

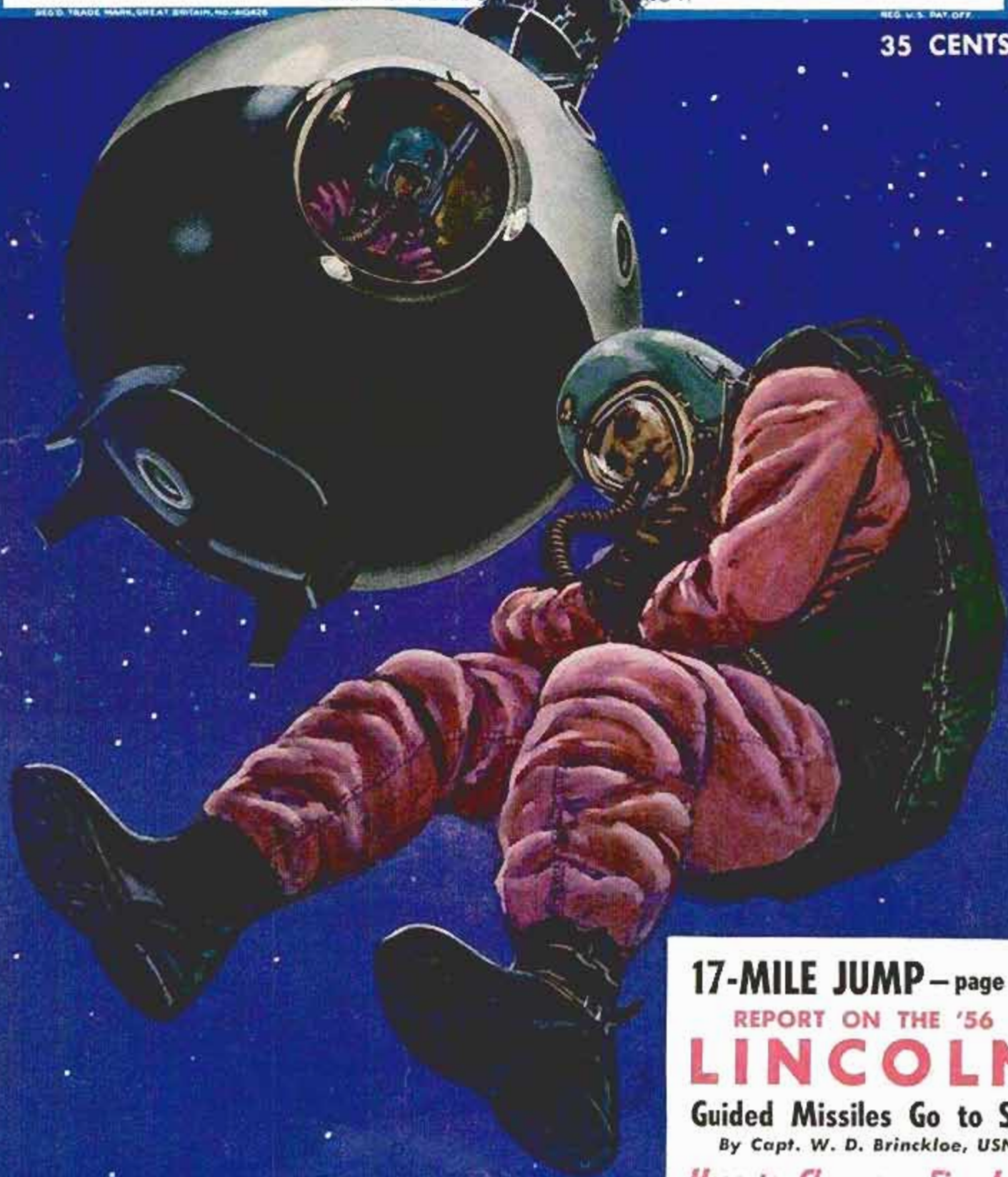
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN DO IT

REG. TRADE MARK, GREAT BRITAIN, NO. 80428

REG. U.S. PAT. OFF.

35 CENTS



17-MILE JUMP — page 97

REPORT ON THE '56

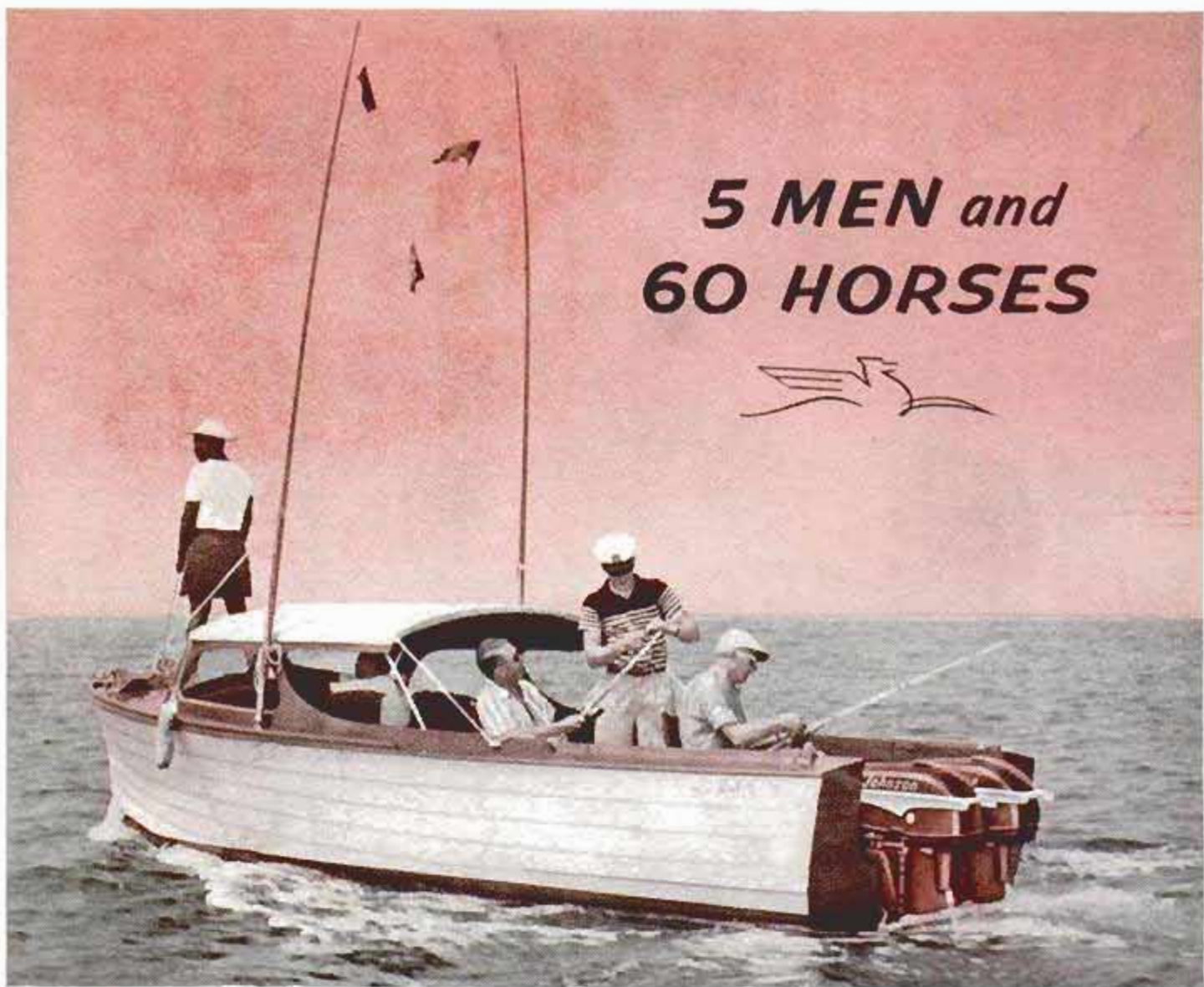
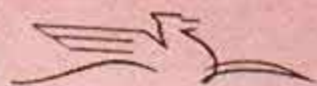
LINCOLN

Guided Missiles Go to Sea

By Capt. W. D. Brinckloe, USN

How to Choose a Fireplace

5 MEN and 60 HORSES



Who says big action lies beyond the range of average fishermen? Not with *today's* Sea-Horses. Their smooth and mighty power makes possible a new type of outboard fishing boat—fast, comfortable, seaworthy—with characteristic outboard maneuverability *and inherent outboard economy!* Ask your Johnson Dealer. Look for his name under "Outboard Motors" in your classified phone book. See the 1956 line — 9 models, 3 to 30 horsepower, all styled in beautiful Holiday Bronze. Featuring new Cruising-Range Fuel Saver (in the 30's) and Stall-Proof Idling. Easier Starting. And *quiet!*

FREE! Write for new 1956 Sea-Horse catalog.

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A DIVISION OF OUTBOARD, MARINE & MANUFACTURING COMPANY
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America's Most Beautiful Outboard Motors

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SEA-HORSE 15	15 hp.	362.00
SEA-HORSE 10	10 hp.	321.00
SEA-HORSE 7½"	7½ hp.	241.00
SEA-HORSE 5½"	5½ hp.	216.00
SEA-HORSE 3	3 hp.	146.00

*Electric Starting... Prices f.o.b. factory, subject to change... All models except the "3" have separate Mile-Master Fuel System... OBC certified brake hp at 4000 rpm (30's at 4500).

Johnson Sea-Horses are famous for **DEPENDability**

It takes *more* than a heavy foot to "flatten" Pikes Peak in record time.

by **Ed Cole**, Chevrolet Chief Engineer

A few days ago, I was talking to a neighbor of mine about Chevrolet's record-breaking run up Pikes Peak. "How," he asked, "does that make the new Chevrolet a better car for *me* to drive? I hardly ever drive on mountain roads, at least not on any as steep or high as Pikes Peak!"

Maybe this same question applies to *your* driving. But have you ever considered what it takes to climb Pikes Peak in a little over 17 minutes, the way Chevrolet did?

Well, it takes a lot more than a heavy foot on the accelerator. For one thing,

it takes superior cornering ability—a quality that involves not only the steering geometry, but the balance of the entire car. And how this new Chevy clings to the curves!

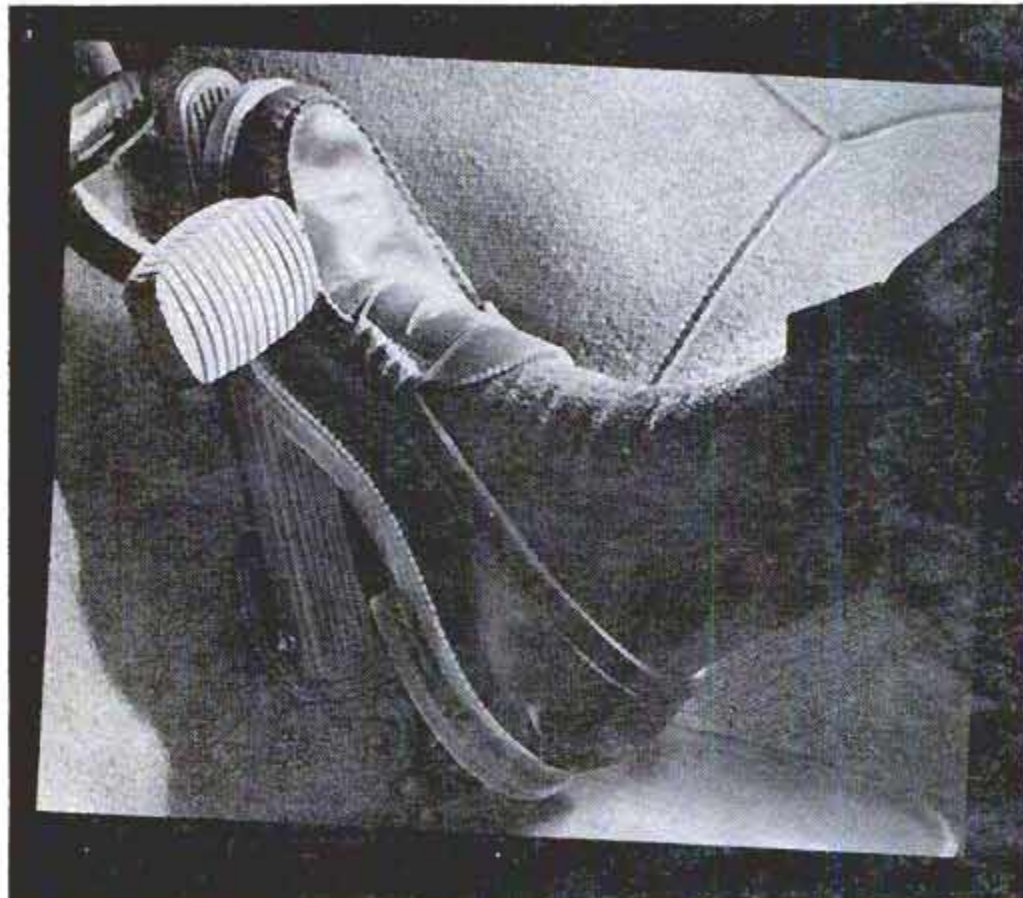
Then, it takes a ready reserve of power for acceleration. We've engineered that into all Chevrolet engines—both the 6 and the V8's. In fact, our horsepower now ranges up to a new high of 205!

Aren't these the very qualities you want in your car? Whether you drive in mountains or not, Chevrolet's inherent stability and lightning acceleration add up to more safety and pleasure for you.

Ask your Chevrolet dealer to lend you the key. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



Here's how Chevrolet proved its superior cornering ability.

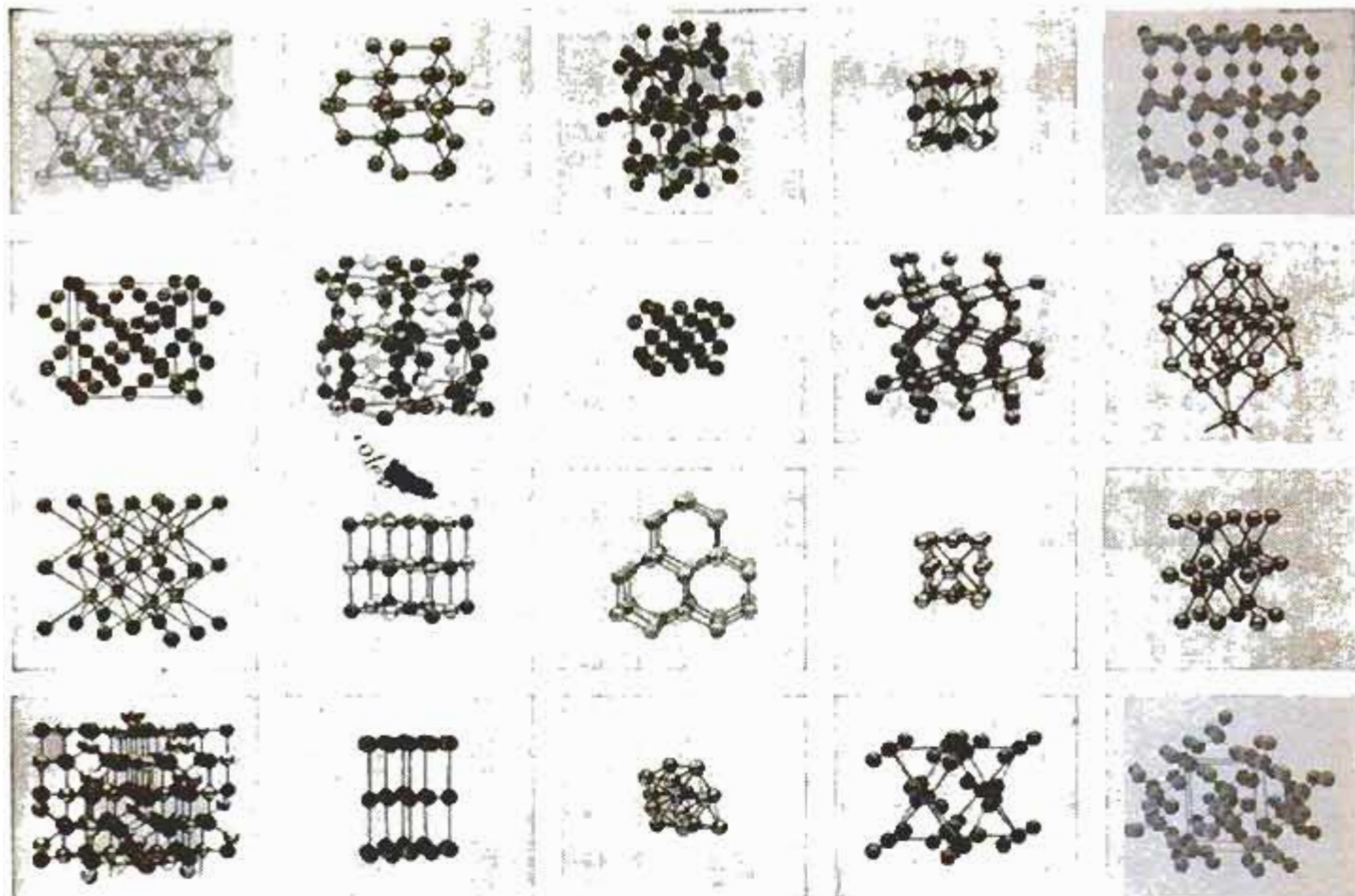


It takes power to sprint up this towering grade.



Chevrolet challenged a mountain—and won!





Crystal structure models. Top row, left to right: cuprite, zincblende, rutile, perovskite, tridymite. Second row: cristobalite, potassium dihydrogen phosphate, diamond, pyrites, arsenic. Third row: caesium chloride, sodium chloride, wurtzite, copper, niccolite. Fourth row: spinel, graphite, beryllium, carbon dioxide, alpha-quartz.

FROM ATOMS TO STARS

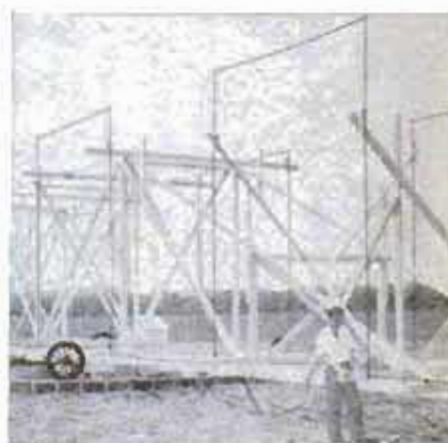
Research at Bell Telephone Laboratories ranges from the ultimate structure of solids to the radio signals from outer space. Radio interference research created the new science of radio astronomy; research in solids produced the transistor and the Bell Solar Battery.

Between atoms and stars lie great areas of effort and achievement in physics, electronics, metallurgy, chemistry and biology. Mechanical engineers visualize and design new devices. Mathematicians fore-

shadow new communications techniques.

Despite the diversity of their talents, Bell Laboratories scientists and engineers have much in common. A habit of teamwork channels these talents into great advances.

These men have developed the world's finest telephone system. In doing so, many have become leaders in their fields. Opportunities for achievement await qualified scientists and engineers at Bell Telephone Laboratories.



Directional antenna used by Karl G. Jansky in discovery of stellar radio signals at Bell Telephone Laboratories in 1932.

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H. H. WINDSOR, *Founder*

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



Next Month

SCREEN HOUSE of many uses—a real boon to families who like to move out in their yards in summer—is featured in our special outdoor-living section next month. The house is easy to build and full construction details make it a cinch for do-it-yourself fans. Floor area is 9 by 12 feet and over-all height of the panels is 6½ feet, providing a roomy space for dining, entertaining or just relaxing. Other features in the April outdoor-living section tell you how to build eight kinds of patios, how to go about lighting your yard, how to build a barbecue cabinet and other pieces of yard furniture, how to build an outdoor workshop and how to set up various yard games

Information not listed on articles in the index, starting on page 90, 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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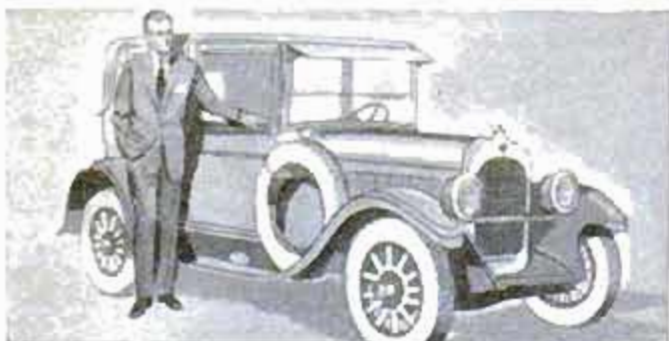
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for other items and manufacturers of available products

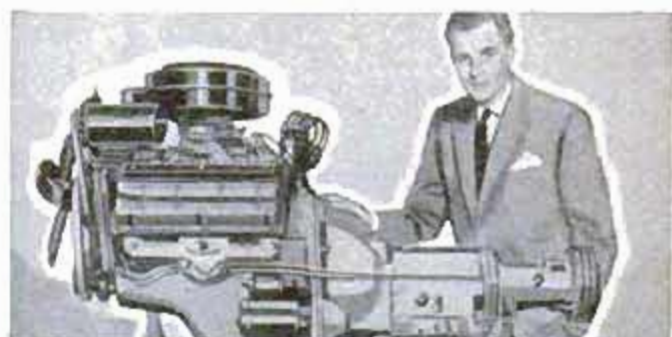


Bill Lundigan* shows how the Automobile engine has improved

(*Your TV host on "Shower of Stars" and "Climax!")



1. "BACK IN THE TWENTIES when the Charleston was the dance and cars had rumble seats, a young fellow named Walter P. Chrysler brought out a car with something the experts said wouldn't work—the high compression engine! It *did* work and became the standard engine for years to come.



2. "THE NEXT MAJOR ENGINE IMPROVEMENT *also* came from Chrysler Corporation—the hemispherical combustion chamber! For the first time airplane engine principles were applied to quantity-produced automobile engines, offering far greater power, performance and economy.



3. "IN THIS EXCLUSIVE DOME-SHAPED CHAMBER fuel burns fast and clean and there are no corners to collect power-killing carbon deposits. No other engines operate at peak efficiency for so long a time. It's the first really new automobile engine design to appear in cars in 26 years!



4. "THE CHRYSLER '300'—boasting a 300 horsepower hemispherical combustion chamber engine—won almost four times as many races as the nearest competitor in the 1955 NASCAR and AAA competitions. Real testimony of this engine's outstanding performance and all-round superiority!



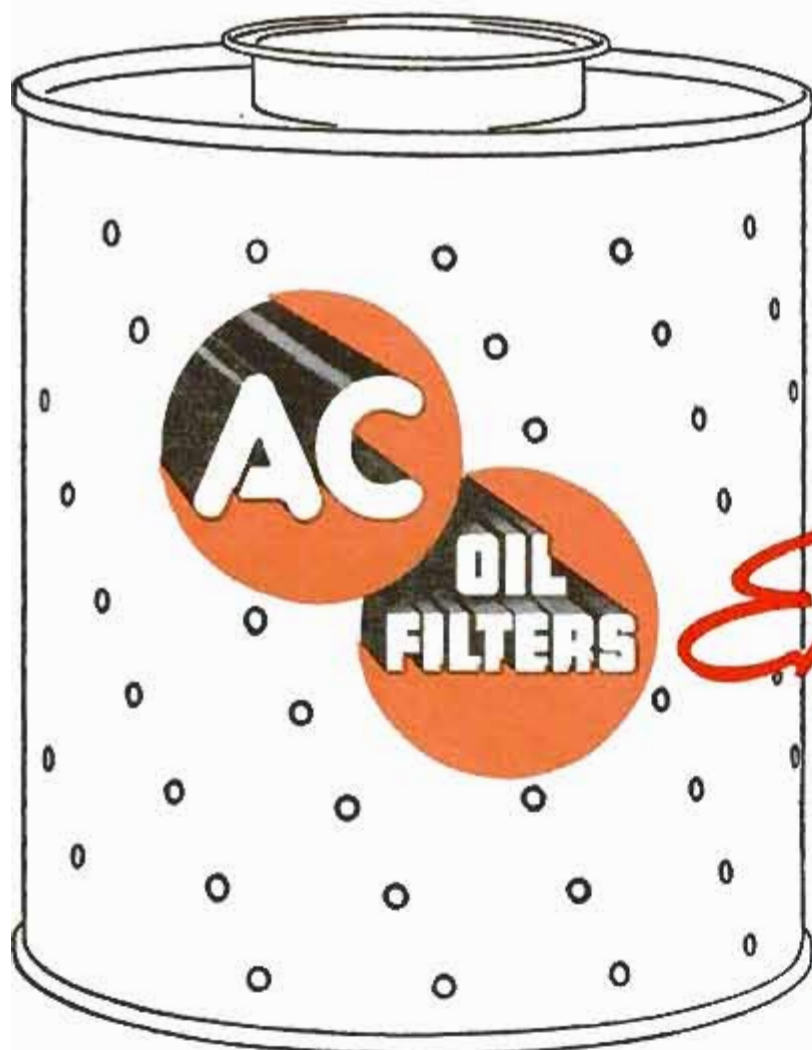
5. "THE ENGINE OF THE FUTURE already has been tested successfully in a stock car—Chrysler Corporation's *gasturbine* engine! It has no carburetor, no piston rings, no radiator . . . only one spark plug and runs on ordinary fuel without throwing flames from its specially designed exhaust.



6. "MORE AUTOMOTIVE 'FIRSTS' have been chalked up by Chrysler Corporation than any other car maker. Many have been copied, many are still exclusive with Plymouth, Dodge, De Soto, Chrysler and Imperial. All are reasons why you get more from a Chrysler Corporation car!"

CHRYSLER CORPORATION  **THE FORWARD LOOK**

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**AC brings you oil filters
that take out the dirt—
not the **DETERGENTS!****

Today's premium motor oils contain additives that keep engines clean by suspending carbon in the oil and holding it there instead of letting it deposit in hard form inside the engine. Oil companies also put in additives to increase the oil's viscosity range—protect your engine over greater ranges of temperature change. AC Oil Filters are so engineered as to take out harmful dirt, dust, grit, metal particles and still not remove or alter the valuable detergents. Always say AC when you change your filter—and, remember to change every 5000 miles!



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FOLDING
ALLOWS

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EVENLY
DEPOSITED
SLUDGE

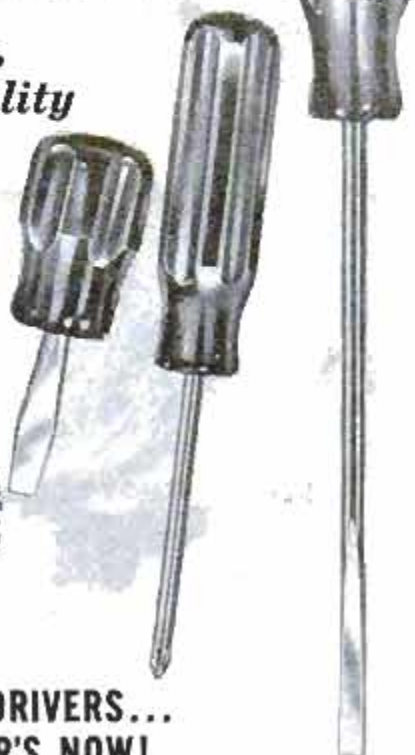


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ACROSS THE DESK



While working in Washington as head of the Battleship-Cruiser-Destroyer Branch, Bureau of Ships, Capt. W. D. Brinckloe, USN, was in close touch with development of the Navy's new guided-missile cruisers. His article, "Guided Missiles Go to Sea," on page 131 is based on his first-hand information and, to our knowledge, is the first



full-length feature article to appear in print on the subject. Captain Brinckloe, one of the Navy's youngest captains, was graduated from Annapolis in 1937 and in 1942 was graduated with top honors in engineering from Massachusetts Institute of Technology. He saw active duty in World War II and in the Korean War when he was awarded the Bronze Star. The accompanying photograph shows him at his desk in Subic Bay, the Philippines where, as the commanding officer of ship-repair facilities, he is in charge of 2300 men in the South-east Asia area.

To the Editor:

When Phil McCafferty of Stanwood, Iowa, sent us his story of "Model A on the Canal Beat," on page 152 of this issue, he told us his brother had more or less enjoyed a wild ride on the "Jitney" in pursuit of the photographs that illustrate the piece.

"They forgot to check the gas," wrote McCafferty, "and they ran out—right in the middle of a 3000-foot tunnel! They had to push her out. My brother commented he'd

(Continued to page 8)

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made interesting and practical
thru problem method

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YOU know as well as we do that Accounting fits many men for positions that pay four to ten thousand dollars a year and up—gives many other men unusual opportunity to start a profitable growing business of their own.

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Granted that privilege, surely your advancement would be far faster than that of the man who is compelled to pick up his knowledge by study of theory alone.

Under the LaSalle Problem Method you pursue, to all intents and purposes, that identical plan. You advance by solving problems.

Only—instead of having at your command the counsel of a single individual—one accountant—you have back of you the organized experience of a great business training institution, the authoritative findings of scores of able accounting specialists, the actual procedure of the most successful accountants.

Thus—instead of fumbling and blundering—you are trained in the solving of the very problems you must face in the higher accounting positions or in an accounting practice of your own. Step by step, you work them out for yourself—until, at the end of your training, you have the kind of ability and experience for which business is willing and glad to pay real money.

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If you want still more proof, remember that over 4,200 C.P.A.'s—one out of every 13 of all those in the United States who have passed the difficult examination for the C.P.A. Certificate—are LaSalle alumni.

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(Continued from page 6)

never seen anything so dark in his life. Of his high-speed run through the 12-mile tube he said "What a ride! That thing is like no Model A I ever drove—it's a monster in disguise!"

Five Tools in One

A New York City high-school student has invented a drafting instrument that does the work of five other drawing tools. Lawrence Kalmis, 16, calls it the "K square." It replaces the T square, the 30-



60-90-degree and the 45-90-degree triangles, the ruler and the protractor. Professional draftsmen say it's as accurate as the separate tools.

Larry took a standard T square, cut a half-inch slot down the middle of the arm and then designed a slide to fit into the slot. To the slide he attached an arm that is adjusted to any angle by a screw lock. The slide and short arm can be moved to any spot on the horizontal arm and locked in place. Larry plans to have the long horizontal arm marked off for lineal measurements. Right now, he's preparing plans to market the instrument.

Richard Petrow,
New York City

To the Editor:

I wish to send you the best compliments for the "Across Four Continents on Two Cylinders" story (PM, Dec. 1955).

It is very well narrated, full of amazing

(Continued to page 10)

Are you a prisoner in your present job?



Are you bored with your work? Do you go home at night tired from doing nothing? **THOSE CAN BE DANGER SIGNALS!**

If you're like the millions of other people before they turned to I.C.S. for help, these things are probably true about you:

You're caught between a job with no future and a family to support. You're sour on your job, hate to get up in the morning to go to work. At night, you're not much fun to have around.

Unless you do something about it, things are going to get worse. "Prisoners" aren't much good to their bosses or families.

And, of course, you can do something to "free" yourself . . . to get a better job, with more money. And insure yourself against layoffs

that come to untrained men. To develop interest in your work. To earn the respect of your family and community.

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Faced with such a problem, six million people have turned to I.C.S. for help. They studied at home, in their spare time. They developed new skills and new knowledge.

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John R. Musik jumped from \$180 to \$360 a month. O. O. Braun from \$120 to \$600 a month. H. A. Howell got a \$100 a month raise as a result of his I.C.S. training.

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Blueprints <input type="checkbox"/> Sanitary Engineering <input type="checkbox"/> Structural Engineering <input type="checkbox"/> Surveying and Mapping <p>DRAFTING</p> <ul style="list-style-type: none"> <input type="checkbox"/> Aircraft Drafting <input type="checkbox"/> Architectural Drafting <input type="checkbox"/> Electrical Drafting <input type="checkbox"/> Mechanical Drafting <input type="checkbox"/> Mine Surveying and Mapping <input type="checkbox"/> Plumbing Drawing and Estimating <input type="checkbox"/> Structural Drafting <p>ELECTRICAL</p> <ul style="list-style-type: none"> <input type="checkbox"/> Electrical Engineering <input type="checkbox"/> Electrical Maintenance <input type="checkbox"/> Electrician <input type="checkbox"/> Contracting <input type="checkbox"/> Lineman <p>HIGH SCHOOL</p> <ul style="list-style-type: none"> <input type="checkbox"/> Commercial <input type="checkbox"/> Good English <input type="checkbox"/> High School Subjects <input type="checkbox"/> Mathematics | <p>LEADERSHIP</p> <ul style="list-style-type: none"> <input type="checkbox"/> Foremanship <input type="checkbox"/> Industrial Supervision <input type="checkbox"/> Leadership and Organization <input type="checkbox"/> Personnel-Labor Relations <p>MECHANICAL AND SHOP</p> <ul style="list-style-type: none"> <input type="checkbox"/> Gas—Electric Welding <input type="checkbox"/> Heat Treatment <input type="checkbox"/> Metallurgy <input type="checkbox"/> Industrial Engineering <input type="checkbox"/> Industrial Instrumentation <input type="checkbox"/> Industrial Supervision <input type="checkbox"/> Internal Combustion Engines <input type="checkbox"/> Machine Design—Drafting <input type="checkbox"/> Machine Shop Inspection <input type="checkbox"/> Machine Shop Practice <input type="checkbox"/> Mechanical Engineering <input type="checkbox"/> Quality Control <input type="checkbox"/> Reading Shop Blueprints <input type="checkbox"/> Refrigeration <input type="checkbox"/> Sheet Metal Worker <input type="checkbox"/> Tool Design <input type="checkbox"/> Toolmaking <p>RADIO, TELEVISION</p> <ul style="list-style-type: none"> <input type="checkbox"/> Industrial Electronics <input type="checkbox"/> Practical Radio TV Eng'ng <input type="checkbox"/> Radio and TV Servicing <input type="checkbox"/> Radio Operating | <ul style="list-style-type: none"> <input type="checkbox"/> Television Technician <p>RAILROAD</p> <ul style="list-style-type: none"> <input type="checkbox"/> Air Brakes <input type="checkbox"/> Car Inspector <input type="checkbox"/> Diesel Locomotive <input type="checkbox"/> Locomotive Engineer <input type="checkbox"/> Section Foreman <p>STEAM AND DIESEL POWER</p> <ul style="list-style-type: none"> <input type="checkbox"/> Combustion Engineering <input type="checkbox"/> Diesel—Elec. <input type="checkbox"/> Diesel Eng's <input type="checkbox"/> Electric Light and Power <input type="checkbox"/> Stationary Fireman <input type="checkbox"/> Stationary Steam Engineering <p>TEXTILE</p> <ul style="list-style-type: none"> <input type="checkbox"/> Carding and Spinning <input type="checkbox"/> Cotton, Rayon, Woolen Mfg. <input type="checkbox"/> Finishing and Dyeing <input type="checkbox"/> Loom Fix'g <input type="checkbox"/> Textile Des'ing <input type="checkbox"/> Textile Eng'g <input type="checkbox"/> Throwing <input type="checkbox"/> Warping and Weaving <p>MISCELLANEOUS</p> <ul style="list-style-type: none"> <input type="checkbox"/> Domestic Refrigeration <input type="checkbox"/> Marine Engineering <input type="checkbox"/> Ocean Navigation <input type="checkbox"/> Professional Engineering <input type="checkbox"/> Short Story Writing <input type="checkbox"/> Telephony |
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(Continued from page 8)

photos; in brief, it is very well done. This is just to express my pleasure in the best story in your magazine for about eight years.

Fernando Barcelo Carvajal,
Santiago de Chile, S. A.

The Story Ends in Fargo

It occurred to us that you might be interested in what happened to the Rambler four-door hardtop that played the leading role in the picture story, "The Building of a Car," published in our February issue.



You will remember it as the car that PM followed from 7 a.m. until midnight, taking pictures as it was assembled.

Well, you'll be pleased to learn that the automobile has a happy home. It ended up in Fargo, N. D., the proud property of Mr. and Mrs. Harold Carstensen. Incidentally, this makes two Ramblers in the Carstensen family—the other model is a 1955 station wagon.

To the Editor:

I read with interest an article in your November 1955 issue entitled "Make Way for the Micro-Midgets." Our club, the Long Island Junior Racing Club, has over 20 members ranging in age from 5 to 12 years, both male and female, each of whom owns a car in a class limited to a maximum of 2½ hp. Some are home-built and some are built from kits and parts available through various manufacturers on the East and West Coast. This club has been in existence for almost two years. Race meets are held every Sunday afternoon in a paved parking lot behind the County Courthouse in

(Continued to page 78)



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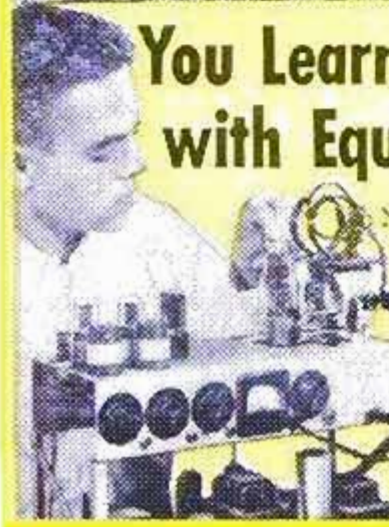
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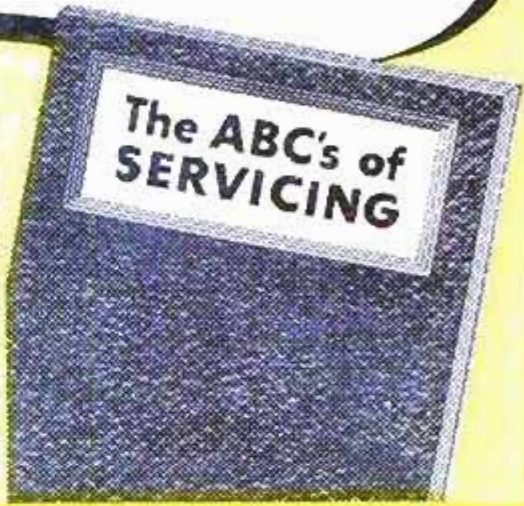
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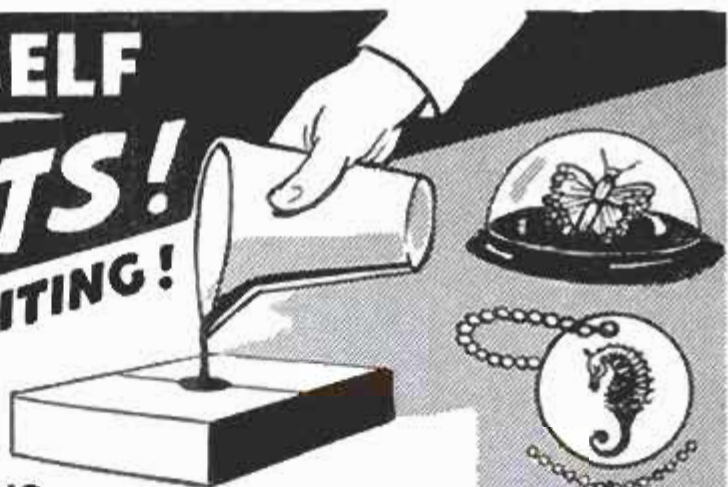
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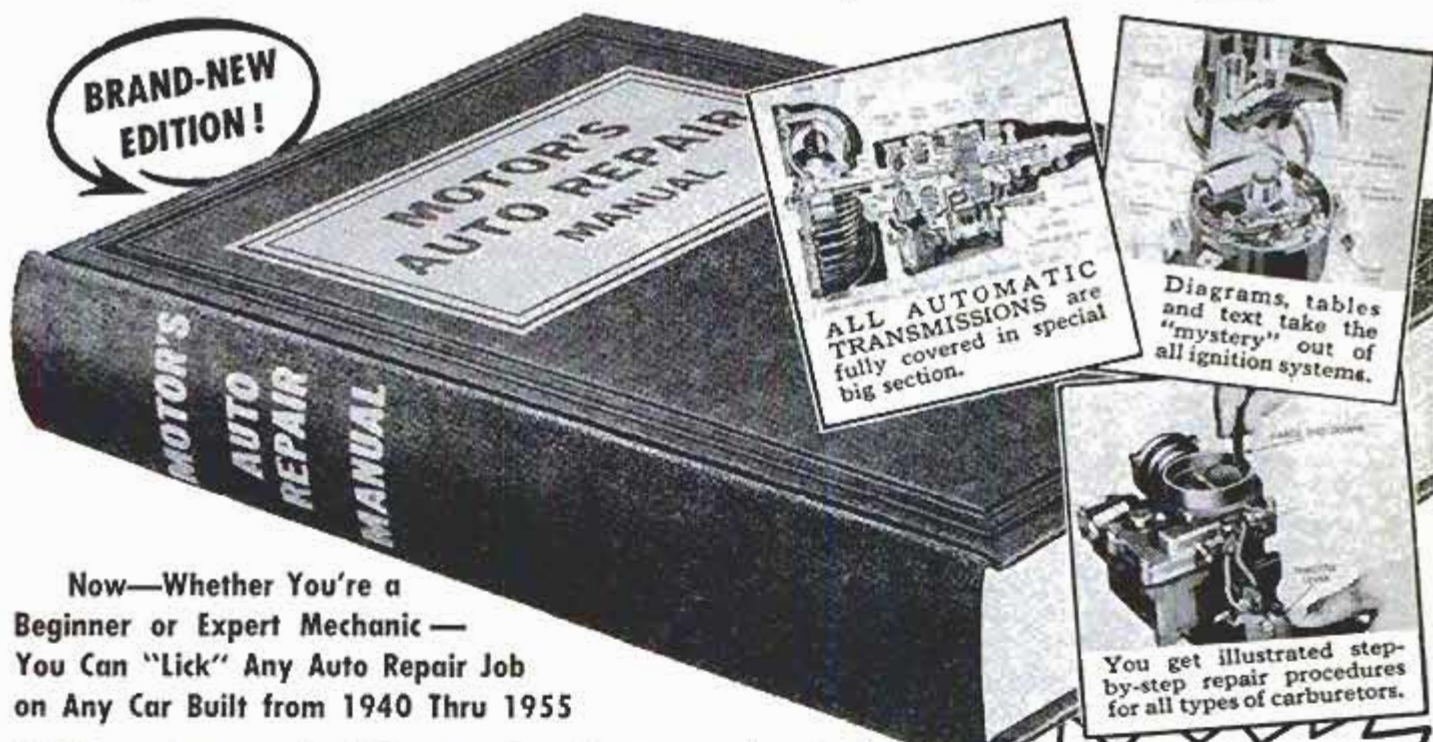
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Hugh Maddox, Los Angeles, Calif. 4/20/54

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Raymond Lapan, Burlington, N. C. 1/24/54

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I have a shop at home and have been working on radio and TV after working hours of my regular job. I average \$50 a week for this part time work. RTTA training helped me in making extra money and giving me experience in the electronic field.

Richard Hennis, Little Rock, Ark. 4/20/54

SERVICE MANAGER



I manage two radio and television shops, one here and one in Pompano Beach. RTTA training increased my knowledge of TV circuits and showed me new, quicker methods of repairing. Lessons as presented are very concise and clear.

William Phillips, Fort Lauderdale, Fla. 4/22/54

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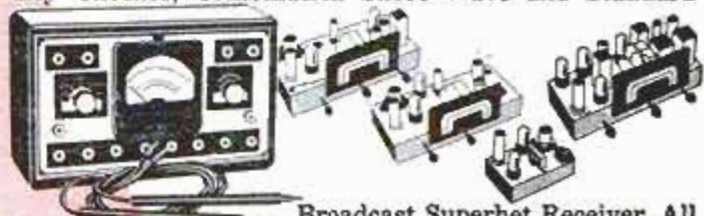
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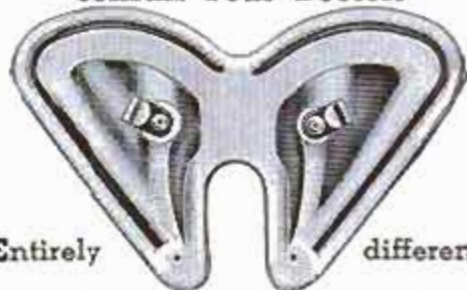
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650-18(6)	6.42	710-15	5.62	750-17	9.72	825-20	16.52
700-16	6.02	750-15	5.62	825x15	12.92	900-20	16.52
750-16(8)	7.52	800-15	5.92	600-20	9.52	1000-20	17.02
550-18	5.22	820-15	5.82	650-20	10.92	1100-20	17.02
550-17	5.22	670-16	5.32	32x6(8)	12.02	1100-22	21.72
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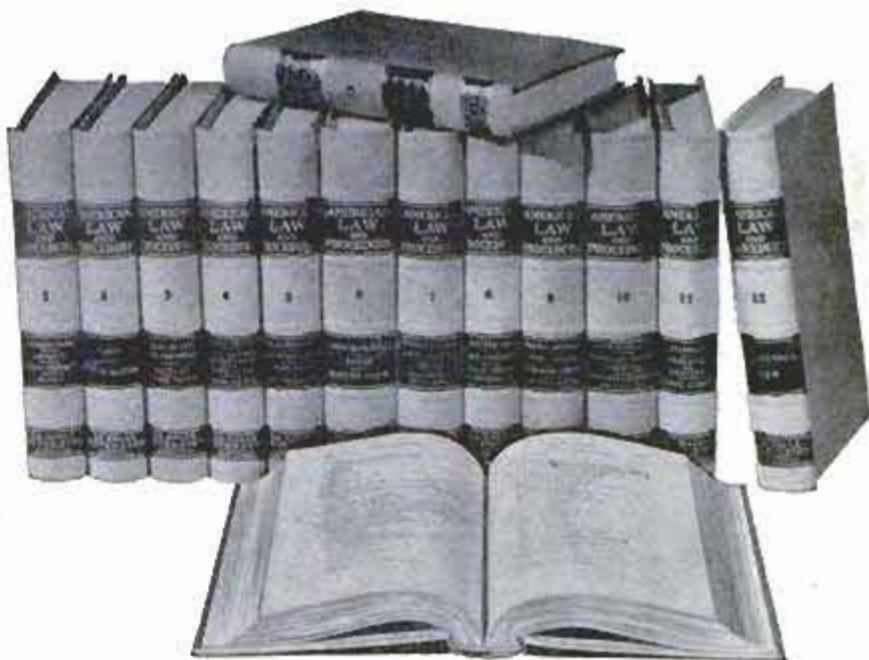
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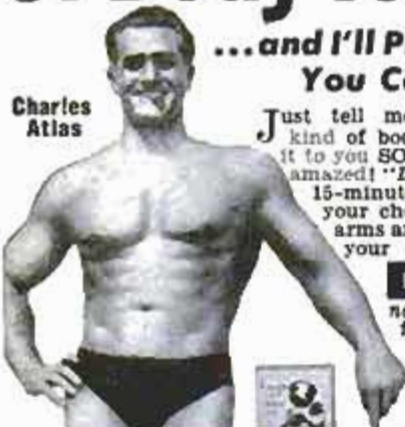


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CHASSIS DYNAMOMETER CHART

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Make of plug: _____ Heat range: _____

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0-30	10.0	1500	0.5	10.0
30-40	10.0	1500	0.5	10.0
40-50	10.0	1500	0.5	10.0
50-60	10.0	1500	0.5	10.0
60-70	10.0	1500	0.5	10.0
70-80	10.0	1500	0.5	10.0
80-90	10.0	1500	0.5	10.0
90-100	10.0	1500	0.5	10.0
100-110	10.0	1500	0.5	10.0
110-120	10.0	1500	0.5	10.0
120-130	10.0	1500	0.5	10.0
130-140	10.0	1500	0.5	10.0
140-150	10.0	1500	0.5	10.0
150-160	10.0	1500	0.5	10.0
160-170	10.0	1500	0.5	10.0
170-180	10.0	1500	0.5	10.0
180-190	10.0	1500	0.5	10.0
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Tustin Auto Parts

100 West Main Street, Tustin, California Phone: 552-1111

Make of car: _____ Model: _____ Year: _____

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Speed (mph)	Time (sec)	Rev. per min.	Gas (gals.)	HP
0-30	10.0	1500	0.5	10.0
30-40	10.0	1500	0.5	10.0
40-50	10.0	1500	0.5	10.0
50-60	10.0	1500	0.5	10.0
60-70	10.0	1500	0.5	10.0
70-80	10.0	1500	0.5	10.0
80-90	10.0	1500	0.5	10.0
90-100	10.0	1500	0.5	10.0
100-110	10.0	1500	0.5	10.0
110-120	10.0	1500	0.5	10.0
120-130	10.0	1500	0.5	10.0
130-140	10.0	1500	0.5	10.0
140-150	10.0	1500	0.5	10.0
150-160	10.0	1500	0.5	10.0
160-170	10.0	1500	0.5	10.0
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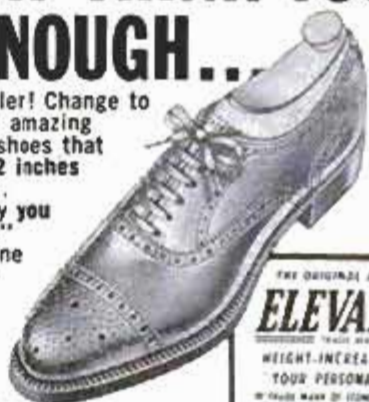
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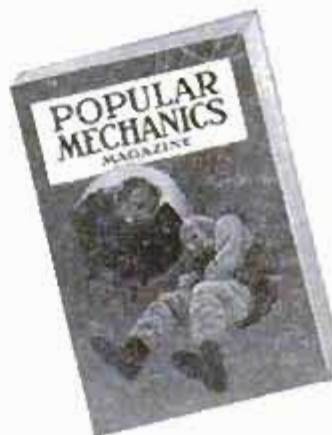


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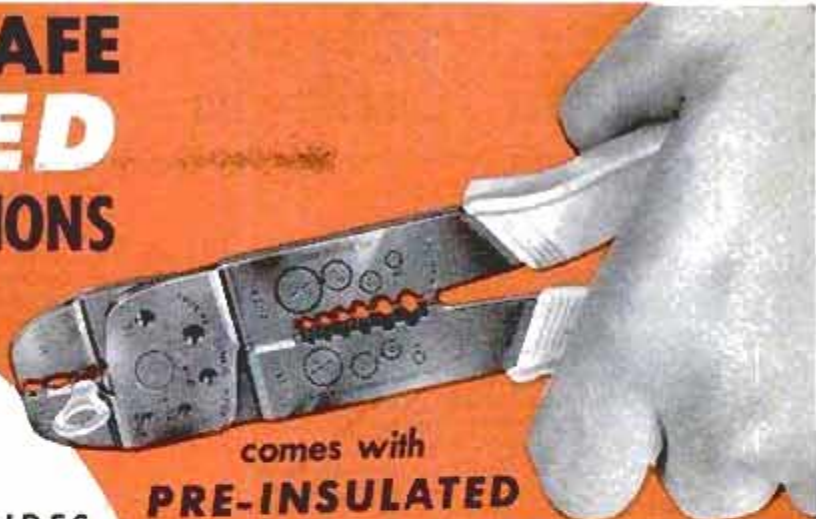
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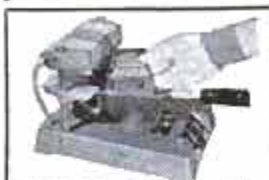
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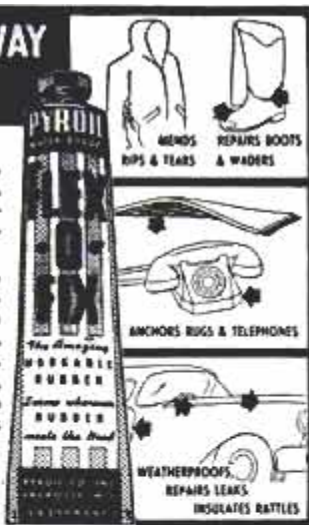
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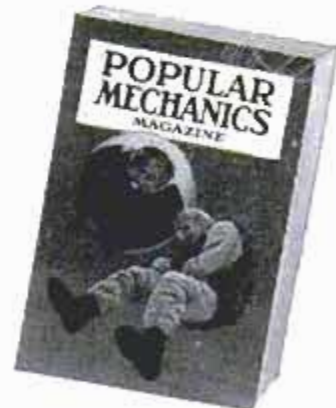
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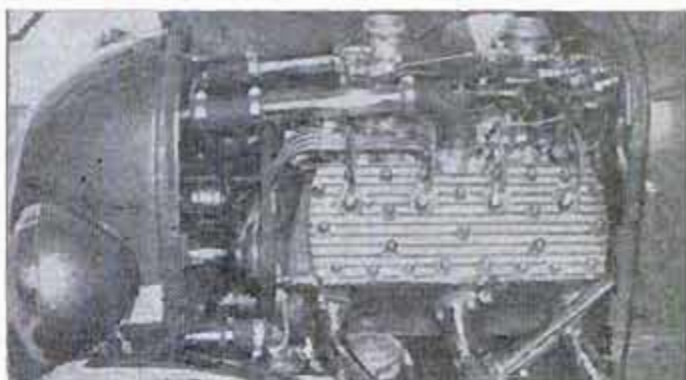
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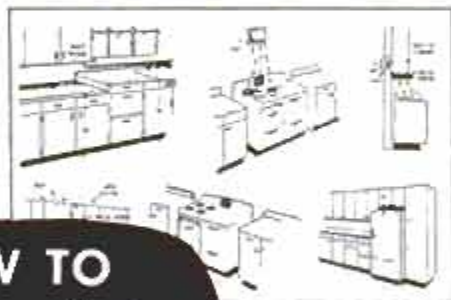


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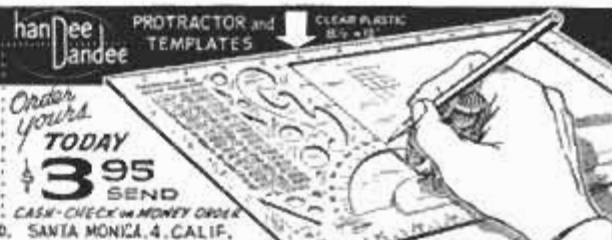
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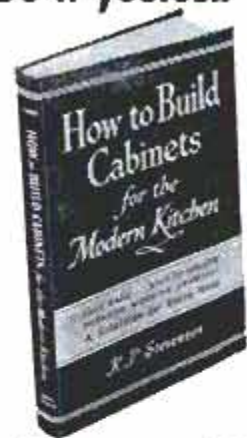
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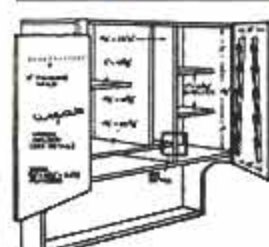


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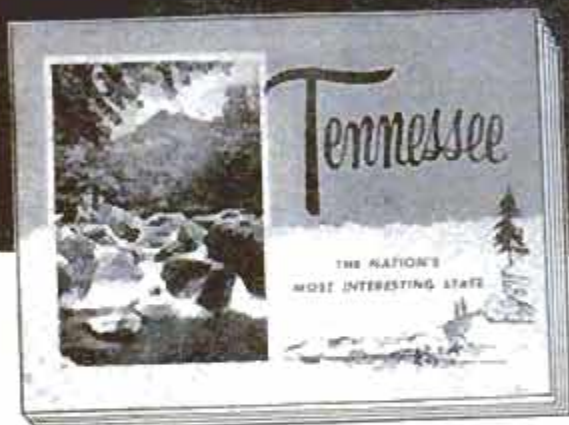
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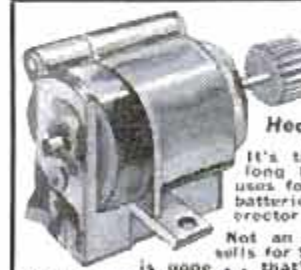


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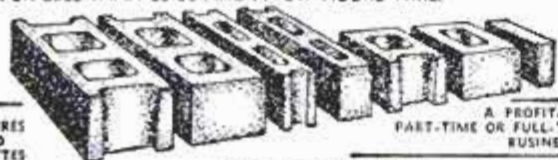
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EARTH Science, the Rockhounds' national magazine. Subscription \$2.00, sample 25c. Box 1357, Chicago 90.

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KLONDIKE Novelty jewelry findings assorted, beads, pearls, jewels, 5 lb. lots \$7.50; sample \$2.00 lb. Merchandise, 19-A 16th St., New York City 3.

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INVENTING Can be an interesting and profitable hobby. Write for complete particulars. Institute of American Inventors, Dept. 40-E 631-E St., N.W. Washington 4, D. C.

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NAZI Insignia, 12 different, \$1.00. Medals, armbands, flags, daggers. Illustrated lists. Medcrafts, 1923 34th St. S.W., Calgary 2, Canada.

UNUSUAL Hobby: Authentic army patches, insignias, ribbons, enameled crests, navy rates, 50 assorted for \$1.00. Rex Military, Dept. B, 1261 Broadway, New York City.

DECLARATION Of Independence, \$1.00. Howard Sawyer, 5813 Benton Hgts., Baltimore 6, Maryland.

FREE Three months' subscription Leathercraft News, write Tandy Leather Co., Box 791-F21, Fort Worth, Texas.

FREE! Leather-needlecraft catalogs. Do it yourself. Tandy Leather, Box 397AH, Tulsa, Okla.

MATCHBOOKS For collectors. Catalog 25c. Charles Edelman, 1311-C East 84, Cleveland 3, Ohio.

EXCITING New book, "How to Collect Stamps, Coins, Paper Money." Packed with amazing facts; information worth dollars. Fully illustrated, 160 pages. 75c. Popular Mechanics Press, 200-ST E. Ontario St., Chicago 11, Ill.

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

BIG Money! Take orders religious articles. Illustrated 1956 catalog. Write Pette Co., 1554A W. 11th St., Brooklyn 4, N. Y.

FRANCHISE Opportunities nationwide! Distributorships, dealerships, agencies. Request information immediately. National Franchise Reports, 333 North Michigan, Chicago 1.

MAILORDER! Succeed with proven, professional money-making line. Houstex, 3026 East Holcombe, Houston, Texas.

DO It with "Floating Henryburgers." 10 million sold. Rare opportunity. Box 936, Wichita, Kansas.

YOU Are cordially invited to learn the secrets of operating a successful saw shop. Send for free literature. Max Manufacturing Company, Dept. A, 138 Stockton Avenue, San Jose 26, California.

\$5,199.90 WAS Paid to John Betts. In few weeks. Grow mushrooms. Cellar, shed. Spare, full time year round. We pay \$3.50 lb. Free book, Mushrooms, Dept. 172, 2954 Admiral Way, Seattle, Wash.

CASH From sawdust, seventy methods. Tin-cans, thirty methods. Newspapers, eighteen methods. Instructions 50c each. All three \$1.00. Charles Company, 12-DXV, Norwood, Ohio.

MAKE Your fortune in South America! Gold, uranium, oil, mahogany, precious gems, buried treasures. Free government land. Job opportunities galore. 1001 ways to get rich. For complete confidential report send \$2.00 to Explorer, Box 222, Miami 2, Florida.

FREE—Sales kit. Power mowers. Wholesale. Farm Products-PM, Excelsior Springs, Mo.

AMBITIOUS But lazy? Big money at home while others do most of work! Postcard OK. Maxson, Falls Church 17, Va.

BE A landscape contractor. Make \$20 to \$60 a day. Start with smaller projects and work into larger jobs. We show you how. Easy-to-follow home study course. Write for free book. National Landscape Institute, Dept. M-36-C, 310 South Robertson Blvd., Los Angeles 48.

BOOMING Swimming pool industry cries for new blood. New materials make opportunity for \$20,000 to \$40,000 income. Send \$1.00 for thoroughly tried plan to get started to: Northeast, Box 95, Hamilton Square, N. J.

CANNA Nursery for sale. 92 varieties. Profitable. Pettet's, 322 E. Oregon Ave., Phoenix, Ariz.

\$30.00 WEEKLY, Plastic sealing work. Easy. Write, Jansen, Sharon 9, Penna.

PRINT Colorful advertising, etc. Fascinating process, no press. 10c particulars. Remle, 2946 Tyburn, Los Angeles 39, Calif.

AMAZING Profits taking orders for nationally-advertised soaps, extracts, cosmetics, medicines, polishes. Advertising giveaways make selling easy. Exclusive territory. Write for free sales aid kit offer! We trust you. Sayman Products, (since 1877), 2101K Locust, St. Louis, Mo.

LEARN Sewing machine repair. "Money Secrets" Purdy's, 207-M, Weatherford, Texas.

BECOME Tax consultant. Our students earn to \$3,000 in 3-month season, part-time. We train you—help you start. State approved. Union Institute, 68 Hudson, Hoboken 2H, New Jersey.

\$30.00 A Day profits raising earthworms. Illustrated booklet 25c airmail postpaid. North St. Paul Worm Farm-D, North St. Paul 9, Minn.

WAXES Floors without wax. New invention. No more floor wax to buy. Sensational seller. Samples sent on trial. Kristee 118, Akron, Ohio.

LEARN To bronze baby shoes. Instruction \$2.00. Don Brady, 433 Market St., Topeka, Kans.

\$1,000 MONTHLY Possible in collection agency business. Free details. Write Cole Associates, Syracuse 2, N. Y.

3 SUGGESTIONS For sales-at-a-profit by mail, plus free counsel offer, 25c. Rawson Wood, 20 East Delaware, Chicago 11, Illinois.

MAKE Perfumes, other products—Sell mailorder. International, 6347 Parnell PM-3, Chicago 21, Illinois.

VENDING Machines—Every description. New or used. Lowest prices—Start a route or sell outright. Mack Postel, 2952 Milwaukee, Chicago 18.

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

EARN Up to \$2000.00 monthly with spare or full time route of automatic 3 in 1 hot drink merchandisers using Maxwell House coffee, Bakers chocolate, Tenderleaf tea, in your community. We train you. \$1190.00 starts you. Write Superior, 4555-BH East Warren, Denver, Colorado.

PAINT Novelties at home. Good earnings. N. Roland, R.D. 1-E, Vincentown, N. J.

AMAZING Home business. Build tubular glass fishing rods. Everything furnished. Wonderful profit. Free details. Rodman, Box 41, Wauwatosa, Wis.

OPERATE Profitable magazine subscription service. New telephone plan. Handle renewals for all magazines. No experience or investment needed. Rush name; send no money. McGregor Agency, Dept. 500-B, Mt. Morris, Illinois.

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

WANT To make big money at home? \$5 profit in an hour possible with invisible reweaving. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 8334 Prairie, Chicago 19, Illinois.

AMBITIOUS? We establish you in your own business, supply catalogues, circulars, etc., ship orders under your name, paid or c.o.d., show you exactly what to do. Household items needed in every home. Sell direct, by mail or through agents. Catalogue, plans, details absolutely free. Write Topval Corp., Lindenhurst 318, N. Y.

SAVE Important dollars! Wholesale! Jewelry, luggage, appliances, etc. Discounts 30 to 80%! Premiums! Details 3c stamp. Alm Co., 38 Fair St., Paterson 4, New Jersey.

HAVE Your own mail order business at home! No advertising or inventory risk! Proven system. Send today for free details. Shanath Company, 340 West 11th Street, New York 14, N. Y.

STAY Home. Make big profits. Operate collection agency. No experience. Free details. Kipp, 608 Boone National, Boone, Ia.

MONEYMAKING OPPORTUNITIES

\$20.00 RETURNS \$400.00. Lifetime repeats. Sample \$1.00. Refundable. Ezee, Bayport 7, Mich.

WANT Up to \$300.00 monthly? Home mail order. Details free. Prinz, Box 402-P, Pico, California.

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

BARGAIN Offers! Interesting mail! Earning plans! Free coupon! Nelson Sales, Elkhorn 99, Nebraska.

EARTHWORMS—Amazing reproduction makes you money. Breeders, supplies, spawn, new "senior kit" information plus newly published booklet and facts. Send 25c. Multiple Enterprises, P.M.-72, Kalkaska, Mich.

"MONEY Getter's Bulletin." sample 25c. Donovan, 791 Greenbelt, Levittown, N. Y.

PRINTING, Office supplies wholesale. Save 50%. Royal, Box 368-A, Cleveland 27, Ohio.

FREE "\$5,000-\$45,000; Unlimited Vacations." Work home! No merchandise, equipment! Haylings, Carlsbad, Calif.

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

\$5.00 HOURLY Possible, spare time home mail order. Details free! Dempsey, Box 42237p, Los Angeles, Calif.

MONEY in saw and lawn mower sharpening sparetime at home. Repeat cash business. Experience unnecessary. No selling. Free booklet explains. V. Foley Company, Columbia Heights, Minnesota.

MAKE Spare time money preparing and mailing sales literature. Adams Surveys, 3513-AT Sunset Blvd., Los Angeles 26, Calif.

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

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

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

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

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

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

SELL Titania gems; far more brilliant than diamonds. Catalog free. Diamonite, 2420-M 77th, Oakland 5, California.

PLASTIC Laminating. Pleasure and profit. Self-sealing. No machines. Complete home kit, \$1.00. Mountainside 1, Springwater, New York.

PRIZE Contests provide fabulous and confidential home income opportunities! Here's how and where to win your share! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

VENDING Machines earn big money! Request 32 page free catalogue. Parkway Machine Corporation, Dept. 27, 715 Ensor St., Baltimore 2, Maryland.

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

MANUFACTURING Comb and sanitary vendors. Start vending today. White's Comb Vendor, Elgin, Illinois.

BE A winner; share in cash and merchandise prize contests; details free. J. B. J., 907 E. 55th St., Los Angeles 11, Calif.

MAKE Money writing short paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, 1751 Morse, Dept. C-27-P, Chicago 26.

WORK From home in spare time. Start profitable magazine renewal service. We show you how; furnish everything free. No experience needed. Write McGregor Magazine Agency, Dept. 500-C, Mt. Morris, Illinois.

MEN And women wanted to start home business in spare time with little table-top rubber stamp machine. Easy to earn up to \$9.80 an hour without previous experience. Full particulars free by mail. Send postcard to Roberts, 1512 Jarvis, Room 73, Chicago 26, Ill.

CRACK The money barrier! Build yourself a new wheel of fortune! Win free cash and cars. Free details. Vernon (7-II), P.O. Box 449, Junction City, Oregon.

SELL Jewelry by mail. Hundred week possible. Free details. Gryder, Box 187, Barborton, Ohio.

SELL Hamburgers, sandwiches, pie. Use your own kitchen without capital. Operate small diner, cafe. Free details reveal plan. Restaurant School, MO13, Fremont, Ohio.

\$5,199.90 WAS Paid to John Betts, in few weeks. Grow mushrooms. Cellar, shed. Spare, full time year round. We pay \$3.50 lb. Free book, Mushrooms, Dept. 173, 2954 Admiral Way, Seattle, Wash.

BOYS, Earn \$1.80 hourly! Cleaning windows after school and Saturdays. Professional tools and instructions supplied. Kent Window Cleaning, Box 6807, Philadelphia 32, Penna.

FREE Vacation! "National Shopping Guide" tells how. Sample copy free. Agents wanted. Big earnings! Globe Publishers, 725-A Providence, Charlotte 7, N. C.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, Hertel Station, Buffalo 16-D, New York.

97 SCHEMES To make a million you might! Information free. Ken-West Distributors, 7-K South Harlem, Worcester 4, Mass.

START Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room 73, Chicago 26, Ill.

SELL Sparetime, fire extinguisher, extermiator, cleaner bargain, refillable by owner. Low cost, excellent commissions. Box 392, Rockville Centre, N. Y.

BUY Wholesale! Save 66 2/3%! Appliances, furniture, jewelry, toys, sporting goods, tools. Free catalog. National Buyers Service, Box 426EB, Oakland, Calif.

\$1,000 MONTHLY Possible raising earthworms! Backyard, garage, basement. Complete illustrated booklet explains raising, feeding, packing, marketing. 25c postpaid! Ozark Worm Farm-J, Willow Springs, Missouri.

WEAVE Rugs—Make big profits. Send for our free catalog, sample card, and low prices on carpet warp, rug filler, looms, parts, inexpensive beam counter. If you have loom, give make, weaving width please. OR. Rug Company, Dept. 3615, Lima, Ohio.

DOLLARS Daily! Clip articles from newspapers. Free details. News Service, 3252 W. 84th St., Cleveland 2, Ohio.

DON'T Miss this. 500 ways to earn money at home. Complete plans, ideas, instructions, only \$1.25. Order now. L. Witherspoon, 2032 N. Minneapolis, Wichita 14, Kansas.

CATALOG! Latest, successful, profitable, opportunities, 50c postpaid! Ridsen, 3468 Cass, Detroit 1, Mich.

OWN A mail-order envelope service. Tremendous demand. No investment. Omaha Envelope, 4721-A California, Omaha 3, Nebr.

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

INCREASE Your income. Free literature. Excello, Box 500, Shreveport, Louisiana.

LEARN Technical metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Premier College of Technical Metaphysics, 2532 McKenzie St., Vancouver 8, B. C., Canada.

FREE Information. Several profitable opportunities. Kennedy, R1, B76, San Bernardino, Calif.

EXCELLENT Profits selling good quality imports. Distributorships available. Importer: Kenmaur Trading Company, 10718 Renton Ave., Seattle 88, Wash.

START Money-making plastic laminating business at home in spare time. Material that costs 11c brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room 73, 1512 Jarvis, Chicago 26, Ill.

MONEY In spare time. You supply information, most of which you can obtain free. No previous training needed. Frank H. Fix, 2056 Switzer Ave., St. Louis 21, Mo.

CASH In on contests now! Get facts that help. Write Sanders & Co., 1762 Euclid, Lincoln, Neb.

HELP Us! Help yourself! Get \$2.00 orders. Keep every cent! Complete details, 50c. Co-Operative, Box 278-P, Manchester, New Hampshire.

MAKE \$3.00 Hourly doing light assembly work at home. \$2.00 delivers all materials and equipment necessary to bring you \$10.85. Send to Gallaway Mfg. Co., Box R87, Osage Beach, Mo.

NEW General, religious, comedy 7"x11" signs—cost 7c, sell 50c. Sample free! Lowy, 812 Broadway, Dept. 917, New York City 3.

100,000 PRODUCTS Wholesale! Free catalogs! Econ-O-Mart, 8 Perry, Whippany 2, New Jersey.

GET Into your own big paying weather-strip business. E-Z-On 11, 1009 Harvard, Evanston, Ill.

INEXPERIENCED? Make money home! Little work! Literature free! Kreger, 3855-PM36 Howard, Skokie, Illinois.

MAKE Money with your 35mm. camera. Amazing new low cost color enlargements can bring you hundreds of dollars in spare time. Nothing else like it! Send 10c for samples and eye-opening facts. Dept. PM-3A, Polypix Co., 723 S. Wells Street, Chicago 7, Illinois.

NEW! Six cream of the crop ideas started now can bring you thousands for the one dollar you mail us today. Box 204, Dennisport, Massachusetts.

500 WAYS To earn money at home. Details 10c. A. Welch, Lake and Central Ave., Delaware, Ohio.

WANT To go in business for yourself without capital? We show you how. Start part time your own home. Postcard brings details absolutely free. Topval Corp., Lindenhurst 220, N. Y.

FORMULAS, PLANS, ETC.

FREE Formula catalog. Anything analyzed \$35.00. Western Chemical, Salem, Oregon.

ANY Formula desired, 25c! Elmer Hayes, B-31, Palo 8, Iowa.

FORMULAS; All kinds, latest, best. Literature free. Kemixal, Park Ridge, Ill.

PRODUCT Analysis, manufacturing formulas, processes developed. Moderate fees. Plastics, Box 1574, Boston 4, Mass.

PRACTICAL Formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

MILLER'S Modern manufacturing formulas make fastest-selling products that get the business and pay. Fifty years supplying the best. Valuable literature free. Miller, Chemist, 1517-M, Tampa, Florida.

FREE Formula catalog. Anything analyzed \$35.00. Western Chemical, Salem, Oregon.

FORMULAS, All products. Information, lists, free. Brockway, 1145 High, Topeka, Kansas.

PLASTICS

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 13, Oregon.

LAMINATING Supplies. Free price list. Solomonson, 46 Cornhill, Boston 8, Mass.

PLEXIGLAS, Cut to size. Clear. Any thickness. Colors. Rods. Tubing. McClarin Plastics, P.O. Box 168H, Hanover, Penna.

NEW Liquid casting plastic, clear, colors. Embed real flowers, insects, photos, coins. Saw, drill, carve. Send 25c for handbook, "How to Cast with Liquid Plastic," and proved success plan showing how to make money at home. Castolite, Dept. C-101, Woodstock, Ill.

PLEXIGLAS, Lucite. Square foot cost, 1/16", \$1.15; 1/8", \$1.52; 3/16", \$1.86; 1/4", \$2.21; 3/8", \$3.23; 1/2", \$4.38. Colors add 10%. Send 15c for postage. Aristocrat Plastics, 23-25 Sussex Avenue, Newark, N. J.

CHEMISTRY

LABORATORY Apparatus, chemicals, microscopes, complete chemistry sets, minerals, uranium ore. 10c brings catalog. Porter Chemical Co., Hagerstown 4, Md.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

FREE! Uranium detector and chemical puzzle (worth \$2.50) with first five lessons of diploma course on practical chemistry! Big package of chemicals, filtering equipment, charts, etc. Only \$1.00. National School of Chemistry, P.O. Box 606-G, Redwood City, Calif.

HOME Laboratory and apparatus kits, laboratory supplies. Catalog 25c. John H. Winn, 124A West 33rd St., New York, N. Y. Established 1931.

CHEMICALS, Supplies. Catalog 25c, refundable. Laboratory Sales, Box 161-E, Brighton, Mass.

CHEMICALS Unlimited! Catalogue 25c. Fabian Chemical Co., 3760 St. Catherine Road, Montreal 26, Canada.

BOOKLETS: 60 pages each! "Beginners Chemistry," "Chemistry," "Einstein's Relativity," "Physics," "Atomic Theory," "Electron Theory," "Scientific Oddities," "Light," "Sound," "Heat," "Electricity," "Radio," "Astronomy," "Useful Tables," "Geometry," "Mathematical Oddities," "Scientific Terms." Order by titles. 10c each. Franks, 3121 South Racine, Chicago 8.

AMAZING New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25c. National Scientific Co., Dept. PM-3, 2204 W. North Ave., Chicago 47, Illinois.

AGENTS WANTED

DO You call on churches? Every church is a prospect for individually designed church bulletins in colors—excellent commissions. Other fast selling printed items also. No postcards please. Write for samples, MWM Color Press, Dept. PM3, Aurora, Missouri.

MAKE Extra money with newest fast selling "Slit" and Photochrome" greeting card assortments. \$1.00, \$1.25 all occasion, birthday, religious, Easter boxes. Stationery, gift wrappings, gifts, gadgets. Experience unnecessary. Amazing profits. Bonus plan. Write today for samples on approval, free gift offer, catalog. Hedenkamp, 361 Broadway, Dept. PM-40, New York City.

NYLON Hosiery, start your own nylon routes. Buy direct and save. Free wholesale price list. Nylons, 2024 West Pratt St., Baltimore 23, Md.

GREETING Cards—\$50.00 cash from 40 boxes sensational all-purpose assortment. Big money all year from special occasion cards—Mother's, Father's Day, birthdays, Eastern Star. Best all-occasion assortments, stationery, gifts. Bargain specials. Color catalog. Samples on approval. Midwest, 1113 Washington, Dept. 699-K, St. Louis 1, Mo.

LET Us send you for free trial everything you need to make extra money. Show friends amazing value new type all occasion greeting card assortments. Profits to 100%. Bonus. Write for feature boxes on approval, 29 free samples personal stationery. New England Art Publishers, North Abington 333-P, Mass.

MAKE Your spare time profit! Over 600 beautiful, unusual gifts, greeting cards, household gadgets, toys, jewelry, baby items, and gift wraps you can sell to friends, neighbors, relatives. Write at once for big, bright free catalog just off the press. Samples on approval. Hurry, get details on sensational money-makers! Greetings Unlimited, 36C Park Square, St. Paul 1, Minnesota.

IF You want to earn money fast, I'll send you a free sample stocking of newest stretch duPont nylons to sell at only \$1 a pair. American Mills, Dept. 490, Indianapolis 7, Ind.

SHINE Cars without polish. New invention. Lightning seller. Cars gleam like mirror. Samples sent on trial. Kristee 84, Akron, Ohio.

BIG Money selling waitresses, beauticians, others guaranteed uniforms \$3.98 up. Dacrons, nylons, cottons. Sizes 9-52. Full, part time. Experience unnecessary. Bonus plan. Free full color catalog. Up-land Uniforms, 208 East 23rd, Dept. G-9, New York City.

THIS Ad worth money to you! Make big profits spare time or full time. Sell over 60c unusual gifts, gadgets, greeting cards, stationery, toys, jewelry to friends and neighbors. No big investment. Samples on approval. Write for big free catalog and tested money-making plan for organizations or individuals. North Star, Dept. 363, 251 E. 5th St., St. Paul 1, Minn.

\$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-G, New York City 16.

FREE! Beautiful feather pictures 200% profit! Apartado 9036, Mexico 1, D. F.

WHOLESALE Catalog! 30-80% discounts! Appliances, musical instruments, typewriters, phonographs, watches, jewelry, recorders, housewares, etc. Consolidated Distributors, 21-10 Lafayette, Paterson 15, New Jersey.

MEN, Women, make money spare time plus new car as bonus for encouragement. Amazing hosiery guaranteed to wear without holes, snags, and runs, or replaced free. For example, lovely 60 gauge nylons guaranteed for as long as 1 1/2 years, or replaced free. Write Wilknit, 1763 Wash., Greenfield, Ohio.

EUN 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-E, 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. McGregor Magazine Agency, Dept. 500-A, Mount Morris, Illinois.

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.

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

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12½c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Nathan Portnoy Associates, 605-AA West 12th Place. Chicago 7.

MAKE \$100 Up weekly—Demonstrate, take orders. Sensational new product. Prospects everywhere, part-full time. Campbell Company, Rochelle 53, Illinois.

SCHOOL Seniors—Be popular with classmates. Have spending money galore. Details free. Craftcards, Box 235-L, Pittsburgh 19, Pennsylvania.

GOLD Or silver letters, numbers. Windows, doors, trucks. 1" to 6". 500% profits. Free samples. Atlas-T, 544 West 79th. Chicago 20.

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

\$1.00 PROFIT Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

CALIFORNIA Sweet smelling beads. Sensational sellers. Particulars free. Mission, 2328 FR, W. Pico, Los Angeles 6, Calif.

USED And new watches \$2 up. Free list. Southern Watches, Gray, Georgia.

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

EASY Handwork makes fast-selling articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

\$18.75 NATIONALLY Advertisers perfume. Closeout price 60c. Sell for \$3. Profit \$2.40. Sample \$1. Details, advertisement reprint free. Esset 73-14L, 175 Flushing 66, New York.

GIVE Away plan pays you to \$5 hour! Your customers receive choice of wonderful gifts (silverware, hosiery, electric shavers, etc.) free with purchases! Show huge line with famous brands like Westbend, International Silver, Melmac unbreakable dinnerware, hosiery, shirts, underwear, etc. Nothing for you to buy. Just write orders. We deliver prepaid and collect. Also weekly payment club plan. Pocket advance cash plus big cash bonuses. Opportunity become manager appointing salespeople. Experience unnecessary. Full or spare time. Nothing to pay now or ever. Postcard brings you complete money-making outfit free. No obligation. Kenmart, Dept. 13, 108 Lawrence St., Brooklyn 1, N. Y.

SELL Sick call crucifixes. Big commission. The James Company, North Attleboro, Mass.

BUY Wholesale, 25,000 items, catalog 25c. Matthews, 1472-B6 Broadway, New York City 36.

STRANGE Dry window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 81, Akron, Ohio.

START Your own business on credit. Your own boss. 1135 dealers sold \$5,000 to \$30,000 in 1954. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. C-U-PPM, Freeport, Ill.

MONEY In minutes! Even beginners scoop up big earnings with Elmira—the greeting line so beautiful, it sells by itself! Friends, neighbors, even perfect strangers want to see and buy from Elmira's exciting array of all-occasion greeting cards, personalized stationery, napkins and gift wraps. Look no further, Elmira gives you everything to make your extra-money dream come true! Send today for free samples, catalog, assortments on approval. Request Elmira's fund-raising plan for churches and clubs! Elmira Greeting Card Co., Dept. 161, Elmira, N. Y.

FREE Sample outfit to agents of complete line of plastics, novelties, etc. Rose-text Mfg. Co., 43 Amboy Street, Brooklyn 12, New York.

60% PROFIT On cosmetics. Famous nationally advertised Hollywood cosmetics pay 60%! Make \$25 day up! Hire others. For free samples, details, write Studio Girl, Glendale, Calif., Dept. 1263G.

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.

MAKE Money introducing world's cutest children's dresses. Big selection, adorable styles. Low prices. Complete display free. Rush name. Harford, Dept. R-4341, Cincinnati 25, Ohio.

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

SELL Nameplates, 100% profit. Free information. Grioux Nameplates, 116 College St., Burlington, Vermont.

VITAMINS, Buy direct—Wholesale. Highest potency, lowest prices. Build very profitable repeat business. Complete sales program free. Write now! Daly Vitamins, 1001A Glendale Blvd., Los Angeles 26, Calif.

AGENTS Calling on industrial and/or school accounts to sell Vaporite pens and inks. There's a pen and ink for any marking purpose. Units have a high closing average. High potential. International company. For complete information write stating territory covered and types of accounts sold. Time Saving Specialties, Dept. 12, 2816 Dupont Ave. So., Minneapolis 8, Minn.

BEAUTIFUL Feather pictures. Big profits. Sample, framed, 50c. Robert Celaya, Brownsville, Texas.

SELL Exotic imported African wood carvings. Fabulous profits. Free details. Kempco, Box 4098, San Diego 4, California.

\$200-\$1000 WEEKLY: "Spark-O-Matic" lifetime spark plug. Exclusive territories. Alquist, Milford P16, Penna.

NEW Costume jewelry item. Latest fad. Fast seller. 300% profit. Free details. Packard (M), 550 Fifth, New York City.

EASY Selling, sensationally new. Taverns, gas stations, restaurants, stores. Tremendous earnings. Free samples and details. Fritch, 610 Coronado, Los Angeles 37.

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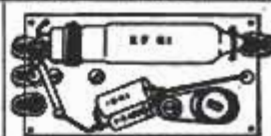
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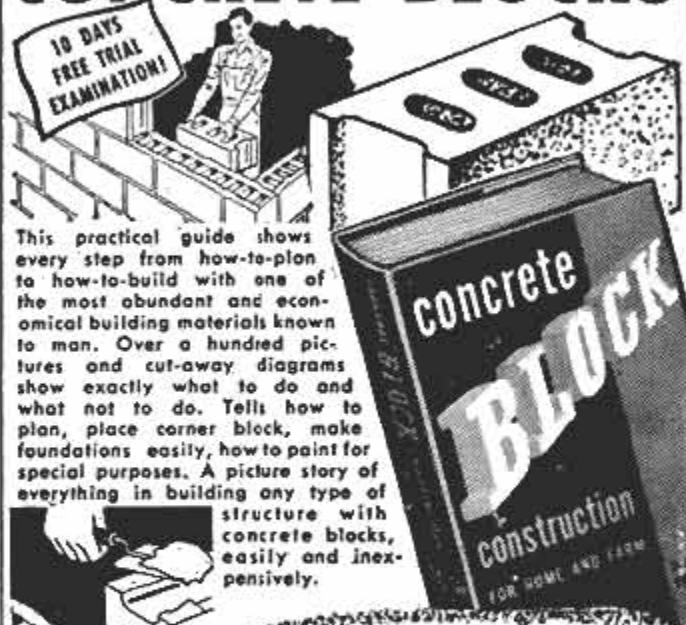
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(Continued from page 10)

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Sid Barry, President,
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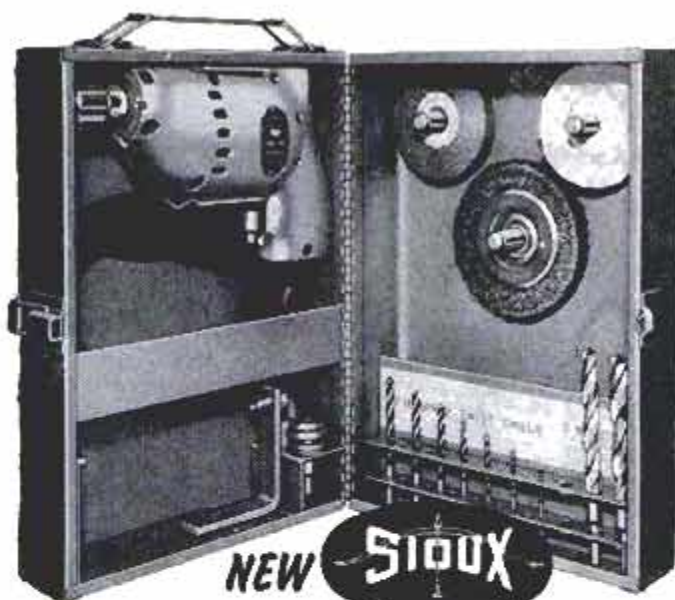
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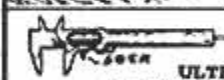
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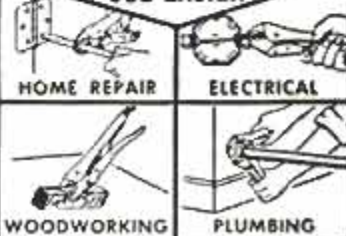
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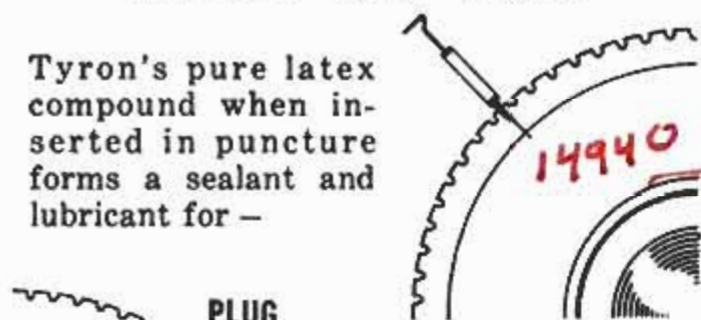
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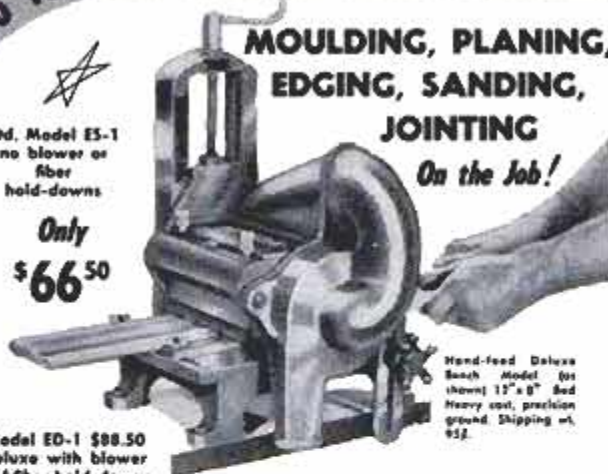
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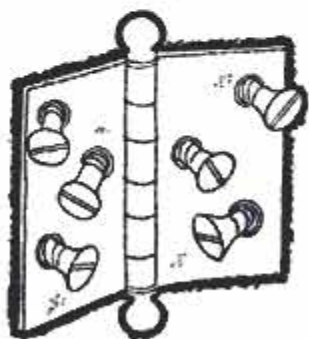
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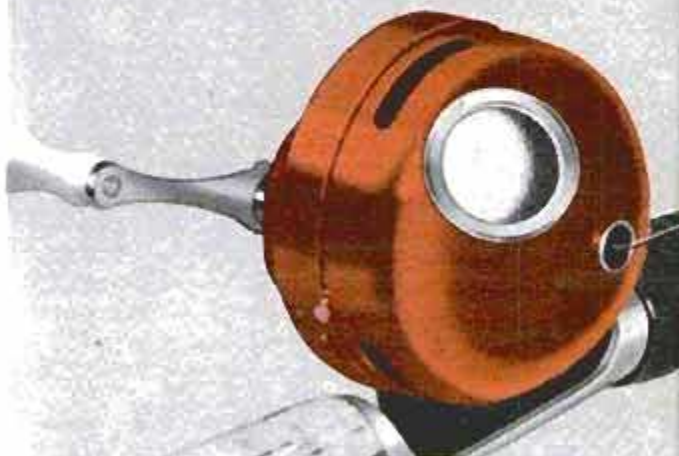
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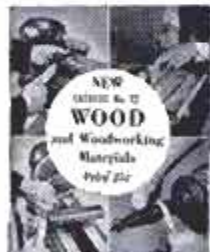
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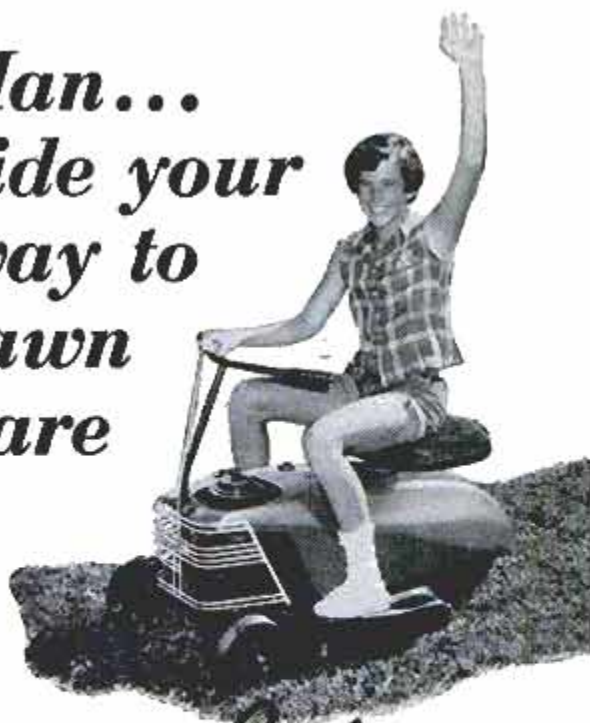
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VOL. 105 NO. 3

Two crack parachutists of
the U. S. Air Force are ready
for their greatest venture



They'll Jump

17 MILES

From the Sky

By Thomas E. Stimson, Jr.

CAN A MAN fall out of the sky and live to tell about it?

Will he freeze to death on the way to earth?

Or will aerodynamic heating literally cook him?

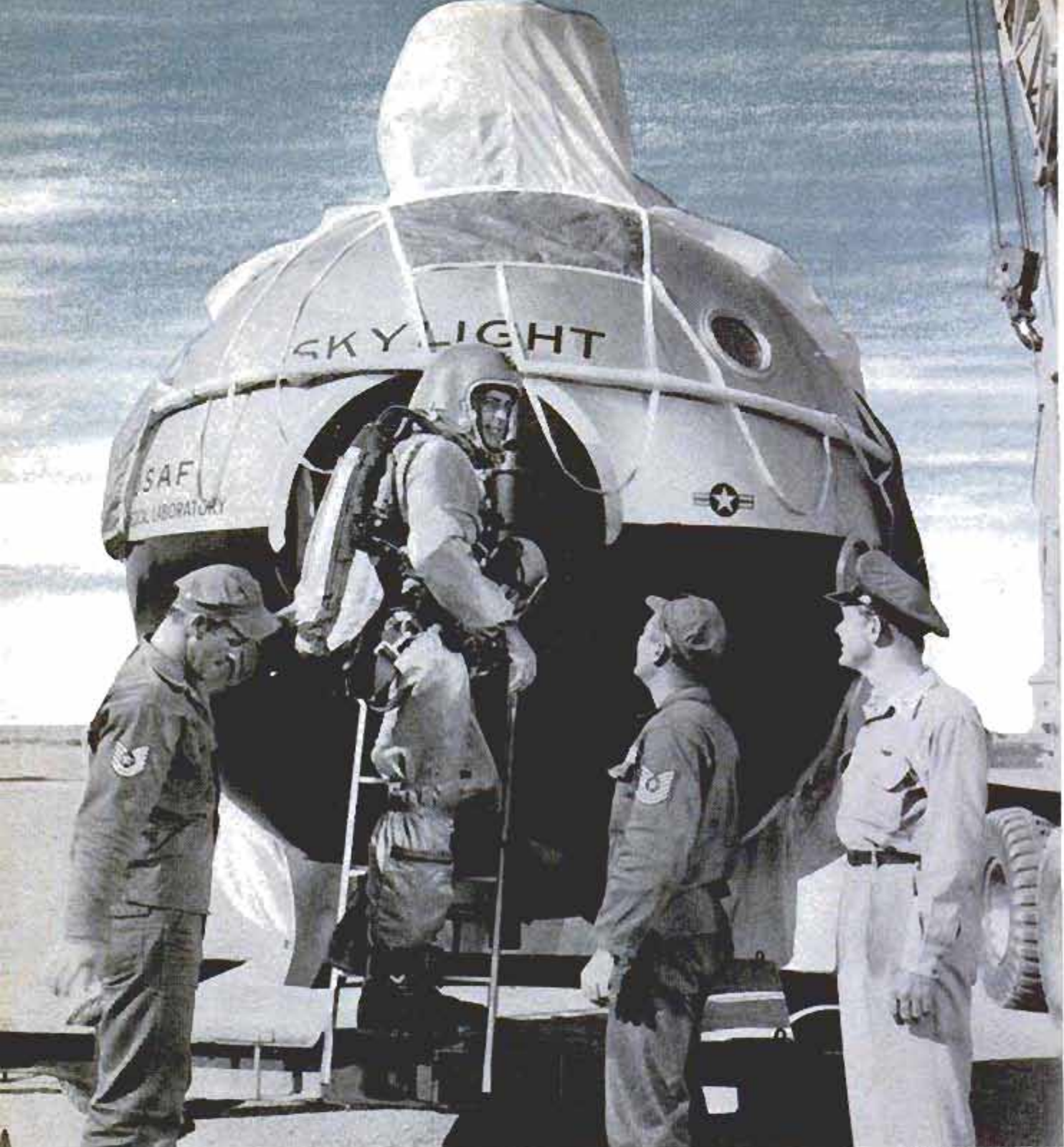
Will his space suit provide the squeeze he needs to stay alive in air where the pressure is less than one pound per square inch? Falling freely, will he spin so fast his heart will go dry? Will his chute rip to pieces when it opens at low altitude?

Today the Air Force is face to face with these and similar questions. Some of the aircraft now on the drawing boards are

designed to fly so high that the possibility of bailouts from the top of the atmosphere must be considered.

To find out ahead of time what will happen to the pilot, the Air Research and Development Command is planning a bold and daring experiment. Two crack parachutists will make a series of jumps from balloons that may ascend as high as 90,000 feet.

Sometime this spring or summer, according to present plans, Capt. Edward G. Sperry and Lt. Henry P. Nielsen will ride the sealed gondola of the "Explorer III" to maximum altitude. There the escape hatch



20th Century-Fox photo

In movie version of this real story, jumper climbs into nine-foot gondola that will carry him to 90,000 feet

will be unfastened and Capt. Sperry will take a long step, the longest ever made. He'll step out of the gondola and then, 10 or 12 minutes later, he'll put his feet on the earth some 17 miles below.

Although he'll be wearing a small drag chute, it is calculated that he will attain a velocity of 420 miles per hour in the thin upper air. This speed will be reached 35 seconds after he steps out of the gondola and has fallen about three miles. Below 75,000 feet the denser air will begin to cushion his fall and he'll gradually slow down. When he reaches 15,000 feet his speed will have dropped to 115 miles per hour. There

Sperry will open his main chute (or it will open automatically if he fails to do so) and he'll drift the rest of the way to earth at a slow, safe speed.

Every possible precaution is being taken to insure his safety. For one thing he'll be wearing a new type of space suit, far more comfortable than the T-1 suit in use today.

The suit will be pressurized against the vacuumlike stratosphere, will carry its own supply of breathing oxygen and will be insulated against the minus-65-degree temperature of the upper air. Meteorlike heating is not expected to be a problem during the 17-mile plunge to earth. The

suit, incidentally, may carry a few compact instruments to measure the jumper's speed and to record other data.

Another safety measure is the small drag chute Sperry will wear. Its purpose is to keep him from spinning violently. Otherwise these gyrations might force his blood out to his extremities and drain his heart dry. The chute will hold his body in a relatively upright position during the free fall.

Both Sperry and Nielsen are skilled jumpers. They hold, jointly, the world record for ejection at 45,200 feet. They know that a jumper dares not open his chute during the time he is falling through the thin upper air. He must wait until he is slowed down by the cushion of heavier air close to the ground. Otherwise the shock of opening might break his bones or rip his chute to pieces. Once he gets down to 20,000 feet or less the jumper can open his chute in safety.

After Sperry steps out of the gondola, Lieutenant Nielsen will operate a mechanism that cuts the gondola free from the balloon. Then the gondola will drop like a rock, trailing a small drag chute behind it. Nielsen plans to ride the sphere down to 20,000 feet, then allow the drag chute to pull out the main gondola parachute that will lower the big ball to a safe landing. Meanwhile Nielsen will step off and ride his own chute to the ground.

The jump from maximum altitude will be the culmination of six ascents, beginning at around 60,000 feet and working up by stages to the final drop. The whole project may require several months.

Unavoidably the balloon flights will be packed with drama even though, basically, they are pure scientific research. They are part of the big upper-air exploratory program that is being conducted by Air Research and Development Command.

Released by ground handlers, balloon starts its ascent to edge of space. Gas ball will expand as balloon rises



BALLOON CARRIES GONDOLA AS HIGH AS 90,000 FEET

MECHANISM WHICH SEPARATES GONDOLA FROM BALLOON

DRAG CHUTE OPENS MAIN CHUTE AT 20,000 FEET

MAIN PARACHUTE PACKED ABOVE GONDOLA



90,000 FEET

AIR PRESSURE HERE IS 1/2 POUND PER SQUARE INCH OR LESS

SPERRY JUMPS AT 90,000 FEET

BALLOON EXPANDS AS IT ASCENDS

70,000 FEET

BLOOD BOILS AT 63,000 FEET

SPERRY MAY DRIFT DUE TO STRONG UPPER-AIR WINDS

SKIN INFLATES LIKE A BALLOON AT 50,000 FEET

50,000 FEET

DURING FREE FALL, SPERRY'S SPEED MAY EXCEED 420 MILES PER HOUR

30,000 FEET

SPEED OF FALL DIMINISHES

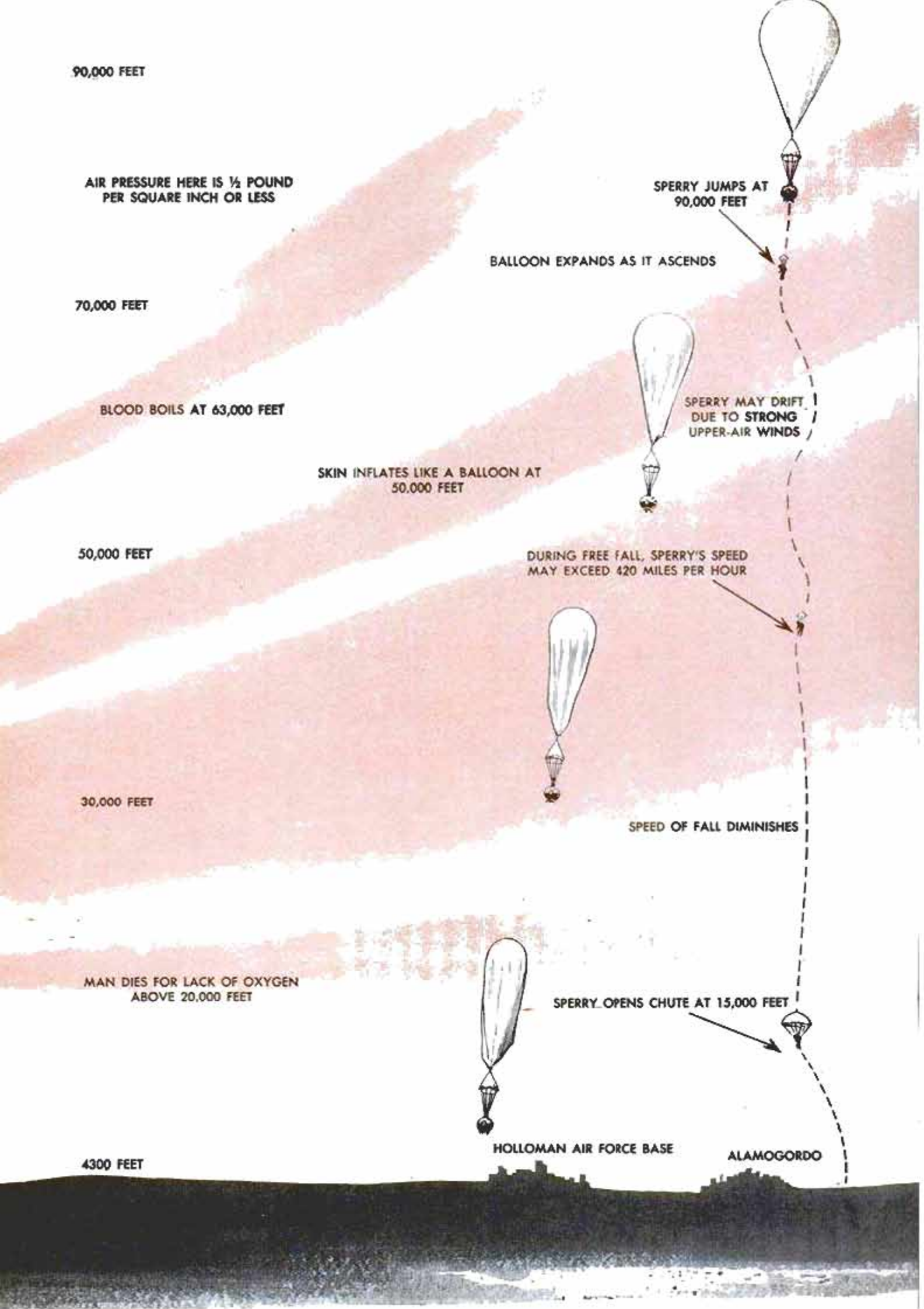
MAN DIES FOR LACK OF OXYGEN ABOVE 20,000 FEET

SPERRY OPENS CHUTE AT 15,000 FEET

4300 FEET

HOLLOMAN AIR FORCE BASE

ALAMOGORDO





**NIELSEN CUTS
GONDOLA FREE
FROM BALLOON**



**GONDOLA FALLS
TOWARD EARTH UNDER
SMALL DRAG CHUTE**



**NIELSEN OPENS MAIN GONDOLA
CHUTE AT 20,000 FEET, THEN
LEAVES GONDOLA AND RIDES HIS
OWN CHUTE TO EARTH**



Drawing shows successive stages that will occur in the record jump. At 90,000 feet Sperry will step out of the gondola. He'll fall 14 miles, with only a small drag chute to keep him from spinning. Nielsen will ride falling gondola most of the way to earth

To give the public a picture of some of the work it is doing the ARDC recently cooperated with 20th Century-Fox in filming a color CinemaScope movie that tells the story of the high-altitude jumping project plus giving other highlights of its research. Not a documentary film, the movie has a fictional plot which emphasizes the hazards of some of the studies that the Air Force is conducting.

The picture, *On the Threshold of Space*, is due for release in early March. Parts of it were filmed at Holloman Air Force Base in New Mexico where the actual jumps are to be made. Some of it was filmed at Egin Air Force Base in Florida. Some of the photographs on these pages were made for *Popular Mechanics* during the filming of the picture.

In the movie Guy Madison plays the part of the high-altitude jumper and Martin Milner acts the part of the other occupant of the gondola. Among technical advisors for *On the Threshold of Space* were Col. Arthur M. Henderson ("I Made the First Jump," March 1955, *Popular Mechanics*) and Captain Sperry himself, the Air Force officer who is scheduled to make the actual final jump from maximum altitude.

Twentieth Century-Fox built its gondola oversize (nine feet in diameter) for easier photography, and assembled it in sections so the interior could be photographed. The movie balloon and its gondola are named "Skylight."

The actual Air Force balloon will be named "Explorer III" in honor of two earlier manned balloons that made record ascents some 20 years ago. Sponsored by the Army Air Corps and the National Geographic Society, the first "Explorer" carried three men to 60,613 feet in 1934. The men almost lost their lives in the venture, for the balloon ripped apart when 11½ miles above the earth. The crew rode it down part way like a parachute and then jumped separately with their own chutes just before the hydrogen that remained in the big bag exploded.

