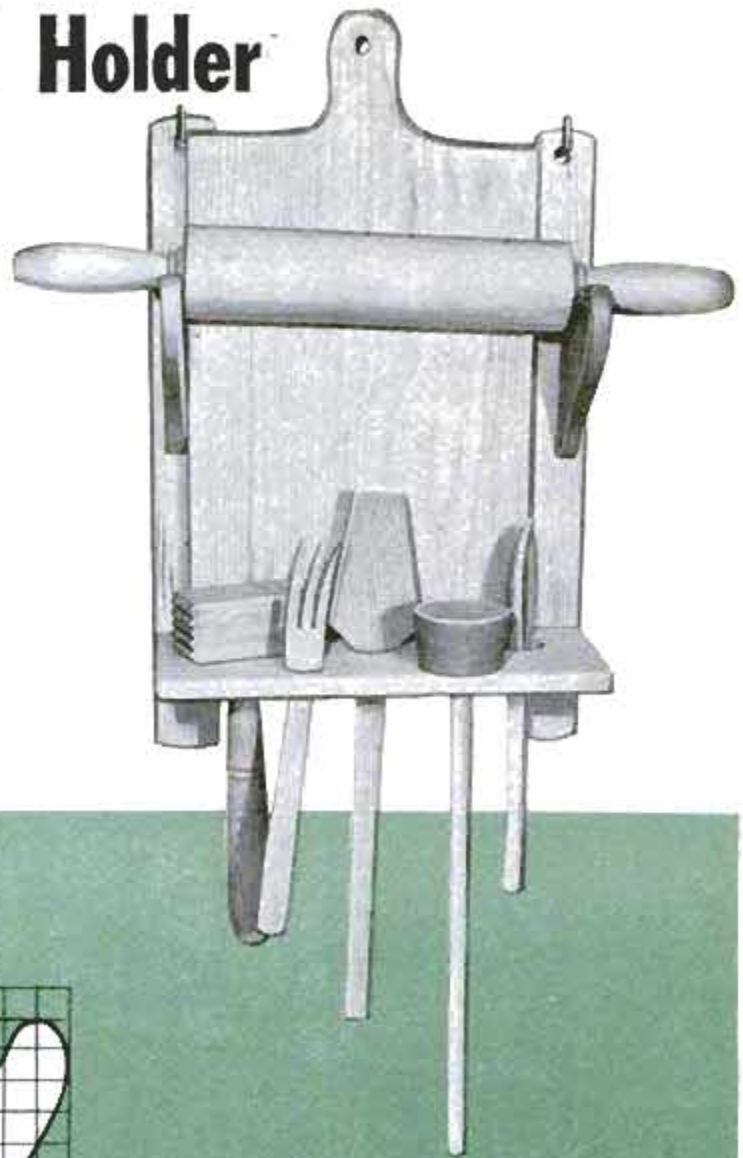


above, below and on both sides of the hole. Cover the excelsior liberally with plaster of paris, then fill the hole about half full of plaster so it will be forced around the fixture when the latter is pressed into place. Work quickly because the plaster sets in a short time. Recessed fixtures that do not have flanges or ribs to anchor in the plaster have lugs between which wire is strung so that it is embedded in the plaster. Press the fixture into the hole and hold it firmly until the plaster sets. Clean off excess plaster around the edges with a putty knife and damp cloth. To prevent water from seeping behind the fixture, calk its edges with one of the special calking compounds made for use in bathrooms.

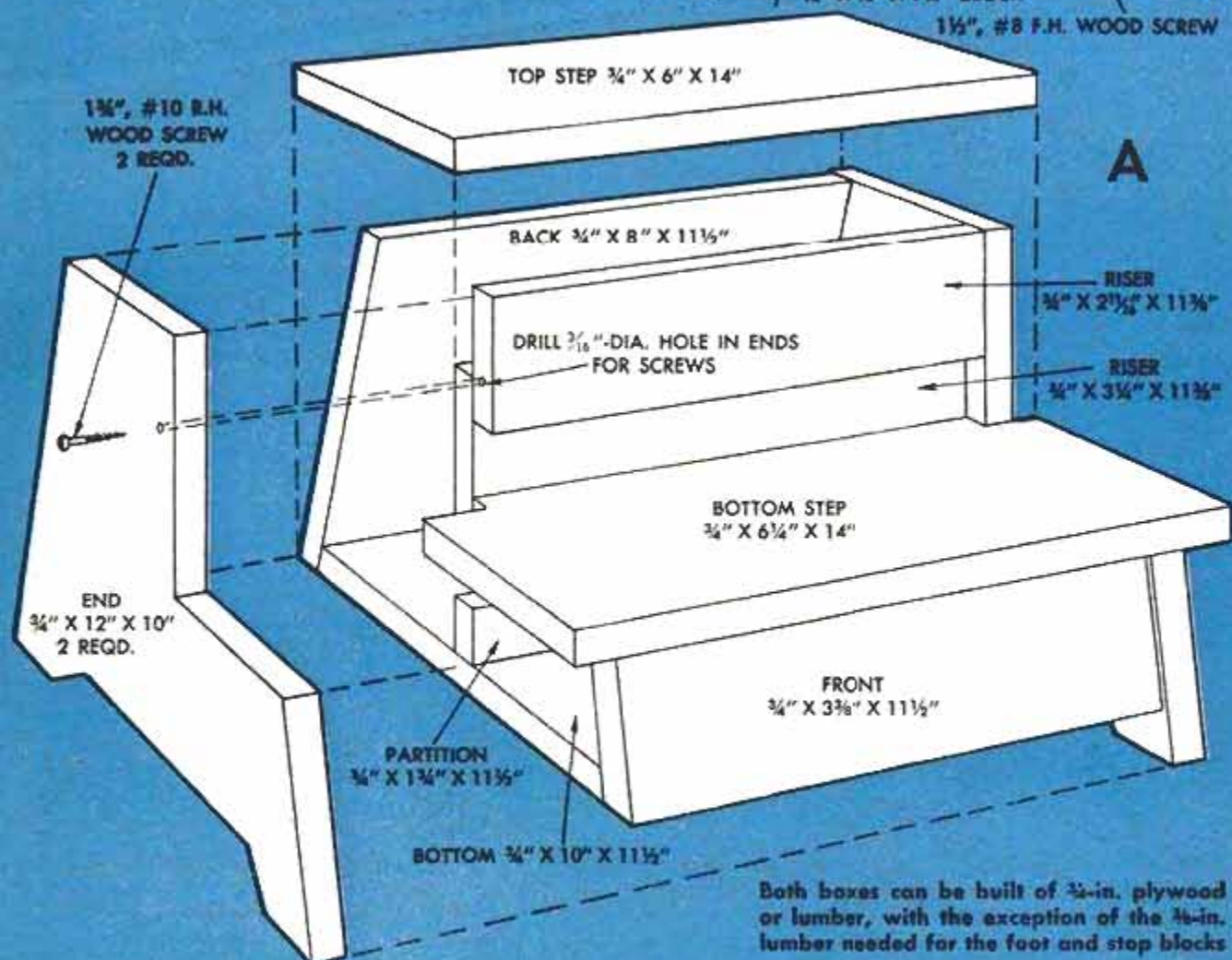
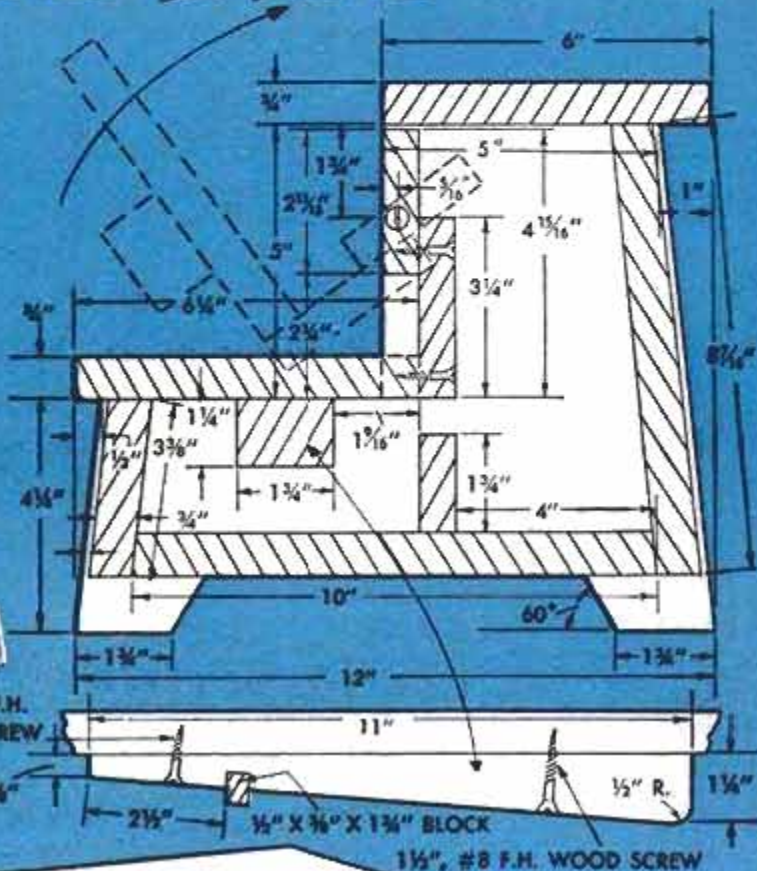
Wooden-Utensil Holder

By Hi Sibley

LOOKING FOR SOMETHING unusual to add a quaint touch to your kitchen? This decorative and practical wooden-utensil holder will accommodate purchased utensils or items made by using the squared patterns below. The cutting board, which slides down behind the rolling pin when the holder is hung on the wall on two L-hooks is cut from softwood, as is the rest of the holder. Close-grained hardwood, such as maple, should be used for the utensils. The pattern on the faces of the meat-tenderizing hammer is made by first cutting V-grooves in one direction, then cutting similar grooves at right angles to those cut first.



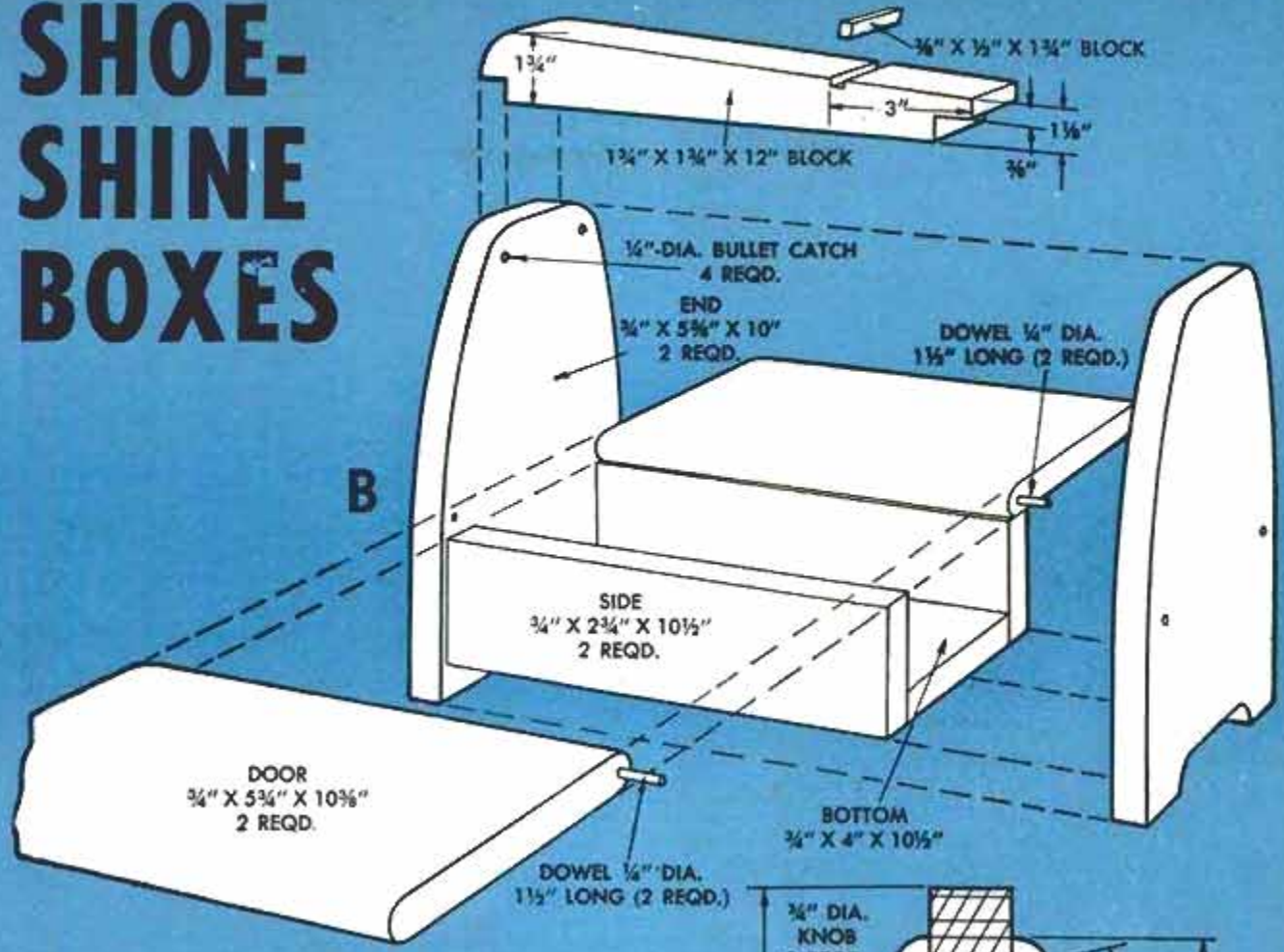
PATTERNCRAFT



Both boxes can be built of 3/4-in. plywood or lumber, with the exception of the 1/2-in. lumber needed for the foot and stop blocks

W.M. 57

SHOE-SHINE BOXES



MATERIAL LIST

Box A

Lumber or plywood

- 1 pc.— $\frac{3}{4}$ " x 6" x 14"—Top step
- 1 pc.— $\frac{3}{4}$ " x $6\frac{1}{4}$ " x 14"—Bottom step
- 2 pcs.— $\frac{3}{4}$ " x 12" x 10"—Ends
- 1 pc.— $\frac{3}{4}$ " x $8\text{-}7/16$ " x $11\frac{1}{2}$ "—Back
- 1 pc.— $\frac{3}{4}$ " x $3\frac{3}{8}$ " x $11\frac{1}{2}$ "—Front
- 1 pc.— $\frac{3}{4}$ " x $2\text{-}11/16$ " x $11\frac{3}{8}$ "—Riser
- 1 pc.— $\frac{3}{8}$ " x $3\frac{3}{4}$ " x $11\frac{3}{8}$ "—Riser
- 1 pc.— $\frac{3}{4}$ " x $1\frac{3}{4}$ " x $11\frac{1}{2}$ "—Partition
- 1 pc.— $\frac{3}{4}$ " x 10" x $11\frac{1}{2}$ "—Bottom

Lumber

- 1 pc.— $1\frac{3}{4}$ " x $1\frac{3}{4}$ " x 11"—Foot block
- 1 pc.— $\frac{3}{8}$ " x $\frac{1}{2}$ " x $1\frac{3}{4}$ "—Stop block

Box B

Lumber or plywood

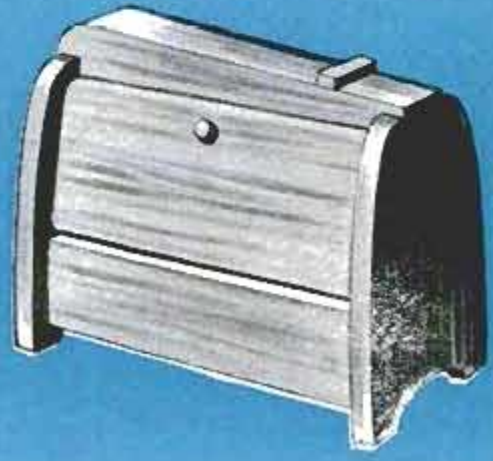
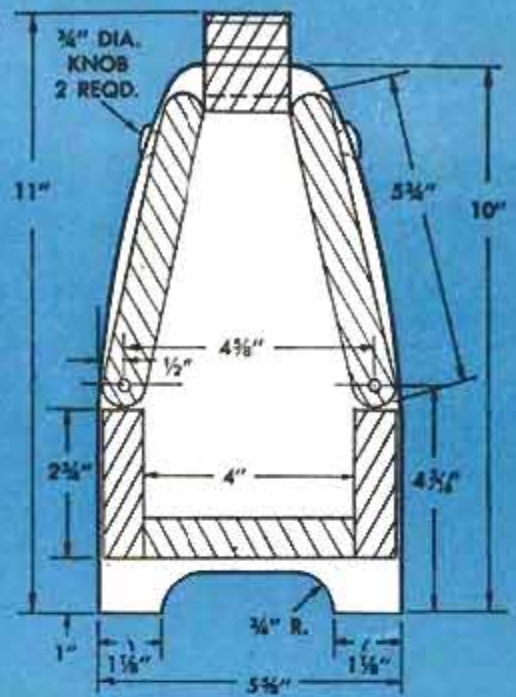
- 2 pcs.— $\frac{3}{4}$ " x $5\frac{5}{8}$ " x 10"—Ends
- 2 pcs.— $\frac{3}{4}$ " x $2\frac{3}{4}$ " x $10\frac{1}{2}$ "—Sides
- 2 pcs.— $\frac{3}{4}$ " x $5\frac{3}{4}$ " x $10\frac{3}{8}$ "—Doors
- 1 pc.— $\frac{3}{4}$ " x 4" x $10\frac{1}{2}$ "—Bottom

Lumber

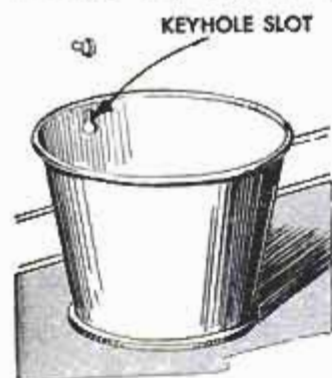
- 1 pc.— $1\frac{3}{4}$ " x $1\frac{3}{4}$ " x 12"—Foot block
- 1 pc.— $\frac{3}{8}$ " x $\frac{1}{2}$ " x $1\frac{3}{4}$ "—Stop block
- 4 pcs.— $\frac{1}{4}$ " dia. x $1\frac{1}{2}$ " Dowels
- 2 pcs.— $\frac{3}{4}$ "-dia. Knobs

FULL-SIZE PATTERNS

If following magazine details is difficult for you, make the shoeshine boxes the easy way—use a full-size pattern with complete directions. Send 50 cents for Plan No. 124 to Patterncraft, Popular Mechanics Press, 200 East Ontario Street, Chicago 11, Ill.



Wastebasket With Slot in Side Hooks on Screw in Wall



The school or shop wastebasket will not be overturned if a keyhole slot is cut in one side of the container to engage the head of a wood screw driven into a wall or other stationary object. The screw should be

located at the same height as the narrow part of the slot in the basket, so that the container rests squarely on the floor.

Nontipping Dog Feeder Made From Coffee Can



To keep a dog from overturning or carrying away his feeding dish, use a coffee can staked to the ground with a wire loop as a feeder. Fit a length of wire through holes punched opposite each other near the lower edge of the can. Bend the projecting ends of the wire down and force them into the ground as indicated.

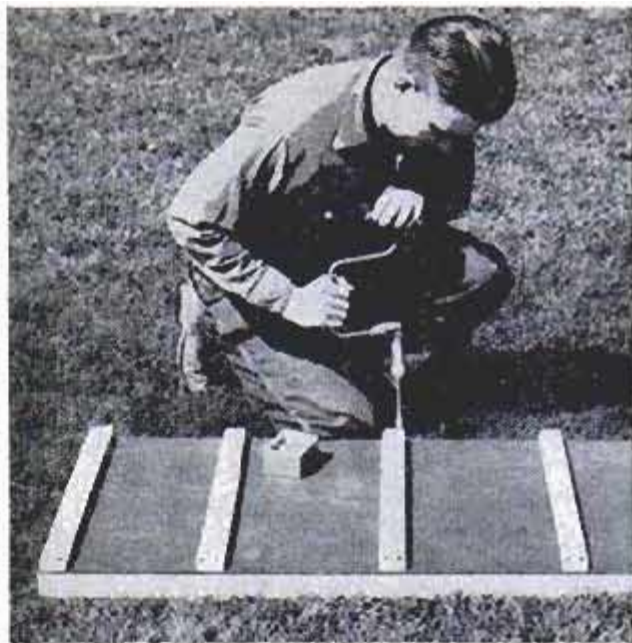
"Chain Reaction" Torch Lights Fire On Windy Day



When a strong wind or a draft makes lighting a fire difficult, a number of book matches and a loosely rolled newspaper can be used to make a torch that will keep reigniting itself. The matches are fitted into slits cut or torn in the

outside surface of the rolled newspaper as shown. Stagger the matches so the starting flash from each match ignites the next one after a slight delay.

Leonard W. Mitchell, Marion, Ky.

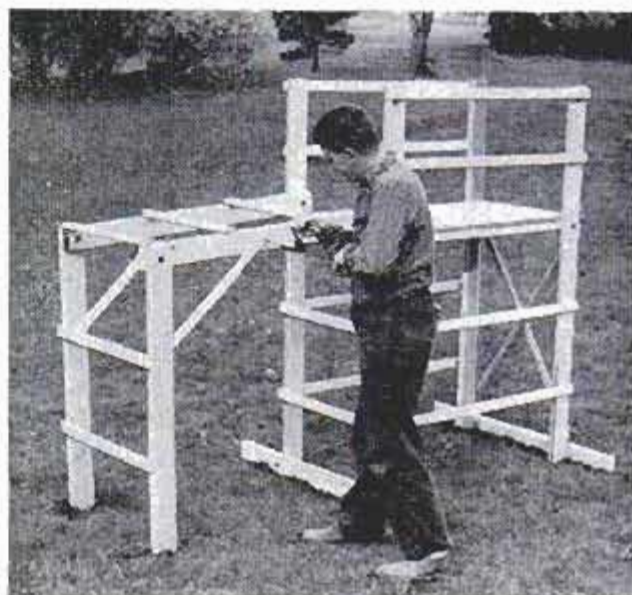


The tempered-hardboard slide surface is reinforced with 1 x 2-in. crosspieces spaced one foot apart

COMBINATION

IF YOU HAVE youngsters between two and eight years of age, here is a combination slide and exerciser which will bring them hours of healthful fun. It dismantles into three easily handled sections so it can be moved indoors and set up in the basement playroom during the winter months. The whole unit is made of standard lumberyard material, consisting mainly of 1 x 2s and 2 x 4s, with hardboard being used for the bottom of the slide. All wooden parts should be protected with a coat of paint followed with two coats of spar varnish. Varnishing and waxing the hardboard will give a slick surface. ★ ★ ★

To provide maximum strength and avoid splitting of the members, pilot holes should be made for screws



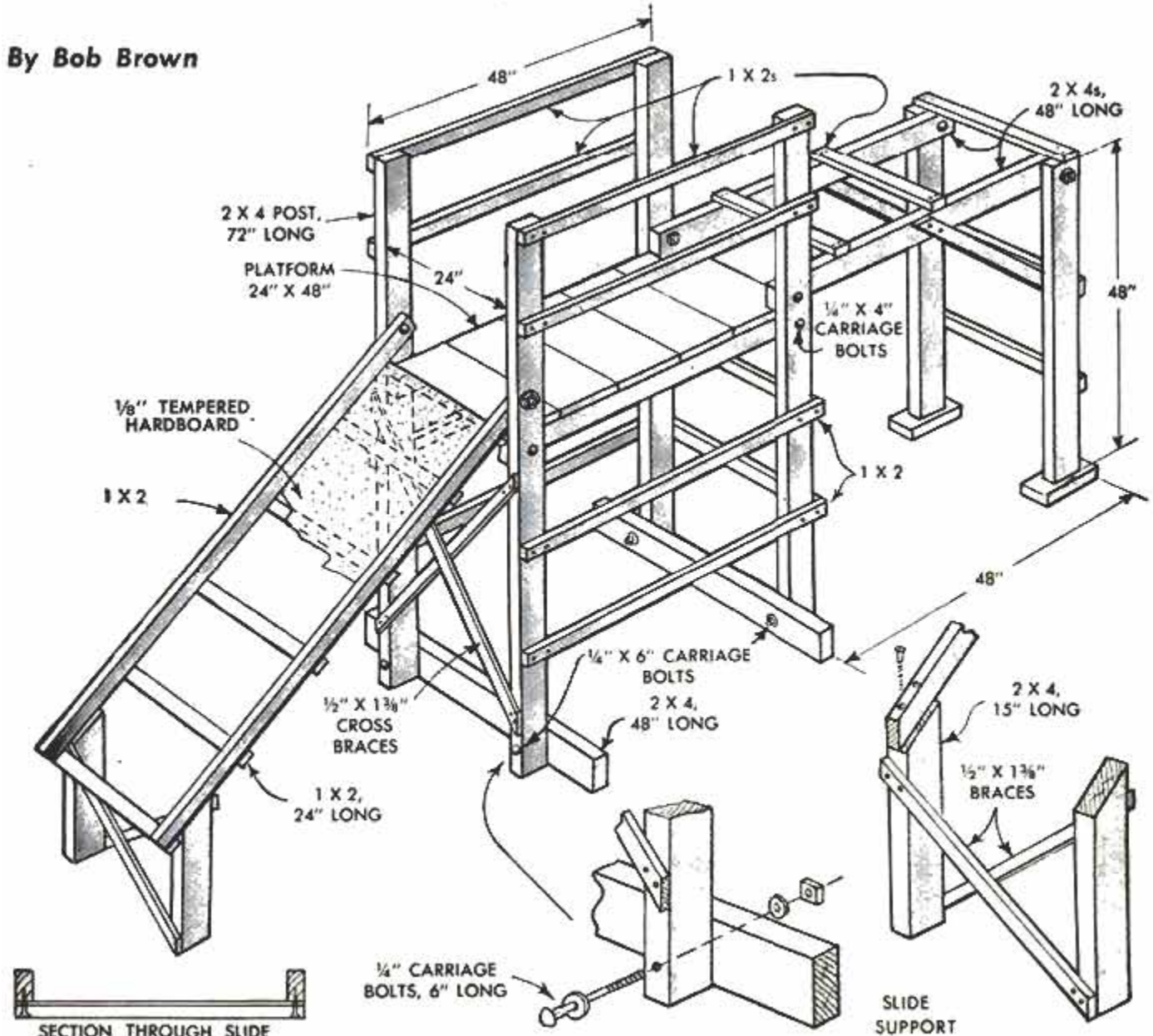
WIM '57



A summer-winter unit — comes apart in sections for setting up indoors when basement space permits

SLIDE AND EXERCISER

By Bob Brown



Baby Oil Removes Paint From Tender Skin Without Irritating



If the skin on your hands burns and becomes roughened when you remove spattered paint from it with thinner or other solvents, use a cloth saturated with baby oil. Used to remove paint from the face also, the oil has no adverse effects upon the eyes as conventional solvents do.

Mousetraps in Coffee Cans No Hazard to Poultry

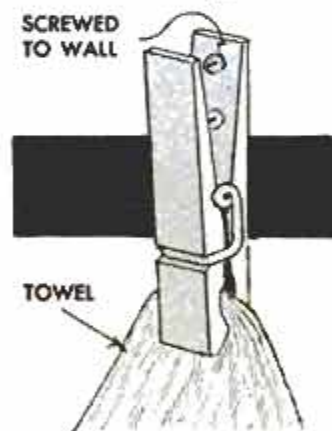
If mousetraps set in a poultry house or chick brooder are placed in coffee cans, they remain effective but present no hazard to the poultry. Cut a hole in the side of each can large enough to admit a mouse, set the trap inside and replace the can cover. A correspondingly larger container could be used in the same manner for a rattrap.



"Snow" Shellacked to Evergreens

A snow effect is given to evergreens for indoor decoration by brushing them with a coat of thinned white shellac and then quickly sprinkling on packaged "snow." The "snow" is held firmly in place when the shellac dries.

Spring-Type Clothespin Provides Quick-Acting Towel Rack



An ideal holder for hand towels and dish towels consists of a spring-type clothespin screwed to a wall or cabinet. Pressing the free leg of the clothespin releases the towel or permits inserting it. To fasten the clothespin to the wall, disassemble

it, drill one leg and screw it to the wall. Reassemble the pin on the wall. To permit easy cleaning and to prevent soiling the wood, paint or varnish the clothespin before reassembling it.

Kitchen Cabinet Redesigned For Living-Room Use

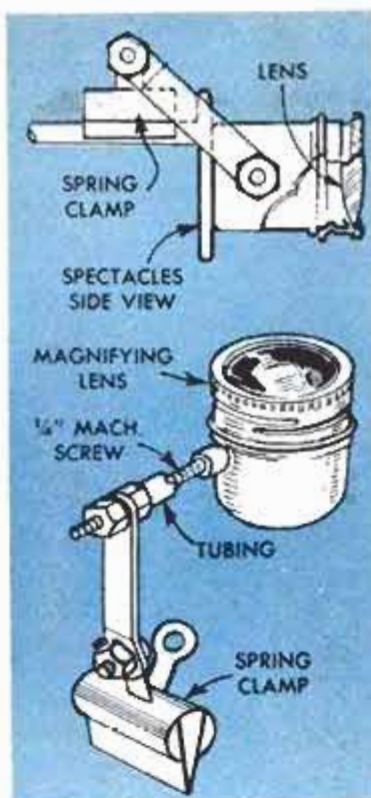
A discarded steel kitchen cabinet was converted into a piece of attractive living-room furniture by refinishing it and mounting it on a base fitted with legs. The base is simply a wooden frame built to fit snugly under the bottom of the cabinet. Short legs of the type shown are used for coffee tables, and can be purchased at lumberyards.

Lynda Carpenter, Santa Monica, Calif.



Magnifying-Lens Holder Clamps to Temple of Eyeglasses

Hobbyists, collectors and photographers who wear glasses will find this magnifying-lens holder handy. It clips to one temple of the glasses and swings away from the eye when not in use. The holder is made from a 35-mm. film container and a lens that will fit snugly inside its cap. First, cut a hole in the cap slightly smaller than the lens and then bend a $\frac{1}{8}$ -in. lip around the top edge of the container to form a seat for the lens which is held in place by the cap. Next, cut off the bottom half of the container, saving only the upper half. Then drill this for a $\frac{1}{4}$ x $1\frac{1}{4}$ -in. screw, inserting the latter from the inner side. Then slide a sleeve of small tubing over the screw, followed by a nut to hold the assembly. Follow this with an arm of heavy sheet metal and a second nut. The arm is bolted to one side of a small paper clamp, which

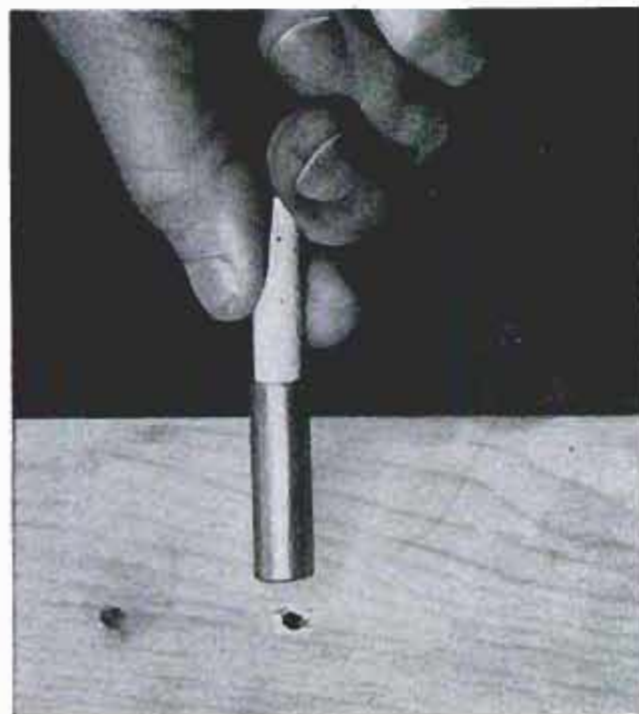


fastens the holder to the glasses. A person who does not ordinarily wear glasses also can use the holder by clamping it to the temple of a pair of sunglasses from which the lenses have been removed.

Length of Metal Tubing Fills Holes With Putty

This handy tool holds an ample supply of putty for use in filling nail holes before painting a house or other smaller projects. It is easily made of a 2-in. length of $\frac{3}{8}$ -in. i.d. metal tubing fitted

with a $\frac{3}{8}$ -in.-dia. wood-dowel plunger that is slightly longer. With a load of soft putty in the tube, press the open end over a nail hole, depress the plunger a short distance and then slide the tube over the work. The result is a smooth, even job in which the hole is packed with putty for a considerable distance.



Hands "Washed" Without Water By Using Shaving Cream

Washing your hands after changing a tire on the highway is no problem when a tube of brushless shaving cream is carried in the glove compartment. A quantity of the cream is rubbed between the palms, worked over the hands, then wiped off with a cloth. Hands are clean enough to prevent soiling clothes, upholstery or steering wheel until there is a chance to use soap and water.

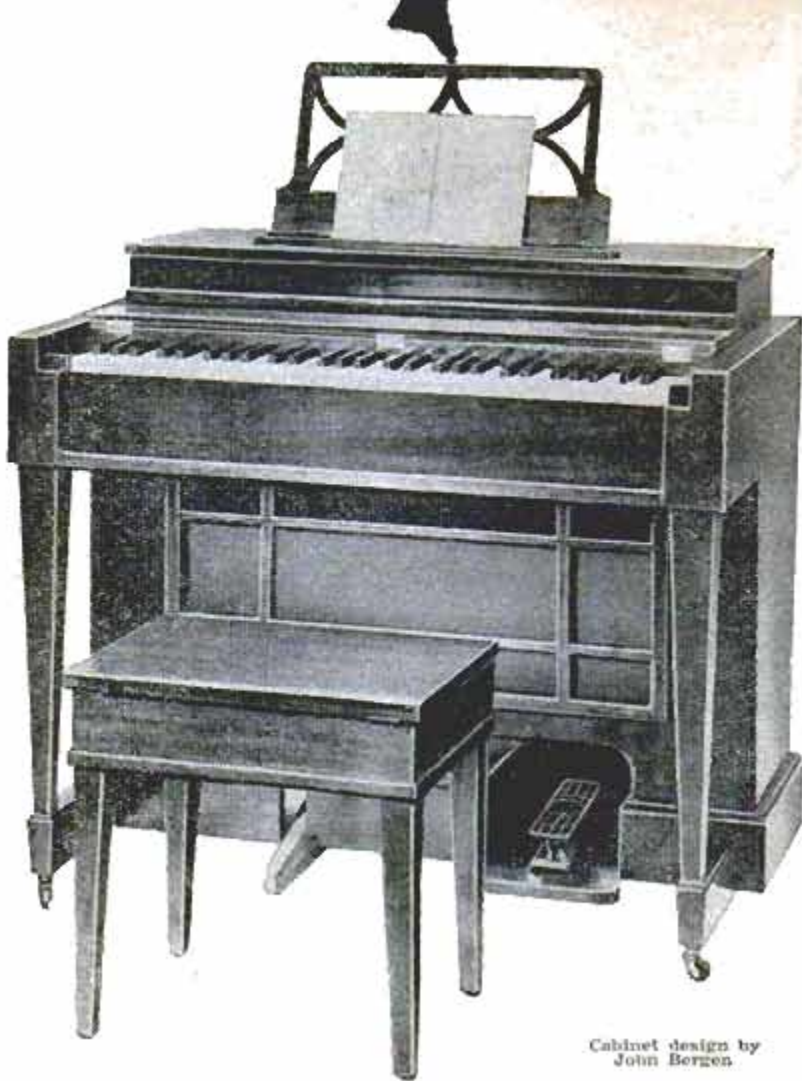


WTM '57

Homemade Organs

By Allan Carpenter

PART II



Cabinet design by
John Borzen

EQUALLY AS HANDSOME a piece of furniture as the accordion-organ presented last month, this somewhat larger one is designed to house musical works that are sold as a kit which anyone can install. The keyboard section and the double set of reeds come ready-mounted as a single unit to simplify installation to the point of merely screwing the keyboard to the mounting board of the cabinet. The photo below pictures the parts that comprise the kit.

