



POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN



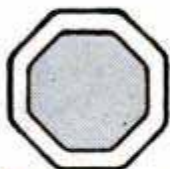
See Page 73

MAKE YOUR OWN BEACH EQUIPMENT

Featured in the Craftsman Section—page 166

BE A CHAMPION DRIVER

LEARN THE "SIGN LANGUAGE" OF THE HIGHWAY!



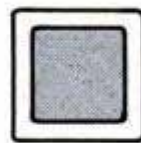
1. The meaning of a highway sign is generally indicated by its shape. The octagonal sign means STOP.



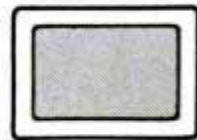
2. A round sign indicates a RAILROAD CROSSING and warns you to approach it with caution.



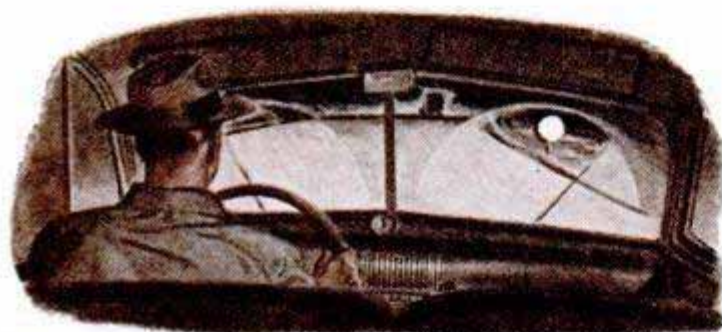
3. A diamond shaped sign tells you to SLOW DOWN—indicating a dangerous curve, hill, or similar hazard.



4. A square sign normally indicates SCHOOL ZONE or other areas involving hazards to pedestrians.



5. A rectangular sign gives TRAFFIC DIRECTIONS—Keep To Right, No Left Turn, No Parking, etc.



On a dark, rainy night like this, the shape of the sign ahead tells this driver that a railroad crossing lies ahead. It alerts him in time and warns him to **approach it with caution.**



Because children are inclined to be heedless, drivers should be particularly watchful for signs indicating school zones. Caution and courtesy distinguish **the Champion driver.**

A Champion driver is attentive to little things that pay big dividends in the pleasure, security, economy and dependability that you derive from your car. Spark plugs contribute largely to these dividends. Check them at regular intervals and replace them every 10,000 miles. They quickly pay for themselves. The great majority of champion drivers prefer and use Champions—the spark plugs champions use.

... BE A CHAMPION DRIVER—IT PAYS!

FOLLOW THE EXPERTS—

Demand



"I used the same identical set of Champion Spark Plugs in winning four major speedboat events last year, including the international Harmsworth race."

—R. Stanley Dollar

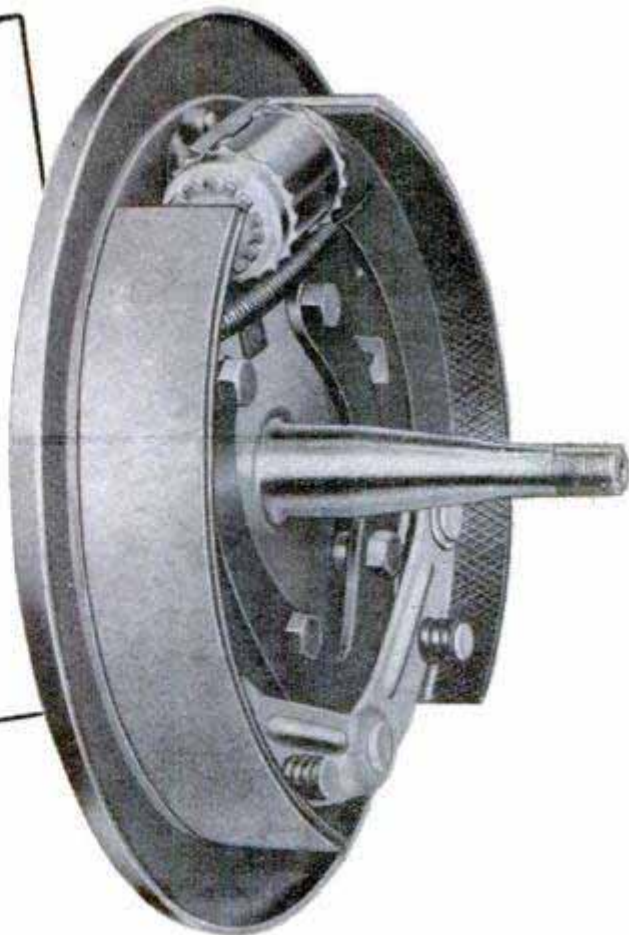


CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

Listen to the CHAMPION ROLL CALL... Harry Wismer's fast sportscast every Friday night, over the ABC network

How RIVETLESS LININGS

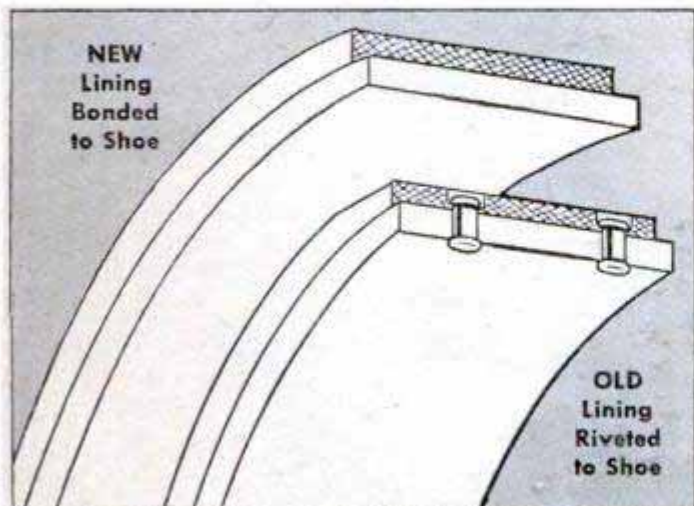
Improve Braking, Cut Costs



CHEVROLET'S Perma-Bond Dobl-Life brake linings, adopted a year ago, have proved their superiority in actual service on more than 1,000,000 passenger cars. They not only improve the braking, but also save money for the car owners.

Because the brake lining is bonded to the shoe, there are no rivets . . . and that means that rivet squeals

There are no rivet holes through the lining to collect damaging grit . . . and no rivets to prevent using practically the full thickness of the lining.



and rivet-scored drums are things of the past. Brakes formerly had to be relined as soon as the linings wore down to the rivets; now, with bonded linings, virtually the entire thickness of the linings can be used.

Bonded linings cut motoring costs two ways. They eliminate the expense of repairing rivet-scored drums . . . and they last about twice as long as the riveted linings. Perma-Bond rivetless brake linings are only one of the many quality features that make Chevrolet **FIRST . . . and Finest . . .** at Lowest Cost!

Your Chevrolet dealer invites you to see the new 1950 models at his showroom.



CHEVROLET MOTOR DIVISION, General Motors Corporation, DETROIT 2, MICHIGAN

This One



JUNE 1950

Look What I'm Learning

—AND EARNING, TOO,
IN A U. S. ARMY
SPECIALIST SCHOOL



Choose Your Own Course to Train for a Career with a Future

Look over these Army Specialist Training courses with your own future in mind. Under the new U. S. Army Career Plan you can discover your best abilities, earn while you learn, and prepare yourself for a satisfying career in a field you are suited for. Opportunity for advancement, earnings you can bank, a secure and congenial way of life—all can be yours in today's Army. Get details at your nearest Recruiting Station.

HERE ARE SOME OF THE COURSES AVAILABLE:

AUTOMOTIVE MAINTENANCE
MEDICAL EQUIPMENT
REPAIRMAN

LOCOMOTIVE REPAIRMAN
CONSTRUCTION EQUIPMENT
MECHANIC

OFFICE MACHINE SERVICE MAN
MARINE ENGINE MECHANIC
ELECTRICIAN

WATER SUPPLY TECHNICIAN
TIRE REBUILDER

CONSTRUCTION MACHINE
OPERATOR

TELEPHONE AND TELEGRAPH
INSTALLER REPAIRMAN

TELETYPE REPAIRMAN

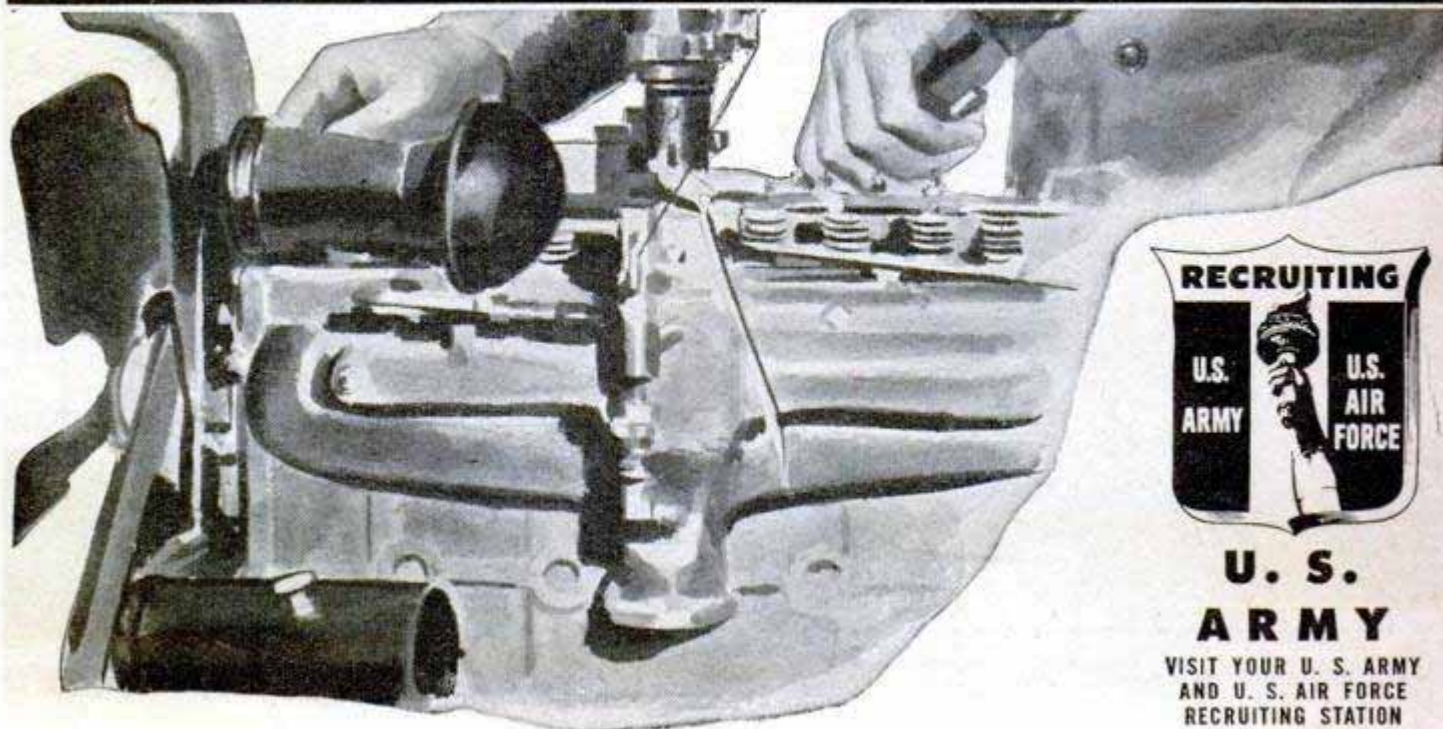
SURGICAL TECHNICIAN

MAP REPRODUCTION

WATCH REPAIRMAN

FIRE CONTROL INSTRUMENT
REPAIRMAN

LEADERSHIP COURSE



**U. S.
ARMY**

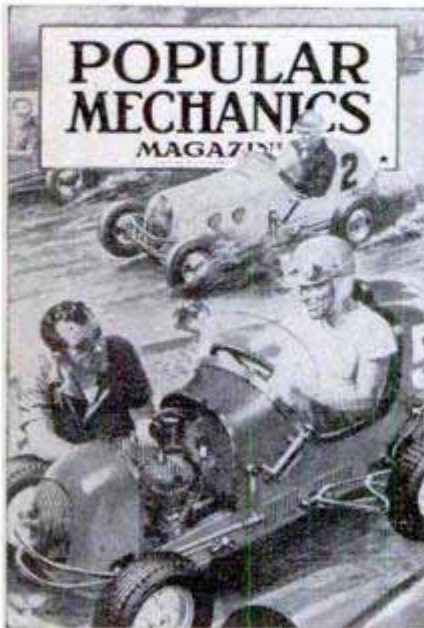
VISIT YOUR U. S. ARMY
AND U. S. AIR FORCE
RECRUITING STATION

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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



this month's cover

EVER WATCH a frightened beetle skitter around a pile of dirt? That's the way the new T.Q. midget racers behave to give screaming spectators a new dirt-track thrill. T.Q. stands for three quarter, which is about the size of the little beetles in comparison to the standard midget racer. They're just a bit larger than Junior's sidewalk auto, which, as a matter of fact, inspired this newest racing craze. Don't sell these half-pints short, though—some of them tear along the straightaway at 100 miles an hour. There's only a handful of T.Q.s in existence, so here's a perfect opportunity for the mechanic or racing fan to get a reserved seat on a new bandwagon. Don't take up the hobby if you're slightly overweight though—it's said that even the smallest driver must grease himself in order to squeeze behind the wheel. For more information on the rip-roaring midgets turn to the opening story, page 73

Published monthly by Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill. H. H. Windsor, Jr., president; William Harrison Petridge, vice president; D. F. Windsor, vice president and secretary-treasurer; Clover L. Perkins, advertising manager; Alan M. Deyoe, circulation manager. Single copy in the United States and Canada, 35 cents; subscription rates in United States and possessions, Canada, Philippines and countries of the Pan-American Postal Union, 1 year \$3.50; 2 years, \$6.00; 3 years \$8.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 30 days in advance so you will not miss an issue. Give both old and new addresses. Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office Dept., Canada. Copyright 1950 by Popular Mechanics Company, Copyright under International Copyright Union, Copyright in France. All rights reserved under Pan-American Copyright Union. Printed in the United States of America.

Volume 93 JUNE 1950 Number 6

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Other items, and manufacturers of available products described, are listed on pages 10, 12 and 14

**"That hammer?
You're kidding!"**



It's a fact, Bill. I've been using this same hammer for 29 years. It helped to build the house you were born in.

Well, I don't know how you do it. I hardly ever *use* a hammer, and yet I've broken two of them in the last year or so.

That so? What kind of hammers were they? What brand, I mean.

Gosh, I don't know. Guess they didn't *have* any brand names. But they were good bargains.

That's where the trouble is, Bill. Look . . . see the name on this hammer? Whenever you see that brand name, you

know it's a good hammer. Stick to the well-known, advertised brands when you buy tools, and in the long run you'll save a lot of money.

That makes sense, Fred. I'll remember it.

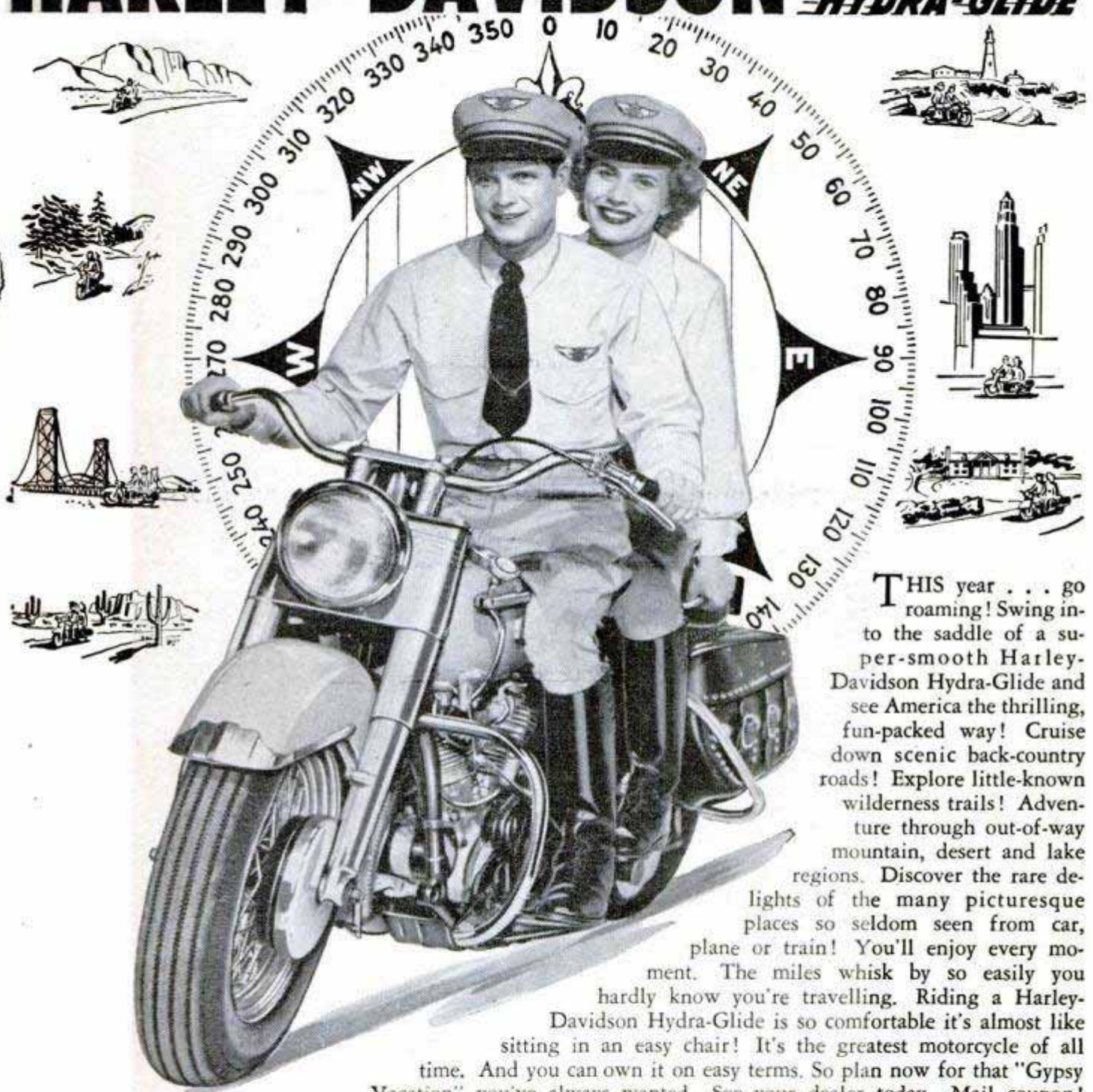
And do your buying at the hardware store, where they don't try to sell you anything but quality tools. That way you'll always get your money's worth.



POPULAR MECHANICS

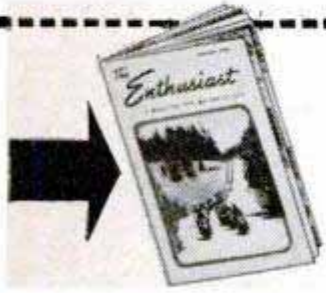
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HARLEY-DAVIDSON MOTOR CO., Dept. P, Milwaukee 1, Wisconsin
 Send FREE copy of ENTHUSIAST Magazine filled with motorcycle action pictures and stories.



Name.....
 Address.....
 City..... State.....

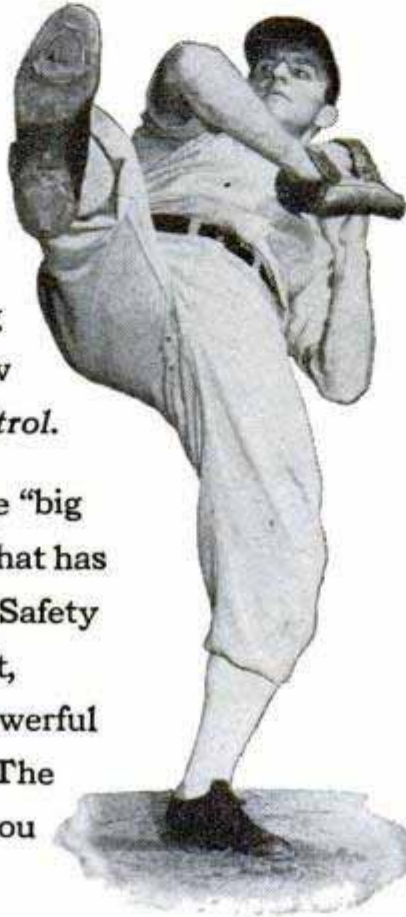
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IN baseball, as in every other sport, the star performer, the big wheel, is the fellow with *constant control*.

In bicycling, the "big wheel" is the one that has a New Departure Safety Brake, the lightest, strongest, most powerful brake ever built. The brake that gives you *constant control* at all times. It brings any bike to a ...



1884



Be sure your new bike has a

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New Departure • Division of General Motors • Bristol, Connecticut

in this corner..... **THE EDITORS**



A NEW NAME appears on our masthead this month. Siler Freeman, automotive editor of the Detroit Times, has been appointed automotive editor of *Popular Mechanics Magazine* to bring you first-hand, authoritative reports from America's "Motor City." He will continue to serve the Times while covering the automobile industry news for us.



A veteran newspaperman, Mr. Freeman is 48 years old and lives in Detroit with his wife and four children. Born in New York City, he spent his early school years in Schenectady and began working on newspapers after graduating from high school in 1918. After serving with the Navy in World War I, he attended the University of Illinois and was graduated in 1923 from Syracuse University. He was successively reporter, sports editor and assistant city editor of the Schenectady Union-Star, copyreader and assistant city editor to Albany newspapers and drama critic of the Worcester, Mass., Gazette. Then he became news editor and assistant managing editor of the Toledo News-Bee, and went to Detroit in 1928 as a sports writer for the News. He studied law and received his law degree from Wayne University in 1931. He joined the Detroit Times staff in 1934 and in 1941 was made automotive and aviation editor. Since 1944 Mr. Freeman has been president of the Off-the-Record Club, composed of automotive and aviation writers.

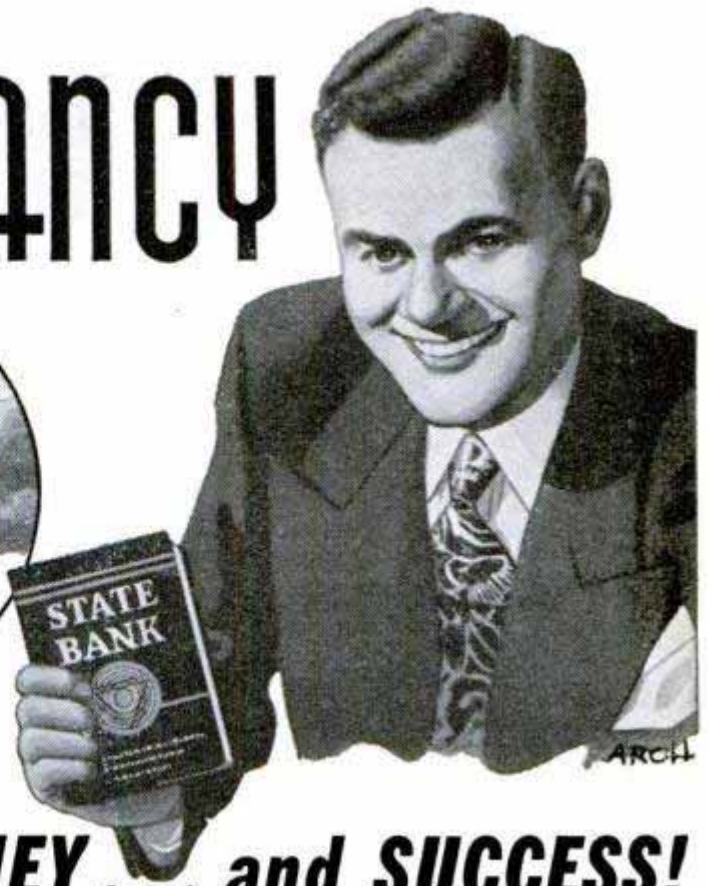
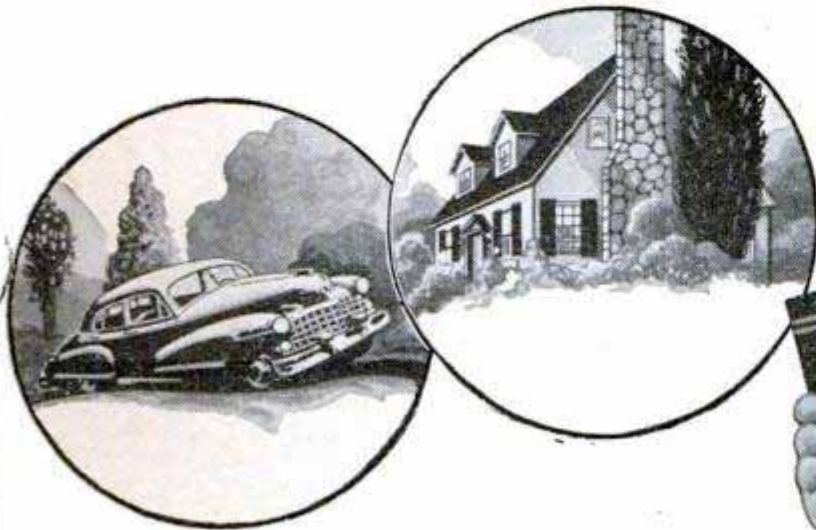
* * *

We Mixed Our "W" States

"Your March issue, page 102," writes D. H. Caryl, Science Desk Librarian at the University of Washington Library in Seattle, "contains a misstatement that indicates to us Westerners that your staff might be contaminated by Wisconsin propagandists. The article 'Sea-Going Eggbeaters' gives credit to F. A. Kirsten of the University of Wisconsin. Sir, the gentleman in question is Prof. F. K. Kirsten of

(Continued to page 8)

5 reasons why ACCOUNTANCY



offers you MORE MONEY . . . and SUCCESS!

REASON #1. If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Even back in "depression years," surveys showed that accountants earned more on the average than men in other major professions.

REASON #2. The demand for accountants is great—everywhere. All businesses must have trained accountants to cope with ever-growing requirements. It's a profession offering wide opportunity—always—to the man who knows.

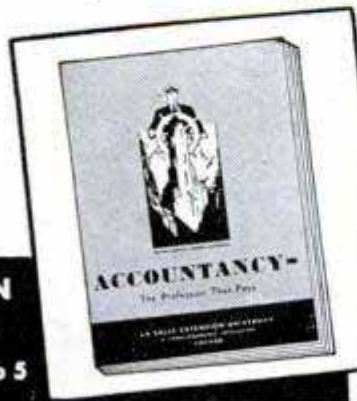
REASON #3. You can fit into any business, anywhere in the country—because accounting principles are universal. Think what this means in terms of security and independence!

REASON #4. Accountancy is open to all. Any man or woman of good intelligence, who enjoys figure work and is willing to follow LaSalle's systematic "problem method" plan, can rapidly qualify for a highly profitable, enjoyable

lifetime career . . . and he doesn't have to finish his training before beginning to "cash in."

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Send today for LaSalle's interesting booklets, "Accountancy, the Profession That Pays," and "Success Reports." Learn about the five great fields of opportunity . . . and LaSalle's time-tested plan for helping men and women to rapid advancement, higher income, greater prestige and professional standing. The coupon below will bring these fact-filled booklets to you—without cost or obligation. Mail the coupon NOW.



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GIVEN! An attractive Pyroll metal savings bank, takes coins up to 50c pieces. **MOTORISTS, it's yours for the asking—sent postage paid.**

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City or Town _____ State _____

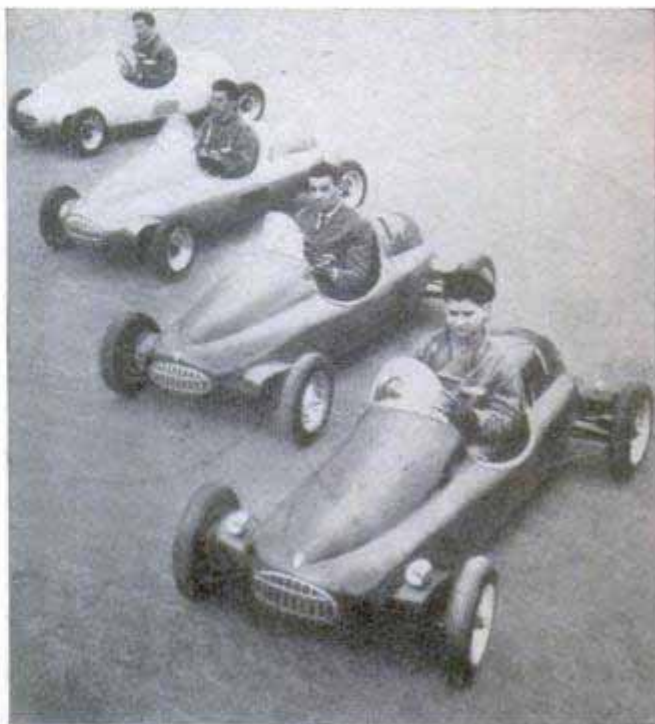


(Continued from page 6)

the UNIVERSITY OF WASHINGTON. To a loyal Washingtonian this is almost defamation of character, however we will forgive you this time."

We're sorry. The staff will turn its face to a corner for five minutes.

* * *



Half-Pints of Speed

This month's cover and the story beginning on page 73 tell of America's newest breed of racing cars, so small they roll on scooter wheels. Here is the Italian version of the midget racer. Lined up in the yards of the Innocenti Works at Milan, these are described by the photographer as "the smallest racing cars in the world."

* * *

Letter to the Editor

Dear Sir:

Would deeply appreciate your publishing a request for back copies of *Popular Mechanics* or other magazines pertaining to hobbies. We here at Yokota Air Force Base, Japan, feel we have the finest setup for hobbies of any field or camp in Japan.

Our shops include a full model-train layout, a miniature race track for cars, a field for flying hand-controlled planes, as well as workshops for building these models. We also have clubs for camera, radio, leather, plastic and woodcraft hobbyists.

S/Sgt. Henry A. Luke, 15234202,
512th Recon. Sqd. (VLR) Wea,
APO 328, c/o P.M.,
San Francisco, Calif.

(Continued to page 18)

A tale of two Texans



J. R. TODD of Crane, Texas, has this to say about his I. C. S. Course in Certified Public Accounting:

“ My I. C. S. training is really paying off. Already, I'm netting \$120 a month profit on my investment—with more to come. Dividends like these are convincing proof of the value of I. C. S. training. ”



H. A. HOWELL of Big Spring, Texas, completed the I. C. S. Course in Architectural Drawing, is currently enrolled in the Complete Architectural Course. He writes:

“ I got my present job on the strength of my I. C. S. training. As a result, I'm \$100 a month richer. You can see why I'm so sold on I. C. S. ”

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|---|--|---|--|

Name _____ Age _____ Home Address _____

City _____ State _____ Working Hours _____ A.M. to _____ P.M.

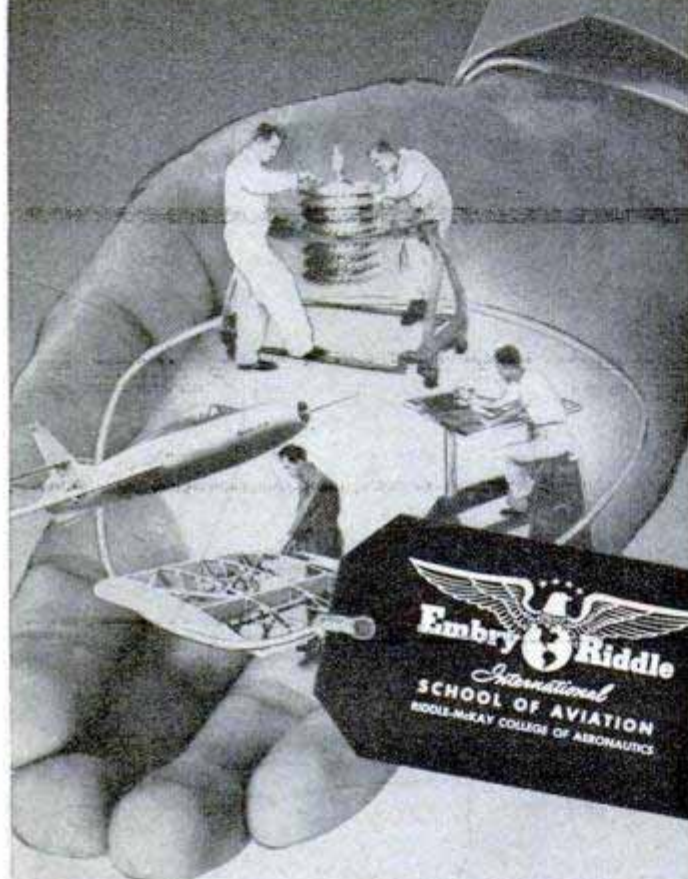
Present Position _____ Employed by _____

Length of Service in World War II _____ Enrollment under G.I. Bill approved for World War II Veterans. Special tuition rates to members of the Armed Forces. Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada.

WHERE-TO-BUY-IT INDEX

Source of supply appears after items commercially available

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ADDRESS _____

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- Commercial Pilot
- Engineering
- A.&E. Combined Commercial Pilot
- Flying Mechanic
- Drafting & Design

Check One Veteran Non-Vet

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AUTOMOTIVE

Arc welder charges battery (Lincoln Electric Co., Cleveland 1, Ohio)	78
Three-color stop light signals driver's action (Harrell Products, 771 N. Van Buren St., Milwaukee 2, Wis.)	82
Motor car at home on rails or roads (Fairmont Railway Motors, Inc., Fairmont, Minn.)	99
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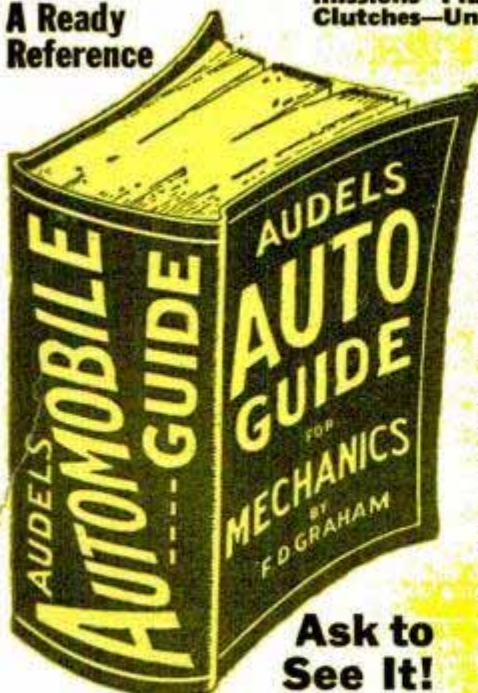
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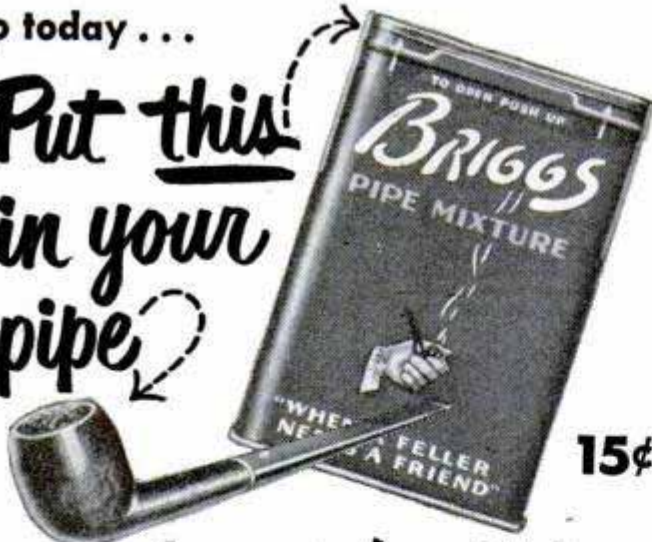
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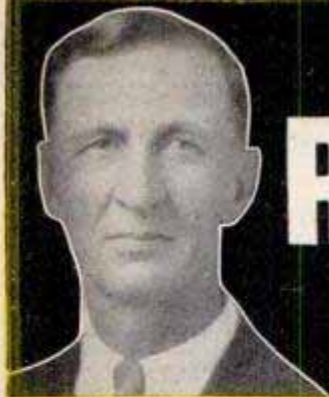
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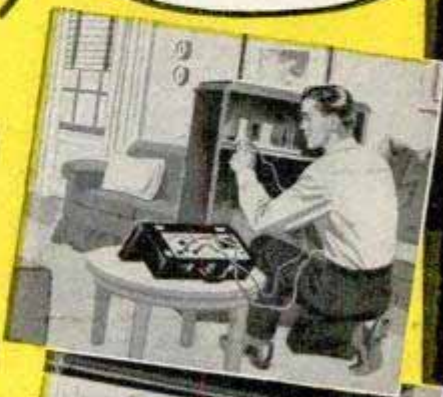
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Radio-Television, Electronics

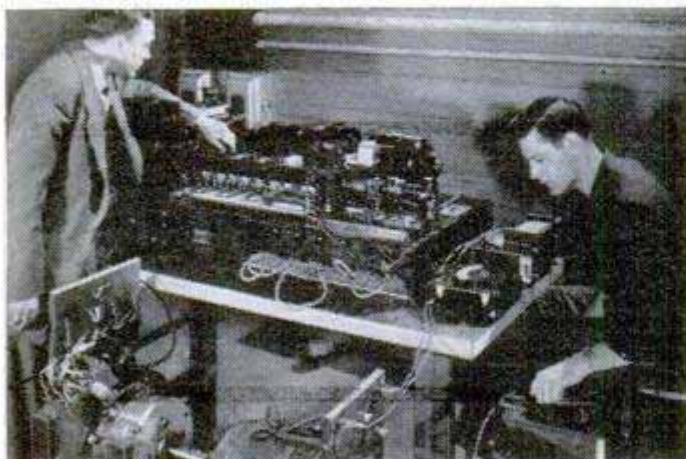
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Pasteurized Vegetables

Fruits and vegetables now are pasteurized like milk to kill all disease germs they may have picked up from contaminated soil. Occupation troops in Japan are the first to try the pasteurized vegetables. Research workers at Rutgers University worked out the technique for the Army Quartermaster Corps. In the past the Army has forbidden consumption of produce grown in some foreign areas because it was contaminated with typhoid, dysentery and other disease germs. Now tomatoes, lettuce, spinach and carrots can be heat-treated at 240 degrees F., killing the germs but leaving intact the quality of the fresh foods.

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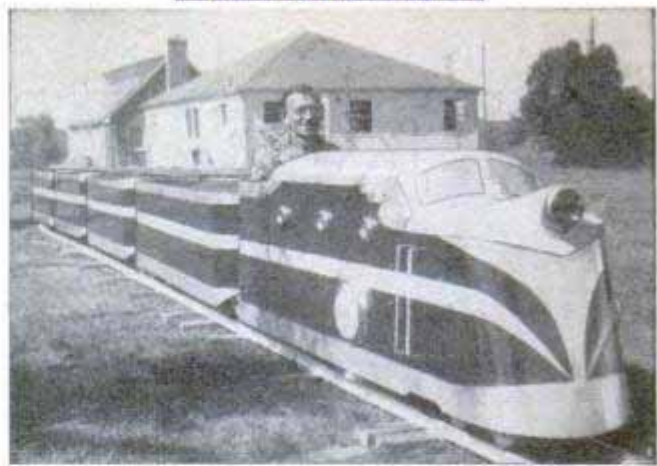
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Neighborhood Streamliner

Father-and-son combination, Leon H. Shay and Leon R. Shay of Freeport, Ill., the elder a Popular Mechanics reader "for more than 25 years," built this streamliner with a six-horsepower engine to carry the neighborhood youngsters, as many as 32 at a time, around a 300-foot loop track. It can travel from one to 45 miles an hour and is usually piloted by Shay's two granddaughters, aged 4 and 7. "We are hoping to take care of all the kids around here this summer," writes Mr. Shay.

This Is Tough on Flies

The garbage trucks have gone out of business in Jasper, Ind., and the garbage can is an outlaw. The entire town of 6800 has abolished garbage collection and electric garbage disposers are being installed in the sinks of Jasper householders. All food wastes will be shredded and washed away to the new municipal sewage-treatment plant. The city authorities hope that by eliminating garbage cans, the fly and rodent nuisance will be minimized and Jasper will be a healthier place to live.

Plug-in the Salt Shaker

Puerto Rican humidity must clog the salt shakers. An inventor at Guaynabo, P. R., has obtained a U. S. patent on a salt shaker with a built-in electric heater.

INDEX TO POPULAR MECHANICS NOW AVAILABLE To make it easier for readers to locate articles quickly, a complete printed index for the first six months of this year has been prepared. To reserve a copy of the index for yourself, your library or workshop, send your request with 10 cents to cover handling and mailing costs to Bureau of Information, 200 E. Ontario St., Chicago 11, Ill.

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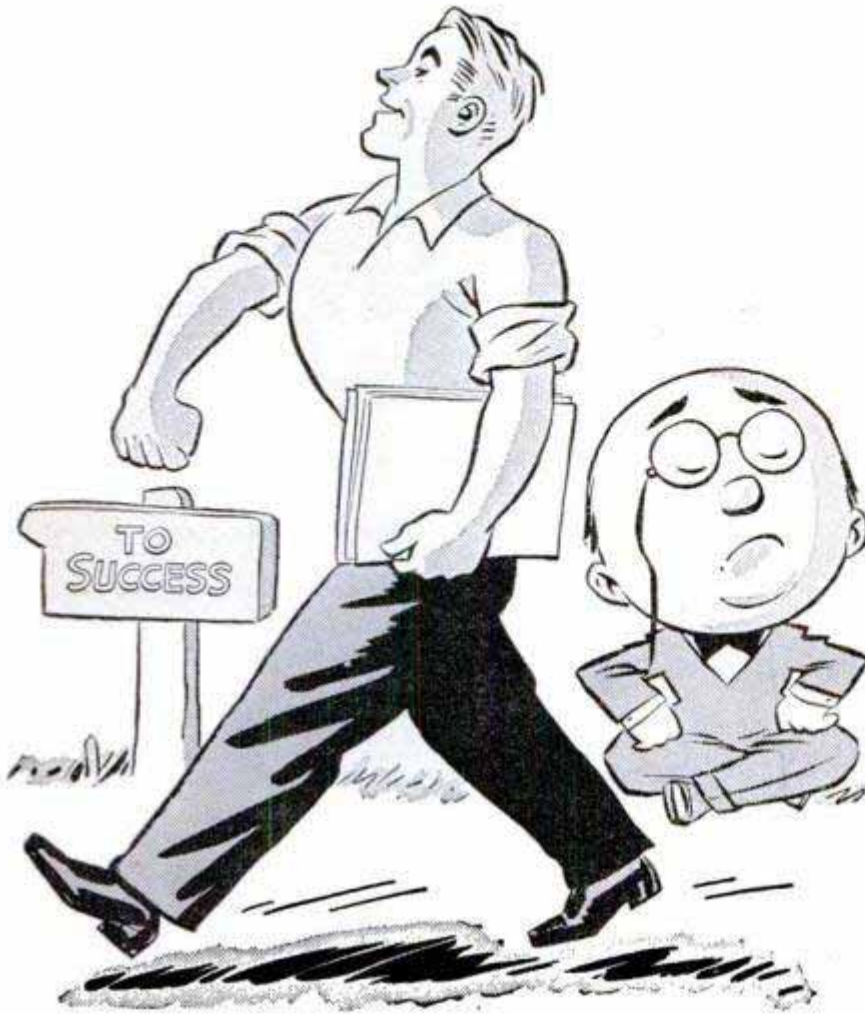
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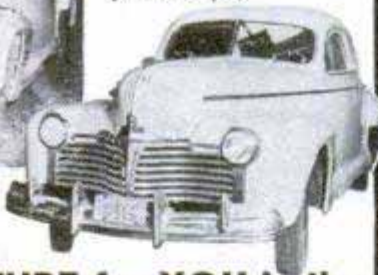
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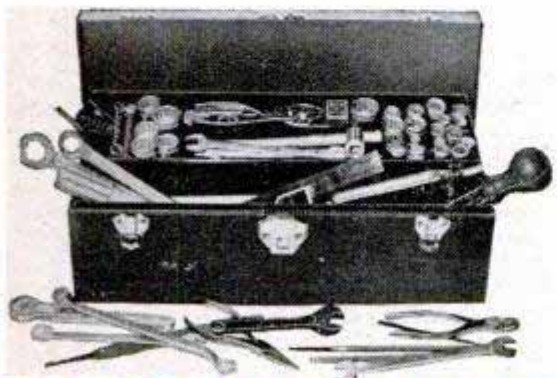
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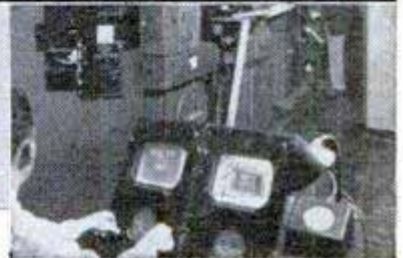
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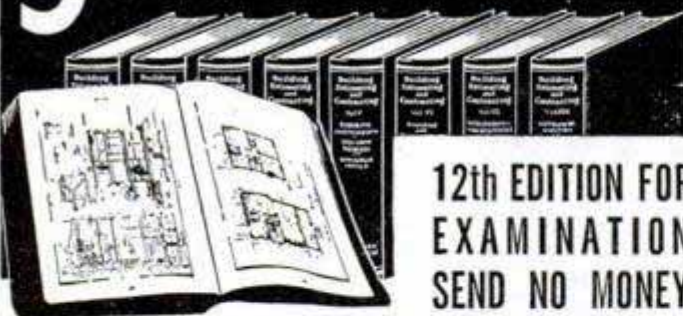
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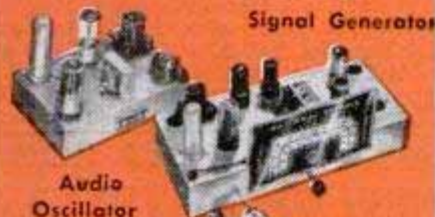
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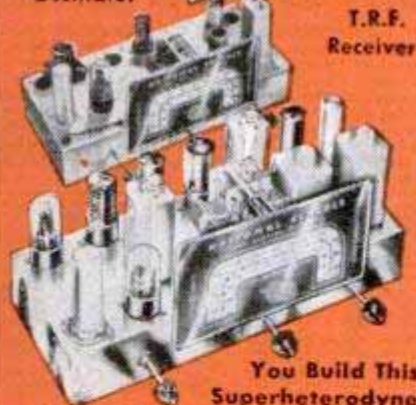
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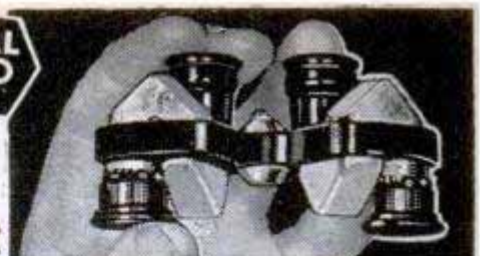
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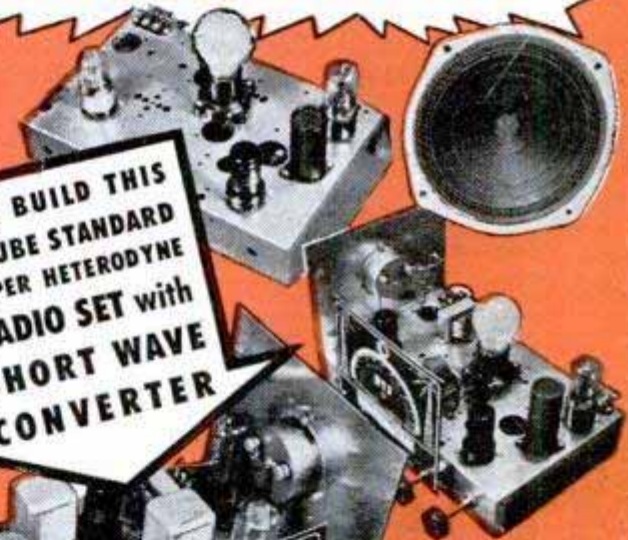
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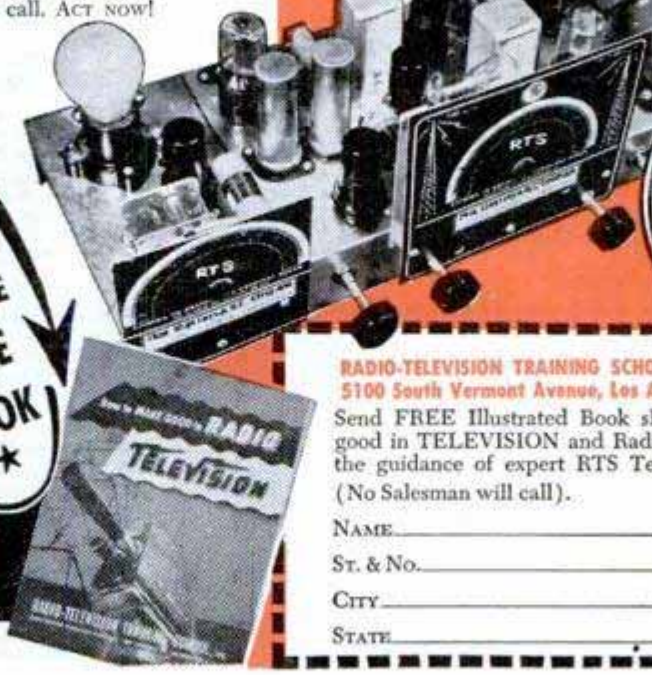
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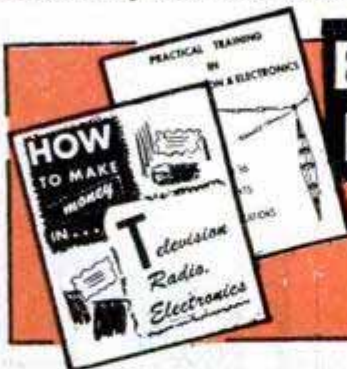
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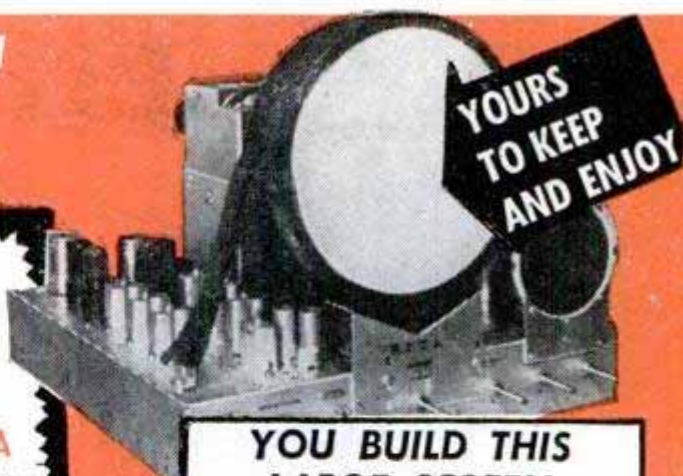
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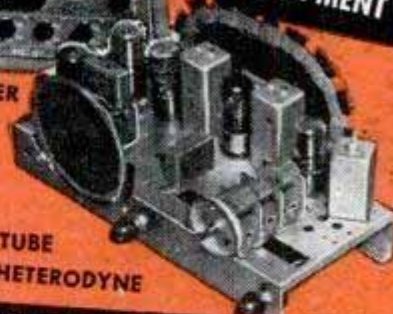


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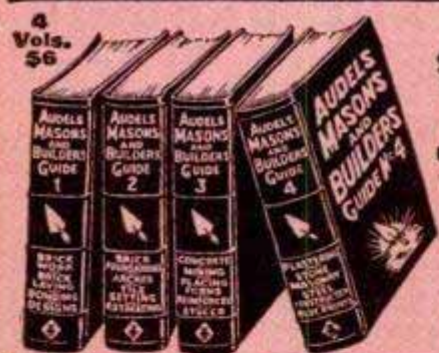
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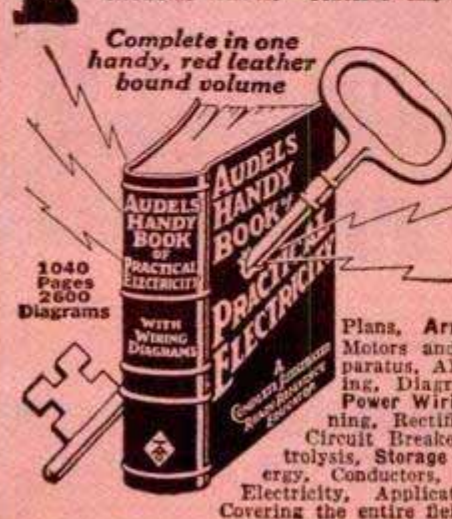
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THIS latest assignment of mine proved to be not only one of the most fascinating jobs I ever undertook, but one of the toughest.

"Find a business," I was told, "that fits this description: It must be new enough so that not many are in it. It must be one that can be operated in a small space—by either a man or woman—in spare time. The work must be interesting, and preferably the kind that will give the worker artistic or creative satisfaction. It must be a business that anyone can *learn* without weeks or months of study. It must be one that can be started without a big investment in special equipment, materials, or supplies, and it must still pay a good rate of profit for every hour invested!"

I wrote down the points as they were given to me, ran my fingers through my hair, went back to my own office and stared at the wall for fully an hour. Sometimes staring at a blank space helps me think—brings pictures to my mind.

But, as I soon concluded, this job was not going to be accomplished by thinking, alone. When I finished the assignment—when I had found the business that fitted every one of the requirements, I had spent eleven months in market studies, personal investigation of hundreds of different kinds of home businesses, sales checks, even research on such seemingly unrelated subjects as chemistry and electronics. And I had spent close to twenty thousand dollars of the company's money.

But the business that came out of my efforts has proved to be worth every hour and every dollar of its cost—for, already, it has been tested and proved successful by a number of men and women. In actual practice, it has proved to be the perfect starting point for those who wish to break away from payrolls, time clocks, and the uncertainty of "jobs." It has enabled many men and a number of women to start a business in spare time (without risking

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The product of the business is one that is familiar to everyone. But the method by which the product is produced probably is an art you've never heard of. I was first started on the investigation of this particular business by a story that I read in the American Magazine. It told about a couple in Ohio, man and wife, who had done a volume of business in excess of a million dollars in one year. Their profit must have been enormous, because the cost of materials that went into each product was only 43c—while the product sold for \$6.00. And it could be produced with not more than an hour of labor time. They had started with no experience and with an investment so small that anyone could get the money together.

Right from the beginning it had the earmarks of the business I was looking for. And everything I unearthed about it confirmed my early impression.

When I tell you what they made and sold, your first thought probably will be "Old Stuff." But wait. Give it a second thought, because while the product is old and well established, the number of people who know how to make it are very few, indeed. And the annual sale runs into millions, because the product is one that is wanted and cherished by every mother. It's a product that is purchased because of love and sentiment—and it's products like this that are called "depression proof." In poor times, people often skimp on necessities to have the things that warm the heart—and that is one of the outstanding characteristics I discovered in Metalized Baby Shoes.

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metalized shoes are made by a process called Electroplating. Electroplating of metal objects is quite common. But to electroplate a non-metallic object requires special knowledge. And that's the process I want to tell you about.

All the results of my investigation have been put into a large printed plan. It is illustrated with more than a hundred drawings, pictures, and photographs. It is called the Warner Success Plan—because it is a completely charted path to success in the Baby Shoe business. It tells all the secrets of electroplating non-metallic objects. It tells how to prepare the shoe, how to assemble the few pieces of equipment needed, how to put a coating of genuine gold, silver, or copper on a shoe or any other non-metallic keepsake. It tells how to get the orders coming in, how to finish the work, how to start in spare time and then—when you are ready—expand into a full time business.

I'd like to lend you this plan—give you an opportunity to read every word of it—learn every secret it holds—so you can then make your own investigation of this business and make your decision on the basis of facts instead of guesswork. If you decide to go into it, you can buy a copy of the Warner Success Plan to keep as your guide. But make that decision later.

Right now, all you need to do is send your name on a penny postcard to the Warner Electric Company, 1512 Jarvis Ave., Dept. 3-H, Chicago 26, Illinois. They are the publishers of the plan and they will arrange to send a copy for your inspection without any money risk on your part.

I'm mighty happy about my part in finding and writing up this business because it has proved to be a wonderful starting point for so many people. I'm sure you'll find it worth every minute you spend in reading it. Send your name, today, so you won't forget it.



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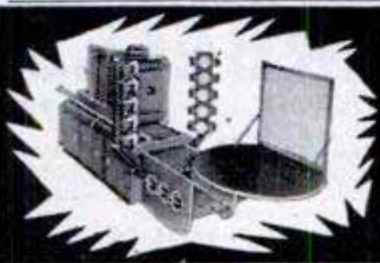
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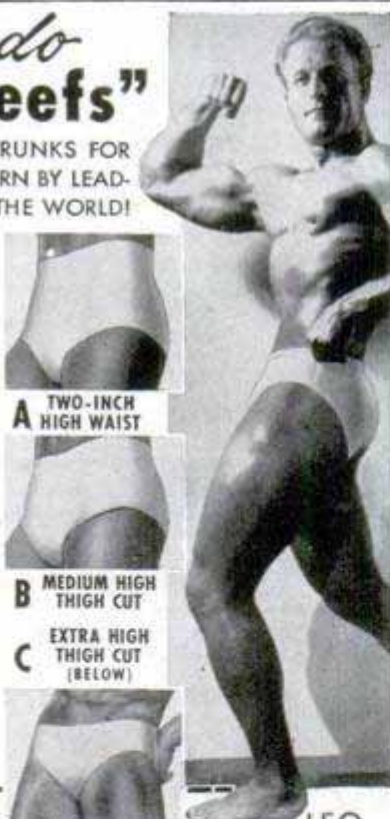
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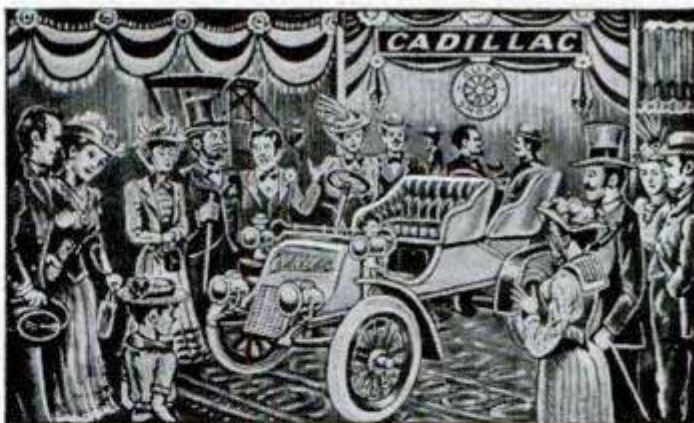
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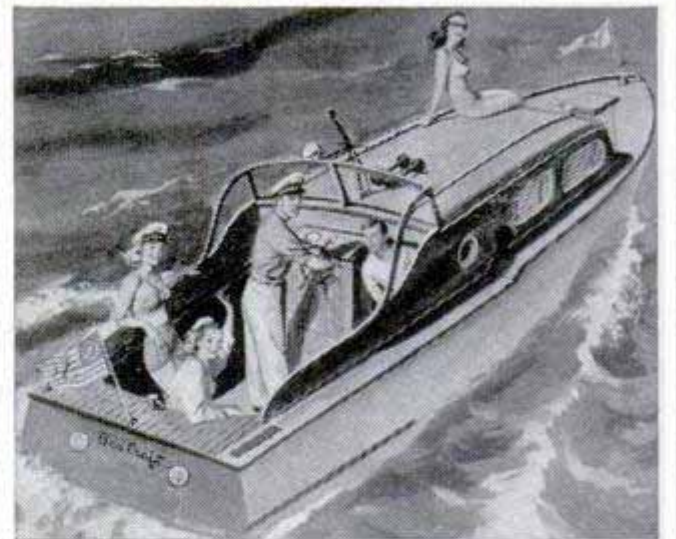
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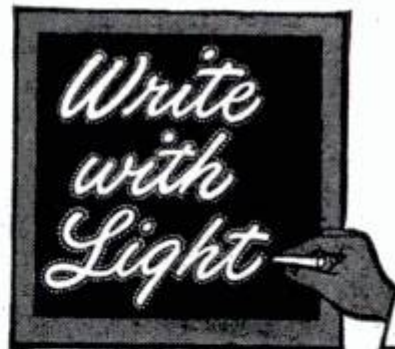
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BUSINESS Information Center, Chesterland, Ohio, will locate sources of any manufactured product you need. \$1.00 brings you 10 sources, guaranteed satisfaction.

HOW And where to obtain capital. Small and large loans. Free particulars. Star Service, Wapakoneta, Ohio.

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FREE! Complete details. Operate profitable mail order business. Sensational successful small "beginner's" plan. Lynn, 5710-M Bankfield, Culver City, California.

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WRITE For free booklet and catalog telling how to earn substantial profits in your spare time by forwarding new and renewal subscriptions to all magazines for your friends and neighbors. Oldest U. S. agency. Established 1869. Moore-Cottrell, North Cohocton, New York.

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\$250 WEEK Reported! Free illustrated book "505 Odd Successful Businesses." Work home! Expect something odd! Pacific-E, Oceanide, California.

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PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

WHOLESALE Plastics supply catalog. 10c. Lucite, clear, colored. Metallic acetate, 15 colors. Thick lucite cutoffs, polished blanks for carving. Metal findings, tools, ideas, bargains galore. Quantity prices on casting plastic. Gem-O'-Lite, Box 686S, North Hollywood, Calif.

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MAKE Money easy. \$5.00 for selling only ten \$1.00 boxes of everyday cards. Also radiant black plastic, metallic and other cards, note paper and wrappings. Send for samples. Howard P. Ellis, Dept. PM-6, Pitman, N. J.

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BIG Profits—Fast selling personalized jewelry. Free literature. Delite Corp., 238-M Neptune Ave., Brooklyn, N. Y.

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AMAZING Metallic birthday cards, stationery, napkins. Samples on approval. Plateless, 392 Broadway, New York 13.

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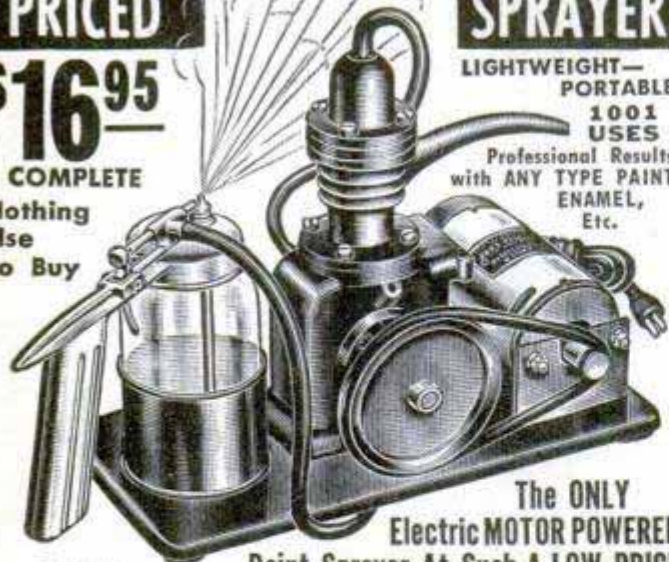
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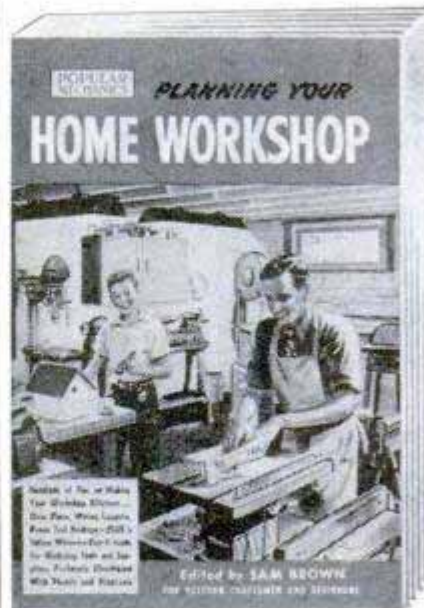
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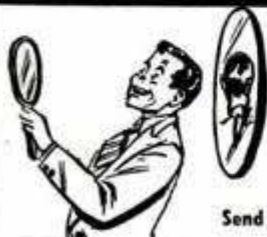
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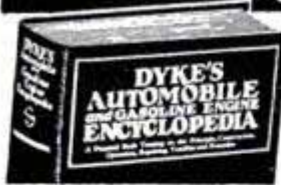
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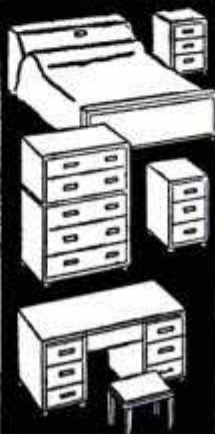


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Bet You Don't Know This About Advertising

by Susan



Quiz No. 2

How much does it cost per dozen to advertise the well-known brands of oranges? Is it 2¢? 3¢? 5¢ a dozen?

Answer: It costs less than 1/2¢ a dozen to advertise the big-name brands of oranges.

That's only half the story. Advertising lowers your cost two ways:

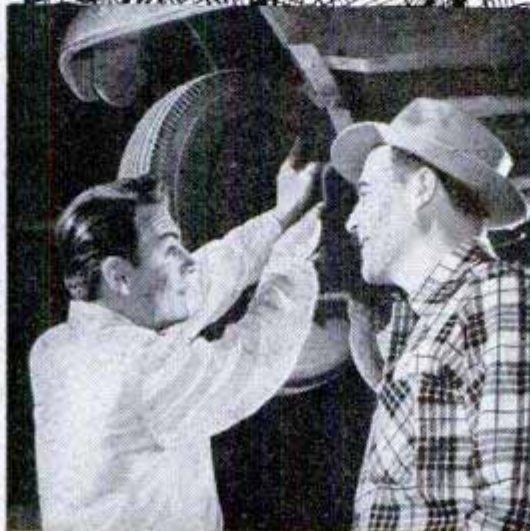
Cuts the selling costs. And by helping make mass production possible, lowers the production costs, too.

So advertising saves you many times that 1/2¢ per dozen.

"THEY KEEP YOUR FORD ALL FORD"



I WONDER HOW MANY FORD OWNERS KNOW WHAT I LEARNED TODAY.



I WAS TALKING TO MY MECHANIC ABOUT THE FINE CARE HE'S BEEN GIVING MY FORD AND DISCOVERED A BIG REASON WHY.



HE TOLD ME HE ALWAYS USES GENUINE FORD PARTS BECAUSE THEY'RE EXACT DUPLICATES OF THE PARTS IN MY CAR.

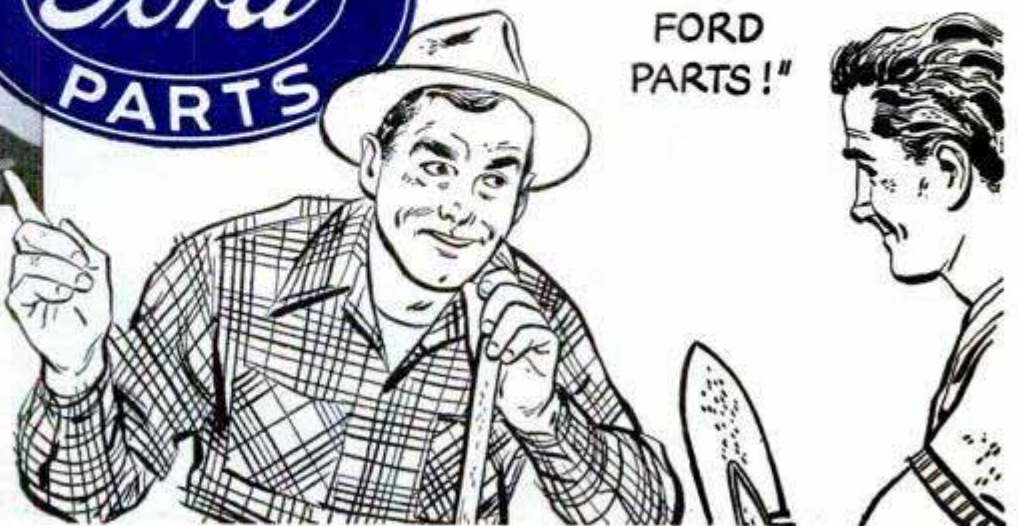


"THEY'RE MADE RIGHT TO FIT RIGHT TO LAST LONGER," HE TOLD ME. "THEY KEEP YOUR FORD ALL FORD."



"IF ALL FORD OWNERS KNEW HOW MUCH TIME, MONEY AND SATISFACTION THEY GAIN — THEN THEY'D ALWAYS SPECIFY GENUINE FORD PARTS!"

AVAILABLE WHEREVER YOU SEE THIS SIGN AT ALL FORD DEALERS — AND SELECTED INDEPENDENT GARAGES



He's riding high
—he has P.A.*

P.A.*

means

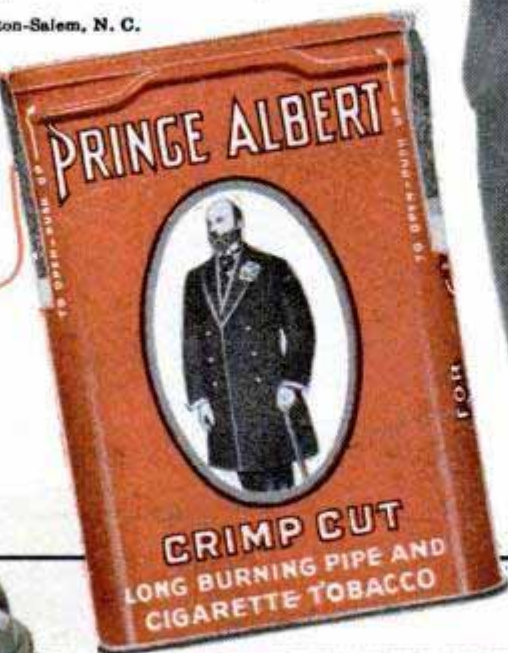
Pipe **A**ppeal
and **P**rince **A**lbert

• Yes! He's riding high! He has Pipe Appeal which attracts admiring glances. And he has real smoking pleasure with mild, rich-tasting Prince Albert—America's largest-selling smoking tobacco.

Try P.A.! The choice, crimp cut tobacco used in P.A. is specially treated to insure against tongue bite.

R. J. Reynolds Tob. Co., Winston-Salem, N. C.

IT'S A CINCH, TOO,
TO ROLL FIRM,
NEAT CIGARETTES
WITH CRIMP CUT
PRINCE ALBERT!



The National Joy Smoke

Sharing a road track not much bigger than a baseball infield is a new class of racing autos with scooter wheels and motorcycle engines—half pint packages of speed!

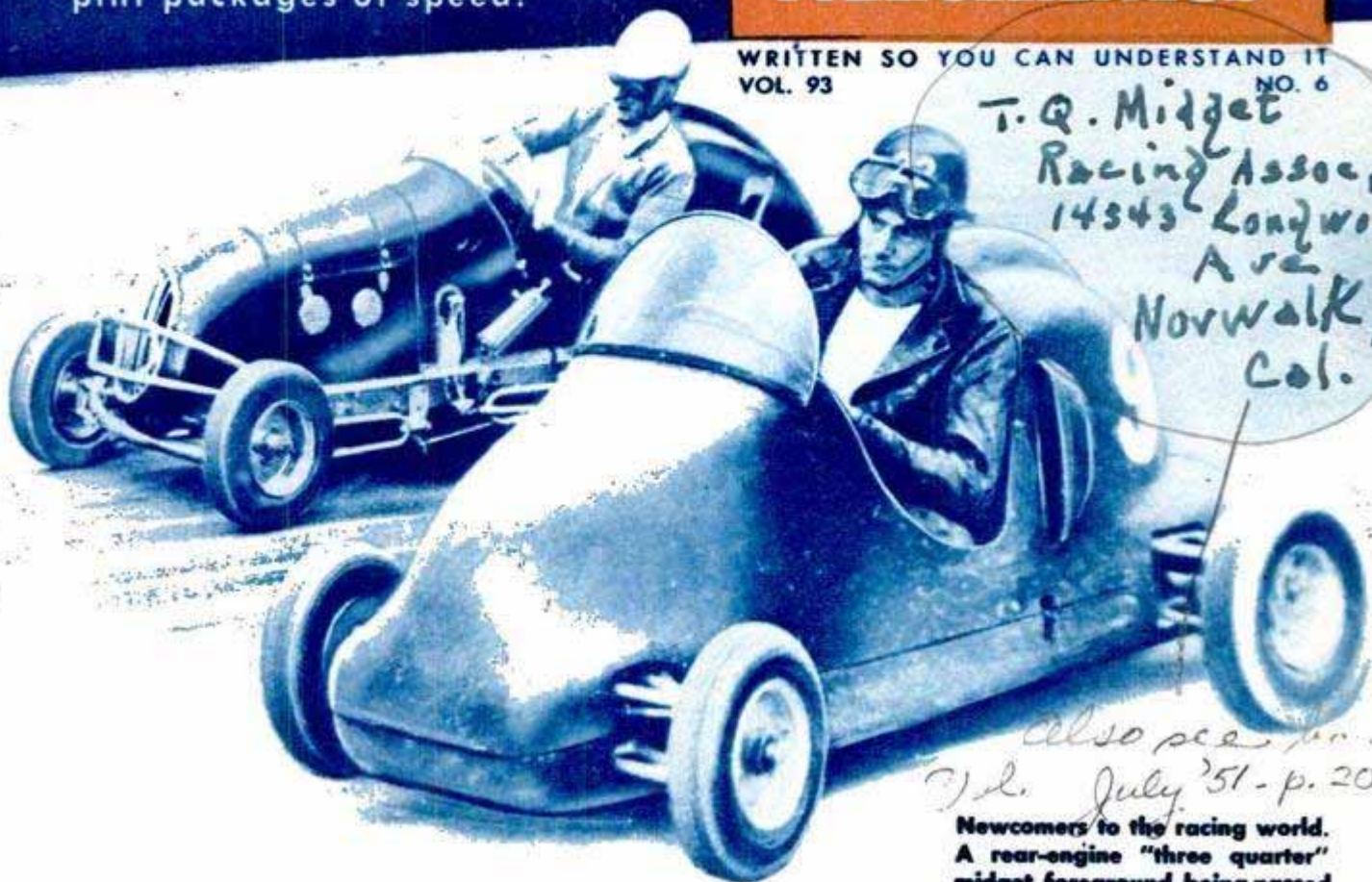
POPULAR MECHANICS

JUNE 1950

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 93

NO. 6

*T. Q. Midget
Racing Assoc., Inc.
14543 Longworth
Ave
Norwalk,
Cal.*



*Also see...
July '51 - p. 201*

Newcomers to the racing world. A rear-engine "three quarter" midget, foreground, being passed on a turn by front-engine job

POPCORN BOWL RACERS

*Midget headquarters
in Chicago.*

MEEET THE newest thing in auto racing—the "three quarter" midget.

These gleaming half-pint creations use motor-scooter wheels and tires. Their frames and rear ends are adapted from Austin and Crosley parts. Most of them are powered with one-cylinder motorcycle engines.

They are so small that the drivers almost need to grease themselves to slide in behind the wheel. Yet some of the bantam-weight speedsters can do a good 100 miles per hour on a straight course.

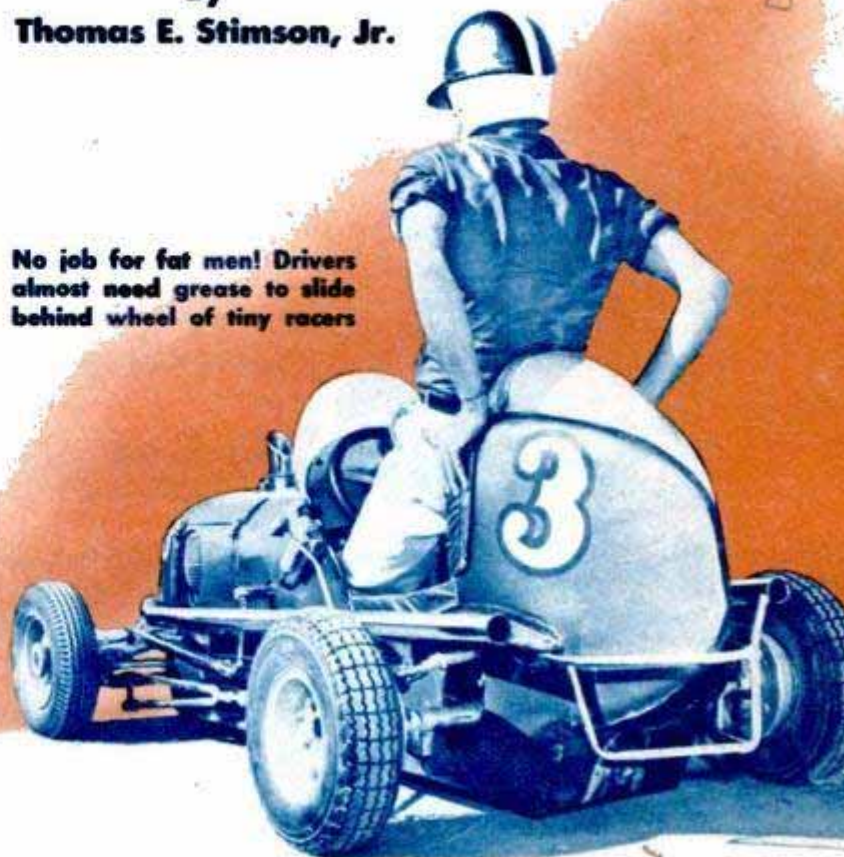
Three-quarter midgets as a racing class are just getting started on a few Midwest and southern California tracks. No more than a few dozen cars have been built but interest in the design is spreading like wildfire.

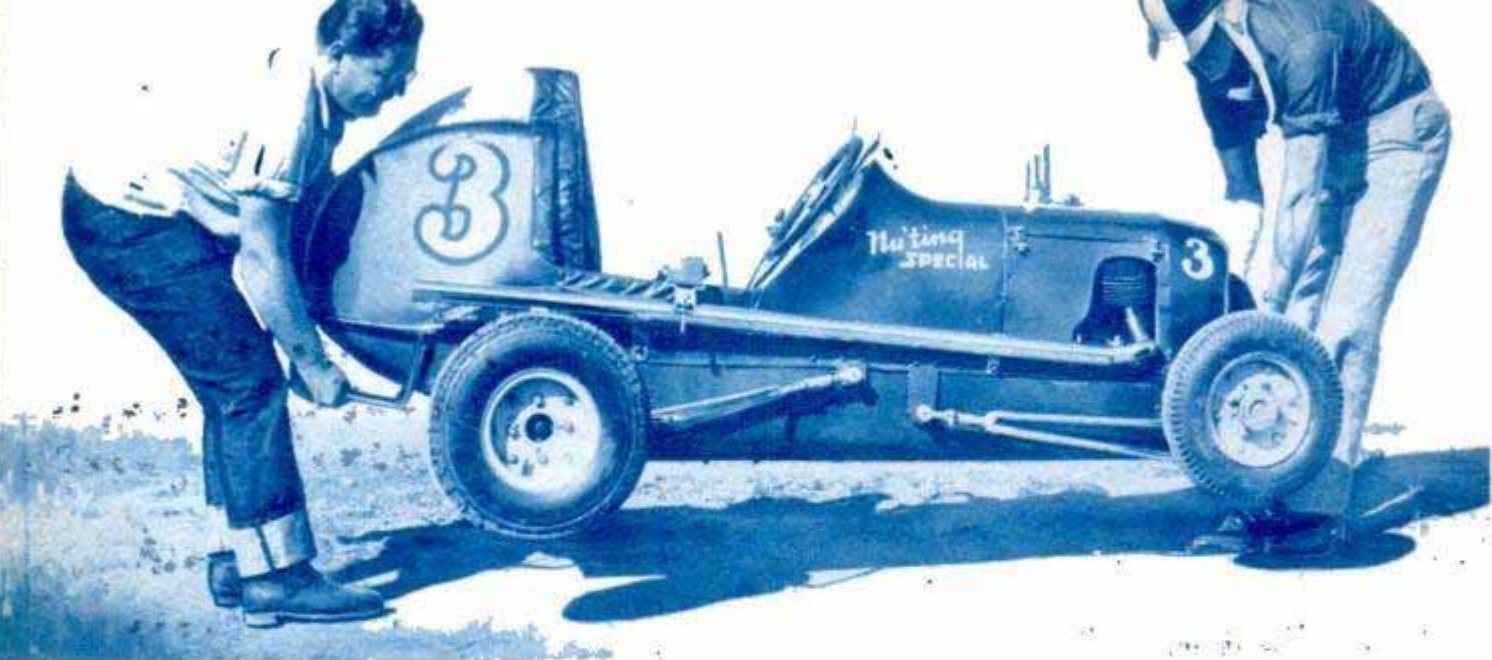
With their motors winding up in high-pitched snarls, half a dozen of the little racing machines give spectators

By

Thomas E. Stimson, Jr.

No job for fat men! Drivers almost need grease to slide behind wheel of tiny racers





Jacks aren't needed to raise either or both ends of new speedsters. Some cars weigh as little as 350 pounds

a combination of thrills and excitement. They behave much like bigger cars and they provide the action of a motorcycle race on a short track. The three-quarter midgets run on oval or D-shaped tracks that are from $\frac{1}{8}$ to $\frac{1}{6}$ mile long. Their name comes from the fact that they are roughly three quarters the size of a standard midget, though frequently they weigh less than half as much.

All the cars are built in small garages or back yards and probably they always will be, for that's the reason why the T.Q. midget was born.

Many of the three-quarter enthusiasts have wanted to get into big-car racing or into midgets but they haven't been able to afford the cost. Even a midget racer can add up to \$3000 by the time it is tuned to go. Some of the half pints, on the other hand, have been built for \$350, plus the owner's labor. One driver invested \$600 in his car and the trailer on which it is hauled to the track. The most expensive one built to date cost less than \$1500.

To prevent the building of costly motors, powerful enough to run rings around the competition, the ruling association has decreed that every race is a claiming race and that any offer of \$2000 for a car must be accepted by its owner. In the three-quarter midget class, the back-yard builder is king.

That doesn't mean that junk parts can be used or that the cars are tied together with baling wire. Safety rules and inspections, pride of ownership and the normal desire to produce a winning car all insure good sturdy workmanship.

The midgets had their beginning back in 1932, according to one widely accepted version, when Al Williams of Fresno, Calif., built an electric sidewalk car for his child.

Other fathers in the neighborhood built similar scooters for their children, mostly with tiny gasoline engines as power plants. Week ends, the fathers took over the cars and held impromptu races. Some of the owners souped up their engines and eventually the cars grew up into what became the standard midget class.

Many of the original group served in the war and when they got out of uniform they found that the midgets were becoming too expensive for a casual hobby. They returned to the original sidewalk cars. Small power plants were replaced by motorcycle engines, chain drives gave way to drive shafts, and the present T.Q. midget began to shape up.

Today, the rules of the Three Quarter Midget Racing Association specify that the wheelbase must be between 54 and 60 inches, tread from 32 to 40 inches, wheels from 6 to 9 inches in diameter, weight from 350 to 650 pounds, and engine from 30.50 to 45 cubic inches, depending on type. All competition cars must have certain safety equipment that includes firewall, positive neutral, flex-type steering wheel, and a tail that extends beyond the rear wheels. Much of the rest of the design and its construction is left to the ingenuity of the different builders.