A year later "Explorer II," filled with nonexplosive helium, ascended to a new record of 72,295 feet. Two men and 64 instruments were carried in the balloon's magnesium gondola, and new information

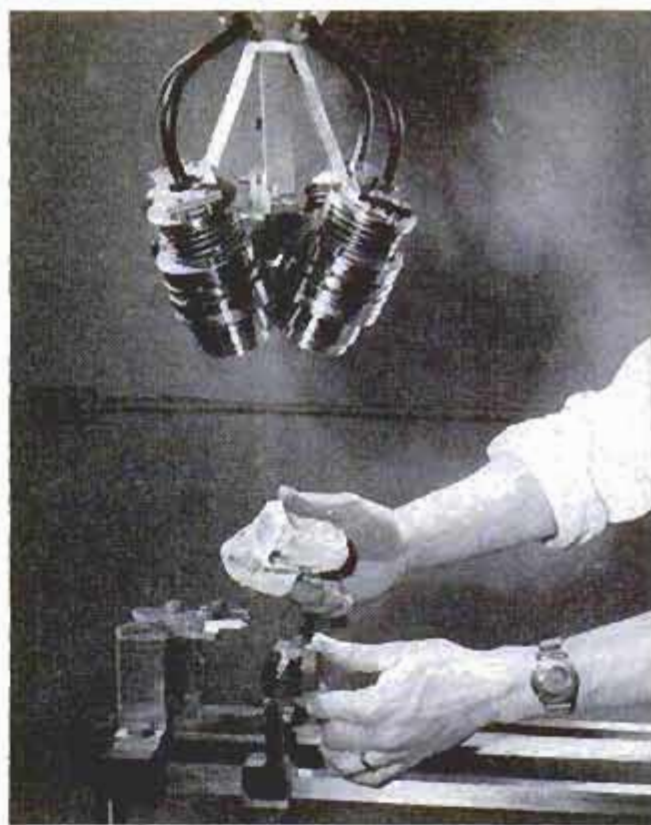
(Continued to page 287)

SACRAMENTO PEAK



Zoomar Lens for Cameras

Extremely long focal length is combined with high picture quality in the new 20-inch Zoomar-Reflectar lens for still and movie cameras. A mirror-reflex housing is available for use on Leica-type cameras. For single-lens reflex cameras, it can be used without the housing. The speed of the lens is $f:5.6$. Lens mounts are available for use with motion-picture cameras.



Laboratory technician, for purposes of illustration, holds monkey skull above headrest of \$50,000 unit

Sound Waves are "Knife" In Brain-Surgery Tool

Sound waves above the range of the human ear would be used to destroy diseased tissue in a new method of brain surgery. A group of University of Illinois scientists, headed by Prof. William Fry, has spent five years in developing equipment for this technique. The sound waves can be focused on tiny areas of the brain without injuring other tissue.

Electric Mopping Machine Covers Two-Foot Circle

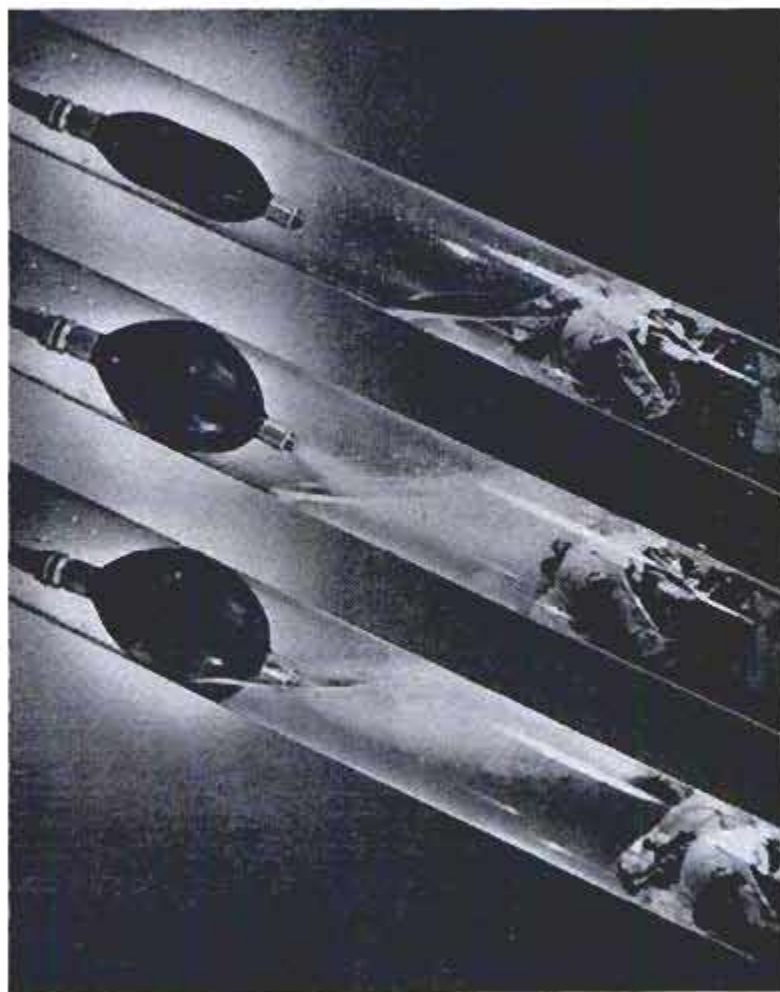
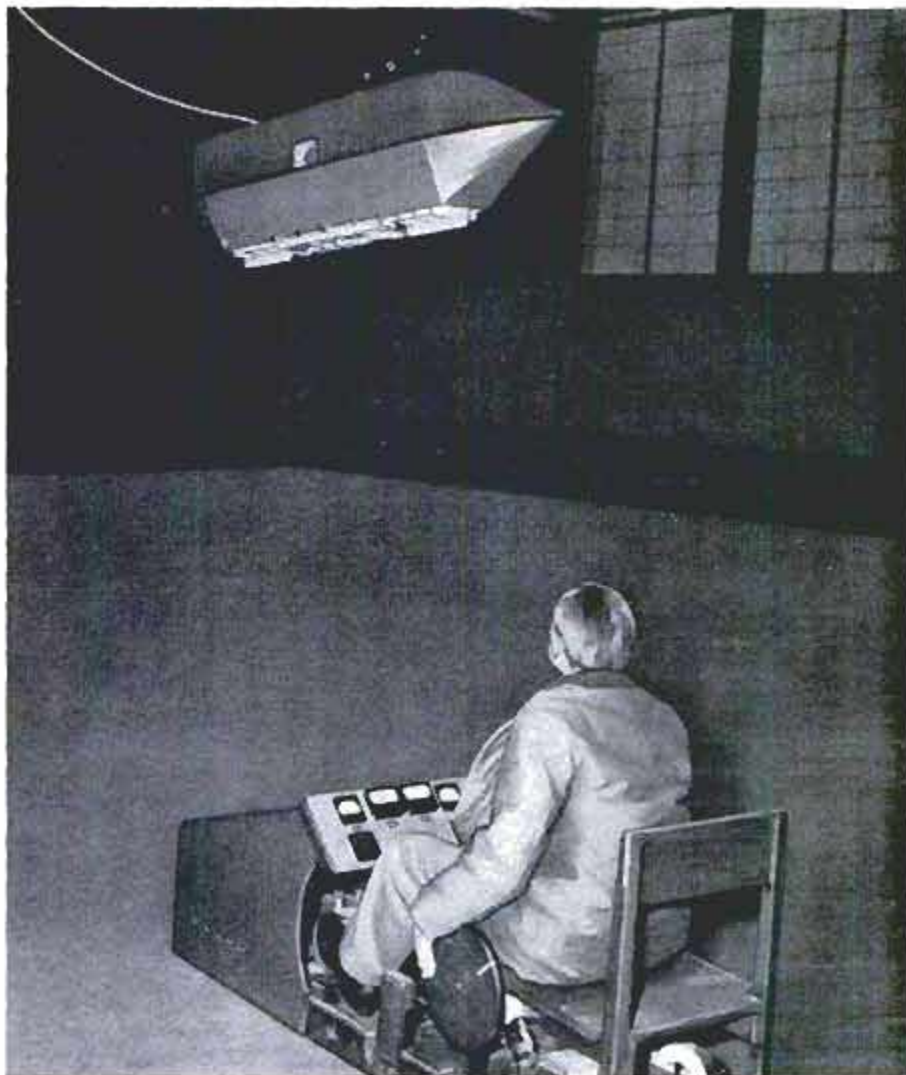
With a new mopping machine (left) you can clean a large area in a hurry. Four mops are mounted on a spinning disk driven through pulleys by an electric motor. They cover a 24-inch circle. To clean the mops, you leave the motor running, dunk the spinning head in rinse water and wring the mops dry by revolving them in a perforated-metal cone. The unit, which can reach under tables and counters, is for commercial use.

☐ Promising results in the relief of pain in amputation stumps by the use of high-frequency sound waves are reported by the U.S. Veterans Administration.



Wingless Flight

Searching for a solution to the oversize airport problem, Dr. Alexander Lippisch, along with other aeronautical engineers, has decided that aircraft of the future will have to rise vertically, hover, and then be capable of high-speed, long-range flight. The German-born scientist's answer to the problem is the Aerodyne, a wingless craft that promises to do all these things. Four fans in the fuselage draw air in at the top and expel it past louvers in the bottom of the craft. Thus riding on a column of air, the ship hovers when the louvers are vertical, and goes forward when they are tilted toward the back. In prototypes, gas turbine engines may be used to drive the fans.

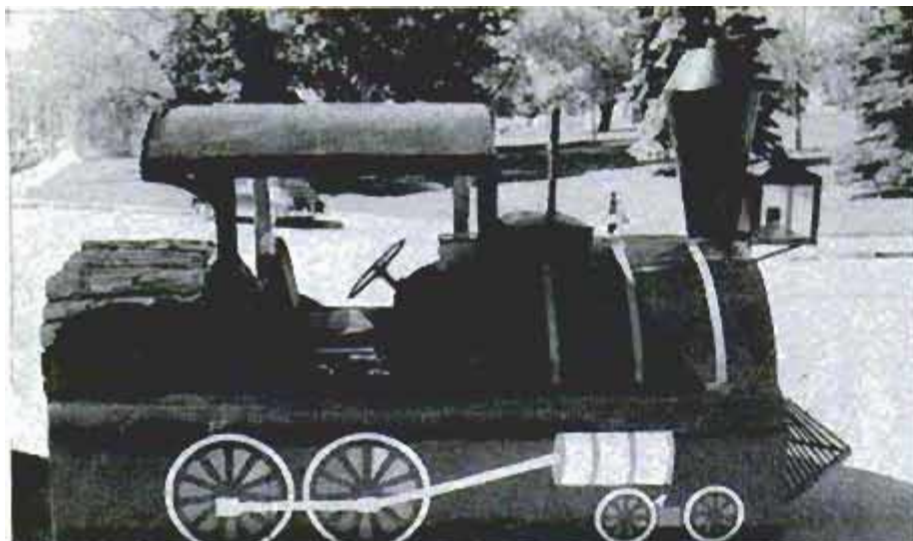


Plastic Defogs Aircraft Windshields

Operating like an electric heating element, a new electrically conductive plastic coating defogs aircraft windshields in seconds, instead of the much longer time required by the double-windshield hot-air system now in use. The coating also reflects 70 percent of the sun's infrared rays.

Drainpipe Flusher Uses Garden Hose

Sewers and drains are flushed free of obstructions with a plumbing device that mounts on an ordinary garden hose. The unit consists of a Neoprene bag with a nozzle on the end. Water from the hose first fills the bag, causing it to swell and seal off the area between bag and obstruction. Water spurting out the nozzle of the bag builds up pressure in front of the obstruction, forcing it free. The unit allows any householder to do a job usually reserved for plumbers.

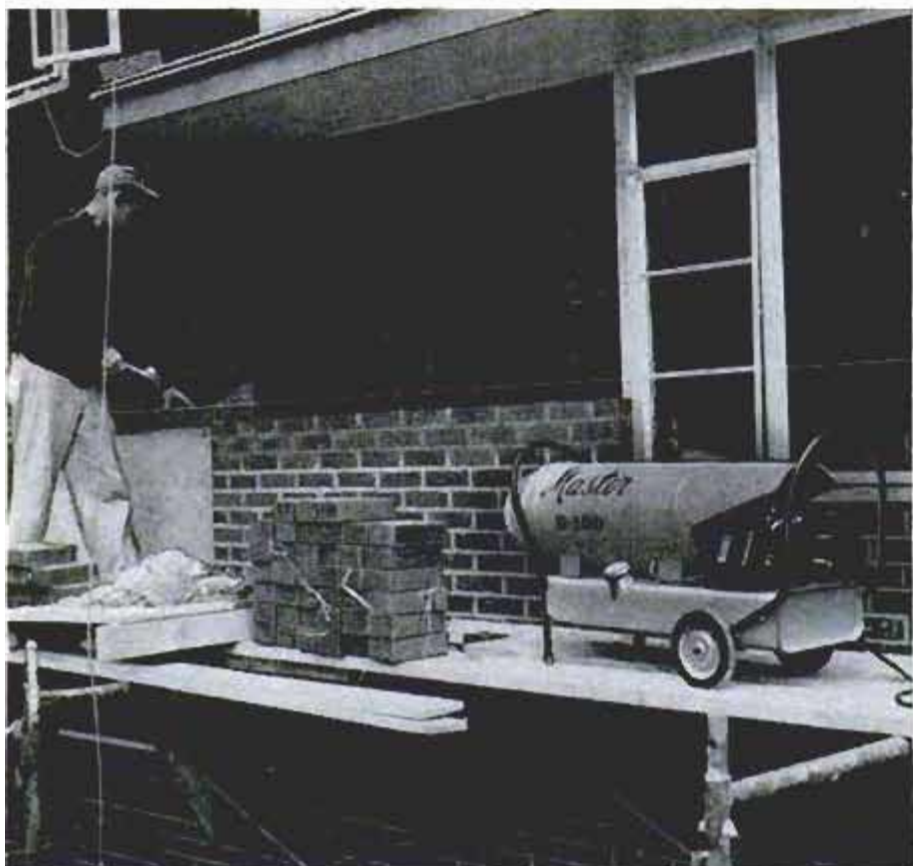
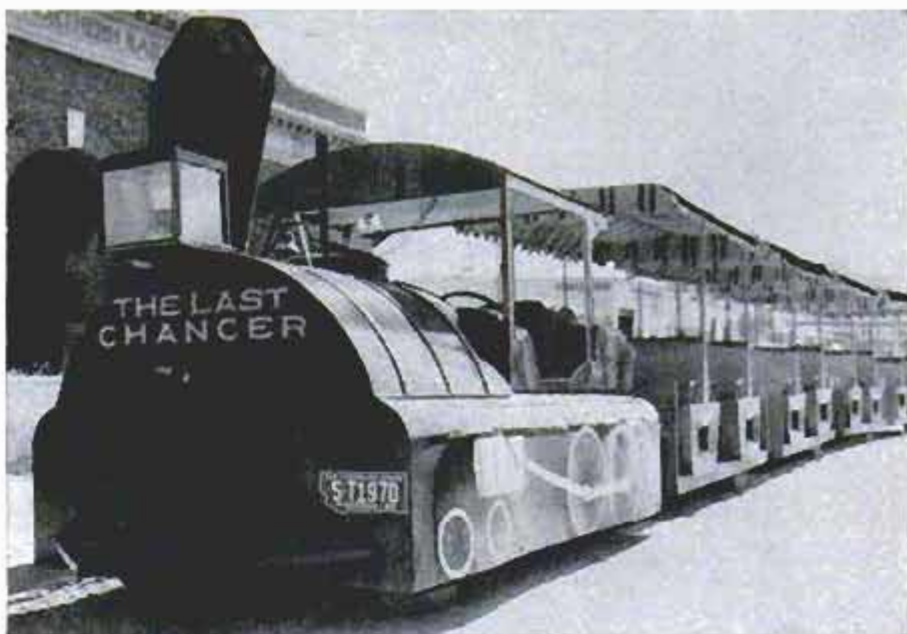


Jeep Train For Tourists

Built over a regulation quarter-ton Jeep, the locomotive is a replica of an old wood burner

During the tourist season, visitors to Helena crowd the tiny cars for sight-seeing excursions

During the tourist season in Helena, Mont., *The Last Chancer*, a replica of an old wood-burning locomotive built over a Jeep, pulls a sight-seeing train of open cars around the city at intervals during the day. Constructed over a regulation quarter-ton Jeep, the locomotive is named after Helena's main street, The Last Chance, where in pioneer times prospectors who had been unsuccessful in the hills panned a creek for gold as a last chance and struck it rich.



Portable Heater Warms Workmen

Workmen are warmed on the job by a small, 78-pound furnace on wheels that can be taken and used almost anywhere. The unit burns kerosene or fuel oil and is equipped with a fan that delivers 500 cubic feet of warm air per minute. The electric motor that powers the fan and pump is fed by regular household current. The heater has a 12-hour fuel capacity. Because there are no dangerous fumes, no vent is needed even when inside. The automatic ignition turns on with a flip of the switch.

The wheeled heater weighs only 78 pounds, can be taken almost anywhere

Heavy-Cargo Helicopter Carries 10-Ton Load



King-sized helicopters are coming. The latest and biggest whirlybird to get off the ground is the XH-17, an experimental heavy-cargo helicopter built by the Aircraft Division of the Hughes Tool Company.

The XH-17 straddles its load with stiltlike legs, grasps it with adjustable lift mechanisms and takes off. Powered by a pressure-jet, single-rotor, the big plane can carry loads of more than 10 tons.

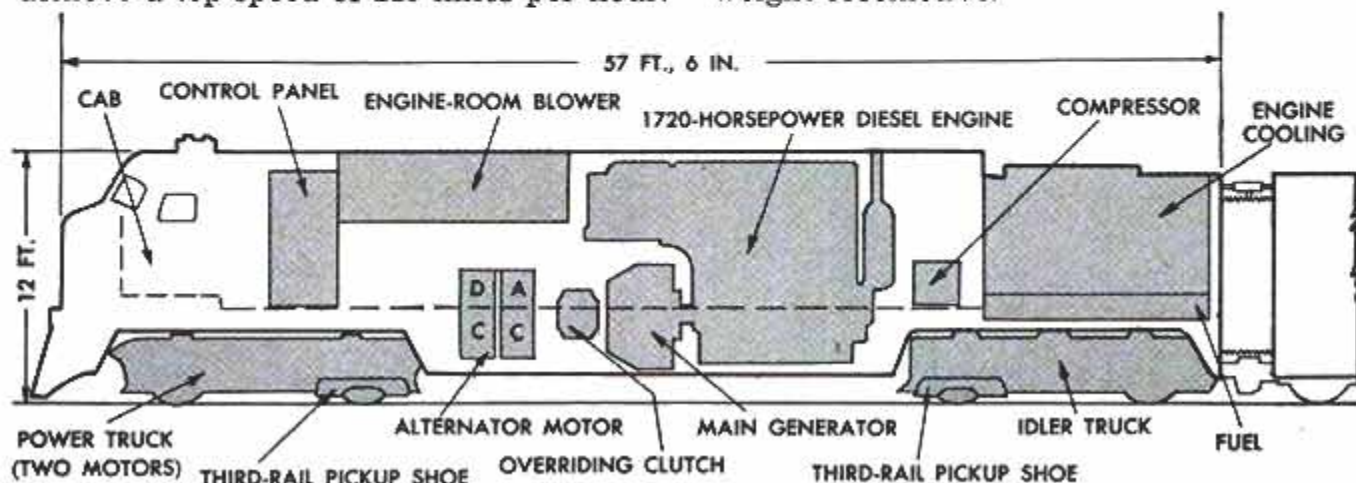
Diesel Locomotive Also Has Third-Rail Electric Pickup

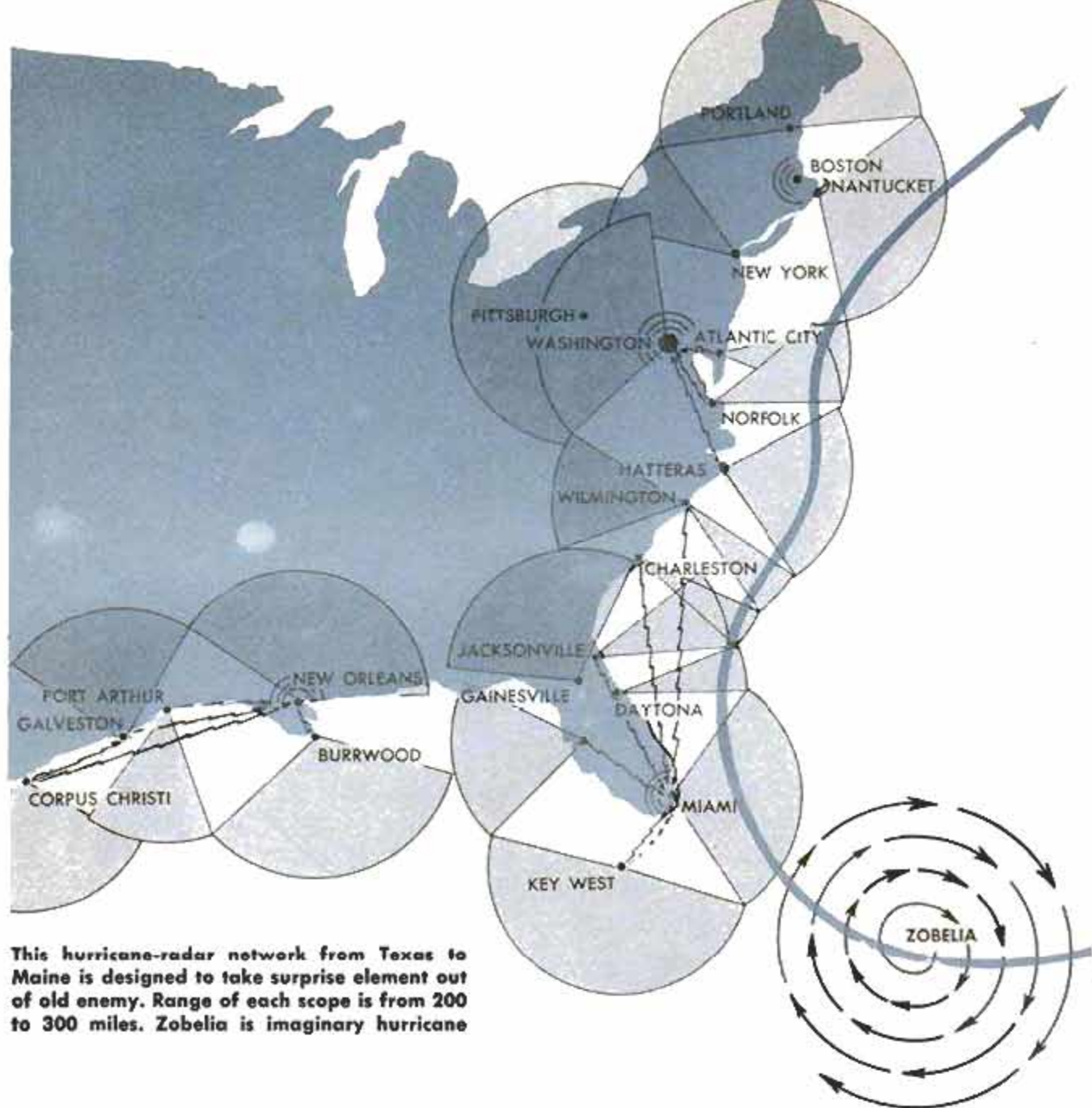
For the first time a diesel-electric main-line locomotive soon will roll right into New York's Grand Central Station. A city ordinance passed in 1903 requires all trains to convert to electric power when approaching Manhattan.

A new diesel-electric locomotive, also equipped to operate as a straight electric locomotive, will power the New Haven's Talgo-type train which is now under construction. The new combination locomotive, being built by Fairbanks Morse, will achieve a top speed of 115 miles per hour.

The locomotive for the new train actually consists of two units, one at each end of the train. Both can be controlled from either cab, so the train will have no front or rear but can be operated as well in either direction.

Each diesel unit produces 1720 horsepower. In addition, each unit has shoes for picking up power from the 600-volt d.c. third rail. This power passes through supplementary electrical control equipment and switch gear aboard the fast, light-weight locomotive.

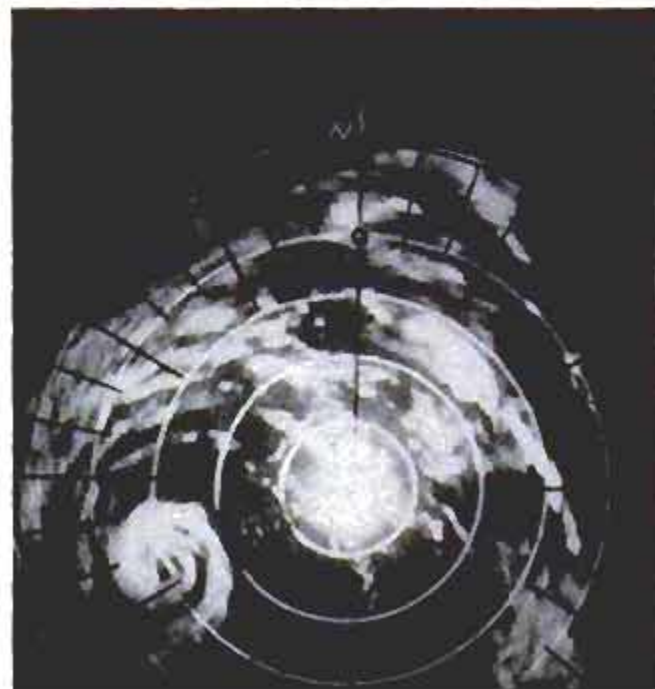




This hurricane-radar network from Texas to Maine is designed to take surprise element out of old enemy. Range of each scope is from 200 to 300 miles. Zobel is imaginary hurricane

Below, long-range-radar station at Hatteras is an important link in chain. Dome houses instruments

This radar-screen photo of Connie, taken at Hatteras at height of storm, spans 20 miles between rings





Why all these HURRICANES?

Nature has been smiting our East Coast with increasing fury in recent years. Radar eyes in a chain from Corpus Christi to Key West to Portland, Me., now peer seaward to tell where the next blow will strike

By Dick Frederic

DIANE WAS WINDING UP 300 miles off the Carolina coast when United States weatherman Vaughan Rockney drove his car from the last ferry to cross Oregon Inlet, and headed into the wild night on a narrow strip of sand surrounded by raging seas. His destination was Hatteras, lonely storm-battered settlement 40 miles south on a desolate spit skirting the North Carolina shores like a 250-mile bracket. To average citizens like you and me the trip down that isolated stretch of ocean-bound sand on such a night would have seemed suicidal. Diane's murderous eye was headed straight for this coastal area. Anyone with transportation had long since left the doomed shores.

"All the protective dunes were gone," Rockney recalls, "knocked flat by Connie the week before. So Diane's forward winds were pushing breakers and tide over the road two feet deep. Salt foam came over the floorboards. In half an hour the engine drowned seven times as the car sent spray geysering. Then, salt water got in the master cylinder and the brakes froze."

A plunging, high-wheeled Coast Guard patrol buggy caught the half-submerged car in its powerful searchlight beam, res-

cued the occupants and carried them to their goal—a squat group of white, storm-whipped buildings bristling with well-braced, domed antennas. There, while Diane lashed them with 100-mile-per-hour winds and stinging rain for three days, Rockney and his crew, including a radar engineer, a radio engineer and a general-facilities engineer, became the eyes and ears for the entire East Coast, watching the hurricane's every twist, turn and change in character as it moved in toward the continent and spent its fury over the New England states. In a room lit only by the eerie glow of a radarscope, Diane's monstrous circulation lay spread out before them on the range grid like a slowly revolving map viewed from a point some 100 miles above the earth's surface. Though power and telephone lines to the mainland had long since been swept away by the raging ocean, an auxiliary generator roared above the noise of the storm, supplying juice to run the 750-kilowatt radar, a powerful high-frequency radio transmitter and radio facsimile equipment capable of sending radio pictures hundreds of miles.

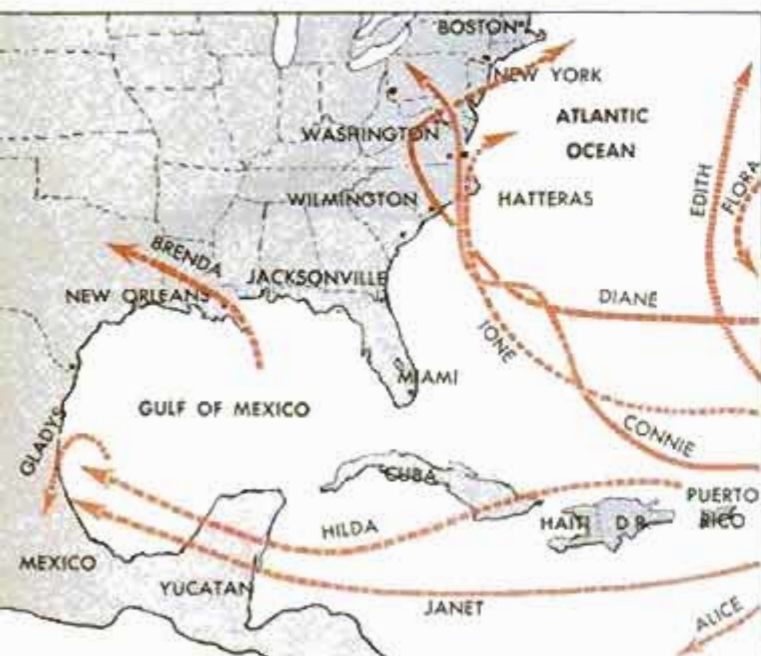
At stated intervals (usually every 30 minutes), Rockney, U. S. Weather Bureau



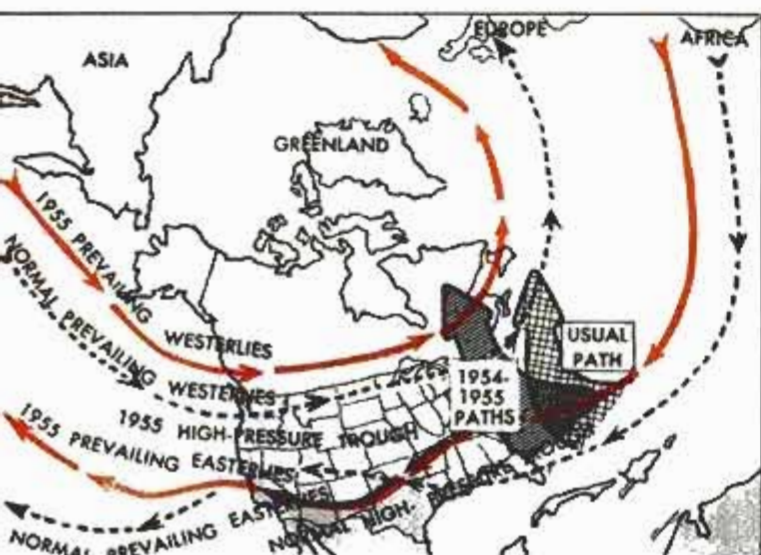
Powerful weather radar at University of Miami is loaned to hurricane network during storm periods



Storm is plotted on huge wall map as it is watched on radar screen. Rings of 50 miles show its speed



U.S. Weather Bureau chart above shows some of the 1955 hurricanes. Below, position of high-pressure troughs in 1955 helped swing the hurricanes inland

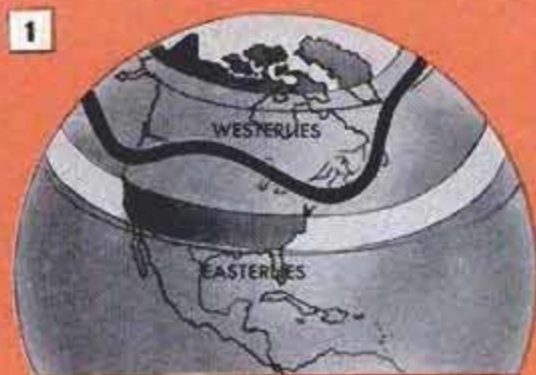


radar meteorologist, calculated the growth, speed and direction figures gleaned from watching the storm's progress on the scope, and went out on the air. His messages sounded like this: "We locate Diane, latitude $34^{\circ}15'$, longitude $74^{\circ}90'$; diameter of eye 20 miles; moving west northwest approximately 15 miles per hour; heavy spiral boundaries with massive precipitation extend out to north and northeast 200 miles; eye of the hurricane is clearly defined by precipitation pattern."

Every few minutes, Rockney clicked the shutter of a Polaroid camera mounted above the scope. Everything the camera saw on that scope was faithfully recorded on a piece of paper film that was quickly peeled from the back of the camera, fastened to the facsimile scanner and shot out across the ether.

Back in the bustling Weather Bureau forecast center at the Washington National Airport, startlingly clear pictures of what Diane had looked like only five minutes earlier rolled off the drum of a whirring facsimile receiver. These, together with Rockney's radio reports, ground observations from hundreds of coastal weather stations, reports of ships and planes in the hurricane area itself, were evaluated by chief forecaster Norquist and consolidated into bulletins. Out they went on the Hurricane network—a permanent storm-season Teletype land line feeding weather stations, Air Force bases, CAA Teletype, Navy bases, news and radio-broadcast services.

Because the big radar eye at Hatteras had a continual picture of the hurricane every moment, forecasters were able to predict with amazing accuracy what she'd



Charts show how changing position of the lofty jet stream has affected hurricane movements. Black line shows mean position of the stream during summer. Red arrows show variations from normal. No. 2 shows a hurricane headed over Gulf of Mexico. No. 3 shows

winds deflected north to Carolina coast and then out into the Atlantic. No. 4 shows what happened in '54 and '55 when dip in jet stream drew storms not only north but into the mid-Atlantic states. White band in No. 1 shows general area of doldrums

do and when she'd do it. Carolina coastal towns in the path of the storm had plenty of time to batten down their hatches and get ready.

"Officers at the Norfolk Naval Base feared a sound tide," says Rockney, "a reverse tide caused by gales that sometimes blow the bay water seaward against unprotected reefs and points, where Navy piers house millions of dollars' worth of ships and equipment. By analyzing Diane's progress on the scope we could tell the Navy she'd pass west of Norfolk and there'd be no sound tide. The information saved thousands of dollars in needless preparation against disaster that wouldn't occur."

Actually, weathermen even spotted Diane's infamous deluge on the big scope

and forecast it well in advance of the storm. "What the rain would do in local areas was not clearly enough interpreted by local forecasters," they explain. "But when new, more emphatic terms for forecast bulletins are worked out in the light of this new tool, even such disasters should be predicted with accuracy."

New last year, Hatteras radar is only one link in a \$5,000,000 coastal chain of high-powered weather-radar stations that soon will stretch from Brownsville, on the Gulf of Mexico, to Portland, Me. Already, nearly a dozen stations are swinging antennas across hurricane-ridden seas. Others, run in cooperation with military, Civil Defense and industrial establishments, help fill in. Twelve new ones (including Hatteras) will soon close the last coastal gaps through

The power of a hurricane is almost beyond the comprehension of mere man. Scientists measure it at five trillion horsepower, or the equal of 500 atom bombs. Figures still beyond our ken. Hurricane Diane brought home in 1955 another measure more readily understood—a single incident reported by the magazine *Compressed Air*. Fifty years ago men began digging a quarry near Easton, Pa. In a half century they had removed

25,000,000 tons of rock. When the rains of Diane fell on the Delaware River valley, the floodwaters spilled into the vast quarry pit and in just eight hours filled it to the brim. The quarry became a 600,000,000-gallon lake a half mile long and 105 feet deep at the center. A week later pumps were put to work draining the hole. What Diane had done in eight hours was undone in 47 days of pumping.

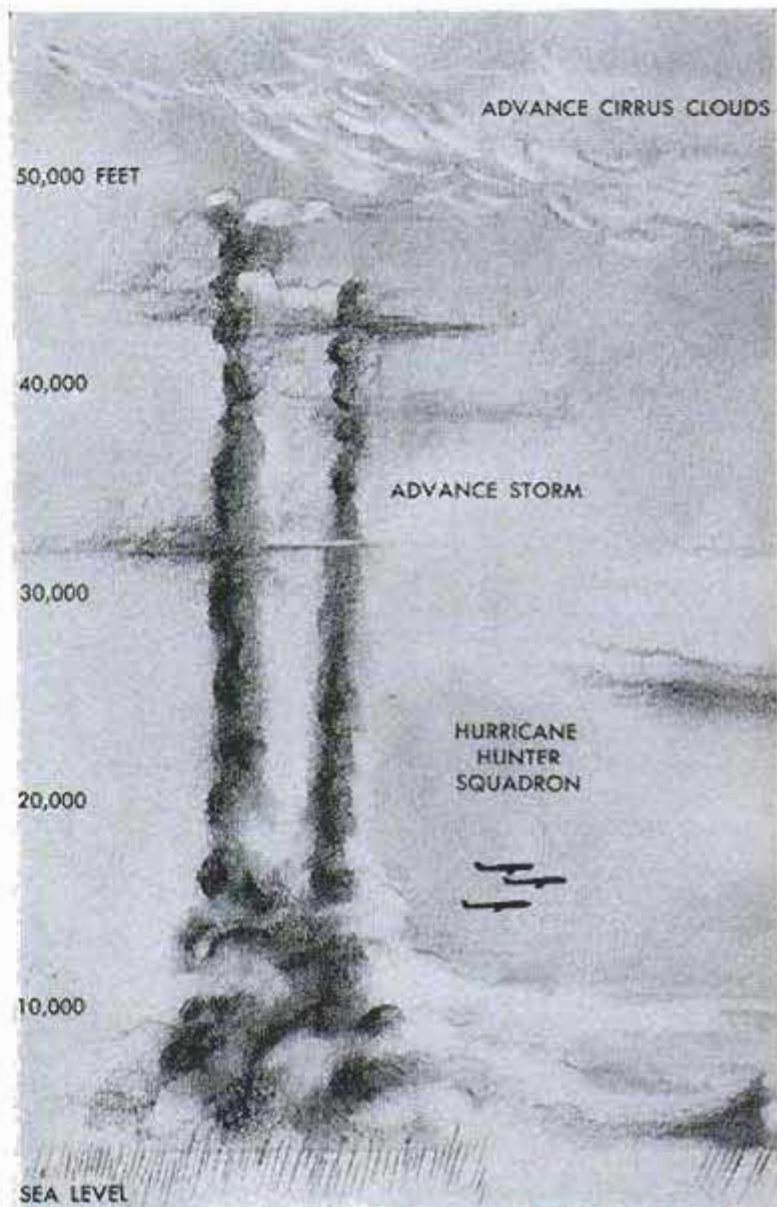


Scene of hurricane devastation in Connecticut was caused by storm that started in faraway Caribbean area

which a hurricane might sneak (see diagram page 106). When complete, any hurricane within 200 miles of shore will be clipped firmly to an electronic leash. "Once a storm is within range," explains Rockney, who is in charge of the weather-radar chain, "we'll have a continuous horizontal cross-section picture of it from then on. By tracking and timing its image across the scope grid we can calculate how fast it's moving and in what direction. We'll know exactly where the eye is at all times. Barring crazy shifts in direction, forecasters will be able to tell within a few miles and minutes just where and when she'll hit the coast. They can warn what direction winds will be blowing in different areas, and how hard. As the storm passes beyond range of one station, it will be pitched along to the next radar up the coast."

Reason for the big network is the hurricane threat to expensive East and Gulf Coast real estate. Not for nothing has the Atlantic Seaboard been dubbed "hurricane alley." Any doubts about the name fitting blew away in the big wind last August when Diane, fourth hurricane of 1955, smashed into the Carolinas. She sent people fleeing resorts and piled up seas that lashed and inundated the coasts. Roaring across northeastern states, her deluges turned placid streams to raging torrents, burst dams, crumbled concrete and steel bridges, thundered over factories and cities leaving a desolation of waste and death behind. In 24 hours she claimed 400 lives

(Text continued to page 252)





Airman inspects dropsonde that is dropped through storm by parachute and sends information by radio

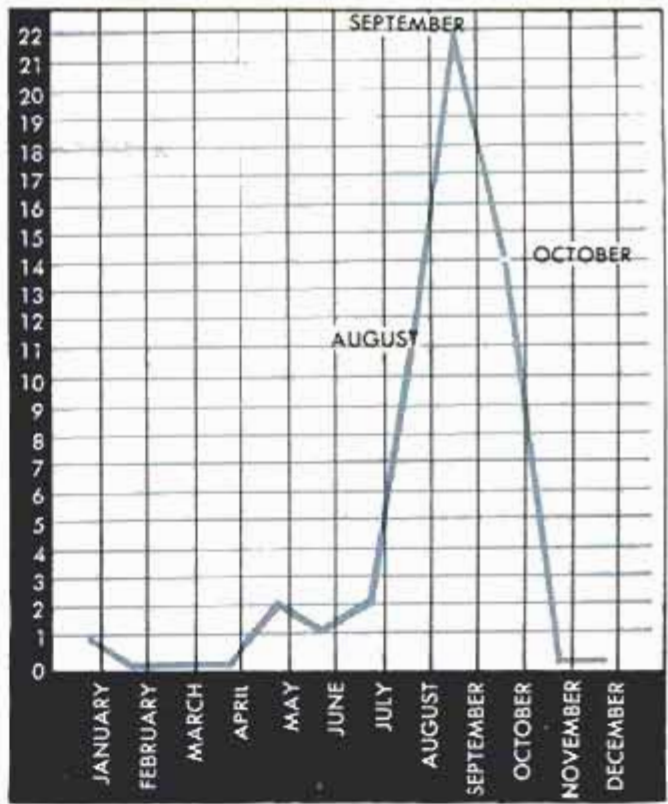
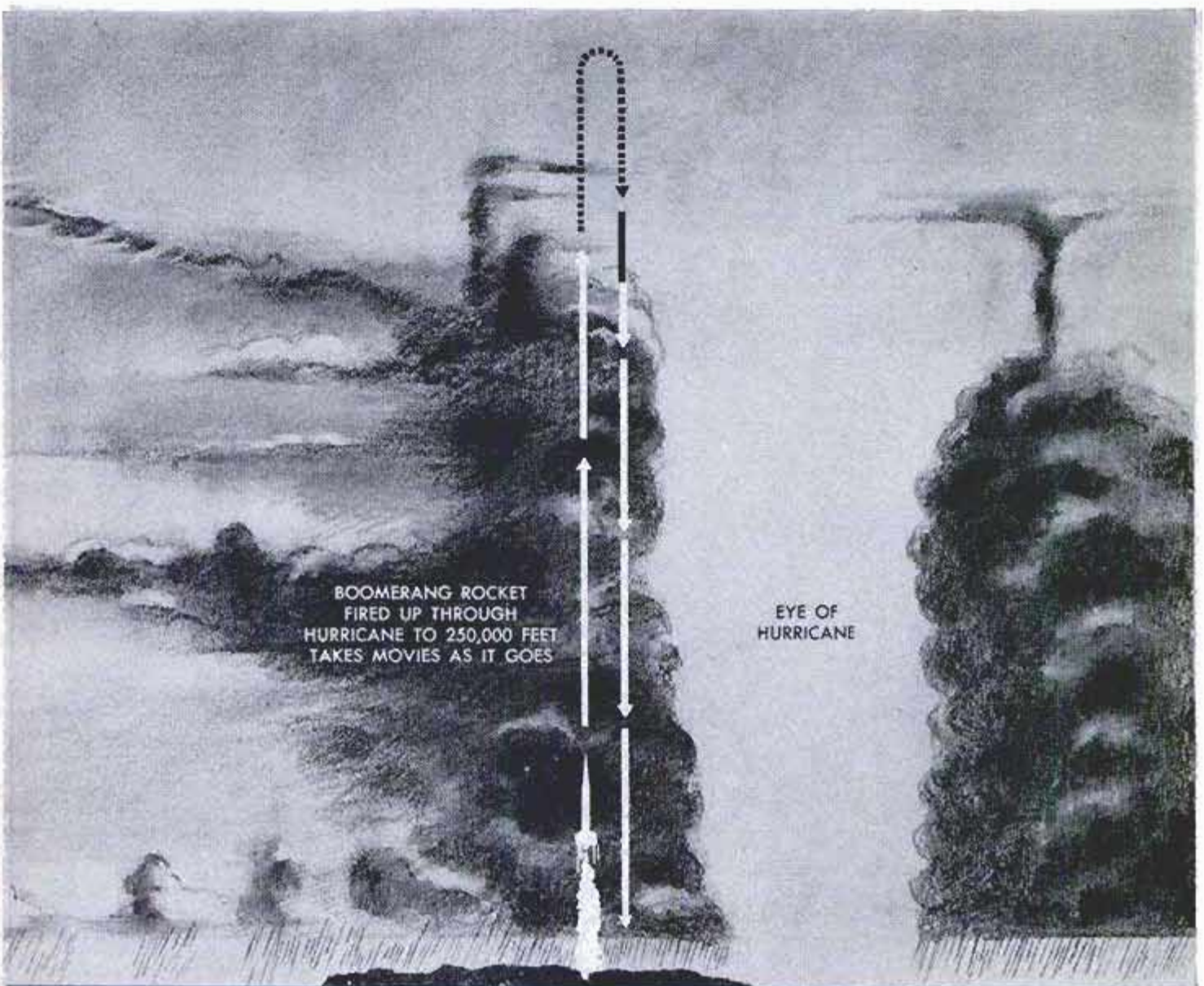


Chart shows 60-year frequency of hurricanes. Below, artist depicts scope of hurricane on ground, sea, air



BOOMERANG ROCKET
FIRED UP THROUGH
HURRICANE TO 250,000 FEET
TAKES MOVIES AS IT GOES

EYE OF
HURRICANE

CARIBBEAN ISLAND



Home Switchboard

Designed as a toy, a miniature switchboard can also be used as a telephone system within the home or between the house and outlying buildings. The set includes the switchboard, an operator's phone and one extension phone with 50 feet of wire. Three additional extension phones may be purchased and hooked into the system. To

call, the extension-phone user pushes a button on his phone. The light for that extension goes on at the switchboard, a signal flag drops and a bell rings. The operator then inserts the correct plug, presses a button and talks. The operator may also ring any extension phone. The system is powered by four flashlight batteries.

Log Shelters Serve as Havens for Fish in Wisconsin Lakes

Brush-filled "fish shelters" made of trussed logs are boosting fish population in Wisconsin lakes. Weighted with rocks and

placed on the ice during the winter, the shelters sink to the bottom with the first spring thaw. In clear lakes with few weed



beds or other hiding places, the shelters act as natural refuges for small fish. Large fish lurk outside the shelters to catch small fish that carelessly venture out. The resultant concentration of rock bass, perch, walleyed pike and other fish makes for better angling. Buoys are placed over the structures in the better-stocked lakes as guides for fishermen. The shelters, built by the state conservation department, are up to six feet high and 20 feet square. They are usually deposited at a depth of 10 to 15 feet in the clear, open water of the larger lakes.

THIS BUSINESS moves so fast in some directions that it becomes confusing at times. Already some of the dream-car styling tricks are obsolete, many others will be obsolete by this fall!

The Chrysler Plainsman, a dream station wagon, doesn't even have push-button shifting, an item that is standard on Chrysler products for 1956. The reason: When the Plainsman was styled by Chrysler about two years ago and the drawings sent to Italy for actual construction of the body, the corporation hadn't decided to switch to push buttons. So the 1956 dream car has a transmission shift arrangement that is already out of date!

The same situation holds in styling. The Plainsman and the other Chrysler dream cars now being displayed around the country will look very, very old-fashioned when the 1957 models come out this autumn.

Fact is that styling is moving so fast that nobody dares to predict more than a couple of years ahead and it takes that long to build an operating dream car.

General Motors plays it safe. Its dream cars don't have to operate. They are built up only a few months prior to actual showing. Being plastic-bodied and nonfunctioning, they can be finished quickly. But Chrysler's dream cars are drivable. In fact, they go out on the test track after their "circus days" are over.

GM has one operating dream car this year, its Firebird II. It has an air-oil suspension system that is not unlike the suspension used on the production Citroen DS19, France's newest car and, incidentally, the car that stole the show at Chicago in January.

Turbines Coming?

There's a lot of talk about turbines (as in the Firebird) and their future use in the family car. Don't expect them overnight. Engineers in convention at Detroit predict that the next step may be the free-piston engine which is sort of a hybrid, combining features of turbine and pistons.

Experts are still betting that the reciprocating engine will hold its top position for several years at least. The reasons are economic as well as scientific.

In its present state, the gas turbine operates at 30,000 to 40,000 revolutions per minute. It consumes fuel voraciously. It has an irritating whine and runs at such high temperatures that it creates insulation problems. In addition, of course, there is the extremely high cost of producing the turbine blades of a very expensive metal.

Prof. A. K. Lahti of the University of Michigan told the Society of Automotive Engineers that today's cars are too small for long family trips and yet too big for

Detroit Listening Post



By Leo Donovan

daily use around town. They are neither fish nor fowl, he implies. His solution is for each family of the future to have two cars—a highway cruiser, perhaps gas-turbine powered for the long trips, and a small runabout, perhaps electric powered for around town.

How to Get in

You can expect early introductions of 1957 models—all out by December 1, probably. One worry at the moment seems to be: Can the public bend over far enough to get inside the 1957 bodies? They will be so low that you will have to be a gymnast to get in gracefully. That is why the dream cars are showing roof panels that open.

We missed the bull's-eye a bit on the Chrysler 300B. We predicted 330 horsepower and a new three-speed automatic transmission. Horsepower turns out to be 340 and the new transmission failed to arrive in time for the 300B's introduction. It will be out in midseason (maybe even by the time you are reading this) on the 1956 Imperial. The new transmission will make an extra button necessary on the push-button console. There will be five buttons instead of four as presently.

Two cars offered by the so-called independents seem to be doing even better than expected in sales: The Rambler and the Studebaker Hawks. Rambler sales for the first few weeks are up about 20 percent over last year and are expected to increase as the cars become more available. Studebaker is months behind in supplying Hawks to customers and has had to set up a separate assembly line for Hawks.

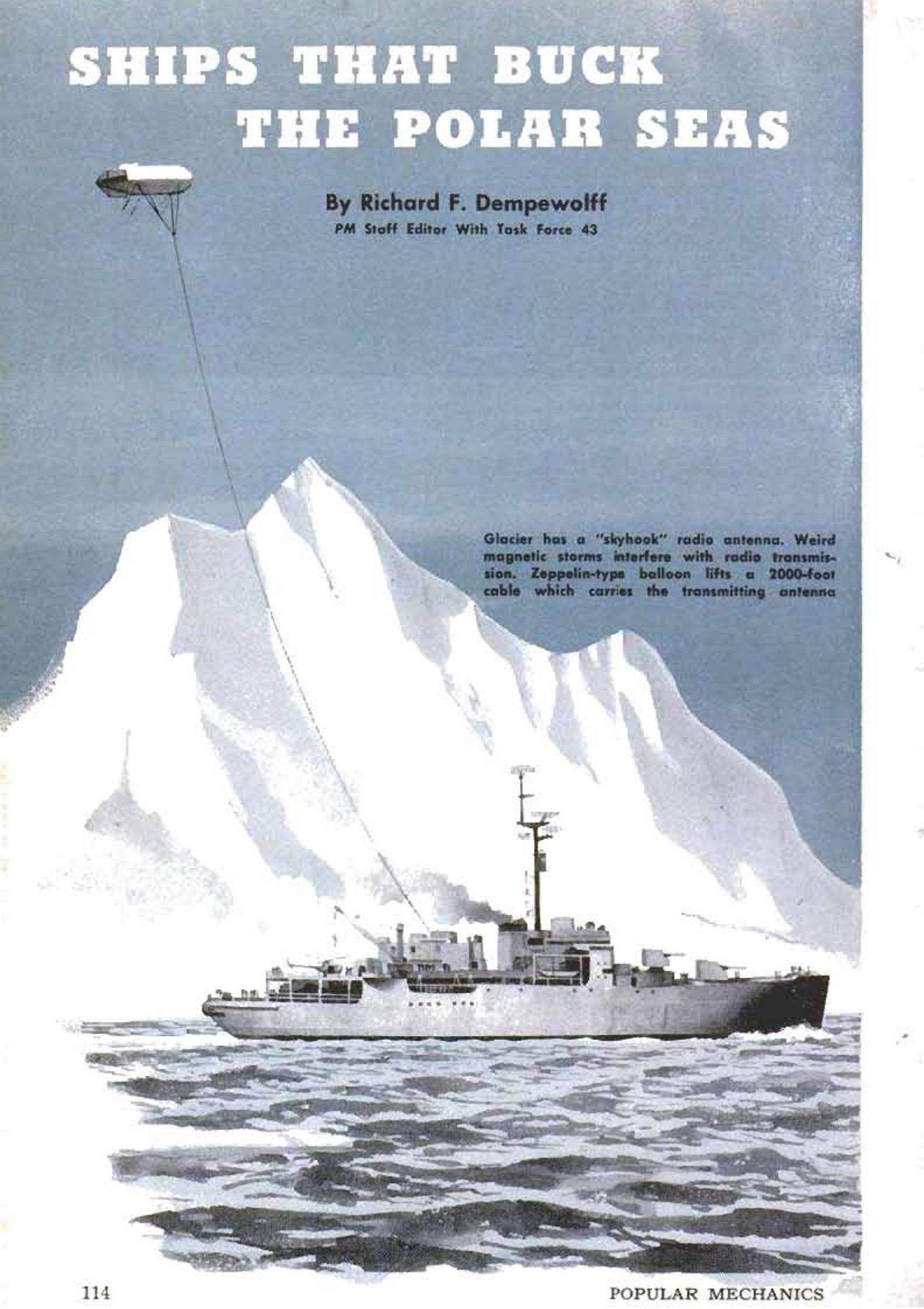
Plymouth seems out to take the "hot one" tag away from Chevrolet. Its 240-horsepower Fury set a new record in acceleration runs at Daytona, beating the 1955 Cadillac record. Top speed for the Plymouth also set a record in its class: 124.01 miles per hour. The Fury has 303-cubic-inch displacement, considerably more than the 277 cubic inches in stock Plymouths.

FLASH: A 1956 Corvette averaged 150.5 miles per hour for one mile at Daytona.

SHIPS THAT BUCK THE POLAR SEAS

By Richard F. Dempewolff

PM Staff Editor With Task Force 43



Glacier has a "skyhook" radio antenna. Weird magnetic storms interfere with radio transmission. Zeppelin-type balloon lifts a 2000-foot cable which carries the transmitting antenna



Icebreaker *Edisto* accumulated this tremendous load of ice on her five-inch mount during previous expedition

WITH GRINDING JOLTS, the squat bow of the USS *Glacier* rode up on endless fields of snow-covered blue ice six feet thick, forming the great antarctic pack. Fissures opened ahead of us like ragged fingers as the 8300-ton icebreaker crashed through to force her own leads in the jam. The forward crew's quarters reverberated to the thunder of multiton chunks of ice whamming the ship's tough hull of two-inch nickel steel.

After 386 miles of broken pack we were in the cold rock-hard ice whose crannies glow with pale blue luminescence. Up on the heated bridge, insulated against the crackling polar wind, Comdr. Eugene "Pat" Maher, captain of this rugged ship, moved back and forth quietly issuing speed and heading orders. High on the mast in a heated crow's-nest the "ice con" peered ahead for cracks or leads into which the *Glacier* could ram her tough steel prow, and reported what he saw via intercom. Over the radio speaker on the bridge came the garbled voice of a helicopter pilot, flying ahead of the ship on ice reconnaissance and reporting on open water miles to starboard.

Ahead of us lay Beaufort Island—last snowy rampart at the gateway of Antarctica. Beyond, muted by polar haze, the blue-white heights of Mount Erebus thrust a plume of volcanic steam into the frigid sky. The foot of that monolith was our first destination on the most ambitious penetra-

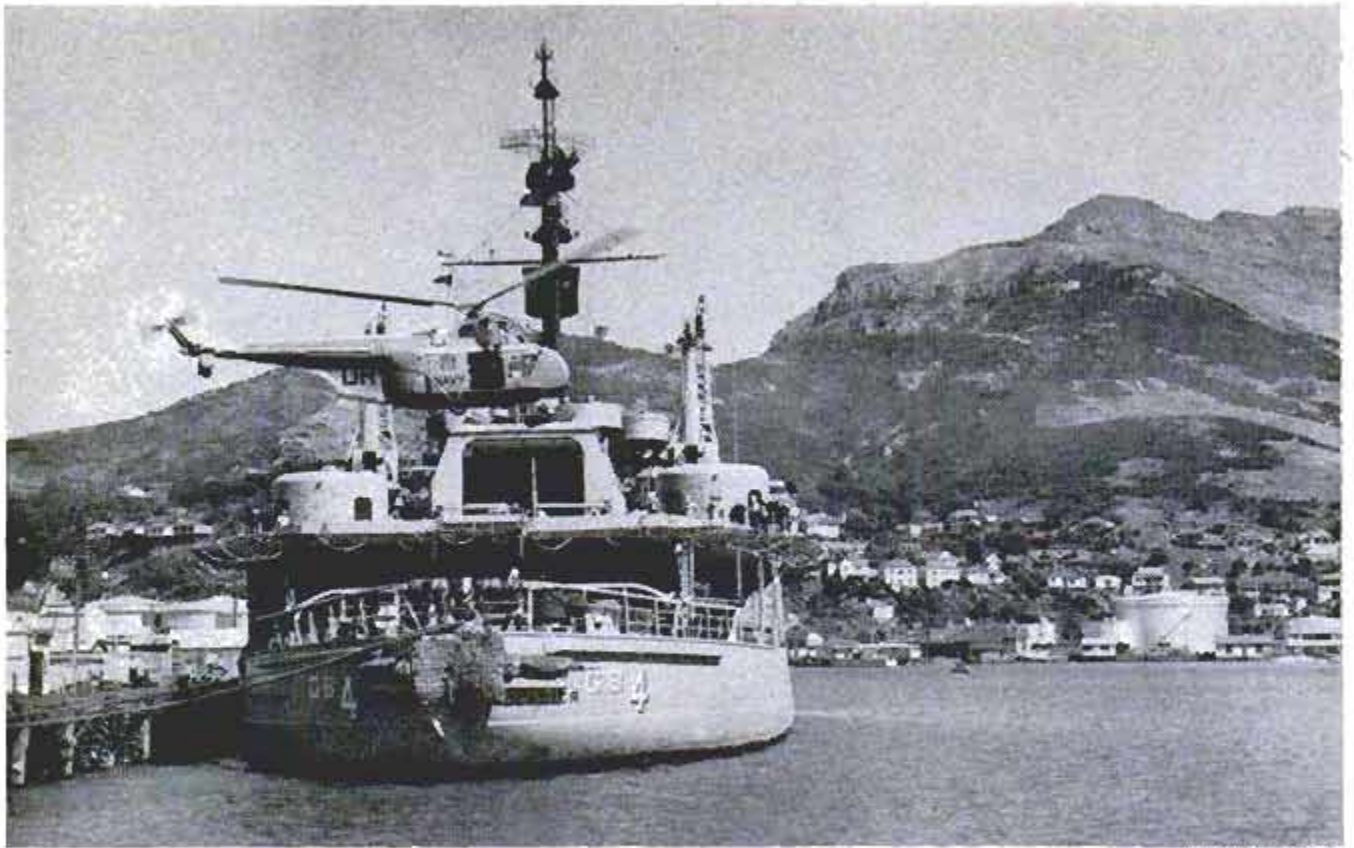
tion of the great white continent ever attempted.

The *Glacier* was a jam-packed ship when she headed for the ice pack from New Zealand last December. Instead of a normal complement of 339 her quarters bulged with 400, including polar experts, a special polar Seabee outfit, a helicopter squadron, scientists, correspondents, photographers and military observers.

Polar diesel oil, 100,000 gallons of it, sloshed in her big heeling tanks. More than 600 tons of extra gear spilled over the decks. Two helicopters and an Otter jammed the hangar deck. Well decks and fantail were a jumbled mass of bright orange Weasels, Snocats, tractors, sleds, skis and thick bamboo poles to make trail-marker flags for antarctic snowfields. Behind us sailed a string of other ships—all similarly loaded.

Everything will be used. The *Glacier* is the spearhead of Adm. George Dufek's Task Force 43, a seven-ship fleet for Operation Deepfreeze under Rear Adm. Richard E. Byrd, officer in charge. Our mission is to plow a furrow through the polar ice pack to the white coast of Antarctica, where foot parties and tractor trains will explore unknown highlands, find sites and build bases for United States participation in the International Geophysical Year (see *Popular Mechanics*, November, 1955).

Last fall during the preparation to get Deepfreeze under way, *Popular Mechanics*



U.S. Navy photo

Helicopter comes in for a landing while *Glacier* is moored in New Zealand before rough trip to Antarctica

was invited to ride the Navy's newest, biggest and most powerful icebreaker on its rough maiden voyage as lead ship of the expedition. The journey promised to test her full punch in the world's toughest ice.

Modern icebreakers are a special breed of vessel manned by a special breed of

men—a far cry from the tiny wooden ships like the famous 700-ton *Terranova* in which Robert Scott bucked antarctic seas in 1910. For 38 cruel days Scott's ship was tossed by windlashed polar seas, racked by ice and fire, and badly swamped. Men worked waist deep in freezing water, throwing off

Icebreaker knifes through ice, splitting it to open up a channel for the convoy ships strung out behind



tons of coal to stay afloat.

To Scott, the *Glacier* would be a steam-heated luxury cruiser. Her thick hull can bounce off any ice, and freeze in without danger of being crushed. Layers of cork and glass wool insulate her against polar winds and water. It's hot, not cold, below decks. Tanks carry fuel enough to take us around the world nonstop and big freezers hold fresh food—enough to feed all on board for a year. Fresh water is no problem. The *Glacier's* own plant turns 1600 gallons of sea into fresh water daily, eliminating the need to scout polar seas for rare fresh-water ponds on the ice floes. A store, a barbershop and an air-conditioned hospital with complete facilities for surgery and X rays give us the feeling of belonging to a small community. Above the fantail sit the flight deck and hangar for two seven-passenger helicopters. To unload ship, cranes lift the removable flight deck away, exposing the holds below.

In spite of all that, ice-breakers are still the roughest, toughest ships afloat, and duty aboard them calls for a rugged constitution. Their job is forever to batter through white storm-ridden seas, bucking the howling darkness of the long polar night. In past years they opened sea lanes once frozen solid 9 out of 12 months. Day after day they grind through ice 15 feet thick, smashing open jeweled waterways. Behind trail convoys of thinner-skinned ships to feed the hard-won ports in polar lands, and open the way to build new ones.

The world's iceboxes are growing more important every year. Outposts of Dewline—the farflung Canadian-American radar defense net—spatter the Arctic with fine disregard for accessibility. A dozen new weather stations operated by Canada and the United States across the arctic islands must be supplied and fed. Greenland's ice-bound coasts swarm with new bases. It's the job of the icebreaker to keep these outposts alive.

Nine breakers work polar packs for this country today. Five are under Navy command, including the *Glacier*, the *Burton Island*, *Edisto* and *Staten Island*. Sailing



Supply ships of a previous expedition tie up to "dead men" sunk into the ice shelf. Then cargo nets start dipping out tons of supplies

under Coast Guard captains are the famous "Wind ships"—*East Wind*, *West Wind*, *North Wind* and the smaller lake icebuster *Mackinac*. Each looks as though someone trimmed up its lines with a meat ax.

The Wind ships, at 269 feet, are shorter than destroyers but wider than cruisers. Though the mammoth *Glacier* stretches to 310 feet she looks no different. Her generous beam spreads to 73 feet, enabling her to carve a broad highway in the ice for a convoy to follow. "She sits in the sea like a watermelon," one crewman aptly describes her. What's more, I know from experience that she behaves like a watermelon on the open ocean. Her round bottom lacks the stabilizing keel found on other ships. In polar seas where violent storms are the rule, she heels sickeningly with fast spasmodic rolls for days on end. On the run to Antarctica the *Glacier* spent nearly a week rolling wildly in a 35 to 40-degree



Icebergs are a great menace even to the sturdy icebreakers. Skippers move carefully through the big bergs

range. Chairs tumbled across the wardroom deck. Meals and men cascaded into one bulkhead, then bounced off the opposite side. The sleepless passengers and crew wedged books and blankets under mattresses to keep from tumbling out of bed. With every mammoth heave, the frigid sea surged over decks. On the third day the reeling ship swung a record 52 degrees to port then staggered back 48 to starboard, cutting a princely arc 100 degrees across the leaden sky.

Work under such conditions is hair-raising, but icebreaker men thrive on it. Bouncing from stanchion to bulkheads, they weave along decks with reckless abandon. Broken noses, black eyes and purple bruises from colliding with the superstructure are the marks of their trade. During the storm a member of the *Glacier* deck crew happened to be moving swiftly eastward as the gun turret was hurtling westward. They met head on. Despite concussion, he was sitting up smiling in a few days, looking at pictures of the ship entering the pack which he missed during his lengthy coma.

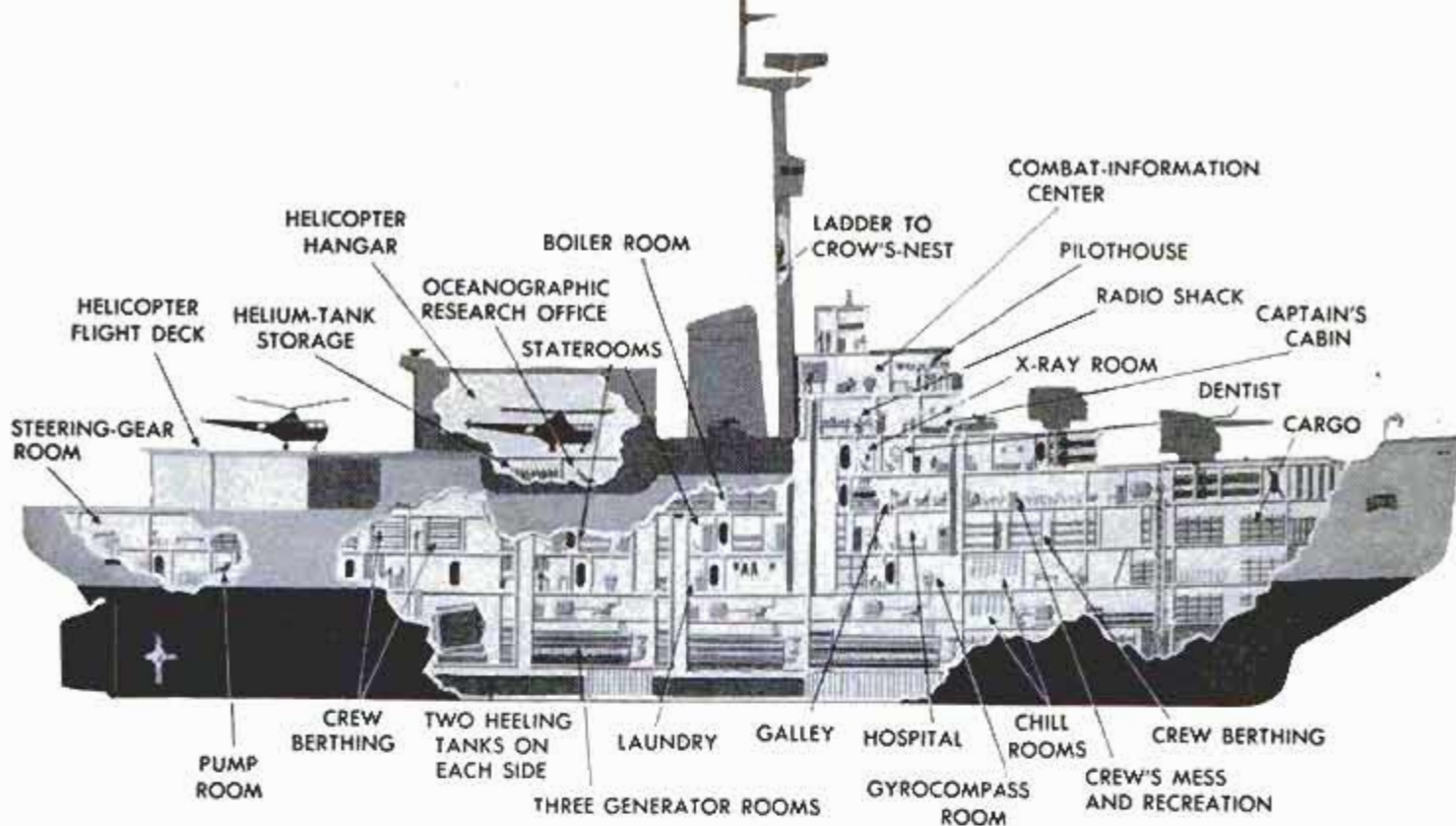
Once in the white pack for which she was designed, however, the icebreaker's ponderous weight and smooth round hull stand her in good stead. Her eight-inch steel stem reinforced by a massive buttressed spine of four-inch plate rams cold blue floes with devastating effect. That stem angles back at the water line, and in heavy pack she heaves up over the edge of the ice, crushing it downward in mighty surges. A sharp

step at the base of the bow gives the ice an additional crack. *Glacier's* ten big diesel generators driving two electric motors shove her into ice with a 21,000-horsepower wallop. She can crack through ice up to 30 feet thick.

I have seen her with one Gargantuan push cleave off a solid 20-acre chunk of hard blue ice five feet thick in McMurdo Sound and grind around into the crack she made, nudging the stupendous floe aside. Her stubby length gives her tight cornering ability to follow tortuous leads through the pack.

The heavy polar pack has one admirable feature. Generally it holds the heaving ocean flat. Hence the icebreaker crews, battered by weeks of pitching and rolling, become ecstatic over the prospect of nosing into the bitter cold grind of the ice world. The ship levels out. She heaves, jolts and trembles as heavy chunks nudge the bow this way or that. Now and then she may grind to a halt, back off and ram back into the wedge that stopped her.

Ice skippers will tell you the pack isn't always so kind. Up on the bridge, peering out on antarctic scud, Captain Maher recounts a terrifying example. He had taken *Edisto* up to the Arctic in the winter night of 1948 to see how far north she could crack her way. "We were off Greenland's sea coast," he recalls. "It was a brutal night with a howling 90-knot wind and zero visibility. The sea had been wild for days. Everyone was fed up with being lashed to his bunk or stanchion, so I turned and



Glacier is the pride of the icebreaker's fleet. She's equipped with two helicopters and the finest instruments

headed into the pack for relief. We got in, but instead of flattening out, the wind and sea had broken the ice into 100-foot blocks and swept them into a grinding heaving mass of treachery. We were trapped in the pressure. All night gigantic cakes hurled against the ship in a thundering barrage that sounded just like shells exploding. Everyone prayed. No one undressed, though if we had sunk our lifeboats would have been crushed like eggshells. One of those big blocks over the deck would have swept away our entire superstructure. A curious thing saved us. Hurling cakes smashed apart against the sides and formed a cushion of chopped ice around the hull and allowed us to ride it out intact, except for mangled boats and deck gear."

Freezing in the pack is no problem for an icebreaker. An ordinary hull trapped in ice would crumple under pressure. But a breaker's round bottom is squeezed upward out of the pack as pressure closes in. This design was first tried on the Norwegian sailing vessel *Fram* in 1893. To test it, her hardy skipper froze her in the arctic pack that year, drifting with ice across the North Pole. Three times she squeezed out of the ice before she melted free near Spitzbergen three years later, sound and whole. Today she sits in the Oslo

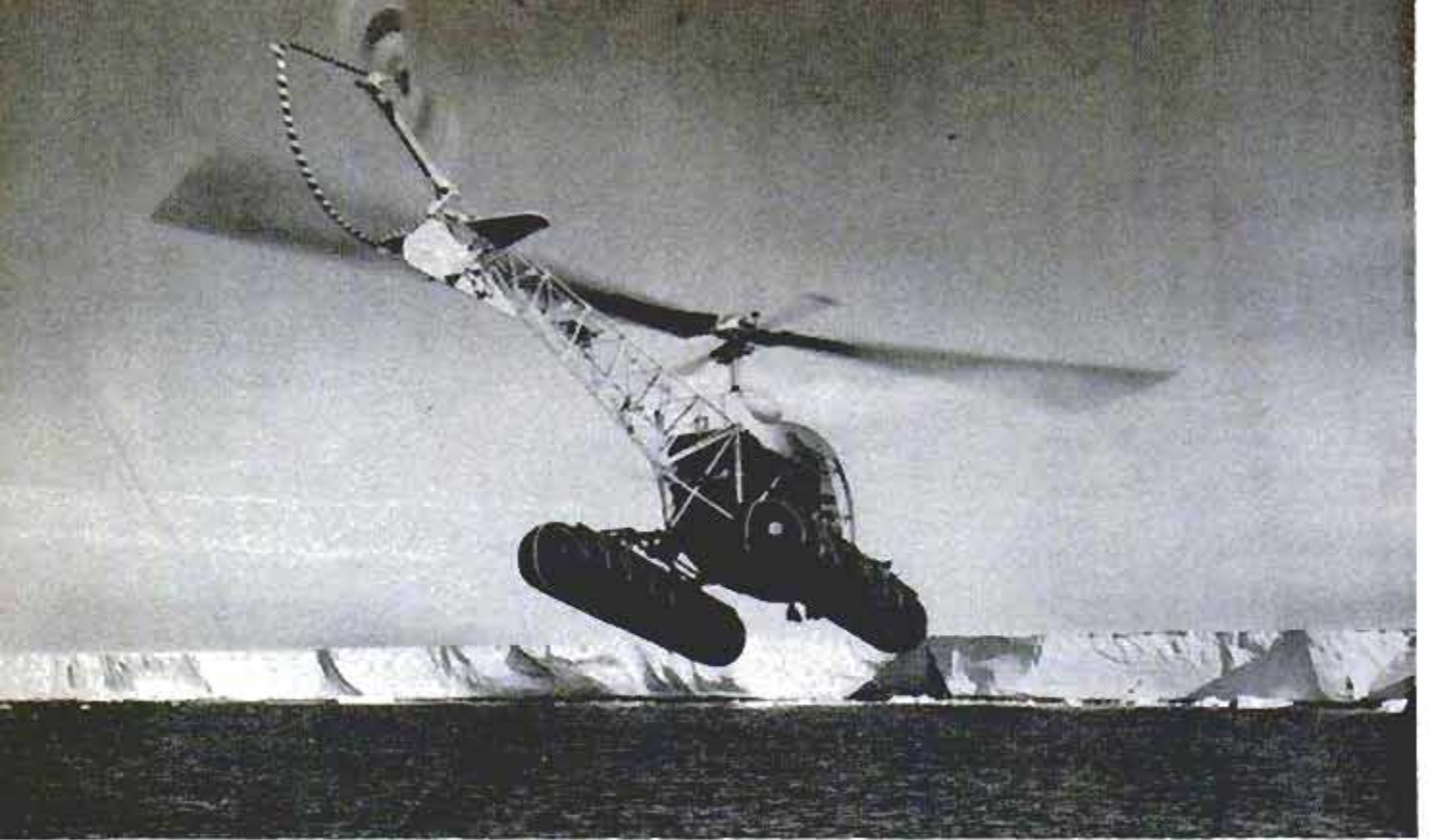
Crew member strips thick layers of ice from a bulkhead on the ship's forecabin with a turbojet de-icer

Museum as a tribute to her designer.

Most interesting place on the breaker while bucking ice is the bridge with its row of double-paned windows kept clear of ice by a current passed through electrolytes in the center. Jets of hot water and fanning wipers brush away slush. Here in the nerve center the ship bustles with activity as she gouges along. Radar sweeps throw eerie light as they pinpoint bergs beyond the horizon.

Speakers and phones blare ice data from lookouts. Officers compare notes. The muted talk is another language. Ice is never just ice. Small chunks of green glacial ice through which the ship thumps without notice are "bergybits" or "blocks" or "cubes" and a motley, loose broken pack can be made up of "brash," "cakes" or "drift ice." When compacted by wind or running sea to make solid ice prairies across the sea it becomes "field ice" that





Helicopter leaves the deck of an icebreaker for an exploratory trip over the thick ice shelf of Antarctica

can be "rafted" or rumpled and overlapped where pressure heaves great pieces atop each other. When a thick sheet of solid ice is frozen fast to the bay shore it's called "fast" ice.

Up in the enclosed crow's-nest, reached via ladder inside the hollow mast, the ice conner doesn't look for open water; he looks for "polynyas"—open lakes in the ice mass. To find them he may study the sky instead of the sea, watching for signs of "water sky"—a blue reflection in the clouds from open water beyond the horizon. He alerts the bridge to avoid "ice blink," bright patches in the clouds reflected from glaring white ice and bergs below.

Twice below the Antarctic Circle we ran through armies of huge icebergs riddled with fluorescent blue caverns big enough to serve as airplane hangars. Some towered a hundred feet above the sea, indicating submarine basements twice as deep, with hidden rams or projections to trap the unwary. These monsters, some of them miles across, had broken from the last ice barriers on the Antarctic coast and floated north.

The *Glacier* steered a wide course around them. A single chunk breaking off or "calving" can weigh half a million tons and would smash this stout ship like a soup can under a sledge hammer.

We were treated to a spectacular sight one afternoon when, dead ahead, appeared a flat-topped iceberg more than three times the area of Manhattan Island! The berg measured at least 10 miles by 10 miles, and had a cliff 150 feet high. This convinced

some of the experts aboard that the berg extended 900 feet below the surface.

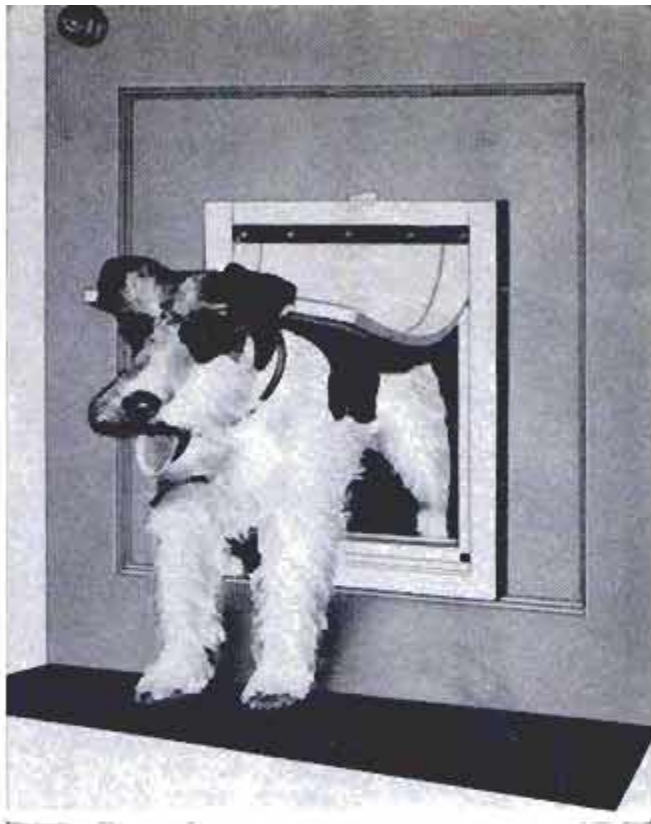
Maher's rule book for ice navigation is simple and direct. "The trick is to go around the big cubes," he says. "In close pack we hunt for leads and wedge king-sized floes apart. It's seldom necessary to bulldoze through. An ice captain develops a firm but respectful approach."

Following these principles, the *Glacier* whammed through five to ten-foot open pack at a steady 15 knots. And in the eight-foot fast ice of McMurdo Sound she rammed, backed and rammed again, crunching along an average ship length per sock.

"The secret is to have a place for the ice to go," explains Maher. Broken pack is easy because the bow wedges into big floes and shoves pieces aside. The vast plains of ice reaching to the horizons are tougher. Great crumbling cakes glide under the hull and tangle the propellers, are churned like cubes in a kitchen blender and have been known to smash a blade. "When you're thousands of miles from a shipyard and battling the pressure pack it's no time to lose a paddle," Pat Maher points out. He should know. "When I was new in the ice," he says apologetically, "I clipped a big cube too hard, snapped two blades and bent the shaft in the housing. Getting out of there was touch and go.

"Actually a broken prop is usable but the stern humps around at certain speeds. And to turn the ship away from the crippled screw you must bounce the bow off big

(Continued to page 266)



Rubber Dog-and-Cat Door Closes Behind Pets

Dogs and cats can enter and leave the house through a swinging rubber door set in the bottom panel of a regular door. The rubber curtain hangs in a wooden frame that is easily installed in any flush panel. Six permanent magnets immediately retract the swinging door to keep out insects and drafts. Sliding wooden panels close up both sides of the pet entrance when no use is being made of it.



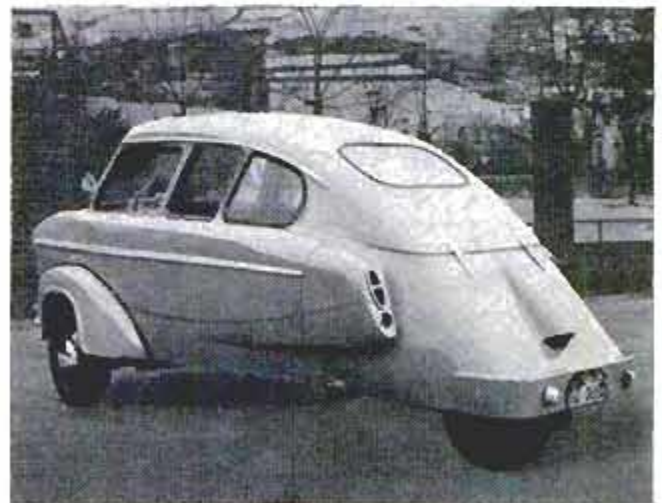
Sticks Moved With Head Guide Powered Wheel Chair

Paralyzed persons who can move only their neck and mouth can operate a wheel chair designed especially for them. A patient operates the chair with a stick held in the mouth. By touching an extended stick with his nose, he can operate forward and reverse controls. A portable respirator can be carried by the electrically powered chair. Inventor Ed Tilden Adkins used discarded airplane and jet parts in the unit.

Three-Wheeled German Car Has All-Plastic Body

Powered by a tiny engine, a small German car has an all-plastic body. The 9.5-horsepower engine is mounted directly above the single rear wheel of the three-wheeled vehicle. Entrance into the plastic body is through a door in front. Two per-

sons can ride in the front seat and one adult (or two small children) in the rear. It will turn around in a 10-foot circle, making it an ideal car in congested areas and for parking. Called the Meyra 200, the car has a top speed of 50 miles per hour.





He Built a Locomotive

By Robert Van Der Velde

OF ALL THE HOBBYISTS today building model railroads—and the estimates run up to 50,000—E. E. Palmer probably holds the world's record for constructing the largest locomotive. It is so big that an entire building on U. S. Route 30 just west of Wooster, Ohio, had to be erected to house it.

"She's really a monster," boasts the 83-year-old railroad enthusiast, "about 40 feet long and more than 11 feet tall. The boiler alone is 18 feet in length and has a circumference of 14 feet."

Even to the forewarned visitor the actual sight of it comes as a shock. Inside the Palmer residence—which resembles a fire station sandwiched between two old railroad cars—the huge engine and its tender tower almost to the ceiling.

Old 999—named to commemorate the New York Central's record-breaker,—is a copy of no particular locomotive.

At the age of 70, Palmer began work on the ingenious combination of metal, fiberboard, wood and cut glass. Constructing it in his garage, he soon had to tear down the building to make room for his hobby.

Realistic-appearing rivets were made by hammering hundreds of chair-leg gliders into the boiler and bulkheads. A few old gauges from wrecked locomotives lent an air of authenticity to the cab—so much so that visiting engineers have remarked that they "feel right at home up there." Red reflectors give the appearance of an actual fire roaring in the firebox. Powered by an old truck motor, the mammoth model rests

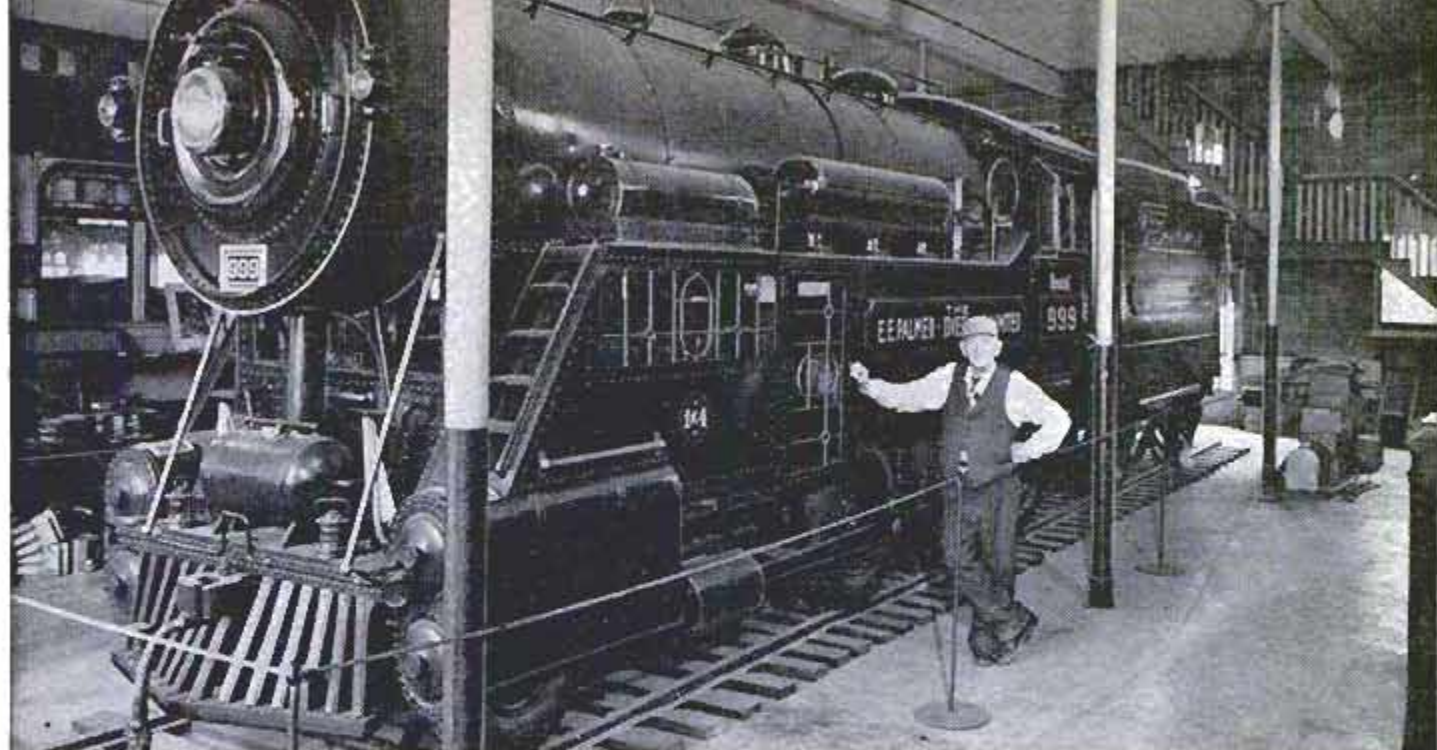
on 12 rubber-tired wheels, and can be driven on the highway "with the ease of an automobile" according to Palmer.

The ex-carnival man, traveling salesman, inventor and one-time "Chipped Glass Name Plate King" has worked at about every conceivable occupation. "But the one I missed was the one I wanted most—railroad engineer," he sighed.

Known locally as the "Locomotive Works," Palmer's house was built especially for the E. E. Palmer Overland Limited. Actual living quarters are squeezed into an ancient railroad car on the right side of the building. Once the private car of some railroad president (even Palmer doesn't know which one), it was according to its owner "one of the most ornate ever to glide over the rails." Its antique atmosphere of faded carpets, dangling chandeliers and fringed curtains delights Palmer and, though wealthy, he would live nowhere else.

Attached to the left side of the main structure, an old interurban coach purchased for \$80 serves as workshop and office for Palmer's name-plate business. In the old relic, which once ran on the old Northern Ohio Traction between Cleveland and Akron, he continues to manufacture chipped glass, sparkling signs and house numbers by the method he patented in 1898.

"During one holiday week end some 300 visitors came to see me and my monster streamliner," he says. Then with a shrug he adds, "But after all, what's more fascinating than a trackless locomotive! ★★"

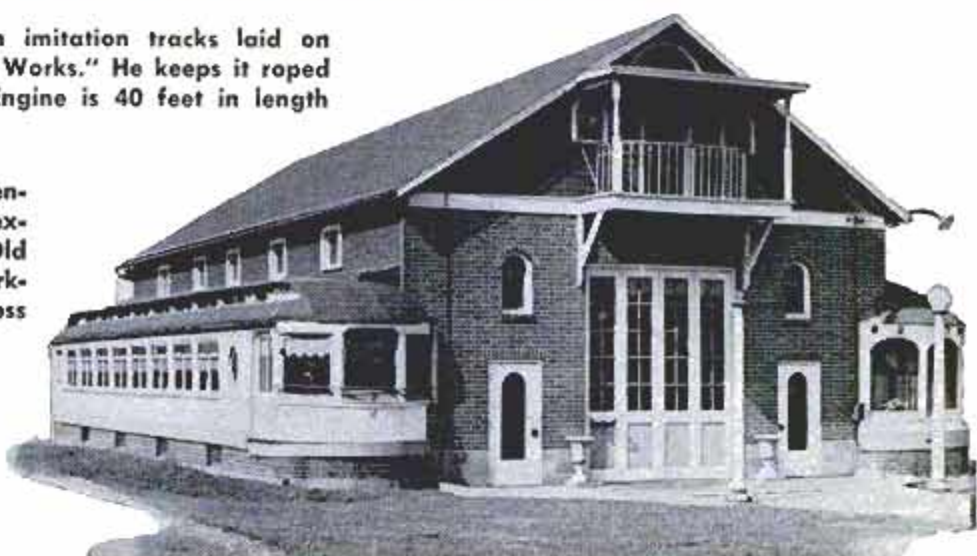


for a Roommate

Palmer's locomotive rests on imitation tracks laid on the floor of "The Locomotive Works." He keeps it roped off like a museum exhibit. Engine is 40 feet in length

Old railroad cars flank the engine's house. Palmer lives in ex-private luxury car at right. Old interurban coach at left is workshop for name-plate business

Below, left, Palmer relaxes in his living room—antique and ornate railroad car. Right, fitted with old gauges, cab of Palmer's engine has an authentic air



OWNERS REPORT:

Who knows most about a car? Its owners? The automotive engineer? Or the experienced road tester? *Popular Mechanics* lets you hear from all three in this report on the 1956 Lincoln

What do owners like best about Lincoln?

"Handles with no effort and I feel no fatigue when driving!"	NEW JERSEY DENTIST	HANDLING EASE	48.3%
"Beautifully designed automobile that puts competitors to shame. Simple yet dramatic and definitely new."	NEW YORK ARCHITECT	STYLING	46.9%
"I like the easy way it gets around curves and up hills and mountains."	VIRGINIA CONTRACTOR	PERFORMANCE	41.4%

What do owners dislike about Lincoln?

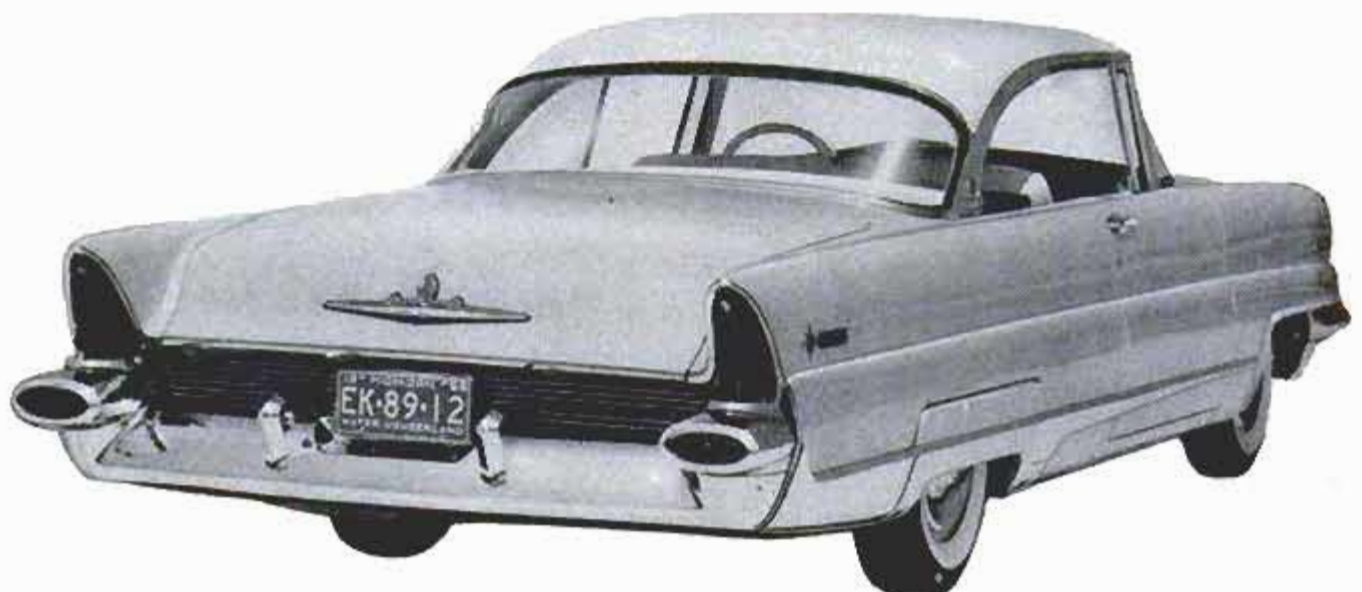
"Very poor assembly quality. Sheet metal not well finished prior to painting. Imperfections show."	MICHIGAN MANUFACTURER	CARELESS ASSEMBLY	32.9%
"Trouble with squeaks, rattles and leaks. Coach work could be better."	CALIFORNIA PHYSICIAN	BODY NOISES	15.4%
"Displeased with our dealer service. They do not take care of a customer the way they should."	CALIFORNIA CONTRACTOR	POOR DEALER SERVICE	14.9%

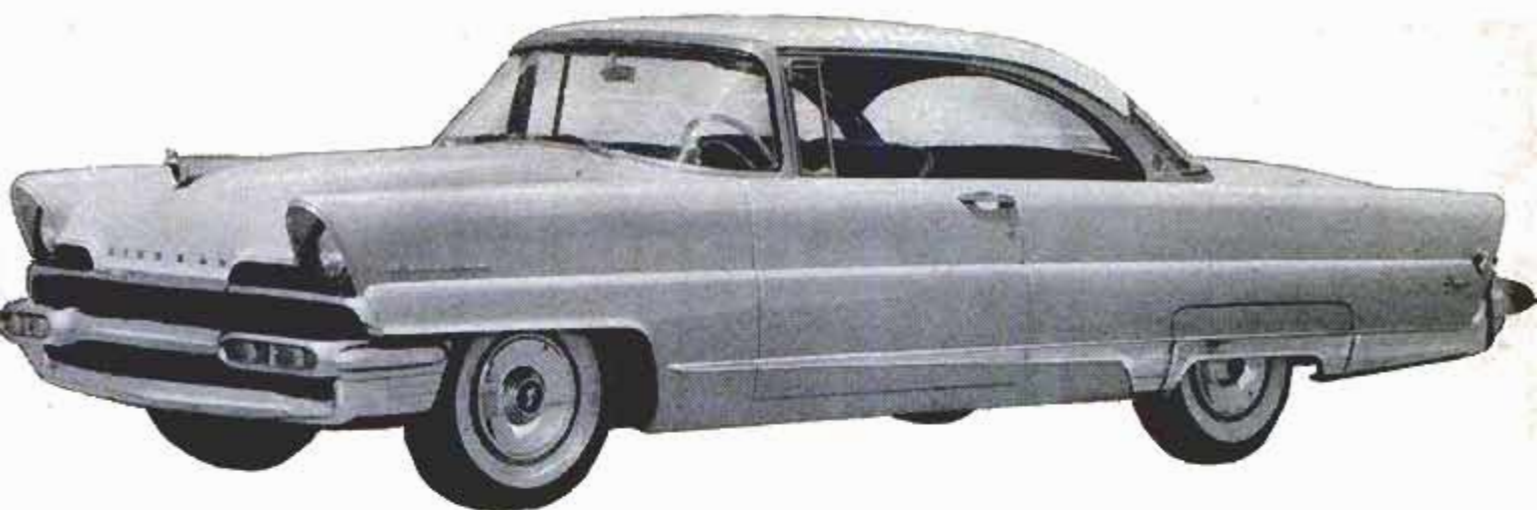
What was most popular reason for buying Lincoln?

"We bought our Lincoln because it looks beautiful."	NEW YORK HOUSEWIFE	NEW STYLING	37.4%
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What do Lincoln owners say about seat belts?

"Had them on my last car and I transferred them to this one. Would not be without them."	CALIFORNIA INSURANCE BROKER
"Fine for trips but can't always remember to use them around town."	KANSAS SALESMAN
"Careful driver does not need belts."	GEORGIA RETIRED OWNER
"Belts don't interest me. Just something to talk about."	ILLINOIS MANUFACTURER





Lincoln Owners Praise Handling Ease Despite Increased Size of 1956 Model

As Told by Owners of 1956 Lincolns

LINCOLN is all new for 1956. It is longer, wider and heavier. But Lincoln engineers have accomplished a miracle, say owners. Despite being bigger, the new Lincoln is outstanding in its ease of handling.

Almost half of the owners in the survey list handling ease as the best-liked feature (48.3 percent).

"It has the looks and ride of a large, fine car, yet retains handling and agility of a light car."—Washington farmer.

"Handles easily. Parks like a small car."
—California housewife.

"I feel no fatigue in driving."—New Jersey dentist.

"My 4-foot-11-inch wife can drive it with ease."—California foreman.

Only a whisker behind handling ease in the list of best-liked features comes styling. Lincoln is one of few 1956 models that have completely new exterior styling and the owners are enthusiastic about it, with 46.9

(Continued to page 126)



CLYMER ROAD TESTS THE 1956 LINCOLN

By Floyd Clymer

Owners say the new windshield has excessive distortion and this picture seems to bear them out (arrow)

I DROVE the test car, a 1956 Premiere Coupe (Lincoln's top line) 567 miles which included some testing over regular highways, mountain and desert roads. The engine is extremely flexible, with minimum vibration and the economy with high-test gasoline was reasonable for a car of its size and power.

Outstanding is the way it handles at high speeds, in cornering and over rough roads. Part of this is due to the ball-joint front suspension, which I consider excellent. There is a minimum corner roll (slightly more than last year's Capri) for

a soft-sprung, easy-riding car. The car is low (2½ inches lower at roofline than the 1955 model). However, due to more weight and more overhang the 1956 model is more cumbersome and cannot be handled as quickly around corners as the 1955 Capri. In a severe crosswind I noticed more tendency for wind-wander than in previous Lincolns and I'm sure the longer and higher rear overhang helps contribute to this.

The power steering required a little more effort than most power-steering units, having some "drag".

(Continued to page 284)

An Engineer Analyzes the 1956 Lincoln

By Dale Kelly, SAE

Model tested: Premiere two-door hardtop equipped with automatic transmission, power brakes, power steering, power seat and windows, air conditioning. Rear-axle ratio 3.31:1 (measured). Curb weight 4740 pounds with gas tank half full (56 percent front wheels, 44 percent rear wheels).

ACCELERATION



(Time in seconds)
0 to 20 0 to 40 0 to 60 0 to 80 ¼ mile

Ignition timed for regular gasoline	3.6	8.3	14.2	22.7	20.4
Ignition timed for premium gasoline	3.5	8.1	13.6	22.5	20.3

(Watch started instant accelerator floored. Engine was not run up against brakes before the start. Low and Drive ranges were used.)

FUEL ECONOMY



(Miles per gallon)
Steady 30 m.p.h. Steady 50 m.p.h. Steady 70 m.p.h. Traffic Route

Ignition timed for regular gasoline	18.3	14.1	11.9	8.8
Ignition timed for premium gasoline	17.7	14.6	12.4	8.8

(On traffic route, car makes 10 full stops per mile and has an over-all average of 15 miles per hour.)

Estimated Annual Gasoline Bill: \$211 for 10,000 miles of driving. (2000 miles at 30 m.p.h., 5000 miles at 50 m.p.h., 1500 miles at 70 m.p.h. and 1500 miles in traffic, with gasoline priced at 27 cents a gallon regular, 29 cents a gallon premium.)

SPEEDOMETER ERROR



Indicated speed, m.p.h.	20.0	30.0	40.0	50.0	60.0	70.0	80.0
True speed, m.p.h.	18.0	27.5	37.5	47.0	56.5	66.0	76.5

Odometer error: Odometer indicated 2½ percent more than the actual distance traveled (102.5 miles per 100).

DRIVER'S VISIBILITY



Some portion of the road could be seen 17 feet in front of the car (A in sketch) by an average driver (5 feet 9 inches tall); full width of the road could be seen 23 feet in front of the car (B in sketch).

MISCELLANEOUS

Steering: From straight ahead, the steering wheel had to be turned 0.8 of a revolution to complete a circle with an outside radius of 50 feet. Lock to lock, the wheel required 3.75 turns. Turn-circle diameter, curb-to-curb, was 45.4 feet; from wall-to-wall, it was 48.8 feet. Diameter of steering wheel: 18 inches.

Trunk capacity: In addition to spare tire and tools, the trunk accommodated 14 cardboard cartons of size used to ship 48 large cans of evaporated milk.

Interior sound level: Inside the car the noise level with all windows closed was 95 decibels at 40 and 60 miles per hour on a smooth road.

Center of gravity: Center of gravity of unloaded car was 23 inches above the ground.

Water resistance: No water entered trunk or passenger area during an automatic high-pressure car wash. Five runs at 20 miles per hour were made through a splash pan containing 2½ inches of water. No water leaks resulted. Ignition was not affected.

Gasoline fill rate: The fuel tank could be filled at a rate of 12.5 gallons per minute when almost empty. No filling-station pump used during the test was capable of pumping faster than the inlet pipe could take it.

percent listing it as a best-liked feature. (And 37.4% say styling is the reason they bought Lincoln.)

"Beautifully designed. Puts competitors to shame. Simple, yet dramatic and definitely new."—New York architect.

"Absolutely the finest car I have owned. Longer, lower, big-car look. As a designer, I can say it has great beauty because of its simplicity and refinement of line."—California engineer.

"Plain, simple, clean lines without a lot of frills."—Michigan carpenter.

"Dignity of style and good taste plus dash and verve."—California physician.

This month, *PM* adds a new feature to its auto section. Dale Kelly, right, provides scientific engineering data on each car we test (as above). Kelly is an experienced expert, having been an engineer in the auto industry, professor of engineering at Lehigh University, and, most recently, automotive test engineer at one of the nation's top research laboratories. He is a full member of the Society of Automotive Engineers.



From coast to coast, owners in 32 states (in color) tell you what's good and bad about their '56 Lincoln

THE OWNERS ANALYZE THE 1956 LINCOLN

OVER-ALL RATING

Excellent	84.6%
Average	12.8%
Poor	2.6%

Had trouble with engine?

No trouble	84.1%
Some trouble	12.1%
Considerable trouble	3.8%

What was engine trouble?

Valves	6.3%
Carburetor	3.4%
Hard starting	3.1%
Timing	2.3%
Electrical	1.7%

Over-all performance is

Outstanding	82.0%
Average	15.8%
Below average	2.2%

Over-all handling is

Outstanding	90.7%
Average	8.0%
Below average	1.3%

Had owned Lincoln previously?

Yes	69.9%
Had not	30.1%

Dealer service is

Excellent	52.1%
Average	27.3%
Poor	20.6%

Trade-in allowance was

Excellent	39.5%
Average	51.7%
Poor	8.8%

Would buy another Lincoln?