The drawings on the facing and following page detail construction of the cabinet. The original organ shown above was made

from mahogany-faced plywood and solid stock where specified. The bench detailed on page 208 can be used with either organ. The cabinet consists of four sections, all being joined together permanently with cleats and screws, except the top section which is left removable.

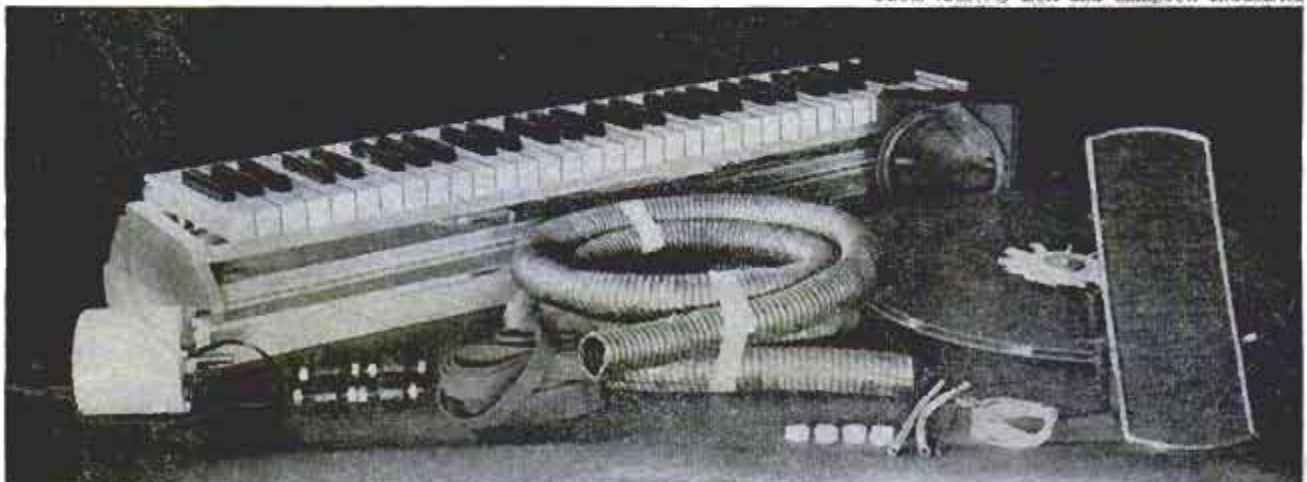
Action of the air supply for this organ is by suction rather than by a blower. Air is pulled through the reeds by a large motor-driven disk which is furnished with the kit. The reed chamber is connected to a distribution box by flexible air hoses. The distribution box is positioned to make light contact against

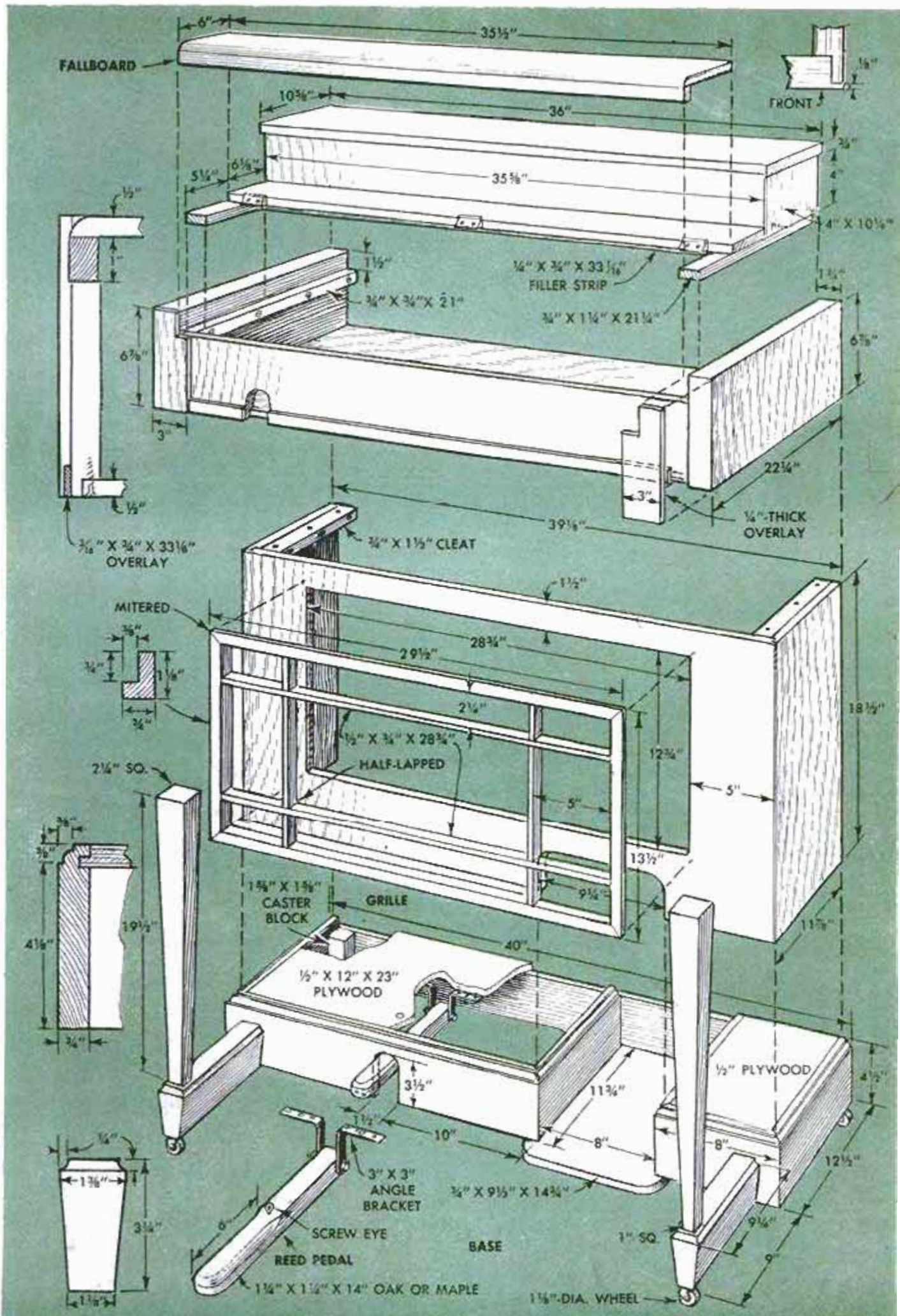
the rotating disk. The amount of pressure against the disk is important. If the box bears too tightly it will slow down the disk, reducing the air supply to the point that the reeds will not vibrate. If the distribution box bears too lightly against the disk, inadequate suction will result. Therefore, the post to which the distribution box is fastened should not be permanently fixed until final adjustment is made. Motor and blower noises are deadened by lining the area around them with U-200 Tufflex, a soundproofing material.

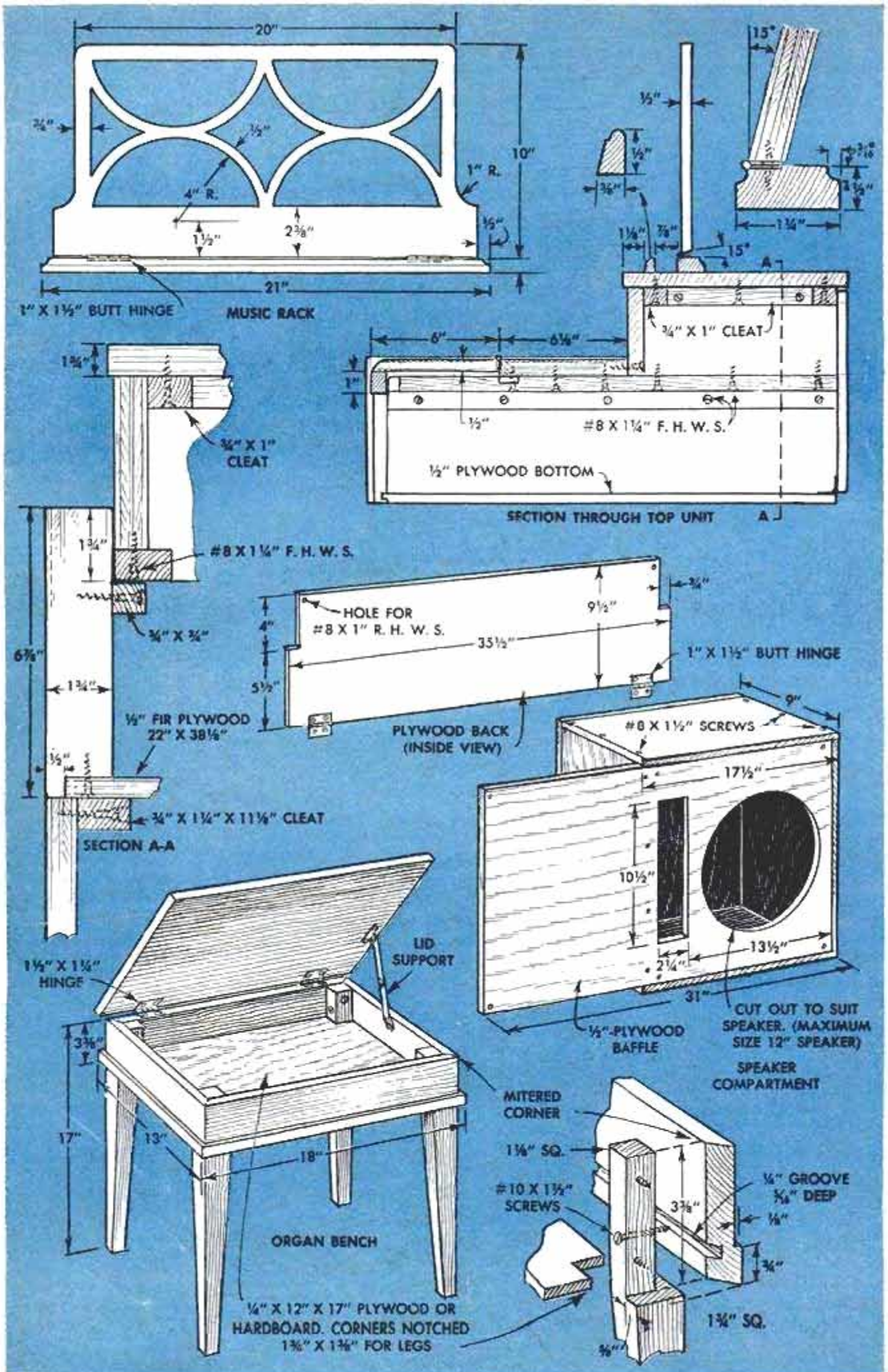
Volume is controlled by the right foot pedal. The pedal is connected to a hinged

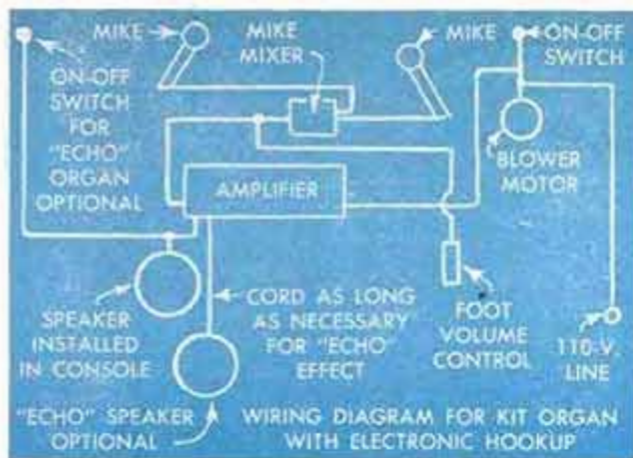
Here's basic kit of necessary parts, including full 61-note reed keyboard. Costs about \$170. Amplifier-speaker kit is available also to operate organ electronically and produce wider range of tone and volume

Photo courtesy Bell and Campbell Industries









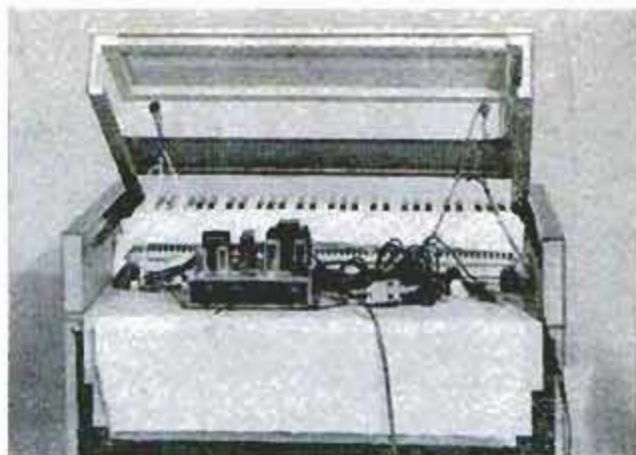
In the wiring diagram above note especially the position of the on-off switches and the echo speaker

leaf, or door, which covers an opening just back of the reeds. This is called a "swell." When the pedal is depressed, opening the swell, the volume is increased proportionally. An even closer control of volume, especially when playing softly, is obtained by soundproofing the keyboard. This can be done by removing the keyboard assembly and fitting strips of soundproofing material into the bottom of the keyboard compartment. This must be done with care as no soundproofing should touch the keys or any other part of the mechanism when the unit is reassembled.

Greater volume and a different tone character are obtained by means of a second swell, which, when opened, activates the second complete set of reeds. This swell is controlled by the left foot pedal. The assembly is covered in the instructions that come with the kit.

Although the organ pictured used electronic amplification to obtain variation in tone and volume, the basic organ can be built as detailed and described and the amplifying system added later.

In the electronic system volume depends largely on the size of the amplifier used, but in any case electronic amplification gives much greater brilliance and range of tone and a closer control of volume. In addition, the effect of an echo organ is made possible by the use of an extra matching speaker. A complete hi-fi system can be had by connecting an AM-FM



Rear view of cabinet showing top compartment with electronic units being assembled for testing purposes

tuner and record player. The original organ was so equipped.

Electronic equipment required consists of amplifier and two crystal-type non-directional microphones, also a microphone mixer, a volume-control pedal and speaker. The wiring diagram for the complete electronic hookup is shown above. Experimentation is necessary to determine the proper placement of the microphones. Moving them about while playing various notes will indicate positions in which the mikes will pick up all notes of the scale without distortion. In order to dampen out any mechanical sounds that may bounce into the mikes from the top of the cabinet, cover exposed areas (except over the reeds) with soundproofing material cut into strips that fit snugly.

When the echo-organ effect is desired, the matching speaker is connected to the amplifier with a long cord and placed in an adjoining room or in the back of the auditorium when entertainment is to be provided for a public gathering. If you plan to use the echo speaker more or less regularly, install an on-off switch to control the first speaker which is mounted in the organ console. Then it is possible to utilize both speakers for interesting musical effects, or the echo speaker individually. In most cases with electronic amplification it will be necessary to remove the swell back of the reeds so the mikes can pick up the sound. ★ ★ ★

Sleeve on Lamp-Cord Covering Prevents It From Unravelling

Braided fabric used on some lamp cords will be less likely to unravel if rubber "ferrules" are used where the fabric is cut for connecting electric plugs. The ferrules are short pieces of rubber tubing of a size to fit tightly on the cord. Stretching the ferrules with long-nose pliers as indicated will facilitate slipping them in place.



Vinegar Used to Prime Galvanized-Metal Surfaces for Painting



Rain gutters and garbage cans are galvanized as a protection against corrosion, but this same surface will not permit a good bond for paint when it is new. Vinegar brushed on the galvanized objects will give them better bonding surfaces for painting. Paint can be applied when the vinegar has dried.

Small-Parts Boxes Kept in Order When Tagged By Numbered Nails

Small-parts boxes in the home or farm workshop get shuffled around as they are used so that a box is seldom found in the same place twice. Numbered nails, of the type used on screens and storm windows, solve the problem easily and inexpensively. Use one of the nails on each box, numbered consecutively, and it is an easy matter to return the boxes to the same position each time they are removed.



Pencil Sharpener Points Crayons

A pocket pencil sharpener is ideal for pointing crayons used to mark things in your shop or shipping room. The sharpener also strips the paper shell off the crayon neatly, eliminating the fingernail-breaking chore of peeling it off by hand.

Oil Can Fitted With Bobby Pin Made "Clogproof"



An oil can used to apply fluid poison to dandelions can be kept free-flowing when a bobby pin is inserted in the spout with the looped end projecting, as shown. The exposed head of the pin may be pressed into the center of the weed at ground level and the fluid injected with little danger of clogging.

Should the spout become blocked, removal of the pin will quickly clear the passage and it can be inserted again with little loss of time. To assure a snug fit in the spout, it may be necessary to spread the pin.

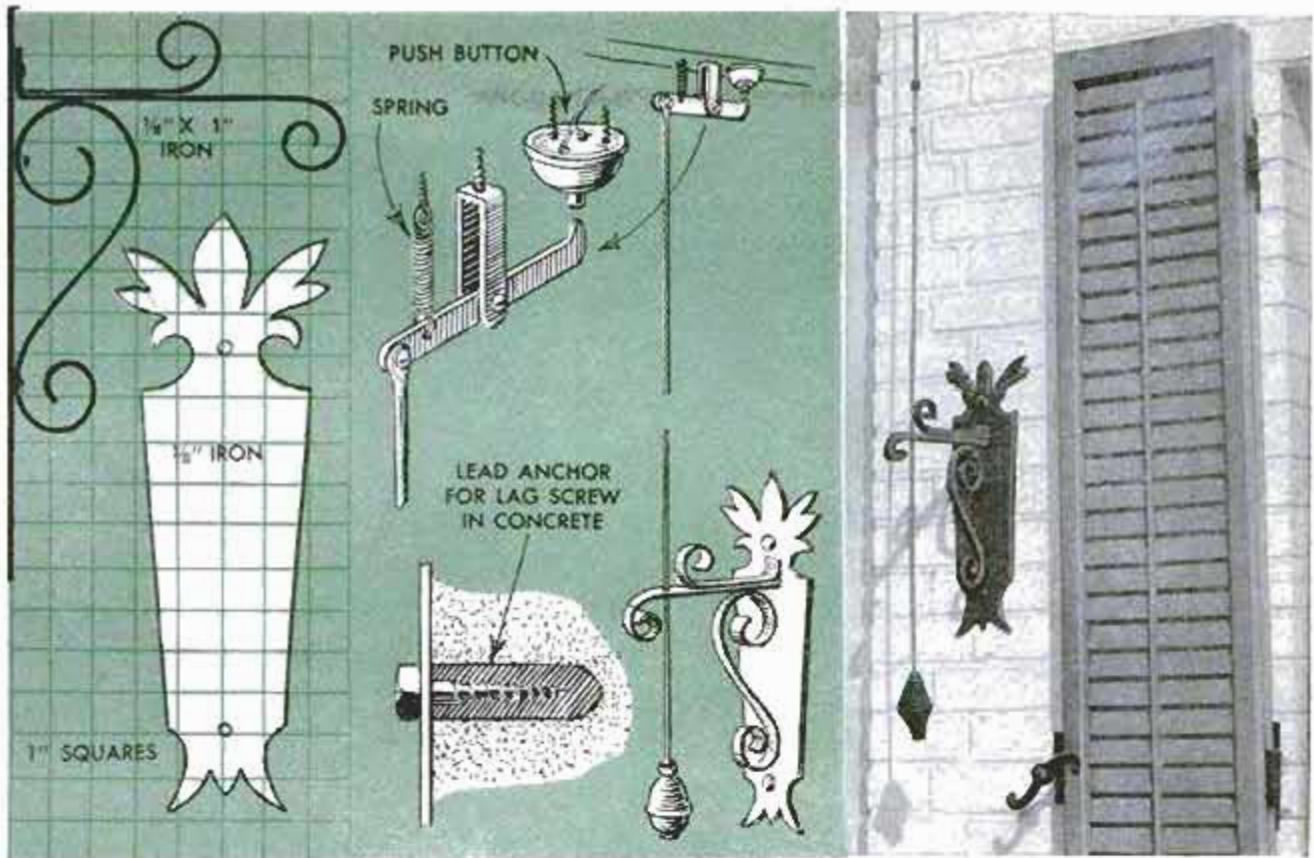
Wire Guard on Feed Grinder Removes Foreign Objects

Farmers who spout grain directly from bins into a feed grinder run the risk of having foreign objects enter the mill and damage it. Such damage is avoided when a wire guard installed over the feed hopper of the grinder prevents metal objects, such as the pliers shown, from entering the machine. The guard is made from a refrigerator shelf with 2-in. metal sides welded in place and a flat-iron leg welded on one end. No bolts are used to hold it in place, making it easy to remove when grinding hay or ear corn.

Ken Hadenfeldt, Storm Lake, Iowa.



Old-Time Pull-Cord Arrangement Actuates Doorbell Push Button



If you want to add a touch of character to the front entrance of your home, install this pull-type arrangement for ringing the doorbell. Its antique appearance simulates the old-time pulls once used to actuate mechanically operated doorbells.

First, the doorbell push button is relocated at some point above the door. If there is an overhang above the door, the button can be screwed to the soffit as indicated. A U-shaped flat-steel bracket also is screwed to the soffit and located so that one end of an arm pivoted in the bracket will depress the button. The opposite end of the arm is drilled to receive a screw or rivet on which the upper end of the pull cord is pivoted. A coil spring pulls the arm away from the push button when the pull cord is released.

When there is no means of locating the push button in a horizontal position, the pivoted arm can be made L-shaped and

pivoted in the U-shaped bracket which then is located above the vertically mounted button. The pull cord would be pivoted to the end of the short leg of the L-shaped arm, which then would be located in the same relative position to the long portion of the arm, but also would be horizontal.

When using either method of mounting, the lower end of the pull cord—it can be light chain, heavy cord or a small-diameter rod—passes through a hole drilled in the horizontal arm of an ornamental, wall-mounted bracket. The wall plate of the bracket can be cut to the shape indicated on the squared pattern or made in any design preferred. Lengths of $\frac{1}{8}$ x 1-in. wrought-iron or steel flats are bent as indicated to form the ornamental brace and projecting arm through which the pull cord passes. The knob on the end of the pull can be a wood turning or any suitable ornamental knob.

Handy Pocket for Eraser Taped to Side of Typewriter



Your typewriter eraser will always be at hand if it is kept in a pocket taped to the typewriter. The pocket is made by folding a strip of light cardboard and then stapling it across each end.

☐ A metal fork inserted under buttons permits ironing under them and keeps the iron from touching plastic buttons that might be affected by the heat.

CLEANING HINTS



Below, paintbrush makes quick work of dusting window mullions where a cloth would be awkward

Above, to aid "spot cleaning," rub stains on table linens with bar soap before placing in washer

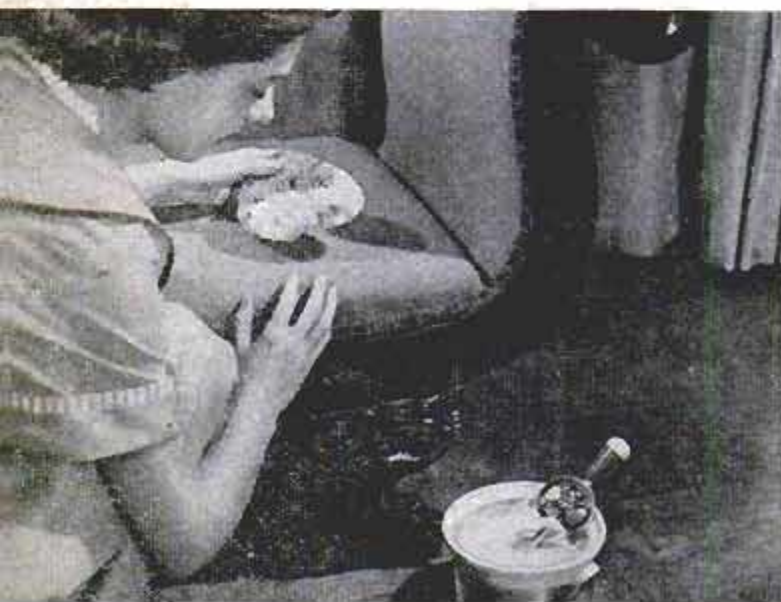


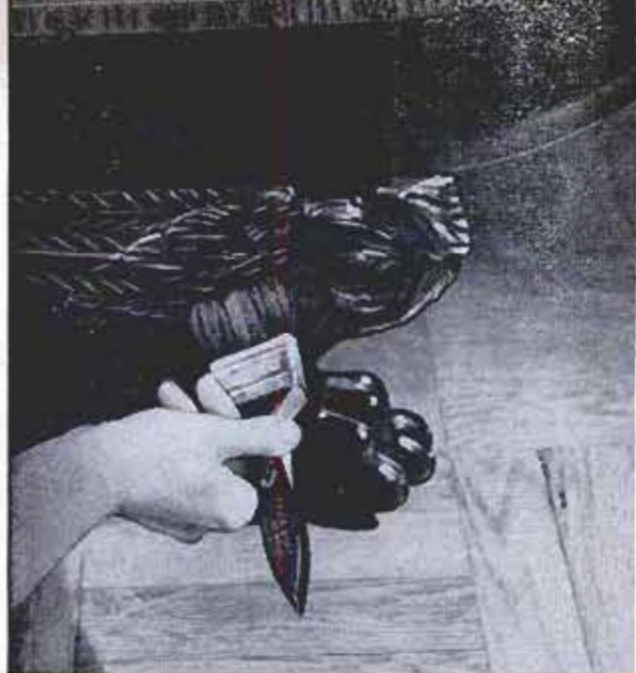
IN HOUSECLEANING, as in other jobs, once the basic techniques have been learned there are dozens of short cuts and aids that can be adopted to save time and lessen the work required. Some of these include using soft paintbrushes for special dusting, wrapping wrists with cloth to prevent water running down arms when washing walls, and sewing a pad into a heavy-duty apron so that it automatically falls into place under knees when scrubbing floors or doing other work that requires kneeling.

As a housewife gains in experience, she tries some ideas that she discards, others that she accepts. However, even the experts will agree on one thing: The first rule in fast, efficient housecleaning is system. Get a good supply of cleaning cloths, stain removers, bleaches, brushes, detergents, etc., and place them all in a handy box or basket that can be carried. ★ ★ ★

To clean upholstery: Dissolve $\frac{1}{2}$ cup soap flakes in boiling water, whip cooled mixture until stiff. Apply in small area. When dry, remove with spatula and wipe with damp cloth. Brush nap when nearly dry

To clean woolen rugs: Make a paste of equal parts of corn meal and cleaning fluid, apply briskly with a cloth. Shake rug and hang to dry. Brush when dry





Dusting intricately carved furniture or valuable china figurines is another job for a paintbrush



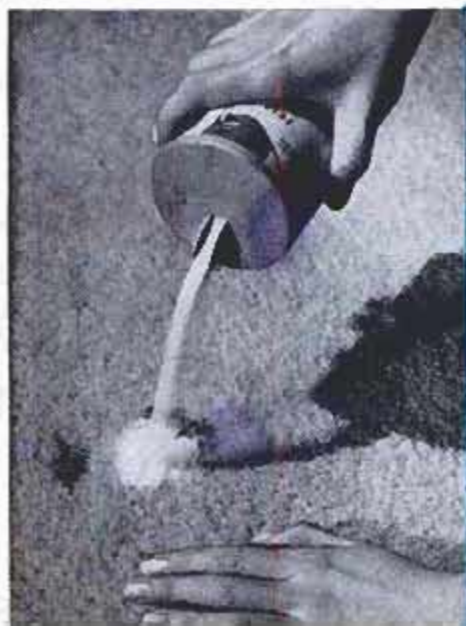
Don't discard paper shopping bags. Save them for rough work, such as scraping grease from range



Above, cleaning refuse can is easier if it is coated with plastic spray. Below, left, if soot falls on rug, sprinkle with salt, sweep up without stains. Below, center, spin mop between palms to untangle it



Above, remove oxidation from copper-bottomed pans by scouring with a mixture of salt and vinegar. Below, right, to clean small items, such as ties, place in jar with cleaning fluid, cap and shake vigorously



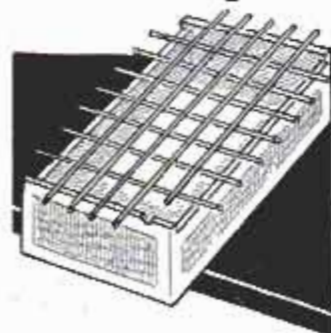


Areas in Water Color Painting Washed Out With Foam Rubber

A small cube of foam rubber is ideal for washing out selected areas in a water color painting, especially when the surface of the paper or illustration board is rough. The texture is not smoothed out by this operation as it is in dry erasing. Sharp-edged areas can be washed out by masking the surrounding surface with masking tape.

Walter L. White, Indianapolis, Ind.

Cigar-Box Jig Simplifies Job Of Soldering Small Grilles



Assembling a wire grille is simplified by using a jig made from a cigar box to hold the wires in place. Correctly spaced slots are sawed in the top edges of the ends and sides of the box to receive the wires. The slots in the sides are slightly deeper to permit the longer wires to rest on top of the shorter ones.

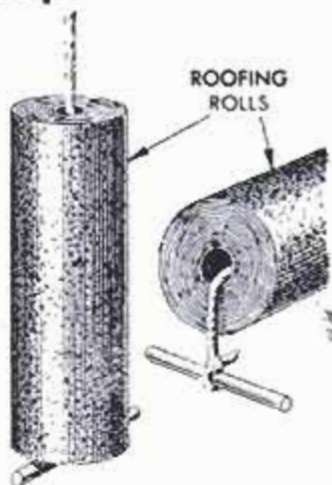
The slots in the sides are slightly deeper to permit the longer wires to rest on top of the shorter ones.

If you want to build a desk...

be sure to see the unusual one that will appear in the February issue of *Popular Mechanics*. It features a well in the top which can be used as a planter or a filing drawer, and its plain, straight lines make it easy to duplicate with only a few tools. The top and legs are cut from a stock flush door; the rest from hardwood plywood

Dowel Secures Roofing-Paper Roll Safely on Hoist Rope

When attaching a hoist rope to a roll of asphalt roofing paper a dowel or a short length of broomstick tied to one end of the rope will provide an easy and safe means of securing the roll to the rope. The stick, when dropped through the core of the roll,



will rest horizontally to support it safely and will also hold the roll in a vertical position so that there is much less danger of it striking and damaging the wall or windows of the building. This method eliminates the problem of having to pass the rope through the core of a roll and securing it with a safe knot each time a roll is hauled to the roof.

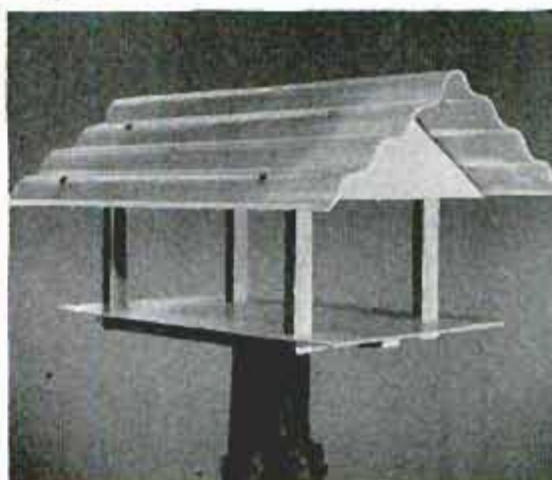
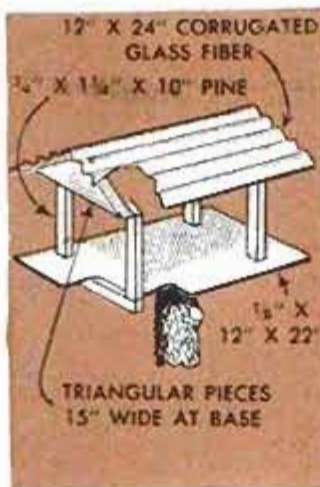
Toothbrush Container Utilized As Miniature Pencil Box

Carrying pencils in luggage or pockets often results in damaged and marked clothing, along with broken pencil points. To avoid these problems, utilize a plastic toothbrush container as a miniature pencil box. Generally, three or four pencils can be carried in the container.



Bird-Feeding Station Has Roof of Corrugated Glass Fiber

This bird-feeding station provides free access both to the birds and to the owner when he restocks it. The base of the feeder is a 10 x 14-in. piece of $\frac{3}{4}$ -in. plywood onto which is nailed the $\frac{1}{8}$ -in. hardboard floor. The floor measures 12 x 22 in. Roof supports are 10-in. lengths of $\frac{3}{4}$ x $1\frac{1}{4}$ -in. stock. Triangular-shaped pieces of $\frac{3}{4}$ -in. material, measuring 15 in. across the base and 5 in. high at apex, are used to support the roof. A 12 x 24-in. sheet of corrugated glass fiber is used for the roof. Aluminum nails



and screws are used to avoid the problem of rust. Protect the wood with several coats of exterior-type paint or varnish.

Screwdriver Fitted With Adapter For Installing Screw Eyes



Slipped over the tip of a screwdriver blade, a holder for driving screw eyes permits doing the job more quickly and easily. The holder is a length of steel tubing flattened and driven onto the end of the driver blade, the lower end being notched to fit over the screw eye as shown. Unless the screw eyes are very small, always drill pilot holes to assure easier driving.

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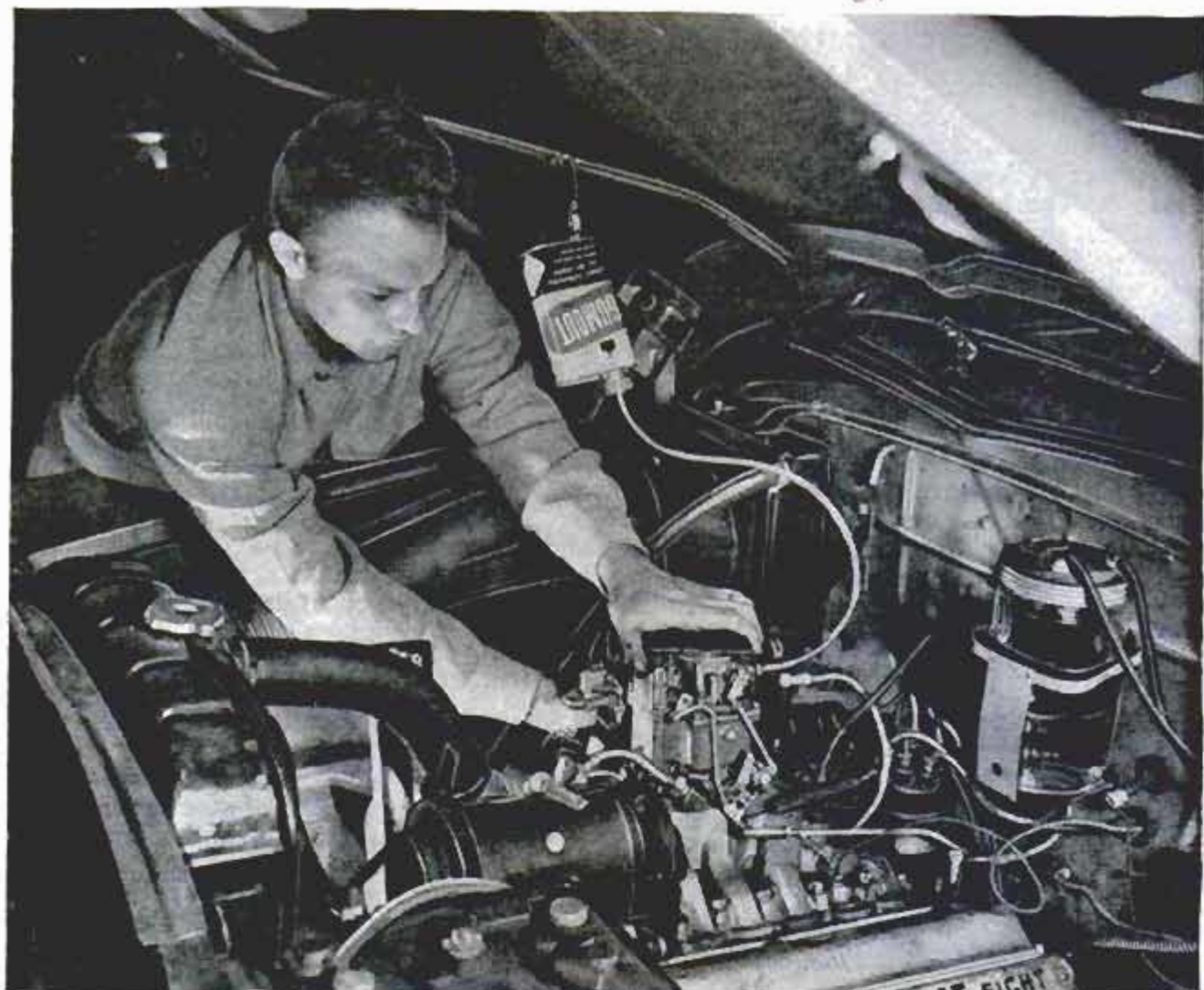
Features of Expensive Homes are included: built-in furniture, unusual amount of closet space, adaptability to various interior arrangements, and materials designed especially for amateur builders. The book is \$2.50 and a complete set of 10 blueprints \$12.50 (a duplicate set is \$5.00). You can place a C.O.D. order or mail your remittance in full.