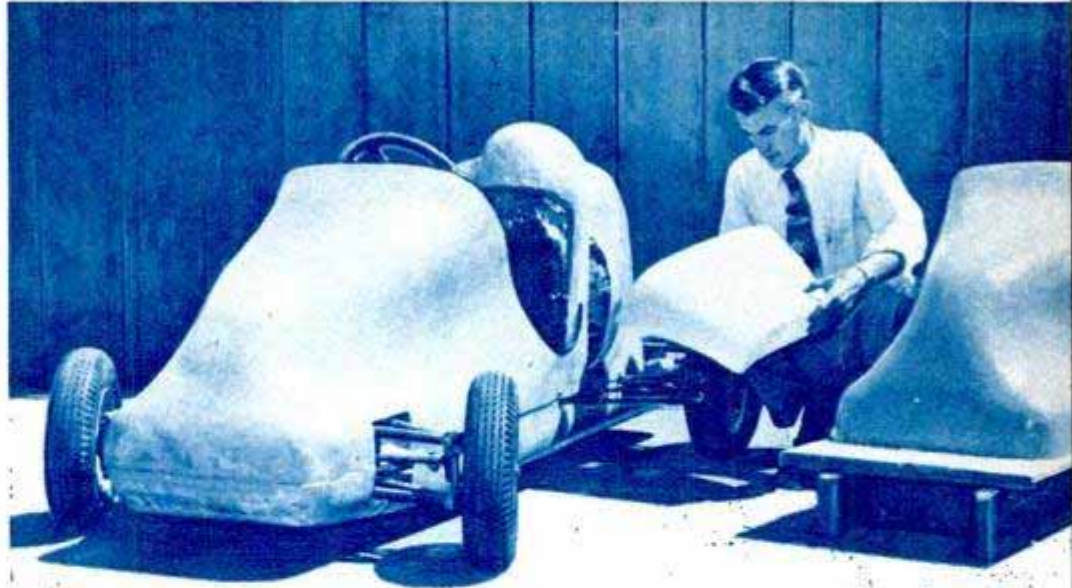
To learn what ideas are being tried out, let's examine a few of the present cars. Cecil Buck, deputy sheriff of Norwalk, Calif., put his car together in about five months, working from two to four hours a day and using standard mechanic's tools, plus a welding outfit. Machine work was farmed out.

The frame channels of Buck's three-quarter midget came from an Austin. So did the springs. Front axle and rear end were cut down from the same small car.

Wheels and tires are from two models of motor scooters. Steering is a reworked Franklin steering assembly that moves the front wheels hard over with a quarter turn of the steering wheel.

The engine is a 45-cubic-inch Scout motorcycle engine, with a carburetor from a six-cylinder automobile engine. Two gallons of methanol fuel are carried in a four-gallon tank and a hand air pump is used to force the fuel to the engine. Battery ignition is used and the racer is started by being pushed by a truck. A standard midget gearbox is used with an "in and out" shift stick in place of a clutch.

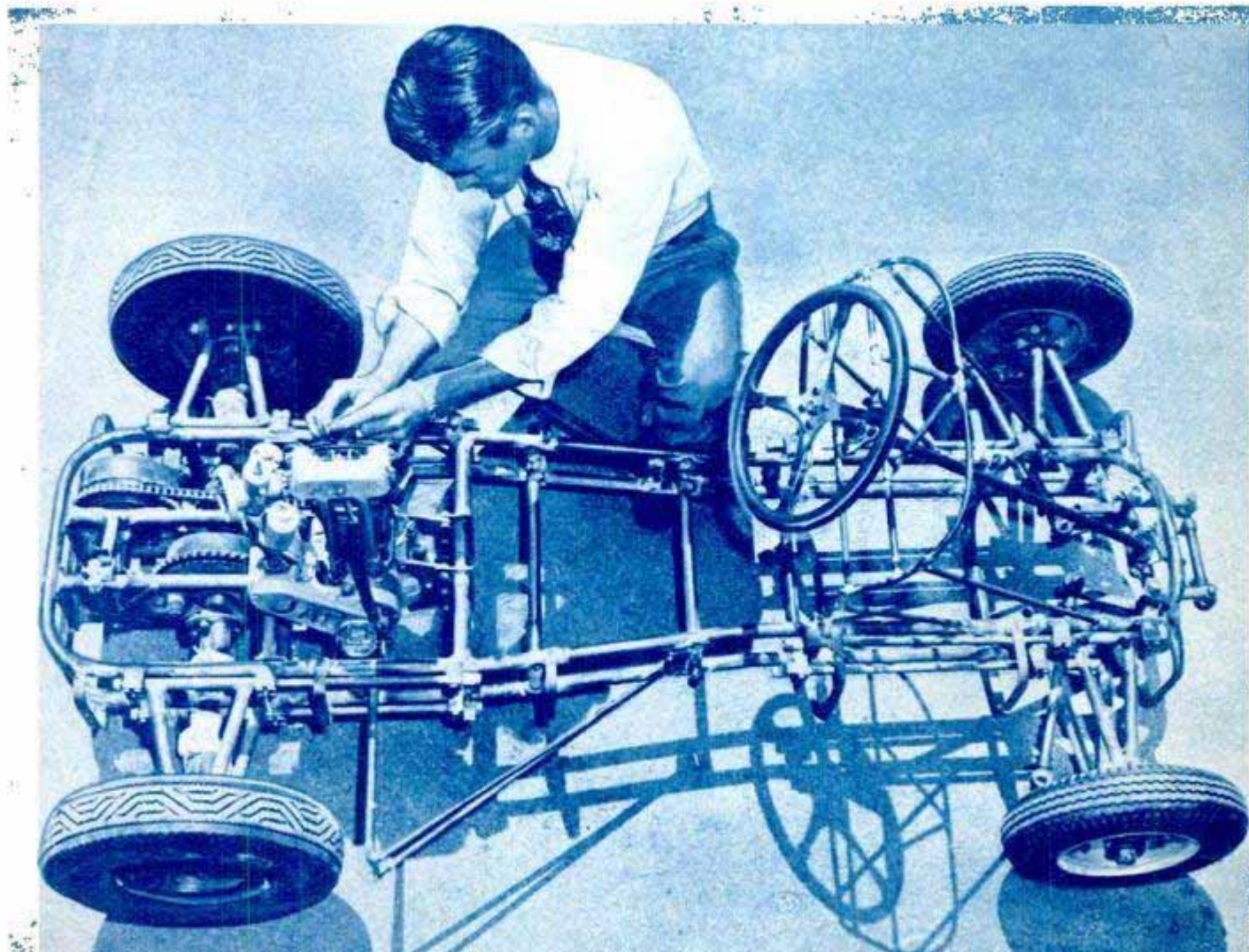
Buck built the body by cutting down stock shapes from stock automobiles. The front grille comes from a pick-up truck, the tail was welded together from parts of late-model fenders and is capped by a streamlined headrest that once was the fairing behind a Cadillac headlight. The side panels and hood were shaped from metal sheets. The car weighs 425 pounds.

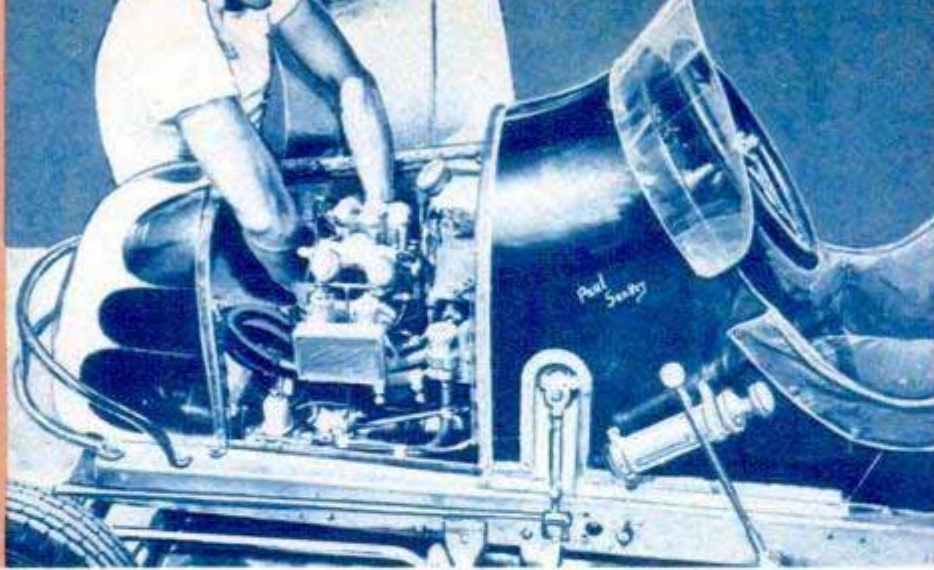


Homemade laminated plastic body. At right is mold over which laminates were fitted. Body was sun-cured, without an oven or pressure equipment

Among the lightest jobs built so far are a pair of rear-engine cars with plastic bodies. They were designed and built by Bob Feuerhelm of Pasadena. Each weighs 350 pounds, has a welded tubular-steel frame and is powered by a 30.50-cubic-inch motorcycle engine that develops 42 horsepower. The engine is in the rear, driver's seat in the center and fuel is carried in front.

Rear-engine midget, with a spring system on each wheel that absorbs four-inch bumps without raising car





With a motorcycle engine, a cut-down stock-car body and motor-scooter wheels, this car built by a Redondo Beach, Calif., man can circle a 1/5-mile track in about 15 seconds

A motorcycle clutch is installed and is used to help bring the car out of a spin, and a motorcycle brake-drum assembly serves for positively locking both rear wheels. A unique torsion-bar springing system on each wheel permits the wheels to take four-inch bumps without raising the car and without spreading the wheels from the vertical.

Each rear axle has two universal joints. The front spindles were cut down from old Model-T parts and the cars have a new design of direct-type steering, with a 1-to-1 steering ratio.

To reduce the cost of the bodies, Feuerhelm shaped wooden molds to the desired contours and made his own laminated-plastic body parts, using the sun-cure method that requires no oven or pressure equipment. The plastic shapes, including the long pan under the car, are bolted to the frame. Fuel tanks also are of laminated plastic, the expectation being that this material will be unaffected by the vibrations that often start leaks in metal tanks.

Other owners put bodies together by

buying old castoff race-car bodies and cutting them down to size. Instead of a motorcycle engine, one owner is reported to be using a surplus opposed-piston gasoline engine that was once used to open the bomb-bay doors of a bomber. Still another cut a four-cylinder Crosley engine in half and is using only two of the cylinders, with a special cam. The compression ratio was raised to 17 to 1.

Small outboard motors also are being used. Instead of motor-scooter wheels, some owners are using bomber tail wheels, removing the center strip of the wheel to narrow the tread.

Harley Camomile, a Redondo Beach, Calif., enthusiast, has a 530-pound job powered with a 30.50 Triumph, equipped with dual carburetion and an electrically operated fuel pump. The car has hydraulic brakes on the rear wheels, a cut-down Kurtis front axle, a cut-down midget quick-change rear end, reworked Franklin steering, leaf springs, motor-scooter wheels and a cut-down midget body.

These examples all suggest that the sky

Started by a push from a larger car, this midget is just gaining speed and temporarily burning a heavy mixture of methanol



High tail and headrest provide some measure of safety for the driver in case of a roll-over

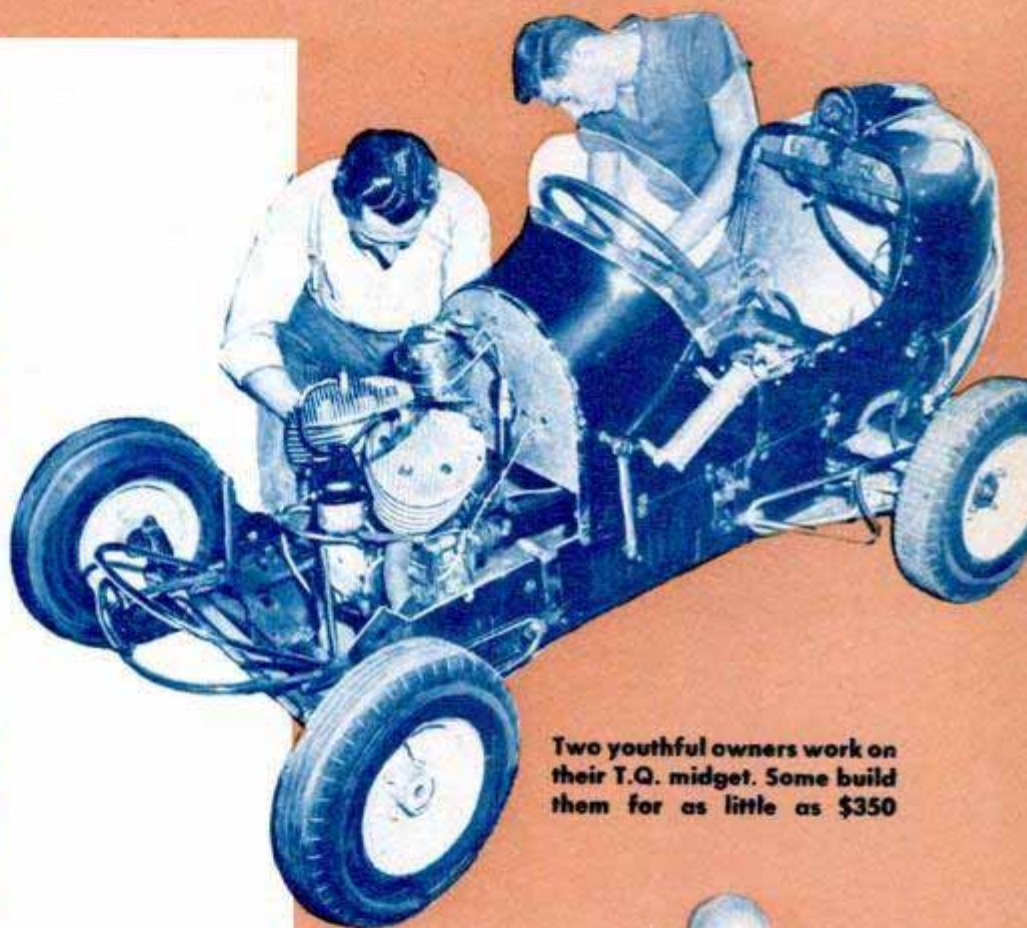


is the limit as far as new ideas are concerned. No two of the half-pint racers are exactly alike. No one yet knows what is needed to produce a consistent winner. The most powerful engines will deliver the most speed in the stretches, the lightest cars will have less trouble in the turns.

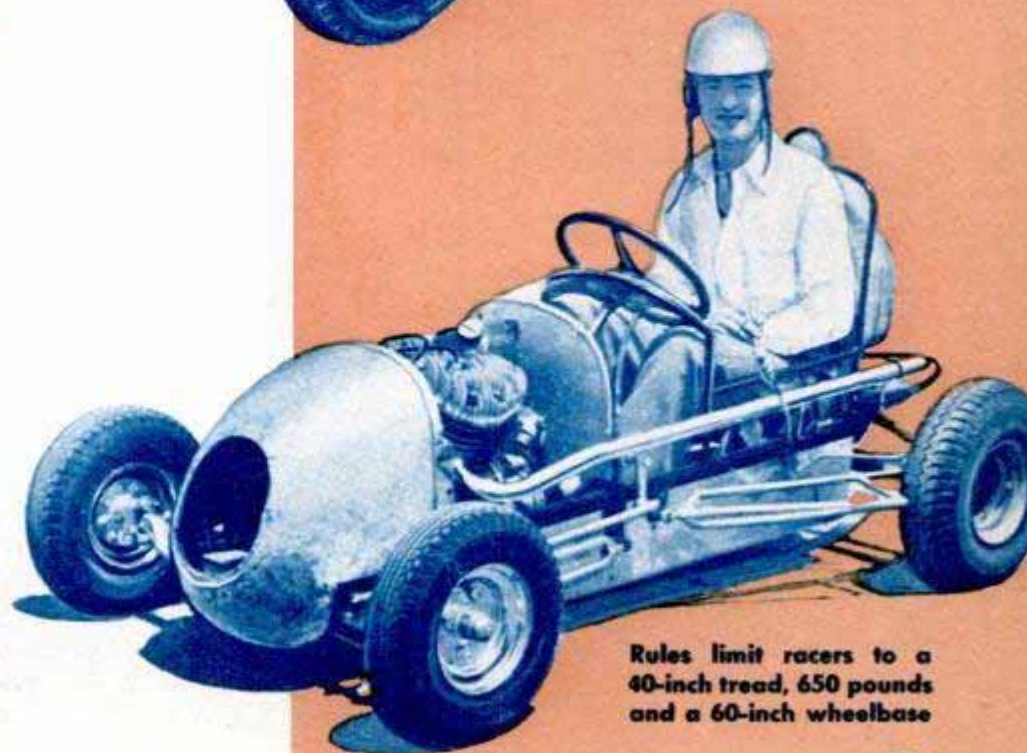
Much of the racing was on an amateur basis in the past, with the drivers competing for the fun of it and with spectators invited free. Now, with experience behind them, virtually all drivers are racing for purses and spectators are charged admission fees from which the purses are taken. If the three-quarter midgets prove to be as popular as their enthusiasts expect, area circuits will be established with one track in each of seven towns. If there is money in it, owners will enter their cars every night of the week.

Winter racing on indoor tracks in auditoriums, bomber hangars and skating rinks, the enthusiasts believe, will make the three-quarter midgets as popular during winter months as the larger race cars are during the summer months. And they offer added thrills for the sportsman who likes to watch exciting speedway duels "close up."

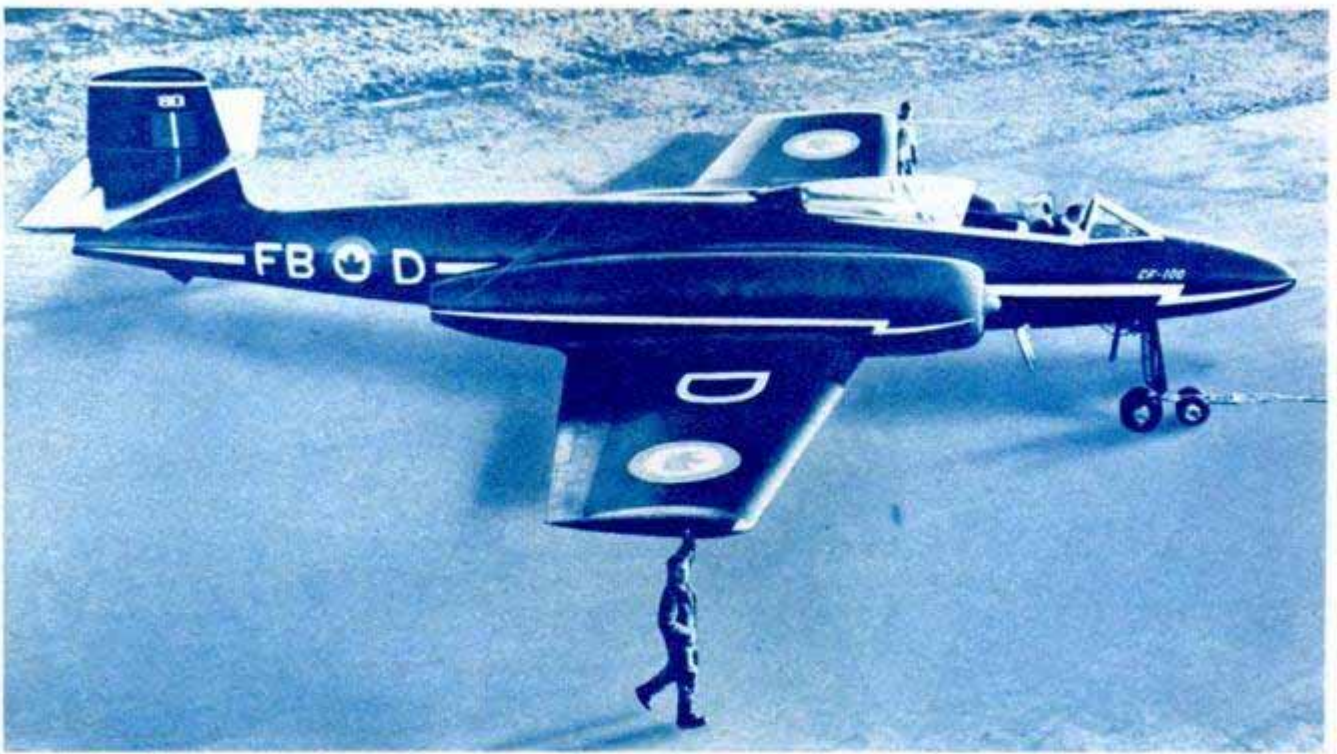
JUNE 1950



Two youthful owners work on their T.Q. midget. Some build them for as little as \$350



Rules limit racers to a 40-inch tread, 650 pounds and a 60-inch wheelbase



Canadian All-Weather Fighter

Designed specifically to fill Canada's defensive needs for a long-range, all-weather fighter, the new Avro CF-100 is expected to have a speed well over 600 miles an hour.

Fitted with a tricycle undercarriage, the plane is powered by two jet engines and is approximately 52 feet in length and wingspan. The craft carries a pilot and a second crewman to operate extensive radar and navigation equipment from the rear seat.

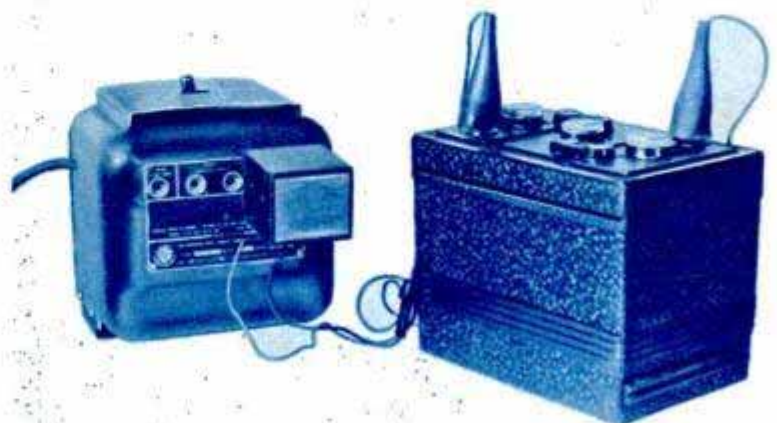


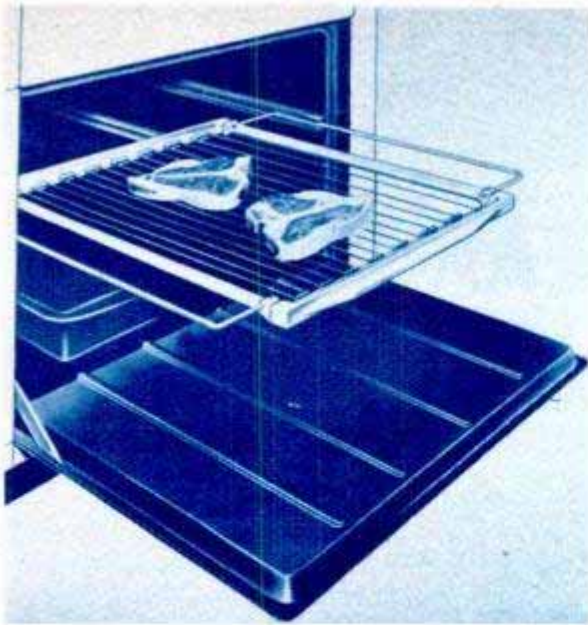
Prince's Weapon Is a Camera-Gun

When Prince Hanwant Singh, young maharajah of Jodhpur in India, goes hunting pictures, he is armed with a specially designed camera-gun that assures steady aiming. Designed to take various telescopic lenses, the rifle-butted camera brings distant subjects up close. The telescopic sight permits exact aiming on subjects a half mile away.

Arc Welder Charges Battery

Automobile batteries are charged quickly with a rectifier that plugs into a low-cost home arc welder, providing the owner with a double-duty tool. The arc welder, designed to operate on a standard house circuit, is used in small garages, service stations and home workshops for welding, soldering, brazing, cutting and heating metals. With the adapter, the owner can use the welder to restore a dead battery to operating condition overnight.





Broiler's Case Serves As Table

When a new charcoal broiler is set up for an outdoor feast, the carrying case doubles as a serving or preparing table. After the meal, the broiler is disassembled and packed into the case to form a unit weigh-

ing only 25 pounds. The rack for the broiler is made of stainless-steel wire, which can be cleaned by simply wiping it with a cloth or paper towel. When used separately, the rack can be adjusted easily to fit the oven in a kitchen stove for broiling meat and other foods.



On-The-Scene Movie Titler

Movie photographers can label their shots as they make them with a pocket-size accessory that slips over the lens like an elongated sunshade. A frosted-glass "slate," on which you jot down identification data, slips into a holder at one end of the titler. There is a lens in the titler, enabling the camera to photograph the title in sharp focus with its lens set at infinity. No additional light is necessary, the light used to illuminate the scene being sufficient. The penciled titles wipe off the glass easily so it is possible to use the small "slate" over and over again.



Paint Thickness Gauge

By the use of magnetic force, a precision gauge measures the thickness of coatings such as paint, enamel and platings on metal. A spring inside the gauge barrel applies an upward pressure on a permanent magnet, a pressure that can be varied by turning the micrometer thimble. When the spring tension is just strong enough to pull the magnet away from the surface, the operator takes a reading on the micrometer scale. This reading, when compared with one taken on uncoated metal of the same quality, provides an accurate measure of the coating thickness.



Dead trees like this one make fine wooden Indians because the wood is thoroughly dry. Below, Suzanne Silvercruys, the noted sculptress, inspects one of Robertson's masterpieces while still in the rough



HEAP BIG WOODEN INDIAN

BACK IN 1919, a four-year-old boy, whopper-jawed with a stick of peppermint candy, sauntered down Main Street in Boise, Idaho. Boy met Indian. Indian looked fierce. Boy yelled for father.

When the father rapped on the Indian's stomach to prove the redman was only so much wood, the boy wailed:

"But he's ugly. He scared me."

Because of this boyhood memory, Thayne Robertson, now 34 and busy sculpturing new wooden Indians, believes he knows why an art—as American as plug tobacco—faded from the national scene. More important, he also believes he knows how it can be brought back.

Any reader who is 35 or more can no doubt remember seeing a wooden Indian. There were once unnumbered thousands of them scattered throughout the United States. No self-respecting cigar store was considered ready for business until a gaudily colored Indian had been rolled out front. Today it is a long jaunt between towns with a wooden Indian.

Several years ago a tobacco company conducted a survey, and found 607 wooden Indians still on active duty in the United States. There are probably only about half that number now. Add a few hundred more tree-stump Indians in museums and private collections, and you have the last of the wooden ones rounded up. What caused the vanishing? Robertson thinks it was because they were too ugly.

He became interested in life-size wooden Indians a couple of years ago, and now carves them along with artistic pipes in his Boise shop.

Robertson has spent many hours studying Indians on their Idaho reservations. He draws detailed sketches of body and facial characteristics, then faithfully reproduces them with chisel on wood. It's good business, too. A new, life-size, wooden Indian brings from \$1000 to \$1500, and the market is booming. Robertson now has enough orders to keep him busy for the next two years. He isn't worried about competition

in the Indian-sculpturing field because it's an art that takes a lot of learning, and is a hard one. Most important is finding the right tree. It must be dead—for about a quarter century. But it must have no decay. Just dry as a desert-rat's throat. The actual sculpturing takes about four months.

Working from a pen-and-ink sketch, Robertson first blocks out the log in major body parts with an ax. Then comes the chisel. As the Indian begins to take definite form, finer carving tools are used. The wrong chipping can ruin many weeks of hard work.

To stay sleek and healthy, a wooden Indian must be well-oiled at all times. So Robertson has revived an old trick of the ancient wood carvers. He bores a hole down through the top of the head and into the trunk as far as possible. The hole is then filled with linseed oil.

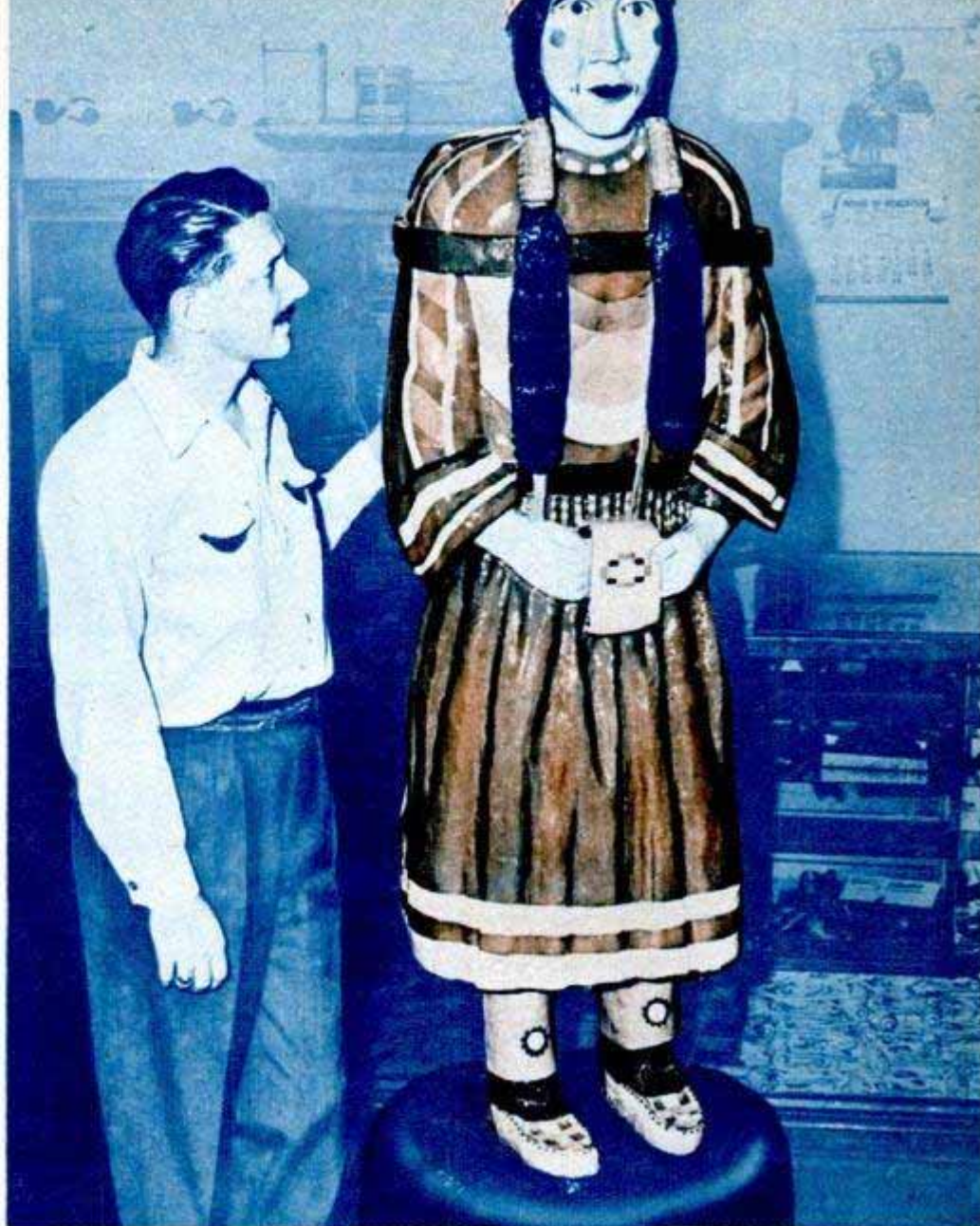
Painting of the wooden Indians — four coats — is not done by Robertson himself. He leaves that specialized task to Bill Runyan of Burley, Idaho, himself a carver who comes from a long line of French wood artists. Rightly painted and oiled, the wooden Indian will outlast any live one.

Wooden Indian carving is generally considered an American art, but it really started in England, says Robertson. At the start of the 17th century, wooden Indians were a common sight in London. Only the British artisans were a little mixed up on the shade of American Indians. They made them as dark as Negroes, and for 200 years the figures were generally referred to as "black boys."

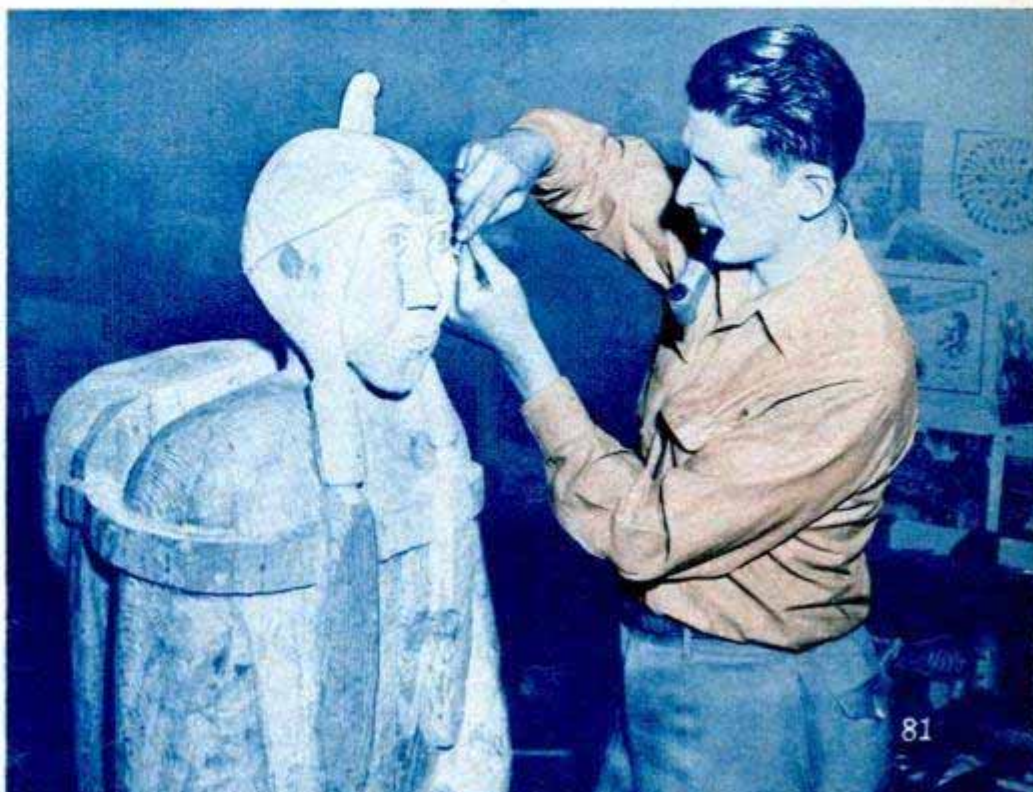
They were used to adorn apothecary shops.

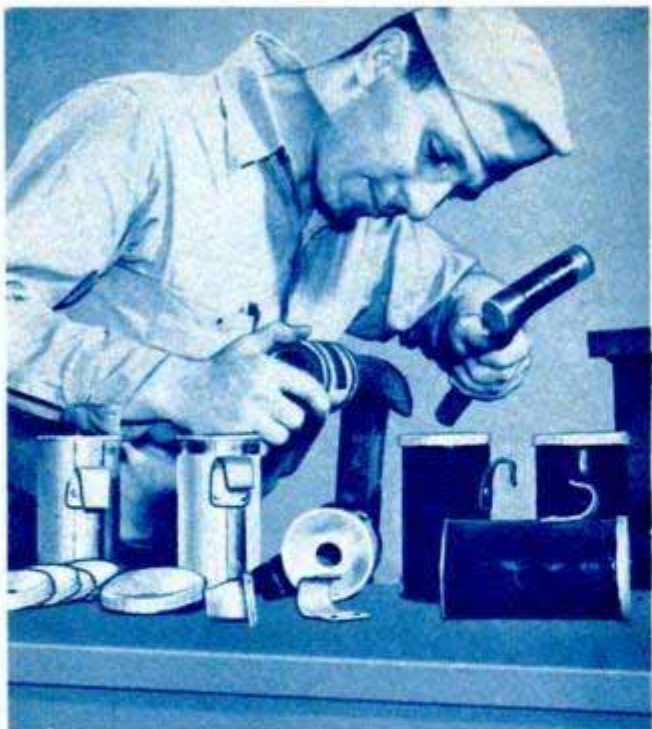
(Continued to page 230)

JUNE 1950



Robertson poses beside Sacajawea, squaw heroine of the Northwest, who is authentic from moccasins to a papoose on her back. The same figure is shown below before paint was applied. Robertson contends that wooden Indians went out of style because the old-fashioned ones were too ugly

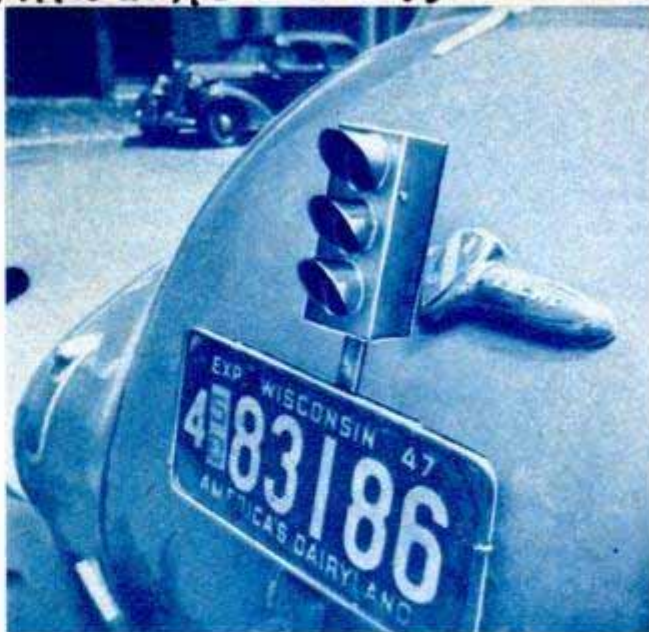




U. S. Air Force photo

Ash Trays From Beer Cans

When he discovered that his squadron's cargo-passenger plane had been stripped of ash trays by souvenir-hunting travelers, Chief Dan Baffari of the Navy went to work with a hammer on several beer cans. He came up with a big stack of attractive ash trays that cost only a few cents apiece. The trays have metal hooks which clamp over the ribs of the passenger compartment, holding them conveniently and securely in place. The tops have flared cigarette rests and the trays are painted with shiny fire-resistant paint.



Three-Color Stop Light Signals Driver's Action

Motorists following a car equipped with a three-color stop light know exactly what the driver ahead is doing. When the car is moving forward normally, the green light is on. As the driver applies the brakes, an amber light operates, warning the following driver that the car is slowing down. When the car slows down below 10 miles an hour, these two lights go off and a bright-red light appears. As soon as the car accelerates again, the green light goes back on. The lights work automatically and are housed in a box that looks like a standard traffic light. Only two wires are required for installation.



Turbojet Heater

Hot air blasts out of a new turbojet engine to warm orchards during frosty weather. One of the units will heat 10 acres, according to the inventor, and replaces 500 smudge pots. The turbojet burns about \$2 worth of diesel fuel per hour, whereas fuel oil for the smudge pots costs about \$35. Within three seconds, the unit develops heat to 1000 degrees, but the hot air is mixed with the cold to make it safe for the operator to stand within three feet of the jet's exhaust. The unit weighs 600 pounds.

Popular Mechanics provides two sources of further information concerning articles published in each issue: the WHERE-TO-BUY-IT INDEX, starting on page 10, and the WHERE-TO-FIND-IT LIST, available from Bureau of Information, 200 East Ontario Street, Chicago 11

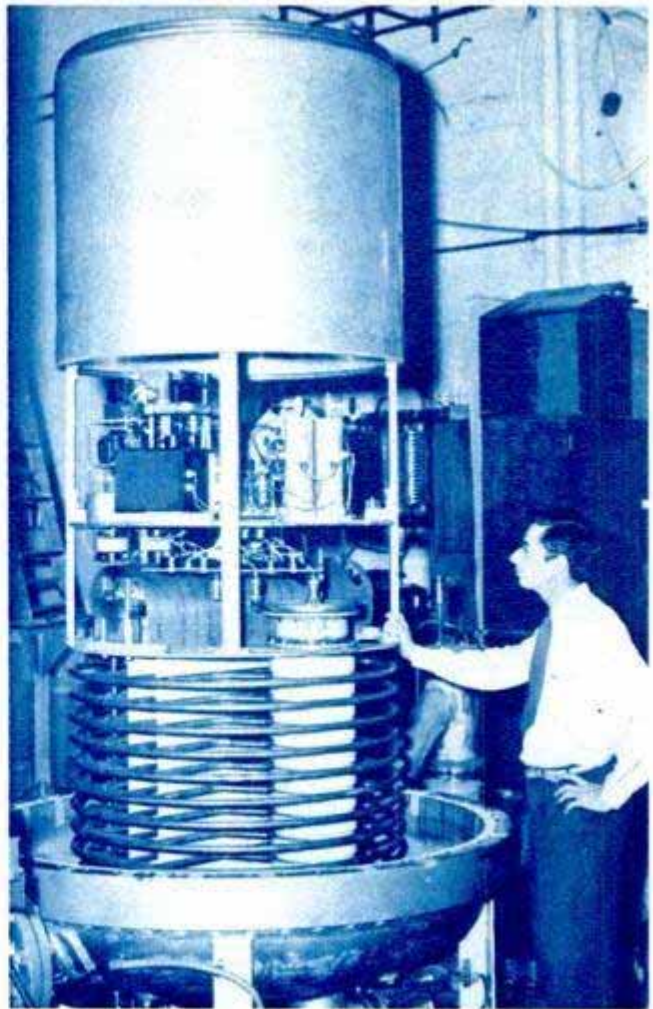


Single-Lens Camera Uses Reflex Principle

Composing, focusing and picture-taking are all accomplished through one lens of a new miniature camera that uses the single-lens reflex principle. Without increasing the convenient size of the miniature, the new design enables the photographer to focus with a brilliant, full-size image on a ground glass while holding the camera at eye level. A reflecting mirror throws the image on the ground-glass screen and it is "bent" and enlarged by a complex prism and lens system to give a greatly enlarged, upright image. Another innovation is a built-in flash synchronizer for the focal-plane shutter with the contact located inside the tripod socket for quick attachment of the flash gun. The combination lens eliminates all parallax problems whether standard, wide-angle or telephoto lenses are used.

Incense Wafts From Ash Tray When Cigarette Is Placed Inside

Cigarette smoke becomes incense inside a novel ash tray. The tray is shaped like a barbecue pit with a chimney which gives off the smoke. A tube inside the chimney contains a wick which soaks up any household deodorant or a special fluid which smells like incense. When the cigarette is placed on the grill, the smoke passes the wick and then spirals up through the chimney to emerge either odorless or with the odor of incense. A removable tray beneath the grill catches the ashes, and two compartments hold cigarettes and matches.



Atom-Smasher Analyzes Smog

As little as a billionth of an ounce of matter can be analyzed by an atom-smashing technique used to study Los Angeles smog. Developed by Stanford Research Institute scientists, the technique uses a half-million-volt electrostatic generator. By bombarding samples of smog, the physicists can detect and analyze layers of material only one molecule in thickness for the elements it contains. Targets of the material are bombarded by a stream of ions, which are scattered and then analyzed by an ion detector. Various elements present in the samples are then readily detected.





In a classroom built by Nature, a student and a professor sit on a stump "desk" and straighten out a point in the day's lesson

College in

By Rafe Gibbs

THERE is a certain type of young man whose elbows get crowded in the ordinary college classroom. He is the student who likes a ceiling of cumulus clouds, walls of pines, desks of fallen logs and blackboards of granite on a mountainside. He'd feel right at home at the University of Idaho forestry summer camp.

Couched on the east shore of Payette

Lakes near McCall, Idaho, the camp is as uncollegiate as caked boots, but the students enrolled in the School of Forestry are enthusiastic. They attend the camp between their sophomore and junior years, and after eight weeks there they've definitely decided whether or not they want to carve careers in the woods.

"The camp seems to separate the men from the boys," commented Prof. Everett Ellis, director, "and it's always gratifying to find that most of the students are men."

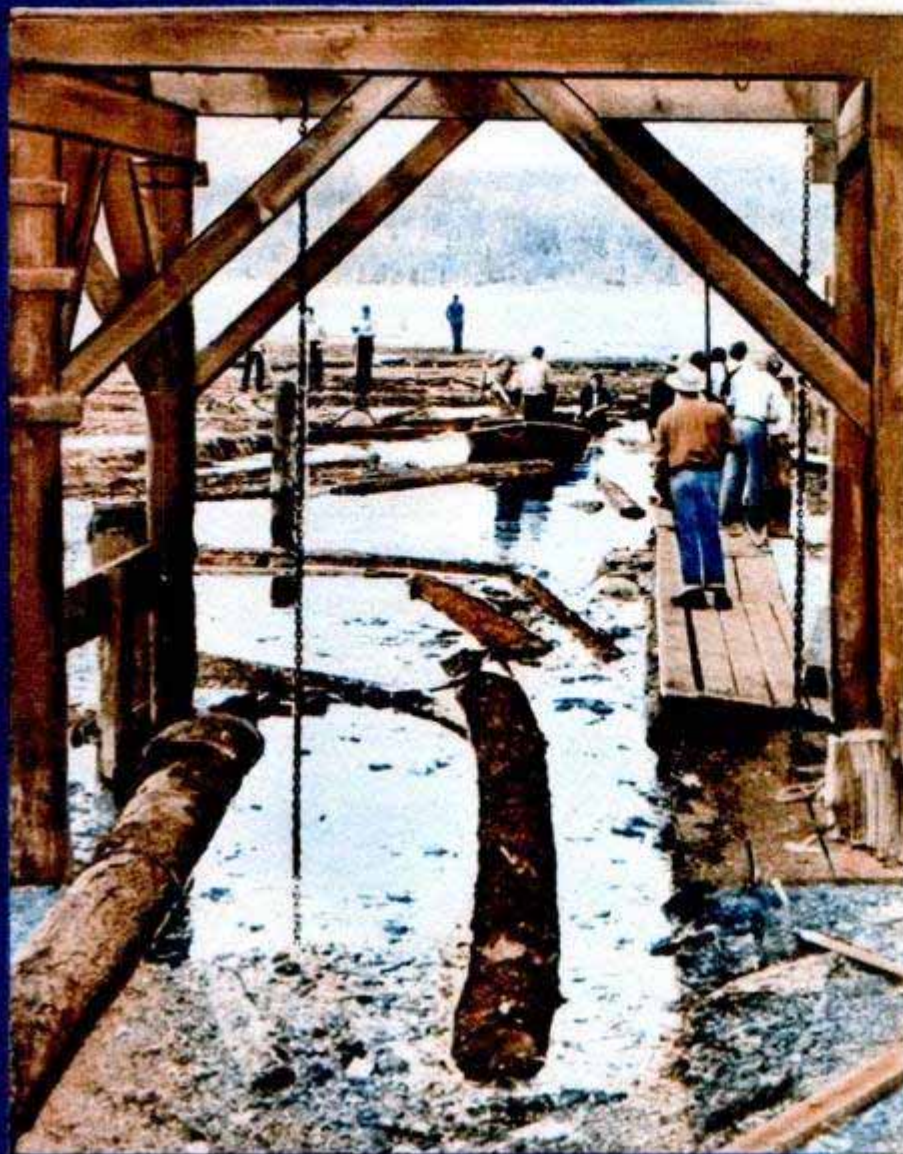
Checking one cold morning on a crew that was running a road survey through a swamp, Ellis found a student holding a tape as he stood in water up to his shoulders.

"He was whistling," said Ellis, "but his teeth were chattering."

It was the same swamp through which



Using forestry instruments, two students figure the height of trees in a stand of timber



Agile collegians tread floating logs in estimating the number of board feet in a millpond

the Tall Timber

actors portraying Rogers' Rangers waded in the filming of "Northwest Passage." Only difference was that the thespians drew big salaries for the assignment. For the students, getting wet is just part of the course.

Field work is not called off unless it is raining so hard students can't take notes.

"Okinawa was never like this," commented one student.

On the millpond of the Brown Tie and Lumber Company in McCall, the students walk logs, and there are always a few "flunkers" who lose their precarious footing and go spinning into the water. An old-time millworker, watching the students, spat reflectively in the pond and snorted, "Darned if I don't think them kids like getting wet."

They do. After class in the evening, some

too big and too hot to handle."

Besides learning fire-fighting technique, the students get some instructions in detecting causes. When the camp ended last summer, Professor Ellis was still chiding the students about a slip-up in the early part of the camp session.

Fire was started in some brush for instructional purposes, and the student fire-fighters came dashing up fast enough to put it out. But their investigations for cause bore no fruit.

Finally, Professor Ellis, who had been puffing a big black cigar all over camp that morning, roared:

"Where's my cigar?"

A prodding of ashes soon supplied the answer.

Probably the most embarrassed students,

of the students—the better swimmers—try riding the white water of the Payette River in rubber life rafts. So far, two have made it without getting dunked. As they reached calm water, they leaped overboard.

From water, the students sometimes turn to fire. Under a cooperative agreement with the U. S. Forest Service and the Southern Idaho Timber Protective Association, the students form emergency crews to be called out—on a paid basis—when fire comes to the forest. Fire-fighting technique is about the first instruction given the students at the opening of camp, and for the rest of the summer they stand ready to use their knowledge. It is a rare summer, too, in which they are not called out.

The students observe first-hand the use of today's parachute jumpers in fighting fires, as the Forest Service's smoke-jumper school is just up the road.

"The point we emphasize to our future foresters," said Prof. Merrill E. Deters, "is getting to a fire early—before it gets



You can't hold a group of college students down. After a bout with the accordion they'll chop the wood for the next morning's fire

however, were the ones the preceding summer who followed their eyes instead of their forester's instruments. Building a campfire out in the woods, which was in theory a forest fire, Professor Ellis supplied the students with azimuth and distance to the fire. Then crews were sent out at intervals of 15 minutes to find the fire by use of compass and pacing count. Most of the crews made it in about 45 minutes, but one crew took more than three hours.

"What held you up?" Ellis wanted to know, and got some grins.

"Well, you see, it was this way," ex-

plained a spokesman. "We had no more than started out when we spotted smoke. We just forgot about the directions and followed the smoke. Only it wasn't from your fire . . ."

Here the speaker paused to wince. "It came from a Girl Scout camp."

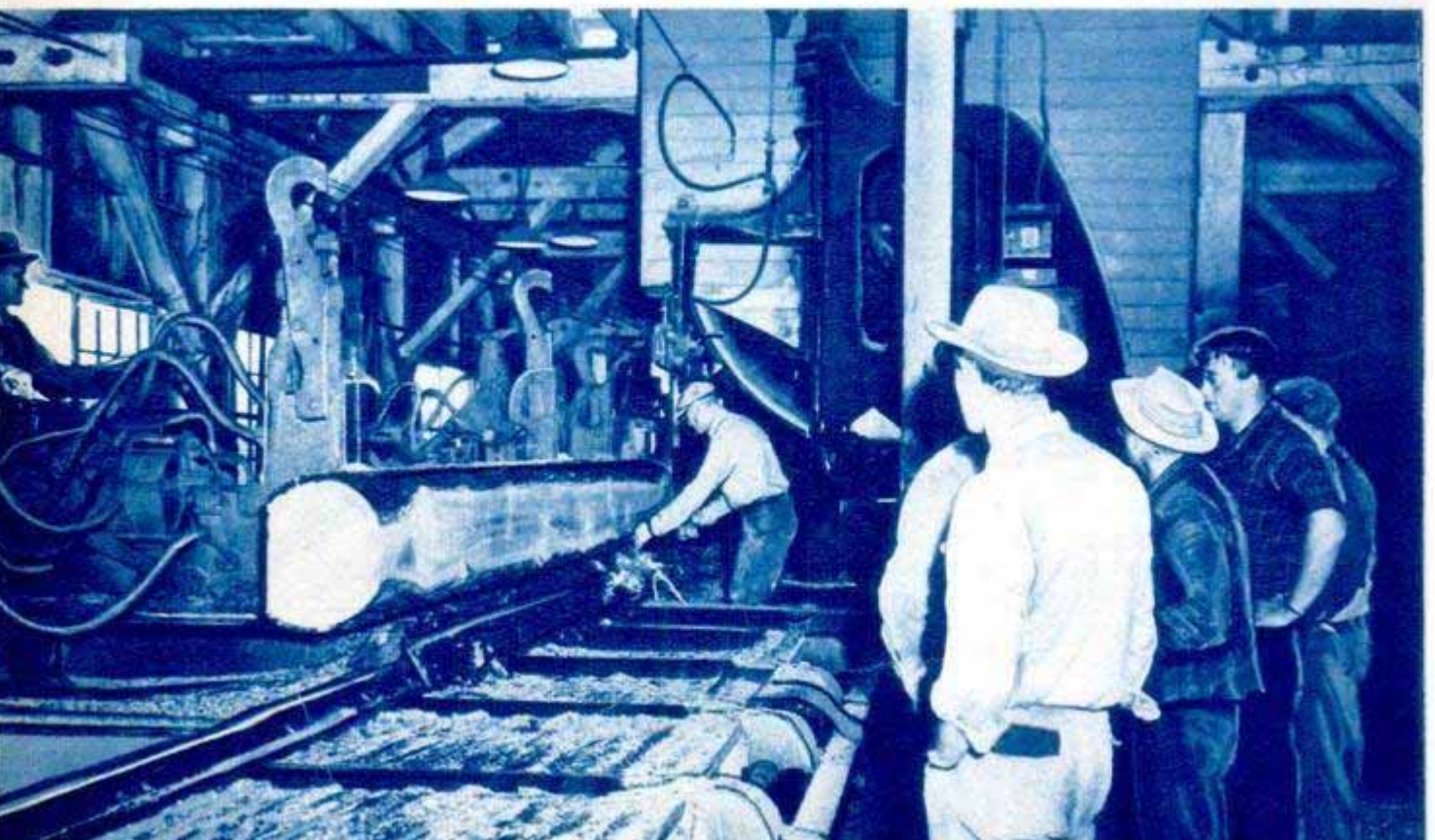
This explanation was a rarity, for foresters—even students—seldom admit getting lost in the woods. Most popular alibi: "I fell in a creek, and had to dry my clothes."

Then there is the story of Prof. Ernest Wohletz, who for many years directed the camp and is noted for his punctuality. He showed up late for a critique, and explained:

"I was checking a cruising crew when I came to a patch of huckleberries. In the center, feeding his face, was an oversize black bear. Now, I had no intention of disturbing the bear's dinner, but he thought I did. He started my way and I began to detour. Every time I heard a noise in the brush I detoured more. I've been detouring, as a matter of fact, all morning."

The students get well acquainted with a variety of wildlife during the eight weeks of the camp. On week ends, many take off into Idaho's famed Primitive Area. There they catch glimpses of mule and white-tail deer, elk and mountain goats. The fishing-minded seek out streams, and Monday breakfasts usually include fresh trout.

Scholars of the tall timber absorb a lesson in modern milling as a big saw rips the logs into lumber



Don't get the idea, however, that the camp is a vacation spot. Some students vacation — before the camp opens. And you can't blame them.

Nature endowed the shores of Payette Lakes with an abundance of towering evergreens, and the camp site was personally selected by Dean D. S. Jeffers of the University of Idaho School of Forestry. The students live in tents. In the center of the camp is a log lodge that blends with the beauty of its surroundings.

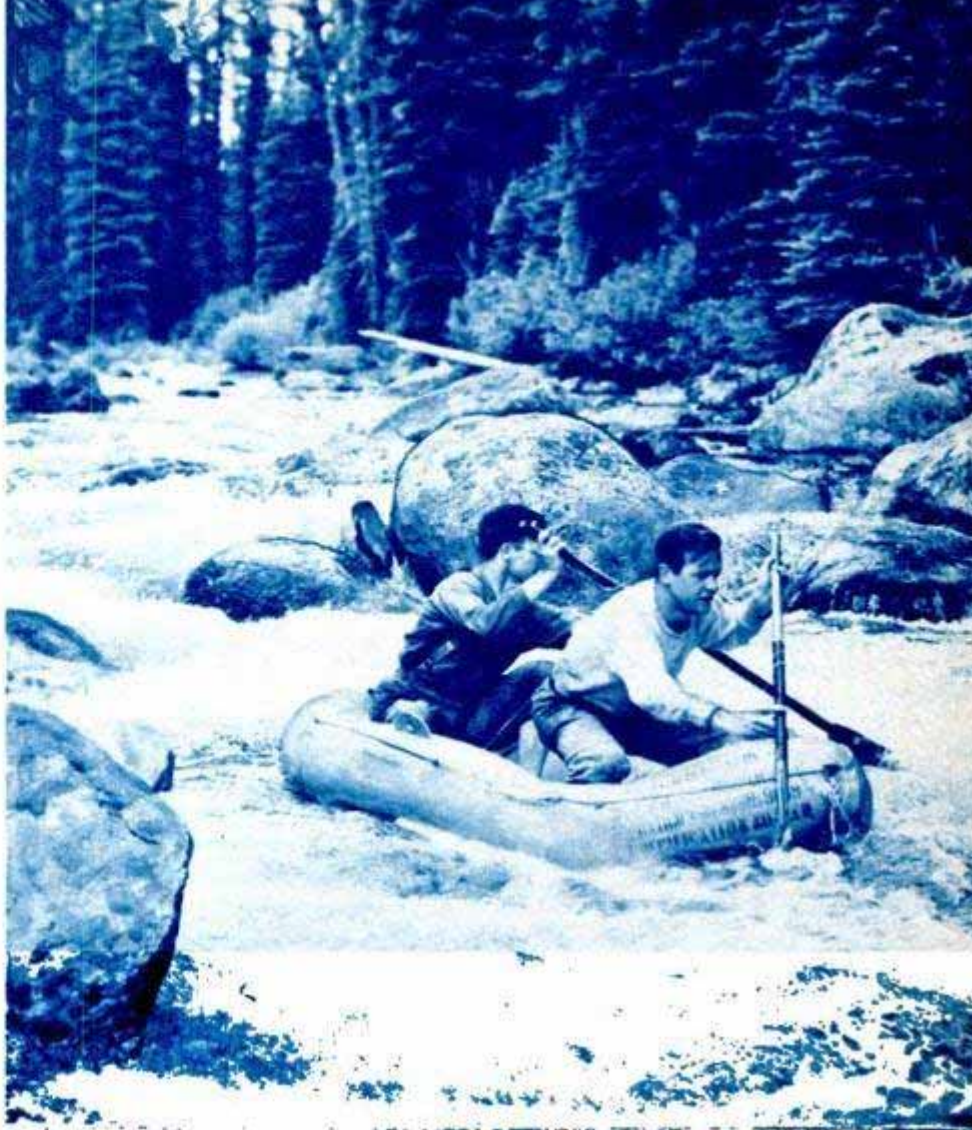
"Professor Wohletz hand-picked every log in it—except one," says Dean Jeffers. "That's the log which is cracked."

But the camp is mostly a setting for work. The students hit the wood floors of their tents at 6:40 a.m. Breakfast is at 7. Field work and lecture classes begin at 8 and sometimes do not end until 9 p.m. Then come study hours. Along toward midnight—just before bedtime—the students go out and chop the next day's supply of firewood.

Even in midsummer, mornings are nippy at the 5000-foot elevation, and a fire is as welcome as a letter from home. In fact, the cold is one reason why many students avoid shaving during the eight weeks of camp.

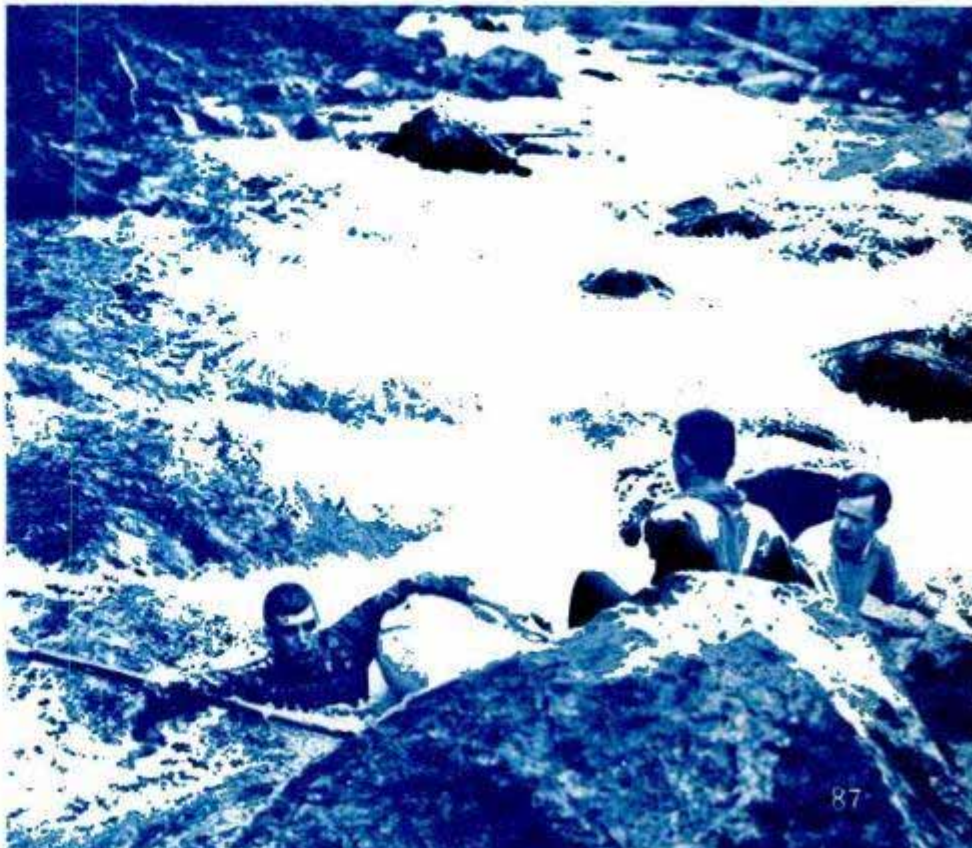
During the day the students ramble the mountain slopes.

(Continued to page 246)



Favorite extracurricular activity is shooting the white rapids of the river in a rubber raft. Only two students have ever completed a trip down the treacherous channel without overturning

Over she goes! Students are dunked in the foaming water when their craft strikes one of many boulders. Left, embryo forester learns to use a "Baltimore cruising stick" to measure a stand of timber

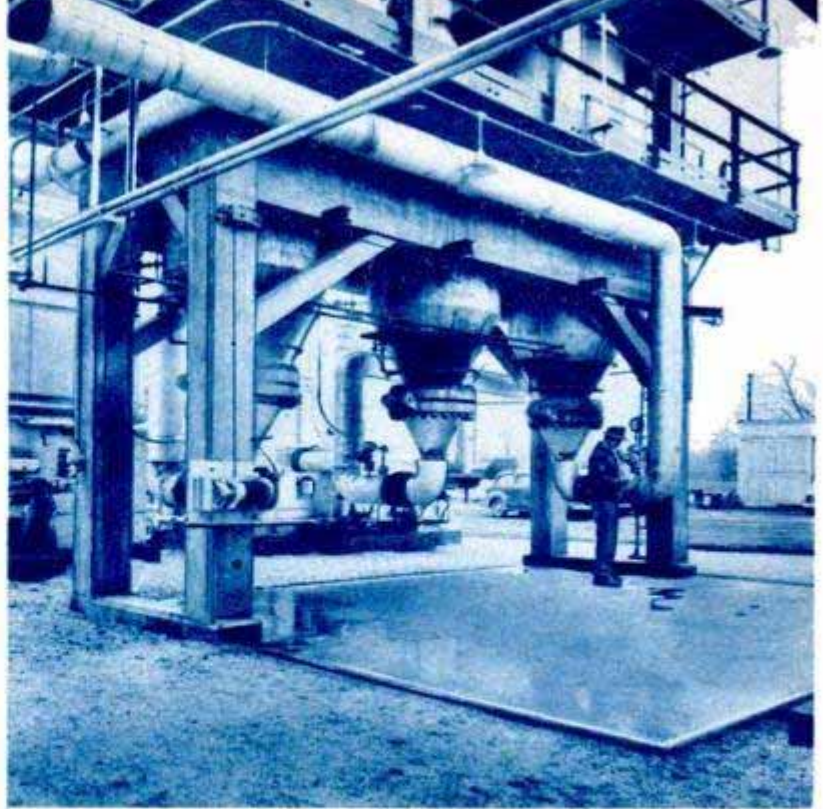


PLATINUM "CAT" MAKES ENGINE PURR

TO MOST of us, platinum is a scarce, precious metal seen only in the company of diamonds and emeralds on display in jewelry-store windows. But, despite its \$70-an-ounce price tag, the rare metal works for a living, making quarter-a-gallon no-knock gasoline for your car!

Mixed with other ingredients, the platinum becomes a catalyst for reforming low-octane straight-run gasoline into a high-quality motor fuel. This reformed gasoline has an octane rating so high it won't knock in any engine under any conditions, according to the Universal Oil Products Company of Chicago, developers of the process.

Motor fuel produced with this platinum "cat" is a mixture of isoparaffins (for antiknock at cruising speeds) and aromatics (for antiknock at power take-offs), similar to the gasoline used in fighter planes during the war. By adding small quantities of tetraethyl lead to this product, called Platformate, refiners can convert gasoline of too poor quality for automobile use into a fuel with octane ratings as high as 98—too high for today's engines! These high-octane fuels will enable the refiner to

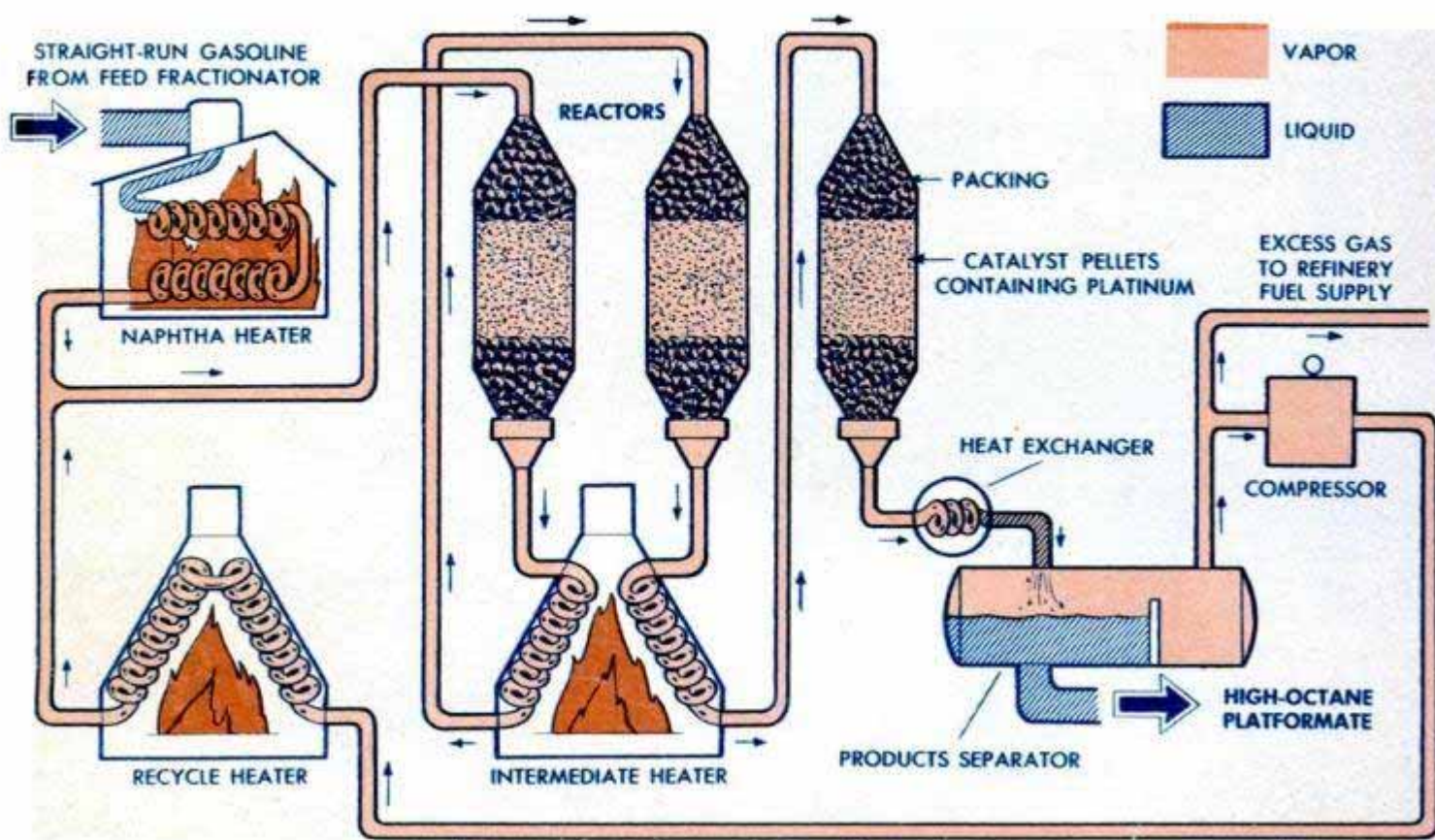


These three vertical tanks with the conical ends are the reactors inside which tiny pellets of a platinum "cat" reform the gasoline

provide gasoline for the high-compression engines of tomorrow.

The catalyst is made into tiny pellets, scarcely larger than a pinhead. These pellets are poured into huge reactors and gasoline vapors forced through them in a continuous process. Tests show that the catalyst doesn't wear out. Even if it does, it can be renewed with no loss of platinum, an important fact because of the high cost of the precious metal.

Diagram of process that changes straight-run gasoline into the high-octane fuel, Platformate (lower right)





Trader Goulding shows Navajo prospector how a Geiger counter reveals radioactivity in piece of uranium ore
Photos by Thomas E. Stimson, Jr.

The Navajos Hunt Big Game...

Uranium

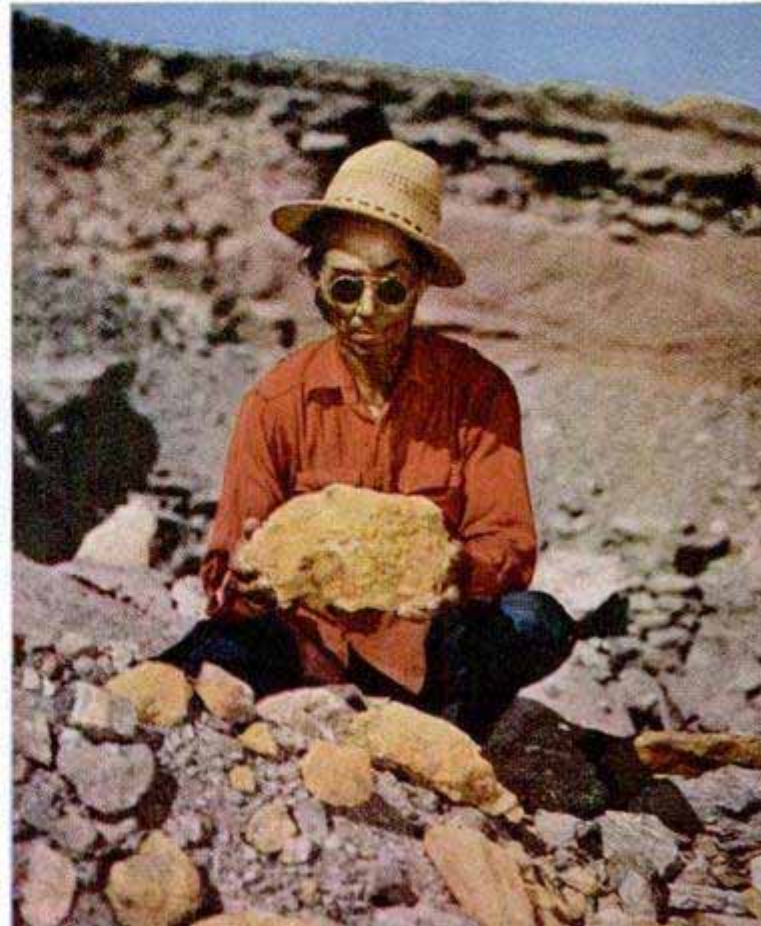
By Harry Goulding
Indian Trader

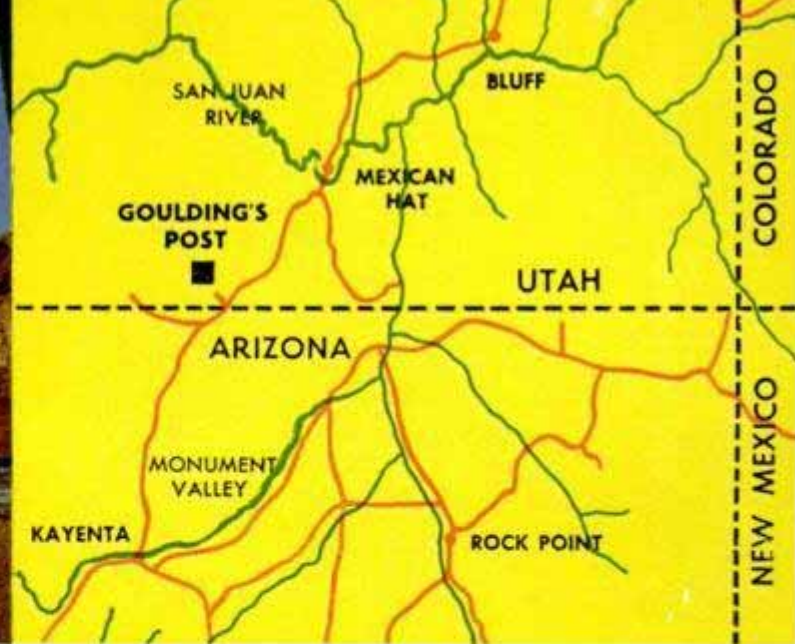
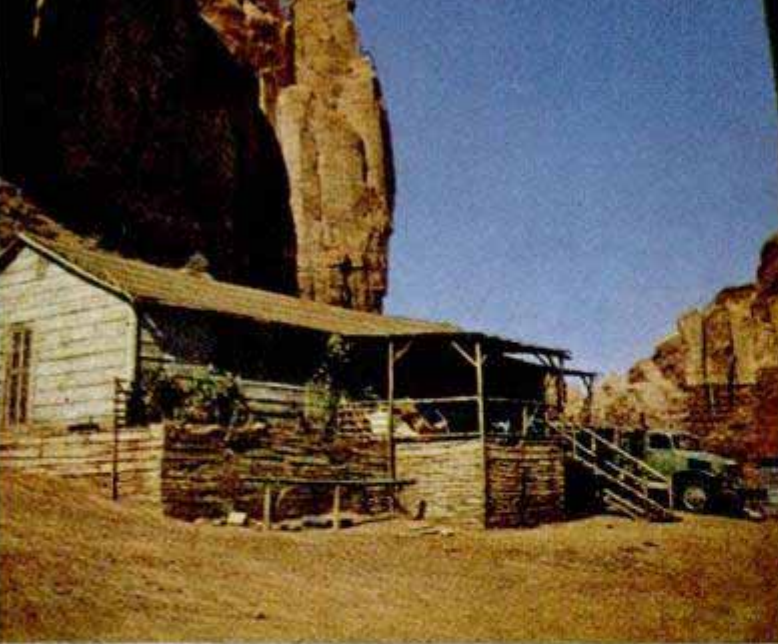
NOT LONG AGO two of my Navajo friends rode up to the trading post and told me of a distant canyon where they had noticed some rocks that were crusted with a bright-yellow substance and some nodules of blood-red crystals.

That is exciting news and I'm going to explore the canyon. In this country a canary-yellow mineral that occurs with the red crystals of vanadium is almost certain to be a uranium ore. Possibly by the time you read this the United States will have one more mine that is producing the raw material for atomic energy.

If the stuff that the Indians described proves to be radioactive, it will be the seventh uranium deposit that I have helped to locate. Several I found myself, early in the war, after the government sent out a plea for new deposits of vanadium. The vanadium was needed, to be sure, but no one told us until after Hiroshima that the

Indian miner inspects a chunk of low-grade uranium ore taken from a new mine in Monument Valley





Goulding's rustic trading post is overshadowed by towering cliff in Monument Valley. Map shows San Juan River and its network of dry-bed tributaries; the red lines indicate dirt roads and trails in the region

associated uranium was the real reason why vanadium was being sought.

Radioactivity, in fact, led us direct to one uranium-vanadium deposit. A photographer whom I was guiding through the area happened to pick up an oddly colored rock and, since his pockets were full, he placed it in his film case. Later, he wrote me that all his film had spoiled and he wondered if the rock could be radioactive. An assay showed that it was, and we went back to the spot where he'd found it and opened up a new vein.

One of the richest uranium mines in the country was discovered by a 19-year-old Indian boy, Luke Yazzie, who noticed an

outcrop of yellow ore while grazing sheep on the east side of Monument Valley. He and I drove over in my beefed-up desert car and prospected it, and found plenty of uranium. Work started on it at once and Navajos were employed as miners. Fifty of them are still working at the mine.

During the war the patriotic Indian miners wanted to wake up before dawn every morning so that they could work as many hours as possible. None of them had an alarm clock and one of the Navajo truck drivers volunteered to buy one on his next trip to town. No alarm clocks were available. The Indian used his head and brought back a rooster instead. Every morning at

Indian miners load low-grade uranium ore into truck in valley mine. It is trucked to railroad miles away





Goulding talks to Indian women who have driven 15 miles to trade homemade rugs for cloth at his post. They camp out overnight and return home next day. Right, many Navajo sheep have couple of extra horns

about four o'clock the rooster started to crow. The noise woke up the miners just as efficiently as any alarm clock.

I operate an Indian trading post in Monument Valley in southern Utah, on the Navajo Indian Reservation. My only white neighbor is 20 miles away and the nearest paved road is 100 miles from my post. The region is the most remote, least known and most starkly beautiful portion of the United States. It is an arid, barren desert, so unpopulated that the nearest post office is in another state. I get my mail at Kayenta, Ariz.

Parts of the area are still unmapped and thousands of square miles of it never have been surveyed. I've lived there for 27 years.

Eons ago Monument Valley was a high, flat tableland. Erosion gradually cut numerous box canyons into the tableland, exposing the underlying red sandstone. Eventually, the canyon walls were worn back until here and there they broke into the next canyon. Left behind were scores of pinnacles, buttes and small mesas, some as high as 1500 feet and all with sheer, vertical sides. These towering buttes give the valley its name and are the scenic attraction of the region.

A thousand years or so ago, with a wetter climate, the valley and the whole area were populated by the cliff-dwellers, an agricultural people who lived in rock houses that they built in depressions on the

Totem Pole pinnacle in distance towers 1000 feet from base and is as high as the Eiffel Tower





Trading-post operator takes time out to watch squaw weave a rug on crude loom; his "taxi" waits by post

faces of cliffs. When the climate dried out the cliff dwellers disappeared.

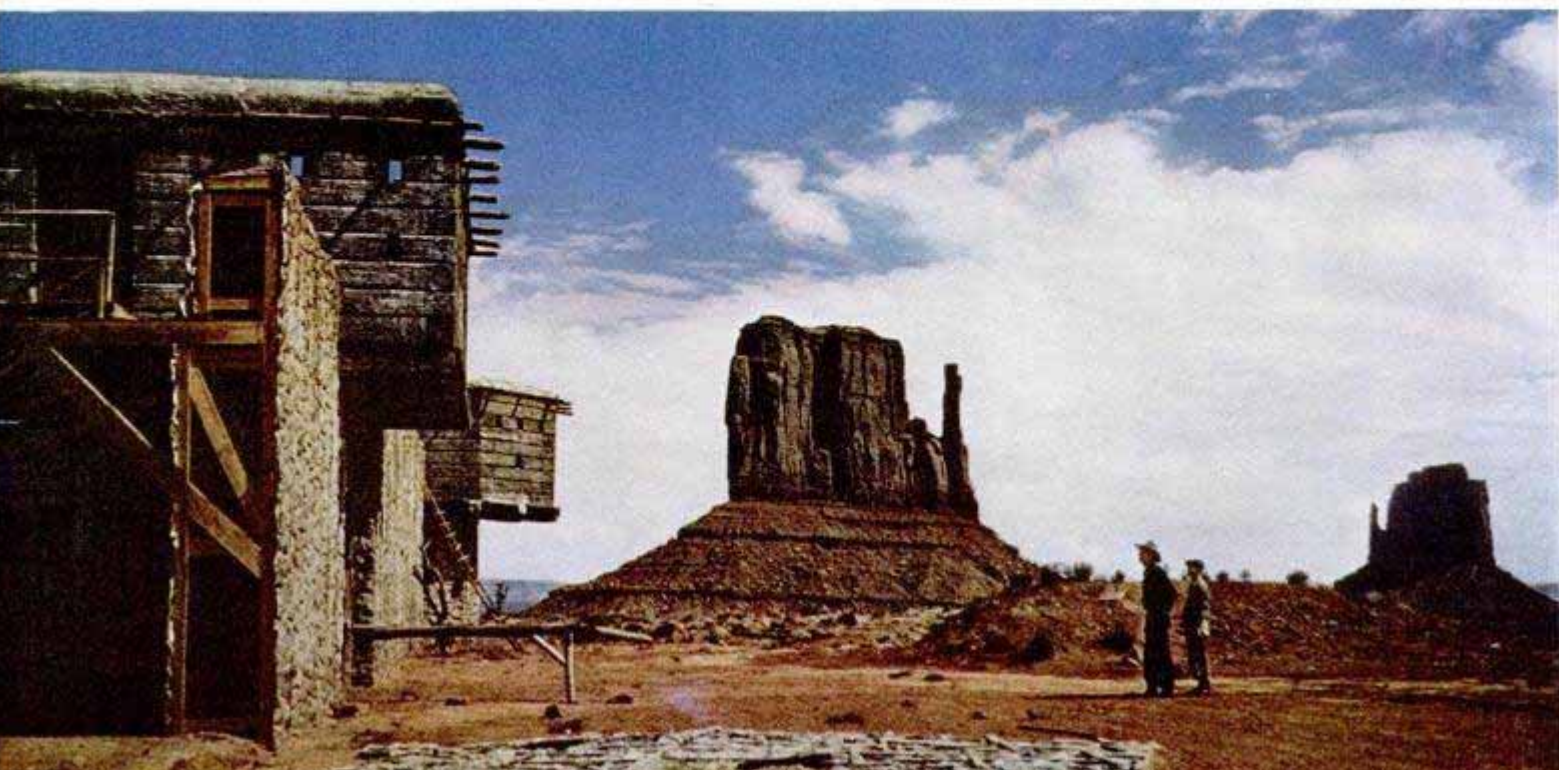
Today, the whole section is an Indian reservation on which thousands of Navajos live. They are a quiet, honorable people with many admirable characteristics. Other tribes have received much government help but the Navajos have been left vir-

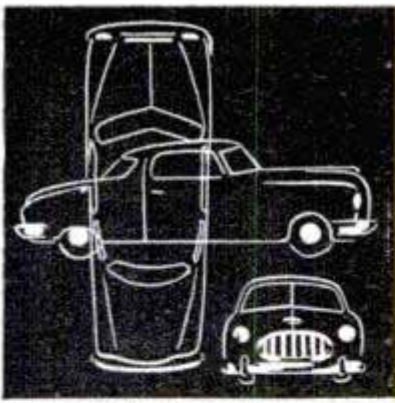
tually to shift for themselves. About 400 of them live in Monument Valley and in its immediate vicinity and they make a poor living by grazing sheep and goats on the sparse vegetation.

The nearest school is almost 50 miles away and it is 100 miles to the nearest

(Continued to page 236)

Movie studio built the realistic fort which the Navajos now own and let other studios use—for a fee





Detroit Listening Post

By Siler Freeman

THE AUTO INDUSTRY may wait another year to hold its first postwar national show. A combined industry show has not been held since 1940.

Because of the interest shown in the General Motors exhibits the past two years and the drawing power of the Chicago show, which was a dealer affair rather than an industry-sponsored exhibit, it was at first believed the manufacturers would get together for their 1951 models.

But the same thing that has prevented previous national shows is again balking efforts to put one on next fall—the raggedy scheduling of new-car announcements. Before the war, most new models were in dealers' showrooms by October. Since resumption of production, however, each company has brought out models when they could be fitted into individual plans.

Last year, for instance, Packard brought out its new line early in summer. The rest strung out until well past the first of the year with the 1950 models. Those which had been introduced in the spring and mid-summer would have looked slightly ancient in a national show.