Yes	66.4%
Might	24.9%
Would not	8.7%

Safety Features

Have safety belts in car	9.5%
Do not have belts in car	90.5%
Use belts all the time	1.3%
Use belts some of time	3.4%
Use belts rarely	1.3%
Did not say how often they use belts	3.5%

Best-Liked Features

Handling ease	48.3%
Exterior styling	46.9%
Power, performance	41.4%
Riding comfort	37.7%
Roadability	20.3%
Automatic transmission	10.6%
Visibility	6.0%
Roominess	5.4%

Most-Frequent Complaints

No complaints at all	30.6%
Careless assembly work	32.9%
Body rattles	15.4%
Poor dealer service	14.9%
Water leaks in the body	9.4%
Poor-fitting doors	8.0%
Windshield distortion	5.7%
Poor gas mileage	5.7%
Inadequate glove compartment	5.4%

What Should Be Changed?

Needs no changes	38.0%
Improve body work	10.3%
Change windshield	4.6%
Improve glove compartment	3.4%
Redesign backup lights	3.1%
Change dashboard	3.1%

Why Did They Buy Lincoln?

New styling	37.4%
Previous ownership	15.1%
Handling ease	3.7%
Performance	3.7%
Riding quality	2.9%
Roadability	2.0%

As these quotations show, the owners are excited about the simplicity of the styling and the restrained use of chrome.

Third on the best-liked list is performance. There are 41.4 percent of the Lincoln owners who list this characteristic. (Only 3.7 percent say they bought Lincoln for its performance.)

"Terrific power in higher speed range."
—New York manufacturer.

"Plenty of power. More than you need."
—Wisconsin dentist.

"Takes off like a jet, drives like a dream, admired by small fry and adults."
—Illinois retired owner.

"I like the easy way it gets around curves and over hills and mountains."
—Virginia contractor.

Fourth best-liked feature is riding comfort with 37.7 percent listing it.

"Comfort is indescribable. One must experience its over-all comfort."
—New Jersey housewife.

"Takes bumps without notice."
—Idaho farmer.

"Like riding on air."
—Wisconsin owner.

Enthusiastic as Lincoln owners are about the good features of their cars, they still have complaints. And some of them are



unhappy enough to write at length about certain of the car's failings. However, almost a third of the owners (30.6 percent) have no complaints at all. They are completely happy.

Among owners, the most frequently mentioned complaint is careless assembly (32.9 percent). Many owners point out that this is particularly bad in view of the high price of the Lincoln and its claim of top quality.

"I was surprised, after listening to a sales talk stressing supreme quality, at the number of bolts to tighten, doors to adjust, lights to adjust and the innumerable small items the dealer is supposed to take care of but does not have time for with the volume sales today."
—Iowa distributor.

"I made the mistake of buying one of the first Lincolns off the line. It takes a few thousand cars to get the wrinkles out, such as lining up moldings, eliminating rattles, etc."
—Michigan grocer.

"Shoddy assembly and inspection are inexcusable for a \$5000 Lincoln."
—Ohio physician.

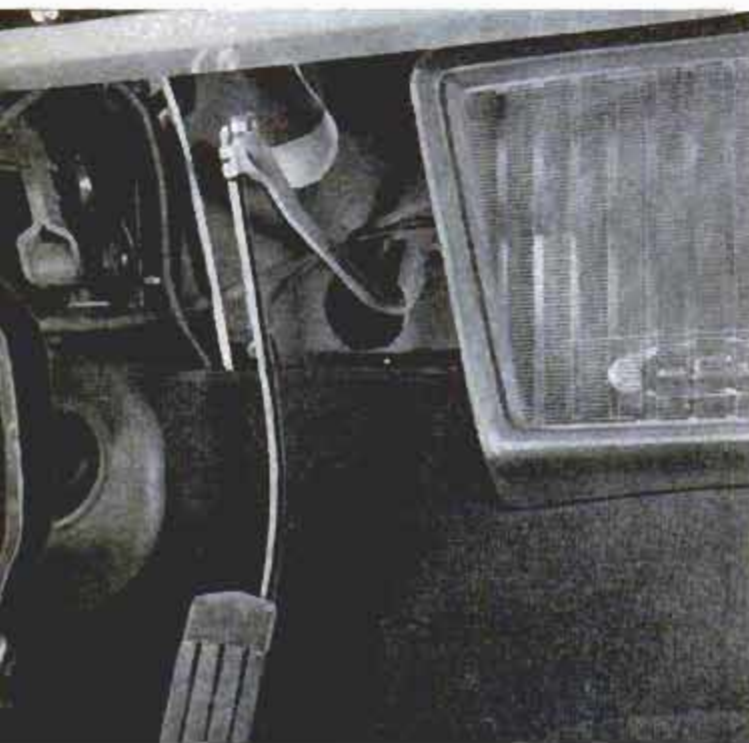
"Assembly work very poor. There were loose bolts, missing bolts and bolts that were cross-threaded."
—California retired automobile dealer.



Lincoln's backup lights are mounted on the rear-deck overhang and depend on bumper to reflect light rays backward (arrows). Owners say light is inadequate



Carburetor air is drawn through grille via duct in foreground. Despite crowded compartment, long dipstick is easy to use. Below, accelerator linkage is "suspended" to eliminate need for hole in floor mat



Second most frequently mentioned complaint is closely related to the first one: Too many rattles, say 15.4 percent.

"Windows rattle. Bumpers rattle."—California contractor.

"Body rattles. The body should be tighter."—California aircraft engineer.

Third on the complaint list is poor dealer service with 14.9 percent of the owners mentioning it.

"We are very displeased with our service. The dealer does not take care of a customer the way he should. When we buy our next Lincoln it will be from a different dealer."—California construction executive.

"Service department could not locate electrical trouble until three trips were made. Can't get rattles out of car. Have had car in service department three times for leaky radiator and it still leaks. I will take car to an independent garage when I have time."—Texas superintendent.

"Dealer is not equipped to service the cars he sells. There are more salesmen than mechanics."—Wisconsin merchant.

Fourth most-frequent complaint also involved body work: Water leaks (9.4 percent).

"Water leaks in around windows and around floor in front and back. Floor mat under carpeting is always wet as an old dish rag. Not able to carry luggage in trunk because of wet condition. Dealer has used so much dub-dub trying to stop the leaks that my car smells like a tar kettle."—Michigan engineer.

"With every rain the whole floor becomes water-soaked."—New York physician.

Owner Comments on Safety

Because Ford Motor Company is stressing safety devices in its advertising and because Lincoln is the first Ford product we have surveyed in 1956, several questions were asked about safety.

Only 9.5 percent of the Lincoln owners state that they have safety belts in their new cars, 90.5 percent do not. A number of owners state that they would have bought belts but they were not available in colors to match the upholstery at the time the car was delivered. Some say they are going to have belts installed later.

A tiny 1.3 percent of the owners state that they wear the belts all the time they are in the car; 3.4 percent wear them some of the time (usually for high-speed driving only); and 1.3 percent say they wear them rarely or never (another 3.5 percent did not answer).

Opinion about the value of belts and other safety features varies considerably. Here are some sample quotations on the

(Continued to page 278)

Electric Heating Belt Warms Thick Liquids

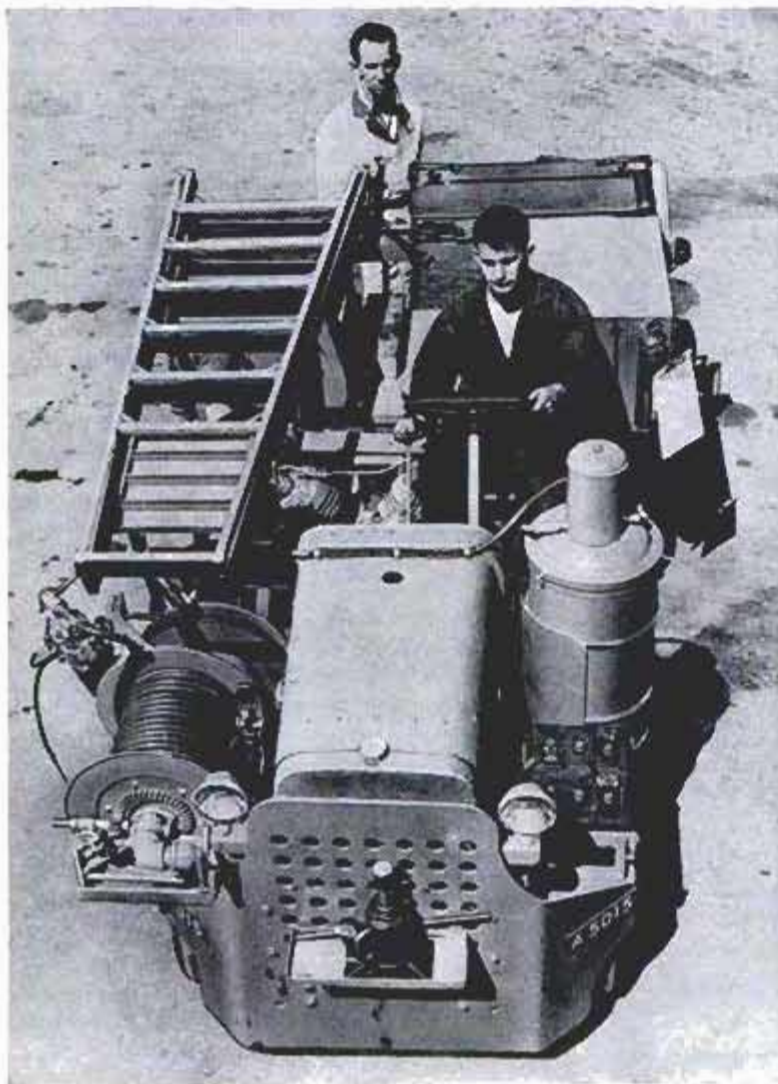
Electric heating belts that snap around 55-gallon drums and 5-gallon containers make thick liquids flow easily in cold weather. The belts, which plug into an electrical outlet, maintain a temperature that insures free flow without damaging the most sensitive material. They can be used to warm oil, grease, wax and some paints. Wrap-around glass-fiber covers may be used to speed the heat-up time.

National Observatory

American astronomers long have hoped for a national observatory which would serve scientists from all over the country. According to a recent announcement, construction of such an observatory will be started within two years. It probably will be run jointly by several institutions, and will provide much better facilities for studying the universe than individual institutions can afford. The site now is being selected under a grant by the National Science Foundation. The observatory probably will be located in the Southwest.



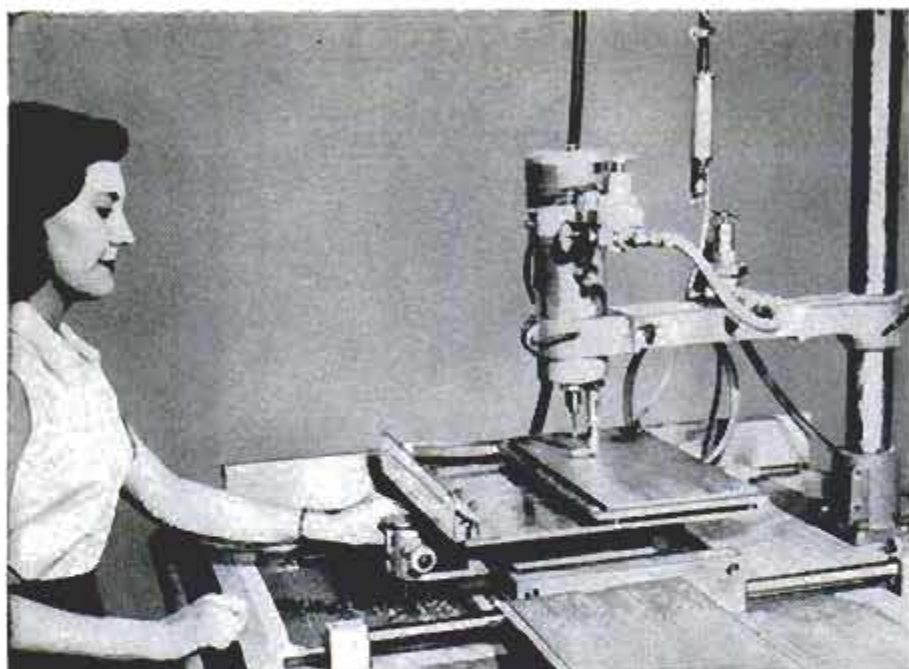
Mobile Repair Shop Services Truck Trailers While They're Loading



Ailing truck trailers can be repaired during loading operations with a mobile shop and service unit. Greasing, inflating or changing tires, wheel packing, checking and repairing air-brake and electrical systems and many other jobs can be accomplished while a trailer is being loaded for its next trip. The unit mounts a compressor, air tank, grease tank, tire rack, ladder, a hose for greasing, one for inflating tires and another for operating pneumatic tools such as a lug-nut wrench. Built by the Pacific Intermountain Express from Army surplus chassis, six units are used at the company's terminals.

Slides Ready in a Minute

Black-and-white transparent slides can be projected on a screen within a minute or two after the picture is snapped with a new film to be introduced shortly. The film has an ASA meter rating of 1000, the fastest of any film ever marketed, and has an ultrafine grain, which permits projection on screens as large as 12 feet high without showing grain structure. The film can be used in any of the existing Polaroid Land cameras.



150 Holes Drilled In Two Minutes

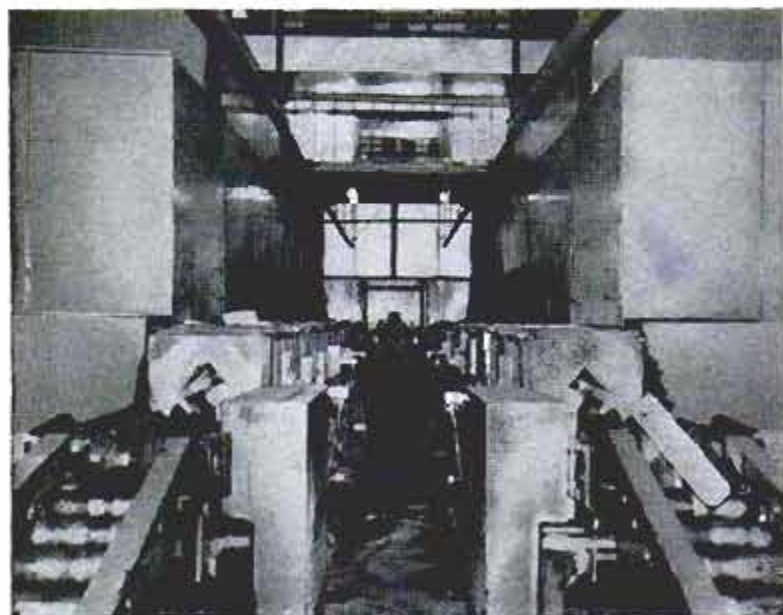
Semiautomatic drill presses, designed to perforate boards on which printed radio circuits have been stamped, complete the drilling operation on a board requiring 150 holes in $1\frac{1}{2}$ to $2\frac{1}{2}$ minutes. The board to be drilled is placed on the drill-press table, and a template is inserted under a stylus in front of the table. When the stylus is pushed over a hole in the template, the table moves, pantograph fashion.

"Tricycle" Attachment Lets You Ride Mower

You can ride your own power mower by attaching a new "tricycle" to it. Then you sit on a tractor seat and ride around the lawn while you're mowing. The attachment can be installed on any reel-type power mower from the 18-inch to the 30-inch size. It is bolted to the top of the mower so the mower's wheels become the rear wheels of the tricycle. The unit has a clutch lever and a throttle-mounting clip. The operator's weight is directly over the power wheels, improving the traction. This permits mower and rider to go anywhere the mower could go without the driver's weight.

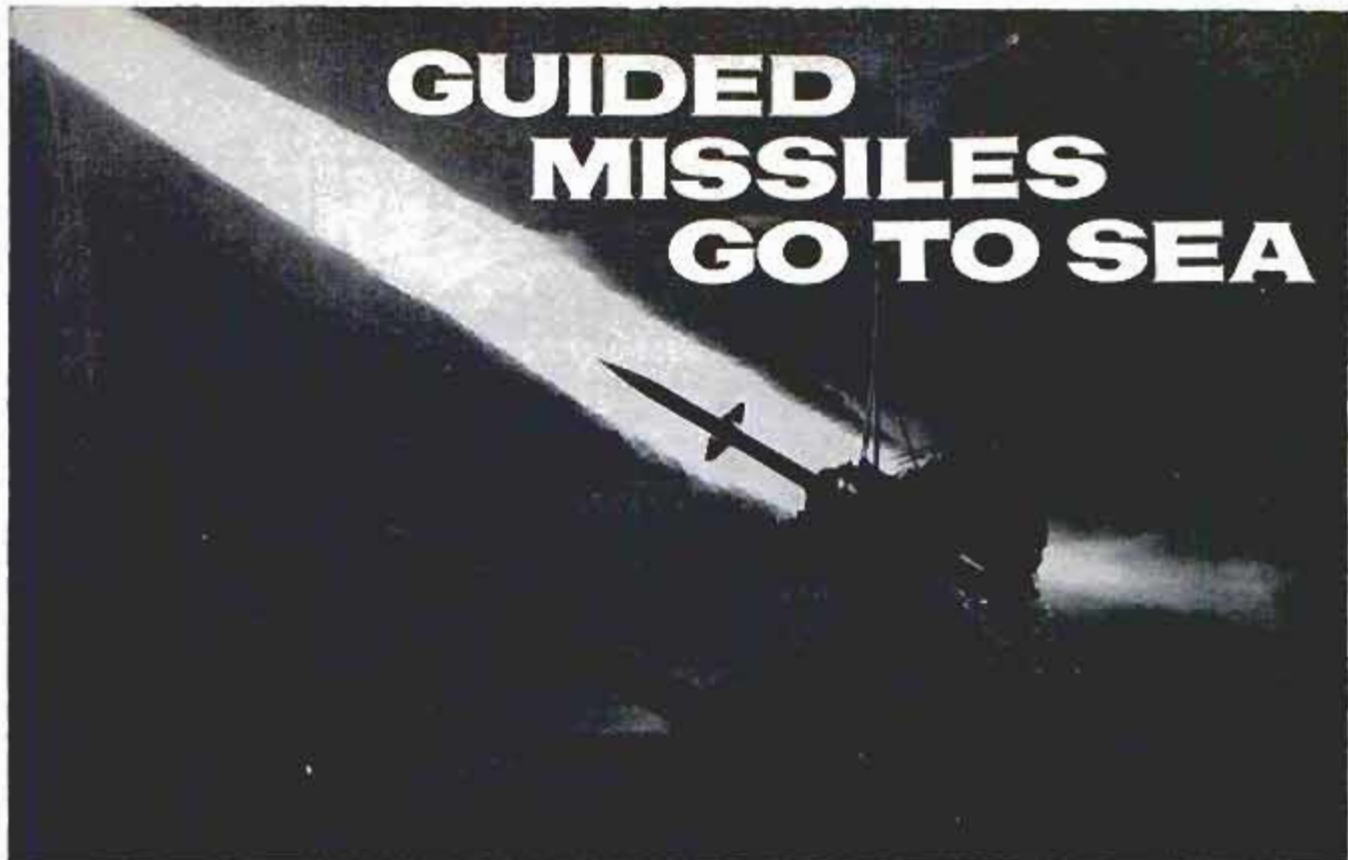


Steel Ingots Heated White-Hot by Electromagnetic Field



Steel ingots heat themselves white-hot as they pass through an electromagnetic field on the production line of a Canadian mill. The ingots are sped by rollers through two tunnels wrapped with 700 miles of current-carrying copper wire. The magnetic field created causes a current to be induced in the steel ingots. Resistance to the current heats the metal to 2300 degrees Fahrenheit in eight to twelve minutes—one fourth the time it takes in a conventional oil-fired furnace. The rolling mill, at Vancouver, B.C., is said to be the first so equipped. The induction-heating unit reportedly has raised production by 30 percent.

GUIDED MISSILES GO TO SEA



Official U. S. Navy photos

Outlined in blast glare are the deadly missile weapons of the U.S. Navy's new guided-missile cruisers

By Capt. W. D. Brinckloe, USN

THE COLD-EYED SQUADRON PILOT, his face lined with fatigue from the strain of the search, turns suddenly alert as his instruments pick up something from the gray ocean beneath. His radarscope tells him there are many ships. It can only be the United States task force carrying the big weapon—the fleet for which his aircraft have been searching and the jackpot for which their murderous weapons are primed. He presses the button on his

microphone and barks guttural words in a foreign tongue to the planes of his squadron.

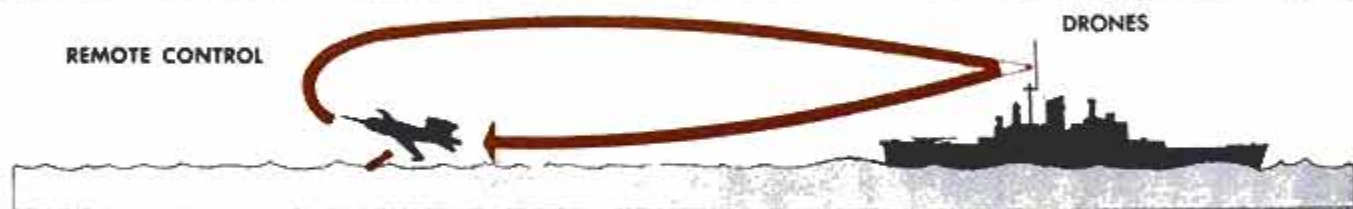
Swiftly the blunt-nosed bombers regroup, orienting their force around the approach axis. Bombsights are readied, weapons unlimbered, computers set to humming and air crews alerted to razor-edge keenness. The force drives through the air with relentless purpose toward the distant fleet it can not yet see.

Needle-nosed Terriers point skyward from afterdeck of rebuilt USS *Boston*, first of the missile cruisers





JAPANESE SUICIDE BOMBERS



SEQUENCE OF GUIDANCE DEVELOPMENT

Guided missiles launched automatically from Missile Control of new cruisers are last word in guidance



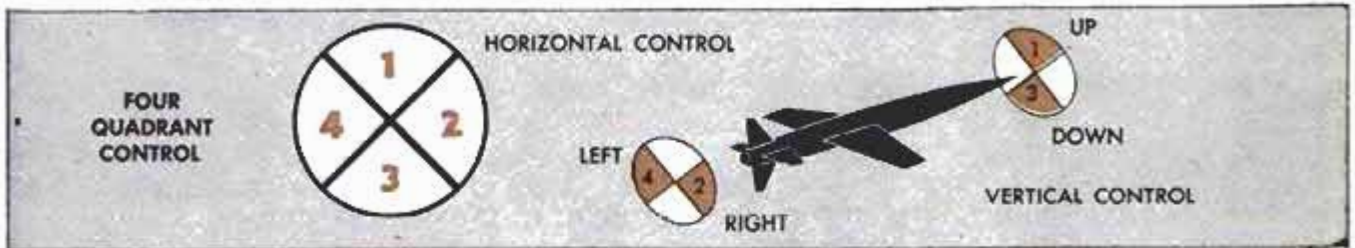
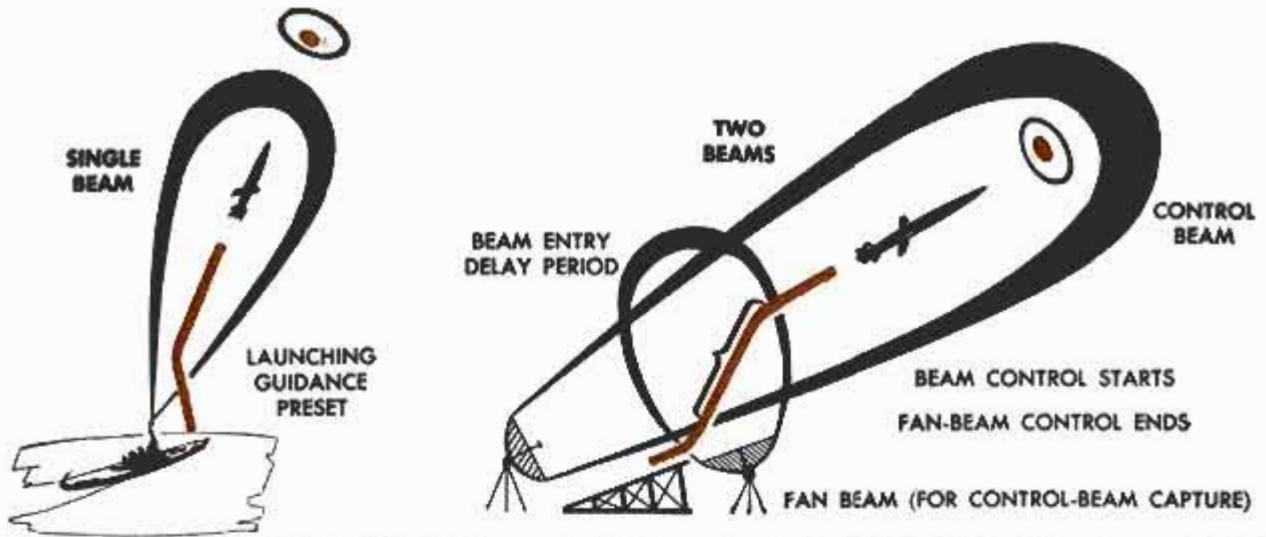
Tests of the supersonic Terrier missile were conducted from the USS Mississippi (above) before the USS Boston (below) was reconditioned as first guided-missile cruiser. The Boston is 673 feet long

The squadron leader grunts his satisfaction and looks about him. Suddenly his eyes meet a chilling sight. One moment his wing plane flies steadily toward the target—the next instant it erupts into a huge fireball that trails burning debris out behind. Even as he watches, another bomber explodes in the air and is gone.

Instinctively the shaken flier peers ahead, squinting down the unseen radar beam to the distant target. His searching eyes find nothing—then, straining desperately, they catch a tiny speck that wobbles slightly as it grows swiftly in size. Cold with horror, he realizes the significance of what he sees. He pulls the big bomber into a violent evasive



BEAM-RIDER GUIDANCE



With radar beams trained on a target, guided missiles like the Terrier can destroy an unseen enemy plane

maneuver, all thought of attack forgotten. A chilling panic clutches his heart. Scarcely has he turned in escape when a searing explosion engulfs him, and he knows no more. . . .

Task Force Pulls a Surprise

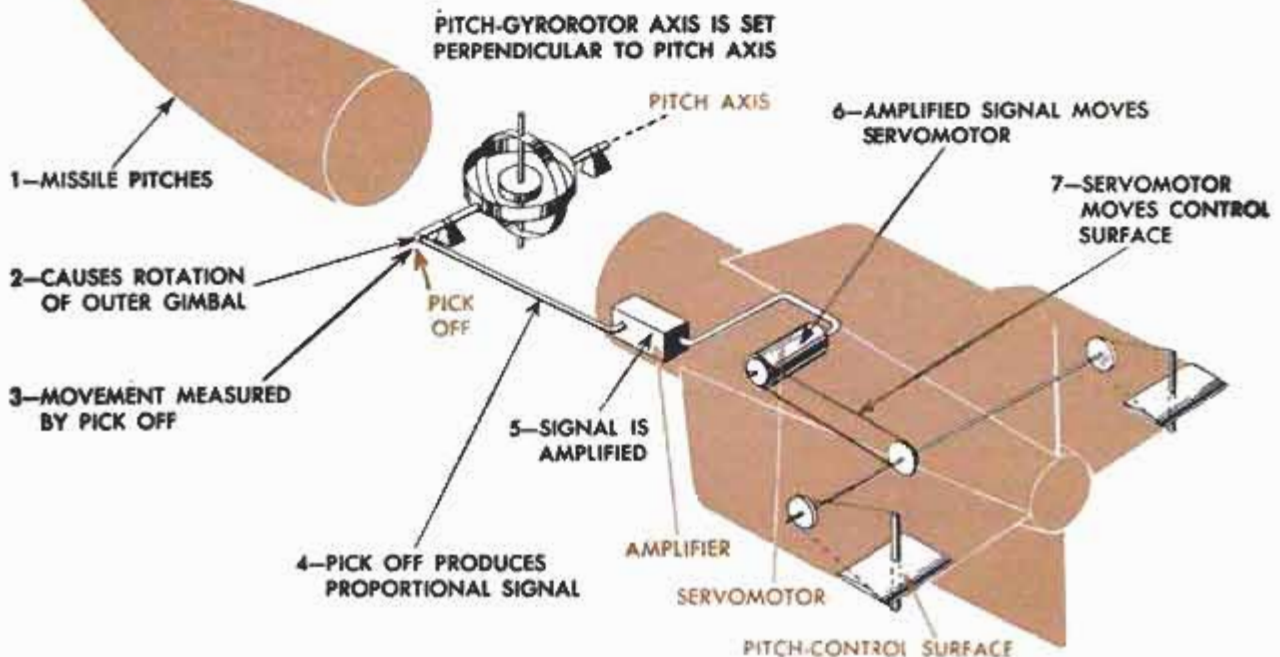
Below in the task force, within the sheltering antisub screen of lean destroyers, steams a hybrid ship. Her lines are those of a heavy cruiser. She bears a cruiser's powerful turrets forward, and amidships her superstructure bristles with a heavy's

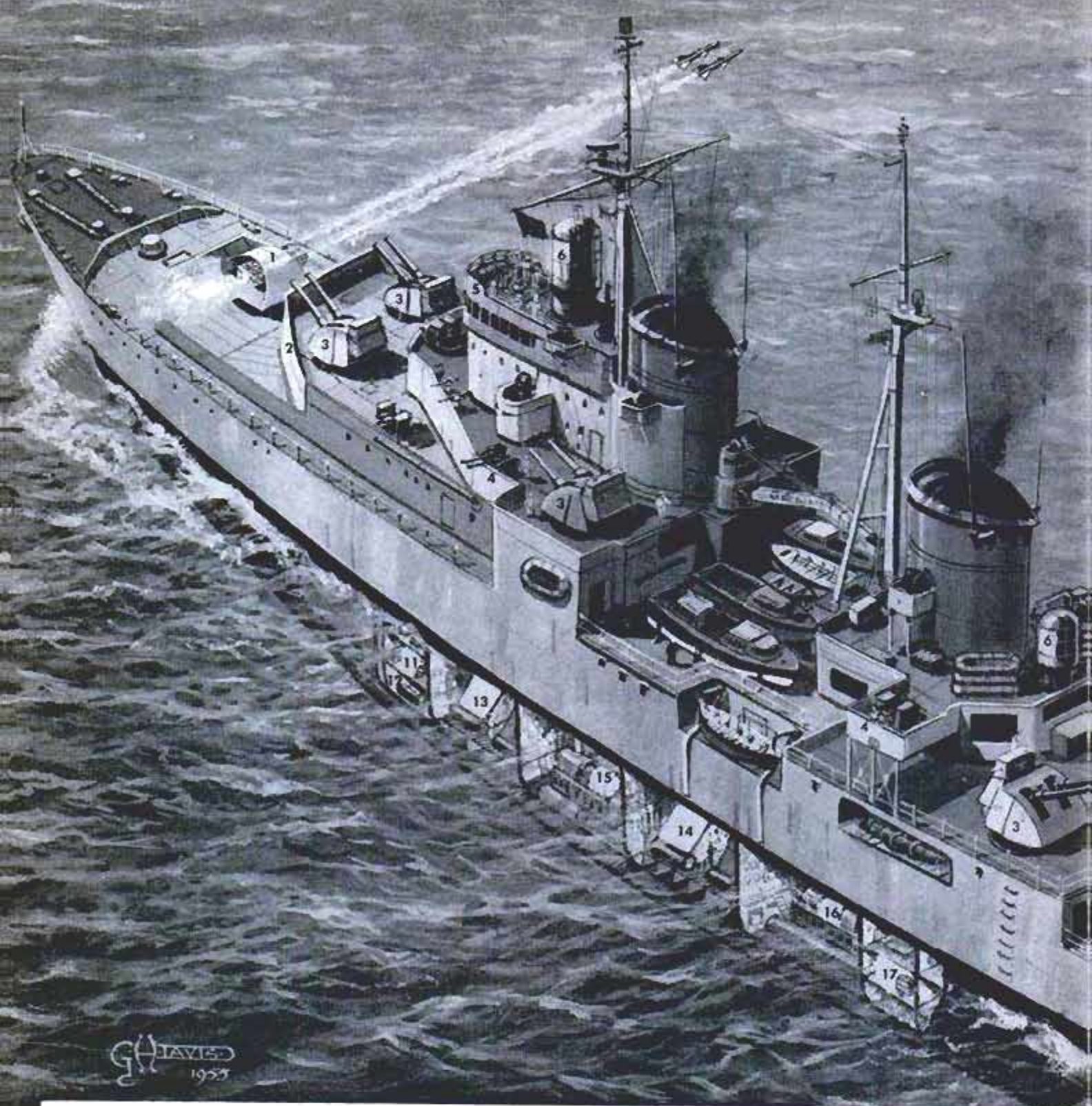
antiaircraft armament—but aft her design is totally new. There, like the take-off site of an interplanetary movie, is an installation new to naval warfare. On the broad afterdeck squats a twin missile launcher, its double snouts momentarily depressed for reloading. Forward and above, a second launcher restlessly searches the sky for another victim.

This new ship, the guided-missile cruiser, brings a third dimension to the age-old battle for supremacy at sea. Heretofore the heavy naval ship, seabound in the age

Precise and sturdy mechanisms of missile must withstand jar of take-off blast and hold course at high speed

PITCH-CONTROL SYSTEM





G. H. Davis, noted London illustrator, gives readers of *Popular Mechanics* a preview on these pages of a design for a guided-missile cruiser for the British Navy. "Behind the scenes in the British Admiralty," Davis writes, "the department of the director of naval construction is formulating plans for the new guided-missile ships. Recently, suggested plans for one of these ships were released from the veil of secrecy and from them this drawing was made. I do not suggest that the drawing exactly follows the lines of these future ships, but it has been stated by experts that it is substantially correct." Britain's missile cruisers will have a displacement of 10,000 to 12,000 tons and will be armed with guided-missile batteries both fore and aft with a new secret system of fire control. (The USS *Boston* described in the accompanying article by Captain Brinckloe has missile launchers only on the afterdeck. The Admiralty's secret system of fire control is probably similar to the electronic Missile Control on the *Boston* which is de-

scribed in the article.) Davis reports that the British cruisers will have a speed of 35 knots and that in addition to the guided-missile batteries will have powerful armament including a main battery of five-inch dual-purpose guns. These guns have radar control and tremendous fire power. Secondary armament includes anti-aircraft guns "of a new and secret type" in multiple mountings, also the latest weapons for anti-submarine warfare. The cruisers will be equipped with elaborate radar installations, stabilizers and even atomic-atmosphere control rooms fitted with radiation-detection devices. The Admiralty has rebuilt a Landing Craft Maintenance Ship as an experimental guided-missile "cruiser" and is conducting extensive tests. (The U.S. Navy held similar tests over a period of many months on the battleship USS *Mississippi*.) Britain's proposed guided-missile cruiser is "the obvious successor to the cruisers of today," according to the First Lord of the Admiralty.



SECOND STEPS

FIRST STEPS FALLING

HELICOPTER SPOTTING

GUIDED-MISSILE CRUISER ENGAGING SHORE INSTALLATIONS



1. Forward guided-missile battery; 2. Flash screens; 3. Five-inch dual-purpose guns with radar control; 4. Antiaircraft guns; 5. Bridge; 6. Fire-control towers; 7. Aft control tower; 8. Guided-missile hoist from magazines; 9. Aft missile battery; 10. Helicopter landing area; 11. Atomic-atmosphere control room; 12. Port stabilizer; 13, 14. Boiler rooms; 15, 16. Portside turbine rooms; 17. Aft atomic-atmosphere (radiation-detection devices) control room

CVA—CARRIER
 CG—GUIDED-MISSILE CRUISER
 DD—DESTROYER
 BB—BATTLESHIP
 DDE—DESTROYER ESCORT
 DDR—RADAR SHIP

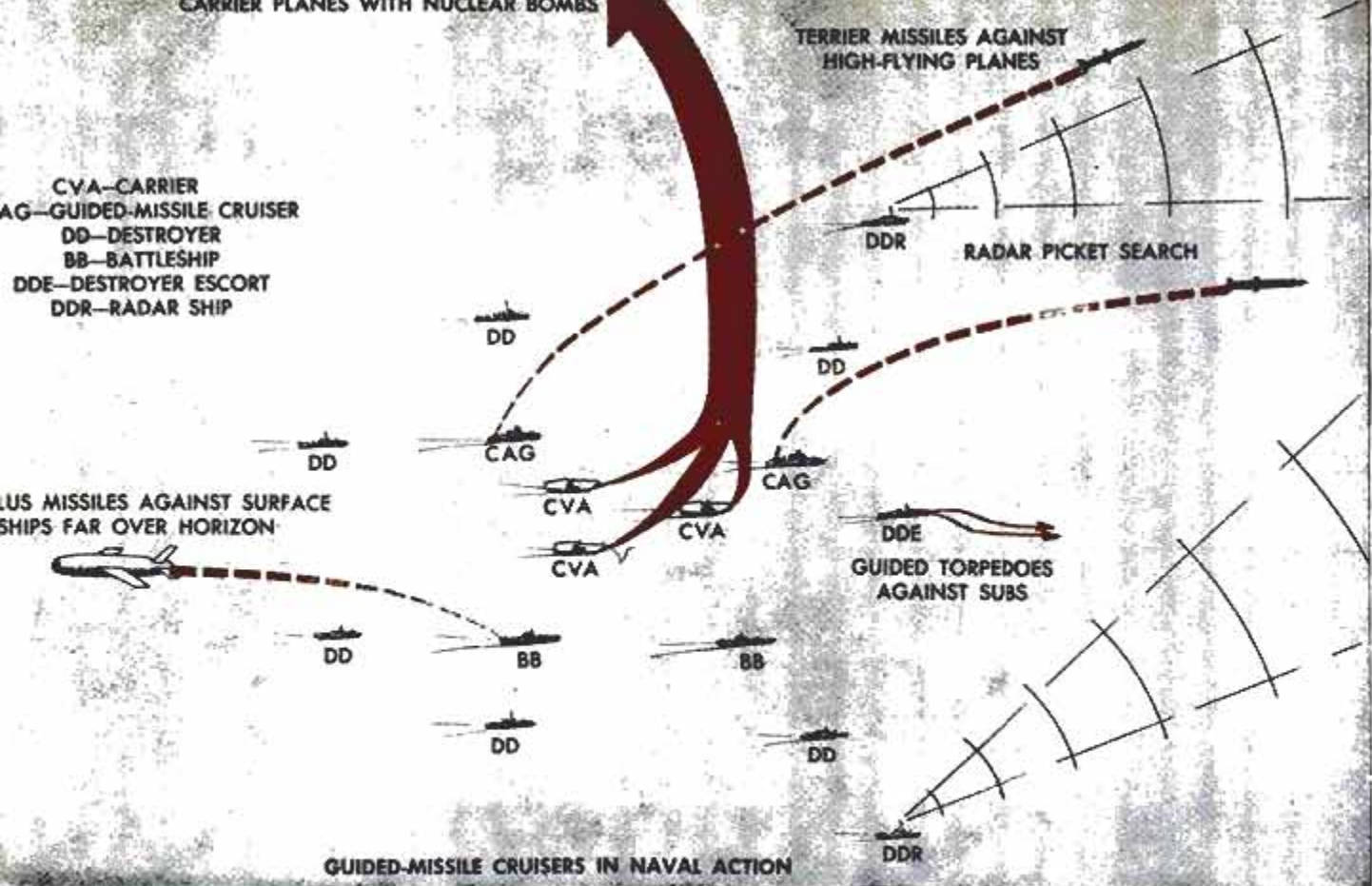
REGULUS MISSILES AGAINST SURFACE SHIPS FAR OVER HORIZON

TERRIER MISSILES AGAINST HIGH-FLYING PLANES

DDR RADAR PICKET SEARCH

DDE GUIDED TORPEDOES AGAINST SUBS

GUIDED-MISSILE CRUISERS IN NAVAL ACTION



Naval strategy makes room for the guided-missile cruisers to take part in any future action on high seas

of air, has been likened by scornful critics to the mythical bird that flies backward because he's not interested in where he's going, but only in where he's been. Similarly the big warship is charged with living forever in its past glories, not daring to face its vanishing role in a jet future. This accusation may have some merit—but not for USS *Boston* and USS *Canberra*, the Navy's two new guided-missile cruisers.

Planners Burn Midnight Oil

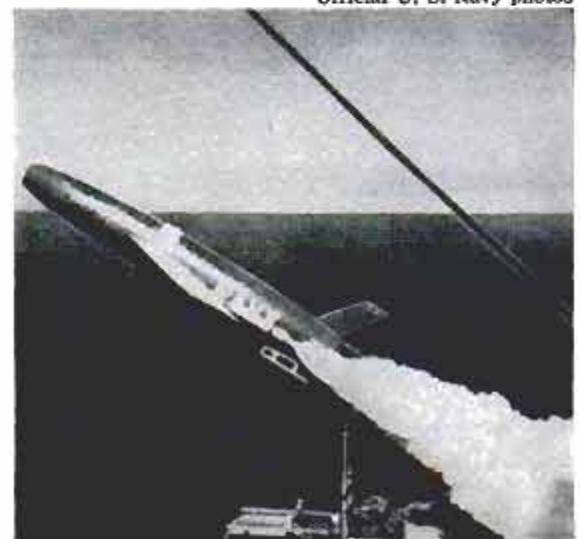
Over in the Pentagon, the naval planners who dope out the Fleet's air defense have been burning midnight oil the last few years. Guns alone aren't enough. Acting Assistant Secretary of Defense Macauley, who heads up research, points out that "as

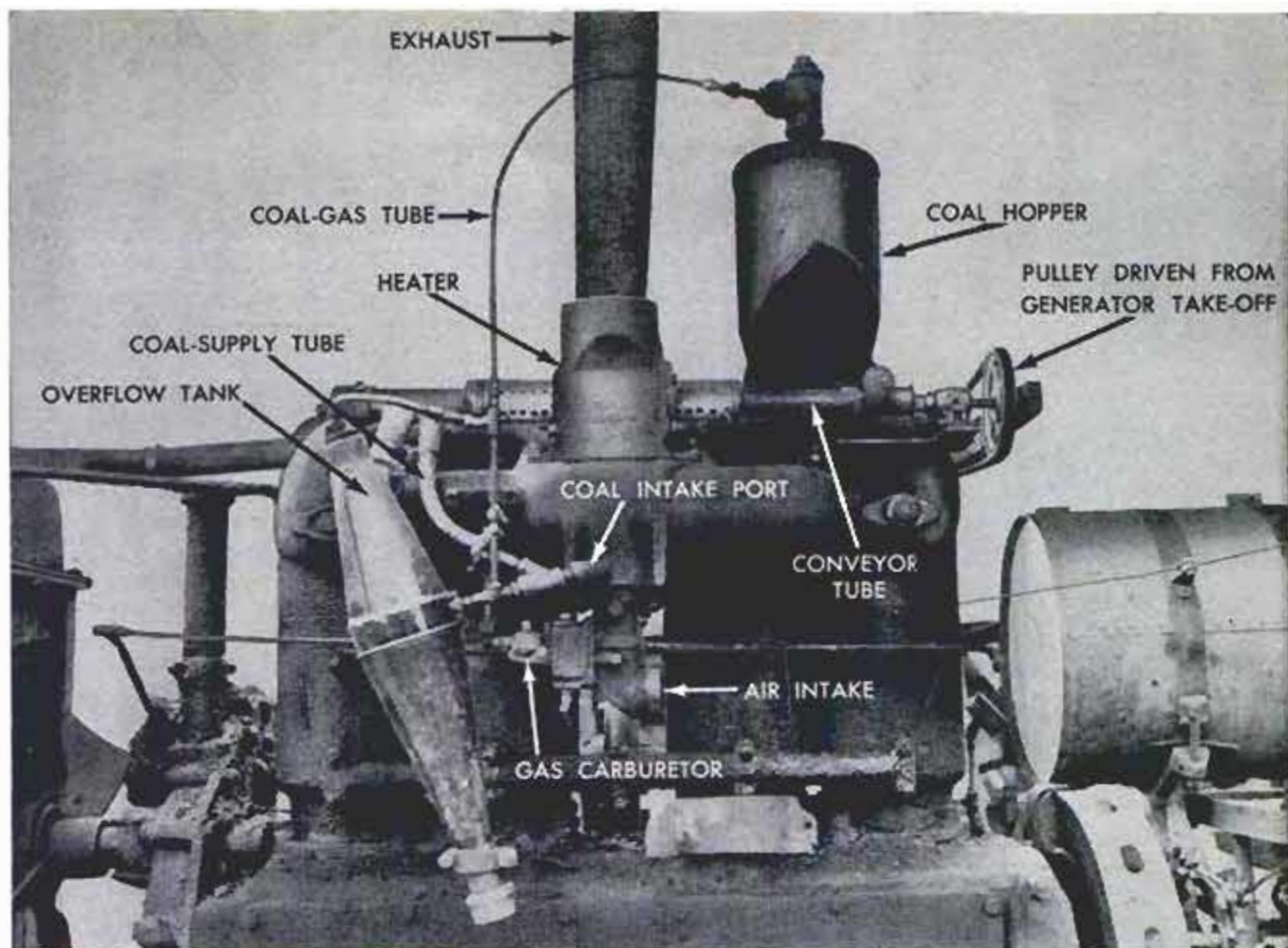
our potential enemies improve their airplanes, it gets to be a fairly easy problem to fly outside the effective range of any artillery that we have." Nor are there any other easy solutions—weight and space limitations severely restrict the size of any radical new weapons that can go to sea; and the perils of fire afloat rule out many of the best rocket fuels, such as hydrogen peroxide, fuming nitric acid, hydrazine and the like. Rear Adm. J. H. Sides, the Navy's guided-missile chief, has this to say to those who would write off the Navy for missilry, "Let me assure you that this would be the mistake of a lifetime! We are accustomed to this specialized environment and we know how to cope with it."

(Continued to page 246)

Twin mount holds Terrier missiles on warship deck. Release and aiming are automatic. The mount tips down for reloading

Surface-to-surface Regulus is shown leaving launcher on carrier deck during maneuvers Official U. S. Navy photos





Harvey converted this old diesel engine into a coalburner by adding or altering the parts shown here

Powdered Coal Operates Gasoline or Diesel Engine

WHEN COAL DUST exploded, wrecking the home of a friend, Russell E. Harvey of Roanoke, Va., decided to put the destructive force to work. As a result he has developed both a gasoline engine and a diesel engine that burn powdered coal as fuel.

Harvey first went to work on a 1940 Buick motor. After months of experimentation he developed an attachment that fed pulverized coal into the auto engine without any alteration to the design of the engine itself. The engine was started in the conventional manner, using gasoline. Then pulverized coal was fed into the engine through a flow valve, and the gasoline intake was gradually reduced until the engine was receiving 90 percent coal and 10 percent gasoline.

Next Harvey applied the attachment to a diesel engine, which now is being used to assemble test figures. A screw conveyor moves the coal through the exhaust vent where it is heated. It then enters the intake manifold, and is burned.

Harvey says the attachment can be applied to any internal-combustion engine, particularly a diesel, without impairing the engine's normal method of operation. The engine may be operated on conventional

fuel or on powdered coal simply by opening or closing a valve. Acceleration is accomplished by feeding more coal into the compression chamber. It is necessary that the engine be started in the conventional way. As the temperature rises, the coal percentage can be increased.

According to Harvey, there are no increased carbon deposits, nor is there undue wear.

Inventor (right) loads the hopper with pulverized coal, which is heated as it passes over the exhaust



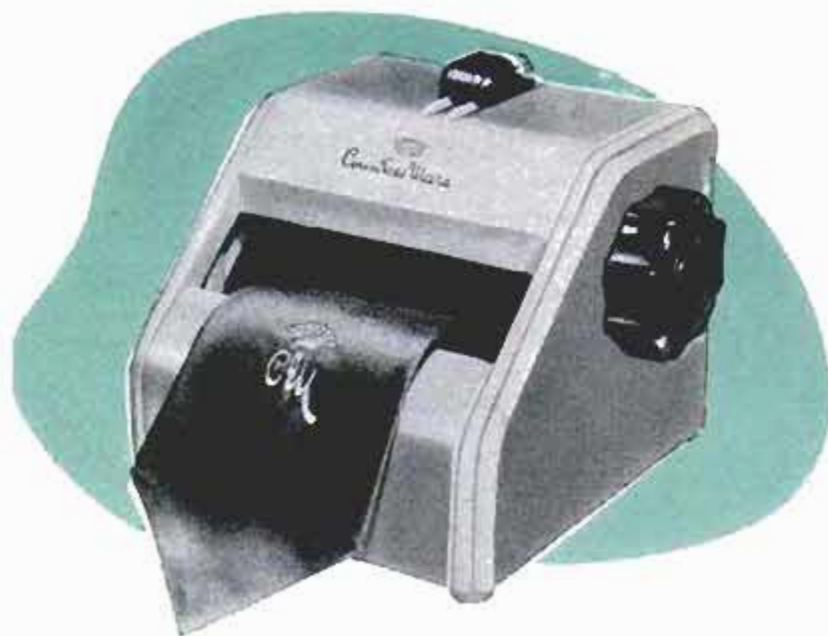
WHAT'S NEW FOR

Your Home



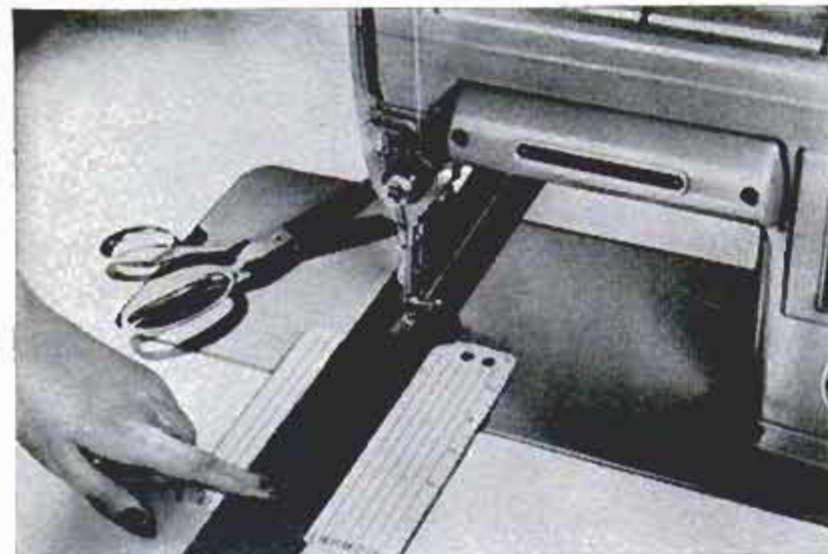
STRIP LINOLEUM 24 inches wide is designed for easy installation by homeowners. The edges are precision-trimmed at factory. Patterns match easily, giving the floor a seamless appearance. The strips can be laid down much faster than block linoleum

Armstrong Cork Co., Lancaster, Pa.



TIE PRESS needs no electricity or heat to remove wrinkles. Tie is cranked into press immediately after wearing. There it is clamped against a pressing cloth and held for a full day. Pressing lever at the top ejects the pressed tie. Freshness is restored

Countess Mara, Inc., 445 Park Ave.,
New York City 22



SEWING GUIDE, a grooved plastic plate that attaches to a sewing machine, enables anyone to make straight seams. As cloth feeds into machine, operator keeps a finger pressed over groove to maintain alignment. Edges are calibrated in various measurements

Sew Strate Co., 18 N. Warren St.,
Trenton, N. J.



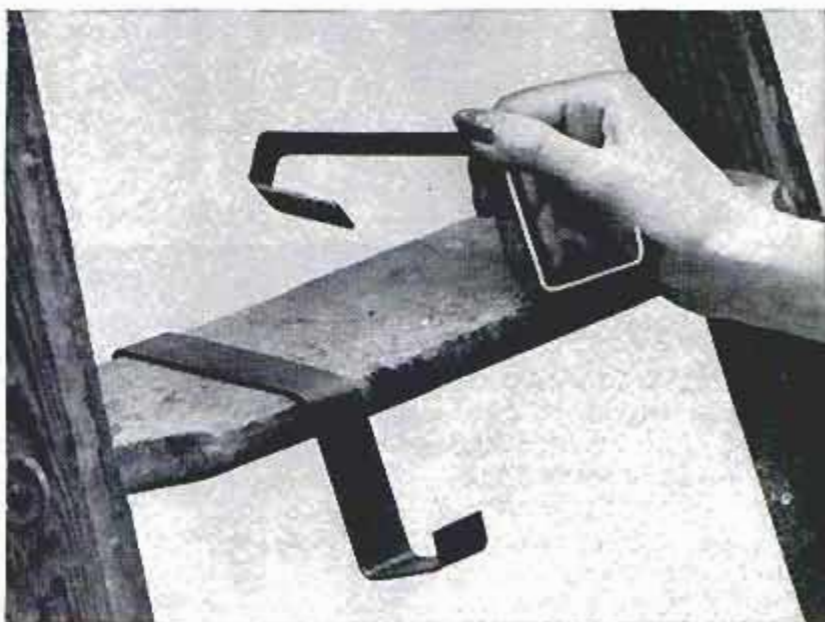
MEAT WATCHER is an automatic electric thermometer inserted in the meat which turns off the oven when the roast is ready. It can be set for well done, medium or rare. A cord connects the thermometer, a feature on a newly introduced range, to an oven outlet

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



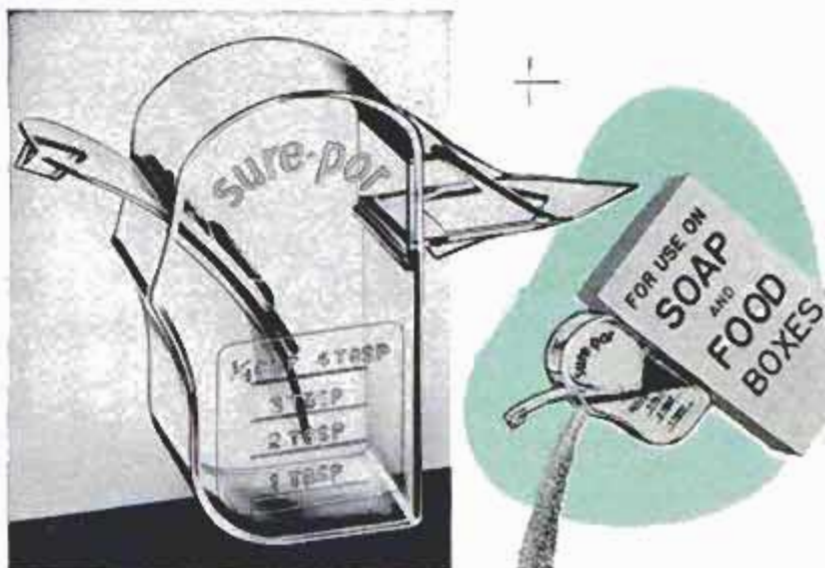
HOOKS that slip over the steps of a stepladder transform it into a sturdy easel for holding material during the washing, glazing or repairing of storm windows and screens. Hooks can also be used to hold planks being sawed. Made of metal, they are easily removed

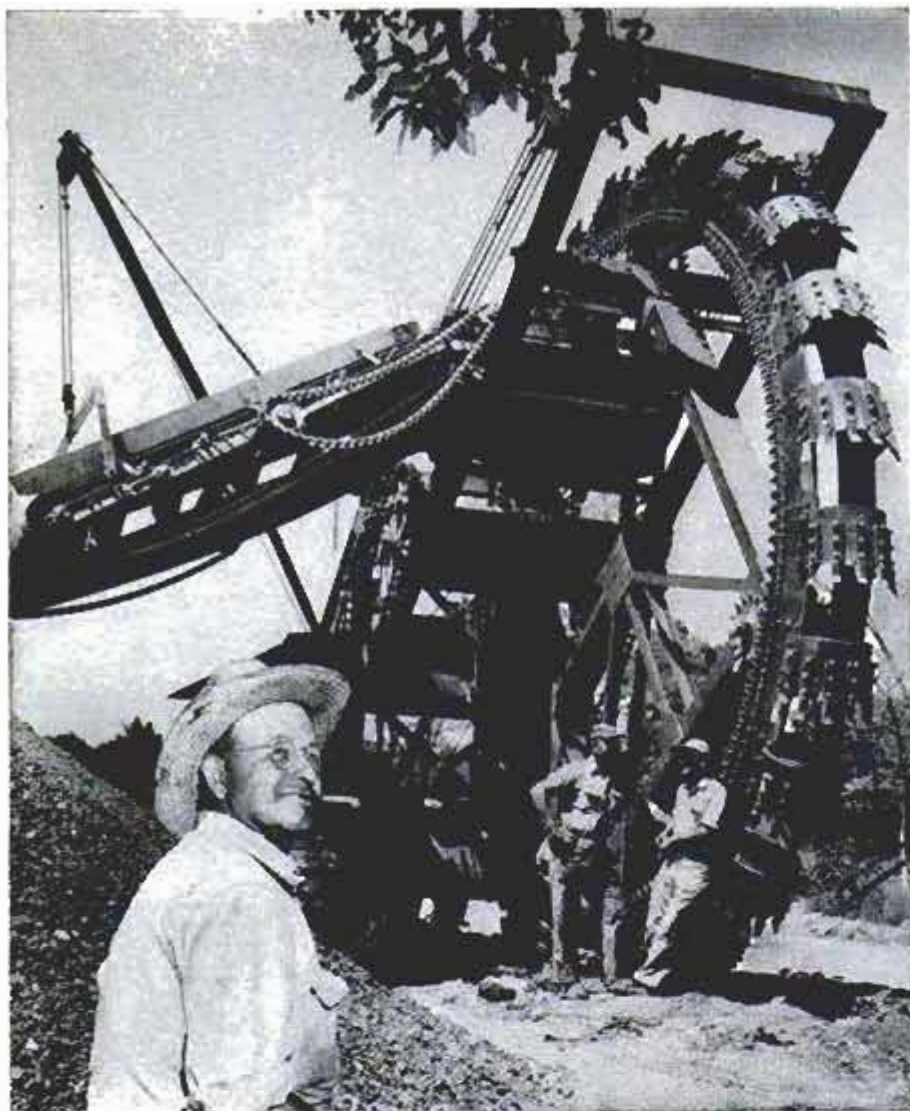
Bill Foster, 3340 48th Ave. South,
Minneapolis, Minn.



MEASURING SPOUT for soap and food boxes doles out one, two, three or four exact tablespoonfuls of the material at a time. Spout is punched into unopened box and a slide is set for the amount to be measured. The spout remains on box until it's empty

Sure-Por Co., Inc.,
1921 Shepherd St., N. W.,
Washington 11, D. C.





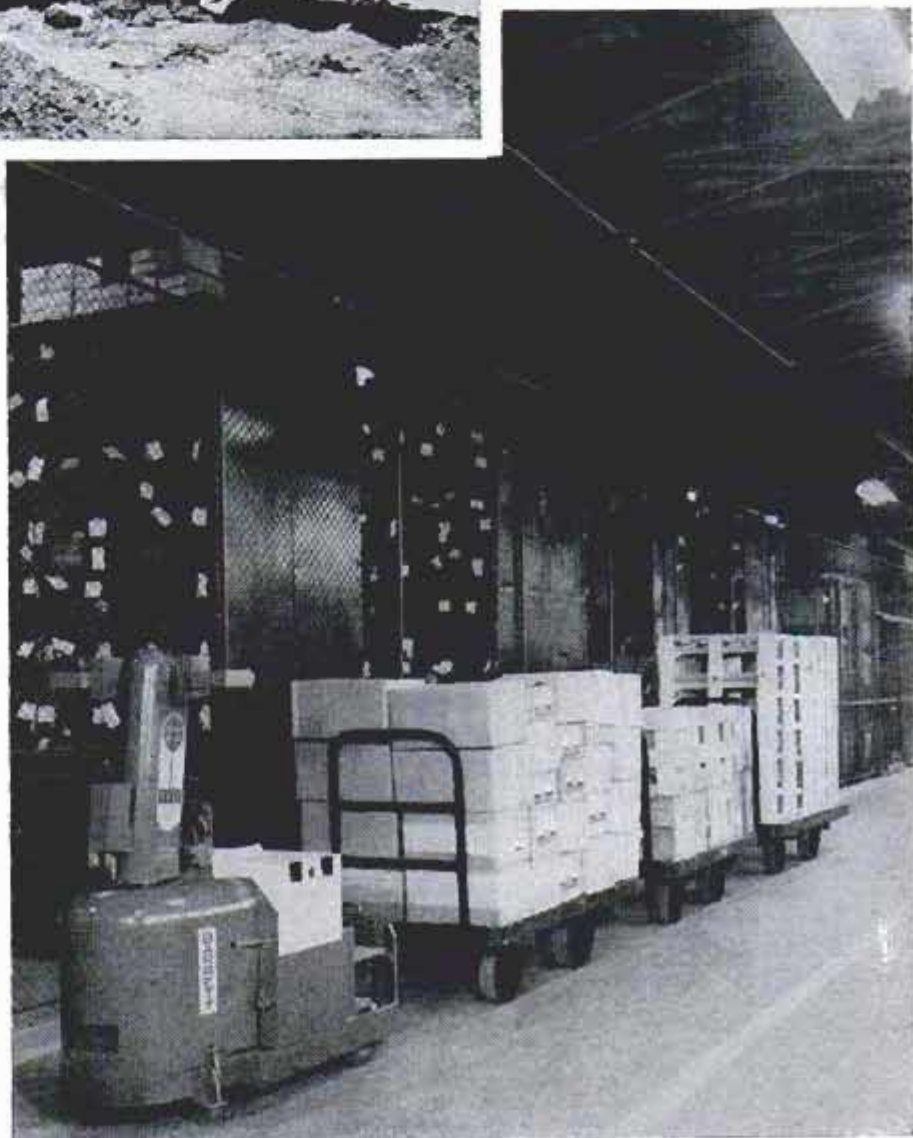
Circular Digger Claws Out Rock

Ditches 16 feet deep can be dug in rocky terrain by a giant custom-built machine in Dallas, Tex. Toothed buckets on a digging wheel with a diameter of 22 feet crunch through sand, rock and gravel, carrying their loads to the top and dumping them on a big moving belt. The digging machine was designed by contractor W. G. Cullum, Sr., built by two local steel companies and assembled on the job site in a period of more than a year. Each part of the machine was specially forged. Powered by a 250-horsepower engine, the mammoth excavating machine covers 600 feet per day and is being used to dig sewer lines.

Driverless Tractor Guided by Radio

Electric tractors equipped with a new control can follow twisting routes by themselves. An overhead wire strung along the predetermined route keeps tractors "on the beam" by radio waves. To call a tractor, you simply push a button on one of several control boxes along the route. The tractor comes immediately to your station. The system is convenient and flexible. Guide wires can be extended easily. There is no trolley or other physical connection between tractor and wire.

Ⓢ Promising reports have been made on an experimental toothpaste, not yet on the market, containing tin fluoride as a decay-checking agent.

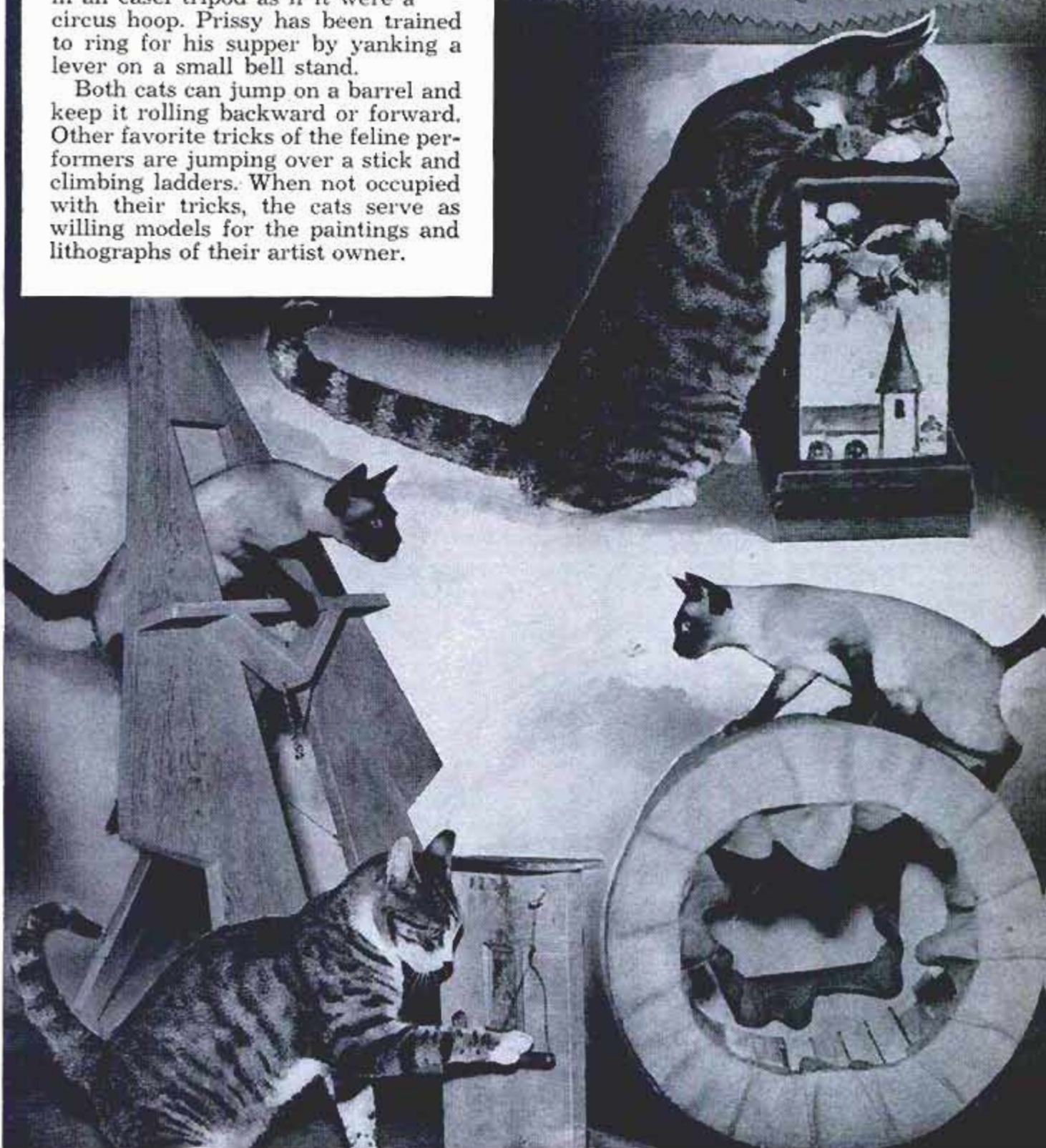


Cat Tricksters

AT 9½ NORTH MOUSE STREET, a little two-bedroom apartment in the rear of Ivan Messenger's home in San Diego, Calif., live two unusual cats. They're adept at tricks that only dogs usually perform.

Messenger, an artist, has taught his young Siamese Tai-Lai to wheel a tiny "mouse carriage" down the street. Prissy, an alley cat, bows his head and folds his paws on a little lectern upon command. Tai-Lai leaps through a small opening in an easel tripod as if it were a circus hoop. Prissy has been trained to ring for his supper by yanking a lever on a small bell stand.

Both cats can jump on a barrel and keep it rolling backward or forward. Other favorite tricks of the feline performers are jumping over a stick and climbing ladders. When not occupied with their tricks, the cats serve as willing models for the paintings and lithographs of their artist owner.





Drill rig, right, has hose leading to big "vacuum cleaner" above which packages dust for disposal



Rock dust and chips are sucked out of the drill hole by a huge vacuum machine that protects workmen from silicosis during rock drilling or quarry operation. The machine also speeds drilling because "down time"

Dustless Drill Rig

is held to a minimum as bits require less-frequent sharpening and changing. It also eliminates the need for "blow backs," another time-consuming operation. The dust is dumped into special collection bags for safe disposal.

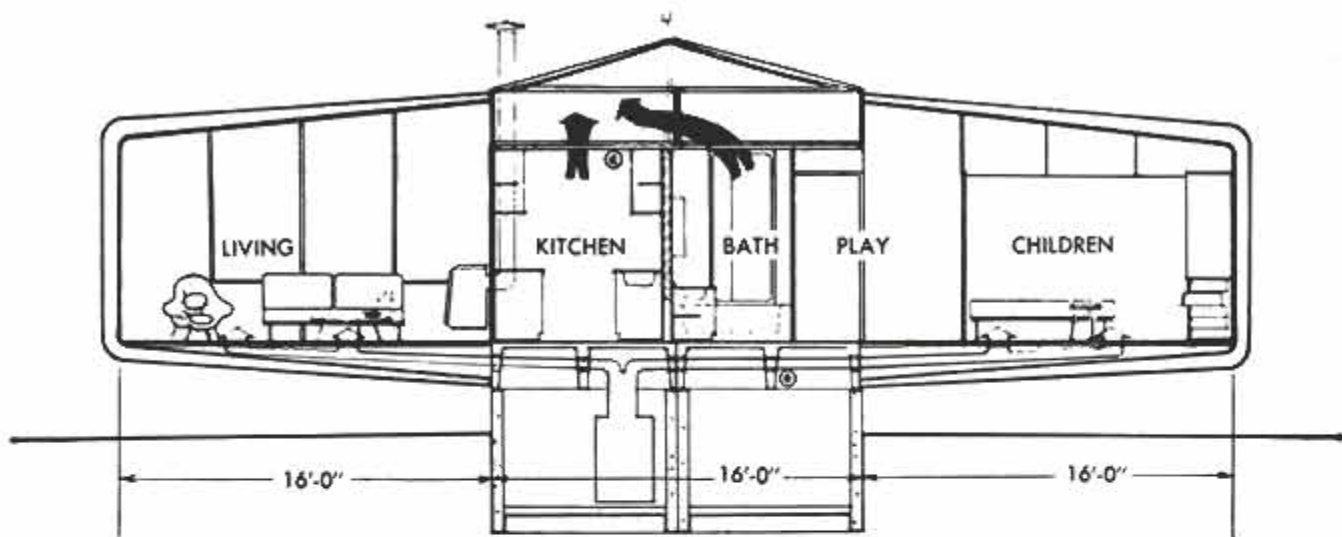
Proposed Excursion Boat Features Seawater Swimming Pool

Safe swimming in the middle of the ocean is possible in a seagoing swimming pool proposed in Mexico. The 80 by 40-foot pool has steel-mesh sides and bottom and is part of a 244 by 107-foot excursion boat. A deck around the pool permits sunning and fishing, while the engine room, bar,

dining room, dance hall and other facilities are in the forward section. The proposed craft is moved by a propeller in front that forces water backward through a tube on either side of the bow. Steering is accomplished by closing either one of the two tubes. There is no rudder.

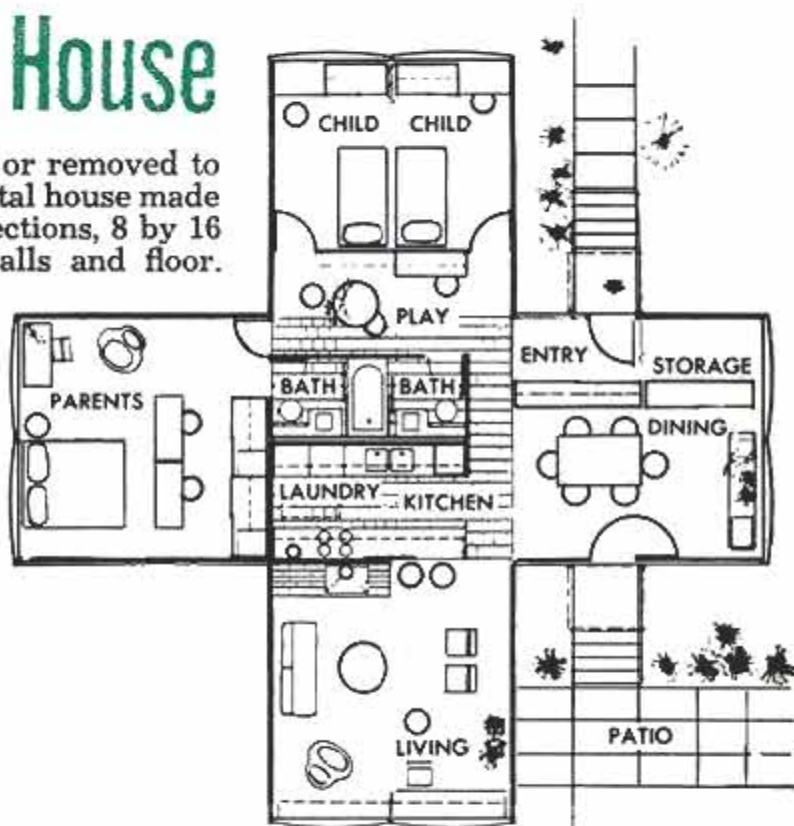
Swimming pool in rear half of boat is actually like a huge strainer that protects those inside from danger



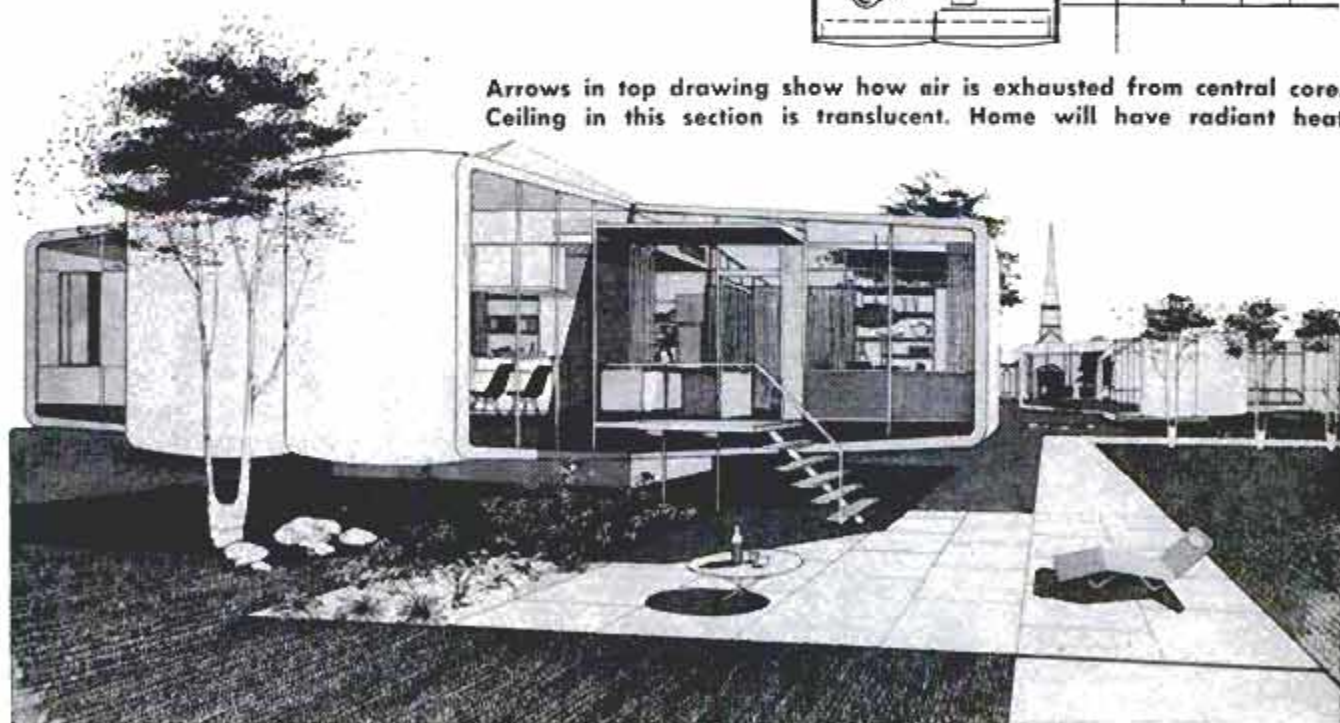


Molded Plastic House

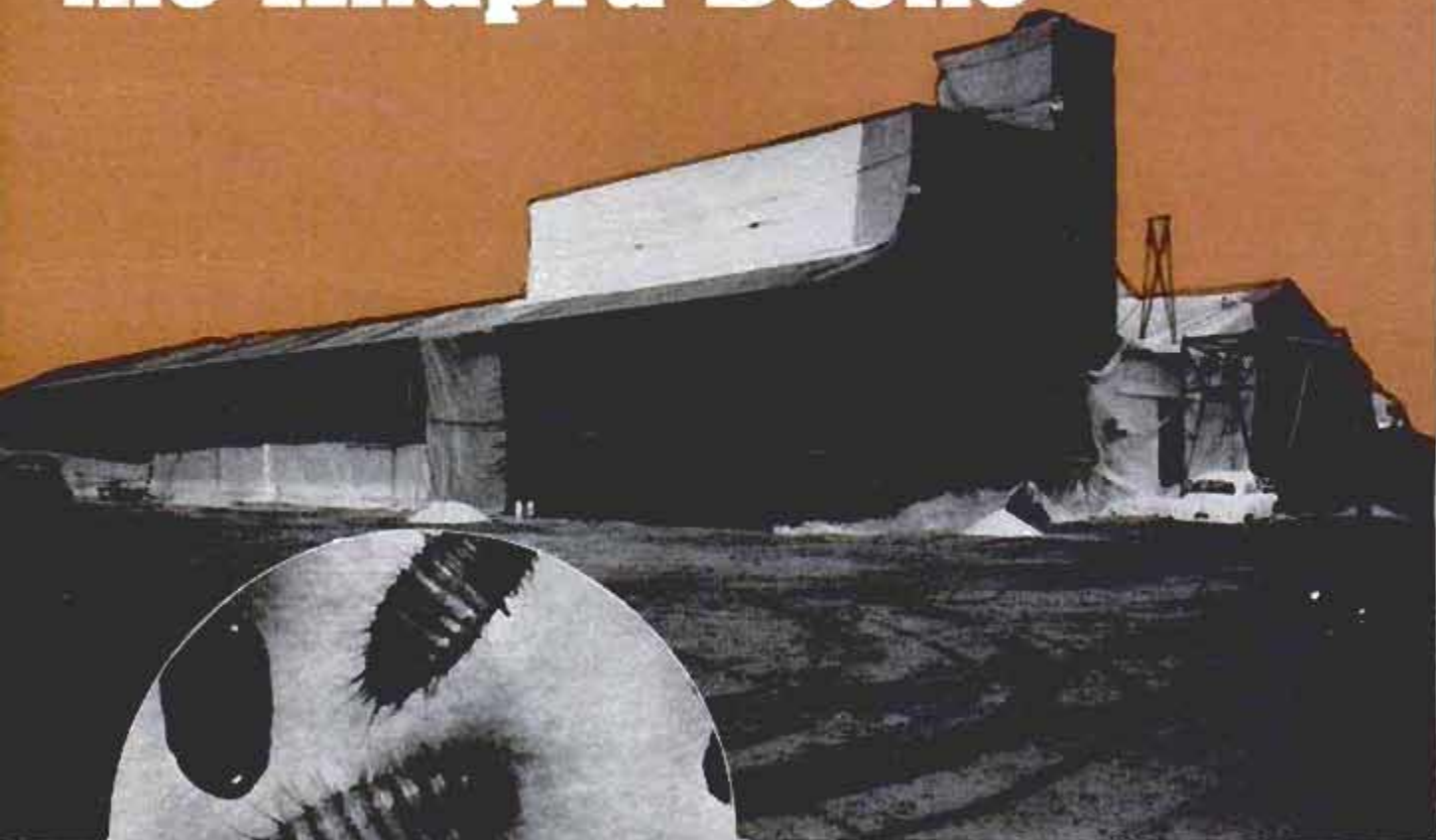
ROOMS MAY BE EASILY added or removed to meet family needs in an experimental house made of molded plastic sections. These sections, 8 by 16 feet, are bent to form ceiling, walls and floor. Eight of the sections are cantilevered in pairs from a 16-foot-square central utility core to form four rooms. Features include movable partitions, curtain walls, varicolored panels to control light, conduits and ducts formed into wall and floor sections, foam plastics for insulation, and specially designed appliances. The design is being refined at the Massachusetts Institute of Technology in a project sponsored by the Monsanto Chemical Company.



Arrows in top drawing show how air is exhausted from central core. Ceiling in this section is translucent. Home will have radiant heat



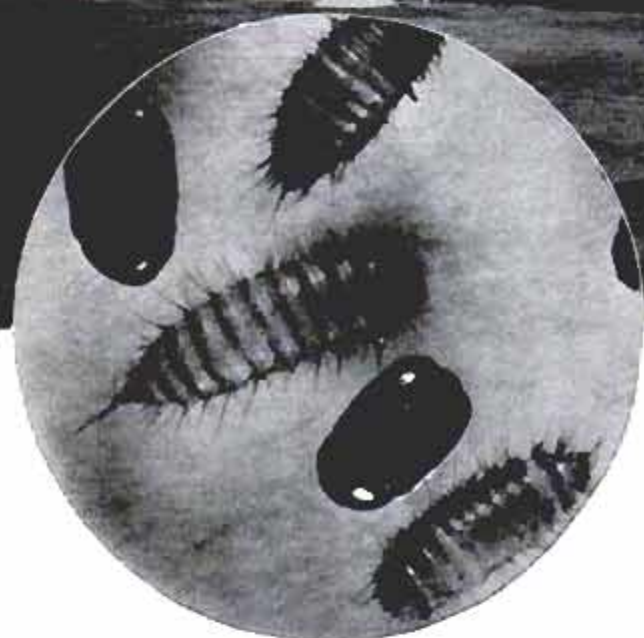
Undercover Enemy— the Khapra Beetle



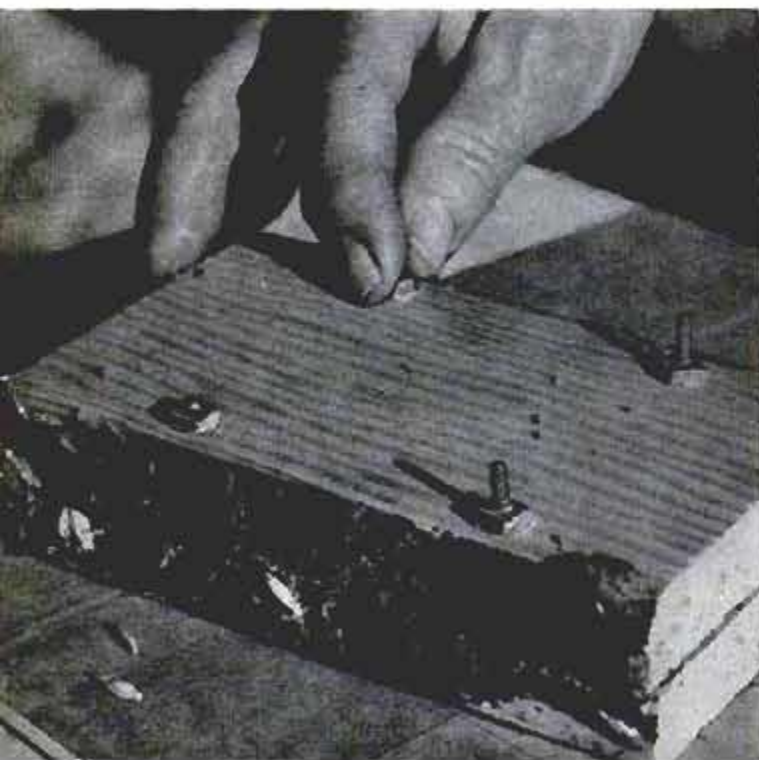
Dow Chemical Co. photos

Warehouse was wrapped with 100,000 square feet of plastic sheeting before fumigation test started

By H. H. Slawson



Adults and larvae, enlarged. Below, beetles were placed between bolted boards sealed on three sides. Gas entered through fourth side to kill insects



FROM CALIFORNIA to Kansas to Texas, a grim battle is being waged to save the nation's stored grains and processed foods from one of the most destructive insect enemies of the human race.

The villain is the khapra beetle, known to scientists as *Trogoderma granarium*. From its native India, it has spread to Ceylon, Malaya, Asia, Australia, Europe, Africa and now North America. It does not fly, but owes its far-flung travels to human transportation of infested materials.

Halted many times at United States ports by quarantine officials, the khapra beetle in 1946 gained entry to a warehouse in Fresno, Calif. The infestation was erroneously ascribed to the black carpet beetle.

Three years later, the infested warehouse was abandoned, together with the 300 tons of stored grain it contained. But insect-bearing burlap sacks from the warehouse were shipped to other California grain-storage buildings, which soon became infested.

In the fall of 1953, the beetle was correctly identified in the central San Joaquin Valley of California.

Hastily organized crews spread out to

look for the pale red-brown bug, which measures only $\frac{1}{10}$ in. long. Latest reports describe it thriving in 111 places: 80 in California, 28 in Arizona and 3 in New Mexico. Another infestation was found in a feed mill at Mexicali, south of the border.

The affected states applied quarantine measures, and federal authorities clamped stricter regulations on California, Arizona and New Mexico. Now, specified grains, seeds and food products must be cleared by Department of Agriculture specialists before they are shipped across state lines.

Meanwhile, the khapra beetle continued to multiply. According to one authority, the average female lays about 50 eggs. A generation can complete its life cycle in 30 days. In six months, under ideal conditions, the offspring of one female total 20,000,000 beetles.

The khapra beetle can live for three years without food, and for some time without water. It resists heat and cold and scoffs at many potent insecticides. Powerful fumigation with methyl bromide, however, might do the trick.

The insect fighters decided to wrap an entire building with gastight tarpaulins and pump it so full of gas that every last larva in every cranny and crevice would be killed.

An infested 1,000,000-cubic-foot grain elevator at Imperial, Calif., was selected as the test project. The corrugated-iron building, resting on a concrete slab, measured 120 feet by 280 feet with a height varying from 20 feet at the eaves to a 65-foot tower.

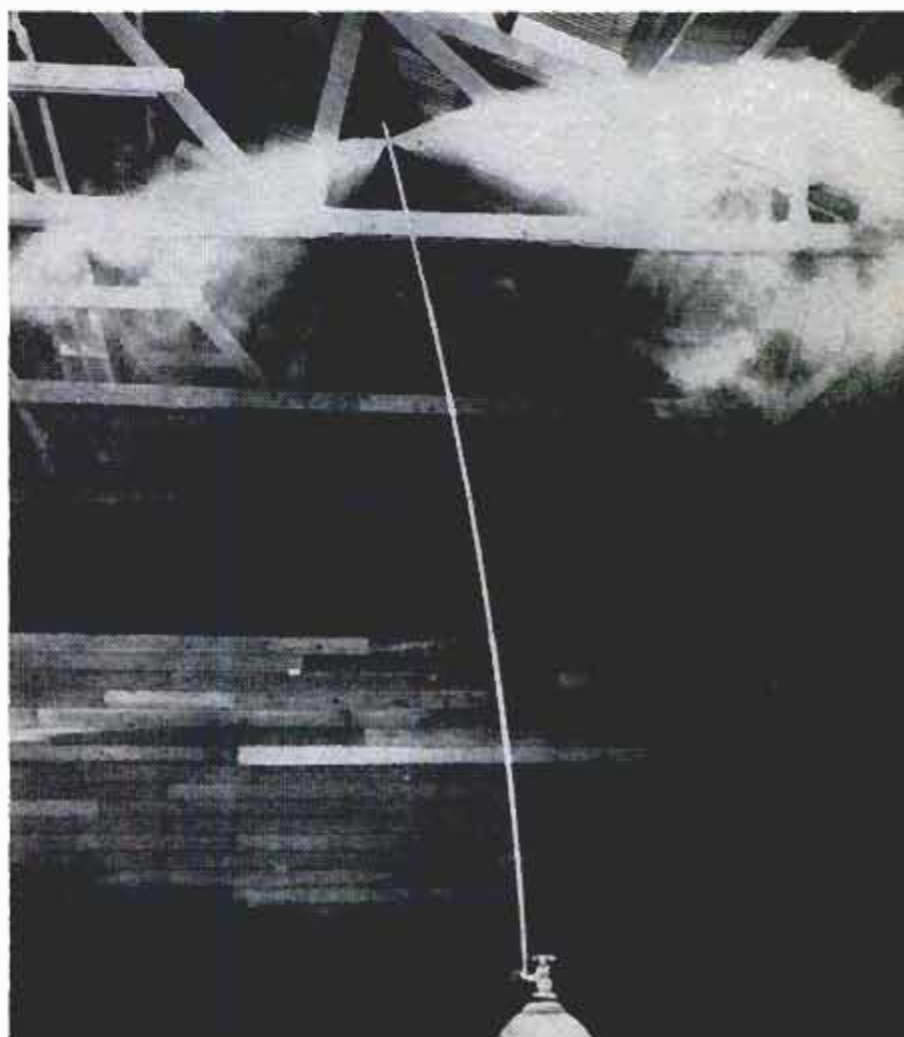
A five-acre area around the building was saturated with heavy malathion spray to kill any displaced beetles. Then came the task of wrapping the huge building in gastight tarpaulins. Seven men worked three days to cover the elevator with 100,000 square feet of canvas.

Polyethylene and vinyl-coated tarps were used at all points under any stress. Heavy spring clamps on the edges of the cover provided a gastight seal. The tarpaulin was anchored on all sides of the building in a tamped-earth trench. Four-inch bands of burlap covered the entire tarpaulin to protect it.



Live khapra beetles in screened Mason jar are placed in screw conveyor. Channel was then covered for test of gas penetration

One of the many cylinders of "cold" methyl-bromide gas placed in the warehouse discharges its spray through a riser tube





Test cages contained in cloth bags were placed in remote places to test effectiveness of fumigator

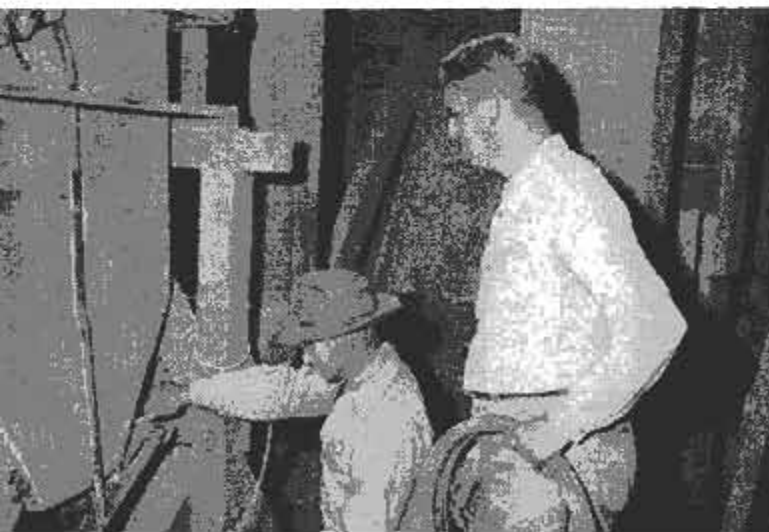
When all was ready, a 48-hour fumigation period began. Over 2½ tons of methylbromide gas were pumped into the building. One ton of methyl bromide and a fumigation period of four hours would theoretically kill all beetles, but the insect fighters wanted to be sure.

About 30 percent of the poison gas was sprayed "cold" from spray nozzles fastened to interior rafters and connected by hoses to cylinders. The rest was released "hot." The liquid methyl bromide was poured into five gas-fired boilers. After passing through copper coils inside the steam chest, the vapor traveled through garden hose to scattered outlets in the building.

As the gas was pumped into the building, the tarpaulins near the ground swelled out some six feet from the building's sides and remained so for 24 hours, indicating that pressure was being maintained.

Elaborate measures tested the killing effect of the fumigation. Beetles were wrapped in paper and placed in screened Mason jars suspended in cloth bags at remote spots. Other cloth bags contained short boards bolted together. Three sides

More than 5000 feet of plastic tubing were used to connect test cages with gas-analysis station outside



of the bolted boards were tarred so that gas could only enter through the short fourth edge and kill the live beetles placed between the boards.

Plastic tubes brought atmospheric samples from test cages inside the building to analysis instruments outside. Caged beetles were placed near the ends of the tubes so that mortality could be correlated with the gas intensity the instruments registered.

At the end of the 48-hour fumigation, the tarpaulins were removed. Test cages were collected and examined after a 10-day waiting period. Every one of the 166,541 beetles placed in them, including adults, larvae and pupae, was dead. The test cages were again closed and set aside for 30 days to allow live eggs to hatch. A total of 491,191 beetles had been hatched, but all were dead.

The Imperial project, directed by California's chief entomologist, H. M. Armitage, gave definite proof that a quarantined building could be returned to service safely. But much remains to be done. The khapra beetle is a hardy foe.

It has been reported living on grain of almost every variety; on dried blood, dried fruit, dried insects; on flour, noodles, nutmeats, tomato, flax and bean seeds, on grain straw, alfalfa hay and other materials.

It's a pest in English malting houses that use grain from North Africa, Syria, Iran and Iraq. British confectioners find the bug in peanuts imported from Nigeria, Burma and India. Infestations in Holland, Germany, France, Russia and other European countries have been traced to Japan, Korea, the Philippine Islands and Madagascar.

So far, economic damage by the khapra beetle in the United States has been felt only in the western coastal and intermountain areas. But if it ever gets beyond control, it would cause major trouble among a host of the nation's food-processing industries. The next 10 years will tell the tale, authorities say. Persons who believe they've spotted the beetle are warned to call the nearest professional pest-control operator, who will notify government specialists if it is the deadly khapra. ★ ★ ★

Five-Minute Test for Gold Reveals Minute Deposits

Prospectors, chemical researchers and doctors can save precious hours with a five-minute test for gold. The only materials needed are two test tubes, a medicine dropper, a reagent, acid and butyl alcohol. As little as one thousandth of a millionth of an ounce of gold indicates its presence by turning the sample a violet color.

Emergency Bailout

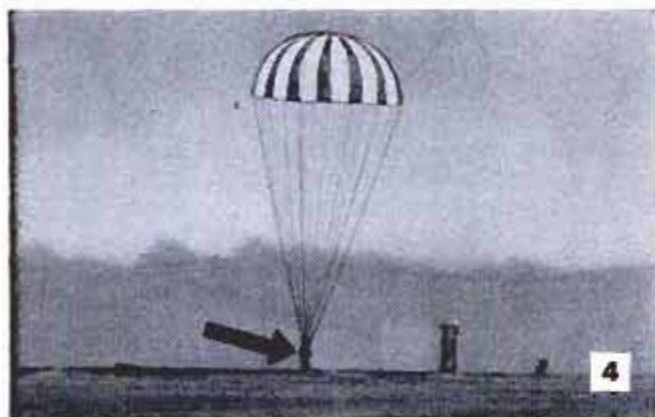
SIX-FOOT, 200-POUND DUMMIES, as nearly like the human body as sponge rubber, steel skeleton and cast aluminum can make them, have been taking rides on a supersonic rocket sled to test the emergency bailout system of the Convair F-102A. The sled screams down a 10,000-foot track at the Air Force Flight Test Center in California's Mojave Desert, reaching speeds of up to 750 miles per hour. The speed is so great that engineers cannot see what happens, but must depend on high-speed movie cameras to record the dummy's ejection from the plane. The sled hits its peak velocity, powered by eight rockets, 3000 feet down the track. Sustainer rockets keep this speed until the ejection is complete. In the last 2000 feet, the rocketing sled runs into a 2-foot-wide trough of water which acts as a brake and halts it.



1. Ejection begins as canopy is blown off. Total time between pictures one and four is five seconds



2. Next, pilot in seat is ejected by explosive charge. 3. At this point the seat detaches, opening parachute



4. Pilot coming down safely under parachute. Below, sled is built for 16 rockets, but so far no more than eight have been used. Two of 10 rockets shown are used to sustain top speed. Water brake stops sled

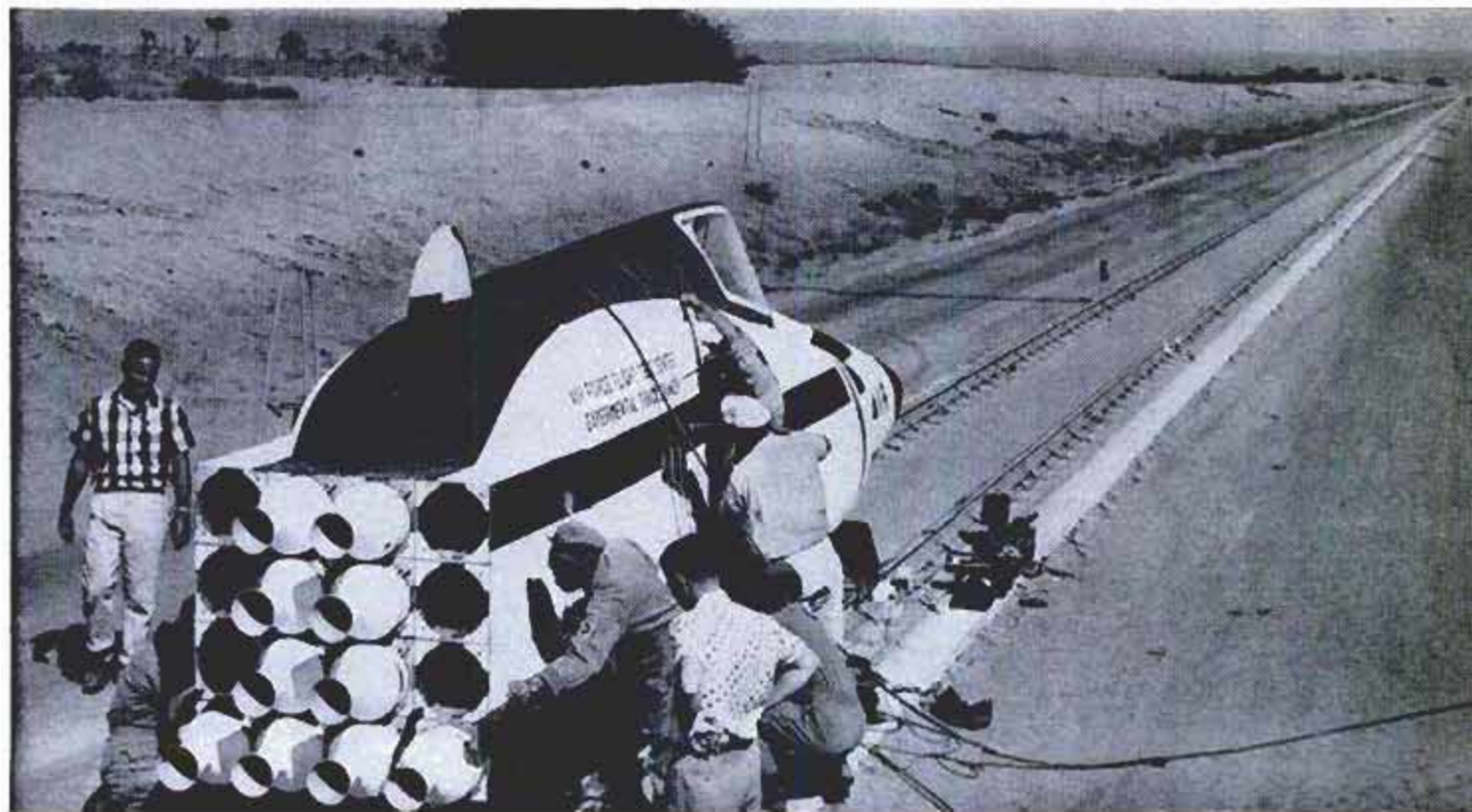
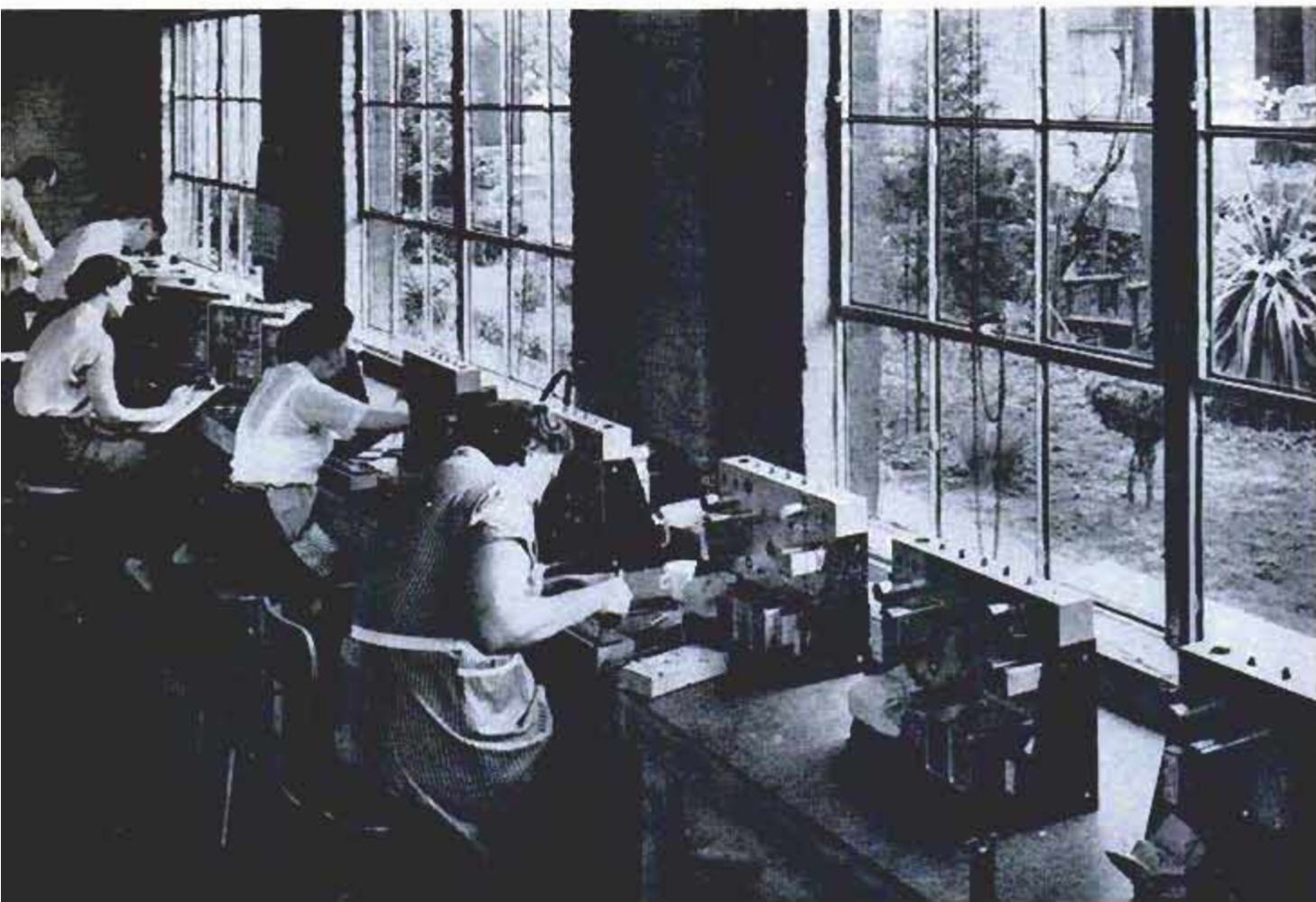
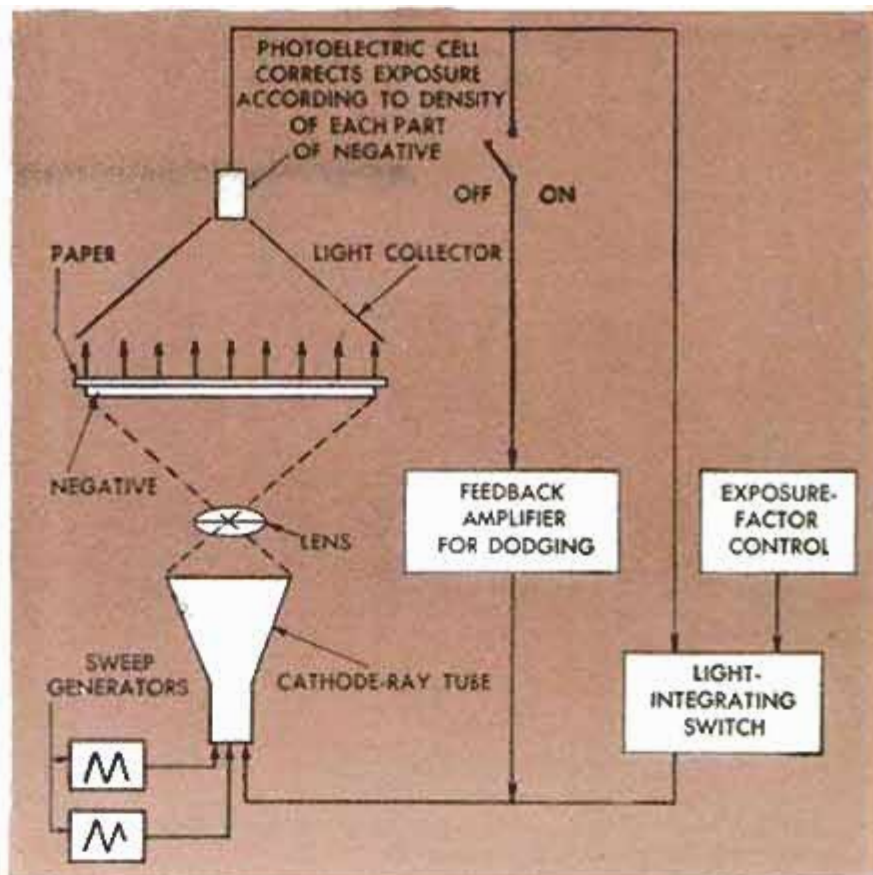
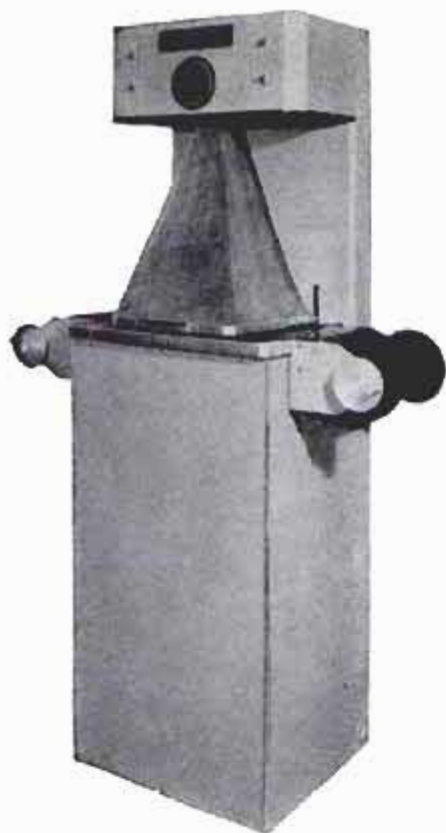




Photo printed by conventional methods has little detail in dark foreground or in bright area through windows

Same negative produced this print in the electronic printer. Note fine detail here that is missing in photo above





Photoprinter, built into a metal cabinet, has a feedback system which varies light according to the negative

Electronic Printer Brings High Fidelity to Photography

ELECTRONICS HAS been applied to photography to bring out the greatest possible detail in photoprints.