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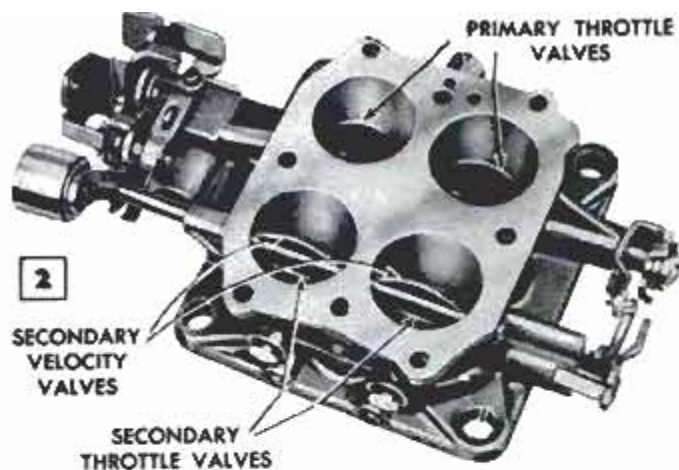
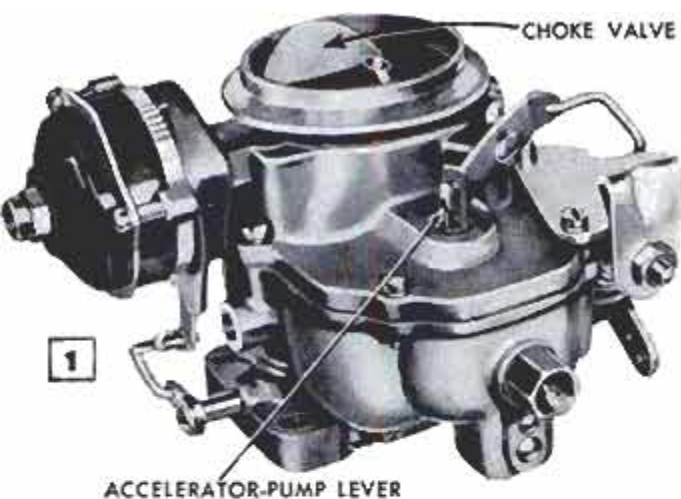
By Ed Packer

THERE IS NO MILEAGE chart to tell you precisely when the carburetor in your car should be cleaned and serviced. You have to judge largely by driving conditions and engine performance. If most of your driving is on dusty country roads, or if you make short runs with frequent starts and stops, the carburetor will need to be serviced more often than it would normally under conditions more nearly average. **But even though your driving is mostly on paved highways and city streets and even though the air cleaner is serviced regularly, the carburetor will gradually accumulate dirt and gum.**

Where there is no mechanical defect to be corrected, a thorough cleaning of the carburetor with a special solvent usually does the trick. Fuel residues, due to heating of the gasoline, form a gummy adhesive that builds up gradually in the tiny passages of the unit. "Inhaled" dust-particles

cling to this coating just as they would to tacky varnish. As the coating builds it restricts the openings, affecting the adjustments necessary for quick starting, fast acceleration and good fuel economy.

Little or no gumming takes place when the engine is running as the carburetor is cooled by gasoline drawn from the fuel tank and also by the blast of air from the fan. This keeps the temperature of the fuel in the carburetor much below the boiling point. But the moment the engine is shut off, the fan ceases cooling and fresh gasoline no longer circulates through the carburetor, absorbing heat. **The latent heat in the engine immediately gathers under the hood and moves upward around the carburetor as it is dissipated.** Gasoline left in the carburetor float chamber is "cooked," in some cases actually is boiled. The residue from the cooked gasoline forms the gum or "varnish" which collects inside the

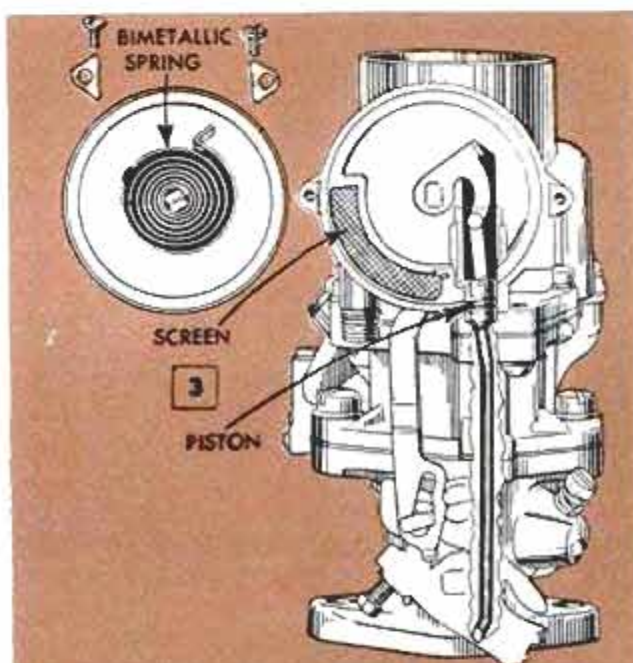


Choke valve is held in the closed position by the automatic-choke mechanism when the engine is cold. When the engine is started it opens automatically

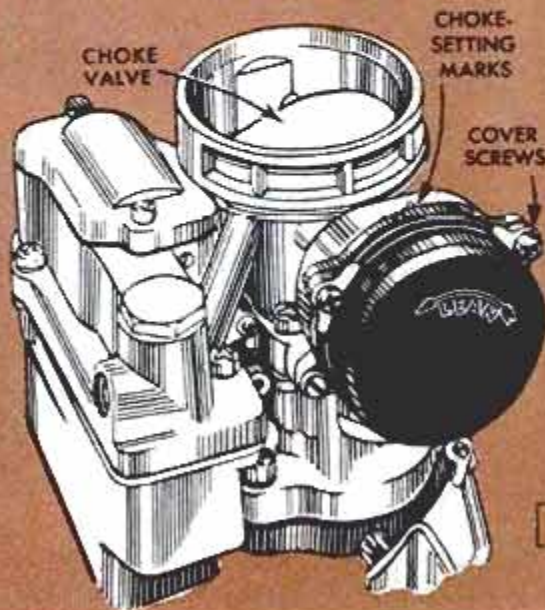
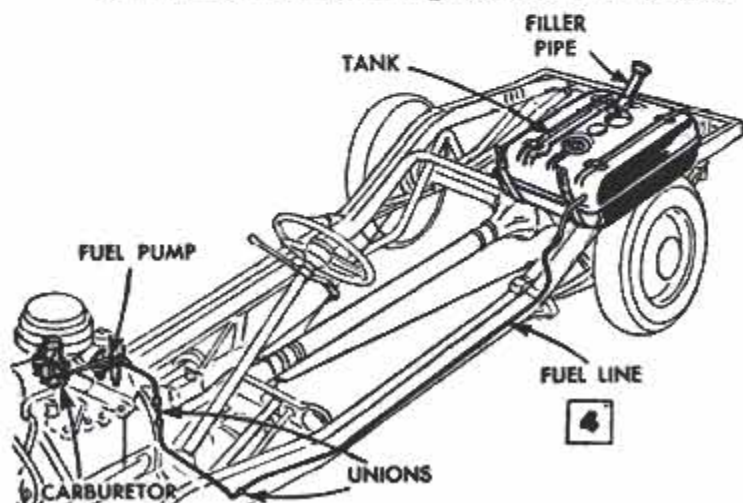
Throttle valves in a four-barrel carburetor control engine speed by regulating amount of fuel. Velocity valves open automatically for top performance

carburetor. Since nozzles and jets in carburetors are calibrated in thousandths of an inch, it does not take much gum, or dirt and gum, to reduce jet sizes or even plug them completely.

One method of cleaning a carburetor without removing it from the engine is illustrated on the preceding page. A can of gum solvent mixed with gasoline is suspended above the carburetor and connected to it, while the regular fuel-supply line is plugged. The engine is started and the 50-50 mixture of gasoline and solvent is run through the carburetor. The engine is operated at high and low speeds, allowed to idle and even run with the choke closed so that a rich mixture of solvent and fuel is forced through all jets, nozzles and passages in the carburetor, removing the gum. Gum deposits in the float chamber also are dissolved and burned by the engine. After the carburetor has been cleaned in this manner, always service the air cleaner. Wash both inside and outside with gasoline, then rinse the copper mesh of the dry type with a suitable solvent, blow out with compressed air and reoil according to specifications. On the oil-bath cleaner, clean out old oil with solvent and replace with new. Use



Above, engine heat reaches the choke mechanism through the screen in the housing. Below, cover, or cap, on the choke-mechanism housing can be rotated to adjust the setting



a slightly heavier grade oil than recommended and a smaller quantity. Excess oil often runs down into the carburetor and clogs air bleeds.

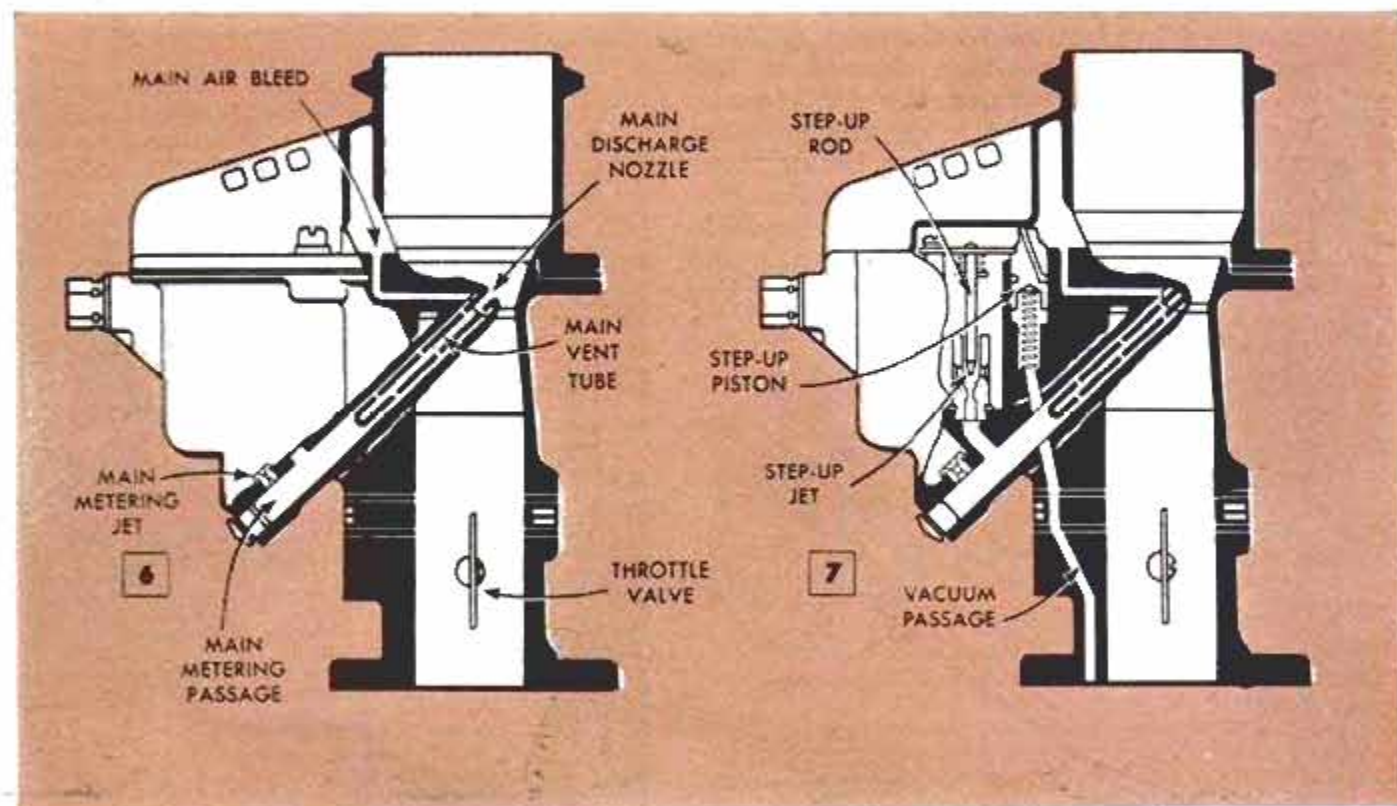
Late types of carburetors and a typical fuel system are shown in Figs. 1 to 5 inclusive. Many late-model cars are equipped with four-barrel carburetors like that shown in Fig. 2. **Parts subject to the greatest wear in both the single and multiple-barrel types are the check valves, metering rods, metering-rod jets, float valves and seats, accelerating-pump plungers and the linkages which operate these parts, Figs. 6 and 7.** Manufacturers now supply repair kits consisting of replacements for all common wear parts, including the necessary gaskets which must be replaced when the carburetor is removed from the engine. The kit includes step-by-step instructions for the make of carburetor being serviced.

As parts of the carburetor wear, the float level tends to rise. Wear points are the pivot, needle and needle seat. Slight wear at these points causes the float to rise higher in order to control the flow of fuel into the bowl. A variation in the float level can materially affect engine performance and fuel economy. Whenever the carburetor is disassembled for any reason, the float level should always be checked with a gauge of the type recommended by the manufacturer.

Before disassembling a carburetor which appears to be affecting engine performance, make sure that you have eliminated all other possible causes of engine trouble which give the same or similar symptoms.

When disassembling becomes necessary, use the right tools for the job. Some units require the use of special jet wrenches to avoid damaging the unit beyond repair. On some types special screwdrivers are necessary. In some cases it is possible to grind a screwdriver blade to fit inside the threaded jet seats, but as a rule the special tools designed for the purpose should be used. Be especially careful to avoid bending such parts as metering rods, and pump linkages, both when disassembling and reassembling. Take special pains to keep all parts in order when removing and replacing.

When reassembling a carburetor, be sure that the choke valve works freely. In nearly all late-model carburetors the valve is actuated by a bimetallic spring mounted on a cap which can be rotated right or left to change the setting, or tension, Figs. 3 and 5. When the engine is cold, the spring holds the choke valve fully closed. As the engine warms, heat rising through the heater tube and the screen into the spring housing gradually opens the valve through thermostatic action of the spring. **Be sure that the heater tube and the screen are thoroughly cleaned and that the connecting linkage and the shaft on which the choke valve is mounted are free of carbon and dirt which may cause the parts to bind.** The air or vacuum-operated piston that controls the choke effect, or degree, according to the load and speed of the engine is an important part of the mechanism, Fig. 3. It must operate freely and should be replaced if it shows excessive wear or looseness at any point. ★ ★ ★



Turkish Towel Speeds Processing of Matte Prints in Drier

A Turkish towel spread over the metal surface of a print drier will speed up drying matte prints by absorbing moisture from the heated prints. Allow the prints to dry just until moisture no longer is apparent when a hand is placed on the canvas cover of the drier. The slightly moist prints then are removed from the drier and air-dried to minimize curling.

Eugene M. Hanson, Los Angeles, Calif.

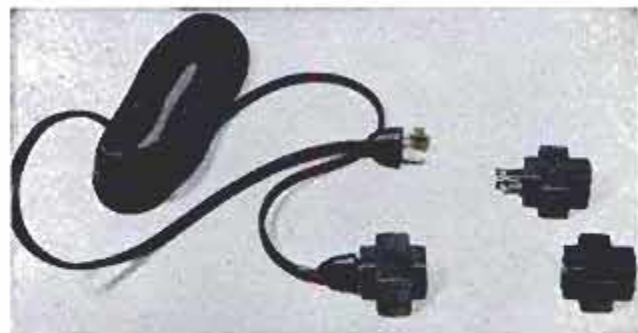
Plastic-Embedded Labels Identify Photo Chemicals



One photographer has found a way of identifying photo-chemical bottles with labels that do not become wet, stained or otherwise illegible. Labels cut from the cans of dry chemicals are embedded in liquid plastic of the type

that sets hard. A hole is drilled in the hardened plastic and a length of corrosion-resistant wire is used to fasten the plastic-covered labels around the necks of the bottles.—Terrell Nichols, Bowie, Tex.

Photoflash Extension Cord Converted by 3-Way Cube Tap



A modified 3-way cube tap is standard equipment for one photographer who has frequent need for a long extension cord. The tap is fitted on one end of a photoflash extension cord that has male plugs on both ends, so that one plug is converted to a female connection. Cut off the blades on the male side of the tap to modify it, push the remaining portions of the blades back into the tap and cover them with tape. A line tap, which is similar to a 3-way cube, except that it has no male blades and is wired directly to the line, can be used in the same manner.

Robert C. Florian, Chicago.



Cellophane Diffuses Scratches On Negatives When Enlarging

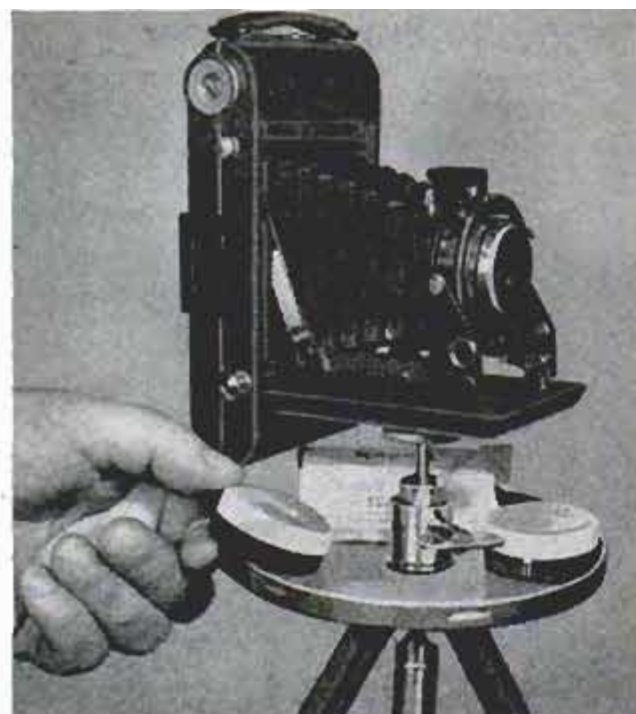
When enlarging a picture from a negative that is scratched, a piece of crumpled, clear cellophane moved quickly back and forth between the lens and the enlarging paper will diffuse the regular lines caused by the scratches. It is necessary to hold the cellophane near the lens to avoid inadvertent dodging and burning.

Masking Easel for Small Prints

A discarded film pack is practically a ready-made enlarging easel for small-sized prints. To make the easel, file the top edges of the pack until they are thin and can be broken off. To use, simply press down the film-pack pressure plate and insert the paper, which then will be held flat and print with an even white border.

D. J. Murphy, Springfield, Mass.



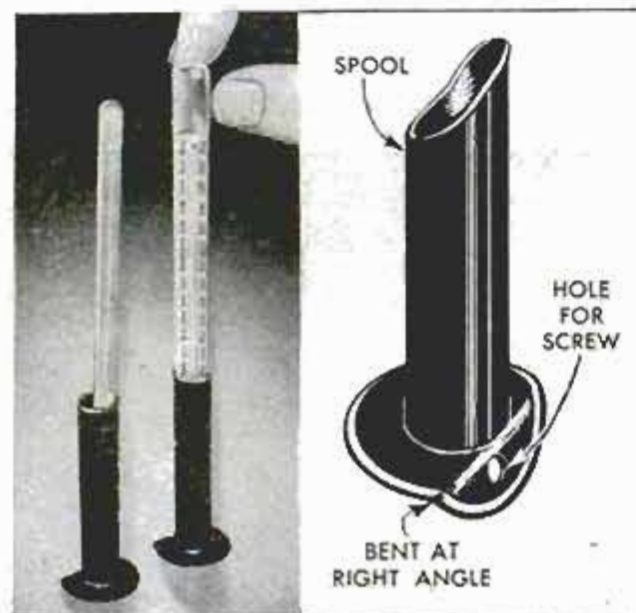


Camera Tripod Accessory Tray Made From Can Lid

Adding a tray to the top of a camera tripod will provide a convenient place to lay extra lens filters, spools of film and accessories. The tray is a metal can lid of large diameter with a hole punched through the center. Keep the flange up and fit the lid over the tripod screw before adding the tilting top and camera.

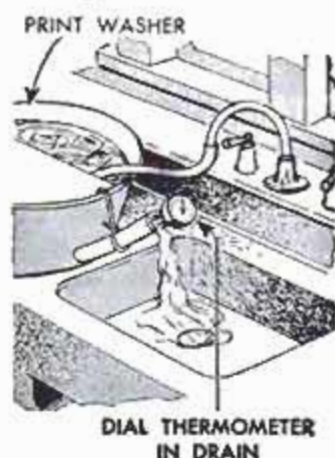
Darkroom Thermometer Holders

Discarded roll-film spools make excellent holders for darkroom thermometers and glass or plastic stirring rods. Cut off one flange of each spool and drill a small hole in the remaining flange. Bend the drilled portion of the flange at right angles and screw the holder to a wall or cabinet.



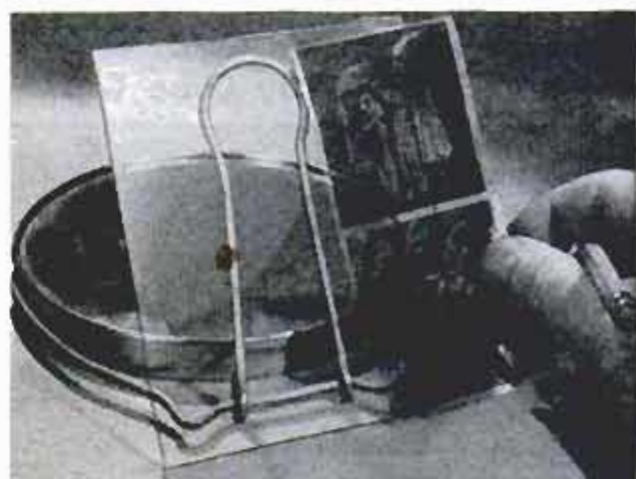
Dial Thermometer in Tank Drain Checks Print-Washing Water

A constant check of faucet-water temperature during the time required to wash photo prints is possible if a dial thermometer is installed in the drain of the washing tank. An occasional glance at the dial will indicate any change in water temperature.



Mirror Is Retouching Stand

You do not need a special retouching stand for working on negatives 4 x 5 in. and smaller, if a small mirror with a wire stand, such as a shaving mirror, is available. Place the mirror flat on a table and rest a sheet of glass against the wire stand as shown. Turn the mirror so light from a window or lamp is reflected through the negative on the sheet of glass. A strip of cellophane tape attached to the table and the bottom edge of the glass will hold it in place. A second strip could be used to hold the glass to the wire stand.



Leakproof Lighter-Fluid Can Used as Small-Size Oiler

When one home craftsman needed a small, leakproof oil can, he used a lighter-fluid can of the type that has a pivot top. The plastic top, which seals when pivoted to either side, was carefully removed and the can filled with oil. With the top replaced, the can is ready for service. Should oil leak between the plastic top and the can, a small amount of nonhardening gasket compound will effect a good seal.

Emmett Vowell, Washington, D. C.

Shop Notes

Portable One-Motor Workshop

By Tom Riley

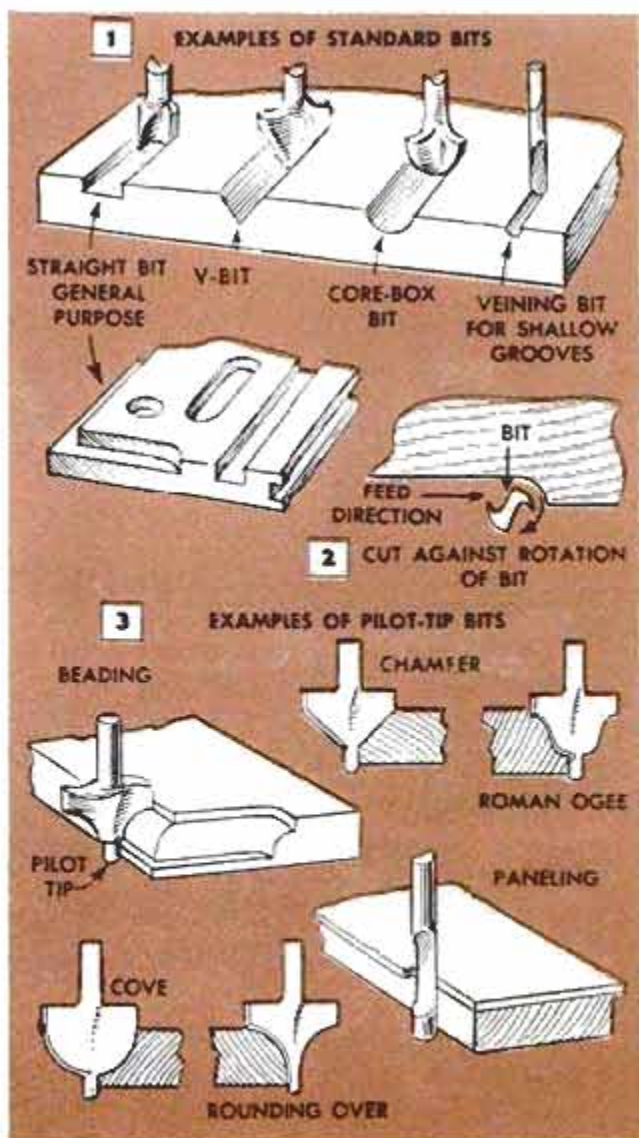
Few power tools can match a high-speed router in variety of applications in the home workshop



A ROUTER does just about everything—even performs some jobs ordinarily carried out on the jigsaw, circular saw and shaper. Cut edges of grooves, rabbets, moldings and beads run with a router are as smooth as surfaces painstakingly sanded with a fine abrasive. Spindles of nearly all hand-held routers, such as the one pictured above, rotate at no-load speeds of 18,000 r.p.m., or even higher. This extremely high speed of the cutters, direct-driven from the spindle, gives factory-perfect work.

The Basic Unit

Routers designed for hand operation usually consist of a special high-speed motor mounted vertically in a base which has a provision for adjusting the motor up or down to vary the depth of cut. The motor can be locked securely at any point. The base usually comes with a circular bottom plate, or shoe, handles on opposite sides and is drilled and tapped for attachment of various types of template guides. An accessory edge guide, Figs. 4 and 5, also is supplied. Its purpose is to provide an accurate means of guiding the router parallel with the edge of the stock when cutting an inlay groove as in the photo above. It will work against a straight or curved edge. The motor can be removed from the base and used as the power source in other types of work. As a rule the motor spindle is fitted with a 1/4-in. collet chuck in which adapters accommodate smaller-shank bits.





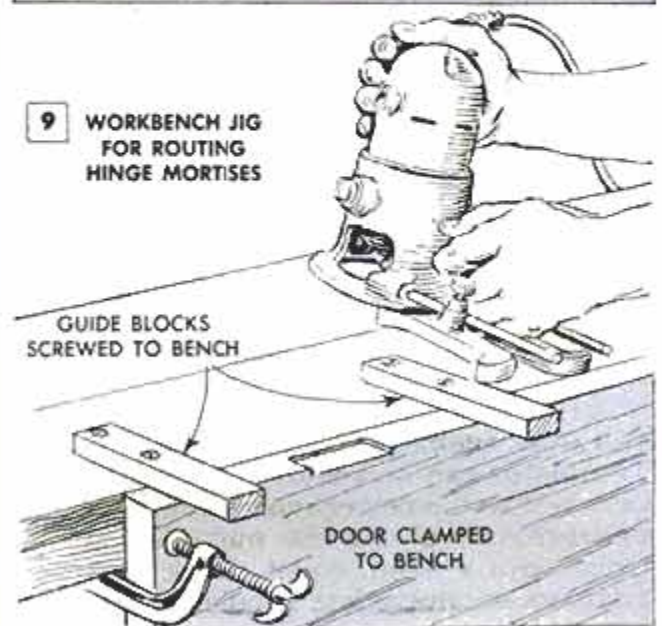
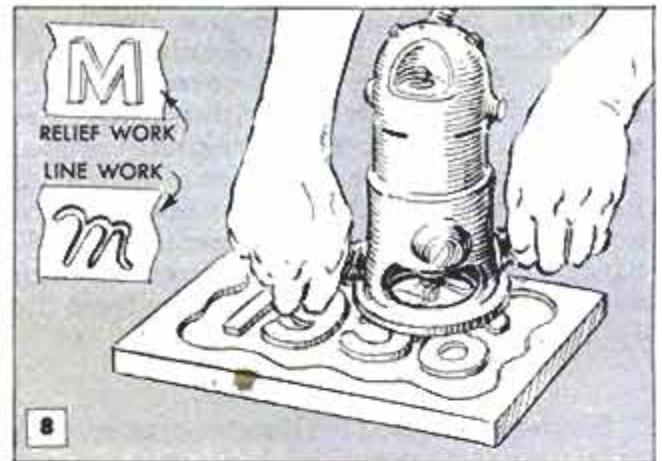
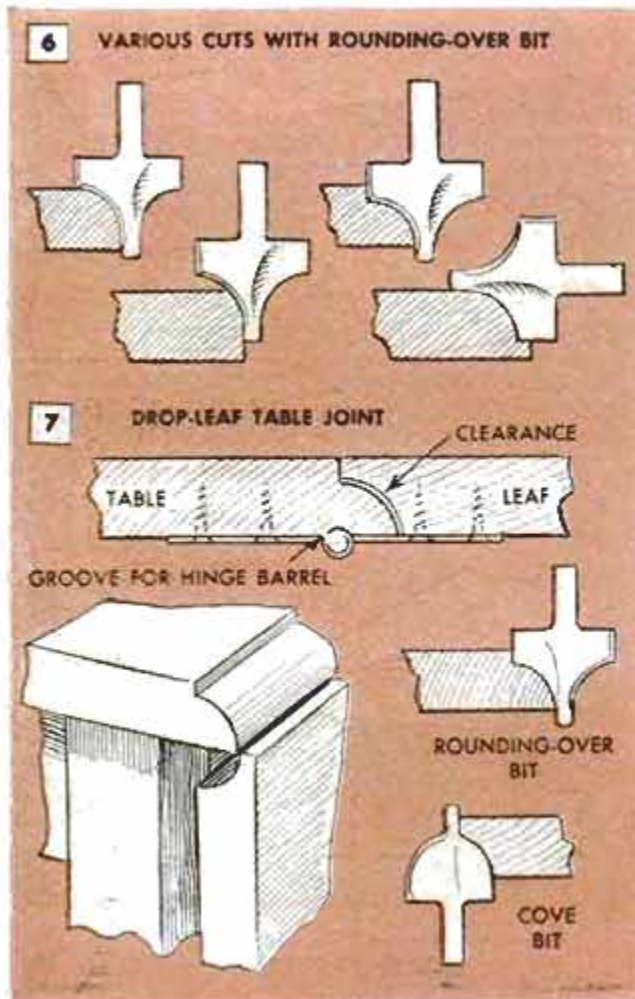
Standard Router Bits

These are designed to cut straight, vee and round-bottom grooves of various widths on the face of flat stock, Fig. 1. Although not ordinarily done, the conventional bits can be used to cut grooves in the edge of the stock as in the left-hand detail, Fig. 2. However, the tool is somewhat more difficult to control due to the narrow bearing surface. All bits are designed to cut against the direction of rotation, Fig. 2.



Pilot-Tipped Molding Cutters

Six types of pilot-tipped cutters are shown in Fig. 3. Five of these are two-winged cutters having two cutting edges like the vee and core-box bits in Fig. 1. Pilot-tipped cutters do not require a guide. The pilot tip riding on the uncut portion of the stock guides the bit and fixes the depth of cut from the edge of the stock. The paneling bit, Fig. 3, is made especially for trimming veneer flush with the edge of the core, also for trimming hard plastic facings in sink tops and table tops. Bits designed for this purpose usually are made from tungsten carbide. A special edge guide is improvised as in Fig. 25.





In certain types of work it is necessary to use bits not having a pilot tip. When working on the edge of the stock the regular adjustable edge guide is sometimes fitted with an auxiliary wooden strip as in Figs. 4 and 5. The strip generally is cut out, or round-bottom notched, to permit chip clearance as in Fig. 5. A guide strip of this type is necessary when making certain cuts shown in Figs. 6 and 7.