General Motors, the leading producer and bellwether of the industry, was to have led the rest back to a more even introduction date. Originally, at least one division was to have had new models in September and the rest would have come in with their '51s by Thanksgiving.

All this is changed again. Most of the GM divisions will run through the year on the same cars they are making now.

Chrysler's planning is now all awry because of the long strike. It is doubtful if its divisions can plan on new models before the first of the year and perhaps later.

Ford, which came out in November last year, will probably shoot at this date again. It is rushing its new plants to take advantage of their capacities to aid them in the new models. The Cleveland plant is to furnish the new six-cylinder engine.

Of the independents, Nash and Kaiser-Frazer are first on the scene with 1951 models. K-F's light car will be in its deal-

ers' showrooms in July. Packard is readying new models in August and Hudson will be an early fall arrival.

The industry's lively interest in new transmissions and engines hasn't lessened but continues to grow. Cadillac is reported working on a new one which is rumored to be superior to the other three now being used in General Motors—Hydra-Matic, Dynaflo and Powerglide. The latter, incidentally, is being soft-pedaled by Chevrolet because of technical difficulties in the Cleveland plant where it is made. The few seen on the streets are principally in the hands of Chevrolet executives.

Cadillac's device is said to be a single-phase torque converter which locks into mechanical high. It has been tested under all conditions and pleases the high standards of that division's skilled engineering staff as well as its former chief engineer, John F. Gordon, who is now the general manager of Cadillac.

The Ford Cincinnati plant is being tooled fast for the new transmission which is expected to appear soon on Ford cars. This is the Borg-Warner development which also follows the lock-in principle, considered by automobile engineers a must if slippage is to be conquered in the automatic transmission.

Kaiser-Frazer is starting to get some of the Hydra-Matics it has contracted for from General Motors. Like the rest of the industry, it is experimenting with its own version but doesn't have the money to tool up for such a device.

On the engine front, Ford is about ready to start tooling for its new V-8 engine. This will follow its six-cylinder job or perhaps even overlap it. Both are highly thought of at the Rouge plant.

Chrysler's work on its new V-8 engine has been sharply set back by the strike. The program, however, is all set up for the 1951 models in the big jobs.

Buick also has a new engine under wraps. Although officials in Flint are uncommunicative about it, the new power plant will be of the V-8 variety and high compression.

It all sums up to high-gear competition for the customer's dollar next year.



Left, foreground is fuzzy in this photo. Right, the same camera took this shot, but the Garutso balance was added to the lens and the whole scene is sharp



GLASS "DOUGHNUT" IN LENS ENDS FUZZY PHOTOGRAPHS

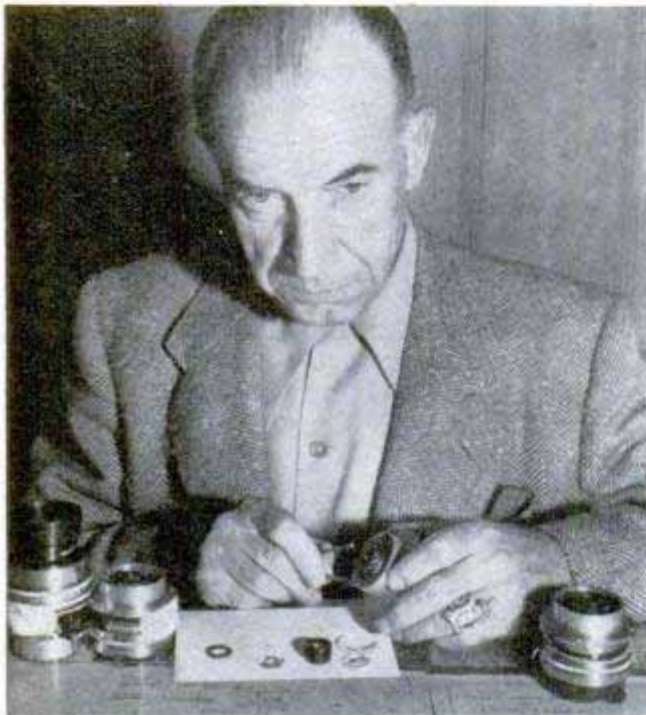
THAT OLD bogieman of photographers, sharp focus, has been dealt a body blow by a newly developed ring-shaped lens that increases depth of focus up to 500 per cent. Like a doughnut, the lens is round with a hole in the center and it is called an optical balance.

Used in addition to the regular lens system, the glass "doughnut" is placed between the front and rear elements. It enables the photographer to take pictures that are sharp from 24 inches in front of the camera to infinity, even with the lens aperture fairly wide open. The optical balance does not absorb any appreciable amount of light, thus does not affect exposure time. In addition, it corrects much of the spherical aberration of the conventional lens, providing greater contrast and good definition through the entire field at wide-open apertures.

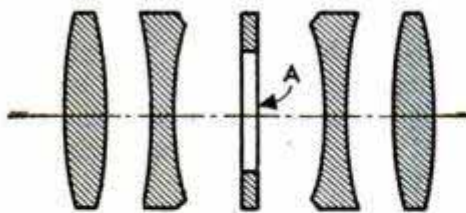
Invented by Steven Garutso, the optical balance was first used on movie cameras in Hollywood, where Garutso, a former Russian camera manufacturer, has been living for 10 years. He spent 25 years developing the basic formula.

Movies made with the Garutso lens provide an illusion of three dimensions because the amazing depth of focus gives a picture that is similar to what the eye would see. Several motion pictures have been made with the optical balance and production of the device has been limited thus far to installations in professional motion-picture and television cameras. Production of the elements for other movie cameras and still cameras is expected to begin shortly.

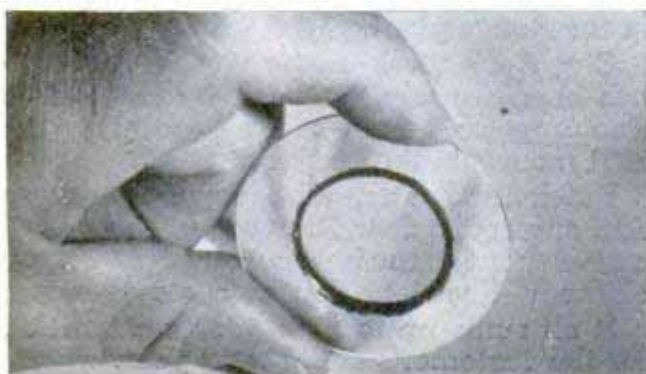
A future development may be an auxiliary attachment that can be slipped over the lens like a filter, eliminating expensive installation costs and bringing the device down to a price that the average amateur can afford.



Steven Garutso, the inventor of the optical balance, adds the glass "doughnut" to a motion-picture lens

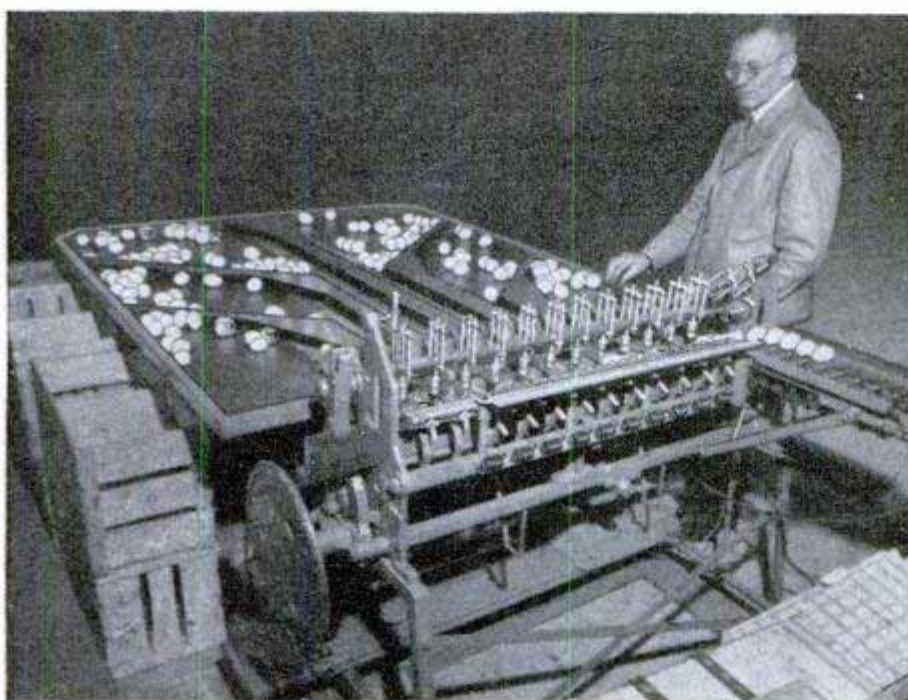


Above, the balance, A, is placed between front and rear lens elements. Below, a close-up of the balance



Golf-Bag Divider Separates 14 Clubs

Golfers can select clubs easier with the aid of a device that provides oval-type bags with 14 separate compartments. Weighing approximately one pound, the plastic divider, which fits inside the top of any bag with free space at least 7½ inches long and 4 inches wide, is held in position by screws. Each compartment can be labeled for a specific club. In addition to protecting the shafts and handles of the clubs from scuffing against each other, an empty slot in the device signals the loss of a club to the user.



Egg Sorter

As many as 6000 eggs an hour are handled by a German machine that does four operations at once without breaking the thinnest shells. Shown at an agricultural fair in Frankfurt on Main, the machine checks, weighs, stamps and counts eggs which are fed into it by a conveyor belt. The number of eggs of each grade is counted automatically during the operation.

Ⓢ Elevators in buildings in the United States travel 500 million up-and-down miles each year.

Suitcase on Wheels

You can be your own "redcap" if you use a suitcase roller that straps to any type of luggage. Two rollers, mounted on metal brackets, support the weight of the suitcase and you simply pull it along behind you by a convenient handle. The brackets adjust to fit the width of the luggage.

Popular Mechanics provides two sources of further information concerning articles published in each issue: the WHERE-TO-BUY-IT INDEX, starting on page 10, and the WHERE-TO-FIND-IT LIST, which is available to readers without charge from Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois

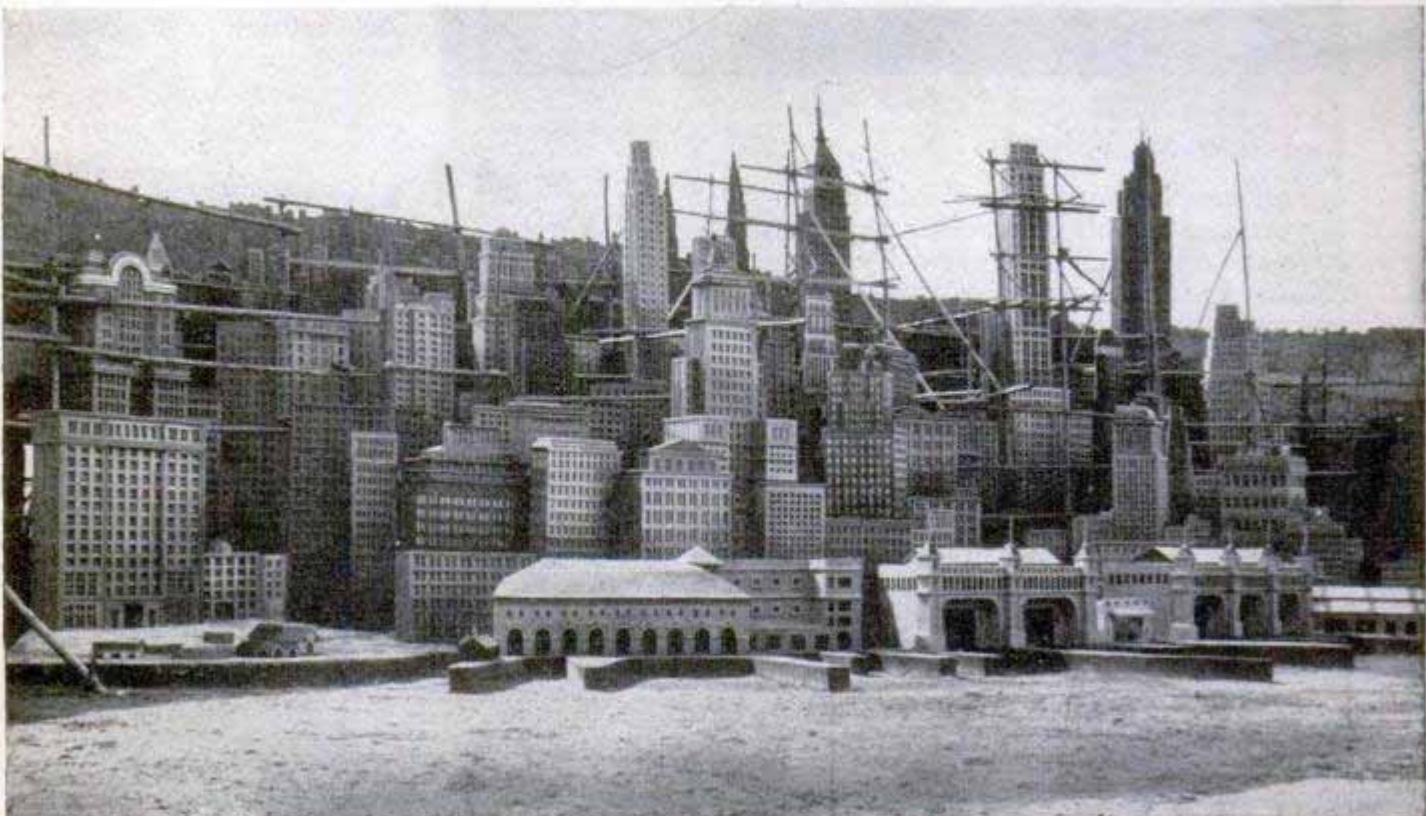




Junketing congressmen would feel at home with the Japanese model of our Capitol. Right, Empire State Building

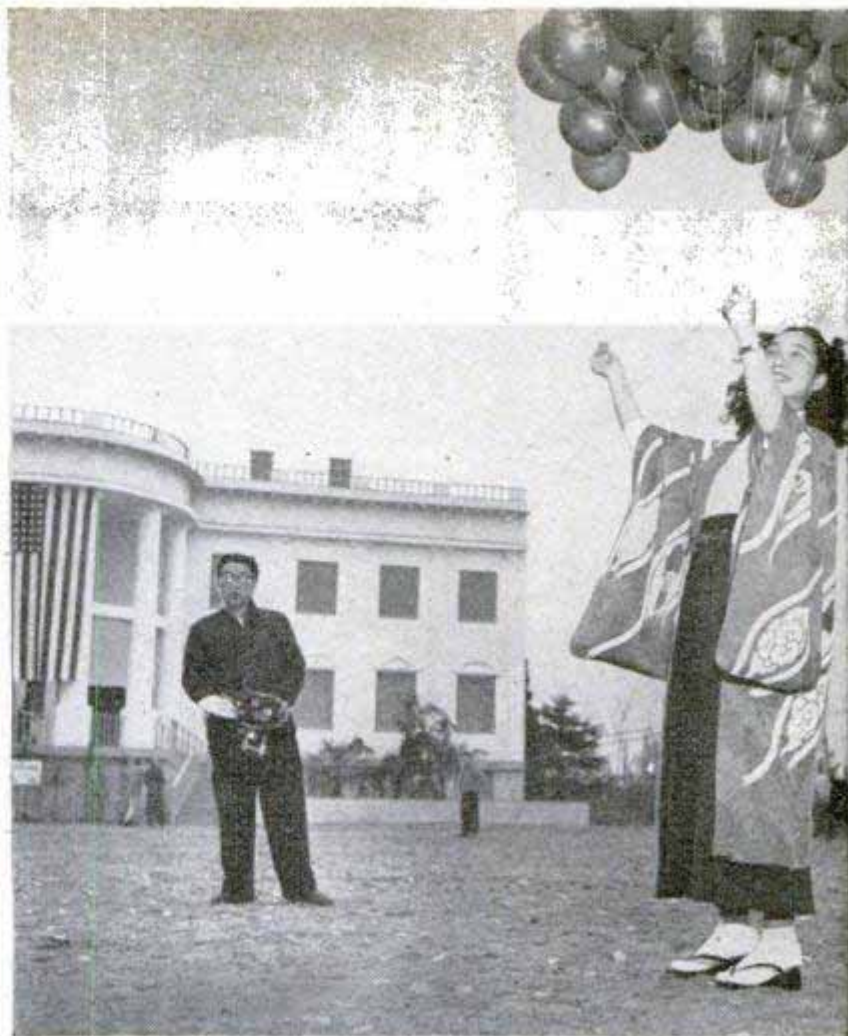
“LITTLE AMERICA”

Most impressive part of the fair is this version of New York City's skyline, shown here under construction





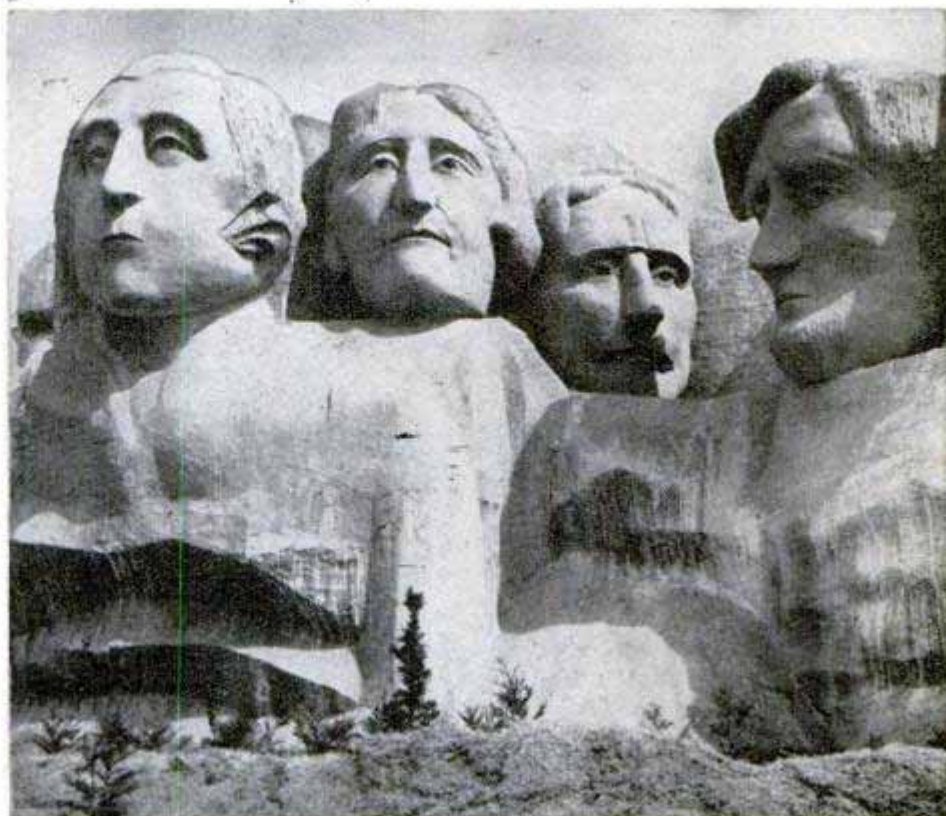
Above, an American GI in Japan looks at a copy of a Lincoln statue. Right, even in the Orient, balloons and fairs go together. That is the White House

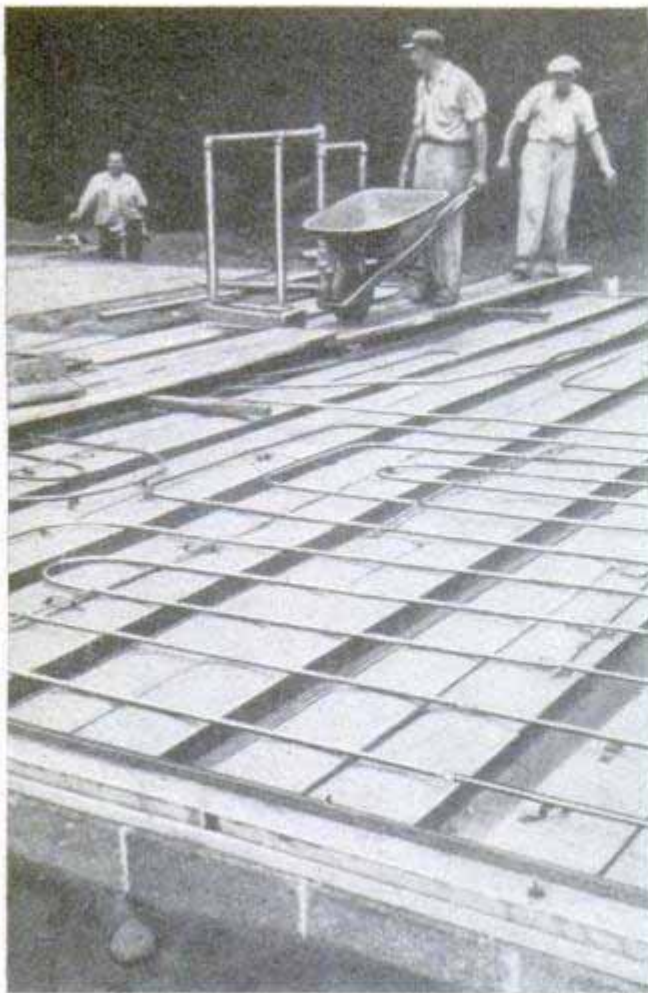


IN JAPAN

JAPANESE get a capsule-size view of the U.S.A. at the America Fair, sponsored by newspapers in Nishinomiya. Covering 75 acres, the fair includes models of famed American buildings as well as such natural phenomena as Grand Canyon, in miniature, of course. New York City's skyline is represented by a detailed scale model as are many of Washington's impressive buildings. On the lighter side are exhibits of bingo games and slot machines! Even the famous sculptures on Mount Rushmore have been skillfully reproduced, with a strange Oriental look.

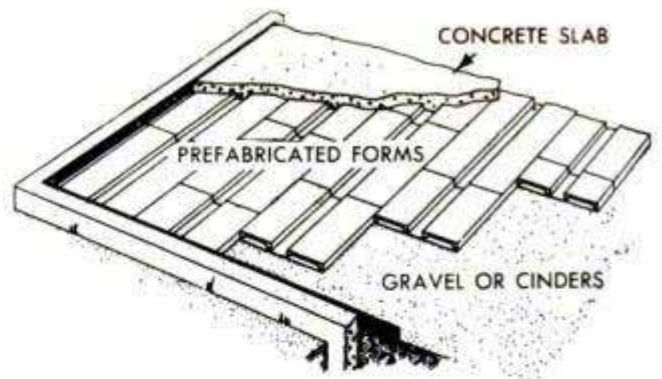
There's an Oriental look to this reproduction of the Mount Rushmore Memorial





Some installations call for radiant-heating coils. Pipes are placed atop "chairs" fastened to the forms

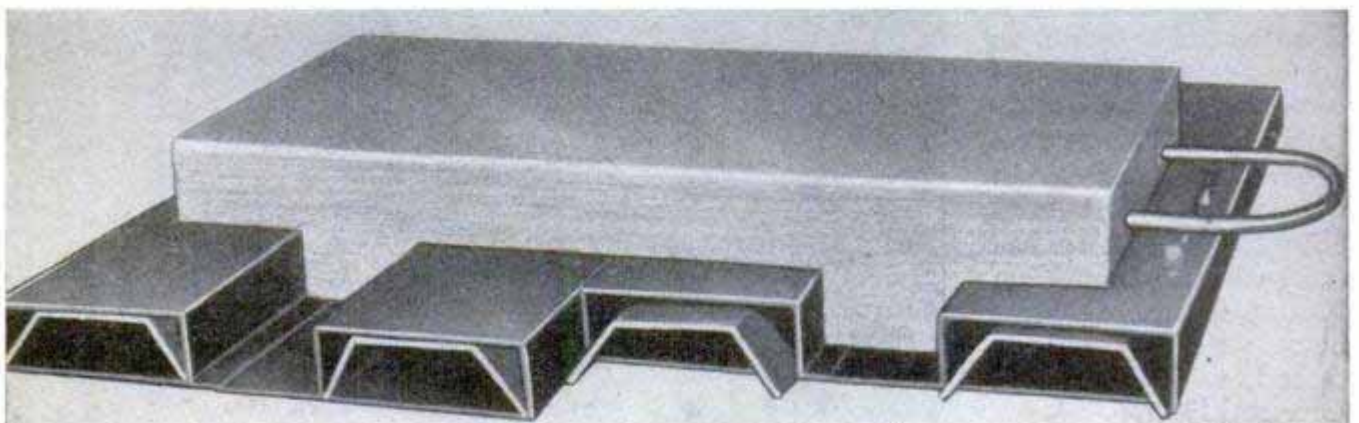
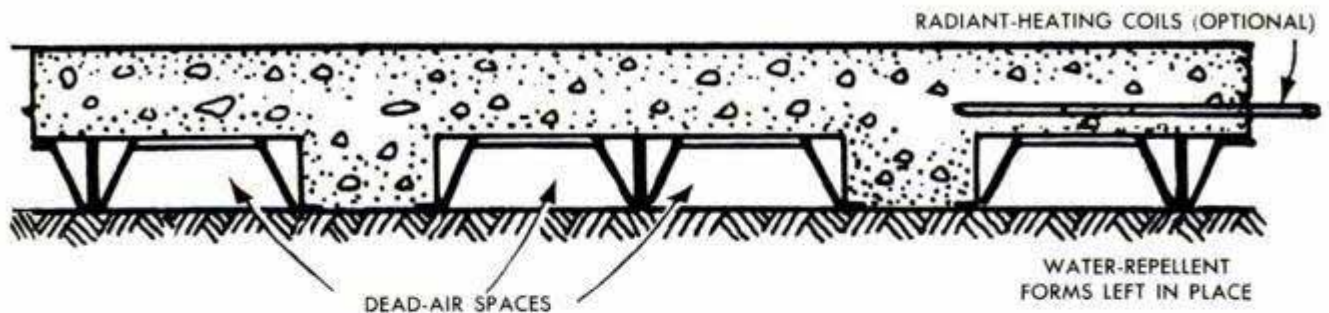
Below, floor poured on the forms has dead-air insulating space under 75 percent of its area. Bottom, form is given strength by a "bridge" inserted through opening. The form holds up to six inches of concrete



Forms are quickly erected and installed over a large area. Slab is poured and forms are left in place

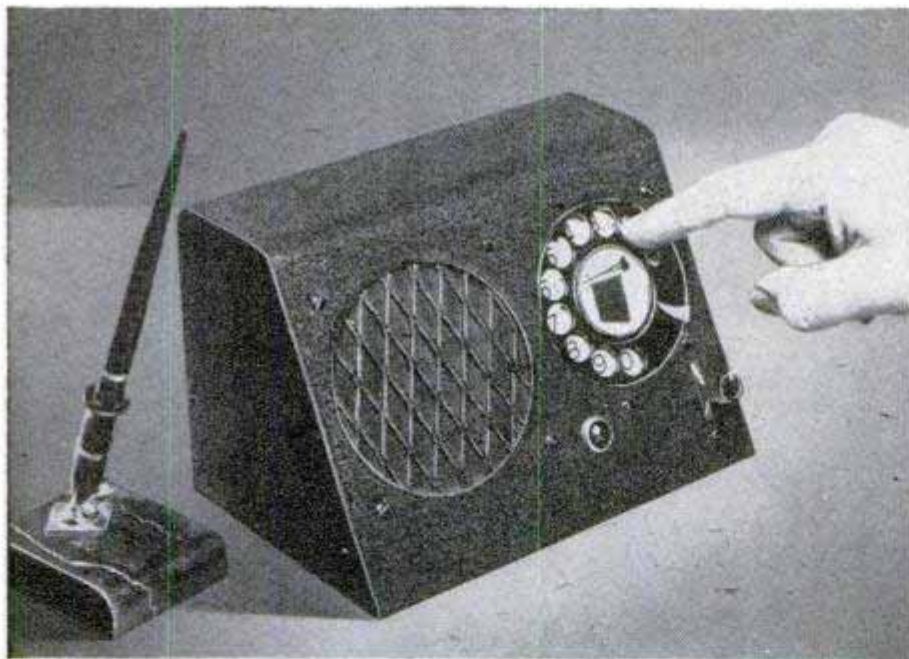
Prefabricated Floor Forms

Prefabricated forms for concrete floors now are shipped collapsed, and erected on the site. They form a floor that is cast on the ground surface, yet has an insulating dead-air space under 75 percent of the floor area, thus giving a basementless building the advantages of an insulating space. Made of water-repellent material, the forms can be placed quickly and altered for pipes and other construction details with a pocket knife. Radiant-heating coils, which are to be built into the floor, are placed on small metal "chairs" so they will be buried in the one-pour concrete at the correct depth. The forms will support wet concrete loads from the normal four-inch thickness for home construction to six inches, reinforced, for commercial buildings. They are shipped collapsed in bundles which make 100 square feet of assembled form.



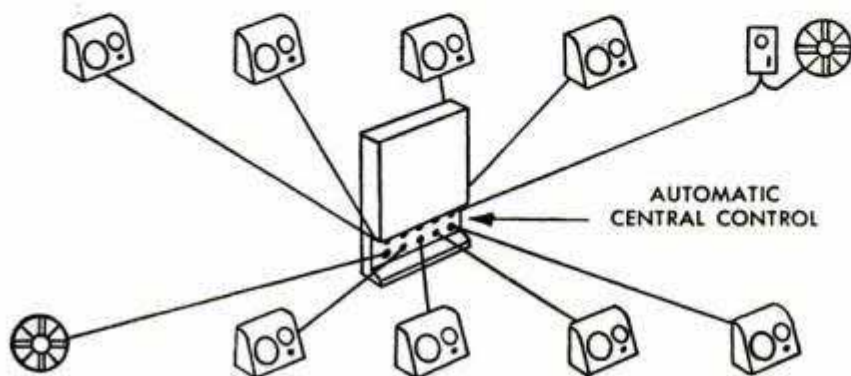
Motor Car at Home On Rails or Roads

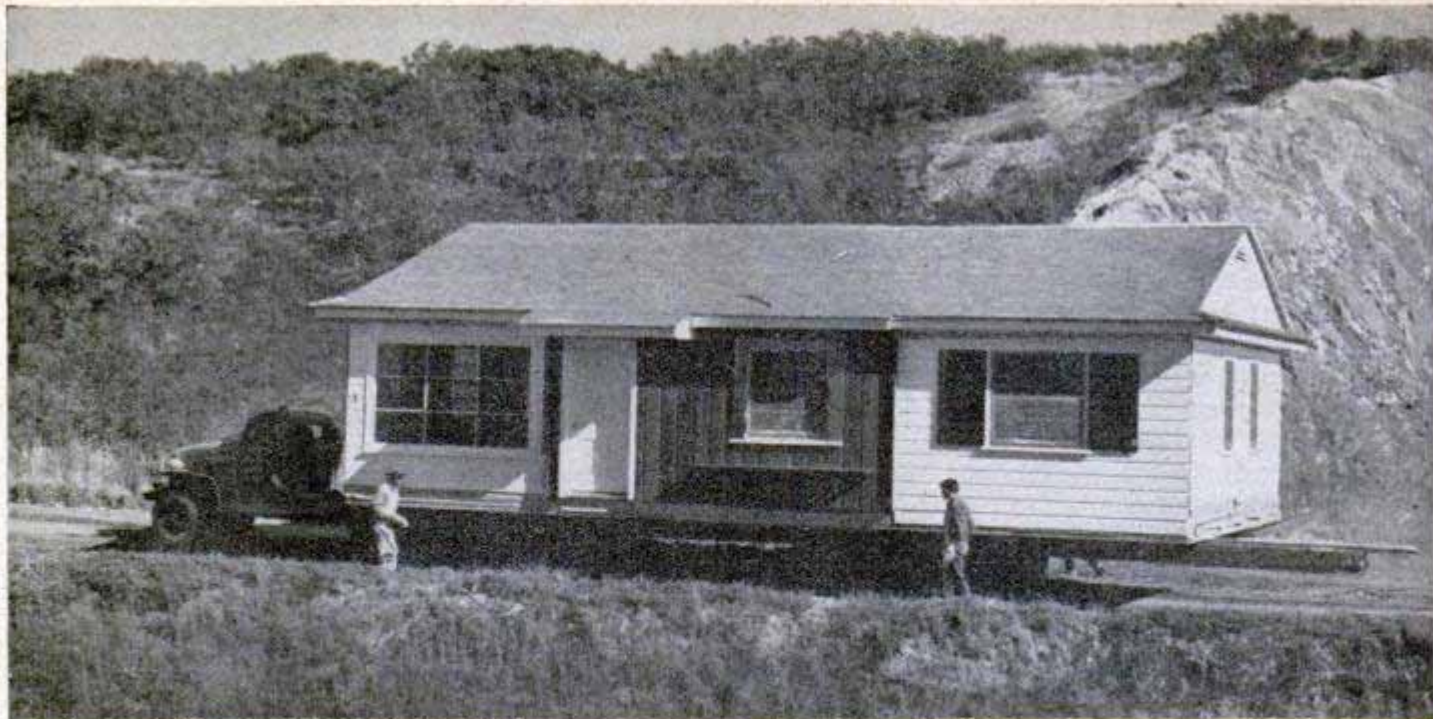
Railroad track 29 or Highway 30, it makes no difference to a motor car that rolls along either on its pneumatic tires. Hydraulically raised and lowered, four guide wheels keep the car on the rails, while the standard rubber tires carry the weight for better traction and riding quality. In case of emergency, such as a flat tire, the guide wheels are strong enough to support the load. The truck can leave the rails at any place along the track because of a powerful four-wheel drive that can climb over rails. When the truck is being operated on the rails, the front wheels are locked in a straight-forward position and the steering wheel is not used.



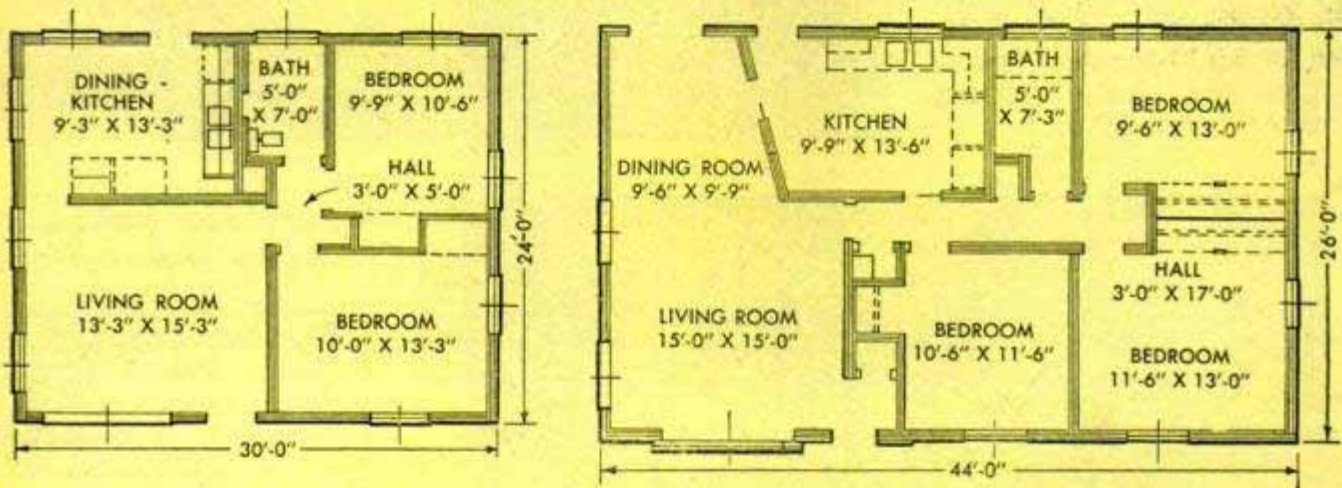
Central Control Panel For Intercom System

Automatically controlled by a central panel to which each speaker set or station is connected, a new intercommunication system offers many advantages. The system uses no radio tubes in the speaker sets and a.c. outlets are not required for the individual stations. Since each station reaches all others on the system only through the central panel, stations may be moved or new ones added without rewiring other stations on the system. In addition, the intercom can be controlled by an automatic time clock which cuts the power in and out of the entire system at predetermined hours, thus eliminating any possibility of leaving a part of the system powered during nonworking hours. Another feature is two-way conversation with privacy between stations.



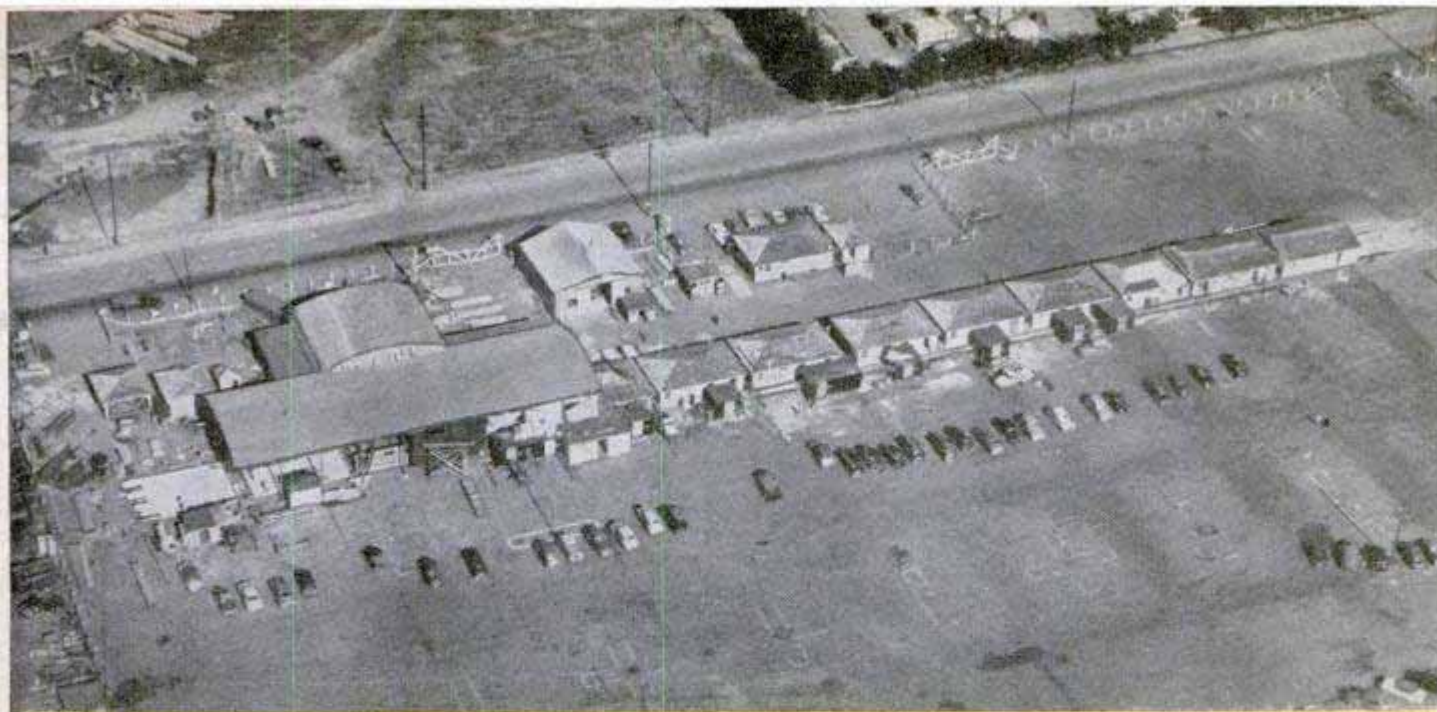


In a few hours the owner can move in! One of smaller factory-built homes rolls down the road toward its site



Resting on rollers, 13 homes move toward completion at once. Above, two of five plans offered in San Diego





Aerial view of factory shows flooring laid down at left, a completed house rolling off line at right

Send Me a Five-Room House

IN A SCORE of American cities you can phone the local house factory and arrange for the delivery of a brand new home with no more fuss than it takes to buy a new car.

You have your choice of up to seven floor plans and can select your own color schemes. Your house will be built on an assembly line in 13 days and then towed to your site. You can move in the same day the house is delivered if water, gas, electrical and sewage connections are made promptly.

Your new residence will be a full-size house built of standard materials by expert workmen. It will be styled to the area in which you live, tastefully decorated, equipped with quality fixtures and hardware. It will cost about 10 percent less than the price of erecting the same house piece by piece at the site.

The only hitch is that right now the factories are snowed under with orders and you may have to wait several months before your house can be built. Hundreds of other buyers have their purchase orders already on file.

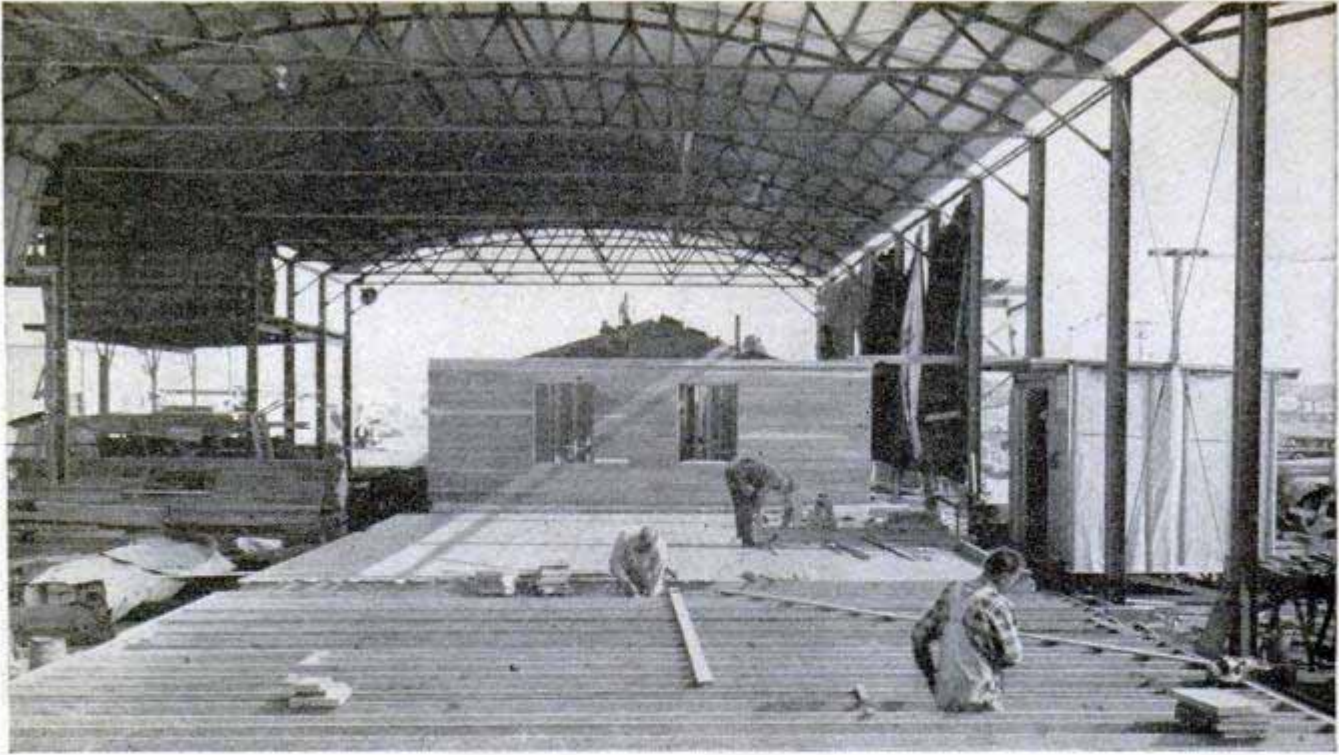
A couple of years ago, a Bakersfield, Calif., contractor named Hugh Curran agreed to build a house that was to be moved as soon as it was finished. The owner would select a site for it in the meantime. During the next few weeks the owner bought a lot, the foundation was poured, and as soon as the house was fin-

ished it was hauled to the site on ordinary house-moving equipment. At the site it was carefully lowered onto the foundation, fastened down and hooked to the public utility lines. Not a window was broken, not a crack was opened up during the moving.

That gave Curran an idea and he designed a long assembly line. At one end the floor joists and flooring of a house would be assembled. This base then would be moved on rollers to stations at which the walls would go up, the shingle roof nailed on and other work performed until a finished house emerged at the other end of the line. Because the house would move during construction, he called it Mobilhome.

A pilot plant was built in Bakersfield and houses began to roll off the line at the rate of one a day. Since then factories have been built in Chicago, Phoenix, Ariz., Gary, Ind., Amarillo, Tex., Reno, Nev., San Diego, Los Angeles and several other California cities. Several more will be built within a few months throughout the Middle West and along the Atlantic seaboard. Some 2000 houses have been produced to date.

A house is delivered free within a 10-mile radius of a factory; beyond that a nominal charge for the extra mileage is made. The biggest tow bill to date amounted to \$600, the price of moving a house a distance of 250 miles. The owner was elated with the deal because the total price was still \$1000 under local estimates.



Joists are laid and tied together with bridging members to start new house. Beyond, flooring is nailed down

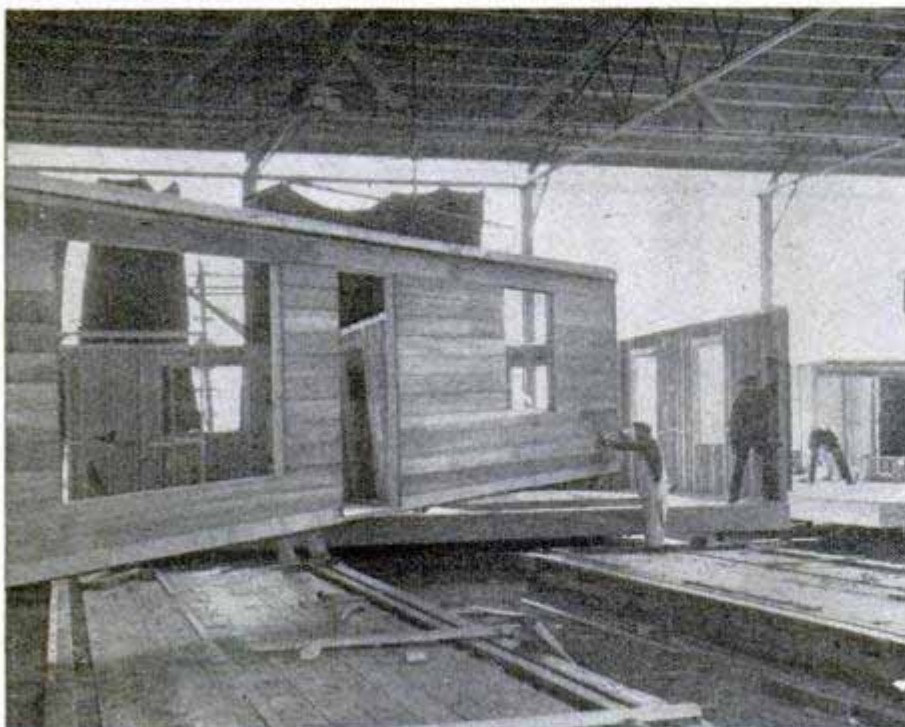
Typical of the factories is the one at San Diego where the assembly line is 585 feet long. The San Diego plant offers five basic houses that range from 720 to 1144 square feet of floor area in size, priced from \$5750 to \$8650 delivered and hooked up, ready for occupancy. Each house is built to conform to the building code of the area to which it will be moved.

The assembly line rests on a pair of sturdy rails 24 feet apart. To the top of each rail a row of rollers is attached. Steel runners are laid on the rollers and the floor joists are laid directly on the runners. Con-

struction starts at one end of the assembly line by raising into place a pair of hinged jig boards that are slotted to receive the joists of the particular design that is to be built. The 2 by 12 joists are laid down and fastened together with bridging members, then a veneer subfloor is nailed to the joists.

Next the jig boards are swung out of the way and a cable that leads to a winch at the far end of the assembly line is attached to the floor unit. The winch is powered by a geared-down, three-horsepower motor, which pulls the floor unit along the line to the next station. All the partly finished

Preassembled wall is raised into position and fastened to the floor



houses in front of the new floor unit are pushed one station down the line when the floor unit moves. The cable is then detached, ready to be hooked up to a new floor unit when that one is finished.

At station two the floor unit receives its select oak floor and a protective layer of thick paper. At station three, under a roof, the exterior walls and interior partitions are lifted into place by overhead cranes. These units had been preassembled in an adjacent working area during the time the floor was being laid. At this station, too, the ceiling joists are installed and the rough wiring and plumbing is started.

There are 13 stations on the line with 13 houses under construction at all times. Each house moves ahead one station each day. Walking along the line, you can see bathroom fixtures and a hot-air furnace being installed in one house, kitchen and bathroom cabinets that were built in an adjacent mill going into another house and the tilework and linoleum being completed in a third. Tomorrow the same crews will be doing the same work in the new houses that have moved to their stations.

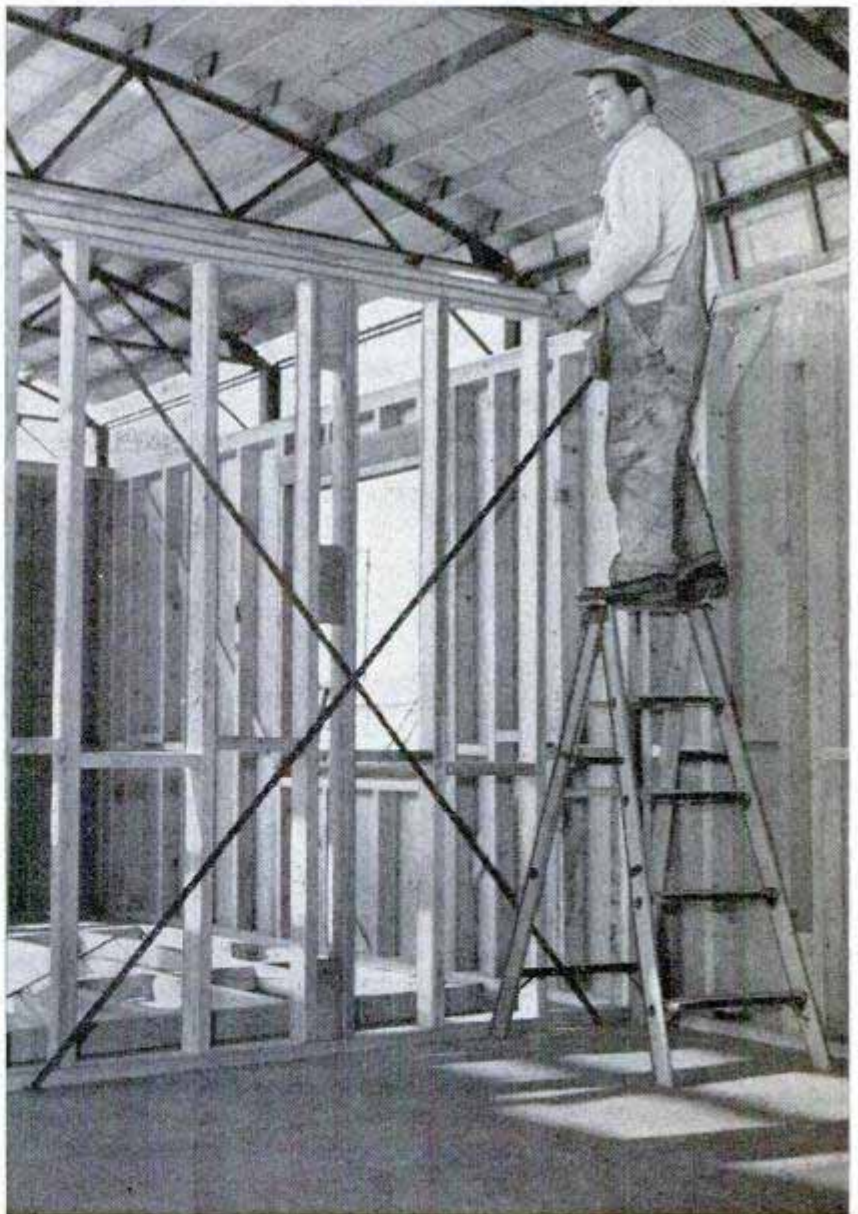
Factory-built houses use the so-called "dry wall" construction materials that include lumber and the various prepared wallboards and panels. Plaster and stucco are ruled out because they require extra days or weeks for drying. Instead, walls and ceilings are surfaced with panels of composition materials, the joints of which are taped and sanded to an even appearance. The tops of the ceiling panels contain a layer of aluminum foil.

After final inspection and clean-up at the end of the line, each house is rolled over a shallow pit and is raised on screw jacks to allow the dollies of the moving equipment to be pushed underneath. Then the house is lowered onto the dollies and is towed away. The houses average 10 tons in weight and are up to 26 feet wide on the narrowest dimension, this being the maximum width that can be moved over San Diego city streets without extra permits. Garage units are built and trucked separately to their sites.

San Diego's Mobilhome factory employs from 65 to 70 expert carpenters, painters, plumbers and other artisans. The men work regularly at the plant instead of jumping from job to job, and their work is laid out so that it can be done easily and correctly. The consequence is that construction goes along much more efficiently than in the field. Officials of the FHA and other financing institutions are



Wooden shingles are nailed in place by an experienced workman, who does the same job on every house as it rolls down the line. Below, metal straps, installed diagonally, keep the interior walls rigid





Near the end of the line the house receives three coats of paint. The purchaser chooses the colors

delighted with the quality of the houses.

As long as the present demand for new homes exists, the factories will find it easy to sell stock houses, but what about the future? The factories will continue to be as busy as ever, in the opinion of Ken Glazebrook, president of the San Diego organization. The present factories are the beginning of a real revolution in-house construction, he thinks.

Any house of almost any dimensions and of most standard materials can be custom-built in a factory better and cheaper than at its site, Glazebrook declares. One large house that contains three bedrooms, three baths, a den and the usual living quarters is to be built at the San Diego factory this year. The residence will have 3000 square

Finished home, still on rollers, moves over a pit so the house-moving equipment can be installed



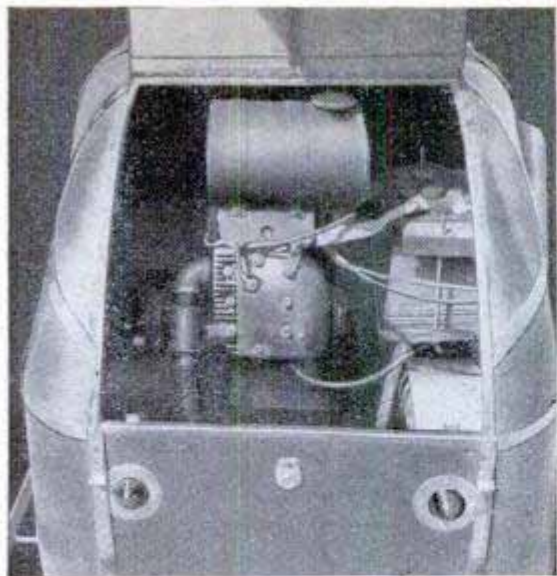
Among the new fixtures built into the homes are windows that can be removed from frames for cleaning

feet of living space, much more than the average house. The scheme is to build it in three separate units, none more than 26 feet wide on one dimension, and then assemble these completed units at the site. The same technique can be used for two-story houses and small office buildings.

If you want stucco on your exterior walls, this material will be applied after the house has been moved. If you want a fireplace, it will be erected in the vacant spot left for it, after the house has been trucked to its site. In the future, Glazebrook says, you'll be able to draw up your own plans and specifications for the kind of house that you want and take them to the nearest house factory for a bid. When you do, you'll be surprised at the low price you get.

During final inspection even the drawers are tested. Then off goes the house to the home-buyer's site





When his 13-year-old son wanted a car instead of a bicycle, an Arizona hobbyist built this neat model, top right, at a cost of \$350. Top left, the engine is in the rear. Above, it cruises along at 40 miles an hour

Boy Won't Need Dad's Car Now!

Thirteen-year-old Jimmy Richardson of Tucson, Ariz., is the envy of all his friends with a midget auto built by his father. What's more, he rides all week on 56 cents worth of gas—the cost for one tankful. The car is made of 20-gauge steel trimmed in stainless steel for a snappy appearance. It stands 2½ feet high, is five feet long and has a ground clearance of only five inches. Built on a frame of bed rail with knee action in front and regular coil springs in the rear, the entire machine weighs about 300 pounds. Its power plant is a six-horsepower, 42-pound Salsbury engine, air-cooled through funnel-shaped vents on

both sides. The car uses an automatic clutch that requires no shifting, is chain-driven with the motor in the rear and stops with mechanical brakes working on the drum-friction principle. On 15-inch wheels it uses 3.50 by 6 tires in front and for better traction 4.50 by 6 tires in back. Jimmy's father, Paul Richardson, reports that the midget has excellent pickup for the size of the engine which is geared five to one. In an early test the car was clocked at 55 miles an hour with a 225-pound man behind the wheel. It was slowed down to a top speed of about 40 miles an hour. Richardson built the midget car in his spare time over a five-week period at a cost of about \$350 for materials.

Storage-Battery's Life Expectancy Increased by Chemical

Storage batteries last longer and recharge more quickly when treated with a chemical compound that successfully combats "sulphation," according to the manufacturer. Added to the electrolyte of lead-acid batteries, the preparation has increased the life of new batteries under severe oper-

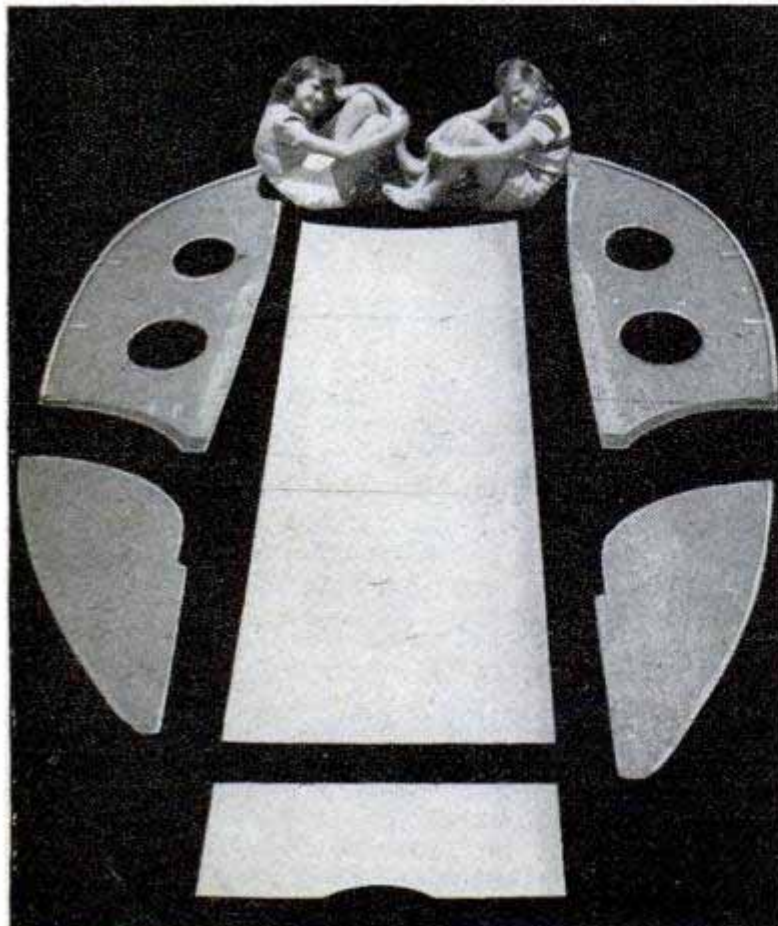
ating conditions as much as five times. It contains sodium sulphate and magnesium sulphate which convert the hardened "sulphate" on the plates into a soft, active material. For best results, the chemical should be added to new batteries, but it also works in mechanically sound old batteries.



With the forward roof folded back in good fishing weather, the cabin gives the boat a neat, snug appearance

A CABIN FOR YOUR BOAT

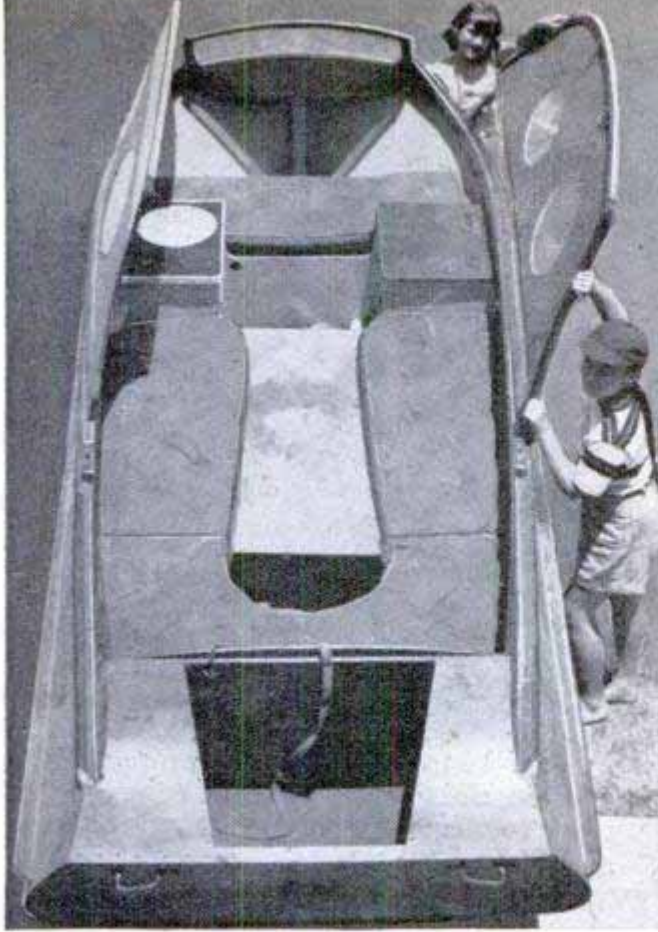
Easily made parts weigh less than 50 pounds, can be stored flat



EVERY small-boat owner who has felt the stinging lash of the rain as he plows across a lake has wished for a snug cabin for his open craft. John Gartner of Long Beach, Calif., decided to do something about it, and came up with no flapping canvas, but a genuine weatherproof cabin. Because of the simple construction, he's sure any other boat owner can adapt the idea to his own craft.

The cabin, made of plywood, folds flat for storage, weighs less than 50 pounds and requires less than five minutes' time and a few bolts to assemble. The only essential element on the boat is some kind of coaming on which the cabin can be mounted. The sides and roof of the cabin are made of $\frac{1}{8}$ -inch waterproof plywood, cleated and braced with $\frac{3}{4}$ -inch-square strips of spruce or oak and some pieces of $\frac{1}{4}$ -inch plywood.

Gartner first clamped a piece of plywood to one side of the coaming from the windshield as far back as he wanted the semipermanent housing. The piece was high



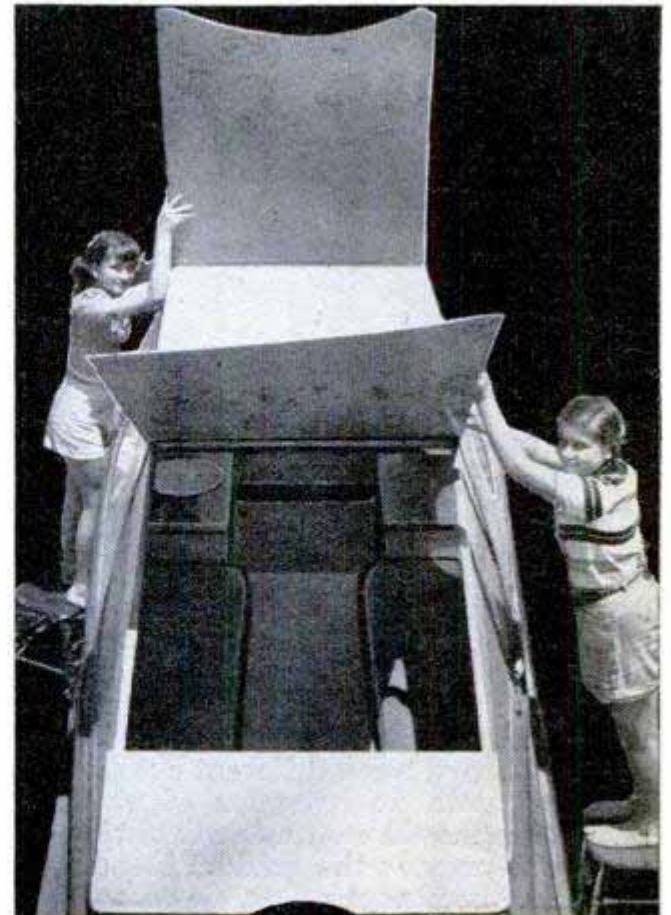
enough to allow comfortable sitting space in at least one seat position. He marked off the roof arch, then clamped another piece of plywood to the aft section and faired down the roof line to the stern. These two pieces of plywood were connected by making joints of $\frac{1}{4}$ -inch plywood strips fastened to each side of the forward section and extending beyond the edge about one inch, thus making a pocket in which the aft section fits snugly.

The top edges of the sections were braced inside with strips of $\frac{3}{4}$ -inch stock bent to the roof curve, and the lower edges reinforced on the outside with strips of plywood three inches wide. Gartner then made duplicate parts for the opposite side of the boat and bolted all four sections to the coaming with $\frac{3}{8}$ -inch brass wing bolts.

He made the top in three sections. The middle section was braced with crosspieces at intervals, and angle irons were screwed to the braces to serve as wing-bolt fastenings on the sides. Then he cut the other two top pieces to size and fastened the three pieces together with piano hinges. An extra section of roofing was needed for the stern of Gartner's particular boat. When on the highway, he lashes down the forward roof with straps. He can get to the storage space inside the boat simply by loosening the hold-down straps.

The windows or portholes, inserted wherever he desired, are made of $\frac{1}{8}$ -inch plastic set in mastic and bolted.

Above, left, side pieces are wing-bolted to the boat's coaming. Top, wing bolts, inserted through angle irons, also hold the roof's center section to the sides. Above, forward roof is strapped down while the boat is on the highway. Loosened straps permit access to the interior. Below, the roof folds down into place on piano hinges to complete the cabin



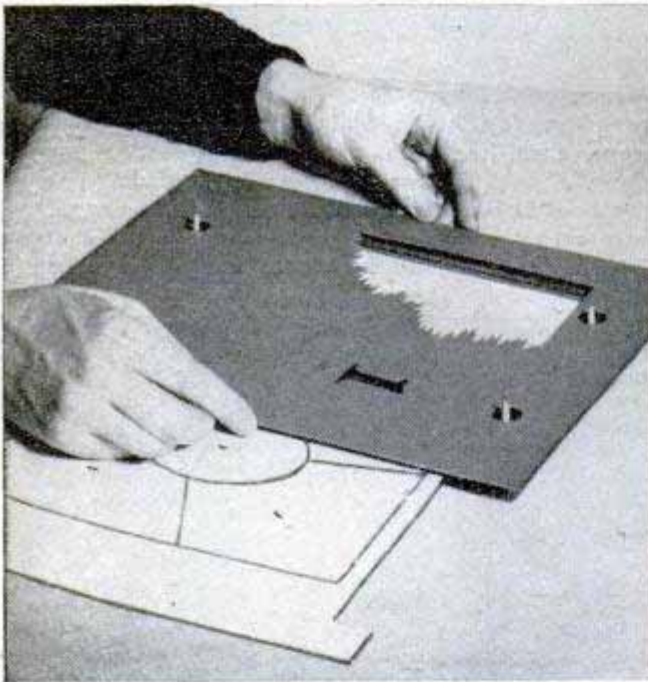


Power Scythe

You don't have to swing a scythe that has an oscillating cutter bar, instead you just guide it along and a lightweight gasoline engine does the work. Ideally suited for trimming around buildings, under fences,



along slopes and rough ground where power mowers can't go, the power scythe weighs only 24 pounds and is carried by a shoulder strap. The cutting blades can be submerged in water for trimming weeds in irrigation ditches or for removing under-water growth around beaches.



Photomontage Kit

Photographic montages are made from five separate negatives with a masking device that blends them so well there are no separation lines between the pictures. The device, sold in kit form, consists of five masking boards, each numbered for identification, a baseboard with four aligning pegs and a numbered target area on which the individual images are composed. Each masking board has a different cutout area, bordered with an irregular edge. These boards are moved continuously during exposure to provide the gradual blending of adjacent photographs.

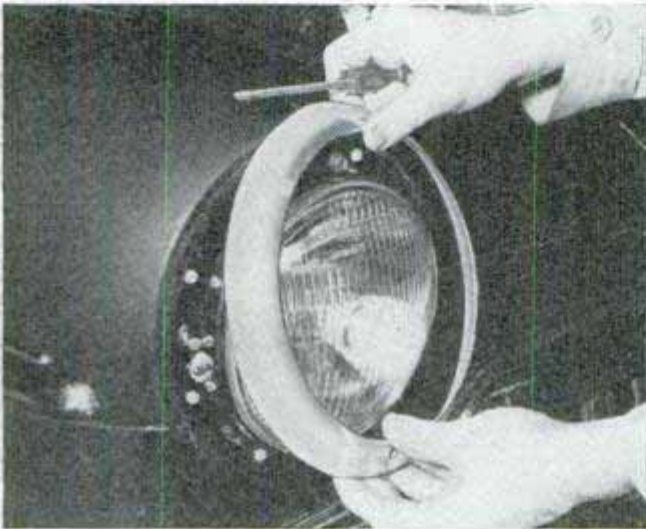


Stamp Examiner

All the instruments used by a hobbyist in examining his postage stamps are included in a new gauge. The philatelist first measures the size of the stamp on a scale marked off in inches and millimeters. He then can place the stamp along a rotating gauge, which he turns until the marks exactly match the stamp's perforations. By looking at the number on the indicator he determines the number of perforations, often the only means of distinguishing between a valuable stamp and one worth only a few cents. As a final check, the collector can place the stamp in a tray on the instrument and test it for watermarks with the fluids available for that purpose.



Plastic shades over headlights reduce glare from approaching car, above left, and eliminate that dangerous, "blind" instant when cars pass. The shades are hood shaped, right, and are slotted to direct light rays away from approaching car. To install shades, you remove outer rim, below left, and screw shade in place, right



Plastic Shades on Headlights Cut Down Glare

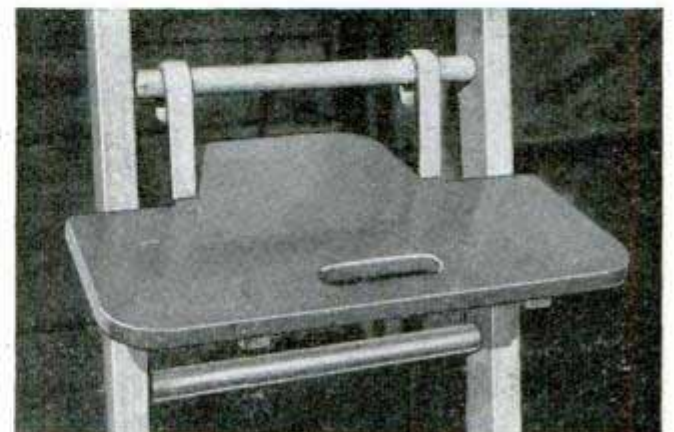
One of the principal causes of automobile accidents at night—headlight glare—is eliminated with a plastic "ray director" that fits over any sealed-beam lamp. The director, or shade, is made up of vertical slots and while it prevents glare it still gives a long driving light, according to the manufacturer. This is accomplished by eliminating certain unnecessary high beams of light and directing the other beams ahead to assure clear vision. A

driver can switch to his bright beam, just before he meets a car without blinding the other driver. This prevents the blind sensation that occurs in the instant of passing. The ray director was invented and patented by Thomas R. Flesher of McAlester, Okla., in 1938, but production was delayed by experiments with various materials and the war. Ray directors are available in smoky, amber or clear plastic and can be installed with ease on a truck or car in a few minutes.

Ladder Platform

Painters and repairmen who stand on ladders for long periods now can work from a platform which hooks over the rungs. The platform, measuring 15 by 20 inches, provides a large standing area. One-inch steel bands hook over the rungs to support the platform, which also can be used as a scaffolding hanger or a rack to hold tools and equipment.

There are 3,300,000 miles of public streets and highways in the United States.

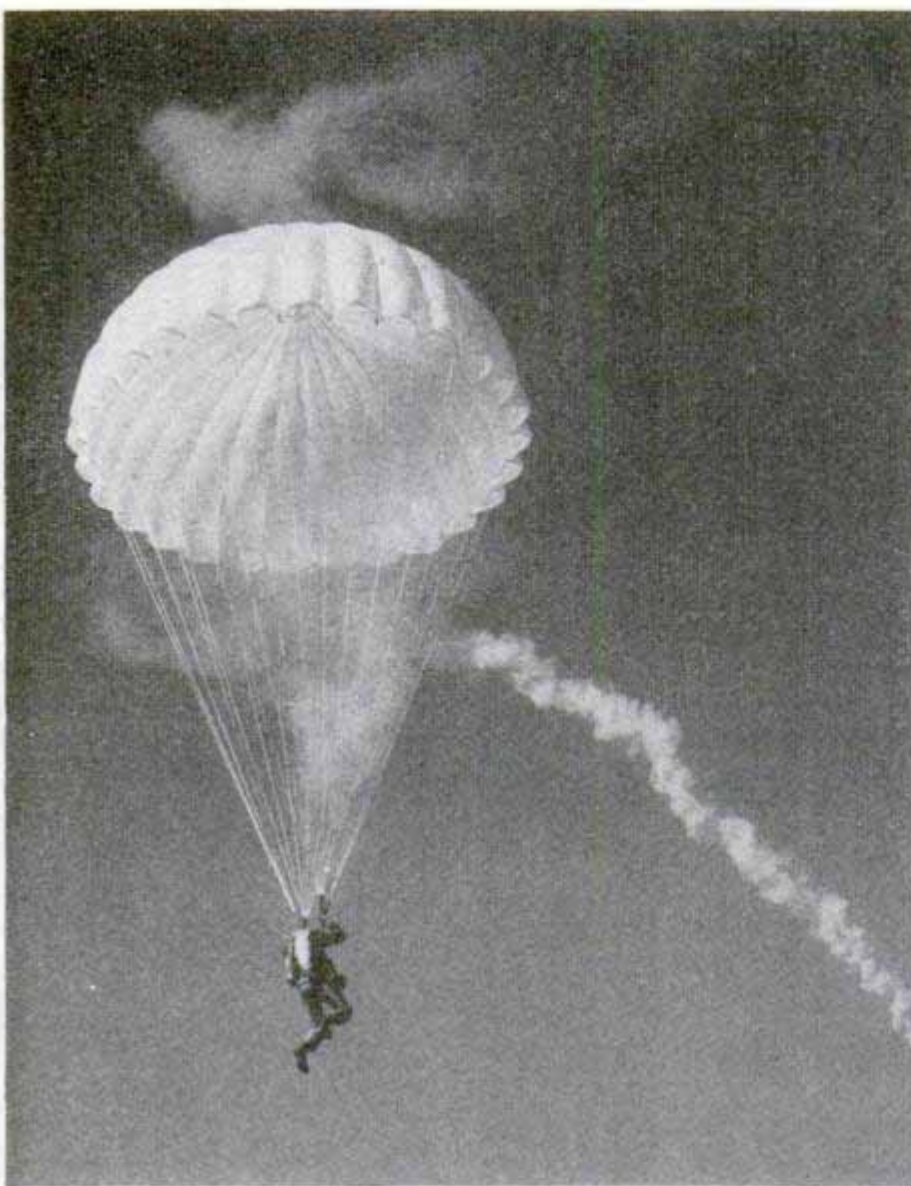


By Ewart Thomas

SOME MEN tame lions for their living. Others shoot Niagara in a barrel. Then there are a few who deliberately dive out of jet planes at 500 miles an hour to find out whether a new-fangled parachute is good enough to lower them safely to the ground.

This group of veteran Navy jumpers forms the hard core of a military project aimed at redesigning the old-time parachute so it still can serve as the escape hatch for the modern pilot, who now whooshes through the air at the speed of sound. The Navy jumper deliberately places himself in an emergency situation, then leaps for his life. Sometimes he dives out of a plane only 200 feet off the ground to find out whether a new style of chute will open quickly enough to save him. A few of the men have bailed out 150 times or more.

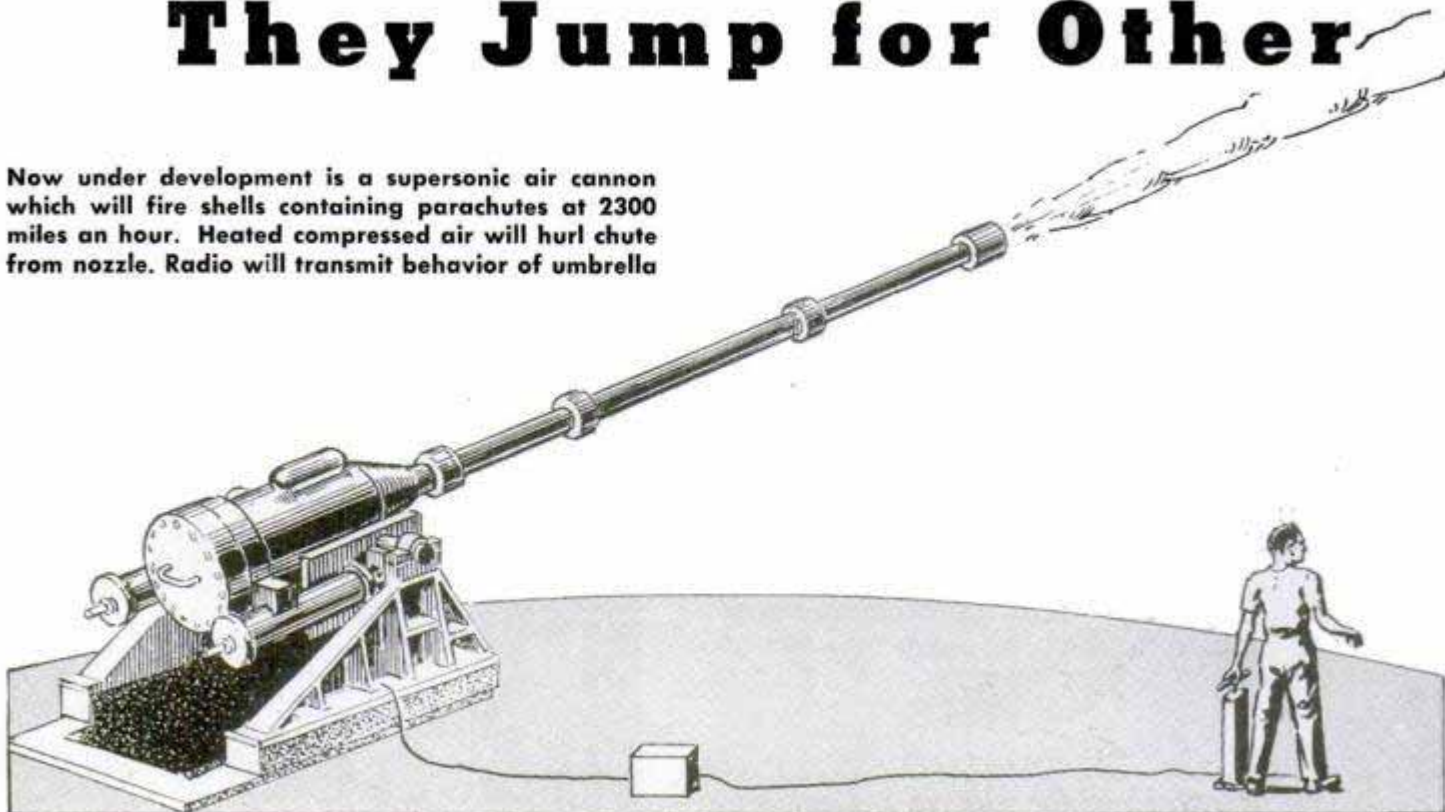
In addition to the daredevil jumpers, the Navy's Parachute Experiment Unit at El Centro, Calif.,

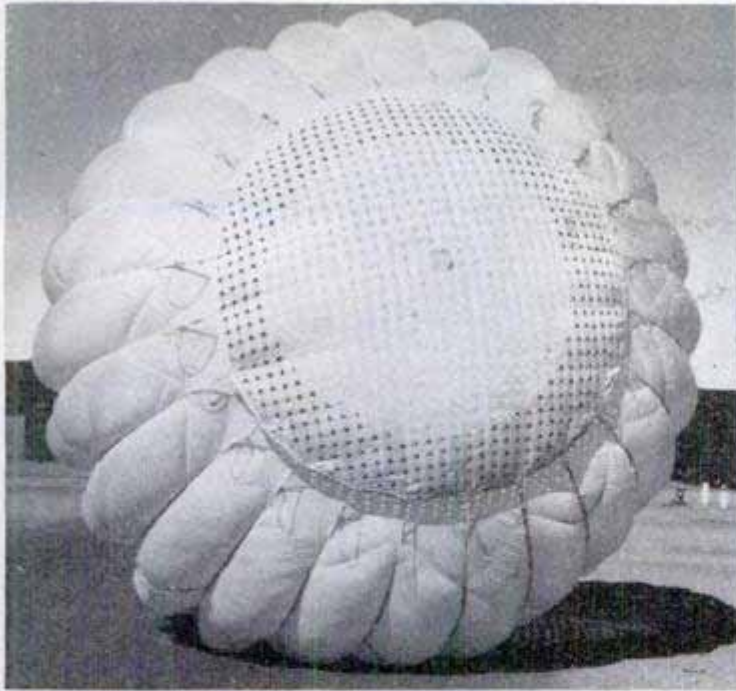


Navy daredevil has just tossed away a smoke candle, which permits ground observation of wind currents. Some of the men have made 150 test jumps

They Jump for Other

Now under development is a supersonic air cannon which will fire shells containing parachutes at 2300 miles an hour. Heated compressed air will hurl chute from nozzle. Radio will transmit behavior of umbrella





Experimental chute has ribbon relief canopy which raises to spill out air during the opening shock



"Apex" chute has an open center with a smaller canopy above, held in proper position by shroud lines

has robot paratroops to test new umbrella designs, and is building a gigantic slingshot and a supersonic air cannon for fire-testing new chutes.

Tumbled out of speeding aircraft, the robot parachuters report by radio the shocks that are imposed on their steel and rubber torsos. One of the big problems, of course, is to design a chute which will open at high speed without jerking the pilot's life away.

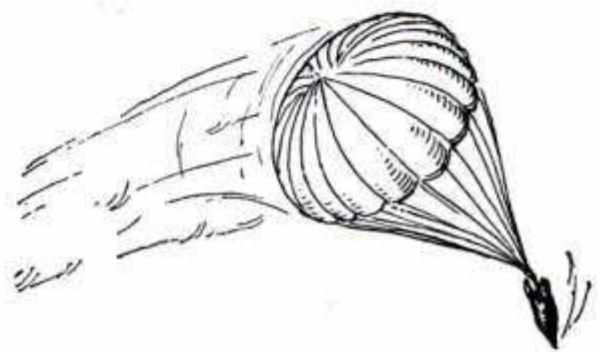
The air cannon will fire a parachute, packed into a hollow-steel projectile, at 2300 miles an hour. The chute will open in flight, and the resulting deceleration of the

Men's Lives

Towed through water at 22 miles an hour, test jumper is about to check a new quick-release mechanism



JUNE 1950



missile will be measured and reported back to the ground by radio.

The slingshot is a long arm atop a 120-foot tower. Dangling from the end of the arm on a 90-foot cable is a nacelle containing a parachute. The arm revolves, gradually building up speed until the nacelle is whirling at 500 miles an hour, when the chute is hurled out to open in free flight.

The research is paying off, too. The principal need of a pilot in trouble is a dependable elevator which will lower him safely to the ground floor. The parachute easily served that purpose in the days of 100-mile-an-hour planes. Now, new types of chutes make it possible for fighter pilots to bail out at 500 miles an hour and live to fly the blue yonder again.