The two photos shown on the facing page were printed from the same negative, yet even a glance shows a surprising difference in detail. The top photo was made by conventional photoprinting methods, the bottom by a new electronic printer.

The printer uses an electronic scanner to record faithfully all the detail in a photographic negative. The system eliminates dodging and all other trial-and-error darkroom techniques designed to bring out the maximum contrast in each small portion of the negative.

Cathode-Ray Tube

Incorporated in the electronic printer is a cathode-ray tube. Coupled to the tube are sweep generators which produce the scanning light.

Built into the lower part of a cabinet, the tube projects its scanning beam through a lens and then through the negative. The print paper is placed above the negative, and above the paper is a photoelectric cell. The cell in turn is connected to a feedback amplifier which completes the circuit back to the cathode-ray tube.

In effect, the amplifier and cell correct the exposure according to the density of

each part of the negative. They do this dodging automatically through the feedback amplifier. Each print made with the negative is exactly the same, and each has the fullest possible detail.

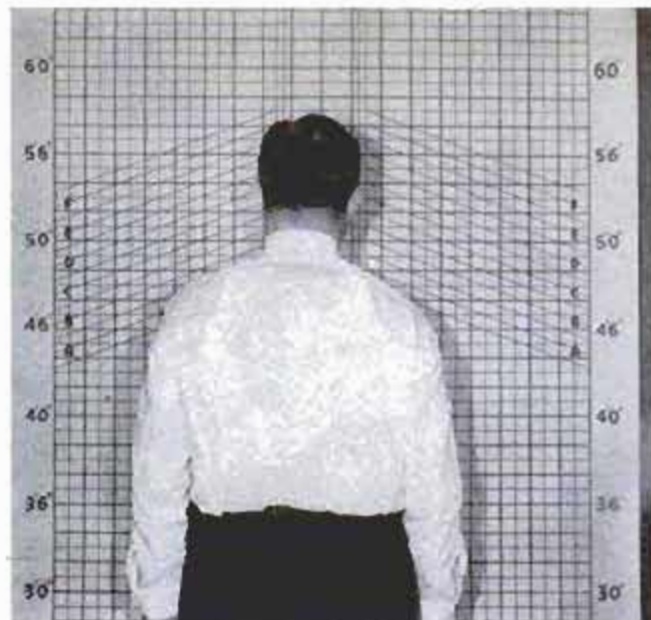
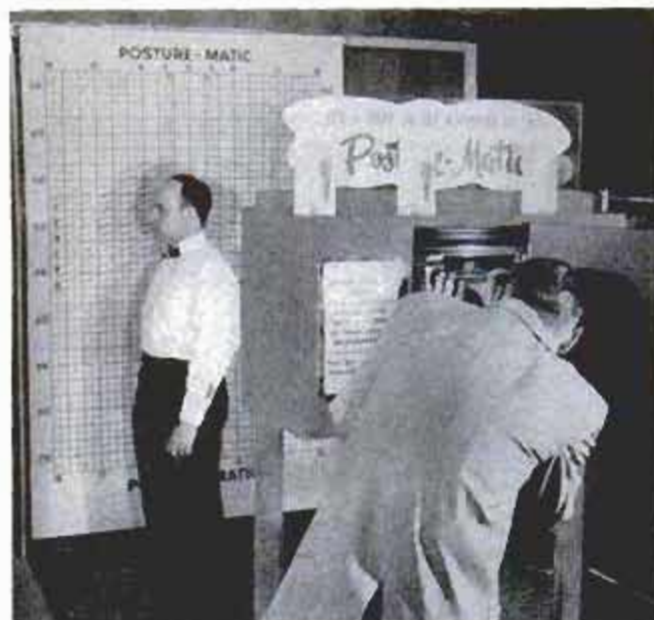
One Setting Required

The printer requires only one manual setting, according to the speed of the paper which is being used. No further settings are required even when negatives are changed, as uniform prints are produced automatically from dense and thin negatives.

The printer has special value in the field of aerial photography. Photographs from the air frequently reveal intricate patterns of light and shadow on small areas of the negative. The electronic printer is capable of bringing out many such details which would be lost if the negative were printed by the conventional process. This results, of course, in more reliable interpretation of the aerial photographs.

The new printer also is used for commercial, scientific and industrial photography, where lighting is a problem.

A special model of the printer is used by hospitals and medical laboratories to produce replicas of radiographs and X-ray films. The process brings out greater detail in such films, detail which may be important to accurate diagnosis. ★ ★ ★

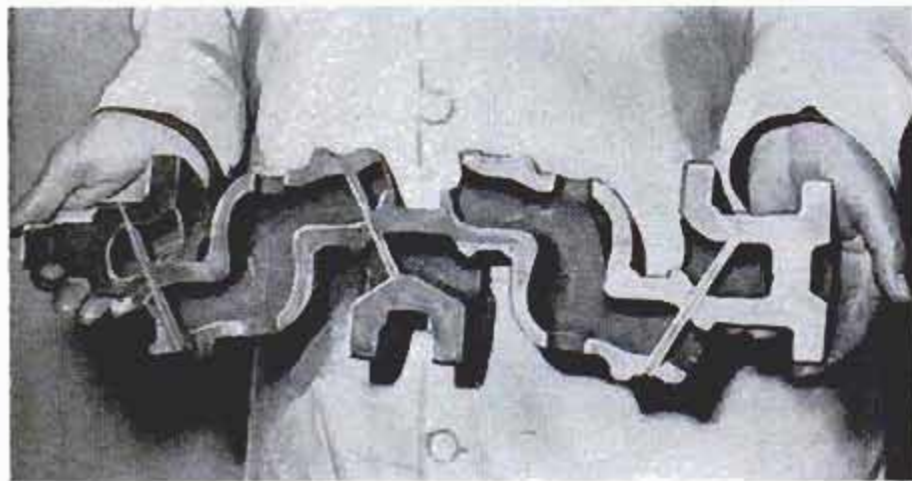


Tailor takes various photos to record customer's measurements, including slope of his shoulders and back

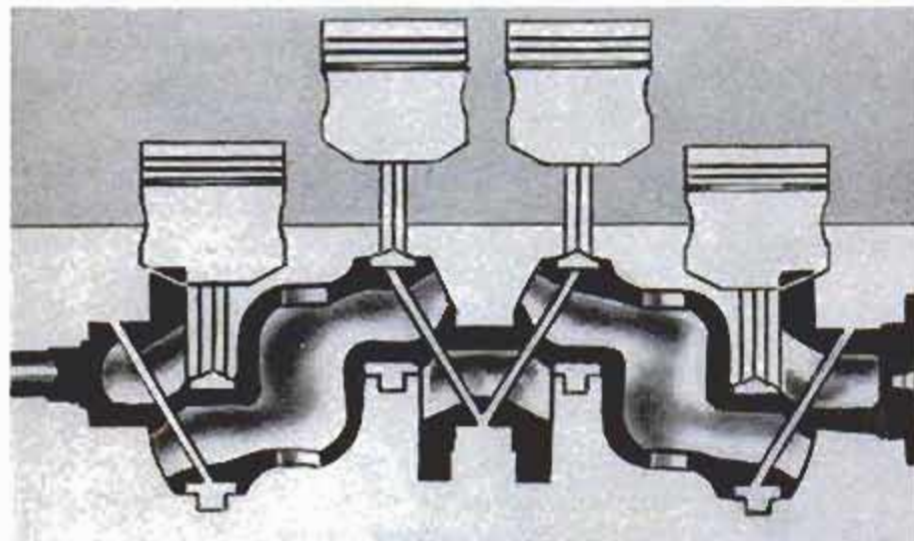
Tailor Photographs Customer to Get Exact Measurements

Tailors have taken a hint from the police and now photograph customers in front of a chart to get precise measurements. The camera used is a Land print-a-minute model and the prints are attached to the order

blank. Lines on the chart show the exact size of the customer and the degree of slope in his shoulders and back. The photos show how much lower one shoulder is than the other, a variation common to most persons.



Hollow crankshaft is lighter in weight and is said to be better balanced than a solid one. Below, steel tubes in the casting carry lubrication



Hollow Crankshaft In German Ford

Many advantages are claimed for the hollow crankshaft now being used in the engine of the German Ford, the Taunus. Steel tubes are embedded in the iron during casting for the forced lubrication system. Among the advantages claimed for the hollow crankshaft are a 35-percent weight reduction, better balance due to improved metal distribution, greater rigidity and a lower cost.

Fish Shipped in Bags

Tropical fish are now transported with less loss in new shipping aquariums composed of plastic bags set in cardboard cartons. The container, accommodating 400 fish, consists of an outer carton, two inner cartons and two bags. The sides of the inner cartons are folded to cushion shocks and provide aeration.



Trailer studio equipped with loudspeakers entertains visitors at fair

Mobile Studio Follows the Fairs

FAIRS, SPORTS EVENTS and carnivals around Massachusetts are enlivened by music and programs from a traveling studio. Although the trailer unit "broadcasts" with loudspeakers, its interior looks like a miniature radio station. A glass partition splits the unit into an engineer's compartment and an announcer's studio. The engineer has a control panel, amplifiers, recording equipment and air conditioner. In the announcer's room are two turntables, two microphones, a playback announcer system, phone, speakers and a hi-fi unit. Michael Wynne-Wilson, owner of the studio, finances the speeches, club programs and music he dispenses with the paid commercials of local and national firms.

Capable of operating either indoors or outdoors, the studio has been in steady use since its start in 1954

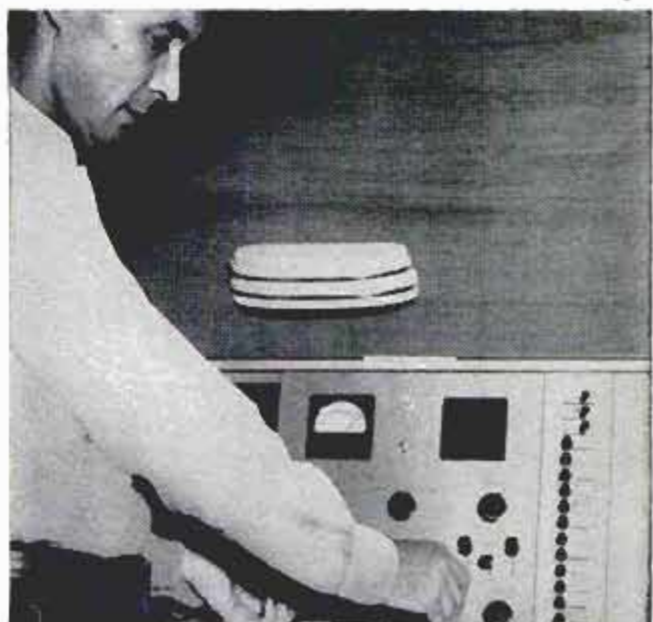


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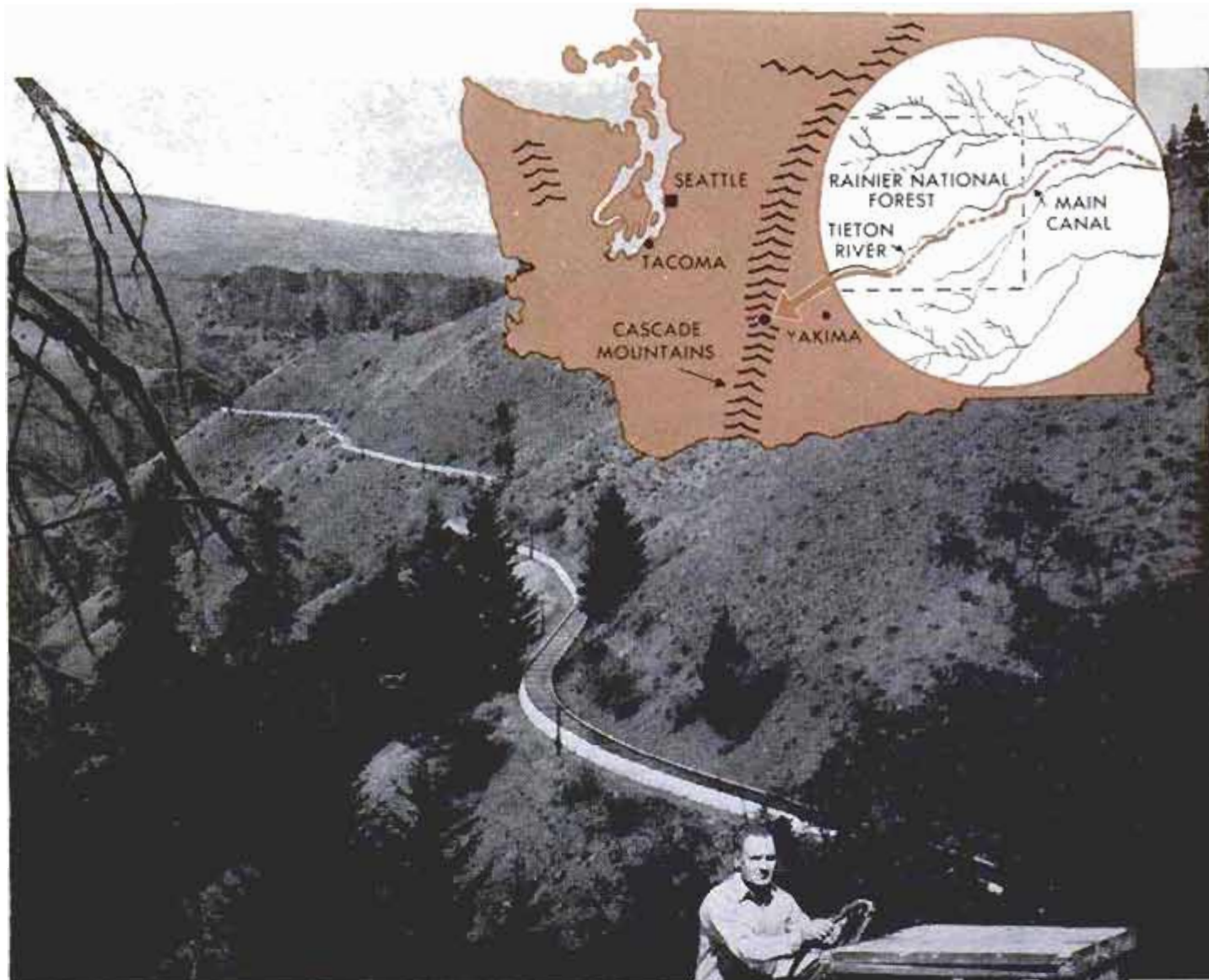


Owner Michael Wynne-Wilson MCs programs from the announcer's booth inside the traveling studio

Chief engineer Alex Troy operates the control panel. Troy, together with Wynne-Wilson, designed interior

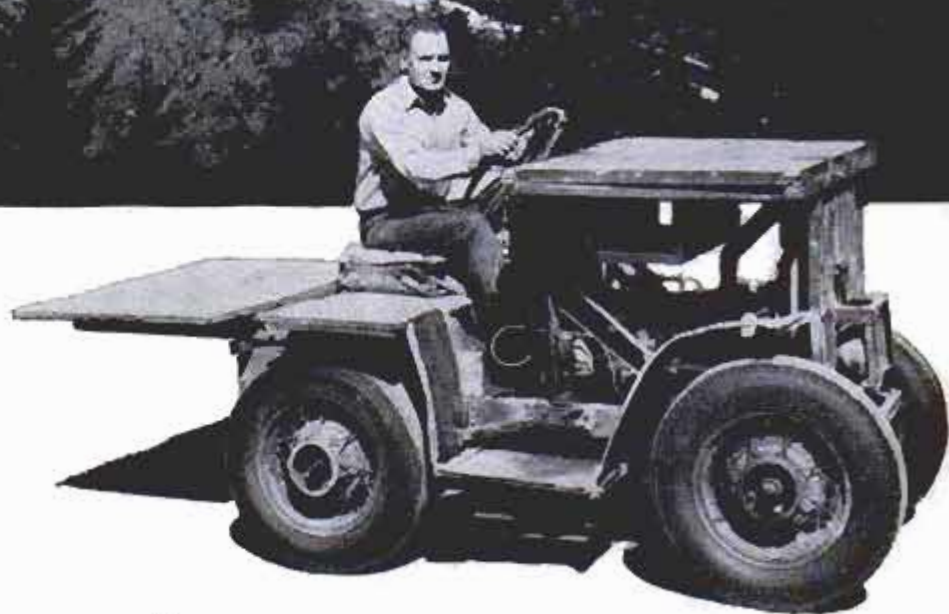


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Canal snakes along mountainside, through tunnels, for 12 miles. Water irrigates 30,000 acres of fruit

Jim Stevenson rides the tunnel-running "Jitney." Only non-Model-A parts are the gas tank, '35 Ford wheels, Chevrolet spring shackles



By Phil McCafferty

**For a wild ride
no carnival thriller can equal,
climb aboard the**

MODEL A on the CANAL BEAT

TAKE A MODEL-A FORD, remove the body, one headlight and the drive shaft, cut 4½ feet out of the frame, chop 20 inches out of the front and rear axles and you've got a "Jitney."

Jitney is the name lovingly bestowed on this condensed little car by her owners and builders, the Yakima-Tieton Irrigation

District near the city of Yakima, Wash.

At first glance, perhaps even Henry Ford could not identify the Jitney's breed, but Don Northcott, one of the men who helped build her says, "she's about 99 percent Model A." She is, too—all Model A save gas tank, wheels and rear spring shackles.

Hop on the seat to test the Jitney and

you're sure it's an "A." Punch the horn button and you get the Model A's distinctive "Ah-oo-huh." Remember how to start her up? Reach under, turn the gas pet cock, push the spark quadrant up for full retard, pull the throttle quadrant down just a bit, crack the mixture control about a quarter turn, belt the choke rod twice while depressing the starter button and she's off, cluck-cluck-cluck-clucking with metronomic precision.

A look at the Jitney would probably fail to arouse the emotions of the Hollywood custom fender-benders, and she certainly would not win a horsepower race. But she was custom built for a special purpose. She is the sole vehicle capable of ministering to the needs of the Irrigation District's 12-mile main canal.

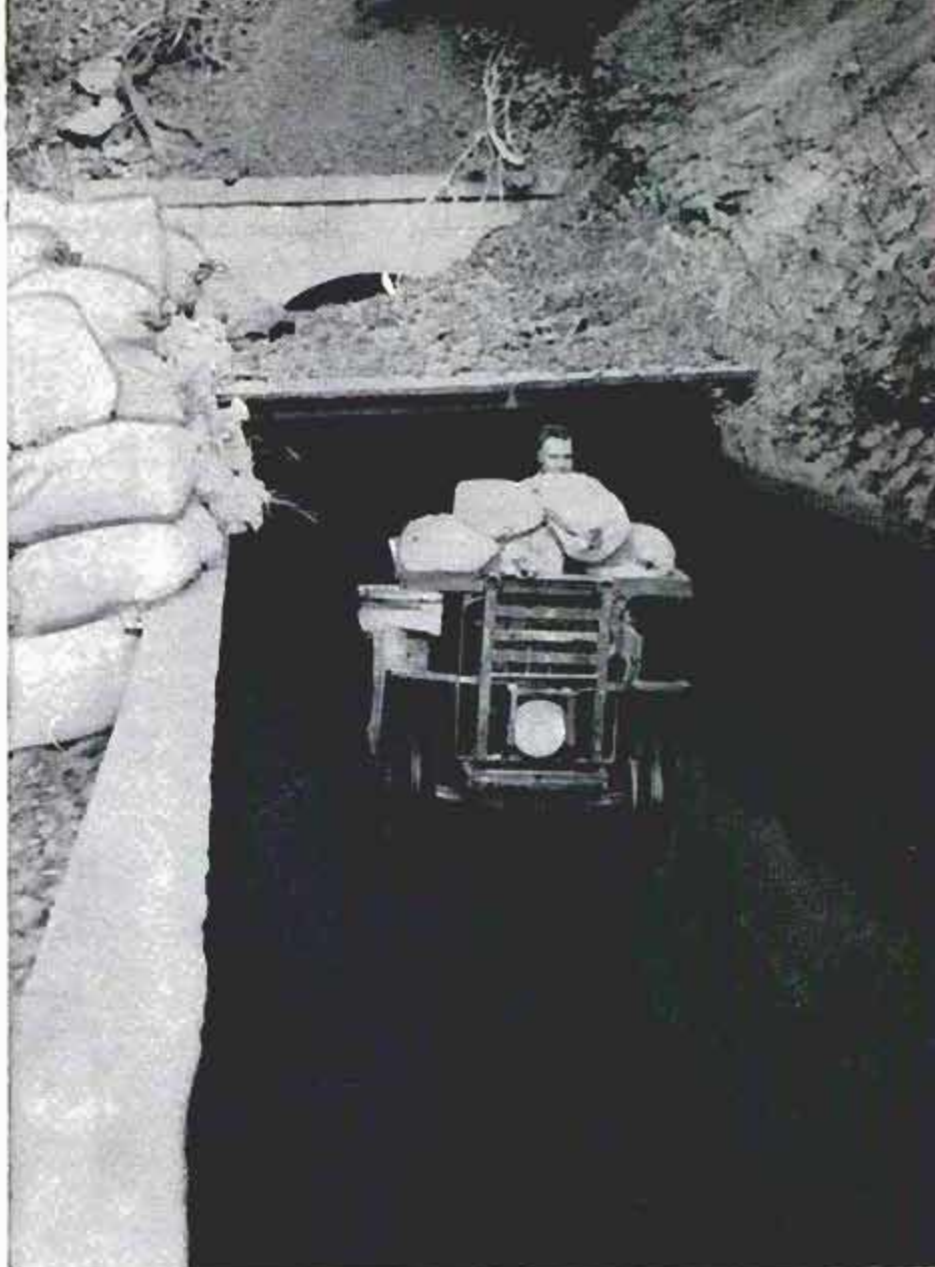
The canal, a circular-shaped 7¼-foot-diameter concrete tube, carries water from Washington's Cascade Mountains to a branch system and finally into some 30,000 acres of apples, peaches, apricots, cherries and pears in the Yakima-Tieton area.

About eight miles of the canal have a six-foot-wide opening at the top. The remaining four miles plunge through five tunnels blasted out of the solid rock. All of it winds along a nearly vertical mountainside, accessible in only three places by normal-sized car or truck.

So the men at the district figured if they couldn't get to the canal, they'd get into it. They did too. During the winter months, from October to April—when the canal is dry—the Jitney runs back and forth through the canal carrying men and supplies needed for inspecting, cleaning and repairing the system.

Ordinary cars just can't travel through such a tube. They had to trim the Model A down to fit the canal. Wheelbase is 54 inches, tread is 38 inches. Those dimensions are just that for a purpose. If the Jitney were any bigger they'd never get it home!

Getting the Jitney in and out of the canal is quite a procedure—turning her around is just as wild. On a small flat area near the "A's" garage they built a ramp across the canal. Planks are run off the side of this ramp under an A-frame built over the canal. The Jitney is driven out on the planks, a block and tackle is attached to a hook directly in front of the steering wheel



Laden with bags of sand for concrete work, the Model A clatters out of an inky black, 3000-foot tunnel. It often pulls the mixer

and the car is lifted up. The planks are slid aside and the car is lowered into the canal, ready to go.

Similar A-frames were built at several points along the canal. When the ditch rider wants to go home, he drives to a turn-around point and hooks up the hoist. By tipping up the back-deck section, taking off the extra front platform, turning the front wheels hard right and lifting the Jitney to the exact center of the canal it will just clear as he swings it around—heading it in the opposite direction for the trip home.

Keeping the Jitney in ready-to-go condition during crop-irrigating season is as important as maintaining a fire truck in a fireworks factory. Water flows through the canal at about 8,000,000 gallons per hour. Mercury-switched floats, located at strategic points along the canal, sound the alarm in case of trouble. If there is a break or obstruction in the canal—this is serious business to the 5000 water users—the



Car is hoisted to the widest point in the tube and turned around with aid of A-frame, block and tackle

water is shut off at the head gate and remaining water is dumped into the river below through huge 22-foot by 25-foot sump valves. The Jitney and a crew go out to locate and repair the damage in the drained canal.

In addition to her duties as year-round patrol car, the Jitney becomes a beast of burden in the winter when major repairs are made in the dry canal. She proudly totes a load that would probably break the spirit—if not the back—of some of Detroit's more modern productions. Almost daily during repairs, workers load her down with twenty-five 100-pound sacks of cement and sand—then they get on! Triumphantly she pulls this load—and pulls a chopped-down cement mixer behind!

Conservation men think she's about the greatest gal alive. Last winter the lives of 138 deer and elk were saved by the Jitney's operators during the dry canal season. The A's owners have built several game bridges across the canal opening, but the animals seem to prefer jumping into the canal on their way down the mountainside, especially during the harried hunting and mating seasons.

When cobuilder Don Northcott was asked if he still takes his creation for a spin, he answered, "No, I'm getting too old, I guess—I just haven't got the nerve any more!"

A test ride in the tube is perhaps somewhat more thrilling than taking a first ride on a bobsled. Though the car never at-



Planks are laid over opening of huge sump valves to allow car to pass. Valves release water in emergency

tains a speed over 40, a spin on the Jitney is well calculated to scare the socks off an Indianapolis "500" driver.

Driving in the canal is a bit different from a Sunday spin. Ordinarily the canal is strangely silent. But wind up the Jitney and the echoing roar of its unmuffled exhaust is almost deafening. Since the Jitney's tires wedge against the canal's circular sides, steering is difficult.

When you ask the Jitney's driver-care-taker Jim Stevenson for a ride he gives you a knowing grin. "Just pull up a sack of cement and hang on," he says. There are no passenger seats. Even the driver sits on a cement sack when she's loaded. Starting out is effortless even in high gear (the canal only drops seven feet per mile). As you gain speed you'll note with some displeasure the steel bars holding the top of the canal together at four-foot intervals are whizzing by at an alarming rate. Don't stand up—they're only 18 inches above your head now!

Going into the first sharp curve is the real sensation. First thing you'll note (after the hair on the back of your neck stands up), is that your hands are locking themselves onto the deck edges. Stevenson says he'd rather take a curve on the highway wide open in his car than take a canal curve at 25 with the A.

Because of the curved canal sides it is necessary to bank the Jitney up on the side to take a curve at any speed. If there were more room in the canal, and if the car



Jitney plunges into tunnel as it makes first canal inspection trip after fall water shutoff

could turn more than about 15 degrees (because the tires are so close to the frame) more speed could be attained. Then centrifugal force would plaster you out against the wall, but taking a curve with the chopped A gives you a sickening feeling that you're going to tip over—which is entirely possible.

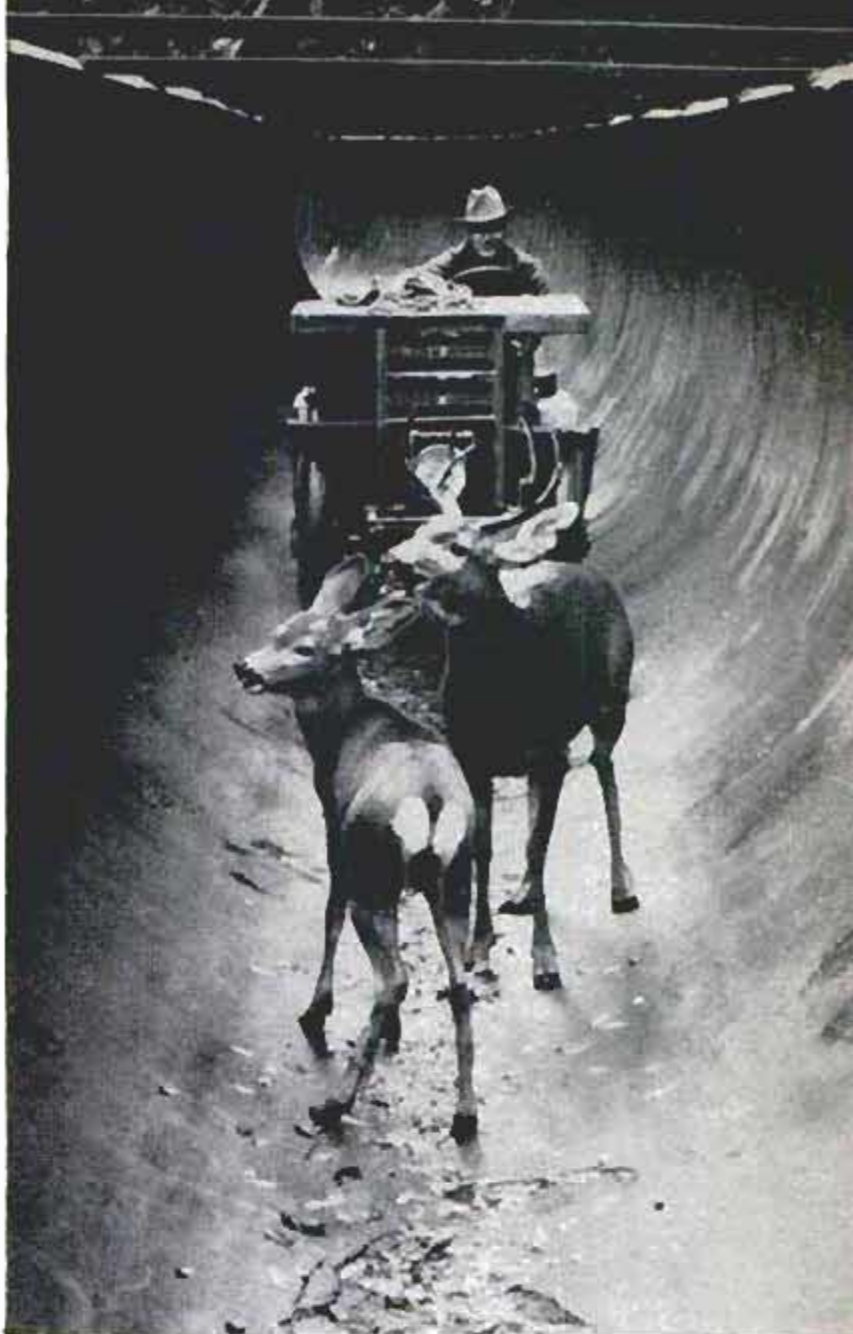
With the exhaust roar you couldn't talk to the driver if you wanted to, but by now he's wearing the same smile you get from the onlookers as you stagger off a roller coaster.

Bank through one 90-degree turn right into another one—wham—you're in the Rail Creek tunnel, probably the blackest you've ever seen. The Jitney's one headlight switches on. Better keep your head down because jagged rock is only eight inches above your head.

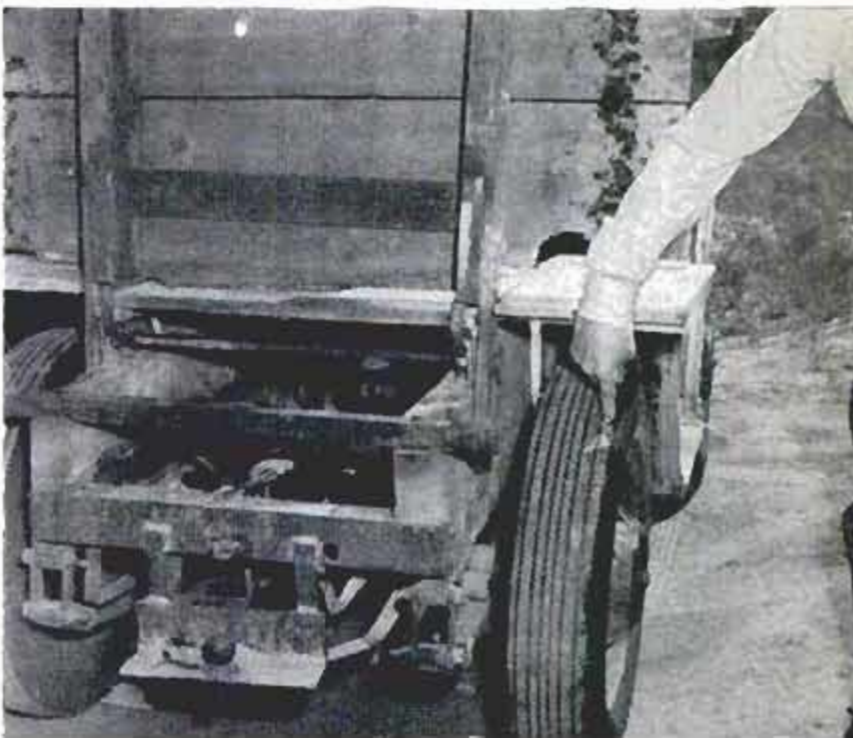
Future heart-stoppers will be about the same for the rest of the trip, but the chances are pretty good you'll come roaring out of a curve and meet face to face with a 1400-pound bull elk who has mistakenly jumped into the tube. By now you've had your thrills, so Stevenson will slow down and gently nudge the big fellow down the canal with the A's nose so he can get out. That's what the Jitney's heavy steel grille is for.

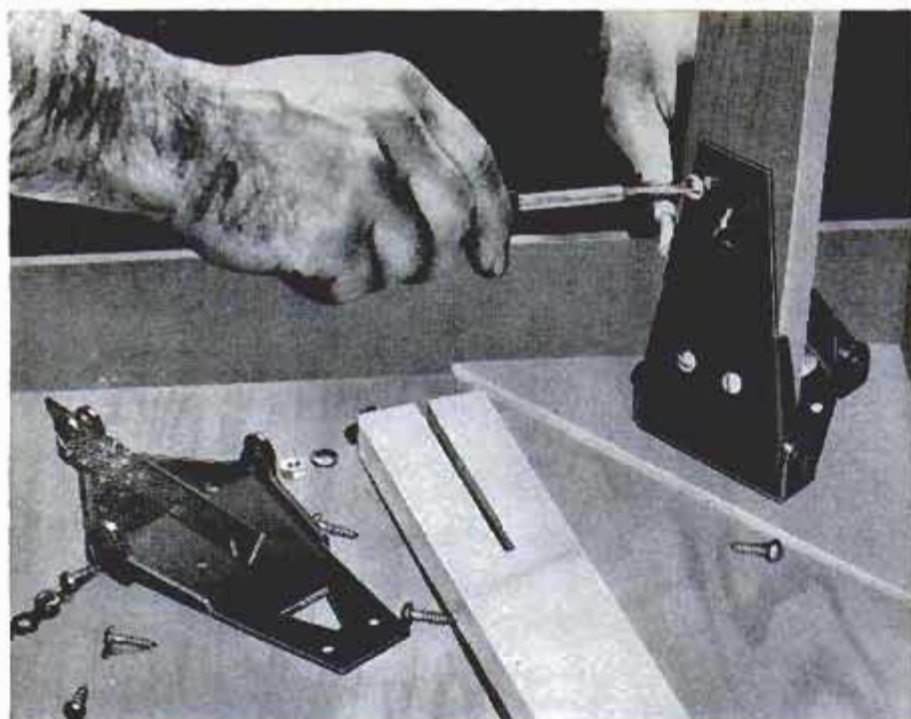
"Henry," first canal car, was a cut-down Model-T Ford of about 1920 vintage. When the "T" wore out, they

(Continued to page 242)



Bewildered game animals like these deer get into tunnel, which is dry during winter, and have to be lifted out or driven out. Below, shape of tunnel makes travel rough on tires. Driver Stevenson points to worn outer tire edges





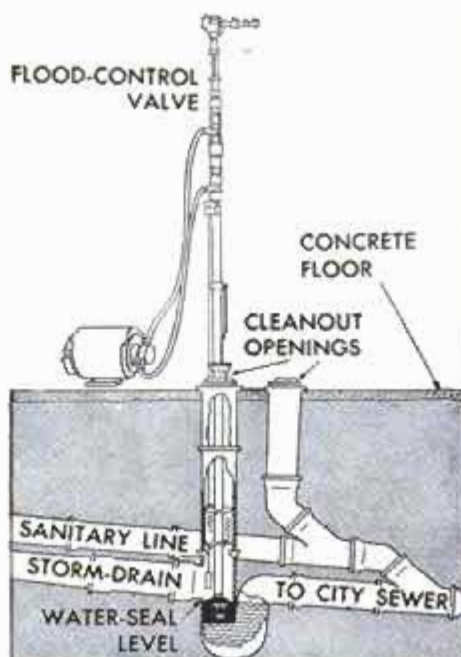
Folding Hinge For Table Legs

With the aid of a special hinge, craftsmen can make their own folding furniture. The heavy-duty hinge is designed for tables requiring strong, rigid support such as model-railroad layouts, table-tennis tables and picnic tables. A brace locks the hinge in the open position. Installation requires only the drilling of a hole and the cutting of a slot in each leg.

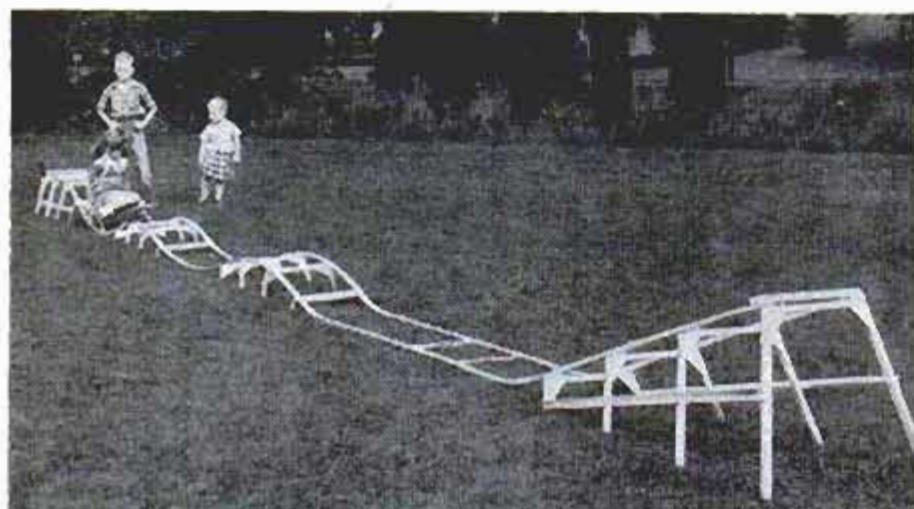
Folding table leg is fastened to the heavy-duty hinge with four screws

Basement Flooding Prevented by Valve

Basements are protected against flooding by an automatic valve mechanism which is installed over clean-out openings in the floor. The valve is encased in a long tube which extends down into the storm-drain line. The upper part of the mechanism is connected to a motor and pump. When flood waters or back-pressure water from the sewer or sanitary lines tend to rise, the valve automatically locks, making it impossible for the water to back up into the basement. At the same time, the pump and motor remove any seepage water that collects in the drain line behind the closed



valve, pumping it out through the valve and into the city sewer, thus clearing the line of all water.



Roller Coaster For the Back Yard

Back-yard play areas can now have all the thrills of a midget roller coaster. This ride isn't as big or as steep as the real thing, but it has enough "waves" to give the children a lot of fun. It can be assembled in lengths of 20 to 200 feet and three models are available for different age groups.

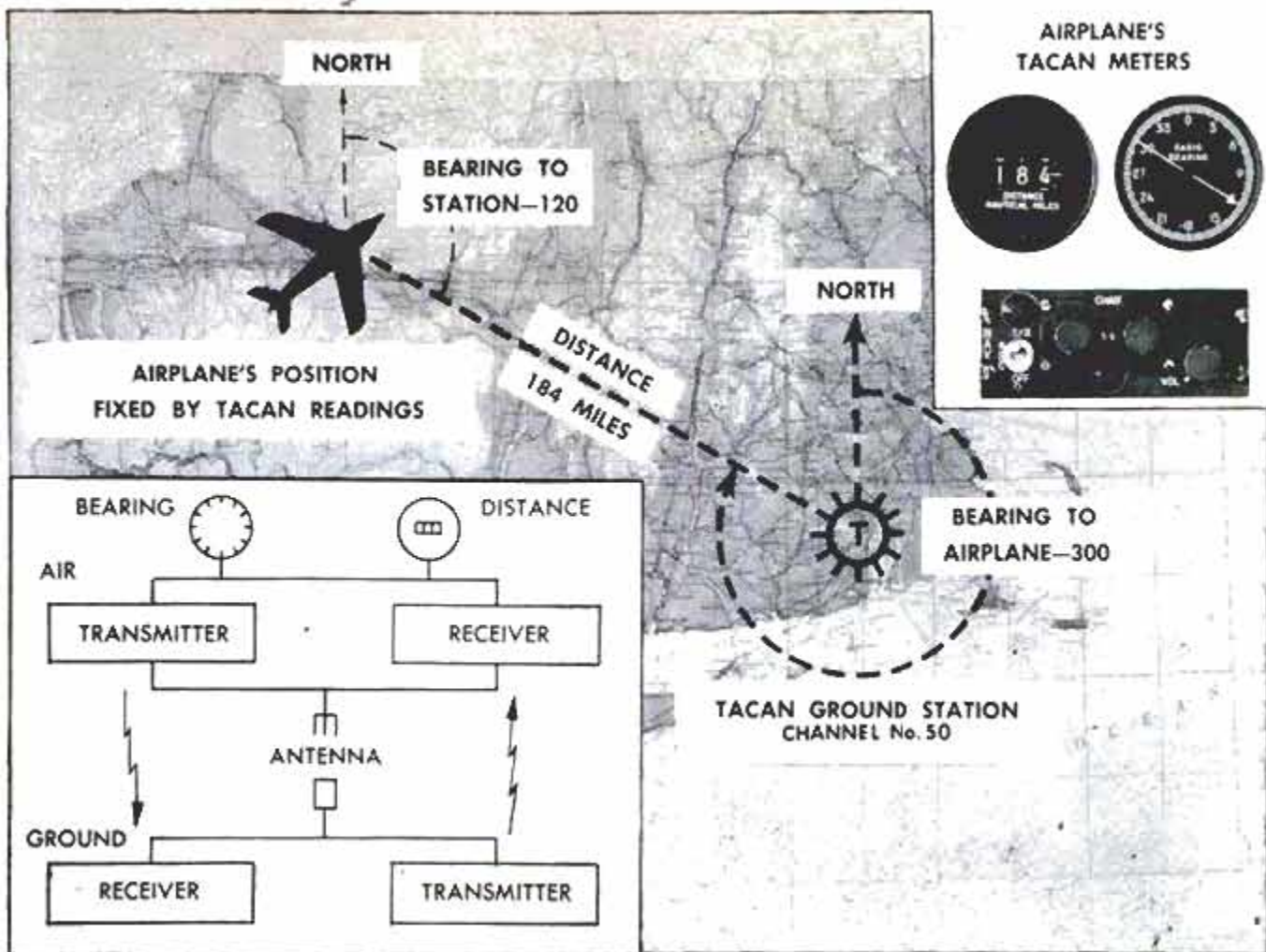


Diagram and map show how TACAN computes plane's bearing and distance. Meters give figures to pilot

TACAN Pinpoints Position For Airplane Pilot

MILITARY pilots now are using a new all-weather navigation system that determines a plane's position with pinpoint accuracy. The system may also be used for commercial flying in the future.

Called TACAN (tactical air navigation), the system requires only one radio channel instead of the several needed for other instruments which perform the same functions. A transmitter-receiver aboard the plane sends out a series of radio signals to a TACAN ground station. An electronic computer measures the interval between the query and the reply signal from the ground, and converts the information into nautical miles. At the same time the cylinder-shaped antenna on the ground is sending out direction signals as it rotates. The result is that the pilot can read his distance from the ground station on a taxi-type meter and his bearing on a dial.

The Air Force and the Navy now are using TACAN and the Civil Aeronautics Administration is studying the system for possible use on commercial airways. A light, compact TACAN unit has been developed for use in private aircraft.

Cylindrical antenna revolves atop an experimental TACAN ground station. It sends out direction signals





The rink of this skating troupe in California was on a trailer on the highway last night, put in place on the fair grounds in the morning and now the skaters are ready with the first show of the evening

Panels that are actually sandwiches consisting of Freon-gas tubes in mastic bound between two layers of sheet steel are laid out and the tubing is connected. Compressor unit in truck provides refrigeration

During the day, when the hot sun would have the compressor running wild trying to keep the ice frozen, aluminum reflector panels are used to cover the rink. Trailer in background is used to transport rink





Ice Rinks on Wheels

ICE SKATERS no longer wait for a freeze before getting their blades sharpened, and they don't have to go searching for a pond or river to cut their figure-eights. Now, whatever the weather, a crew of men unrolls a few miles of flexible pipe on a playground or at a county fair, truck-mounted compressors start chugging and the next thing you know, the skaters are pirouetting on a slick rink.

Manmade rinks aren't new, but until recently the equipment was so bulky and difficult to handle that moving a rink from one spot to another was undertaken with about the same zest as moving the Empire State Building would be. Then inventive minds went to work. In Wilmington, Del., where normally no more than two or three weeks of ice skating could be expected in a year, a civic-minded recreational group installed a portable rink in a field used for baseball during the summer months. Using flexible plastic piping made from Du Pont's "Alathon," they set up an 85 by 185-foot rink that provides outdoor skating when temperatures reach the upper 60s.

An ice-skating show, anxious to play before audiences at county fairs along the West Coast, came up with another version of a portable rink. This one consisted of Freon tubes packed in a mastic and sandwiched between steel plates. A number of these panels are laid side by side and interconnected. Then water is sprayed over the sandwiches until a thickness of ice is built up. This rink has been used in areas where the temperature reached 110 degrees in the daytime. Aluminum reflector panels are used to protect the ice from the sun under these conditions. But the panels are removed long enough before the show goes on to permit the hard ice to soften slightly, so the skates can bite in for control. ★ ★ ★

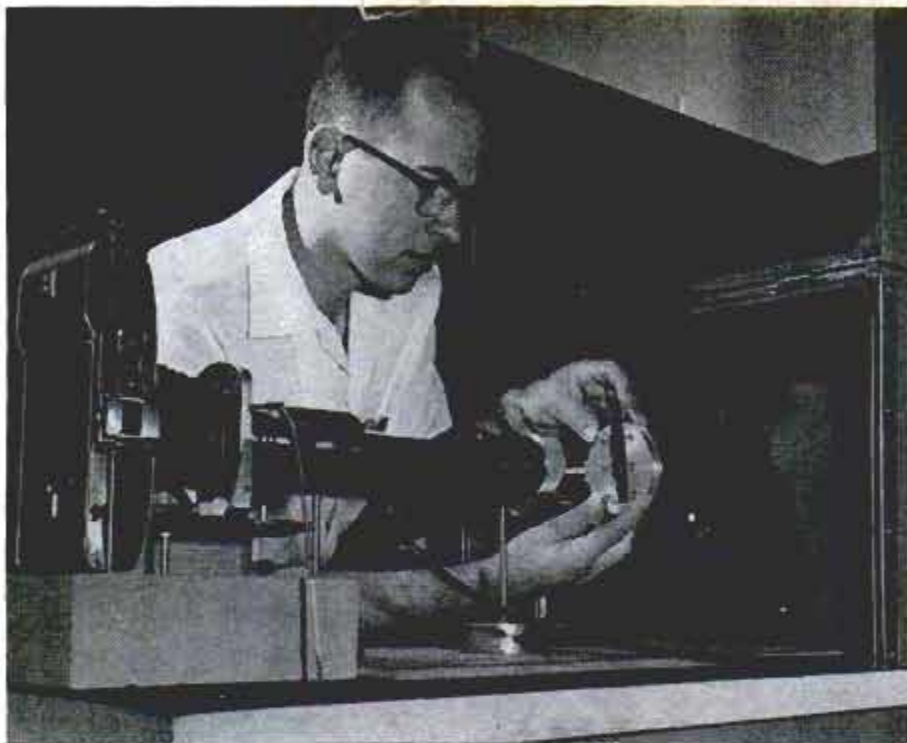


Plastic tubing to carry refrigerant is connected to the supply pipe in Wilmington, Del., playground rink



Above, truck carries four compressors to provide 140 tons of cooling for 85 by 185-foot rink. Below, after pipes are covered with sawdust, water is sprayed on to build a layer of ice three to four inches deep



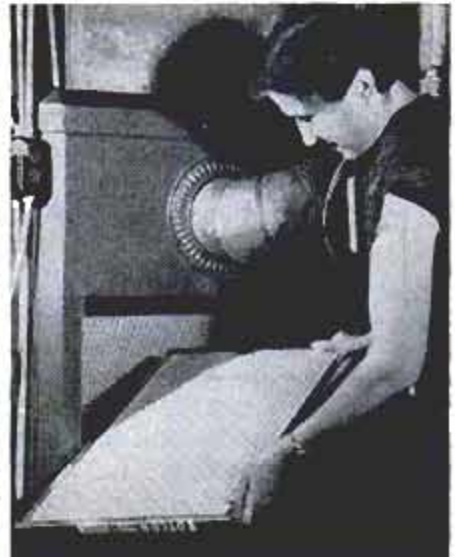
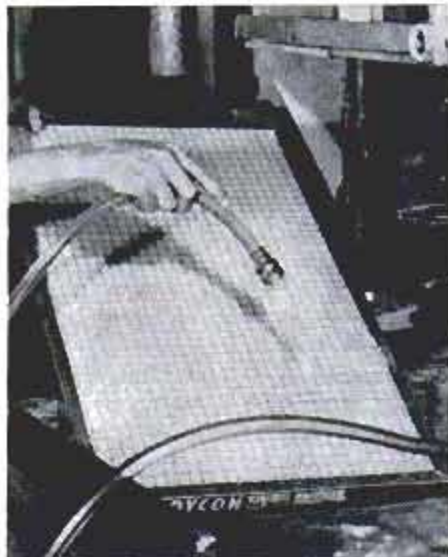


Infrared "X Ray"

With a modified World War II "snooperscope," physicist William Dash finds that he can look through purest silicon—which has the appearance of stainless steel. The wartime device enables the General Electric scientist to study the interior of silicon sections microscopically, in polarized light. An ordinary incandescent lamp is placed on one side of the silicon section. The silicon stops all visible light, but allows infrared rays to pass through and be changed to visible light by the scope.

Reusable Filter For Home Furnace

You can rinse the dirt from a new air filter and reuse it indefinitely in your furnace or air-conditioning system. An un-oiled filter of selected synthetic fibers, it removes and retains dust particles from the air stream by means of an accumulated static charge. The unit is rinsed with a stream of cold water from a faucet or hose. It is said to last the life of the furnace.



Tire Remover

Flat tires can be removed without taking the wheel off the car with an air-powered tool. The device, equipped with two stationary prongs and one movable prong, breaks the outside bead of the tire for easy removal. The tire remover is said to save time and to work equally well on tubeless or regular tires. It can be used on any wheel, including those with safety rims.

☞ Since 1932, more than 1,000,000,000 passengers have been carried by 166 elevators in New York's Rockefeller Center.

Tow Trailer Replaces Truck

Any car equipped with a new tow trailer can replace a tow truck in transporting wrecked or disabled autos. A hand crank on the winch of the trailer is used to elevate the damaged end of the auto to be towed. The two-wheeled trailer was developed by the owner of an Oregon body shop who found that long drives in his wrecker were tiring and expensive. Now he uses the trailer to haul wrecks behind his passenger car. The unit is now in production.



Sun-Powered Radio Promises "Something for Nothing"

Solar batteries and transistors combine in this experimental receiver that might last a lifetime. It has no external power sources, requires no repairs and makes the replacement of batteries a thing of the past. The set is powered by seven solar cells which are activated entirely by energy obtained from the sun. These provide enough power to drive a high-gain eight-transistor circuit to full loudspeaker vol-

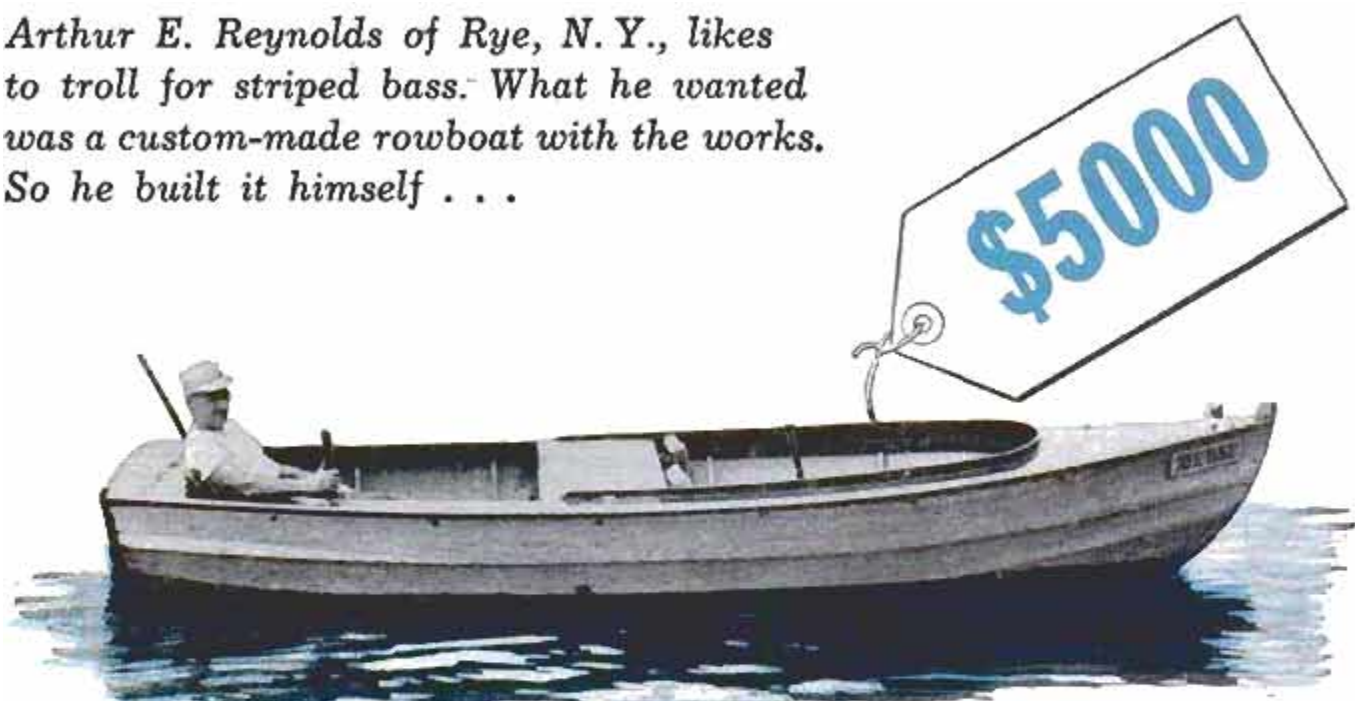
ume. The small amount of voltage required for properly operating these transistors, less than 1.5 volts, assures virtually unlimited life by eliminating temperature and voltage breakdowns. Cloudy days, or dark-room operation, would create no problem in providing power for the set. A turn of the selector switch, located on the end of the cabinet, puts in operation the receiver's rechargeable stand-by battery. This battery, the size of an ordinary flashlight cell, provides about 50 hours of continuous operation and is recharged by the solar batteries. The current cost of suitable solar cells (about \$25 apiece) makes impractical the immediate production of a commercial version of this receiver.



Uranium Umpires

When a uranium miner and the Atomic Energy Commission disagree on the uranium content of the miner's ore, both parties call for the umpire. Commercial research laboratories throughout the West have been designated by AEC as "umpires," and when the AEC and a miner don't agree, a sample of the ore is sent to one of the labs. Both parties agree in advance to abide by the umpire's decision. The umpire gets the ore without names or details, and doesn't know whether it belongs to a miner or is a test batch put through by the AEC. This way, his impartiality is assured.

Arthur E. Reynolds of Rye, N. Y., likes to troll for striped bass. What he wanted was a custom-made rowboat with the works. So he built it himself . . .



THE PERFECT BASS BOAT

A LONG THE rock-strewn shore near Rye, N. Y., lives a special breed of fishermen, addicts of the intricate sport of night-trolling for striped bass. Enthusiasm runs high and reaches its peak in Arthur E. Reynolds.

Two years ago Reynolds bought some lumber to build the ideal rowboat for striper fishing. By the time he had finished designing, working, fretting and sweating

By Gene Casey

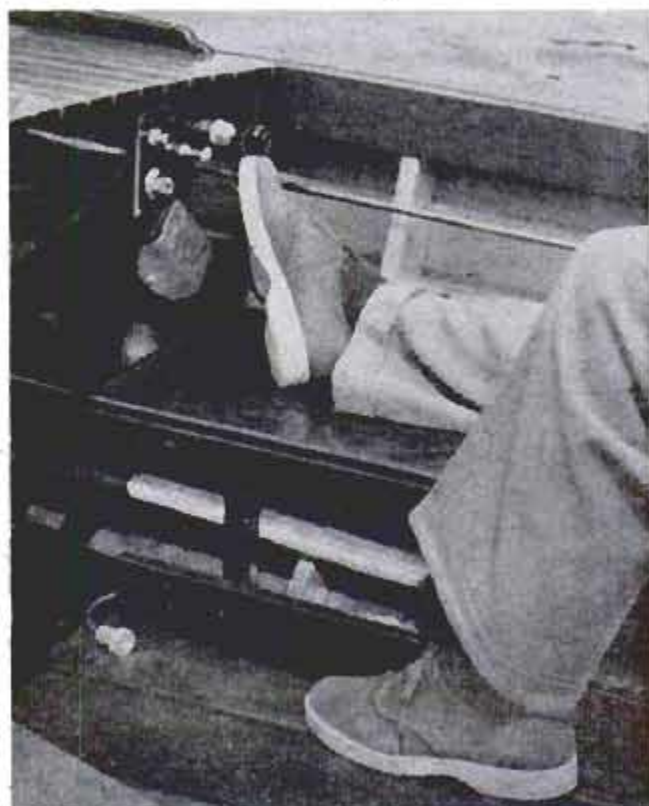
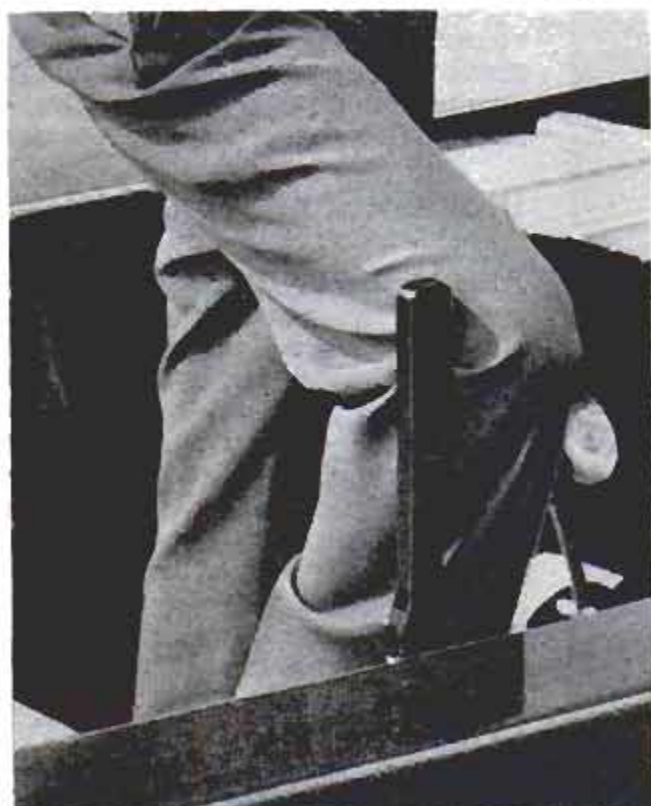
in his two-car garage he had constructed a boat that was a work of art. He values the craft in excess of \$5000. Some rowboat!

An optician by trade, Reynolds is a stickler for precision and perfection. He couldn't find a ready-made boat embodying the features he wanted so he decided to do the job himself.

His objective was a boat that would troll

Special tillers, just the right height, permit Reynolds to control boat with knee while playing fish

Seat is exactly the right length so he can operate the vernier or fine-throttle adjustment with his toe

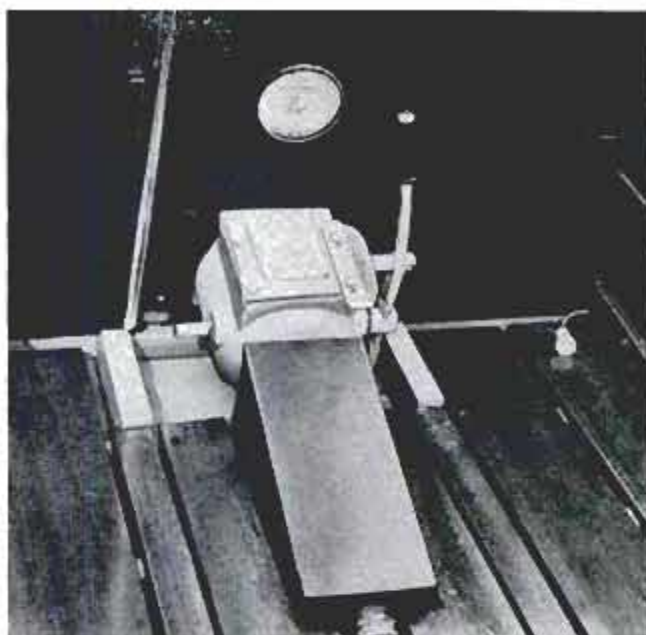




Deadwood area of the keel is cut away, making the boat respond more quickly to the oversize rudder

extra slowly without losing way in fast-running tides. The craft had to be able to maintain an unerring course to avoid the sharp reefs and rocks where the stripers lurk. It had to have a low nose and sheer line for minimum wind resistance, and a keel flaring to nine inches under the rear cockpit to give the greatest stability in rough water. Finally, it must quickly respond to the tiller so Reynolds can avoid the underwater obstacles that might otherwise tear a hole in the hull.

There's no doubt that the resulting boat is unique. Reynolds cut a large area of

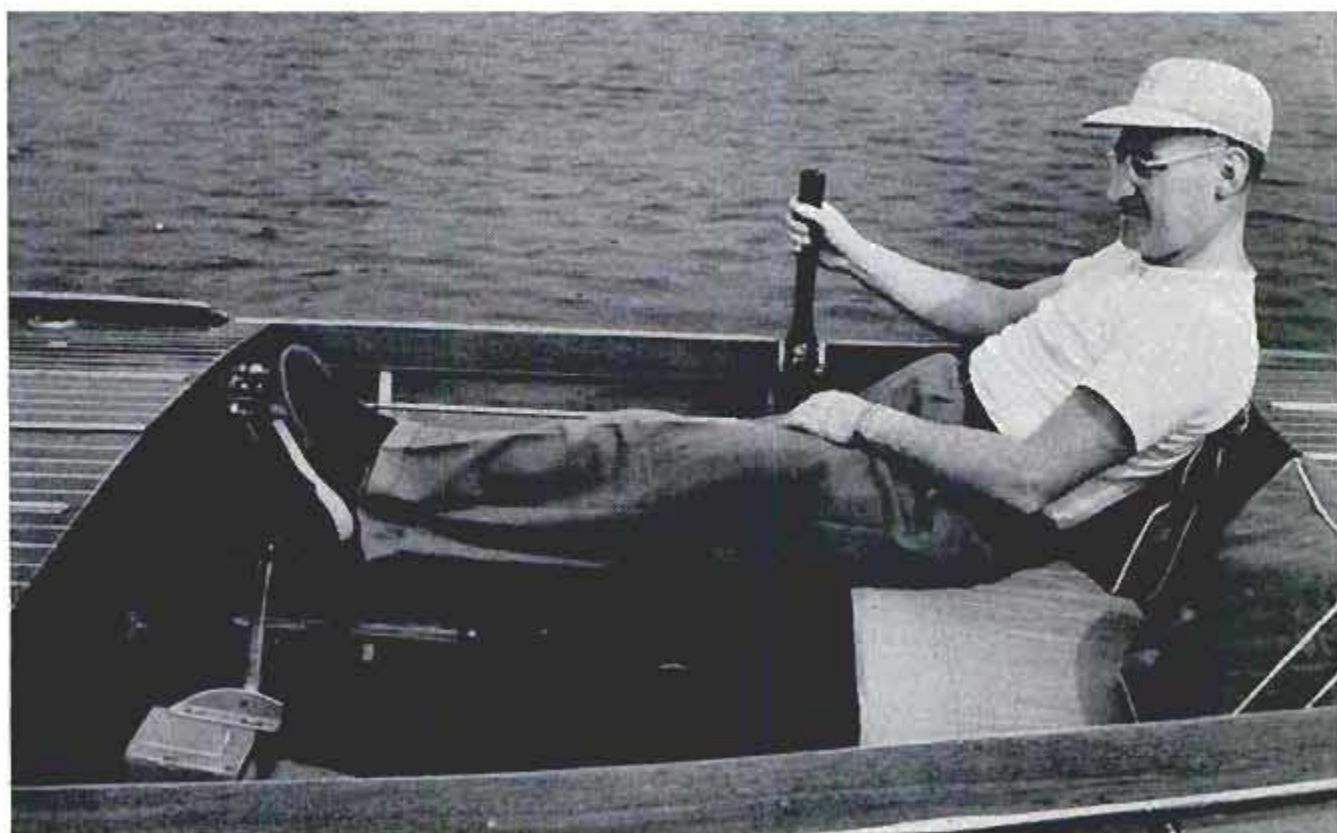


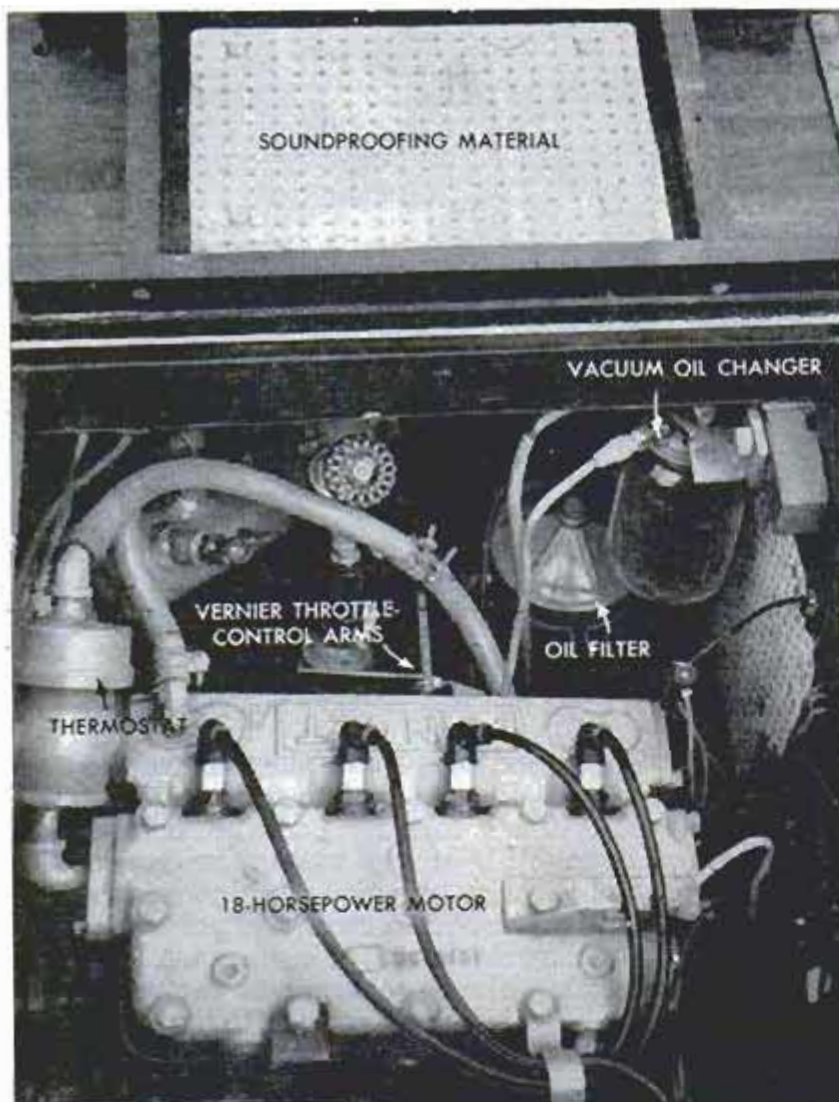
Positive neutral position of gearshift leaves no room for doubt that prop might be turning at slow speeds

"deadwood" out of the skeg end of the keel and installed an oversize rudder. He made dual tillers for front and rear cockpits. Through his control system he can control the boat with his knee while playing a fish. The length of the rear cockpit was determined by the length of his legs while seated, enabling him to manipulate the vernier or fine-adjustment throttle with his feet while trolling. He also developed a special neutral gear.

Reynolds selected an 18-horsepower motor which will troll at slow speed hour after hour, yet moves the boat at a good

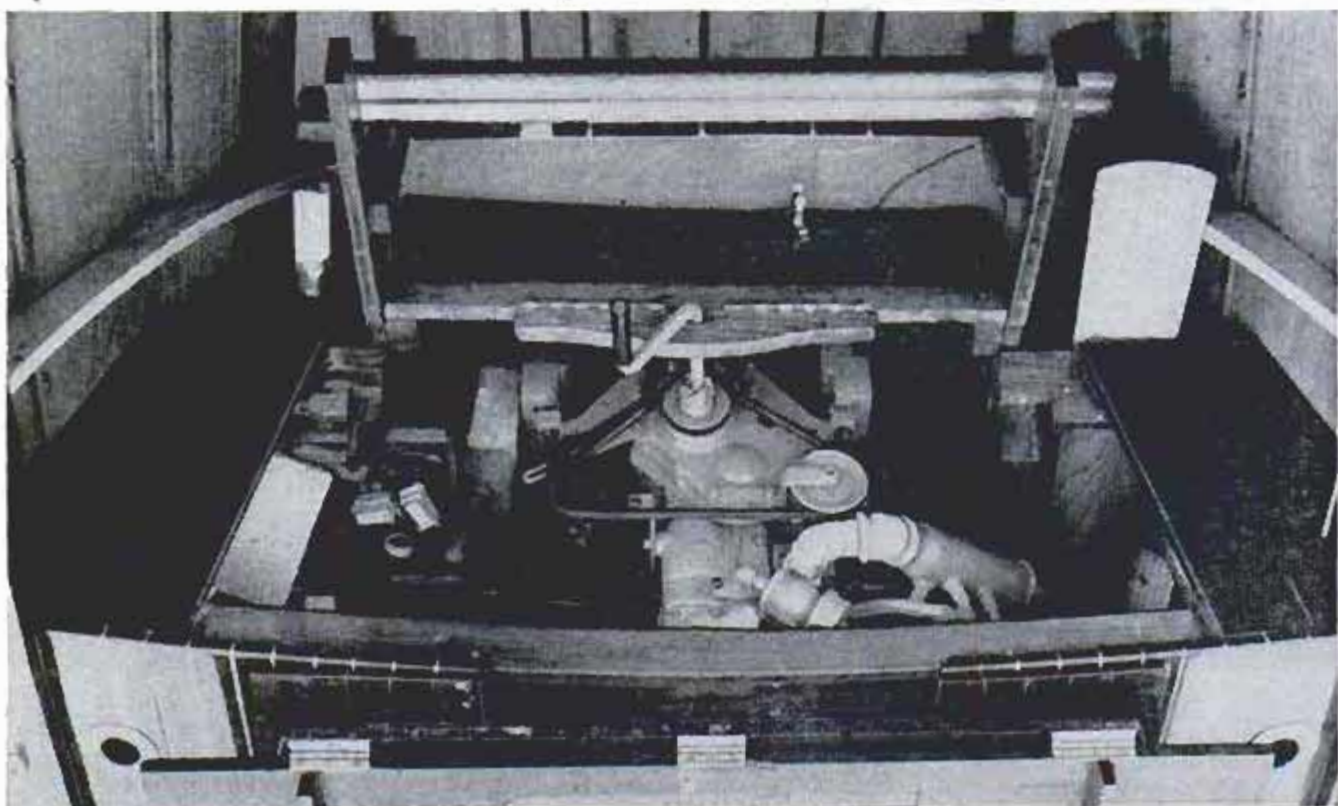
Here's sheer comfort on the water. Reynolds can start the motor, control speed and shift gears with his feet





Reynolds has added special parts to the 18-horsepower motor including thermostat, oil filter, vacuum oil changer and vernier throttle. The motor hatch is lined with soundproofing material. Also on hand is a jointed sweep for sculling the boat if the motor should fail

Removable seat in forward cockpit gives complete access to motor. Crank can be used if the battery fails



clip between trolling areas. He lined the motor hatch with soundproofing material. A special vacuum oil changer speeds that job. He made a jointed nine-foot sweep with which he can scull the boat at a surprising rate.

Experience had taught Reynolds that a trolling motor runs cold and builds up condensation, so he installed a thermostat to make the motor run hot.

The craft has an over-all length of 17 feet and a 6-foot 4-inch beam amidships. The ribs are oak. The transom, seats, and floor boards are all made of mahogany, but of four different kinds—Honduran, African, Mexican and Philippine. The hull is $\frac{3}{4}$ -inch cedar.

There are four red antiglare lights for baiting set into the cockpits. The aft locker is rainproofed by a gutter that runs around the seat.

What did the boat cost?

"I don't want to know," says Reynolds, "so I've never added up the bills. But I figure I couldn't get it built for \$5000."

To Art Reynolds the boat is worth more than money. He catches stripers when nobody else can. How can you put a price on that? ★ ★ ★

Ultrasonic Tester Checks Pipe Walls

Ultrasonic waves from a lightweight machine are used to check for flaws in metal pipe. The flaws cause a wave reflection which shows on a "reflec-toscope." Pipe-wall thick-ness to within .005 inch is tested at bends—spots usually difficult to check. Two men can carry the portable machine around to various parts of a factory.

Flaws in thickness of a pipe wall show up on the scope of portable tester



Balloon Guitar

Invented by a Paris night-club musician, a pneumatic guitar takes up very little room when not in use. The body of the guitar collapses like a balloon. It is inflated by mouth when the instrument is to be played. According to Felix Barrel, the inventor, the guitar produces the same sounds as those produced by an ordinary instrument.

←French musician pre-pares for a performance by blowing up his guitar



Hose Washes Paint From Auto Bodies

Eliminating the need for hand-sanding, a chemical paint remover prepares an automobile body for repainting in a few hours. The chemical is brushed or sprayed onto the surface to be repainted. After one to three hours, the digested paint can be washed off with a hose. Several coats of paint are removed at a time, leaving no residue to contaminate the new paint job. The bare metal is ready for painting.



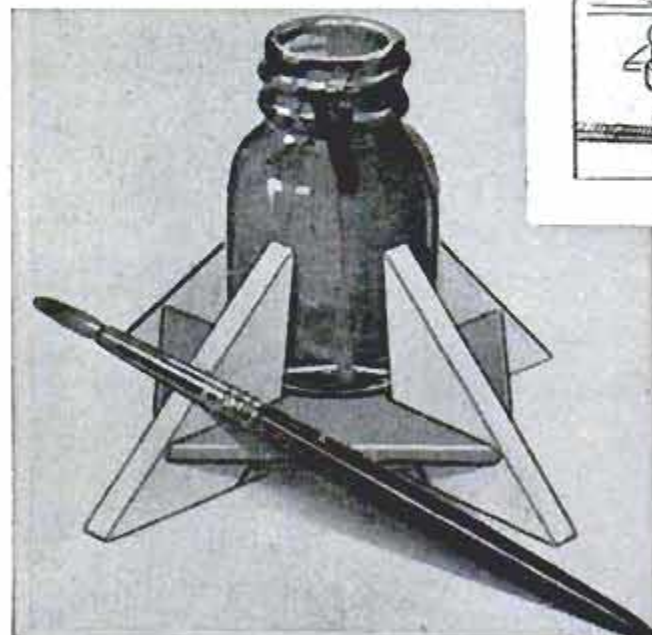
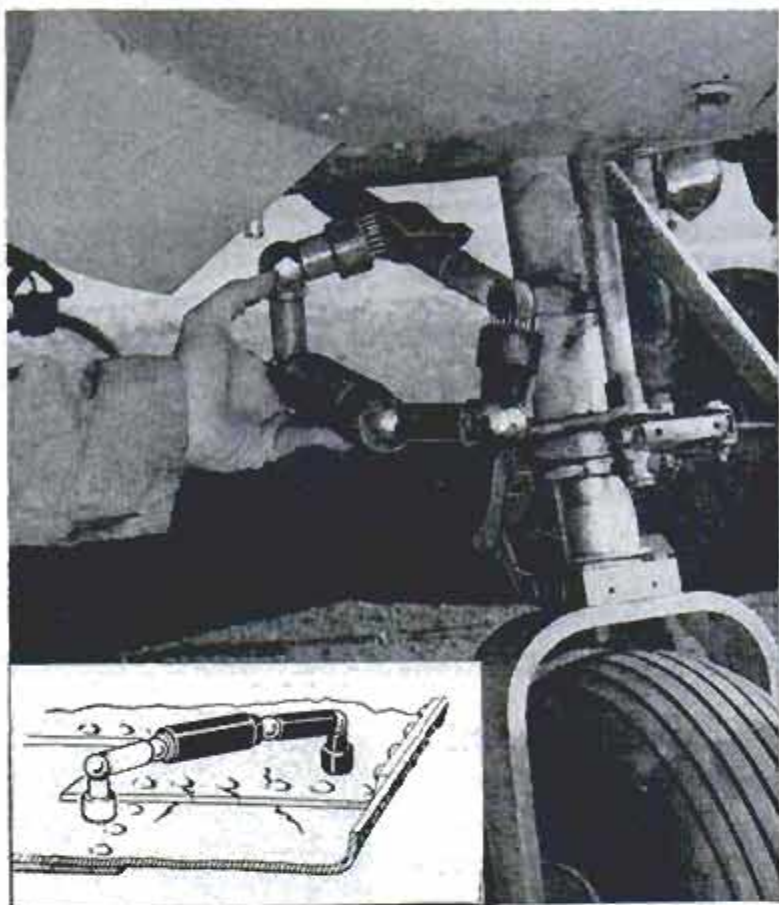


Earthmoving Scoop Is Portable Platform

Drilling holes in rock 15 feet above the ground seemed no easy task to Tom Terry, road superintendent of Idaho County in Idaho. Then he hit upon using an earthmoving scoop as a portable scaffold. He took the drill from its wheels, bolted it to the side of the scoop, and towed the air compressor behind. The driller stood on the scoop and completed the job in a short time. The scoop could be tilted to the desired working angle, provided an excellent platform for the operator, and also furnished a place where he could store drill steels, bits and other supplies.

Magnet Reveals Flaws

Magnetism is used to detect flaws in metal with an 11-pound instrument. The area to be inspected is sprayed with iron-oxide solution. When the area is magnetized with the inspection tool, the iron particles regroup themselves along the lines of magnetic force. Surface or subsurface flaws cause the lines to be broken at the defective point. The flexible tool adjusts to fit any irregular surface. Its source of energy is a permanent magnet.



Pedestal Grips Bottle

Small bottles won't tip easily when they are mounted in a little holder with a sturdy base. The platform of the wooden holder rests on four right triangles that fit into slots and act as legs. Ordinary rubber bands beneath the platform cause the triangles to press firmly against the sides of the bottle. Three different sizes are made: One for bottles up to two inches in diameter, one for bottles with sloping sides, and one for test tubes.

KEEPING UP WITH THE ATOM

YOUR FAMILY DOCTOR is rapidly becoming an atomic physician, according to Dr. Sidney Rubinfeld, Professor of Clinical Radiology of New York University. Dr. Rubinfeld points out that the different rays emitted by each element have a selective action on various tissues. Thus a particular isotope provides radiation that affects only the desired spot in the patient's body. Iodine has an affinity for the thyroid gland, making it possible to treat hyperthyroidism. It also is used to control angina pectoris, a disease of the heart. Radioactive phosphorus has an affinity for the bone marrow and is useful in the treatment of chronic leukemia. Radioactive cobalt is used to treat deep-seated cancer, and gold to treat cancer of the prostate and chest.

☆☆☆

Gasoline has been extracted from oil through the use of gamma rays, according to the Esso Research and Engineering Company. High temperatures, high pressures and catalysts now are used in the cracking process, but scientists are seeking a fourth method, the use of radiation. An atomic pile has been used experimentally to produce gasoline from crude oil.

☆☆☆

Will world production of uranium soon reach the saturation point when all that can be used safely is produced? This is suggested by Prof. George W. Bain of Amherst College, who points out that the surface of the earth can dissipate radioactive by-products from the fission of a maximum of 15,000 tons of uranium annually. Within a year or two, new sources of ore coupled with the existing sources will be producing this much uranium. There are only two possible solutions, according to Professor Bain: Either discover a more efficient method of fission, or limit the amount of uranium that is used each year.

☆☆☆

Probably the world's smallest atom smasher

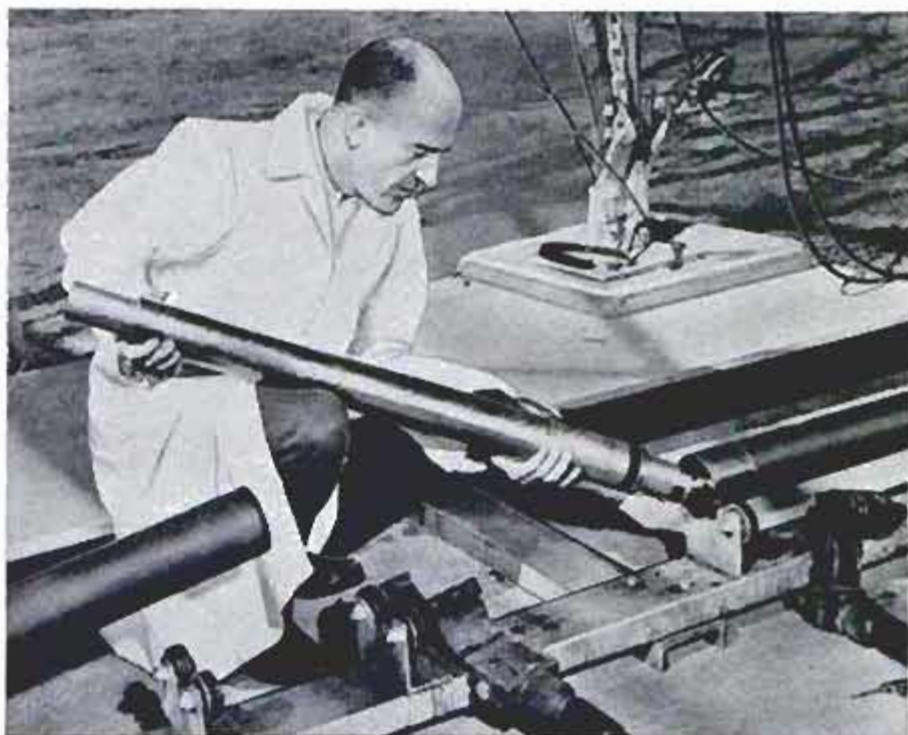
(see photo) now is helping to locate underground oil deposits. The instrument, only three inches in diameter and 47 inches long, develops up to 20,000 volts. Lowered into a well hole, the unit fires neutrons which penetrate the surrounding earth. Radiation-detecting equipment is used to measure the earth's reaction. This, correlated with known data, helps geologists determine whether oil is present.

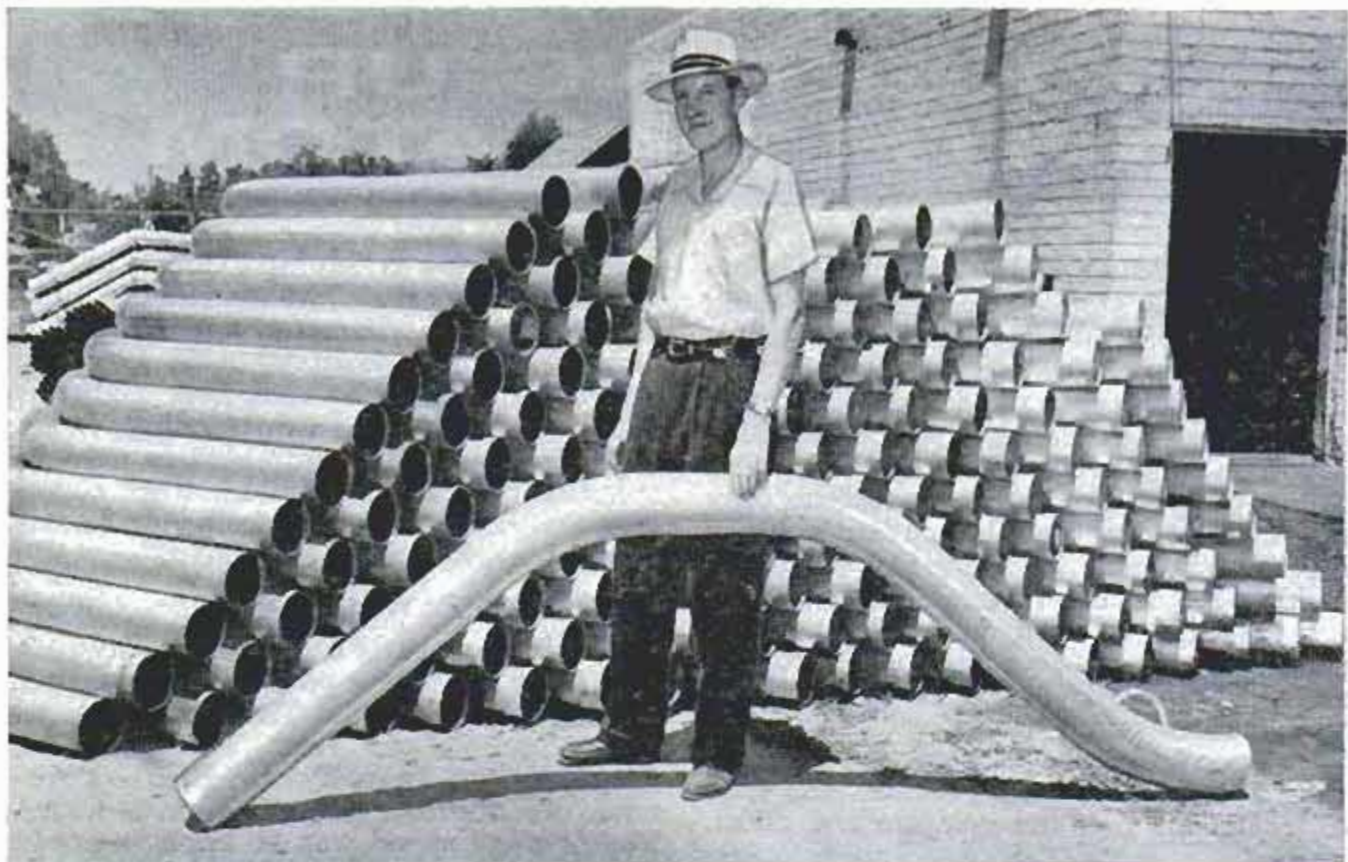
☆☆☆

Results of an early cruise of the *Nautilus*, the Navy's nuclear-powered submarine, have been revealed. The craft cruised totally submerged from New London, Conn., to San Juan, Puerto Rico—a distance of more than 1300 miles—in 84 hours. The average speed was 16 knots, a speed attained for only one hour by any other combatant submarine. The cruise was 10 times the distance of the former undersea record. Eighty-four hours is also the longest period that any U. S. submarine has cruised completely submerged.

☆☆☆

Wood products may someday be coated with a gamma-irradiated plastic, according to Timber Engineering Company. The gamma rays would alter the plastic's molecular structure, producing a hardened material that would be moistureproof, fireproof and insectproof.





William Swanson, manufacturer of aluminum irrigation tubing, poses with 10-foot tube having three bends

What's His Line? --- Tube Bender

By Don Urry

To start siphon process, tube is filled with water by submerging it. After tube is filled, one end is capped



ONE DAY IN 1947 a Western farm manager asked William Swanson, a Phoenix, Ariz., fabrication shop owner, if he could bend some aluminum tubing. It sounded easy until the purpose was known. The farm man wanted the tubes—scores of them for just an average farm—to siphon water from irrigation ditches onto farmland.

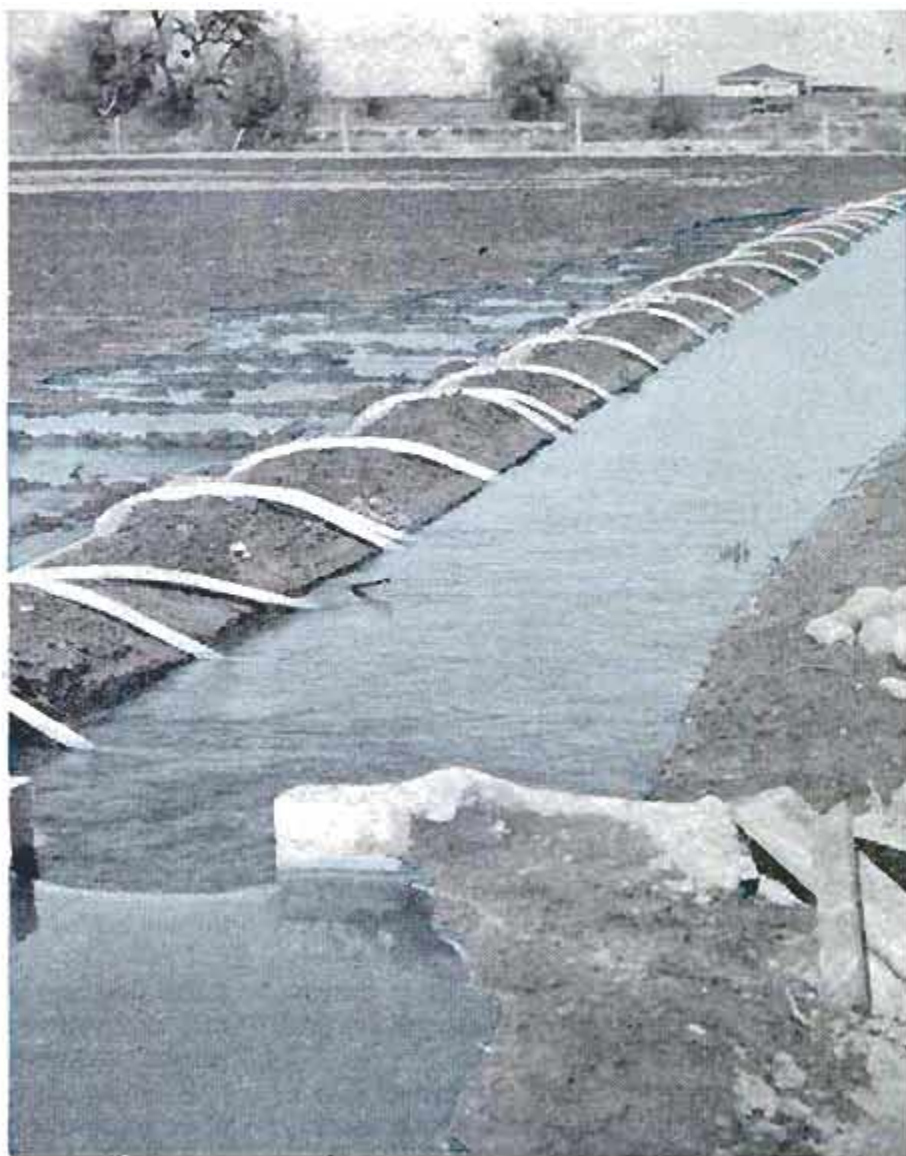
To produce the tubes needed meant working with metal which in some instances was only .028 inch thick (.062 in the larger tubes). It meant preserving the roundness of the tube so that the water would flow freely. Above all, it meant bending the tubes quickly and cheaply enough for mass-production profits. The job was neither easy nor simple.

It took months of experimenting with hydraulic bending machines by Swanson. But finally he learned how to bring up to 1600 pounds of pressure to bear on a straight tube, nestled in a grooved quadrant and supported within by a steel rod up to the point of curvature, and produced the desired result.

Since that time, Swanson has turned out nearly 2,000,000 of the shiny irrigation tubes which are quietly revolutionizing ditch farming in the 17 dry Western states, parts of Mexico, and will soon make an appearance overseas in the modernized agriculture of Israel. He has developed 43 different diameters and lengths of tubing, curved into one, two or three bends, complete with lip flanges at either end, and handles to facilitate the curious knack of capturing water from a flowing ditch.

The aluminum tubes come to the Phoenix factory in straight lengths of 30 or 40 feet. They are cut to the varying irrigation lengths, from four to ten feet, depending on the thickness of the ditch bank they are to span. Tube diameters varying from ½ inch to six inches take care of the different flows of water required by different crops and irrigating conditions.

During the bending process the concave side of each bend gains perhaps 15 percent in metal thickness. Both ends of each bent



Field containing border crop is flooded by siphoning water from irrigation ditch over the bank by means of regularly spaced six-inch aluminum pipes

tube are then held against a revolving disk which literally rolls the soft metal back into a smooth flange for protection against denting and crushing during field use. Finally the tubes, resembling bizarre musical instruments, get sickle-shaped handles by Heliarc welding.

This strange farm "implement" takes its place along with the standard equipment of the farmer who must bring water to his land in default of normal rainfall. On an average Arizona cotton farm, 75 such tubes will be required at an initial cost of perhaps \$175. They pay for themselves, and more, through savings in labor otherwise required to cut holes in ditch banks and maintain them against the constant erosion of loose soil battered by swift water flow.

The farm worker completely submerges the siphon tube in the irrigation ditch, lengthwise to the flow. When the water has filled the tube, its field end is tightly covered by one of three methods. In the case of the smaller tubes (three-inch diameter or less) the hand is placed over the end. For larger tubes, either a rubber stopper



Tubes of small diameter, used to irrigate a single furrow, are bent two at a time in hydraulic presses

is fitted into the tube mouth or a canvas sleeve, previously clamped to the tube end, is twisted tight by hand.

With the vacuum thus maintained inside, the tube is quickly inverted by its handle and the field end is drawn over the ditch bank. The other end of the tube must remain under water. The bends of the tube conform to the contour of the bank, the field end of the tube lies level with the ground to be irrigated, and the stoppage of that end is suddenly removed. That starts the siphon process. The water flows steadily through the tube and the worker repeats the process with the next tube a few feet farther down the ditch.

Except for the more costly installation of a sprinkler system, the siphon-tube method of irrigation provides the best possible control of precious irrigation water. With the curved aluminum tubes in place at proper intervals along the ditch for the length of his field, the farmer can turn his water on or off for each crop row as easily as if he were manning the faucets of a series of bathtubs. No water is wasted. His ditch bank stays firm from one irrigation to the next.

For cotton, potatoes and other row-planted crops he uses the smaller tubes. Here he must pinpoint the flow down a single furrow of earth. For so-called border crops, like alfalfa and barley, he has a huge field expanse to flood. For these he uses the bigger tubes for their quick flow. A



Array of different shapes for irrigation tubes can be seen behind the press, above, which produces them

tube size has been adapted for every standard irrigation need, and some are custom-made for special needs.

Swanson also makes plastic or canvas sheets for damming irrigation ditches, since the ditch level of water must be higher than the land on which it is to be siphoned. These dams are simple and effective. A two-by-four is run through a sleeve at the top of the sheet, and the bottom is weighted by rocks under the water. When one field has been irrigated, the dam is moved down the ditch for the next.

The wide variety of tube sizes is necessitated by several factors: The size of the ditch bank, the kind of crop, how fast the particular soil absorbs water, and whether the land is level or sloping. With the right tubes, the farmer can deliver his water where and as fast as he wants. Gadgets called flow reducers can be fitted into the tube for even finer control.

By developing a process for bending aluminum tubing, Swanson made it possible to take advantage of that metal's noncorrosive qualities and its lightness of weight. The biggest tubes weigh only 13½ pounds, while the smallest are only a few ounces.

Since the labor saving over the old method of cutting holes in ditch banks runs from 33 to as high as 80 percent, long rows of bright aluminum tubes are likely to be a more and more familiar sight on the numerous irrigated farms of the water-short West. ★ ★ ★



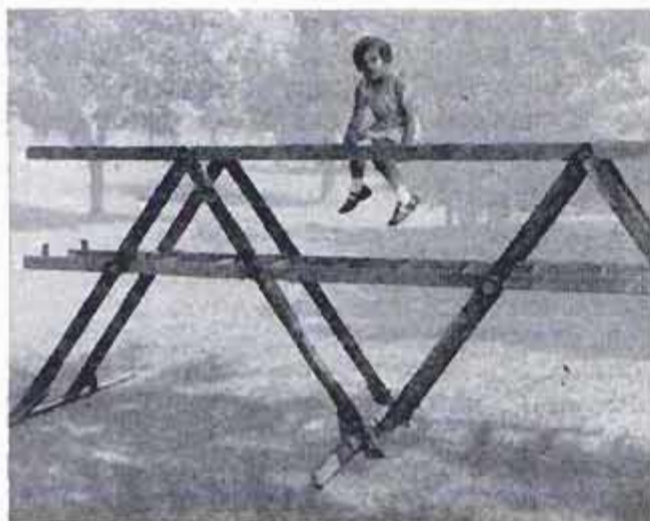
Rickey Wilson, Yearicks' five-year-old grandson, keeps tight rein on his team of hedge horses as he rides privet chariot. Below, Rickey poses as model while Yearick finishes shaping of cyclist hedge form

Statues in Living Hedge Shaped by Clipper Artist

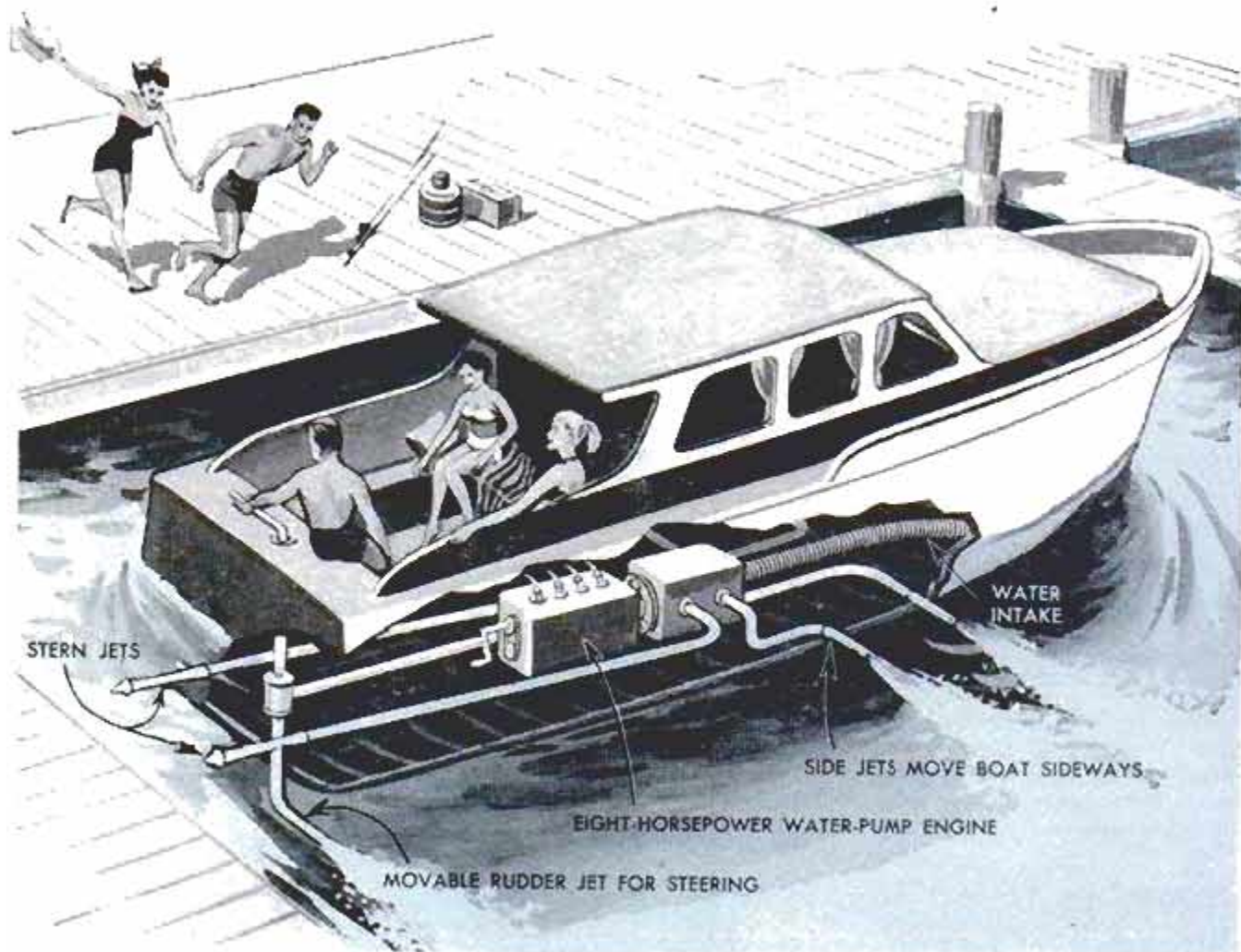
Gus Yearicks of Wildwood, N. J., has spent 26 years of spare time in trimming and shaping the privet hedges of his garden into "living statues." More than 100 examples of his work are on view in his one-acre lot, including a cyclist, a wagon pulled by two horses, a ship and a baseball game. Yearicks estimates that he spends 40 hours a week on his garden and that a total of 75,000 people have visited it. Yearicks has a full-time job in a magnesite plant.