Freehand Routing

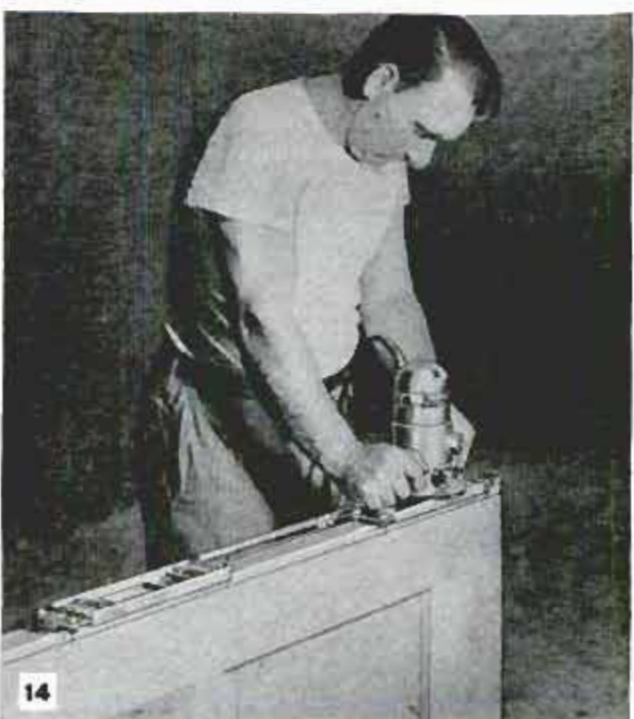
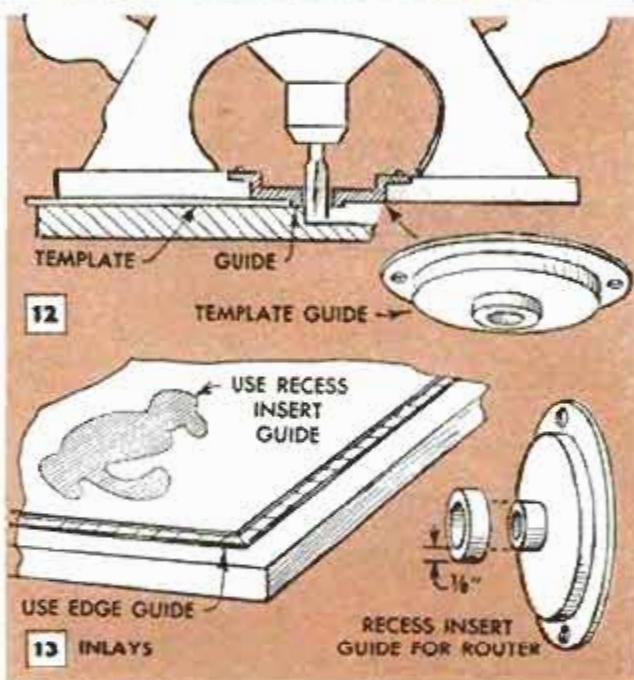
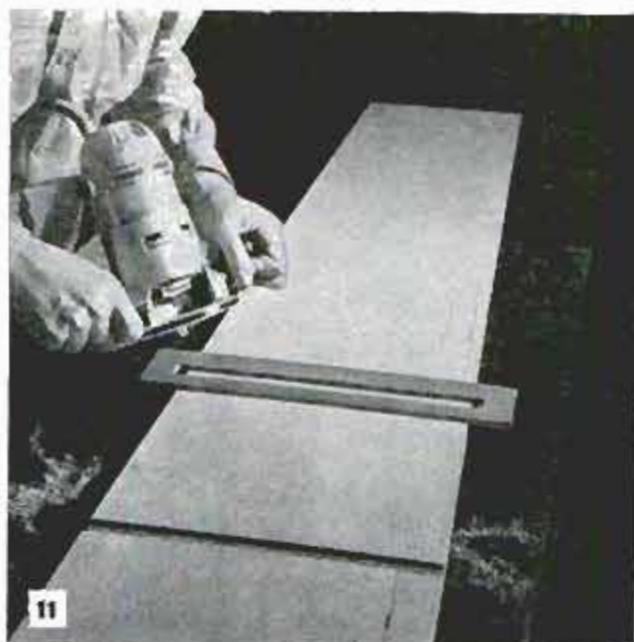
Extreme high speed of the bits and cutters makes it easy to control the tool when it is necessary to work freehand as in Fig. 8. The trick is to make successive shallow cuts, not more than $\frac{1}{8}$ in. deep, until you reach the required depth. For curved relief such as that shown in Fig. 8, follow the penciled pattern lines with a $\frac{1}{16}$ or $\frac{1}{8}$ -in. straight router bit, outline the border and remove the background waste with a bit of larger diameter. This procedure works well with signs, cartoons and curved-line drawings, but straight-line designs, block lettering and long, sweeping curves should be done with a guiding template cut from plywood. When working this type of design, either freehand or with a template, it helps to wax the router base to aid free movement.

Freehand Shaping

Most shallow cuts with pilot-tipped shaping cutters can be run in one pass. Deeper moldings which require the full capacity of the cutter should be run in two or more passes, starting with a shallow cut first and then lowering the router to increase the depth of cut until the molded shape is of the desired size and form. Before running a shaping cut with a pilot-tipped cutter be sure that the edge of the stock is smooth and true, as any irregularity will be reproduced in the molding cut.

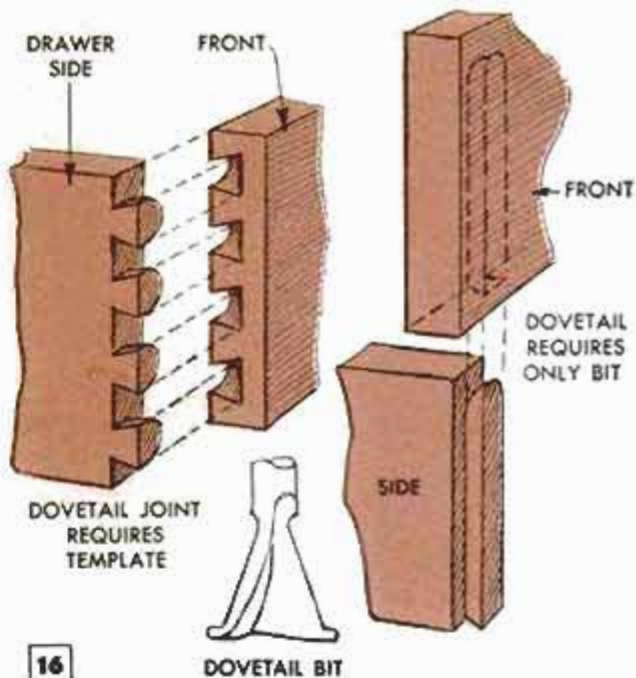
Using an Edge Guide

Edge guides supplied with hand routers usually will adjust to permit cutting at least 6 in. from the edge of the stock. This

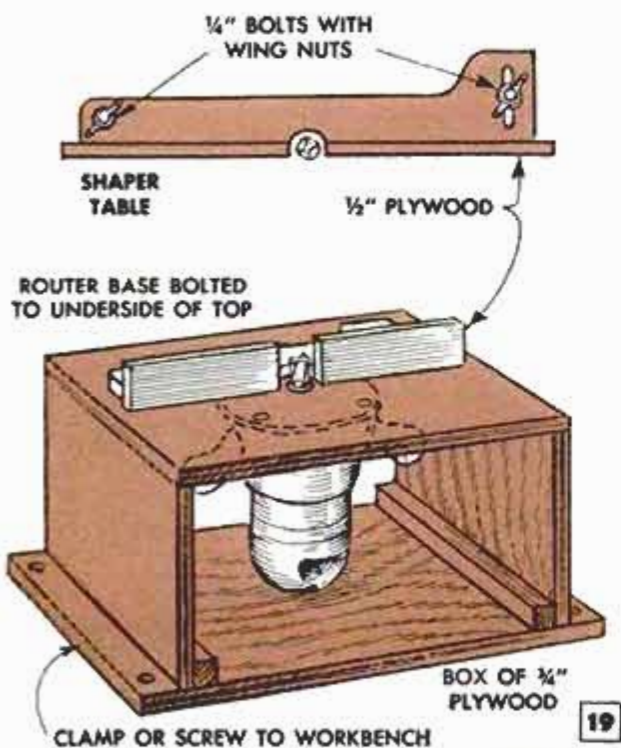




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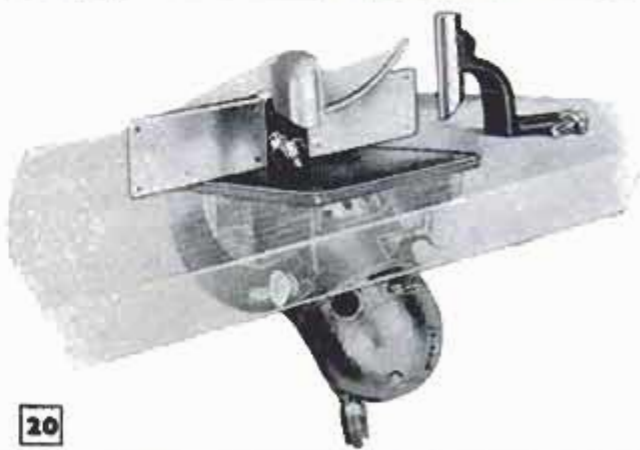
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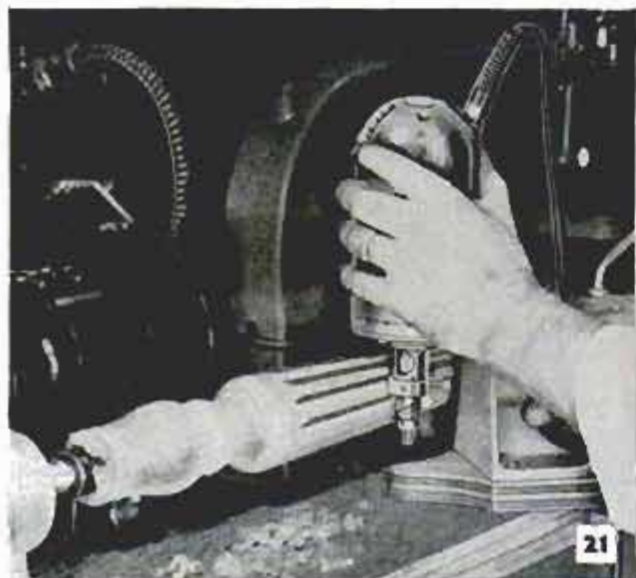
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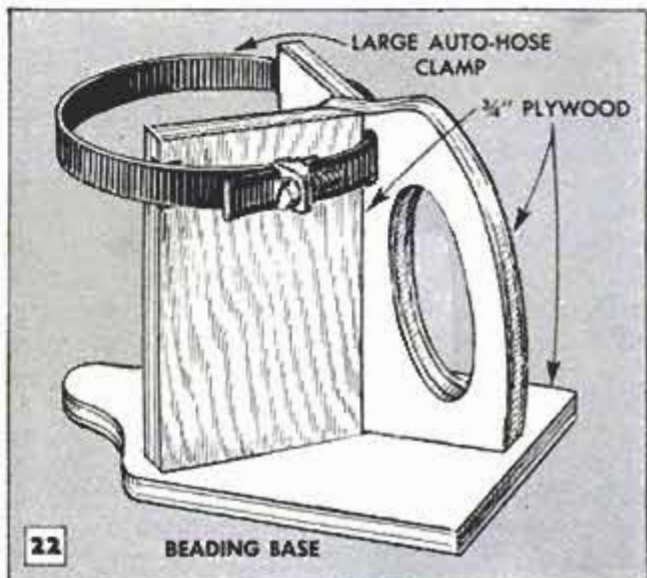
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covers the practical range of veining and also grooving for inlaying and certain types of marquetry and two-tone veneering, Figs. 12 and 13. When it is necessary to work beyond 6 in. from the edge of the stock, the base of the router can be guided by a strip clamped to the stock, Fig. 24, or by a template, Fig. 10. Grooves across the grain are cut with a special template as in Fig. 11. If you wish to make a dado, which is a stopped groove generally made across the grain, use the same template, locating and clamping it to stop the groove as desired. Use a template guide, Fig. 12, for best results. An example of this type of work is cutting dados to house the ends of non-adjustable bookcase shelves. By reversing the regular edge guide you can cut grooves near the edge of stock which has been cut to a fairly short radius. As an example, note the work being done in the photo above Fig. 1. A simple setup for routing door-hinge mortises is shown in Fig. 9. The door is clamped to the edge of the bench and the router fitted with the regular edge guide. Stop blocks screwed or clamped to the bench top limit the lengthwise travel of the router. A professional-type template jig for the same purpose is pictured in Fig. 14.

Template Routing

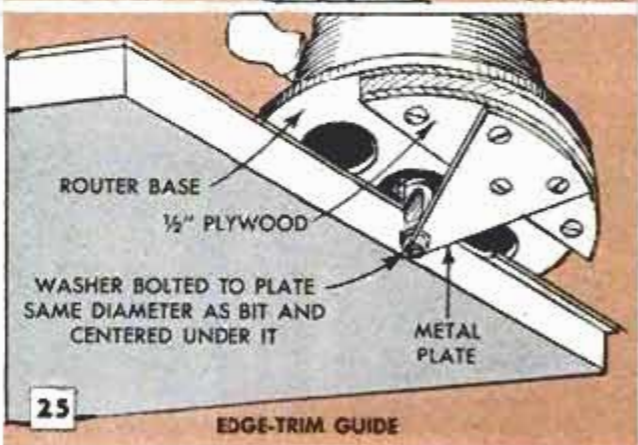
Intricate designs cut in relief, circular cuts and pierced work require a template for best results. When a template is used, the router base must be fitted with a template guide, Figs. 12 and 13. The guide fits in the position shown in Fig. 12 and has a projecting sleeve which bears against the edge of the template. Templates for this type of work should be jigsawed from $\frac{1}{8}$ or $\frac{1}{4}$ -in. plywood and the cut edges sanded smooth. For working with the type of template guide shown in Fig. 12 the plywood templates can be quite intricate in design with curves of short radius. Cutting through the stock, or piercing, as it is sometimes called, gives results similar to intricate jigsawed patterns with the added advantage that the edges of the work do not require sanding. Keep in mind that the template must be oversize. The amount it is over is determined by the size of the



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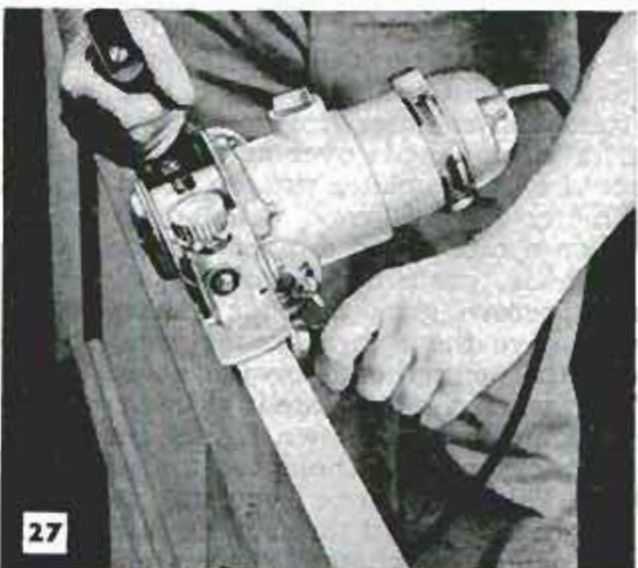


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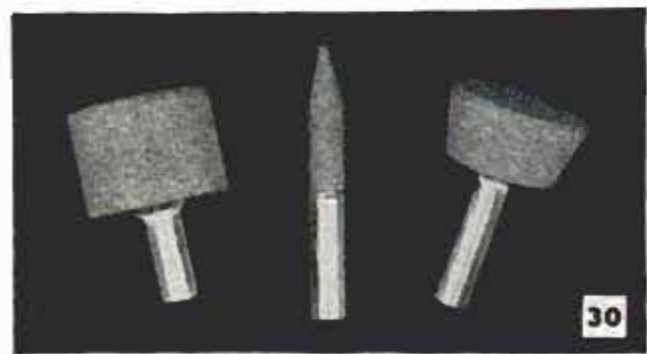
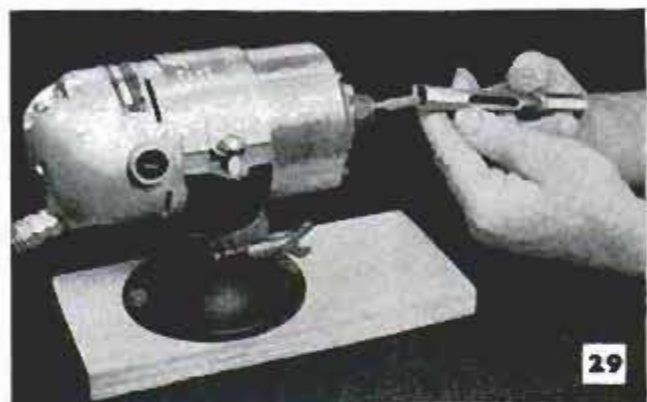
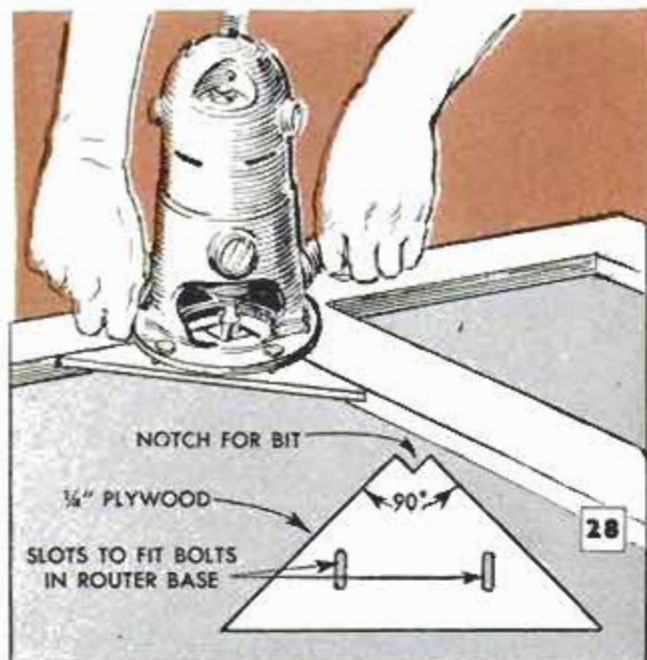
EDGE-TRIM GUIDE



26



27



template guide being used, usually half the diameter of the guide less half the diameter of the bit, but be sure to take careful measurements as otherwise you may end up with work that is over or under the size required. Templates usually are attached directly to the work with small brads. When a number of duplicate parts are to be made, craftsmen often select several small screws, grind the ends to sharp points and drive them through the template so that the pointed ends project about $\frac{1}{16}$ in. Then when the template is placed over the work and pressed down tightly the sharp points of the screws hold it securely in position. This also is done frequently when the pattern is to be cut through the stock, as in end panels of whatnot shelves and chair

splats, a type of work ordinarily done with the jigsaw.

Dovetailing, Beading and Shaping

Figs. 15 to 22 inclusive picture the basic router adapted to special operations by means of accessories. The dovetail jig turns out a complete joint, Fig. 16, the dovetail sockets and matching pins being cut in one pass of the router equipped with a dovetail bit, Figs. 16 and 17. Single dovetails also can be cut as in the right-hand detail, Fig. 16. For an occasional job of straight shaping you can improvise a shaper table as in Fig. 19, mounting the router below the table and using the accessory shaper spindle, Fig. 18. For a wider range of shaping operations, use the inexpensive accessory in Fig. 20. This unit provides for angle adjustment of the motor as indicated and is designed for installation in a bench or table top.

Certain types of period-furniture reproductions require beading on the turnings. Fig. 21 pictures a typical operation with a router accessory. A special beading collar, fitted with an eccentric ring for adjusting the depth of cut, is attached directly to the router motor. The router itself is clamped in a subbase which provides a vertical adjustment. The work is mounted in the lathe as shown and the indexing head is used to space the beading cuts. An improvised beading base, suitable for occasional jobs, is detailed in Fig. 22.

Grinding, Carving and Planing

Certain light grinding operations can be carried out freehand, or with the router motor mounted in a stationary stand as in Fig. 29, using wheels of the type pictured in Figs. 26 and 30. Some carving can be done as in Fig. 23, using burr-type cutters, or rotary files. Use only grinding wheels and cutters recommended by the manufacturer. An edge-planing attachment utilizing the router motor is pictured in use in Fig. 27. A similar attachment is available for weather-stripping window sash. An improvised paneling guide, Fig. 28, makes it easy to rout out molding on the stiles and rails of a door so that you can remove a plywood panel and replace with a pane of glass or a mirror. ★ ★ ★

Aluminum Lettering for Trucks

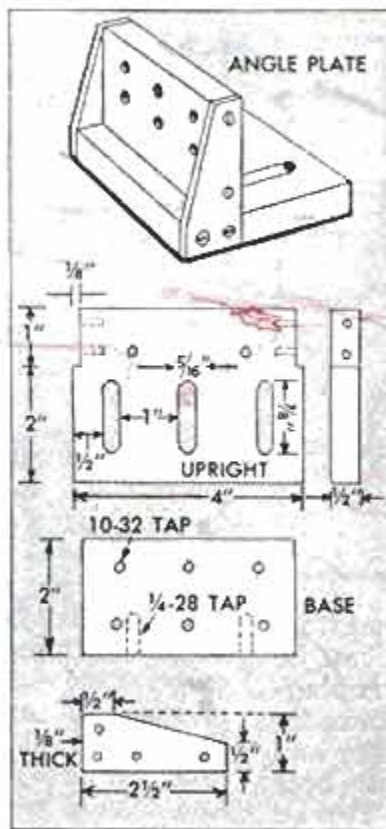
When applying aluminum lettering on trucks or other objects, use aluminum paste mixed with spar varnish thinned with turpentine. The mixture will cover well and outlive more difficult "dust" jobs. Be sure decals are removed and the surface is clean before applying the new lettering.

Edward M. Mayover, Bradenton, Fla.

This Accurate Angle Plate Is Shop-Made From Flat-Steel Stock

An angle plate for holding light irregularly shaped pieces of work on a lathe faceplate can be made from cold-rolled steel flats. Three $\frac{5}{16}$ -in.-wide slots are milled in the upright which bolts to the faceplate. The base is $\frac{1}{2}$ -in. stock, while the two side brackets are $\frac{1}{8}$ -in. stock. A rabbet is milled on two edges to receive the side brackets. Holes are drilled and tapped for assembly to the base as shown. Two $\frac{1}{4}$ -in. holes are drilled and tapped in the face to attach work pieces of various shapes. When using the angle plate it is necessary to add a weight near one edge of the lathe faceplate as a counterbalance.

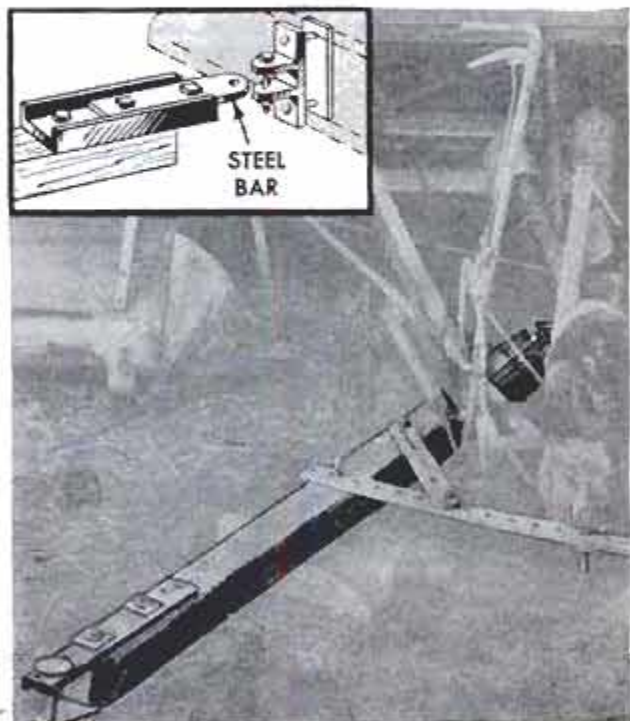
C. W. Woodson, Chicago.



Offset Drawbar for Combine Reduces Towing Width

This auxiliary offset drawbar permits towing a combine directly behind a tractor so it will pass through narrow gates and farm lanes without difficulty. The drawbar is a 7-ft. length of 5 x 5-in. oak. A tractor hitch is provided on one end of the drawbar and a length of steel channel is bolted to the opposite end while a projecting flat of steel is bolted inside the flanges of the channel. The drawbar is fastened to

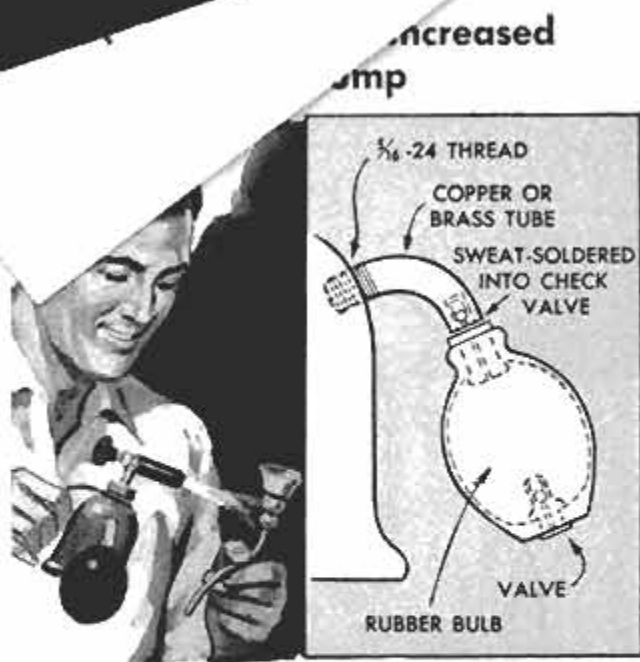
the combine by a clevis pin passed through a hole in the overhanging end of the flat and into holes in a clevis clamped to the combine drawbar. The offset between the combine and auxiliary drawbar is maintained by two braces which are lengths of steel flat drilled at 2-in. intervals for bolts. The holes allow adjustment to permit centering or any degree of offset of the combine behind the tractor.



Hose Centers Tap-Wrench Handle

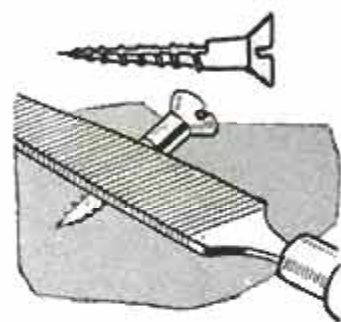
To avoid breaking taps when using a T-handle tap wrench, secure the handle with two short lengths of small-diameter rubber hose, as shown, so it will not slide to one side. Breakage is usually due to the handle slipping off center, which permits application of too much pressure to one side of the tap, causing it to bind and break. The tight-fitting hose will keep the rod in the center of the wrench and will also provide a grip-type handle to grasp.





The heat output of small self-generating-type gasoline and alcohol torches can be increased by fitting them with a rubber-bulb pump. By pumping slight pressure into the tank, the flame becomes longer and more pointed, as well as hotter. Drill a hole near the top of the tank and tap it. Thread one end of a length of brass or copper tubing to fit this hole, then bend it L-shape. Solder the unthreaded end of the tubing into the pump check valve and screw the threaded end into the tank. It is best to also solder the tank connection. When doing so, fill the tank about two thirds full of water to prevent ignition of any remaining fumes.

Screw Holds Firmly in End Grain When Flat Is Filed on Threads



A wood screw will hold more securely when driven into the end grain of lumber or into the edge of a piece of plywood if a flat has been filed on threaded portion of the screw. Instead of forcing the wood fibers apart as does a regular screw, the modified screw will tear its way into the wood, thus anchoring itself.

Quick Alignment of Lathe Centers

When a shaft being turned in a lathe shows a taper due to the tailstock being out of alignment, use a dial indicator to eliminate guesswork when realigning the tailstock. First, determine the amount of misalignment. Then clamp the dial indicator in the toolholder on the lathe carriage

and move the carriage so the indicator contacts the tailstock quill. Move the tailstock exactly one half the amount of taper and it will be in accurate alignment. Vertical alignment of centers would, of course, require shimming under the tailstock.

Frank LaSaracina, New York City.

V-Block for Drilling Round Stock Assembled From Tubing

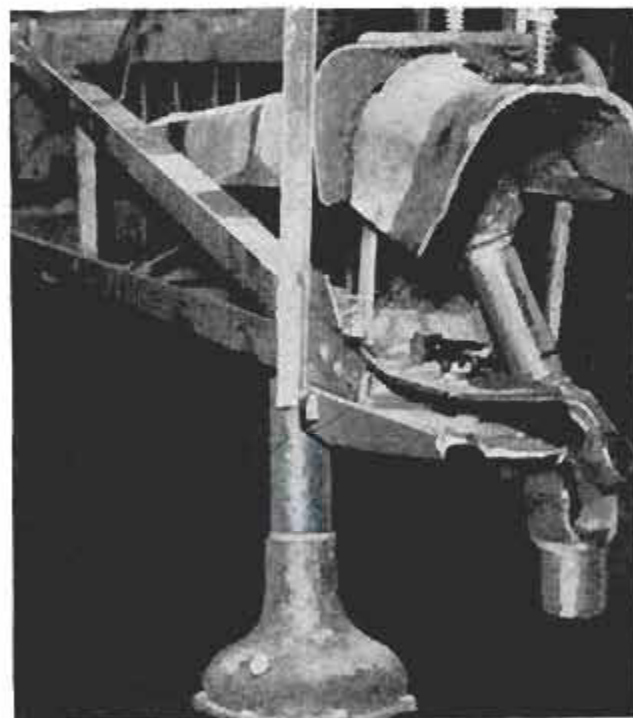
An accurate V-block to hold round stock for drilling can be assembled quickly from two short lengths of metal tubing or from two smooth-surface pipe nipples. Holes are drilled diametrically across the lengths of tubing

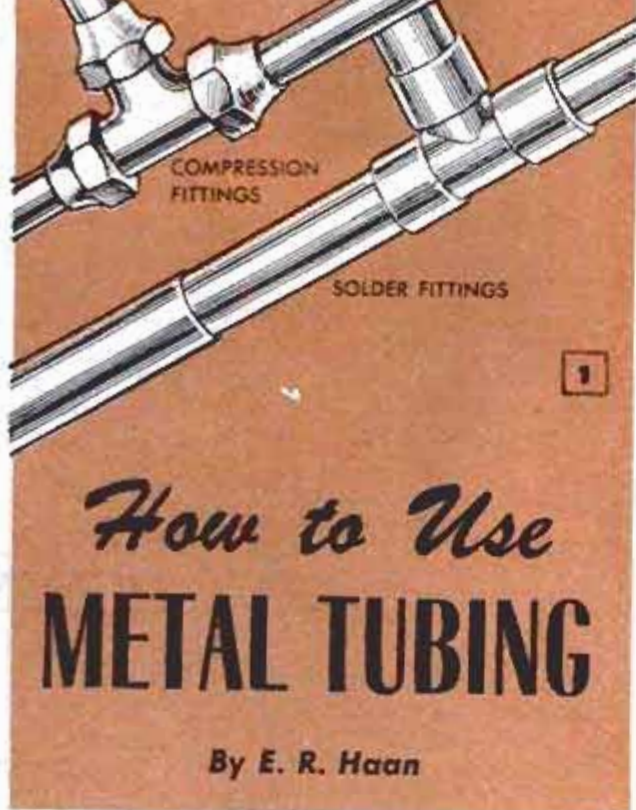


near each end to take the long bolts which hold the assembly together. For accuracy and ease of handling, both sections of tubing should be of the same diameter.

Car-Axle Housing Forms Prop To Support Combine Tongue

If a combine tongue is held on a heavy-duty support it requires no lifting and can be hitched to a tractor by one man. The support is a section cut to the required height from the differential-axle housing of a car. Sideways stability of the support is assured by the large diameter of the differential housing resting on the ground.





How to Use METAL TUBING

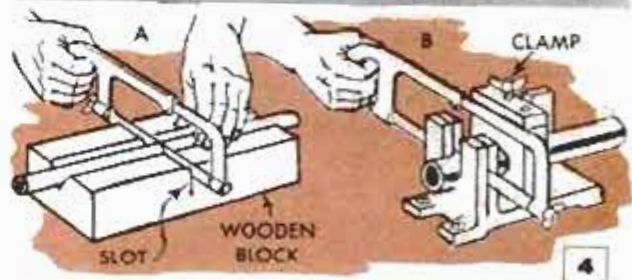
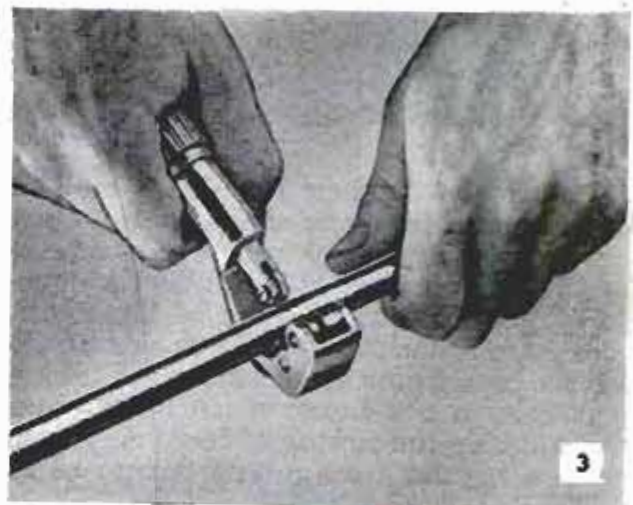
By E. R. Haan

WHEN REPLACING WATER LINES, extending old ones or adding new ones in your home, the job may be simplified by using soft copper or aluminum tubing. It can be run around corners, over or under obstructions and "snaked" through partitions with ease. Besides being rustproof, soft tubing expands if water freezes in it and therefore can resist several successive freezings before rupturing.

Available in 60 and 100-ft. coils, tubing eliminates many pipe-cutting and threading operations and requires fewer fittings than does rigid pipe when used in continuous runs. The tubing generally used ranges from $\frac{1}{4}$ to 2 in. in diameter, and comes in hard as well as soft varieties. The former is made in straight lengths, while the latter is obtainable in coils.

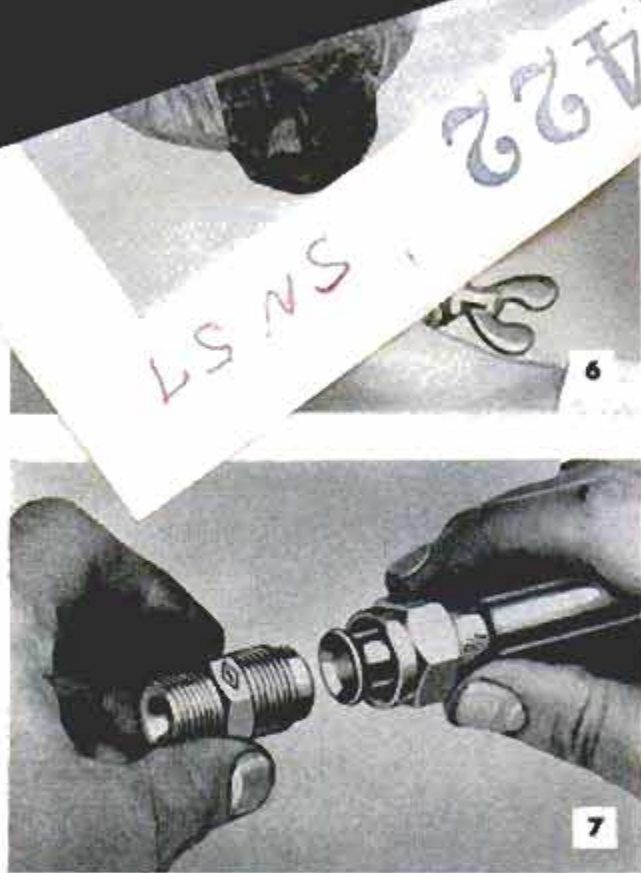
Two assembly methods: There are two methods of tubing assembly which differ in the kinds of fittings used, as shown in Fig. 1. Compression fittings are used with soft tubing, and solder fittings with both soft and hard tubing. The fittings include practically all the kinds used in regular pipe work plus adapters that connect tubing to threaded pipe. Copper, tinned-steel and brass tubing can be soldered readily. Aluminum tubing is assembled with compression fittings.

Straightening coiled tubing: To straighten coiled tubing, set the coil on edge on a flat surface and unroll it slowly while holding the straightened portion down as in Fig. 2.



JIGS FOR SAWING TUBING WITH HACKSAW



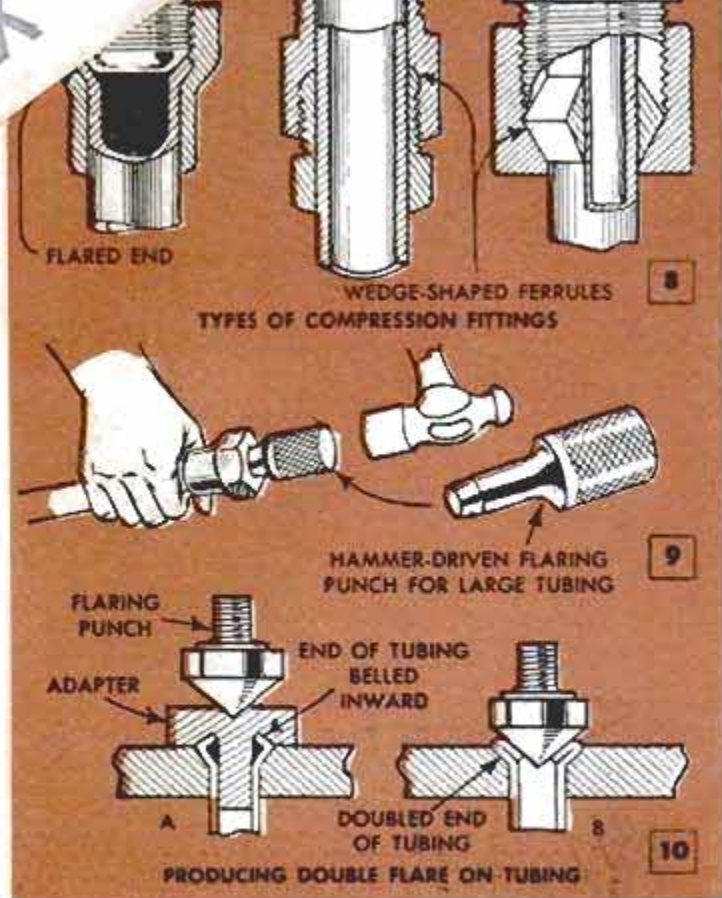


How to cut tubing: For either method of assembly, the ends of the tubing must be cut off absolutely square. Cutting is best done by means of a regular tube cutter, Fig. 3. Cutting also can be done with a fine-tooth hacksaw—32 teeth per in. To assure square cuts when sawing the tubing it is held in a V-block which has a cross slot to guide the saw as in detail A, Fig. 4, or in a regular tube-cutting fixture as in detail B.