Strange, new types of chutes are emerging from the tests to serve a variety of other uses. Already, 30-foot chutes are used as brakes to help land 60-ton jet bombers, and big drogue chutes lower airborne artillery and vehicles safely to the ground. Nevertheless, parachutes that can carry even greater loads and open safely at even greater speeds will be needed shortly.

A new piece of parachute equipment undergoes months of accelerated testing at

111



Glenn L. Martin Co. photo

Ribbon parachute serves as an extra brake to reduce the landing run of a new high-speed three-jet bomber

El Centro before it is ready for adoption. It may be tested a thousand times by radio automatons and other dummies, then checked by the 10 experienced jumpers in scores of live jumps before it is approved.

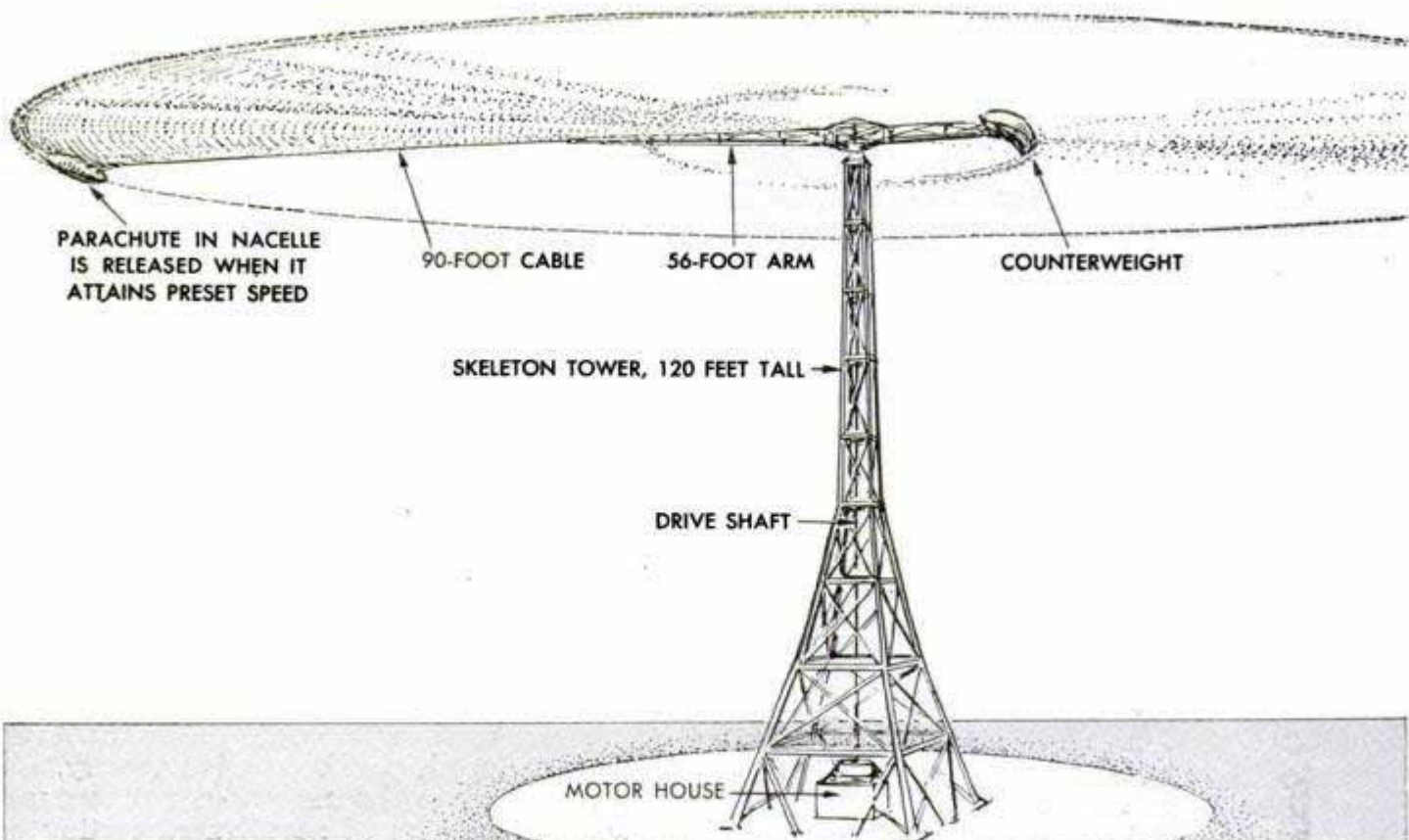
Usually, a test jumper carries 35 pounds of equipment including a second chute for emergency use. Occasionally, he is so loaded down with experimental gear that he can't walk. Lifted into the plane by his mates, he's tossed out at the proper altitude.

In most cases, the live jumpers make their own reports of how a new chute func-

tions; in the case of the radio dummies all the needed information including opening shock, strain at different parts of the canopy, oscillation and rate of descent is measured by special instruments. The data is transmitted to the ground via an eight-channel telemetering unit contained in the dummy. The antenna projects upward from the dummy's neck.

Photographers with high-speed movie cameras record the falls of the nonradio dummies and the live jumpers. They work from small aircraft that fly wing-to-wing

Big whirl tower to be built this year will spin chutes on a long cable, then sling them out at high speeds



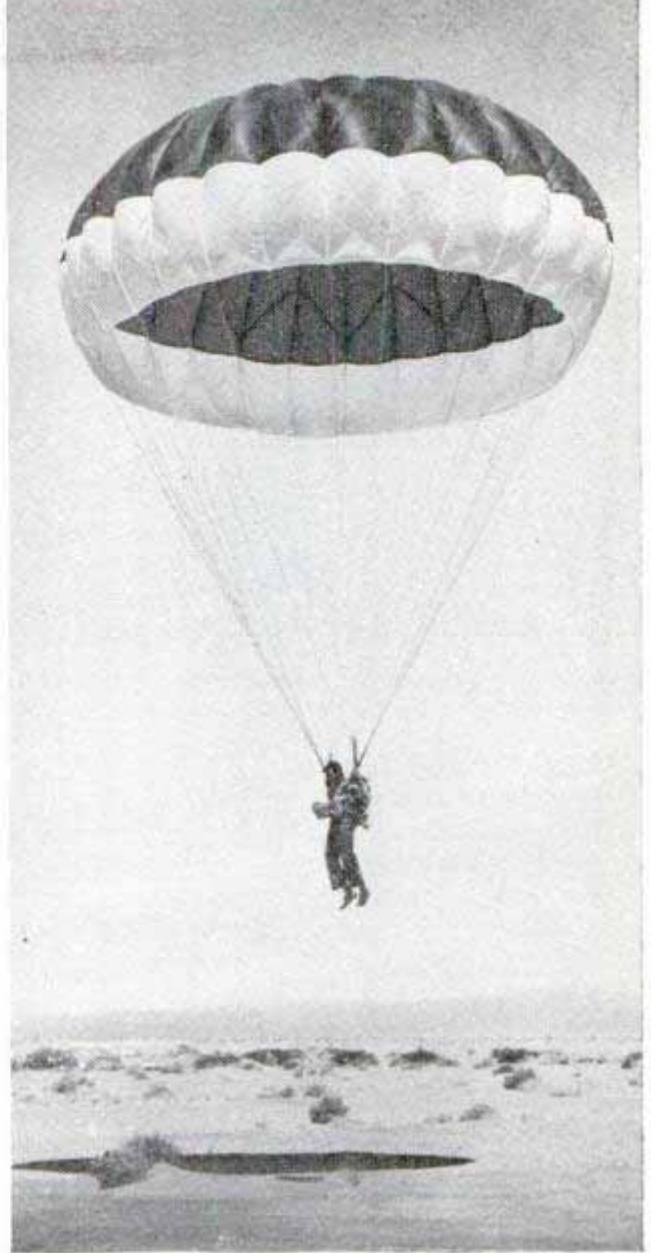
with the parachute plane, or from helicopters that can follow particular jumpers all the way to the ground.

The El Centro experiment unit, directed by Lt. Cmdr. John A. Morrison, has the over-all job of developing and testing all the Navy's aviation life-saving needs. In addition to developing personnel chutes, it tests parachutes designed for such special purposes as lowering pilotless aircraft and prototypes of guided missiles to the ground after their power is expended.

One of the unit's accomplishments is the new chute adopted for use by Navy jet pilots, which may become standard for all Navy needs. The chute reduces or eliminates most objections to earlier designs.

In the first place, the canopy material is lighter and far stronger than the material it replaces. The porous nylon fabric weighs only 1.1 ounces per square yard as against 1.6 ounces per square yard for standard parachute nylon. The new material is cross-ribbed with a concentration of warp and filler threads at approximately $\frac{1}{8}$ -inch intervals, materially reducing the chance of a tear and tending to stop any rip that might occur.

Instead of the usual 24-foot canopy, the new parachute has a 28-foot canopy plus a so-called extended skirt, cut on a camber, that gives the chute a cuplike shape when inflated. The parachute opens more gently, reducing the shock that is imposed on the jumper, and can carry a heavier load more safely to the ground. Extended skirt designs, in fact, are being adopted by all the armed forces.



Above, new parachute with extended skirt is becoming standard equipment for Navy jet pilots. It has less opening shock, softer landing, yet packs into same space as old chutes. Below, 105-mm. howitzers spill out of cargo planes to be lowered to ground by parachute

Department of Defense photo

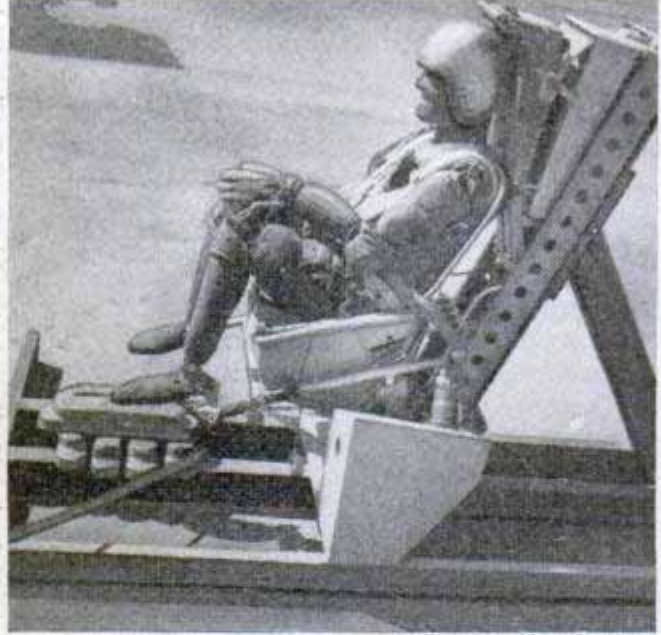




Parachute is strapped on robot jumper for a test leap. Rubber-coated antenna projects from dummy's neck

Minimum opening shock is insured by a new "deployment bag," attached to the pilot chute, which holds the shrouds and canopy. The bag holds the canopy in a tight bundle until the shrouds have been pulled free by the weight of the jumper. Then the canopy itself is released and the deployment bag drifts away with the pilot chute. Simply because it permits the shrouds to stretch out before the canopy is released, the new bag reduces the jar to the jumper by about one ton.

Jumpers who have seen stars in front of



Douglas Aircraft photo

Another robot is used to test ejection seat, which hurls the jet pilot free of his high-speed plane

their eyes when an ordinary chute takes hold at moderate speeds find that they now experience no noticeable shock. And those who have had to maneuver their bodies into position before pulling the rip cord at high speed can now open their chutes at any altitude without excessive shock.

Sometimes jumpers, after landing safely, have been severely injured when they were dragged across rough ground by their inflated chutes. Others have almost been drowned when they landed in the water and were towed by the billowing chute. The new chute has quick-release mechanisms at the shoulders and a jumper can free himself of the parachute as soon as he lands. Another feature of the new chute is that it is made entirely of nylon, including the webbed body harness. The old cotton webbing tended to mildew and had to be replaced at regular intervals for safety.

Ordinary chutes can be opened safely at speeds up to 250 miles per hour and the new chute can withstand openings at 500 miles per hour with safety. At that speed it opens with a boom that can be heard on

(Continued to page 256)

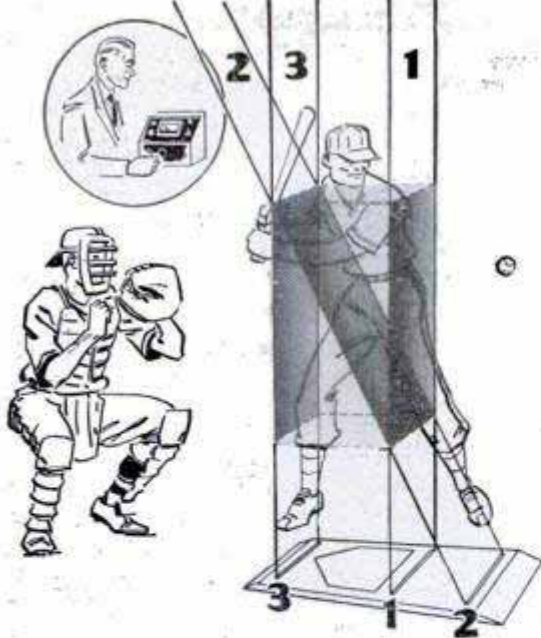


Pilot pulls lever, ejecting the pod. Fins stabilize it in free flight

Gun fires drogue chute out in a deployment bag. Main chute then comes tumbling out the open door

Main chute opens and lowers pod to ground

Latest escape hatch for the pilot is this breakaway cockpit capsule, which is blown from the plane when the pilot pulls a lever. Capsule is pressurized and insulated. Large chute lowers it to the ground



General Electric photo

To register as a strike, a ball must cast shadows, in 1-2-3 sequence, on three electric eyes looking up from 17-inch-wide slots in home plate. Right, Capt. Peewee Reese of Dodgers tests new electronic umpire

Electronic Umpire Judges Balls and Strikes

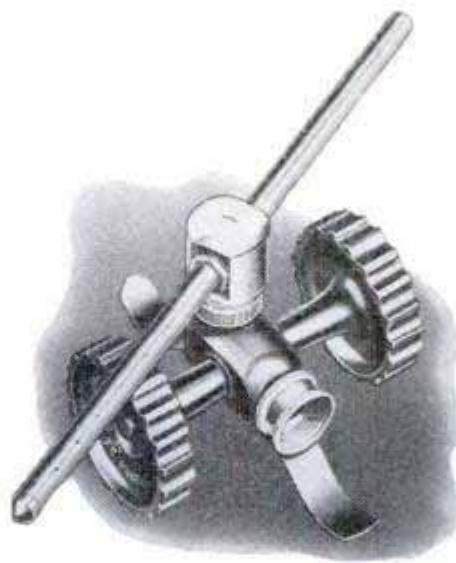
Players on the Brooklyn Dodgers baseball team have discovered an umpire who is never wrong. The infallible umpire isn't human; it is an electronic unit that flashes a light only when the ball passes through the strike zone—which is 21 inches wide and between the batter's knees and armpits. The Dodgers met "him" at their spring training camp in Florida. The electronic umpire's two main parts are a metal box 4 feet long, 21 inches wide and 1½ inches deep, upon which home plate is located, and a cabinet containing the recording and

strike-indicating equipment. Lenses and mirrors in the ground box enable three electric eyes to "fence in" the strike zone as they look at the sky through three slots in the top of the box. A ball passing through the strike area casts its shadow on the three eyes in a definite sequence, creating impulses which light the strike indicator. The device is intended only for practice and not to replace the umpires in actual games. It can be adjusted to fit the height, and corresponding strike zone, of any player.

Remote-Control Lawn Sprinkler Moves on Wheels

Steps and time are saved by a new lawn sprinkler whose spray range and position are adjusted by pulling or pushing the attached hose. The turning of the corrugated brass wheels on which the sprinkler head is mounted controls the water flow over the area being sprinkled. It can send out a mist-like spray that will cover any radius from 5 to 45 feet.

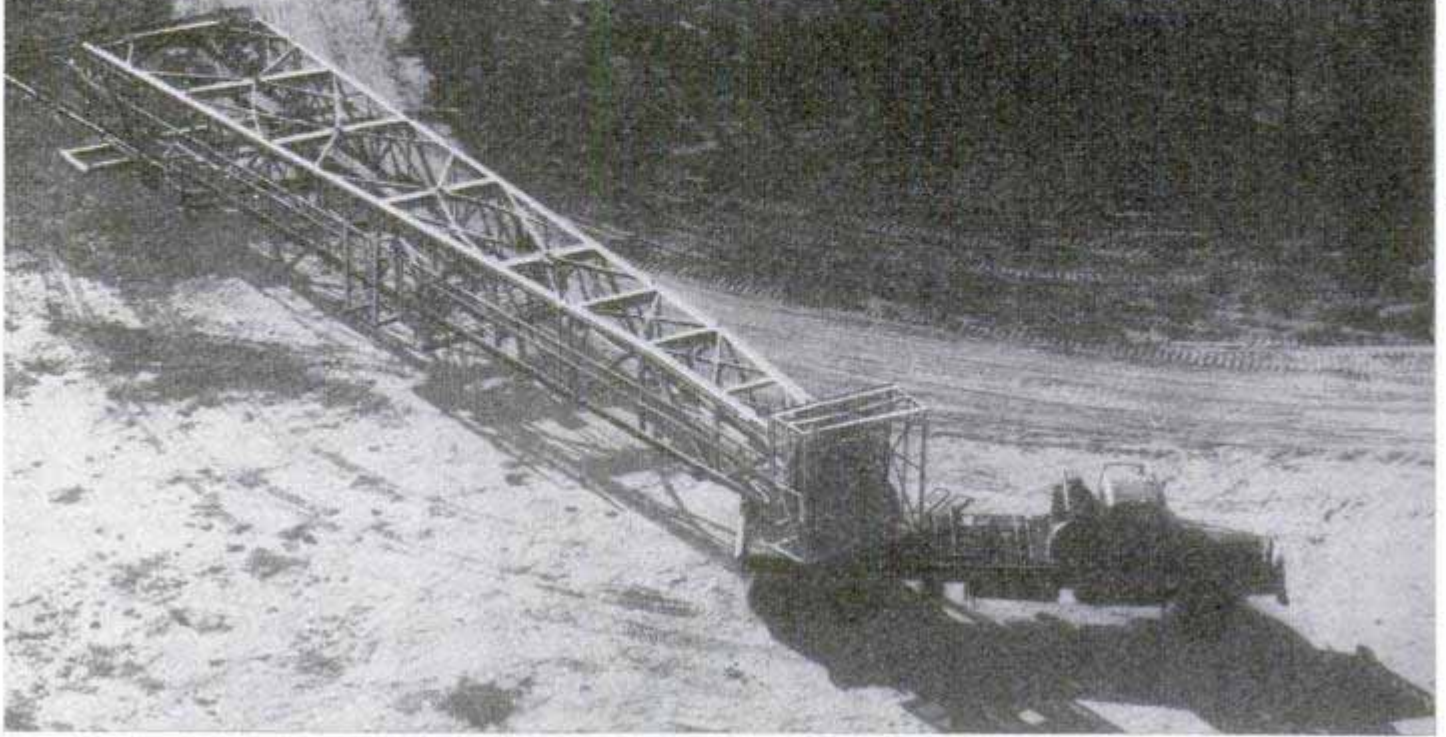
Doctors in a Danish hospital are carrying experimental pocket-size radios which ring when a particular wavelength is called, signaling the doctor to operate his receiver and find out where he is wanted.



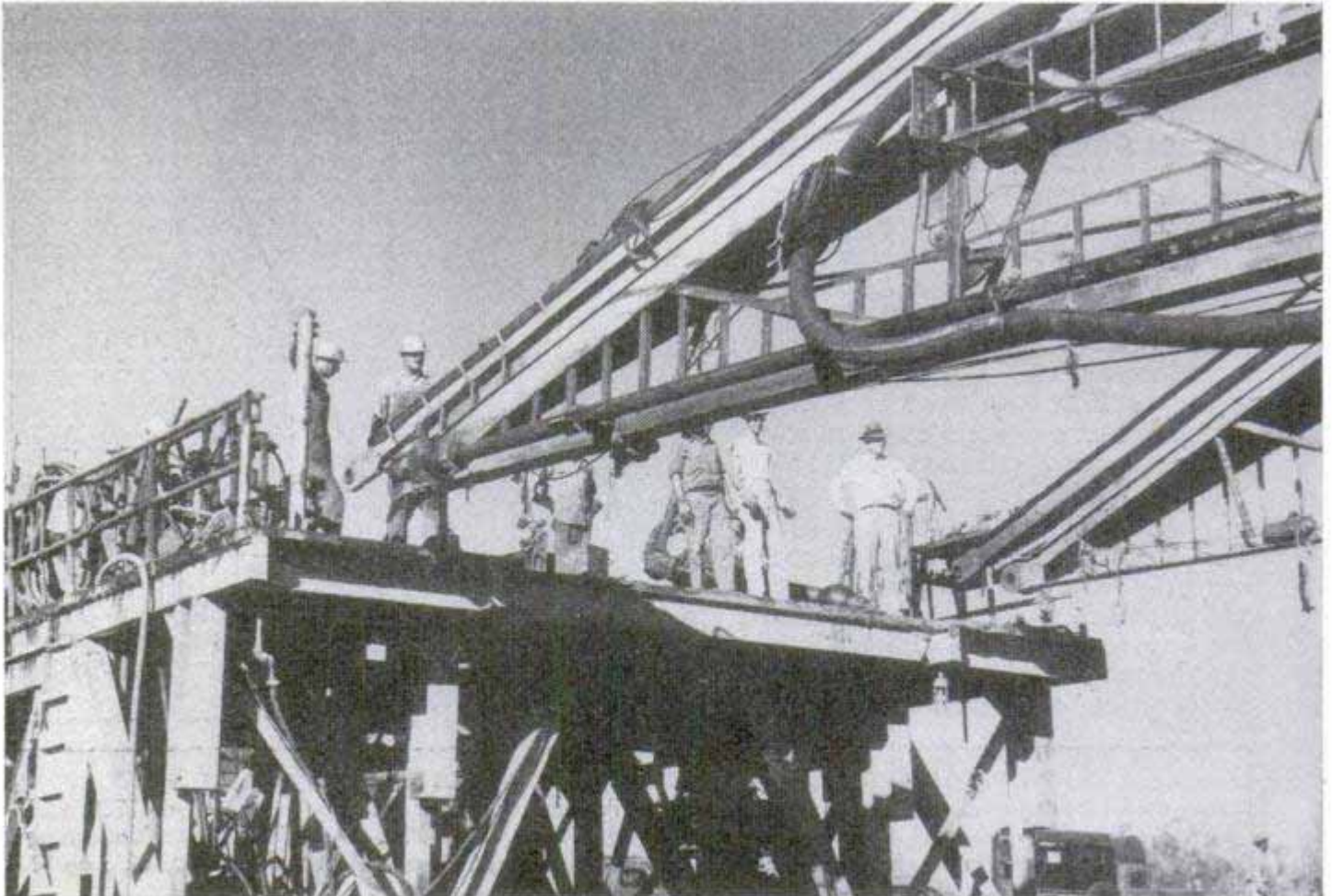
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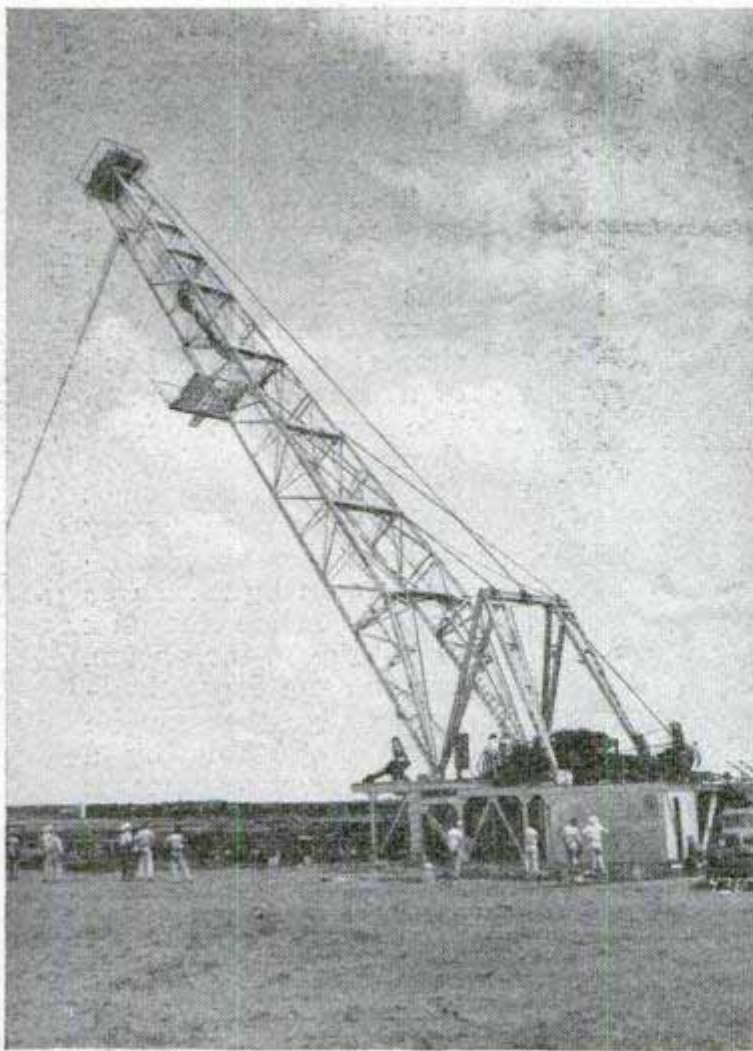
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"JACKKNIFE" OIL DERRICK ROLLS TO WORK



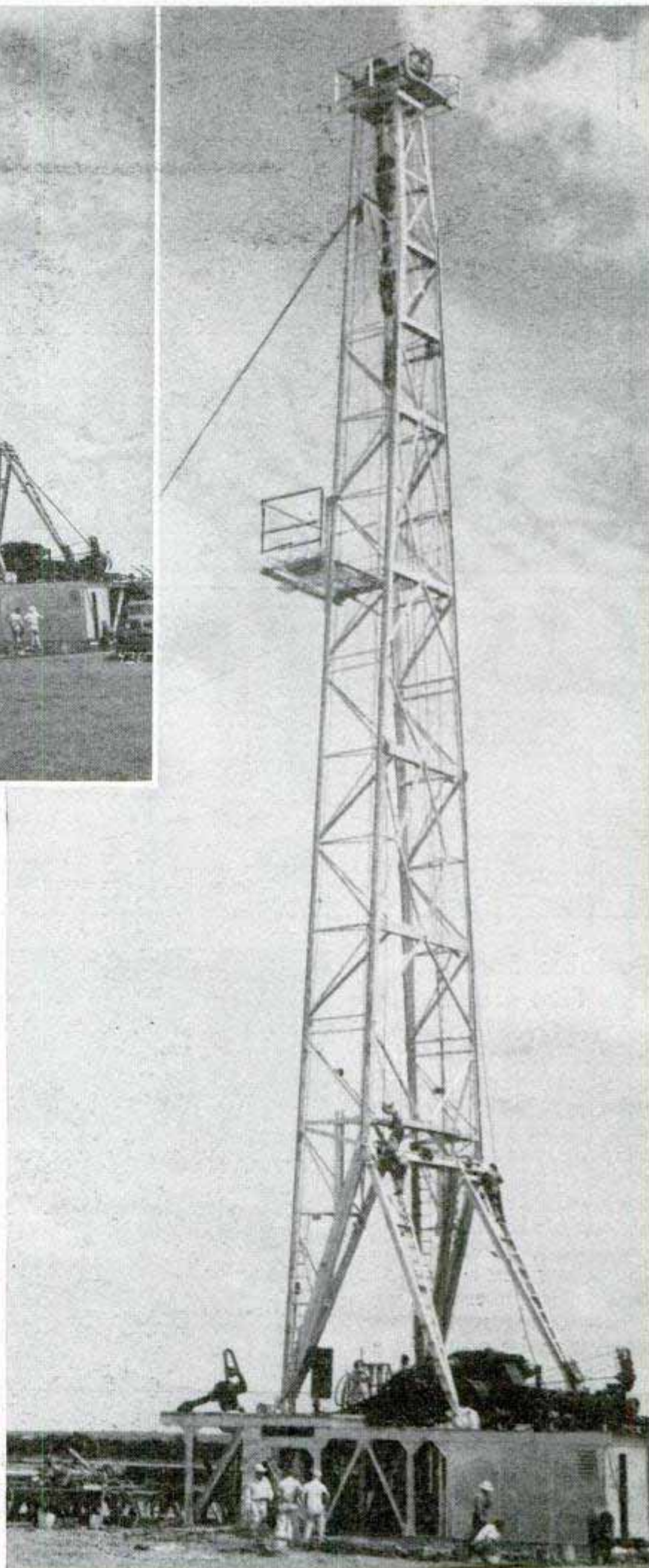
Above, truck swings wide to negotiate a curve in pulling the 136-foot drilling mast to its new location. Below, after pins are slipped out of the legs, the mast is lowered onto a truck and special dolly for the trip





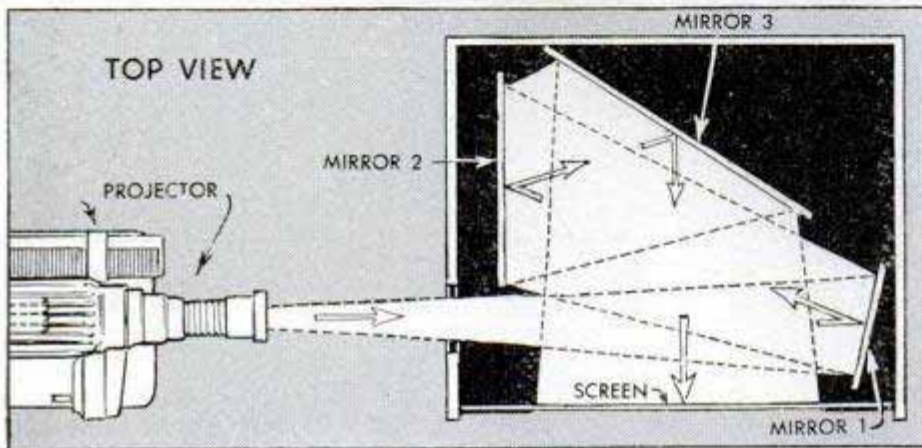
At new location, the mast is raised to position with standard equipment. Right, fastened in place, the rig is ready for another wildcat test

WHEN a new oil derrick has finished its job at one location, it is folded down like a jackknife blade and hauled off to another spot where the next wildcat test is to be made. Conventional rigs must be dismantled, then reassembled with bolts. The jackknife mast is attached to its base by large steel pins. When a move is made, the steel pins are slipped out of their sockets and the mast is swung down to the ground. Then the 136-foot tower is towed on airplane-tired dollies by tandem trucks. The substructure, divided into two 25-ton sections, is moved in the same manner. Three other trucks haul the accessory equipment. A Texas operator moved one of the jackknife rigs 14 times in a 15-mile-long area within seven months.



Daylight Screen Uses Three Mirrors To Enlarge Image

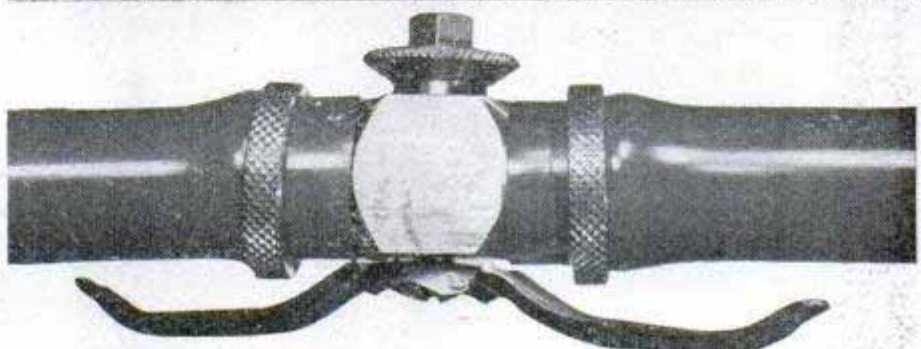
Projector operators can sit up front alongside the screen when they use a daylight viewing device that "folds" the light beam three times and shoots it against the back of a translucent screen. The image is projected through an opening on the side of the cabinet and can be seen clearly without dimming ordinary room lights. Three mirrors inside the box "fold" the 34-inch beam, providing a large, brilliant image that can be seen comfortably by a group. The cabinet is only 16 inches high and 12 inches wide. Similar to the "black" screens used in some television sets, the screen provides high contrast without glare. A compartment in the base of the cabinet provides storage space for slides, a small projector and a stand that supports the projector at the proper height.

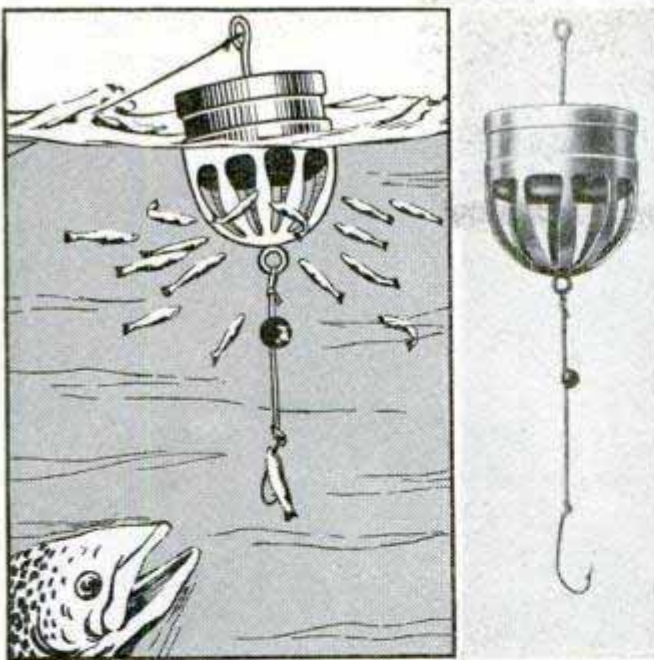


Portable Sprinkler Has Five Outlets

Five brass sprinkler heads spaced along 50 feet of plastic hose may be used to water narrow strips and irregularly shaped areas around trees and shrubs. Skids beneath each of the sprinklers automatically switch into position lengthwise with the hose when the hose is being dragged from a wet area. The range of the spray can be adjusted at the faucet or by turning off some of the outlets.

▮ Brazil's extensive deposits of oil shale can provide enough local fuel for its needs, according to an investigation by the U. S. Bureau of Mines.



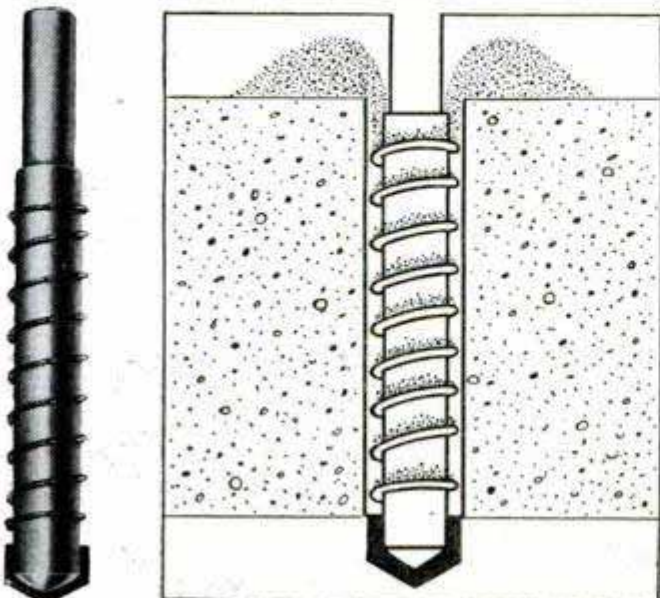


Floater Lures Bait and Fish

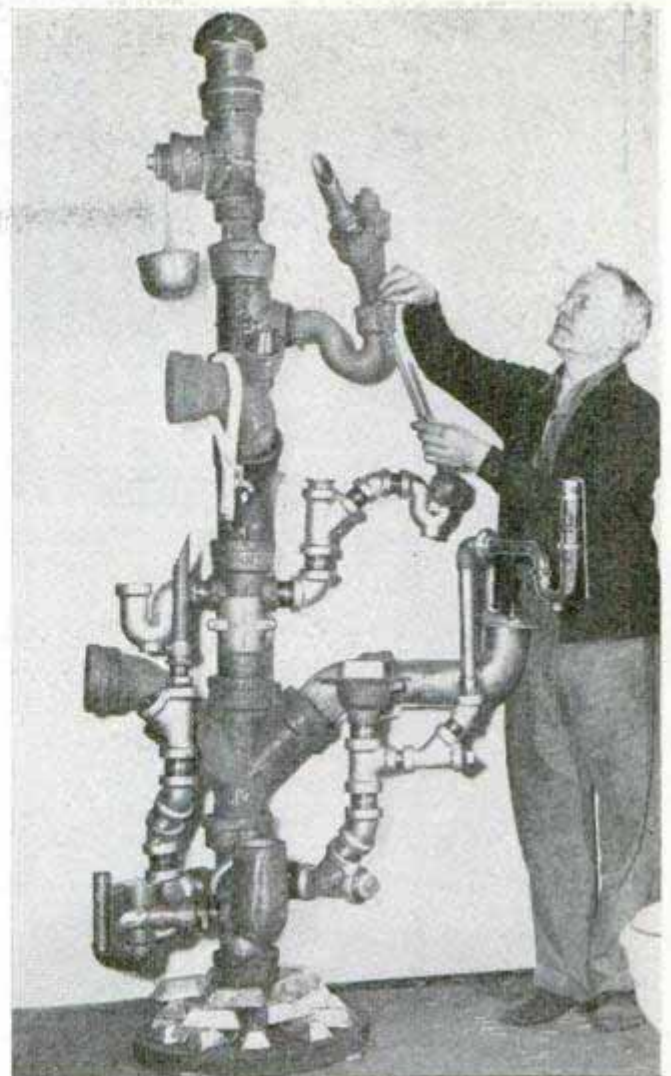
Designed for still-fishing, a new floater has a detachable bait container beneath which is attached a leader and hook. Minnows attracted to feed at the floater containing doughball, bread or other bait, in turn attract larger fish to the hook baited with a captive minnow. As the free minnows can swim away, the large fish is left with the captive.

Dust "Elevator" Speeds Drilling

Holes being drilled in masonry are continuously cleaned of dust by a carbide drill with a wire spiral that carries the cuttings up and out of the hole. Because the dust is removed as soon as it is formed, there is no tendency for it to pack in the hole and stall the motor. Drilling is faster because no time is wasted in cleaning the hole and an almost constant rate of penetration is maintained. The drills come in sizes from $\frac{1}{4}$ to 1 inch.



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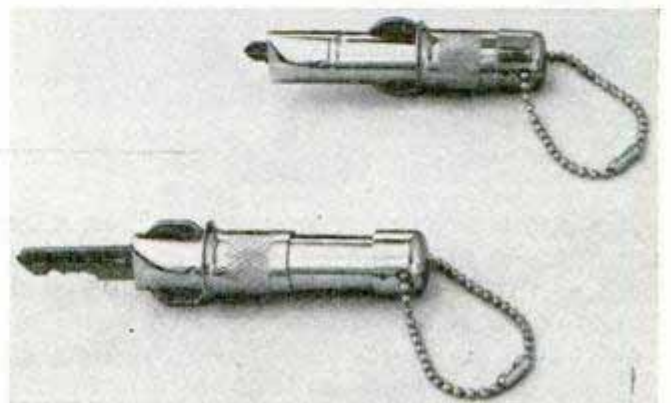


Plumber's Tree

More than 125 joints and fittings form a plumber's tree displayed by a Chester, Pa., firm. All the bends, traps, elbows and other parts comprising it are commonly used soil and water-pipe connections. The joints are packed with oakum.

Key Ejector

Car keys can't be carelessly left in the ignition for a thief when they are installed in a spring-action holder. When the motor is turned off, the key is ejected into the driver's hand, reminding him to pocket it. The ejector also prevents the driver from locking his key inside the car.



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Chemical Spray Dissolves and Washes Away Paint

Old paint is washed off almost any surface by a chemical that is applied in a hot-water solution by means of a hose and nozzle. The solution dissolves the paint, one coat at a time, leaving the base surface

ready for immediate refinishing. The chemical is noninflammable, nonacid, odorless and fumeless. It does not harm calking seal, chrome or canvas and is especially valuable for boat owners.



Plastic Water Wheel

Swimmers have a new play item this summer—a huge water wheel which spins on the surface to provide the thrills of a roller coaster. The wheel, made of Vinylite, is six feet in diameter. When inflated, it forms a double ring that has circular open-

ings spaced uniformly between the two rings. It can be made to roll across the surface, used in a competitive “king of the mountain” game or anchored as a float for diving or sun-bathing. The plastic resists abrasion, oil, grease and temperature change. Deflated, the wheel rolls into a small bundle weighing only eight pounds.

WORKSHOPS for G I JOE

By John L. Kent

THIS IS just like home. Now you join the Army and get—a basement workshop!

To make military life as home-like as possible, the Army has even thrown in a fully equipped hobby shop for GIs to use during their off-duty hours.

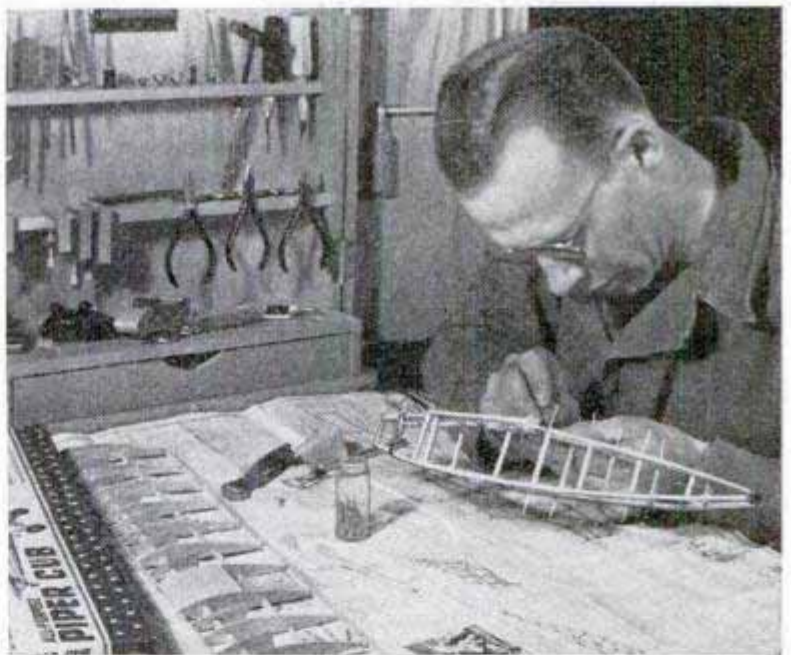
In fact, home was never like this. It would take a lot of skimping—such as cutting out the movies for a few years—to buy the equipment found in the hobby shops at many of the Army camps today.

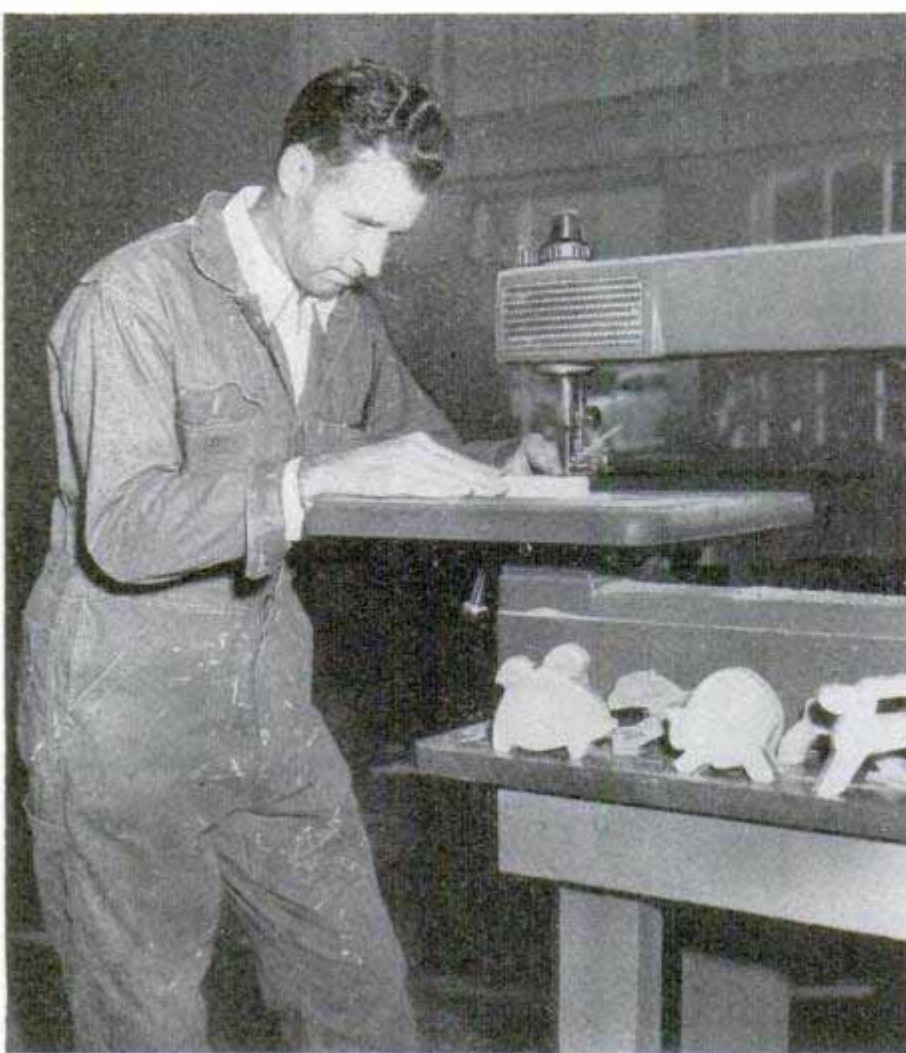
The serviceman, as well as the civilian, likes to use his hands, and is proud of whatever skills he may have. A hobby-shop program was set up by the Army's Office of Special Services to provide him with facilities for developing those skills in his off-duty hours. More than 260 hobby shops are already operating at the various forts, camps and stations around the country and at posts overseas.

The shops are an outgrowth of the Army's crafts projects started during World War II. Then, however, much of the equipment was of a portable nature so that it could be moved with the troops. The shops were generally makeshift.

Today, they are equipped with the best woodworking machinery and other tools, and separate rooms and buildings are set aside for them. The typical shop includes a bandsaw, a circular saw, several sanding machines and a number of workbenches. In cabinets along the walls are handsaws,

Making toys and games for youngsters, top, is one of the most popular uses for the Army's hobby shops. A flying model of a Piper Cub, middle, takes shape. Full sets of tools are close at hand. Below, a belt and a leather handbag near completion





Using a power-operated jigsaw, an officer constructs a Noah's Ark, with a large assortment of animals, as a Christmas surprise for his young son

Winner of second prize in a worldwide crafts contest for servicemen was this China Clipper ship model. Many build tiny stagecoaches and planes

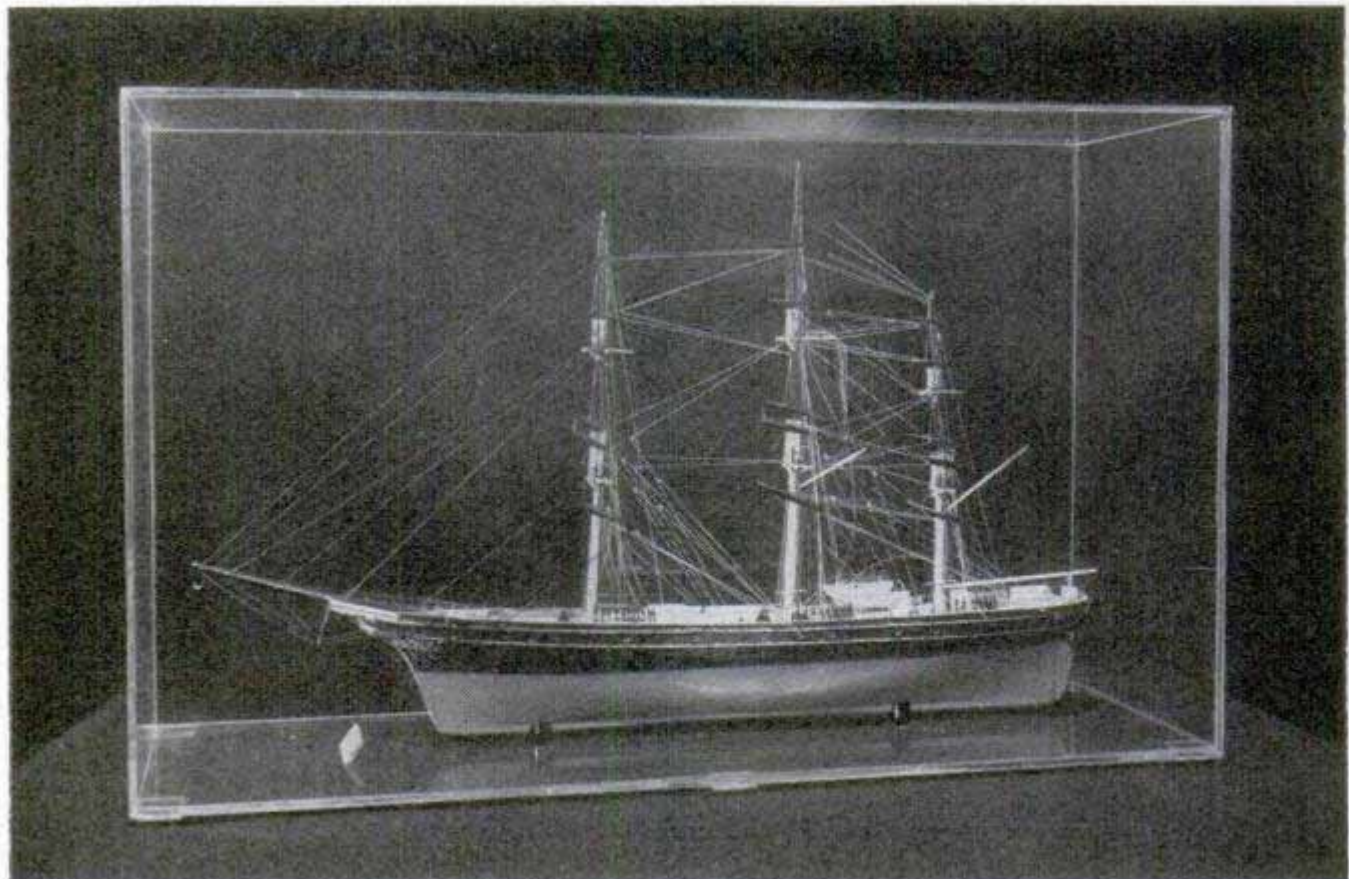
planes, chisels, hammers and other small tools. Some even have metal-working equipment, including power shears and soldering irons, so that budding machinists and radio hams may practice their hobby. Most of the shops also include photographic darkrooms.

Although there is some model-ship building, model airplanes are built at every camp hobby shop. These are usually flying models, powered by miniature gasoline motors. Model cars and stagecoaches are also popular.

The shops are largely financed from "nonappropriated" funds, that is, they are not paid for with the taxpayers' money appropriated by Congress. The money for the equipment and tools comes from profits of the post exchanges, where the soldiers purchase cigarettes, soap and other items.

Supplies such as photographic papers, leather, plastic and wood are sold to the hobbyists at cost.

Running the all-masculine



line hobby-shops program is a woman—Dorothy M. Kitterman.

The interest shown in a worldwide crafts contest initiated last year by Miss Kitterman proved that the Army hit upon something that today's soldier appreciates. There were 187 entries from military personnel stationed in the United States and overseas, with first prize going to M/Sgt. Benjamin P. Moody of Fort Sam Houston, Tex. His entry of a hand-tooled leather purse and billfold won him a \$500 U. S. Savings Bond and a complete set of power woodworking equipment. He also got honorable mention for his entry of a leather holster.

Sgt. Robert L. Barnett of Burbank, Calif., won second prize with a China Clipper ship model. Third place went to Pvt. Thomas H. Hannen of Winfield Township, N. J., for his precision square and vise.

Other interesting entries were an intricately carved clock, brooches and pendants carved from deer horn, hand-carved coffee table, chess sets and a miniature Buick convertible.

There's a reason, of course, why the Army is interested in furthering soldiers' hobbies. In dedicating a post hobby shop recently, Maj. Gen. Thomas W. Herren, the Army's Chief of Special Services, explained it.

"In this day of modern warfare," he said, "the Army is becoming increasingly a technician's Army. The soldier of today must be clever with his hands. In the event of an emergency, he must be able to repair a radio transmitter, repair a vehicle or skillfully prepare a map of an area."

The soldier who uses his leisure time in creative recreation has a tangible proof of his ability. There are few satisfactions in life that surpass that of giving a jewel box or lamp he has made to his girl friend or mother. Such personal gifts have a value that money cannot buy.

The Army is also aware that for many men duty assignments do not always provide the chance they need to show their creative ability. As a means of expression, one of the best answers is a personal hobby.

The hobby shops are here to stay.



Two contest judges inspect an intricately hand-carved clock. Another GI fashioned brooches and pendants from deer horn

Master Sergeant Moody, right, receiving first prize from Major General Herren. His hand-tooled handbag is in the foreground





Above, center, with guide cord wrapped around a drum staked in the center of a field, the wheelless mower cuts the grass in a giant circle without attention. Left, the twin model cuts a 36-inch swath. Right, underside view of skid pan and rollers that support the mower and prevent blade from digging up lawn

Below, the operator sits down at his work on this sulky. The mower cuts short and tall grass and works well on rough ground



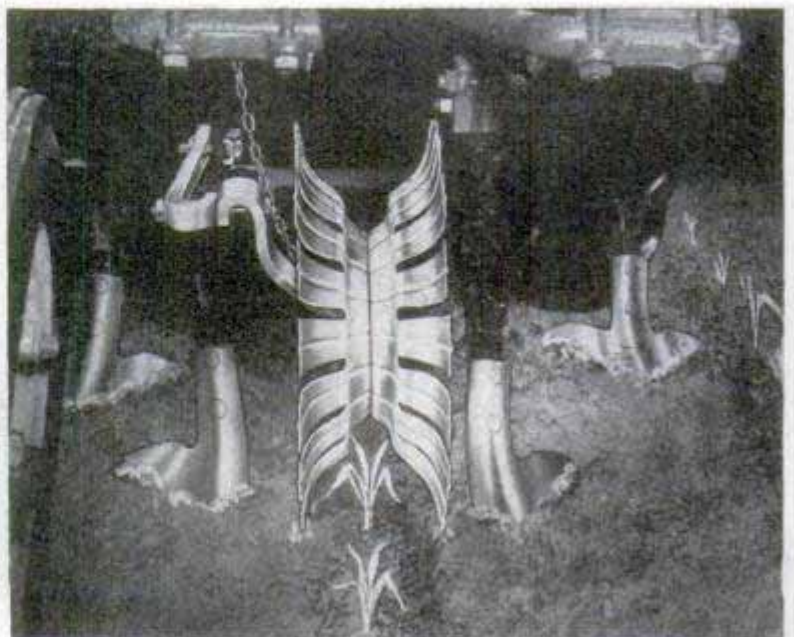
Wheelless Power Mower

Mowing, rolling and trimming lawns are all one operation with an unusual power mower that glides along on a skid pan, instead of rolling on wheels. A large roller at the rear provides traction and, at the same time, rolls the lawn. A whirling cutter blade mows the grass evenly and, because there are no wheels, it cuts within a fraction of an inch of walls and other obstructions, thus eliminating hand trimming. For mowing large lawns, the machine is tethered by means of a cord wrapped around a drum-type stake. As the machine moves it unwinds the cord, cutting the lawn unattended. In this manner, the center can be cut automatically, leaving only the corners to be mowed by the operator. The mower comes in various sizes and models, which range in width from 18 to 72 inches.

Rotary Shield on Tractor Cultivator Protects Plants

Young plants are protected during cultivation by a rotary shield that attaches to the cultivator and straddles the plants, protecting them from clods and stalks. Cultivation can be done with the tractor in high speed, saving the farmer's time. The slots in the shields allow fine soil to sift in around the base of the shoots to cover grass and weeds. Providing a crop clearance of five inches, the shields work on all types of soils.

University of Wisconsin scientists are trying to breed corn with sterile pollen to eliminate the detasseling operation from hybrid seed-corn production.





Painting courtesy The Lamp, Standard Oil Company (New Jersey)

Sentinels of Canada's oil boom, these derricks at Leduc field extend for miles over Alberta wheatlands

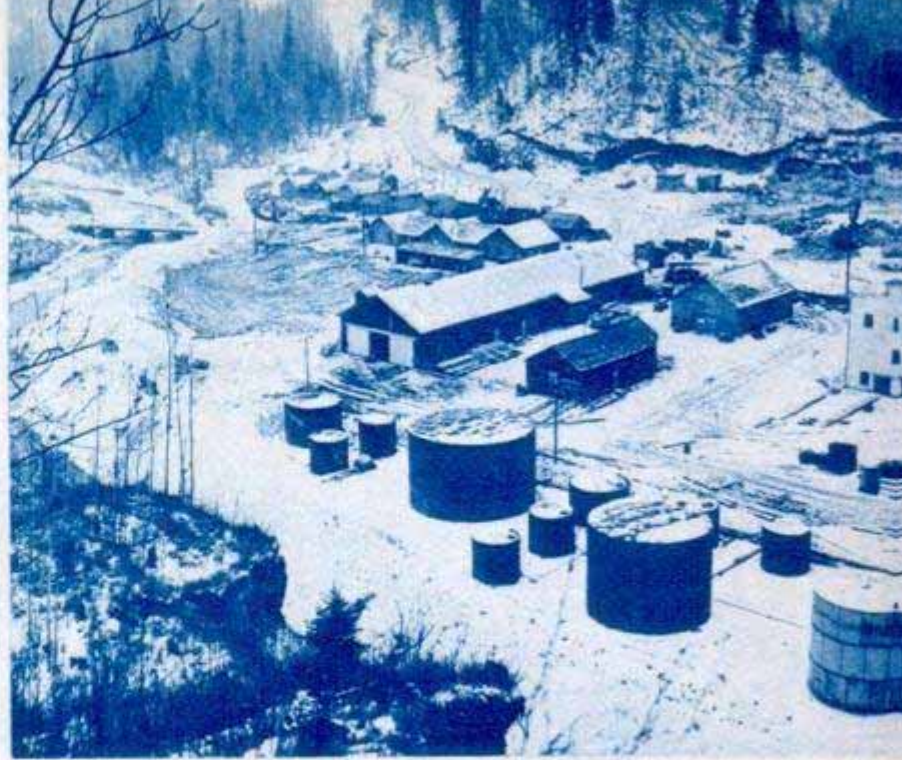
By Wayne Whittaker

THREE HUNDRED AND FIFTY miles north of Montana's northern border an obliging airplane pilot banks his plane and jerks a thumb in the direction of a sprawling city about the size of Wichita, Kans.

"That's Edmonton," he shouts above the roar of the engines, "the new oil capital. See how the Saskatchewan River divides the town?"

"Yes, but where are the oil derricks?" asks the visitor who has heard fabulous tales of the

PRAIRIE OIL BOOM



In northern Alberta, at MacMurray, are rich tar sands and recovery plant (right); left, chemist tests sand

province of Alberta's new oil fields and expects to see a forest of derricks.

"They're spread out," answers the Canadian pilot. "Everything in this country is spread out. Before we land I'm going to circle a little to the southwest and you'll see the famous Leduc-Woodbend field."

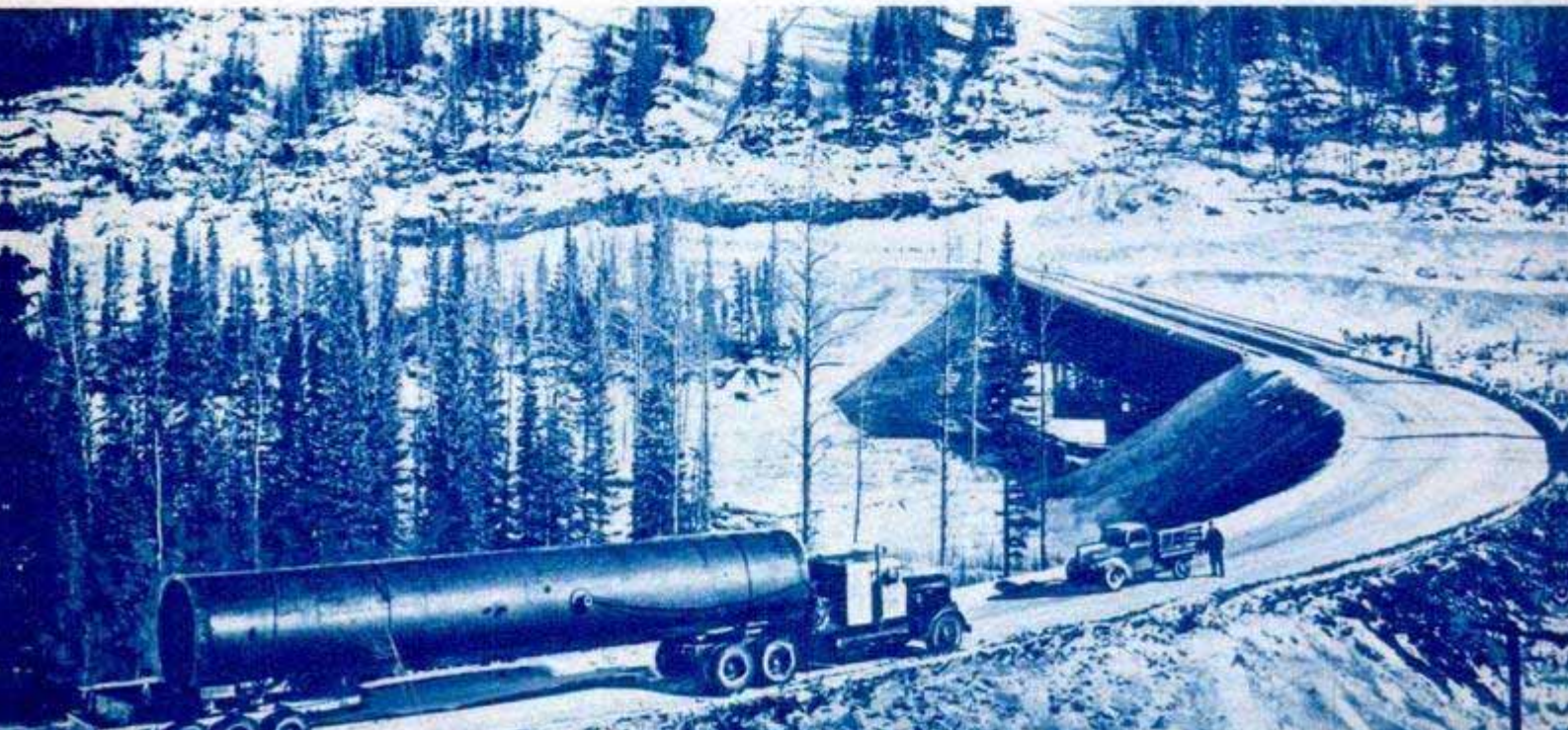
A few minutes later the visitor looks down on the flat green wheat farms of the Leduc area and the carefully spaced derricks—one about every 40 acres as far as the horizon. There is an orderliness in the spacing of the derricks that is typical of Canada's well-organized and nonhysterical boom that promises to yield at least two billion barrels of oil—possibly five. This is about the biggest thing that has happened to Canada in the country's history.

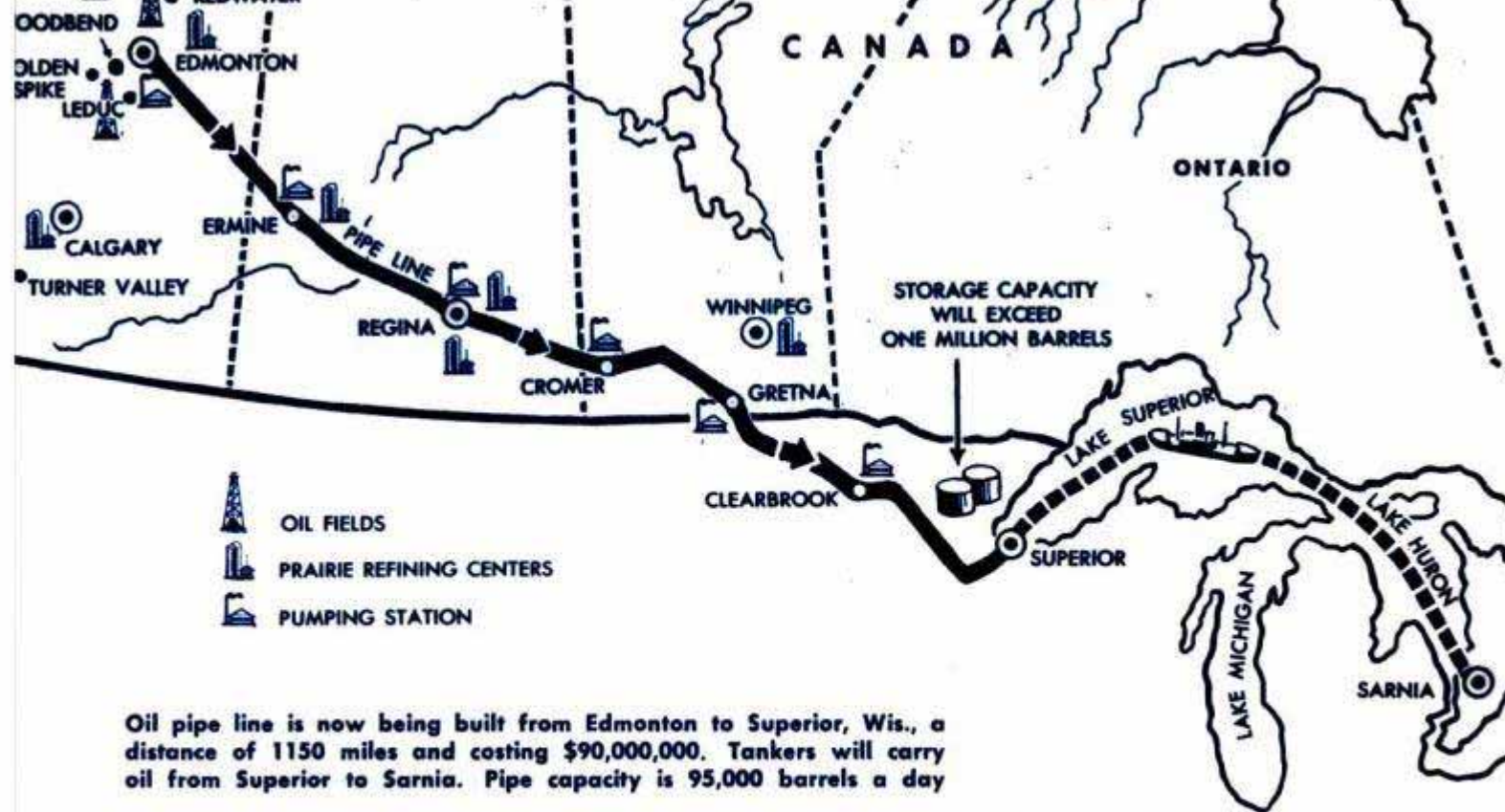
As the pilot circles back over Edmonton, losing altitude for a landing, he points out the fractionation towers of the oil city's new refinery.

"They moved that refinery down here from Whitehorse piece by piece," he explains. "Carried it down in trucks over the Alaska Road—over a thousand miles."

After landing at the orderly and busy airfield at Edmonton, the visitor boards a taxi for the MacDonald Hotel and along the way looks in vain for evidences of an oil-boom town. There are no get-rich-quick natives in overalls careening around in Rolls Royces, no saloons or brothels in sight along the clean wide streets! Canada's oil-boom capital would make poor meat for the movie cameras.

Whitehorse oil refinery built during war was trucked in pieces 1000 miles over Alaska highway to Edmonton





"Don't see any signs of the oil boom," the visitor complains to the taxi driver.

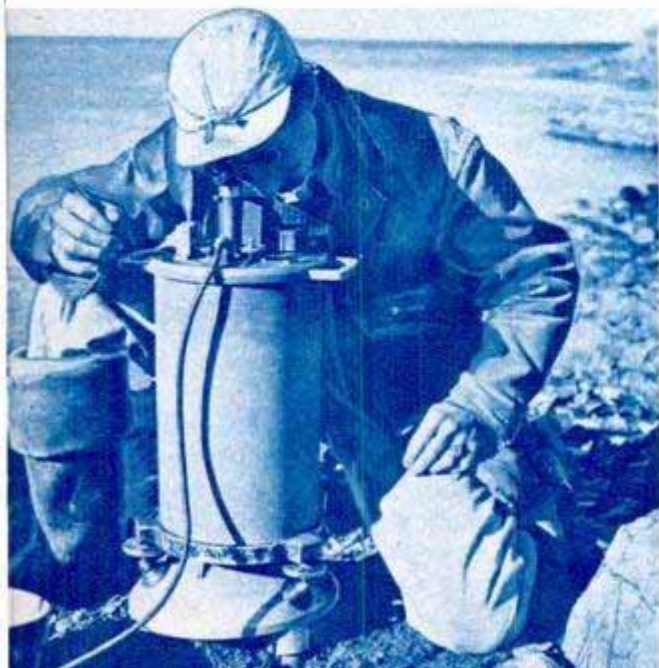
He laughs. "Why should the people get excited? Most of the oil belongs to the government."

Since 1887, the government has reserved mineral rights on any land sold to individuals. The province of Alberta owns the mineral rights under 90 percent of the land (147 million acres) and may someday be rich beyond the dreams of an Indian prince.

For years, oil geologists have known that by all the rule books there should be oil down under the Alberta prairies. Major oil companies, such as Imperial Oil, Ltd., of Canada (an affiliate of the Standard Oil Company of New Jersey) have spent millions on the gamble that there was oil under

those wheat fields, wilderness areas and endless miles of muskeg marsh. Some companies got cold feet after spending a few millions in this high-stake game and bowed out—to their later sorrow. Others, like Imperial, plunged ahead drilling one bone-dry well after another. One single dry well cost a whopping \$1,600,000, but most cost much less. At the height of exploration, companies were spending a million dollars a month for exploring parties alone—seismograph, gravity meter and magnetometer units. Despite all the advances of modern science, the oilmen were learning once again that the only way you can be sure about the presence of oil is to drill, drill, drill. This, Imperial had done over a 25-year period to the tune of 130 dry holes at

Left, gravity meter helps study subsurface structure without taking core. Right, mapping spot for soundings





Hard-working crews drilled 5000 feet into the prairie around Leduc to find rich oil storehouse. Below, petroleum engineer checks gauge regulating production to insure maximum recovery

Imperial Oil, Ltd., photo



a cost of more than \$23,000,000. Why didn't they give up? Because the geologists knew the formation of the earth deep under Alberta was the extension of a stratum formed in what is known as the Devonian Age. This rich oil basin, which lies east of the Rocky Mountains, extends from Texas to the Arctic Circle. The Devonian limestone coral-reef formation under Alberta was hiding oil somewhere and lots of it. The trick was to find it by drilling in the right place. When they did—three years ago at Leduc—there was much tossing of hats in the air by relieved geologists.

There was reason for the celebration. A good grade of crude oil gushed forth from the earth at the rate of a thousand barrels a day. Another flowing well was put down and another. One, Atlantic No. 3, gained world fame for the Leduc field by being a bad actor. It went wild for six months during 1948, whooshing up an untold amount of inflammable gas and more than a million barrels of oil. Before it was brought under control, it caught fire and the smoke and flame seemed to extend into the stratosphere.

By this time the rush was on. Today, there are more than 335 wells in the immediate area of Edmonton. This includes the Leduc and adjoining Woodbend fields, the big 1949 strike at Golden Spike just west of Woodbend, and the Redwater field about 30 miles northeast of Edmonton. Some 180 oil companies are now active in Alberta.

The oil boom has been under the thumb of N. E. Tanner, Minister of Mines and Minerals of the province. He handles the oil leases, driving shrewd but fair bargains (according to the oilmen) in the name of the province all based on the premise that the government itself does not want to get actively into the oil business.

The boom has grown to such proportions that neither Edmonton nor the small town of Leduc could handle the influx of oil people—engineers, geologists, field men of every category, drilling crews and their families. Imperial bought a field from a farmer and made it into a town called Devon. This is a crude town with good

plumbing, a fancy restaurant, wide streets and its own newspaper (The Devonian) as well as lots of mud and some portable houses. These portable houses are as compact as a trailer and have sledlike foundations which are handy for moving them along as operations advance. This summer the Devonians are building a \$40,000 swimming pool.

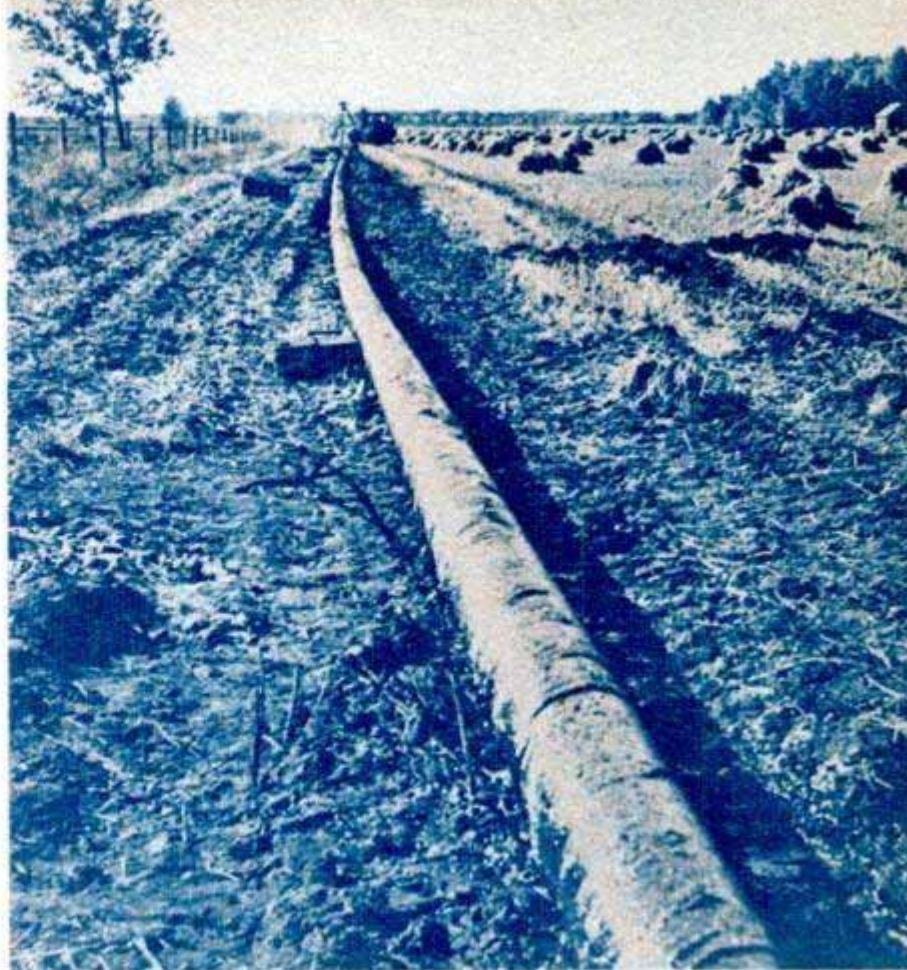
Although most of the farmers around Leduc do not own the mineral rights beneath their land they are prospering by "surface rental" to the oil companies. For the use of a few acres for drilling operations farmers receive \$1200 for the first year and about \$400 a year thereafter.

Since the Whitehorse refinery, originally built for the wartime Norman Wells project in the Far North, has been moved down and set up at Edmonton the western Canadian refineries have a processing volume of about 65,000 barrels a day. The present possible yield of the Alberta wells is 125,000 barrels daily and this is increasing with every new producing well that is drilled. The limit on refining capacity makes prorating of production necessary among the various companies. Canada, long starved for oil, now has the problem of an avalanche of the stuff and a sad lack of properly located refineries. The closest big refinery is at Sarnia, Ont., a long haul from Edmonton. It would take a train of 500 tank cars to haul 100,000 barrels of crude oil out of Edmonton in a day.

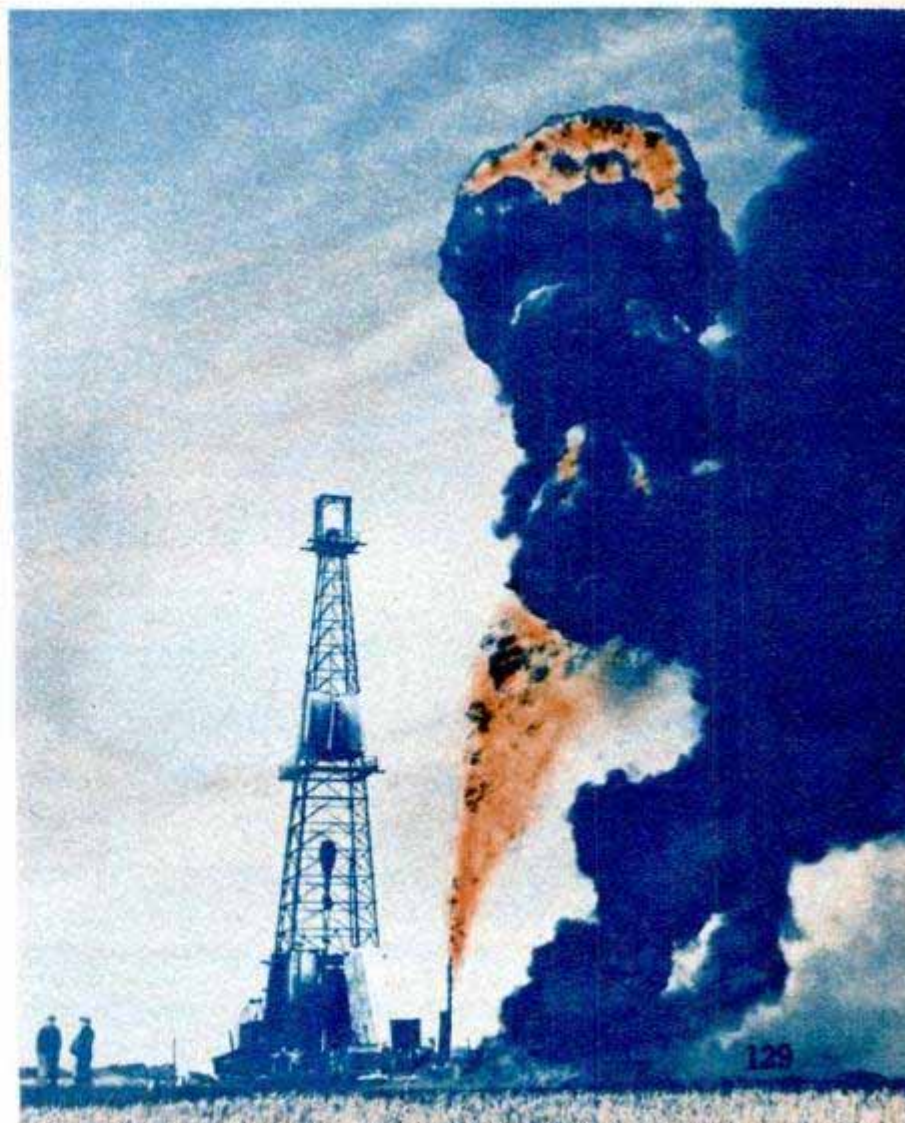
The only answer is the pipe line, which is now under construction from Edmonton to Superior, Wis., a distance of 1150 miles. At Superior, tankers will load the oil and carry it via the Great Lakes to Sarnia. This pipe line, stretching across farm lands, woods, swamps and under rivers is costing \$90,000,000. By operating nine crews the Interprovincial Pipeline Company, sponsored by Imperial, hopes to finish the line by the end of the year. The pipe-line route goes from Edmonton, through Regina and Gretna, and then across northern Minnesota to Superior. The line will have three sizes of pipe in various sections, 16, 18 and 20-inch, and it will be able to

(Continued to page 244)

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Oil-well artery—pipe line—is being built in three sizes, 16, 18 and 20-inch. Below, burning contaminated oil mixed with mud and chemicals from discovery well at Golden Spike field

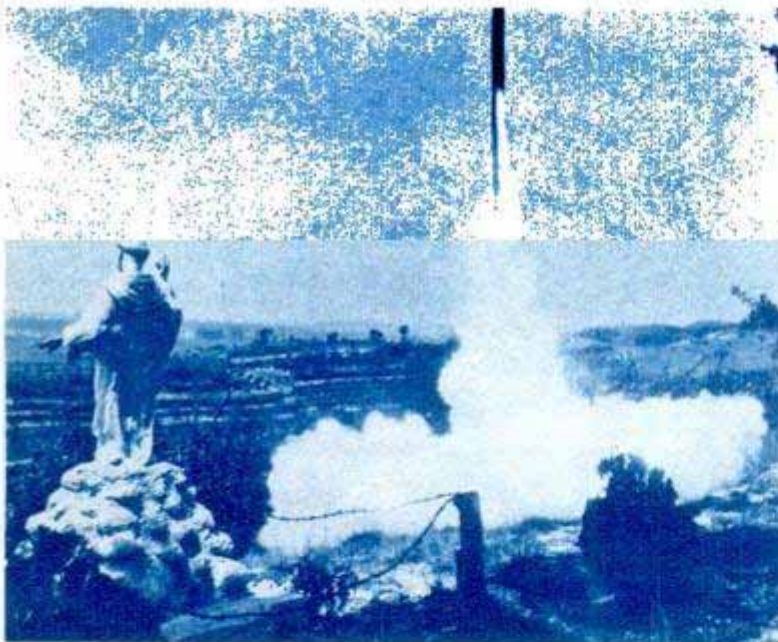




War Against Hail

Vineyard keepers in France and Italy are now engaging in rocket warfare against hailstorms, which cause serious damage to their crops each year. The rockets are fired into the clouds to disperse them before the storm begins. If effective, the rocket technique will save as much as several million dollars for grape growers annually. Networks of antihail rocket zones have been set up in each country with commanders in each zone to direct the "battle" against the damaging storms.

Top, vineyard rocketeers get set to fire. Left, rocket takes off to disperse cloud



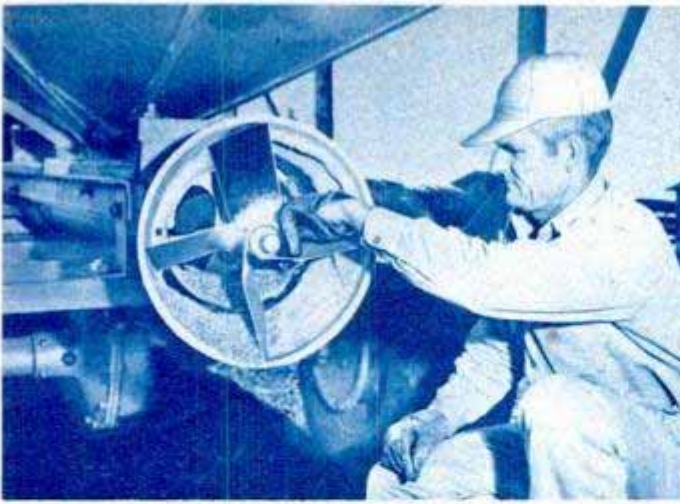
Department of Queer Behavior—Metal Shrinks When Heated

Scientists investigating a rare radioactive metal called polonium have discovered that it has a unique property—it shrinks when it is heated. This is the only metallic element known which grows smaller instead of larger when heat is applied. Polonium was discovered in 1898, but such minute quantities have been available that its

physical properties have never been studied. Larger amounts of the element now are available through the Manhattan Project. Polonium, which has been used in very small quantities to paint figures on luminous watch dials, shoots off alpha rays, thereby decomposing into lead. It has a half-life of 138.3 days.