Halves of Extension Ladder Become Back-Yard Gym Set



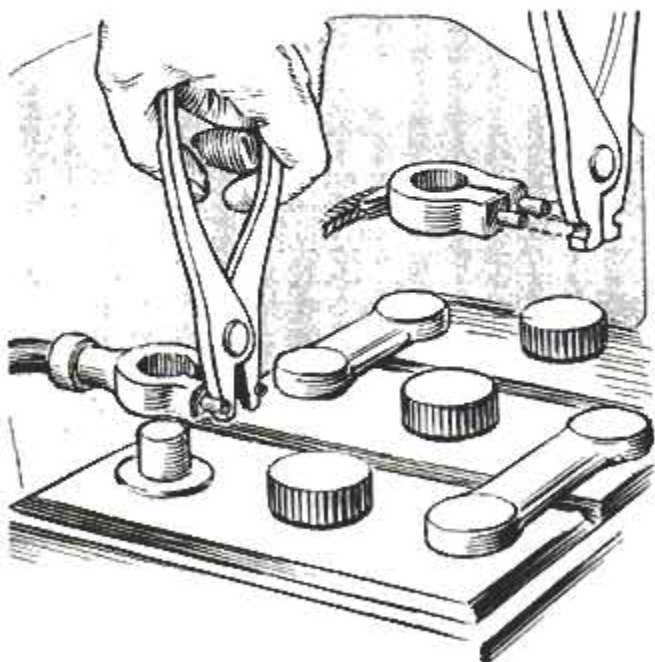
Two halves of an extension ladder serve as horizontal bars for youngsters to play and climb on in Ben Brown's back yard in Ballwin, Mo. Two double triangles of one by three-inch hardwood, bolted to the ladder sides with $\frac{3}{8}$ -inch carriage bolts, support the ladder sections a few feet above the ground. The rungs of the ladder serve as horizontal bars for climbing, swinging youngsters. Large wooden "washers" make up the difference in width between the top and bottom halves of the ladder, which can be returned to service any time by simply removing the bolts. Five-foot supports across the bottom of the legs can be buried to prevent tipping.



Jets Push Cabin Cruiser Broadside Through Water

Ships go forward and ships go backward, but ordinary ships just won't move sideways. Now a retired navy commander in England has developed a cabin cruiser that actually will move broadside through the water. Comdr. George Wheeler believes that a big ship, using the same power system, would require no tugs to move it into a pier.

In Commander Wheeler's cabin cruiser, an eight-horsepower pump draws in sea water and ejects it under pressure through nozzles at the stern, forcing the boat through the water. On each side of the craft are two more jets, powered by a separate motor. These jets push the craft sideways at the turn of a switch, enabling the skipper to slide up to the dock.



Battery-Cable Terminal

Spring action holds a new battery-cable terminal to the post of an auto battery. A specially designed reverse pliers is used to clamp the rugged spring-steel loop to the post or to pull it off. The new terminal does away with the bolt and nut, which frequently corrode and can't be separated.

Three-Way Light Bulb

Any standard electric socket holds a light bulb that combines incandescent, fluorescent and mercury-vapor illumination. It contains an incandescent tungsten filament, a mercury-vapor arc discharge tube and fluorescent phosphors activated by ultraviolet rays from the arc tube. The "fluomeric" lamp has a life of 12,000 hours and needs no external transformers.

Transistors— The Modern Miracles

ABOUT EIGHT YEARS AGO, a new electronic component emerged from one of the nation's foremost laboratories; a unit which promises to revolutionize the entire industry. It is called the transistor.

The transistor is a tiny device which threatens the position of the vacuum tube as the basis of all electronics. It can perform many of the tube functions, as amplifier, oscillator, etc., and it can do the job better, cheaper and more efficiently.

The transistor's advantages lie in its small size, Fig. 1, low power requirements, extreme ruggedness and relatively long life. These make possible the design of battery-operated, portable equipment with remarkable characteristics. Some of the many transistorized items which have recently made their appearances on the commercial market are illustrated and described on page 176.

Unlike a vacuum tube, the transistor's elements are embedded in a solid material. As a result, it can take shock and vibrations which would quickly ruin even the most rugged of tubes. Equally important, the operating life expectancy of transistors will exceed even that of the equipment in which they are used.

Transistors have no filaments, and give off very little heat. This not only eliminates the ventilation problem, but assures longer



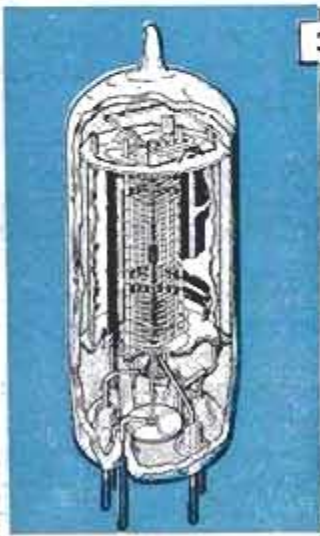
Tiny transistor, left, is dwarfed by conventional subminiature, miniature and standard vacuum tubes

life for any components in the associated circuitry.

Many transistors are now available at prices comparable to those of popular vacuum tubes. As production techniques improve, even lower prices are anticipated.

With all their advantages, transistors still have some limitations. They are, as yet, unable to provide the large amounts of power of which vacuum tubes are capable. Furthermore, special units which can operate at very high frequencies are still relatively expensive, and all transistors are somewhat susceptible to heat and temperature variations. As the state of the art progresses, however, these problems will undoubtedly be solved and the uses of transistors will be further expanded. In this electronic age, transistors can truly be classified as electronic miracles.

Experimental transmitter, Fig. 2, built into golf ball which broadcasts its position to receiver-carrying owner is proof of transistor ruggedness. Simplicity of transistor structure compared with tube in Fig. 3





"Little Giant" Transistor Radio

By L. M. Dezettel

Small in size but giant in performance, this little radio makes an ideal project for beginners, students and experimenters. Beginners will appreciate its simplicity which practically eliminates the possibility of wiring errors, while experimenters will welcome the opportunity to work with transistors which have only recently come into general use.

For so small a set, this "Little Giant" offers surprising selectivity. Even stations which are very close together can be separated without difficulty, and strong stations will come in with sufficient power to drive the built-in loudspeaker to room-volume levels. A headphone jack is provided for reception of the more distant stations.

The little radio is completely divorced from the power line and, therefore, presents no shock hazard. All of the necessary operating power is supplied by a single long-lasting 4½-volt battery.

Construction: The simplicity of this little set is illustrated by the schematic diagram in Fig. 1. In order to prevent crowding of parts and to simplify construction, the model was built into a commercially available aluminum case which is actually much larger than necessary. Since the placement of parts is not at all critical, the receiver could be built into a much smaller housing.

Assembly and wiring of the receiver can easily be accomplished by following the illustrations in Figs. 2 through 5. The spac-

ing and diameters of the case mounting holes are shown in Fig. 2. Unless otherwise marked, all hole diameters are made to clear No. 6 screws. Before drilling the case, all of the necessary parts should be purchased. If it is necessary to substitute some of the components listed in the parts list with units by other manufacturers, some of the hole spacings may need to be changed to accommodate the parts on hand.

The speaker opening can be cut out with a circle cutter or an ordinary coping saw and file. The latter tools can also be used for the rectangular switch cutout and for the ½-in. holes. A tapered reamer, if available, will simplify the job of making the ½-in. holes by enlarging No. 6 holes to the required sizes.

After drilling the case, the large parts can be fastened in place as shown in Fig. 4. The hardboard block which mounts the transistors should be prewired before being fastened in place by means of the two lower speaker-mounting screws and nuts. To prevent damaging the transistors while soldering, the leads should be left long and, during the soldering operation, each lead should be held firmly with a pair of long-nosed pliers. The pliers will conduct some of the heat away from the transistor.

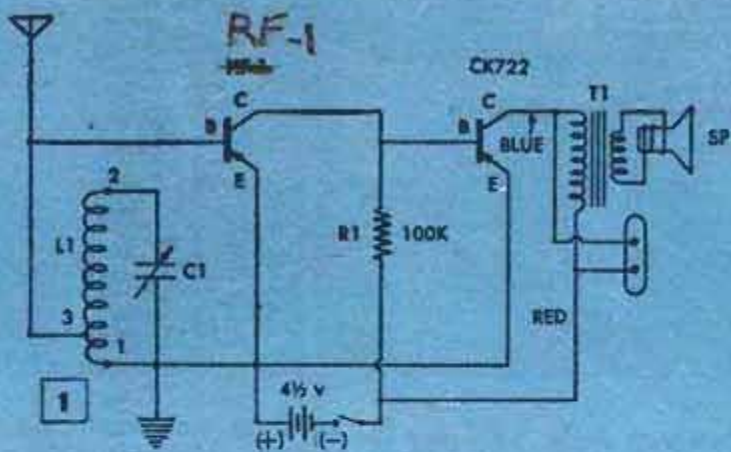
The variable capacitor is fastened to the front of the case with two 6-32 x ¼-in. machine screws which fit into corresponding holes in the capacitor frame. If these screws are too long, so that they interfere with the rotation of the capacitor plates, one or more small washers can be inserted between the capacitor frame and the case to eliminate this difficulty.

The battery is fastened to the case cover with a homemade bracket, as shown in Fig. 3. The positive (+) battery terminal is grounded to a solder lug.

Final assembly and wiring are shown in Fig. 5. The r.f. coil is soldered securely to the grounded lug of the antenna terminal strip. It is important that the coil be mounted by its No. 1 lug which can be identified from the detailed coil drawing.

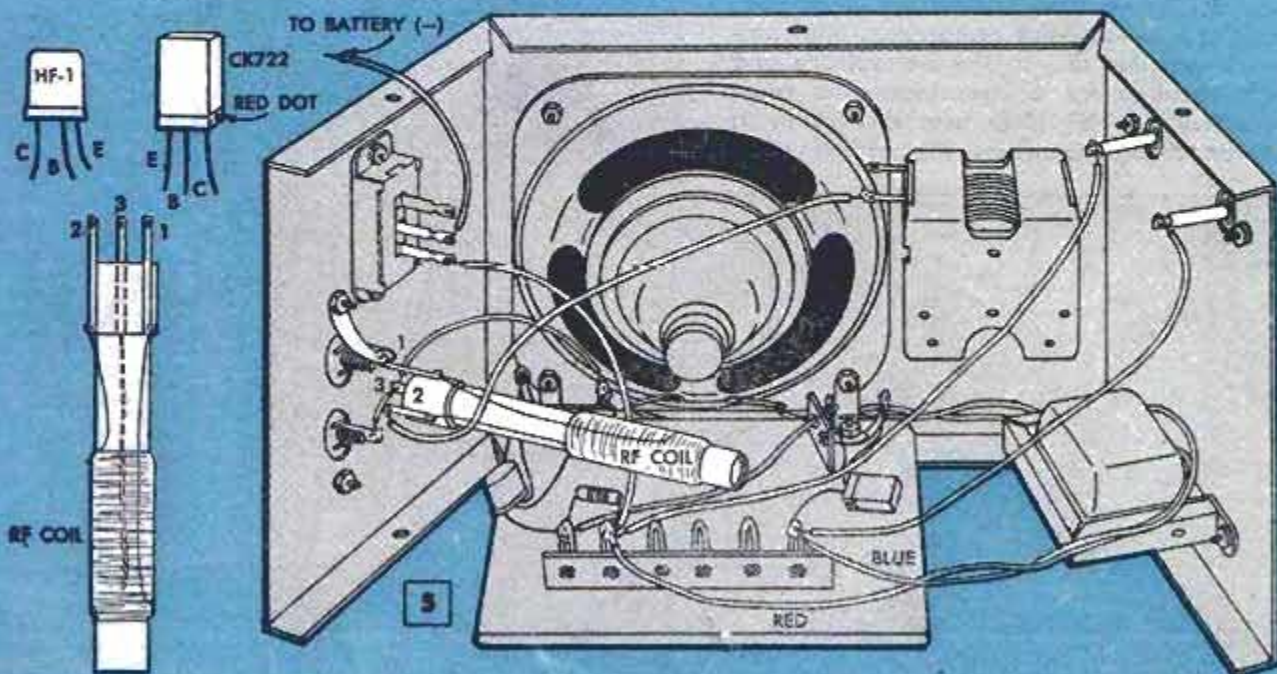
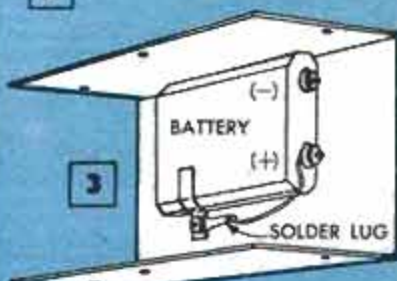
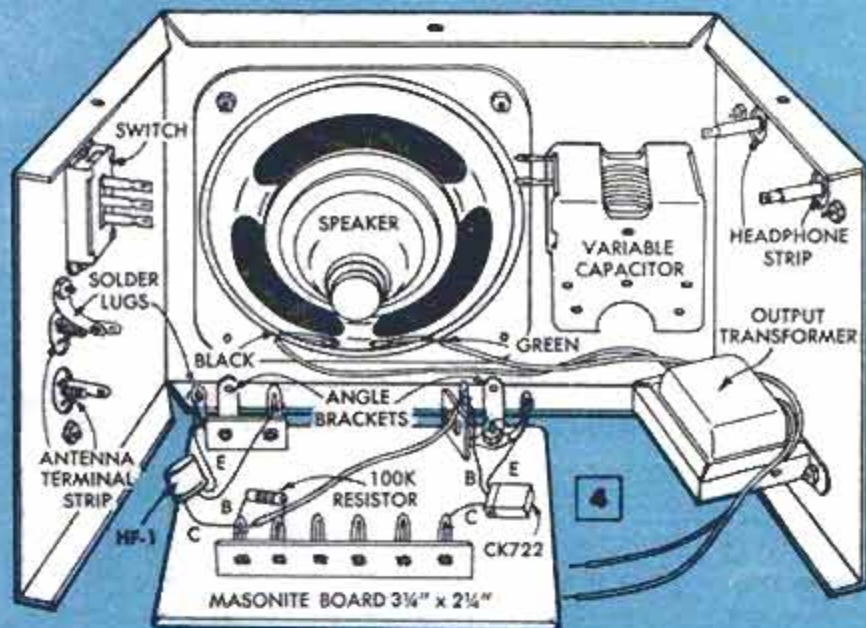
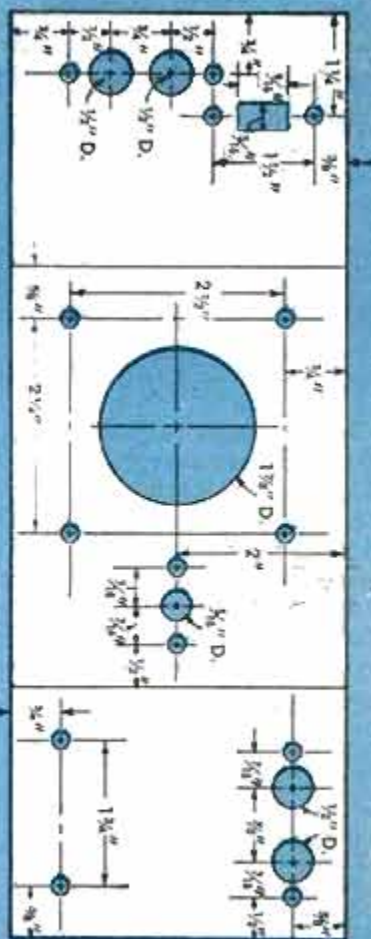
Operation: A good outdoor aerial and ground are essential for proper operation of this simple receiver. While excellent results have been obtained with an outdoor TV antenna (by disconnecting the lead from the TV set, twisting the two wires together, and connecting this to the "antenna" terminal of the radio), reception will be even better with a good radio aerial. A cold-water tap or a rod driven into the earth will serve as a ground.

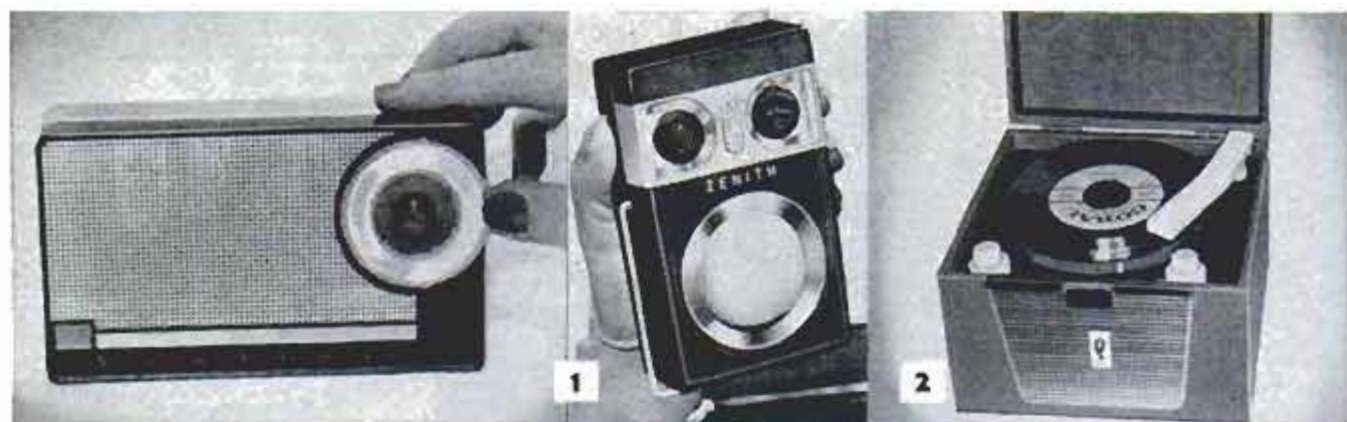
Broadcast-band aeriels are available in kit form from most radio-parts distributors. These kits, some of which cost less than one dollar, are complete with all parts and installation instructions. ★ ★ ★



LIST OF MATERIAL

- | | |
|--|--|
| 1—High-frequency transistor
Marvako 1000 RF-1 | 1—Single gang, midget variable capacitor (C1),
365 or 375 mmfd. Allied 61H009 or equiv. |
| 1—Audio-frequency transistor,
Raytheon CK722 | 1—Transistor r.f. coil, Allied RK-121101 (L1) |
| 1—3-in. loudspeaker, Jensen 3J6 (SP) | 1—Aluminum case, 3 x 5 x 4 in. ICA 29340 |
| 1—Resistor, 100,000 ohm, 1/2 watt (R1) | 1—Knob with setscrew, for 1/4-in. shaft |
| 1—4 1/2-volt battery, Burgess 5361 | 1—Antenna-ground term. strip |
| 1—Slide switch, S.P.D.T. | 1—Headphone jack strip |
| 1—Output transformer (T1), 8000 ohm to
3.2 ohm, Stancor A3329 or equiv. | 2—1-terminal tie-points |
| | 1—6-terminal tie-point |
| | 2—Angle brackets |
| | 4—Solder lugs |





Due to numerous advantages, transistors are replacing tubes in many commercial products, some of which are shown here. Fig. 1 shows two of many transistorized radios which are small enough to fit into pocket or purse. Battery drain is much less than for equivalent vacuum-tube portables. The portable phonograph of Fig. 2 utilizes an all-transistor amplifier. It will play 3000 standard 45 r.p.m. records on a set of four ordinary flashlight

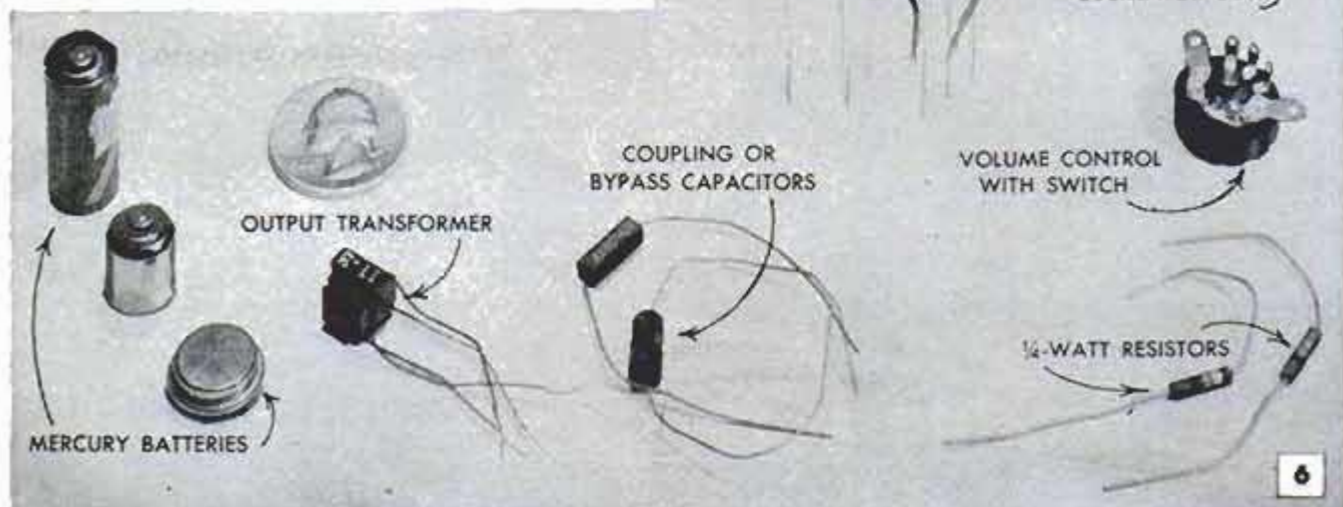
Transistors at Work

cells. Fig. 3 shows the latest car radio. Transistor operation eliminates vibrator power supply, reduces battery drain and cuts service needs. The transistorized Radiò Pager, Fig. 4, is the latest in short-distance communications. Pocket receiver permits instant contact between control unit and paged person regardless of his location. Tiny hearing aid in Fig. 5 can be hidden behind a man's tie or in a woman's hair. Operates for 10 cents a week



Tiny Parts Aid Miniaturization

To enable designers to take full advantage of transistors, complete new lines of miniature components have been developed. Some of these are shown in Fig. 6. The coin in the illustration permits approximate-size comparison. Miniaturization is possible due to the low voltage and current requirements of transistors and associated circuitry. Negligible heat dissipation in transistor circuits increases life of all parts



the

POPULAR
MECHANICS

CRAFTSMAN

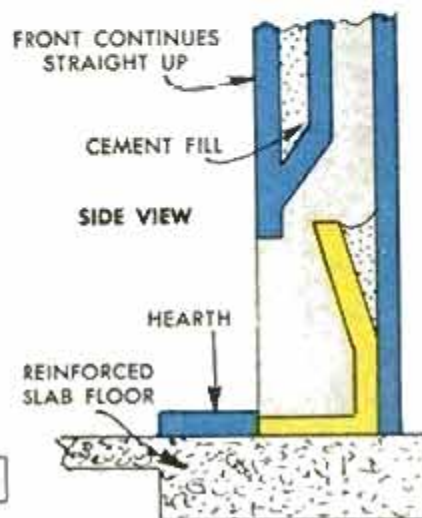


BUILD YOUR HOME AROUND A FIREPLACE

By Tom Riley

FEW HOMEOWNERS actually build their own fireplaces, which is a job for the experienced mason. But knowing how one should be built and what types are popular will be helpful when you decide to have a fireplace.

When planning to build or remodel it is important to choose a fireplace that will create the atmosphere you desire. A few years ago there was little choice. The fireplaces in all the homes along your block generally were quite similar, differing perhaps in their brick or tile facing and bookcase or shelf treatment at each side. Today you have a wonderful variety of types and designs from which to choose and can have a fireplace





Excellent blend of modern and traditional. Raised hearth is most popular feature of today's fireplaces



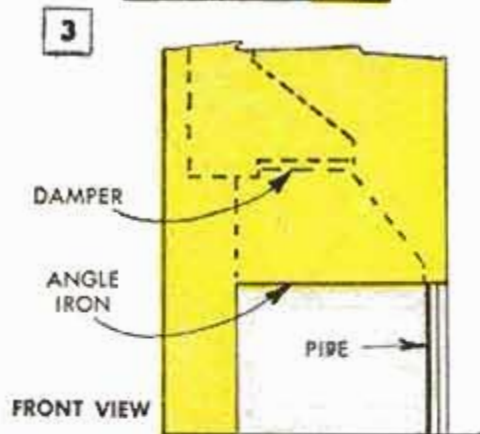
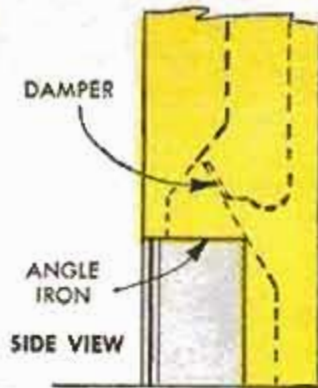
Above, copper hood replaces considerable brickwork in this corner-type fireplace. Below, this fireplace is part of a curved living-room wall of Arizona fieldstone. Shelf-type hearth is black marble



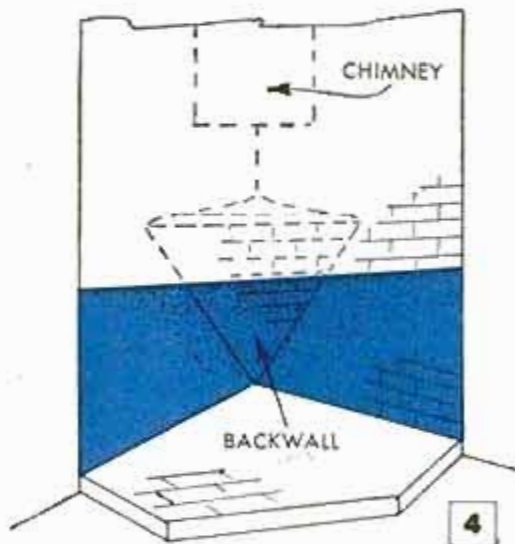
that definitely belongs in a particular room of your home.

Most fireplaces built today, whether of brick, block or stone, use a conventional, time-tested firebox. Thus, manufactured dampers can be utilized, the firebrick lining is simple to install and there is a smoke shelf above (to baffle chimney down-drafts). This standardization of the firebox design has very little to do with the fireplace's exterior, which can vary in a hundred ways. In general, the traditional finish was intended to hide the masonry behind wood or plaster walls, leaving only a little masonry exposed around the edge of the fireplace and perhaps up to a mantel. The trend today is to expose as much of the brickwork as possible—the masonry is attractive so why not show it? And so, instead of slanting the brickwork back to slim it down to the size of the chimney, the brickwork of the front and sides of the fireplace now often continues straight up to the ceiling, or on up through the roof to have a generous-sized chimney on the exterior. Thus, some large spaces will appear between the brick of the upper fireplace shell and the chimney proper, which seems confusing when you look at a half-completed job. The spaces are often used for extra flues for the furnace or they may be filled with rubble and cement. If not exposed through the roof, these spaces often are simply left open in the attic.

Exposing all the masonry of a fireplace



Above, two ways Swedish fireplaces can be built. Below, triangular-shaped back-wall forms smoke shelf to corner fireplace



does give a saving in that there will be much less plaster and wood wall in the house to construct. When the fireplace is located along an interior wall, it also means that you can have brickwork in the kitchen or dining room as well as in the living room. Then, another or a barbecue fireplace can be added on the back side at considerably less cost than that of building two separate fireplaces. Fig. 2 and the photo show such a barbecue fireplace designed for a manufactured grill. As grills vary in size, it is always a good idea to obtain the size of the grill first and build the firebox accordingly. Because a barbecue



Black iron and concrete blocks give dramatic modernity to this Swedish fireplace. Note how raised hearth incorporates bench

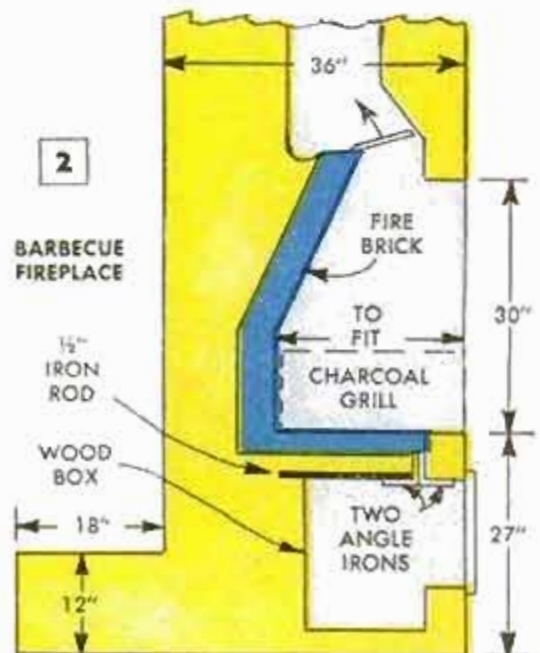


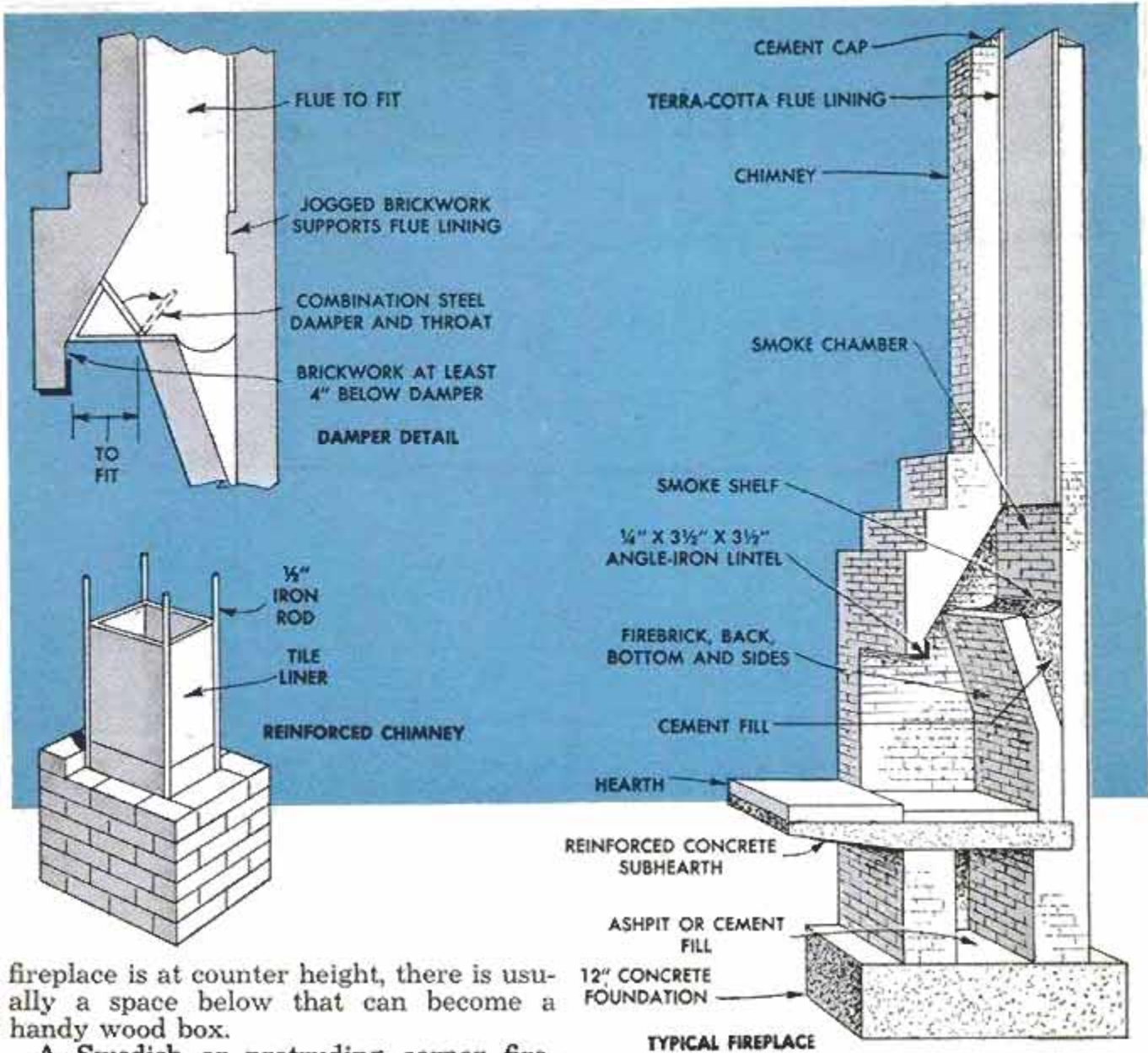
Above, serving as a room divider, this variation of the Swedish fireplace gives firelight to both living and dining rooms. Flue must be extra large so cross drafts won't force smoke sidewise. Below, corner type takes little floor space





Island-wall fireplace of used brick divides living and dining rooms. Dining-room side of fireplace has charcoal grill and wood box





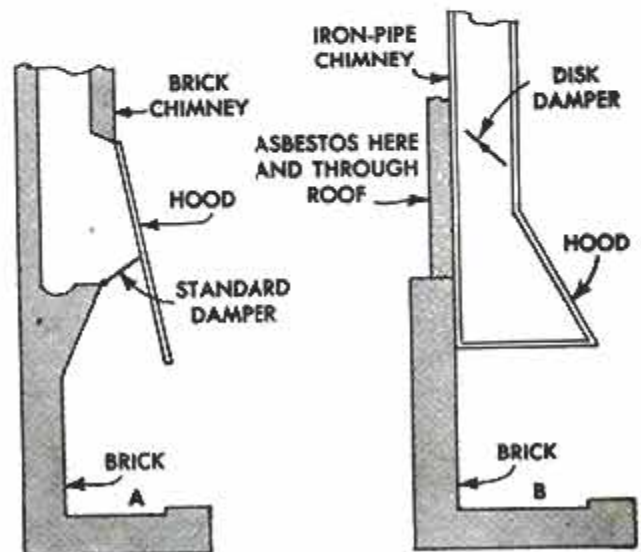
fireplace is at counter height, there is usually a space below that can become a handy wood box.

A Swedish or protruding corner fireplace is a somewhat different type very popular today. These give a view of the fire from two directions. They can nestle into a corner of a room or accent the end of a partition wall. As shown in Fig. 3, the Swedish can be built with the conventional firebox design, having one side left open back to the slanting rear wall. Or the side can be fully open and the rear wall vertical. Then the flue above should be offset, as shown, to the rear or the side to give a shelf to baffle down-drafts. On all Swedish designs, the angle-iron lintel must extend around the corner to support the side opening, and the corner needs a 1 to 2-in. iron-pipe upright to support it. An attractive finish is obtained here by sliding an equal length of thin-wall brass or copper tubing over the pipe before erecting.

Corner fireplaces are receiving deserved popularity today because they can be seen from any part of a room and because they require little floor space for their hearths. Slanting across a corner, they will also break up the squareness of a room and will

TYPICAL FIREPLACE

The two details below show different ways of building a hood into a fireplace. In detail A the partial hood replaces only part of the front and side brickwork, whereas in detail B, the complete hood and iron-pipe chimney replaces all the brick above firebox





Above, this corner location allows warmth of fire and view through window to be enjoyed at same time. Upper right, purchased metal form for circulating fireplace simplifies actual masonry construction for ambitious do-it-yourself homeowner



This fireplace with its raised hearth was built around a metal form. Note warm and cold-air inlet and outlet in the masonry

brighten a dark corner. Fig. 4 shows how a triangle of firebrick in the corner can protrude to give a smoke shelf. Or the chimney can be offset to the rear, as with a Swedish fireplace, to give the smoke shelf. The chimney above a corner fireplace can be square with the walls of the room or it may be built so it slants across the corner.

Most hooded fireplaces will give a very dramatic touch. Such a fireplace will also give considerably more heat, because of



the radiation from the large hood. A hooded fireplace can be built in two quite different ways, one as a conventional fireplace with the metal hood simply replacing some brickwork at the front and sides directly above the firebox. The other utilizes a complete hood and metal-pipe chimney that is made up in a sheet-metal shop and which replaces all brickwork above the firebox.

Not to be ignored are the circulating fireplaces. Their manufactured shells make these fireplaces fairly easy to build yourself and they are efficient heaters. Often considered objectionable is the warm-air grillwork exposed above the fireplace. A small hood can be made to cover the grillwork, to direct the heat upward. Or, the grillwork can be hidden in a mantel in the form of a shallow trough or planter box.

On almost any type of fireplace, a raised hearth can be an enjoyable feature. Built 12 to 16 in. above the floor and about 18 in. wide, the hearth will become a huge bench for serving guests and for placing decorations, as well as the best place to sit close by the

fire. Many of today's fireplaces have the floor of the firebox lower than the hearth. Then, sparks cannot sneak out beneath a fire screen and ashes are much less noticeable.

Constructionwise, the first thing about the fireplace you choose is its foundation. Its foundation concrete should be at least 12 in. thick and the bottom must be below frost level of your climate to prevent movement in freezing weather. The foundation can be simply a thickening of a concrete



Although of good size, this fireplace is kept subdued by incorporating it in a long Roman-brick wall

slab floor, or a separate slab in the crawl space or basement. The concrete subhearth detailed in the drawings on page 181 is the cantilever type. Note it is keyed into the rear brick wall and has the firebrick backwall resting on it. The cantilevering is done merely to simplify the wood-floor construction in a house. The hearth can also be built with a third brick wall supporting it on the front edge; that construction is best on a wide hearth. Either way, the concrete subhearth must be reinforced generously with wire mesh or rods.

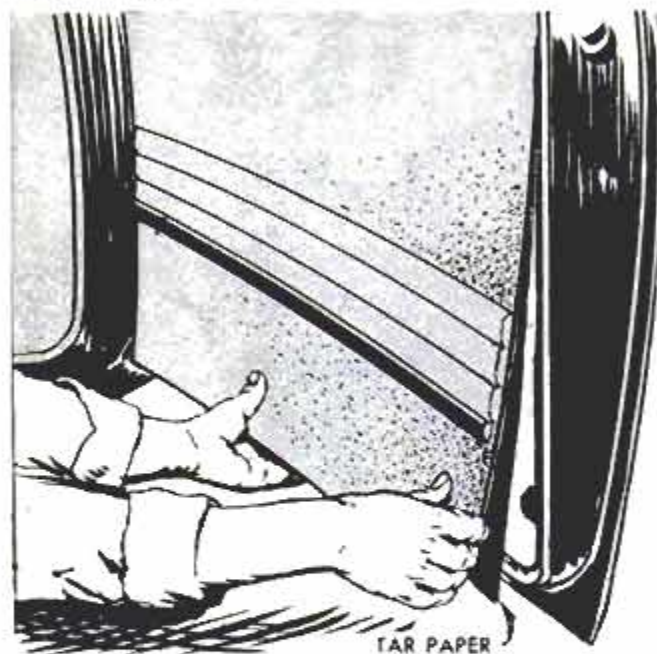
To have a fireplace that works properly, there are several points to keep in mind. The height of most fireplace openings should not exceed 33 in.—the average height is 29 to 30 in. The bottom of the damper assembly should be placed at least 4 in. above the fireplace opening. Most dampers today come in a heavy metal box called the throat. These usually are the easiest to install and their metal throats are smoother than brickwork, giving best passage for the smoke through this important spot. The damper should extend the full width of the fireplace opening, if possible, and must have a cross-sectional area not less than that of the flue.

The smoke shelf behind the damper should be 6 to 12 in. deep and have a smooth concave surface. The smoke shelf should extend the full length of the throat or damper. The smoke chamber above the damper should have smoothly plastered sides that slope in at an angle of not more than 30 deg. from the vertical.

The most important thing is to have a chimney flue of adequate size. The cross-sectional area of your rectangular flue should be at least $\frac{1}{10}$ the fireplace opening's area. For a fireplace 40 in. wide and 30 in. high, you thus would use an $11\frac{1}{4} \times 11\frac{1}{4}$ -in. (inside diameter) clay tile for the flue. Because round flue tile is more efficient, you can use $\frac{1}{2}$ the area to compute for round. On a Swedish or hooded fireplace, add the area of any open side as well as the front opening of the fireplace to compute the flue size. The chimney should extend a good 2 ft. above the ridge of a pitched roof and 3 ft. above a flat roof.

In localities subject to high winds or earthquakes, reinforcing rods in a chimney are a good safeguard against expensive repairs. For winds, the rods can start at the bottom of the tile flue liner, extending to within 6 in. of top of chimney. For earthquakes, these rods are tied to other reinforcing rods that are anchored in the concrete foundation and are bent to extend up through the fireplace walls to the chimney. Along with the rods, a chimney on an outside wall of a house can be held securely against the house by two $\frac{1}{8} \times 1\frac{1}{4}$ -in. iron straps, tied to two rods, passed through the brickwork and anchored to ceiling joists or upper plates of the house frame. The straps will give slightly when the house settles. Never key any rigid wood members of the house frame into the brickwork. That can give a fire hazard, and the difference in settling of the fireplace and house frame will cause cracks or other troubles. ★ ★ ★

Tar-Paper Water Shields Protect Automobile Door-Trim Panels



If the trim panels on the inside of your car doors are becoming warped or stained there is probably no water shield behind them. A sheet of tar paper, easily installed between the trim panel and the door, makes an excellent shield. To do this, remove the trim panel and cut a sheet of tar paper to cover the inside surface of the door but leaving one inch of the outer edge of the metal exposed. With this shield taped in place, cut holes for the window and door controls and replace the trim panel. Use cleaning fluid to remove smudges.

Antique Churn Modified for Use As Wastepaper Basket



Towel Fogproofs Mirror

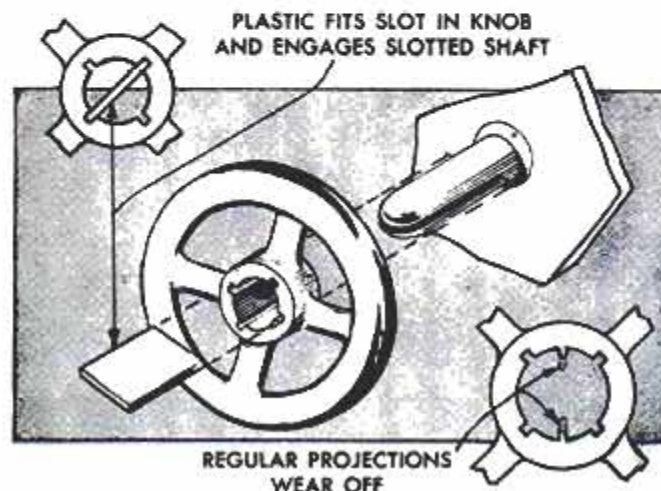
To prevent a mirror on a bathroom cabinet from becoming fogged when taking a bath or hot shower, open the cabinet door and hang a dry towel over it. The towel will prevent moisture from condensing on the cool mirror, while the open door will permit the warm, humid air to circulate freely around the mirror, heating it to room temperature by the time you have stepped out of the bath.

George P. Pearce, Albuquerque, N. Mex.

Repair Loose TV-Control Knobs With Plastic Keys

Plastic knobs on a TV set that slip can be repaired by cutting a flat key from thin, clear plastic and using it to engage the slotted shaft and opposing slots in the knob. If the slots in the knob are too shallow or narrow for a secure fit, they can be enlarged with a fingernail file or a flat needlepoint file.

Charles H. Hardy, Los Angeles, Calif.

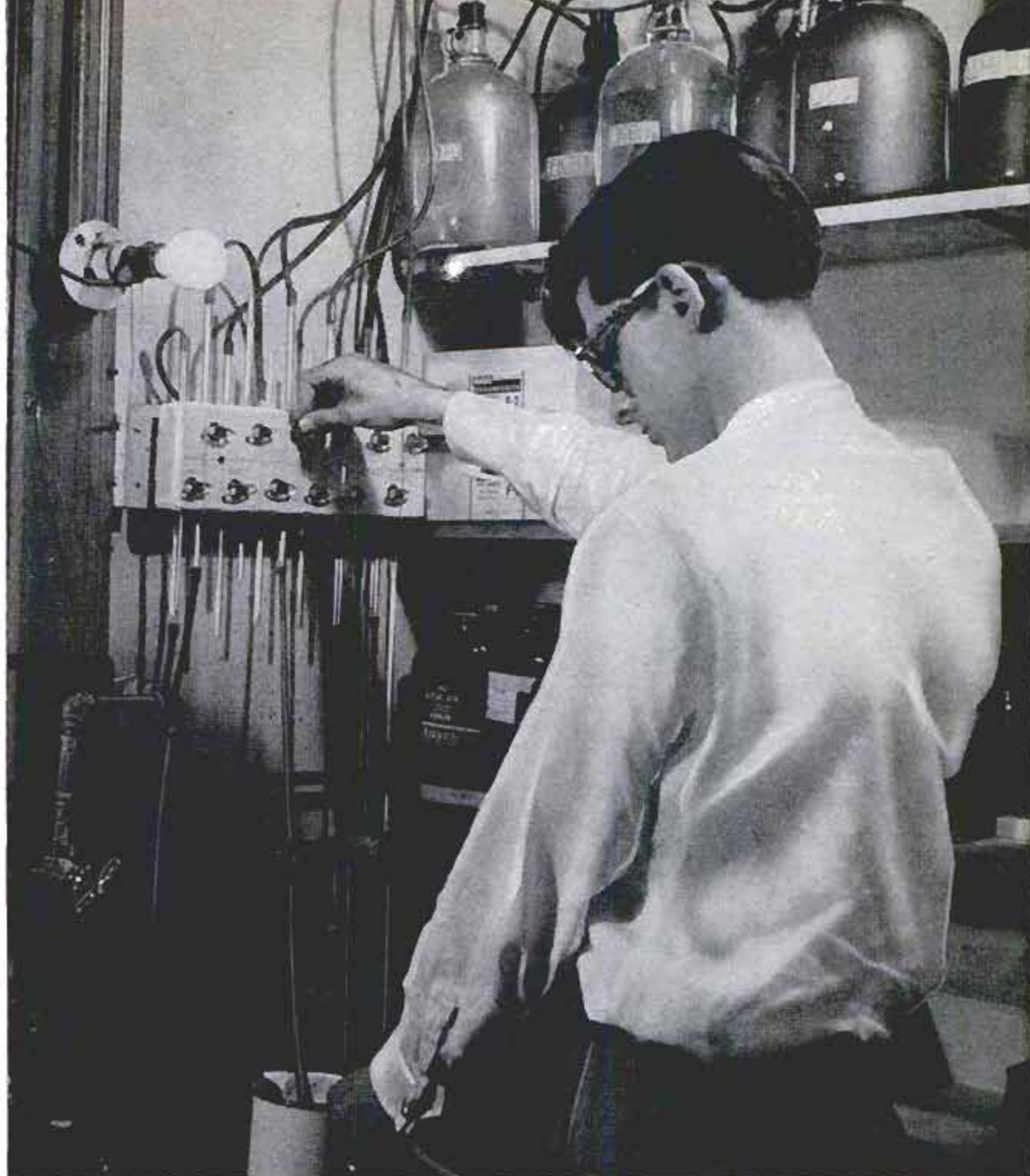


One homeowner who has colonial-style furniture adapted an antique butter churn for use as a wastebasket. The paddles were removed and the shaft cut off just inside the churn. The modification retains the original appearance of the churn, but provides more space inside for wastepaper. A coat of wax protects the natural finish.

Plane Tight Door on Hinge Side

When it is necessary to plane a door that is too wide, plane the hinged edge instead of the edge carrying the latch. This is especially advisable if a considerable amount of wood has to be removed, which would necessitate resetting the latch. It is much simpler to relocate the hinge screw holes than it is to reset the latch.

☐ The harsh ringing of a doorbell can be softened by fitting a piece of adhesive tape on the edge of the bell so the clapper strikes the tape instead of metal.



There are no bottles to handle in measuring out photo chemicals when they are kept on tap—just turn a cock

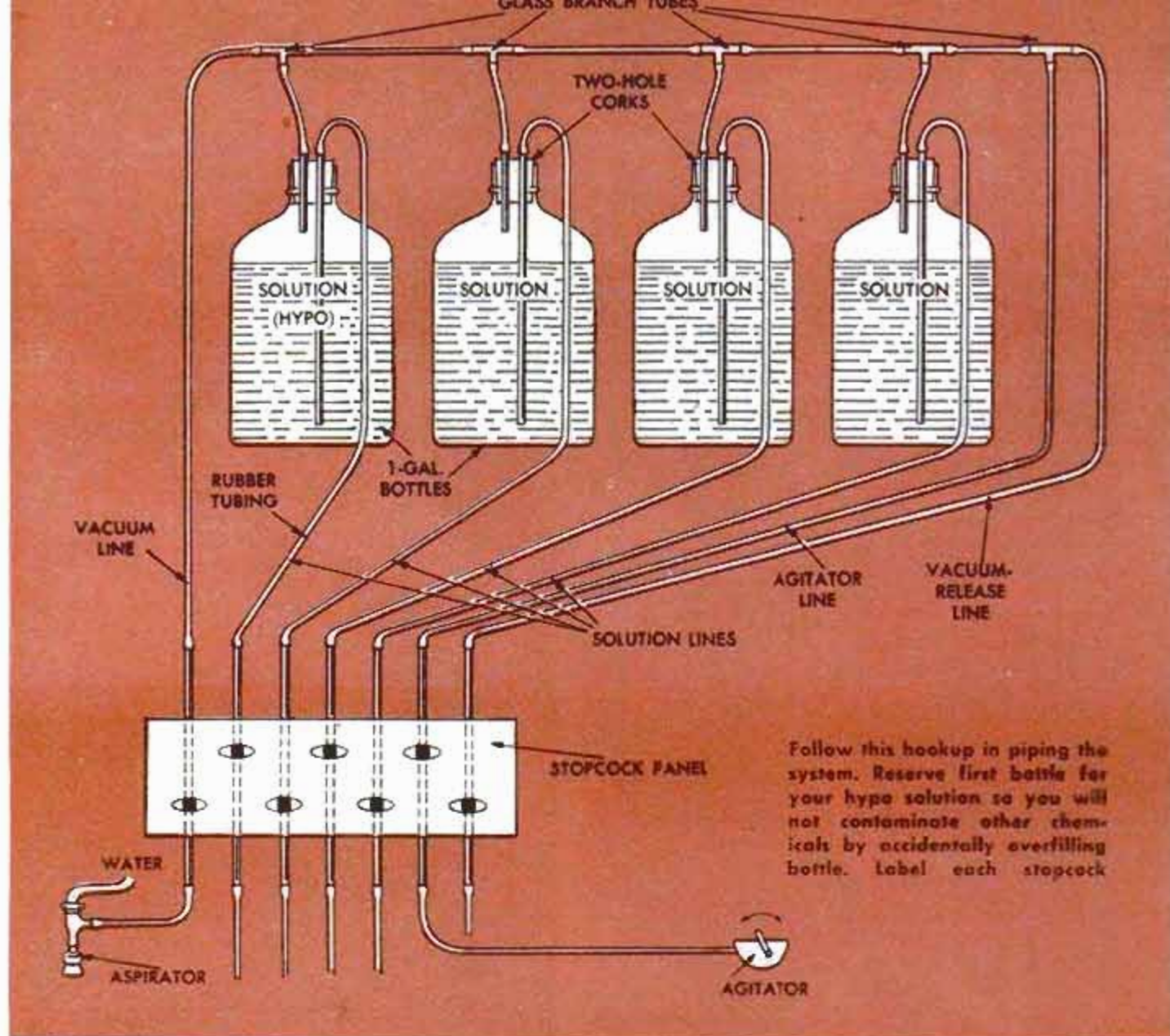
PHOTO CHEMICALS KEPT ON TAP

By John Hoke

TURNING A VALVE to measure out photo solutions as you would a water faucet is a real darkroom convenience that will appeal to anyone who processes his photos at home. This is made possible with an easily installed vacuum-siphoning system which permits solutions to be tapped from stock bottles stored out of the way on an overhead shelf. The vacuum in the system is maintained by a device called an aspirator which is attached to the darkroom-sink faucet. Vacuum is created by

running water through the aspirator. The vacuum also makes it possible to operate an efficient film agitator that is improvised from a windshield-wiper motor.

To install this system in your darkroom you'll need at least four 1-gal. bottles, seven glass stopcocks, four 2-hole corks to fit the bottles, five glass branch tubes, an aspirator and $\frac{1}{4}$ -in. rubber and glass tubing. The glass stopcocks are the valves which control the flow of solutions kept on tap. All seven stopcocks are cast in a



plaster-of-paris panel. A shallow cardboard box makes a good form for the casting as it can be easily stripped off. Holes are made in the sides of the cardboard box to insert the glass tubes attached to the stopcocks and the latter are positioned in the box in the manner shown in the drawing above. Pieces of wire and bits of metal mixed in with the plaster will reinforce the finished casting. Finally, each stopcock is labeled with the name of the solution it is to deliver, and the block is mounted at a convenient height on the darkroom wall.

Piping the System

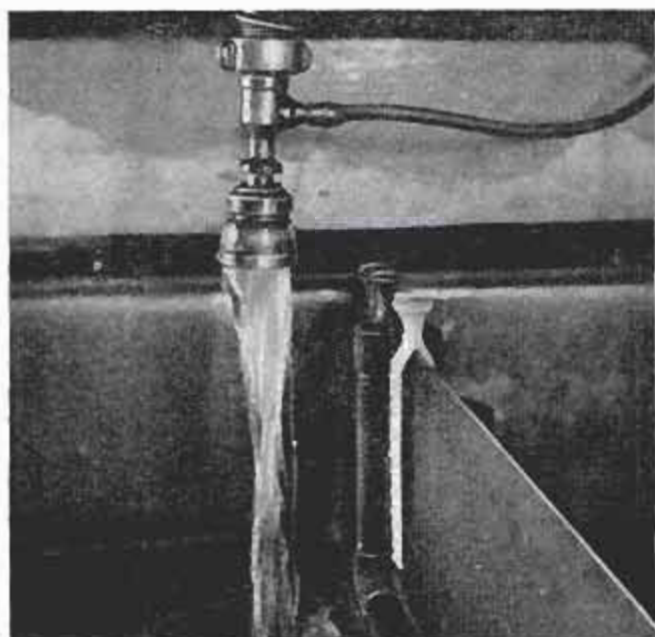
The diagram above shows clearly how the stopcocks are connected with rubber tubing to the bottles, aspirator and agitator. You'll notice that each bottle cork is fitted with two lengths of glass tubing, one being long enough to nearly touch the bottom of the bottle.

Be careful in pushing the glass tubes through the holes in the corks. Wetting the corks with water will help make the tubes slide through easily, but you should

take the added precaution of wrapping the tube and cork with a towel to protect the hands in the event a tube should break.

The vacuum of the system is controlled by the stopcocks at the ends of the panel, the one on the left being labeled vacuum and the one on the right, vacuum release. After each bottle is hooked into the vacuum line and connected to its respective stopcock in the manner shown in the diagram, the aspirator is connected to its stopcock and the agitator to its stopcock. The rubber tubing at the lower ends of the stopcocks should be long enough to reach into the darkroom sink.

The windshield-wiper motor is rigged up to rock a tray platform placed in the bottom of the darkroom sink. A bracket to hook it over the edge of the sink can be formed of coat-hanger wire and another piece of wire is used to connect the platform to the rocker arm of the motor. The platform can be either wood or metal, and a cork fastened to the underside at each end will provide pivots on which it can rock. To make the agitator work, turn on



Aspirator screws onto sink faucet and is connected to stopcock panel with length of rubber tubing

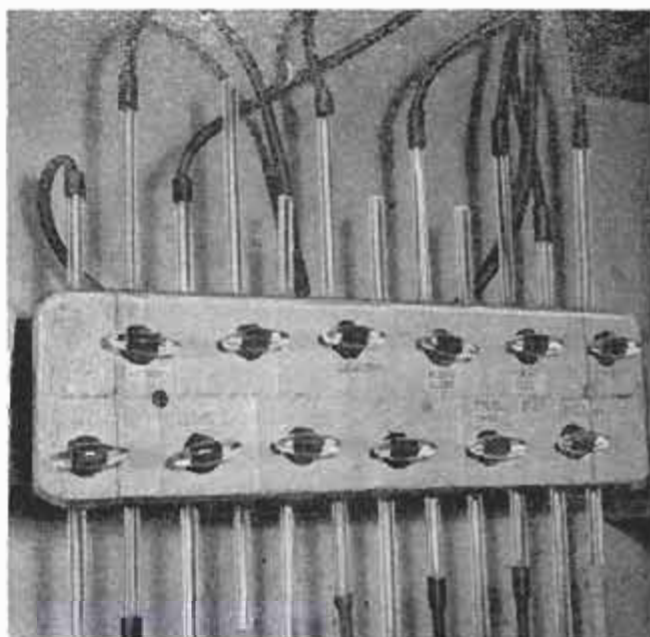
the water faucet so water will run through the aspirator and open the stopcock labeled agitator. Adjust the flow of water through the aspirator so the agitator will rock the tray with a slow periodic movement. Avoid rapid agitation when developing film as this may cause flow lines on the surface.

Operating the System

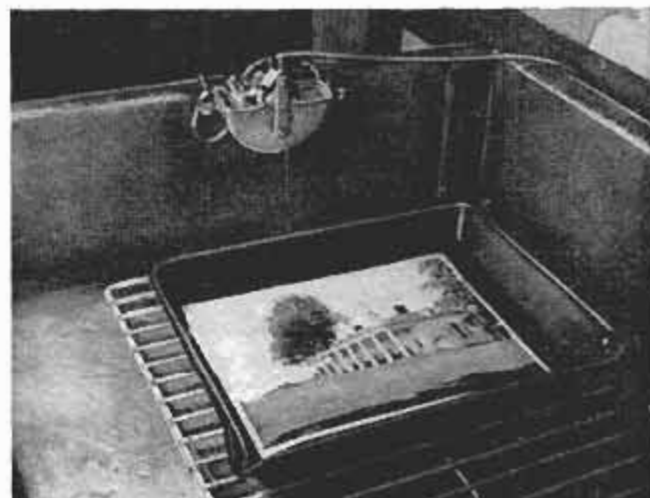
To siphon solutions into the bottles, a vacuum must be created by running water through the aspirator. All stopcocks must be closed except the one which controls the bottle you are filling. As the vacuum increases, the solution will flow more rapidly into the bottle. Do not attempt to fill the bottle too close to the top or you run the risk of pulling the solution into the vacuum line and out through the aspirator. When the bottle is full, close the stopcock.

Don't let the container from which you are drawing the liquid become completely empty so as to draw air into the bottle. A column of solution must be left standing in the glass tube of each stopcock that delivers solution.

Let the first bottle of the group hold hypo. This will prevent any chance of the other solutions becoming contaminated should you accidentally overfill the hypo bottle. By keeping it first in line, any excess hypo will merely flow out through the aspirator. To insure cleanliness of the



Stopcock panel controls flow of siphoned chemicals. Rubber tubing slips over ends of the glass tubes



Agitator is made from windshield-wiper motor and vacuum-operated by running water through aspirator

bottles after having exhausted the supply, draw some clean water into the bottle and drain it out again before refilling.

To tap the stock bottles, first open the vacuum-release stopcock and then the stopcock of the particular solution you wish to use. Should the tubing have no solution standing in it, turn on the water faucet and pull some water into the tube. Then release the vacuum again and the solution will flow. When not being used, seal off the system under a vacuum. This will help prevent oxidation of the chemicals that oxidate under normal air pressures. ★ ★ ★

Metal Primer Prevents Peeling Paint on Steel Casements

When paint peels from steel casement doors and windows it is a pretty good indication that the steel was not entirely free from oil and grease when originally painted, or that a metal primer was not used. To eliminate this condition remove

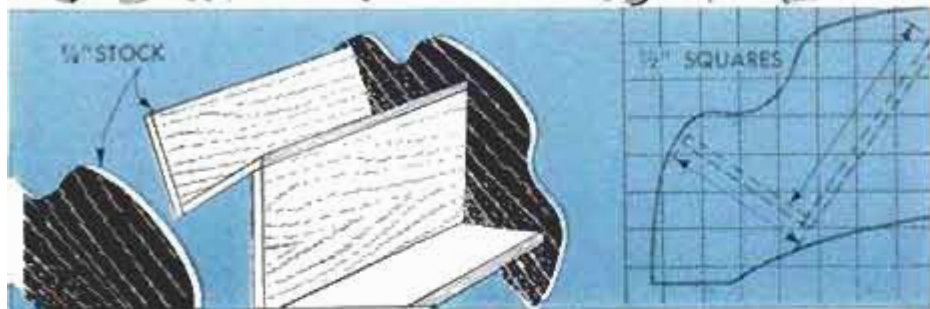
the old paint, clean the bare metal with fine steel wool, and wipe clean with a cloth dipped in turpentine. Then apply a metal primer and allow it plenty of time to dry. Finish with one or two coats of outside paint.

Versatile Snack Tray Cut From Light Plywood



This large all-purpose wooden snack tray is a versatile item that can be used for both indoor and outdoor entertainment. The original was made from $\frac{1}{4}$ -in. plywood, with the ends cut from a pattern laid out on a grid of $\frac{1}{2}$ -in. squares, as shown, although this design can easily be modified. The length of the tray may be varied to suit its intended use, keeping in mind the problem of storage. The tray can be left natural, or finished in a number of ways. Decals can be attached to the tray for a decorative touch.

I. M. Fenn, Chicago.



Discolored Enamel Cleaned

To remove surface discolorations on a bathtub or sink, use a mixture of baking powder and peroxide. Make a paste of the two materials and apply it to the discolored areas with a cloth. After the paste has dried, wash it away and the original luster will be restored. The mixture also can be used to brighten the finish on a refrigerator.

Barbara Pritchard, Syracuse, N. Y.

King-Size Cigarette Case

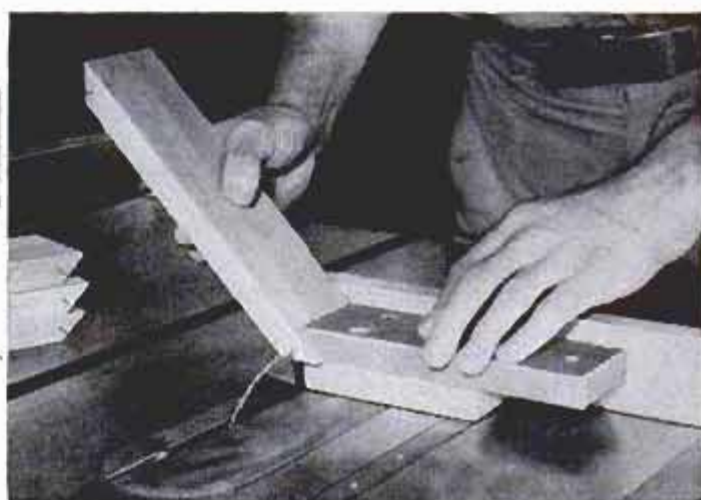
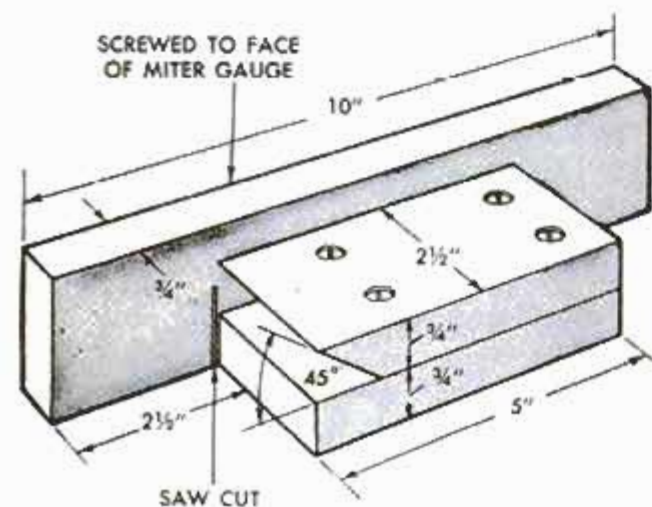
A medium-size adhesive-bandage box is excellent for carrying a pack of king-size cigarettes. The sturdy metal box with hinged lid protects cigarettes from moisture and crushing when carried in a shirt or trouser pocket at work or while hunting or fishing. Give the outside of the box two coats of enamel.

Herbert Kondo, Champaign, Ill.

Jig for Cutting Clamp-Nail Grooves on Mitered Corners

This wooden jig permits easy and accurate cutting of clamp-nail grooves on the mitered ends of a bookcase, cabinet base or corner blocks on a table. The three members are cut from $\frac{3}{4}$ x $2\frac{1}{2}$ -in. stock and fastened together with wood screws as shown. In use, the jig is attached to the miter gauge of a bench saw. Use a thin

saw blade for cutting the grooves, which should be made slightly deeper than half the width of the clamp nails, to permit secure fastening. Grooves for splines also may be cut with the jig by using a thicker blade, such as the outside blade of a dado head or groover saw blade.—Gordon D. Carlson, Minneapolis, Minn.

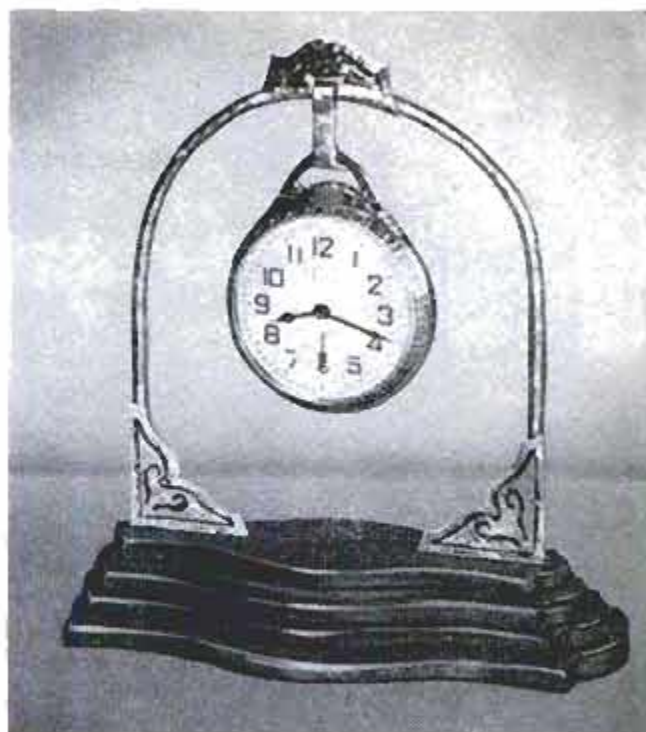


DECORATIVE STAND FOR POCKET WATCH

By *Bertram Brownold*

AN INEXPENSIVE pocket watch suspended from the arch of this decorative stand serves as a novel and useful mantel timepiece. Or, your grandfather's watch with its heavy gold case (if you have one), can be used for this purpose and be given prominent display rather than collect dust in a drawer with other forgotten mementos.

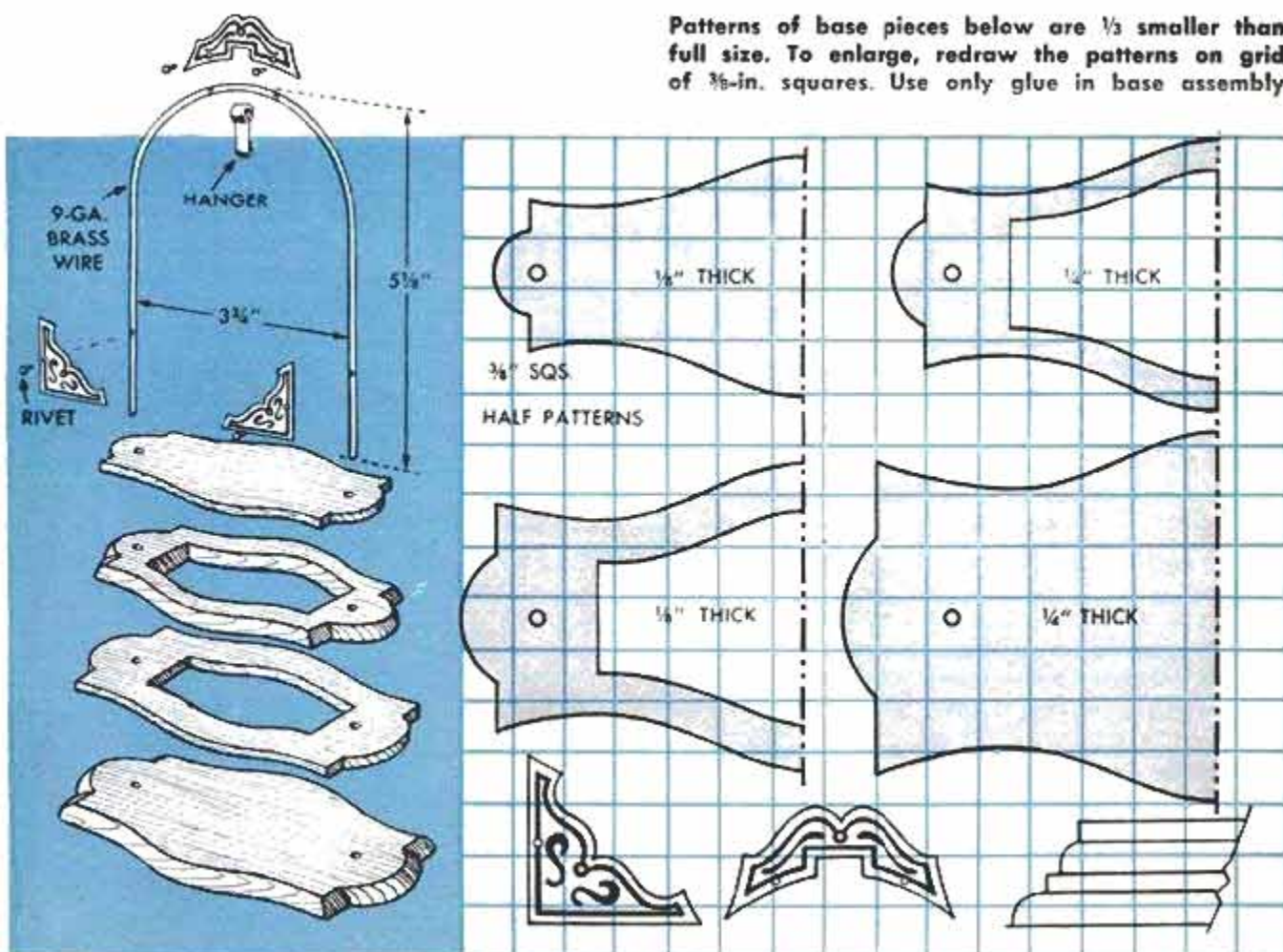
The wooden base in which the ends of a 9-ga. brass-wire arch are set is hollow and filled with lead for stability. The base is assembled with glue from four pieces of wood, two of which have their centers cut out as shown in the squared pattern below. The wire used for the arch can be shaped on a piece of wood, with the contour of the arch cut on one end, and peened and burnished if an antique finish is desired. Three pieces of sheet brass shaped as shown are riveted to the arch for ornamentation. The design painted on these pieces is in black enamel, applied with a fine brush. An ordinary pen also can be used, if the enamel is thinned with turpentine



Apply a finish on the base of the stand that will harmonize with the furniture on which it is placed

so that it will flow easily. When the enamel is dry apply a protective coat of lacquer. The watch hangs on a hook made from a strip of brass the lower end of which is bent to form a hook. The upper end of the strip is bent around the arch. Finish the base in a suitable color.

Patterns of base pieces below are $\frac{1}{3}$ smaller than full size. To enlarge, redraw the patterns on grid of $\frac{1}{8}$ -in. squares. Use only glue in base assembly



By Ed Packer



Keep Home Appliances RUNNING SMOOTHLY

OIL-STARVED BEARINGS can cause failure of a home appliance long before its time. But too much oil also can damage seriously such motor-driven units as fans, washers and mixers. Excess oil thrown from sleeve bearings of a motor tends to creep, or migrate, to the commutator and windings where it can become both an insulator and conductor. Eventually the motor burns out and must be replaced. Take time to count the motors on duty in the various appliances in your home. These motors alone represent a considerable investment. Lubricants applied properly can mean extra long life and satisfactory performance, but incorrect lubrication can be the cause of replacement. Nearly all motors in older units require periodic lubrication, but appliances of a later model may come equipped with motors having lubricated-for-life bearings.

Manufacturer's instructions usually are quite specific as to the kind and quantity of lubricant to be used. In addition to light machine oil, several other special lubricants supplied in dry powder, stick, semisolid and liquid forms are well suited to use on household appliances and fittings. These are pictured above in the containers in which they are regularly available. A one-drop oil can is essential for oiling food mixers, cooling fans and sewing machines having small motors requiring only a drop

or two of oil at each servicing. Some small motors are equipped with wool-packed bearings, others with wick-type oilers designed to use either a very light grease or a light oil. These usually are fitted with a spring-loaded wick, or wiper, which carries the lubricant to the shaft.

Kitchen ventilating fans often operate with the motor in a vertical position and it is important to follow the manufacturer's instructions when lubricating. Fan motors gather much lint and dust at best so it is especially important to clean the motor thoroughly after servicing to remove any oil or grease from the end housings and frame. In some cases it is permissible to equip centrifugal blowers with continuous oilers of the type pictured in the upper right-hand photo on the opposite page. The oiler must be adjusted to give only a single drop of oil at fairly long intervals.

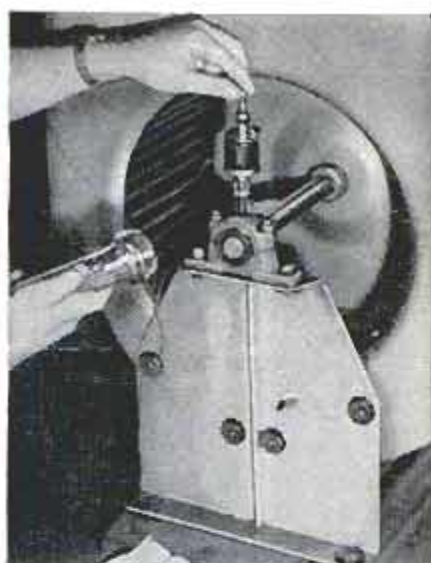
Dry graphite lubricants are just the thing for easing the operation of tumbler locks. Graphite lubricant is supplied in a special gun which simplifies application. Use a nondripping lubricant on hinge pins, also on lock bolts to prevent the latter from jamming against the striker plate. Stick lubricant makes drawers slide easily. It also can be used on metal weather stripping to make doors close easier. Window sash open and close more readily when the weather stripping is lubricated. ★ ★ ★



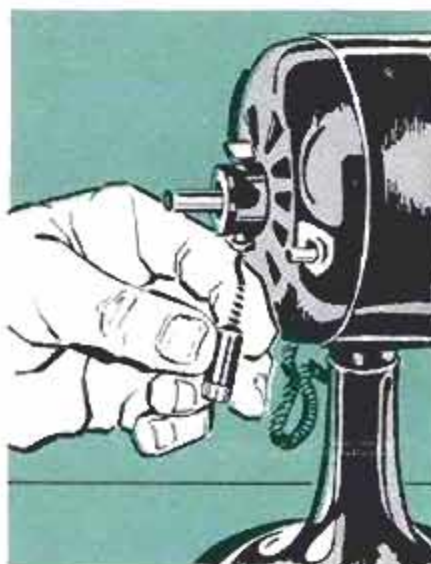
Use special care when oiling food-mixer motor and be sure to follow the manufacturer's instructions



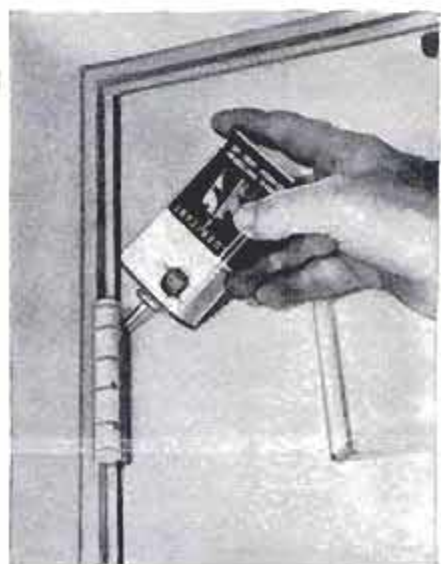
The oscillating mechanism of an electric fan usually requires a special gear oil applied sparingly



Often it is permissible to equip bearings of centrifugal fans with continuous oilers of type pictured



Older fan motors generally are equipped with oilers having spring-loaded wick to carry oil to bearing

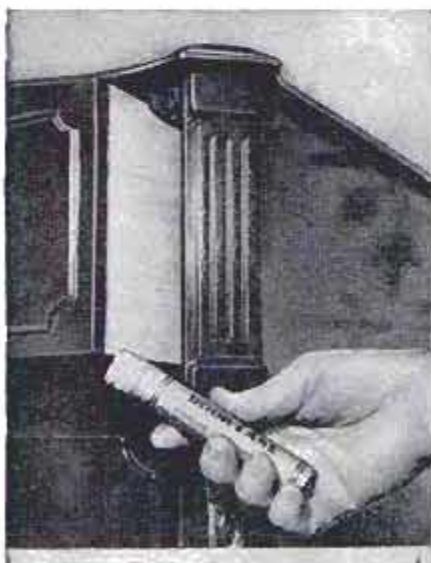


Use nondrip lubricant on hinge pins. Wipe away excess lubricant to prevent it from gathering dust

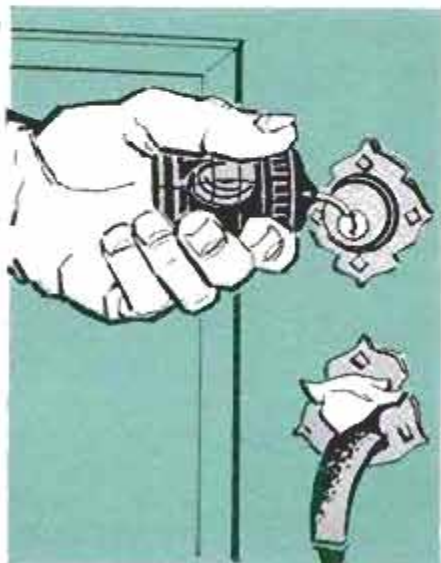


Some kitchen fans have motors operating in a vertical position. Clean motor thoroughly after servicing

Stick lubricants are useful on wood as well as metal surfaces. Use to ease closing of doors and drawers



Dry graphite, supplied in a special gun, lubricates tumbler locks. Only a very small quantity is necessary



Tiny motors that operate clocks, gas valves and similar units require application of special oils



Small-Parts Box Easy to Carry When Fitted With Saw Handle



An old saw handle fitted to a wide strip of metal and strapped around a small-parts cabinet makes it easier to carry from one job to the next. With this handle it is not necessary to stoop to pick up the cabinet and the ease with which it can be carried in a horizontal position prevents drawers from sliding out on the floor.

Dried Paint Removed From Shoes

Removing dried paint from leather shoes can be done with shoe polish and steel wool. A generous application of paste polish is put on the shoes without polishing, and then the individual paint spots are rubbed gently with grade 0 steel wool until they are removed. Brush the steel-wool particles from the shoes, apply another coat of polish and buff to desired gloss.

E. F. Brandt, St. Augustine, Fla.

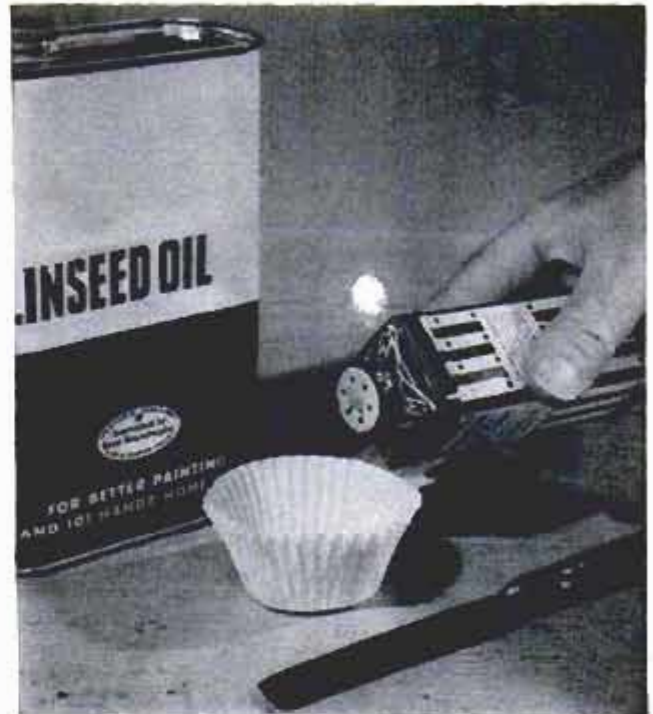
Talcum Powder and Linseed Oil Make Emergency Putty

A mixture of talcum powder and linseed oil can be used as a satisfactory substitute for putty when only a small amount is needed to finish a job. Mix the two ingredients to a puttylike consistency and apply in the usual manner. A stick of chalk ground to powder can be used instead of talcum, if the latter is not available. Left-over material can be kept in a covered jar.

Rustic Picture Frame

For a picture frame that will have a "grainy" look, use plywood strips cut across the grain for the frame members, which can be glued or stapled together. Thickness of the plywood used should be determined on the basis of size of picture to be framed and the effect desired.

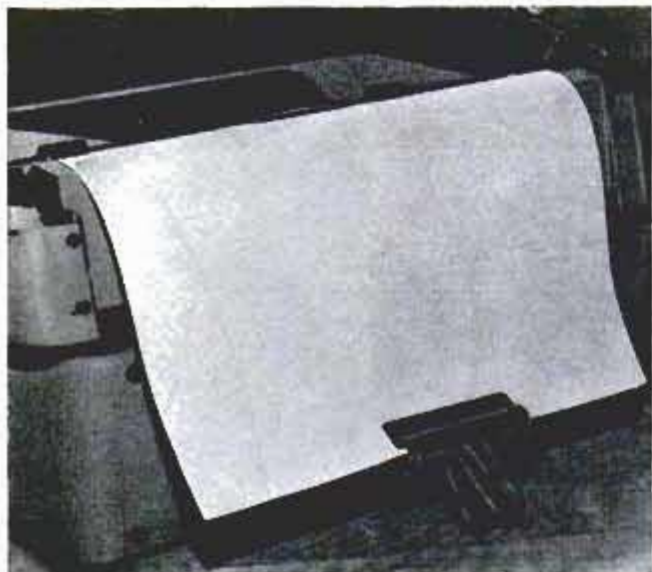
Arthur Shults, South Bend, Ind.



Clamp Prevents Paper Blowing When Typing Outdoors

If you like to use your portable typewriter outdoors but find that a breeze keeps flipping the end of the paper over the keys, try adding a little weight to the free end. Simply clip a spring-type paper clamp over the projecting bottom of the sheet after it is inserted in the machine. When the paper has rolled slightly more than halfway through the typewriter, transfer the clamp to the top edge of the sheet and continue with your typing.

☞ To preserve the original appearance of the cover of a much-used book, brush on a thin coat of shellac.

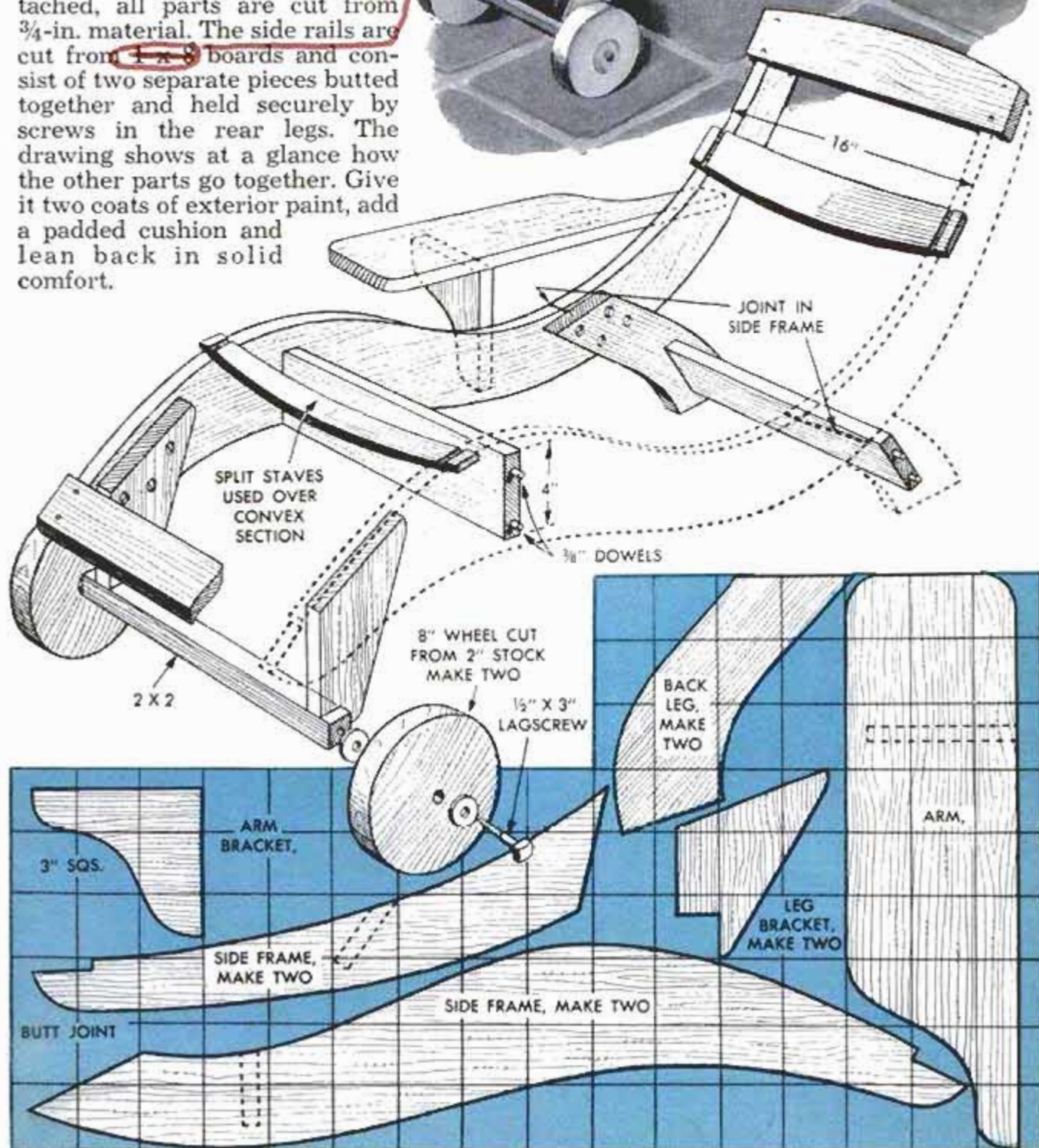


Patio Lounge

By Hi Sibley

LOTS OF LAZY COMFORT is built into this contour patio lounge, and it's a fairly simple thing to make if you have a band-saw to cut out the curved parts. Staves from nail kegs, which are used to cover the top, add to its body-conforming comfort. Except for the wheels and the member to which they are attached, all parts are cut from $\frac{3}{4}$ -in. material. The side rails are cut from ~~1 x 8~~ boards and consist of two separate pieces butted together and held securely by screws in the rear legs. The drawing shows at a glance how the other parts go together. Give it two coats of exterior paint, add a padded cushion and lean back in solid comfort.

1 x 10

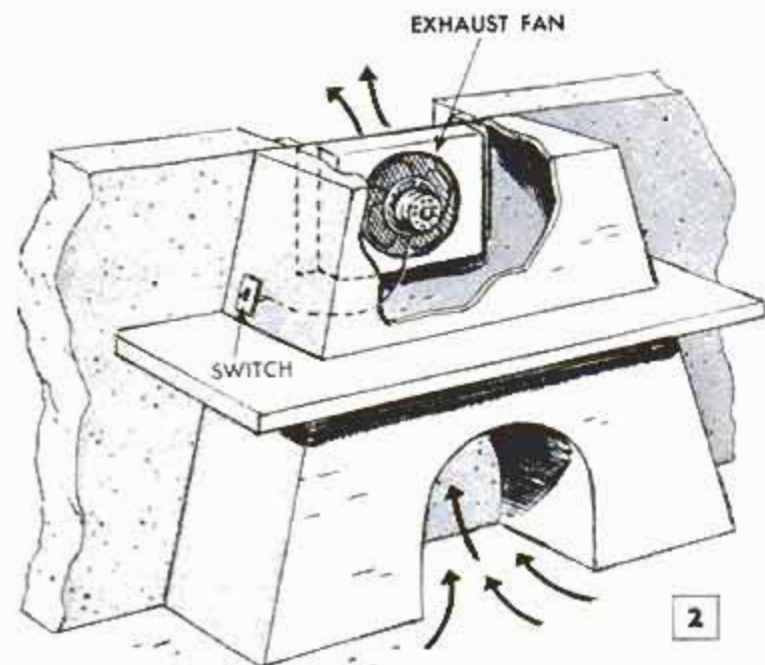


SOLVING

Home Problems



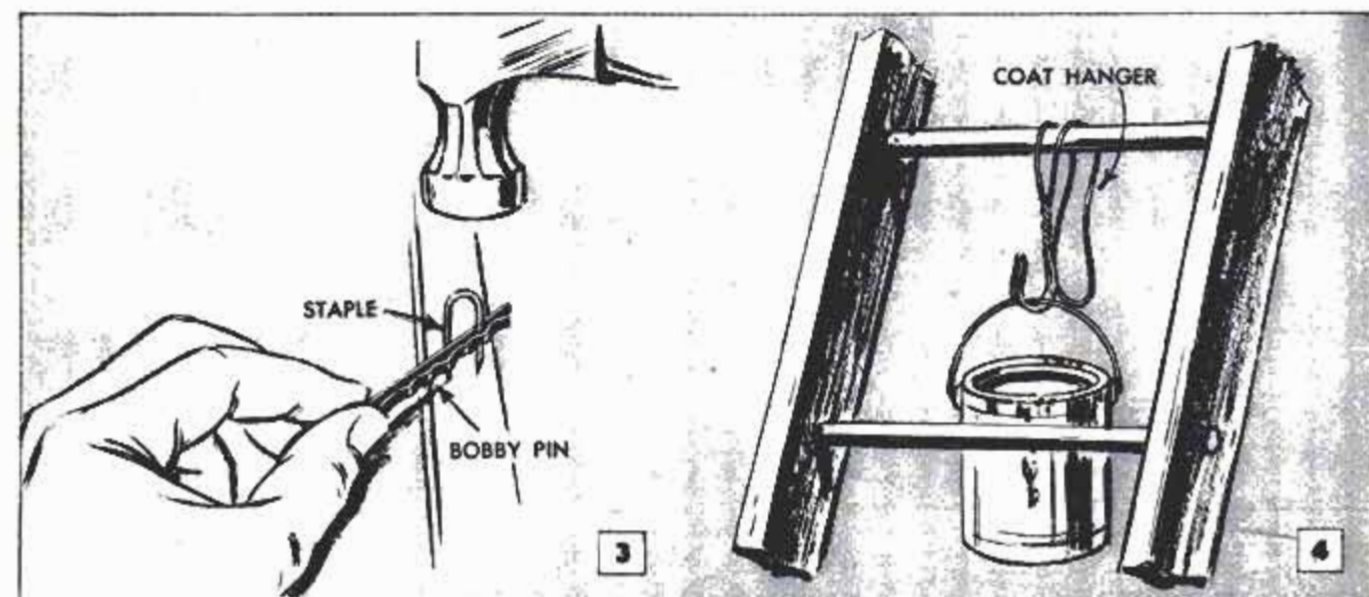
1. CUT FLOWERS will keep that fresh, on-the-vine look hours, even days, longer if you add a pinch of ordinary table salt to the water in the vase at the time the blooms are arranged. The exact amount of salt is not too important. If vase holds a pint of water then a small pinch of salt is sufficient

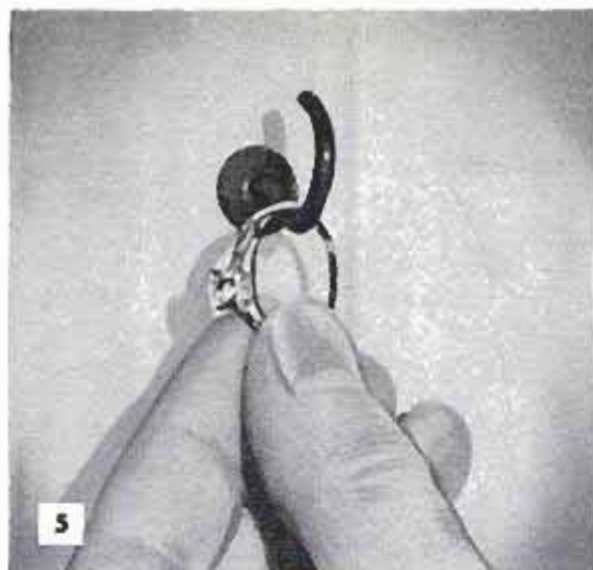


2. AN EXHAUST FAN utilized for ventilating a damp basement can be made inconspicuous and the noise less objectionable by an imitation fireplace mantel extending from floor to ceiling. Mantel and fireplace can be built from 3/4-in. plywood. Cover with imitation brick

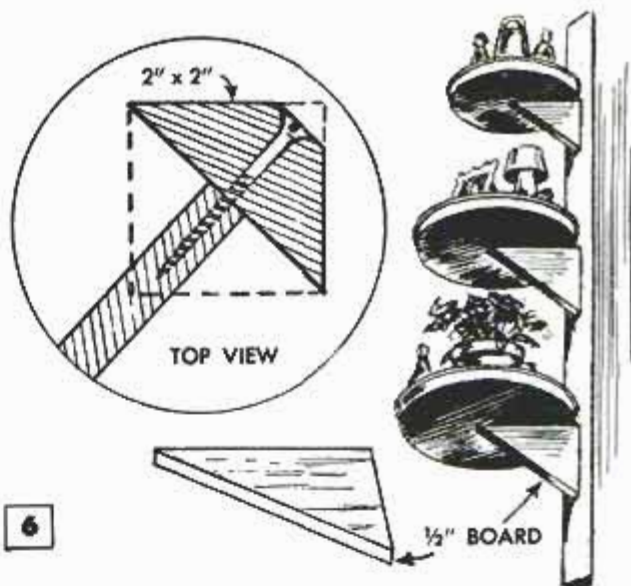
3. IMPROVED HOLDER for small staples saves tempers and fingers when starting the staples in hard-to-reach places. Holder is bobby pin of crimped type. One leg of staple is passed through opening between crimped and straight leg of pin, then started with hammer

4. A COAT HANGER, bent as shown in the detail, makes a handy hook for supporting a bucket of paint on the rung of a ladder. It's better and steadier than a hook bent from a single wire. First, straighten the wire hanger to form a long loop. Then bend loop into a hook

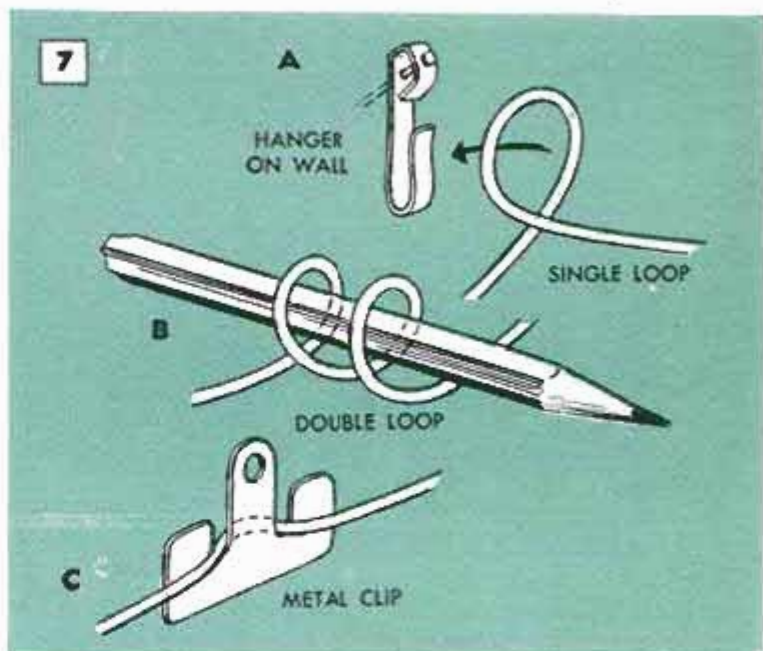




5. CUP HOOK screwed into the wall above the kitchen sink makes a handy keeper for the ring you always remove when washing dishes. Ring is not easily removed or knocked off the hook inadvertently and, in case you forget to replace it, it is less likely to be lost on the floor or down the drain. Locate the hook out of reach of small children



6. CAKE TINS of graduated sizes form shelves of this three-tier whatnot. To make the frame with brackets, rip a 2 x 2 diagonally to form vertical member and then cut three brackets from 1/2-in. stock, the sizes graduated to suit varying sizes of shelves. Space brackets and screw to vertical member. Then attach shelves with screws



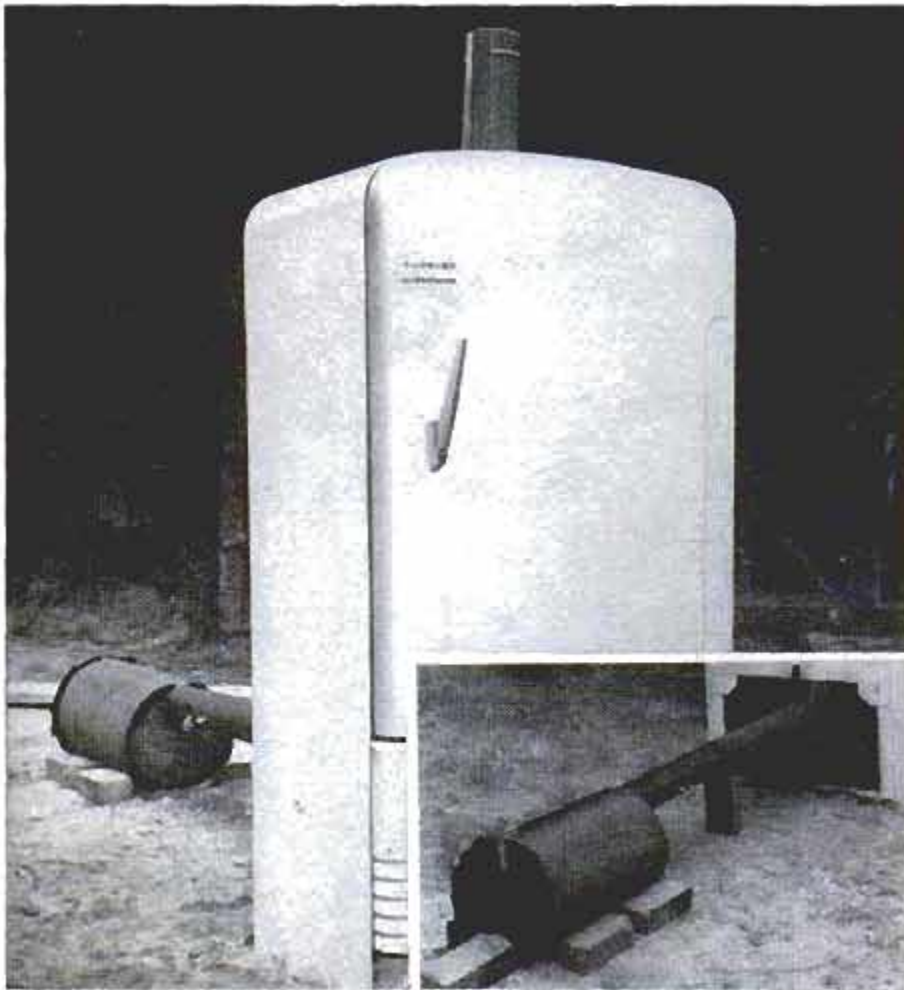
7. FRAMED PICTURES can be prevented from tilting by the simple trick of snubbing the cord or wire around the hanger. A single loop, detail A, usually does it, but in some cases a double loop formed as in detail B is more effective. Also available for this purpose are the special clips shown in detail C. These are slotted to slip over wire

8. SCRAPS OF BAR SOAP from the laundry and bathroom can be salvaged by running them through a meat grinder as pictured. This procedure reduces the scraps to flakes which can be utilized without waste. The job of running the scraps through the grinder can be made somewhat easier by heating soap slightly before feeding into the grinder



Home-Built Smokehouse

Smoke-flavored fish and game are home products of one man who built his own smokehouse using a refrigerator cabinet from which the mechanism had been removed. A 4-in. hole cut in the cabinet top permits inserting a length of 4-in. stovepipe which projects 2 in. inside the cabinet liner. A 4-in. hole in the cabinet bottom accommodates a 4-in. stovepipe elbow. The firebox for the smokehouse is a small steel oil drum that has a 4-in. hole cut in one end. The other end is cut out, then hinged and used for a lid. A damper is fitted in the first length of pipe. Two lengths of stovepipe are used for fish and meats, four for sausage. — Earl Stowell, Milwaukee, Wis.



Hang Bowed Door With Concave Surface Facing Outside

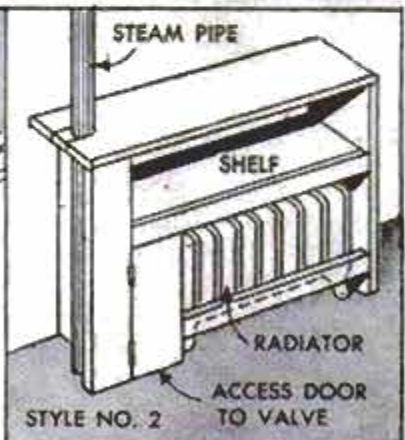
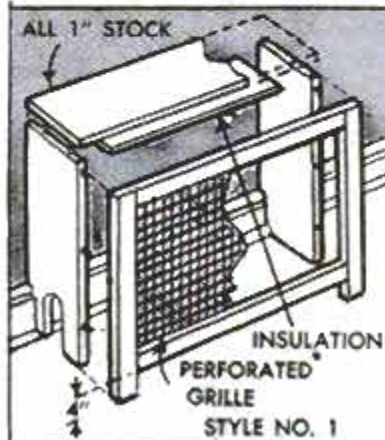
When installing a wooden door that is bowed slightly, be sure the concave surface faces away from the doorstop, for a good fit. Sight down the top or bottom edge of the door to determine the direction of the bow and install the hardware on the door and doorjamb. There will be a slight

amount of tension on the door when it is in the closed position, but the latter condition will eliminate rattling and also will cause the door to straighten perfectly and fit flush against the doorjamb after it has been in use a short time.

Walter L. Stein, Kenosha, Wis.

Attractive Radiator Covers Provide Added Storage

If your home has cast-iron radiators, one of these two cover styles can be adapted to make them more attractive. The undersides of the cover tops should be insulated with blanket or rigid-type insulation so that books and bric-a-brac can be placed on the covers. Style No. 1 has a perforated-sheet-metal grille; this material can be purchased in sheet form at most hardware stores. Both cover styles should be 1 in. longer than the radiator, 1 in. higher plus space for insulation, and $\frac{1}{2}$ in. wider than the distance from the wall to the outer edge of the radiator. The length dimension of style No. 2 will vary to permit fitting around the valve and steam pipe.