A cutter forms a burr on the inside of the tube and it is necessary to remove it by reaming lightly as in Fig. 5. Hacksawing produces burrs on both inside and outside. To remove them, use a reamer on the inside and a file on the outside. When reaming or filing, always hold the open end of the tubing downward so that the chips fall away from, rather than into, the tube.

Compression fittings: Fig. 8 shows three types of compression fittings. The kind shown in detail A requires flaring the ends of the tubing. Those shown in details B and C require merely pushing the tube into a fitting, then tightening the latter. This compresses a wedge-shaped ferrule or sleeve firmly on the tubing wall.

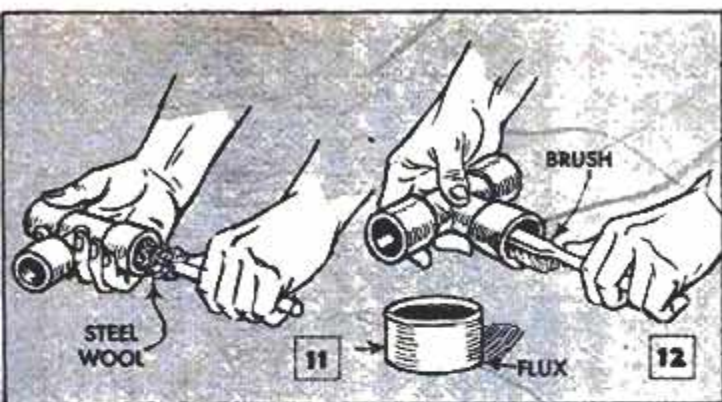
Flaring the ends of tubing: Flaring is done with a special tool as shown in Fig. 6. After slipping the compression nut of the fitting over the tubing, insert it in the block of the flaring tool so the end will pro-



ject from $\frac{1}{16}$ to $\frac{1}{8}$ in. above the block. Tighten the block to grip the tubing securely, then screw down the threaded punch. Most flaring tools accommodate tubing from $\frac{1}{4}$ to $\frac{5}{8}$ in. in diameter, but larger ones are available. Also, for large tubing, a hammer-driven flaring punch of proper size often is used, as shown in Fig. 9.

Double flaring, Fig. 10, is recommended for steel tubing, which is especially likely to crack when only a single flaring is used. Double flaring also is advised for copper and aluminum tubing when extra-strong joints are desired, or where they must be frequently disconnected and reconnected. The inside bend is made by using an adapter on the flare block as in detail A, Fig. 10, after which the flaring proceeds as in detail B. A little oil on the end of a flaring tool reduces friction and helps to prevent scoring the metal. Avoid using excessive pressure when flaring tubing, since pressure hardens it and makes it more likely to crack from strain or vibration. After flaring, assemble the fitting as in Fig. 7.

Solder fittings: With solder fittings you merely insert the tubing in a fitting and sweat-solder the two together. If there is any distortion caused by soldering heat, the tubing must be shaped to perfect roundness by means of a sizing tool, Fig. 17. The surfaces to be soldered together (the outside of the tubing and the inside



of the fitting) must be cleaned thoroughly with fine steel wool or emery cloth, rubbing the metal as in Fig. 11 until it is bright. Wipe the tubing clean, then apply a thin film of soldering flux, Fig. 12. Push the tubing into the fitting as far as it will go, then rotate it a few times to assure even distribution of the flux.

Preheating and soldering: Preheating the joint comes next, using any suitable kind of torch. Play the flame over the fitting, not concentrating it too long at any one point. As most torches produce a flame that has a temperature considerably higher than the melting point of copper (1900 deg. F.), care must be taken to prevent burning a hole.

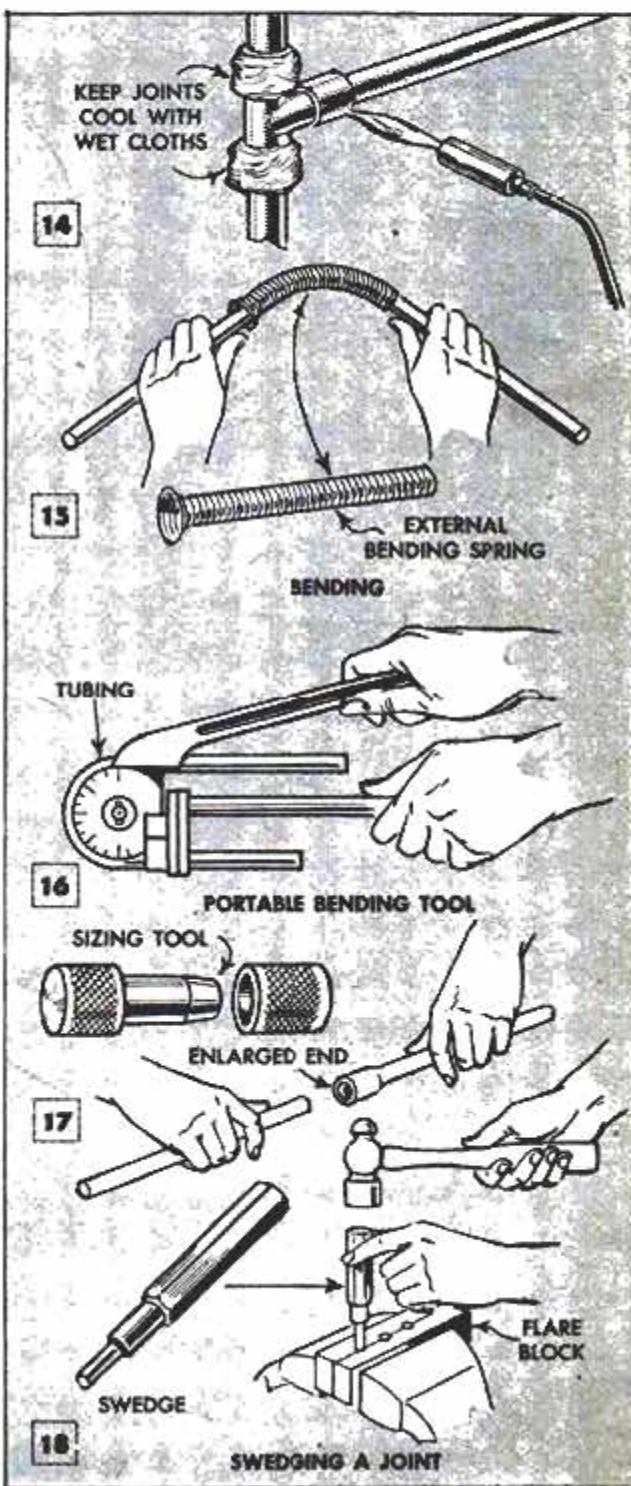
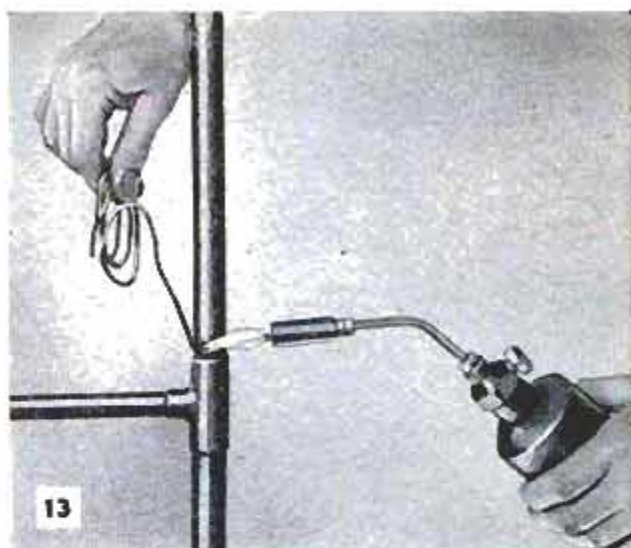
While heating, touch the end of a piece of wire solder to the edge of the fitting occasionally—outside the flame—to check for correct soldering temperature. This is reached when the solder liquefies immediately when touched to the fitting. Do not heat the metal above this temperature.

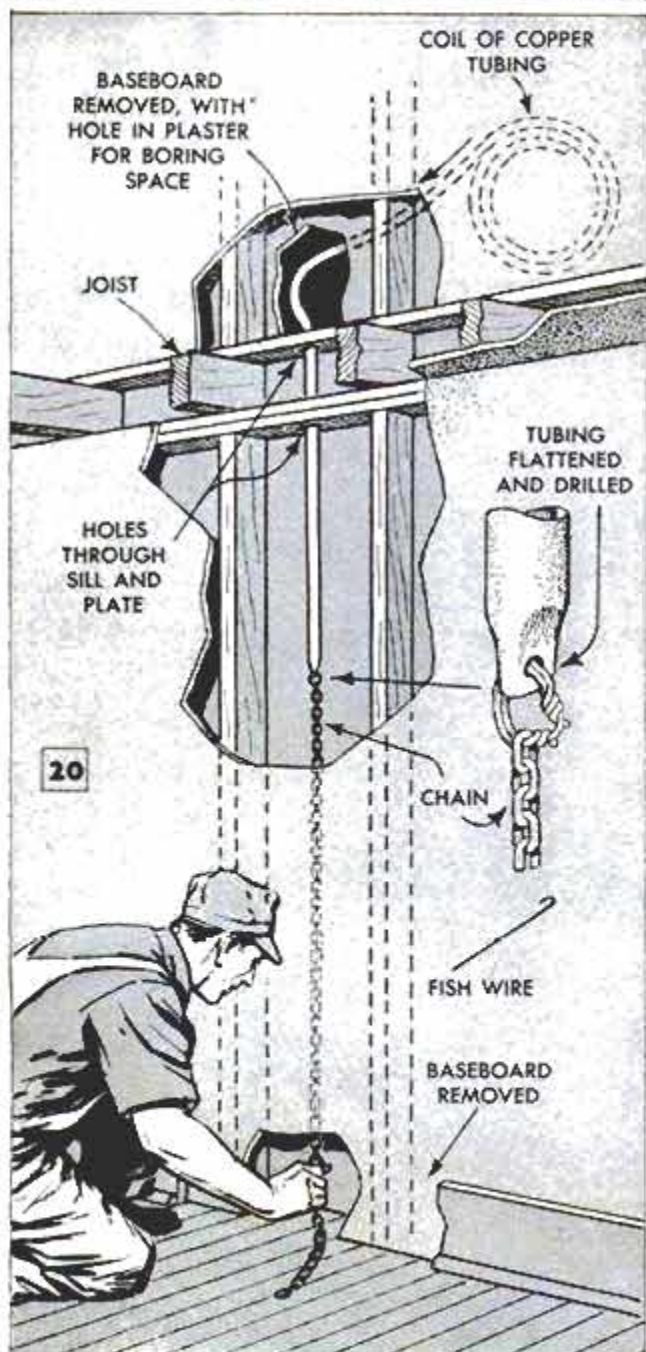
Next, feed the solder along the edge of the fitting, Fig. 13, while keeping the fitting hot. The solder is drawn between the contacting surfaces by capillary attraction no matter at what angle the fitting is held. Generally, the correct amount of $\frac{1}{8}$ -in. wire solder to use per joint is a length equal to the diameter of the tubing.

Avoid getting solder all over the work. You can wipe off excess solder while it is still liquid with a moistened cloth but do not remove the bead from the chamfered ends of the fitting. Avoid movement of the tube or fitting until after the solder has "set" or hardened, since any disturbance before this time weakens the joint. To protect wood or other combustible material in the vicinity of the flame when soldering a joint, use a sheet of asbestos board or asbestos paper.

Whenever soldering tubing into a fitting which has other outlets already soldered into it, prevent the latter from melting loose by wrapping wet cloths around the joints to be protected as in Fig. 14.

Solder to use: Ordinary "soft" solder is





satisfactory where joints are not subjected to much strain or vibration and are never heated to temperatures above 250 deg. F. For producing stronger joints, use "hard" or brazing solder which flows at temperatures of 1300 and 1400 deg. F.

How to bend tubing: You can bend soft copper tubing by hand as in Fig. 15, using spring-steel bending coils. Bending coils come in various sizes, for either inside or outside application. For accurate, small-radii bends, use a bending fixture, Fig. 16.

When copper tubing is bent or otherwise worked, it becomes hard and brittle. Therefore, before rebending copper tubing, anneal it by heating to a dull cherry-red color, then quench it in water. Aluminum is annealed in the same manner.

Swaged joints: Lengths of tubing can be spliced together by swedging, thus eliminating the need for a coupling. A swedging tool of the proper size, Fig. 18, increases the diameter of tubing a short distance from its end so it can be fitted over the end of another length. The joint is finished and soldered in the manner already described.

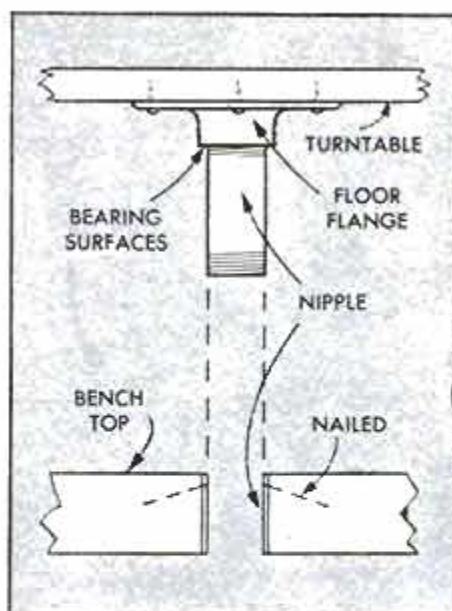
"Snaking" tubing through partitions: Copper tubing usually can be snaked through partitions as shown in Figs. 19 and 20. Two workers are required for this job. Holes are bored through the top and sole plates of the partition, a length of chain is lowered from the upper to the lower opening and it is pulled through the lower opening by means of a piece of wire with a hook bent in the end. This arrangement permits the worker below to pull the tubing through the partition by pulling on the chain while the worker above feeds the tubing into the partition. If any cross-pieces or fire stops are encountered, it is necessary to open the wall at this point and notch the obstruction.

Horizontal lengths of tubing must be supported adequately with suitable hangers to prevent sagging at any point. The hard variety of tubing generally is used for long horizontal lengths.

Buried copper tubing: Copper tubing buried underground should never be run through cinder fill, especially where the ground is wet. The sulphur in the cinders attacks copper. Where such a condition exists, damage to the tubing can be prevented by wrapping it with canvas liberally coated with an asphalt compound such as roofing cement or roofing paint. The covered pipe then is surrounded for a distance of 1 ft. with a layer of sand mixed with lime or broken plaster in equal proportions. Compression fittings are preferred for underground work and should be tack-soldered for added security against loosening. ★ ★ ★

Removable Bench-Top Turntable Aids in Model and Radio Work

A bench-top turntable will prove invaluable when working on radios or any job that requires frequent rotating. It consists of a disk of $\frac{3}{4}$ -in. plywood with a floor flange screwed to the center of one side. A short pipe nipple is screwed into the flange and fits inside a second nipple set flush in a hole in the bench top. Two small holes are drilled in the wall of the second nipple to take finishing nails which are driven into the bench top.



Prevent Loss of Marking Pencil By Taping Magnet to End

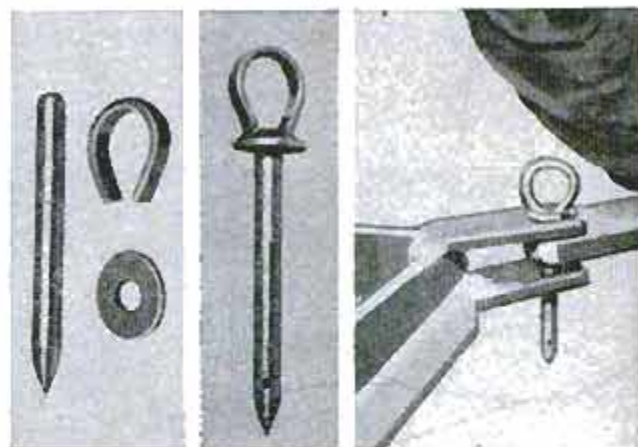


A marking pencil, used when working with a circular saw or other power tool, will not readily become lost if a magnet is taped near its upper end. The pencil then can be "hung" at any convenient point on the steel table or frame of the power tool. Should the pencil be dropped, the weight of the magnet will cause it to fall eraser-end first, thus protecting the point.

Welded Drawbar Hitchpins Made In Farm Workshop

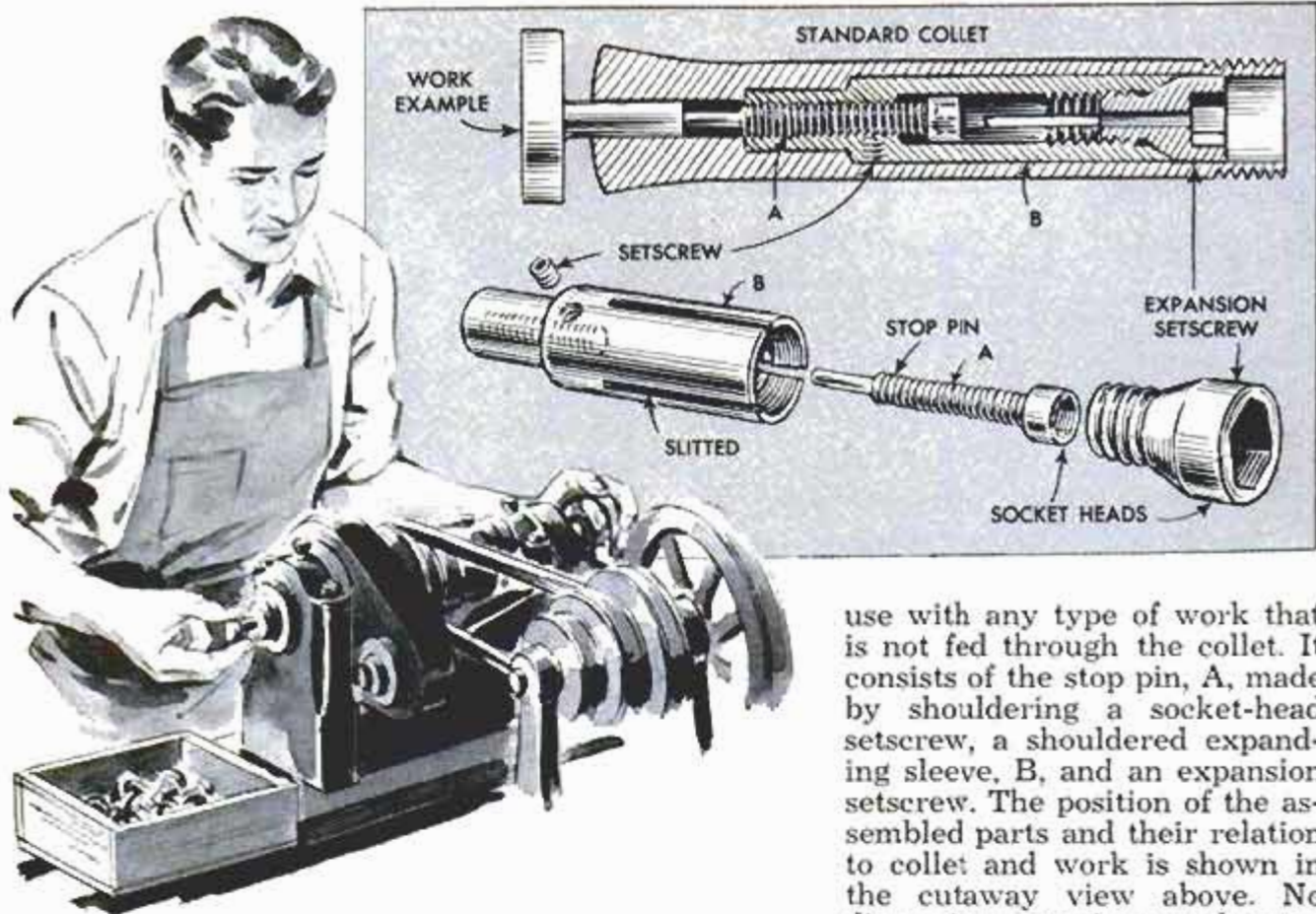
Watering Trough for Cattle

One farmer made this sturdy watering trough for his cattle by cutting a large steel oil drum in half lengthwise with a cutting torch. After the rough edges were ground smooth, a piece of steel plate was welded at each of the four corners to provide a means of bolting on the wooden legs as shown. The legs can be made from lengths of 2 x 6-in. oak as shown, or steel angles or flats.



Inexpensive drawbar pins that can be designed to fit a particular implement hitch require only a length of $\frac{5}{8}$ or $\frac{3}{4}$ -in. steel rod, some steel washers of the same diameters and a length of $\frac{3}{16}$ x $\frac{1}{2}$ -in. steel flat. The rod is cut to the desired length and ground to a taper on one end. A washer then is welded to the opposite end and a U-shaped length of the steel flat is welded to the washer. An additional safety precaution can be provided by drilling a hole near the end of the pin for a cotter key.

Collet Stop Locates Lathe Work for Facing Cut



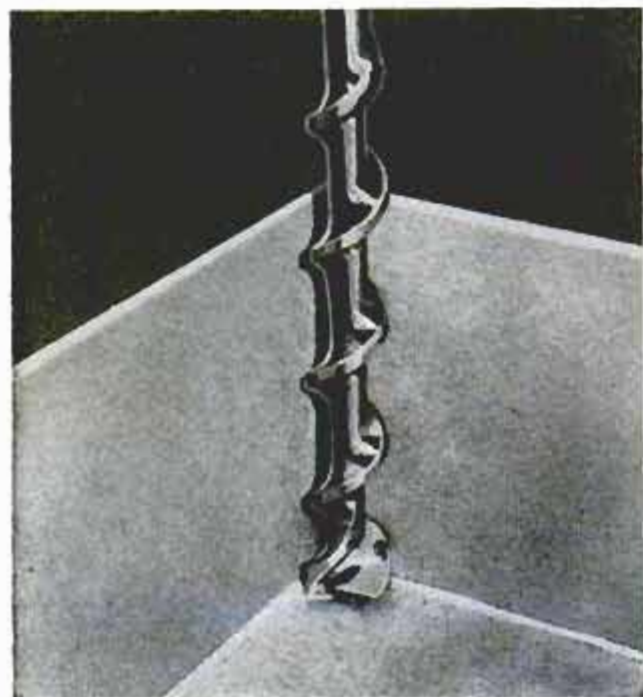
Repeat facing or cutting off work gripped in a collet chuck requires a positive stop in order to hold the length of each part within the limits usually specified. The adjustable stop detailed is designed to fit inside a standard collet and is suitable for

use with any type of work that is not fed through the collet. It consists of the stop pin, A, made by shouldering a socket-head setscrew, a shouldered expanding sleeve, B, and an expansion setscrew. The position of the assembled parts and their relation to collet and work is shown in the cutaway view above. No dimensions are given as the stop must be made to fit the collet.

The shouldered end of the stop pin should be ground and hardened. Machine the sleeve, B, to a light press fit. Then only a slight turn of the expansion screw will lock it in place at any point desired.

Taft A. Buaz, New Bedford, Mass.

Carton Corner Guides Drill For Hand-Held Brace and Bit



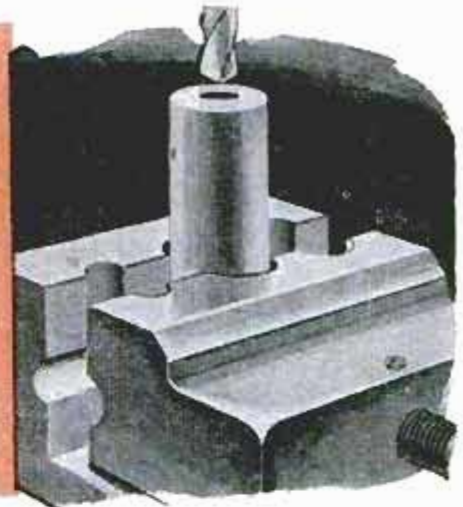
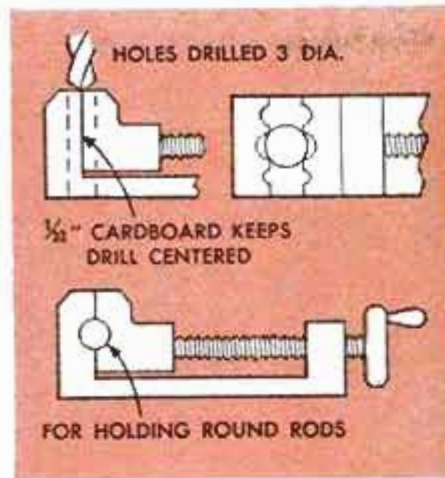
It is not easy to drill a perpendicular hole with a hand-held brace and bit. But it's a simple trick if you use the inside corner of a cardboard carton as a bit guide. Place the bit in the corner of the carton so it touches adjacent sides and force the spur point through the bottom. Then spot the drill point over the hole to be drilled.

Detecting "Thumping" Car Wheel

Determining which one of the tires on an automobile is causing a "thumping" can be done in the following manner: Inflate three of the tires to 45 lb. pressure and drive at the speed which results in a thumping noise. If no thump is evident, inflate the fourth tire to 45 lb. and reduce one of the others to normal pressure. Repeat this until a tire with normal pressure causes a thump. This is the tire that is causing the trouble.

Drill-Press Vise Modified to Hold Cylindrical Pieces of Work

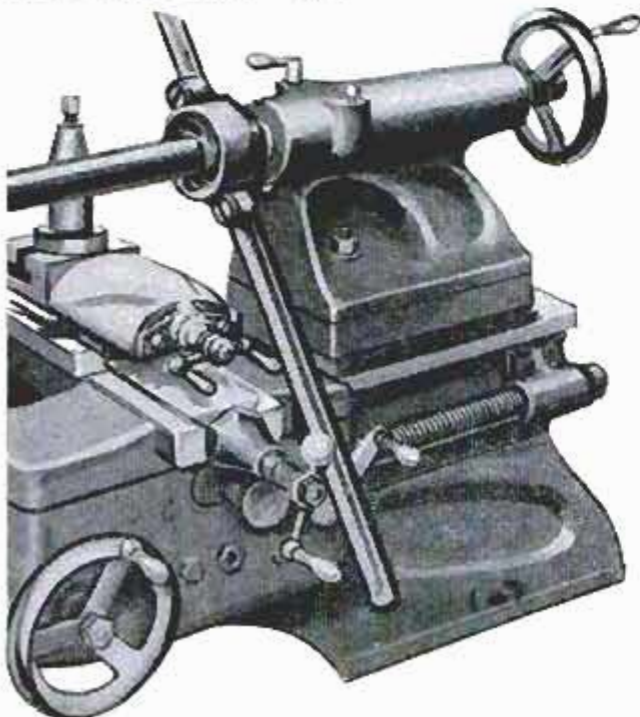
The smooth-faced jaws of a drill-press vise must be modified to provide a positive grip if the vise is to be used extensively for holding cylindrical pieces of work. To modify the vise for holding work vertically, clamp the vise on a piece of light cardboard and drill three holes of different diameters vertically down through the jaws as shown in the upper detail. When the cardboard shim is removed, the jaws will tighten firmly on objects of the same diameter as the holes. Modifying a vise to hold cylindrical objects horizontally, such as when drilling cotter-key holes in small-diameter axles, requires drilling a hole horizontally through the



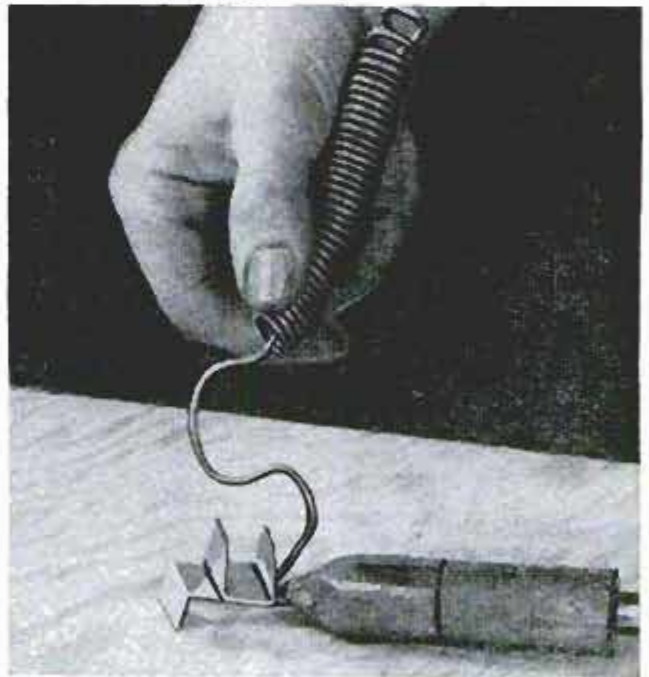
closed vise jaws. The cardboard shim is used again between the jaws while they are being drilled. Hole sizes should be determined on the basis of minimum and maximum diameters of stock most frequently used.—Carl S. Bates, Chicago.

Die Started Squarely on Rod By Using Lathe Tailstock

The difficulty of starting a thread die squarely on a shaft or rod held in a vise can be avoided by using a lathe. Chuck the rod in the headstock, fit the die on the end and force the tailstock quill against it. Keep the tailstock snugly against the die while the rod is turned into it to hold the die square with the end of the rod. Operate the lathe at its lowest speed, or by hand. It may be necessary to substitute a length of pipe for one handle of the die so it can rest on the carriage or some other point clear of the lathe ways.



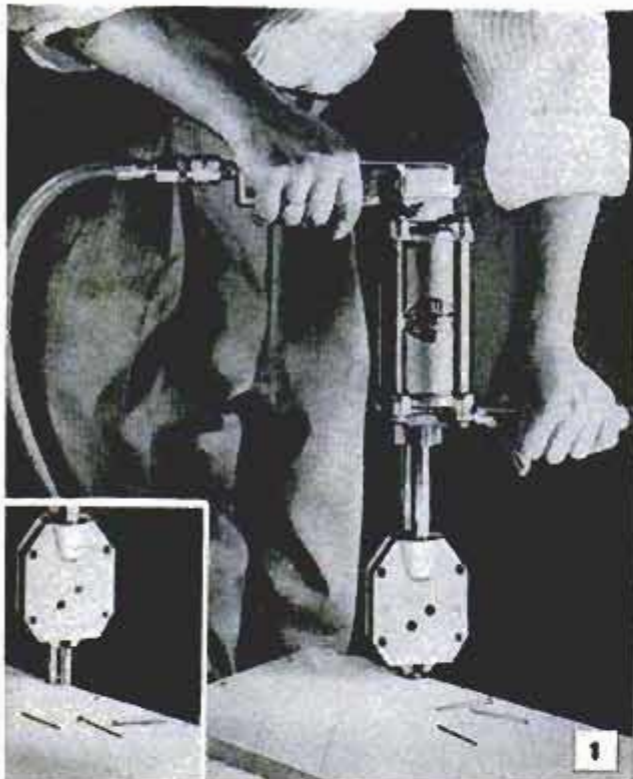
Wire Solder Easy to Handle In Coil-Spring Shape



Instead of wrapping wire solder into a cumbersome loop from which it must be used wind it on a small dowel or pencil so it will assume the shape of a coil spring and be easy to grip. Push one end of the solder through the coil until it extends beyond the opposite end a distance convenient for soldering. As the solder is used, more is pulled out, which reduces the length of the coil.

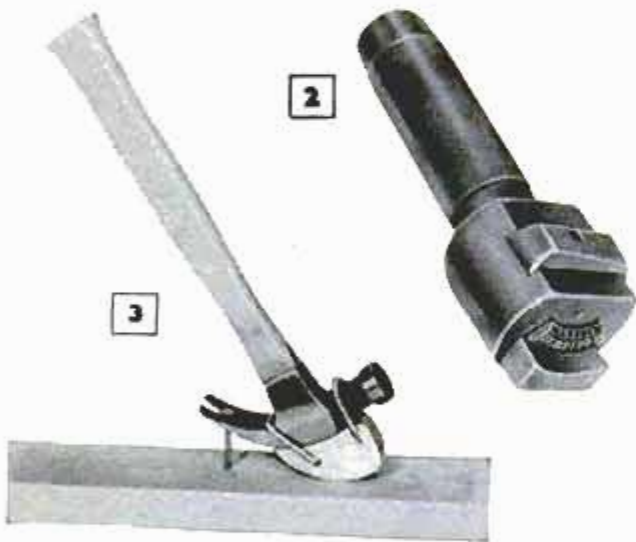
☐ A clear finish on wood is obtained by applying a coat of thinned white shellac followed by sanding and a wax polish.

SHOPPING FOR TOOLS



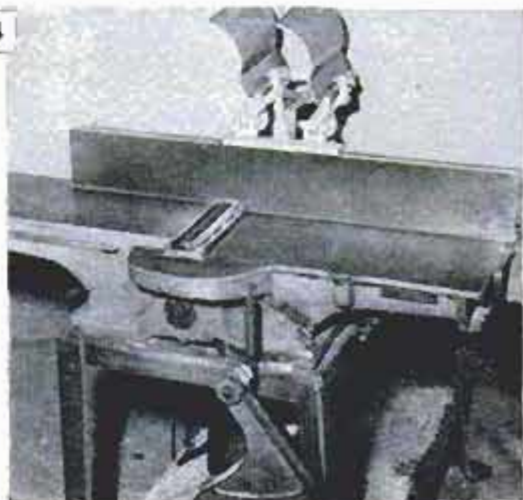
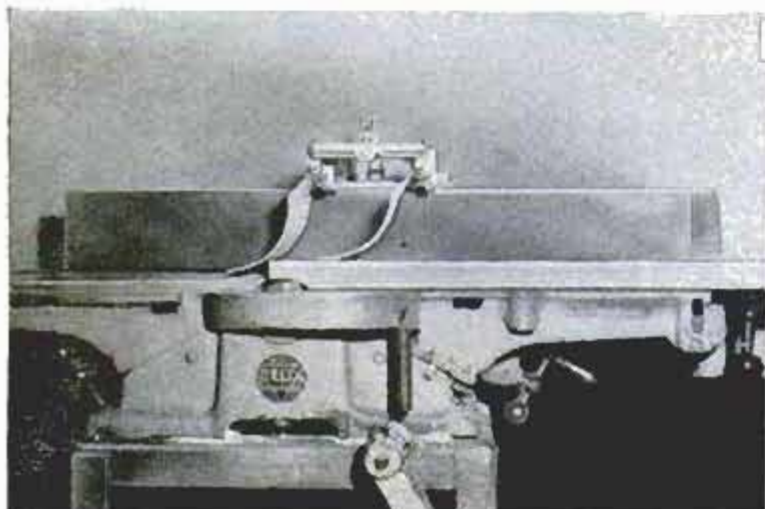
1. AIR-OPERATED NAIL-PULLING DEVICE pulls nails without bending them. Because of straight, powerful pull, lumber is not split when nail is removed. Since neither nails nor lumber are damaged, both can be reused, resulting in a considerable saving in material. Manufacturer claims puller does not grip nail-head, but grips nail itself, so even head is unmarked. Also states that the puller can be used to open boxes containing delicate instruments without damaging the contents. Puller operates on 75 to 100 lb. air pressure. Several sizes are made, covering various sizes of nails; 6 to 10d, 10 to 20d and 10 to 30d
W. D. Allen Manufacturing Co., 506 W. Lake St., Chicago 6.