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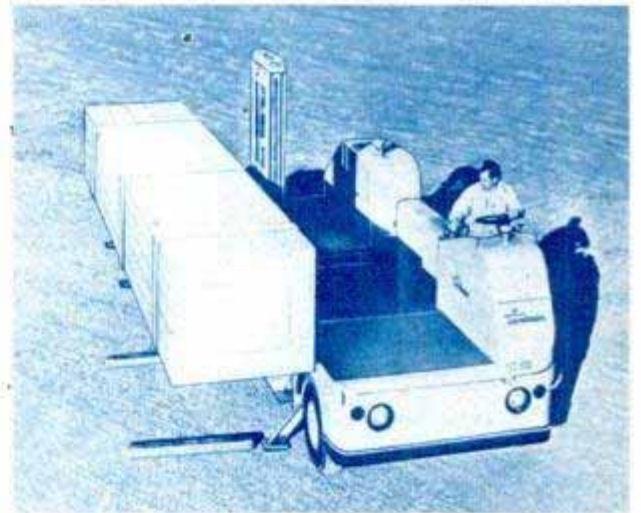
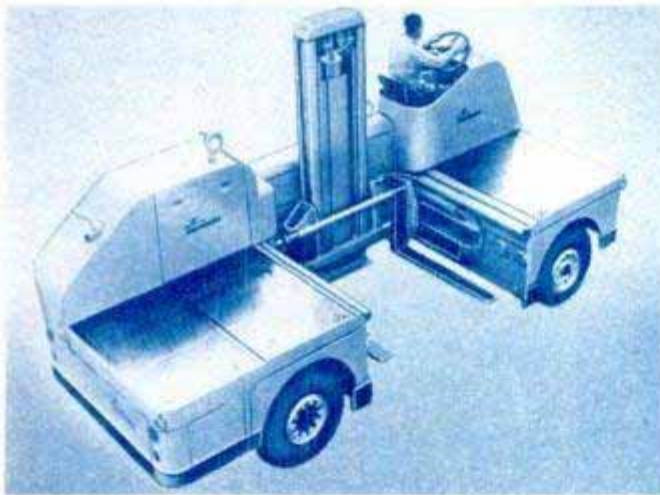
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Trailer "Sows" Chicken Feed

Scattering grain for 16,000 pullets by hand required six man-hours of work, so Horace Vantress, manager of a large farm at Marysville, Calif., built a mechanical distributor that does the job in 1½ hours and does it better. The distributor is a two-wheel trailer on which is mounted a hop-

per holding 3000 pounds of grain. An auger, powered by a V-belt, feeds the grain from the base of the hopper to a four-blade whirler at the rear of the trailer. This whirler spreads the grain in a 40-foot swath as the trailer is towed across the feeding area by a Jeep. Vantress has trained a dog to trot in front of the Jeep, chasing the pullets out of its path.



Elevator-Truck

Materials of any type are lifted, then carried any distance from 50 feet to 50 miles by a flat-bed truck with a hydraulic elevator. The middle section of the truck's platform is cut away and replaced by the elevator. The driver and all the controls are carried on the side of the platform. First, the driver wheels the truck up beside the load and lets down a pair of jacks which stabilize the machine so it can lift loads up

to 30,000 pounds. The hydraulic elevator slides out sideways and heavy steel forks pick up the load. Then the forks move up to bring the load aboard and deposit it on the carrying platform. The truck has five speeds forward and one in reverse, and travels along the highway at speeds up to 30 miles an hour. Accessories include a spindle for picking up and laying cable and a pair of cranes for picking up loads in gondolas. The truck is available in 3000, 10,000 and 30,000-pound capacities.

Food Laboratories Seek Frozen Milk With Natural Flavor

Concentrated frozen milk with exactly the same flavor and food content of the real liquid is the latest project of food laboratories. Though the goal hasn't been achieved, frozen-food packers already are looking forward to the time when they can

market frozen milk in cans. To a six-ounce can, the housewife would add 18 ounces of water to make 1½ pints of milk. The packers believe they can market the frozen milk at a lower price than whole milk through savings in transportation costs.

WHAT'S NEW *For Your Home*



AIR DRIER, right, takes the moisture out of that "it's not the heat, it's the humidity" weather, protecting clothes and equipment from damage in damp basements. Holding 15 pounds of calcium chloride, it removes up to 3½ quarts of water a day

ELECTRIC SPIT, below, brings the outdoor barbecue inside. It slips into the oven of a new electric range. An electric motor turns the meat slowly in the heat of the giant broiler



RENEWABLE SPRAYER handles any liquid. Carbon-dioxide cartridge recharges it

GREASING BRUSH has a handle-full of shortening that is brushed on baking pans





HOSE CONNECTOR is held tightly inside the faucet by an expander that works as a knurled screw is turned. It can be used on any faucet and stays tight under pressure



PAIL GRIPPER attaches to any step of a stepladder and grips securely anything from a paint can to a pail of water



ELECTRIC TIMER, built into the base of sun lamp, shuts it off after a preset time

COFFEE DISPENSER meters out a table-spoonful per half turn. It replaces can lid



GARBAGE CONTAINER in center of sink has its own drain so you can rinse all scraps off the dishes directly into it





Above, Dr. Ira S. Bowen, director at Palomar, inspects one of the 12 fans on the telescope. Right, the fans are arranged in a ring on the mirror cell

Blowing Distortion Out of Palomar's Eye

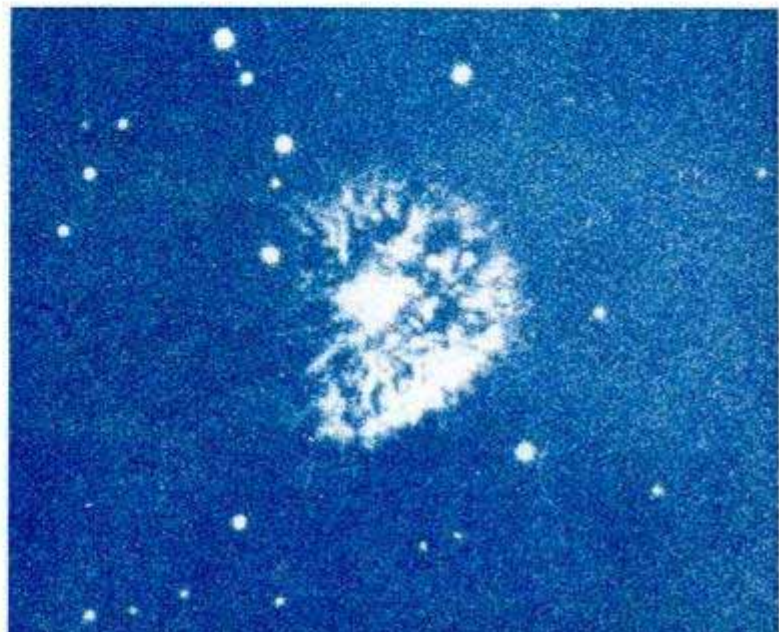
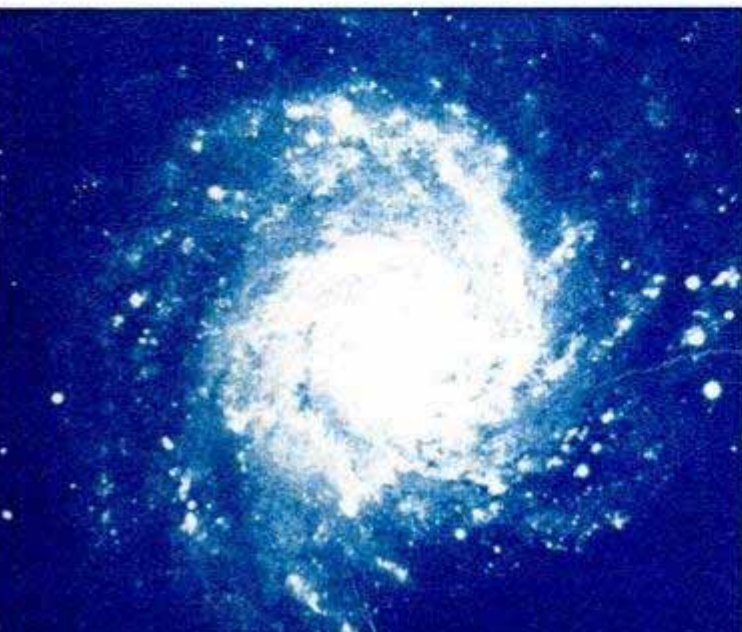
ORDINARY electric fans—a dozen of them—plus an “overcoat” of insulating foil are helping the Big Eye of the Palomar Observatory to see clearer and farther into the vastness of the universe.

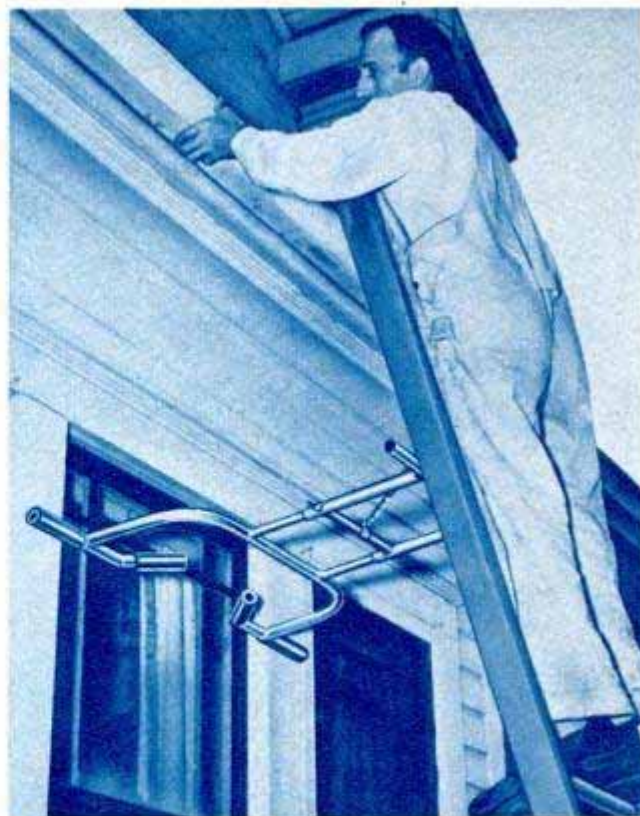
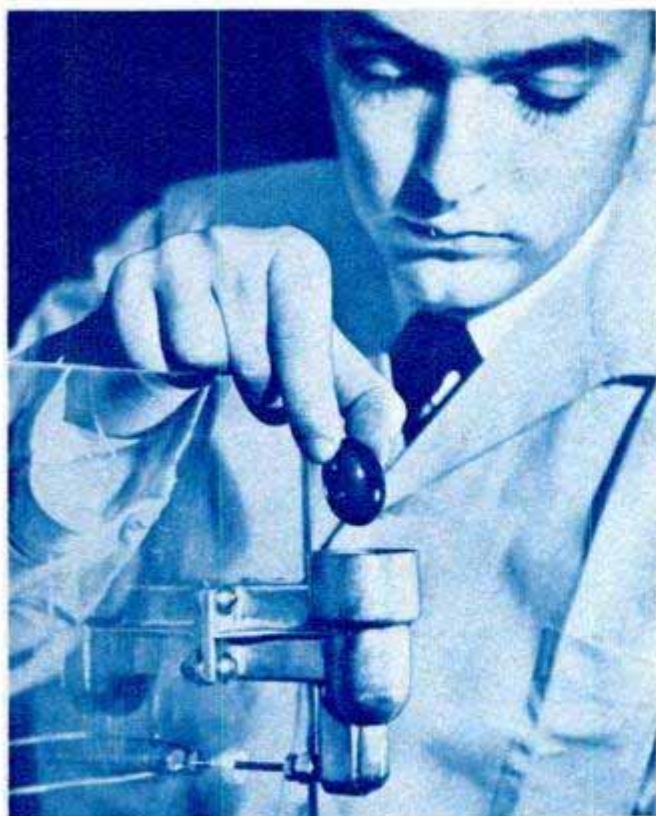
Arranged in a circle in the 20-ton metal cell that holds the 200-inch mirror, the fans cut down distortion caused by uneven temperature changes in the glass. A sudden five-degree change in temperature may distort the mirror surface a few hundred-thousandths of an inch while the glass adjusts itself. To the astronomer, even this minute distortion is serious when he is photographing celestial bodies millions of

miles away. The fans reduce this distortion an estimated 50 percent by circulating air over the back of the mirror, causing the giant glass disk to contract or expand evenly. A coating of insulating foil around the rim of the mirror also helps maintain an even temperature over the whole mirror.

Although the Hale telescope at Palomar is already the most perfect large astronomical telescope ever built, astronomers are continuously working toward perfection. Recent repolishing of high spots around the mirror's outer edge and the addition of the fans and insulating foil are part of these continuing efforts.

Two pictures taken by the improved telescope. Left, spiral nebula NGC 628 in the constellation of Pisces. Right, Nova Persei, a star that exploded in 1901 and out of which a gaseous shell has been growing since





Vitamin Pills for Your Car

Now it's vitamin capsules for your car—"medicine" which warms up an auto engine for quick starts even in the coldest weather. The applicator for the capsules can be installed on the dashboard or steering column. Fluid released from the capsule is atomized and primed into the intake manifold, simultaneously warming the combustion chamber. The result is a pre-warmed engine which, according to laboratory tests, will start in less than 10 seconds even when temperatures drop down to a chilly 40 degrees below zero.

Ladder Bracket

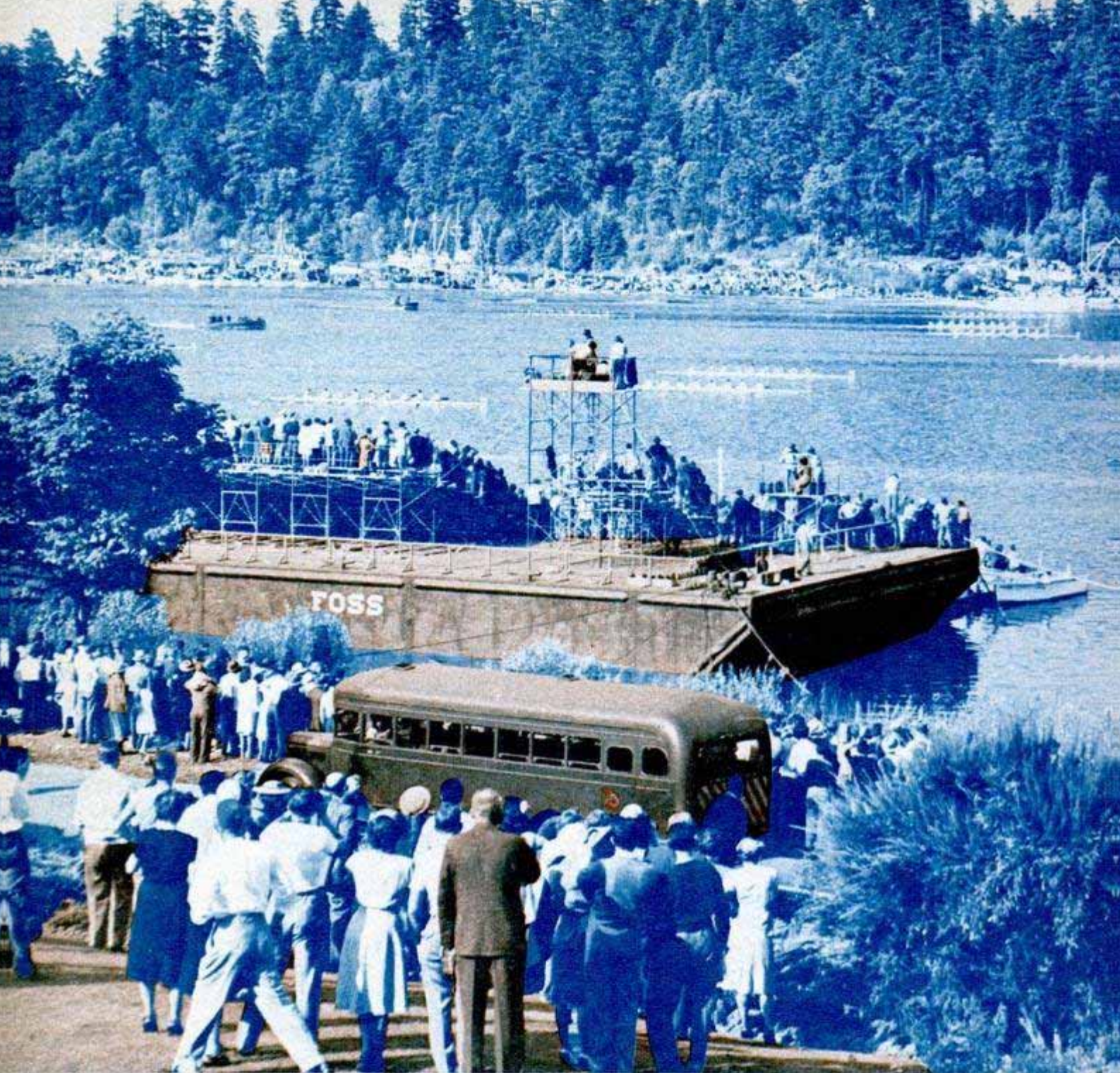
Ladders are made safer and handier by an adjustable bracket which holds the worker away from the side of a building, permitting him to work without leaning. The bracket, which can be clamped to any rung of the ladder, has two rubber feet which hold it securely against the building to eliminate shifting. The feet are far enough apart to span windows of normal size, allowing the ladder to be placed directly in front of the pane. The bracket also will hold the ladder directly on the corner of a building.

Invalid Car

With all controls operated by the hands, a three-wheel British car provides the invalid with a safe, economical means of transportation. Designed especially for the comfort and convenience of wheel-chair users, the car has a double-hinged door that opens wide for easy access. A closed compartment in the rear houses a folding wheel chair. The convertible-type top can be raised or lowered from the seat. There are two brake levers, one on each side of the seat, two clutch controls, one on the gearshift lever, the other on the steering column. The motorcycle-type, twist-grip throttle is mount-



ed on the steering wheel. With three speeds forward and one reverse, the single-seater car goes 70 miles on a gallon and cruises comfortably at 30 miles an hour. Over-all length of the car is nine feet nine inches.



High-Speed Splinter

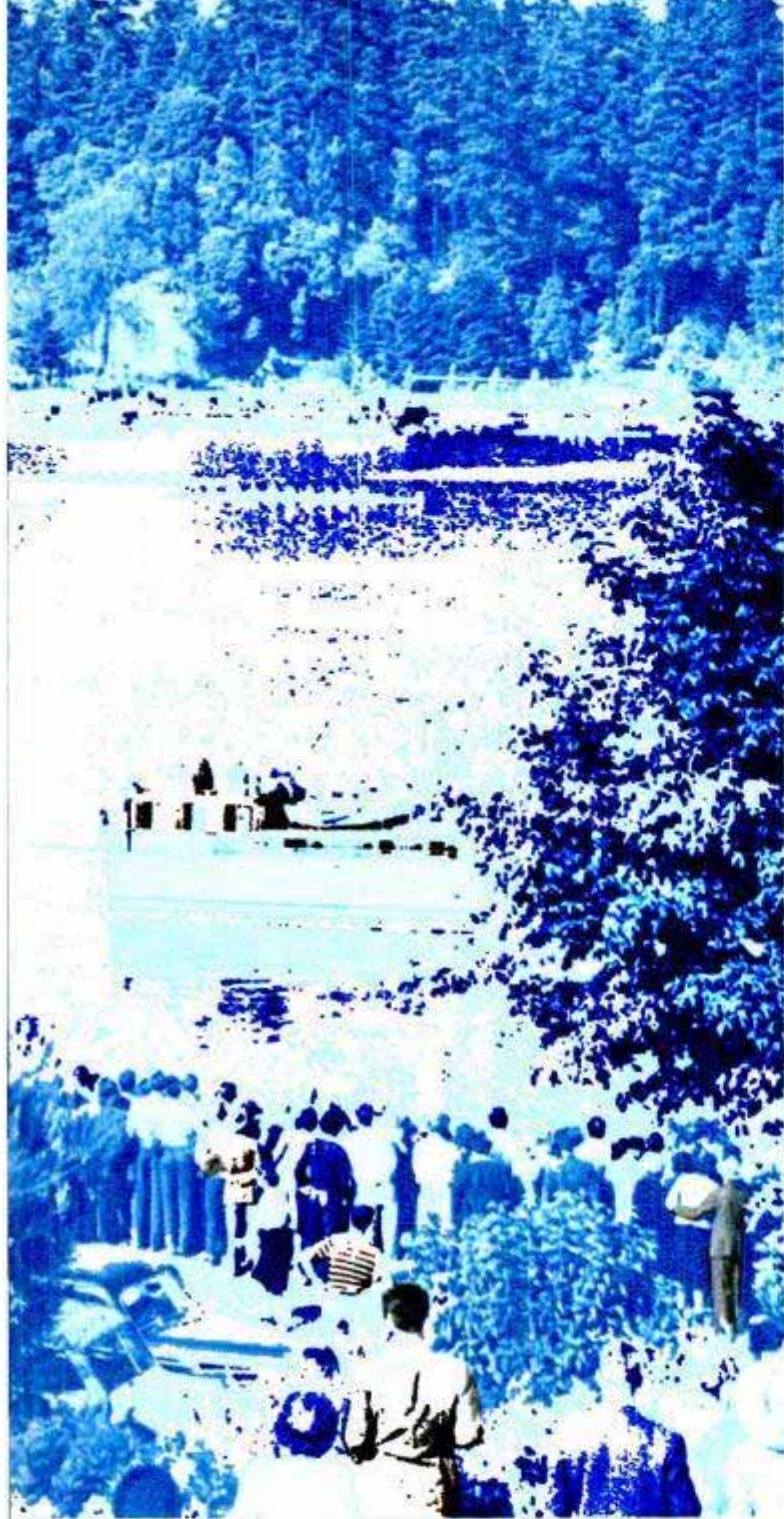
FROM A DECREPIT old building on the campus of the University of Washington in Seattle come the modern, scientifically designed racing shells that are prized by college and club rowing crews.

The famed Pocock shells are built by George Pocock and his son Stan for some 15 major universities, a number of smaller colleges, and many rowing clubs here and abroad. After an early apprenticeship in England, the elder Pocock has been building shells in Seattle for the last 38 years. Various improvements he has made to the

basic racing shell have increased its speed.

In a splinterlike racing shell, 26 feet long and only a foot wide, an expert oarsman can easily do 12 miles per hour, and for short spurts he can attain speeds of 16 miles per hour and better. The shell weighs only 30 pounds, and has four inches of draft and two inches of freeboard. With his weight almost entirely above the water line, the oarsman has to acquire an acute sense of balance to avoid frequent capsizes.

For greatest leverage, the sculls or oars are secured to tubular-steel outriggers

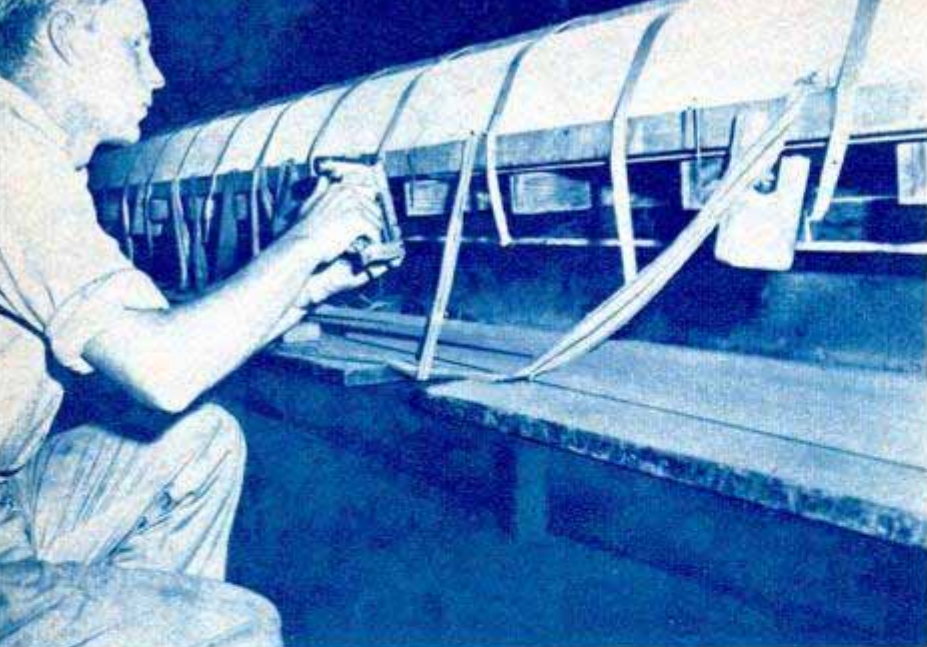


Above, resembling a cluster of water bugs on the surface, eight-man boats from a dozen universities and colleges race on lake adjoining University of Washington campus. Right, checking the lines of a one-man shell. Transparent decking is varnished glass fiber

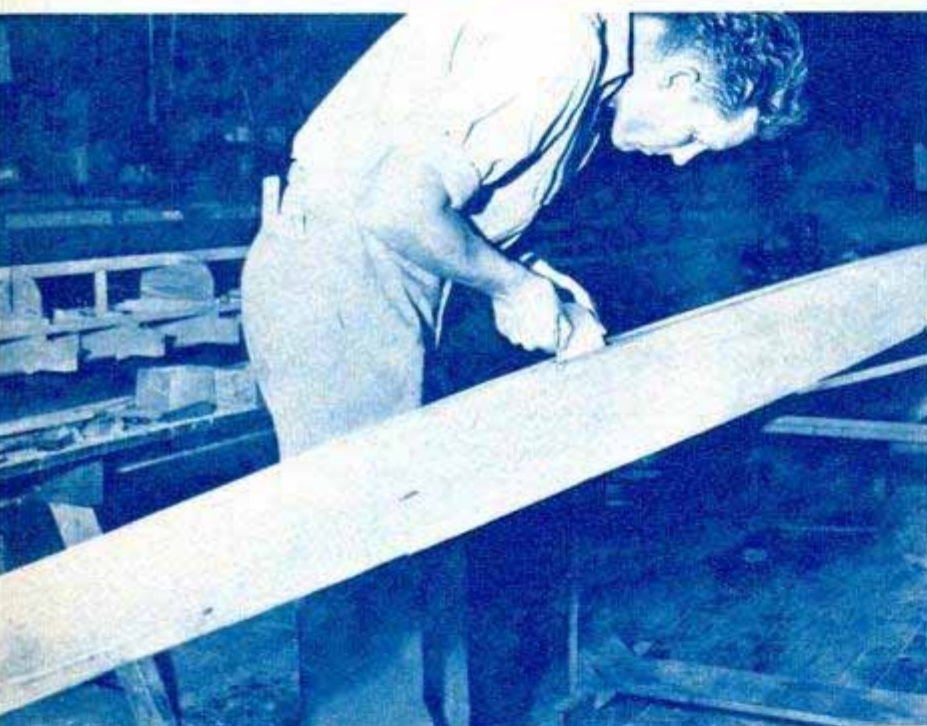
projecting from the sides of the hull. The oarsman sits on a small wheeled seat that slides on a track on the bottom of the shell, giving him latitude for the longest possible stroke.

Shells are made as singles, doubles, fours, sixes and eights. The big eight-man-and-coxswain shells are the most widely used in competition. An eight-man shell is 61 feet long, two feet wide and weighs 285 pounds, about one quarter of the weight of the crew that it carries. All shells use outriggers and sliding seats and, in the case

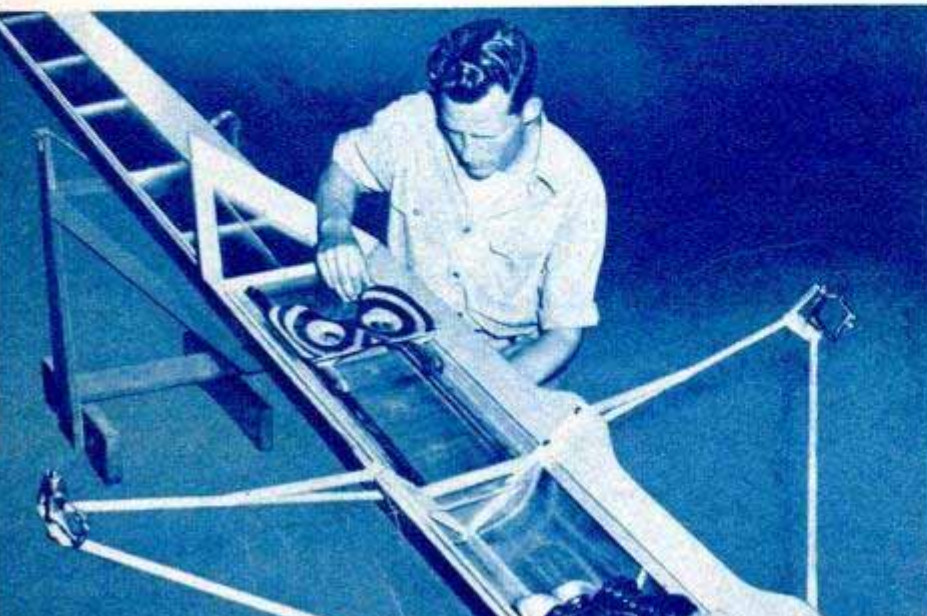




Above, tying down the 1/16-inch-thick plywood skin that will form hull of one-man shell. Steam will mold it into final shape



Above, attaching small metal dagger keel to the bottom of a boat. Below, the seats in racing shells rest on rollers that slide back and forth on a track, permitting oarsmen to extend their stroke. The clogs or shoes serve as footrests for the stockinged oarsmen



of the larger hulls, each crew member handles only one sweep, the name by which the large oars are known. Crew rowing has its peak at the intercollegiate regatta each June, usually on the Hudson at Poughkeepsie, this year at Marietta, Ohio.

A Pocock shell is a handmade work of art and craftsmanship, fragile but sturdy, light but strong. Even lighter shells could be made but they would not be seaworthy in rough water such as often is encountered at Poughkeepsie. Light as they are, Pocock shells usually are good for 20 years of use. Instead of mass-producing his hulls, Pocock carries each one through from the start and produces no more than a dozen eights and half a dozen singles and fours in an average year.

One Pocock improvement is a new design of outrigger that requires no lower brace attached deep to the hull, which formerly scooped up water and tossed it into the boat. Another is the use of translucent glass-fiber sheeting for the decks, just as strong and somewhat lighter than the veneer that it replaces.

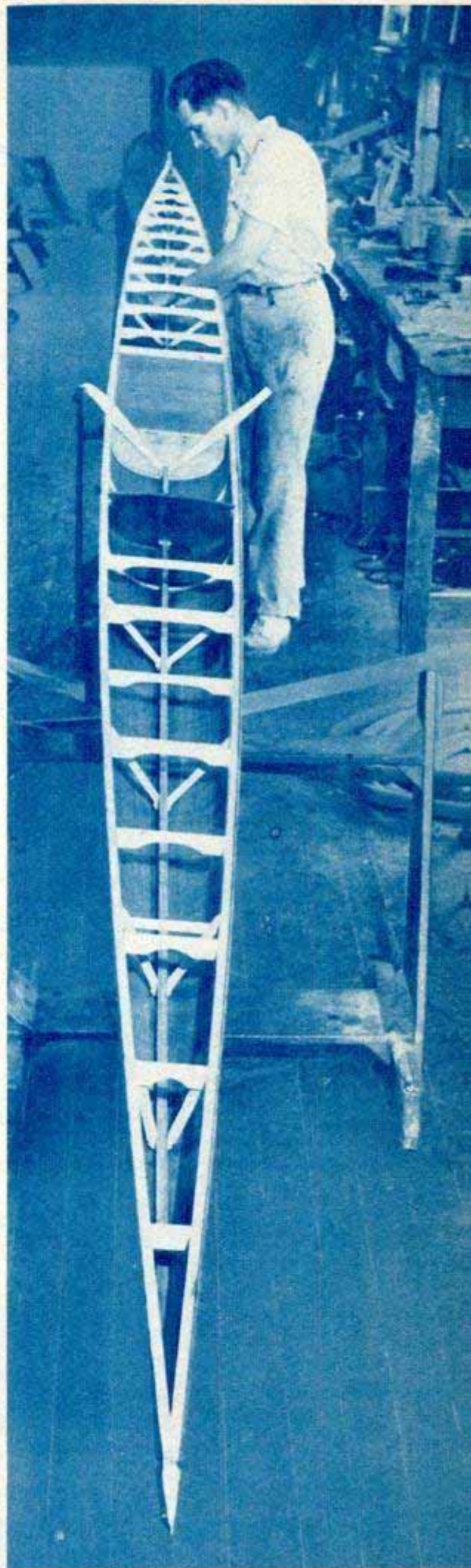
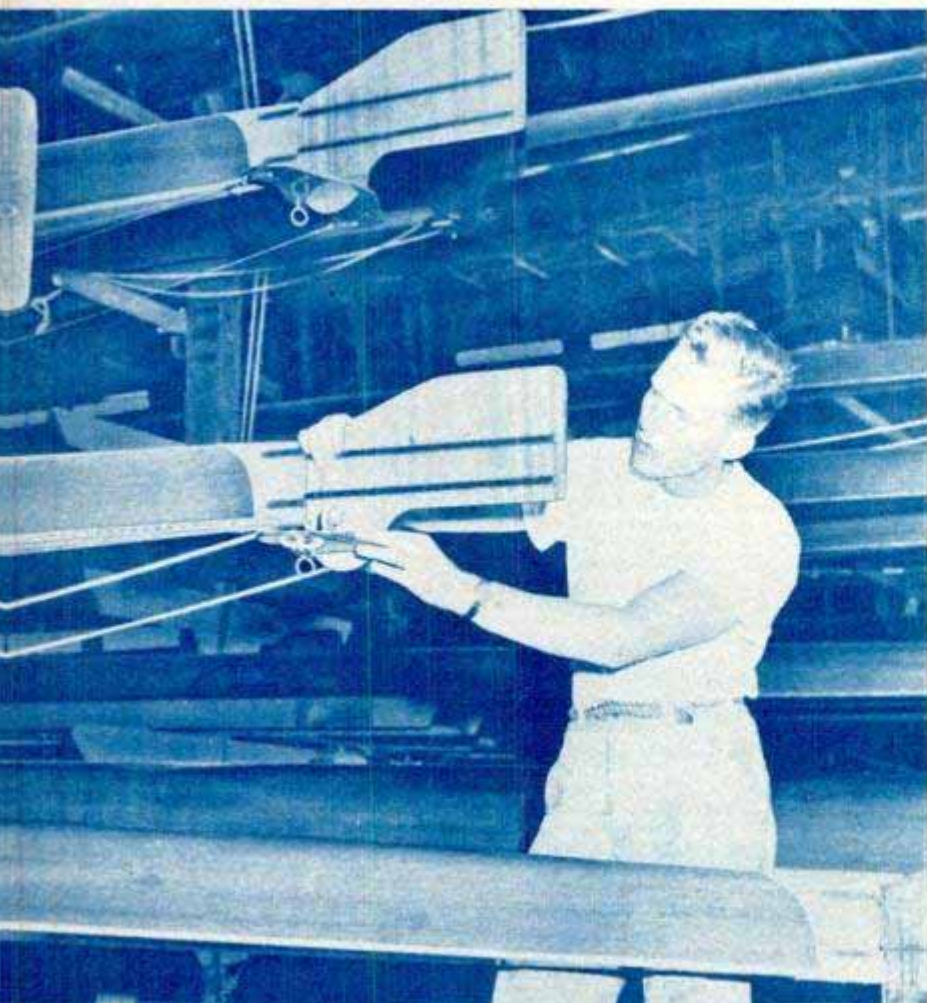
Another improvement is in the elimination of the conventional ribs for singles and other small shells and the ribs in the bow and stern sections of the larger shells. Instead of ribs, simple V-shaped members hold the keel and the gunwales in place. The molded-plywood skin retains its shape without support, at the same time acquiring flexibility that aids in riding through waves and rough water. All shells must be limber enough to work with the water and not pound.

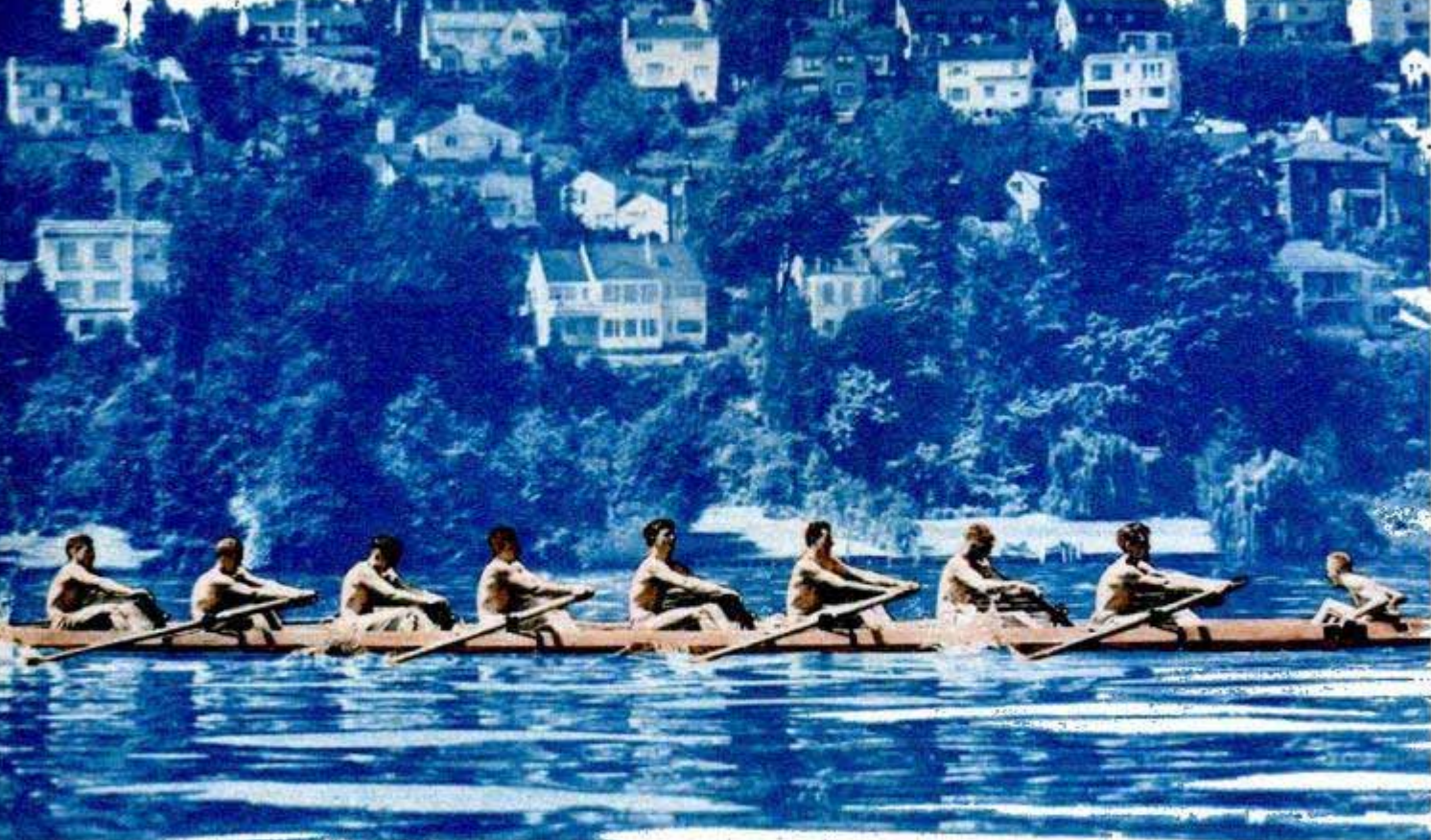
The choice of woods for the different parts of the shell has been a matter of research for years. Each type of wood that goes into the hull is chosen for characteristics that fit it for a specific role. Two-ply red cedar is the ideal skin material and, in the case of a one-man single, is only 1/16 inch thick. An eight-man shell has a skin that is only 5/32 inch thick.

The keel and gunwales are of sugar pine and the deck supports and the few ribs are of ash. All these frame members are



Above, boarding a one-man hull is a ticklish maneuver that usually results in repeated spills for the novice. Interior keel, gunwales and deck members are added (right) to a 26-foot one-man shell. Use of diagonal brace members that do not touch the skin, in place of conventional ribs, permits the skin to flex when slithering through waves and rough water. Below, eight-man craft has a rudder that is steered by the coxswain. Boats are turned upside down in storage





Crew members in a big shell are placed according to weight. The four in the bow should each weigh about 20 pounds less than the four in stern, who weigh up to 185 pounds. The coxswain weighs about 110 pounds

steamed to shape on a mold and are nailed and glued together. The skin, meanwhile, is shaped on a separate steam mold, laid over the frame and then secured to the keel with nails and glue. Glue holds the skin to the gunwales. The decked portions of the hull provide water-tight compartments to keep the shell afloat if it is swamped.

Shells are finished with four coats of hand-rubbed spar varnish. Before a race the hull usually is rubbed down with pumice and linseed oil to provide a smooth, slick surface. Various other treatments, including graphite, have been tried with no noticeable improvement.

One particular spruce, the Rocky Mountain variety, is preferred for sweeps and sculls. Oars made from this wood literally

whip themselves out of the water at the end of the stroke because of their springy action.

A Pocock sweep is 12 feet one inch long and weighs 8½ pounds. The shaft is a hollow tube, reinforced along its back with a glued strip of Australian ironbark to provide compression strength. Without this support the soft-spruce shaft would be crushed. The grip area is of bare wood, roughened to provide traction for the hands. The blades, built up of thin laminates and slightly cupped, are mortised and glued to the shaft. The sculls that are used with the smaller shells are shorter but are made in the same way.

Rowing is one of the oldest competitive

(Continued to page 236)

In the water the hull of a 30-pound shell has approximately four inches of draft and two inches of freeboard



1950 Bellanca Adds Speed and Size

Larger and 30 miles an hour faster than last year's model, the four-place Bellanca has the widest operational leeway in its class. It lands as low as 43 miles an hour and cruises at 180, with a 1400-foot-per-minute rate of climb at its gross weight of 2600 pounds. If a hydraulic line to the landing gear is broken, the gears snap into extended and locked position upon release from the "up" position with a very gentle pull out.



Electronic Torch Too Hot to Measure

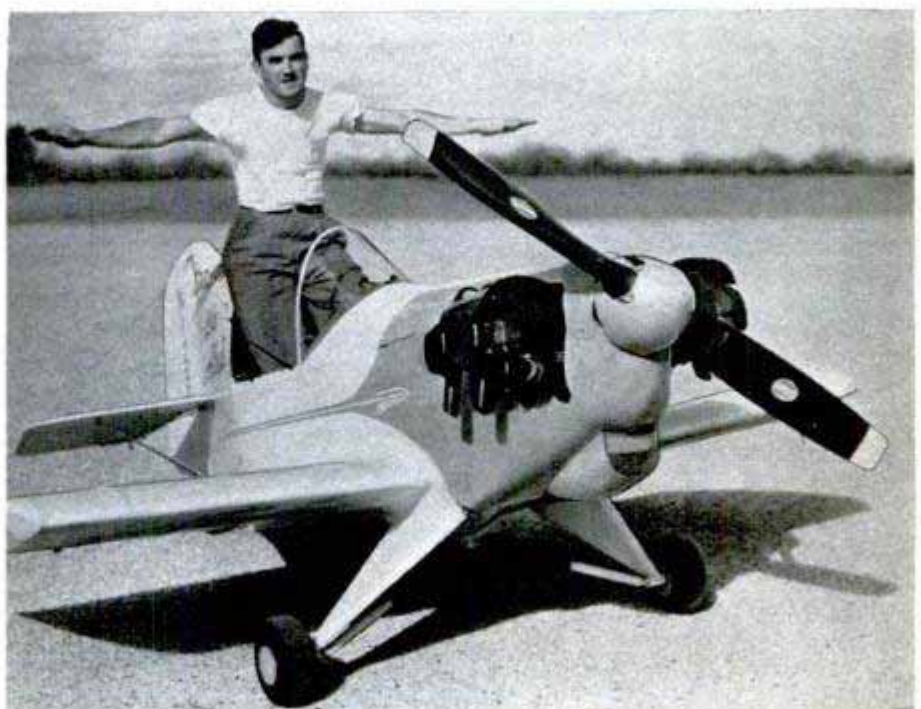
Producing a flame that is so hot there is no way to measure its temperature as yet, an electronic torch melts firebrick and tungsten like butter. Tungsten melts at 3370 degrees Centigrade. The flame consists of nitrogen being passed through a high-frequency arc, formed by radio waves at a frequency of one billion cycles per second. A tube, called a magnetron, generates the radio waves, which break up the two-atom nitrogen molecules into individual atoms. When the atoms reunite to form molecules, heat is released. The torch was developed by a General Electric scientist.

Left, scientist watches heat of the electronic torch melt quartz rod like ice cream on a hot summer day

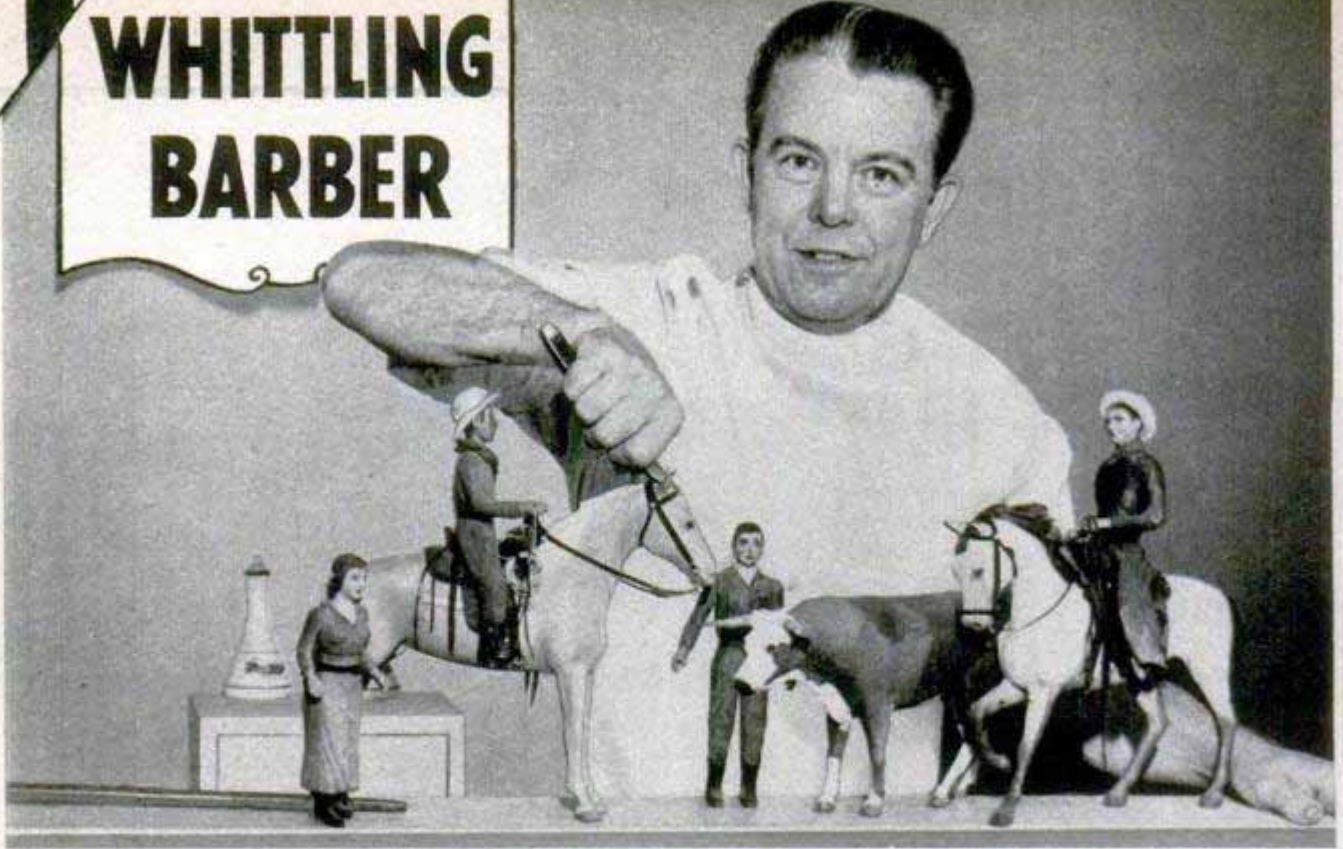
Midget Airplane

Tiny but fast, a midget plane designed and built by Raymond Stits of Battle Creek, Mich., will climb 800 feet a minute and fly 170 miles an hour. With a wingspan of approximately 9 feet and an empty weight of 393 pounds, it is believed to be the smallest airplane in the world. Its maximum carrying capacity is more than 220 pounds.

☐ Old Faithful erupted 1174 times during the 1949 Yellowstone Park season, an average of once every 62.3 minutes.



WHITTLING BARBER



With a 50-cent pocketknife Mercer touches up the ears of a cow pony. Figures are whittled from white pine

CUTTING HAIR is Johnny Mercer's trade, but whenever the last patron leaves his barber shop in North Hollywood, Calif., Johnny heads for the back room where he becomes a cowboy again. Johnny once rode the range in Texas. Now he duplicates the ranch scenes in wood. In

the barber shop you'll find a chaparral glade in a Texas desert, a band of sheep, some red bulls, cows and calves lounging in the shade of scrubby trees, and several horsemen. Johnny whittled each of the figures from white pine, using a 50-cent pocketknife and a few other tools. He

While the old-time rancher stands by, battered hat in hand, his children bring the dusty livestock to the well



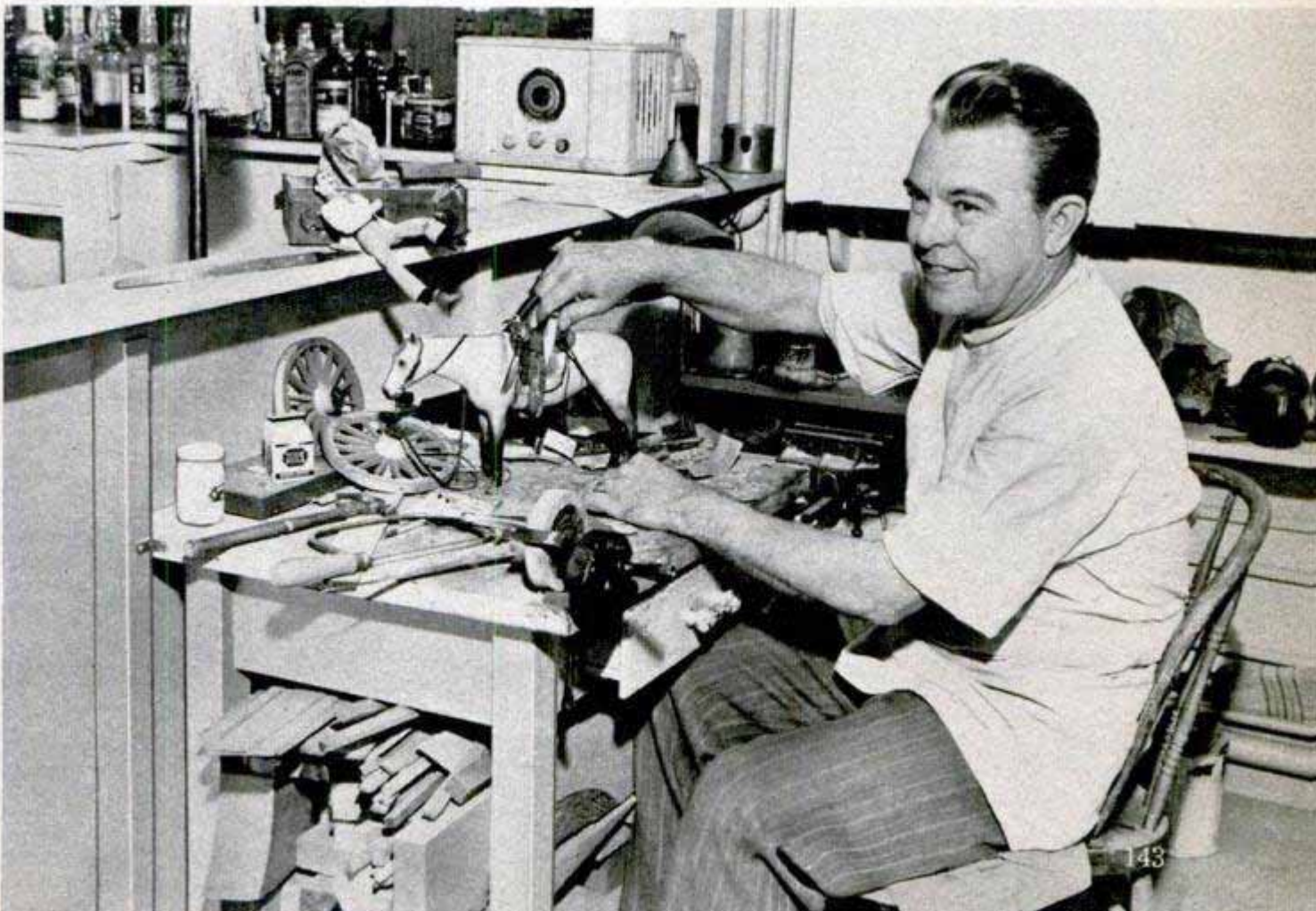


In his barber shop Mercer has a stage where he recreates the old West from frontier days in modern times

paints each of them himself, and builds realistic settings which include ranch houses, log cabins and rail fences. He is a good range hand with a needle and thread, too, so he makes all the tiny shirts, chaps and other bits of clothing for his cowboys. To complete his Western scenes, he fashions

saddles and tools, buckets and harnesses. Johnny has exhibited his figures at county and state fairs and handicraft shows. One of his favorite pastimes is teaching young admirers how to whittle. After a few minutes in Johnny's shop, many a young "cowboy" has started whittling his own horse.

He works at a battered bench with a few hand tools. Mercer also fashions clothing and equipment for figures



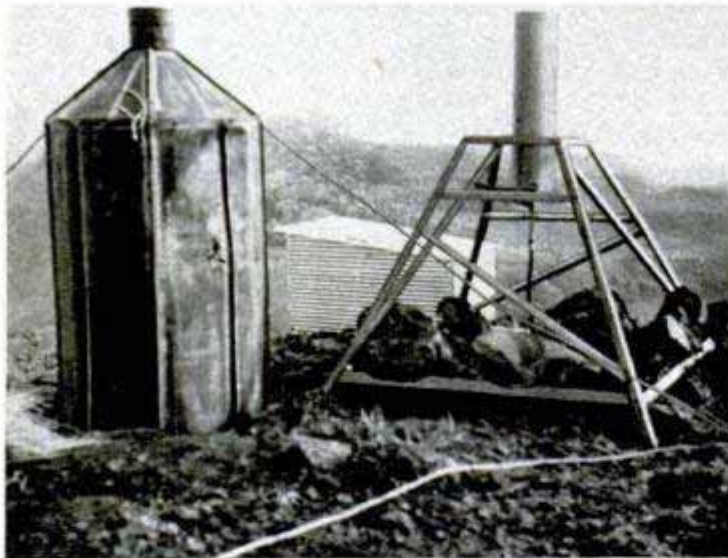


Ship Models in Plastic

Giving a new twist to an old hobby, Ray Workman of Chicago makes ship models out of plastic. Into a Workman model go all types of plastic—liquid material for the hull, sheet and rod plastic for the sails and



masts. In making a hull Workman carves a wooden model and casts it in plaster of paris. Then he melts liquid plastic in a pan on the kitchen stove, dyes it and pours it into the mold. He sandpapers the sheet plastic to give the sails on his models a frosty white appearance.



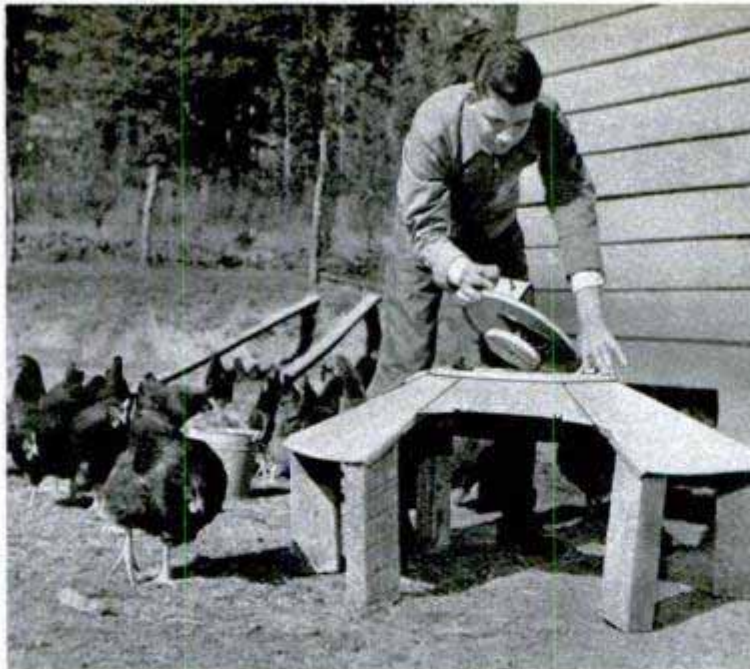
World's Wettest Spot Gets Special Gauge

It's nearly always raining "cats and dogs" atop Mount Waialeale, mile-high peak on the island of Kauai, Territory of Hawaii. So great is the annual rainfall that a specially designed gauge had to be installed to measure it accurately. Previous gauges have been too small for precise measurement. Since 1910, the mountain has been soaked by an estimated average of between 450 and 470 inches each year. In one really wet year, it was estimated that 531 inches fell. The U. S. average is only



Left, the old drumlike rain gauge and the new model. Above, during the frequent downpours, the crew that set up the new gauge took refuge in a mountain cave

29 inches a year. The other leading contender for the world's wettest title is a mountain in India where the average is 426 inches a year. The continuous recording gauge, just installed by the Geological Survey Department, requires reading only once a year and will measure accurately the heaviest downpour. Caught in an upright tube, the rain is piped into a tank in shelter where a stylus records the amount on a roll of waxed paper. A helicopter carried the equipment to the mountaintop.



Old hot plate becomes chick brooder in Johnny's hands. Right, another of his machines counts gladiolus bulbs

Boy Builds Push-Button Farm

Around Fayette, Ala., 16-year-old Johnny Clive Williams is known as a wizard at putting electricity to work on the farm. Using such materials as old lard cans, hot plates and discarded vacuum cleaners, the youth has invented ingenious machinery for cutting corners. Johnny's mother raises

gladioli for sale to florists, so Johnny came up with an automatic machine that counts up to 30,000 bulbs a season and dusts each one with DDT. It does a 24-hour job in 3½ hours. The lad, who won a Westinghouse scholarship, also built an electric chick brooder from a hot plate and scraps of metal, rewired the farmhouse, wired the barn and built in fans and lamps.



Ash Tray Fits Cigarette

Smokers can attach a new ash tray directly to their cigarettes. The ash tray is a tube of stainless-steel screen with a hinged cap on one end. The smoker opens the metal cap, pushes the cigarette through the tube, lights it, then pulls it back until the end is in the tube. When he closes the cap the screen catches all the ashes. As the cigarette becomes shorter it is pushed farther into the tube. The cigarette also can be placed upright on the cap without danger of marring any surface.

Rescue "Knife" For Crash Victims

To save survivors trapped in wrecked or burning aircraft, Australian engineers have developed a giant rescue "knife" that cuts through metal fuselages as if they were paper. Eight feet high, with a razor-edge steel spearhead, the knife is mounted on the front of an armored car. In a test at Melbourne, it quickly severed the tail from a surplus bomber.





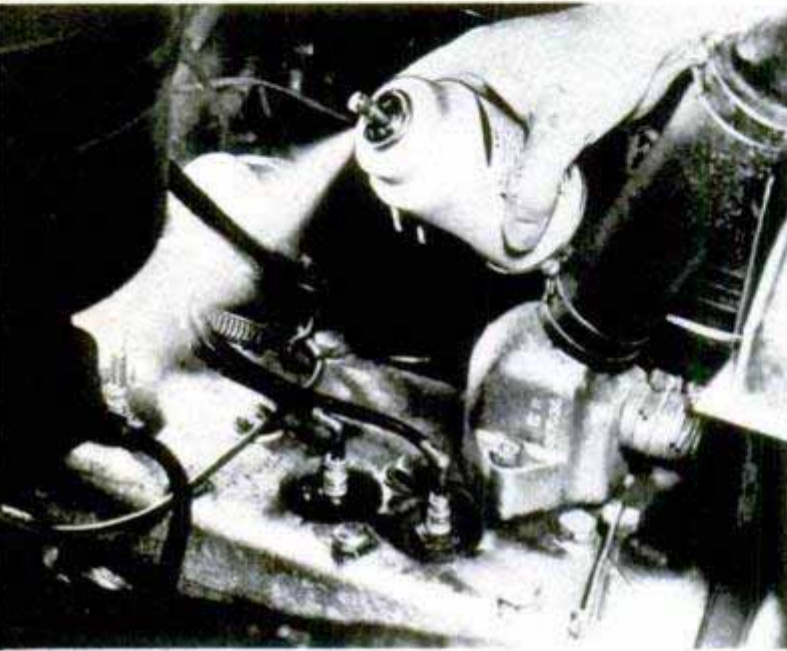
Du Pont Company photo.

Using Freon, a fluorine product, as the propellant, plastic sprays are being made that protect art work, leather and even garden tools against dust and rust.

SPRAY BOMB and A-BOMB

Below, wood goes up in flame on contact with compound containing 62 percent of available fluorine. Bottom, a few spray bombs already on the market.

Pennsylvania Salt Mfg. photo.



Single spray applications completely moistureproof automobile and other all-weather ignition systems.

High-pressure aerosol bombs help keep trains, planes and other public conveyances free of insect pests.



cousins under the shell

By Leonard Engel

THE OTHER DAY, a paint chemist, threading his way through New York traffic in a brand new sedan, was side-swiped by a passing broken-field driver. The swipe put half a dozen long, ugly scratches in his fender. Having it retouched would normally have cost \$15 or \$20.

But when the chemist reached his lab, he fetched a "spray bomb," a small can containing lacquer and a driving gas to expel

the lacquer in the form of a fine spray. He took aim and pressed a button. In a few minutes, without muss or fuss, the fender's finish was restored to new.

Everyone knows the "bug bomb," the handy canned spray for getting rid of insects. Ready-to-use push-button sprays are already appearing for furniture and kitchen paint and others are coming out for floor and auto wax, furniture polish, rug shampoo and window-cleaning compound. Sprays will spread chemicals to kill kitchen odors, and coat household goods and garden tools with a liquid plastic to protect them from rust and dust. Still other push-button bombs will spray perfume, under-arm deodorant, sun-tan lotion and penicillin.

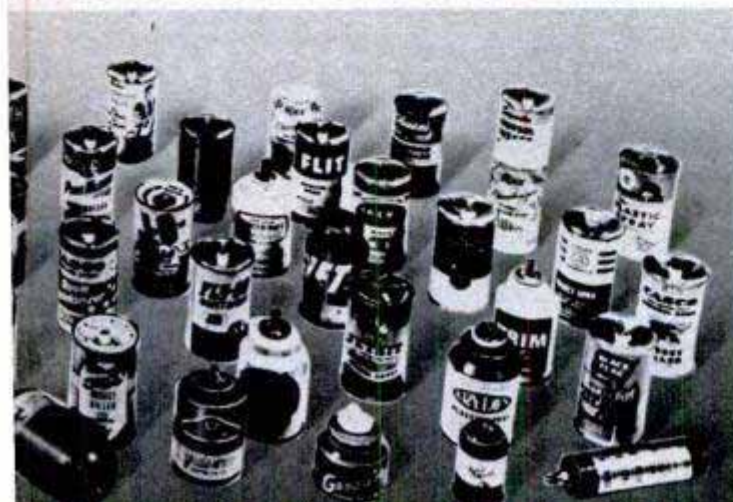
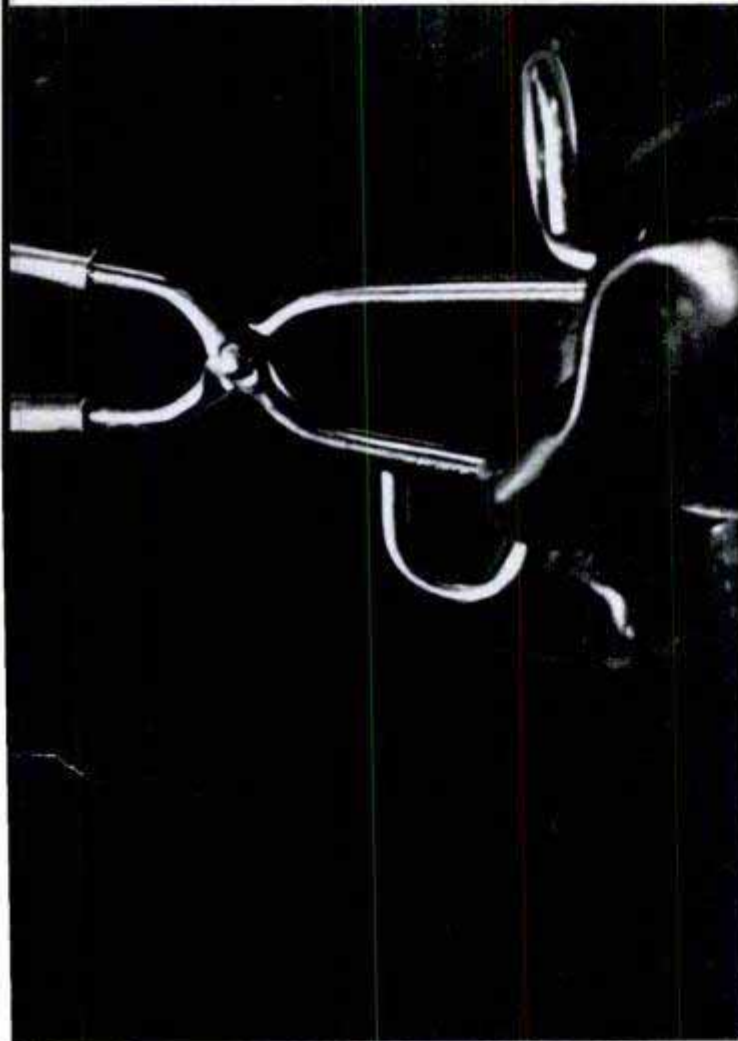
The approaching canned-spray era in homemaking springs from a remarkable yellowish gas named fluorine. Freon, the driving gas of the bombs, is a fluorine product. Fluorine is nature's supreme terrorist—the most potent corrosive known. It can go through substances as imperishable as stone and incorruptible as stainless steel as easily as a hot spoon through a brick of ice cream. A jet of the pure gas could make flesh burst into flame.

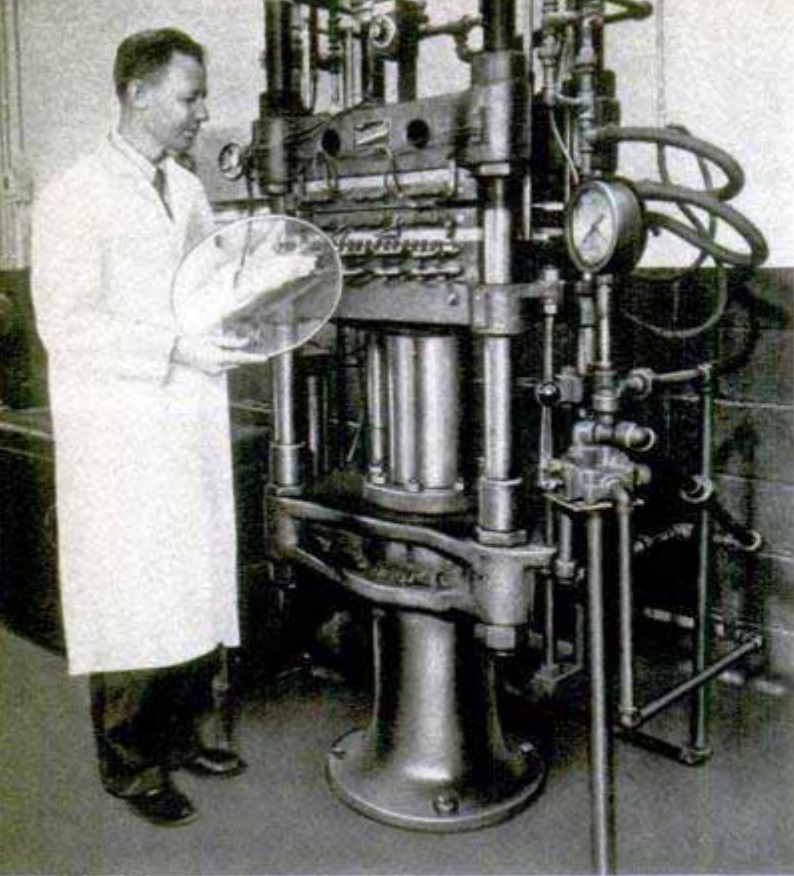
Fluorine was tamed by the scientists who put together the atom bomb. It was needed to produce the atomic explosive uranium 235. Now the puissant vapor is delivering a whopping first installment on the atomic-energy project's promise of a new world.

Beside canned sprays, fluorine has already brought drugs to ward off tooth decay and the dread eye disease, glaucoma; dyes, plastics, lubricating oil and rubber that last indefinitely; safer anesthetics and insecticides. Soon to come are insulation for super-powered electric motors and equipment; heat-resisting fluids for the turbines of atomic power plants, and a fuel hot enough to weld copper or hurl rockets to the moon.

Space ships and welded copper were far from mind when the atomers began looking into fluorine. What they were after was a lever to pry explosive uranium 235 from ordinary uranium—a point on which the whole A-bomb enterprise hung.

The uranium mined at Great Bear Lake—as indeed all the uranium in the earth's crust—is an intimate mixture of two varieties of the metal. Every 100 pounds of natural uranium contains 99.3 pounds of U-238





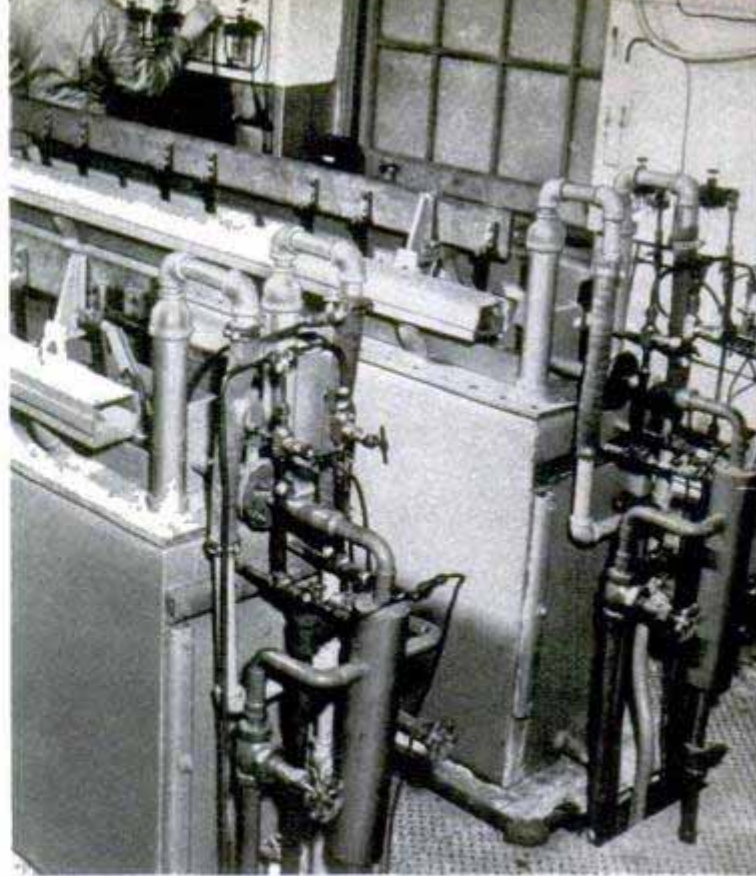
Glasslike, but with toughness of steel, fluorothene plastic lines pipes at uranium separation plants

and .7 pound (a trifle over 11 ounces) of U-235. The two are more alike than identical twins. But only one, the scarcer U-235—and then only when it has been concentrated in pure chunks of a certain size—goes wham.

How to get them apart? Farmers skim cream from milk by whirling milk in a centrifuge; the cream, lighter, floats to the top. U-235 is very slightly lighter than U-238. Perhaps it might be skimmed from natural uranium in somewhat the same way. But uranium would have to be turned into a liquid or, preferably, a gas. The only practical way of accomplishing this was to combine uranium with fluorine to form a gas known as uranium hexafluoride.

Only a handful of laboratories had made fluorine previously, a few whiffs at a time. One of the 92 basic chemical elements, fluorine had lain locked away in rocks of the earth's crust from the dawn of creation to 1886, when a Parisian chemist, Henri Moissan, succeeded in producing a flaskful. What was learned by Moissan, who went on to win fame as the first man to make diamonds synthetically, and others convinced most lab men they wanted nothing to do with the acrid, yellowish gas.

Fluorine attacks practically everything it touches with the utmost fury. Wood and sulphur flare into flame at once. Glass and asbestos disappear in smoke. Even water burns in fluorine, with a bright lavender flame. The gas can also consume steel; overheated steel fluorine-handling equip-



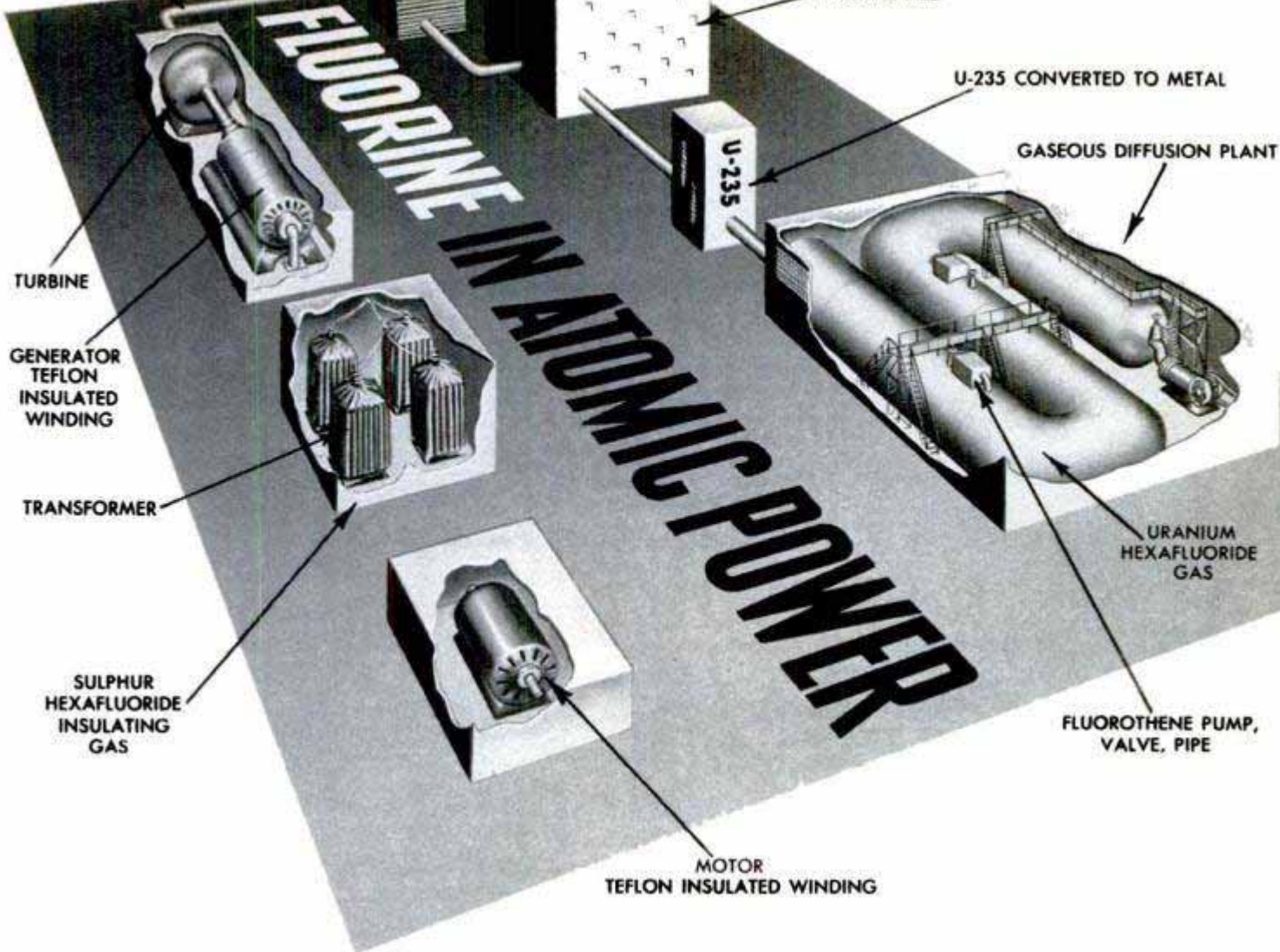
At Penn Salt's Whitmarsh laboratory, fluorine is now being generated in large-scale electrolytic cells

ment may go off like a king-size Fourth of July sparkler. And hydrogen and fluorine make an explosive combination second in potency only to the A-bomb itself.

This was what the atomeers had to produce and handle—not by the ounce, but by the ton. Moreover, the uranium-fluorine compound, uranium hexafluoride, was also something to cause furrowed brows. Samples showed it to be almost as corrosive as the original fluorine.

Operation Fluorine was actually disposed of before anyone was sure that the chain-splitting of atoms—the source of the bomb's power—would work. In 18 months of fevered toil, chemical engineers from three of the companies that took part in the atom project contrived an electric cell for generating pure fluorine in quantity. Meanwhile, a young Cornell University chemistry professor, William T. Miller, Jr., on loan to the secret atomic laboratory at Columbia University, was shrewdly catching the thief with a thief.

Reasoning that something made from fluorine should be immune to further attack by the gas, Doctor Miller devised a remarkable fluorine material, fluorothene, a glasslike plastic with the toughness of mild steel. Fluorothene was exactly what was required for lining the miles of pipe, acres of tanks and tens of thousands of valves and pumps in the giant uranium separation plants. Without Miller's plastic, there would have been no Oak Ridge. Another of his discoveries, a fluorinated oil,



Fluorine products played major roles in developments leading up to the first successful atomic bomb

provided the U-235 plants with a needed fluorineproof lubricant.

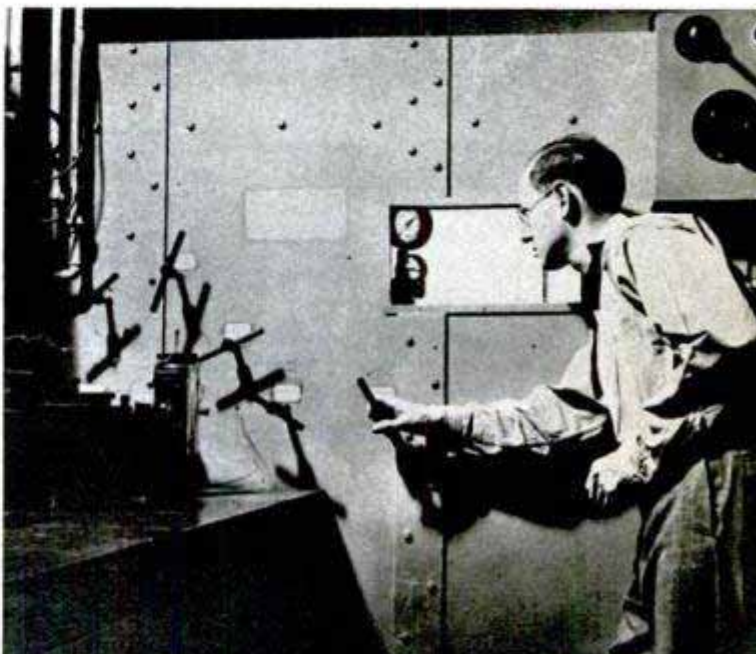
You might imagine that nonatoms would still be glad to leave something like fluorine alone. In Miller's discoveries, however, the A-bomb enterprise had served up something guaranteed to whet scientific and industrial appetites. Fluorothene is impervious not only to fluorine, but to virtually all chemical agents. It is already finding a wide place in industry in the handling of corrosive chemicals.

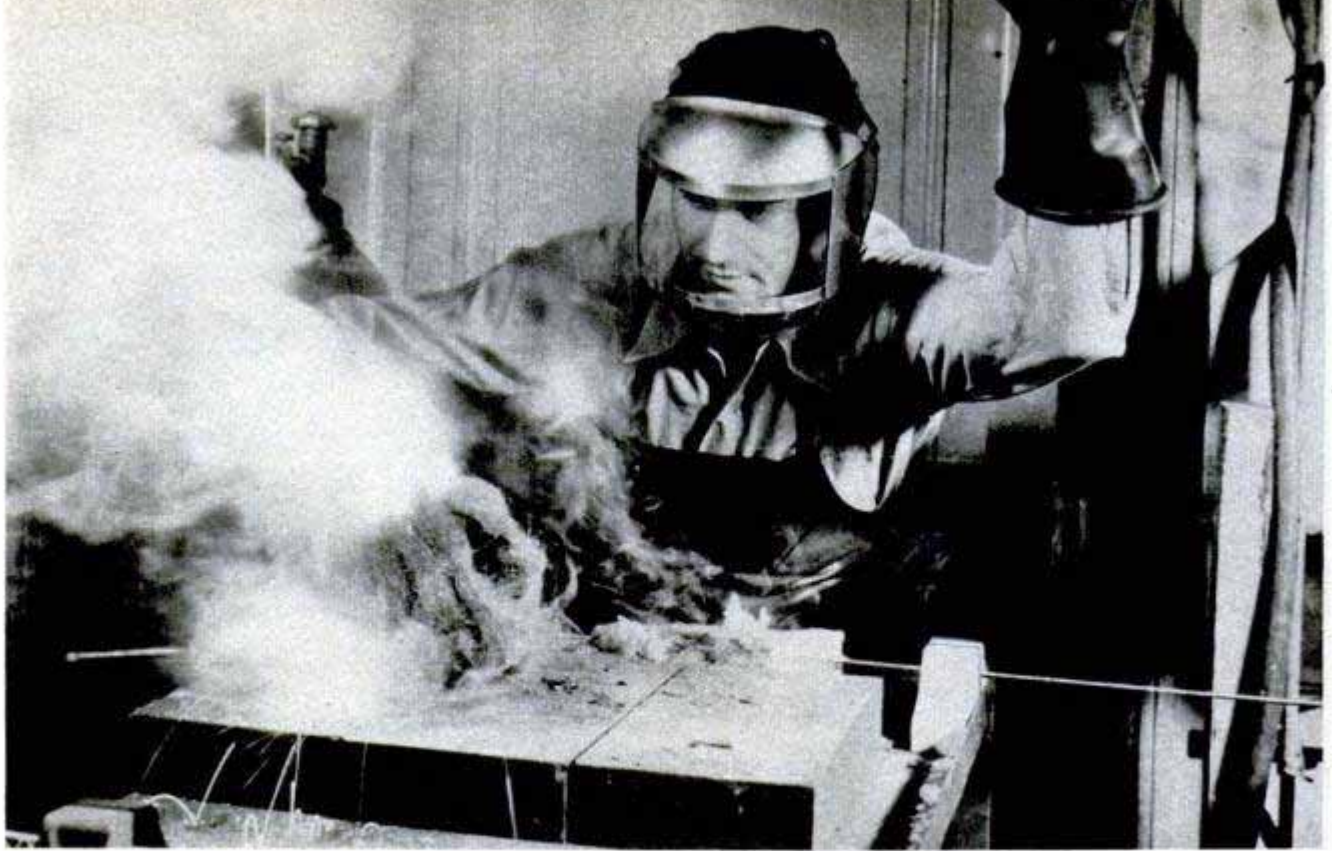
Miller's other development may end the expensive necessity of stopping your car every few hundred miles for a refill of oil. Fluorinated oil is not quite as efficient a lubricant as the petroleum product. Like fluorothene, however, it is proof against a wide variety of disruptive agents, including those that carbonize lubricating oil, and it lasts indefinitely. An improved fluorinated oil sealed into the engine at the factory—in engines of special design—would provide lifetime lubrication for cars.