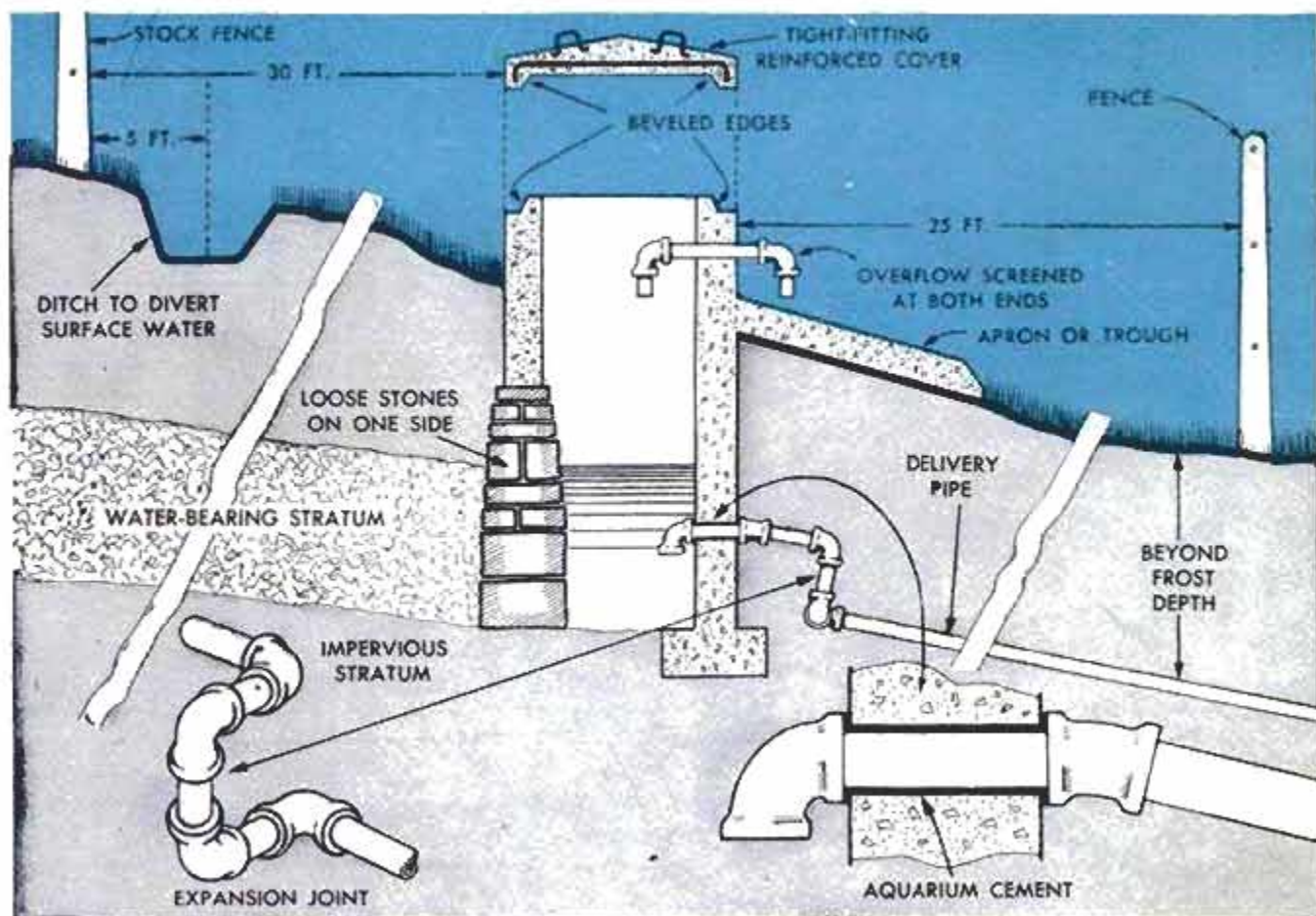


"HARNESSING" YOUR SPRING

IF YOU ARE LUCKY enough to have a free-flowing spring on your property, this concrete enclosure can be constructed over it to reduce contamination by surface seepage and assure a more constant supply of reasonably clean water. First, dig a trench that will drain all the water from the spring to a depth sufficient to permit excavation of earth to admit forms for the concrete enclosure. Later, the delivery pipe will be laid in the same trench as shown in the detail. The lower half of the wall that faces "upstream" is built up of flat, loose-fitting stones. An overflow pipe discharges water on a concrete apron. As an additional precaution against contamination of the water, build a fence around the spring to keep stock at least 25 ft. away, and divert surface water by providing a ditch inside the fenced-in area as shown.



Nipples for the overflow and delivery pipes should be positioned in the forms at the desired levels before the concrete is poured



Clothes-Drier Standard Held by Stepping on Footrest



Holding the standard of an outdoor folding-type clothes drier in its socket while raising the line-holding arms is no problem when a footrest is provided. The rest is an L-shaped length of $\frac{1}{4}$ -in. steel rod fitted into a hole drilled through the standard just above ground level. Standing on the rest with one foot holds the standard in place. When the clothes drier is folded for storage, the rest pivots against the standard. A similar footrest also can be used to hold the standard of a large beach or patio umbrella while opening it.

Andrew Vena, Philadelphia, Pa.

Keyed Typewriter Platen Assures Uniform Margins

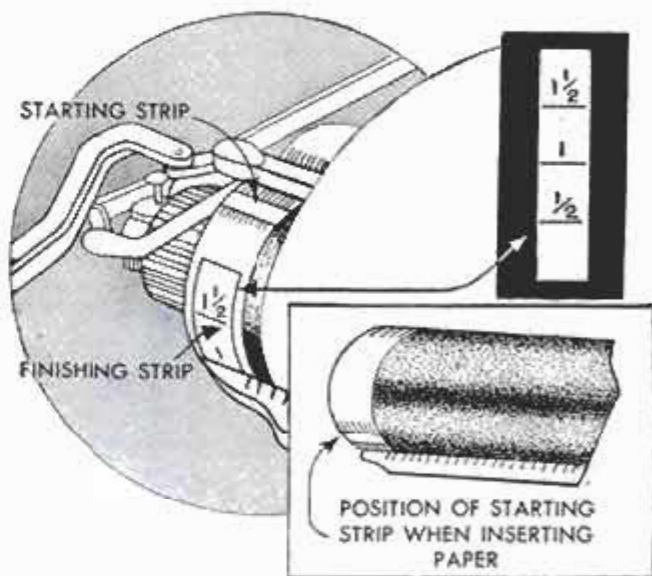
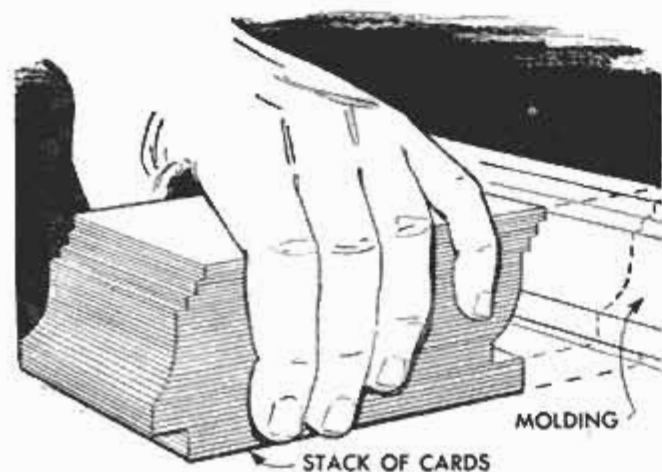
Here's a simple method of assuring the same margin at the bottom of typewritten sheets. Use two small strips of masking tape, sticking one short piece horizontally to the left-hand end of the platen for the starting strip. Whenever an 11-in. sheet of

Emergency Paint Remover

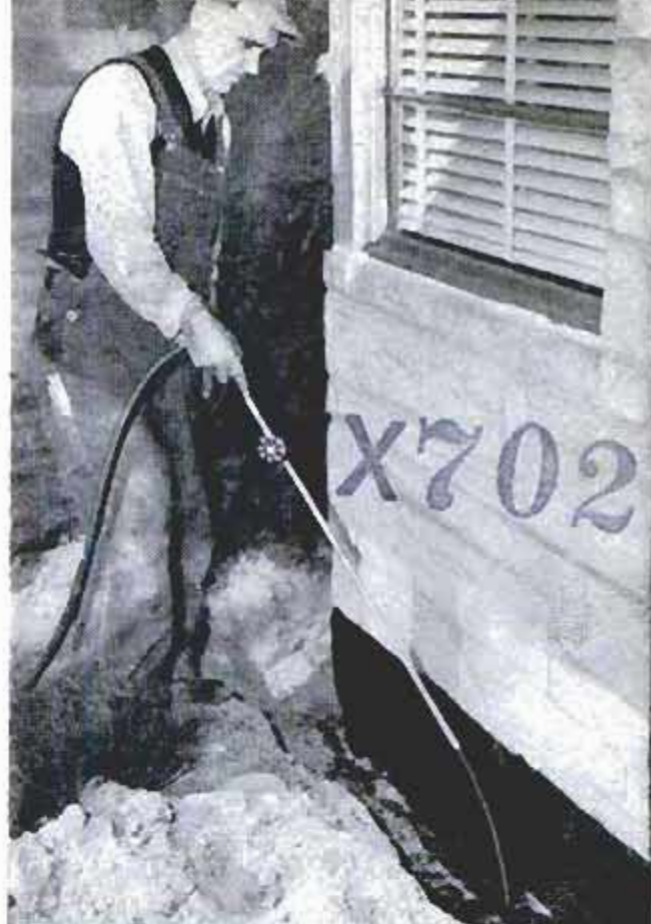
When commercial paint remover is not available, try a mixture of turpentine, 1 part, and household ammonia, 2 parts. While not as effective as modern paint removers, this solution will soften most oil-based paints so they can be scraped off.

Irregular Contours Copied With Stack of Cards

Usually it is difficult to make a profile template of an irregular contour such as a baseboard molding. However, an easy way of obtaining the exact contour is to place two or more decks of playing cards in a stack and tap the ends against the surface to be copied. Identical contour is reproduced on the outer edge of the stack and the contour profile is easily traced on paper.



paper is inserted in the typewriter, and the spacing at the bottom is to be observed, the platen is adjusted to bring the strip to the position shown in the lower detail. Next, rule lines $\frac{1}{2}$ in. apart on a 2-in. length of tape and letter these $1\frac{1}{2}$, 1 and $\frac{1}{2}$ as shown. This is the finishing strip. Now, insert a standard 11-in. sheet of paper after adjusting the platen for starting. When this sheet is rolled through almost to the end, hold it carefully against the platen as it comes free. Then stick the second length of tape on the platen vertically along the edge so its lower end comes in line with the lower edge of the paper. When the lower end of a sheet being typed is concealed by the platen, the finishing strip comes into view and indicates the distance from the lower edge.



After trenching around foundation to depth of 12 to 30 in. earth is saturated with a special insecticide

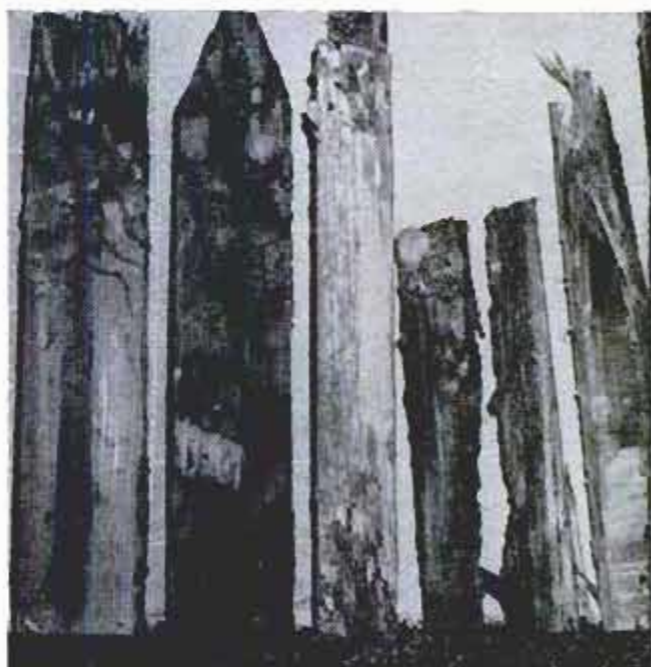
CONTROL TERMITES

By Grover Brinkman

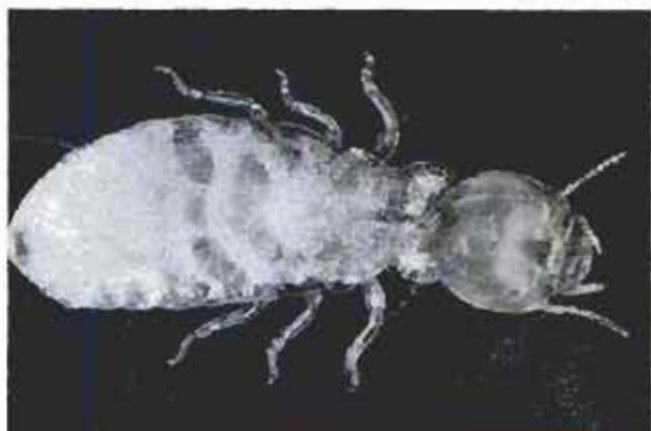
THOSE CURIOUS WINGED ANTS you saw at the corner of the house, and those earthlike tunnels leading from the grade level to the weatherboard on the outside of the foundation usually are the first warning signs of the presence of a colony of subterranean termites. Already your home may be seriously damaged, and then again it may not be. Much depends on how long the colony had been established before you discovered its presence.

Adult Termites

Termites are social insects that live in colonies in damp earth and every established colony is made up of three castes known to entomologists as reproductives, workers and soldiers. The fellow pictured at the right is an adult worker, greatly enlarged, and he is the one who does the real damage to the building frame. Workers are rarely seen in the light. They will only be exposed by breaking into the earthlike shelter tunnels along the foundation walls or by cutting into infested framing members to reveal the honeycomblike tunnels and galleries which are characteristic of extensive termite damage. The winged individuals you see, either inside or outside the building, are reproductives that have emerged for the purpose of establishing a



Above, honeycombed form boards taken from concrete stoop. Below, worker termite greatly enlarged

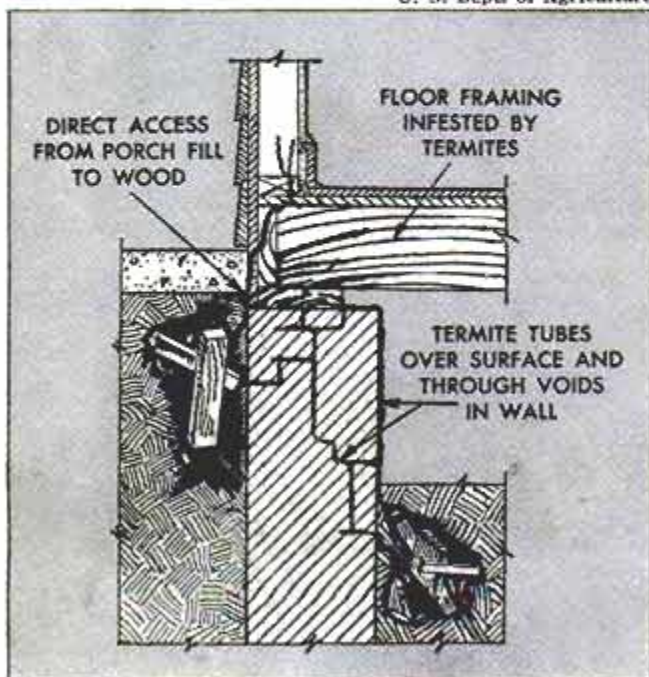




After trench has been filled, fresh earth is thoroughly saturated with a suitable chemical solution



U. S. Dept. of Agriculture



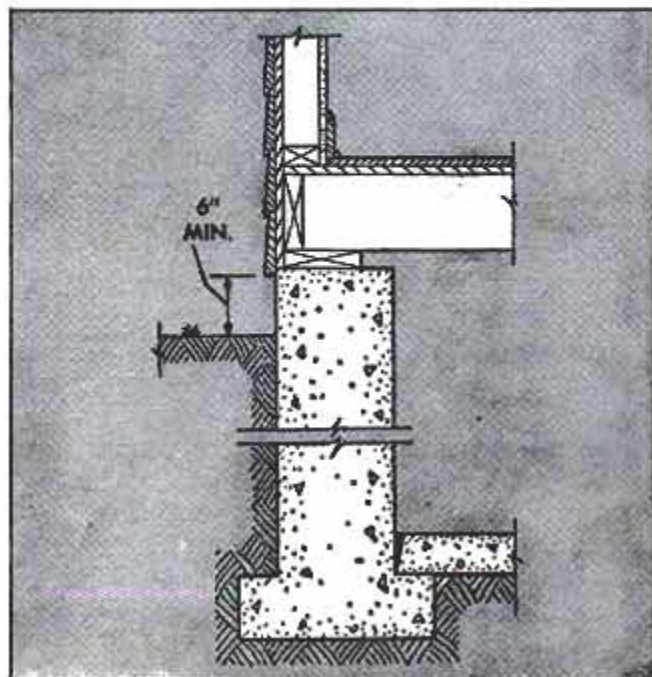
new colony, possibly near the building already infested but more likely at a distance. Examine one of the insects closely and you will see that the body is comparatively short and thick, unlike the wasp-waisted body of the common ant. Also that there are two pairs of gauzelike wings of the same shape and length. Here again the winged termite differs from the winged ant in that the latter has two pairs of wings that vary in size and extend from the body very nearly at right angles when in flight.

Character of Damage

Entomologists are quite generally agreed that extensive damage to a building is unlikely to be caused by a termite colony less than 5 to 7 years old. However, they warn that this time interval cannot always be relied on as especially favorable conditions may enable a colony to build up a large force of workers in a much shorter time. Once termites have bridged the foundation and have established a system of tunnels (note the upper photo on page 202) that protect the workers from exposure to the light, they attack sills, joists and studding, the cellulose content of the wood supplying the colony with food. From then on it is likely that damage will steadily increase in degree and extent.

Conditions That Favor Infestation

The presence of food in the form of damp, partially rotted wood is an open invitation to winged adult termites to establish a new colony. This can be anywhere near the building or inside the structure itself. Remnants of concrete forms, wooden shingles, fireplace logs, lumber cuttings from new buildings, grade stakes, tree stumps and outbuildings having sills or wooden piers in contact with damp earth



POPULAR MECHANICS

are food for termites. Cracks in concrete walls and small voids in concrete-block, brick and stone masonry often permit the insects to enter the building and attack wooden members of the structure. In new construction, wood buried below grade near foundations and particularly the remnants of forms left in enclosures such as those under concrete stoops are likely places for termite colonization.

Preventive Measures

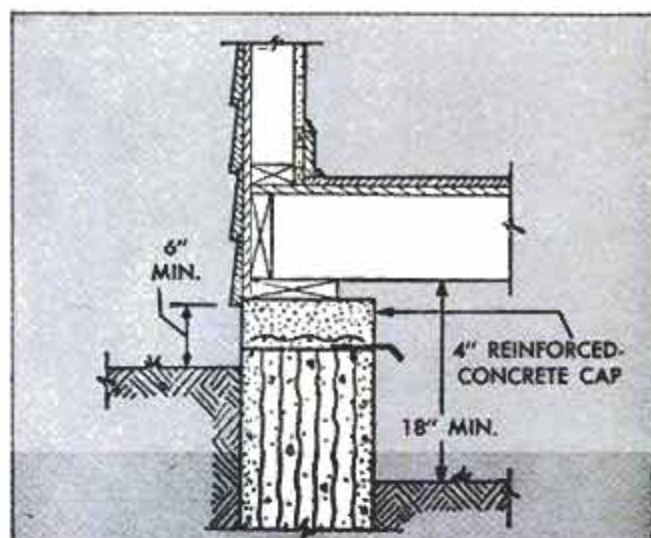
Destroy all sources of food in and near both old and new construction. Provide new buildings with approved termite shields as illustrated in several of the details. If the building has been constructed without vents to areas enclosed by concrete or masonry foundations extending above grade, chisel manholes in the foundations and install protective grilles to provide ventilation and access for regular inspections. Basementless homes should be constructed with sufficient crawl space beneath the floor to permit easy access should a colony be discovered nearby or within the area enclosed. Heated basements favor a much longer period of termite activity, even in the colder climates, and homeowners with older-type homes having damp basements should avoid accumulations of kindling wood, fireplace logs, old books and papers and keep a close watch for winged adult termites and the beginnings of shelter tunnels on the foundation walls.

Destroying a Colony

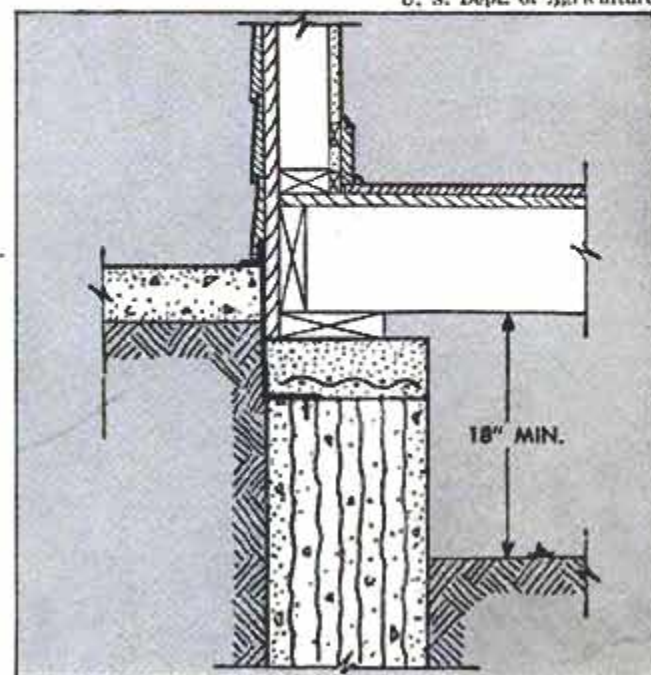
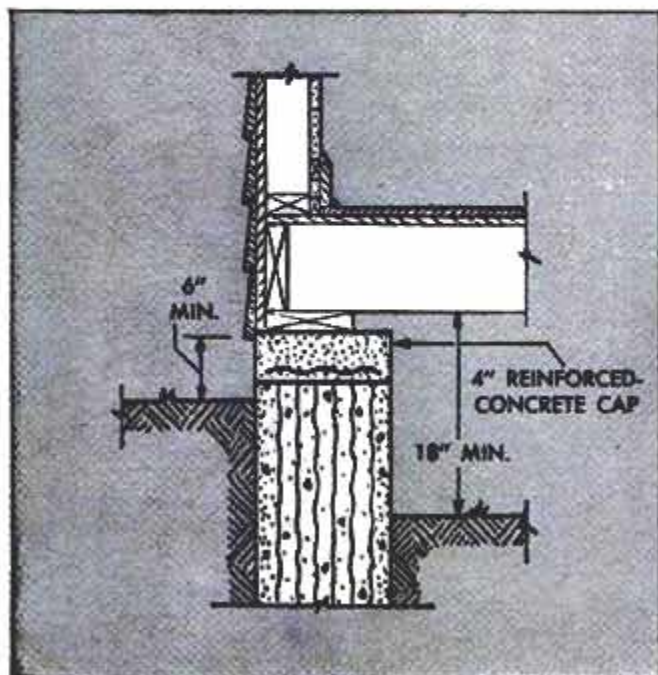
The dotted map on page 200 shows roughly the known limits of termite activity in the United States. Although in some cases it may be rather difficult and costly to apply control measures that completely eradicate well-established colonies, most termite



When applying hot tar to foundation walls be sure that coating is brushed to uniform thickness



U. S. Dept. of Agriculture





Shelter tunnels built by a termite colony on the inside of basement wall in order to reach wood above



Above, cut manholes into any areas completely enclosed by concrete foundation walls. Remove all wooden form members. Below, after treating soil under floor, fit opening with grille to provide access



infestations are quite readily destroyed by chemical treatment of the soil around the foundation and damage to the structural members is comparatively easy and inexpensive to repair. The first steps are to determine the location of the colony and the extent of the damage. Where the infestation appears to be fairly extensive it is the regular practice to trench around the building to expose the foundation walls below grade. Note the series of photos which picture these procedures. Usually the trench is made about 12 x 12 in. but in some cases it is dug as deep as 30 in. Then the foundation wall is thoroughly cleaned and coated with a hot-asphalt solution. In most cases it is advisable to apply a fabric and coat again with the hot asphalt. Then the trench is partially filled with a solution containing pentachlorophenol. Solution is added until the soil is thoroughly saturated. Then the trench is refilled with the earth which was removed and the latter thoroughly soaked with solution. Protect shrubbery root systems with tar-paper barriers.

Inside the structure drill holes in all infested floor joists and force the solution into the wood under pressure. Treat wooden sills in the same manner. If the infestation proves to be widespread rather than localized in a small area, it's a good idea to drill holes through the basement floor and force the solution underneath. Cut manholes into any areas enclosed by foundation walls, such as the concrete foundations of a stoop, and treat thoroughly with solution. Remove all wood in contact with the ground.

Caution: Handle chemicals with special care, either in or out of solution. Wear rubber gloves when handling solutions and avoid inhaling the fumes. Most solutions require use of a fuel-oil carrier. Take precautions against fire. Apply solutions only when soil is dry and warm. ★ ★ ★

Drill holes into infested floor joists, headers and sills and force solution into the wood under pressure



Adjustable Ladder Step

Quickly hooked over or removed from two ladder rungs on which it is fitted, this platform, or step, combines safety with comfort for the man who must spend considerable time on a ladder. The platform is a piece of $\frac{3}{4}$ -in. plywood bolted to flat-iron brackets as indicated. Platform width is determined by ladder width, and length by the distance required to provide a comfortable foot support. The lower platform brackets are bolted to strap hinges so the platform can be folded compactly for storage when not in use.



Bottom Margin on Typing Paper Indicated With Colored Dot



your typing paper to expose the edges slightly as shown, and draw a line down the side with a colored pencil. A dot will be left on each sheet where it can be readily seen when typing the bottom line.

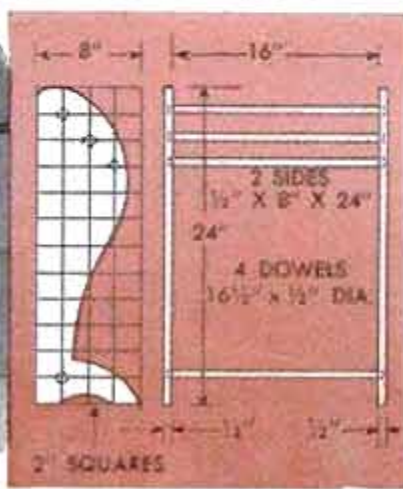
The annoying problem of trying to maintain the same bottom margin throughout a multipage letter or a manuscript can be avoided by placing a mark on the lower, left edge of the paper. Flex a pack of

Nut Meat Blends Furniture Finish To Hide Scratches

The meat of a walnut or pecan is an excellent material for concealing shallow scratches or nicks in the finish of wooden furniture. Simply rub the oily meat over the scratch until it blends with the finish, then wipe the surface lightly with a polishing cloth. Be sure the nut meats are fresh, because stale, dry meats would cause more scratches.



Space-Saving Towel Rack Is Ideal for Small Bathroom



If your bathroom does not have enough towel racks, and wall space is limited, this rack is the answer to your problem. Cut the ends from $\frac{1}{2}$ -in. plywood, using a pattern drawn on 2-in. squares. The towel bars are lengths of $\frac{1}{2}$ -in. wooden dowels. Brush on several coats of varnish to protect the rack against moisture from the towels.—Ted Fenn, Chicago.

Plywood Cut on Stiff Support Prevents Saw Binding



Asbestos-Covered Block Supports Work While Soldering

To protect his workbench top and provide a nonskid surface for work to be soldered, one craftsman uses a wooden block as a support. The top surface of the block is covered with two layers of sheet asbestos, either tacked or cemented in place. If the block has a tendency to slip around on the bench top, cover the underside with asbestos.



Labels Typed in Envelope Window

The next time you encounter difficulty in typing a small card or label, remember that it can be held in an envelope. Cut a window in one side of an envelope large enough to expose all but a small border around the card to be typed and slip the card in the envelope as shown.



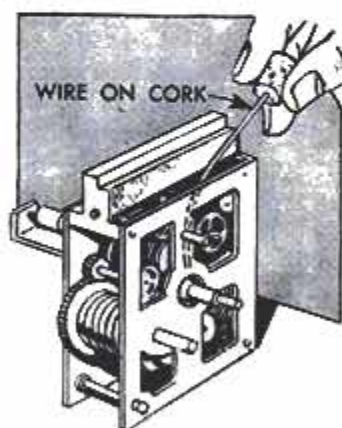
When cutting a large sheet of thin plywood or hardboard with a handsaw, the severed pieces will not bind if the material is placed on a 2 x 4 braced against a wall as shown. The support will prevent the plywood or hardboard from bending and permit a better and easier job.

E. Wooden, West Wareham, Mass.

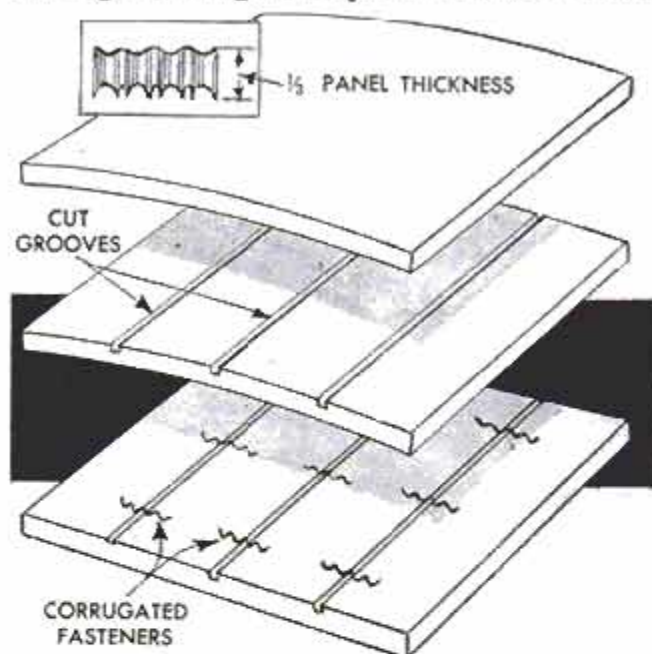
"Oiler" for Clockworks Is Length of Wire

When the spout of an oil can is too short, or the can is too large to enter a restricted location such as the works of a clock, a length of wire can be used as an "oiler." The wire is bent as necessary to contact the point to be oiled.

Oil dropped on the wire will run down to the end and lubricate the spot. To permit easier manipulation of the wire, force one end into a cork.



Straightening Warped Wood Panel



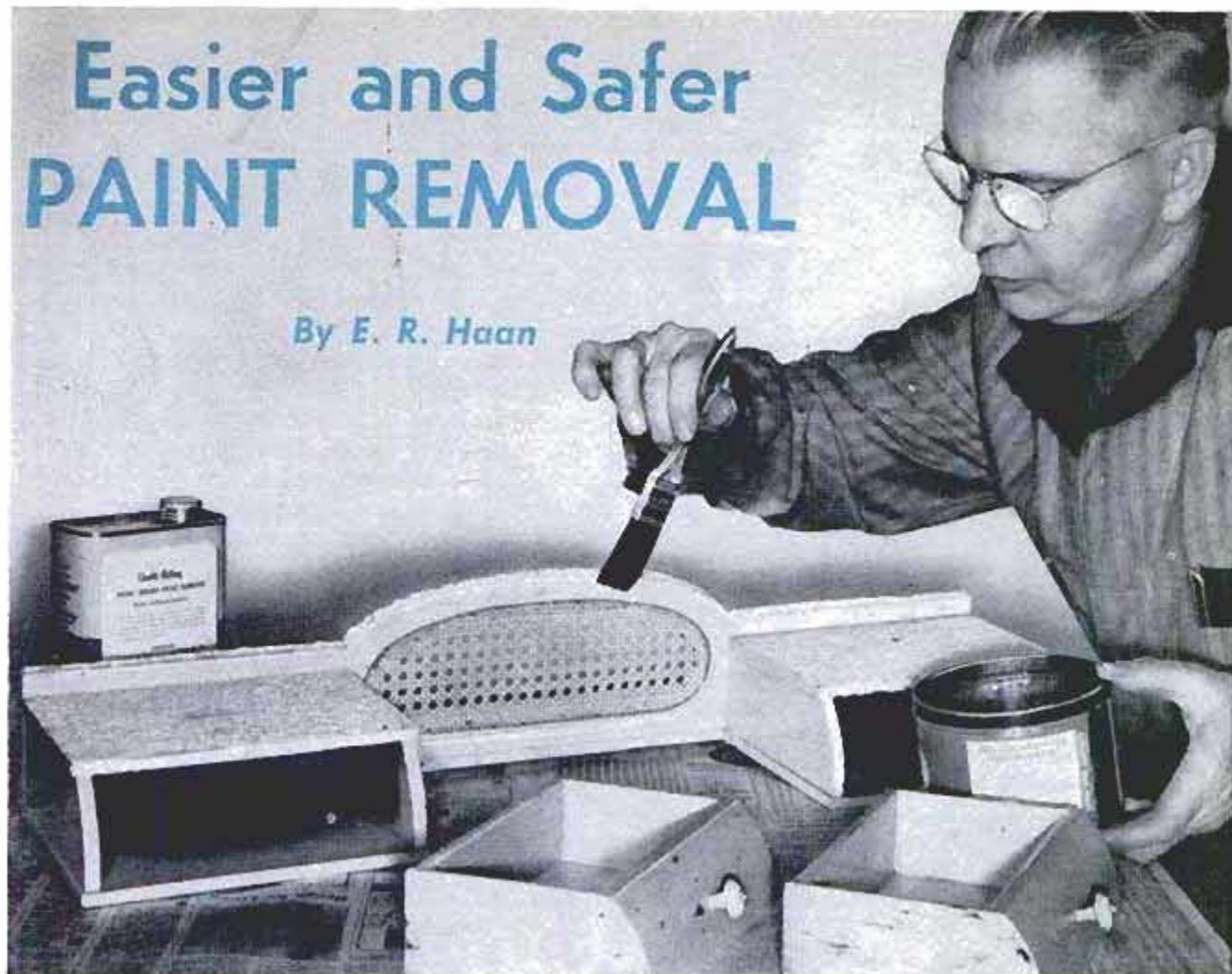
A warped, solid wooden panel can be straightened by using the method shown. First, make several saw cuts about half-way through the panel on the convex side at right angles to the warp. Press the panel on a flat surface and drive corrugated fasteners into the panel across the grooves. Fasteners should be of a size that will drive about one third of the way through the panel.—Kenneth Loo, Lawndale, Calif.

X 462

SN 58

Easier and Safer PAINT REMOVAL

By E. R. Haan



New nonflammable paint removers take off old finishes right down to bare wood—paint, enamel or varnish

HAVE YOU TRIED the new liquid paint removers that are nonflammable, have faster action and a deeper bite and do not require any "after wash" or neutralizing? If not, there's a distinct surprise in store for you!

For years paint removal has been looked upon as a difficult chore—one to be avoided if at all possible because of the slowness, messiness and fire hazard. Now, since paint removal has become so much easier, it is considered a desirable basic step in standard refinishing procedure. There's no need for inferior paint jobs over old, cracked and broken finishes.

The New Liquid Removers

These are available in two forms, the free-flowing kind and the heavy-bodied variety. The first is a nonviscous liquid which you apply to horizontal surfaces, like floors and window sills. The second is a semipaste designed to stick to vertical and overhead surfaces without spattering, dripping or running.

Often referred to as "strippers," the new improved removers don't just dissolve or soften finishes, but loosen them from the base to which they adhere, permitting them to be actually stripped or peeled off with



Courtesy the Klean-Strip Co., Inc.

Here's the way old finish comes off in a "blistered" film easily scraped from surface with putty knife

very little mess. Stickiness and gumminess have been largely eliminated, making the removers so much cleaner and easier to use. Most of them evaporate more slowly



New removers are especially effective on carvings and moldings as finish is lifted, not merely softened



Above, when removing the paint film from a flat surface begin at the center and work out to the edges. Below, by working from the center out you avoid scraping loosened material over wet surface of work



than the old removers. Because of this you need not be in a hurry to loosen the paint before it dries and hardens again.

Some of the new removers are capable of removing several coats of hardened paint, enamel, shellac or varnish with a single heavy application. Others, especially designed for automotive and aircraft work and other industrial use, are capable of removing any type finish, including baked enamel and synthetic finishes, from metal.

Nonflammable removers do not involve fire hazards like most old-time removers and, therefore, contribute to safety when used indoors. Practically all modern nonflammable removers contain a paintable retardant instead of paraffin wax. The elimination of wax does away with the need to wash the surface with turpentine or benzene before applying the new finish. Nor do they raise the wood grain or attack the filler. As a rule, they do not stain or bleach the wood and they are noncorrosive to metals.

How to Use Them

Before attempting to use a paint remover, read the manufacturer's instructions. After making provisions for adequate ventilation, as will be explained, you flow on a heavy, even coat of remover liberally, using a soft-bristle brush. Brushing should be done in one direction only—not back and forth, which breaks up the film that is formed and which should be kept intact so the gases formed will not escape but will share in the softening process.

The time required before an old finish is loosened from a surface varies with the kind of finish, its age, thickness and condition—generally from 10 to 30 min. You let the remover stand until the old finish becomes blistered completely and peels away readily when scraped lightly with a putty knife. Use a putty knife or painter's scraper to remove loosened paint from flat surfaces. Steel wool, excelsior or rags are most convenient on curved surfaces. Small spots of the old finish that still adhere are quickly rubbed off with steel wool dipped in remover. After all traces of the old finish are gone, you wipe the surface with a cloth and allow the work to dry before applying a new finish. No neutralizing is necessary except for removers that contain wax.

Adequate Ventilation

Paint removers contain volatile solvents that produce fumes which should not be inhaled. However, modern removers based on methylene chloride are not nearly as toxic as the benzol used in many older removers. To avoid inhalation, a positive circulation of air is important. The current of air should flow away from the worker and

out an open window or door. An exhaust fan of suitable size will assure enough circulation.

Advisable Removal of Old Finishes

There are numerous conditions that make it highly advisable to remove the old finish instead of applying a new one over it. Mars, scratches, checks, cracks, brush marks, runs and sags, wrinkles and many other surface imperfections in an old finish cannot be effectively concealed simply by covering them up with another coat. In such cases, a good refinishing job is possible only after the old finish has been removed.

Feathering down edges of old paint along bare spots with fine sandpaper in order to make the edges inconspicuous when covered by a new coat takes considerable time and effort. You'll find it just as easy and generally better to remove an old, defective coat up to the nearest stopping edge or corner. This treatment applies particularly to jobs such as refinishing window sills.

Delicately carved or molded surfaces and edges of furniture and woodwork frequently are ruined by a thick accumulation of varnish or enamel. This should be removed completely in order to restore the original sharp lines and contours. On legs of chairs and tables and other vertical surfaces, it is best to use heavy-bodied remover.

On the outside of a house, it is advisable to remove excessively thick coats of paint that are beginning to check and crack, particularly on horizontal surfaces, such as window sills, and then repaint. Remember that any fracture in the paint film exposes wood underneath to moisture, which causes further destruction of the paint film. Instead of using a torch flame for softening paint to remove it, which may void fire-insurance benefits, it is better to use a good liquid paint remover.

Removal of Finish Standard Routine

The complete removal of hardened old finishes is now often considered an essential step in routine procedure for producing good new finishes. The reason for this is that the quality and durability of a new finish over an old one are greatly influenced by the condition of the latter. There is only one way to prevent an old coat from having any effect on a new finish applied over it, and that is to remove the old coat. A new finish over an old coat seldom adheres as tenaciously as it would if applied to the original base, even if the surface is sanded to provide a "tooth" for the new coat. More effective than sanding is the application of a paint softener (either as a separate chemical or contained in some enamel undercoaters), which allows the new coat to bond with the old one. ★ ★ ★

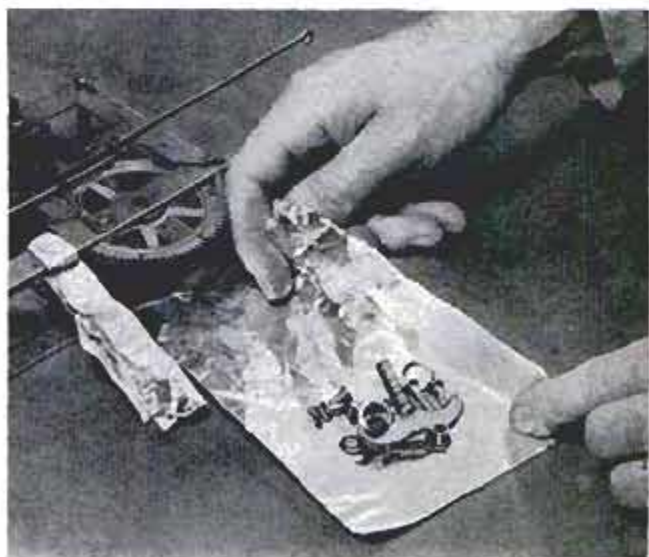
Campsite Kept Free of Insects By Dusting With Chlordane



Ants and other insect pests will not invade a campsite, cottage or trailer if an ordinary garden dust gun loaded with a powder containing 20 to 40-percent chlordane is used to dust the surrounding grounds. Chlordane, available at most garden-supply stores, is effective against spiders, beetles, wasps, roaches and flies. Dust all anthills and other possible sources of insects near a campsite, as well as beneath a tent or trailer. Although the chlordane powder is only mildly toxic for human beings, it is best to wash immediately after using the dusting gun.

Clockworks Subassemblies Stored in Aluminum Foil

When disassembling an instrument such as a camera or clock, loss or mixup of small parts can be avoided if related parts or subassemblies are packaged in aluminum foil. A free end of each piece of foil can be folded to make a narrow strip and wrapped around an open member of the frame as shown for safekeeping.



Spacer for Wooden Shingles Attached to Hammer Handle



With this adjustable metal shingle spacer fastened to the handle of your hammer and the first row of cedar shingles secured in a straight line, every succeeding row will be properly spaced if it is used to position each shingle as it is nailed. To mount the spacer, use a roundhead wood screw and a small washer.

Clinton R. Hull, Santa Ana, Calif.

Mildew Brushed From Books With Dry Cloth

In most instances, mildew may be removed from a book by merely brushing it off with a soft, dry cloth, after which the book is set on end with the pages loosely opened and aired in a sunny place. If some pages are stained badly, sprinkle them with chalk and close the book for several days. Then brush off the chalk. If necessary, repeat the chalk treatment and then follow with drying in the sun.

Helen Kay Harris, Showlow, Ariz.

Talcum Removes Grease Spots

Grease spots that are difficult to remove from heavy woolen clothing with ordinary cleaning fluids usually can be removed with talcum powder. Just turn the garment inside out and sprinkle the powder on the spot, allow a few minutes for it to absorb the grease and then shake it out. Repeat the application until the powder takes up no more grease, and then complete removal of the spot with cleaning fluid. Use a clothes brush or your vacuum cleaner fitted with the furniture-cleaning attachment to remove any traces of powder smudges left on the garment.

Eleanor E. Lynch, Syracuse, N. Y.

Record Shade Size on Roller

To facilitate re-ordering or repairing a window shade, record all the dimensions and other necessary information on a slip of paper and tape it on the wooden roller.

The data you will need to know should include the length, width, color and brand name of the shade, and the dealer's name and address.

Mrs. M. Fey, New York City.

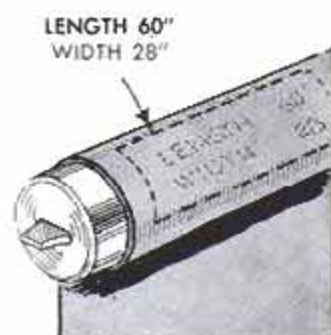
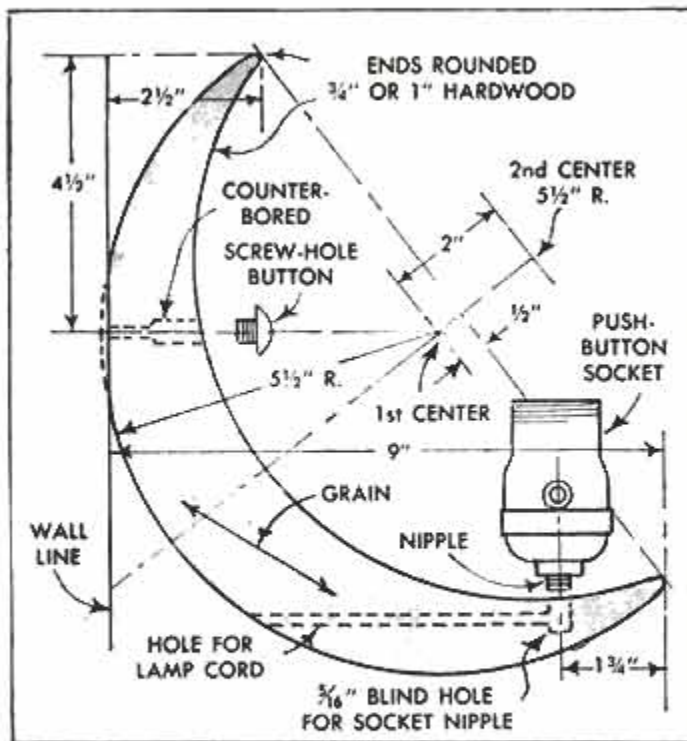


Table Salt Sprinkled in Skillet Extinguishes Grease Fire

Table salt in an open container can be used effectively to extinguish a grease blaze when an open skillet catches fire on a gas range. Kept within easy reach, the salt is sprinkled on the flames, with little damage to the food being fried and quelling the fire before it spreads, which might happen when water is used. Use of commercial fire extinguishers or sand destroys the food.

Do not discard the expendable inner disk of a two-piece fruit-jar lid. Instead, mark it with an "X" and keep it on the jar during storage to protect the edge against possible chipping and to keep the jar clean inside.

Wall Lamp Features Crescent-Moon Bracket



One evening in the workshop should do this wall lamp complete. The moon is cut from hardwood having an attractive grain for finishing in the natural color, or from a close-grained wood such as poplar for finishing in bright-gold paint. Note from the detail that the crescent must be laid out from two centers. It's a good idea to make the layout on a sheet of paper and then transfer the pattern to the stock. Be sure to use the same radius for both arcs.

After jigsawing to the pattern lines take time to sand the cut edges thoroughly to remove the last trace of saw marks. Then drill blind holes and counterbore as in the detail. Before installing the lamp cord, finish the crescent either with gold paint or varnish as desired. Attach to the wall with a screw driven through the counterbore and into the lath. Conceal the hole with a screw-hole button finished to match.

Enno R. Haan, Evanston, Ill.

Wet Paintbrushes Stored in Airtight Plastic Wrap

If you cannot finish a paint job in one day, time and trouble cleaning brushes can be avoided by storing them overnight in an airtight package. To do this, wrap the brush in aluminum foil, plastic kitchen wrap or cellophane and secure the ends around the handle with tape or string. This method of storage can also be used when you don't have time to clean the brushes after completing a job and must let them go until the next day.



Controlling Growth of Evergreens

The growth of evergreens can be regulated so as to cut down on pruning, by controlling the nitrogen content in the soil. Soil that is too high in nitrogen and low in other elements, such as potash and phosphorus, might alter the beautiful dwarf form of some ornamental evergreens, or it may produce "leggy" evergreens or "long neck" shoots. When this occurs, apply a balanced fertilizer once a year.

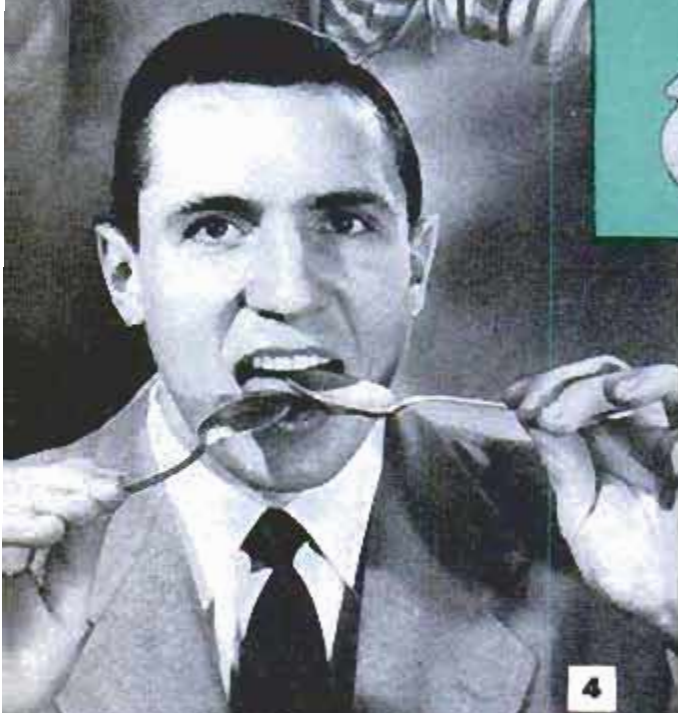


1

2

3

Sense and Nonsense



4

1. Trust your senses? When a ripe pear is held close to your nose the slice of apple you eat will taste like pear

2. Sense of touch indicates to blindfolded person that he is touching two balls when index fingers are held as shown

3. Accurate depth perception requires two eyes. Close one and attempt to touch points of pencils held in each hand

4. Stainless-steel spoon held on bottom of tongue and silver on top causes tiny electric charge due to galvanic action

5. Back has few tactile nerves, therefore girl will feel only one point, although both scissor points touch her



5



6



7



8

6. How does clean stick taste? Taste buds in tip of tongue will indicate sweetness, those in base of tongue, bitterness

7. Trust your ears? Timepieces have visual association, so blindfolded person seldom knows direction of ticking clock

8. Is it hot or cold? When ice cube fresh from freezer is touched to back of neck, most people feel they are burned

9. When your eyes are closed, your ears have difficulty telling whether brush or fingernails are used on your coat

10. Hands have many nerves close to the skin surface. When scissor points touch the skin, they feel like a knife blade

11. While you are blindfolded, have someone pass an onion, tobacco and coffee grounds under your nose. Identify items



9

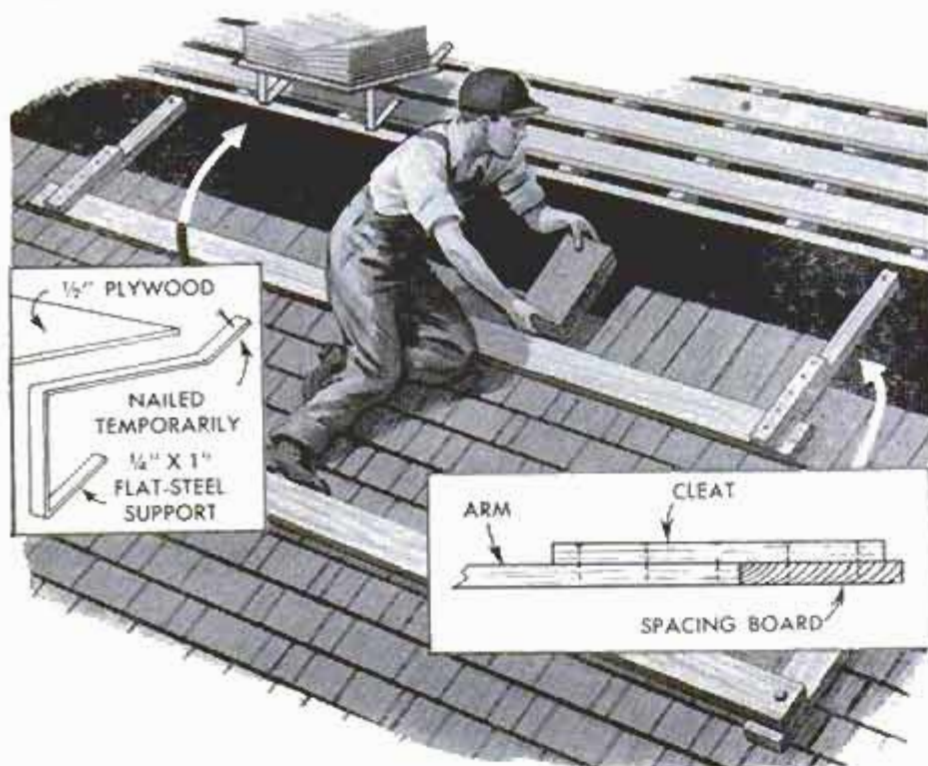


10



11

Spacer Board Permits Easy Shingle Installation



Wood shingles can be installed with speed and ease by use of a spacing board as shown. The board assures both getting equal weather exposure on all shingles and keeping each course in a straight line. The width of the spacing board must equal the required amount of weather exposure of the shingles. A wooden arm at each end of the board should extend about 2 ft. In use, the spacer board is placed on the last course of shingles laid, so its lower edge aligns with the butt ends. The arms are tacked to the roof and shingles placed on the spacer board.

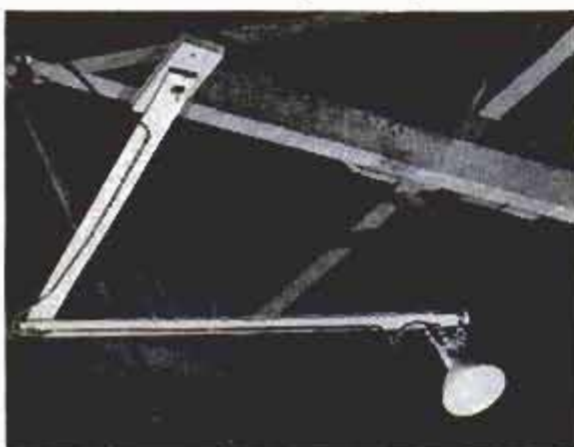
Protective Shade for Plants Made From Venetian Blind

Slats salvaged from discarded Venetian blinds are ideal for quick assembly of a "lath house" which is used to protect plants from the direct rays of the sun. A simple wooden frame made from 1-in. stock is all that is required. The house can be made large enough to cover a number of plants or shrubs in a bed, or made smaller and fitted with shelves to hold potted plants. If the frame is not wide enough to accommodate the full length of the blind slats, they should be cut off flush, since the thin slats, if wood, will break easily. Metal slats, when cut, present a thin, sharp edge that may cut hands or tear clothing. Give the finished frame two coats of house paint.

Grace Gannon, Glendale, Calif.



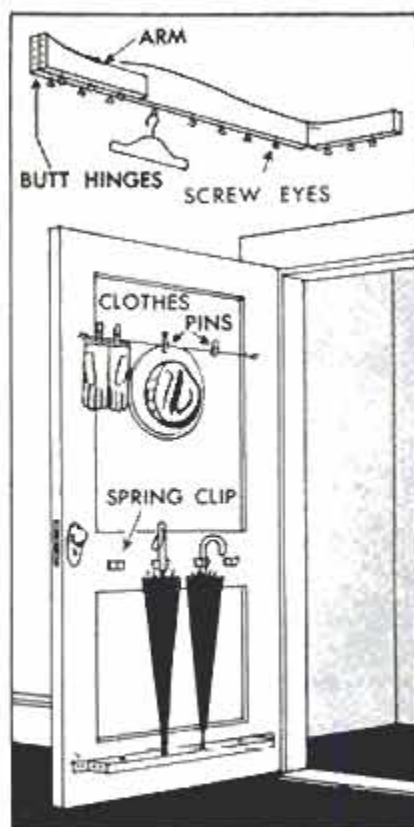
Photo Floodlamp Suspended From Boom on Studio Ceiling



Easily reached, yet out of the way when not needed, this photoflood boom lamp is ideal for a low-ceiling studio. Two 36-in. lengths of 1 x 2 are pivoted together to form the boom, one end of which is pivoted to a block nailed to the ceiling. The socket is held on the boom by a clamp bolted to a corner angle screwed to the boom end.

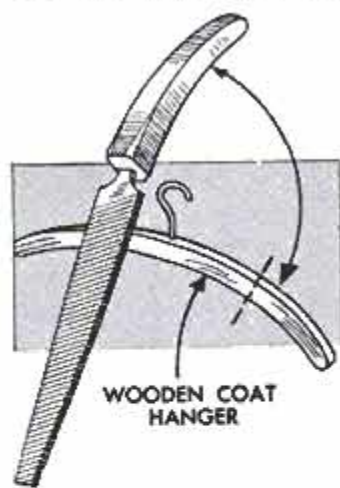
Closet Storage Space Can Be Increased By Installing Racks

There is almost always a need for more closet space in the home. One method of gaining added clothes storage in existing closets is to install racks that utilize space not generally used. Quite a number of coat hangers can be hung from a simple rack made of 1-in. lumber and fitted with screw eyes as shown in the upper detail. Hats, gloves and other light articles can be held by spring-type clothespins hung on a cord or wire strung between two hooks on the inside of the door as indicated. Several umbrellas can be stored neatly in a hall closet by attaching a number of broom clamps at a suitable height on the inside of the door to hold the handles. A narrow shelf, in which blind holes have been drilled, then is screwed to the door near the bottom edge to hold umbrellas. The trouser rack shown



in the illustration holds several pairs, yet folds compactly against the inside of the door when not in use.

"Pistol Grip" File Handles Cut From Coat Hangers

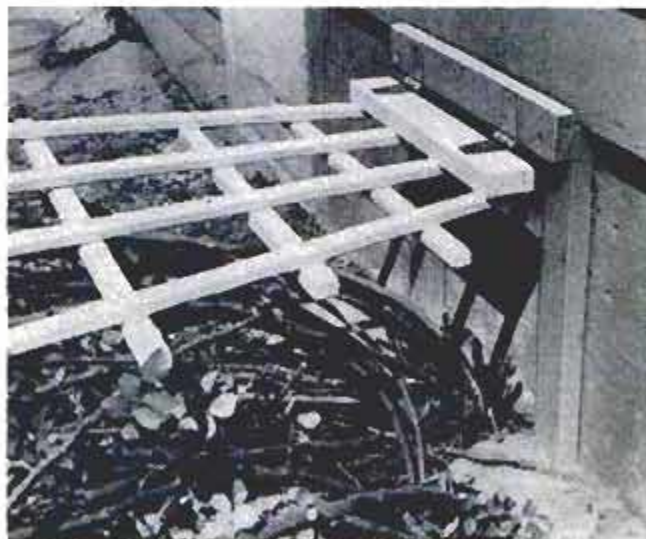


providing a handle with a positive "pistol type" grip. Several handles can be cut from each hanger.—Robert L. Sargisson, Berwyn, Ill.

Hardwood file handles can be made by cutting sections from a wooden coat hanger of the type shown. Drill a hole in one end of each section to receive a file tang and file the opposite end and edges smooth. The curve of the coat-hanger section fits naturally in the hand, providing a handle with a positive "pistol type" grip.

Trellis Hinged to Swing Down When Painting House Wall

Painting the house wall behind a rose-bush trellis is no problem for one homeowner who hinged the lower end of the trellis so it can be swung down out of the way. The hinges are screwed to a 1 x 2 nailed to the lower end of the trellis, and to a second 1 x 2 mounted on the side of the house or, as in this case, to 1 x 2s set vertically in concrete. Hooks and screw eyes are used to hold the top of the trellis against the wall.



A Grandfather's Clock . . .

may be something you have always wanted. If so, you'll be told how to build one in a series of articles beginning in the April issue. The series also will give details for building a grandmother's clockcase and modern and traditional wall cases in which you install kit movements



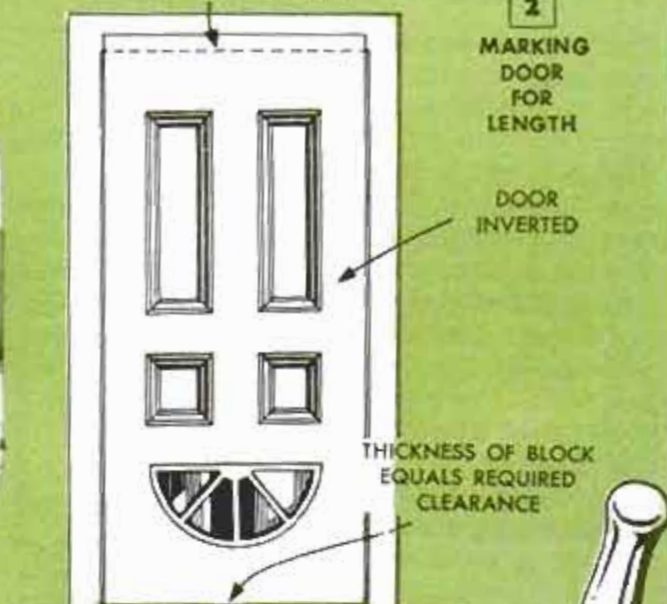
PORTION TO BE CUT OFF

2

MARKING
DOOR
FOR
LENGTH

DOOR
INVERTED

THICKNESS OF BLOCK
EQUALS REQUIRED
CLEARANCE



LOCK EDGE OF DOOR BEVELED

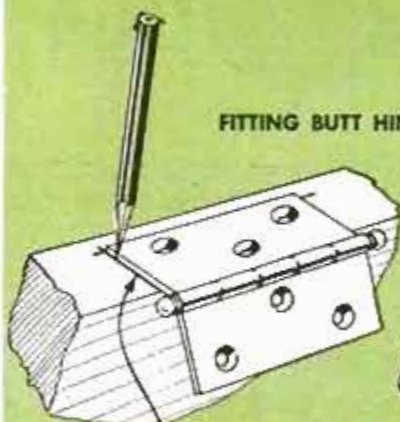
DOOR

3

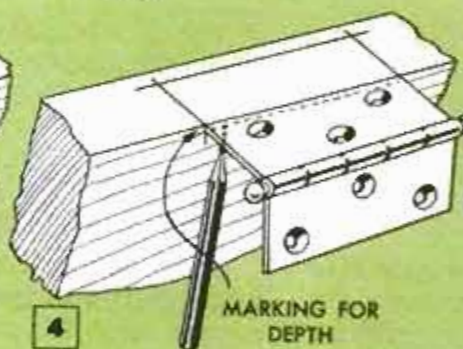
5°
BEVEL

FITTING BUTT HINGE TO DOOR

SCORING
WASTE

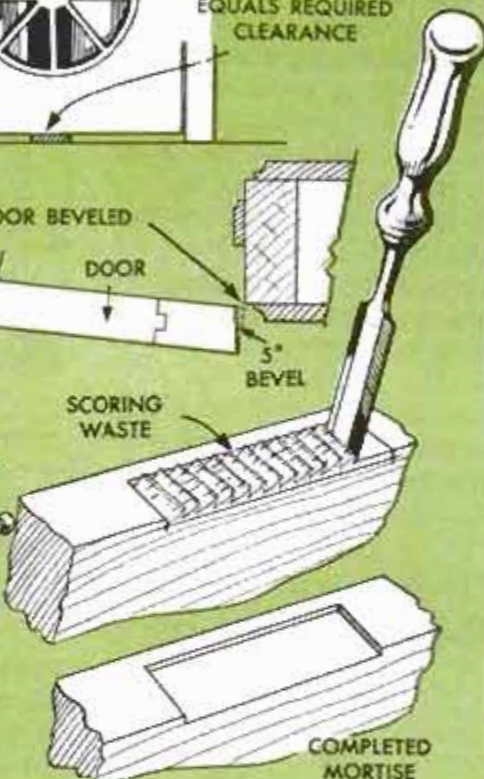


MARKING FOR
LOCATION



MARKING FOR
DEPTH

4



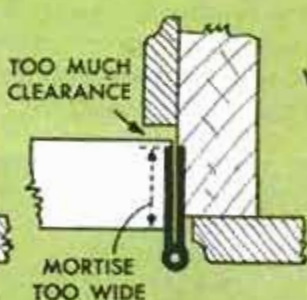
COMPLETED
MORTISE

5

WHAT TO AVOID WHEN HANGING DOOR



MORTISE
TOO NARROW



MORTISE
TOO WIDE



MORTISES
TOO SHALLOW



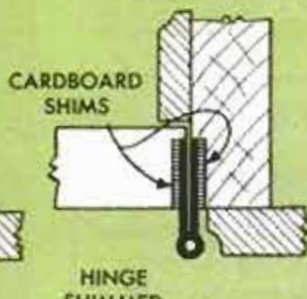
HINGE
BENT



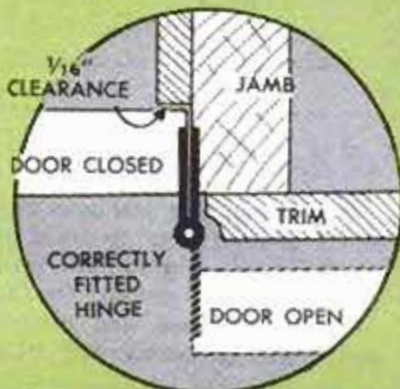
MORTISES
BEVELED



MORTISES
BEVELED



HINGE
SHIMMED



1/16"
CLEARANCE

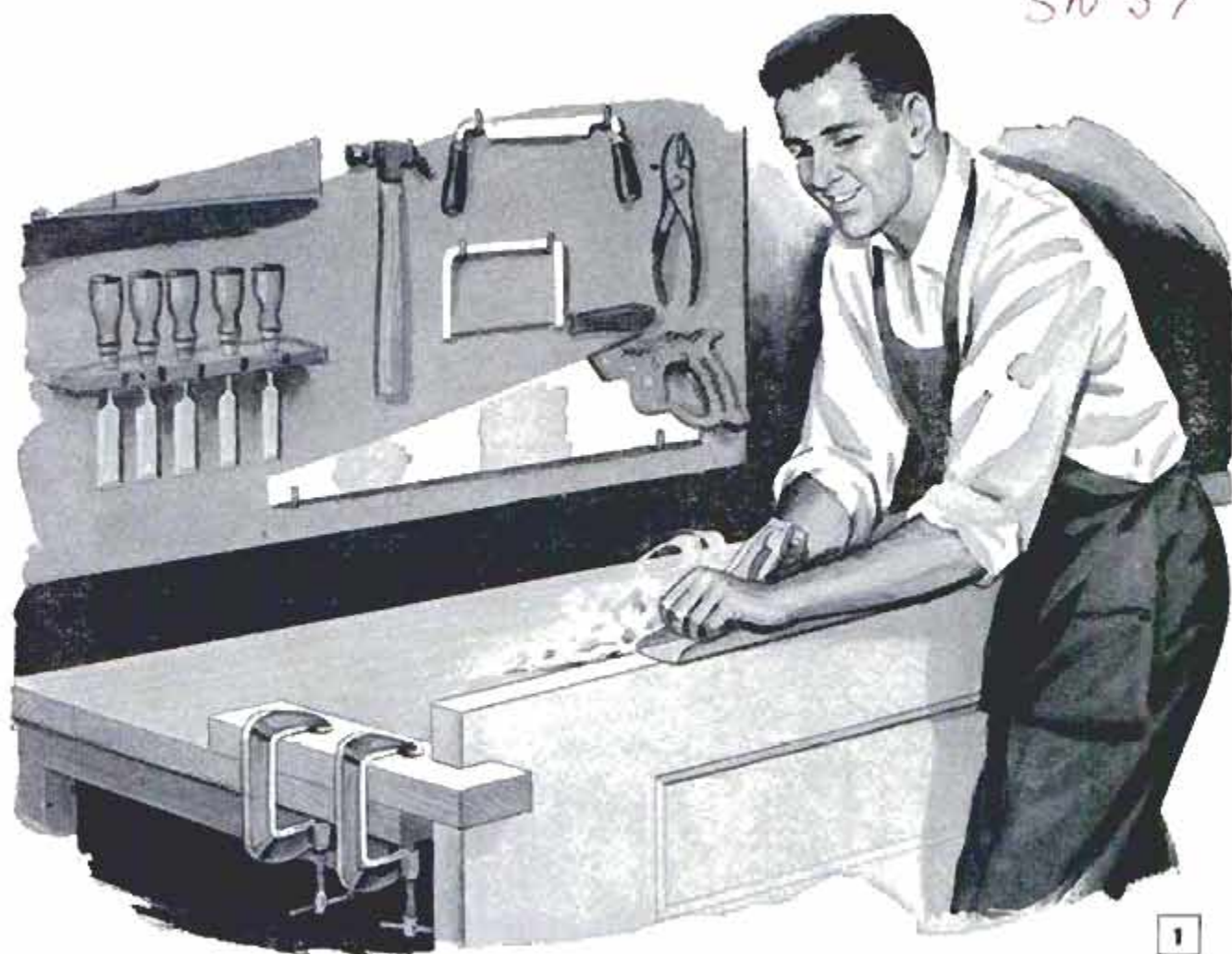
JAMB

DOOR CLOSED

TRIM

CORRECTLY
FITTED
HINGE

DOOR OPEN



An experienced carpenter can hang a door in an hour — complete with lock. A knowledge of the methods he uses will help you —

TO HANG A DOOR

By William B. Eagan

ALTHOUGH YOU MAY not be able to hang a door as quickly as an experienced carpenter, you can come up with a workmanlike job by using the basic techniques and short cuts employed by carpenters. The main objectives in hanging a door are, first, to fit it within the opening so it has proper clearance all around and, second, to attach the hardware so it functions freely and presents a neat appearance.

If a doorframe, or casing, is square at the corners, the quickest method of determining the correct length of a door is to invert it and hold it against the casing as in Fig. 2. Fit a $\frac{1}{4}$ -in. block under it to provide the required $\frac{1}{8}$ -in. clearance at top and bottom. However, if the casing is not square, measure the height of the hinge side of the casing and cut the door to a length $\frac{1}{4}$ in. less than the height. When marking the door for height, hold the square on the hinge edge. This edge must be kept straight to assure that when the hinges are attached

they are parallel to each other and will work freely.

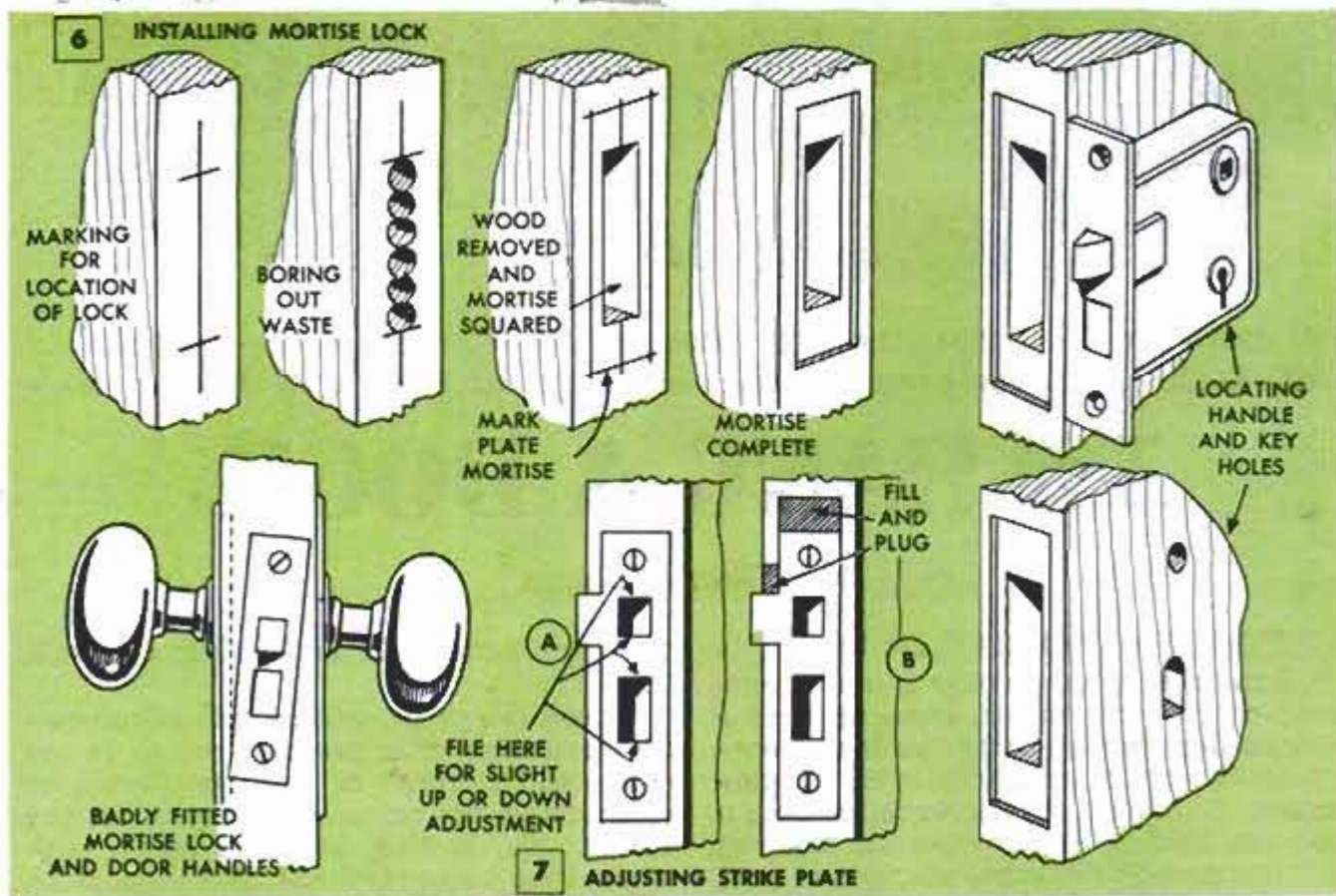
Unless the jambs (sides of the door casing) are absolutely parallel, which is not common, the width of the door should be determined by actually fitting it in the casing. To do this, hold the hinge edge against the hinge jamb and fit a $\frac{1}{8}$ -in. shim under the bottom edge of the door. Now, mark it for width by running a pencil line along the lock side, holding a $\frac{1}{8}$ -in. block between the pencil and jamb to provide the necessary clearance. This method of determining width is more accurate than measuring the casing at top and bottom and transferring these measurements to the door, since running the pencil parallel to the jamb will automatically compensate for any irregularities. If the amount of material to be removed is only about $\frac{1}{8}$ in., the door can be marked for fitting after it has been hung on the hinges. Swing it against the jamb and mark it in the same manner



as described on page 215. If the amount of material to be removed is appreciable on a door that has a stile, window or decoration that would be placed off-center by trimming only one edge, it will be necessary to trim both edges an amount equal to one half the width of the material to be removed. The lock edge of the trimmed door should be planed to about a 5-deg. angle as indicated in Fig. 3 so it will clear the jamb when the door is swung shut.

Holding a door in position for planing the edges is best done by using one or two wooden stops clamped to a workbench or similar surface as shown in Fig. 1.

After the door has been fitted in the casing, the next step is to install the hardware. Measure 7 in. down from the top of the door and 7 1/8 in. down from the underside of the casing top and mark the locations of the top edge of the upper hinge. Repeat this operation at the bottom, using 11 in.



on the door and 11 1/8 in. from the floor or threshold on the hinge jamb to determine the location of the bottom edge of the lower hinge. If three hinges are used, locate the third hinge halfway between the other two. Fig. 4 shows the progressive steps in marking and cutting the hinge mortises on both the door and jamb. Be sure that all mortises are the same width and length and are parallel to the surfaces in which they are cut to avoid the conditions shown in Fig. 5. If an incorrect fitting requires recutting a mortise, the hinge can be fitted by shimming under it with cardboard and filling

the unused portion of the mortise with wood putty. The lower right-hand detail in Fig. 5 shows a correctly fitted hinge.

If the mortises are cut properly, but the hinges still bind, it is due to the jamb being bowed or distorted. In such cases, it will be necessary to shim under one edge of the leaf hinge on the jamb to align it parallel with the leaf hinge on the door edge.

Installing a lock, the most difficult operation in hanging a door, can be done almost as simply as mortising a hinge. Careful measuring and patience, as with any woodworking project, are all that are required in addition to sharp tools. Although there are many kinds of door locks on the market, they fall into two general types, the mortise and the tubular.

A mortise-type lock requires the most fitting as detailed in Fig. 6. First, mark the door 3 ft. from the floor to indicate the position of the center of the knob. Next, mark the center of the door edge and over this line indicate the length and width of the lock body. Use a drill bit having a diameter equal to the width of the lock and drill a series of holes along the center line to a depth equal to that of the lock. Then chisel out the wood to provide a squared recess. Fit the lock into the recess and mark the mortise for the lock plate. Cut it as indicated in Fig. 6. Finally, mark the locations of the holes for the handle or doorknob shaft and key as indicated in Fig. 6. Then drill through the door, making sure that the hole for the knob shaft is at right angles to the surfaces of the door. The condition illustrated in the left-hand detail in Fig. 7 is a result of not doing this. After the lock has been screwed in place, the strike plate can be held against the doorjamb and the door closed on it to accurately locate its position. Move the plate so the latch is held firmly against the front edge of the latch opening and there is clearance above and below it. Also, turn the key so the lock

bolt fits freely in the lock opening of the strike plate. Now, mark around the front corners of the strike plate. When the door is opened, these marks can be used to locate the plate in its correct position. Mark around it for the mortise and cut it just deep enough to permit the strike plate to fit flush with the surface. At this point also drill and chisel out the recesses to accommodate the latch and lock bolt.

A tubular lock is installed in a somewhat similar manner, except that two holes are drilled at right angles for the lock, one being in the edge of the door to take the tubular latch, and the other through the face of the door for the knob shaft. Then the strike plate is located and installed in the same manner as the plate for the mortise-type lock.

After a door has been hung for some time, it may be necessary to readjust or reposition the strike plate. Misalignment of the plate may result when the house foundation settles or the frame of the house becomes slightly distorted for other reasons and affects the alignment of the door casing. If the adjustment is slight, the strike-plate openings can be filed at top or bottom as indicated in the center detail in Fig. 7. If the misalignment is considerable, it will be necessary to lengthen the mortise for the plate. The unused portion of the mortise then should be filled with a wood putty. After the putty has hardened, sand it smooth and apply one or two coats of paint to match the door casing.

With some types of loose-pin butt hinges, it is necessary to know whether they are to be used on a left-hand or right-hand door. To determine the "hand" of a door, stand on the side from which it is pushed away from you to open. If the door is hinged on the right side it is a right-hand door and requires right-hand hinges. If left-hand, the hinges are on the left side.

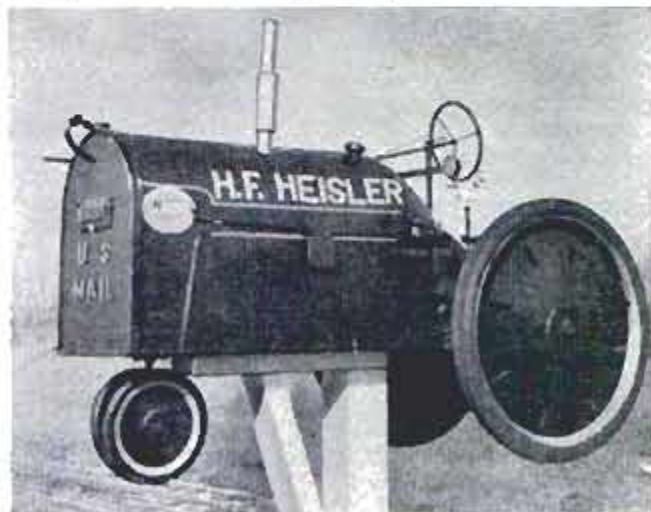
★ ★ ★

Make Unique "Tractor" Mailbox by Attaching Toy Parts

The addition of wheels, steering wheel and a little sheet metal to this rural mailbox gave it the appearance of a farm tractor. A sheet-metal extension supports the rear wheels, steering wheel and controls. Front and rear wheels were salvaged from children's toys. A clever paint job adds to the "tractor" appearance of the box.

A. M. Wettach, Mt. Pleasant, Iowa.

☐ A bench knife can be made from the broken blade of a jackknife by flattening one end of a piece of brass tube of suitable diameter and soldering the blade into the flattened end. Wrap the handle with friction tape for a good grip.





Aluminum Foil Protects Car Hood From Bugs and Gravel

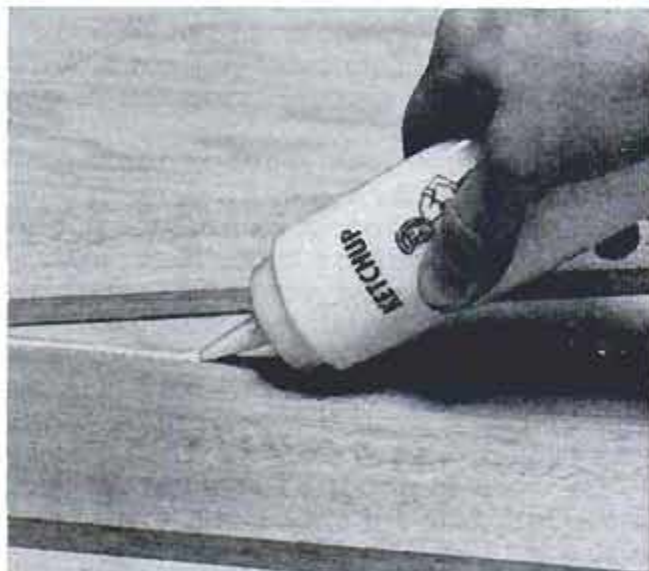
The disagreeable job of cleaning bugs off the front of a car can be eliminated by taping heavy aluminum foil on the front of the hood and the small areas around the headlights. When the foil becomes badly soiled or torn, it can be replaced easily and quickly. All edges should be taped securely to prevent the wind from tearing the foil when the car is in motion.

G. H. Elliott, Lincoln, Neb.

Plastic Ketchup Bottle Used As Workshop Glue Dispenser

A plastic "squeeze" bottle of the type used for ketchup provides an ideal glue dispenser for the workshop. No applicator or brush is required, since the small opening in the nozzle permits applying glue in a thin line or inserting it in dowel holes. A nonferrous nail is used as a stopper in the dispenser.

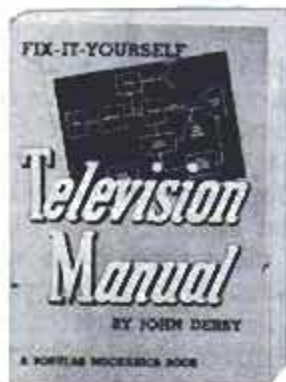
❏ Mulch should not be removed from around rosebushes during March, as the alternate freezing and thawing which occur in this month often kills the plants.



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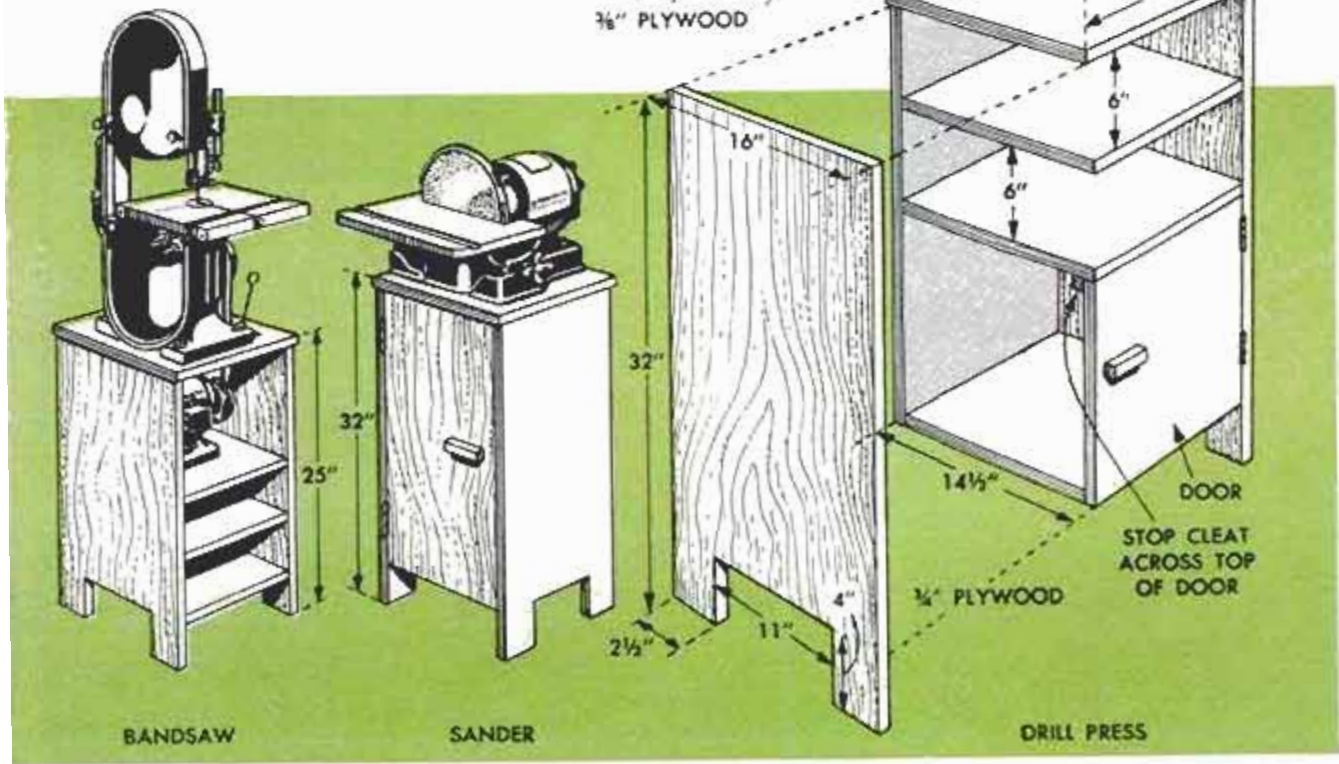
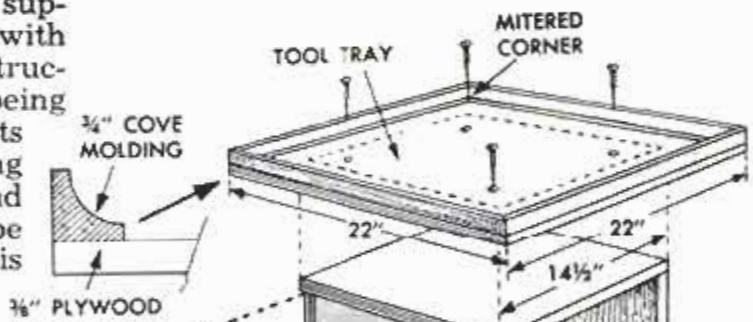
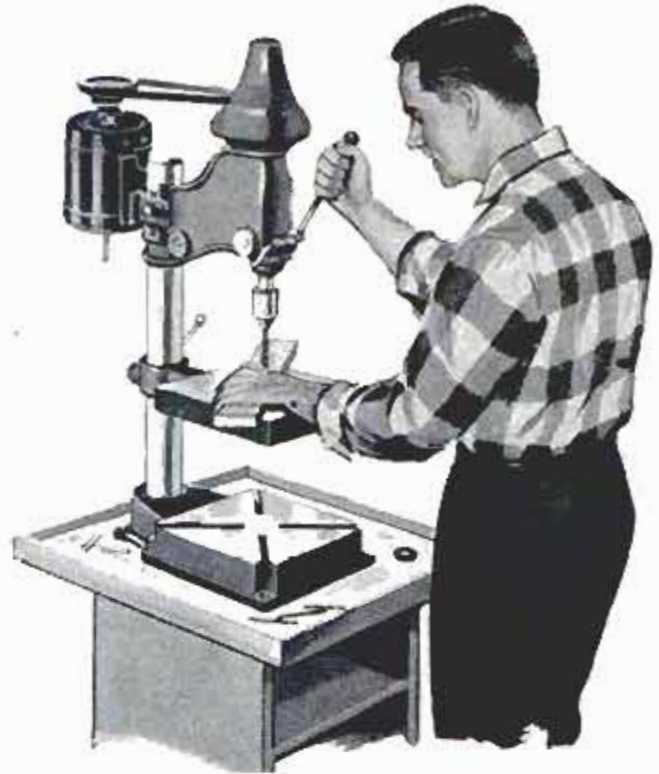
SHOP NOTES

Mount your power tools on these space-saving

CABINET STANDS

INDIVIDUAL POWER-TOOL STANDS that incorporate storage space make good use of space generally wasted in regular open-type stands. This feature is of particular importance in a workshop that is cramped for space. There's the convenience angle, too, of being able to store related accessories close to the tool itself.

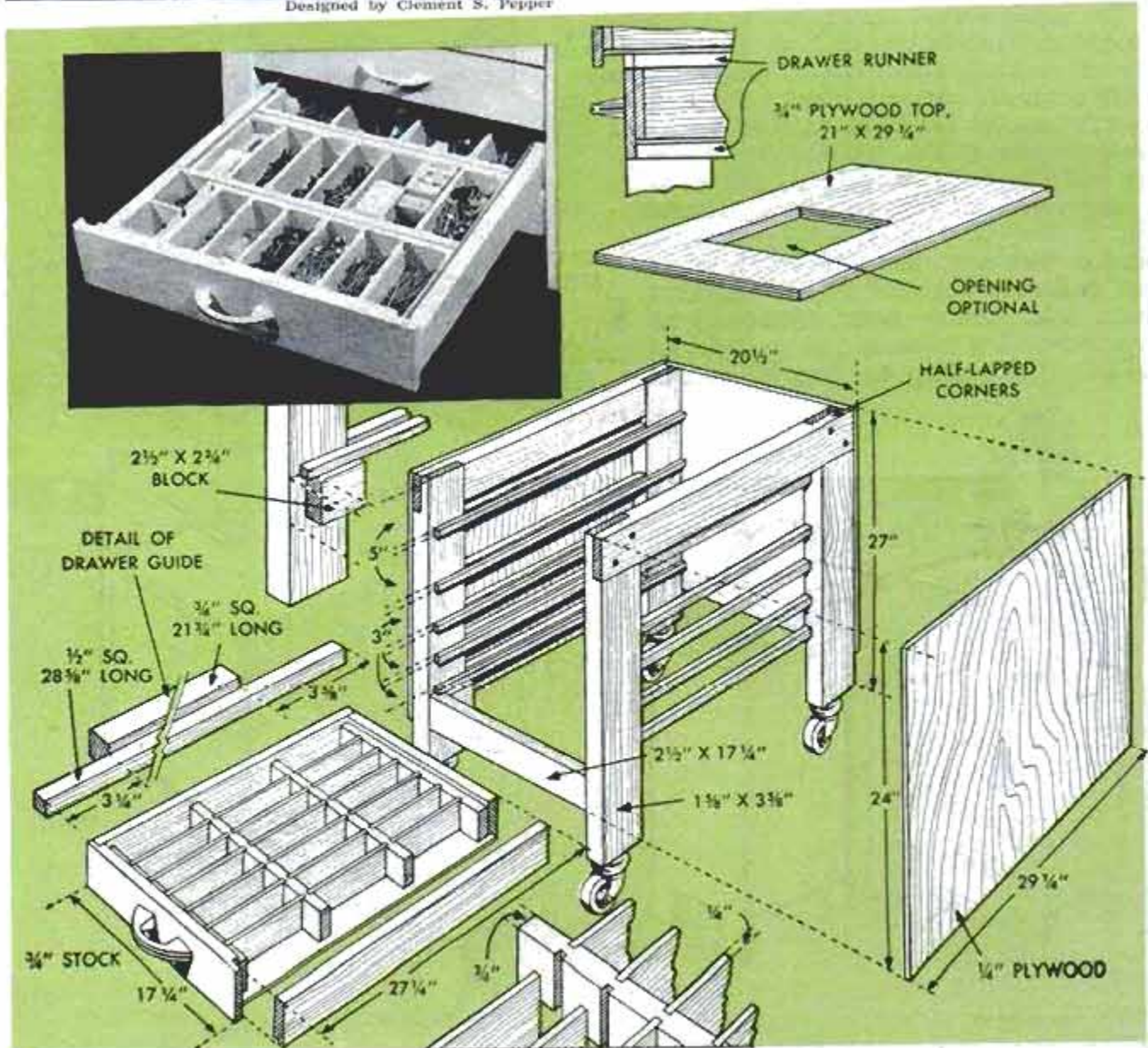
The basic design shown below is adaptable to any power tool and can be made in several ways interior-wise. It can be made with open shelves, or fitted with a full-length door or provided with an enclosed lower compartment. If the stand is to support a drill press, the top can be fitted with a large, overhanging tool tray. Construction is simple, with 3/4-in. plywood being used throughout. Use glue on all joints and nail securely with 2 1/2-in. finishing nails. The cabinet stand pictured and detailed on the following page might be called a "workshop on wheels" and is



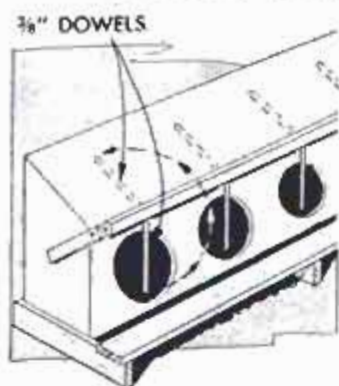


Designed by Clement S. Pepper

especially suitable for holding a circular saw. Occupying about the same space as an automatic washer, this cabinet mounted on casters will appeal to the home craftsman who has only the corner of a utility room or small garage at his disposal. Five drawers in the cabinet provide storage for hand tools, nails, screws and other workshop materials. A circular saw or other power tool can be mounted on the cabinet or the top can be used simply as a work surface. As indicated in the details, the cabinet frame consists of half-lapped 2 x 4s. The cabinet back and sides are $\frac{1}{4}$ -in. plywood and the top is $\frac{3}{4}$ -in. plywood. The L-shaped drawer guides are made by nailing $\frac{1}{2}$ x $\frac{1}{2}$ -in. strips of wood to $\frac{3}{4}$ x $\frac{3}{4}$ -in. strips. All drawers are identical in size except for their height, the two top drawers being 5 in. and the lower three drawers being 3 in. high. Fitting the drawers with compartments extends their usefulness. Vibration can be minimized by mounting the power tool on rubber pads. Rubber heels, as well as short pieces of thick rubber belting, can be used for the pads. ★★



Stop Chickens Roosting in Nests With Pivoted Fence



To prevent the chickens from roosting in the nests of his poultry house, one farmer devised a pivoted fence which can be dropped down to close the nest openings at night, or folded up over the top to leave them accessible in

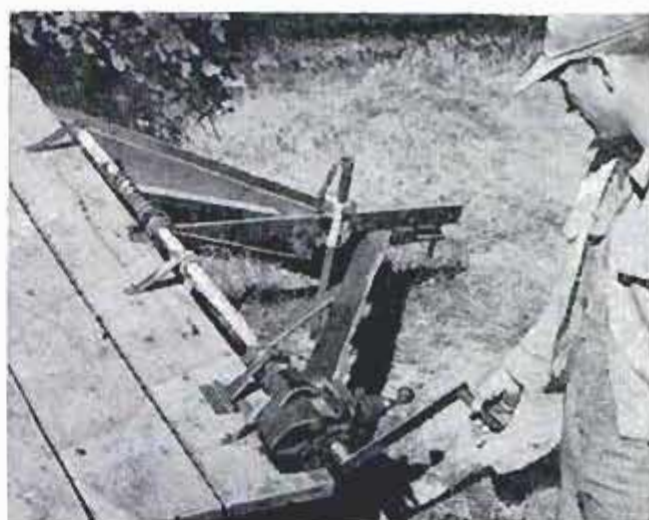
the daytime. The fence is made of a wooden strip drilled to receive lengths of dowels which are spaced to fit over the centers of the nest openings when the fence is down. Two wooden brackets hold the strip in position and permit it to pivot on screws turned into each end.

Linseed Oil Secures Hammer Head

To keep the head of a hammer from loosening on the handle, stand the head end in a can of linseed oil overnight. Then wipe off the excess oil and repeat the process whenever the head loosens. If the head is excessively loose, secure it with the usual wedges before giving the linseed-oil treatment to the wood.

"Bolt Blocks" Strengthen Trough

Hardwood blocks at each end of this hog trough make it possible to bolt the end-pieces in place. Short lengths of 2 x 4 are bolted to both the trough boards and to the end boards. Carriage bolts are best for trough boards, the heads being placed on the inside of the trough to prevent injury to hogs when feeding.

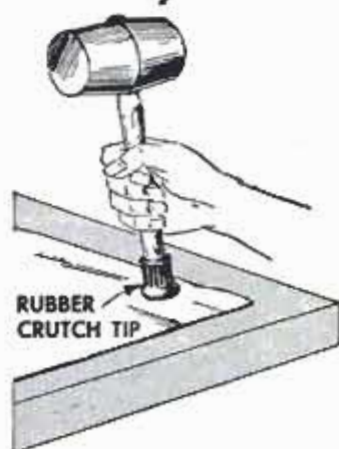


Farm-Trailer Loading Winch Is Automobile Transmission

The hand-powered winch on this trailer makes loading farm machinery onto its bed a one-man job. The winch is a discarded auto transmission with a crank fitted to the clutch-shaft end. The winch cable is wound on a length of pipe coupled to the drive-shaft end. A strap hinge bears against the teeth of a small gear wheel on the shaft to provide a ratchet. The transmission gears are shifted to provide the required power, and neutral gear allows the cable to be run out freely. The heavy trailer frame is built from a discarded livestock scale and has a drawbar jack. The jack is a length of pipe with a welded foot which slides inside a sleeve made from a short length of pipe welded to the drawbar. A setscrew in the sleeve locks the jack. The winch can be used to raise the trailer drawbar by passing the cable through a sheave on the drawbar and dropping the hook into the top end of the jack, as shown in the photo.

Rubber Tip on Mallet Handle Slides Sheet Metal Safely

Large metal sheets are difficult to pick up and move around on a workbench or squaring shears and often inflict painful cuts and bruises. Time can be saved and much of the hazard removed from this operation when a rubber crutch or cane tip is fitted on a mallet handle and used to slide the sheet

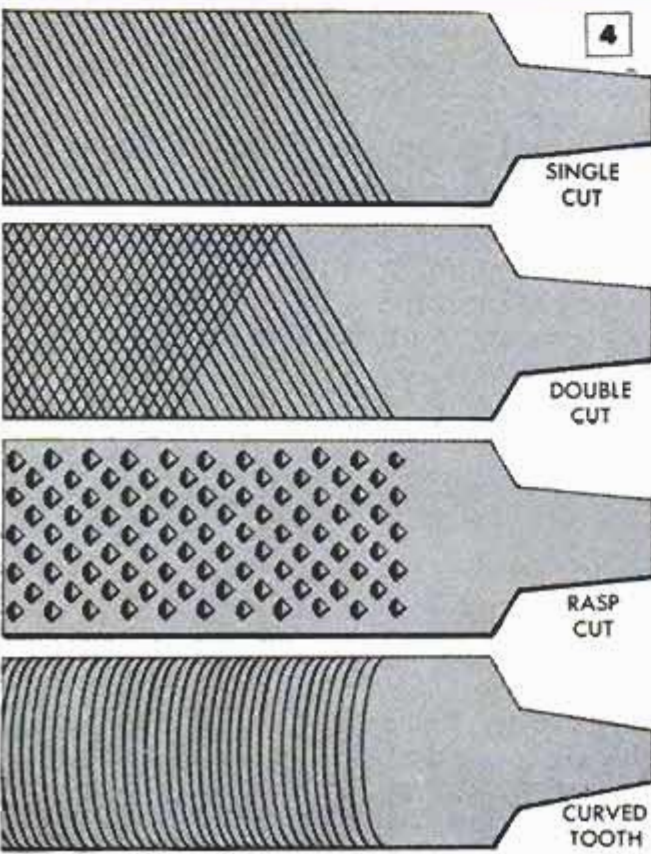
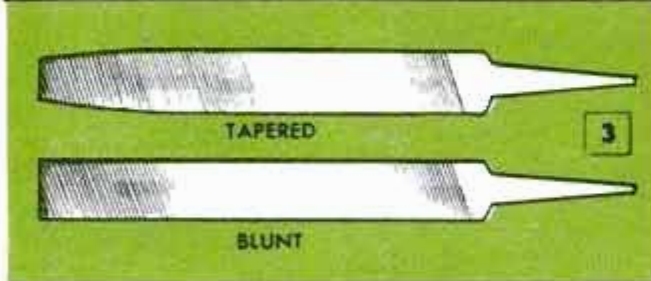
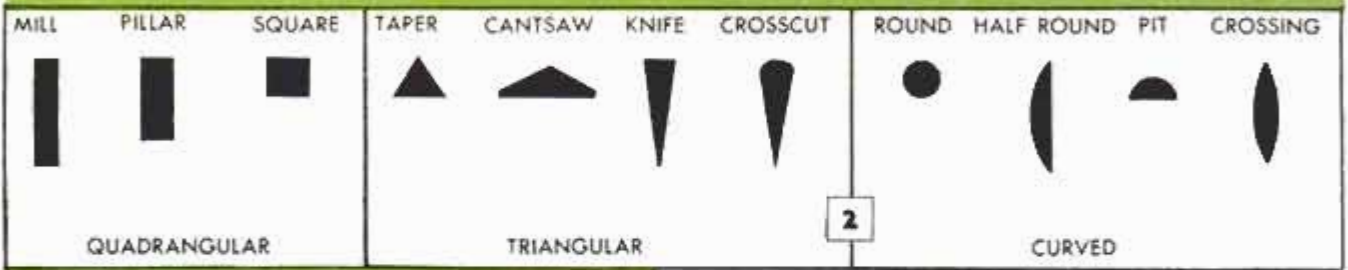


quickly to the desired position. The friction created by the soft rubber is sufficient to move the metal with little effort.



BETTER

By E. R. Haan

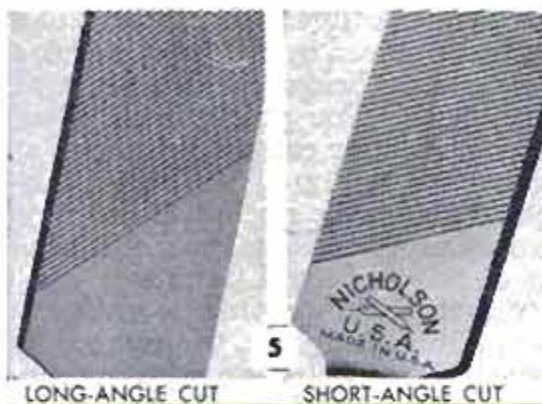


A GOOD WORKING KNOWLEDGE of files and filing will pay you substantial workshop dividends in the form of better home projects and devices completed with less effort at lower cost. No homeowner's toolkit is complete without one or more of several types of files.

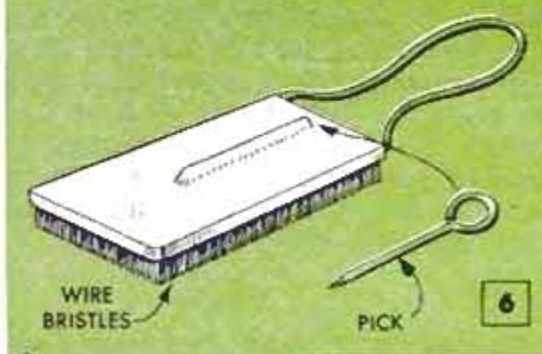
For occasional all-around use you can get a household utility file, which is a flat, 8-in. file having a fine cut on one side, a coarser cut on the other and a safe edge. A handle is cast at one end instead of a tang. Other files varying in size and shape and coarseness can be acquired from time to time as needed. Most files in common use vary from 4 to 10 in. in length. These lengths refer to body length as shown in Fig. 1, excluding the tang.

A File for Every Purpose

The various types of files are classified according to the shape of the body and type and cut of the teeth. An important consideration when selecting a file for a job is the kind of material to be filed. In respect to the shape, or cross section of the body, files are rectangular, square, triangular, round and half round. There are several variations of these shapes, most of which are referred to by words developed by trade usage, which indicate purpose and shape of a file as shown in Fig. 2. Concerning their lengthwise design files may be



FILING



tapered toward the tip or they may be blunt as shown in Fig. 3.

Kinds of Teeth

File teeth may be single cut, double cut, rasp type or curved as shown in Fig. 4. Usually, single-cut files are used for finishing under light pressure. Double-cut files remove metal faster but require more pressure. The angle of the cut on a file varies as shown in Fig. 5. This may be a "long-angle cut," or a "short-angle cut." The checker-board arrangement of teeth on a rasp-cut file is designed for extremely rough work on wood, leather and some soft metals. Files having curved teeth are single cut and are used mostly for soft metals. File teeth generally classify into sizes that vary in degree of coarseness, such as the following: dead smooth, smooth, second cut, bastard, coarse and rough. Each of these varies in proportion to the size of a file. Thus, a 10-in. second-cut file will be coarser than a 6-in. second-cut file. Most files have a smooth, second or bastard cut.

For superfine finishing work, Swiss-pattern files, also referred to as diemakers' files, are made within closer tolerances than the conventional American-pattern files. Both have similar cross sections but differ in shape. Swiss-pattern files usually have longer tapers and smaller points. Also, they are available in finer cuts ranging from No. 00, the coarsest, to No. 6, the finest.