2. CURVED-LINE STAMP HOLDER simplifies stamping on ends of round bars, shafts and tubular sections. Unit is supplied with or without gauge that enables operator to position holder so all parts are marked in same place. For tubular parts, radius of type circle can be changed within limited range. Special feature is type-retaining device. When slide is opened, retaining bar drops out of slots so type can be changed. When slide is closed, wedge arrangement lifts retaining bar into type slots, locking type
M. E. Cunningham Co., 1025 Chateau St., Pittsburgh 33, Pa.

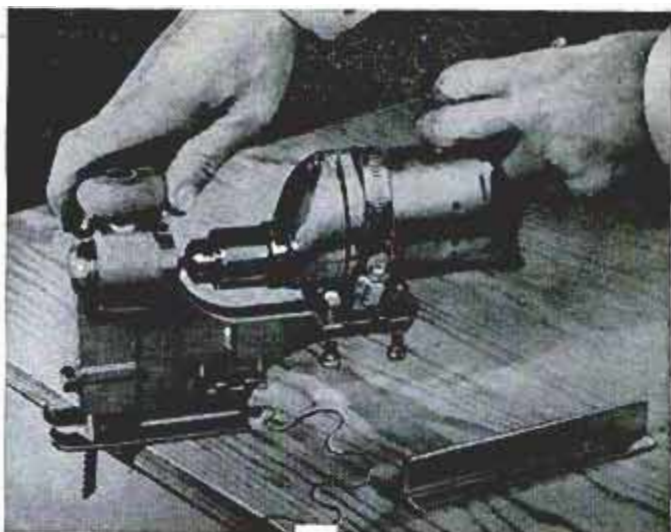


3. NAIL-PULLER ATTACHMENT FOR CLAW HAMMER fits over hammer head to add leverage. Permits pulling most nails without bending them. Curved surface of fulcrum block provides an infinite number of adjustments in distance between hammer claws and nailhead. Puller consists of three parts: Wire bail that slips over claws, coil spring that hooks over hammer head and "nonmarring" fulcrum block
Johnson Products Co., 1670 N. Jackson St., Milwaukee 2, Wis.

4. JOINTER SAFETY HOLD-DOWN consists of two adjustable-tension, C-shaped springs suspended from a pivoted bracket. When doing edge work, hold-down swings out of way as in right-hand photo. Left-hand photo shows how device holds stock so hands need not approach blade. Rough finish, chatter and kickback are eliminated it is claimed. Even thin stock can be planed in perfect safety; work is pushed into one end, pulled out other, with no need for push stick. Plastic window is available to cover open side of hold-down to protect operator's face
R. E. Peterson, Co., Turlock, Calif.



5. JIGSAW ATTACHMENT FOR 1/4-IN. DRILL has flexible-shaft drive inside hollow spindle which permits close coupling of drill and attachment, yet allows for drill-chuck "run-out." Vibration is reduced by using two pistons in unit, arranged so they reciprocate in opposite directions. One piston drives saw blade, other is air pump. Leather cup on air piston assures generous supply of air. Unit has T-bar which permits clamping it in vise so it can be used as stationary saber saw
Babcock Mfg. Co., 6253 Claremont Ave., Oakland 18, Calif.



6. OPEN-END ROLLER RATCHET WRENCH will fit over badly burred or heavily plated nuts, due to spring expansion allowed behind precision-made steel rollers in wrench jaw. It is stated that jaw will not mar chrome-plated fittings. Wrench can be used on all tube fittings, soft aluminum, brass or plastic nuts and bolts, turnbuckles and connectors or wherever an open-end wrench is required with quick-ratcheting action. Ratcheting arc permits wrench to be used in tight locations
TKF Company, Fisher Building, Detroit 2, Mich.



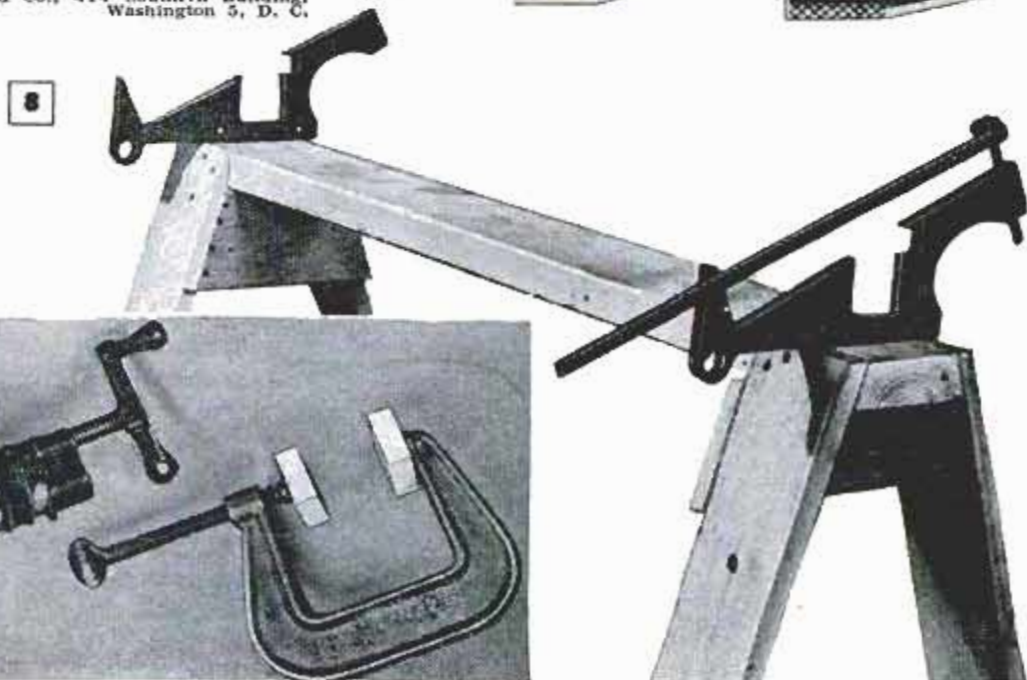
7. INEXPENSIVE NEW DRILL CHUCK fits standard hand drills, power drills and lathes. Chuck is ideal for working on radios, model building, jewelry making or any hobby or operation that requires accurate drilling of very small holes. Drill bits from size No. 61 to No. 80 can be accommodated. Selling for about 50 cents, chuck pays for itself in savings of drill-bit breakage
X-Acto, Inc., 48-41 Van Dam St., Long Island City 1, N. Y.



8. QUICK-ACTING CLAMP FOR SAWHORSE holds most stock sizes of lumber for planing and sawing operations. Versatile clamp combines functions of bench vise, square, saw gauge and miter box. Screws directly to top or end of any sawhorse. Units are sold on a ten-day-trial basis
W. I. Stearns Co., Arlington, Vt.



9. SELF-ATTACHING WOODEN PADS for clamp jaws utilize small permanent magnets to provide that "extra hand" that often is needed when attempting to insert wooden non-marring pads between clamp jaws and work. Pads come in 2 sizes, 1 3/4 x 1 3/4 x 3 in. and 1 1/2 x 1 x 3/8 in.
Hildebrandt and Co., 414 Southern Building, Washington 5, D. C.





NEW BONDING AGENT called Kwik-Weld permanently bonds concrete, tile or plaster to almost any surface. Product can be brushed or sprayed. Eliminates acid-etching or chipping concrete

Chemical Products Co., Inc., Aberdeen, Md.

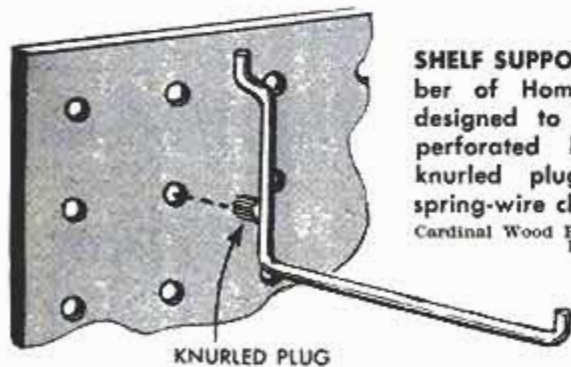
NOW ON THE MARKET

FOR THE
DO-IT-YOURSELF HOMEOWNER



"BUBBLE OFF" ACTION of Zip-Strip paint remover can raise dozen coats of paint in one application. Leaves wood ready for repainting. Safe to use; won't ignite

Star Bronze Co., P.O. Box 568, Alliance, Ohio

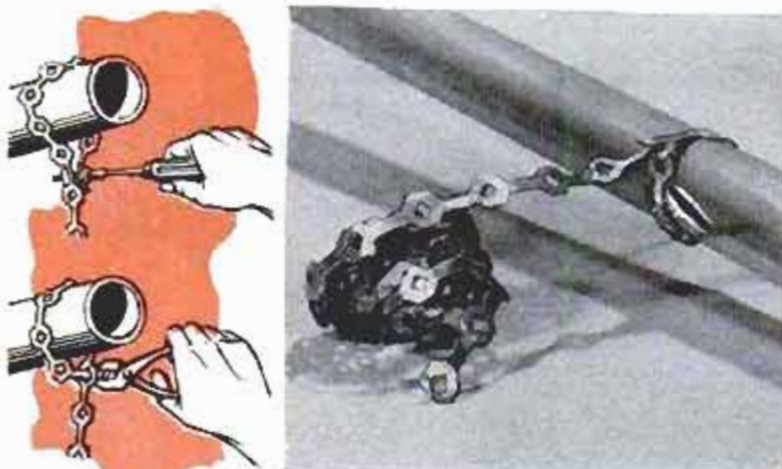


SHELF SUPPORT, one of a number of Homeboard Hooks, is designed to anchor rigidly to perforated hardboard by a knurled plug. Eliminates the spring-wire clips ordinarily used

Cardinal Wood Products, 9229 N. East Prairie Rd., Skokie, Ill.

EASY-TO-USE PIPE HANGER, Fix-O-Strip, is locked by passing end through perforation and twisting with pliers. Also may be bolted. Excellent for banding and repairing wire or link fences

Jaysen Strips Co., 157 Adelpi St., Brooklyn 5, N.Y.



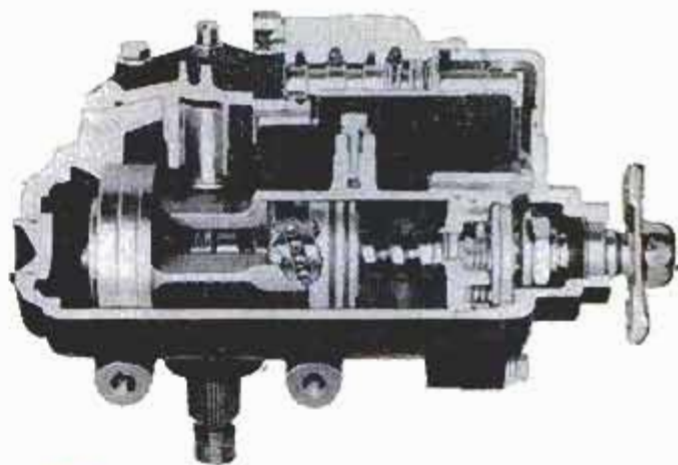
SQUEEZED FROM A TUBE, Flex-O-Fix dries into a tough, elastic rubber. Mends and waterproofs fiber, leather or rubber. Retreads small tires and insulates wiring. Stops car rattles, seals windows

Pyroil Company, Inc., LaCrosse, Wis.



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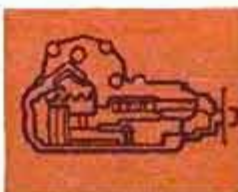
1 TWICE-AS-EASY PARKING. Revolutionary new valve design cuts maximum manual effort in half. It never exceeds 5 lbs.

2 GREATER ROAD STABILITY. New system helps hold car "on course"—assures even more secure "road feel" than ever.

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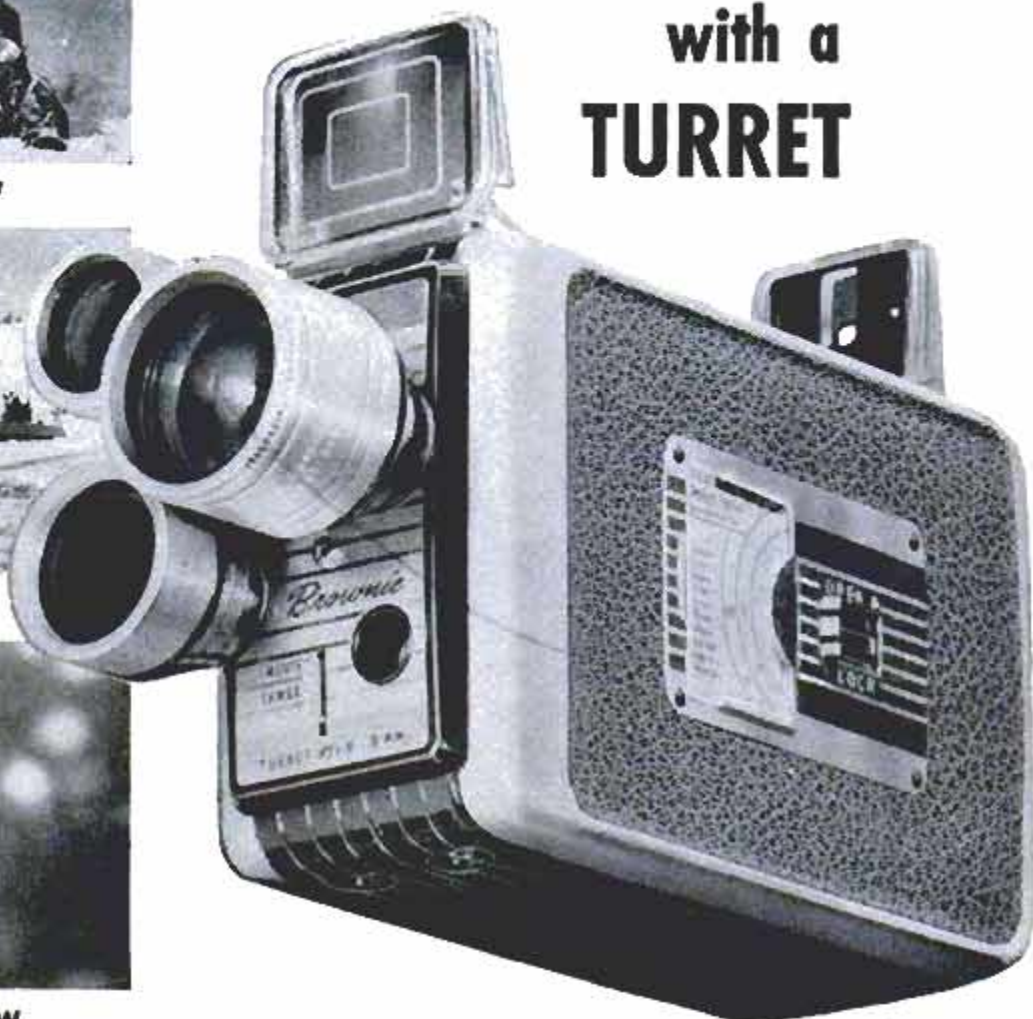
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NEW! BROWNIE with a TURRET

Brownie Movie Camera, Turret $f/1.9$... Only \$79⁵⁰

Imagine! 3-lens range at a 1-lens price!

Now you can enjoy the thrill of having a whole turret-full of lens power at your command—backed by true “Brownie” ease and economy. Just sight through the finder and note the color of the rectangle that frames the view you like best (regular, wide-angle, or telephoto). Then simply click the turret around until the color-coded lens of your choice is in shooting position. No individual exposure adjustments to make—the setting for the regular lens is automatically

“right” for wide-angle and telephoto conversion lenses, too. This is a camera you must see for yourself to fully appreciate.

Here are a few of its special features

- A complete 8mm turret camera for the price many amateurs have paid for *one* auxiliary lens.
- No focusing—never before the versatility of a 3-lens turret camera that’s so easy to use!
- All 3 lenses shoot as fast as $f/1.9$.

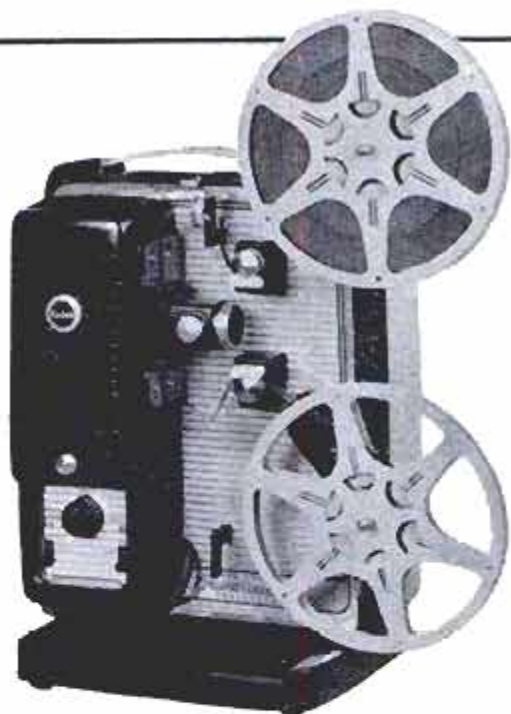
Cine-Kodak Medallion 8 Camera

No bigger'n a minute, the Cine-Kodak Medallion 8 Camera has the look, feel, and "purr" of a finely built watch. Takes but 3 seconds to load it with a magazine of film; little more to switch from indoor to outdoor color. Fast $f/1.9$ Ektanon Lens focuses down to 12 inches for close-ups, is directly interchangeable with all "D-thread" type lenses. Optical finder adjusts to show fields of lenses from $6\frac{1}{2}$ mm to 38mm. Speeds of 16 to 48 frames per second, plus single-frame. Continuous run lock; ready-set footage counter. It's an easy-to-use little gem—yet the Medallion 8 Camera comes packed with the kind of features every serious movie maker wants. **\$144.50**



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TRADE-MARK

Care and Feeding of Engines



BY
S. P. CORP

BRAKE SQUEAL

To silence squealing brakes, remove the brake drum and inspect the brake shoe to remedy the cause of vibration which produces the squeal.

1. Move shoe toward brake backing plate, noting clearance of guide, which should hold shoe square. If cam pin is too long, throwing shoe out of alignment, file pin until shoe moves in line with center of wheel cylinder. Check guide to see that it is not forcing shoe away from backing plate. Lubricate guides with a thin coating of Lubri-Plate. 2. Check for a bent brake shoe by laying web of shoe on a flat surface plate. It should contact plate for full length of shoe. 3. When assembling, make sure brake shoe fits anchor pin snugly. If there is clearance, replace shoe.



VALVE SPRINGS

Valve reconditioning should always include these important checks on valve springs: Compare with a new spring for length, discarding any which are more than $\frac{1}{8}$ " shorter than new spring. They have lost tension. Check squareness of spring ends. A distorted spring will cause trouble. Look for cracks, checks or pitting, discarding springs which show such damage. Rusty springs should be cleaned. Check under load for correct spring height. A load of 80# should compress spring to $1\frac{1}{2}$ " in height. Get manufacturer's specifications from car dealer. Place right end up. If coils are closer together at one end than the other, install with tight coils toward head of valve, otherwise spring will break in operation. Replace all springs if they have been used a long time.



RIGHT WRONG

from car dealer. Place right end up. If coils are closer together at one end than the other, install with tight coils toward head of valve, otherwise spring will break in operation. Replace all springs if they have been used a long time.

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PISTON RINGS

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.

Paint Cracks



Q—When we redecorated the whole interior of our house about a year ago, I painted the interior woodwork, doors and sash frames the same color as the wall in several rooms. The old finish seemed fairly good so I applied two finish coats of the new paint. Now, the new paint has peeled back to the old finish on the doors. What could cause this?—A. L., Mass.

A—It's difficult to say with certainty. You do not say whether the old finish is paint, varnish or shellac, or whether you cleaned the surface thoroughly before applying the new finish. We would suspect that the trouble is due to the presence of fingermarks, wax or oil, any one of which could prevent the new finish from bonding properly to the old. Wherever the failure to bond occurs, peeling of the new paint film will result. Moisture is not likely to be the cause, inasmuch as the old finish is not affected. About the only sure remedy is removal of the defective paint, followed by a thorough cleaning of the surface with a solvent. To make doubly sure, it may be wise to remove the old finish back to the bare wood. This is easily and quickly done with a paint remover: Then wash the surface with a solvent, sand smooth and apply an undercoater of the type recommended for use under interior paints. Follow with one coat of interior finish in the color desired and allow this to dry thoroughly. Then go over the surface lightly with fine sandpaper and apply the finish coat.

Rotted Supports



Q—The 4 x 6 wooden supports under the center beam in my home are beginning to show signs of rot at the lower ends. They will have to be replaced soon. The beam is in two pieces, the ends meeting on a post at the center. The length is 30 ft. and there are three posts. Can I replace the posts myself?—W. D., Ore.

A—One possibility is replacing the original wooden bearing posts with adjustable steel posts which will be available through your local building-materials dealer. However, it may be best to replace

(Continued to page 244)

MEN WITH MECHANICAL SKILLS:



CAN YOU MEET THIS CHALLENGE?



Mechanics Creed

Upon my honor I swear that I shall hold in sacred trust the rights and privileges conferred upon me as a certified mechanic. Knowing full well that the safety and lives of others are dependent upon my skill and judgment, I shall never knowingly subject others to risks which I would not be willing to assume for myself, or for those dear to me.

In discharging this trust, I pledge myself never to undertake work or approve work which I believe to be beyond the limits of my knowledge; nor shall I allow any superior to persuade me to approve aircraft or equipment as airworthy against my better judgment; nor shall I permit my judgment to be influenced by money or other personal gain; nor shall I pass as airworthy aircraft or equipment about which I am in doubt, either as a result of direct inspection or uncertainty regarding the ability of others who have worked on it to accomplish their work satisfactorily.

I realize the grave responsibility which is mine as a certified mechanic to exercise my judgment on the airworthiness of aircraft and equipment. I, therefore, pledge unyielding adherence to these precepts for the advancement of aviation and for the dignity of my vocation.

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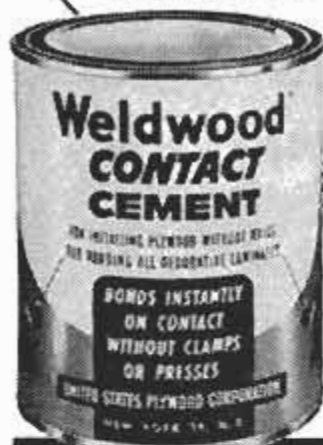
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1001 USES FOR HOME, HOBBY, GARAGE!

THINGS YOU CAN DO!

APPLY MICARTA or other plastic surfacing materials, without clamps or presses!

PUT UP PLYWOOD paneling without nails!

STAIR TREADS—put down stair treads made of any material.
WEATHER STRIPPING—apply it to doors or windows of home or car.

PROTECT WITH FELT—apply felt bases to lamps, vases, etc.; make felt-backed protective covers for dining tables etc.

LEATHER—apply leather to any surface: desk tops, tables.

HOBBY WORK—model building; leather crafts; metal working; wood working.

ALUMINUM—make place or counter mats; cover anything with aluminum.

CLOTH & PAPER—apply cloth of any kind (canvas, upholstery material etc.) to wood, composition board or metal. Fasten paper to paper or anything else.

THINGS YOU CAN MEND!

Restore loose wood veneers, even in places where clamps can't hold—because no clamps are needed.

Repair rainwear, beach bags, rubberized cases, furniture covers, etc.

Repair or replace weather stripping of home or car.

Repair or replace articles made of Novoply, Masonite, Weldwood Hardboard, Tekwood.

Reline or recover luggage; mend belts, bags, book bindings, etc.

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PM 1-6

Please send me information on Weldwood Contact Cement.

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City _____ Zone _____ State _____

(Continued from page 242)

with wooden posts of the same size as the originals. We are assuming that you have a concrete floor in the basement. We also are assuming that the lower ends of the present posts rest on concrete footings which are below the level of the floor. It will be necessary to support the ends of the beam, or girder, adequately before the center post is removed. This can be done with two jackscrews and 4 x 4 extensions long enough to reach from the jackscrew pads to the underside of the beam. One full turn on the screws should raise the beam sufficiently to release the post. The new center post should be fitted with a bolster, 4 x 6 or 6 x 6-in. sectional size and 18 to 24 in. long. Soak the lower end of the post overnight in a creosote solution, cut to length, place in position and lower the beam onto it. Proceed in the same manner in replacing the other posts. In some cases builders would advise breaking up the floor and replacing the footings also, especially if the tops are below the floor level. In this case forms should be placed and the new footings poured with the tops above the floor level. If the floor is damp for long periods of time, this extra step may be advisable.



Protecting Bulbs

Q—A year ago last fall we planted bulbs in a small, round bed following the planting instructions in all details, but only a few plants came up in the spring, less than half the number of bulbs we planted. We covered the bed with a leaf mulch while the weather was still quite warm. A neighbor says this was the cause of failure, that the bulbs will rot if the bed is mulched immediately after planting. Is this correct?—W. N., Iowa

A—We doubt that the mulch alone is the cause of the trouble. In many locations, early mulching of bulb plantings prevents freezing of the ground and encourages field mice to take up winter residence. The mulch provides shelter and the bulbs—especially tulips and crocuses—are an unfailing source of food. The ideal time to mulch bulb plantings is after the ground is frozen to a depth of about 2 in. The mulch will prevent thawing during mild winter days and the frozen ground effectively prevents mice from digging down to the bulbs. However, in some locations, especially in warmer climates, mice may cause trouble even though the bed is not mulched. To protect beds under these conditions, gardeners place strips of ½-in.-mesh hardware cloth in a trench dug entirely around the bed. The top of the bed is covered with the same material, the edge overlapping that of the vertical strip.

Repairing Wooden Gutters

Q—The wooden gutters on my home are cracked badly in several places. I was told to fill the cracks with paste white lead, which I did about six months ago. Now I notice that the cracks have opened again and the gutters leak almost as badly as before. They must either be replaced or repaired this coming spring. I would like to repair them if this is possible. Is there a satisfactory repair and if so, how do I go about it?—F. H., Ala.

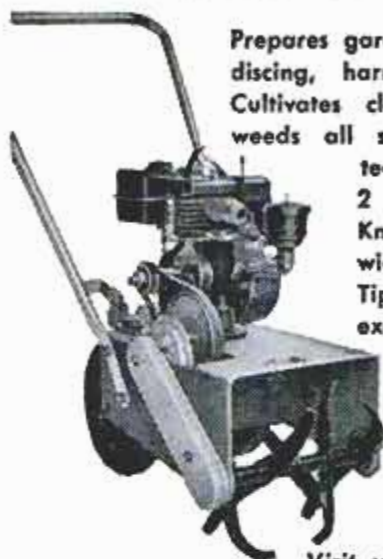
A—Of course, we would ordinarily recommend that you replace the wooden gutters, either with copper units or new ones of wood. However, if you wish to carry out a repair, as you say, there is one fairly effective procedure that can be expected to add from 1 to 3 years of useful life to the present gutters. First clean thoroughly and apply two coats of outside oil-base paint. Thicken the second coat to a heavy-cream consistency with paste white lead and before the second coat sets place strips of medium-weight canvas over the paint and press into close contact. After the paint dries (about 2 weeks) apply a third coat. Treat the full length of the gutters in this manner, not just the sections that are cracked.

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With the "Husky Boy" 200 amp. arc welder you can do profitable general shop and outside repair work; emergency service on pickup trucks—all on a low investment. It's compact and lightweight—easy to transport. For extra convenience when used inside, wheels and handles easily bolt to the unit, and are available at slight extra cost.



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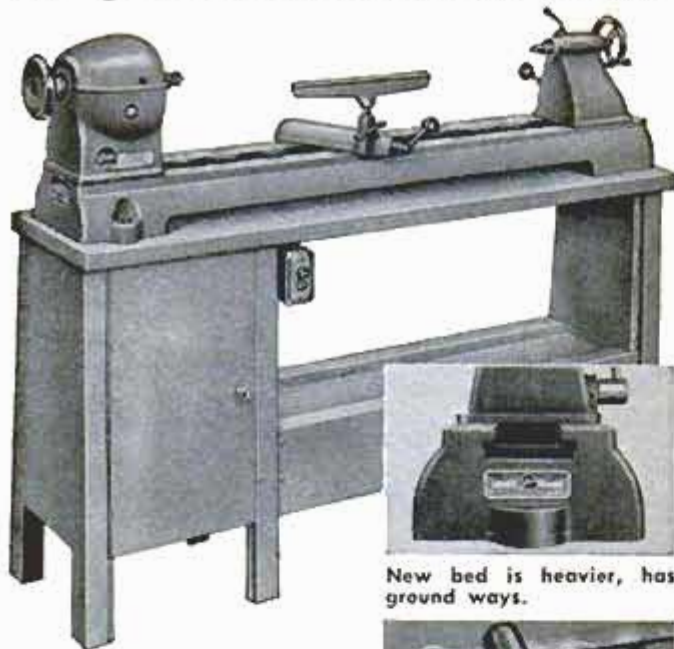
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One movement of lever loosens tool support for instant positioning, or anchors it to bed.



Headstock spindle is turned from a solid bar of tough, fine-grained steel, accurately ground. Sealed-for-life ball bearings take all radial and thrust loads and are pre-loaded at factory to eliminate spindle play. Top is hinged to make belt changing easy.

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And what a stand . . . a completely new cabinet design . . . a massive foundation for accurate work, with $\frac{1}{8}$ " steel plate construction, thick wood top, enclosed V-belt drive. Your shop isn't complete without this fine lathe. Write for literature.



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Please send catalog showing wood lathe. Enclosed is \$_____ for 20-Pfan Book.

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The Hot-Line Men Never Trust to Luck

(Continued from page 162)

are depending on its current. So the power industry has developed methods of working safely with lines energized anywhere from household voltages of 110 volts up to transmission-line voltages of 220,000 or more.

To work on a line carrying up to 7500 volts the lineman wears rubber gloves inside leather gloves. He covers all nearby lines with rubber "snakes" and rubber blankets. He wears a hat with a brim. He keeps his sleeves rolled down. He wears no watch chains or metal wrist bands. He never works alone; he works with a partner whose job is to watch him. Before the two linemen climb to their working position high on a pole, they take part in a "tailboard conference" at the truck. There, the job is discussed and hazards are talked over, and the entire plan of action is worked out by a foreman. When work starts, the working member of the team tells his watching partner what he intends to do before doing it. The chance for error is minimized; there is no haste. This work must be done surely, safely, one step at a time, no matter how noisy the wind or how wet the rain.

To work on lines energized above 7500 volts the lineman uses tools called "hot sticks." They are special-purpose tools ranging all the way from hacksaw to socket wrench, with six-foot handles of dry, clean wood. A good hot-stick man can work as nimbly with those long-handled tools as Grandma can work with a pair of knitting needles. High on a pole where electrical corona makes his hair stand on end, he deftly cleans, twists, cuts or bolts together the deadly high-voltage wires. He may be 100 or 200 or even 400 feet above the ground; he knows what he's doing and he's not afraid.

"You work in constant alertness. You keep your thoughts always on the job, on what you're doing, on what's to be done. You keep a leg pressed tight to the pole, or tower, to ground out the static charge that keeps building up in your body from induction. Wearing thin pants helps a lot; heavy cloth where you touch the pole insulates you more and lets the static build up more, and you keep waiting for it to let go into the pole. You keep listening and watching."

That's not from an amateur at hot-line work; that's a 25-year man talking, an expert, an instructor in "hot stick" operations. He still climbs up there where "220

(Continued to page 248)

How TO SAVE 30% to 40% WHEN YOU BUILD A HOME



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Civilians can now obtain a 70-millimeter high-speed combat camera developed for the Army. Complete with a basic four-inch lens, assorted accessories, a telephoto lens and a 90-degree wide-angle lens, it sells for \$3320. The camera weighs five pounds, far less than a standard press camera, yet is suitable for press and other professional use. With one winding of a spring motor, you can prepare the camera to take as many as 10 pictures in six seconds. The film is loaded in cassettes, and produces 50 negatives 2¼ by 2¾ inches on one strip of film. A built-in slicing knife chops off exposed film for processing after any number of pictures have been taken. A pistol grip keeps the camera steady. The camera has a synchronized shutter with nine speeds from 1/600 second to one second. The three lenses are rapidly interchangeable, and as each lens is inserted, the view finder and range finder are automatically coupled in proper adjustment.

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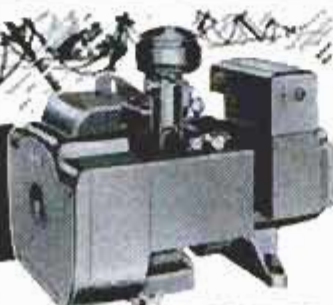
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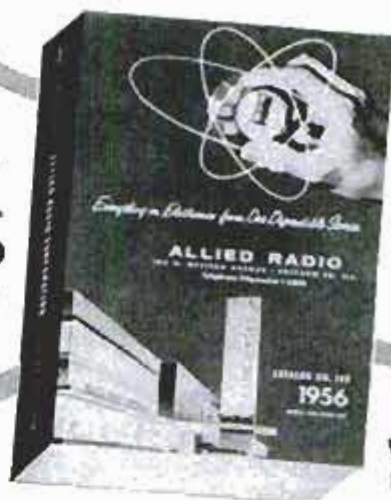
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We're Running Out of Airspace

(Continued from page 138)

permits the controller to take over positive control of the plane from some distance, save a place for it in the landing parade, and slip it directly into this niche.

Transponder Answers Radar Call

Another instrument that may prove valuable in the future is the transponder. The radio band now is so crowded that radio and radar beams are interfering with each other. At long range, a ghostly blip may appear on a scope that may—or may not—be a scheduled plane. At Indianapolis, six DC-3s of Lake Central Airlines have been equipped with transponders. These are small metal boxes housing special radio equipment. A faint radar beam from 200 miles away will trigger the transponder, which automatically sends out a strong beam in return. This not only produces a bright, strong blip on the scope, but the equipment can be so rigged that it will send out a coded message so the plane identifies itself. The transponder, if installed in all commercial planes, will greatly extend the range and usefulness of radar. No longer will a tower man have to ask a pilot to make a 90-degree turn so he can identify the plane on the scope.

Strong, long-range radar will also prevent the kind of traffic pile-up that occurred in Chicago not so long ago, when a small private plane became lost on instrument flight somewhere near the city. Neither the airport radar nor the radar at the Glenview Naval Air Station could find the lost pilot. All flights into the city were held up for one hour and 45 minutes until the plane finally was located and guided in. During that time this one small private plane forced some 80 scheduled airline flights from all over the country either to land immediately or to proceed to holding fixes.

Air traffic has become so heavy and planes so large that some thought is being given to ways that the pilot himself can spot imminent collisions. An experimental periscope, installed in a DC-3 at Indianapolis, enables the pilot to see the air all around him, eliminating his present blind spots. Electronics firms may produce an aircraft-proximity warning indicator.

Computer May Be Answer

Perhaps the inevitable answer to the airspace problem is a computer that will take much of the personal element out of juggling planes for a landing. Such a unit, called Volscan, already has been built and is reported to be under test by the Air

Force. As soon as a plane turns up on the edge of the radar scope, its blip is connected electronically to the computer. The computer surveys a scope full of blips and figures quickly and constantly the course that the planes must fly to bring them safely to the airport at a rate of two per minute. All the dovetailing is done by calculating an indirect route for each plane, so its entry into the gate will be on time.