Fluorothene and fluorinated oil made the pungent gas an irresistible magnet. Literally scores of Canadian and American laboratories are racing to turn up new fluorine products. You can sense what is coming at

the scientific conventions where fluorine is discussed. "Every big company sent a dozen of its best men," says a chemist who attended the fluorine sessions at the last gathering of the American Chemical Society, "but no one but the university people talked. The industry men didn't say a word; they just made notes. They wouldn't even

Handling and packaging of fluorine demands extreme caution. Whitmarsh control chamber has 1/2-inch steel-plate walls and two-inch-thick glass windows





Flaming steel! Steel wool instantly bursts into flame when a small jet of fluorine gas is played upon it

give you the time of day, for fear of giving away a million-dollar fluorine secret."

Paradoxically, what makes fluorine so valuable is the violence that once held researchers off. The tantrums of the yellow gas reflect what chemists call reactivity—readiness to enter into chemical combination. Fluorine unites with other substances more enthusiastically than any other of the chemical elements, and once united, is more tightly joined. Substances containing fluorine are not easily broken up or changed. They withstand, without disintegration or explosion, million-volt bolts of electricity. They can be mixed safely with all sorts of other chemicals, as in the canned sprays. They are little affected by heat, light, oxygen and the other corroding influences that shorten the life of practically everything we use, and make possible goods which, for all practical purposes, won't wear out.

Fluorine's astonishing potentialities are being pursued most intensively at a 100-room mansion, Whitemarsh, in a pleasant Philadelphia suburb. Built 30 years ago for a Philadelphia railroad magnate—and boarded up by his widow when he died—Whitemarsh is the main laboratory of the Pennsylvania Salt Manufacturing Company. This old and respected firm, which marks its hundredth birthday next year, had no hand in the bomb. But it is well acquainted with one of fluorine's less violent cousins, chlorine, the germicidal gas used to purify water; it was the first manufacturer to supply liquid chlorine.

The company was also the main war-

time producer of another fluorine product, hydrofluoric acid, an essential in refining aviation gas. Dr. John F. Gall, its research chief, is probably the foremost American authority on fluorine.

As a starter, the chemists at Whitemarsh have come up with a new fluorine chemical for toughening cement, a rinse to offset "soap yellowing" in laundry and a new insecticide, DFDT, equal to DDT in effectiveness but less dangerous to animals and man. The Whitemarsh chemists have also done valorous service as the foot soldiers of the fluorine campaign, in the hard and unglamorous but vital task of finding better ways of preparing and handling the troublesome genie. One of their accomplishments is a "magic vat," in which electricity is the cook, for generating fluorine. It will take the place of the wartime cell, which worked well but was expensive.

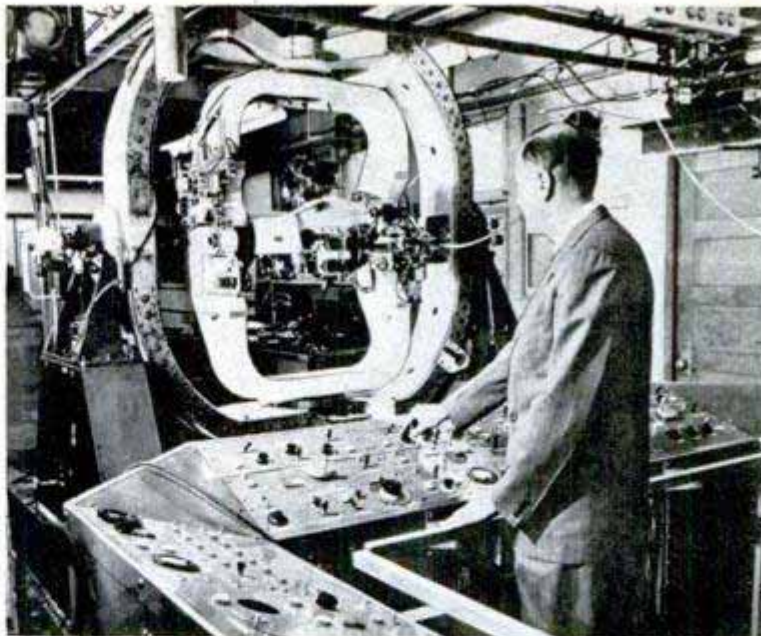
Penn Salt has two of its "magic vats" set up. Except for the fact that they are made of steel, they might be outsize exemplars of the old-fashioned covered bathtub. The fluorine generator strips fluorine from hydrofluoric acid.

The acid, whose corrosive fumes have been employed by glassworkers for 150 years to etch glass, is obtained by chemical treatment of a handsome many-colored crystalline rock, fluor spar, a favorite working material of vasemakers. Powerful currents coursing through the vat decompose carefully purified HF, liberating hydrogen and fluorine, in much the same way as hydrogen and oxygen are liberated from

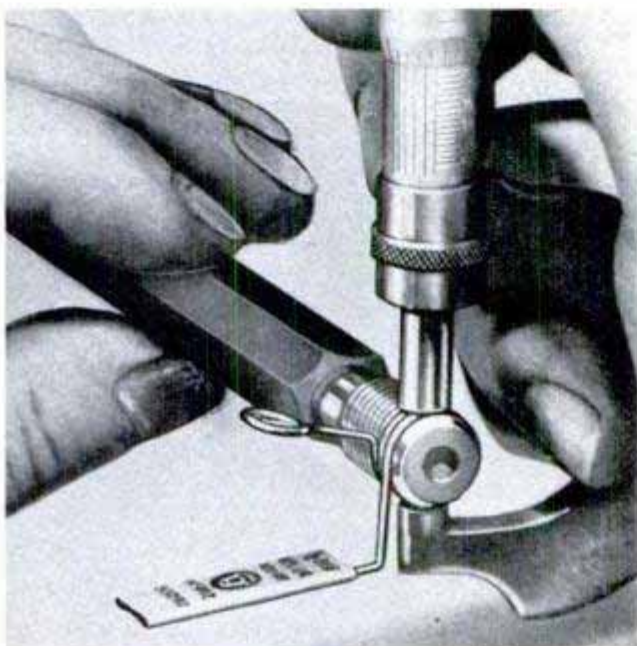
(Continued to page 248)

Robot Test Pilot

Planes can now get a thorough "flight test" from a calculating machine before they are built. The new apparatus, developed for the Navy by the Massachusetts Institute of Technology, permits design defects to be found and corrected without the cost of actual construction and flight testing. Engineers using it set up an invisible, electrical "model" of any aircraft or guided missile in an advanced stage of design and have an autopilot "fly" the nonexistent, theoretical craft. Questions about the design, fed into the machine by electrical signals, are answered in chart form within seconds.



Department of Defense photo.



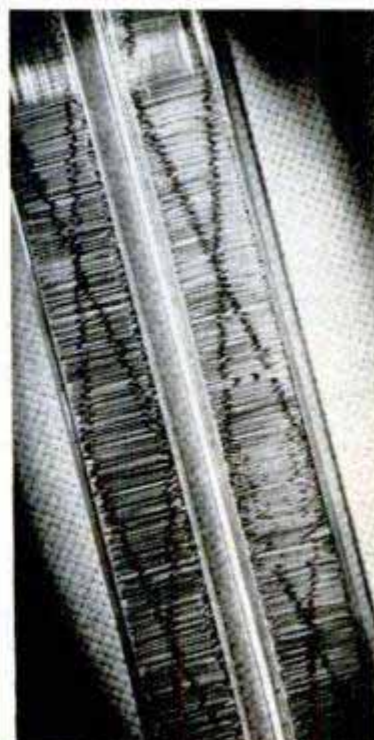
Thread-Measuring Gauge

Coiled to fit inside the screw threads to be measured, a spring-wire gauge enables a machinist to check thread diameters quickly and accurately with a micrometer. Based on the widely used Three-Wire method of measuring diameters, the gauges eliminate the need for holding three separate wires while manipulating a micrometer and also make it unnecessary to refer to complex charts or to make long calculations. All necessary data are marked on a plate attached to the gauge. The operator simply takes a reading and compares it with the limits engraved on the data plate. The coiled gauges, which come in various sizes, open when the projecting ends are squeezed, allowing the gauge to be slipped over the thread quickly.

Ticket "Detective"

Theater tickets are completely processed by a new machine which discourages dishonesty on the part of amusement-house employees. The ticket taker collects the tickets, counts them, cuts them, checks and records the sequence of every ticket, then stacks the stubs into sealed tubes in the order they were collected. Tickets are perforated according to a pattern, and the filled tubes show this pattern at a glance. Any tickets which are missing or not collected in the proper order are spotted immediately, thus preventing employees from palming tickets and re-selling them.

Ticket collector stows stubs in long tubes. Tube at far right shows stubs out of place.





Fluorescent Tubes Now Have Guide Bumps

Tiny bumpers on each side of a fluorescent lamp base enable you to slide the tube into the socket without fumbling. The bumps serve as a guide during insertion and as a visual signal that the tube is in the correct position. Sloping shoulders on the base also make it easier to insert the tube.



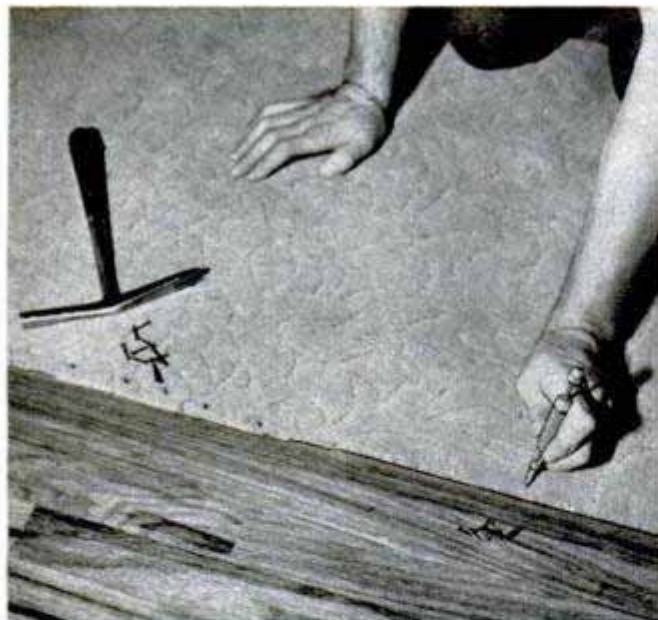
Westinghouse photo

Hair Drier Is Noiseless

Soundless in operation, a compact hair drier has a collapsible hood that concentrates the warmth around the head. Electrically operated, the drier requires only 15 to 25 minutes to dry the hair completely. It can be hung on the door or placed on a table. The hood folds into the body of the drier for storage and the entire unit weighs only eight pounds.

Projector Aids Hymn Singing

Singing response at the Belvedere Ward Chapel in Salt Lake City is enthusiastic because of a screen and a motor-controlled slide projector. The projector flashes the words and music on an eight by eight-foot screen in front of the congregation. Well over 100 songs have already been put on slides, and many more will be on the list soon. The projection equipment was installed for \$250, whereas 400 song books would cost several times that amount.



Left, tool sets pins invisibly compared with tack method (far left). Right, pins in plywood strip grip carpet

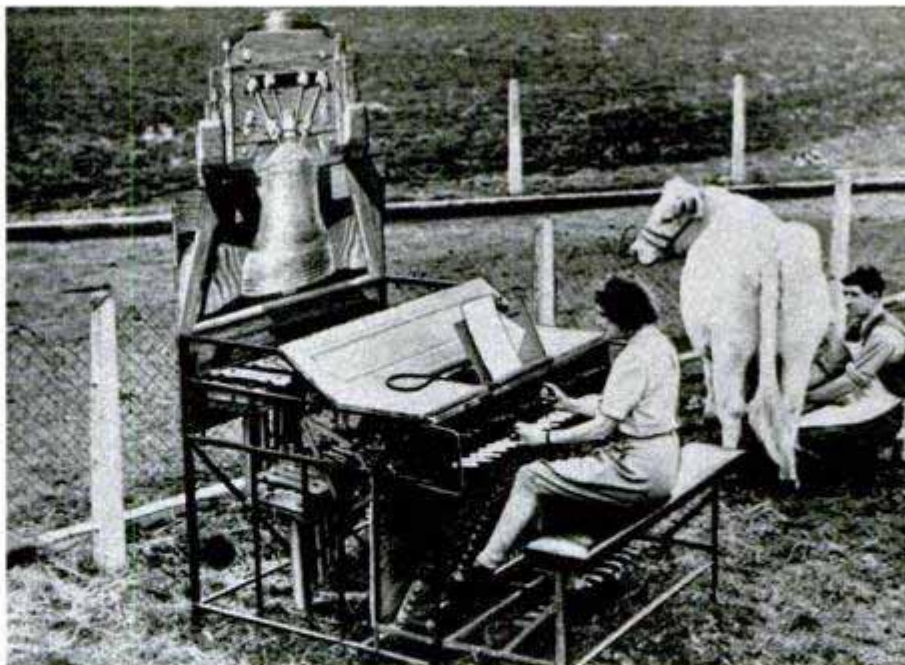
Tackless Carpeting

Wall-to-wall carpeting is anchored firmly to the floor without unsightly tacks by a pin-studded plywood strip that works on the same principle as a curtain stretcher. The strip, attached to the floor, contains a row of short pins that grip the back of the

carpet from below and cannot be seen from above. Also available is an invisible tacking tool that looks like a nail set. A small carpet pin slips into the barrel of the tool. Lips on the end of the tool open the nap of the rug enough to allow the pin to be driven. When the tool is removed, the nap springs back to cover the head of the pin.

Music for Bossie

Do cows like music well enough to give more milk? Miss Nora Johnston of Thorpe, Surrey, in England, believes they do, and has set out to prove her theory. She travels about a large farm with a portable carillon of her own design, playing a musical accompaniment while the cows are milked. She says figures accumulated over a period of time prove that the milk yield has increased since she started her program of music for Bossie.



Taxicab SOS

German taxicab drivers, who need assistance in handling troublesome passengers, can send out an SOS by pressing a button that turns on a pair of illuminated signs. Printed on the signs, one being mounted at the front and the other at the rear of the cab, is the word "Hilfe," meaning "Help." The switch can be mounted on the floor or steering wheel if desired. In a test at Munich, five pedestrians saw the sign and immediately called police, who stopped the car after a chase.

Mail-Order Judge Collects Traffic Fines

Parking violators in New York City will mail their fines to a new machine that records each offense and detects all offenses of previous violators. Designed to save the city nearly \$200,000 each year in operating costs, the machine also promises to save New York drivers some 350,000 trips to traffic court during the year.

INDEX TO POPULAR MECHANICS NOW AVAILABLE

Your useful free copy of the new six months' index to Popular Mechanics, January through June 1950, will be mailed to you upon receipt of your order and 10 cents to cover handling and mailing. Address your order to Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11





Tatum and a Red Cross lifesaving expert demonstrate how not to fish from a boat



Over they go! Standing up in the boat raised the center of gravity. Then the motion of a cast tipped them into the drink

Have Fun in a Boat, But..

SWIMMIN' time again, with a world of fun—and some serious hazards, too. As usual there'll be tipped boats and other horseplay. G. E. Tatum, safety engineer for a public utility, offers common-sense advice on how to have fun and stay alive. In case your boat tips you overboard, Tatum says, rock it to slosh out as much water as possible, then crawl over the stern

Two mermaids, about to be flipped into the river because they stand up to change positions in canoe

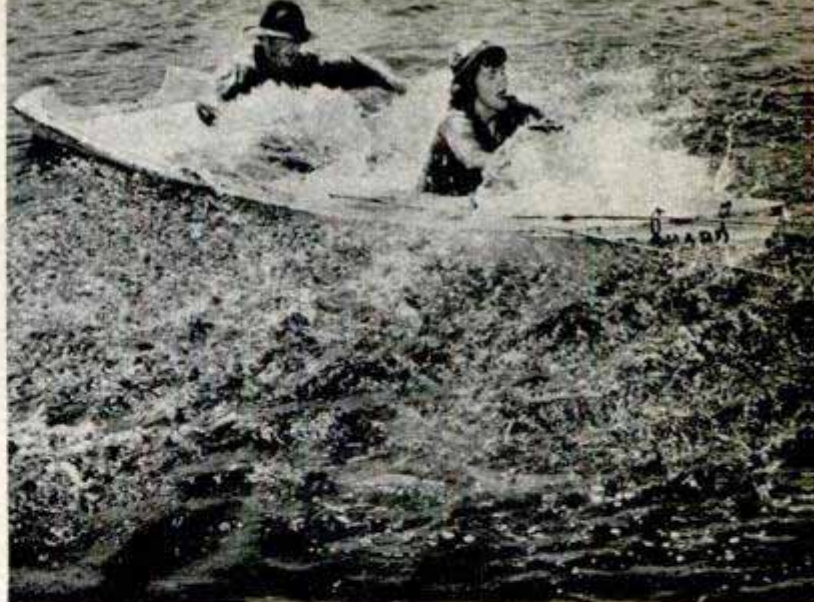
and sit on the bottom while you scoop out the rest. In no case should you leave the boat. If the craft capsizes in a fast river, grab it and angle upstream, not down, so the current will help you ashore. In a canoe, keep your weight low, and if you must change places one person should bend low while the other crawls over him. If the canoe overturns, swim to the stern,

That's better. One kneels in the bottom of the craft while the other crawls over her. Both hold side rails





No! Go back to the boat! Most persons in such a predicament swim for shore—the worst thing they can do

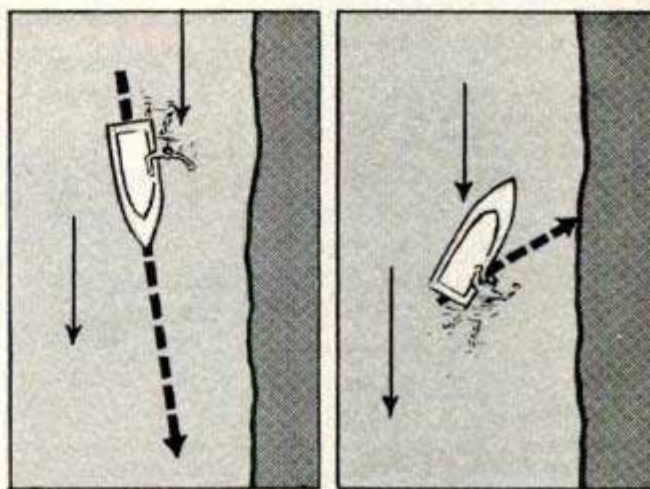


That's right, swim back to the boat. Right it, rock out some water, crawl over stern, splash out the rest

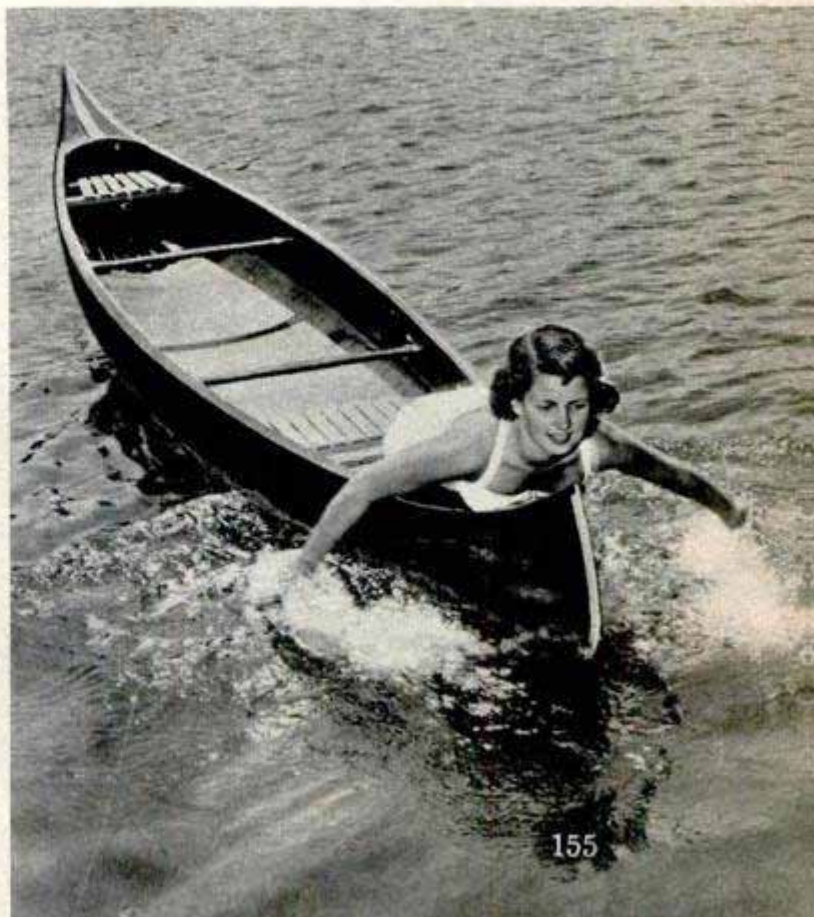
DON'T DROWN

push it down and stand on it under water. The canoe will shoot up and out, dumping part of the water. Then rock it from the side to slosh out the rest, grab both railings and swing yourself in so you land in a sitting position. Safety rules won't spoil your fun, but they may save your life!

Right, don't splash ashore with the current, but against it. Current will push you toward shoreline Tatum shows how to clear a swamped canoe. Grab one side and roll it back and forth. Water splashes out



Stuck without a paddle? Lean over the prow and use a breast-stroke motion. You can move fairly fast



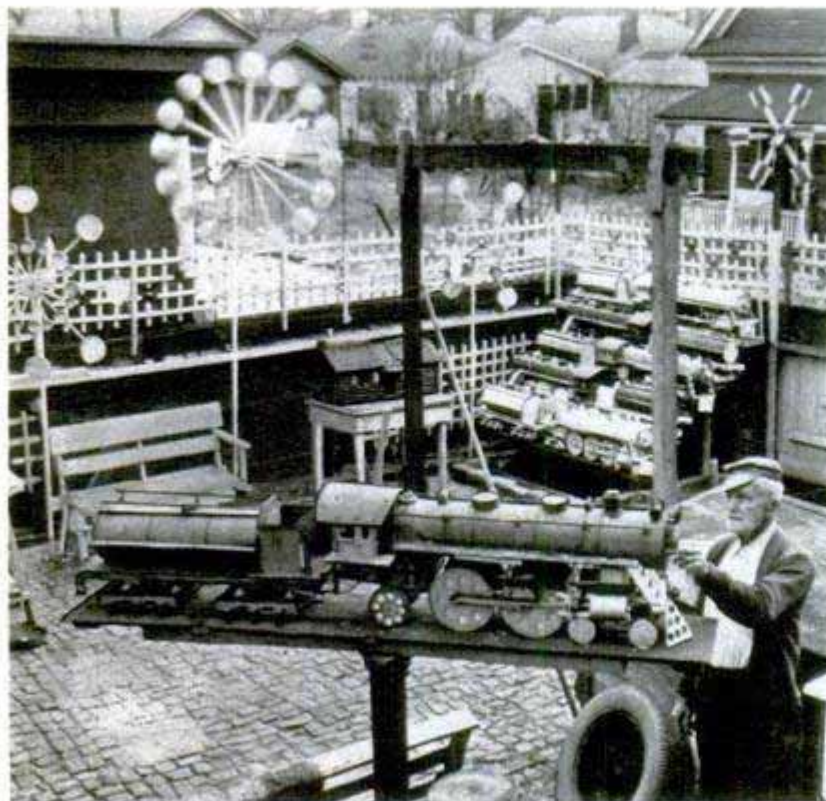
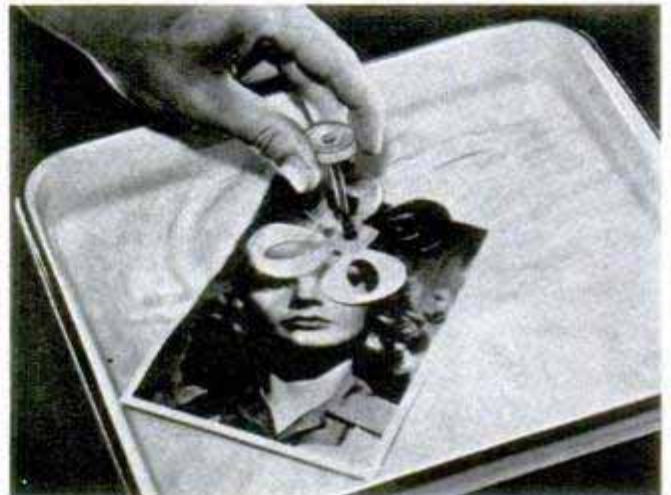


Periscope Hood

Airmen have gone down to the submarine for their latest teaching aid, a periscope that sees down instead of up. It is designed for instrument training, to permit the pilot to see the dials, gauges and knobs before him plainly, but to prevent him from seeing outside the plane. Made of aluminum, the periscope hood weighs less than five pounds and extends out about six inches from the face. The old system required the pilot to add an amber Plexiglas windshield to the plane and to wear tinted glasses in flight. This made it impossible for the pilot to see outside, but allowed him full vision for the instrument panel.

Photo Tone Matcher Assures Good Prints

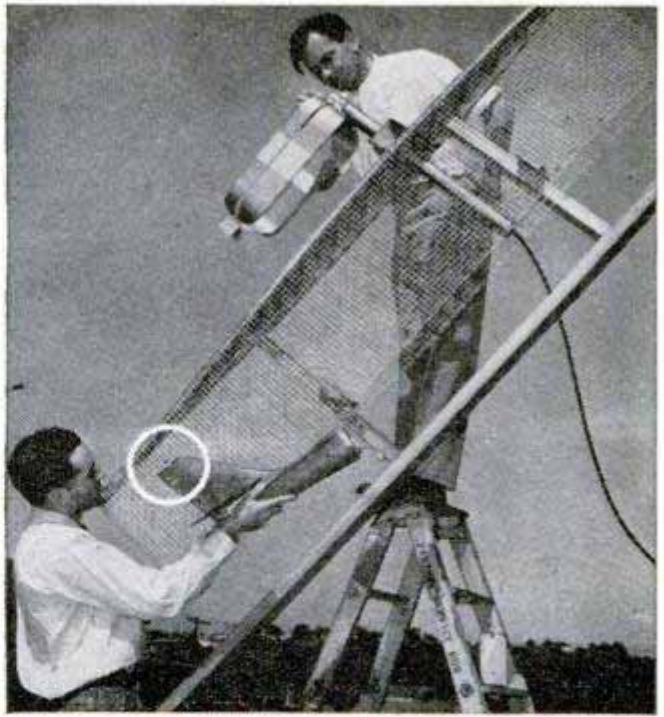
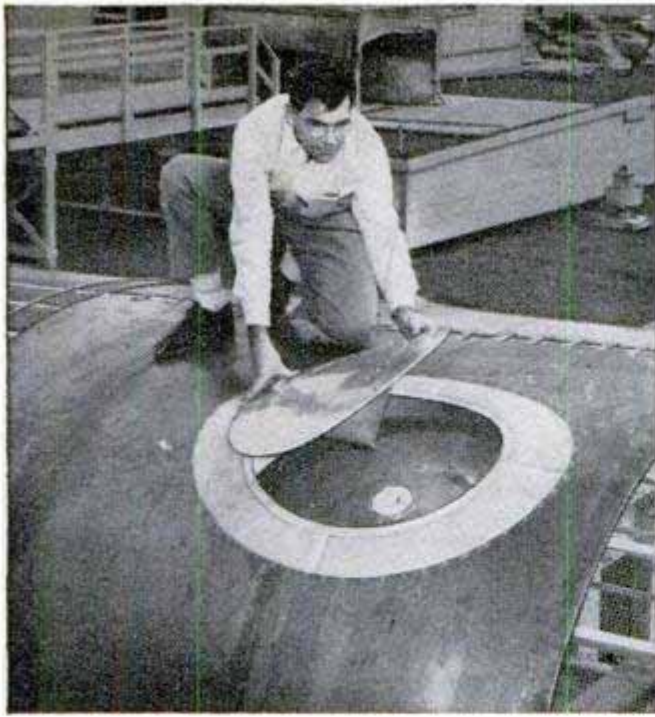
Photo hobbyists can reduce paper waste with a tone matcher that assures proper development of prints. The matcher consists of four plastic leaves of differing gray tones. The lightest is the tone preferred for flesh tones in portraits and the darkest matches shadow tones. An oval hole in each leaf allows the hobbyist to compare the tones with any portion of the print. The four leaves also serve as agitators during development and the stem is colored to indicate when developer should be discarded.



Tin-Can Railroad

When a Georgia railroad man retired, he had to do something "to keep from going crazy" and naturally he turned to trains for his hobby. Using ordinary tin cans as raw material, W. E. Chester, 86-year-old Atlantan, has built himself a realistic collection of locomotives in his back yard. Occasionally, to add variety, he produces weather-vanes and whirligigs, using the always-available tin cans, but most of his time is spent fashioning locomotives of various sizes and types.

¶ Army medical researchers are making mosquitoes radioactive so they can follow the little nuisances with Geiger counters to study their flight and attack habits.



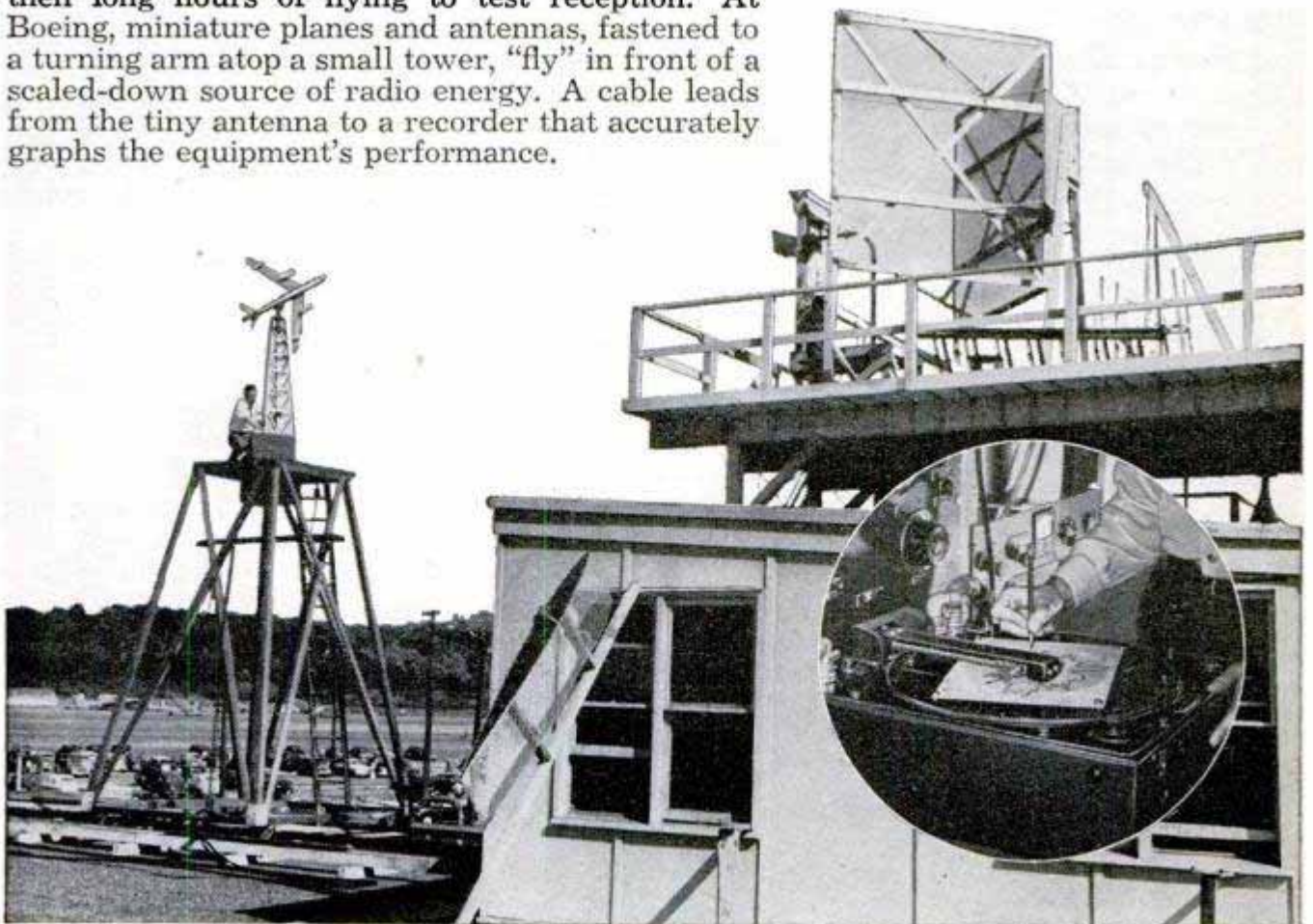
Ridding Fast Planes of Their "Barnacles"

Jet speeds are sweeping radio antennas out of sight. Protruding antennas, long recognized as "built-in headwinds" that slowed the plane, have also been found guilty of creating dangerous shock waves at speeds near sound. To lick the problem, the Boeing Airplane Company has built a special laboratory to learn where they can be put, to work as well or better, without creating drag. The old system required full-size construction, installation, then long hours of flying to test reception. At Boeing, miniature planes and antennas, fastened to a turning arm atop a small tower, "fly" in front of a scaled-down source of radio energy. A cable leads from the tiny antenna to a recorder that accurately graphs the equipment's performance.

Upper left, after tests with 1/25 scale model, engineers went ahead with a flush-mounted antenna on mockup of big jet B-47

Above, comparing scale and full size, tail section and antenna in circle duplicate wire and metal mockup above the ladder

Below, tower on which model planes turn is at left, while radio waves come from "horn" at right. Inset, graph recording of a test





Frank S. Milburn, engineer, (right) confers with man who invented the broom attachment on opposite page

BRING ON YOUR

Frank Milburn is a sort of baby sitter for brain-children. His little shop in Burlington, Ky., hires out as adviser to inventors with ideas—and if they're good, helps put them on the market

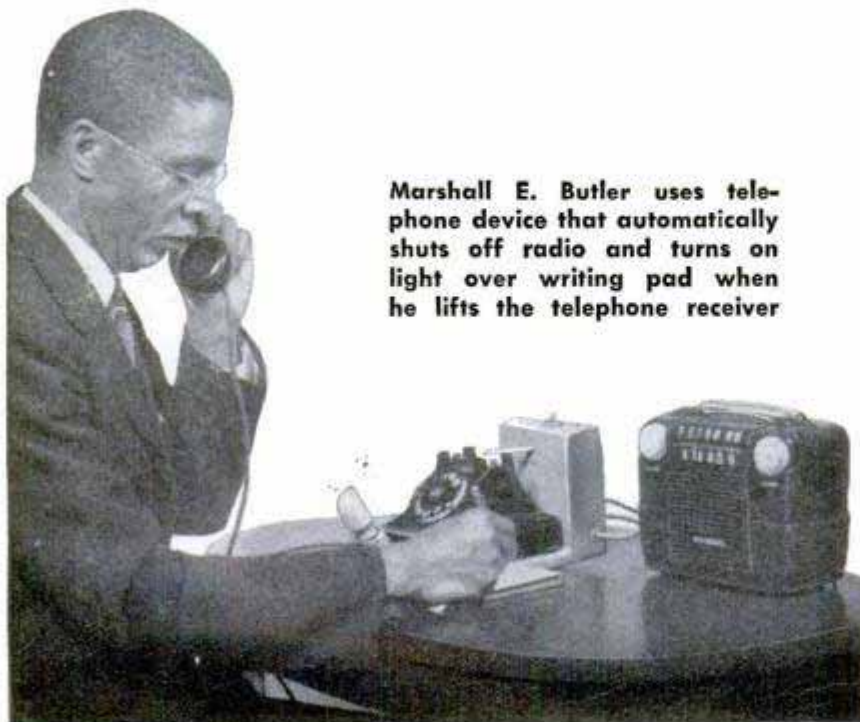
STRANGERS who visit the little town of Burlington, Ky., occasionally stop on Main Street and ask a native for directions. Before the visitor can open his mouth the native says:

"S'pose you-all are lookin' for Frank Milburn's place."

The surprised visitor nods.

"Well, you keep on this street until you come to the gravel and then follow the winding road till you pass a red tobacco barn on the left, then at the next bend you'll see a one-story building sitting in a cornfield. That's Frank's place."

Frank's place, as they call the Milburn Manufacturing Company in Burlington, is a mecca for inventors either in person or via the mailbag. Milburn and his associate, Henry W. Jenisch, have learned that the world is chock-full of eager inventors. Milburn says he is convinced



Marshall E. Butler uses telephone device that automatically shuts off radio and turns on light over writing pad when he lifts the telephone receiver

of the old saying that if you scratch the skin of any man deep enough you'll find a potential inventor inside.

Most everybody at some time or other has had an idea for an invention that they would like to turn into a gold mine. But Milburn, who ought to know, says that inventors are not greedy people. They get as big a kick out of hearing their brain-child acclaimed as they do the clink of coins. However, the fact that some \$300,000,000 was paid out in royalties in the U. S. last year doesn't dampen anybody's enthusiasm.

Frank Milburn, a young semiretired engineer, has for a number of years devoted part of his time to acting as a link between inventors and manufacturers. His job is engineering inventions—taking the inventor's rough sketch or crudely made gadget and from this making a production model. In his machine shop, Milburn and his assistants make the dies or molds necessary to produce the items. This, of course, follows careful study of the invention and decisions as to whether it should be made of metal, plastic or some other material.

Milburn charges for his services, but he says he refuses to engineer an elaborate article in which he thinks there is no merit. One man insisted that he produce a die-cast lollipop made of metal with flavoring in the metal alloy! Another insisted that Milburn make a rabbit whistle which is supposed to make a sound like a baby rabbit. The whistle is made of plastic, brass and reed and, over his



Garden-hose attachment on broom is used to clean out a dirty basement. Below, metal joint fastener below stops splitting (top)

INVENTIONS!

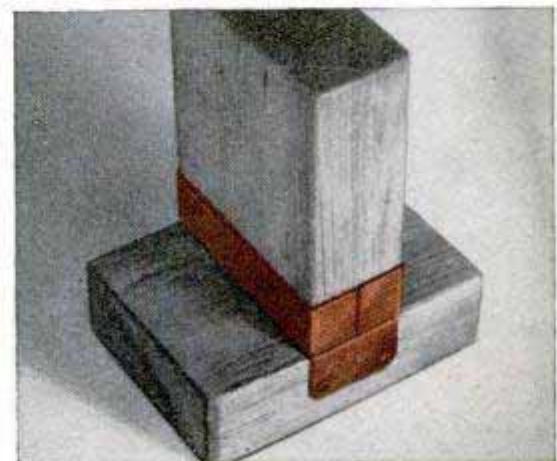
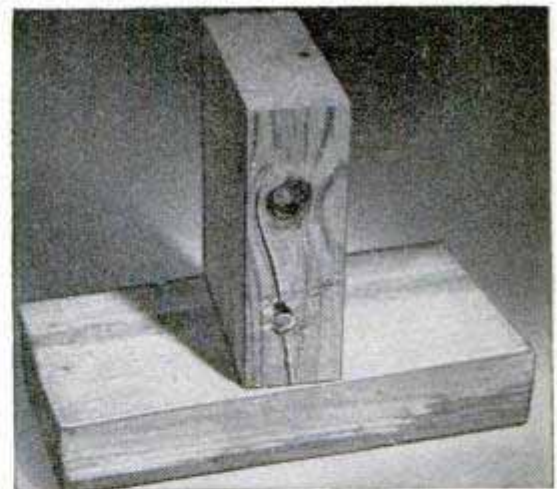
better judgment, he made one for the inventor.

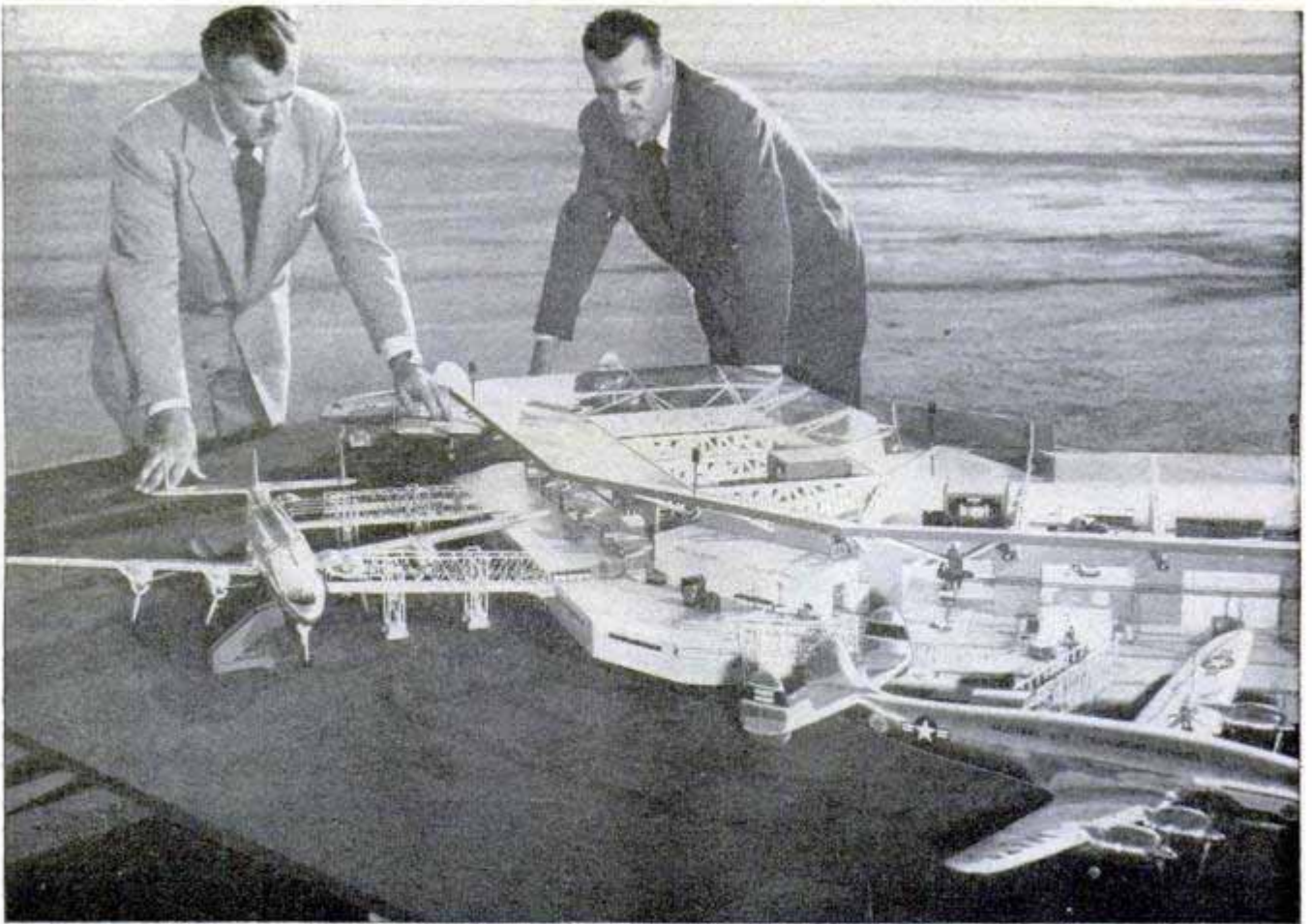
But these cases are the exceptions. There are other inventors like M. C. Duncan, a druggist in Russellville, Ky., who for years had had trouble with the various labels that a pharmacist has to use. Many of the labels were so small they would not stay in his typewriter. He came to Milburn with a few sketches and a cardboard model of what he figured would make a good labeling device. It consists of a little stand holding various sizes of labels in the form of rolls. These rolls can be run through a typewriter and torn off in varied sizes. Recently, Duncan added a statement roll to his stand and types out his monthly bills the same way.

Late one afternoon a man from Cincinnati walked into Milburn's office with a paper bag held reverently in both hands. The man dumped its contents on Milburn's desk: two old flashlights and five standard fuses. The inventor explained that he lived in an apartment building where his neighbors were always overloading the fuses which he had to replace. Usually in those cases he could find neither his flashlight nor fuses. His idea was a container for fuses with a flashlight attached. The finished article is now a small pen light fastened to a plastic fuse container.

One of Milburn's favorite inventors is J. A.

(Continued to page 242)





Model Air-Freight Terminal

Air-freight handling is speeded by a new conveyor that tows empty and loaded hand trucks to and from planes over an endless, oval track. The conveyor moves at a speed of three miles an hour. Either the trucks or mechanized loading belts continue into the planes with the freight, using mobile,

extendable platforms. Other features of the air-freight terminal, designed by the Lockheed Aircraft Corporation, are a raised floor to permit level loading and unloading and close-in ramp areas for the largest-type transports. This equipment could handle an estimated 80 tons of cargo hourly, approximately the daily capacity of the largest terminals now existing.

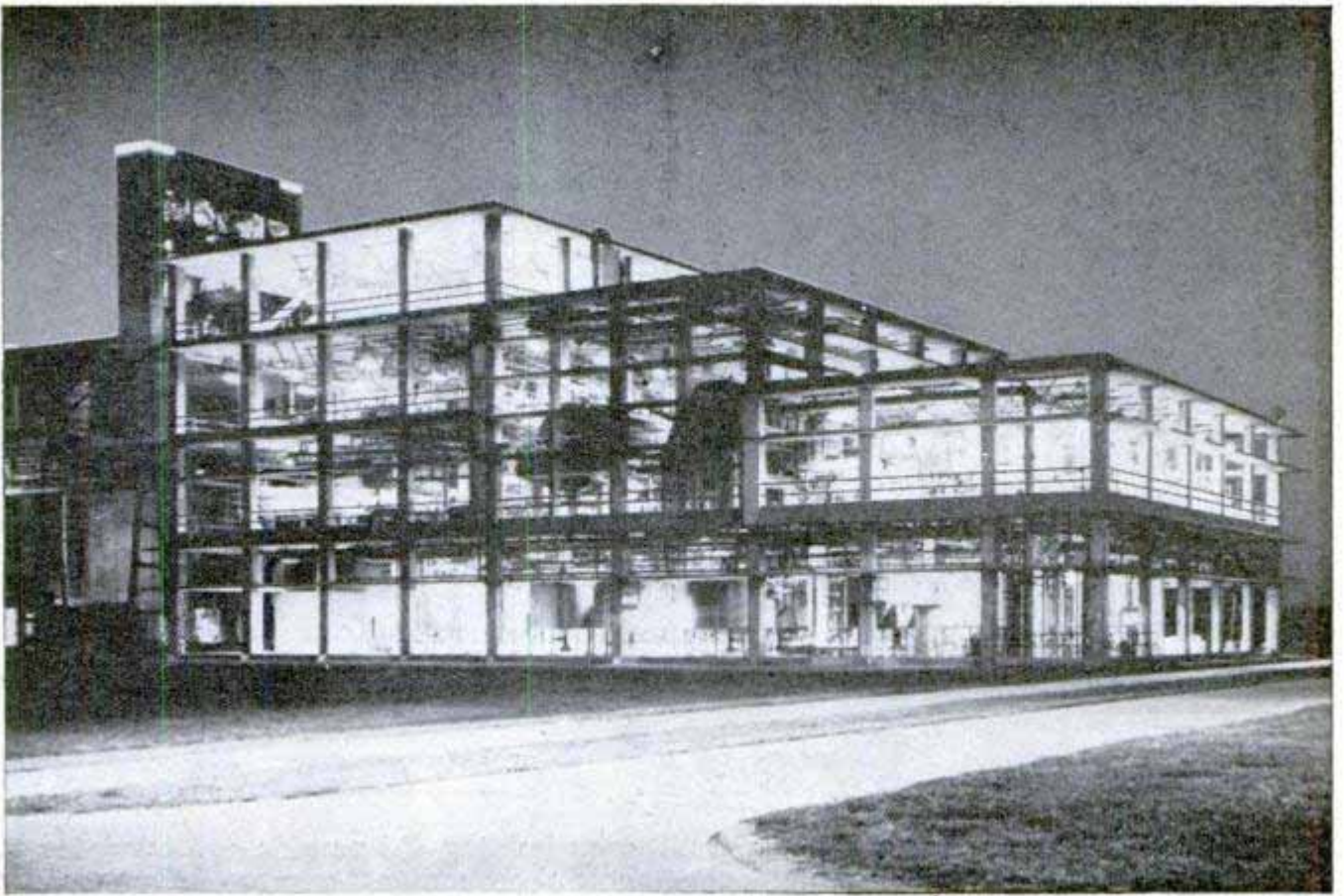
Low-Cost Homemade Car Runs 40 Miles Per Gallon

With the frame and wheels of a 1934 Ford, a 12-horsepower four-cylinder water-cooled engine, a clutch, transmission and

rear end from a junk yard, a former instructor at Dakota Wesleyan University built a unique automobile. The body of the car

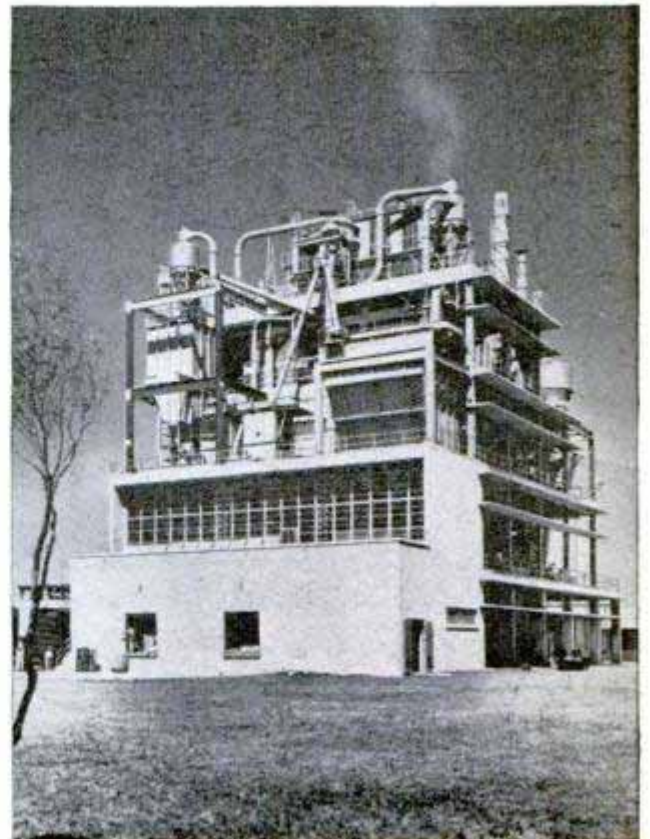


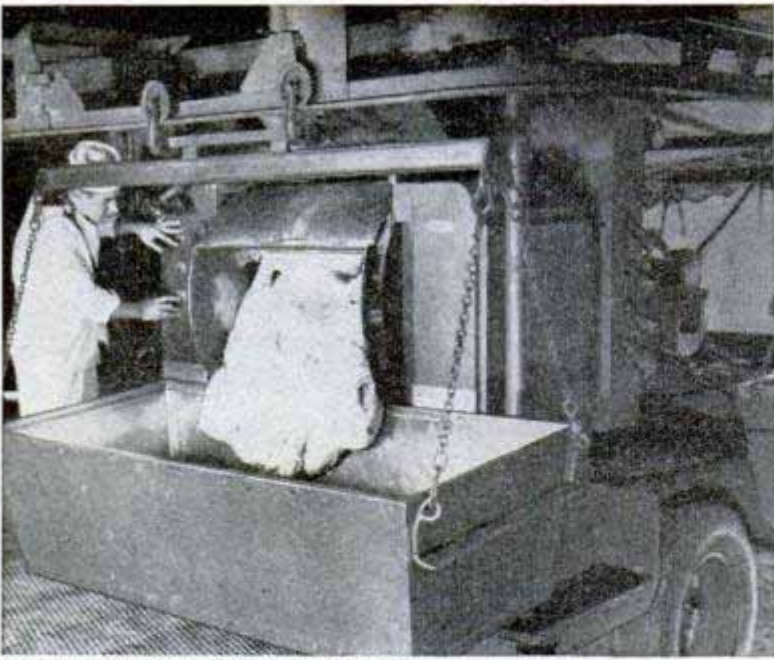
was made from scrap lumber, covered with hardboard and held together by two boxes of screws. Headlights, taillights, radiator grille and windshield were obtained at minimum prices. The hood ornament was the container for an airplane's loop antenna and a glass dome for the top is from a refrigerator. The builder, Nelson Beck, devoted six weeks' work and \$76.68 to his project which has begun to repay him by running 40 miles to the gallon at an average speed of 55 miles per hour.



Factory Without Walls

Fresh air wafts through all the buildings of a new factory in Corpus Christi, Tex.—there are no walls to hold back the wind. The factory refines sorghum grains and corn into starch, sugar and cattle feed, a hazardous process because of the danger of grain-dust explosions and poisoning from sulphuric-acid fumes. Designers of the modern factory decided to eliminate all walls, thereby preventing concentrations of dust and fumes inside the buildings. Night photo above shows how the columns bear only the ceilings and floors. Below, left, only stairways and maintenance rooms are enclosed. Right, overhangs hold out sun and rain





Quartermaster Corps, U. S. Army, photos

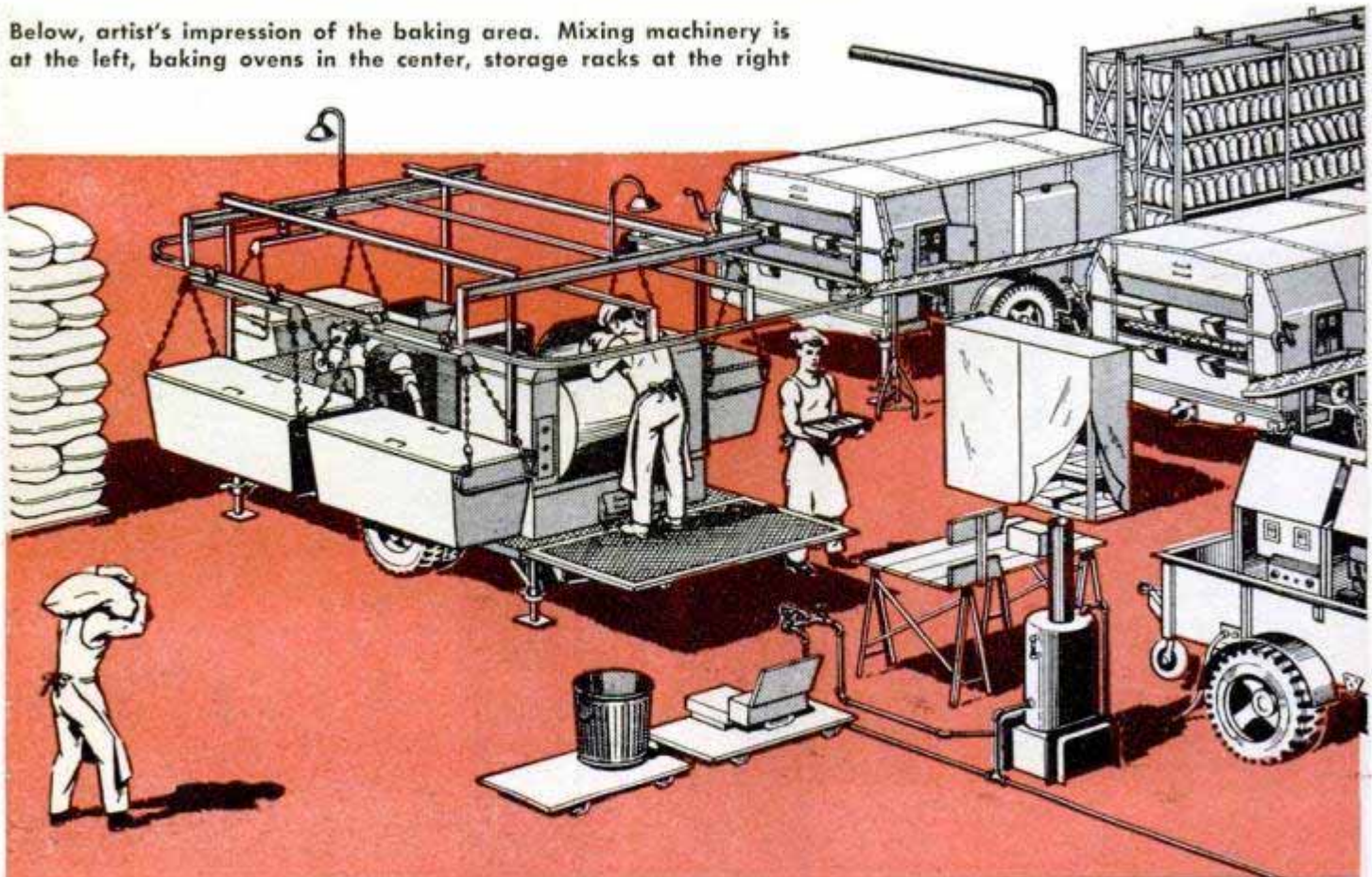
Left, mixed dough being poured into 492-pound trough. Right, "punching the dough" during fermentation stage

Enough Bread for an Army

FRESH BREAD daily for 96,000 soldiers, more than double the old equipment's capacity, is turned out by the new mobile bakeries developed by the Army's Quartermaster Corps. Each bakery company, with three mixing and make-up trailers and six oven trailers, can now produce the two-pound loaves at a 20-per-minute rate. The men eat an average of $\frac{1}{2}$ pound apiece daily. The stainless-steel dough troughs,

each holding 492 pounds, are insulated to hold their contents at a fixed temperature during the monorail ride from the mixing bowls. Measuring and molding of the loaves is done mechanically. From the ovens, the loaded pans move over skid-wheel conveyors to storage racks where they are left to cool for two hours. The complete bread-making process takes four hours, including two hours for dough fermentation.

Below, artist's impression of the baking area. Mixing machinery is at the left, baking ovens in the center, storage racks at the right





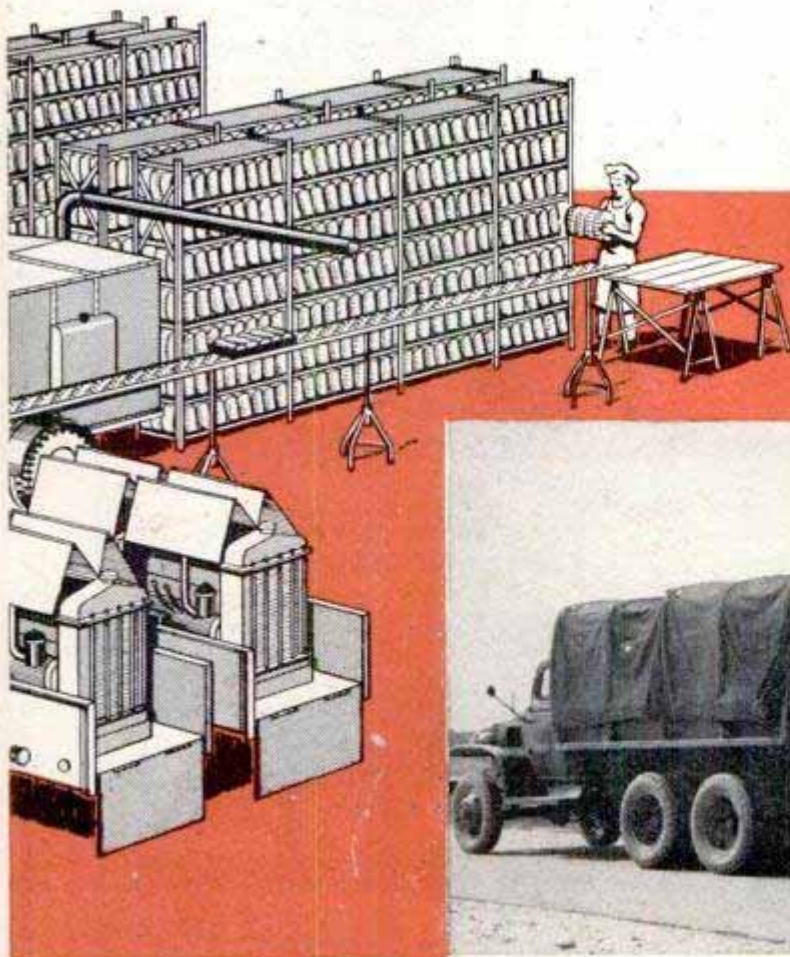
Above, the man standing in the background is feeding dough into the divider, from which two-pound pieces drop onto conveyor belt and move into molder. The two soldiers in the foreground are putting molded loaves into pans, where they will stay for 30 minutes while the dough achieves proper degree of lightness

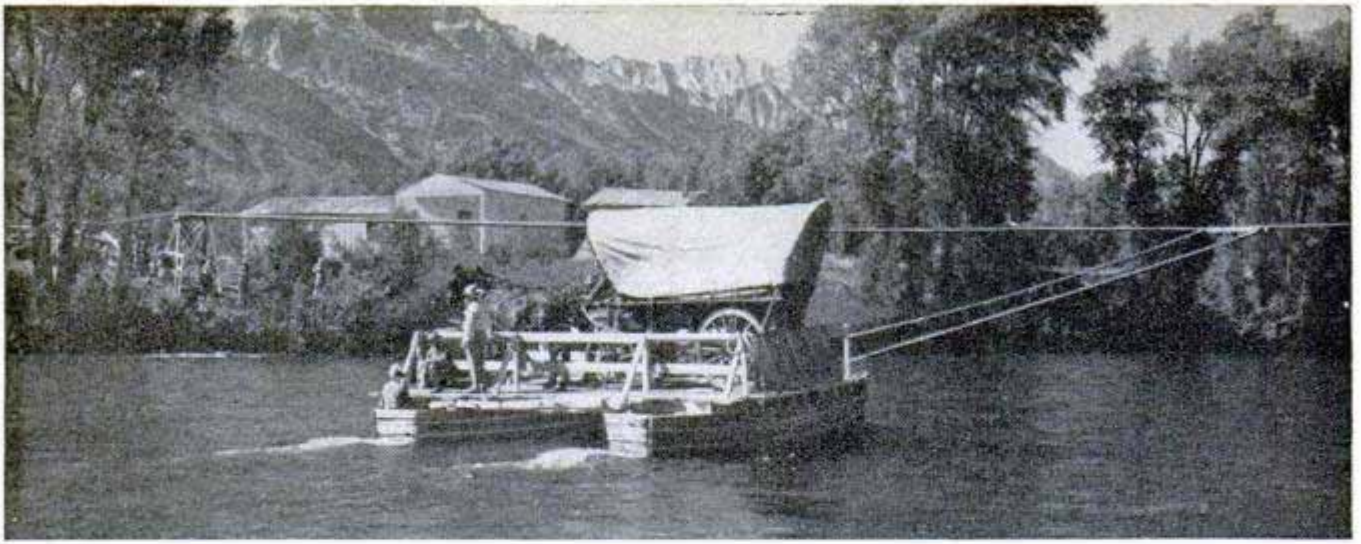


Above, after the dough has risen to correct consistency, loaves are put into oven to bake for 30 minutes



Above, pans of baked loaves are put on conveyor for transfer to storage racks, where they have to cool for two hours. Below, Army truck and a mixing and make-up trailer ready to roll to new site

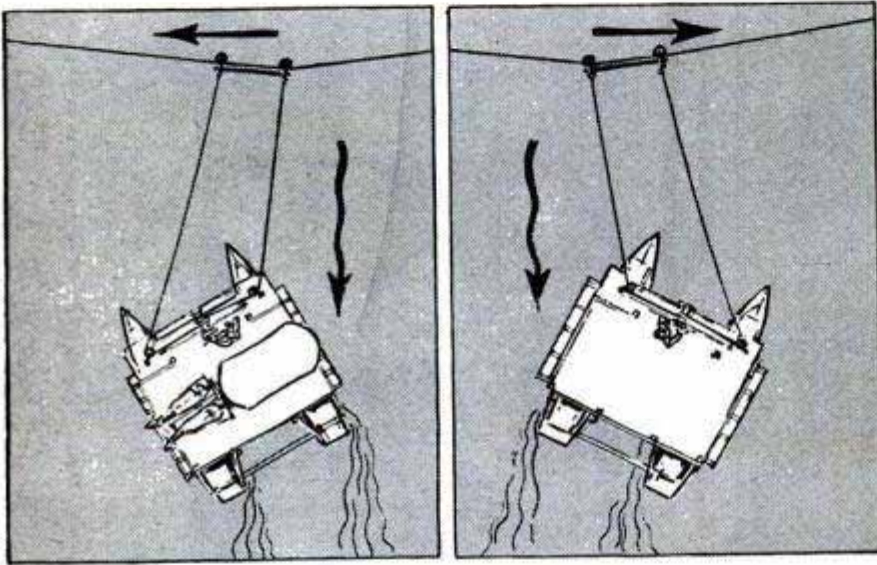




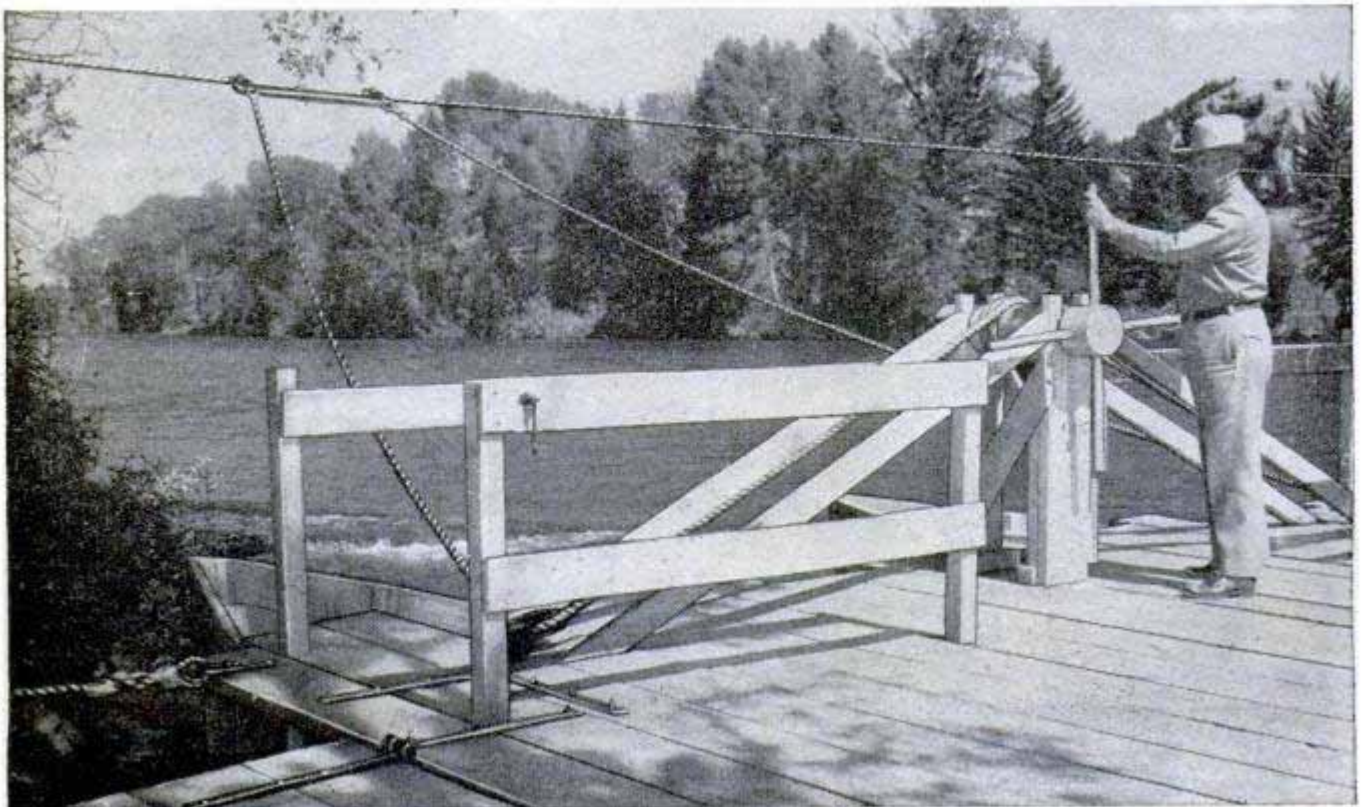
Carrying this old Conestoga wagon and its team of horses, the ferry makes its initial trip across the Snake River after the restoration

COVERED-WAGON FERRY RESTORED IN WYOMING

Increasing traffic in 1927 forced abandonment of Menor's Ferry, for 35 years the only connection between the east and west sides of Jackson Hole, Wyo. Instead, a steel bridge was built near by over the Snake River. After 22 years of inactivity, the ferry has been restored by Rockefeller interests. The replica was achieved by examining old photographs and original remnants of the rotting ferry gear. Now visitors to this ferry at Moose, Wyo., may ride across a real piece of the Old West.

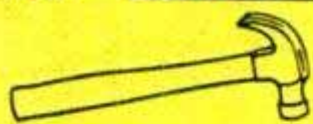


Above, the current is the ferry's "motor." Below, a winch changes the angle of the boat in the current and, thus, its direction of travel



the

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Featuring

Stop Leaky Plumbing... 183

Fit Out Your Boat... 189

Bandsawing Metal... 211

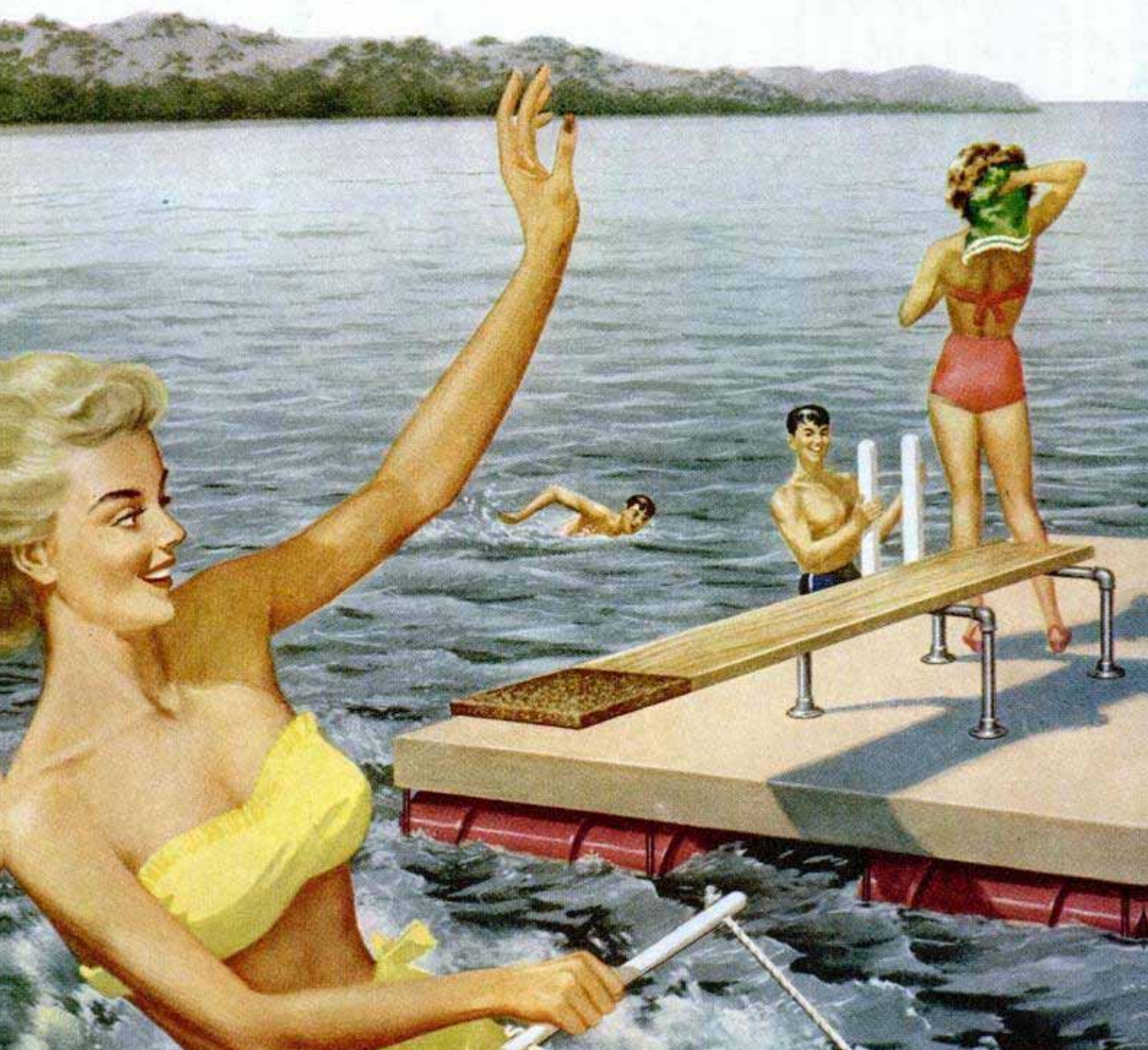


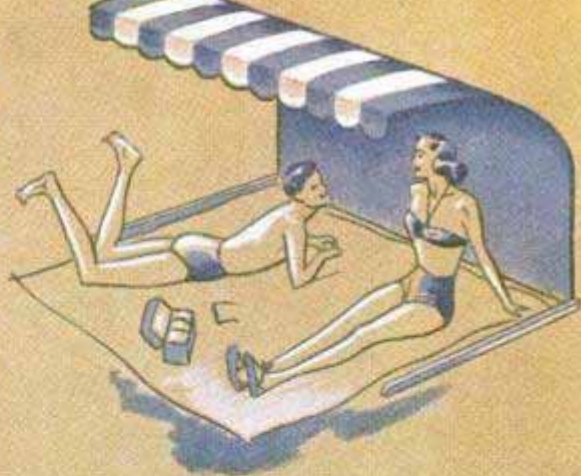
Kosta
Beach Equipment
See Page 166

Beachward Ho!

By Frank N. Stephany

Spending the summer at a private beach or driving the family to the seashore for a day's outing is twice the fun if you have the right equipment. Whether you enjoy relaxing in the sun or rigorous water sports, here's everything you'll need to have a wonderful time

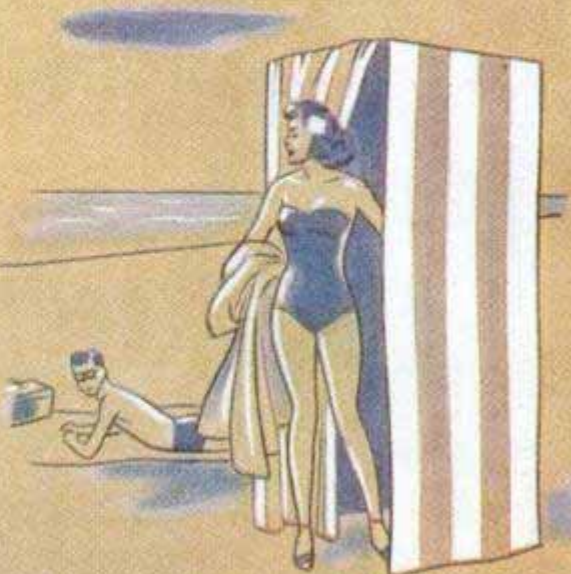




Awning-covered frame provides attractive sunshade

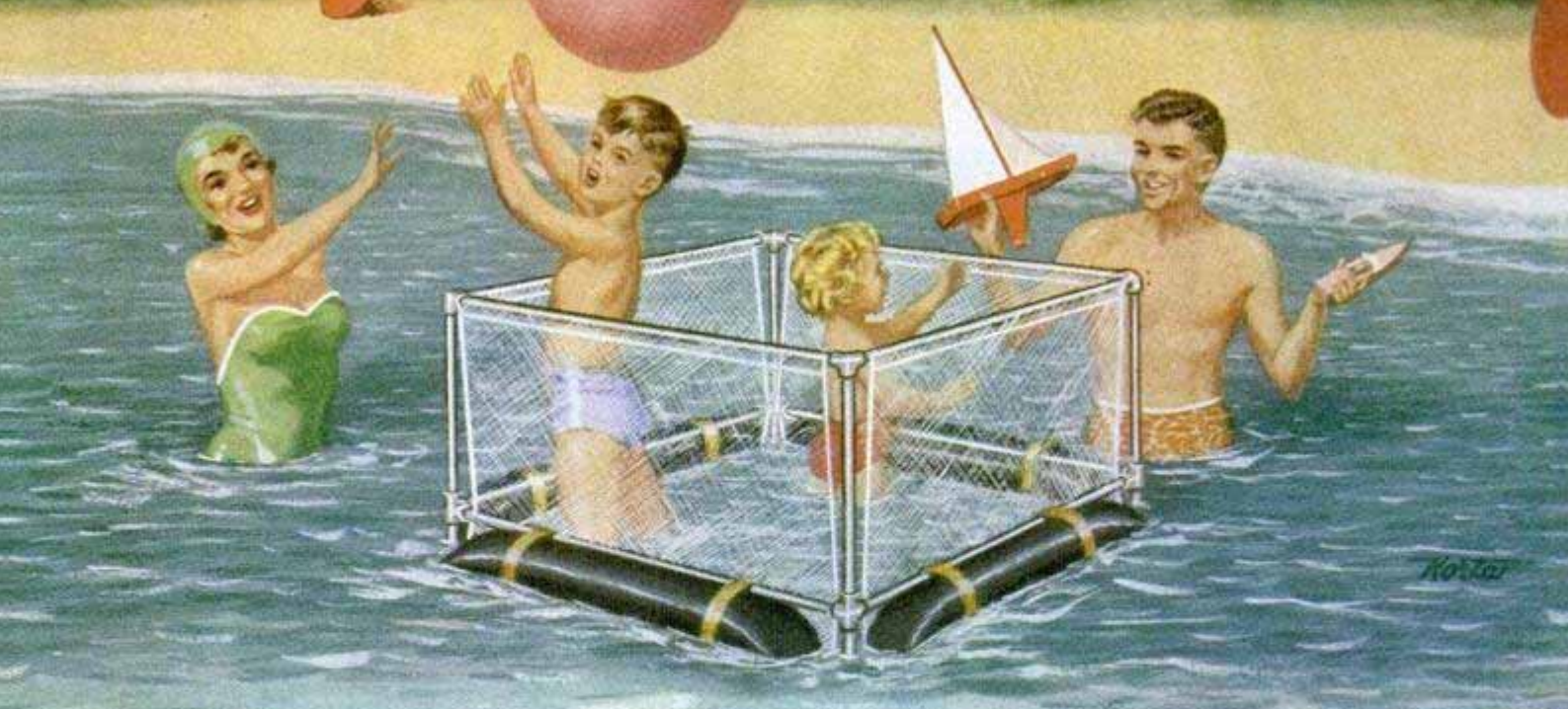


Beach chair folds like a suitcase for easy carrying



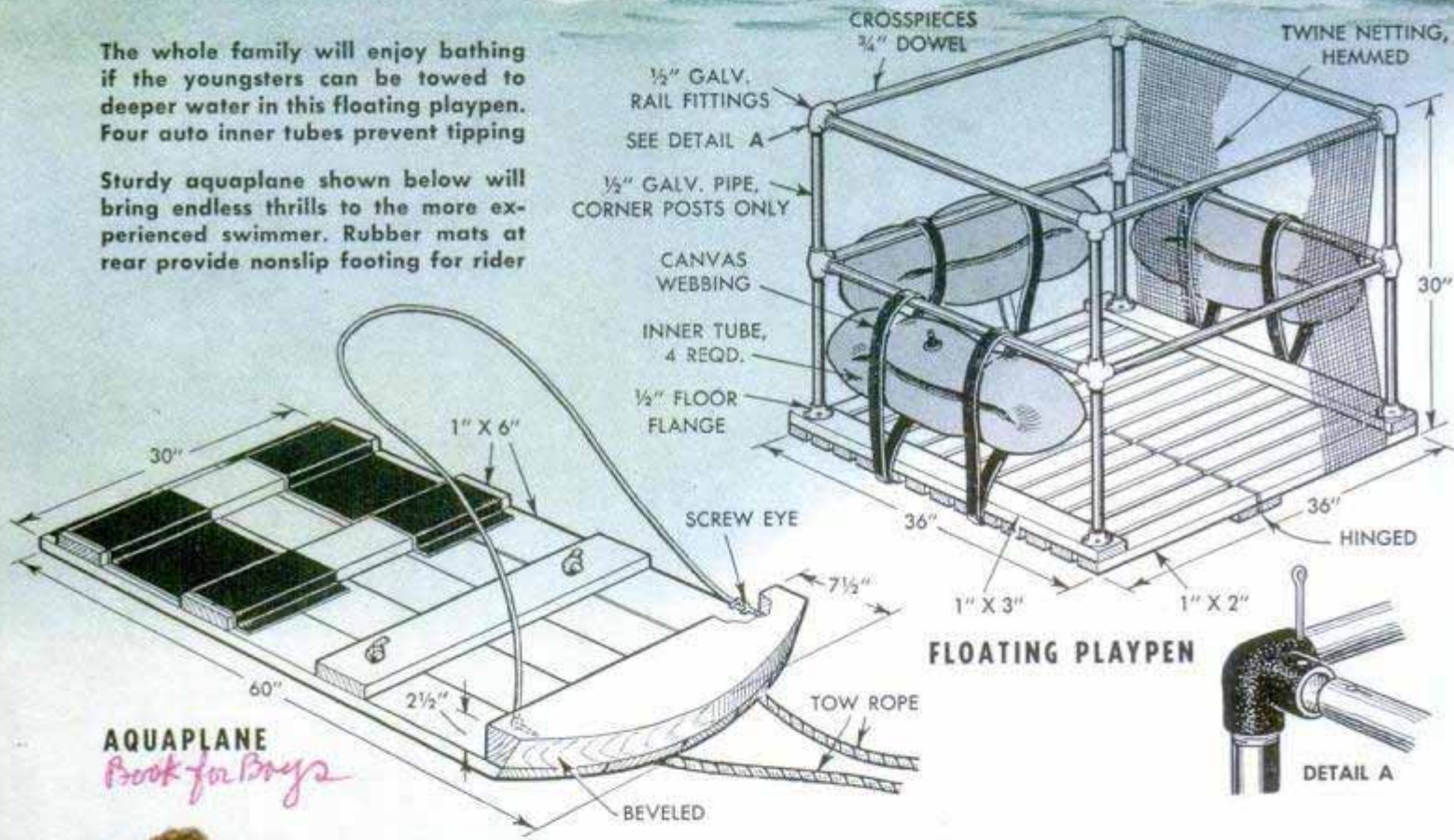
Portable "dressing room" affords complete privacy

Artista

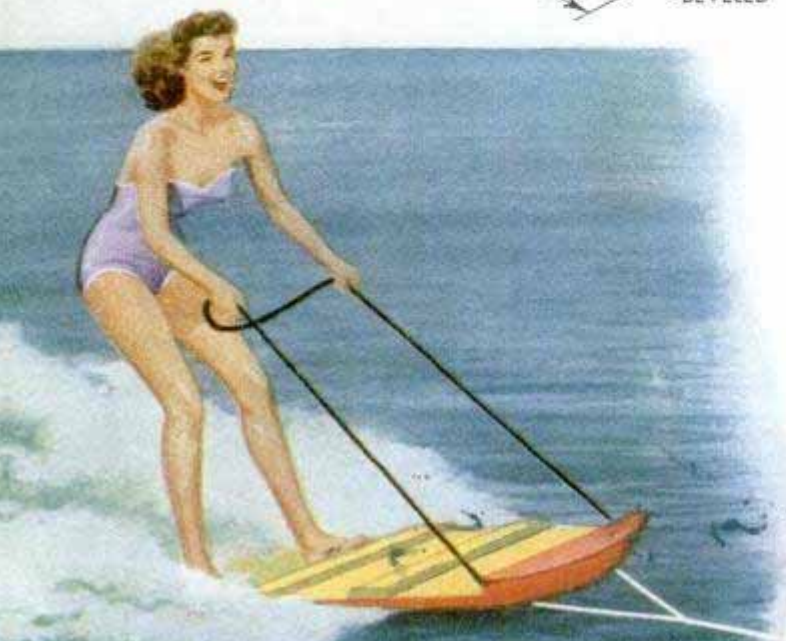


The whole family will enjoy bathing if the youngsters can be towed to deeper water in this floating playpen. Four auto inner tubes prevent tipping

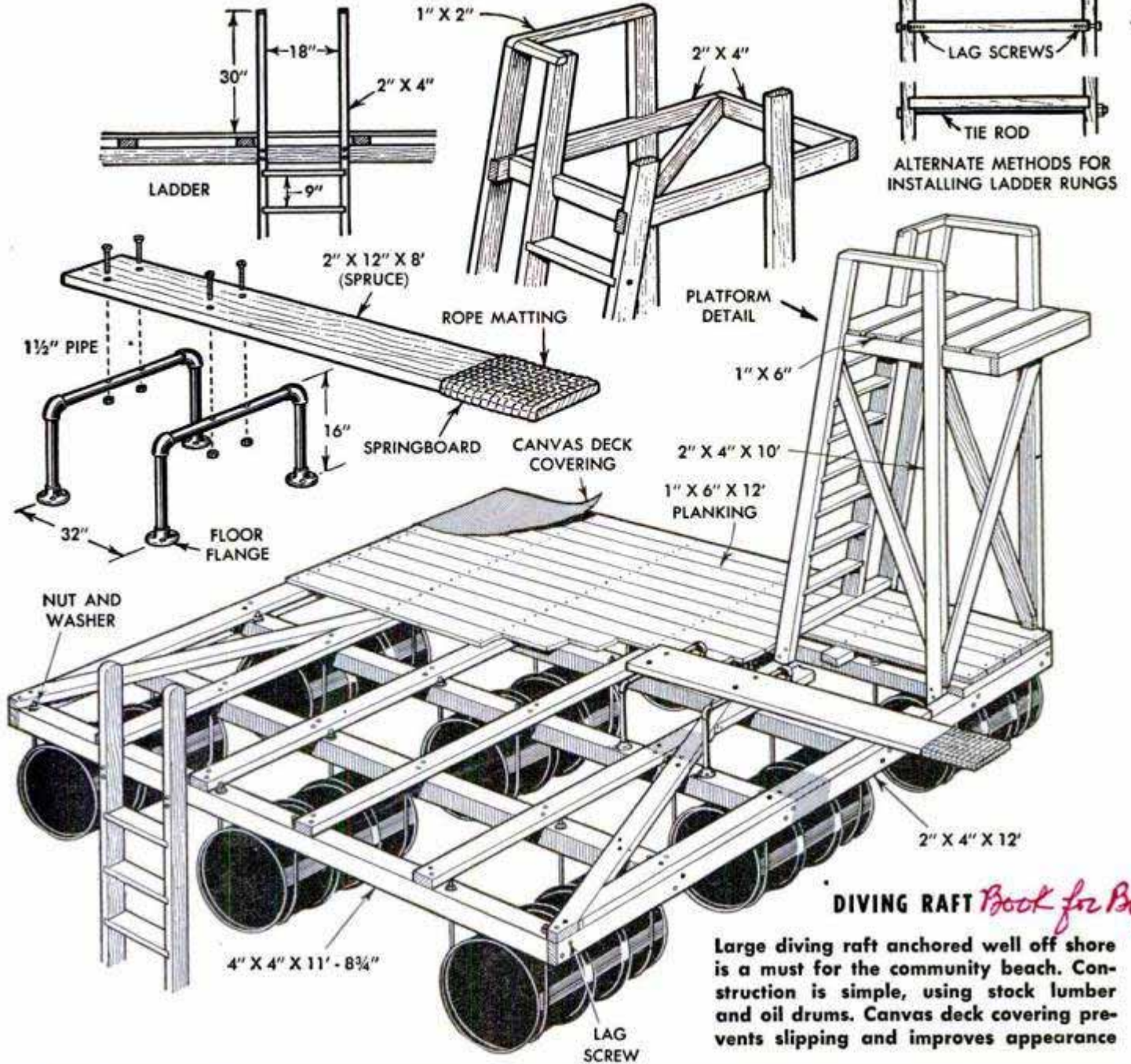
Sturdy aquaplane shown below will bring endless thrills to the more experienced swimmer. Rubber mats at rear provide nonslip footing for rider



AQUAPLANE
Book for Boys



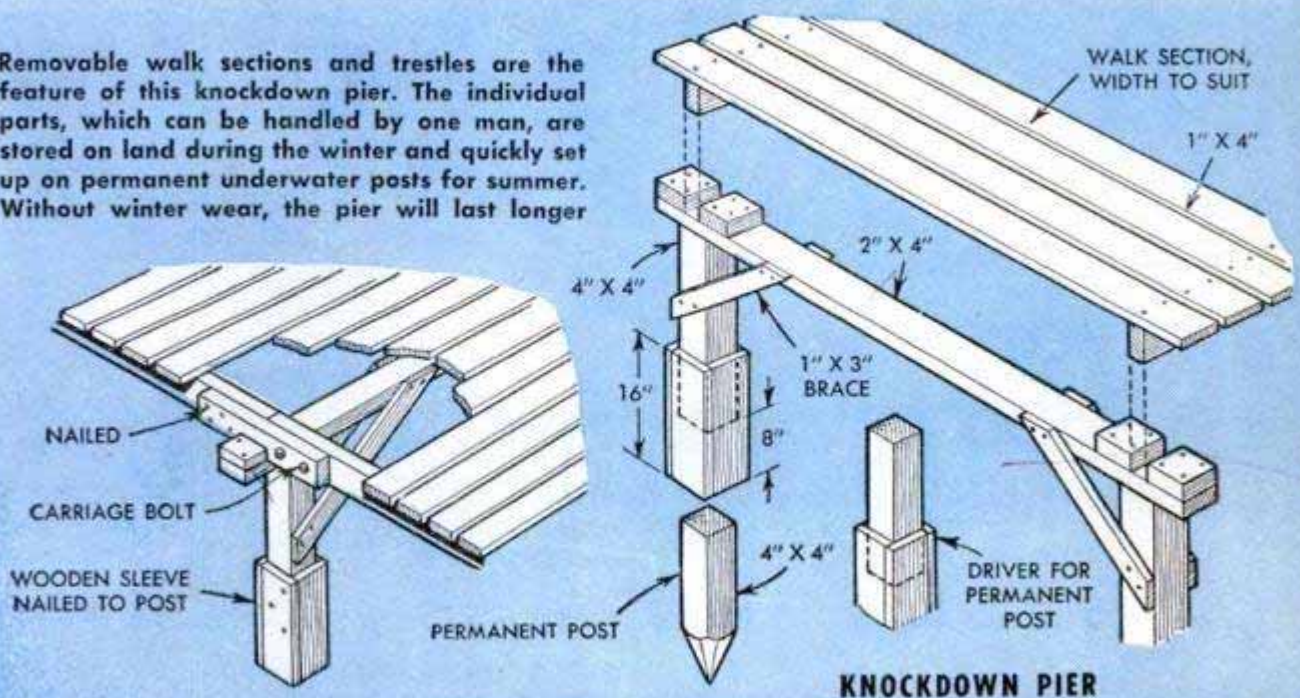
OF THE various beach items described on this and the next three pages, the diving raft, knockdown pier and lounging chair are the only ones which require a considerable amount of work. Most of the remaining articles can be built in a few hours and feature simplicity of construction along with maximum portability. For example, the floating playpen detailed above comes apart merely by removing the pins which hold the rails in place. After the rails are pulled from the netting, the inner tubes deflated and the pipe uprights unscrewed from the floor flanges, the hinged platform can be folded and the entire unit then packed neatly in the trunk of a car.