Cutting Action of Files

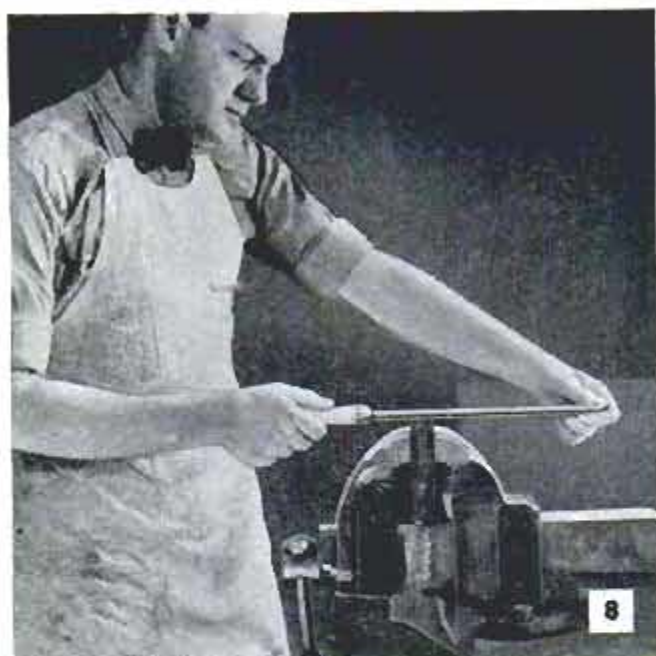
The sharp, hardened teeth of files are pointed toward the tip and cut only on forward strokes, which produce chips or filings. A sharp file will cut with very little downward pressure, although this will vary somewhat with the depth of bite and the material being worked. With a sharp file, practically no pressure is required for finishing work. Excessive pressure dulls the teeth. Insufficient pressure, which allows the teeth to slide over the work without cutting it, also tends to dull the teeth. Sliding also may be caused by clogged teeth.

Keep Files Clean

Files cease to cut properly and tend to scratch the work when the gullets between the teeth fill with chips or filings. When the latter condition exists, remove filings with a wire brush or file card as shown in Figs. 6 and 7. To remove filings that are compacted tightly in the gullets forming "pins," use a soft-iron pick shown in Fig. 6. To minimize formation of "pins," rub chalk on the file. This is especially good for fine finishing. For rough filing, the file should be "chalked" and then brushed clean.

Support and Height of Work

Work should be supported rigidly when any appreciable filing is done, and particularly when accurate filing is required. For



this a vise is most convenient for work of a size that can be placed in it. The work edge should be a little below elbow height as shown in Fig. 8. For precision filing of small work, the latter can be positioned at a higher level as in Fig. 9. For better control, arrange the work so that the surface to be filed is on a horizontal plane, if construction of the work will permit.

Narrow, brittle work should be uniformly gripped, although lightly, throughout its entire length. Heavy pieces can extend beyond the jaws of a vise. Thin, flexible material is adjusted so that the edge to be filed is close to the vise jaws, as in Fig. 10, which prevents it from vibrating.

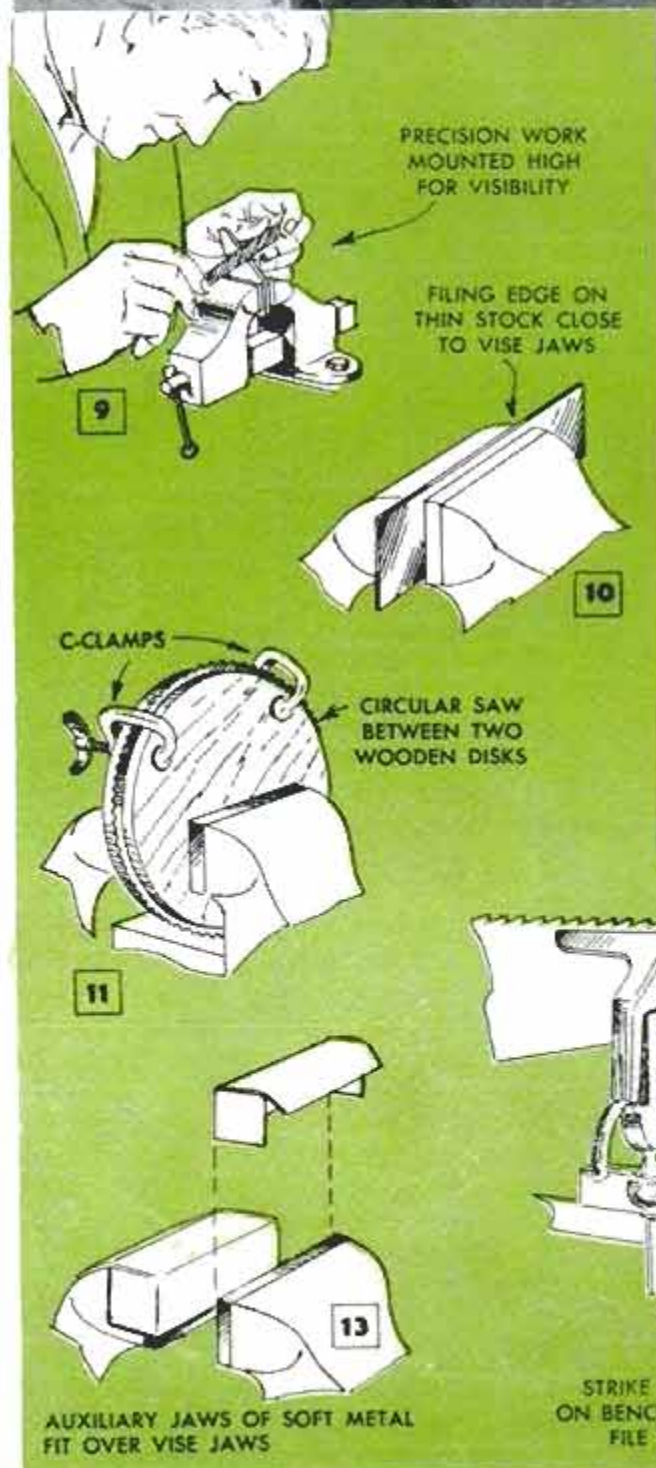
Special vises are made for filing saws. An improvised method of holding a circular-saw blade between two wooden disks is shown in Fig. 11. A handsaw vise is shown in Fig. 12. Work that cannot be held in a vise should be otherwise supported so that it will be rigid. C-clamps can be used for this purpose. To avoid marring plated or other finished work with checkered jaws of a vise, use wood pads or slip-on auxiliary jaws of soft metal as in Fig. 13.

Fit Files With Handles

Don't attempt to use a file without first providing a suitable handle, because the sharp tang can injure your hands. A handle is pushed on the tang so that it lines up squarely with the file. Then the handle is brought down sharply on the bench top as shown in Fig. 14. Never hammer a file into a handle as in Fig. 15. The file might chip or break. A handle that is not aligned properly may cause inaccurate filing.

How to Grip a File

A file is used with both hands, generally. Grasp the handle lightly so it rests in the palm of one hand. The thumb should be on top of the handle and the ends of the



PRECISION WORK MOUNTED HIGH FOR VISIBILITY

FILING EDGE ON THIN STOCK CLOSE TO VISE JAWS

C-CLAMPS

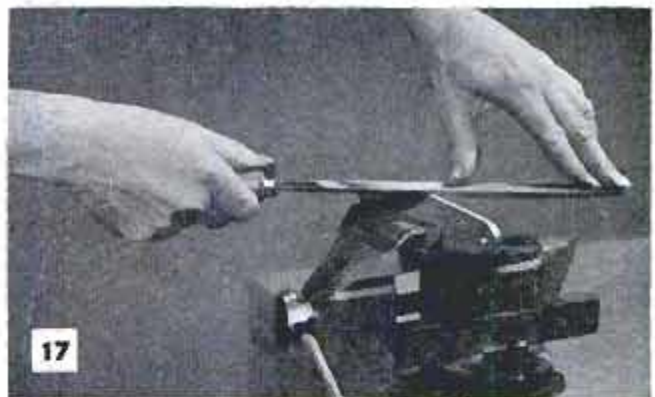
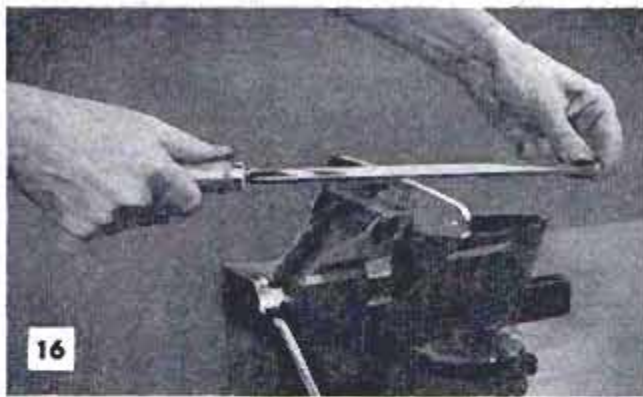
CIRCULAR SAW BETWEEN TWO WOODEN DISKS

VISE FOR FILING HANDSAWS

DON'T HAMMER FILE TO DRIVE TANG INTO HANDLE

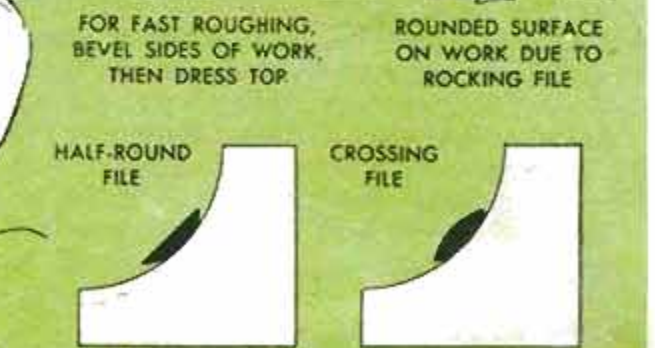
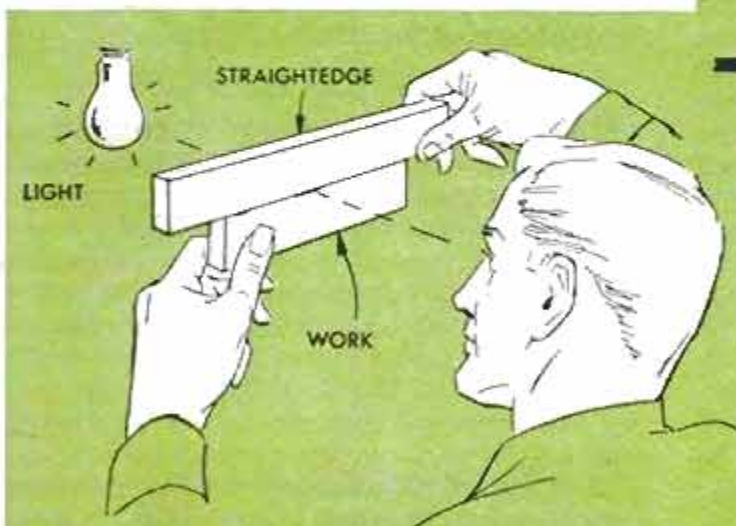
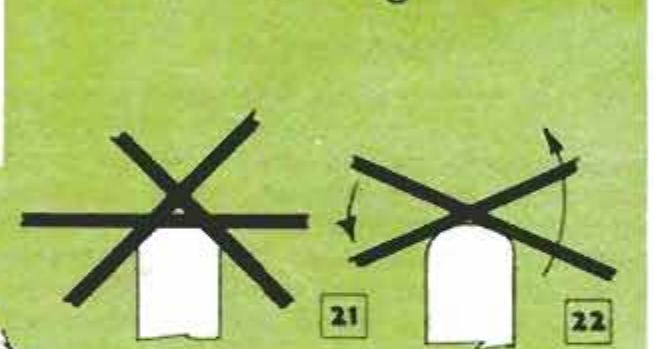
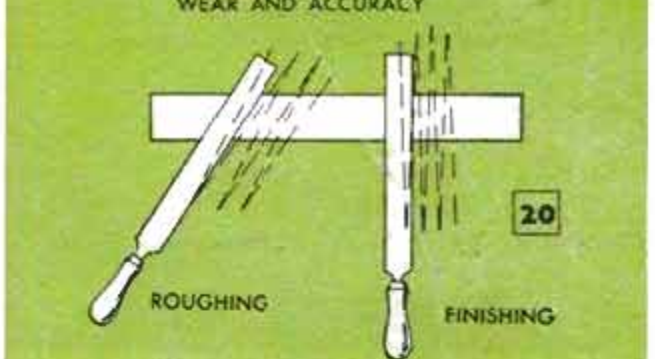
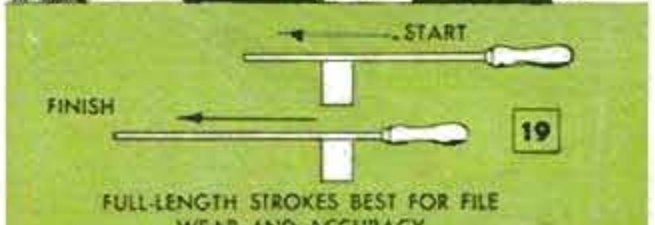
AUXILIARY JAWS OF SOFT METAL FIT OVER VISE JAWS

STRIKE HANDLE ON BENCH TO SINK FILE TANG



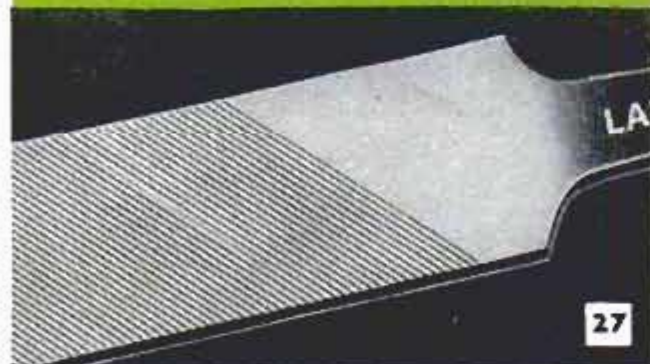
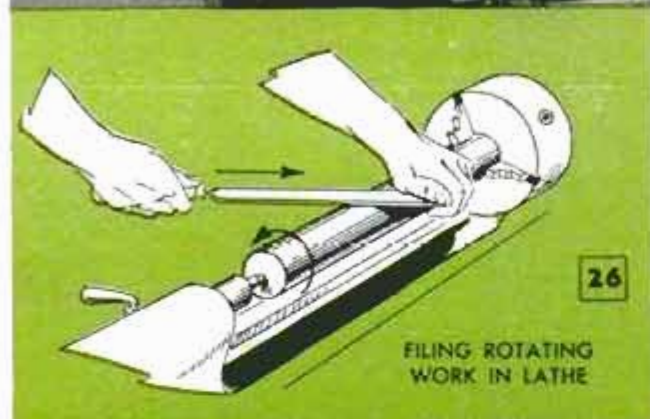
fingers should point toward your face. With the thumb and fingers of the other hand take a light hold on the tip as shown in Fig. 16, or rest them on it as in Fig. 17. A tight, clumsy grip, as in Fig. 18, can make accurate filing almost impossible. Start the forward stroke at the top of the file. It should be a full-length stroke, ending at the heel as in Fig. 19. At the beginning of a stroke on flat work the downward pressure on the tip should be a trifle more than that on the heel. At the center of a stroke the pressure should be equalized and at the end of a stroke it should be slightly greater at the heel. Short strokes wear down the teeth on only a portion of a file and shorten its useful life.

The two most common errors committed by beginners are: Rocking a file on straight work and dragging it over the work on backstrokes. Even when the rocking movement is barely perceptible, the work surface becomes rounded as shown in Fig. 22. It is necessary to rock the file on round work, however. Then the handle is held high when the tip contacts the work. Bring the handle down as the stroke is continued. When filing hard metals, raise the file on the backstroke to clear the work. This is not necessary on soft metals where file contact with the work is an advantage, since it helps to dislodge filings.



24 TESTING STRAIGHTNESS OF FILED WORK

23 FILING CONCAVE SURFACES



What File to Use

When starting a job, first remove humps and high spots from the work with a relatively coarse, double-cut file. Then dress down the entire surface, using diagonal strokes as shown in Fig. 20, to a very short distance from the finish line. Considerable metal can be removed quickly by filing the work edges at a bevel and then dressing down the top as in Fig. 21. Finishing is done with a single-cut file, using strokes almost straight across the work as shown in Fig. 20.

When filing concave surfaces you can use a round or half-round file as shown in Fig. 23. Sweep the file along the curve in both directions while stroking. A crossing file often is preferred for this purpose. For best results the radius of the file should be slightly less than that of the work so that the file will cut at its center.

Filing grooves, notches and inside corners can be done with a file having a "safe,"

or uncut, edge. With the latter, each adjoining edge of the work can be dressed down to the finish line separately. An attempt to file down two adjoining surfaces of a corner at once often results in excessive filing on one surface.

Instead of guessing at the amount of metal to be removed by filing, scribe the work so that the depth of cutting can be governed accordingly. When a filing job nears completion, hold a straightedge or square on the surface. Humps and hollows will show up plainly if you hold the work between your line of vision and a source of light as shown in Fig. 24. Then, the surface can be trued by means of drawfiling.

Drawfiling differs from crossfiling in that both ends of the file are grasped as shown in Fig. 25, and pushed and pulled over the work with a lengthwise stroke. Drawfiling eliminates irregularities and scratches of crossfiling, and results in a straight, smooth surface if done properly. When a considerable amount of stock must be removed you can use a flat, double-cut or bastard file first. Then finish with a mill file. Files with a long-angle cut are best for this purpose since they are least likely to leave marks. However, the same effect can be obtained with a file having a short-angle cut if it is held so that the cut is at a 45-deg. angle to the work edges.

Filing Rotating Work

When filing round stock rotating in a drill press, or in a lathe as in Fig. 26, keep the file moving forward as the work rotates toward you. Also, move it toward one side during the forward stroke. This minimizes grooving and helps to discharge filings. Never hold a file stationary against the work. Work mounted in a drill press should be supported with a "dead center" or a bearing at its lower end to take side strain. The best file to use on rotating work is a long-angle-cut lathe file shown in Fig. 27, which gives shearing action when held straight across the work.

Filing Soft Metals

Most files clog excessively when used on soft, ductile metals such as aluminum, copper, brass, lead and babbitt. An ordinary double-cut file is shown in Fig. 28, for comparison with special-purpose files as shown in Figs. 29 to 32, inclusive. The aluminum file has a tooth construction that resists clogging. The first series of cuts, the overcut, is fine, and the crossing cuts, the upcut, are deep and open-throated. The small scallops formed on the upcut break chips so that the file cleans itself readily and does not chatter or take too large a bite. A good finish is obtained by moving the file toward the left to get a shearing action on strokes.



28 REGULAR



29 ALUMINUM



30 BRASS



31 LEAD - COPPER



32 OTHER SOFT METALS

Fig. 30 shows a file for brass. Note the long-angle overcut and the short-angle up-cut. This file has sharp, sturdy, nonclogging teeth that minimize grooving and do not tend to run the file off the work. A file for cutting exceptionally soft metals, such as lead, babbitt and pure copper is shown in Fig. 31. The single, short-angle cut removes metal rapidly under light pressure, and with even less pressure produces a smooth finish.

A shear-tooth file, shown in Fig. 32, combines fast cutting action with good finish on many other types of soft metals, alloys, plastics, hard rubber and wood. On a forward stroke this file is pushed slightly toward the right to prevent running toward the left.

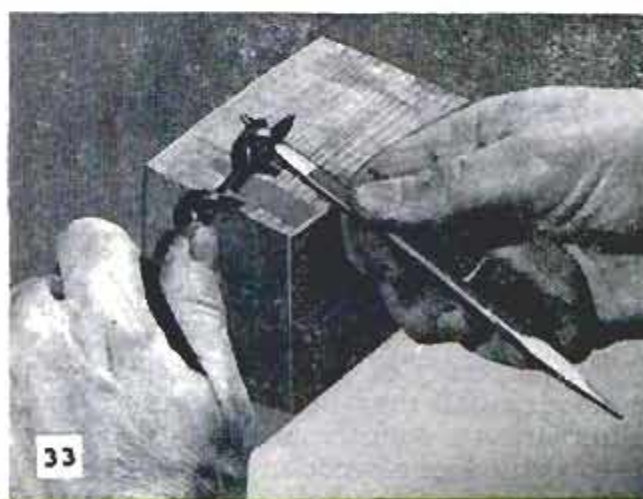
The tough, dense composition of stainless steel dulls ordinary files rapidly. Therefore, files having unusually high wearing qualities are used on this type of metal. They require only light pressure with slow, even strokes to remove metal quickly and to produce a smooth finish.

The teeth of ordinary files are not tough enough to withstand hard, rough surfaces and sharp edges of iron and steel castings, since only a few teeth contact the work at one time. For such work foundry files are used. The teeth on these files are more rugged and have massive backing to support the cutting edges, but they cut more slowly than regular files.

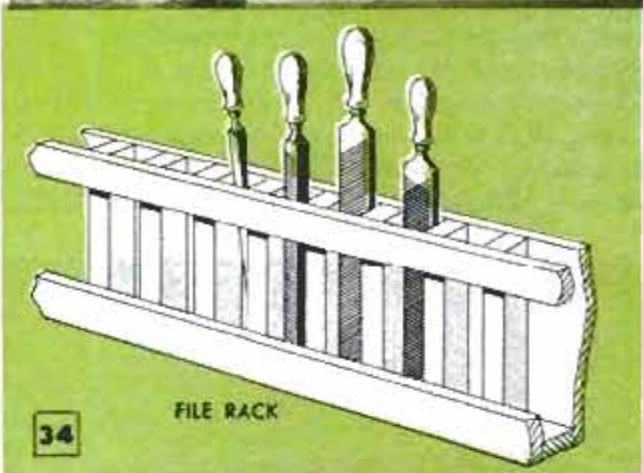
Another special type of file is used for die castings, which also tend to damage and clog teeth of ordinary files. A small, pointed file having a safe edge is used for sharpening augers as shown in Fig. 33. Other small, flat files are made especially for cleaning ignition points and similar small work.

File Care

A file should never be thrown on a bench, since this might chip or break it. Store files in notched crosspieces or place them vertically in a wall rack of the kind shown in Fig. 34. Rust destroys the sharp edges of



33



34

FILE RACK

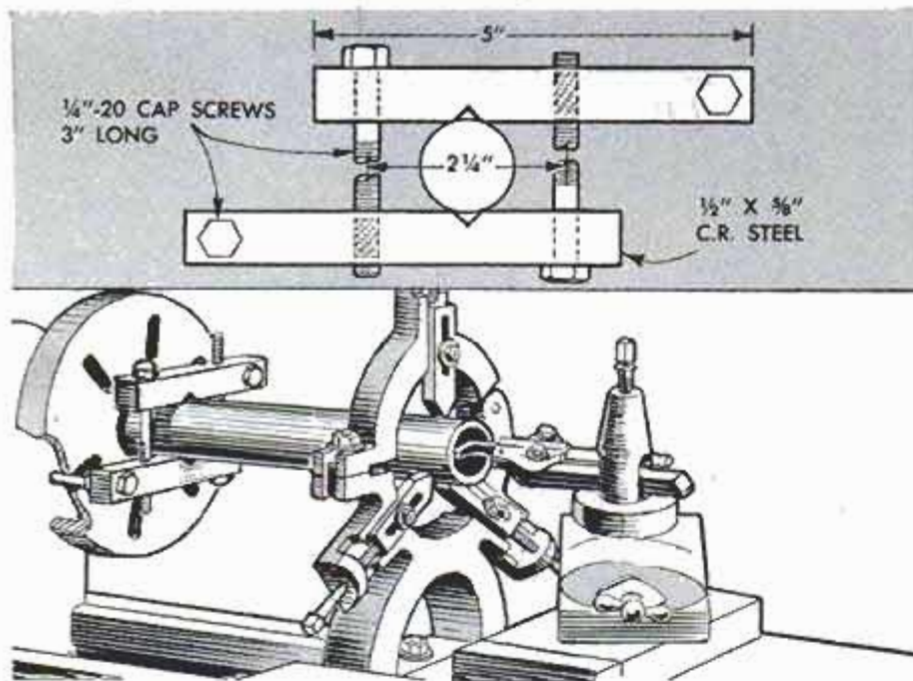
the teeth. Where humid conditions prevail, files not in use should be wrapped in moistureproof material. Excessive oil and grease accumulating on files can be absorbed by chalk. After rubbing chalk on a file it should be brushed clean with a file card. ★★★

Mucilage Bottle as Tool Oiler

The spreader tip on a mucilage bottle filled with oil provides a clean and handy means of applying a preservative film of oil on tools and shop equipment. This removes the temptation to put tools away without oiling because of the old method of wiping with an oily rag.

R. G. Cooper, Trenton, Ont., Canada

Clamp Screwed to Faceplate Holds Work Accurately on Center



A clamp screwed to the faceplate of a lathe will provide a more positive means than rawhide laces of holding work when the end of the work to be machined is held in a steady rest. A clamp made of $\frac{1}{2}$ x $\frac{5}{8}$ -in. steel bar to the dimensions given in the detail will accept work up to 2 in. in dia. Both capscrews used in the clamp should be the same length and weight, and the two screws used to hold the clamp to the faceplate also should match to assure a well-balanced unit, especially when the lathe is run at high speed.

"Cradled" Wooden Balls Permit Easier Drilling

The difficulty of drilling a hole through a wooden ball may be overcome by "cradling" it on a countersunk hole which has been drilled in a wooden block. Preparatory to drilling, the ball is placed over the hole and positioned under the drill bit, with the block clamped tightly to the drill table. To accommodate balls of varying diameters, drill a number of countersunk holes in a range of sizes sufficient for your needs.

William J. Kadi, Long Beach, Calif.



Dry Chemicals for Spraying Mixed With Rubber Plunger

Mixing large quantities of chemicals, in powder or crystal form, with water for farm or orchard spraying can be speeded up when a plumber's plunger is used to "churn" the mixture in a barrel. A



row of holes is cut around the lower part of the plunger as shown, and a long handle attached. After the right quantities of chemicals and water have been poured into the barrel, move the plunger up and down on the bottom. This action creates vigorous circulation of water with the chemicals, dissolving them quickly.

Angle of Metal Square Realigned By Using Ball-Peen Hammer

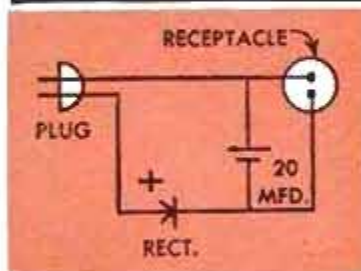
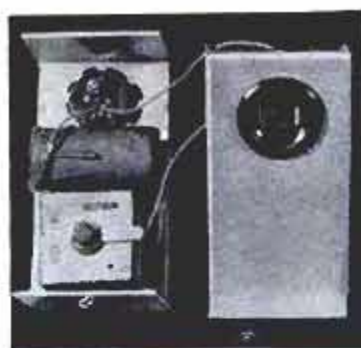
If a carpenter's square has been bent so its angle is greater than 90 deg., place it flat on a metal surface and peen it near the outside corner. This will expand the metal at this point to reduce the angle. If the angle is less than 90 deg., increase it by peening the square near the inside corner. To check the accuracy of the angle, hold the long leg of the square on a horizontal surface and scribe a line along the short one on a vertical surface. Then swing the square 180 deg. so the short leg is on the opposite side of the vertical line. If this line and the short leg are parallel, the angle is correct.

Rectifier Unit Increases Motor Speed of Electric Razor

If your electric razor lacks some of the speed with which it ran when it was new, and it has an a.c.-d.c. type motor, this simple rectifier unit will convert alternating current to direct current and permit the razor to operate at a higher speed.

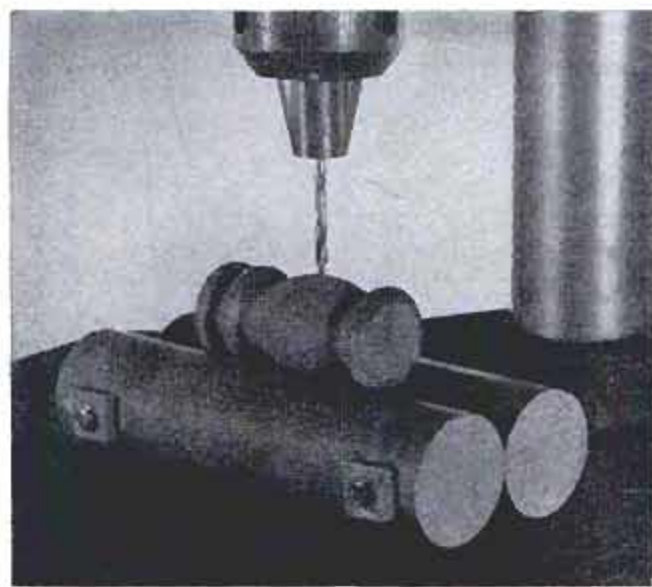
Obtain the following parts from a radio supply house: a 20-mfd. 150-volt capacitor, a 65 to 100-ma. selenium rectifier, an Amphenol type 61-F receptacle, an Amphenol type 61-M plug, a metal box $3\frac{1}{4} \times 2\frac{1}{8} \times 1\frac{5}{8}$ in., assemble them in the box and wire them as shown in the diagram.

If your supplier does not have the parts as listed, he can suggest substitutes, since the components are not in the least critical.



Use a good grade of electrical tape to insulate all wires in the box and paint the unit to match the color on the wall.

Francis Wright, San Carlos, Calif.
Box 793



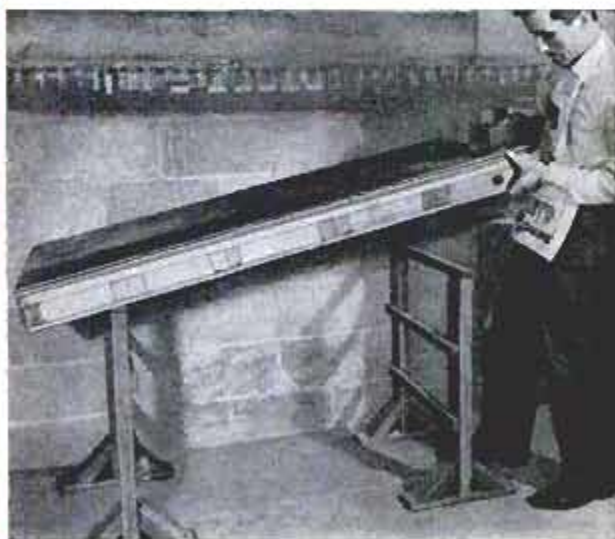
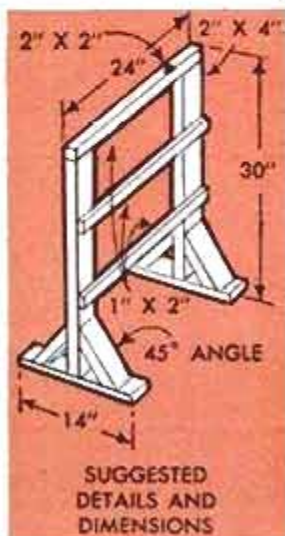
V-Block for Drill Press Improvised From Dowels

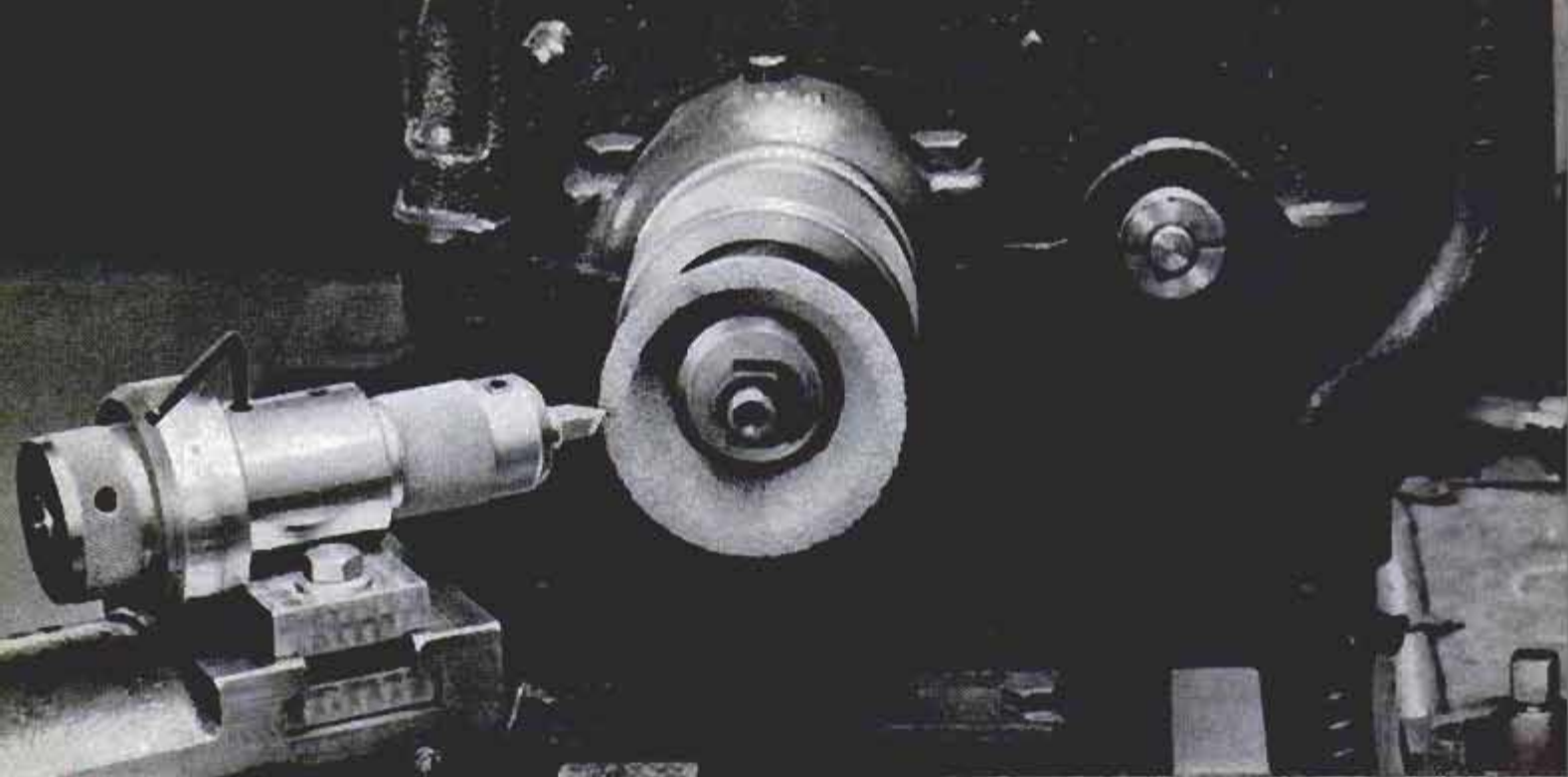
When there is immediate need for a V-block to hold round work on a drill press, and none is available, a suitable one can be improvised from two lengths of large-diameter dowel. Aligning holes are drilled in the dowels after the two members have been cut to the desired length. Then fasten the members together with bolts as shown. To assure good hole alignment, clamp the dowels together between two pieces of scrap wood and drill through the diameter of both dowels while they are in that position. For a nonslip surface wind several turns of friction tape around each member before assembling.

Multipurpose Horses Used for Shelving and Tables

These utility horses can be used for an endless number of jobs around the home or shop. Planks laid across the two lower crosspieces and top provide easily knocked-down shelving. Although the suggested dimensions show the horses to be 24 in. wide and 30 in. high with 14-in. feet, the measurements can be increased or lessened for any particular situation.

—Michael Ligocki, Gary, Ind.





TOOL-GRINDING FIXTURE

By
Rodney B. Wyatt

*SN 58
Error somewhere - see Jimmy*

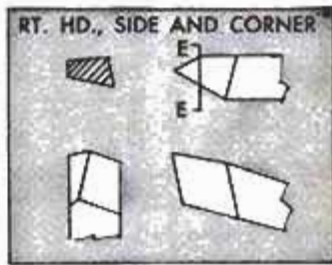
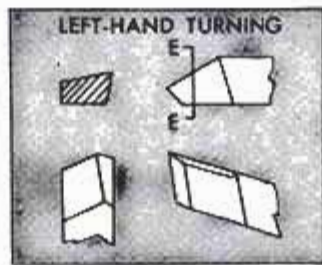
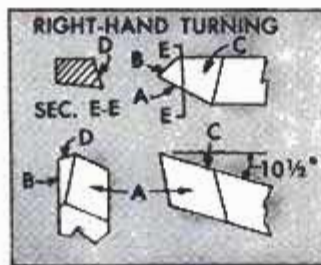
FREEHAND GRINDING of lathe tools is not always satisfactory due to the difficulty of maintaining uniformity of rake and clearance angles, especially in production runs where continuous use of cutting tools shortens the time between regrinds to a matter of hours or even minutes. The tool-grinding fixture pictured is designed to eliminate inaccuracies and speed up grinding of cutting tools. It is shown mounted on the tool post of the lathe, but can be adapted to use with a conventional grinder. It consists of a spindle, a "chuck," spindle bearing, a stationary disk carrying a witness mark and a graduated quadrant and locking sleeve. The quadrant is divided into four equal segments as in the insert in the photo on the opposite page. The segments are graduated into nine divisions of 10 deg. each and numbered 0, 1, 2, 3, 4, 4, 3, 2, 1, 0. Note from the insert that the segments also are numbered 1, 2, 3, 4.

To use, the fixture is mounted in the

tool post, as pictured, with the compound set at 0. Now, note the settings for tool face A in the left-hand column in the data table below. Swing the compound 30 deg. to the right as directed, turn the fixture quadrant to the segment marked 1 and set at 0. Then turn the quadrant 20 deg. to the right and lock the setscrews to hold the spindle. Settings for grind faces B, C and D are made in the same manner.

It should be remembered that the data table given below is not all-inclusive. It is merely a generalization of common tool-grinding practice. Several tools are shown with sharp points when in actual practice the points are rounded freehand to a radius varying from $\frac{1}{64}$ to $\frac{1}{16}$ in., depending on the type of work being done and the degree of finish desired. Also, in certain types of work it has been found impractical to use a tool that is ground with all angles theoretically correct. This can be due to other factors, such as flexibility of the work. ★★★

Side-clearance angles for right and left-hand threads will vary with pitch of thread and diameter of work. Compound setting is swing of handle to right or left in deg. Make grinds in order shown by key letters

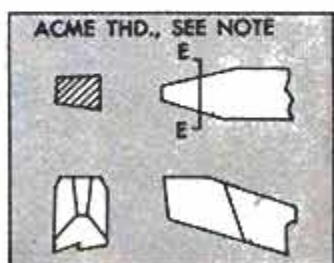
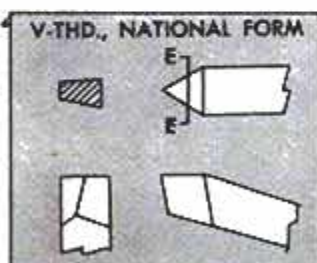
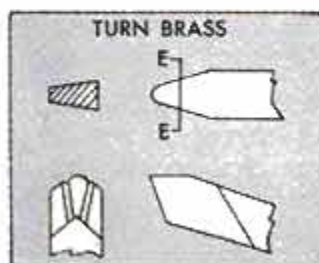
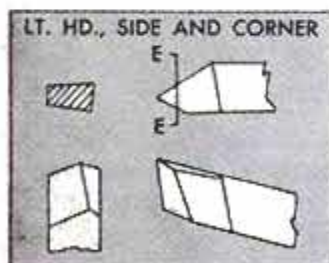
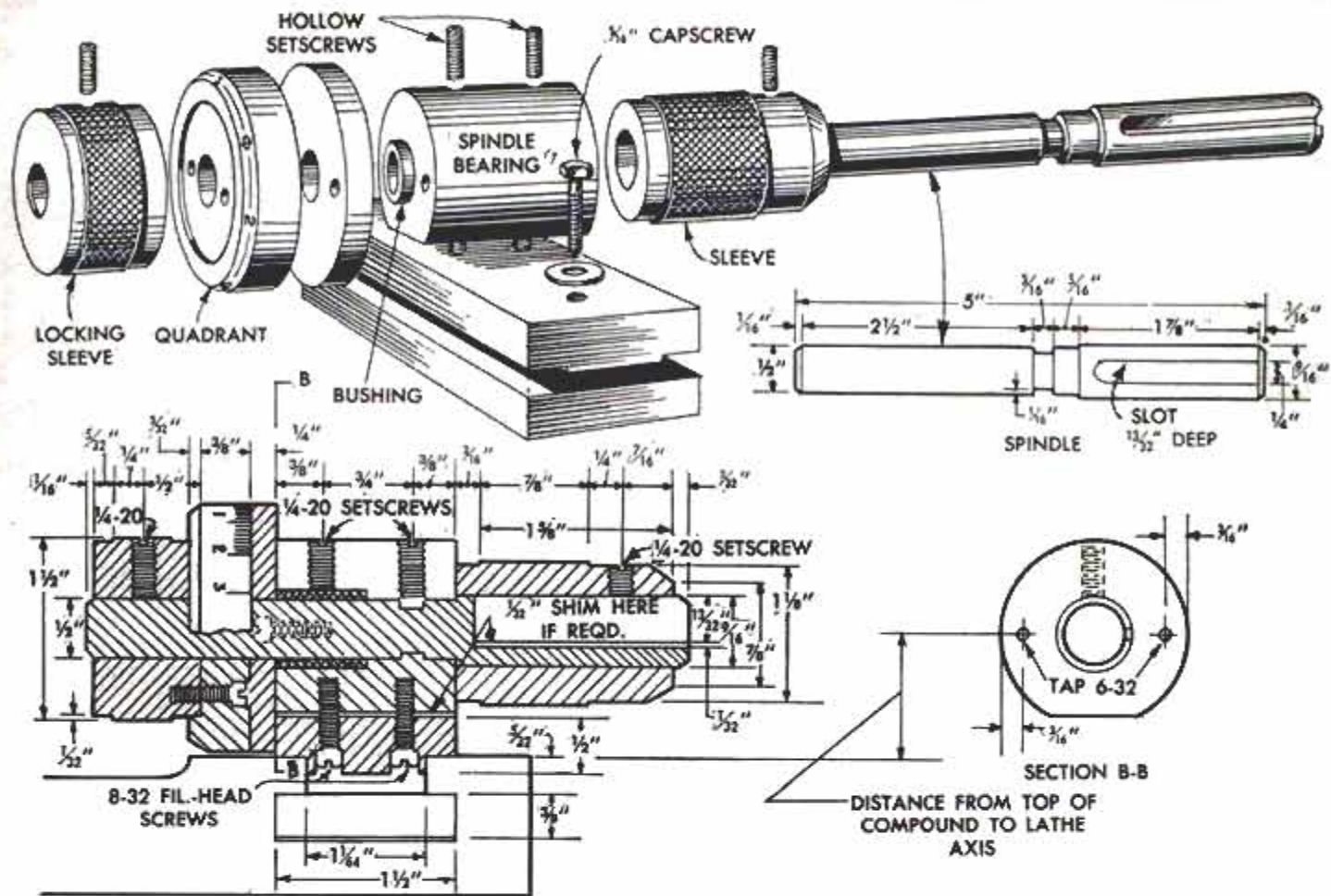
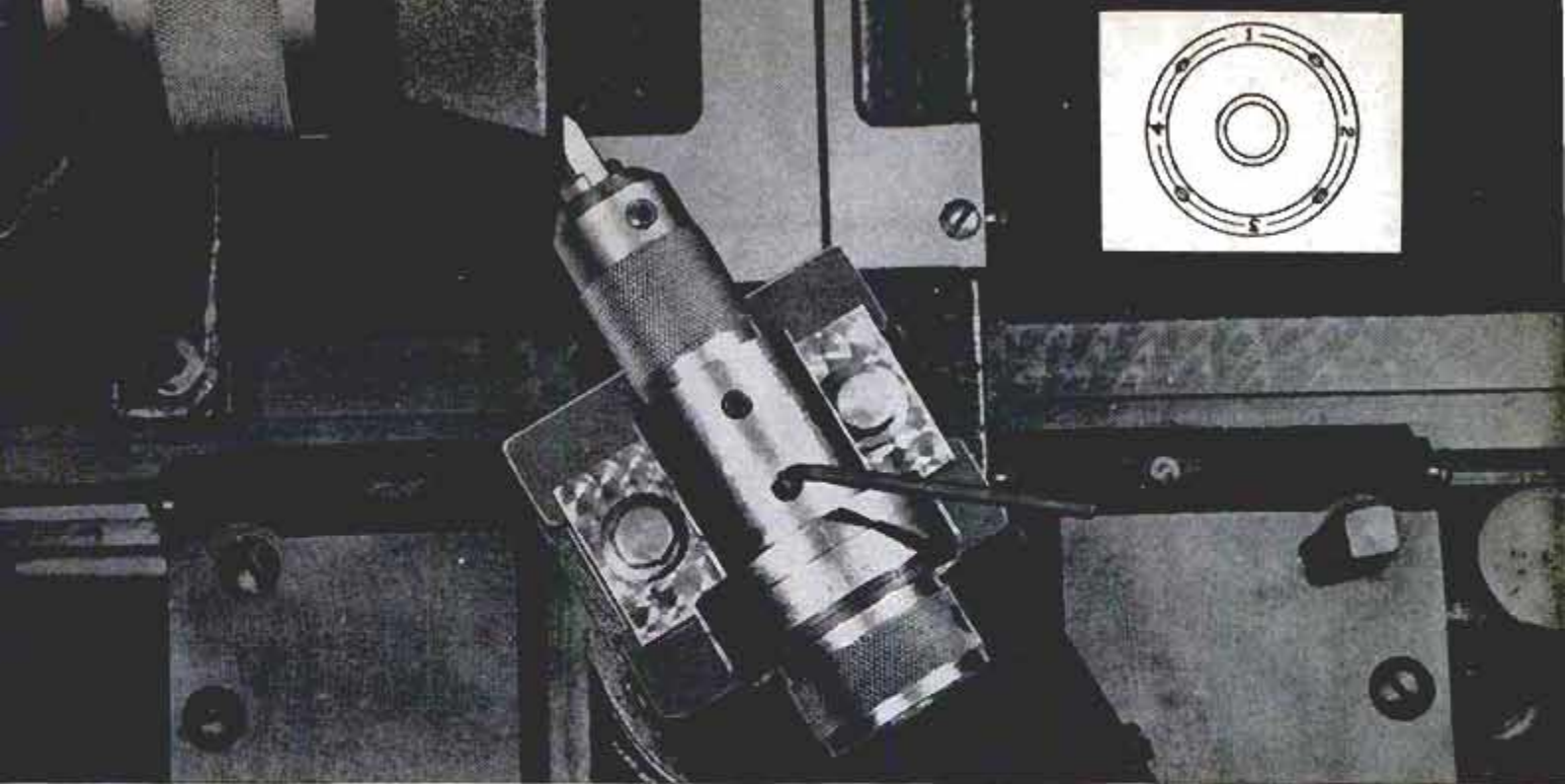


SETTING FOR _____
COMPOUND _____
QUADRANT _____
DEGREES _____

A	B	C	D
30° R.	45° R.	None	0°
1	3	None	2
20° R.	10° L.	None	12° L.

A	B	C	D
30° R.	45° R.	None	0°
3	1	None	2
20° L.	10° R.	None	12° R.

A	B	C	D
30° R.	30° R.	12° L.	0°
1	3	2	2
20° R.	10° L.	0°	14° L.



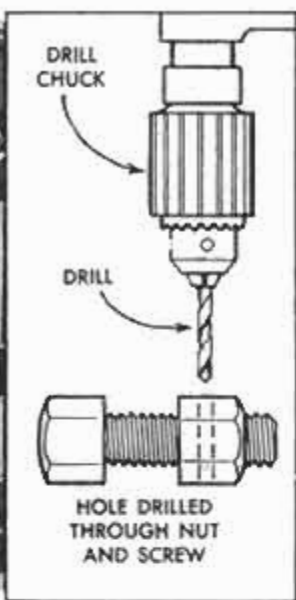
A	B	C	D
30° R.	30° R.	12° L.	0°
3	1	2	2
20° L.	10° R.	0°	14° R.

A	B	C	D
14° R.	14° R.	12° L.	None
1	3	2	None
10° R.	10° L.	0°	None

A	B	C	D
30° R.	30° R.	15° L.	None
1	3	2	None
10° R.	8° L.	0°	None

A	B	C	D
14½° R.	14½° R.	16½° L.	None
1	3	2	None
5° R.	5° L.	0°	None

Punch-Marked Hex Nut Centers Drill Bit Through Machine Bolt



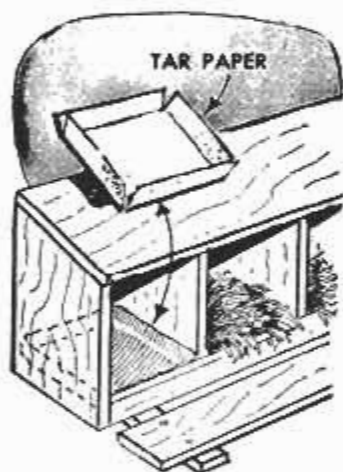
Drilling a cotter-key hole through a bolt without having the drill bit slip to one side is no problem if a nut is used as a simple jig. Run the nut on the bolt to the point where the hole is to be drilled, center-punch the side of the nut and drill through both nut and bolt.

Frank LaSaracina, New York City.

Floor Mat Retains Small Parts On Repair Bench

When disassembling a clock, doorbell, radio, or other small machine or instrument, the small parts will not roll off your workbench and get lost on the floor if a rubber auto floor mat is placed under the work. Then, small parts which are deposited on the mat will remain in the depressions until they are needed or placed in containers for later use. Parts can also be arranged in subassemblies in the order of removal, to facilitate reassembly. Only mats with deep ridges or squares are suitable.—A. J. Calandra, Gloversville, N. Y.

Tar-Paper Liners Aid Cleaning Hen's Laying Nests



Vermin will be discouraged from infesting the nests in your poultry house, when tar-paper liners, as shown in the detail, are fitted into the nests before adding straw or other nesting material. To make a liner trace an outline of the floor of a nest on a sheet of

tar paper, add 2 in. on each side and slit the corners. When it is necessary to give the nesting units a thorough cleaning, simply remove the liners.

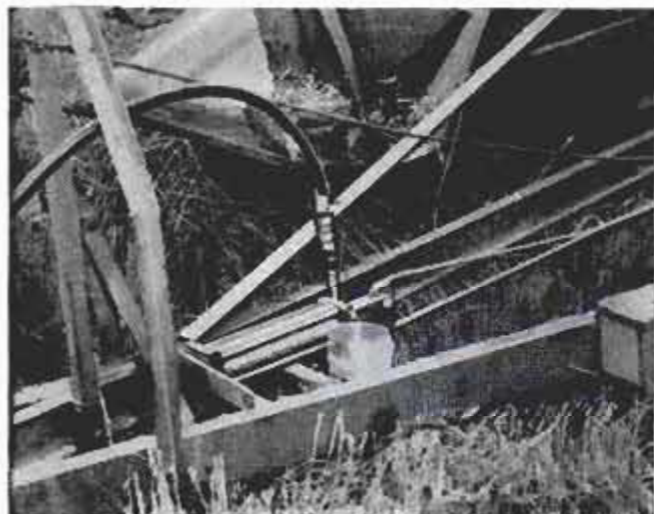
Paintbrush is Handy Duster

For general dusting around the shop an old paintbrush with the handle sawed off just above the ferrule makes a serviceable dusting brush that is especially handy to use in tight corners. When thoroughly



cleaned of hardened paint, the fine bristles are ideally suited for dusting furniture or other woodwork that is being sanded preparatory to finishing.

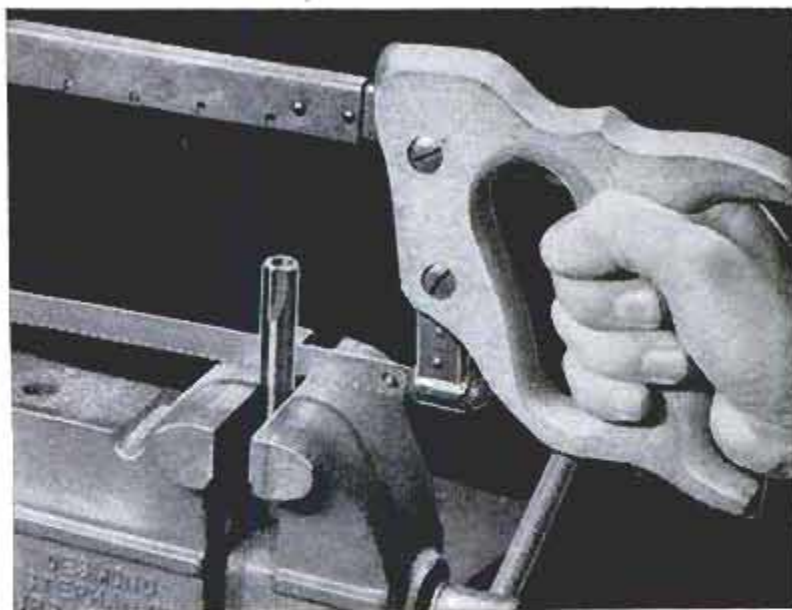
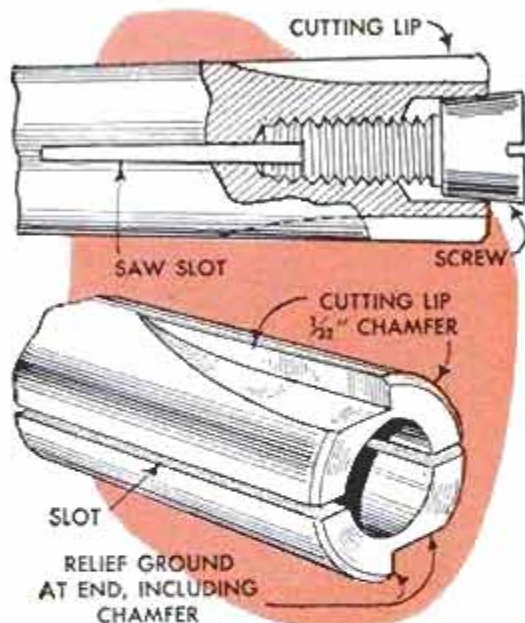
Hydraulic Cylinder on Combine Replaces Cutter-Bar Lever



The cutter bar on this combine is raised and lowered from the tractor seat by means of a single-action hydraulic cylinder that replaces the original hand lever. To connect the lever rod to the cylinder it was necessary to shorten the rod and weld it to the lower end of a length of steel flat fitted vertically in the piston-rod clevis. The flat, which measures approximately 2 x 4 in., was drilled at the center to receive the piston-rod clevis pin. A lighter rod was welded to the upper end of the flat and to the lever rod to provide a brace. The hydraulic cylinder was bolted to angle-steel brackets so it was in line with the rod.

A. M. Wettach, Mt. Pleasant, Iowa.

Expansive Reamer Enlarges Auger-Bit Holes



Have you ever wished for a bit that would drill holes in wood just slightly larger than are possible with standard-diameter auger bits, such as when assembling with dowels? Then you'll appreciate this reamer that can be adjusted to enlarge $\frac{1}{2}$ -in. holes up to $\frac{3}{32}$ in. oversize.

Hand tools can be used to make the reamer, although use of a lathe would reduce the required time and labor. The reamer described is designed to enlarge $\frac{1}{2}$ -in. holes. Reamers for smaller or larger holes would be sized proportionately. First, a length of $\frac{1}{2}$ -in. steel rod is drilled and tapped lengthwise to receive a $\frac{1}{4}$ -20 machine screw, then counterbored to provide a recess for the tapered head of the screw. Next, the two cutting edges, which are $\frac{3}{4}$ in. long, are formed, either by milling or sawing and filing, to produce square-edge grooves as indicated. Longer edges would be better if deep holes are to be reamed,

although the shorter edges will work well if the tool is withdrawn occasionally and cleaned of wood chips. The lower end is chamfered and the cutting edges are relieved by grinding away a small amount.

The rod then is split lengthwise by sawing at right angles to the plane of the cutting edges, making the cut just long enough to permit the adjusting screw in the end to readily spread the two halves. The taper-headed adjusting screw is made from any screw that has a head that can be turned to the shape shown. If no lathe is available, chuck the screw in an electric drill and file the head to shape while it is rotating. The reamer can be used in a drill press, electric drill or hand drill, so the next operation is to shoulder the upper end of the reamer to a diameter that will fit the chuck of the tool in which it will be used. Cutting end of the reamer should be hardened.

W. E. Burton, Akron, Ohio.

Drill-Press Routing Made Easier By Rough-Routing Work First

When work is routed on a drill press, much time can be saved if the routing bit is first used as a drill for roughing out the area, moving the work a step at a time. While doing this, the work is held in place by a wood auxiliary table with a coarse sandpaper facing, which affords a nonslip surface. After the work is roughed-out, the wood table is removed and the work finish-routed in the usual way. With this method of routing there is practically no side thrust on the router bit and much of the vibration and noise is eliminated.

Keep a magnet in your toolbox for retrieving steel items from hard-to-reach spots, or parts dropped in sawdust.



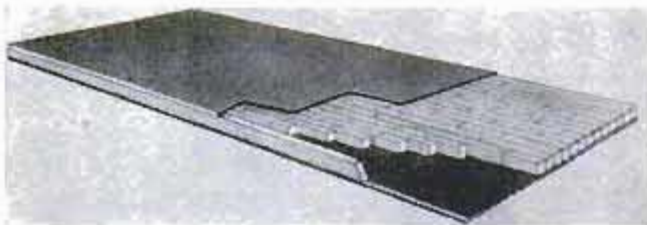
SHOPPING FOR TOOLS



HAND DRILL solves the problem of drilling holes in hard-to-get-at places on work that has been partially or wholly assembled but which requires holes to be drilled for additional fasteners, such as screws or nails. The drill chuck, 1/4-in. capacity, swivels through 270 deg. and the handle turns through a 180-deg. arc at right angles to chuck movement. There is storage space in the handle for extra drill bits



P & C Hand Forged Tool Co., P.O. Box 5926, Portland 22, Ore.



WORKBENCH TOP is of laminated construction having a core of wooden blocks faced with a special hard-board which is oil-and-grease resistant, splinterproof and warp-free. Available in a wide range of sizes

Rock Island Millwork Co., Rock Island, Ill.



HUB-CAP TOOL makes quick work of removing hub caps and wheel disks from car and truck wheels. Will not damage cap or wheel. Also is useful for loosening quarter round, chrome moldings and friction can lids

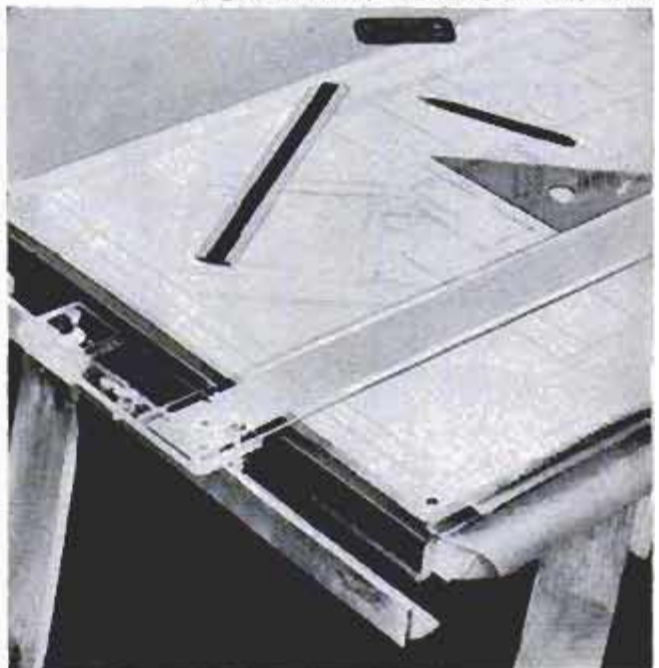
Maymac Co., 79 W. Grand St., Mt. Vernon, N. Y.

CARBIDE COUNTERSINK is designed to eliminate chatter. A round chip-clearance hole is centered in the cutting edge, permitting chip to curl away without clogging cutting edge. Speed is 250 to 500 r.p.m.

Raymac Div., Dexco Corp., 15490 Dale Ave., Detroit 23, Mich.

DRAFTSMAN'S T-SQUARE has a ball-bearing head which aligns automatically on an angle guide that can be attached to drawing board. Slides over board with slight pressure. Snaps on and off angle guide

Align-O-Matic Co., Box 2001, Durham, N. C.





NEW HAMMER AND HATCHET have tubular alloy-steel handles fitted with rubber-cushion grips which are said to be positively nonslip even when wet or when the user is wearing gloves. Handle shafts are wedged into the toolheads and are pinned in such a way as to prevent breakage and reduce impact shock

True Temper Corp., Cleveland, Ohio

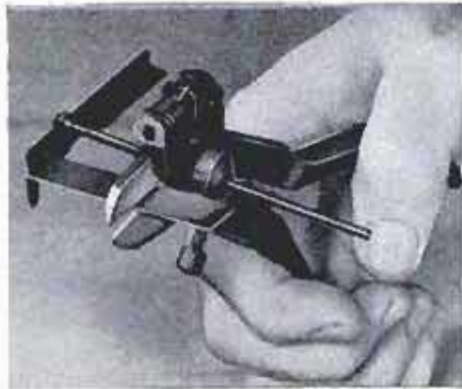
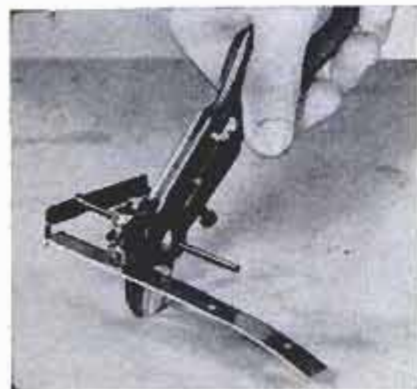


HACKSAW HAS TUBULAR FRAME that is light, rigid and balanced for a wide range of work. Can be adjusted for 10 or 12-in. blades by sliding tubular frame in handle. The latter has convenient thumb rest for control when making cuts to close dimensions

Forsberg Mfg. Co., 125 Seaview Ave., Bridgeport 1, Conn.

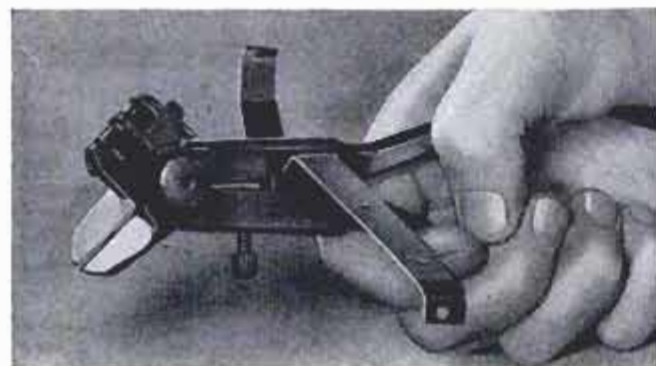
PISTOL-GRIP TORCH for soldering, burning and sweat-soldering is designed for use with propane gas. Pressure on trigger produces instantaneous ignition. Length of flame is controlled by varying pressure on trigger. When trigger is released flame snaps out

Velocity Power Tool Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.

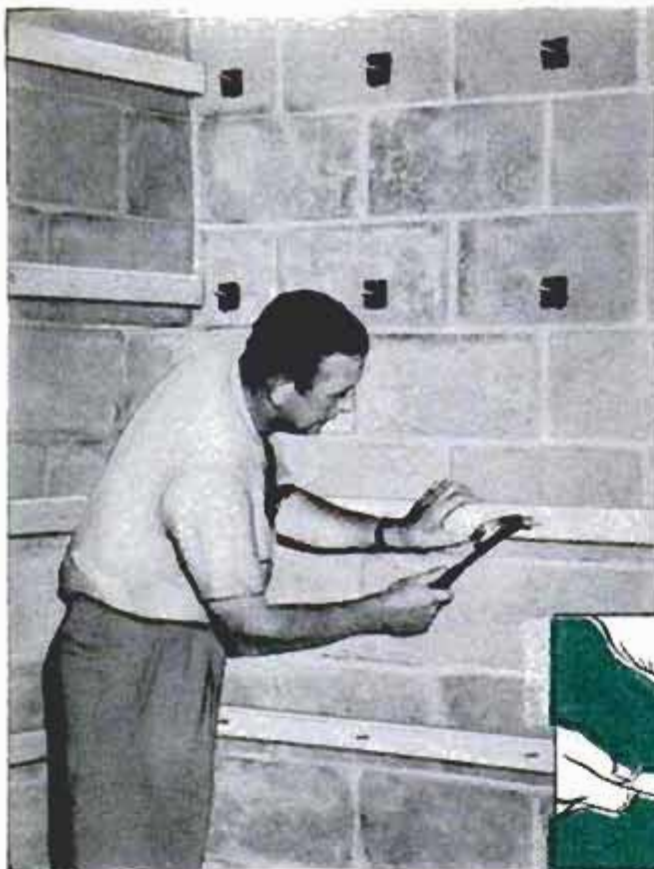


COMBINATION TOOL is a tin snips, metal punch, metal bender, or "brake," and wire straightener in one. The hanging planter pictured is an example of the range of work that can be done. Unit comes with a stop for spacing holes and cutting to length as in photos above. Bending operation is shown below

The Holly Co., 2737 N. Pine Grove Ave., Chicago 14

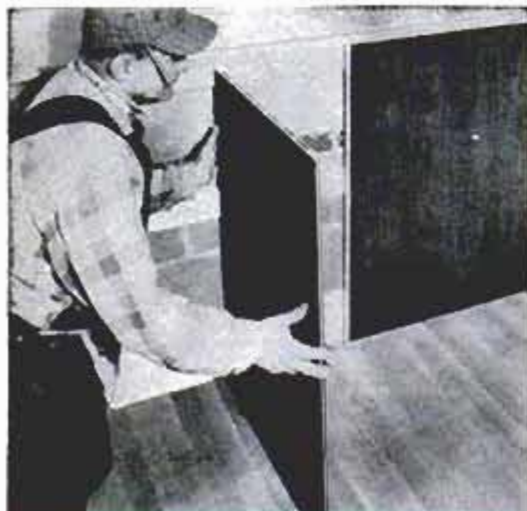
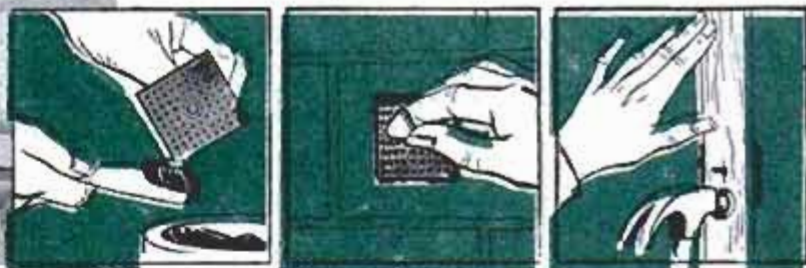


On the MARKET



ANCHOR NAILS provide a means of attaching furring strips to masonry and concrete walls. The perforated nail plate is coated with special waterproof adhesive, then pushed against wall with twisting motion. When the adhesive dries, furring strips are driven onto nails which then are clinched as indicated

Goodloe E. Moore, Inc., Danville, Ill.



FLEXIBLE-PLASTIC CONTAINER in which this glue is packaged also is applicator. Squeezing sides of container forces glue through tapered nozzle so that narrow bead of glue can be laid on edge of wood or small amount can be applied to one spot in hard-to-reach location

Midcontinent Adhesive Co.,
Gore City, Ohio

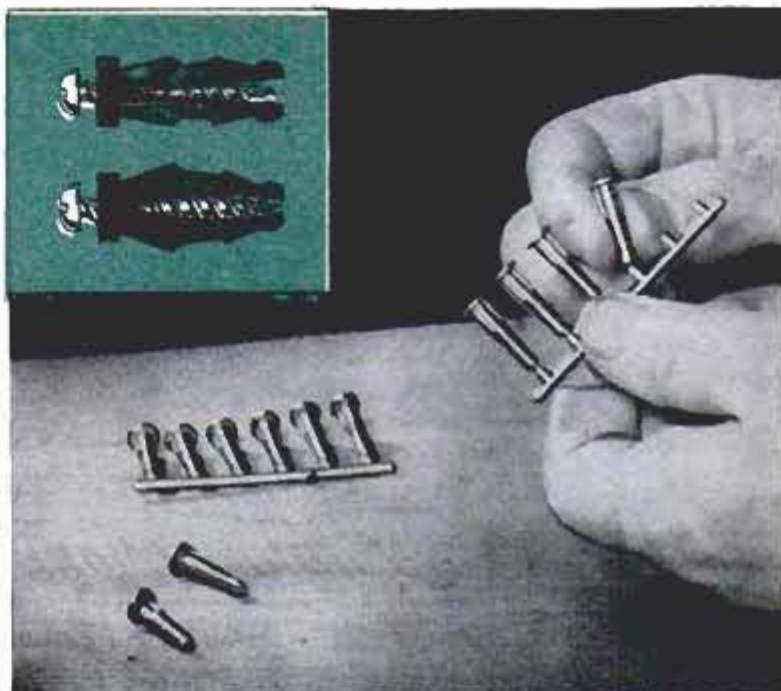


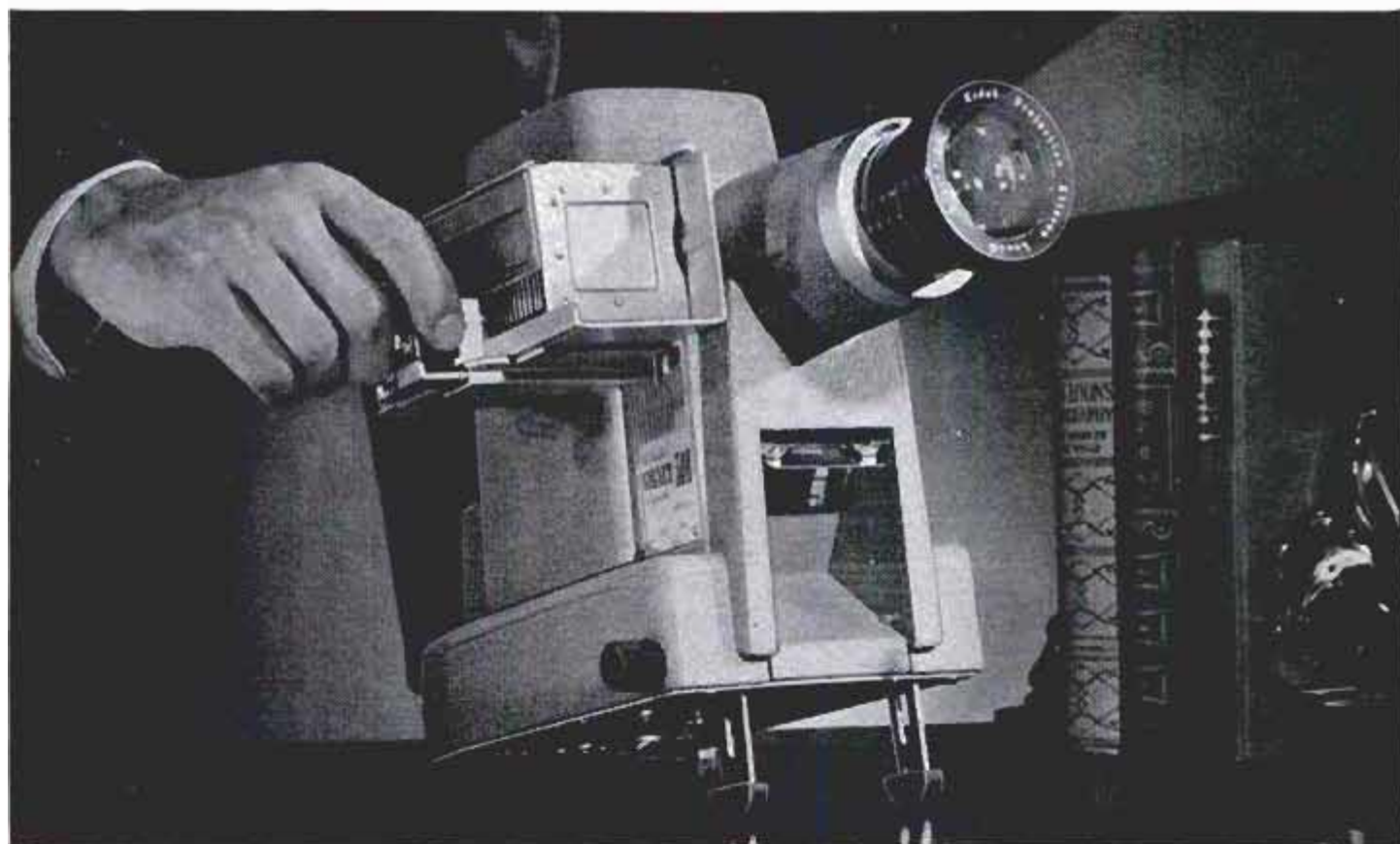
PREFINISHED HOLLOW-CORE PANELS consist of two sheets of tempered hardboard on wood core. Tongue-and-groove ends and edges aid assembly. Predrilled tongues speed installation with screw-type nails as indicated in detail. Panels are $\frac{3}{8}$ in. thick, come in 2 x 4-ft. and 2 x 8-ft. sizes

Marsh Wall Products, Inc., Dover, Ohio

PLASTIC SCREW ANCHORS can be used in any type wall, hollow or solid. In hollow wall, anchor body snaps apart and spreads to lock itself in place as in upper detail. In solid wall, anchor expands as indicated in lower detail. Ribs on outer surface prevent anchor from rotating when installed

Wall Plugs, Inc., 1216 W. 79th St., Chicago 20





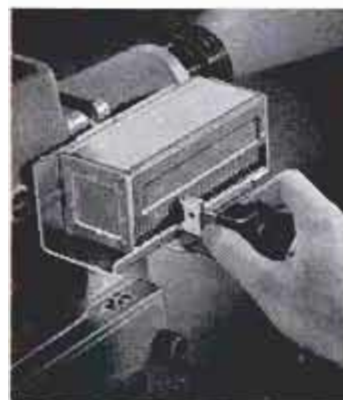
What makes a Kodaslide Signet an outstanding slide projector?



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That's easy. Top-quality performance. For the thrill of brilliant, big-screen slide projection, you can't beat a Kodaslide Signet Projector. A fine Ektanon Lumenized Lens, together with close-coupled condensers, is your assurance of sharp, bright images of highest color purity.

And thanks to a 6-way selection of models, your Kodak dealer can show you a Signet with the features you want . . . at the price you want to pay. Prices range from \$59.50 for a Signet 300 with $f/3.5$ lens and single-slide changer, to \$89.50 for the Signet 500 Projector with $f/2.8$ lens and automatic changer. (Signet 300 with automatic changer, shown above, \$69.50.)

Prices are list, include Federal Tax, and are subject to change without notice.

Eastman Kodak Company
Rochester 4, N. Y.

Kodak
TRADE MARK

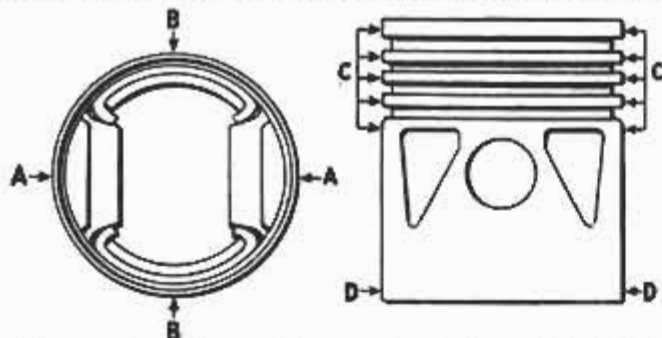
Care and Feeding of Engines



BY
S. P. CORP

CONCERNING PISTONS

The piston's job is to transfer the force of combustion into rotary motion through connecting rod and crankshaft. To do this, it must support the rings that seal combustion. Most pistons today are of aluminum alloy, to reduce the load on connecting rod bearing.



Diameter A should be .010" to .012" less than diameter B.

Diameter C should be .0005" to .0015" less than diameter D.

The piston is elliptical in shape to allow for expansion and to control side thrust on cylinder wall as piston gets hot in operation, when it becomes round. All pistons must be fitted to specifications, using a feeler gauge on the B dimension. The top is narrower than the bottom; always measure about 1/4" up from bottom.

When fitting new rings to old pistons, inspect to see that ring lands are square. A worn top land will prevent a new top ring from sealing properly. The Sealed Power GI-60 Insert is the best means of correcting this condition, permanently and economically.

CARBURETOR AIR LEAKS

A carburetor air leak may cause hard starting by making mixture too lean. To check, connect a vacuum gauge to intake manifold, removing air cleaner from carburetor and high tension wire from coil. Have someone step on starter. Place hand over carburetor so air can't enter. Gauge should show 12 to 14 inches of vacuum. If less, remove carburetor and repeat test with hand over intake manifold. If reading is still low, replace manifold gaskets. If second reading is above first, look for leaks in carburetor body or at throttle valve shaft. Check all gaskets—between air horn and float body, between float body and throttle body, and the main gasket at bottom of carburetor.

FREE BOOKLET FOR YOU

This illustrated booklet contains a world of valuable facts about car care. It's yours for the asking. And be sure to use Sealed Power KromeX Ring Sets when you re-ring—for easier starting, for greater oil economy, and for double ring life. Your dealer has them or can get them for you. Sealed Power, Dept. G-3, Muskegon, Michigan



Sealed Power

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.

Tile Over Linoleum

Q—The inlaid linoleum on my kitchen floor is about 30 years old and of course it is badly worn—appears to be cracking and breaking up in several places, in front of the range and sink especially. It has seemed to me practical to lay rubber tile over it. Certainly this procedure would save a lot of work. I'm told this is not advisable, but no one seems to know exactly why. The old linoleum was cemented to the wooden floor. Why can't I lay the tile right over it?

—Y. K., N. J.

A—You can. But we hesitate to recommend this procedure. Some tile cements tend to soften old linoleum. The added thickness of the new top floor may prevent doors from closing, especially if the floor is slightly uneven. Heavy fixtures, such as stoves and refrigerators, will cut quickly through the new tile due to the "softness" of the double floor. The new tile will wear more rapidly in heavily traveled areas due to lack of a solid underlayment. However, we do know of one homeowner who laid hardboard underlayment over old linoleum and then tiled the floor. So far as we know the job was satisfactory. But we still think it advisable to remove old linoleum before laying new covering.

Zoysia Grass

Q—What is Zoysia grass? I've heard about it from several sources, but want to know more specifically what it is, how it grows and where. Is it started from seed? How far north in the United States will it winter successfully? Will it withstand the wearing effects of normal foot travel in a manner equal to other common lawn grasses? Will it grow in moderate shade? Is there more than one variety?

—H. J., Md.

A—There are several varieties of Zoysia grass, but a newly developed hybrid, Emerald Zoysia, shows considerable promise of a wider adaptation.

(Continued to page 240)



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THE NEW Behr-cat[®] BRAND HANDY-GRIP DISPENSER ROLL

Now you can mask off those "non-painting" spots in a jiffy and get the clean-cut, professional-looking paint job you want! Behr-cat Masking Tape now comes packaged in a handy dispenser box...easy-to-grip and quick-to-use. A quick pull against the built-in cutter bar tears off the tape at the length you want. Save time with Behr-cat Masking Tape also in wrapping, sealing, holding and many other jobs around the house or shop.



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BEHR-MANNING
TROY, N. Y.
division of MORTON Company

Pressure-sensitive masking, strapping, freezer and many other tapes. Sandpaper, abrasive cloth and sharpening stones for home and industry.

(Continued from page 238)

However, its northern limits of successful growth in the United States have not yet been determined. Experiments have shown Emerald Zoysia to be a highly desirable lawn grass, fine-leaved, dense-growing, and of a uniformly dark-green color. Once the grass is well established, it is highly resistant to weed invasion. It is shade-tolerant and withstands foot travel exceptionally well. In the southern and southeastern states it remains green late into the fall. Emerald Zoysia is started in a manner similar to the method of starting bent grass, by means of what are known as sprigs. Summer is the generally accepted time for starting a new lawn. First, the soil should be tested and should it show more than ordinary acidity, lime must be applied to correct the condition. Also, if the test shows the soil to be deficient in plant food, a complete lawn fertilizer should be applied. Then the soil is worked into a well-compacted, finely pulverized bed and the sprigs spaced 6 in. in rows 6 in. apart, in other words, a 6-in. planting. Ordinarily the sprigs are set at an angle with one end 2 in. below the surface. The new planting must be well watered and weeds kept down during the first season.

Evergreens Die

Q—For two years I've tried without success to start evergreens along the front of my new home. They die out during the winter, both the high and low-growing types. I watered them regularly during the summer months but this didn't prevent loss. I also had them checked for red-spider infestation in the fall. What do you think is the cause?—D. S., Wis.



A—Even though you say you watered the new plantings regularly, we still believe that lack of water is the most likely cause. We'd suspect that the fill around the foundation may contain such inert materials as large stones, broken concrete, possibly gravel or sand and comparatively little compacted soil. If this is the case, then water applied to the area near the foundation walls would drain away to a low level in a comparatively short time, leaving the roots of the new plantings without sufficient moisture. Thus the value of watering just before the ground freezes is largely, if not entirely, lost. Evergreens will not ordinarily live through the winter if the root system freezes dry, as a certain amount of growth takes place throughout the cold months. We suggest that you investigate the character of the soil where the planting was made. This usually can be determined by trenching to a depth of 20 or 30 in. If you discover large stones, broken concrete and the like, this should be removed and fresh soil, preferably clay, substituted as fill. This done, it probably will be safe to go ahead with another planting. If the house has wide cornices, keep the plantings outside the line of the eaves. In addition to the probable cause outlined there are others, remote, but still possibilities. One is that the soil may somehow have been contaminated with crankcase drainings, fuel oil, or some other chemical that would "poison" the soil for a period of time, preventing normal growth of evergreens.

Masonry Bond

Q—In estimating a repair job my mason contractor stated that he would have to clean a portion of one wall with acid so that cement plaster would bond to it. What does he mean by "bond"?

—V. D., Mich.

A—Your description does not make it entirely clear just what is to be done, whether the wall is to be cleaned or etched by the acid. Ordinarily acid (generally a mild solution of muriatic acid) is used to etch the surface of smooth concrete (monolithic) walls, also floors. If the mason is referring to cleaning the wall he means that some surface coating, such as oil, grease or paint spatters, must be removed in order to obtain a surface to which the plaster will adhere.

Texaco Tips On Car Care



If one of your lamps burns out at night...

and there isn't a nearby station to replace it, put white reflecting tape across the lamp in a criss-cross position. By reflecting the rays of oncoming lights, it indicates the outline of your car. Carry a small quantity of this tape with you for such an emergency. Another good tip—be sure to keep your headlights clean. Surprisingly, a single day's accumulation of dirt may cut their effectiveness as much as 50 per cent.

If your car feels like this...

it's time for *Marfak* chassis lubrication. *Marfak* is what you get—always, at no extra cost—when you get your car lubricated by a Texaco Dealer. It's the famous lubricant that lasts for a thousand miles or more—delivers more miles of *cushiony*, comfortable driving. So forget rough going! Get *Marfak* chassis lubrication today. See your Texaco Dealer, the best friend your car has ever had!



MARFAK
Lubrication



TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America

THE
TEXAS
COMPANY

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE, on TV Saturday nights, NBC.
Metropolitan Opera radio broadcasts Saturday afternoons, ABC. See newspaper for time and station.

From attic gloom to extra room!



NOW YOU CAN TURN that waste space into a cozy extra room with Gold Bond Insulation Plank and Ceiling Tiles. Use them in your attic, basement, house extension, or anywhere. They'll keep you warmer in winter, cooler in summer, too!

COSTS LITTLE. Gold Bond Insulation Planks come ready to install . . . no painting or papering needed. Just nail or staple them in place. Special edges hide the fastenings. You can choose ivory or a blend of four harmonizing colors. The cost? Far less than you'd think possible!

FOR THE CEILING use Gold Bond Insulation Tiles. They absorb sound just like the Insulation Planks . . . perfect for a bedroom, add restful quiet to a den or game room.

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NATIONAL GYPSUM COMPANY Buffalo 2, N. Y.

FREE LITERATURE . . . Mail the coupon for Gold Bond Plan #14 . . . complete illustrated instructions that show how you can build a room just as attractive as this!



MAIL THIS COUPON TODAY!

National Gypsum Co., Dept. PM 36, Buffalo 2, N. Y.
Please send me Gold Bond "How-to-Do-It" Plan #14, giving complete instructions on how to apply Gold Bond Insulation Planks and Tiles.

Name _____

Address _____

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Model A on the Canal Beat

(Continued from page 155)

built the Jitney about the same but added more platform and beefed it up for handling greater loads. Mules were used to haul material through the canal, built in 1909, in the pre-T days.

Little trouble was encountered while cutting down the 1929 Model-A sedan to size. After a section of one rear axle was removed and the shortened axle welded, it broke. Better welding took care of that difficulty.

In short-coupling the A, the transmission was coupled directly to the differential, eliminating the drive shaft and torque tube.

Northcott says they choose a Model A because it was rugged and dependable, and added, "It just wouldn't be right to replace a Model T with anything but a Model A, would it?"

Plans have been formed in the back of Northcott's mind for a new ditch buggy when the Jitney reaches retirement age. His idea calls for a special frame, built to take two Jeep four-wheel-drive front axles. He'd whip the biggest problem—turning in the ditch—with this setup. The proposed car would have two steering wheels, each provided with a locking mechanism. You would just lock one set of wheels and drive as far as you wish. When a return trip is desired, you'd simply lock that steering system, unlock the other and drive home.

No mention of a motor to power Jitney II was made, but from the obvious nostalgic love for the four-jug Ford it seems a safe bet to say if there's a way of incorporating it into the new design, the motor will be a Model A. It should truly be a *Modern A*.

★ ★ ★

Silent Wrist Alarm



Instead of ringing, a wrist alarm for the hard of hearing "tingles" the wearer's arm. A special vibrating back does the trick. The 17-jewel watch, designed to wake a person in the morning and remind him of appointments during the day, has equal value for those

with normal hearing. It has luminous dial and hands, a stainless-steel back, antimagnetic movement and dual unbreakable mainsprings.

SOMETHING *NEW!*

**30% THINNER
TWICE AS STRONG
GRIPS LIKE A PIPE WRENCH**

CLEAN, SHARP
TEETH

FLUSH RIVET
NO PROJECTIONS

BOX JOINT ADJUSTABLE TO
4 POSITIONS UP TO 1½" CAPACITY

EXTRA THIN—ONLY ½"
AT THICKEST POINT

NON-SLIP CHECKERNUT
KNURLING

Crescent's No. P210 Utility Plier is completely new... revolutionary! It's not a "slip-joint" plier and not to be confused with conventional lap-joint "pump" pliers. Its *double-strong* box joint design is absolutely unique and assures a powerful grip like that of a pipe wrench without sideways twist or strain. It will grip flat, square, hex or round objects with powerful leverage.

QUICK, POSITIVE ADJUSTMENT

This cut-away view shows joint construction with its extra generous bearing surface at the arrow point. Adjustment is made by simply "walking" the rivet recess over the bearing point with a pumping action of the handles. Easy, positive, capable of heavy loads.

Handsomely finished in rust-resistant zinc plate. Overall length 9½ inches.

Sold by hardware dealers and industrial distributors everywhere.



CRESCENT TOOLS
Give Wings to Work

*Sign of the Artisan
Symbol of Excellence*

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by **CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK**

"IT COULD ONLY BE A
Shakespeare
WONDEROD"

THE
STRAIGHT-FIBER
GLASS ROD WITH
THE SPIRAL
MARKINGS



*Feel the
Difference!*

Only Shakespeare, using the patented Howald Process, laminates thousands of parallel glass fibers compactly, under tension, so they run *straight and continuous* from butt to tip—for strength! No crisscrossed or ground-off strands.

ACTION Built-in Wonderod has the slimmest-strongest tip possible... vibrant and lively, for "catapult-action" casting; responsive, to work the bait.

POWER Built-in Here is "backbone" that lets the rod do the work. Springy glass fibers cast for you—and stand the gaff to fight the fish.

ACCURACY Built-in The faster, more responsive tip unerringly puts lure or bait where you aim. No wishy-washy sway. You cast more accurately!

No. 1266 SPIN-WONDEROD

You'll feel the difference the moment you pick up this beauty. White rod, dressy winds, Carboloy top. Choice of light action or medium action; lengths, 6'6" or 7'... **\$2250**



No. 1266

Free! NEW 1956 "TIPS and TACKLE" BOOK-PAK WITH POCKET FISHING CALENDAR

Catch more fish! These 4 new books show ways to fish, where to find 'em, tackle for:

SPINNING • BAIT CASTING
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Dept. PM-3, Kalamazoo, Michigan.

Please send, FREE, new 1956 "TIPS and TACKLE" booklets and Joe Godfrey pocket fishing calendar.

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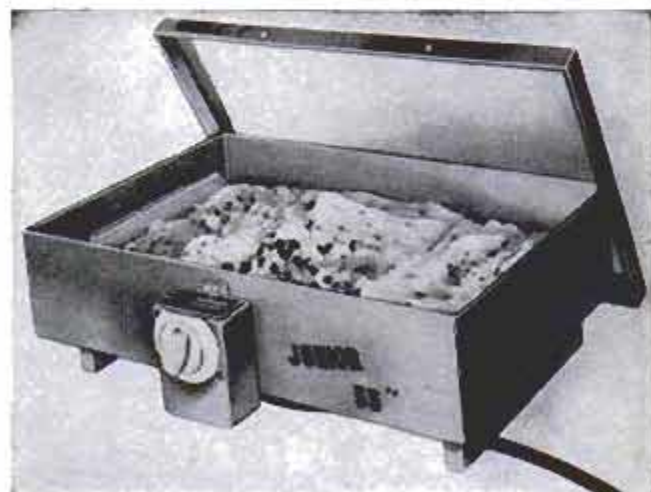


Shadow Box for Medals

Heirlooms and war medals can be displayed in a new plastic shadow box. The unit has no clamps or screws, but clips together by simple hand pressure. Glass protects the enclosed keepsake and the velvet cushion on which it rests. The shadow box can be hung vertically or horizontally, and is made in black plastic and red velvet or ivory plastic and blue velvet.

Seed Germinator

Farmers and gardeners can test the germination of plant seed with a small, electrically heated unit. Made almost entirely of aluminum, it has a sturdy glass observation top, sensitive heat controls and a moisture system. Tests closely simulating actual soil conditions and temperatures can be made in a short time.



GRAVELY

More for your Money!



GRAVELY MAKES TOUGH JOBS EASY!

Gravely does jobs other tractors won't . . . because Gravely has that *extra* power you need for the tougher mowing, gardening, field and farm jobs. Does a better job, even on *steep slopes!*

You get *more* when you get Gravely. All-gear drive, power reverse, simple operation. More traction from easy-handled, *balanced* weight.

NEW FOR 1956

An optional ELECTRIC STARTER . . . push-button power! A new STEERING SULKY for finger-tip handling of your Gravely . . . a small dozer blade . . . and tractor improvements for MORE value . . . new cooling system, chrome rings, engine improvements for *more* power . . . see the improved Gravely!

- ALL-GEAR DRIVE
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- Power Attachments Securely Mounted by Only 4 Bolts



5-HP

SINCE
1922

PLUS . . . 23 JOB-RIGHT TOOLS!

Your choice of 23 tools for a versatile tractor that saves time, work and worry *all year long*. Tools to do every mowing, gardening, field and farm job.

Send coupon today for "Power vs. Drudgery", the big booklet that shows how Gravely equipment solves your upkeep and gardening problems . . . *faster, easier, better!* (EASY PAY PLAN, TOO!)

GRAVELY TRACTORS, INC.
BOX 363 DUNBAR, W. VA.

Please send me "Power vs. Drudgery" Booklet and dealer's name.

NAME _____

ADDRESS _____

CITY _____ STATE _____



Guided Missiles Go to Sea

(Continued from page 136)

The need for guided missiles became brutally apparent at Leyte Gulf, when the first "Divine Wind" pilots crashed their kamikazes into our ships. The research program, thrown into top gear at that time, just now is grinding out usable missiles for the Fleet. There is the Sparrow missile, for launching from airplanes against aerial targets. There's Regulus, a surface-to-surface missile that increases the striking range against enemy ships from thousands of yards to hundreds of miles. There's the Petrel, an air-to-surface guided missile. And there's Terrier, the deadly surface-to-air weapon that spark-plugs *Boston's* and *Canberra's* challenge to aerial attackers of the Fleet.

This slim, needle-nosed missile, designed for ranges that would make a conventional gun curl up and die, and effective in fog or blackest night, first flamed into life from the seared decks of the *USS Norton Sound*, the Navy's guided-missile test ship, in late 1951. Countless firings since that first tentative flight have brought the precocious infant to swift maturity. Most of the test firings have been made without the explosive warhead, but with a device to signal a "kill" by releasing a puff of smoke near

the target plane. Even without warheads, Terrier has smashed many target drone aircraft by direct collision. Today it is a rugged and tested weapon, ready to take its place in the battle line.

Enemy Found Electronically

When the searching radars pick up unknown planes far over the horizon, the signal instantly flashes to Missile Control. Outdated and forgotten is the colorful "Bogey at three o'clock!" lingo of the last war. Instead the news travels electronically by instruments of unbelievable speed and complexity, and the unknown target is located and classified by the control radar without a word being spoken. The circuit closes—and in a flash a deadly missile roars off into the radar's beam.

Unaided, a rocket starts very sluggishly. But Terrier needs a fast start, because its stubby airfoils can't control it at low speeds. So the designers tie a "can" to its tail—a booster propelled by a slow-burning explosive, which gives a tremendous initial push and drops off exhausted. As it falls away, Terrier's rocket motor brings the speed up swiftly to its supersonic cruising speed and it streaks out toward the target.

The problems of designing guided missiles are staggering. Accelerations in
(Continued to page 248)

IT SMELLS GRAND



FRESH AND FRAGRANT AS A
NORTH WOODS BREEZE

IT PACKS RIGHT



CUT JUST RIGHT TO PACK WITH EASE

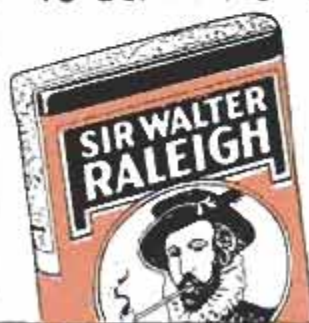
IT SMOKES SWEET



COOL AND SMOOTH—IT'S SURE TO PLEASE

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE
KENTUCKY BURLEYS IS EXTRA-AGED
TO GUARD AGAINST TONGUE BITE.



FREE!

24-PAGE BOOKLET ON
PIPE CARE. JUST WRITE
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DEPT. G6, LOUISVILLE, KY.

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DIFFERENT BRANDS OF SANDERS TO CHOOSE FROM

14 13 12 11 10 9 8 7 6 5 4 3 2 1
15

WHICH IS THE BEST SANDER FOR YOU ... ?

Professionals claim it's the sanding pad motion that counts in surface removal. Today's army of over 22 sanders use 1 of 4 different "motions"! Which motion will do that sanding job *best* in your home *away* from advertising claims and salesmen? We say exclusive Syncro MULTI-MOTION will *BECAUSE*—most wood grain being naturally crooked and irregular—only Syncro "Multi-Motion" sanding pad action *can* sand *with* such grain and completely *finish* the *whole* surface! See for yourself—accept our sporting offer shown below—and get your *next* home sanding job done *without* having to buy *any* sander!

* Maybe More Any Day!



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"No—My Sander is Better!"
"Don't Believe Their Claims!"
"Ours Sands Perfectly!"
"X-Sander is Cheaper and Better!"

RENT—TRY THIS SANDER ON YOUR OWN JOB... RETURN FOR PROMPT RENT FEE REFUND... OR BUY IF IT SATISFIES YOU!



SEND NO MONEY

DO THIS: (1) Send coupon, your tool dealer name, address—we'll ship No. 900 Sander, Sanding Handbook, Sandpapers to you. (2) Pay postman \$20 (10 days rental fee), COD fee, postage charge, on arrival. (3) Use sander 10 days, return it prepaid—we'll refund your \$20 promptly. (4) To buy it, pay dealer (named on coupon) balance of \$19.95. Send us *receipt of purchase* from dealer, we'll ship you \$3 worth of sandpapers as our Gift!

Free

OF EXTRA COST

In addition to the Free Sandpaper included with your Rental 900 Sander, if you buy sander after trying on this offer—send us receipt of purchase from dealer, we'll ship you \$3 worth of sandpaper FREE.



"900" SANDER FACTS

Outlasts and outsands others. Jump-Free. Easiest of all to use. Exclusive Multi-Motion sanding pad action. Heavy-duty. Guaranteed against burn-out during rental use and ownership. Full 6 months Warranty. Retail Price only \$39.95.

OFFER ENDS JULY 1, 1956

TO: SYNCRO CORPORATION
Dept. 1-36, Oxford, Michigan, U.S.A.

Send me Syncro #900 Sander COD on 10 Day Rent Fee Refunded Offer. Within 10 days after Rental Period I may either (1) return Sander prepaid to factory only (Syncro Corporation, Oxford, Mich.) for prompt \$20 refund. Or (2) I may pay dealer direct (named below) balance of \$19.95 and I will own Sander. Offer ends July 1, 1956.

Name of Hardware Store or Tool Dealer: _____

ADDRESS _____

MY NAME _____

ST. & NO. _____

CITY _____ ZONE _____ STATE _____

(Offer Good Only In Continental U.S.A.)

DEALERS WRITE!

Dealers write on letterhead for complete Rental Sander details... for entirely different store-operated "Rent or Buy" Plan that can increase sander sales 60% at Full Dealer Profits!

Don't buy before you try

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SYNCRO POWER UNITS
GUARANTEED
AGAINST BURN-OUT DURING
YOUR OWNERSHIP OR
REPLACED FREE!

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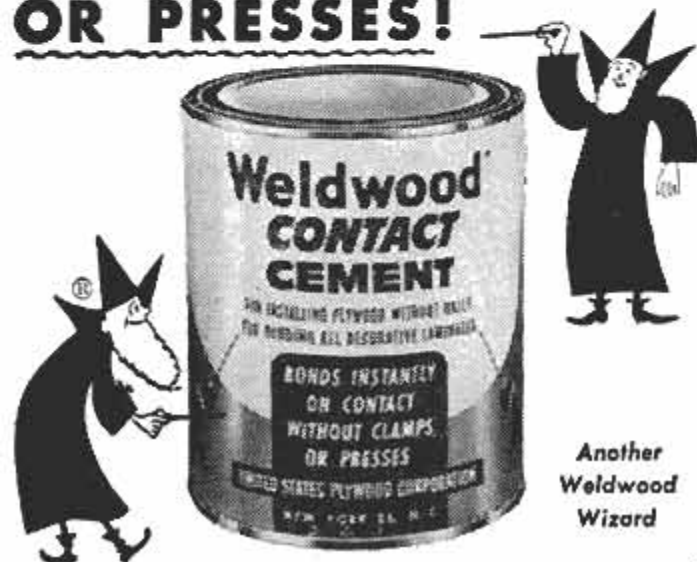


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Makes it a cinch to
DO-IT-YOURSELF



**NOW! APPLY MICARTA
or other Plastic Surfacing
WITHOUT CLAMPS
OR PRESSES!**



Another
Weldwood
Wizard

**Use amazing new Weldwood®
Contact Cement! Bonds instantly...
permanently on contact! Makes it
easy to modernize table tops, kit-
chen counters, bathroom surfaces!**

Weldwood Contact Cement works like magic! No need for clamps or presses. Just apply... let dry... then bring laminate and surface together! Instantly you get a permanent bond!

PUT UP PLYWOOD WITHOUT NAILS! Do it yourself with Weldwood Contact Cement. Revolutionary new method—faster, easier. No nail holes to spoil finished surfaces!

1001 JOBS MADE EASIER around home, shop, garage. Weldwood Contact Cement bonds any combination of wood, glass, leather, paper, cloth, Fiberglas® and metal (including do-it-yourself aluminum).

In tubes, bottles, cans. 25¢, 35¢, 60¢ and larger sizes at hardware, paint and lumber dealers and variety stores. Mail coupon for leaflet!

United States Plywood Corporation

Box 525, New York 46

PM 3-6

Please send me information on Weldwood Contact Cement.

Name _____

Address _____

City _____ Zone _____ State _____

launching impose brutal shocks on delicate control gear. The tremendous flight speed produces, in addition to the heat from the inner works, external heating from skin friction. At speeds of Mach 2 or 3, dust particles or even raindrops can chew up materials normally proof against such trifling obstacles. The maintenance problems are no less rugged—elaborate schooling and practical training are necessary for the missile teams. A two-year draftee has little place in a missile organization.

The gadgetry in some of our missiles would turn Rube Goldberg green with envy. Missiles can do celestial navigation, using star-tracking telescopes that activate "educated" photocells or can steer by measuring the earth's magnetic currents. Some "smell out" the target by radar, by measuring its heat emission, or by sensing its electromagnetic activity. Some even rival CBS—they scan the target and send a TV picture back to the launching point, where the bombardier can watch the screen and guide the missile into the target.

How accurate are these new weapons? Are they dependable enough to hit the targets time after time? Those who are in a position to know answer with studied vagueness: "We think all we can say is that we are not going to shoot any until they are accurate enough to deliver the payload with a fair probability into the target area." When you couple that with the fact that we're shooting Terrier now, it turns out to be a pretty reassuring reply.

War Veterans Join the Act

Boston and *Canberra* both are war veterans. The latter, named for the gallant Australian cruiser which went down at Savo Island, herself took a torpedo, but lived to fight again. Awakened from the torpor of moth balls, they were towed from the West Coast around to New York Shipbuilding Company's Camden yard to be ripped apart in the most complete conversion a ship could undergo.

Our streamlined task forces in any future war will have the elusiveness of a bantam and the Sunday punch of a heavyweight. When the bell sounds, chances are they'll already be far at sea, carrying the fight into the enemy's corner and smothering him with blows he never saw coming. The Fleet's task is threefold: Maintain control of the seas so convoys keep moving, support amphibious landings, and deliver the nuclear weapon on enemy strong points. For each of these jobs, the versatile task force gets the nod.

Star of the act, the queen bee surrounded by her fierce fighters, is the supercarrier;

(Continued to page 250)

NO MATTER WHAT YOUR JOB
Friedman-Shelby HAS A WORK SHOE
 THAT WILL FIT IT TO A "T"



Your particular trade calls for a particular shoe to give the best service. That's where your Friedman-Shelby dealer is ready to serve you. He has the perfect shoe to fit your job . . . and fit your feet, too!



No. 8053
 Brown glove; leather lined; lace-to-toe; Boltan sweat-resistant insole; Vulcork sole and heel. For Roofers, Riggers, Carpenters, Painters.



No. 8047
 Brown glove; cushioned insole; brown neo-cork (oil resistant) sole and heel. For Truckers, Meat Packers, Mechanics, etc.



No. 8022
 Black glove blucher oxford; cushioned insole; black neo-cork (oil resistant) sole and heel. For Filling Station Operators, Machinists, Factory Workers, Postal Workers.

For finer dress shoes ask for JOHN C. ROBERTS and KINGSWAY

Friedman-Shelby DIVISION • INTERNATIONAL SHOE COMPANY • ST. LOUIS 3, MISSOURI

and dispersed around her are the screening ships who stand ready, like the fighter bees, to sacrifice themselves in her defense. The rangy destroyers, aided by helicopters with "dunking" sonars, probe the waters for lurking subs. The radar pickets out on the flanks peer aloft, endlessly searching the fathomless skies. And the missile cruisers, proudly bearing their brave new weapons, stand ready to strike down the marauders who attack from the air.

One gnawing worry creeps occasionally into the bull sessions of these missile teams as they pause for coffee—what would happen if the enemy should manage to slide a missile of his own down their radar beam? The practical problems of doing this are well-nigh insuperable, but still. . . .

The opinions and assertions contained herein are those of the author, and do not necessarily reflect the views of the Navy Department or the naval service at large. ★ ★ ★

Louvered Sunglasses Use No Glass

Louverlike slats replace glass in a new type of sunglasses. The slats shield the eyes from sunlight but do not darken the user's field of vision. Both frames and slats

are made of lightweight plastic in a variety of colors. In seconds, one set of slats can be removed from the frames and another inserted to harmonize with a change in dress or sports costume. Available are 21 different color combinations.



The boat to take on any lake



If you plan to own a boat or rent a boat...take an Aluma Craft, everytime. Always dry, always ready...always fast, always steady...there's no boat quite like an Aluma Craft. Erich Swenson designs assure top performance, top speeds, seaworthiness, stability. If you rent your boats—look for the man with a fleet of Aluma Craft. If you want your own, see your dealer or write for nearest dealer's name. Aluma Craft may be purchased on easy terms.