Experiments also are underway at Indianapolis to solve the controllers' biggest headache. For years controllers have kept track of each plane in flight on a flight-data strip. This slip contains a description of the plane, its destination, altitude, the time that it passes certain fixes and any other pertinent information. By expert reading and juggling of these strips, controllers are able to spot conflicts in advance and give the necessary orders to each pilot to keep the precious block of airspace around his plane.

To solve this problem, research workers at Indianapolis have come up with some ingenious electromechanical display boards that present instantly in numerical fashion all the data on any flight. They also are working on horizontal map-type display boards. On such pictorial displays, each plane is identified by a small "shrimp boat" (so named for its pointed shape). The point of the boat indicates the direction the plane is moving. A slip of paper on the boat gives all the vital information on the flight. As the plane checks in at various points on its course, the boat is moved with it. A somewhat similar system has been tried with a radar projector. The picture of the scope is thrown onto a large horizontal glass disk, and the shrimp boats are moved along as the radar blip moves. These systems give the controller a two-dimensional image of the traffic. He adds the third dimension mentally.

Color Radar?

And even this problem may be taken care of if another new development is adopted. Officials at the Center hope to test color radar within a few months. This equipment, when used with transponders, would present a great deal of visual information about planes approaching a metropolitan area. For example, the traffic controller in the New York area could tell at a glance (by the colors) the altitude of each plane in the area and its terminal airport.

All this research adds up, not only to safe air travel in the future, but better means of utilizing one of our most precious of modern resources, the crowded space above our heads. ★ ★ ★

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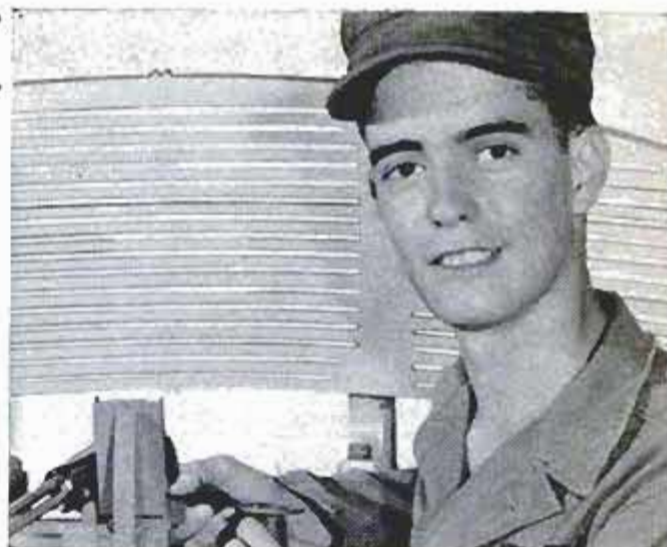
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Stay Alive in the Great Outdoors

(Continued from page 156)

burial and almost certain death beneath those tons of snow.

Every winter dozens of skiers collide with trees while downhill at better than 30 miles per hour. Results are messy—and sometimes fatal. The same applies to the guy afoot who decides to run downhill. It looks easy, and it is—until you try applying the brakes.

Running downhill throws your normal center of gravity off kilter. To regain it, you instinctively run faster. The greater your speed, the more off balance you become until you're out of control and heading for trouble.

"Make yourself into a triped, rather than a biped," advises ranger Lewis, "especially in steep, rocky country. Work down a slope with one hand on the ground. Slower? Sure. But also safer."

It's natural for hikers to play follow the leader. Sticking close to the pack builds confidence. There's no denying the going's easier, following a well-worn trail. Yet it can be a dangerous practice. A rock dislodged a few hundred feet above you builds up terrific speed. Even a small stone can become a deadly missile when hurtling 40 miles per hour and better. So, whether climbing or descending, spread out, each member of the party working parallel and on approximately the same level.

Rock falls are one reason—but only one—why many rangers have discarded their time-honored Stetsons in favor of hard hats, fabricated from plastic or aluminum. Hard hats, universally used on the fire lines, are versatile. They protect against falling rocks. They're cool. With the chin straps as handles, they're easily converted to half-gallon buckets, and have been mustered into "hat brigades" to douse small, stubborn fires. In emergencies they substitute for shovels. Moreover aluminum's visibility from aloft can very well be a lifesaver.

Uncontrolled fire is always dangerous. It's doubly so for the camper. The "don'ts" have often been recited: Don't fire logs or snags, don't kindle campfires in vegetable soils, don't strike any fire before you've cleared 10 to 20 feet all around and cut heavy, overhead growth.

Forest Service firefighters will long remember July 20, 1953—the Grindstone Canyon disaster, when 14 tough, fire-wise volunteers died in Mendocino National Forest. The fire they thought controlled suddenly jumped the breaks. Seconds later, goaded by a stiff wind, it roared up a canyon where line watchers camped. Some

threw themselves up sheer canyon walls. Others tried to outrun the explosive fingers of flame. If those 14 could speak, they'd likely tell campers that nothing moves faster through dry timber than fire. A fire in Las Padres National Forest was clocked at 35 miles per hour. Another burned at better than 43 miles per hour. By comparison, a man fighting through heavy brush is lucky to make 150 feet in five minutes.

"It's 100 to 1 against you winning the sprint," says ranger Leslie Cammack who, with his wife, lives at 5700 feet near Crystal Lake in Angeles National Forest.

Yet Cammack and a dozen fire fighters once beat the odds. As the fire swept toward them, they hurriedly built a backfire, pressed wet bandannas over their faces, and reached the safety of their self-set burn a jump ahead of the main blaze. But notice, they ran for a "burn," not away from the fire.

Campers have cheated fiery death by holing up in low-lying caves (below, not above the fire), by wading a stream's center and occasionally by hacking a firebreak, walling themselves from danger.

Hikers get themselves into enough jams, but fishermen go them one better. Ranger Cammack tells of an angler who was following a trail high off a stream. Instead of keeping his eyes on the trail, he was scouting rainbows—the finny variety. Suddenly the trail turned. The fisherman didn't. He plunged 75 feet into the ravine, wrenching his back. He lay there 30 hours before rangers got him out.

Spring and fall are seasons of rock slides, almost as dangerous as wintertime avalanches. A false step, dislodging a single rock, can bring down a ton of mountain.

Three hikers once headed for high country. Foolishly, they ascended a 45-degree slope, taking no heed of its barrenness nor of its gouged profile, indicative of previous slides. Nearing the crest, the leader stubbed a rock. Moments later a slide roared down upon his companions. One man jumped clear. The third wasn't as lucky. The slide caught him and carried him 300 feet, shattering both ankles.

Rangers effected a rescue with ropes, crampons and some sound advice. Any denuded slope greater than 45 degrees is slide-prone. Wind erosion can trigger an avalanche; so can a sudden temperature change. Even lizards have been blamed for starting slides. The rangers' creed: Stay off slide areas. If you must venture up, skirt the slide, working its vegetated edges.

Take the experts' word for it. An ounce of common sense equals 10 pounds of grub when it comes to staying alive—and having fun—in America's great outdoors. ★ ★ ★

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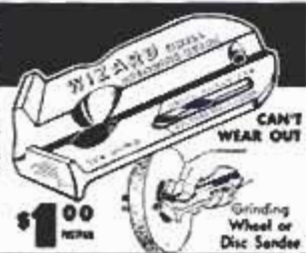
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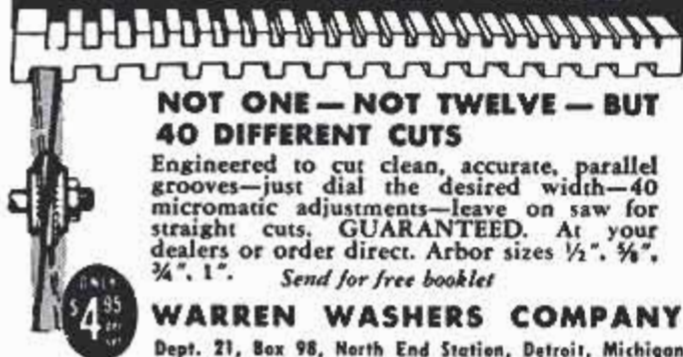
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Wire Your Home for Sound

(Continued from page 182)

individually adjusted to the desired level. Each control may be located at some distance from its associated speaker.

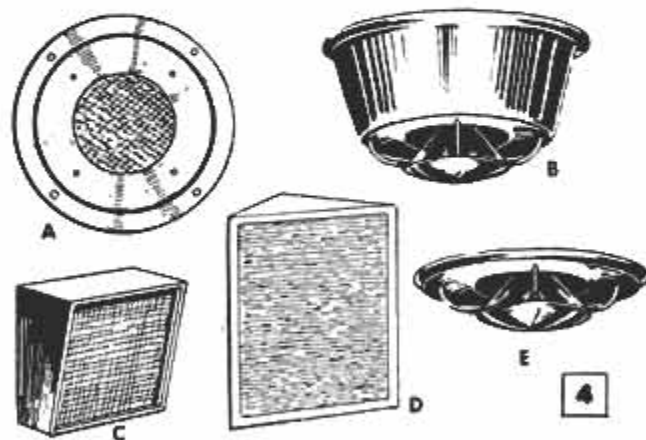
If each speaker has its own control, the amplifier must be correctly adjusted if maximum undistorted power output is to be obtained. To do this, set the volume control of the main speaker to maximum and adjust the radio or amplifier volume control to the highest level possible before distortion sets in. The amplifier control can then be left in that position, and all further volume adjustments should be made with the individual speaker controls.

If the amplifier control is on the same shaft with the on-off switch, the maximum position of this control can be marked on the panel so that it can be reset to that particular point whenever the system is turned on.

Extension-speaker cabinets and baffle plates are available in a great variety of styles, some of which are illustrated in Fig. 4. These are suitable for any type of installation, including wall baffles, ceiling fixtures, separate enclosures, etc. Of course, extension speakers may also be built into existing cabinets, closets, or especially built enclosures to fit in with any type of room decor.

If you are building a new home, plans can easily be made to install the necessary speaker wiring in the walls, along with the electrical wiring. In existing homes, it may be simpler to run the connecting wires along the baseboards, behind quarter rounds or under carpeting. Since these wires carry only low voltages, no safety hazard exists, regardless of the type of installation.

Ordinary 2-wire lamp cord may be used to interconnect the extension speakers. The individual conductors should be No.



Some commercially available baffles for extension speakers: A. Flush-mounting wall type; B. Surface-mounting ceiling type; C. Sloping-front wall mount; D. Corner baffle; E. Flush-mounting ceiling baffle

18 wire, or heavier, to prevent excessive losses in lines more than 30 ft. in length.

Loudspeakers are available in sizes that range from 3 to 15 in. in diameter. The larger units are able to handle more power and will provide better sound quality. Usually, a 5 or 8-in. speaker is adequate for extension-speaker use.

Speaker prices vary even more widely than their sizes. A 12-in. unit, such as found in some radio or TV sets can be purchased for less than \$10.00, while a hi-fi speaker of similar size may cost more than \$100.00. Low-cost replacement-type speakers will provide equal or better performance than speakers usually furnished with ordinary radios. However, if you have a hi-fi system and wish to provide high-fidelity reproduction throughout the house, more-expensive speakers should be used.

Hi-fi speakers usually have voice-coil impedances of 8 or 16 ohms, while replacement types are normally furnished with 3.2-ohm voice coils. However, there is at least one manufacturer, the Quam-Nichols Co., that will supply the inexpensive speakers with any desired voice-coil impedance. These special speakers are available on special order from most large radio-parts distributors.

Helpful Hints

1. If two or more speakers are to be installed in one room, they must be properly phased in order to prevent dead spots. To do this, wire the speakers together in the proper manner and connect the input leads across a 1½-volt flashlight cell. When this voltage is applied, both speaker cones should move in the same direction, either in or out. If they do not, reverse the connections to one of the speakers.

2. When proper matching is possible with either series or parallel wiring, the parallel connection is preferred. In a series connection, if one voice coil should open up, all speakers would be silenced, thus making troubleshooting more difficult. In a parallel connection only the defective speaker would be silenced.

3. If you live very close, within a hundred yards or so, to a powerful radio or TV transmitter, shielding of the speaker leads may be necessary to prevent pickup of the station. The shield should be grounded.

4. In some installations, flat TV lead-in used as speaker cable may be easier to hide under carpets, behind quarter rounds, and baseboards, than ordinary lamp cord or other round cable. ★ ★ ★

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(Continued from page 171)

made underwater shots in color, an information plaque beside each of the lighted aquariums tells what speed and exposure to use for various films. Floor markings indicate the distance to the subject, and at the flip of a switch powerful photoflood lights, balanced for both color and black-and-white pictures, make possible perfect exposures without a flash gun.

The Seaquarium boasts another first in that provision has also been made for nighttime operation. With the coming of darkness every corner of the spacious grounds is flooded with carefully controlled light, whether it be the fish tanks, the 2500-car parking lot, the special 750-foot circular viewing channel, the large crustacean pools or the amphitheater where the porpoises perform. Since the Seaquarium accommodates as many as 10,000 visitors daily, an emergency generating system is necessary. With such large crowds, panic might result if the regular service should falter or fail altogether.

Channel for Large Fish

The large viewing channel, 24 feet wide by 8 feet deep, consists of a circular concrete structure that surrounds a picturesque coral island. The island is reached from the perimeter by a series of connecting moats or scanning bridges. Here are kept in captivity such large ocean specimens as sharks, barracuda and rays that are brought directly into the channel via an entrance lock that connects it with the nearby bay and ocean. Past experience has proved this to provide an ideal method for handling large fish; that is, not removing them from the water at all. A shark, for example, has a large liver that remains in safe equilibrium only so long as the fish is submerged; the liver can be harmfully ruptured should the captive be lifted from the surface.

Provision has been made to control the flow of water from 2 to 10 miles per hour in this well-aerated 750-foot millrace. Here may be kept for the first time in captivity such specimens as sailfish, marlin and other deep-water gamesters. Heretofore such species, because they are very swift swimmers and easily excited, have killed themselves by striking the walls, rocks and similar obstructions in conventional confinement tanks. Such obstacles will not exist here and the excitable captives will follow the curving sides of the channel instead and take their exercise against the controlled current.

Westward from the viewing channel is a

65-foot kidney-shaped pool where spectators may have front-row seats in an outdoor theater that features Adolf Frohn, world-famous animal trainer, as he puts his porpoises and trained sea lions through their jumping, balancing, bell-ringing, flag-raising and similar acts.

On the Biscayne Bay side of the Seaquarium island are two interlinking crustacean or tidal pools, low ponds surrounded by native jungle areas that have been landscaped with plants, flowers and vines from all over the Caribbean area. Here one encounters giant clams, lobsters, starfish, trunkfish and tree-climbing robber crabs, many of which have never before been exhibited in their natural habitats.

Two additional pools are kept stocked to capacity with every type of sporting and food fish to be found in Florida waters. Here every child who visits the Seaquarium can catch some of these fish and take them home at no extra charge. Fishing equipment is provided gratis. There's a "no adults" rule here.

Water Is Filtered, Cooled

A complex filter plant insures the fish of water that surpasses in purity requirements even the most-elaborate human swimming pools. Each day the aquarium water is given tests for alkalinity, salinity, turbidity, bacteria count and chemical analysis. In addition, the water is "medicated" to insure that the various finny inhabitants enjoy robust health. One need for such medication is to compensate the fish for loss of protective skin slime as a result of handling and confinement, which can be fatal to the fish.

To avoid danger from a too-high bacteria count in this tropic latitude it became necessary to install a \$265,000 refrigeration plant to cool the water and maintain it at a constant 72 degrees by cooling coils about the intake and filter piping systems.

Located but 15 minutes from downtown Miami via the Rickenbacker Causeway, the costly Seaquarium project was financed by a group of well-known sportsmen. They hope that the aquarium will in time become the property of the taxpayers in the area. Curator Craig Phillips, marine biologist and artist who helped design the Seaquarium, explains that the main object of the huge installation is to encourage the public, particularly students, to become directly acquainted with the myriad fish and other marine specimens that are found throughout the world's waters. Scientifically accurate painted seascapes and the careful use of concealed lighting inside the

(Continued to page 258)

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aquariums give the illusion of looking into the distance along the floors of such distant oceans.

Specimens Are Wanted

Specimens are gathered by whatever means prove best suited for the particular quarry involved. Teams of fishermen range throughout the Florida Keys, the nearby Bahama Islands and elsewhere. Often hooks are used, but they are three times normal size to prevent them from being swallowed, thereby injuring the fish internally. Charterboat captains and spearfishermen are encouraged to bring back live specimens for purchase by the Seaquarium.

A tremendous amount of food, both in the live and dead state, must be kept on hand at all times. A 60,000-pound capacity "icebox" provides storage for perishable delicacies, maintaining these at a temperature of five degrees above zero. Many of the fish are vegetarians and eat Irish and sweet potatoes, onions and cabbage.

Curator Phillips recalls with a wry smile that some imported California sea lions snubbed the choice Florida butterfish offered them at mealtime. "They had to have herrings, no less," he says. "And the herrings, in turn, could not weigh more than a half pound each!" ★ ★ ★

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Boats are made more buoyant by aluminum-covered foam plastic that can be installed under the seats, in the bow and along the sides of a boat like a liner. Odorless and lightweight, it does not absorb water and will not rot or mold. A chunk four feet long, five inches deep and ten inches high, according to the manufacturer, will support four 175-pound men.



Clymer Tests the 300SL

(Continued from page 140)

always certain, even from very low speeds in fourth gear.

To check this unit I wanted both low and high-altitude tests. At Salton Sea I was 246 feet below sea level and near Lake Arrowhead at El Cajon Pass in the San Bernardino Mountains, the altitude was 4301 feet above sea level. The injector system worked equally well within these altitude ranges.

The engine is mounted in the chassis at an angle (the cylinders are placed in about the same position as one bank of a conventional V8) to permit the use of a lower hood. The body is actually only 51 inches high.

The handling qualities of the car at high speeds, over rough roads and around corners are terrific. There is but little exhaust or wind noise at high speeds and little body rumble. Acceleration is extremely fast and there is a feeling of safety in the car even at high speeds. The car I used was not specially prepared for the test yet it proved to be very fast. The speedometer needle hit 150 miles per hour on speed runs.

The SL is a car that must be really driven to enjoy its unique qualities. By that I mean it is necessary to do considerable gear-shifting to keep engine speed up to the most efficient point for top performance. In many ways, driving it can be compared to the thrill of riding a powerful scrambles-model motorcycle because of its lively performance and quick response to steering.

The test car had a rear-axle ratio of 3.25:1, the highest of the optional gear ratios, the others being 3.42:1, 3.64:1, 3.89:1 and 4.11:1. The 3.64 axle is stock and the most popular for ordinary use. With the 3.25 axle, Mercedes claims 161-mile-per-hour speed and, with proper tuning and road conditions, it is undoubtedly possible. It does 100 easily at 5200 revolutions per minute in third gear. In fourth gear it loafs at 110. The car's top speed almost seems limited only by highway and traffic conditions and not by mechanical factors.

The fuel consumption is surprisingly low, considering the high-performance engine. Oil consumption was approximately 300 miles per quart. There is an oil radiator to keep temperature down in hot weather—an excellent feature.

The car steers hard, due to the fast steering ratio (two wheel turns from lock to lock). This is desirable for high-speed driving and cornering. Double-acting dampers are used on all wheels and the steering gear

(Continued to page 260)

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has a hydraulic shock damper. The car corners as though it were mounted on steel rails except when over-sliding. Even in a four-wheel slide the car retains its maneuverability and the driver has a feeling of unusually good control. There is very little roll and no softness when cornering. Rear suspension uses coil springs with swinging half axles. Front suspension is by independent coil springs with wishbones. There is a front antiroll bar. Of course, a feature that is vital to the road-holding qualities is the low center of gravity.

Brakes are hydraulically operated with a vacuum servo assist for easy pedal operation. The drums are aluminum with cast-iron liners and radial vanes to assist in heat dissipation. The brake shoes are aluminum and self-adjusting. This car has the excellent brakes that are necessary with such high performance. I found them very efficient, with little evidence of fading at any speed or under any conditions. The hand brake is on the left side of the driver's seat and is applied by an upward pull. There is a wing nut for adjustments that become necessary because of lining wear.

Doors are hinged at the top and open upward. Entry and exit are inconvenient, especially for a woman. But, after all, the 300SL is supposed to be a competition car and this feature does not bother the sports-car enthusiast—in fact, many like it. The steering wheel folds down to permit easier entry. The doors are counterbalanced, lift up and pull down easily once unlatched. Door handles fold into the body and thumb pushing is required to flip out the recessed lever, which is then pulled to open the door. A double hand movement is necessary to accomplish this—it is not a good arrangement.

The seating position is extremely comfortable and the vision is good. The low, sloping hood gives fine vision directly forward. The driver and passenger have the feeling of sitting in an airplane cockpit, rather than in an automobile, as the instrument panel is loaded with instruments and knobs of every kind. Well-located directly in front of the driver are the 180-mile-per-hour speedometer and tachometer, which the sports-car enthusiast uses to advantage, especially in competition. To the driver's left is an ignition-control button to advance or retard timing to match fuel octaves, a fuel gauge for the 32-gallon gas tank located under the rear deck and an oil-pressure gauge.

Also on the dash are a water-temperature gauge, oil-temperature gauge, clock, a button to control a rear-mounted fuel pump, which is sometimes used at high speed and is also used to place the 2.3-gal-

lon gas reserve in operation. There are two horn buttons, one in the center of the steering wheel and one at the right for the use of the passenger, cigarette lighter, excellent two-speed windshield wipers, heater and levers to control the inside ventilation on either side. The ventilating system is designed for draft-free ventilation. A slot above the rear window exhausts stale air as you drive. Fresh air comes in through the port ducts. The passenger can smoke in the car with all windows closed and the driver won't be bothered as the smoke is exhausted through the rear slot. While the ventilating system is suitable when the car is moving, it is almost a bake oven in hot weather. The door windows can be entirely removed if desired. There are hinged glass wings at the door fronts.

Mounted on top of the instrument panel is a removable ash tray. The rear-view mirror has considerable vibration and the glass was somewhat distorted. Directly above the mirror is a dome light which turns on when a covering shield is opened—a nice arrangement. The turn-indicator lever is on the right (wrong side to suit Americans). It is mounted on the steering column below the wheel and is not self-canceling. It must be pushed back to non-flashing position after cornering.

Foot pedals are small and the throttle pedal could be higher or the brake pedal lower for more-convenient operation. Only light pedal pressure is required for brake operation. The clutch is rough, rugged and has extremely heavy springs, necessary for the power that the engine develops and the abuse that the car usually gets. As a result, pedal pressure is heavy—so heavy in fact, that constant operation in traffic is tiring. It should have additional power-assist for easier operation.

The four-speed transmission is synchromesh and there is no clashing of gears when changing. The transmission is of excellent construction designed for abuse and quick shifting, but in first, second and third speeds the gears are noisy. These noises are annoying to the novice but, again, the sports-car enthusiast thinks nothing of them. There is a slight hum when cruising in fourth gear but with it is a feeling that only the sports-car fan enjoys. It is a feeling of mastery of a car that has power, speed, strength and durability.

The bumpers, as on most foreign cars, are narrow and do not afford enough protection for parking. Quite often when foreign cars are bumped or pushed when parking, the massive bumpers used on American cars are apt to slide above the small bumpers and do damage to the body. ★ ★ ★

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Owners Report on the Mercedes-Benz 300SL

(Continued from page 144)

two weeks awaiting mechanic from Mercedes to repair fuel-injection system, as it is out of service today."—Nevada surgeon.

Other less-common complaints are described in the following quotations, listed in order of frequency of mention:

"Race venting of the brakes provides a hazard on wet days as the car is often without brakes and requires maximum downshifting for stopping. It is also difficult to stop the car when the engine stalls."—California owner.

"Gearbox is noisy compared to the very pleasant quiet engine."—New York owner.

"Excessive noise when rear-axle differential starts to work."—California owner.

"Naturally I don't care for the method of getting in, the way the windows operate and the high-pitched sing of the racing tires. But I realize these are essential to the outstanding performance of the car."—Illinois retired banker.

"Both doors leak in the rain."—New York banker.

"Poor ventilation in summer in the rain. Windows are either full in or full out. All windows leak."—Wisconsin executive.

"Windows are awkward at toll gates."—New York financial man.

"Inconvenient to get out and open trunk lid at each fuel stop."—California owner. (Note: The gasoline tank is located inside the trunk, which has to be opened for access to the filler pipe. However, the tank holds 34 gallons and, at 20 miles per gallon, requires a refill only every 680 miles.)

"Rear bumper unsatisfactory. It is made of two pieces, is too weak and much too near the body."—California owner.

"Turn signals not self-canceling. Dash

Dashboard of the 300SL is businesslike. The hinged steering wheel makes it easier to get into the seat



lights have no dimming rheostat. Steers like a truck."—Pennsylvania contractor.

Probably the most backhanded compliment handed out by a 300SL owner is this one from a Nevada doctor:

"My complaint is that there are too many people who want to inspect the car. I am pestered with questions. Whenever it is parked, people gather around."

Best-Liked Features

Outstanding performance is the best-liked feature of the 300SL, say the owners.

"I have driven up to 130 miles per hour, but have not yet tried for top speed."—Ohio manufacturer.

SPECIFICATIONS

ENGINE

Type	6-cylinder, single overhead camshaft
Bore and stroke	3.346 x 3.465 inches
Displacement	182.8
Compression ratio	8.55:1
Horsepower	240 at 6100
Maximum engine speed	6400 r.p.m.

GENERAL

Steering-wheel turns (lock to lock)	2 turns
Turning circle	38 feet
Brakes	Hydraulic with vacuum booster
Curb weight	2849 pounds
With load as tested	3200 pounds
Weight distribution	
front	52%
rear	48%
Wheelbase	94.48 inches
Suspension	
front	Independent, with coil springs and wishbones
rear	Independent, coil springs and swinging half axles
Ground clearance	5.1 inches
Width	70.5 inches
Height (unloaded)	51.2 inches
Length	178.0 inches

CAPACITIES

Gasoline tank	34 gallons
Water capacity	16.5 quarts
Oil	Including oil tank: 4 gallons

"No other car is as docile in traffic or as strong at the top end. In Nevada there is ample room to let it out. I have averaged 108 miles per hour for 4 hours."—Nevada restaurant owner.

"It will go as slow as 12 miles per hour in high and is still accelerating at 135 miles per hour."—Pennsylvania executive.

"I have challenged the field to this race: Follow me from Thompson raceway to Springfield, Mass., in heavy traffic on a hot day. Park and then load cars with groceries, luggage. Drive back with long waits in traffic. Then, without adding oil, water or fuel, race for 30 laps. Nobody accepts this challenge because no other car could do it. The 300SL is the only dual-purpose

(Continued to page 264)

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ITEM #31C — 3 1/2" bore, 1 1/2" stroke. Alloy steel cylinder wall. Micro-Honed and all steel 1 1/2" diameter piston rod. 19 1/2" overall length closed. Clevis mounting at base and shaft. Will lift 625 lbs. with 1000 PSI Pump Pressure. Uses 3/4" tubing fittings. (Fittings to pipe thread; two 3/8" MPT @ 35c.) A \$102.00



value, shipping weight 11 lbs. FOB Chicago. **25.00**

ITEM #16C — 1 1/2" bore, 20" stroke. Will lift 1760 lbs. with 1000 lbs. pump pressure. Great for hay loaders, etc. 1 1/2" stainless steel piston rod. Postpaid. **16.95**

ITEM No. 33C — 1 1/2" bore, 4 1/2" stroke, alloy steel barrel, aluminum alloy ends, clevis mounting at both ends, lifting capacity 1760 lbs. in approximately 1/2 second using 1000 P.S.I., overall length closed 15 1/2", has 2 — 1/4" pipe thread ports. Postpaid. **8.95**

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• Electric Saw, Electric Drills, Pipe Bender.
• Refrigerator, Deep Freezer, Incubator.
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1000 WATTS OUTPUT, continuous duty. 115 Volts A.C. 60 cycles, 9 amps. Powered by husky, easy starting Clinton engine. Engine and generator operate at 3600 R.P.M. for maximum efficiency at minimum weight. Both units are mounted on steel base, with heavy sheet metal belt guard. Generator is self regulating, and is equipped with outlet box containing fuse and 2 A.C. convenience receptacles. Cost only 5c an hour to operate. Dimensions: Length 20 1/2", Width 12", Height 16". Shipping wt. 100 lbs. F.O.B. Chicago. **149.50**

700 WATT-GENERATOR SET — same as above, slightly smaller — with Briggs-Stratton Engine — Model 708 — F.O.B. Chicago. **129.50**

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CONTROL HANDLE
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FILLER PLUG
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CONTROL LOCK

with FINGERTIP CONTROL

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps.

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1 1/2 H.P. Shafts 5/8" diam. Input rotation counter-clockwise facing shaft. Input speed 750 R.P.M. 7 1/4" x 7 1/2" x 1 1/2". Govt acquisition cost \$428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **54.50**

U. S. NAVY ALL BRONZE CENTRIFUGAL PUMP

These all bronze Centrifugal Pumps are ideal for use as marine bilge pumps, circulating pumps, fire protection or irrigation, car-washing, watering, basement sump pumping, lawn sprinkling. Will pump water, oil, brine, gasoline, DDT and sulphur compounds. Equipped with 6" adjustable "V" pulley, 2" dia. inlet and outlet, 180 GPM capacity. Inlet and outlet take hose with 2 1/4" inside diameter. Dimensions 11" x 8" x 11".

Total head-feet	Speed	H.P.	GPM
25	3600 RPM	3	180
35	3000 RPM	1 1/2	90
20	2400 RPM	1 1/4	75

Back plate may be rotated for most convenient inlet position. Shipping weight 31 lbs. Govt. cost \$29.50. \$6.00. F.O.B. Chicago. **29.50**



ITEM #384

TORQUE AMPLIFIER

An ideal unit for close control torque boosting of rotating device requiring instant start, stop, and reversing. A small amount of power applied to the input shaft is reproduced at the output shaft with greatly multiplied torque. Speed and direction of the output shaft vary directly with speed and direction of the input. The Torque Amplifier is powered by a 1/40 H.P. three phase, 115 volt, 60 cycle motor. The motor may be run on 115 volt single phase merely by adding a starting capacitor. Power is transmitted from the motor through reduction gears, and is controlled by two carbon disc clutches. The gearbox is totally enclosed in an aluminum case. Dimensions: 12" H, 5 3/4" W, 7 1/2" D. Weight 23 Lbs. Ship. Wt. 30 Lbs. **12.95** F.O.B. Chicago.

ITEM #209

SELF-PRIMING ROTARY PUMP

Item #104A — A fine pump for gasoline, fuel oil, water, kerosene. For fuel transfer, sump pumping, for draining basements. Capacity, 400 gallons per hour. 3/4" pipe thread inlet and outlet. Has built-in, adjustable relief valve, set at 30 P.S.I. Adjustable to 100 P.S.I. Rotation in either direction; use 1/4 Hp. motor; 1/2" standard shaft, ball-bearing supported. Dimensions: 5 1/2" x 3 1/2" x 10". Shipping weight 8 lbs. A \$55.00 VALU. F.O.B. Chicago. **16.50**



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• For electric golf carts
• For self-propelled scooters, children's mid-cool cars.

Rated 1 H.P., — 100 amps, 5600 R.P.M., 12 volts, D.C. — This double shaft motor of ball-bearing construction may be run on 6 volts for lower horsepower requirements. — Standard 3/4" shafts, nut and bolt electrical terminals. Flange mounting — Dimensions: 8" x 4 1/2" x 4 1/2". Ship. wt. 19 lbs. A real value at..... **12.50** F.O.B. Chicago



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Ideal for powering electric tools, oil burner, refrigerator, lights, or other appliances requiring up to 700 watts of power. 700 WATTS. 115 Volts, 60 cycles A.C. 3600 R.P.M. Compact, self-regulating generator with V Belt pulley and double outlet receptacle. Rotation counterclockwise. May be driven by tractor or auxiliary gasoline engine. Requires 2 HP minimum. Dimensions: 10" long x 8" high x 6" wide. Shipping wt. 27 lbs. F.O.B. Chicago. **59.50**



Model 1010 — 1000 WATTS (Same as above) F.O.B. Chicago. **79.50**

SELF-PRIMING HAND FLUID PUMP WITH STRAINER

ITEM #129 — Type D-2 — May be used as a boat bailing pump, sump pump, barrel pump, fuel transfer pump, for water, oil, gasoline, insecticides, etc. Bronze and aluminum construction, 3/4 in. pipe thread ports. Fine general utility hand pump. Capacity — 300 Gal. per hr. Ship. wt. 6 lbs. F.O.B. Chicago. **11.95**



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sports car in the world today."—Connecticut owner.

The car's wonderful handling characteristics are second on the list of best-liked features.

"I like best the driving pleasure."—Arizona retired owner.

"I drive a lot and enjoy taking my hobby with me."—Connecticut executive.

"Drives fine. Haven't enjoyed a car as much since I owned a Cord in 1932."—Michigan manufacturer.

Roadability is the third-best-liked feature, say the owners.

"Pickup is really incredible, but what impresses me most is the way it sits down as though on railroad tracks at high speed."—New York photographer.

"Drove 400 miles through 5 inches of snow. It went through as easily as a truck. I was worried because of low clearance, but could drive off road into deep snow and back out with no trouble. Drove on ice and sleet for 300 miles. Could slide with no worries. It has a good solid feel."—Michigan owner.

Fourth on the list is comfort. Next is the pleasure of high-speed touring.

"Riding qualities are as good if not better than any American production car. Ride in one for more than 10 straight hours and see. It is really terrific."—New York executive.

"The ultimate in high-speed cross-country driving where too much baggage does not have to be carried."—Colorado rancher.

"Extremely comfortable in driving on long trips. Noise level at high speeds is at very minimum. Mileage is excellent—17 miles per gallon at 110 miles per hour."—Nevada investment banker.

"Have just returned from a 5000-mile trip with my wife through the West. Whenever the opportunity arose we would cruise at more than 80 miles per hour. One hour's run through Nevada we averaged 101.5 miles per hour. At all times we felt that we were not being reckless or careless as we have four small children. The sense of security in all types of driving is incomparable."—California oilman.

Here are the other best-liked features, listed in order of frequency of mention:

"Styling will look modern for years to come."—Nevada dairy processor.

"Brakes are best feature. Give feeling of absolute control."—California owner.

"This car is strictly for people who like to drive. For them, it surpasses anything that I have ever seen or driven."—Illinois executive.

"Extremely well made. The acme of German know-how."—Ohio physician.

"Simplified and functional design makes

it easy to work on. Every item on the car has some function."—California aeronautical engineer.

What Changes?

As you have no doubt noticed, the 300SL owners are a happy group. But they do have just a few changes to suggest. Here they are in order:

"Should have adjustable steering column. Wheel is too far away from driver."—Illinois retired owner.

"Improve method of getting in and out."—Nevada owner.

"Make another model with a folding cloth top."—Virginia quarry owner.

"For those who don't race, a 20-gallon gas tank would be better. Say 10 gallons in each rear fender so you could have some space in the trunk for luggage."—Missouri owner.

"Put gas-filler pipe outside to eliminate occasional gasoline fumes in passenger compartment."—New York owner.

"Add a glove compartment."—New Jersey manufacturer.

"I have no complaints about the car but would like a better and clearer instruction book for people who love, understand and like to care for their cars themselves. This car is, in my opinion, out of this world."—Pennsylvania car enthusiast.

"Add Zeus fasteners to belly pans."—California mechanic.

"Better headlights. Present lights are inadequate for high-speed driving."—Tennessee executive.