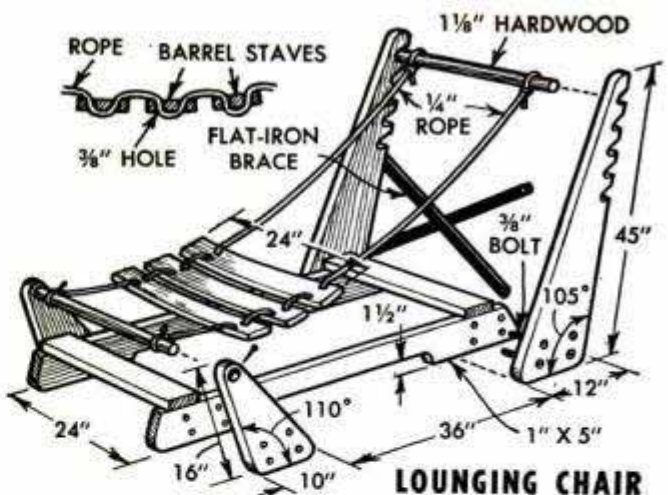


DIVING RAFT *Book for Boys*

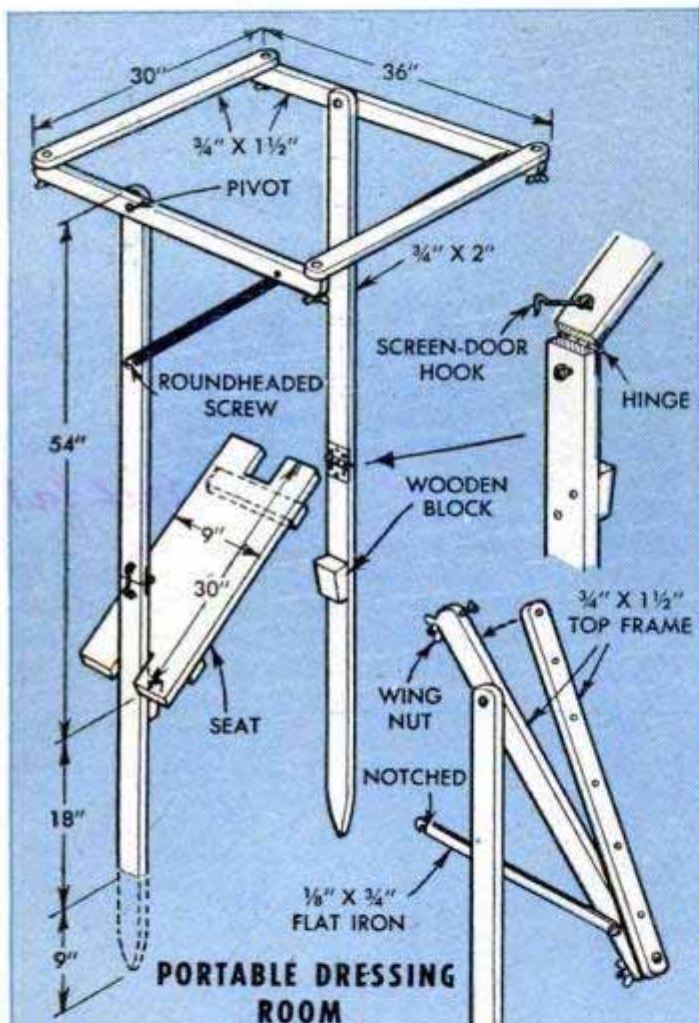
Large diving raft anchored well off shore is a must for the community beach. Construction is simple, using stock lumber and oil drums. Canvas deck covering prevents slipping and improves appearance

Removable walk sections and trestles are the feature of this knockdown pier. The individual parts, which can be handled by one man, are stored on land during the winter and quickly set up on permanent underwater posts for summer. Without winter wear, the pier will last longer

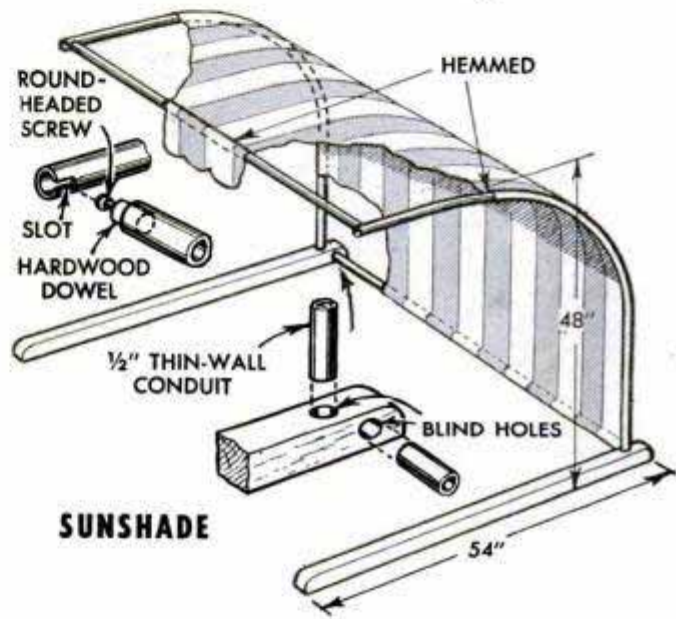




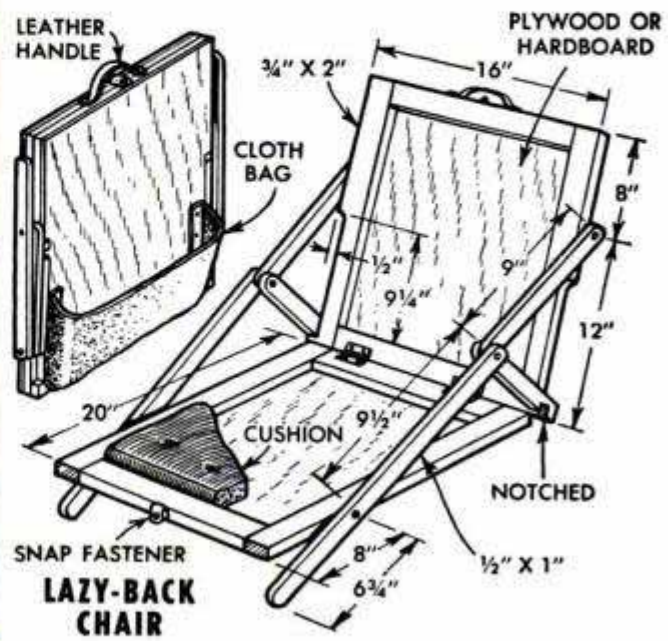
This lounging chair for the private beach is just the thing to help you spend those lazy summer afternoons in solid comfort. It's adjustable to four different positions so you can sit up to read or lie down to relax while basking in the sun

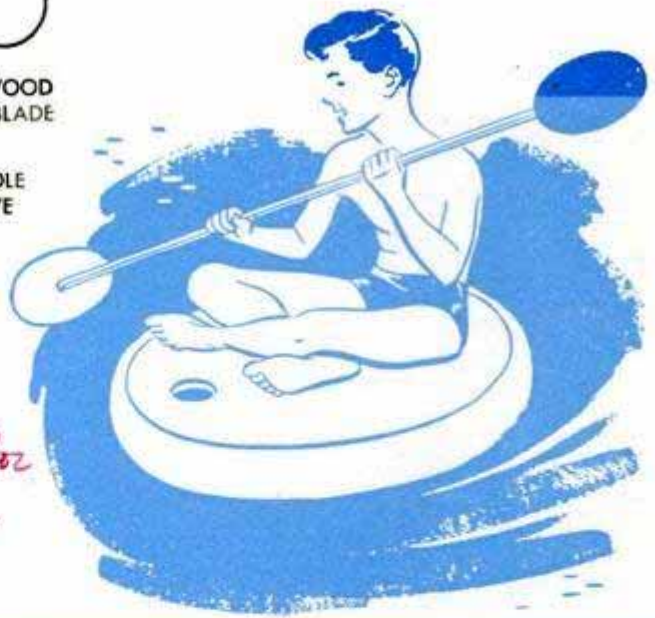
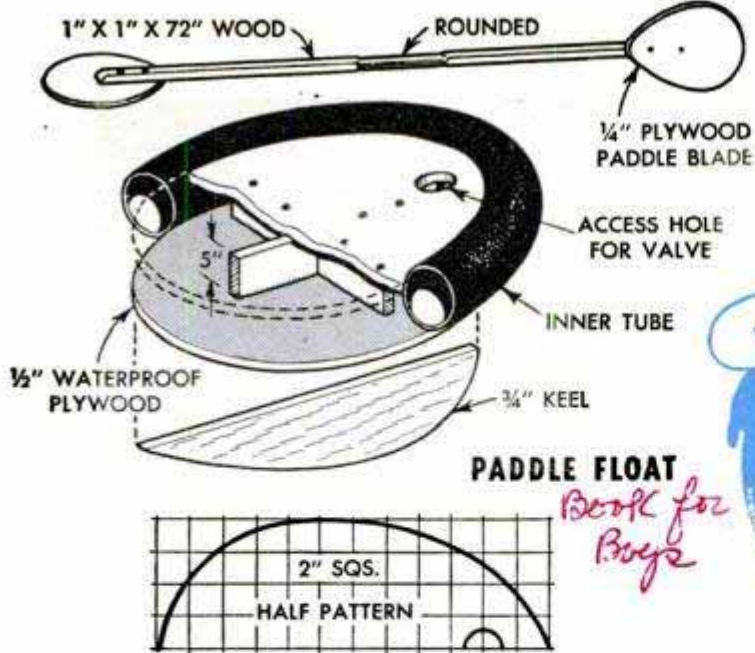


Conveniently carried in the trunk of your car, this portable dressing room is set up on the beach in a few minutes



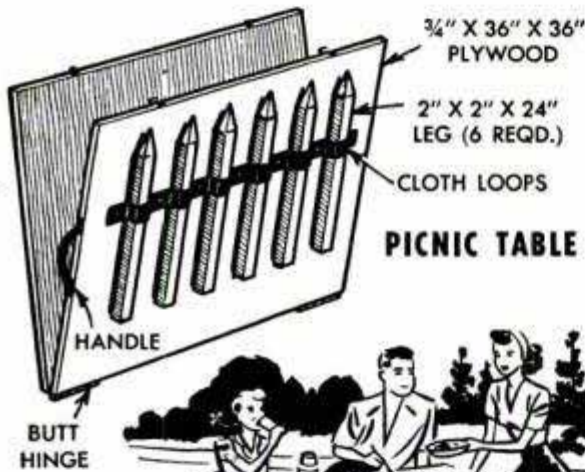
Thin-wall conduit forms the frame for the generously proportioned sunshade shown above. Two lengths of wood support the frame. Below, lazy-back chair with pocket for sundries has handle for carrying. Cushions are used on seat and back





Book for Boys

There's real adventure in the shallow beach water for the young mariner who is master of his own paddle float, above. Drive the stakes for the picnic table, below, place the top over them, and you're all set. For easy handling, the top folds together and the stakes fit in cloth loops

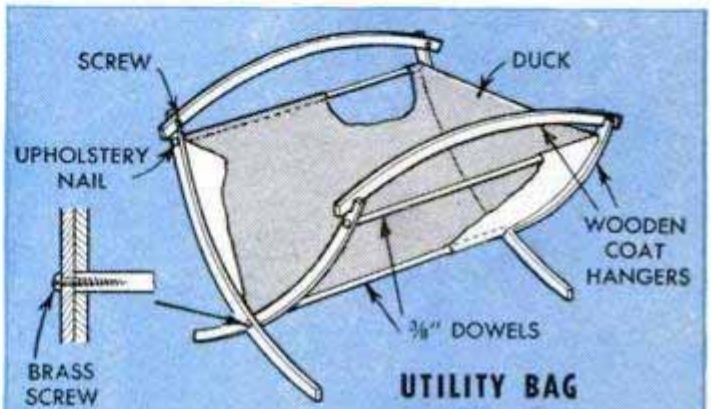


PICNIC TABLE



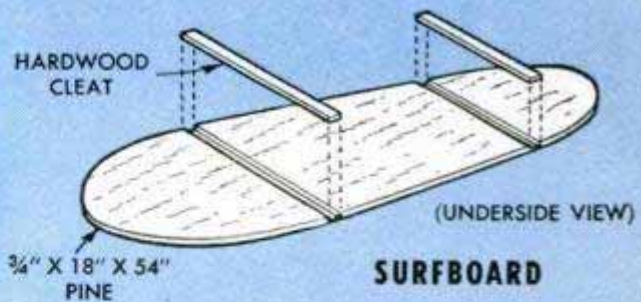
If the 12 x 12-ft. diving raft, which is floated on tightly sealed oil drums, is too large, the basic construction can be adapted readily to a smaller and less pretentious raft. The cross members are spaced to rest near the edges of the drums and are held tightly in place with hangers of threaded 1/2-in. iron rod. Should extra buoyancy be needed, additional drums are easily installed. Note that the diving platform and spring-board can be located to straddle any pair of the 4 x 4-in. cross members.

The knockdown pier may be built in as many sections of a conveniently handled size as are required to attain the desired length. When assembling the pier, the trestles are slipped over permanent posts set below water level.



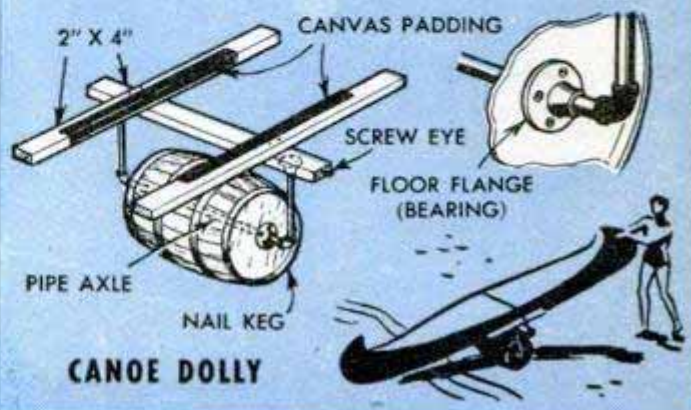
UTILITY BAG

The utility bag shown above is made from wooden coat hangers. The surfboard, below, is simply a pine board with rounded ends. Hardwood cleats glued in grooves on the underside prevent warping



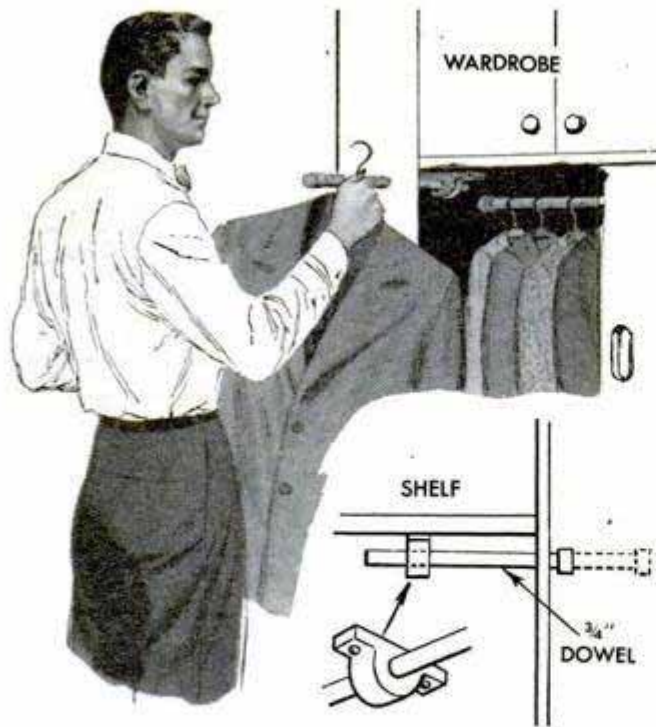
SURFBOARD

Bringing a large canoe across a sandy beach is almost effortless if the boat is lashed to this nail-keg dolly. A reamed floor flange at each end of the keg serves as a bearing for the axle



CANOE DOLLY

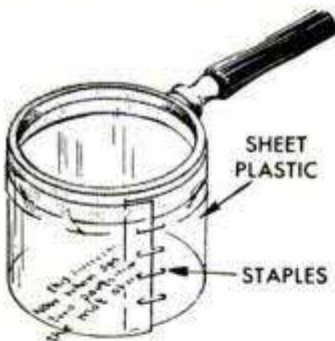
Wooden Pull-Out Bar on Wardrobe Aids Handling Garments



Sorting a number of garments for the dry cleaner or even selecting a particular suit or dress is facilitated by this handy pull-out bar which is installed at one end of a wardrobe. As each garment is removed from the clothes pole, it can be hung from the bar, leaving the hands free to remove another garment, or to close the wardrobe doors. In addition, the bar holds the garments out in the open where it is easy to brush the lint from them. The bar is simply a length of $\frac{3}{4}$ -in. dowel fitted through a hole drilled in the front of the wardrobe and supported by a wooden hanger. A pin driven through the rear end of the dowel prevents its being pulled from the hanger, and a disk, slightly larger than the diameter of the dowel, is screwed to the front end of the bar to keep the coat hangers from slipping off. The bar is stained or painted to match the finish of the wardrobe.—Hi Sibley, Nuevo, Calif.

Magnifying Glass Supported By Plastic Cylinder

Taped around the frame of a magnifying glass, a plastic cylinder steadies the glass at the desired height above the reading matter, thus making it easier to manipulate the glass with one hand while holding the newspaper or magazine in the other. To form the support, cut a sheet of transparent plastic, making it a little longer than the



circumference of the lens frame. Then, overlap and staple the ends together to form a cylinder. The width of the plastic should be sufficient to support the glass at the proper height above the type. Then attach the cylinder to the outside of the lens frame with one or more strips of cellulose tape. If the plastic is thin, more than one layer may be required for rigidity.

James Vick, Church Road, Va.

Safety Shutoff for Gas Range Is Out of Child's Reach

When they are allowed to play in a basement where there is a gas range or hot plate, there is always the danger that the children will turn on the jets with disastrous results. To prevent this, equip the gas line with a shutoff which is within easy reach of an adult but well beyond the reach of a small child.—Paul Will, Chicago.

Clay Holds Phonograph Needles

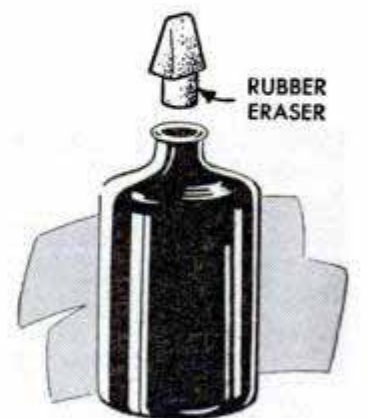
A ball of modeling clay stuck to the underside of a phonograph lid forms a convenient holder for new and used needles. New needles can be inserted in the clay like pins in a pin-cushion while the worn ones may be pressed completely into the clay, thus eliminating any guesswork when selecting a new needle. When a number of used needles have accumulated, the ball of clay is discarded and a fresh one substituted.

Theodore Simonson, Averill Park, N. Y.



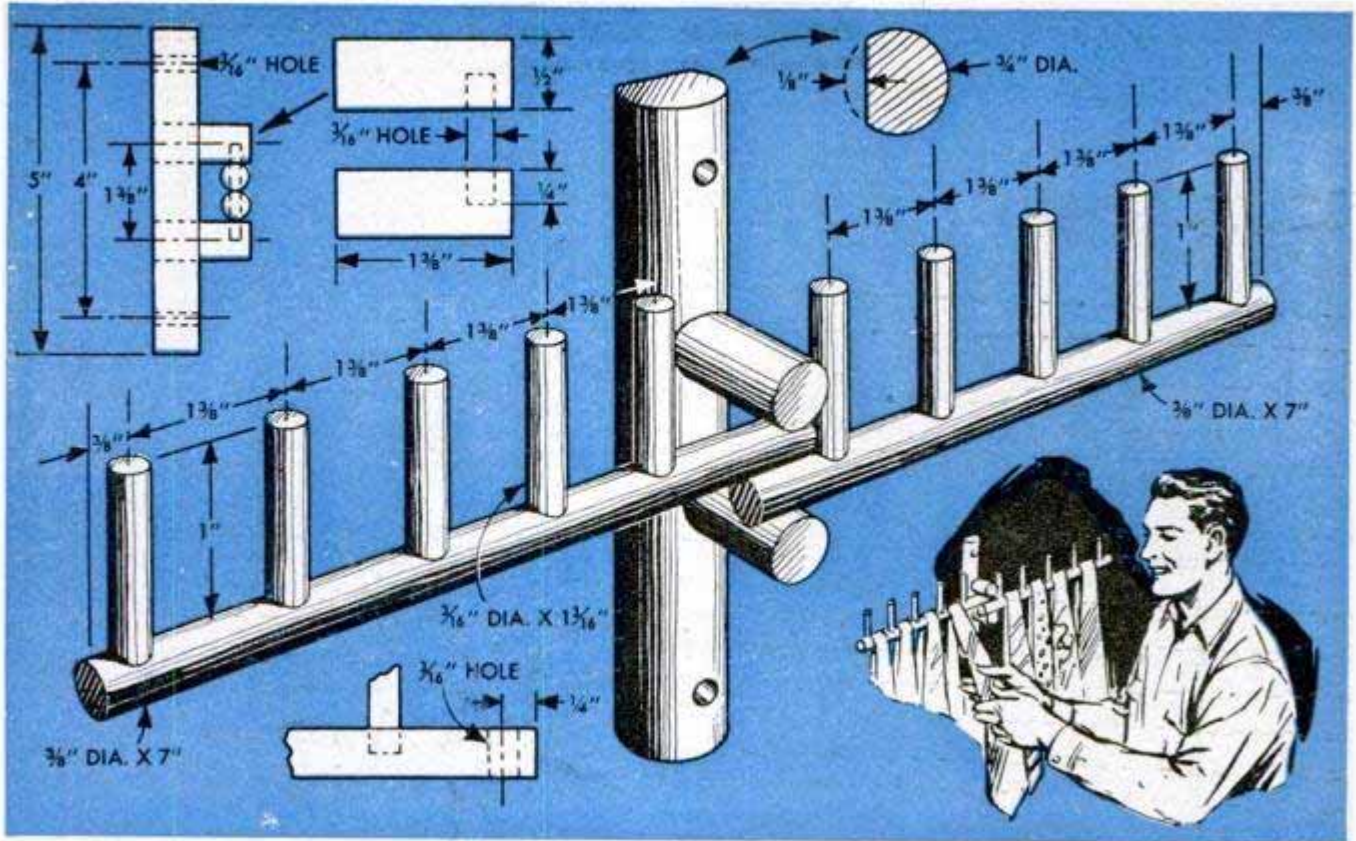
Pencil Eraser Forms Bottle Cork

If the cork from a small bottle is lost, a suitable stopper can be had by pressing a detachable pencil eraser into the neck of the bottle. The wedge-shaped top of the eraser provides a fingerhold for removing the stopper.



☛ Cayenne pepper sprinkled liberally in the camp food box will give complete protection from ants and mice.

Novel Swinging Tie Rack Is Made From Dowels



If you like "quickie" projects, here's a wall tie rack that can be made almost entirely on the drill press in a matter of minutes. The whole thing is made of three sizes of standard dowel rod, the armpieces being supported by a V-block when drilling blind holes for the dividers. Locate and drill four holes through the base, two near the ends for screws and two for the 1/2-in. supports for the swinging arms. Cut the arms to length and space and drill holes for the dividers. Cut dividers from 3/16-in.

dowel stock and glue in place on the arms. Drill one end of each arm clear through for a 3/16-in. pivot dowel, also drill 3/16-in. holes halfway through each support piece. Now you're ready to assemble the unit. Place the ends of the arms together so that the 3/16-in. holes line up and force the pivot dowel through until the ends project equally. Then assemble as in the upper left-hand detail. Finish in the desired color and attach to the wall with screws.

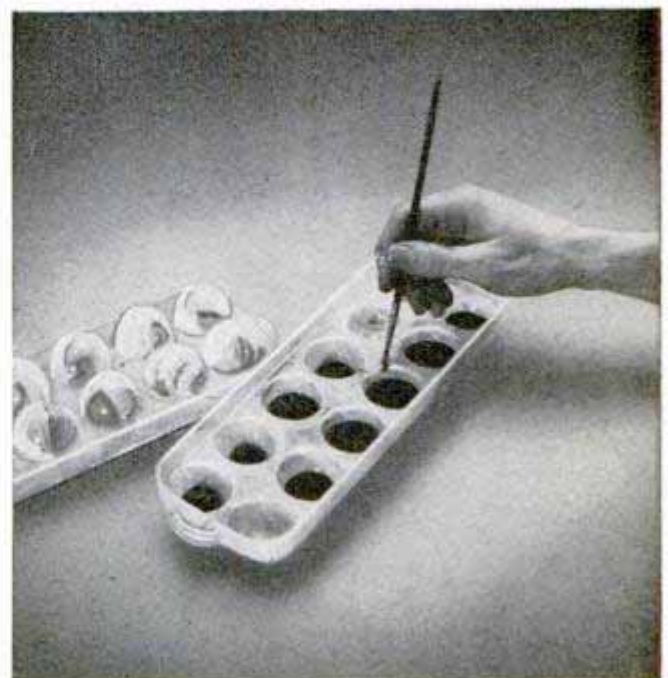
I. M. Fenn, Chicago.

Plastic Egg Tray Forms Palette for Mixing Water Colors

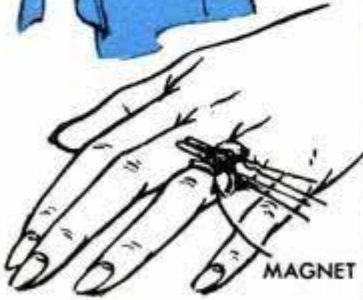
A two-part plastic tray of the type used to store eggs in the refrigerator provides an inexpensive palette for mixing water colors. Both the bottom and top of the tray can be used, each affording a dozen individual compartments which will hold more than enough color for ordinary purposes. The tray will rest steadily on a flat surface and is exceptionally easy to keep clean.

Open Top Sash to Cool Room

To cool off a warm room as quickly as possible after a hot summer day, lower the upper window sash several inches in addition to raising the bottom sash. The cool air will enter at the bottom of the window and the hot air in the room will escape readily through the opening at the top. Use a small collapsible screen to keep insects from entering at the top of the window.



Solving HOME



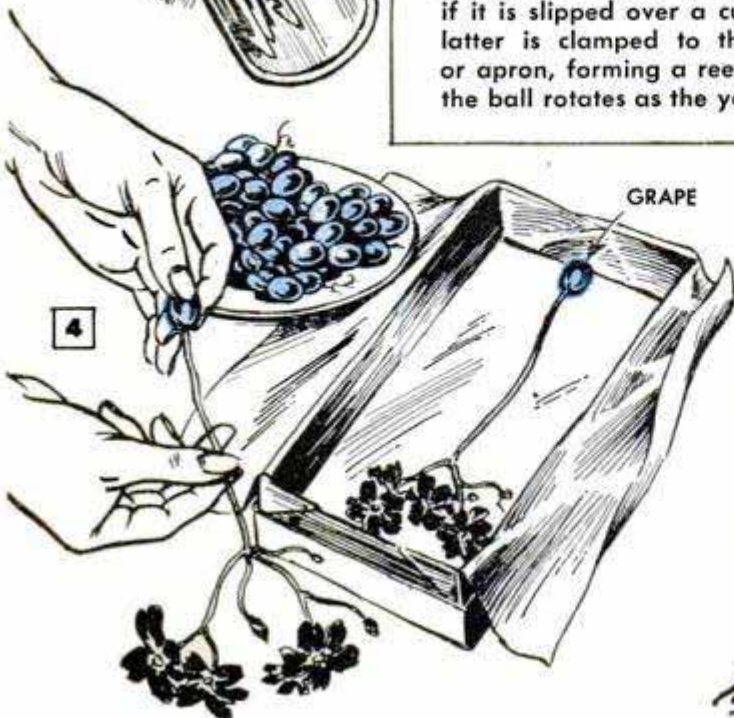
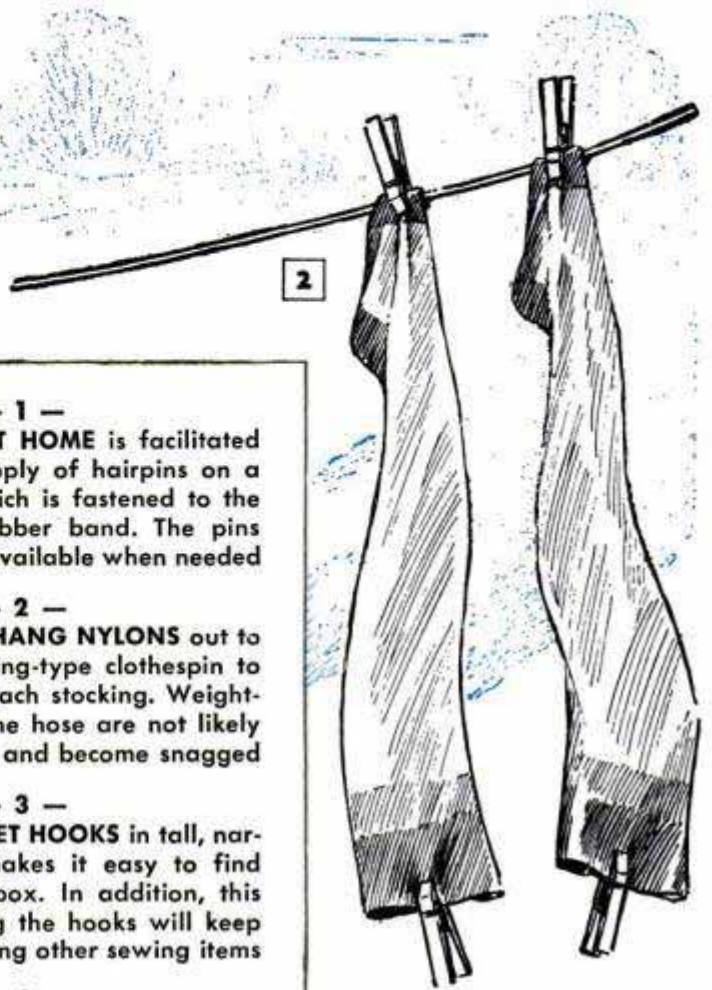
— 1 —
SETTING HAIR AT HOME is facilitated by keeping a supply of hairpins on a small magnet which is fastened to the finger with a rubber band. The pins are immediately available when needed

— 2 —
NEXT TIME YOU HANG NYLONS out to dry, clamp a spring-type clothespin to bottom edge of each stocking. Weighted in this way, the hose are not likely to blow over line and become snagged

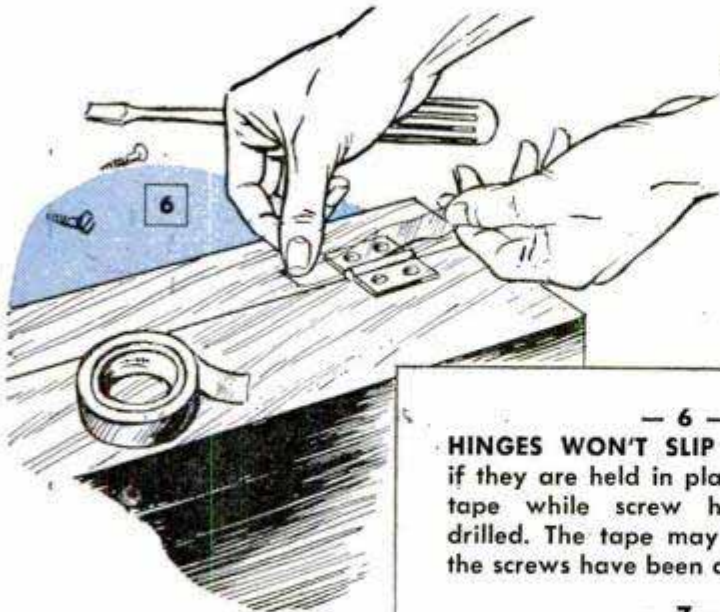
— 3 —
STORING CROCHET HOOKS in tall, narrow olive jars makes it easy to find them in sewing box. In addition, this method of storing the hooks will keep them from snagging other sewing items

— 4 —
TO KEEP FLOWER CUTTINGS MOIST when sending them through the mail, impale a grape on end of each stem. The grape will supply sufficient moisture to keep the cutting in good condition

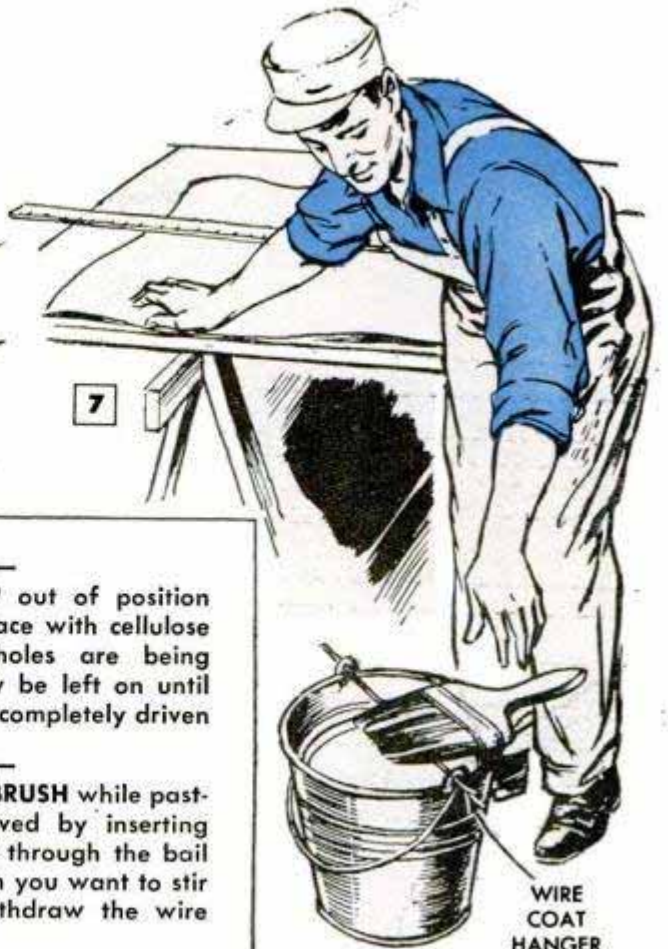
— 5 —
A BALL OF YARN is easier to handle if it is slipped over a curling iron. The latter is clamped to the house dress or apron, forming a reel around which the ball rotates as the yarn is unwound



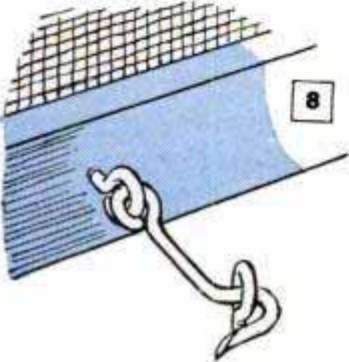
PROBLEMS



— 6 —
HINGES WON'T SLIP out of position if they are held in place with cellulose tape while screw holes are being drilled. The tape may be left on until the screws have been completely driven



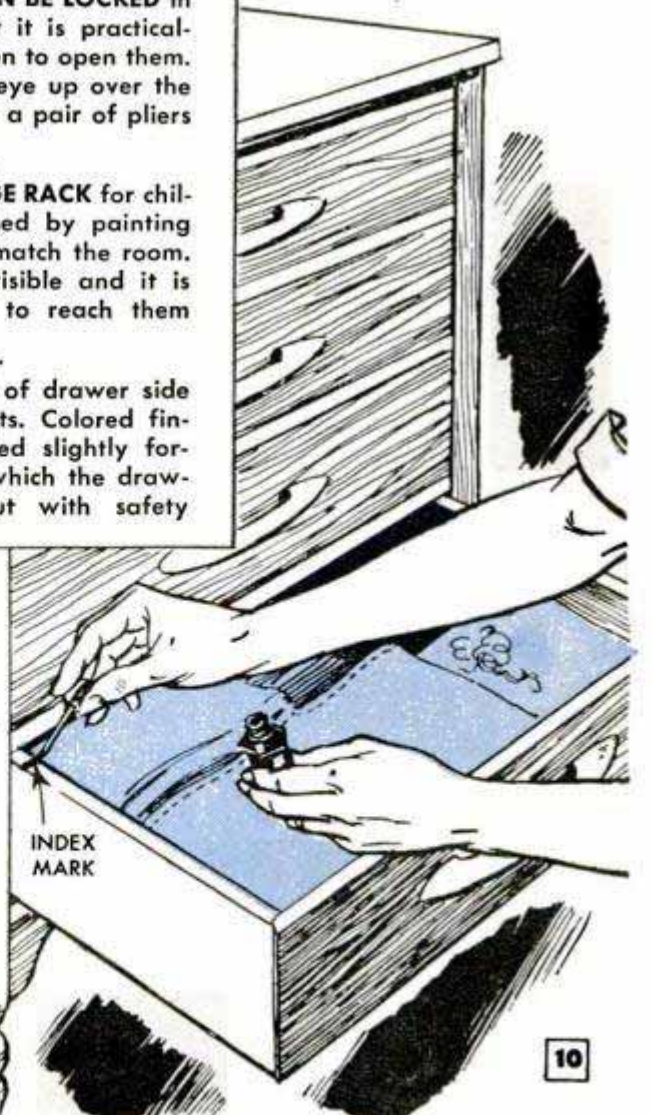
— 7 —
WHERE TO REST THE BRUSH while pasting wallpaper is solved by inserting a length of stiff wire through the bail eyes of the pail. When you want to stir the paste, merely withdraw the wire



— 8 —
WINDOW SCREENS CAN BE LOCKED in closed position so that it is practically impossible for children to open them. Simply turn the screw eye up over the shank of the hook with a pair of pliers



— 9 —
AN EXCELLENT STORAGE RACK for children's toys is improvised by painting wire vegetable bin to match the room. The toys are clearly visible and it is easy for the children to reach them



— 10 —
INDEX MARK on edge of drawer side prevents spilled contents. Colored fingernail polish is applied slightly forward of the point to which the drawer can be pulled out with safety

Carpenter's Apron Holds Jars To Facilitate Berrypicking



Having to hold a container while picking berries allows only one hand to be used to lift the bushes and pick the fruit. So that he can do a faster job by using both hands to gather the fruit, one gardener wears a carpenter's apron and inserts a pint fruit jar into each apron pocket. This allows him to pick a quart of berries before emptying the jars into a larger container.

Special-Shaped Modeling Tools Easily Formed From Plastic

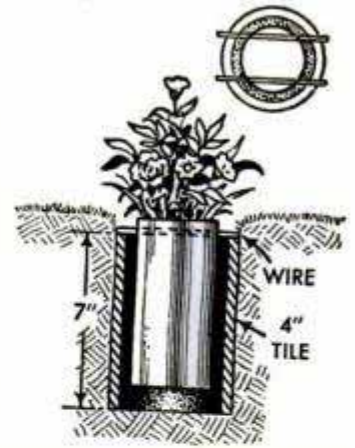
Plastics provide an excellent material for making your own special clay-sculpturing tools. The photo to the right shows a number of the various shapes that can be formed to suit practically any requirement. The pattern for each tool is drawn on the protective paper covering on the plastic and cut out with a jigsaw. Shaping the edges and points of the tools is done either by filing with a coarse file or by sanding. If part of the tool is to be bent, the paper covering is removed and the plastic is placed in an oven at 275-300 deg. F. and heated until pliable. Then it is removed and formed by hand to the desired shape. Upon cooling, the plastic regains its original rigidity. In handling the plastic, it is best to wear gloves not only to protect the hands but to avoid finger marks in the soft plastic. If you wish, the tools can be given a high polish by buffing with rouge.

Doris Aller, San Francisco, Calif.

☐ A short candle stub forms an easily removed stopper for a glue bottle. The wax will not adhere to the sides of the bottle as will the cork of an ordinary stopper.

Sunken Vase for Cemetery Flowers Cannot Be Tipped by Wind

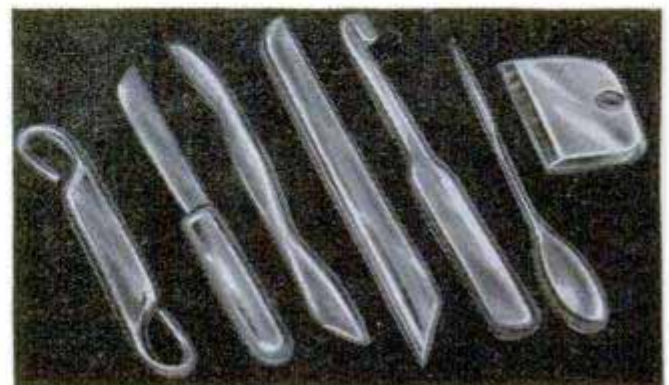
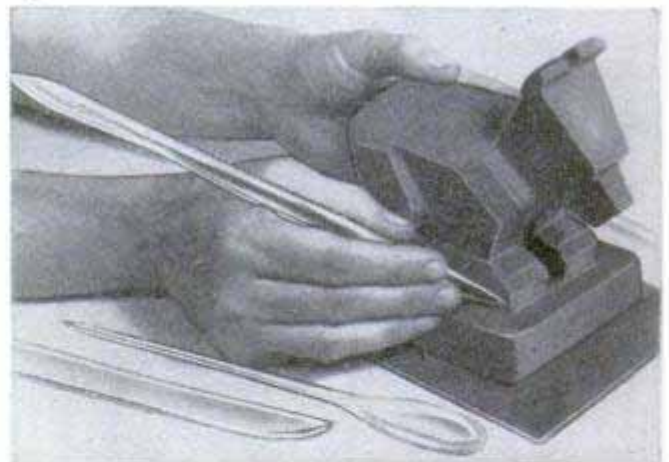
This sunken vase for a cemetery lot is not only windproof but it also allows the flowers to enhance the grave for their maximum life without being blown or knocked over. The vase itself is simply a tin can with holes punched about $\frac{1}{4}$



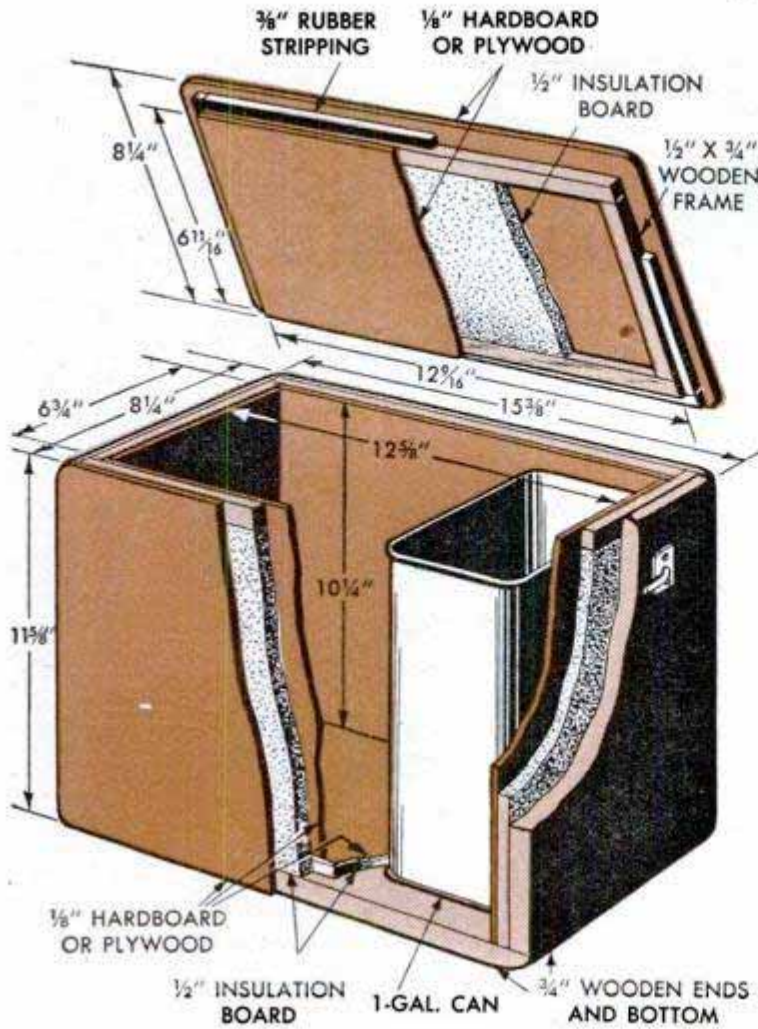
in. from the top edge to take two pieces of stiff wire as indicated in the detail. The vase is placed inside a length of 4-in. tile which has been set in the ground, the wires of the vase resting on the edge of the tile. The latter is set in the ground and the earth packed tightly around it. The hole for the tile should be deep enough so a lawn mower is able to pass over the can without interference.—Ralph Frankart, Tiffin, Ohio.

Lemons Softened in Cold Water

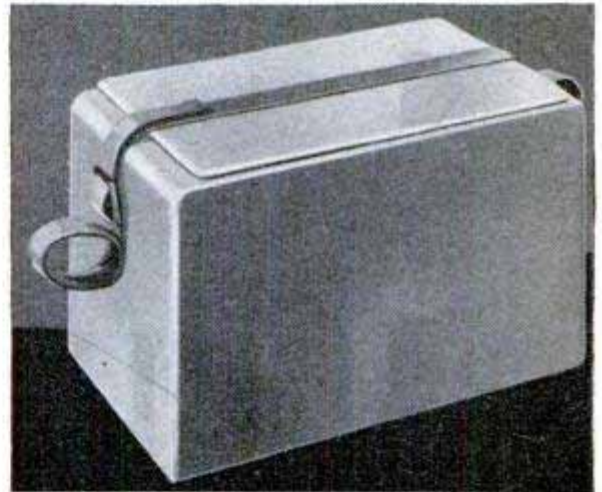
When lemons have been kept for some time and become too hard to permit squeezing out the juice, soak them in a pan of cold water overnight. The water will soften the lemons sufficiently to allow squeezing them without difficulty.



Cans Form Liner for Inexpensive Picnic Icebox

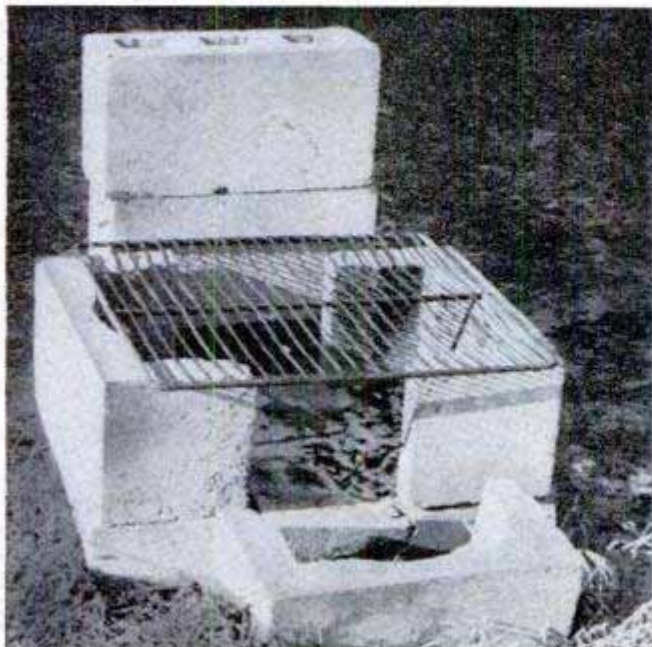


Above, removable open-top cans, one of which contains ice, keep inside of box dry. Below, cover is held securely with a strap and buckle



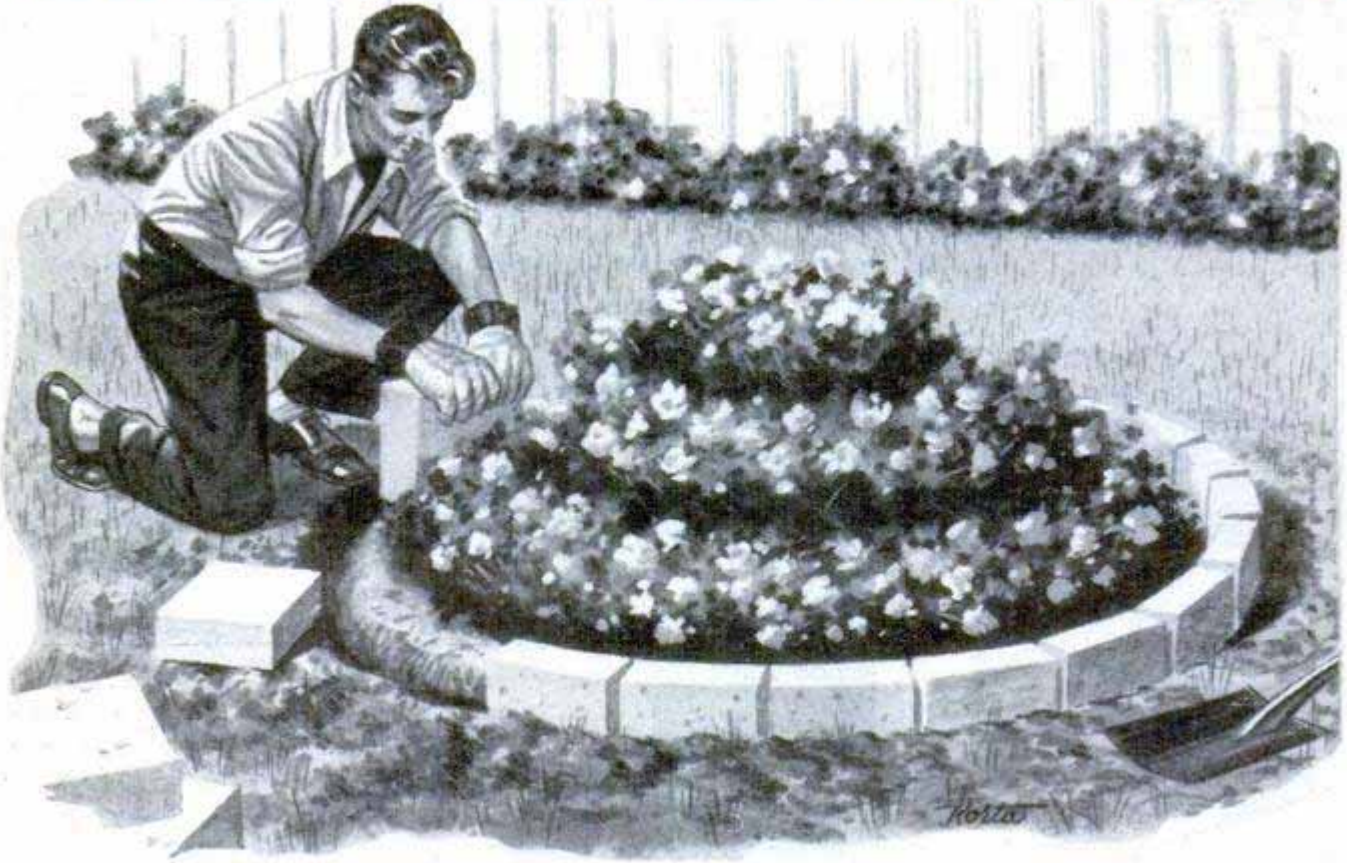
Featuring the use of three standard 1-gal. containers to provide a ready-made metal liner, this neat little icebox is just the thing to keep your picnic beverages cool. Insulated with soft composition board, the box is lined inside and out with tempered hardboard, the ends and bottom being made of wood. Actual dimensions are determined by the size of the cans. Sponge-rubber stripping is used on cover to make tight seal.—Robert Hoppough, Waukegan, Ill.

Eight Concrete Building Blocks Provide Knockdown Charcoal Grill



About all the effort required to build this charcoal grill from concrete blocks is the work of stacking them up. That's how simple it is—not even mortar is used. And, being of knockdown construction, the grill can be easily moved from one place to another if desired. The bottom of the pit is formed by laying three blocks together, face up and buried about 4 in. deep. Then one side of three blocks is broken away and two of the blocks are used to form the sides of the pit, with the third one being placed across the back on the ground. The rear block forms an opening for the smoke to enter the flue of the chimney, which is made any desired height by merely setting blocks on top of the rear one. The cored holes in the blocks form a natural flue. A wire oven grate set over the pit provides an excellent broiling shelf.

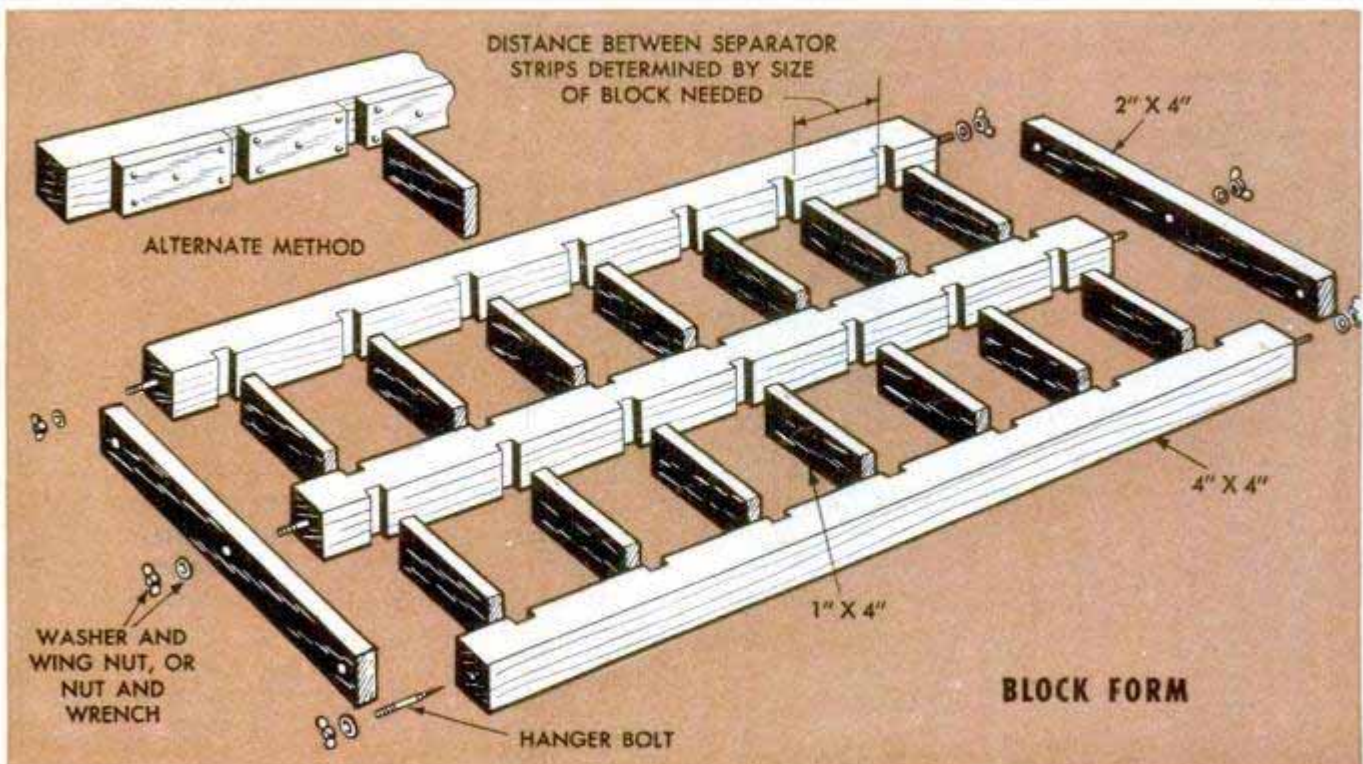
Border Blocks for Your Garden

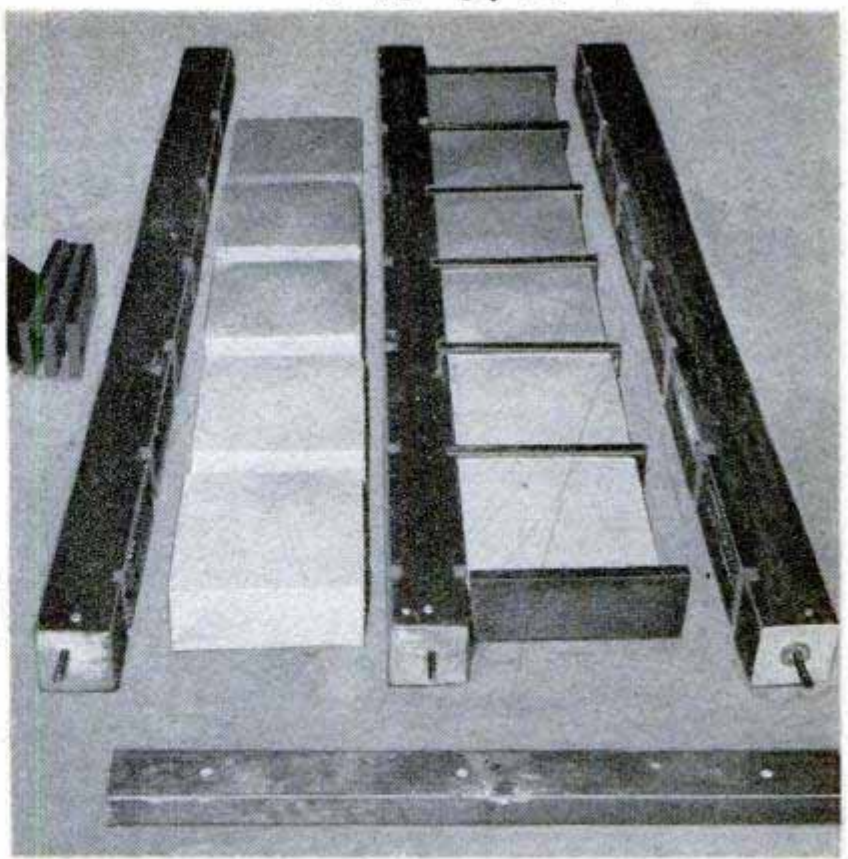
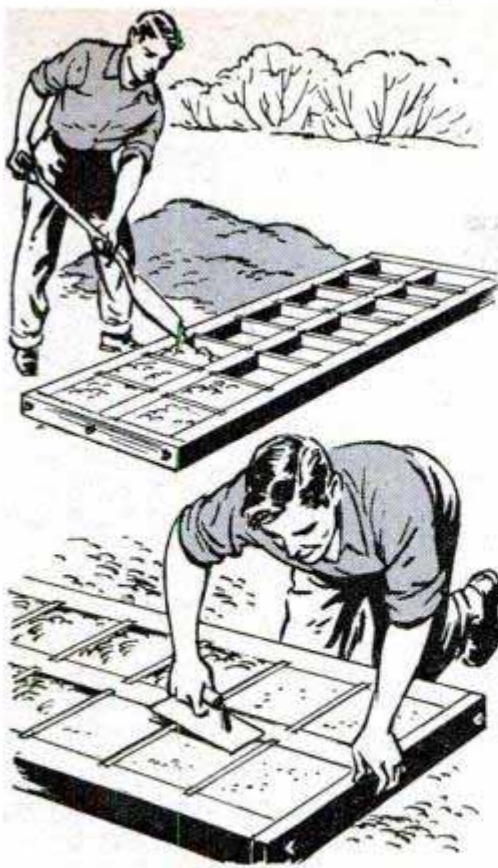


By William O. Davies

CONCRETE blocks can be used to advantage in the garden in many ways, such as, flower-bed edging, walk borders and terrace walls. By pouring the blocks yourself, they are inexpensive and can be made to the size best suited to the intended purpose. The form illustrated permits pouring a dozen identical blocks at a time. However,

the form can be built to make blocks of different sizes. Construction of the form is simple, requiring three stringers of 4 x 4, two 2 x 4s for the endpieces and 14 separator strips of 1 x 4. Notches in the stringers to receive the ends of the separator strips are either cut or formed by cleats nailed to the inside faces of the 4 x 4s as shown in the upper left-hand detail. Notches should be made about $\frac{1}{8}$ in. oversize to allow for





swelling of the separator strips. The end-pieces are drilled to slip over hanger bolts embedded in the ends of the stringers and are fastened with wing nuts. When in place on the hanger bolts, the endpieces should lock the form tightly together.

The form should be assembled on a comparatively smooth, flat surface, such as a concrete garage floor or driveway, so that the underside of the blocks will be even. The base as well as all surfaces of the form which will come in contact with the poured concrete should be coated with oil to prevent sticking. After pouring, the concrete is floated with a straightedge for a rough finish or troweled to a smooth finish. It was found that a mixture of cement, 1 part, sand, 4½ parts and enough water to produce a mix the consistency of mortar gives excellent results. It will set sufficiently under ordinary summer conditions so that the form can be stripped from the blocks

The above photo shows the wooden form partially stripped from the newly cast concrete blocks. Oiling the wood facilitates removing the form. Note that faces of the blocks have been troweled smooth

after 24 hours. The day after the forms have been removed, the blocks should be stacked between layers of boards and allowed to cure for a week before using. After one batch of blocks has been removed from the form, clean the wooden surfaces with a wire brush and recoat with oil before again filling with concrete.

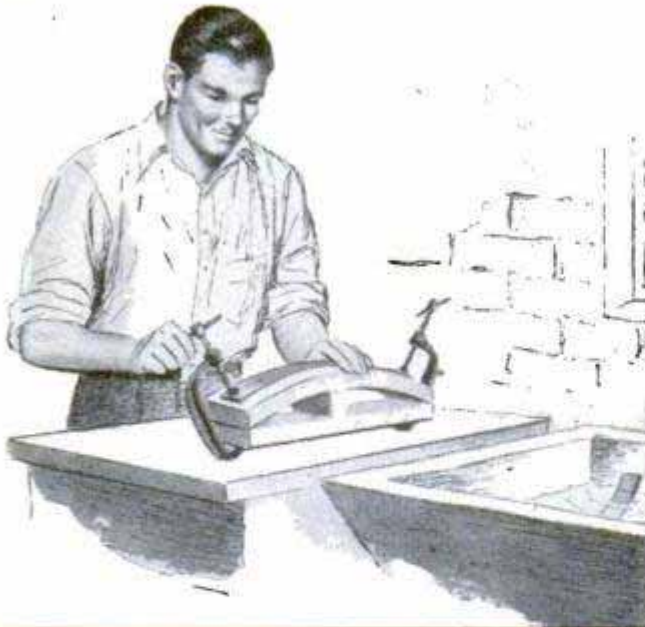
Variety can be had in the blocks by making impressions in the concrete after it has set for several hours, using a star, circle or other simple design to decorate the face of the block. Another interesting treatment is to use old wood for the form and "rake" the surface with a wire brush. In this way, the texture of the grain will stand out in relief on the edges of the concrete blocks.

Special Baits for Catching Common Fish When Ordinary Lures Fail

When ordinary baits don't seem to be tempting the fish, try some of these special baits which have brought excellent results. For bluegills, bream and sunfish, use meal worms or the drone larvae of the honeybee. Yellow perch will bite on an eye taken from a perch which has already been caught. Crappie, calico bass and rock bass like tadpoles, while small-mouth black bass go for small bullheads. Muskellunge and pike usually can be caught with a live meadow mouse when other baits fail. Make a harness for the mouse, using lightweight

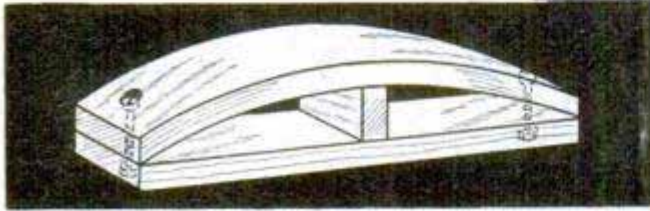
wire, and thread two small corks on the wire to keep the mouse afloat. For wall-eyed pike, use a tandem hook with a small spinner ahead of it and bait each hook with a shiner minnow. Most of the fish will be caught on the rear hook. Try small pieces of clam meat for suckers and buffalo. To get action with large-mouth black bass and pickerel, bait a medium-sized green meadow frog on a tandem-type double hook. Kill the frog and skin the hind legs so the skin will trail out behind the frog's feet.—R. A. Jenkins, St. Louis, Mo.

Slats for Ladder-Back Chairs Are Bent on Special Wooden Form



Used by H. E. Schwan of Denver, Colo., to form curved slats for ladder-back chairs, this simple bending form permits the pieces to be steamed while right on the form. The radius of the jig is bandsawed slightly less than the required curve to compensate for spring-back which occurs when the slat is removed from the form. The slats are cut to size and soaked overnight in a tub of water. Then each slat is clamped to the form, being drawn down tightly at each end, and, after this, the slat and form are placed in a hot oven to dry. Steaming takes place during the drying period, causing the slat to assume the approximate curve of the form when the clamps are removed.

David P. Costello, Fort Collins, Colo.

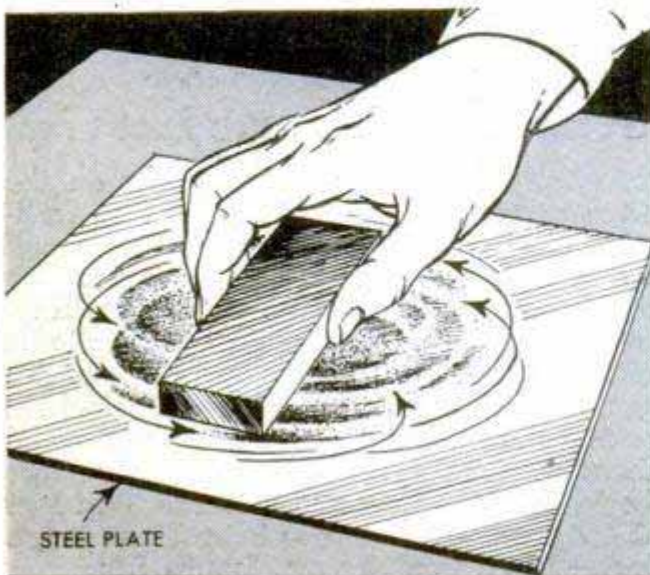


Salt Polishes Tarnished Silverware

To clean tarnished silverware, rinse with water and sprinkle with a liberal amount of table salt. Then rub with a soft cloth or cleansing tissue until the surface takes on a bright polish.

Emery Dust Laps Oilstone To Renew Cutting Surface

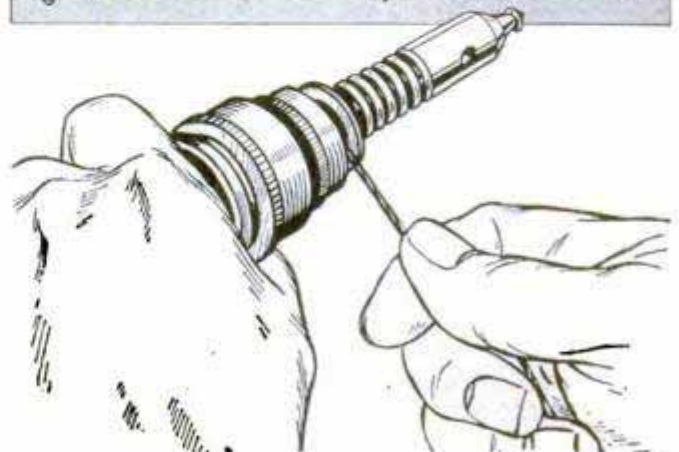
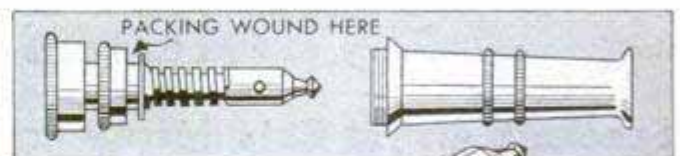
A worn oilstone can be resharpened many times before it is necessary to discard it. Simply lap the stone on a steel plate, using coarse emery dust and water as an abrasive. Mix the water and emery dust to a paste consistency and, with the mixture on the plate, rotate the stone both counter-clockwise, as indicated in the drawing, and clockwise. When the stone has been lapped perfectly flat in this manner, the cutting surface will be sharp and completely free from embedded metal particles. If a flat steel plate is not available, a sheet of plate glass which is large enough to permit rotating the stone will serve the purpose.



Leaking Hose Nozzle Repaired With Faucet Packing

If the nozzle of your garden hose dribbles continuously even though the washer between the nozzle and the hose connection is in good condition, try tightening the joint between the gland and the nozzle cylinder. If this does not stop the leak, it will be necessary to repack the joint. To do this, unscrew the cylinder from the gland and wind several turns of graphite-string packing between the washer and the gland. It is best to wind the packing as shown in the drawing so that when the gland is screwed to the cylinder, the packing will be evenly distributed throughout the joint.

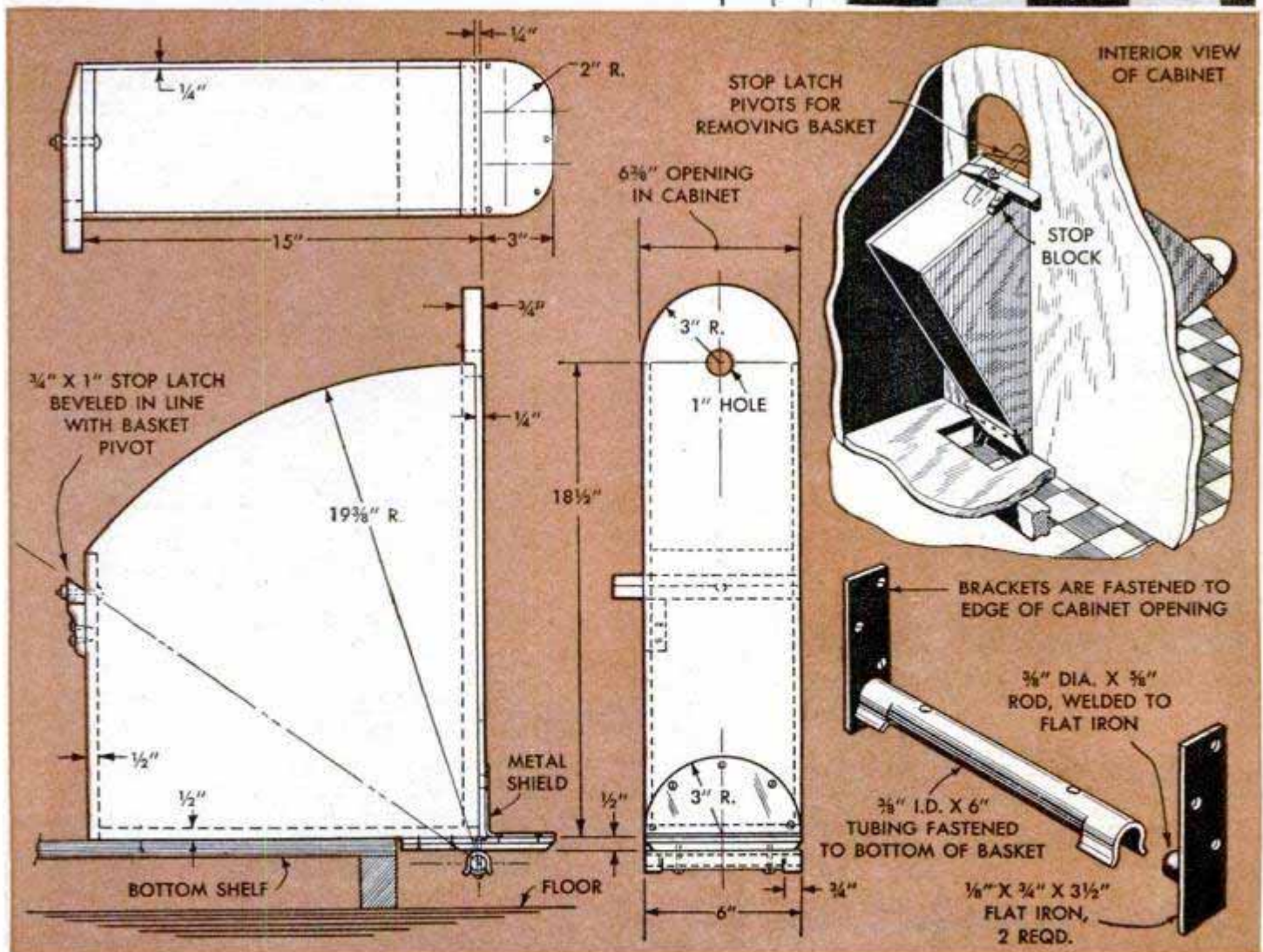
Charles Kimball, Los Angeles, Calif.



BUILT-IN WASTEBASKET

By E. E. Mason

IF YOU are building a new kitchen-sink cabinet or if the cabinet you already have provides the necessary clearance, you'll find this unusual wastebasket a time and space saver. The sides of the basket are of plywood but the end and bottom pieces are cut from solid stock. After cutting an opening in the sink cabinet, fit the front piece of the basket in the opening, allowing about $\frac{1}{32}$ -in. clearance to prevent binding. Rabbet the edges of the front piece for the plywood sides and join the sides to the front, back and bottom pieces with screws and glue. Provide a swinging stop at the back of the basket as indicated. The basket pivot unit is made up from stock materials as in the lower right-hand detail. In some kitchens the projecting treadle used for tilting the basket will be objectionable. In this case, the treadle can be omitted entirely and a handle provided at the top of the front piece, or the front piece can be made in two parts to form a toe recess for the treadle. When this is done, the pivot unit must be placed farther back.



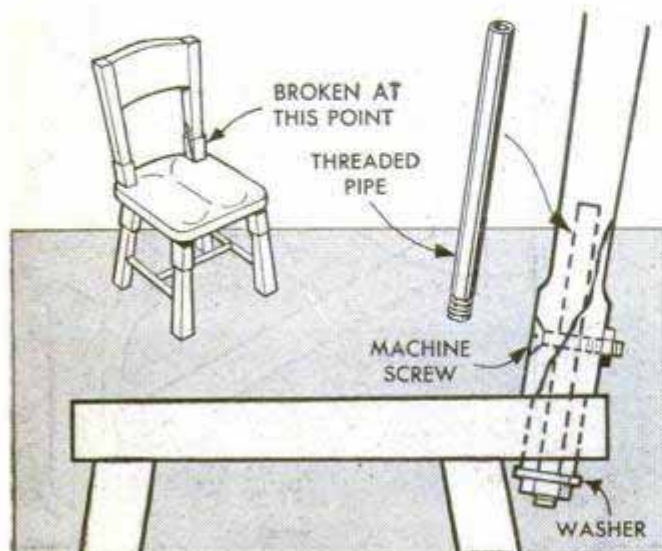
Flower Box Serves as Hothouse



By supporting two panes of glass with slotted wooden blocks, a flower box or a small section of the garden can be converted into a miniature hothouse in a few minutes. This is handy to protect delicate plants from the wind and extreme temperature changes. A triangular piece of wood or sheet metal can be propped at each end of the hothouse to fully enclose the plants, and afford maximum protection.

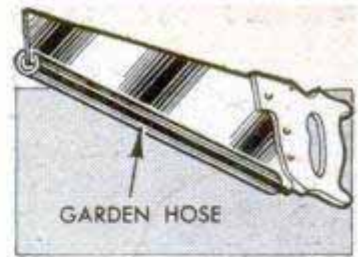
Pipe Tenon Makes Rigid Repair for Broken Chair Back

Chairs of the type pictured, that have backs which are pegged to the seats, invariably become loose and the backs split off just above the seat. When this happens, here's a way that you can repair the break and make the chair as rigid as when new.



Garden Hose Shields Saw Teeth

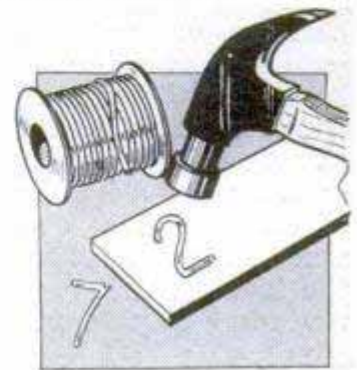
When a hand-saw is stored in a toolbox or tray, the saw teeth are likely to be dulled or damaged by contact with other tools. To prevent this, shield the teeth with a section of garden hose. The latter is slit lengthwise so it can be slipped over the teeth, and should be long enough to extend the full length of the saw blade.