Send for free full color catalog with complete specifications.

ALUMA CRAFT BOAT COMPANY

2625 27th Avenue South ★ Minneapolis, Minnesota

DO IT BETTER
DO IT WITH DP



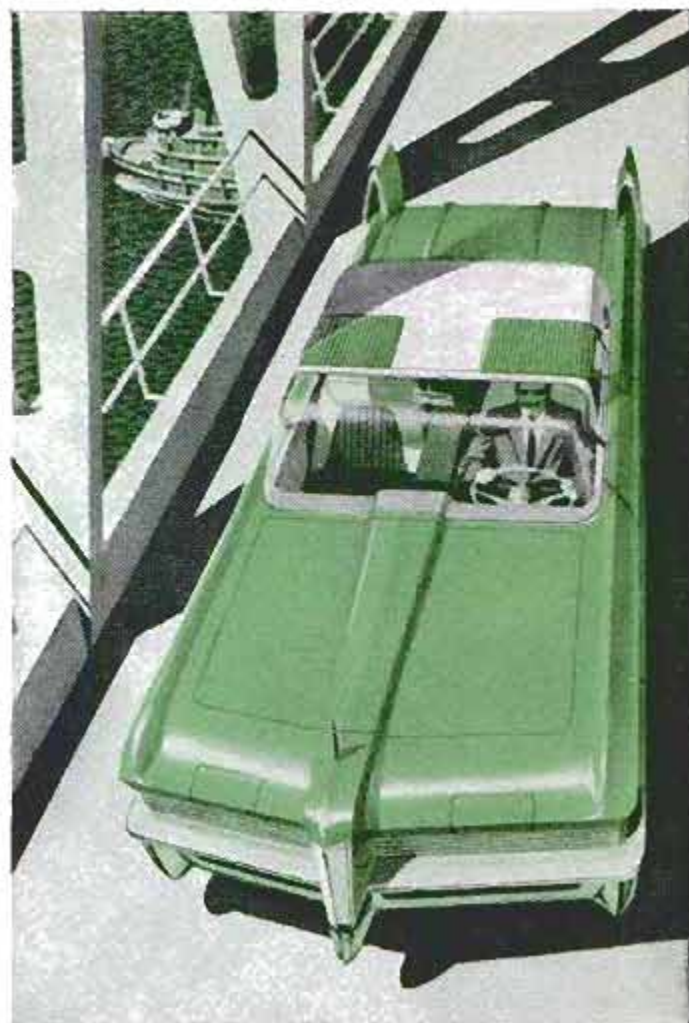
GLAZE
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 SEAL
 PATCH

Don't putter around with just any putty! Take the trouble to specify **D-P Putty** . . . you'll get the best. And, for **Glazing Compound** (that won't dry out or harden in the container) . . . it's **D-P** . . . quick, easy, economical to use for a smooth, permanent, elastic seal between glass and sash. Always look for the **D-P** trade mark, at all good stores!

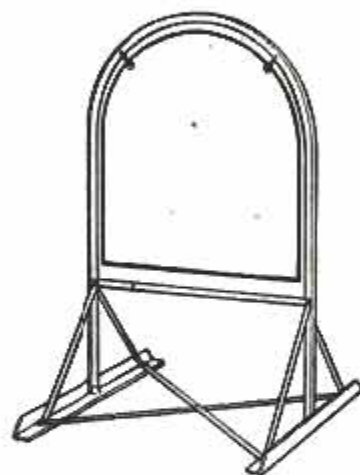
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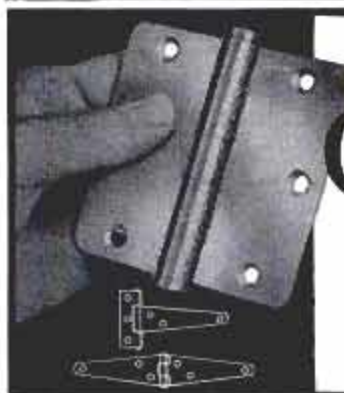


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 America's finest tractor. Ruggedly built. Easy to operate. 790 lbs. Borg-Warner clutch, trans. and diff 140 to 1 reduction. 40% more drawbar pull than ordinary tractors 8-1/4 H.P. engine. 20 quick change implements. HOOD, FENDERS.

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TOOL CHEST FOR YOUR HOME WORKSHOP



This may be the lowest cost full-sized chest in America! 4 sliding drawers in blue-gray rugged steel cabinet. 26" x 12 1/2" x 12 1/4". Free bulletin describes this and 12 other models!

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A small
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Why All These Hurricanes?

(Continued from page 110)

and \$1,000,000,000 worth of property. Diane had come close on the heels of Connie, who tore up much the same path, pushing tides over land and strewing wreckage before her winds. And after Diane came Ione.

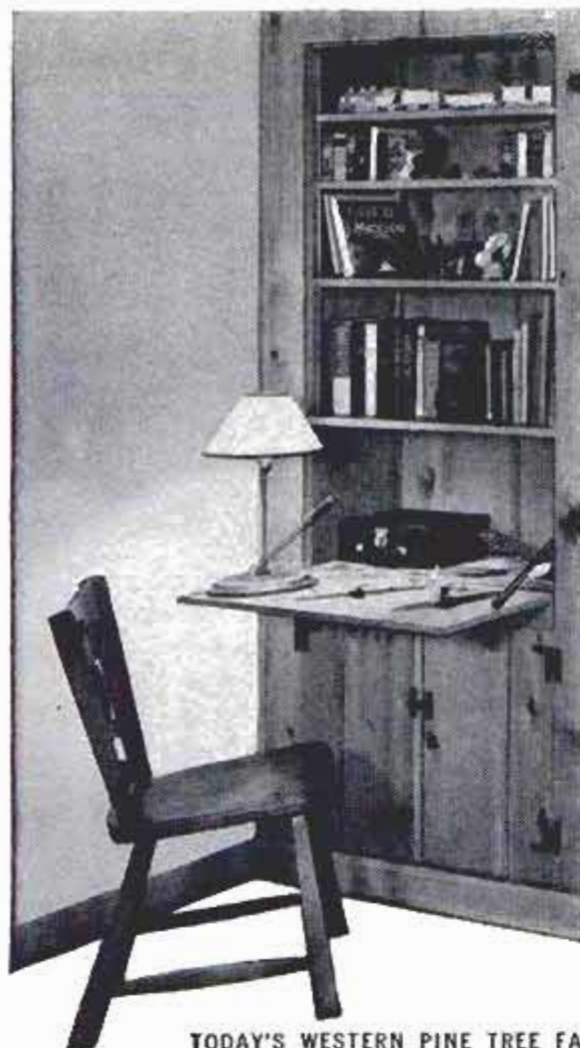
These, on top of '54 hurricanes Carol, Edna and Hazel, which battered New England to a billion-dollar pulp, are an indication to some weathermen that East Coast hurricanes are no longer freaks. Philadelphians, New Yorkers and Bostonians, who never noticed news items about a hurricane brewing unless they owned Florida real estate, now twitch visibly when the announcer reports a "disturbance 800 miles east of Guadaloupe." Since 1938, storms that used to spend themselves at sea are smashing inland with increasing regularity, until they've now hit a rate of two or three a year. Whether it is a cycle or a permanent trend, experts won't say.

Why is it happening? Meteorologists aren't sure. Some suspect a shift of jet streams is responsible. These rivers of polar air, 25 miles wide and a half mile deep, travel 300 miles per hour across the skies at 40,000 feet. Until recently, one curved out over the Atlantic well beyond Long Island and down across the Caribbean. Since the 1930s, that stream has shifted steadily inland. No one knows why. But some weathermen believe its new position may have something to do with warmer eastern winters—and the change in hurricane routes. Another theory is that a vast new high-pressure area that has drifted in and squatted on the North Atlantic may be acting as a hurricane road block, forcing the big storms inland.

Many schemes for throwing the switch on New England-bound hurricanes have been suggested. One involves saturating the ocean under the storm with oil, making a huge slick to simulate rolling landscape. The delicately balanced air currents of hurricanes break up when crossing land. By creating land effects at sea, sponsors of the plan hope to fool the hurricane and disperse it before it comes ashore. Another idea is to "over seed" hurricane clouds. Usually, rainmakers spray just enough particles to make raindrops form and fall earthward. By overseeding a hurricane, some think no single seed could gather enough moisture to fall. Hence, rain would stop, the storm's balance would be destroyed and the show would be over. The most drastic suggestion is to blow up the storms with atom bombs.

Cautious weathermen view all these

(Continued to page 254)



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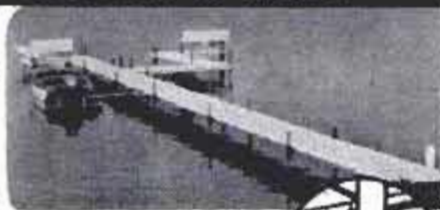


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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

ideas with jaundiced eye. The vastness of a hurricane involves forces so tremendous that even atom bombs seem like pinpricks. A full-blown storm may cover an area the size of Georgia. It all begins, meteorologists now believe, when two huge masses of air in the easterly trade winds converge on the edge of the doldrums. The wedge of warm, moisture-laden Caribbean air between them is squeezed and forced upward 40,000 feet against the frigid jet stream sweeping down from the Arctic. Moisture, wrung from the Caribbean air by condensation, pours down rain, whipping the seas into myriad squalls that slowly join and swell into a single circulation. "For every gram of rain produced," explains William Haggard, research meteorologist at the Washington, D. C., forecast office, "600 calories of heat are released. The earth's rotation starts spinning the massive circulation of complex air currents—clockwise south of the equator, counterclockwise north of it. The released heat energy roars in to help push it faster and build cyclonic action, until winds swirling around the open core, or eye, reach a howling 150 to 200 miles per hour, with gales extending as far out as 300 miles from the center."

Into the vortex of the huge doughnut-shaped storm, 2,000,000,000 gallons of water may be sucked and flung skyward in a single day. "Once under way," says Haggard, "a mature hurricane is a thundering, self-perpetuating thermodynamic engine generating up to five trillion horsepower—the equal of 500 atom bombs. That's more than we've fired in this country so far. We're not likely to break up or stop such Gargantuan forces even with atom bombs which, incidentally, would pose a serious fall-out problem, even if they worked."

The answer, according to such top meteorologists as R. H. Simpson, special assistant to the bureau's chief, is forecasting. "With proper warning, people can be evacuated from danger areas," he points out. "Buildings and property can be secured. Ships can be detoured. Small boats can be hauled ashore and lashed down to prevent damage—like the \$20,000,000 worth of such craft that were smashed by 1954's hurricanes. If people know where the storm's headed, vast sums can be saved, too, by preventing needless preparation in areas it won't hit."

So, like DEW Line's far-flung radar net, providing early warning of any plane that has no business here, the hurricane-radar net will put the electronic eye on any cyclonic storm approaching within 200 to 300 miles of the coast. Weathermen won't

(Continued to page 256)



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depend on radar alone, however. Advance information from the net will be evaluated along with data from many other sources. With all the pieces fitted, each community the storm is destined to touch will be "alerted" 48 hours in advance. If the hurricane stays on course, the bureau will wave the red flag, or "warning," for each doomed community 24 hours ahead of the wind. That one means she's definitely coming through.

Here's how the over-all hurricane net works: Map makers toiling over the day's charts in the San Juan weather office are busily plotting wind and barometer readings broadcast every six hours by hundreds of ships and planes crossing the Caribbean. Suddenly a few reports drawn into the map show two odd things: 1. There's a faint westerly breeze smack in the middle of the easterly trade winds 300 miles southeast of Puerto Rico; 2. Over the same area a small hump, or wave, appears in the smooth-flowing isobar lines (contour lines of equal barometric pressure you've seen on weather maps). Weathermen call this an "easterly wave." Accompanied by that westerly breeze, it can mean only one thing: A huge eddy in the trade winds.

Fresh reports of troubled weather in the same region remove any doubts that this is a "suspicious area." So, at the Navy's San Juan base, a hurricane-hunter pilot climbs into his gear and heads out in a storm-reconnaissance plane to scout the area. Roller-coastering his plane through a mass of murky clouds and horrendous winds that twist, torture and toss it about like a leaf in an autumn gale, he knives the storm at various altitudes and radios the bad news back to San Juan: "Well-defined circulation at longitude 62°48'; latitude 15°1'; open to southwest; maximum wind 45 miles per hour in northeast sector."

There's a bustle at San Juan, and out over the circuit to Miami goes "Advisory No. 1 Zobelina, a tropical storm located by reconnaissance aircraft." It contains all available information about the storm.

Every six hours from now on, hurricane squadrons of Navy and Air Force ride through the storm out of San Juan (later out of Miami, Jacksonville, Bermuda and northern bases) as Zobelina moves up her course.

Buffeted and battered, they fly around the whirling monster to get wind forces and direction in all sectors up to 18,000 feet. Lashed to seats, crews catch their breath as the planes are tossed, or dropped, 1000 feet at a clip while they penetrate the storm to get a center fix on the "eye." After each flight, an advisory is sent out. Many

(Continued to page 258)

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1964

hurricanes have reached advisory 40 or 45 before they finally blew themselves out over Nova Scotia.

As these reports fly over radio and land line nets to Florida, Miami forecasters make up maps, adding data from ships, planes and ground observers throughout the Caribbean. Bulletins on Zobelgia go out on a special hurricane net to some 75 weather stations up and down the coast.

One of four coastal "forecast centers" in the hurricane belt, Miami Weather Bureau, under veteran meteorologist Gordon Dunn, operates much like a filter center in Civil Defense. Weather reports flutter in from everywhere on a "paper snowstorm" of radio, Teletype and telephone dispatches. Out of the mess rises a vast picture of all United States weather south of Hatteras and east of Florida. Hence, as Zobelgia moves in and booms up the coast, all reports on her from the hurricane hunters, ships, planes, ground observers—and hurricane-radar stations as well—will filter through Miami until she passes Hatteras. Then, Washington, D. C., Forecast Center takes over until the hurricane gets to Block Island, off New York. Above this point, bulletins come from the forecast center in Boston. For Gulf cyclones, a big weather center in New Orleans issues the official word.

All this is why, when Zobelgia creeps over the scope rim on Adm. William Freseman's powerful 750,000-watt weather-radar set in Coral Gables, the word you get does not come from him. What he sees is flashed over land line to Dunn's forecast center, evaluated with all other weather data, and Dunn's forecast is the "hurricane bulletin" you'll read in the paper.

Freseman, retired Navy admiral, operates the southernmost radar in the East Coast hurricane net. On loan from the Navy, the 300-mile-range set is operated by the University of Miami and is one of many privately owned stations currently helping to fill gaps in the weather fence. As Zobelgia spins slowly across the grid of the big plot tube, movie cameras whir, recording her every move. The gleaming banks of powerful transmitters hum and whistle, and 11,000 volts spit crackling blue charges across the arcs. Hunched over the scope with slide rules, radar meteorologists plot Zobelgia's speed, size, direction, location of eye, force of her winds and mass of her rain. Communication lines to Miami Weather hum with their findings.

As she moves northward out of range, the whirling storm will be passed from station to station up the coast. As she drifts off the limits of Coral Gable's set, she

(Continued to page 260)

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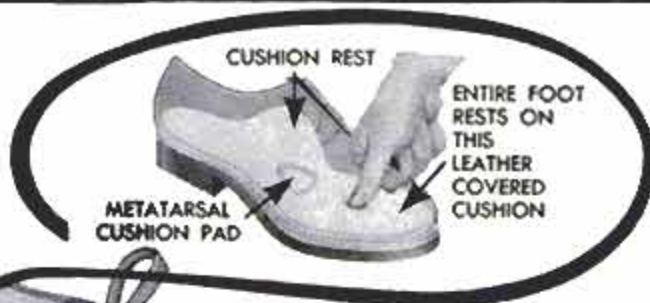
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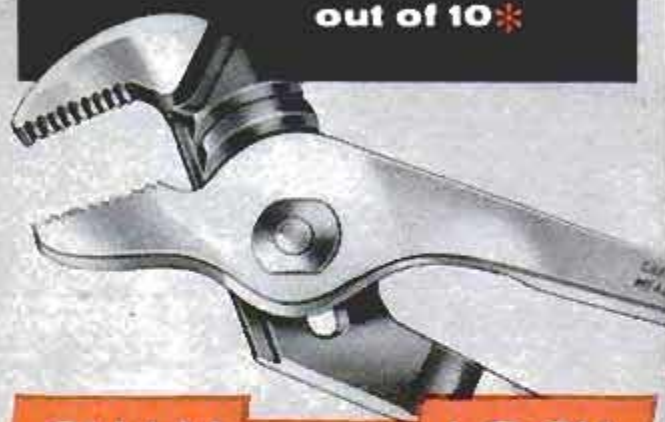
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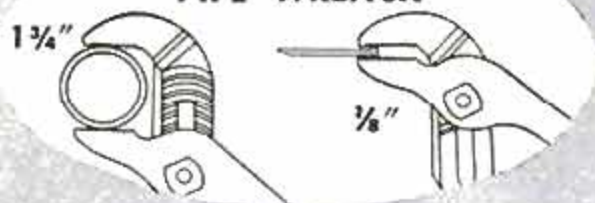


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CHAMPION DEPARTMENT TOOL Co. MEADVILLE, PA.

probably will creep into view on the next scope on the University of Florida's radar at Gainesville. Here, Marinus Latour and Nelson Rosier, with their crew of three student assistants, are all set for a stretch of duty. "If a storm looks promising," says Latour, "we fill the food locker, bring cots and blankets and set up relief schedules. We check the toolbox for spare parts and ammeters. An extra phone goes in. All the brass shows up to watch the scopes from behind the barrier."

Operating since 1949, Florida University's towering transmitter is one of the oldest weather-radar stations in the net, and the boys have had experience. During the famous 1949 Cedar Key storm that corkscrewed all over Florida, the crew ran an unbroken watch for 35 hours.

Life in a weather-radar shack at the height of a storm is never a picnic. Frequently the eye of a howler will pass right over the transmitter, and 150-mile winds will batter everything to a shambles. A Gulf hurricane that moved square across the station at Freeport, Tex., in 1949, blew winds so powerful the antenna couldn't move against them and the radar had to go off the air. During a 1950 whopper over Florida, winds tore a chunk of the roof from the Florida University shack. "There were three inches of water in the transmitter room," recalls Latour. "Rosier put raincoats over the equipment and worked like a demon to keep us on the air. Slopping around with high voltage leaking all around him, he finally had to quit and build tents over everything. We went back into operation an hour later. Besides all that, the anemometer atop the tower tore apart. Rosier climbed the 200-foot structure, lashed himself to it while 100-mile gales tore at him, and repaired the thing."

If hurricanes would start out on a course and follow it decently, the new radar network would very nearly solve the problem of these destructive storms. Unfortunately they don't. The Cedar Key storm is a great example of how unpredictable a hurricane can be. Born in the Gulf, it wandered aimlessly up toward the Gulf states. Then suddenly it veered and boomed into Florida, whammed across the little town of Cedar Key, stopped, described a complete loop, came back and hit Cedar Key again. There it sat, for 24 hours solid, whirling the town away in a devastating maelstrom of flying splinters and wreckage. Wandering on back to the Gulf, it described a few more loops and staggered away over the Gulf states to die.

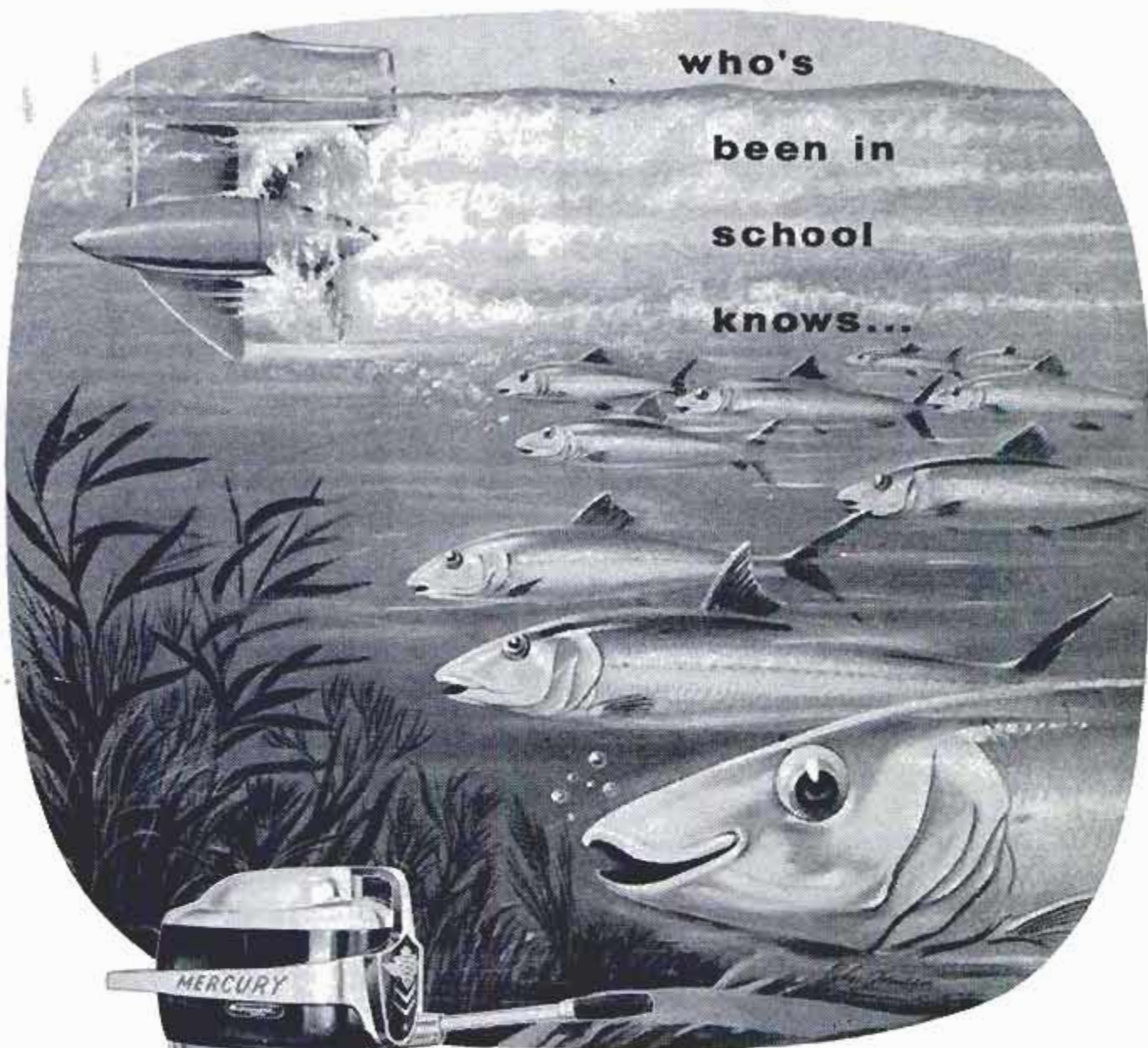
Weathermen are the first to admit they know little about the big storms. But

(Continued to page 262)



most
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who's
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knows...



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Nicholson 8" Handy File: double-cut side for fast metal removal; single-cut side for finishing. Ideal for aluminum and for wood, metal, plastic. **Not shown: 6" Half Round File,** for removing burrs inside aluminum tubing after cutting.

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NICHOLSON FILE COMPANY
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*T. M. Reynolds Metals Co.



they're about to find out some secrets. Under a stepped-up research program, lots of things will be happening.

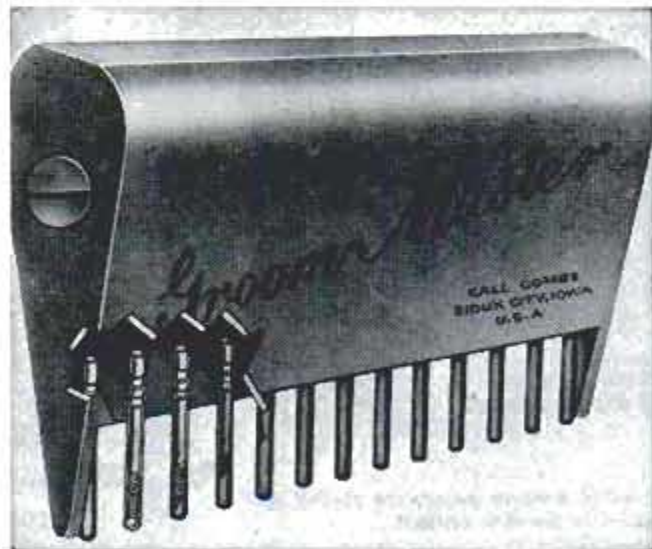
From island stations in the Caribbean next year, "boomerang" rockets will roar up 250,000 feet through hurricanes, with movie cameras grinding away in the nose to record everything they see. "The pictures will be studied by forecasters to learn more about hurricane structure and improve forecasting techniques," explains R. H. Simpson. The picture-taking missiles, designed to fall within a mile of launching site, will be tracked during the journey.

More planes with Navy and Air Force hurricane hunters will penetrate each storm, investigating the complex air currents at a wide variety of levels. While two tabulate data for the usual forecast purposes, a third will be bouncing around on a wild but revealing research mission.

Meanwhile, at Princeton's Laboratory for Advanced Research, the hum of a huge electronic brain will be gulping figures and data from thousands of observations, trying to discover if there are any constant factors about the most inconstant science known to man. If there are, meteorologists will be well on their way toward doing something about the weather in general, and hurricanes in particular. ★ ★ ★

Comb Applies Hair Tonic Through Ball-Point Teeth

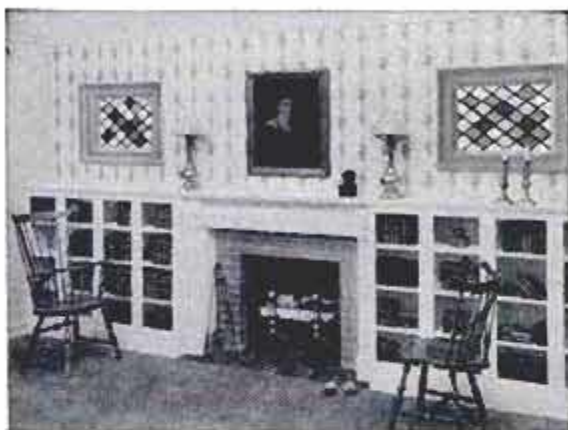
Tonic is applied directly to the scalp with a comb that feeds fluid from a reservoir through hollow teeth like ball-point pens. Used to apply medication to human scalps without moistening the hair, it is also useful when grooming pets. Flea and mange medicine can be applied under the fur where it will do the most good. The comb has a 1½-ounce plastic reservoir, chrome teeth, bronze springs in the teeth and metal ball points.





See what Weldwood V-Plank can do! Warm cherry transformed the drab scene (below) into this picture-book family room. And all the V-Plank shown, including facing those practical built-ins, costs only \$105.

See how you and wood panels can make a room lie about its age



Before Weldwood, here's what this fireplace wall of a 35-year-old house looked like.

Here's a 1920 living room with 1956 ideas. Look how Weldwood Cherry V-Plank panels helped make it warm, cheerful and more livable. New built-ins tell you this is a room for *today's* living. At right: a handy desk-bookcase unit. At left: a neat nook for kindling and logs, plus a home entertainment center.

You and Weldwood paneling can do the same in your home. See pre-finished V-Plank and other paneling at your lumber dealer's, or at any of our 87 offices in principal cities. Or send coupon for booklets.

Choose from 6 fine woods in Weldwood V-Plank*: walnut, \$85; Korina®, \$79; mahogany, \$79; Samara*, \$52; cherry, \$79; prices are for a wall 12' x 8'.

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() Enclosed is 10¢ for full-color 20-page book of home decorating ideas, "Beautify Your Home with Weldwood Paneling."

() Enclosed is 25¢ for 40-page book "Do It Yourself with Weldwood Plywood," plus directions for making desk and turntable compartments shown above.

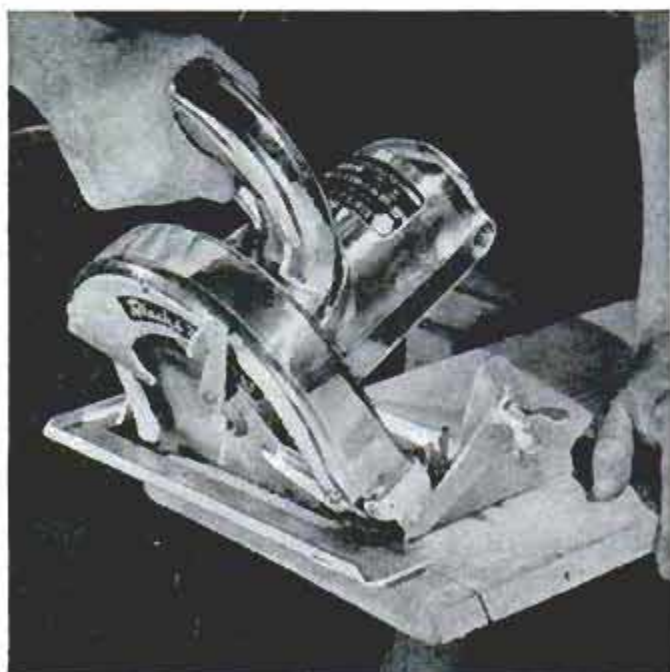
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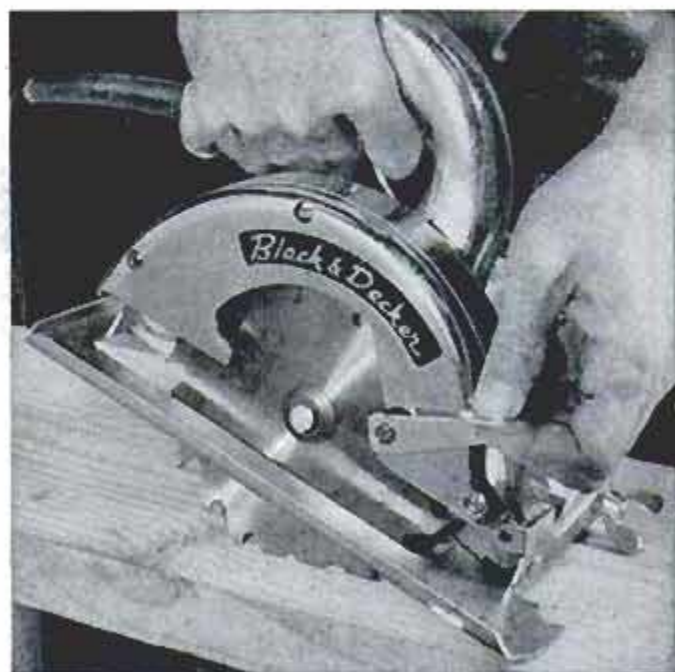
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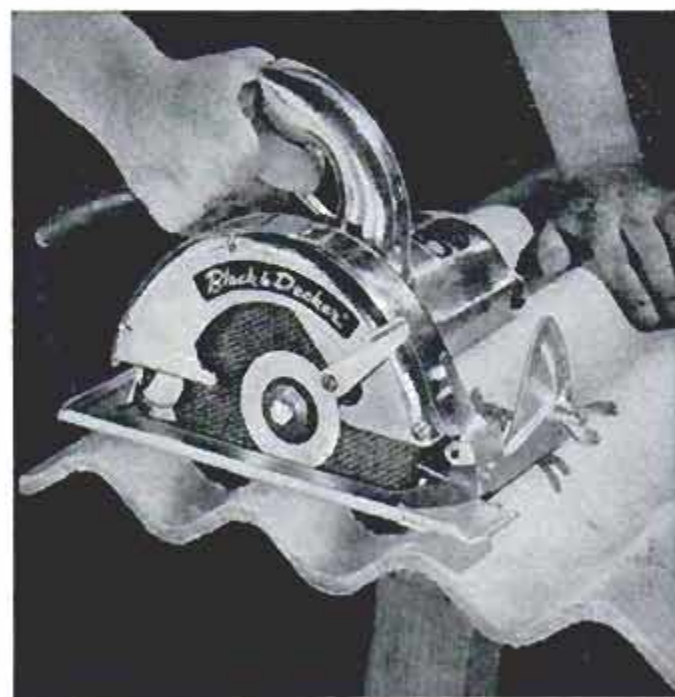
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*T-M. (Reg. U.S. Pat. Off.) O-G. F. Corp.

Ships That Buck the Polar Seas

(Continued from page 120)

chunks of ice to make her swing over."

Propellers or no, it's not always possible to find open water from the bridge 30 feet above the waves. And that's where the helicopters come in. They are the ice-breaker's long-distance "eyes." *Glacier's* two Sikorskys under Cmdr. William Shockley are squadron HU2 assigned to the task force. Their job is to whirl through the bleak sky while the ship is in ice, scouting for leads beyond the horizon. They wind-milled away over the barrier ice to Antarctica's treacherous mainland carrying passengers in and out of the base sites, hunting sites for airstrips.

Pilots live under a constant threat. The polar regions have a treacherous phenomenon—whiteout. Like the blinding blizzards that sweep down without notice, whiteouts can develop out of clear sky in a matter of minutes. There's sudden overcast, and brilliant light reflected from the snow illuminates the clouds, obliterating any semblance of the horizon. Everything is dead white. Distance and shadow are lost. A baseball 10 miles away may look like a big blimp. A Weasel a few hundred yards

(Continued to page 268)



Make her happy — INSTALL BEAUTIFUL JALOUSIES

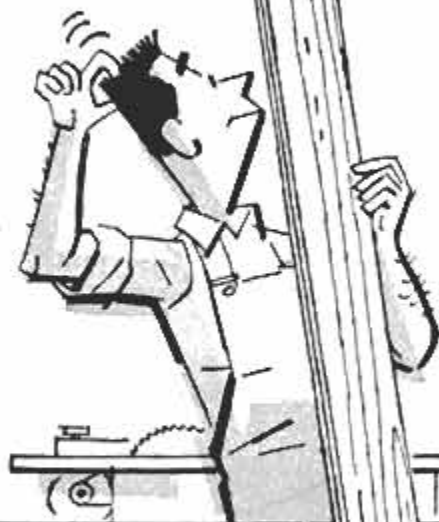
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off may seem a scrap of a trail flag flying in the snow. "Moving an aircraft in that stuff is like flying around in a bottle of milk," one whirlybird pilot told me.

Chuck Knight, *Glacier* copter pilot, explains vividly how all sense of balance and direction are gone when he is hovering in whiteout. "You look for shadows where there are none. Even buildings and people vanish from the ground. You think your instruments lie, then vertigo takes over and the next thing you're flying upside down helping gravity finish you off." As an example of what can happen, a helicopter pilot caught in the whiteout during Operation Hijump in 1948 flew his craft right into an ice shelf. He was still certain he was high in the air.

As a matter of fact, whiteout touched off the first flight of this expedition across the South Pole. Lt. Col. H. R. Kolp, commander of a four-engine Navy transport, ran into a whiteout on an exploratory flight over Wilkes Land. He turned aside and explored an unknown area running clear to the Pole. The crew dropped aviation smoke bombs, lamp black, a die marker and a piece of cardboard on the Pole. Returning at low level on another sweep, the crew could see no sign of the markers, leading

(Continued to page 270)

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FOR REPAIRING ALL
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MOTORS • AUTOMOBILES • TV TUBES**

As an electrical trouble shooter the Model 70:

- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, Leakage, etc.
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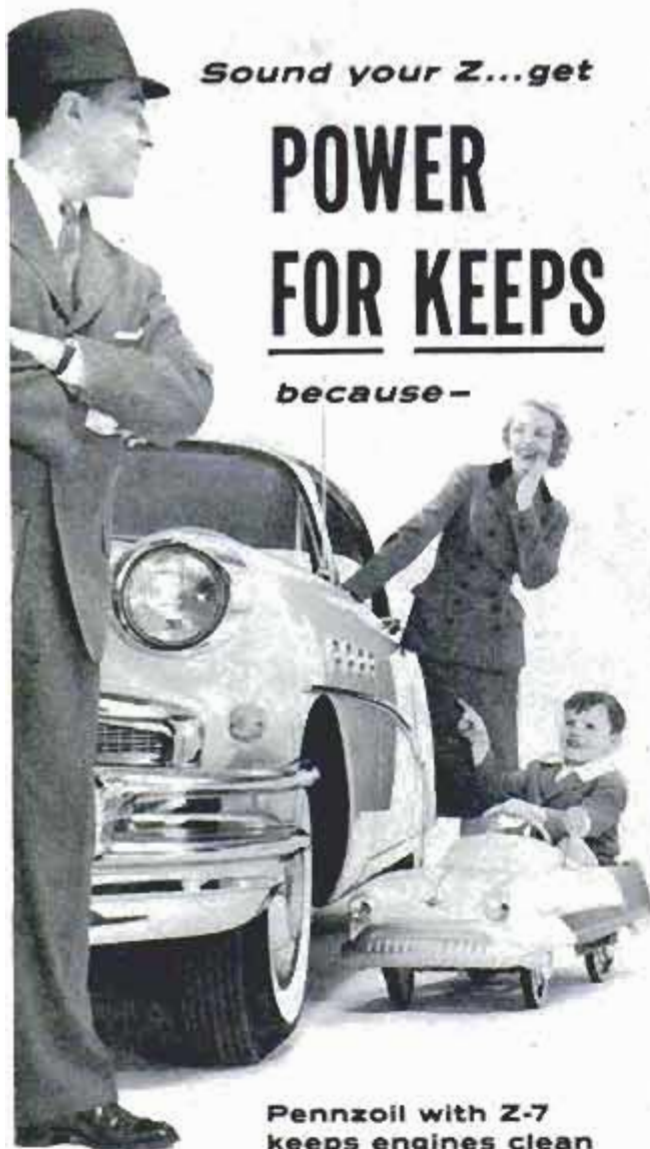
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them to believe the Pole is covered with fine, powdery snow.

Polar navigation for icebreakers is just as tough and hazardous as it is for helicopters and airplanes. The radio goes haywire due to weird magnetic storms, especially in the Antarctic. None of Deepfreeze's breakers are able to transmit from McMurdo to ships at sea, yet an aircraft transmitter 40 miles out on the ice threw a signal clear over our heads to New Zealand, where it was rebroadcast and picked up. To help overcome atmospheric witchery, the *Glacier* has a 2000-foot cable skylifted by a 20-foot blimp. Even this spire is no use in many of Antarctica's strange invisible storms.

On top of this hazard, days of overcast give the navigator no chance to shoot the sun for a fix. Howling wind sends the pack and ship drifting at unknown speeds in unknown directions.

The *Glacier* nearly missed a task force rendezvous at Scott Island due to such a situation on the fogbound morning of December 23. For 30 hours we'd been zig-zagging through the pack on a crazy course through a freezing "pea soup," while harried navigator Lt. Bob Newcomb went mad trying to keep a fix made two days before.

(Continued to page 272)

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Produce bigger and better yields by preparing the ideal seed bed in one operation.

The SUPER MUSTANG is used to till, weed, cultivate and mulch better, easier and faster. It's simple to operate and economical too.

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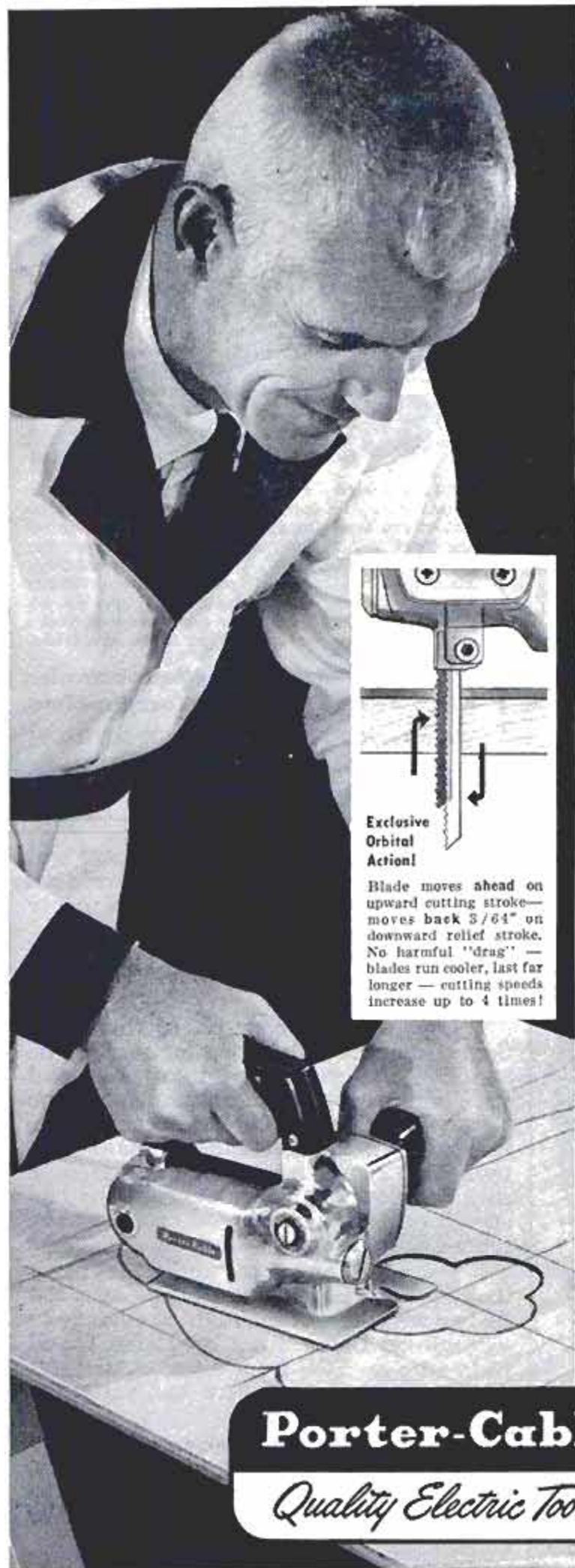
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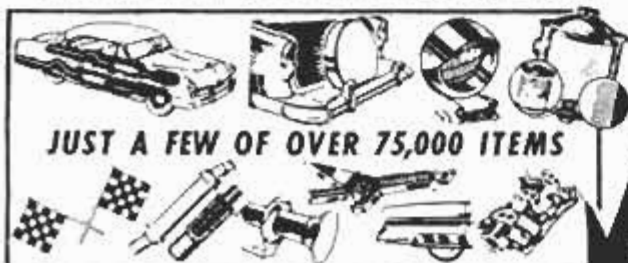
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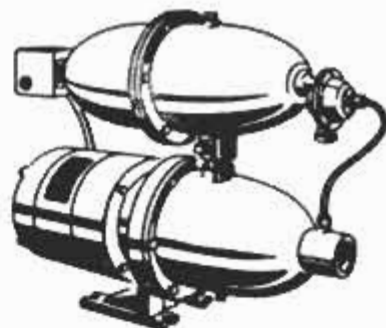
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Radio contact was perfect but there was no way to tell if the ships were a hundred miles or yards away. Radar showed plenty of blips but were they ships or icebergs? A misty ship turned out to be a ship-shaped iceberg. Newcomb's canny ability pulled us back on course.

Taking a contour graph of the ocean floor from the ship's depth sounder, he matched the submarine mountains and valleys to depth marks on nautical charts of the area. Thus, using the ocean bottom for a map, he calculated the *Glacier's* position. Two hours later dim outlines of a ship grew out of the sea ahead. If he had stayed on the previous course we'd have missed Scott Island by 25 miles.

It's usually Yankee ingenuity that saves the day on the breaker's mission. Pat Maher won't forget the night the *Edisto* in ice-jammed Davis Strait off Baffin Island picked up an SOS from a tiny settlement in a Greenland fjord. Fire had destroyed the winter oil supply.

"We headed for it through one of the wildest nights I ever saw," Capt. Maher recalls. "It was black as pitch with a roaring blizzard so thick we couldn't see the bow. We

(Continued to page 274)



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MIDLAND, MICHIGAN



got to the mouth of the fjord when our radar blew. Charts showed a narrow channel in the center but an attempt to navigate it blind would put us hard aground on jagged shoals. Then the navigators had an idea. The ship was equipped with sonar, used to detect and locate submarines in wartime by sending out sound waves and picking up reflected echoes. Why not use it to detect channel walls? It worked. We rode five miles up the channel by listening and timing pings bouncing off the banks and holes until the storm abated. Then we went in to help the stricken town."

Occasionally, when the ice is heavy and thundering winds are packing it against the headlands, even rugged icebreakers may be "nipped"—frozen in. "Sometimes we dynamite the ice," says Maher, "but the best thing is just to throw a party on the ice and sit it out. Packs resembling solid snowbound land today will break up tomorrow when the wind shifts."

Actually it would take a tough "nip" to immobilize the *Glacier*. When all else fails, her heeling system goes to work. There is a row of three massive tanks on each side, and 140,000 gallons of sea water are sucked aboard to fill them halfway. Powerful pumps then throw nearly half a million

(Continued to page 276)

**LAWN..SHRUBS..
FLOWERS..TREES**
Carry Costly Price Tags!

Why Let Them Wither Away In
HEAVY or SANDY SOIL
When Pennies For Terra-Lite
Saves Garden Dollars..

Valuable plantings can slowly wither and die in heavy or sandy soil. But why worry? A few pennies worth of Terra-Lite vermiculite performs a garden miracle...loosens, aerates soil...lets roots stretch, breathe. Holds water in sandy soil, too. Plants thrive...turn deep green again! For example an evergreen worth \$20.00 can be protected with as little as 10¢ worth of Terra-Lite.



Terra-Lite®
Nature's Own Soil Conditioner

FREE BOOKLET
...tells how ¼
Terra-Lite mixed
with ¾ soil can
keep your garden
gloriously green. As
little as \$2.35 of
Terra-Lite condi-
tions 200 sq. ft. of
soil.

Terra-Lite Division
Zonolite Company, Dept. PM-36
135 S. LaSalle St., Chicago 3, Ill.
Please rush me free booklet telling how
pennies for Terra-Lite will protect the
dollars I spend for garden shrubs, flowers,
etc.
Name _____
Address _____
City _____ Zone _____ State _____

ON SALE AT GARDEN SUPPLY DEALERS

SHOP BY MAIL AND
SAVE
at **GROBAN'S**

SURPLUS & NEW MANUFACTURE
FOR HOME, FARM AND FACTORY EQUIPMENT

ALL
ITEMS
Unconditionally
GUARANTEED!

**GROBAN FOUR-WAY
OPEN CENTER HYDRAULIC
CONTROL VALVE**

ITEM #126 — Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has 3/4" pipe thread inlet and outlet. 1/2" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10 1/2 lbs. **AN OUTSTANDING BUY!**
P.O.B. **21.50**
Chicago

**PESCO GEAR TYPE
HYDRAULIC PUMP**

Compact — Powerful — Reliable
ITEM #160 — Especially designed for belt drive from fan belt, power take-off, drive pulley, electric motor or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for 3/4" hold-down bolts. Standard 1/2" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 PSI at 2800 RPM with 4 HP. Hardened steel gears turn in dense nitrite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. **F.O.B. Chicago 22.50**

**HYDRAULIC
LIFT CYLINDERS**

• For Fork Lift Trucks • For Presses • Loading Ramps • Lifts 12500 lbs. heavy duty hydraulic cylinders, at big savings.
ITEM #502—3" Bore—36" Stroke—1 3/4" Piston Rod. Wt. 95 lbs. **F.O.B. Chicago 72.00**
ITEM #503—4" Bore—54" Stroke—1 3/4" Piston Rod. Wt. 135 lbs. **F.O.B. Chicago 96.00**



FREE! — NEW CATALOG
1956 EDITION, 56 PAGES. chock-full of unsurpassed War Surplus and newly manufactured Equipment Bargains for farm, home, factory, workshop. Write letter today.

**FACTORY-TO-YOU-VALUE
PORTABLE ELECTRIC
LIGHT PLANTS**

POWER TO OPERATE:
• Electric Saw, Electric Drills, Pipe Bender.
• Refrigerator, Deep Freezer, Incubator.
• Water Pump, Radio, Lights, Air-conditioner.
BRAND NEW 1956 **ITEM #1008**
COMPACT — FITS IN THE TRUNK OF YOUR CAR
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 **149.50** wt. 100 lbs. **F.O.B. Chicago**
700 WATT-GENERATOR SET—same as above, slightly smaller—with Briggs-Stratton Engine—Model 708—**F.O.B. Chicago 129.50**

GROBAN HYDRAULIC SPEED REDUCER

WITH FINGERTIP CONTROL
USE FOR: • Reamer Drives • Midcut Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separator • Garden Tractor Shafts • Pumps.
Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/2 to 1 1/2 H.P. Shafts 3/8" diam. Input rotation counter-clockwise facing shaft. Input speed 750 R.P.M. 7 1/2" x 7 1/2" x 11 1/2". Gov't 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, dewatering, 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 3600 RPM 1 1/2 90
20 2400 RPM 1 1/2 75
Back plate may be rotated for most convenient inlet position. Shipping weight 31 lbs. Gov't. cost 96.00. **F.O.B. Chicago 29.50** **ITEM #384**

GROBAN SUPPLY CO. Dept. PM-3
1139 S. WABASH AVE., CHICAGO 5, ILL.

**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 1/2" Hp. motor; 1 1/2" standard shaft, ball-bearing supported. Dimensions: 5 1/2" x 11" x 10". Shipping weight 8 lbs. **A \$25.00 VALUE** **F.O.B. Chicago 16.50**



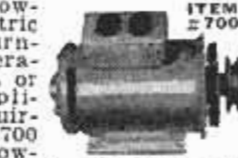
**BRAND NEW 1 H.P.
12 Volt Electric Motor**

• For electric wheel chairs (Pop. Mech. dealer—Mar.-1963)
• For electric golf carts
• For self-propelled scooters, children's mid-let cars.
ITEM #308
Rated 1 H.P.—100 amps., 2600 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 3/8" shafts, nut and bolt electrical terminals, flange mounting—Dimensions: 9" x 4 1/2" x 4 1/2". Ship. wt. 10 lbs. **A real 12.50 F.O.B. value at...** **F.O.B. Chicago**



**BELT DRIVEN
A. C. GENERATORS**

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) **79.50**
F.O.B. Chicago

ORDER DIRECT FROM AD
SATISFACTION GUARANTEED
Send Payment Or Purchase Order Today
For Phone Orders call WEbster 9-3793

READY CUT HOMES DO-IT-YOURSELF \$SAVE! \$\$\$

BUY DIRECT FROM MILL & SAVE ON LABOR COSTS

You can assemble any of the 57 designs from easy-to-follow plans. Every piece marked, easily identified, ready to erect. You don't have to measure, or cut. It's all done economically by precision production machinery (not prefabricated). Save high skilled labor costs and material wastes. Save contractor's profits and overhead. Complete with all hardware, paint, nails, roofing, glass, etc. Sterling Homes are mod-

ern designed for comfort and convenience. Plans sold separately.
FIVE EASY PAYMENT PLANS INCLUDING MONTHLY PAYMENT

ORDER TODAY - SAVE UP TO 40%

PRICED FROM \$2150.00 AND UP

Send 25c
Color Catalog including Floor Plans



INTERNATIONAL MILL & TIMBER CO., BAY CITY, MICH. DEPT. PM 36



This Winter
Put Part of Your
Fuel Bill in the Bank!

REYNOLDS Do-It-Yourself ALUMINUM REFLECTIVE INSULATION

This aluminum foil bonded to both sides of sturdy kraft paper is as easy to handle as famous Reynolds Wrap.

All you do is staple it—or tack it—to your attic studding. Because aluminum reflects up to 95% of all radiant heat, this insulation keeps heat in, locks moisture out—saves dollars every month. (Attics are up to 15° cooler in summer, too.) Call Western Union Operator No. 25 for the name of your nearest hardware or lumber dealer.



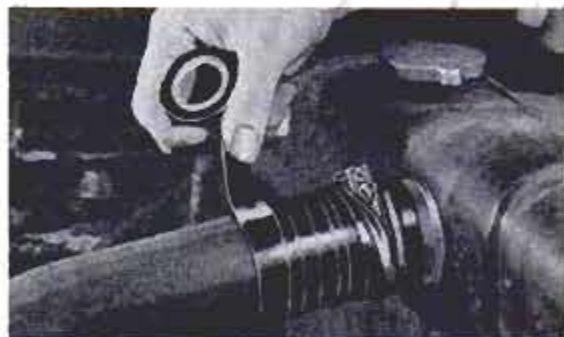
Look for this rack—
Reynolds Aluminum
by the makers of
Reynolds Wrap

REYNOLDS METALS COMPANY
2494 South Third Street, Louisville 1, Kentucky

See Reynolds new show "Frontier"—Sundays on NBC-TV

FIXIT TIPS

WITH "SCOTCH"
33 PLASTIC TAPE



MEND AUTO HOSES with tight wrap of stretchy, waterproof "SCOTCH" 33 Plastic Tape. Stretchy plastic seals tight, resists corrosion.



WRAP TOOL HANDLES. Tough, long-wearing plastic tape covers rough handles, makes smooth non-slip grip. Get "SCOTCH" Brand 33 Plastic Tape, 39¢ or 79¢ at stores everywhere.

MINNESOTA MINING & MFG. CO.,
ST. PAUL 6, MINN.



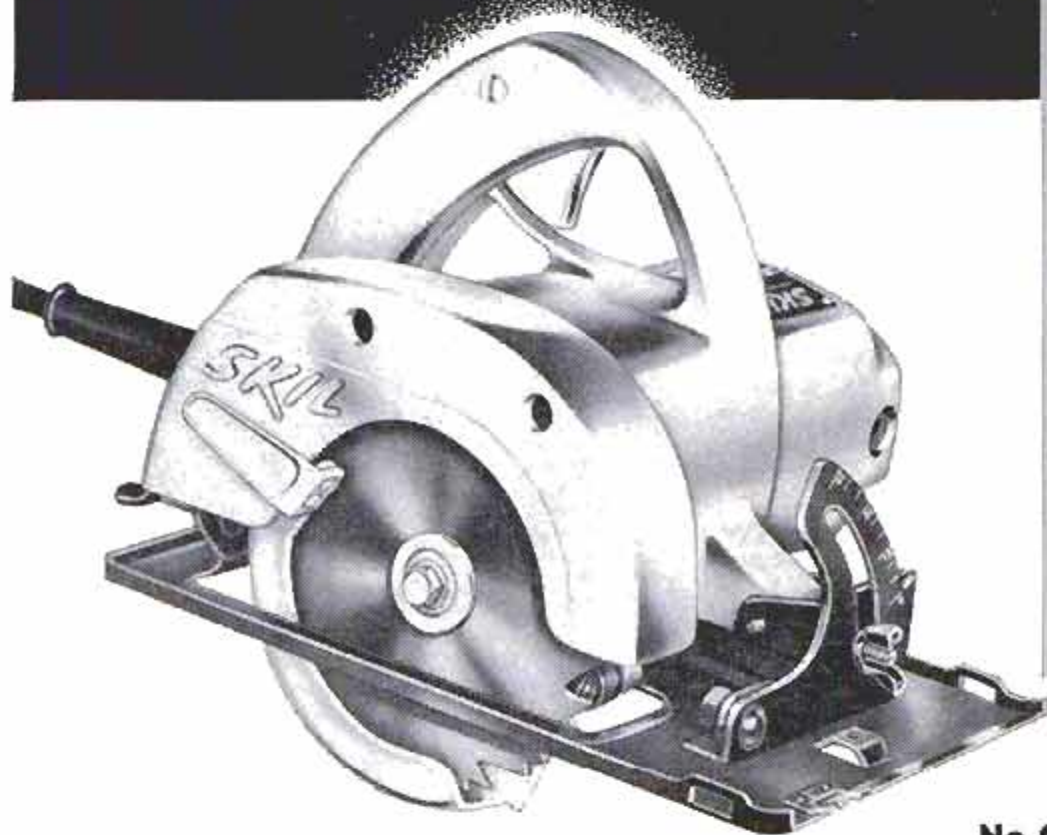
pounds of water alternately from tanks on one side to the other in 80 seconds. The whole ship begins to rock 10 degrees in the crush. "Then we wind up the screws," says Maher, "and with everything going at once, the ship humping and heaving, something has to give. We hope it's the ice, and usually we can pry her out of there."

Crunching through the pack with her string of four supply ships tagging behind at 400-yard intervals, the *Glacier* and convoy made an impressive picture. With a "family" to consider, the icebreaker had an even tougher job. With their thin skins the freighters couldn't cut sharp corners without cautious backing and filling. One jagged cake could cut a hole in a hull or mangle a screw, so progress was slow as we moved through the solid ice.

Often, for this reason, two breakers work in tandem with a convoy. The first breaks the lead, the second peels corners off the

(Continued to page 288)

**Now! The builders of over a million
power saws offer a
GENUINE SKIL SAW
for only \$29.95**



Why settle for less when you can own a *guaranteed* SKIL Saw for only \$29.95! At this low price no craftsman can afford *not* to have a SKIL. The real thing in portable saws—with all the power and performance you'd expect of a SKIL! More cutting ability than any other saw in its price range regardless of size . . . speeds through the toughest materials without stalling or burning out.

Capacity to spare, too. This highest-quality SKIL will cut paneling, wall-board, Formica and other materials. Handle 2 x 4's with the 4 1/4" blade saw simply by flipping the board. Make 45° cuts to a depth of 1"! Vertical cutting depth is 1 5/32". Here is an ideal investment for home or shop. Let this new SKIL help you clean up all the hobby or building jobs that need doing. Ask for demonstration at your Hardware Dealer's today.



• Make cabinets, cupboards, closets, an easy weekend project with SKIL Saw!



• Extra rooms, extra storage space. It's easy to build them with SKIL Saw!



• Cut paneling, shelving, siding, or plywood. SKIL handles them all.

**Model 504
No Other Saw in This
Price Range Offers These
Famous SKIL Features**

- Powerpacked motor
- Guard-lift-Depth and bevel adjustments
- Trigger-type switch
- Built-in sawdust blower
- Telescoping blade guard
- Comfort-grip handle
- Fully backed by the famous SKIL standard guarantee.

SKIL
BUILDERS TOOLS

Made Only by SKIL Corporation, Formerly SKILSAW, Inc.
5033 Elston Ave., Chicago 30, Illinois
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in ALL Leading Cities

Lincoln Owners Praise Handling

(Continued from page 128)

subject by owners who wear belts all the time.

"I have belts and wear them all the time. It's a habit now. I have never been in an accident but believe firmly in prevention."
—Illinois life-insurance executive.

"In addition to safety angle, I use the belt to hold me in the correct driving position on long drives."
—California owner.

1956 LINCOLN SPECIFICATIONS

ENGINE	PREMIERE
Type	8-cyl., OHV, V-type
Bore and stroke	4.00 x 3.66 in.
Piston displacement	368 cu. in.
Brake horsepower	285 at 4600 r.p.m.
Compression ratio	9 to 1
Transmission	Turbo-Drive—Torque converter with gears

GENERAL

Steering ratio (over-all)	20.9 to 1
Steering wheel, lock-to-lock	3.3 turns
Turning radius (curb-to-curb)	22.7 ft.
Brakes	conventional hydraulic
Tire size	8.00 x 15 tubeless (8.20 on air-conditioned cars)

Recommended tire pressure	24 lb. front and rear
Ship. wt., 4-dr. sedan	
unladen	4362 lb.
Capri	4289 lb.
Wheelbase	126 in.
Tread, front	58.5 in.
Tread, rear	60.0 in.
Height over-all (unladen)	61.2 in.
Width over-all	79.9 in.
Length over-all	222.8 in.
Road clearance	6.8 in.

CAPACITIES

Oil (less filter)	5 qt.
Water (less heater)	23.3 qt.
Gasoline	20 gal.

INTERIOR DIMENSIONS

Front-seat width	61.7 in.
Rear-seat width	63.8 in.
Headroom, front	35.4 in.
Headroom, rear	34.1 in.
Legroom, front	44.8 in.
Legroom, rear	42.5 in.

"Belts are the only way severe injuries can be avoided."
—Wisconsin surgeon.

"With excellent brakes, quick stops cannot always be avoided in city traffic. I wear the belt all the time."
—California insurance-company executive.

It is perhaps only a coincidence, but two of the above four quotations are from insurance executives, one from a medical man, the fourth owner did not list his occupation.

The following quotations are from owners who have safety belts but wear them only part of the time:

"I wear them any time I am going out of the city. They should be compulsory on all cars."
—California van operator.

(Continued to page 280)



solves woodworking problems in seconds!

Speed your jobs, get answers to countless building and woodworking questions immediately! Improved

GREENLEE Woodworking Calculator converts linear to board feet, gives nail specifications, tool sharpening tips. Compares woods, gives bit sizes for screws, concrete mixes, painting information, etc. Convenient . . . simple to read. 6" diameter . . . heavily varnished cardboard. Special offer by

the makers of famous GREENLEE tools . . . **Only 25c**
(no stamps please)



The GREENLEE line of fine tools includes auger bits, electric drill bits, chisels, gouges, spiral screw drivers, drawknives, and many more. At leading hardware and building supply dealers.

GREENLEE TOOL CO.,
2103 Columbia Ave., Rockford, Ill.



AAA Champion Bob Sweikert—won at Indianapolis and placed in six other "big car" races.

Biggest winners in AAA and NASCAR races prove Champions best for your car!

Bob Sweikert and Tim Flock used 5-rib Champion Spark Plugs in every one of 43 races!

Here's solid proof of what Champion Spark Plugs can do for your car:

Not only in racing cars, but in NASCAR races with all makes of standard cars—regular passenger sedans just like the one you drive—98% of the winners were powered by *Champions*.

Bob Sweikert, 1955's AAA champion—who finished first in the Indianapolis "500"—powered his racing car with *Champions*.

Tim Flock, the year's top NASCAR winner, drove his Chrysler "300" with *Champions*. In fact, virtually every racing

driver in America insists on Champion Spark Plugs—*regardless of the make of car he drives.*

These men really know cars and know engines. What stronger evidence could there be that *Champions* are best for your car, too!

No matter what car you drive, new *Champion Spark Plugs* will give you quicker starts, fuller power, better gas mileage.

Remember—even the best plugs become inefficient after about 10,000 miles. Have yours checked today. If you need new spark plugs, get the best—5-rib *Champions*.



CHAMPION

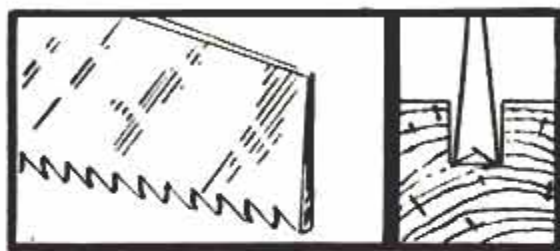
LOOK
FOR THE 5 RIBS

NASCAR Champion Tim Flock—*Champions* powered his Chrysler "300" to 18 wins, 15 placings.





Next time you use a Disston, note how easily it cuts through the wood. Its clean, sharp bite is due to the bevel-filed teeth, the double-taper ground blade perfectly tempered to hold its fine edge.



you can see it's a DISSTON

Tapered to the point, tapered to the top, and with teeth the same width along the entire cutting edge.

There's so much extra satisfaction in using good tools, remember to ask your hardware dealer to show you DISSTON—

- Hand saws • Circular saw blades and dado heads • Band saws • Chisels and gouges • Garden tools and lawn rakes • Carlson steel tape rules.

Henry DISSTON DIVISION

H. K. PORTER COMPANY, INC.

311 Tacony, Phila. 35, Pa.

In Canada: 2-20 Fraser Ave.,

Toronto 3, Ont.



"Fine for trips. Can't always remember to use them around town. Keep me from sliding on corners."—Kansas salesman.

"Had them on my last car and transferred them to new car. Would not want to be without them."—California insurance broker.

Here are some typical quotations from those owners who do not have belts on their 1956 Lincolns:

"With the new door latches, belts are superfluous."—Massachusetts retired owner.

"Safety belts defeat their purpose. Give teen-age drivers more false security."—New York food broker.

"I would have belts if I drove at very high speeds."—California retired owner.

"Belts are good but slightly over-rated."—New York airline pilot.

"Careful driver does not need belts."—Georgia retired owner.

"The selling point of safety is silly. They cut down vision with tinted glass and distorted windshield."—Wisconsin doctor.

"Why did Ford leave safety dash and padded visors off its finest car?"—California appliance dealer.

"Dashboard is a disgrace. It is the only car built with a built-in guillotine."—California executive.

What About New Engine?

Lincoln offers a new engine for 1956: It has a 368-cubic-inch displacement, a 9.0:1 compression ratio and develops 285 horsepower. What do owners say about it?

Of the owners taking part in our survey, 84.1 percent report no trouble with their engines, 12.1 percent report some trouble, and 3.8 percent have had considerable trouble. The most frequent trouble seemed to be with the valves—usually of a minor nature. Second most frequent trouble is carburetor adjustment. Third is starting difficulty, especially in cold weather. The following quotations illustrate the various types of trouble in order of frequency of mention:

"Valves noisy, engine won't idle smooth."—North Carolina accountant.

"Constant adjustment to carburetor and timing."—Michigan regional manager.

"Hard starting on cold mornings."—Indiana retired owner.

"Distributor diaphragm defective."—California doctor.

"Excessive oil consumption."—California salesman.

Additional Best-Liked Features

The following quotations from Lincoln owners describe additional best-liked fea-

(Continued to page 282)

WORN ENGINE BURNING OIL!

Reduces oil bills!
Restores compression!
Increases miles per gallon!
 Forms self-lubricating seal at piston top. Inserted through spark plug holes. Used by millions of motorists. Tested and approved by motoring experts.



\$4.95
 Tube for most cars

* PISTON SEAL



Applies like putty
Sets metal hard

Fills dents, holes, cracks, etc. File or sand smooth. Water, oil and gasoline proof. Takes enamel or lacquer.

LOY COLD METAL

LOY TWIN PACK Tube \$1.00
 8 oz. Can Metal; 2 oz. Jar Solvent. \$1.79

REPAIR CRACKED CYLINDER BLOCK without dismantling

For internal or external cylinder cracks—cast iron or aluminium. Vibration, heat, pressure proof.



HOLTWELD

Can \$1.59

REPAIR LEAKY RADIATOR While you drive!

... permanently cured, non-corrosive, non-blocking, unaffected by heat or pressure.



RADWELD

Can .69

Holt's HAVE THE ANSWER!

REPAIR MUFFLER AND EXHAUST LEAKS in 10 min.

The plastic gas-tight seal sets hard, withstands heat and vibration. Prevents carbon monoxide gas poisoning.



Holt's GUN-GUM

* MUFFLER SEAL

PLASTIC

SETS LIKE A WELD — NO TOOLS NEEDED

At Auto, Accessory and Montgomery Ward Stores

TREGLOWN CO. INC, FANWOOD 63, N.J.

* TRADE MARK REGD.

CANADA: 1366 GREENE AVE, MONTREAL 6

Write for Full DETAILS

\$1.69 per can



EARN EXTRA MONEY the IDEAL way!

SHARPEN POWER OR HAND MOWERS LIKE AN EXPERT!

NO EXPERIENCE NEEDED

You can sharpen your first lawnmower expertly on an Ideal® Sharpener. Just put the mower in your Ideal—no need to take it apart—and you'll have a perfect cutting mower in minutes.

CASH-IN ON THE POWER MOWER BOOM

Start a profitable business full-time, or in your spare time at home. Hundreds of power and hand mowers are in use in your area. It's a real opportunity. Be ready for spring and summer business . . . get your Ideal Lawnmower Sharpener now!

Write for FREE catalog to:

The FATE-ROOT-HEATH CO.

Dept. PM-3, Plymouth, Ohio

IDEAL LAWNMOWER SHARPENERS, THE QUALITY LEADER FOR 52 YEARS!



Need more closet space? This one's easy to build. Made from Upson $\frac{3}{16}$ ". Just nail Upson in place and paint. Upson's easy to work, edges sand smooth.

save 50% and more wherever your projects call for wall board

Upson wall board is perfect for all kinds of do-it-yourself projects. The list is endless: make cabinets, chests, closets, use Upson to finish your basement walls and ceilings, garage, add-a-room. Or make cut-out toys, a model train table. In fact, use Upson like plywood. Only with Upson you save money. Save up to 50% on each square foot you buy. And Upson is easy to work, light, strong. Saws like wood, paints beautifully.

Upson comes in a large variety of thicknesses and sizes. From $\frac{1}{10}$ ", $\frac{1}{4}$ ", $\frac{3}{16}$ " to waterproofed, super-strong $\frac{3}{8}$ " for outside use. Pebbled, smooth and striated surfaces. Sizes from 4' x 6' to huge 8' x 20'; plus 12" sq. Ceiling Tiles.

There are many imitations, so ask for Upson wall board by name!

See your lumber dealer



Upson wall board saws easily, edges sand clean, smooth!

UPSON

WALL AND
CEILING PRODUCTS
SIDING, SHEATHING



99% new spruce wood fibers laminated for great strength
THE UPSON COMPANY, LOCKPORT, NEW YORK

tures in order of frequency of mention. For the exact percentages of owners mentioning each of these items refer to the table on page 127.

"Will take curves at higher speed than any other car."—Idaho truck contractor.

"On snow and icy streets it holds the road with no sliding or slipping. Well balanced."—Michigan plant manager.

"Transmission is tops. Smooth shifting and no jerks when you slow down to stop."—New York farmer.

"Excellent visibility. No blind spot. No steering wheel in front of your eyes."—New York housewife.

"Roomiest I ever had."—Ohio salesman.

"I like the power accessories: Power steering, power brakes, one-shot lubrication, safety steering wheel."—Nebraska contractor.

"Interior color schemes and upholstery."—New York welder.

"I like safety features."—Minnesota lawyer.

"Roomy trunk."—Michigan gas-station operator.

"I want dependability and I have always found it in a Lincoln."—Illinois advertising director.

"Praise must be given Ford's service policy, especially when on the road."—Illinois mechanical engineer.

"Exclusive distinction. They aren't a dime a dozen on the highway."—Michigan owner.

"Quietness."—California tool specialist.

Additional Complaints

Also in order of frequency of mention are the following owners' complaints:

"Doors will not close tightly. Drafty."—Michigan motel owner.

"When I look through the curve of the new windshield my eyes feel as though they were crossed. Extreme distortion."—Ohio service-station operator.

"Low gas mileage, but with all the power and weight I really didn't expect it would be good."—Washington rancher.

"Glove compartment won't even hold a flashlight when open. Everything falls out. Also too sharp a point in case of an accident."—California trucker and logger.

"Backup lights poorly designed. Actually worthless."—Ohio merchant.

"Too much overhang in rear. Should be shorter."—Illinois manufacturer.

"Almost impossible to get up many driveways without scraping back end."—Georgia manufacturer.

"Uncomfortable position for dimmer switch."—Michigan owner.

(Continued to page 284)

BE PRECISE

Say **STANLEY**

It's A Good Rule



**FREE
MAGNA
VIEW BOX**

Easy to use 8' tape rule- Model 1208W
\$1.19 at your hardware store.

Other Stanley Rules from 75¢ up, 6 ft. to 12 ft., and each in the reuseable plastic box with the magnifying lens. You'll use the rule — you'll use the box.

Write Stanley Tools, 2603 Elm St., New Britain, Conn., for free booklet on measuring tools and how to use them.

STANLEY

Also Eshelman
Adult 2 Pass.
**SPORT &
GOLF Cars**
1/5
the Price of
most other
Cars. 70 Miles
Per Gal.
Free Catalog.

ESHELMAN TRACTORS

LOW AS \$99

RAKES - PLOWS - CULTIVATORS - SAWS
DOZER - HARROWS - SNOW - PLOW - BELLS
SPRAYS - MANGLES - MOWERS - CUTS - TILLS

Eshelman Tractors, Tillers, Riding Rotary Mowers for Better Lawns and Gardens. Advertised in GOOD HOUSEKEEPING and Leading Magazines, Amazing Savings. Write for Free Literature. ESHELMAN CO., Dept. R-53, 109 Light St., Balto. 2, Md.



1 to 8 HP

Shipping Points: BALTIMORE - CHICAGO - RENO

new!

BULLDOG
Screw Type
Top Crank
JACK

- Fits Any Tongue
- Makes Hitching and Parking One-Man Job
- Adaptable to Channel, Angle or Wood Tongues Up to 4" Thick
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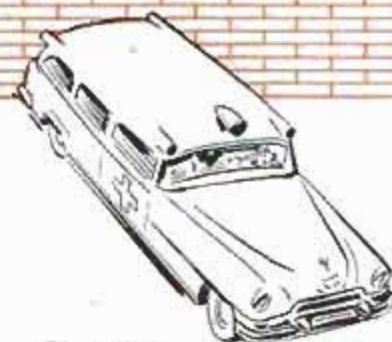
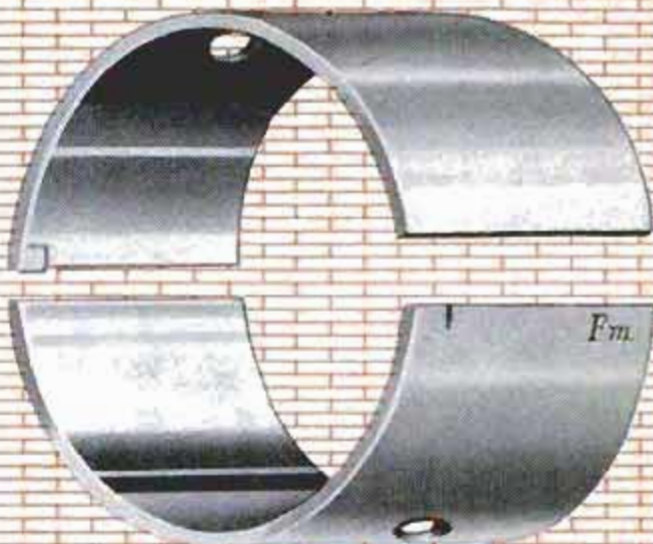
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"Exhaust smoke stains back end."—California farmer.

There you have it: The full story of the 1956 Lincoln as told by the people who know the car best—the owners themselves. For test data on the Lincoln turn back to page 126. Clymer's driving impressions begin on page 125. ★ ★ ★

Clymer Tests the Lincoln

(Continued from page 125)

There was but little evidence of brake fading when used at high speeds. I also tested the car over mountain trails, back roads and desert stretches. Even with higher horsepower, however, I found the all-around performance no better than that of the Lincoln Capri which I last tested.

At top speed the speedometer needle showed 114 miles per hour, which I consider a trifle slow. The car loafs along at 90 to 95 miles per hour, but on rough roads there is considerable hood flutter and some front-fender vibration—more than on previous Lincoln test cars.

The automatic transmission, which Lincoln calls Turbo-Drive, is a torque converter with planetary gears. It is a little spongy on the take-off (not as positive as the Hydra-Matic used on earlier Lincolns) and acceleration in Drive is moderate, but more rapid in Low. Incidentally, the gearing of the Low range is such that the test car would run 95 miles per hour in Low. Use of Low range is excellent for descending steep hills. It can also be used for emergency braking as the shift lever can be thrown into Low at quite high speeds with no resulting damage.

If the throttle is held to the floorboard in Drive range, the upshift to top ratio occurs at approximately 70 miles per hour. Below 63 miles per hour, by depressing the throttle, the downshift is fast and smooth.

(Continued to page 286)



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The first upshift takes place at about 38 miles per hour. Upshifting in normal driving is noticeable and could be smoother.

The interior of the car is luxurious, with top-flight styling. The driving position is comfortable. The seat cushions and seat backs are well padded and very comfortable for long-distance driving. The two handholds on the steering wheel are novel and desirable.

Front vision is good even though the hood is higher in front and longer than on previous Lincolns. There is some glass distortion at each end of the windshield, but Lincoln's distortion is no worse and no better than other makes using the wide wrap-around design. Even though there is a full-circle horn ring, it is small and speedometer vision is good. The numerals, which are white against a beige background, are artistic, but a little difficult to read. I prefer black numerals. The finish of the shroud covering the instruments is dark, which reduces reflection. The mileage numerals are magnified and very easy to read. The trip odometer is easily reset.

The glove compartment is small. The slanting design of the cowl prohibits taking full advantage of the storage space which might be utilized if a drawer were used.

The wide brake pedal is located close to the throttle and little foot movement is necessary to move the right foot quickly to operate the brake. The hand-brake lever is mounted quite far forward, is easy to operate, and out of the way of the driver's legs when entering.

Door closing is a little on the heavy side. One feature I certainly do not like is that the ignition switch must be turned on before the electric windows can be raised or lowered.

For a car of its size, it is easy to park and back out of tight driveways as the fender tips are easily seen.

The bumpers, front and rear, are large and I like the fact that they do not have the bulletlike projections that are on so many modern cars. The front license plate attaches to the center of the bumper. It is the first piece of metal to touch the rear bumper of another car making for denting and disfiguring the plate. Car manufacturers of all makes seem to think that license plates need no protection. Exhaust is emitted through twin exhaust pipes mounted high and within the bumper tip on each side. This is becoming common, but I can't say I like it, due to the fact that the bumper soon becomes black with soot. It is too easy to dirty a suit or dress when a person accidentally touches the outlets while walking around the car in a garage or parking lot.

They'll Jump 17 Miles

(Continued from page 101)

about the upper air, cosmic rays and radio transmission was obtained.

The new "Explorer III" gondola consists of a seven-foot shell of laminated glass fibers and plastic. Aside from the escape hatch it has three small ports through which the earth and sky may be observed. Complete with crew and stripped-down equipment, it will weigh between 1200 and 1300 pounds. Carrying this weight, the calculated ceiling of the balloon will be somewhere between 85,000 and 90,000 feet.

A few recording instruments will be carried, as well as a radio transmitter and trailing antenna. A large supply of liquid oxygen plus a converter for changing it into gas at the proper rate will provide both the pressure and oxygen required by the two occupants of the gondola. Chemicals will absorb the moisture and carbon dioxide that the men exhale.

The ascents are to be made under one of the huge polyethylene-plastic balloons with which the Air Force has been conducting upper-air studies for several years. Instruments and even small animals have been carried aloft, some to 120,000 feet and for as long as a day and a half.

These flights helped pave the way for the

forthcoming balloon jumps. They proved that some of the hazards of the upper air are not as dangerous as had been supposed.

Primary cosmic radiation, for instance, is no longer regarded as a big threat to health. Once it was thought that these high-speed particles might destroy nerve cells, damage the skin and cause eye cataracts and loss of hair.

Only one adverse result has been reported: Black rats that have been sent aloft are found later to have a sprinkling of white hairs in their pelts. Presumably cosmic rays caused damage to the pigment cells of hair follicles.

The conclusion is that a spaceman has little to fear from cosmic radiation aside from the chance that some of his hair will turn white.

The balloon jumps will answer some but not all of the problems in getting a man safely back to earth. They will be made from a vehicle that is drifting at slow speed. What about a pilot who has to leave a high-flying airplane that is traveling at, say, Mach 2 or 3? Even at 125,000 feet the ram temperature at Mach 2 is a couple of hundred degrees. At Mach 3 it is about 600 degrees. One of the next steps in space research will be to find a way of cooling the pilot if he has to eject at high speed and high altitude. ★ ★ ★

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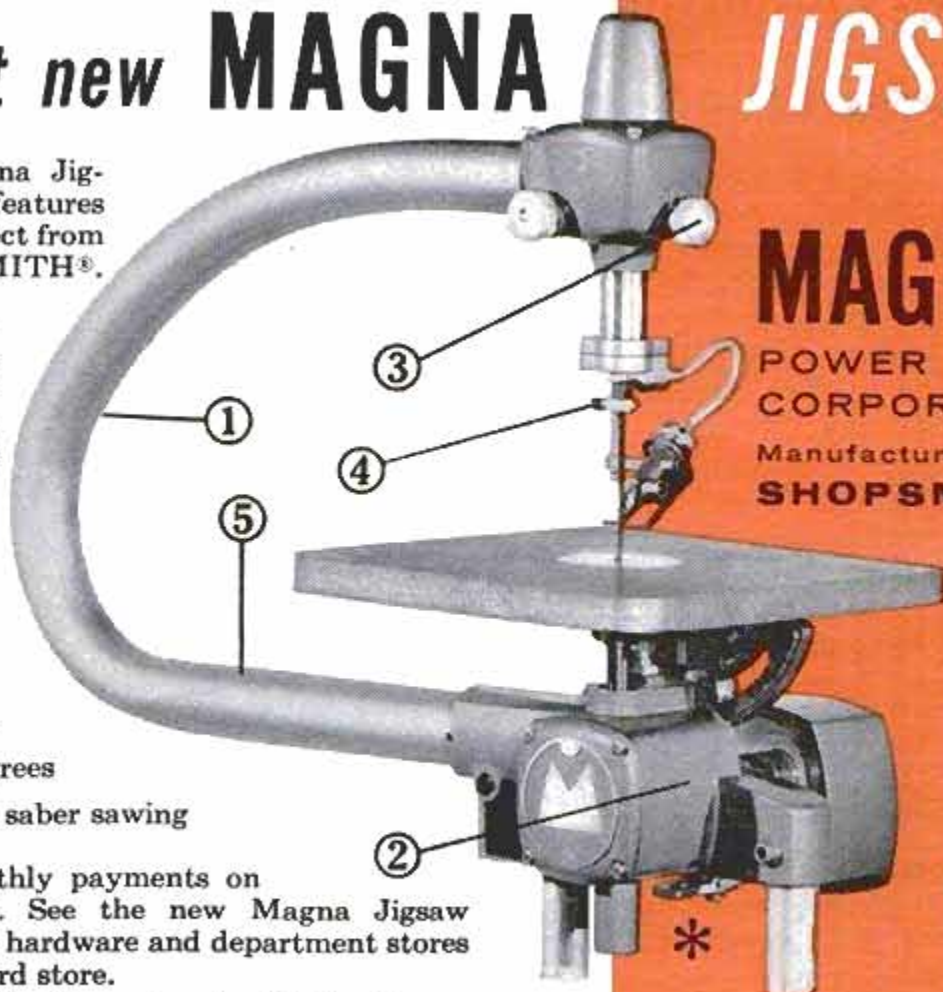
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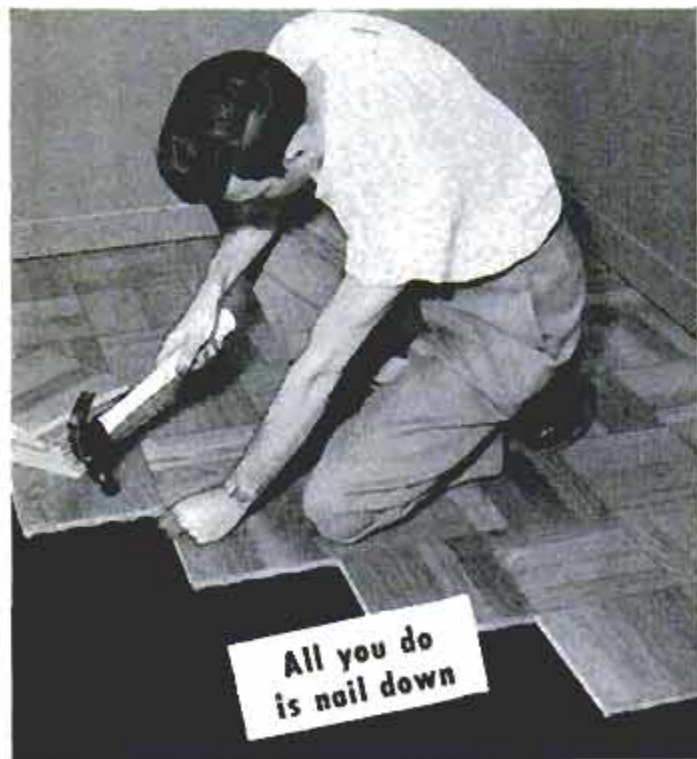
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Slowly the stuck ship moves into the breaker's wake and the show is back on the road.

In really bad ice, the *Glacier* may run out a tow cable and winch a following ship up close until she's snubbed into a V-shaped groove on the fantail. Then the two move through the pack ice with coordination of engine and tender. The *Glacier's* big tow already has had a workout. She hauled a tiny oil barge carrying 225,000 gallons of aviation gas 7000 miles across the Pacific at the end of a quarter-mile cable. It was the longest distance any ship known to the Navy ever was towed. The winch was exercised by hauling in a baby tanker for resupply when the weather was good.

In rough seas the provisions went back by highline. When the seas reached 20 feet at Thanksgiving, the turkeys were life jacketed and floated back on a line. Four times during the voyage cable moorings snapped, and the barge kited all over the sea before she was retrieved. But, to the crews' relief, both vessels made the long journey intact.

For all its hazards, icebreaker duty is considered enviable by crewmen. Four thousand of them applied to fill 300 berths on the *Glacier* before she departed Norfolk last November. What's lost in skin on the heaving decks is gained in recreation, camaraderie, beard contests and far-famed chow. The crew's chow on the *Glacier* is prepared by a man who was chef on the presidential yacht *Williamsburg* and who cooked for leaders at the Potsdam Conference. The ice jockeys earn and look forward to good refueling. And the men know the rich value of the experiences they live at the bottom of the world. They know if Operation Deepfreeze succeeds in establishing the base it plans right on top of the South Pole, it will be the icebreakers and their rugged crews who made it possible for men, materials and machines to plunge through icy barriers and get to the jump-off place. ★ ★ ★

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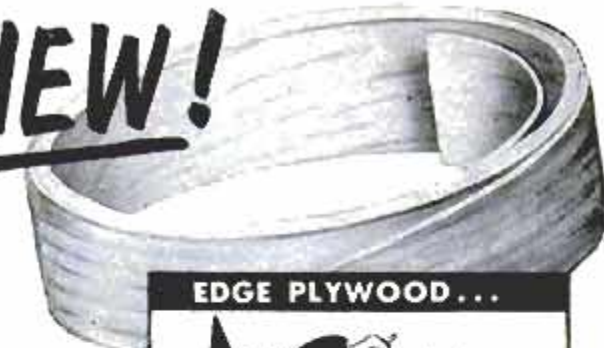
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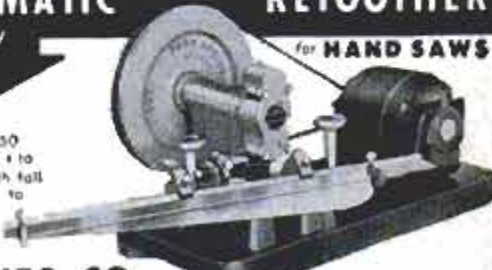
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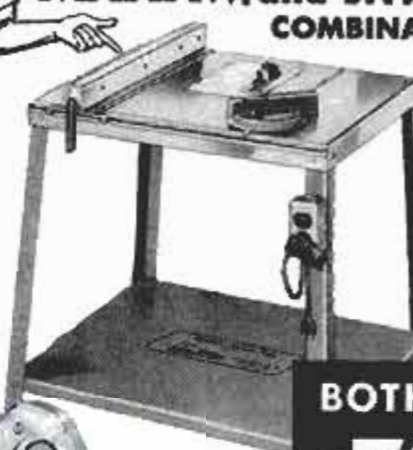
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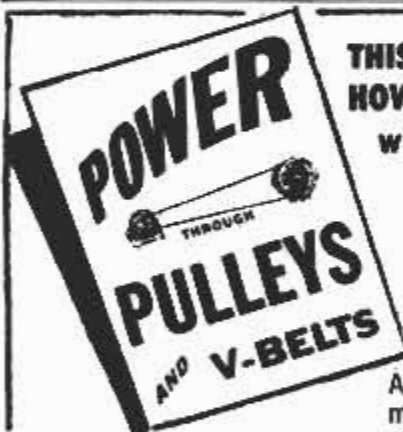
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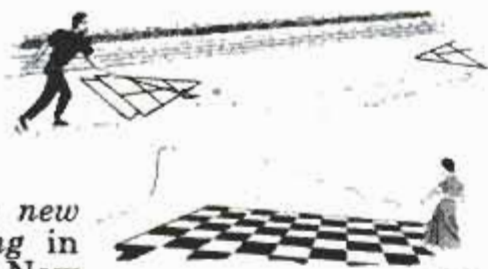
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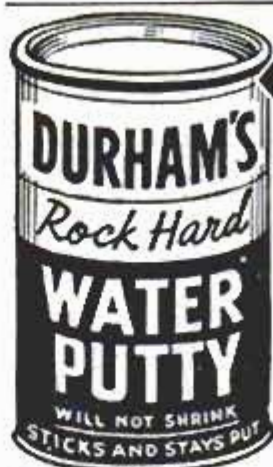
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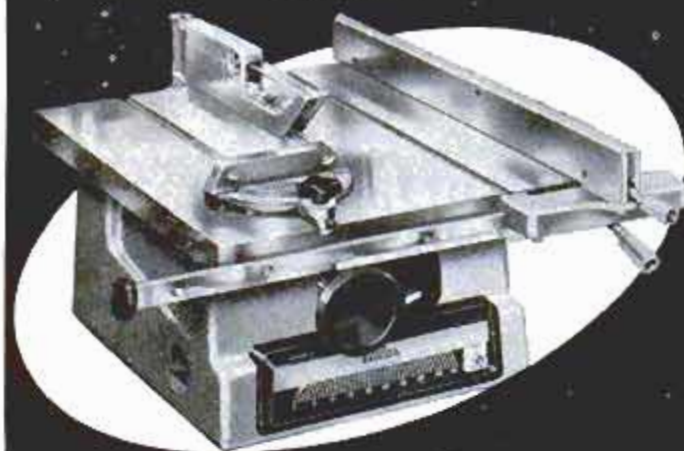
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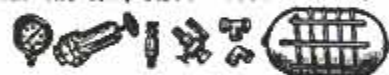
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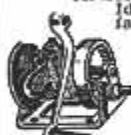
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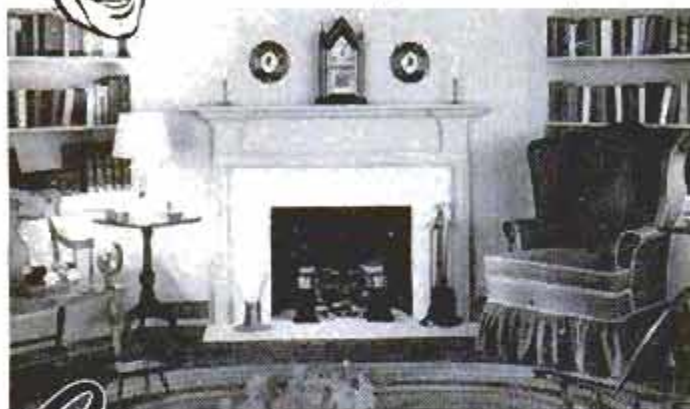
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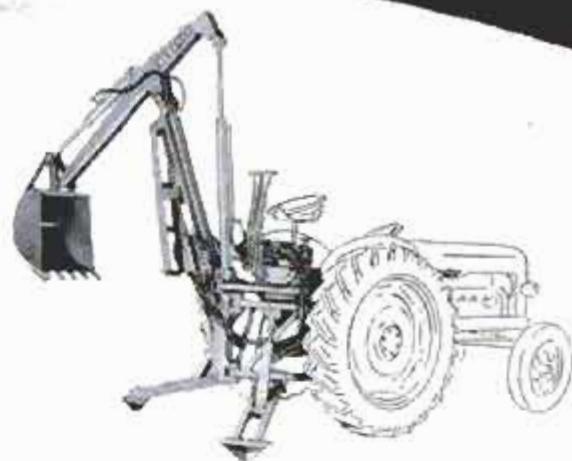
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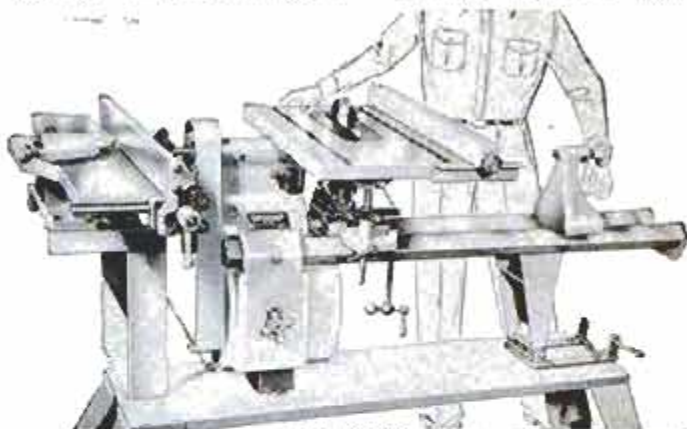


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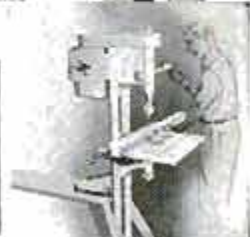
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1300-1500 WATT PLANT

115 v. 60 cyc. AC Push Button Start. Powered by a 3 1/2 HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22), Wt. 110 lbs. Reg. \$475 value, Factory price... **\$239.50**

1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery charging built-in. Factory price... **\$279.50**

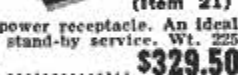
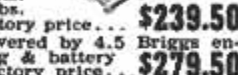
MASTER-LITE 2500 Watt Plant

110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price \$645.00 (Item 21) Factory Price... **\$329.50**

3500 Watt Plant Push Button Start (Item 23)

115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. \$760. Factory Price... **\$379.50**

DUAL VOLTAGE 110/220 for any of above plants—\$30 additional.



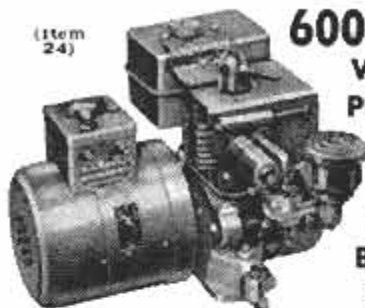
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(Item 24)

TERRIFIC SAVINGS at MASTER MECHANIC'S bedrock factory prices!

600-700 WATT PLANT



115 v. 60 cyc. AC Powered by a rugged 2 HP. easy starting Briggs engine. No wiring necessary: just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 7.5 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Regular \$275.00 value... **\$143.50**
1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine... **\$199.50** with 50% greater output.

PUSH BUTTON START

LESS THAN WHOLESALE

GIANT 2000-2500 WATT PLANT

110-120 v. 60 cyc. AC. Absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 3000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price \$585. Special at... **\$299.50**

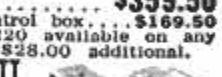
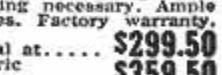
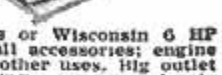
Same plant with electric self starter (Item 31a)... **\$359.50**

Generator only and control box... **\$169.50**

DUAL VOLTAGE 110-220 available on any of above models for \$28.00 additional.

NEW 1000-1200 WATT

Belt drive, 115/130 v. 60 cyc. AC. Powered by a rugged 2.75 HP Briggs engine. Excellent for portable or standby emergency power. Produces current for any power tools, oil burner, freezer, radio lights, etc., which require up to 1200 watts. Engine easily disconnected for other uses. Control box and voltmeter included (Item 19)... **\$179.50**



Recoil Starter

RUBBER HOSE



TERRIFIC VALUES!

Genuine Neoprene Hose—outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies—yet completely flexible. Equipped with standard thread male and female fittings. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc.—or pump gas and fuel oil. Volume factory prices—save more than 60%.

Inside Dia.	Length	Price
1"	10 ft.	5.95
1 1/4"	25 ft.	13.95
1 1/2"	50 ft.	24.75
1 3/4"	100 ft.	40.95
1 1/2"	10 ft.	10.95
1 1/4"	25 ft.	14.75
1"	10 ft.	17.50
2"	14 ft.	22.50

1 1/2" I.D. HIGH PRESSURE STEAM HOSE per ft. \$1.00

AIR HOSE Heavy duty, 1/4" I.D., 2 braided (150 lb. pressure) with standard couplings, 20 ft. lengths, ea... **\$2.95**

PAINT SPRAY MATERIAL HOSE

3/8" I.D. Synthetic thickened inertube and neoprene cover—finest made! 25 ft. lengths with standard couplings, (Item 62) each... **\$7.50**



MASTER DC ARC WELDERS

Now! a portable, rugged, industrial type welder with terrific performance, yet

at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate. **WELDER ONLY—DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 35a.) Wt. 110 lbs. \$450 value... **\$119.50**

WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) Wt. 110 lbs. \$400 value. Special... **\$99.75**

COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp. air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing \$1200. **\$449.50** Factory Special.

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **\$10.50**

"MASTER" CENTRIFUGAL PUMPS



For pumping out basements, and excavations, filling fish ponds or stock tanks, fighting rural fires, irrigating, spraying, pumping petroleum and countless other uses. "MASTER" Centrifugal pumps deliver more gallons per dollar! Ideal for builders, plumbing, sewer and road contractors. The "MASTER" special impeller design enables our pumps to handle water with a high content of mud, sand or gravel, yet at practically no loss in pumping efficiency! And direct factory prices save you money on every model!

HI-FLO CENTRIFUGAL PUMP (Item 502)

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per minute! Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Pre-lubricated sealed bearings for years of heavy low-cost service. Big 1 1/2" Model. (Item 502) Wt. 70 lbs. **\$134.50**
2" Model (150 gal. per min.) with 2 3/4 HP engine. Item 502a. 90 lbs. Fact. Spec. **\$154.50**

BIG JOE Portable Pump

A powerful pump that handles up to 10,000 gal. per hour. Easy to operate. Self-priming (after initial prime), no foot valve needed—resulting in 20% more capacity. Exclusive impeller design provides maximum rate of water per horsepower, yet handles water containing a large percentage of stone, gravel and mud. 2 in. suction and discharge. Powered by an easy starting 6 hp. Wisconsin engine and mounted on steel skids. Wt. 250 lbs. (Item 503) Factory price... **\$275.00**
Big rubber tired wheels. \$20.00 additional.

EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable. 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **\$8.95**

NO. 10-2 POWER CABLE. Heavy duty, very flexible, rubber covered, 50 ft. with male and female fittings. Wt. 9 lbs. (Item 502a) \$10.45

50 ft. without fittings (Item 502)... **\$9.45**

NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 190) Wt. 8 lbs. \$6.95. 100 ft. (Item 200)... **\$12.95**

JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463... **\$329.50** Special factory price.



Send check or M.O. Prices I.o.b. Factory. 10 day Money back guarantee. SEND 10c for... **816** 1956 **MASTER MECHANIC MFG. CO., DEPT. 28-M Burlington, Wis. Catalog**

HEATING & VENTILATING FAN



(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Overrange removes kitchen smoke and odors. Powerful continuous duty motor. 110-120 v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super efficient fan moves huge volume of air. (400 to 600 c.f.m.)

8" Pipe, wt. 5 lb. **\$6.85**

9" Pipe, wt. 6 lb. **\$7.85**

10" Pipe, wt. 7 lb. **\$8.85**

12" Pipe, wt. 8 lb. **\$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan. Wt. 8 lbs. (Item 10F) \$11.95.

12" Fan. Wt. 10 lbs. (Item 10D) **\$12.95**

52 pc. SOCKET SET



LIFE-TIME GUARANTEE

Highest quality, guaranteed nonbreakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in 1/4" drive, 3/8" drive and 1/2" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job; in a big doghouse steel box. Wt. 17 lbs. (Item 203) List price \$62.90, Special... **\$27.95**

MASTER AIR COMPRESSOR

COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 209) High pressure type (4 c.f.m.) Large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing, sand blasting, etc. Piston type 2 1/2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed SAFE. Low factory prices. 1 1/2 HP Model (cap. 85 lbs.) Reg. \$175. (Item 209)... **\$99.50**



1/2 HP heavy duty model, Rep. Ind. motor & unloader switch (Item 209a) **\$129.50**

Tank Tested up to 500 lbs. per sq. in.

1 1/2 HP Model (cap. 85 lbs.) Reg. \$175. (Item 209)... **\$99.50**

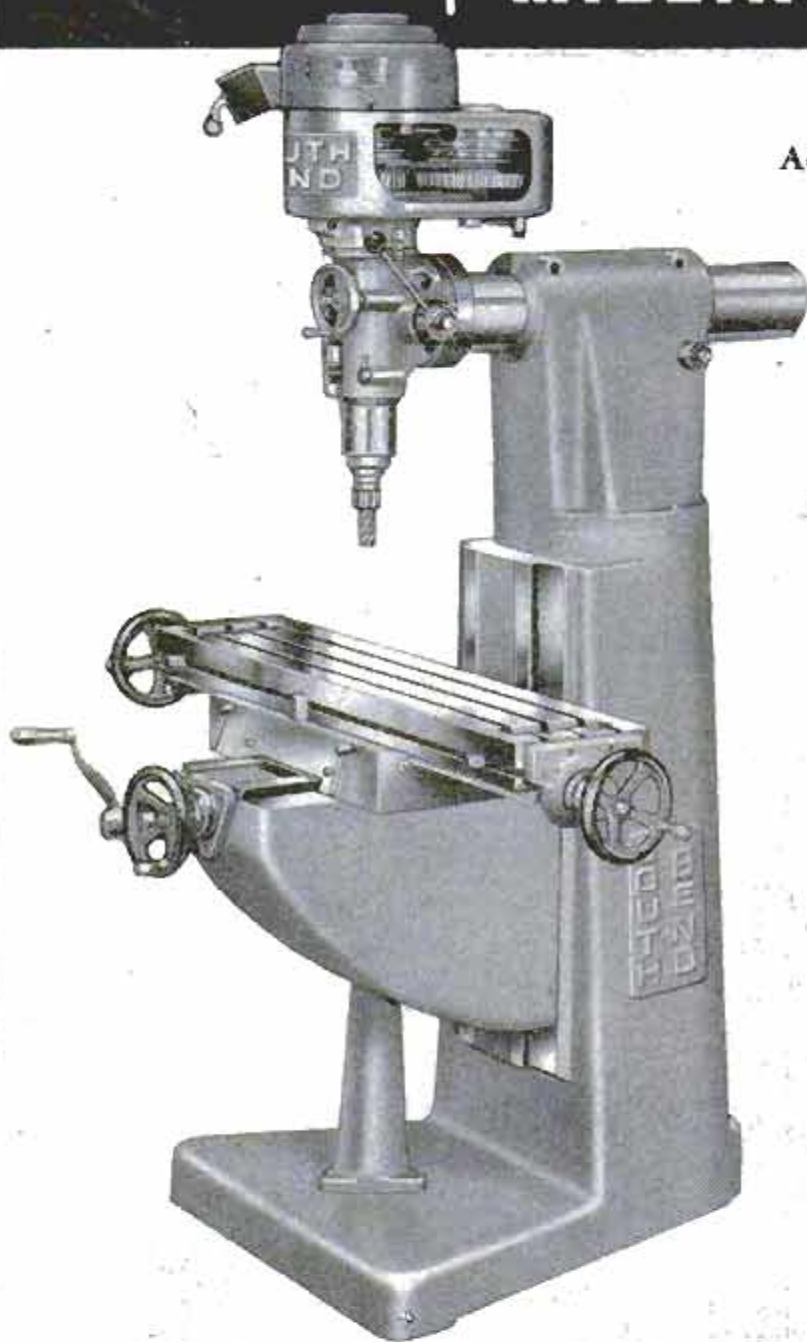
1/2 HP heavy duty model, Rep. Ind. motor & unloader switch (Item 209a) **\$129.50**

1 1/2 HP Model (cap. 85 lbs.) Reg. \$175. (Item 209)... **\$99.50**

1/2 HP heavy duty model, Rep. Ind. motor & unloader switch (Item 209a) **\$129.50**

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SOUTH BEND PRECISION VERTICAL MILLING MACHINE



Adequate capacity, accuracy and speed give this new milling machine the ability to keep machining costs low on a wide variety of work. Its simplicity of design provides ease of accessibility and set-up. Reduces operation and job change-over time to a minimum. Ideal for toolroom, production and maintenance work. *Write for information.*

LO-LOSS spindle drive. Precision ground and fitted quill.

Positive action controls with large, adjustable, graduated collars.

Power longitudinal table feed and automatic quill feed optional.



SPECIFICATIONS

Table travel.....	20 or 30"
Cross feed.....	9½"
Spindle to table (max.).....	20"
Spindle to column (max.).....	20"
Ram travel.....	15"
Spindle speeds.....	8
Head rotation.....	360°



SOUTH BEND LATHE South Bend 22, Indiana
Builders of lathes, milling machines, shapers, drill presses, pedestal grinders



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