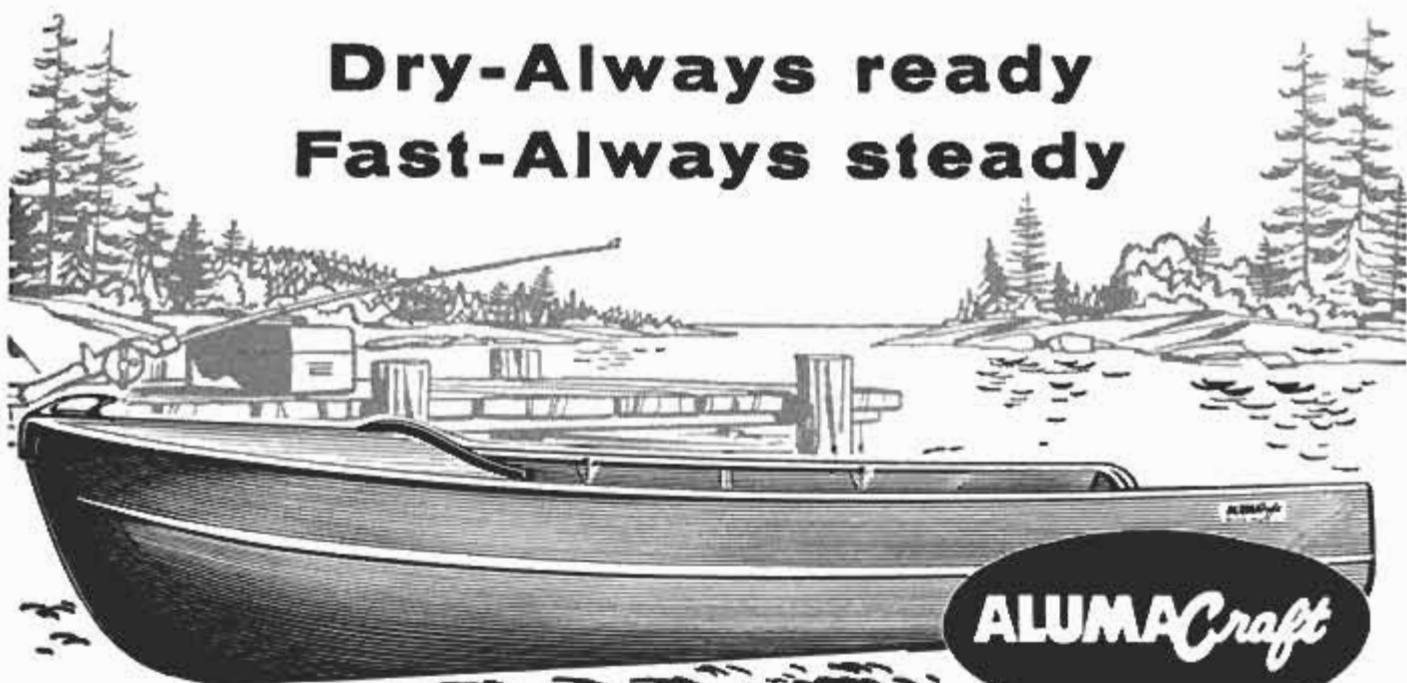
"Install a small jump seat for the kids as on the XK140 Jag."—Nevada doctor.

There you have it. That is what the owners think about one of the world's outstanding automobiles. To find out what Floyd Clymer thinks about the car read the test report that begins on page 140. ★ ★ ★

Tooth Freezing

Dentists using an experimental device developed in France are actually freezing mouth tissue to prevent pain during drilling. Increasingly colder air is directed at the mouth tissue until a temperature of 33.8 degrees Fahrenheit is reached and the area is anesthetized. The method may be used in cases where the dental patient cannot tolerate the conventional local anesthetics. When 100 persons were given the mouth-freezing treatment at the Naval Dental School, Bethesda, Md., 94 reported little or no discomfort from having cavities filled. The other six who reported pain had cavities mainly involving wisdom teeth, which are not easily accessible.

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SAY YOU SAW IT IN POPULAR MECHANICS

Winter is the Best Time for Fishing

(Continued from page 128)

blame—or credit—for fishing derbies. Back in 1947 Perry Dotson, former St. Paul newspaperman and general overseer and publicist for the winter carnival, was casting about for an idea that would have mass-participation appeal. The big parade was fine, but after that the events were specialized. He wanted something that anyone from 8 to 80 could join.

"Why not an ice-fishing contest," we asked.

"That's fine," said Dotson, "and you're now the chairman."

Some of the more conservative leaders of the carnival either laughed the idea off as a joke or took a dim view. Their greatest fear, and mine too, was the safety of the event when it became apparent that there would be not just a few hundred out on a Sunday morning, but thousands.

The district Army Engineers' office in St. Paul had some tables showing the safety of ice. As little as two inches would support a man. Sixteen inches would support a heavy vehicle. But what of hundreds of vehicles, or thousands? That never had been done, although old-timers in the north logging country had hauled sleds weighing tons across the ice.

With the aid of veteran game warden John Salvator and Harold Leich and others of the White Bear Rod and Gun Club, the event was whipped together.

It was amazingly successful and aerial photos of the ice pattern were printed in almost every newspaper in the nation and in many foreign countries. Letters from incredulous readers are still arriving. The ice-fishing contest gave the winter carnival its greatest piece of national publicity.

No Serious Accidents

Fishing contests are commonplace today. Fortunately there have been no serious accidents at any of them, and with reasonable precautions there should be none in the future.

There is only one drawback. With hundreds of hurrying anglers chopping holes in the ice—some even use truck-mounted posthole augers—fishing results at such affairs generally have not been as good as individual efforts elsewhere.

Moyle and his men also made a study of that phase of ice fishing. His reaction to the study: "If I were a fish, I think I'd try to get away from all that noise too."

But the boom in winter fishing apparently has not yet seen its peak. When their feet are warm and the fish are biting, few anglers can stay away. ★ ★ ★

IT SMELLS GRAND



WANT AROMA WITH "LIFT"? MAN, HERE'S HOW

IT PACKS RIGHT



AND IT PACKS SO NEAT IT RATES A BOW

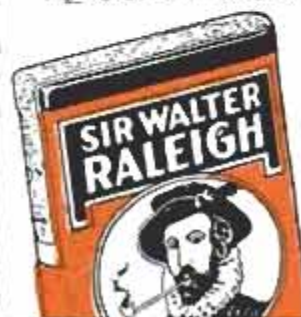
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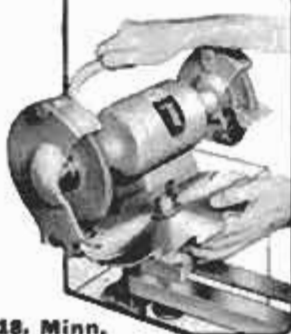
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Ben Franklin— Trail Blazer for Inventors

(Continued from page 102)

them later reported, but Franklin rode along by its side to observe it closely. He chased it for three quarters of a mile, even trying to beat it down with his whip.

Poor Richard seemed obsessed with poor fireplaces. His letters and notes are filled with observations on smoking chimneys and unhealthy drafts. Eventually this interest led him to the invention of the Franklin stove (Pennsylvania fireplace). The stove, as built to his specifications, was made of iron. It could be free-standing within the room (connected, of course, with the chimney) or slipped into an existing fireplace. What made it so unique? The back wall actually was a false wall, with a chamber between it and the true back wall. Hot smoke and gases from the fire were trapped at the top of the fireplace and forced through a passage down behind the chamber. Fresh air, introduced into the chamber, absorbed much of the heat and this warm air was vented into the room, while the smoke passed up the chimney. Today, in countless modern homes, we are using prefabricated fireplace units that operate on the same principle.

Ben Franklin was the first man, as far as is known, to experiment with the conductivity of heat by color. His experiment was classically simple. He cut small squares of cloth, ranging from black and white through all the colors of the spectrum. These he laid out on a sunny snowbank, starting with black at one end and getting progressively lighter to white. The black piece soon melted the snow and sank out of sight, the white piece remained on the surface, and the other pieces sank varying degrees depending upon their colors.

Scientific Farmer

As an agronomist, Franklin brought to this country new crops such as turnips, Swiss barley and Scotch kale that have become important to the modern dinner table. In turn he sent several nut-bearing trees, pippin apples and various grasses to Europe. He introduced to the Colonies the idea of applying mineral fertilizers to fields. He urged the adoption of plaster of paris (gypsum) as a fertilizer. To impress Pennsylvania farmers he used gypsum to write in huge letters on a field "This has been plastered." The next rain washed out the letters, but they soon reappeared in brilliant green grass compared with the brownish grass of the rest of the field. He was the first American to recommend that the

(Continued to page 270)

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agricultural subjects be taught in colleges.

Though he was not a physician, patients and even doctors sought his advice. He developed an instrument for showing the circulation of the blood, invented a flexible catheter and suggested experiments to determine the cause of lead poisoning. He pinned down the dangers of infection from impure water. He made a great many observations on the contagious nature of colds and influenza, observations that became important when other scientists tackled the problem.

Millions of persons have cursed their first bifocals, then grown to prize them. Here is Franklin's own account of his simple but valuable invention: "I formerly had two pairs of spectacles, which I shifted occasionally. Finding this change troublesome . . . I had the glasses cut and half of each kind associated in the same circle. By this means, as I wear my spectacles constantly, I have only to move my eyes up or down, as I want to see distinctly far or near, the proper glasses being always ready."

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One of his inventions which failed the test of time was his musical instrument, the armonica. He mounted 37 hemispherical glasses of varying sizes on a spindle, and used a treadle to turn the spindle. The musician rubbed the edges of the moving glasses with damp fingers, producing "sweet, ethereal" tones. The instrument enjoyed great popularity for more than 40 years, and both Mozart and Beethoven composed music especially for the armonica.

Walk into almost any grocery store and you'll see one of Franklin's minor inventions. An avid reader, he needed a tool for reaching books on the highest shelves. His long mechanical hand survives today in the tool grocers use to reach cereal and soap chips on the top shelves. Franklin also designed a library chair with an underframe that folded down to convert the chair into a short stepladder. Today we use the same idea in stools that convert into kitchen ladders.

Franklin lived during the days of the first balloon ascensions, and suggested the use of aerial reconnaissance and airborne troops. After witnessing balloon ascensions he observed that aircraft might "possibly give a new turn to human affairs. Convincing sovereigns of the folly of wars may perhaps be one effect of it, since it will be impracticable for the most potent of them to guard his dominions. Five thousand balloons, capable of raising two men each, could not cost more than five ships of the line; and where is the prince who can

(Continued to page 272)

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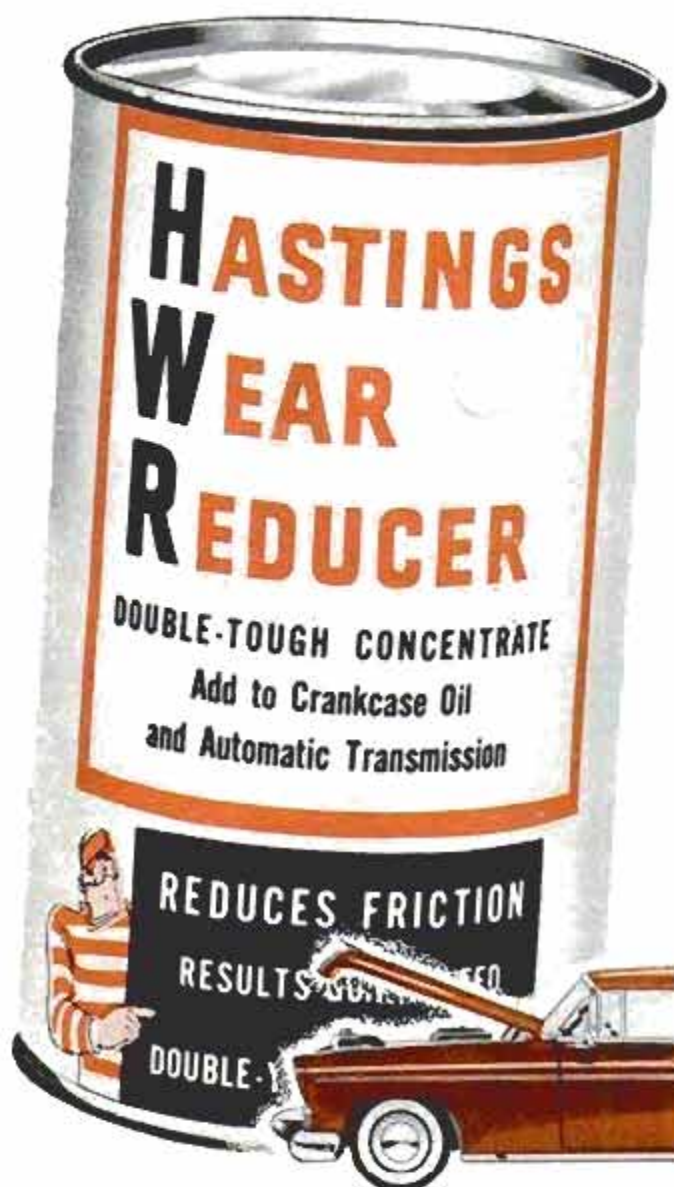
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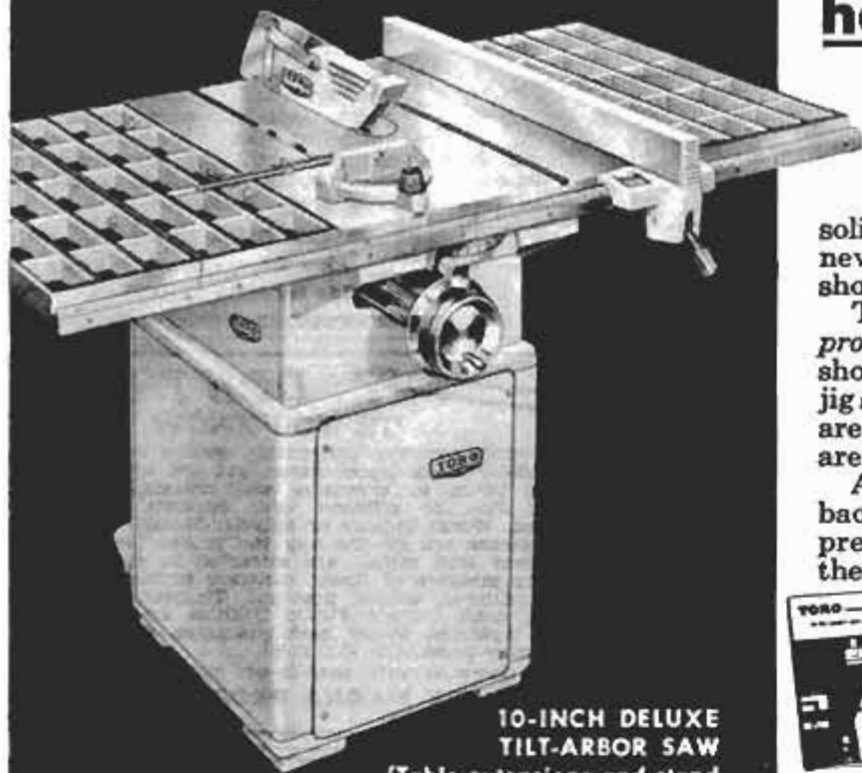
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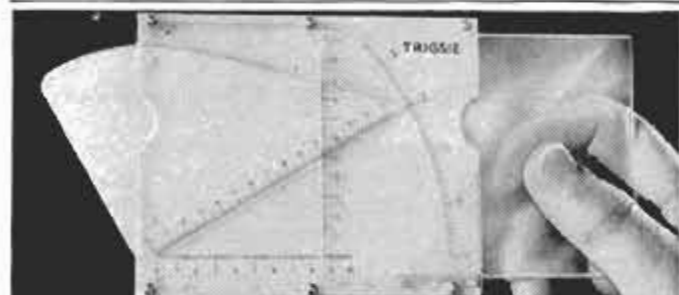
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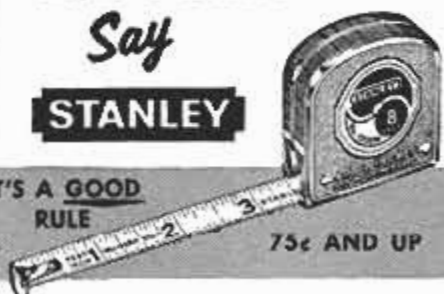
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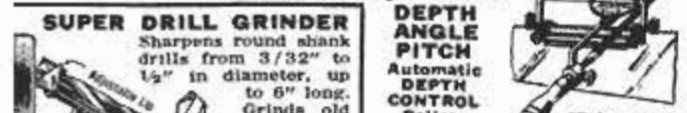


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- Fully enclosed mechanism for utmost safety



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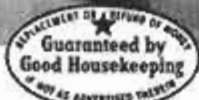
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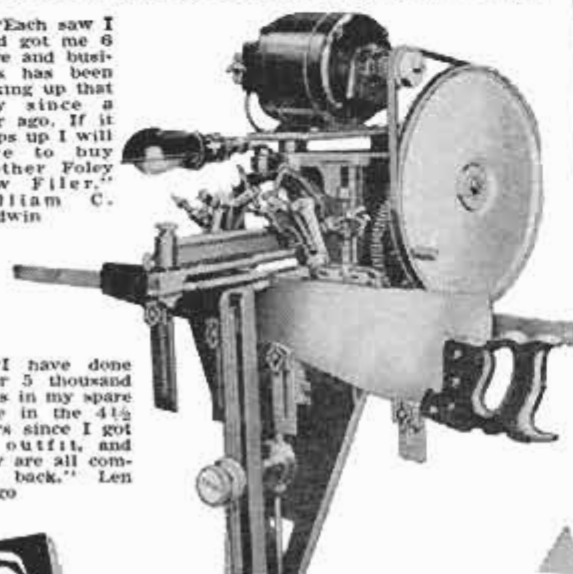
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Traffic Tunnels Under Greenland's Icecap

(Continued from page 121)

the denser is the snow, until at about 150 feet it turns to ice. But ice is plastic, will flow and, under the terrific pressure of the icy mass above, pushes out at the edges of the icecap in the form of glacial streams and icebergs. As far as is known, the altitude of the icecap remains the same. The amount of ice pushed out around the edges of the icecap equals the precipitation which falls on the surface.

The icecap starts only a few miles from the coast. It is only 12 miles from the giant U. S. Air Force base at Thule, which rests on permanently frozen ground. Icy cliffs only 100 feet high mark the edges of the icecap. The farther inland you go, the deeper is the icecap. At the point where the experimental tunnels were dug, it is 7000 feet thick.

Although the inland portion of the icecap has a snow covering, the coastal rim is solid ice, and is subject to melting and deformation. Dangerous crevasses and abrupt drop-offs mark this rim.

Here, along the icy coastal rim of the icecap, the trench tunnels made of and with snow cannot be used. Instead, the expedition tunneled through the ice with hand picks. The work went fast, for the ice at this point is cold and brittle.

A tunnel connecting Thule with other points on the island would have to start several miles inland from the edge of the icecap. A dirt road built on top of a natural ice ramp leading onto the icecap would extend for three to five miles. At other points an ice tunnel might lead directly from the edge of the icecap to its top.

An ice tunnel (not to be confused with a snow tunnel) 10 to 20 miles long would be dug, possibly by machine. From this point, the snow tunnel would be employed.

"The possibilities of tunneling don't stop with transportation," says Doctor Bader. "We could hollow out huge underground rooms in the ice only a few miles from Thule. Huge caches of supplies could be stored there, safe from anything but a direct hit by an atom bomb. The rooms, supported by conventional wooden beams, could be any size desired. Inside the ice room a building would be placed. With this room-inside-a-room arrangement, heating and insulation would not be a problem.

"Naturally, the same kind of hidden depot could be built in the snow at any point where we might wish to build a snow-field runway or store vital supplies. And each year, Nature would place another protective covering over our heads." ★ ★ ★



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BC168	" " 6"	" " " "
BC1810	" " 8"	" " 10" "
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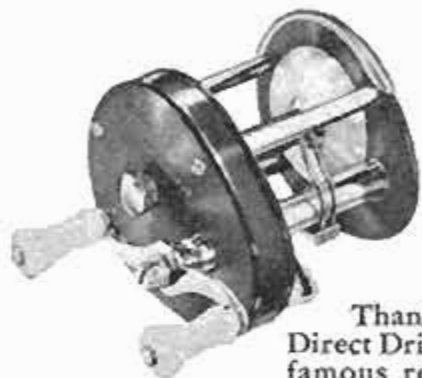
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They Graduate Underwater

(Continued from page 112)

buckles. This provides a "quick release" feature whereby with a single jerk both the heavy lung and belt can be released, permitting the diver to surface quickly.

The belt contains thick, coin-shaped lead weights of one pound each. They provide "neutral buoyancy" for the diver. The average male requires five pounds, the female four, to provide neutral buoyancy.

All this time you have kept your face mask in position, breathing through your mouth, so that now—as the instructor fits your mouthpiece into position—you "go on" compressed air for the first time.

"Breathe in firmly, causing a slight suction in the hose," he tells you. You feel the dehydrated air coming as you demand it from the regulator. It is tasteless.

Fill Mouthpiece With Water

You have been standing waist-deep in the pool, and now Townsend orders you to remove the mouthpiece and deliberately fill it with water at the surface. "This is exactly what happens should you suddenly sneeze or hiccup or otherwise lose your mouthpiece while swimming underwater," he says. "If you are down deep, that means you will not have time to make it back to the surface. You *must* be able to clear that mouthpiece and exhaust hose of water—and fast!"

Demonstrating with his own flooded equipment, he now shows you how to drop your left shoulder, tilting your body—and hence the regulator assembly at your back—in that direction. "Since the stale air normally goes out the left-hand tube to the exhaust valve, which is located on the left side of your regulator, you are now making sure that the clogging water follows the same path," Townsend explains. "Then, rolling even farther—so that you are almost over onto your back—you make sure this water has settled into the lowest part of the regulator. You use the remaining air in your body to blow it out, like this..." As he blows sharply into the mouthpiece the unwanted water can be seen emerging through the regulator's flapper valve, thereby clearing once more the lung's vital breathing circuit.

"Now go sit on the bottom and do it several times," Ed Townsend tells them.

Rid Masks of Water

Before the students are turned loose to roam the pool depths, Townsend also teaches them how to rid their face masks of water without surfacing. Such masks

(Continued to page 284)

As little as \$53* (full price!) buys a 1956 CHRIS-CRAFT Boat Kit!



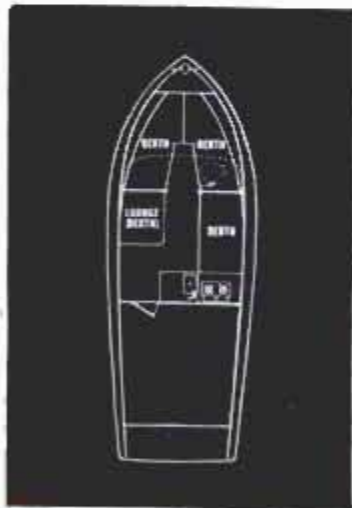
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Enjoy new fun and adventure, save up to 50% with a 1956 Chris-Craft Boat Kit! Choose from such top performers as the *8-ft. pram (kit \$53); the sporty 12-ft. Vagabond (kit \$133); the trim 14-ft. Dolphin (kit \$158); the rakish 14-ft. Caribbean (shown at left; kit \$192); or the rugged 15-ft. Marlin (kit \$255).

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may suddenly leak, and he feels the resultant loss of vision is the first step toward uncontrollable panic—and death.

"Once more, tilt your body sharply to the left," he explains. "Then, using the right hand to hold the right side of the face mask close against your cheek, blow out sharply through the nose and into the mask. The air so compressed in the mask will force the water past the seal on the lower, or left edge."

The ocean-diving portion of the school comprises a trip by cruiser to reefs off Hollywood and Fort Lauderdale, Fla. The boat is anchored in 40 or 50 feet of water and, under the watchful care of three instructors (one of whom dives with you), you are permitted to go overboard.

To avoid possible injury from the 40 pounds of equipment on your back (it could knock you out by striking the head), you are shown how to jump in feet first or to sit on the gunwale and tumble over backward. The latter method prevents sudden contact from dislodging your mask.

You are cautioned always to swim up-current. "That way a student in trouble can surface and let himself drift back to the boat," explains Townsend. "Should he be permitted to swim in the opposite direction, the current speed plus his own speed would have him a mile away within 15 minutes."

Emergency Signal

The emergency signal is an upraised hand at the surface. It is given only in the event of a cramp, if the pupil is running out of air or in a similar emergency.

As you descend the sloping anchor line you experience an exhilarating feeling of newfound freedom and excitement that will very likely remain as long as you live. Below you awaits a vague, shimmering world of gold and jade. You are surprised at the loud croaking clatter made by a family of crayfish as they emerge partially from their cavern to inspect you. Perhaps you hear the grunt of a big grouper or count the slow, booming revolutions of a freighter's screw half a dozen miles away.

Cost of a good quality outfit, says Townsend, will range from \$135 to \$185. Face mask and fins will add about \$15. Charge for having one of the compressed-air tanks refilled is \$1.50. This quantity of air enables an experienced diver to operate at a 30-foot depth for about 90 minutes.

"Remember that it is exceedingly simple to put on one of these devices and dive down," Ed concludes. "And it is equally simple to get into trouble. Unless you are prepared beforehand to combat it, panic can hit you, boom—just like that!" ★ ★ ★

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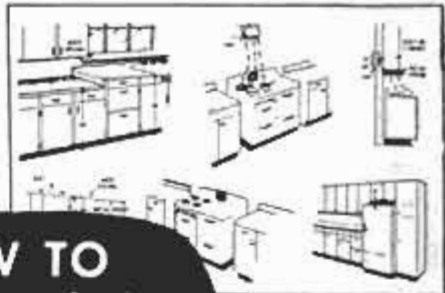
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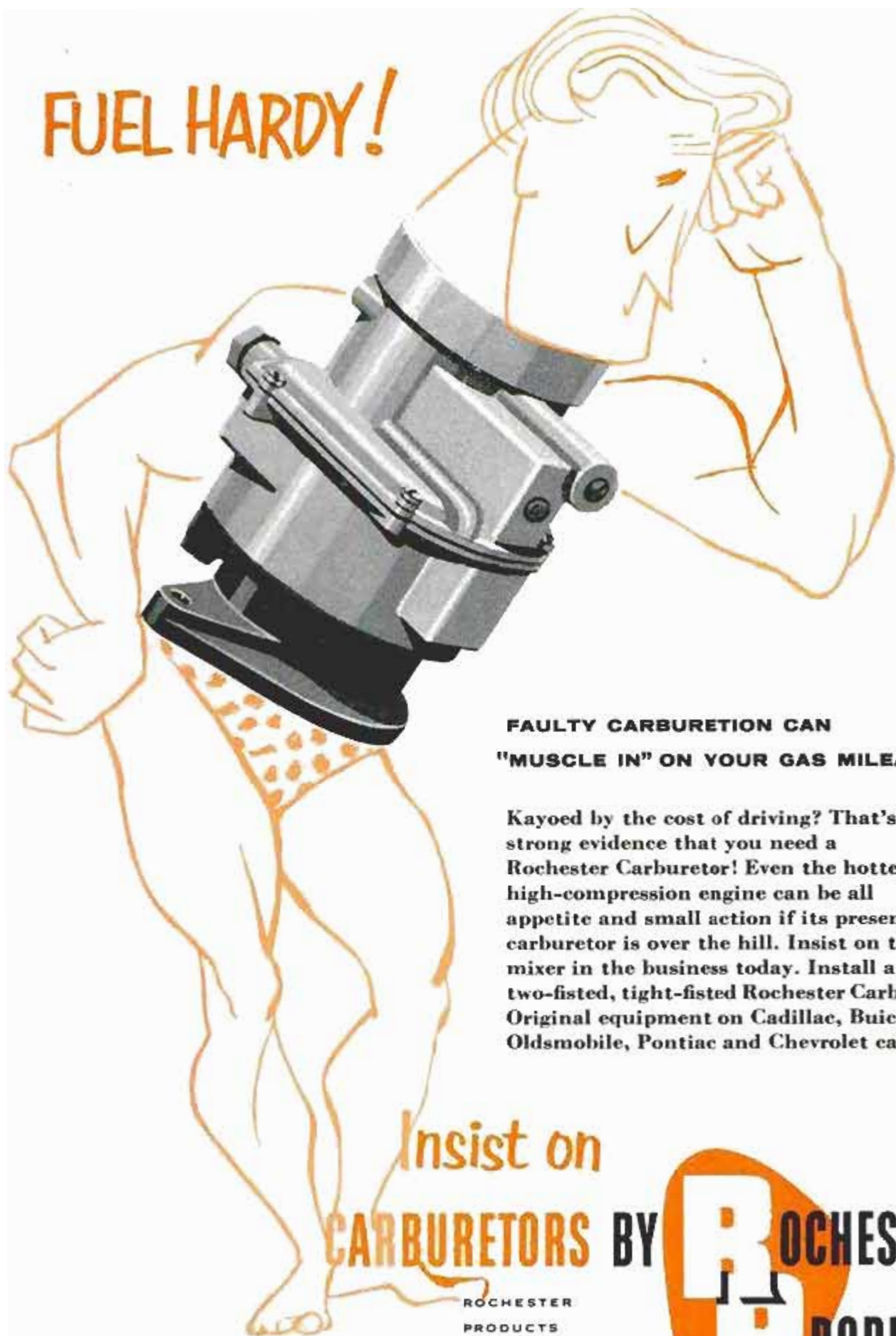
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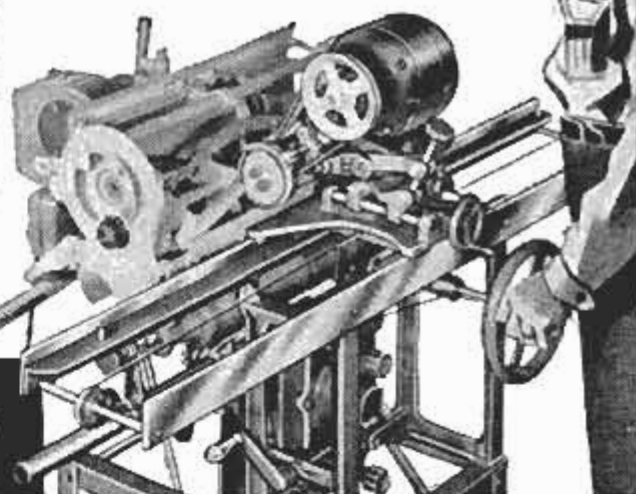
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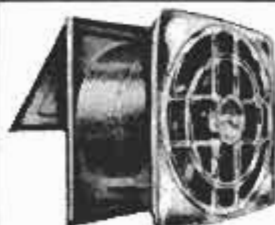
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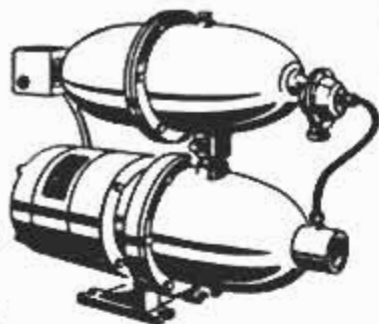
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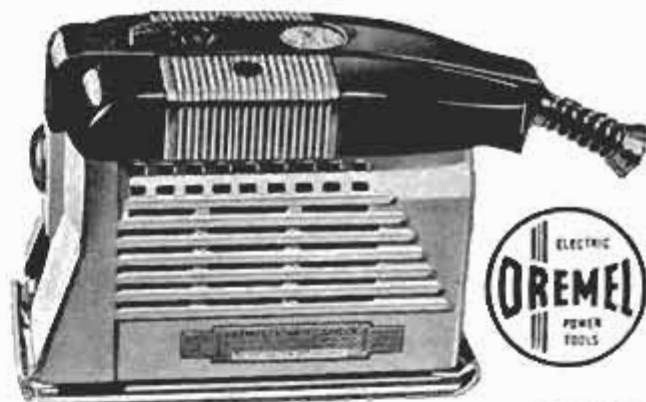
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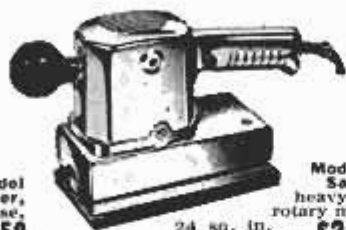
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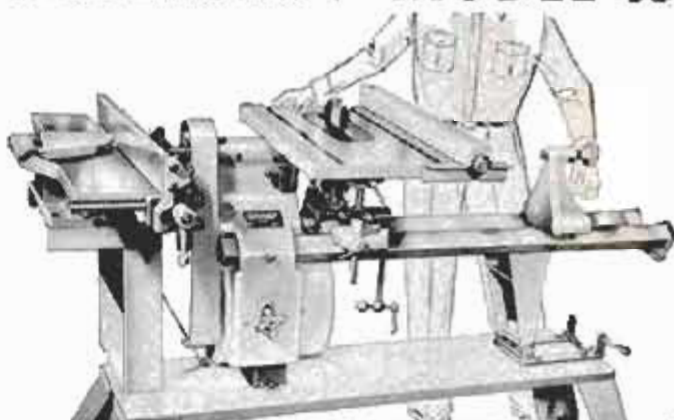
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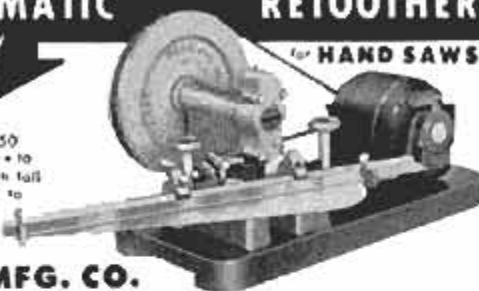
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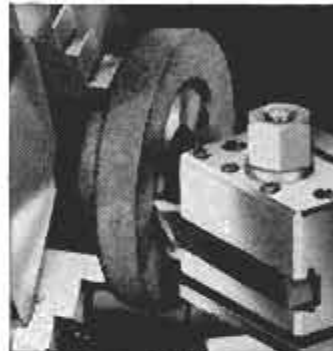
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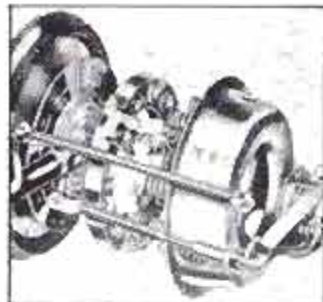
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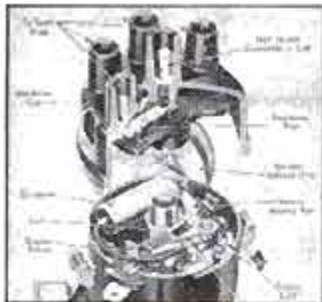
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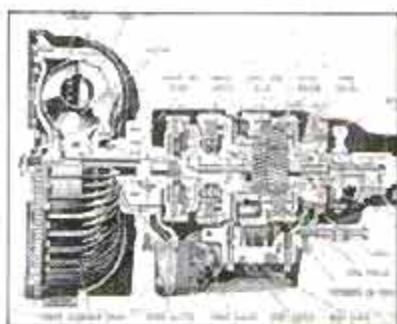
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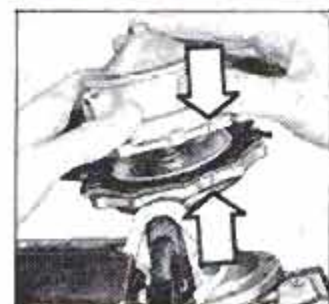


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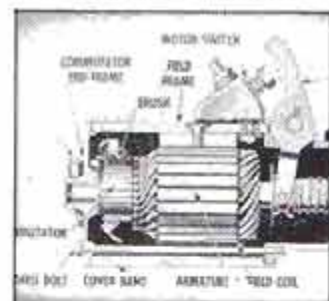


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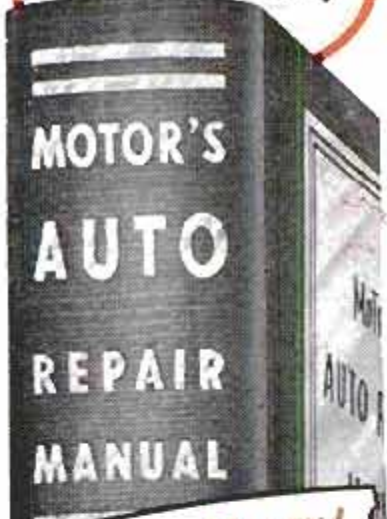
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