E. W. Moses, Jr., Blacksburg, Va.

Monogram Craftwork Initials Hammered From Wire Solder

Lengths of wire solder bent to shape and hammered flat provide novel monogram initials and numbers for craftwork. Because of the flexibility of the solder, the characters can be fashioned in a variety of interesting designs. After hammering, the solder is sanded or polished to suit and then given a coat of clear lacquer or varnish. When dry, the characters are cemented in place or fastened with small brads.



T. P. Ilari, Louisville, Ky.

First, work glue into the split section and clamp securely with a C-clamp or bind it tightly with twine. Then, turn the chair upside down and bore a $\frac{3}{8}$ -in. hole up through the center of the back post for a distance of 4 or 5 in. Cut a length of $\frac{3}{8}$ -in. pipe long enough to extend about 1 in. below the seat, thread the end for a nut and insert the pipe in the hole. Next, pin the pipe in place by drilling a hole crosswise through both the pipe and the post, and add a flat-headed machine screw. Thus, with the pipe locked in the post, the chair back is held firmly to the seat by merely drawing up the nut on the end of the pipe. Note that a wedge-shaped spacer formed from hardwood is used to provide a flat surface for the washer and nut.

☞ To obtain a legible stencil signature, place a square of cellophane wrapper over the stencil and sign the name with a stylus. The cellophane affords a smooth writing surface and eliminates torn stencils.



STOP

WHAT WATER LEAKS CAN COST YOU PER YEAR

SIZE OF LEAK	CU. FT. PER DAY	COST PER YEAR AT \$2.16	RATE PER 100 CU. FT.
..... STEADY DROPS	3		
• 1/4	6	\$4.32	1st 10 M CU. FT. 18¢
• 1/32	23	\$15.12	2nd 40 M CU. FT. 12¢
• 1/16	93	\$60.48	OVER 50 M CU. FT. 9¢
• 1/8	400	\$196.80	

THOSE WATER LEAKS!

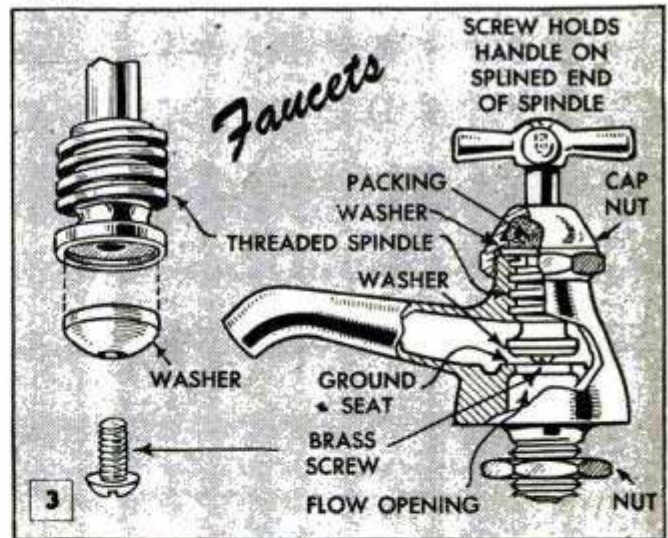
By E. R. Haan

DO YOU KNOW how much water can be wasted in the course of a year by a single leaky faucet or flush tank? A slow drip from one of the plumbing fixtures or faucets may cost only a couple of dollars a year, but the price for neglecting a continuous running stream only $\frac{1}{16}$ in. in diameter may run as high as \$60 a year. A study of the chart in Fig. 1 will show why it is important to stop the leaks. Any homeowner can repair most leaky fixtures with only a few household tools and repair parts which are available anywhere.

Repairing compression faucet: When any repair to the plumbing fixtures is to be made, first shut off the water supply. There may be a shutoff valve near the fixture, such as the valve underneath the sink or flush tank, or it may be located in the basement. As a rule, it is best to shut off the main valve at the meter. Almost all faucets in modern homes are of the compression type. There are various styles of the compression faucet such as those having side handles and the two-faucet units having a common spout. Although the exterior characteristics may vary, the principle of operation is the same. The cutaway view of the faucet shown in Fig. 3 is typical. To replace the faucet washer, loosen the cap nut on the faucet. If the nut is hexagon shaped,



2 First step is to unscrew cap nut from faucet



3



4 Lift out the spindle



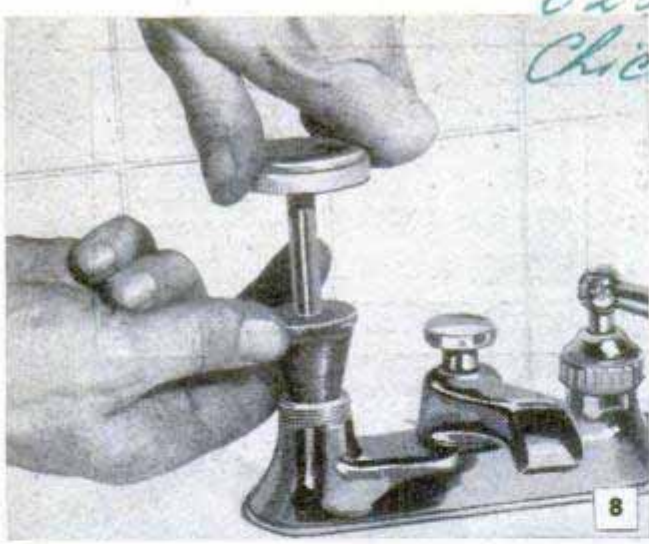
5 Remove the washer



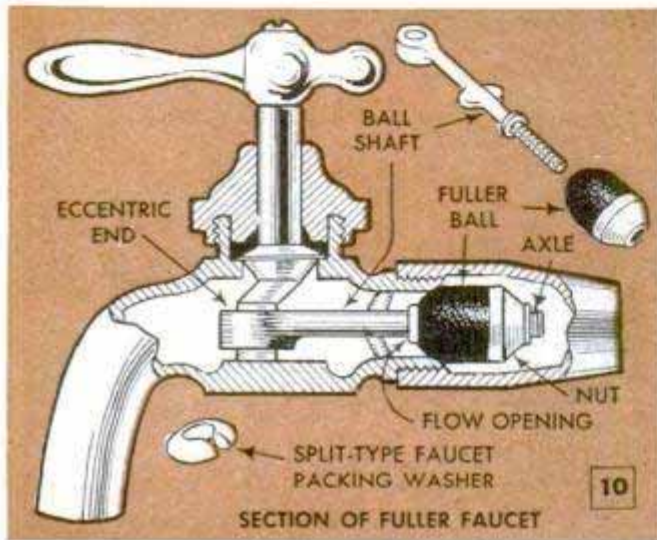
6 Measure washer size



7 Adjust faucet handle

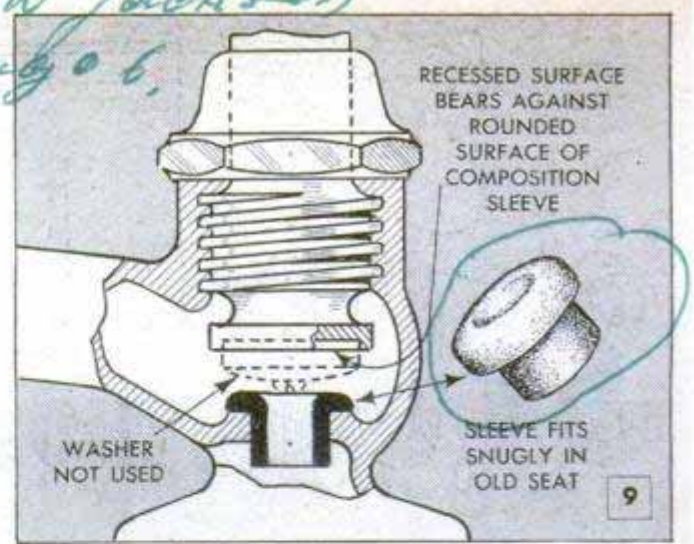


This hand tool quickly refaces faucet seats that are roughened by wear and corrosion. The tool has a tapered thread that screws into the faucet body



Leaks due to worn or frayed packing can be easily stopped with a packing washer or with a graphite-asbestos wicking especially made for this purpose

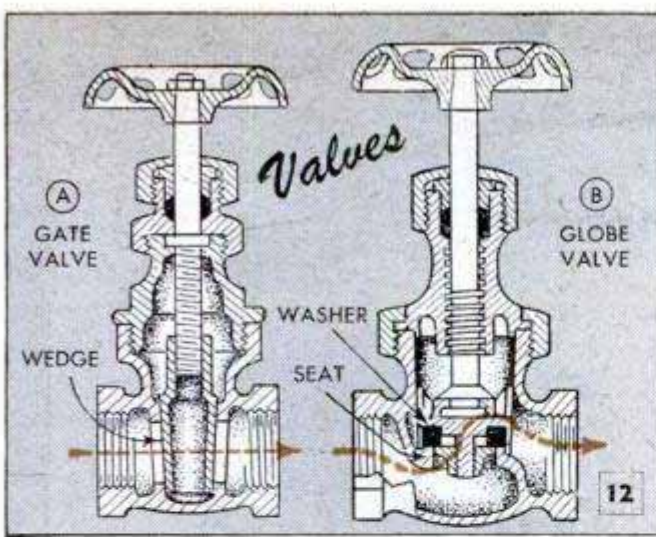
use an adjustable wrench, as in Fig. 2. Protect the chrome or nickel finish from being marred by inserting a strip of cardboard between the nut and the wrench jaws. If the cap nut is round and is serrated or knurled, a pipe wrench can be used, the nut being protected from damage by wrapping a cloth around it. After loosening the cap nut, turn the faucet handle in a counterclockwise direction so that the threaded spindle unscrews. Then you can lift out



A special composition sleeve slipped into the faucet seat makes old faucets leakproof. Regular washer is not used as the washer seat bears on the sleeve

the spindle assembly as in Fig. 4. It may be necessary also to turn the faucet handle at the same time to provide clearance for the nut. Next, loosen the brass screw that holds the old washer on the end of the spindle, Fig. 5. Sometimes the screw is corroded and so tight that it will not loosen readily. An application of penetrating oil may help. If the screw breaks off, it usually can be removed by drilling a small hole in the remaining threaded portion, pushing the pointed tang of a small file into the hole and then turning the file. If necessary, scrape away all traces of the old washer. To determine the size of a new one, measure the diameter of the recess in which it goes, Fig. 6. It is sometimes necessary to dress the outside edge of a washer with a file to make it fit flat in the recess. With the new washer in place, turn the spindle into the faucet and then screw the cap nut down. When it is desired to shift the position of a faucet handle, the screw holding it is removed as in Fig. 7. Some faucets, however, have handles that cannot be removed from the spindles. For example, there is one in which the spindle works in a sleeve which is lifted out with the spindle. The spindle washer moves upward against the bottom of the sleeve when closing. Replacement of the washer is practically the same, except that a nut holds the washer instead of a screw.

Refacing faucet seat: If the flat surface of the faucet seat against which the washer compresses is rough, it will be impossible to prevent recurring leaks by merely installing new washers. Such roughness is caused by corrosion or by abrasion due to sand and rust particles becoming embedded in the washer. The roughened seat should be refaced by means of the tool shown in Fig. 8. After refacing the seat, see that all bits of metal are flushed away before replacing the faucet spindle. Another method



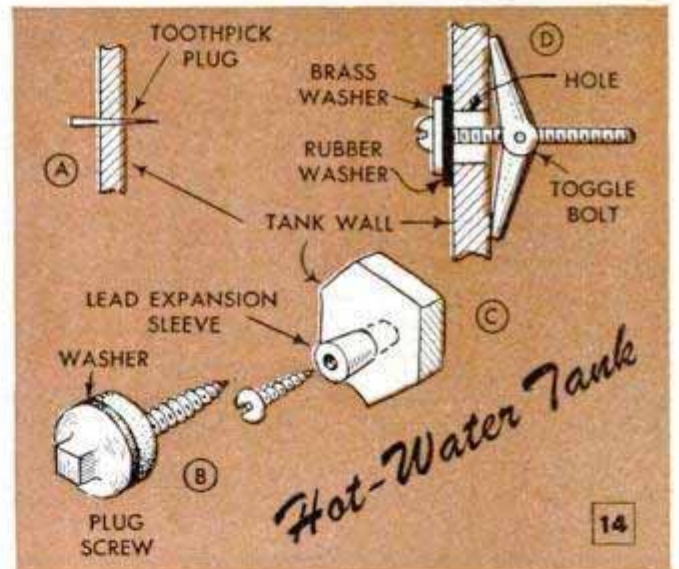
Two types of shutoff valves that are commonly used in water lines to shut off the supply to fixtures. The main shutoff valve usually is placed near meter

of providing a new seat, which eliminates the cost of a refacing tool, is to use a special hard-composition sleeve that is pressed inside the old seat, Fig. 9. The end of the spindle, from which the washer and screw are removed permanently, bears against the top rim of the sleeve when the faucet is closed.

Leaky stem: Leaks sometimes develop between the stem and the cap nut. If tightening of the cap nut does not stop the leak, loosen the nut, slip it up against the handle and replace the packing. You can use stranded graphite-asbestos wicking, which is wrapped around the stem as in Fig. 11. Or, you can use a ready-made packing washer available in either the slit or the solid type. The slit type, Fig. 10, is used on faucets from which the handles cannot be removed.

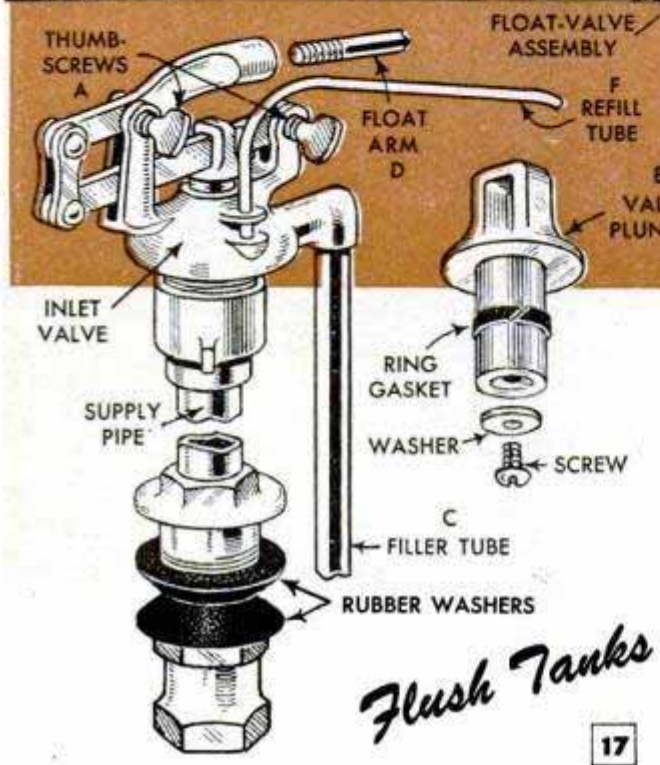
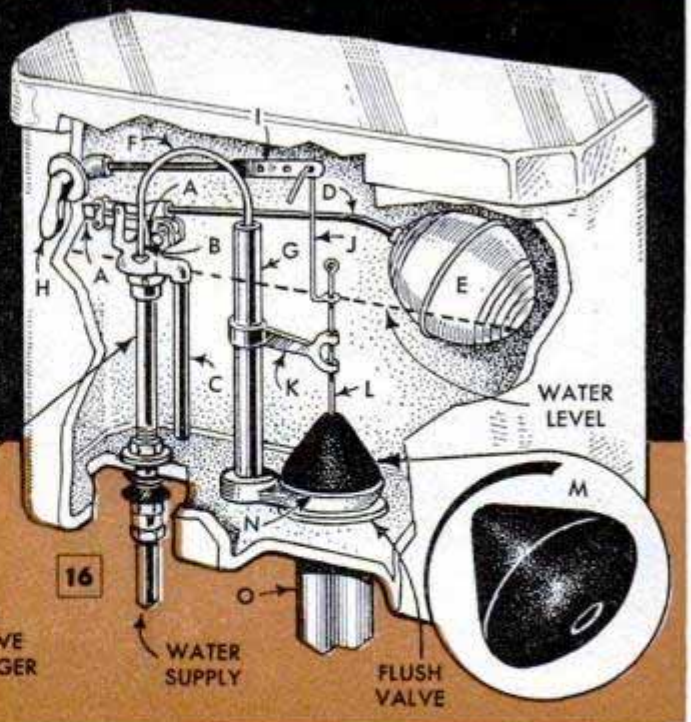
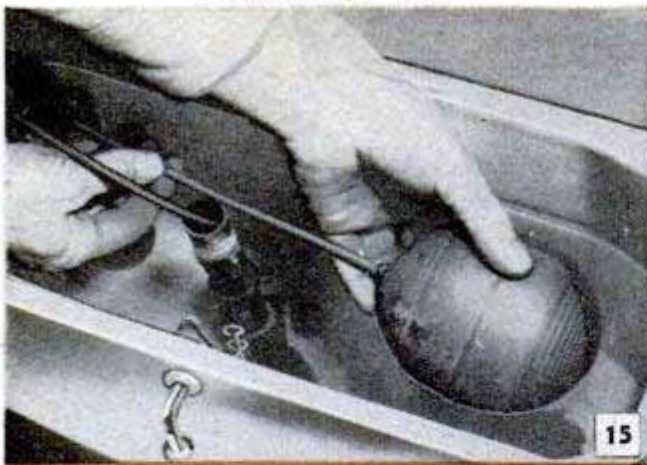
Repairing Fuller faucets: Although practically obsolete, there are still many Fuller faucets in older homes. On this type of faucet, Fig. 10, the handle can be swung in either direction to open or close the faucet. A horizontal spindle with an acorn-shaped rubber stopper or ball (known as a Fuller ball) at one end is moved back and forth by a crank-shaped vertical spindle to which the handle is attached. The entire faucet must be removed when the ball is adjusted or replaced. The sleeve enclosing the ball cannot be reached with long-nosed pliers. Turning the nut to bring the ball closer to the seat may stop the leak, or a new ball, Fig. 10, may be required. A worn spindle or ball shaft can be replaced at small cost.

Sill cocks and shutoff valves: Sill cocks—outside faucets with threaded spouts to permit attachment of garden hose—are usually of the compression type and have washers just like indoor faucets. Repairs and replacements are made in the same way. Valves installed in water-supply



pipes are either of the gate or globe type, Fig. 12. The former, Fig. 12 A, has a sliding wedge to open and close it, while the latter, detail B, is similar to compression-type faucets. As shutoff valves generally remain open those of the globe type are apt to have warped washers and corroded seats from the constant flow of water, particularly hot water. Because of corrosion, they sometimes fail to completely shut off the water supply to permit repairing fixtures. Replacing the washer and perhaps refacing the seat of the valve is then necessary.

Leaky radiator valves: For hot-water and steam radiators, gate or globe valves of special construction are used. Escape of water or steam at the stem is stopped by



Flush Tanks

tightening the packing nut slightly or by replacing the packing. When repacking is necessary, a hot-water system is drained until the water level is below the radiator; a steam boiler is kept at low heat so that no steam is formed. Then the valve to be repacked is closed, the handle is removed and the packing nut slipped off. Special metallic packing compound for this purpose can be had from plumbing shops, although asbestos wicking, the same as that used in faucets, will do. After removing the old packing, the new is pressed or wound in place tightly.

When a leak occurs at the union which connects to the radiator, and tightening the union does not stop the leak, there may be a little dirt between contacting surfaces. Take the union apart, clean it thoroughly and reassemble. It is best to use a large adjustable wrench for this purpose as in Fig. 13. A pipe wrench not only mars the fitting but may distort it.

Replacing leaky pipe: A temporary repair on a leaky water pipe requires just about as much time and effort as replacing a section of the pipe. First shut off the

Above and at the left: A, pins or thumbscrews to release valve plunger; B, valve plunger; C, filler tube; D, float arm; E, float; F, refill tube; G, overflow pipe; H, trip-lever handle; I, trip lever to release rubber stopper; J and L, stopper wires; K, stopper guide; M, stopper; N, flush-valve seat; O, discharge pipe

water supply, and then cut through the defective portion of pipe with a hacksaw, so that both ends can be unscrewed from the nearest fittings. Get two lengths of pipe of the same diameter as the old pipe and a union to connect them. The total length when connected should be equal to that of the pipe removed. Use pipe-thread compound on the threaded ends of the pipe to form a watertight joint.

Leaky hot-water tank: Leaks in a hot-water tank generally indicate that the tank is old and should be replaced. However, an old tank sometimes can be kept in service until a new one is installed if a temporary repair is made. On insulated tanks the outer jacket and the insulation must be removed first to get at the tank wall. Pin-sized leaks often can be plugged by driving in the ends of round toothpicks, Fig. 14 A. Swelling of the wood keeps these plugs tightly in place. Larger leaks may be stopped by driving in a plug screw as in Fig. 14 B. Another way is to drill or ream the hole to $\frac{1}{4}$ -in. size to admit a tapered lead expansion plug as in detail C. Driving a screw into a small hole through the plug expands it. Still another method is to enlarge the hole enough to permit the insertion of a toggle bolt to hold a brass-and-rubber washer snugly against the outside as shown in detail D.

Water losses from flush tanks: Much more water can be lost through faulty valves of a lavatory flush tank than most

homeowners realize. These tanks have an automatic float valve to admit water into the tank, and a flush valve fitted with a large rubber stopper to discharge the water, Fig. 16. Leakage of water from a flush tank nearly always is accompanied by a slight noise. In checking for a leak, first see if water constantly runs off through the overflow pipe. This indicates either that the float valve is not fully closed or that it leaks when closed. Next, find out whether any water leaks through the flush valve at the bottom of the tank.

To repair either valve, shut off the water supply and flush the water from the tank. If the trouble seems to be at the float valve, unscrew the float and the float rod, Fig. 15. Shake the float to see if it contains water as a result of pinhole leaks caused by corrosion. If so, replace it with a new one. Then release the two removable thumb-screws or pins in the linkage to the valve, detail A in Figs. 16 and 17. This releases the plunger B and permits replacing the washer. If the washer is held by a brass cap, remove the latter carefully to avoid breakage. When the washer is removed, examine the seat of the valve. If this is corroded, replace the entire valve assembly, Fig. 17. These assemblies come in either the long or the short size. To install one, turn off the water and disconnect the supply pipe at the underside of the tank. Then loosen the nut holding the float-valve assembly and lift out the latter. Reverse the procedure when installing a new valve.

When the leakage is traced to the flush valve, first see if the stopper seats properly, Fig. 16 M. The stopper guide K, which is clamped to the overflow pipe G, may not be centered over the valve seat. The wire L, which is screwed to the stopper, should project about an inch through the eye in the wire J, which connects to the trip lever I, or the stopper may not seat properly. If alignment and action of the stopper seem correct, remove the stopper by unscrewing it from the wire and clean the rounded surface. Also dry the valve seat N and clean it with fine emery cloth. If the valve still continues to leak, substitute a new stopper. Generally stoppers require replacement every few years. Occasionally the flush-valve seat is so badly corroded that it allows water to pass when the valve is closed, even after installing a new stopper. This requires replacement of the seat and overflow-pipe assembly, which is one unit.

Film Container Holds Fishhooks

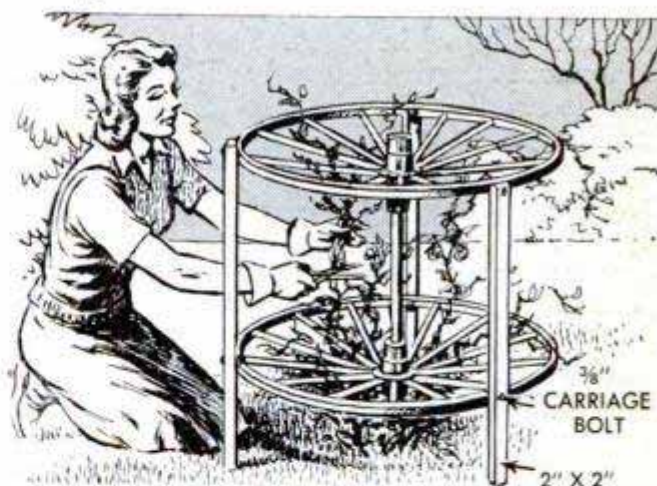
The discarded metal can from a roll of 35-mm. film provides a handy container for carrying extra fishhooks. It fits nicely in the tackle box or in a trouser pocket.



Slanted Partitions in Spice Drawer Hold Cans for Easy Selection

Cans of spices stored in a kitchen-cabinet drawer are easier to select if they are set at an angle so that the labels can be read at a glance. This can be done by fitting the drawer with slanted partitions of plywood or hardboard. For easy removal when cleaning the drawer, the partitions rest on cleats or are set in grooved inserts nailed to the sides of the drawer. To keep the cans from sliding forward and possibly out of sight behind the partition in front of them, tack a strip of wood along the lower edge of each partition.

Wagon Wheels Form Novel Trellis



While trying to find a novel way of using a couple of old wagon wheels as ornaments in his yard, one homeowner hit upon the idea of mounting them horizontally, one on top of the other, to form an attractive trellis. He supported the wheels with three 2 x 2-in. stakes spaced evenly around the edges, attaching the wheels to the stakes with $\frac{3}{8}$ -in. carriage bolts. For maximum life, it is best to creosote the portions of the stakes which will be below ground.

Golf Ball Provides Plumb Bob



If you need a plumb bob for a job around the house and do not have one, you can save going to the hardware store by improvising a plumb bob from a golf ball. Just turn a screw eye into the side of the ball to permit attaching the string, and drive a wood screw into the ball directly opposite the screw eye. Try to align the screw eye and screw as closely as possible through the center of the golf ball. Then, cut off the head of the screw and file the shank to a point.

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

Bushing Centers Toggle Bolt



When toggle bolts are used to attach brackets to plastered walls, the hole made in the wall is necessarily larger than the diameter of the bolt. Thus, it is difficult to draw up the bolt tight enough to hold the shank centered when any weight is exerted on the bracket. To correct this trouble, slip a wooden bushing, the same size as the hole, over the bolt before it is slipped in place. The bushing can be a short length of dowel which is drilled for the shank of the bolt so that the latter is a snug fit in the hole.

Drop of Wax on Candle Wick Permits Lighting Quickly



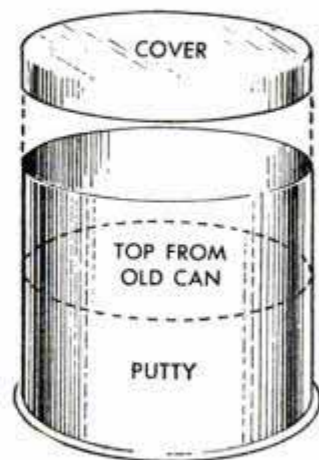
To insure against embarrassing delays when lighting the candles on a birthday cake or those used for decoration at a party, light an extra candle before the guests arrive and allow a drop of wax to fall on the wick of each candle to be used at the party. In this way, the candles will ignite instantly when the flame of a match is applied to the wicks.

G. E. Hendrickson, Argyle, Wis.

Inner Lid for Putty Can Keeps Contents Fresh

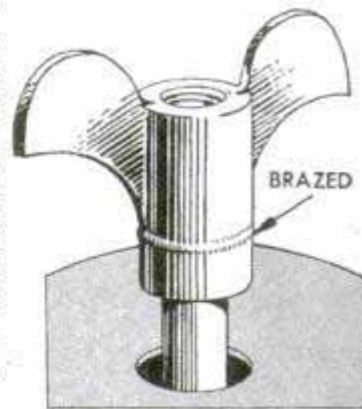
Putty remaining in a partially empty can will stay soft for a longer time if it is protected from the air with a tight-fitting inside cover. Using a rotary-type can opener, cut the end from a tin can and press the metal disk down tightly on top of the putty. The disk should just fit inside the putty can so that it affords the maximum amount of protection from the air. The same idea can be used to preserve wood putty, except that the design of most wood-putty containers does not permit inserting a metal disk that will completely cover the contents. However, a paper disk cut to the same diameter as the inside of the can will serve the purpose.

H. D. Hatch, Wollaston, Mass.



Replacing Outboard-Motor Shield Speeded By Wing Nuts

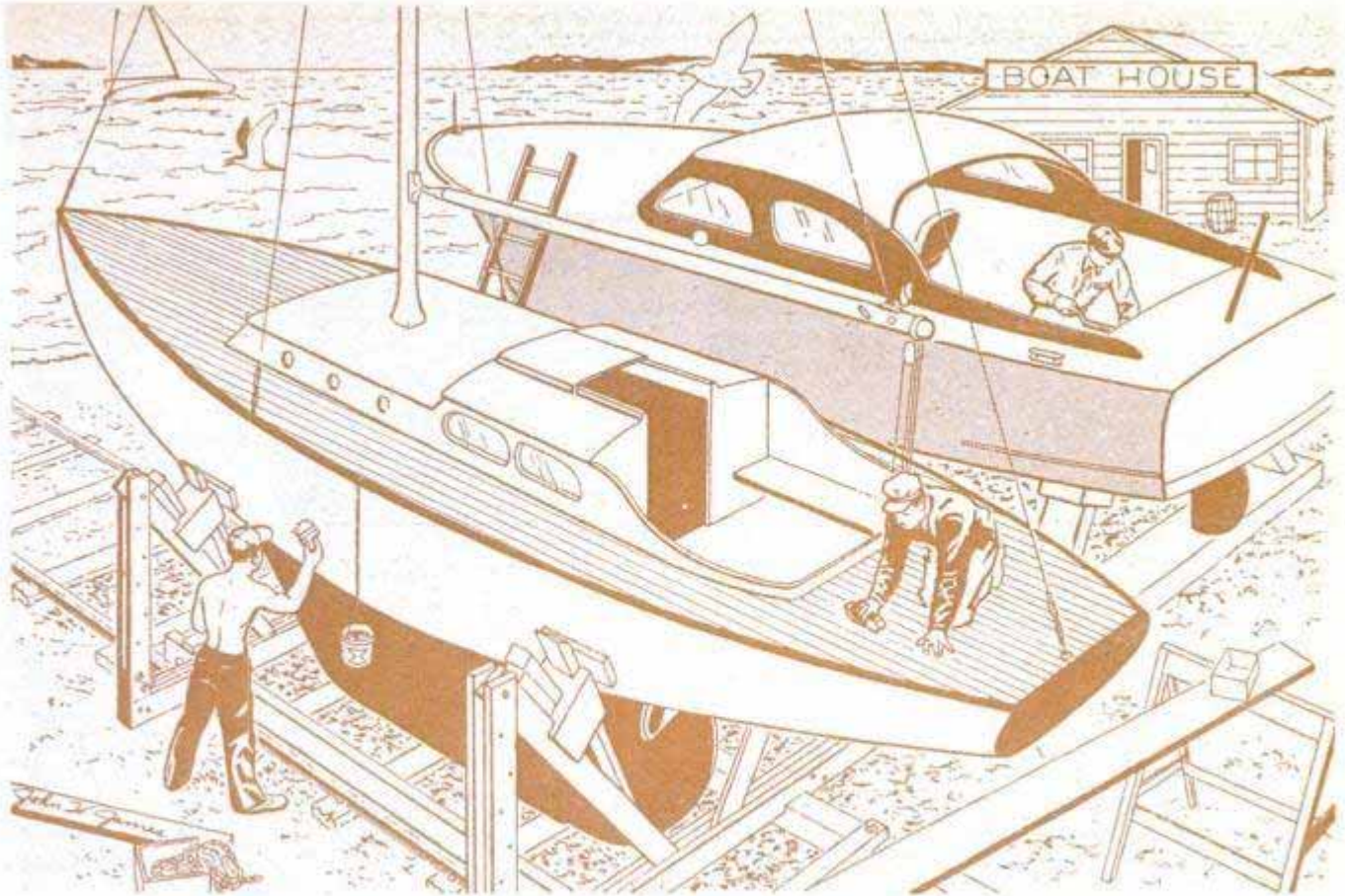
Removal and replacement of the spark-plug and carburetor spray shield on an outboard motor is speeded by brazing brass wing nuts to the heads of the bolts which hold the shield in place. The bolts can be removed without using a screwdriver and are considerably easier to start in the threads when replacing the shield. However, be sure that the shape of the wing nuts allows the bolt heads to seat properly in the shield.—Clinton R. Hull, Costa Mesa, Calif.



Rosin Removes Water-Base Paint

Water-base paint is removed from walls by rubbing the surface with a cloth which has been immersed in hot water and sprinkled lightly with powdered rosin. A large salt shaker can be used to apply the rosin to the cloth.—A. E. Fenn, Chicago.

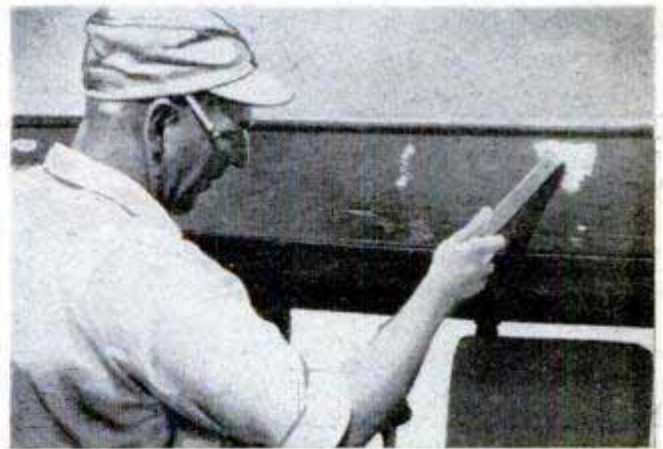
Use a 4-in. brush when painting outside walls. It holds considerable paint and is lightweight enough for easy handling.



MAKE YOUR BOAT SAFE

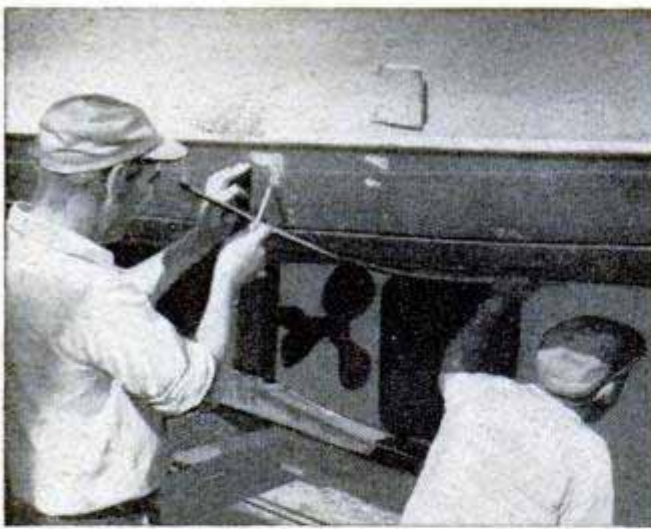
By Elon Jessup

BOATMEN say that a boat hull is no better than its fastenings. In this they are referring not only to the condition of the numerous screws, nails, rivets and bolts that hold the parts together, but also to the state of the holding power of each of these fastenings. That's the important thing. In any wooden hull a slow disintegration process is going on constantly, whether the boat is in daily service or laid up in the yard or boathouse for the winter season. Wood shrinks and expands with changes in temperature and moisture content and wet and dry rots attack hidden parts in the bilge. Service conditions vary throughout the season from the severe pounding of a fresh-water chop to the normal working of a wooden hull due simply to strains developed by its forward progress through the water. Any of these conditions sets up stresses in the hull structure which eventually cause flexing of the frame parts and movement of one plank past another in a fore-and-aft direction. This tends to build up shearing stresses on all the fastenings. In power boats with wooden hulls, an in-board motor that vibrates unduly because of improper carburetor adjustment or some other mechanical fault, can cause the same trouble. Thrust from a powerful outboard motor not only will wreck a small-boat

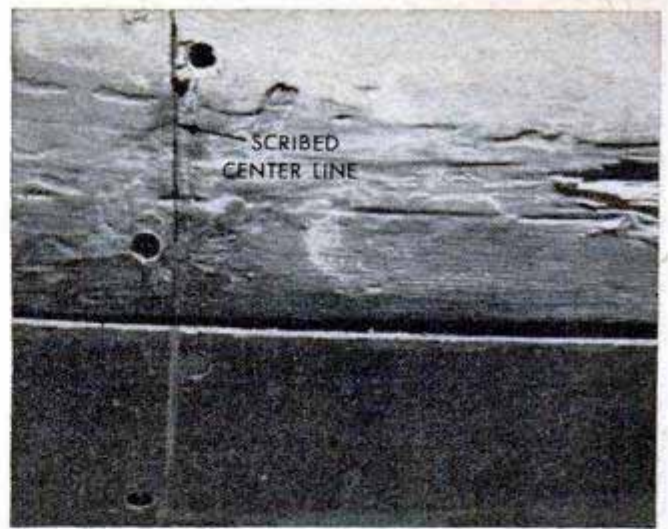


Above, repair damaged planking with any of the special fillers made for marine use. Below, use a flexible wooden strip for scribing to locate the frames

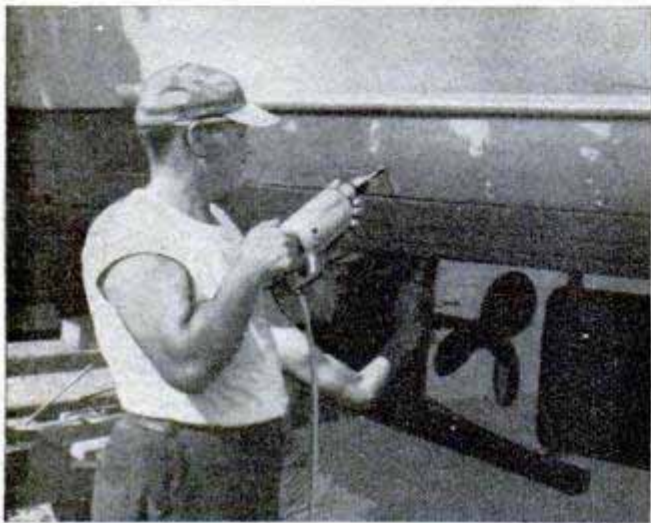




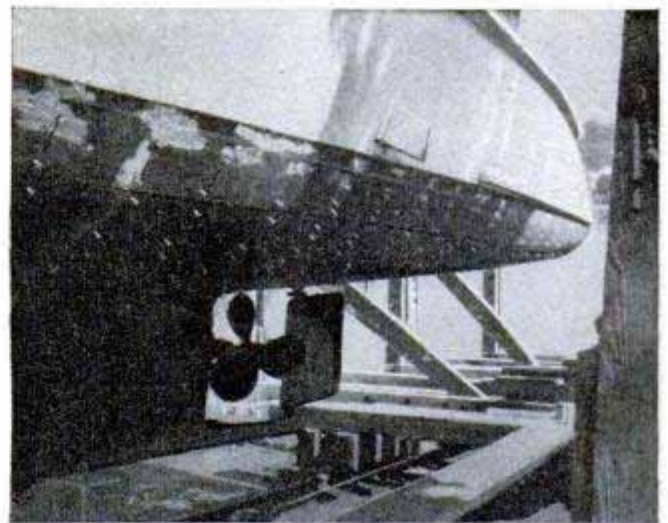
Be sure that the line scribed along the strip is directly over the center of the frame member



Stagger the new holes for screws alternately on each side of the line scribed on the hull planking



Use an electric drill for drilling the screw holes. Wooden stop on the drill bit assures uniform depth



Set small screws lightly in the new holes with a hammer, then drive by hand to a uniform tension

transom in time but also will cause a gradual loosening of the hull fastenings.

Of course, most of the fastenings in the average boat are hidden, but usually there will be indications of loose fastenings long before the safety and usefulness of the boat are seriously impaired. Examine the planking carefully from the keel to a point well up on the freeboard on both the port and starboard sides. If any of the screws holding the planking to the frames or battens are loose, you will see raised edges of the planks at the joints, or seams, as they are often called. A batten, wood lath or a thin strip of wood held with one end at the keel and bent up over the swell of the hull amidships, as in the lower photo on the preceding page, will show up any irregularity of the curve. Use the same batten as in the upper left-hand photo above when scribing lines to indicate the position of a frame member. In older boats, the condition of the frames should be checked at the beginning of each season, especially forward of midships and near the keel on both sides. Soft, spongy wood will not hold fastenings.

If the wood proves to be in good condition, the fastenings are at fault. After years of use, some galvanized fastenings erode to about half their original size. Such a condition develops slowly and grows progressively worse until it reaches the point where something vital lets go. That's why seasonal checks of the hull are so important, especially on older boats.

Just how you proceed to repair natural wear depends on the condition of the hull. In some instances, boatmen find it possible to tighten the original fastenings. This is generally the case where brass, bronze or copper fastenings have been used, as these metals are highly resistant to corrosion. When examination shows that the fastenings must be renewed, it generally is easier to install new fastenings, such as planking screws, without removing the old. To do this, most boatmen score lines on the hull to locate the frames as in the two upper photos above. Then a staggered line of holes is drilled as in the upper right and lower left-hand photos. The staggered line is made to straddle the old line of screws,



Where large screws must be used, set them with a hand screwdriver, then drive home with brace driver



On older boats having large hulls, calking the seams is a job calling for skill and painstaking care

the position of the new holes alternating with the old. This procedure usually is much more practical than removing all the old fastenings. Plug all the new holes with wooden plugs after driving the screws. Repair damaged planking with any of the prepared wood fillers made especially for marine use. When dry, sand the filler flush before painting.

In any fitting-out job, the hull planking should be recalced, especially where the boat has been in use for several seasons without a thorough overhaul. After renewing all necessary fastenings, proceed to calk the hull as in the upper right and lower left-hand photos. After calking, give the hull a thorough sanding in preparation for painting. On old hulls on which the planking is rather rough, some boatmen prefer to rough-sand the hull before calking. Then, a final finish-sanding puts the surface in excellent shape for painting. Before calking a hull, make sure that it will not be necessary to renew any fastenings at the stem or along the keel. Should renewal of any of these fastenings be neces-



Seam cement is forced into calked seams to make a smooth watertight job before sanding and painting



It's regular practice to apply a nonfouling copper bottom paint, especially if boat is used in salt water

sary, be sure to use a new fastening of the same metal as the original. The same is true of the planking screws, especially if the boat is to be used in salt water.

In repainting older boats, large or small, it's the usual practice to apply a copper bottom paint up to the water line and a marine paint of the owner's choice in kind and color from the water line to the sheer. Whether or not a primer is necessary will depend on the condition of the hull and the old paint. Many boatmen consider sanding between coats well worth the extra time consumed as it produces a final finish of top quality and durability. When painting two colors to a line, use painter's masking tape to assure a sharp, clean line between the colors.

Ready-Made Trellis Crosspieces Provided by Wooden Coat Hangers

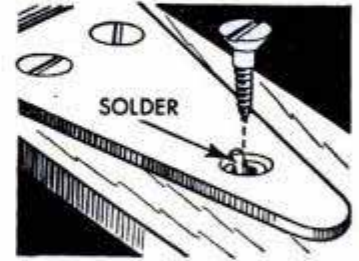


Half the job of making a small trellis is done before you start if ordinary wooden coat hangers are used for the cross members. Just nail the coat hangers across three uprights of lath or lattice stock, give the trellis two coats of paint and, when dry, embed the ends of the uprights in the ground.

Roland Cueva, Hayburn, Ohio.

Wire Solder Anchors Wood Screw

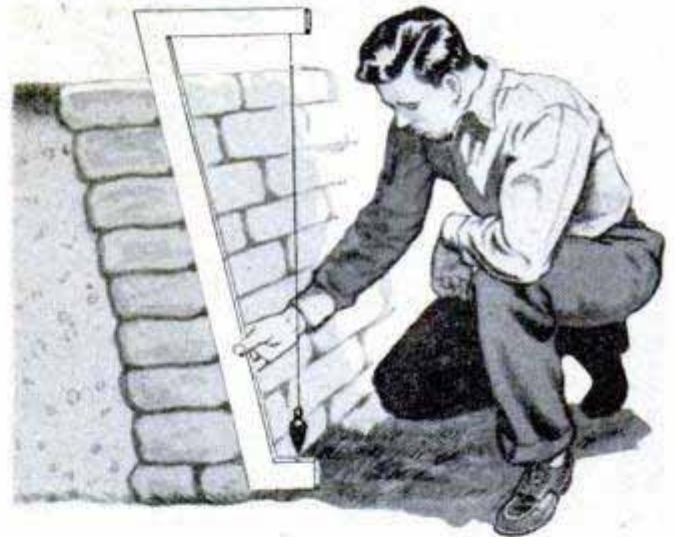
When a wood screw has worked loose, a quick repair can be made by dropping a short length of wire solder into the hole and then redriving the



screw. The solder fills the hole so the screw grips tightly. This takes less time than the usual method of filling the hole with a wooden plug and redrilling for the screw.

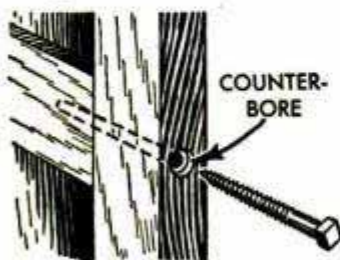
Plumb Bob for Terrace Walls Aids in Keeping Uniform Slant

By using this easily made plumb bob when building terrace walls, it's a simple matter to keep the angle of slope uniform throughout the length of the construction. You will be surprised at how much neater the finished job will look if you keep an accurate check on the pitch of the wall instead of relying on guesswork. Just build up a frame from scrap lumber, setting the upright at the desired angle to the horizontal members. Drill a hole through the top crosspiece for the plumb line and mark a cross on the upper face of the bottom crosspiece in exact alignment with this hole. Then mount the plumb bob in the frame so that it swings free of the bottom crosspiece. To use, hold the upright against the wall, as shown, and note the position of the plumb bob in relation to the cross mark. When the plumb bob is directly over



the cross, the wall is at the same angle to the ground as the upright member of the frame.—W. Fehlberg, La Crosse, Wis.

Lag Screws Draw Up Joints Between Stiles and Rails of Paneled Door



If the joints between the stiles and rails of a paneled door separate as a result of warpage, they can be repaired easily by drawing the two members together

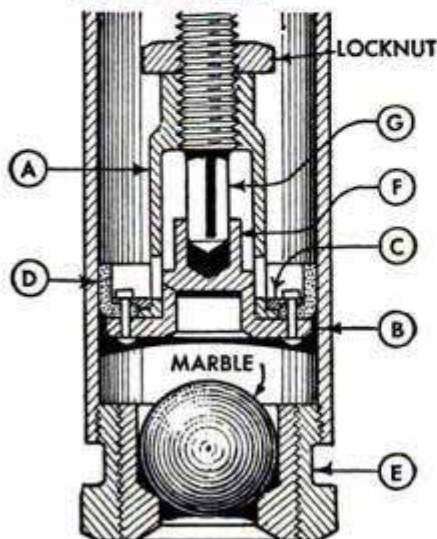
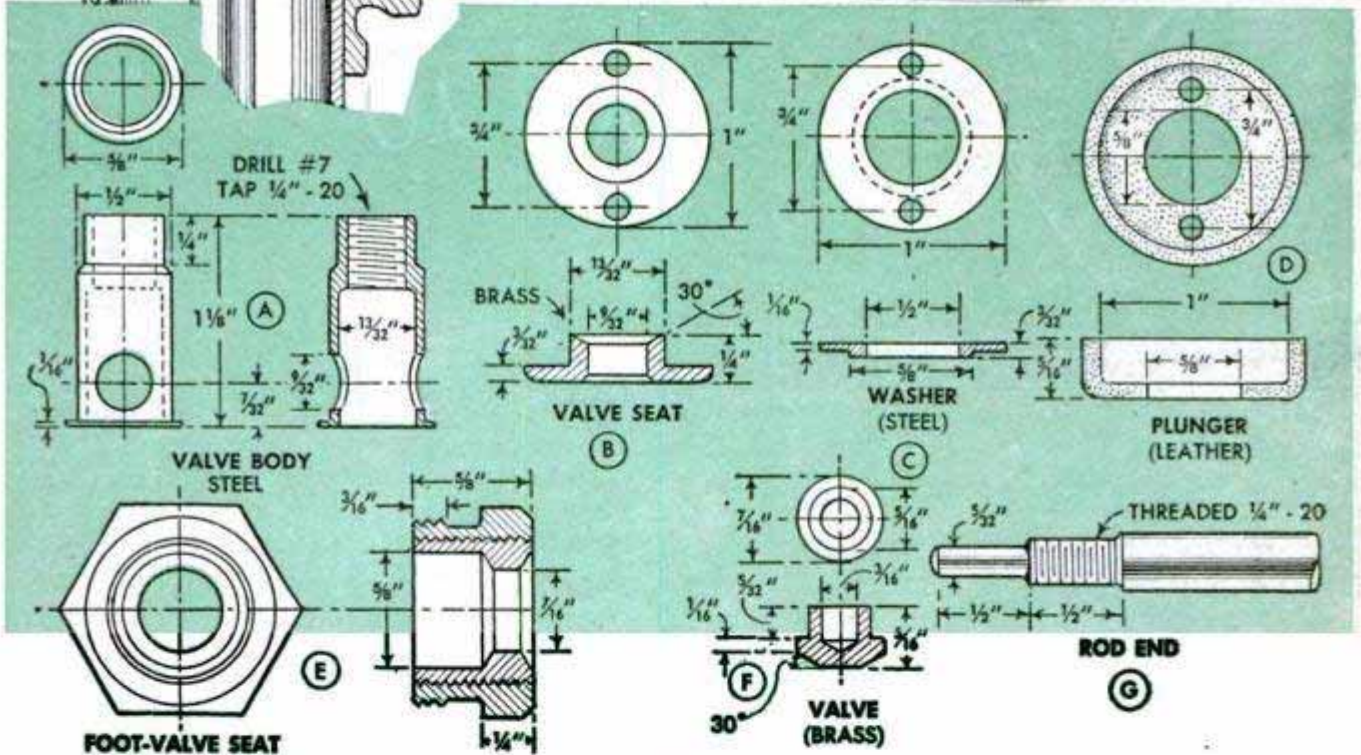
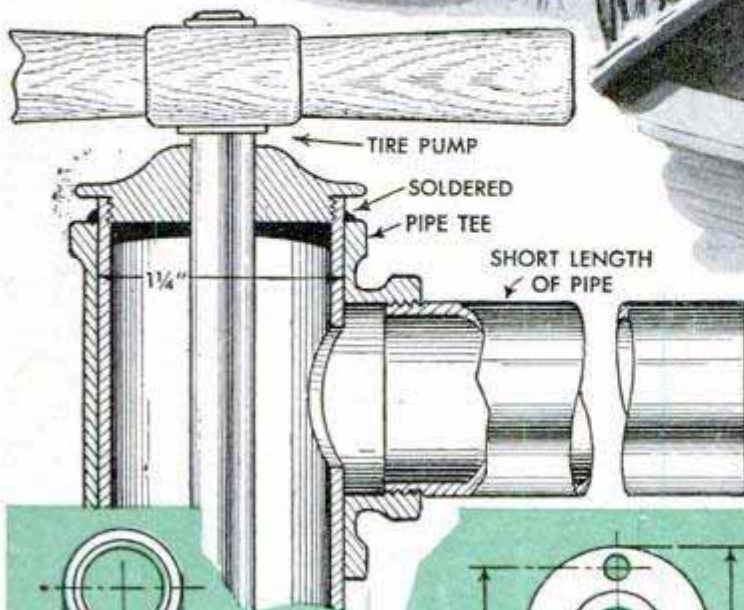
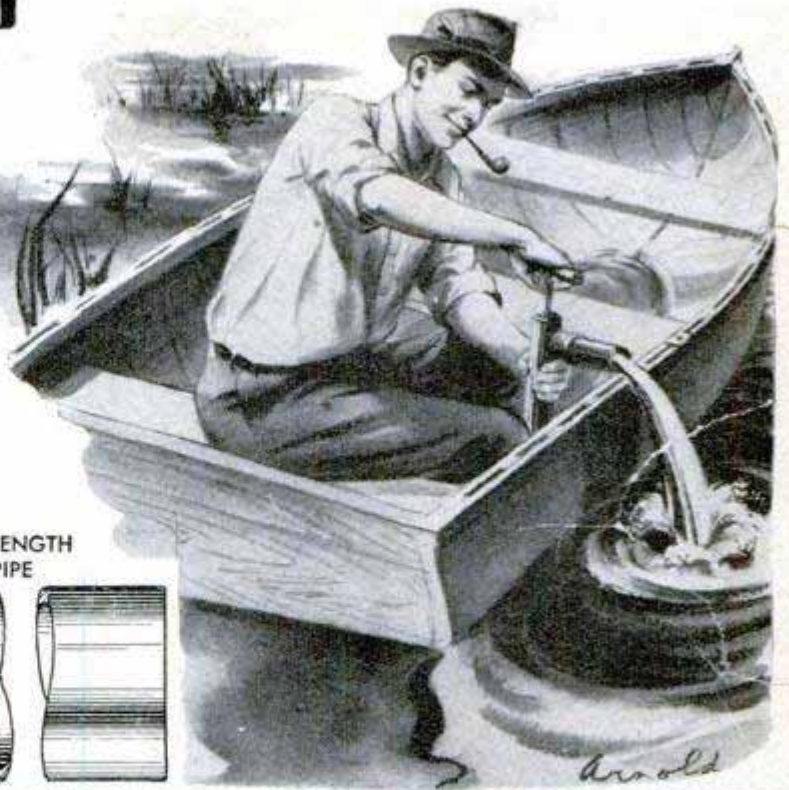
with a lag screw. Frequently, this can be done without removing the door from the hinges. First, a hole is drilled through the stile and into the rail. Then the hole is

counterbored to bring the screwhead slightly below the edge of the door, the counterbore being made large enough to permit driving the lag screw with a socket-head wrench. After the lag screw is in place, the head is covered with wood putty or a hardwood plug which is then finished to match the rest of the door.

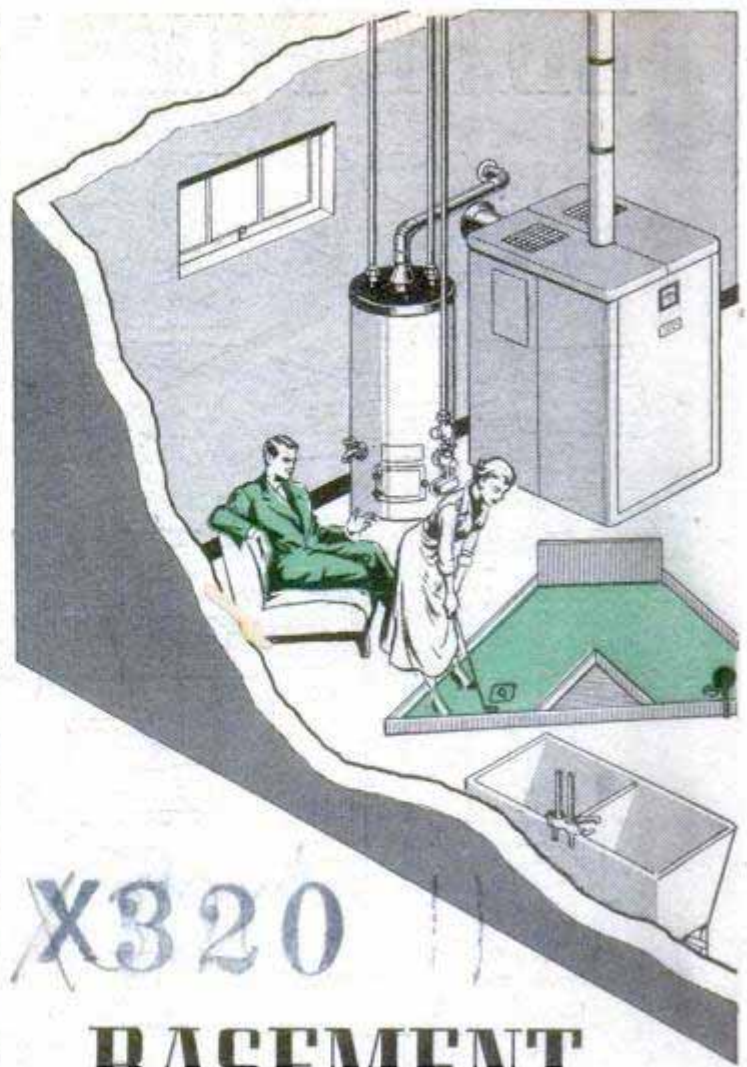
☛For maximum operating efficiency, it's important to use a good grade of oil in your car. Inferior oil results in higher gas consumption because of increased friction.

BILGE PUMP

By John M. Avery



BY FITTING an old tire pump with valves and a discharge spout it can be converted to an efficient bilge pump. The base and hose of the tire pump are removed and the end is threaded internally for a brass pipe bushing which is fitted with a valve seat turned from a smaller bushing. The upper end of the pump is equipped with a pipe tee that is bored out to fit over the end of the barrel and sweat-soldered. A hole is cut through the barrel for the discharge outlet. The body of the valve itself, part A, is made first, as the rest of the component parts are made to fit it. All parts are keyed with the sectional view to show assembly. Note that the small end of the pump rod keeps the valve aligned. A glass marble is used for the foot valve with a cross-wire stop being provided to keep the marble from coming completely out of the valve.

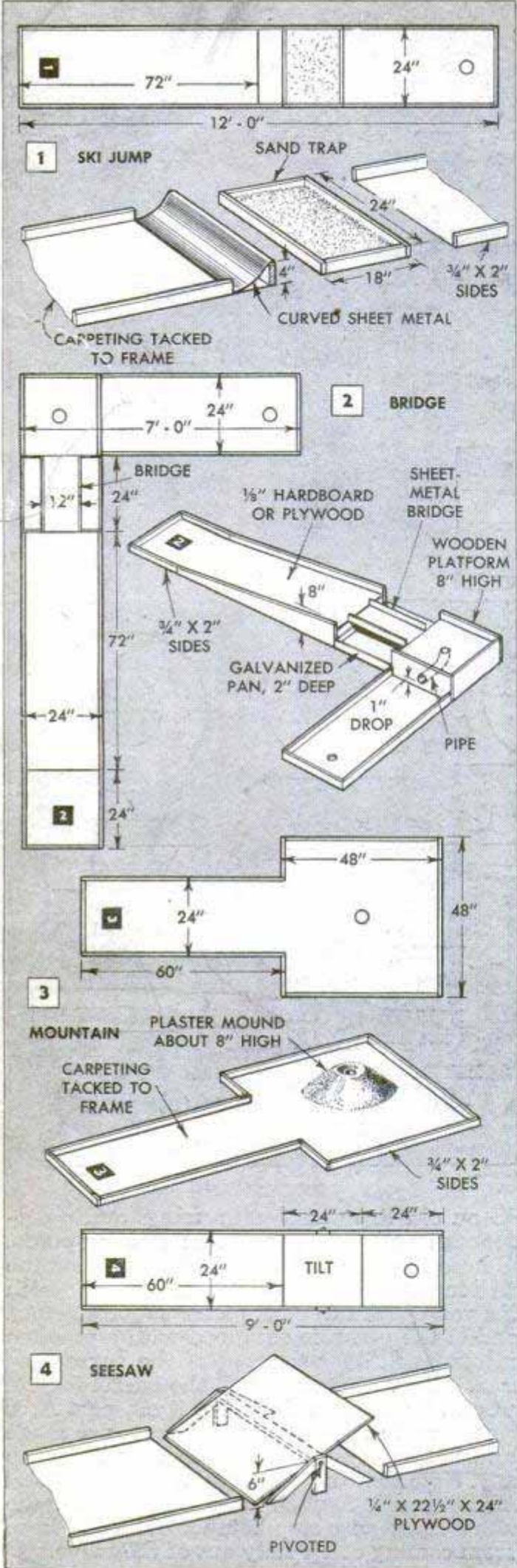


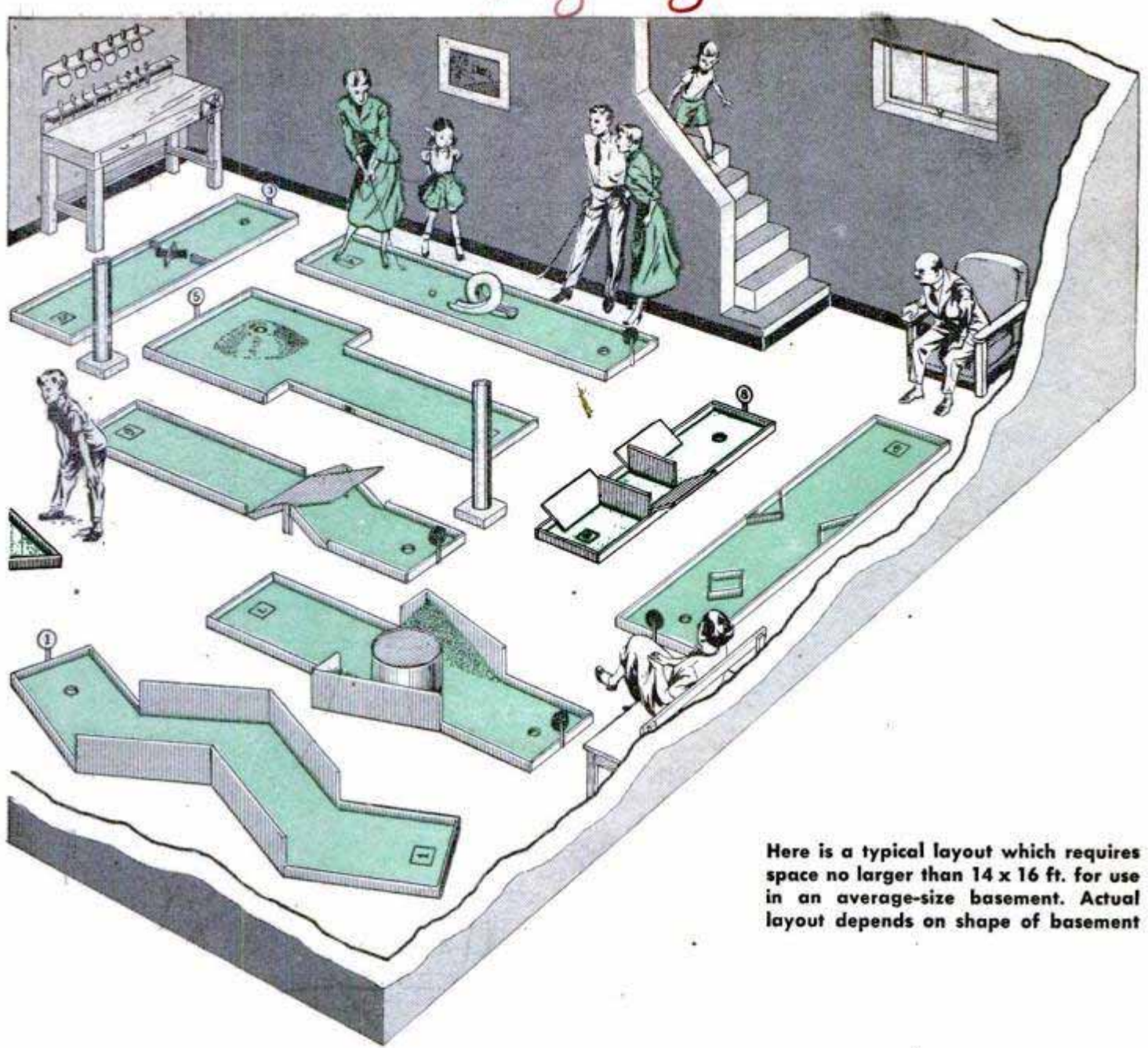
X320

BASEMENT GOLF

By Allan Carpenter

POPULARITY of miniature golf has brought the game right into the basement in the form of a knockdown course that can be picked up and stored away almost as easily as you would a game of croquet. It's an exciting game the whole family can enjoy the year round—from the youngsters on up to the avid golfer who will find it good practice in keeping his putting eye keen. Standard putters and irons are used and scoring is done as in real golf, penalties being counted as strokes. As for space, most basements, especially those with compact heating units, will accommodate the "concentrated" nine-hole course pictured in the illustration above, but, where there's only a minimum of space, a lot of fun can be had from a much smaller course. As each green is complete in itself and lightweight, the course can be quickly set up. Most of the greens are fairly shallow to permit stacking them in little space when not in use. Where yard area





Here is a typical layout which requires space no larger than 14 x 16 ft. for use in an average-size basement. Actual layout depends on shape of basement

is sufficient to permit an outdoor course, a suggested layout for an 18-hole one is given in the plan view on page 197. Construction of nine additional greens is given to supplement the nine shown above.

The various greens detailed can be adapted to almost any size layout. While the ones shown have been purposely kept small, the fairways being only 24 in. wide, they can be made larger, if space permits, and made even more tricky. In laying out your course, remember to place the greens in numerical order, keeping the tee of the following green adjacent to the hole of the preceding green. The last hole, whether it is No. 9 or 18 of the course, should be located so that the player is brought back to the starting point. It is good, too, to place the greens so that the first and last holes are near the basement stairway. In designing your own special greens, don't make a hole-in-one shot impossible. Rather, design and locate the hazard in such a manner that the ball can be banked

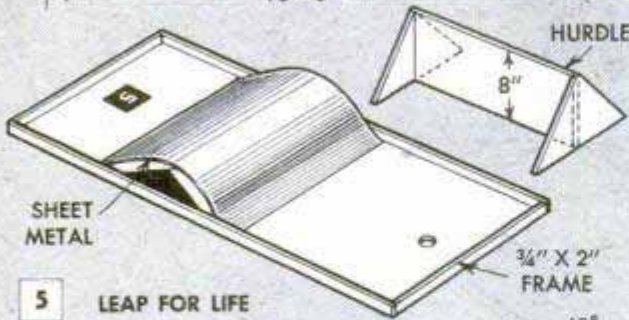
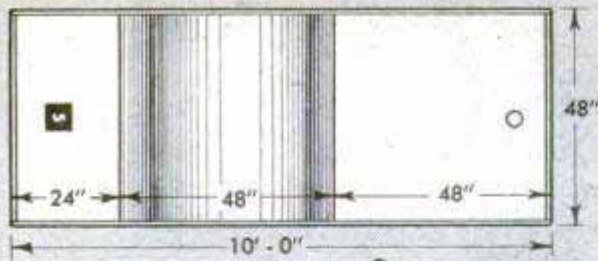
into the cup. The plan view for the 18-hole course shows by dotted lines how it is possible to make each hole in only one shot.

Figs. 1 to 18 inclusive detail the construction of all 18 greens. Old carpeting tacked to the edges of the framework is perhaps the best material to use for the turf. The basement floor is much too smooth for accurate control of the ball. Jute padding and coco matting also can be used. For an outdoor course, sawdust is recommended for the playing surface, Fig. 19. This is spread over a dirt fill to produce a layer about 1 in. deep when the sawdust has been dampened and rolled smooth. Commercial courses generally use a concrete base topped with sawdust. If desired, the sawdust can be colored green to look like turf by dyeing it with water-soluble dyes. Shallow can lids are used for cups and Fig. 20 shows how these are set flush with the rug pile in holes cut in the carpet. Adhesive tape applied across the underside keeps the cups from falling out when the greens are

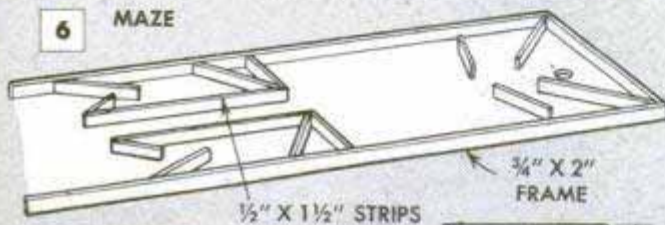
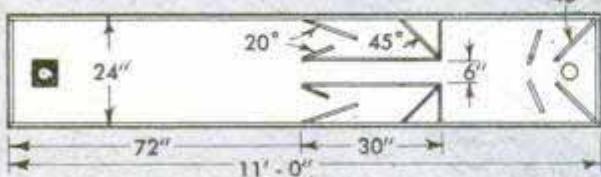
moved. A small square of carpet with a numeral painted in the center is glued to each green to serve as a tee. A can-cover marker attached to the far end of the green identifies each hole.

Green No. 1 features a hazard of curved sheet metal to lift the ball over a sand trap. In green No. 2, an inclined fairway carries the ball over a small bridge. If it misses the bridge, the ball falls into a shallow pan of water, with the player being penalized one stroke for lifting it out. The lower end of the pipe which guides the ball to the cup should be in direct line with the cup to permit a hole-in-one shot. The mountain, green No. 3, has the cup placed in the center of a mound of plaster of paris. The hazard at green No. 4 consists of a plywood panel critically balanced so that the weight of the ball in rolling over it causes the panel to tilt forward toward the cup. In the case of an outdoor course, the hill in green No. 5 can be formed from a mound of dirt, but indoors it is made from sheet metal or linoleum which is bowed and placed across the center of the fairway. An alternate hazard is provided at this hole in the form of a hurdle which is a board set vertically over which the ball must be lifted. For this shot an iron is provided and left at the hole after play is completed. The maze at green No. 6 is formed from strips of $\frac{1}{2}$ x $1\frac{1}{2}$ -in. wood which are tacked in place to the carpeting from the underside.

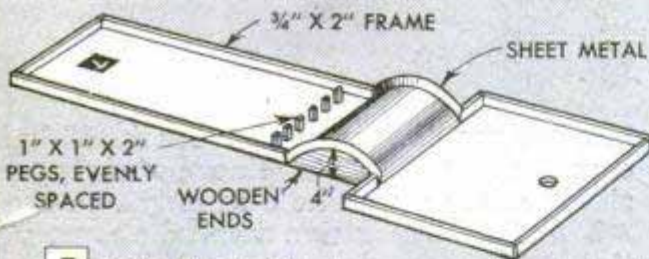
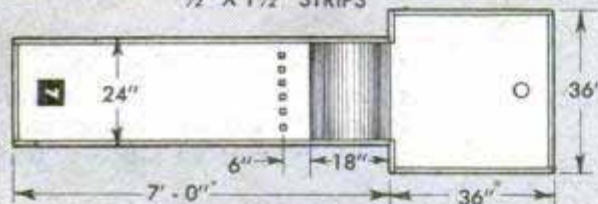
The obstacle for green No. 7 is made up of short pegs set vertically in front of a sheet-metal bunker. Note that the



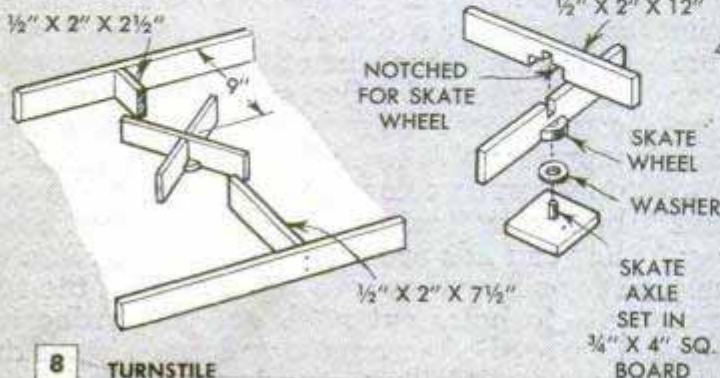
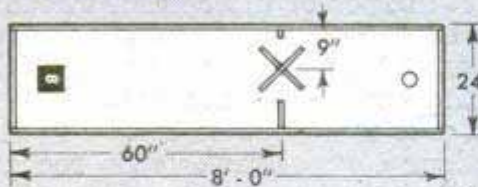
5 LEAP FOR LIFE



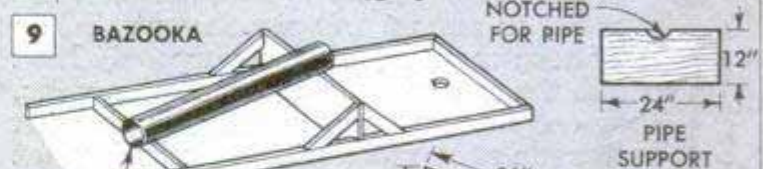
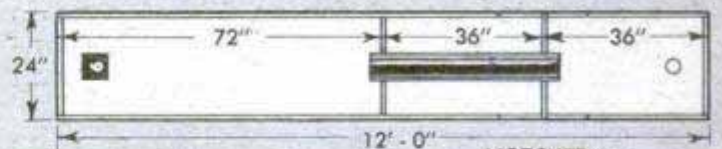
6 MAZE



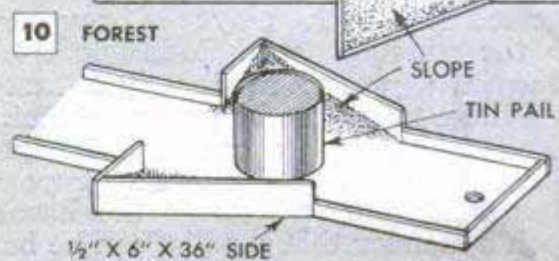
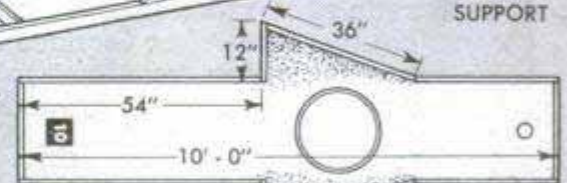
7 OVER THE HUMP



8 TURNSTILE



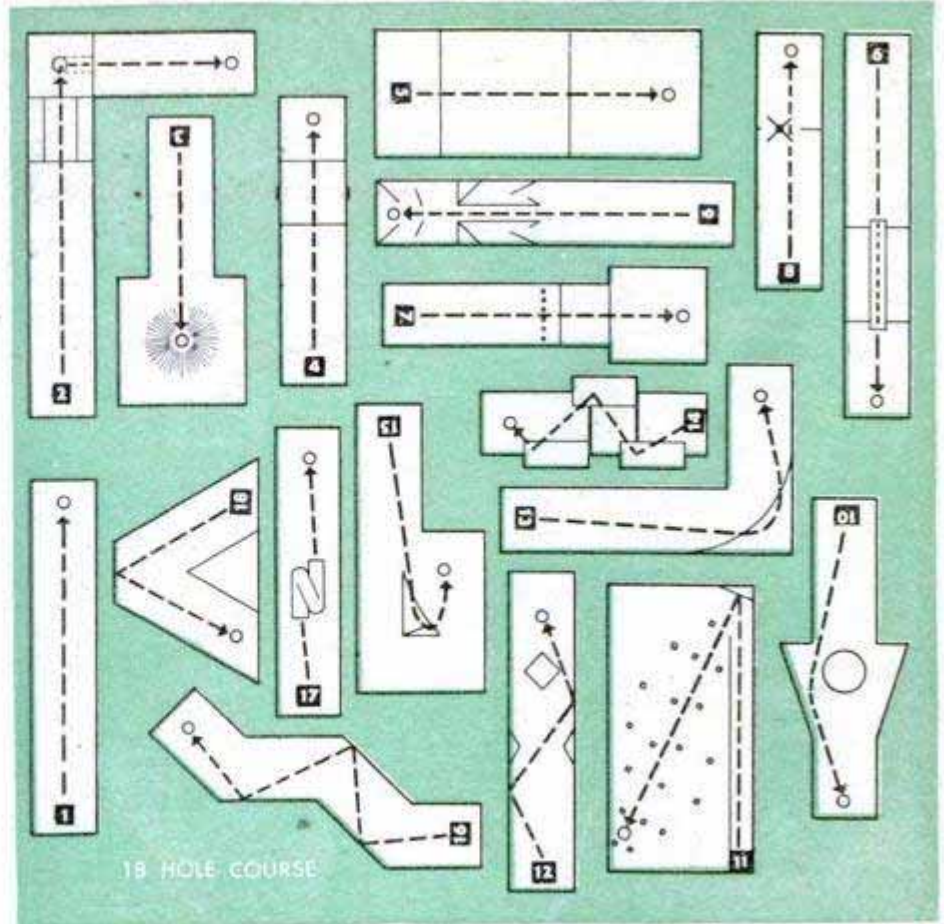
9 BAZOOKA



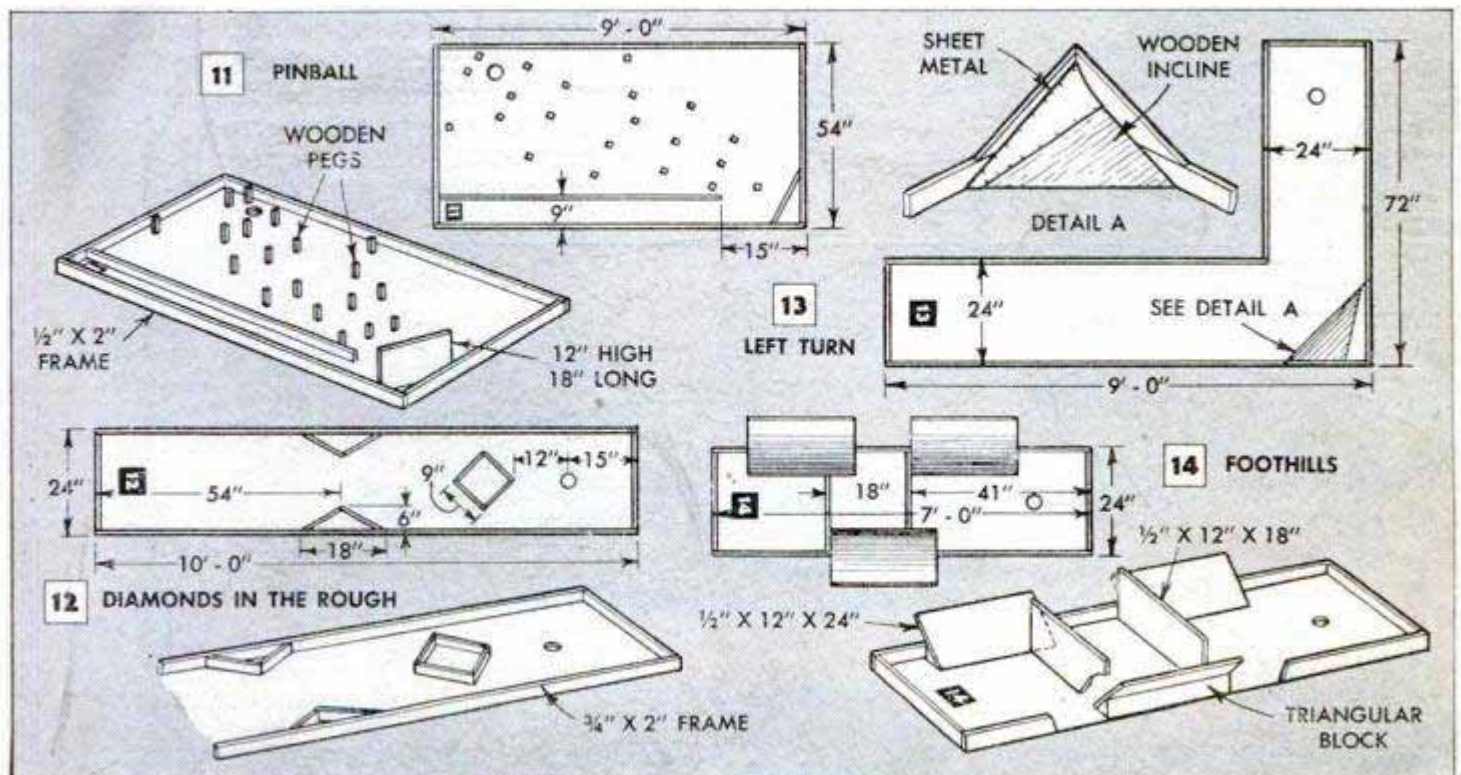
10 FOREST

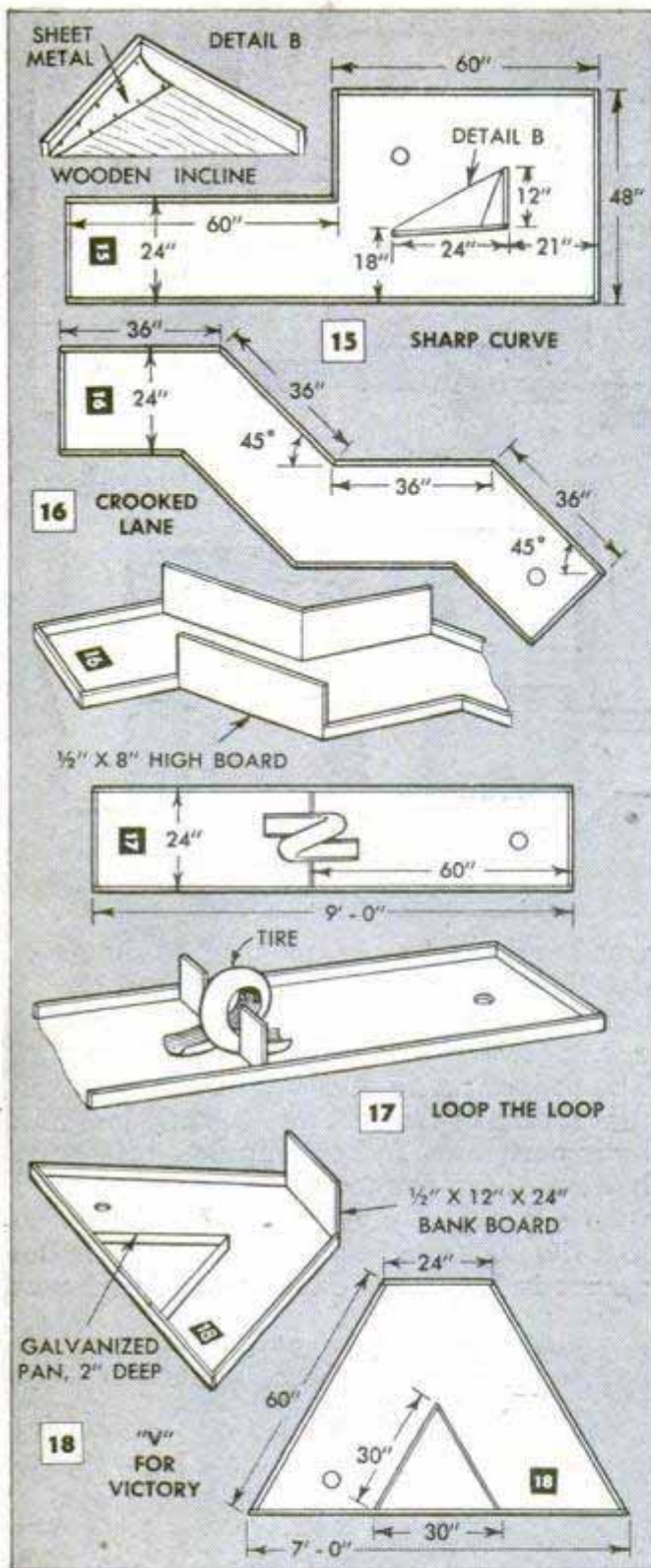
center space between the pegs must line up with the cup to permit a hole-in-one shot. The pegs can be fastened in position by nailing a wooden strip across the underside of the carpet fairway and then driving screws through the strip and up into the pegs. The strip, cut to fit between the side members, causes a slight hump directly under the pegs. This adds to the difficulty of making a hole-in-one. The pivot point for the turnstile at green No. 8 is placed off center of the fairway so that the blade at the right-hand side is directly in line between the tee and the cup. Be sure that the amount of clearance under the turnstile will not allow the ball to roll under it. The bazooka hazard at green No. 9 consists of a length of stovepipe placed at an angle, the lower end being sunken slightly in the green to permit the ball to enter the pipe easily.

On an outdoor course, green No. 10 is built around a tree if possible, although a barrel or a 5-gal. paint pail will serve the same purpose. The fairway is sloped on each side of the tree to bank the ball. Dirt or concrete can be used to form the bank on an outdoor course, while indoors a piece of



wood and sheet metal are used as shown in detail A, Fig. 13. The pegs at green No. 11 are placed so that a narrow path is kept open between the bank board and the cup. The proper angle to set the bank board so that it directs the ball into the cup is found by experiment. In building this green, the bottom of the framework must be covered with a panel of plywood or hardboard so that the pegs can be attached to it after the carpet is in place. Simple wooden forms

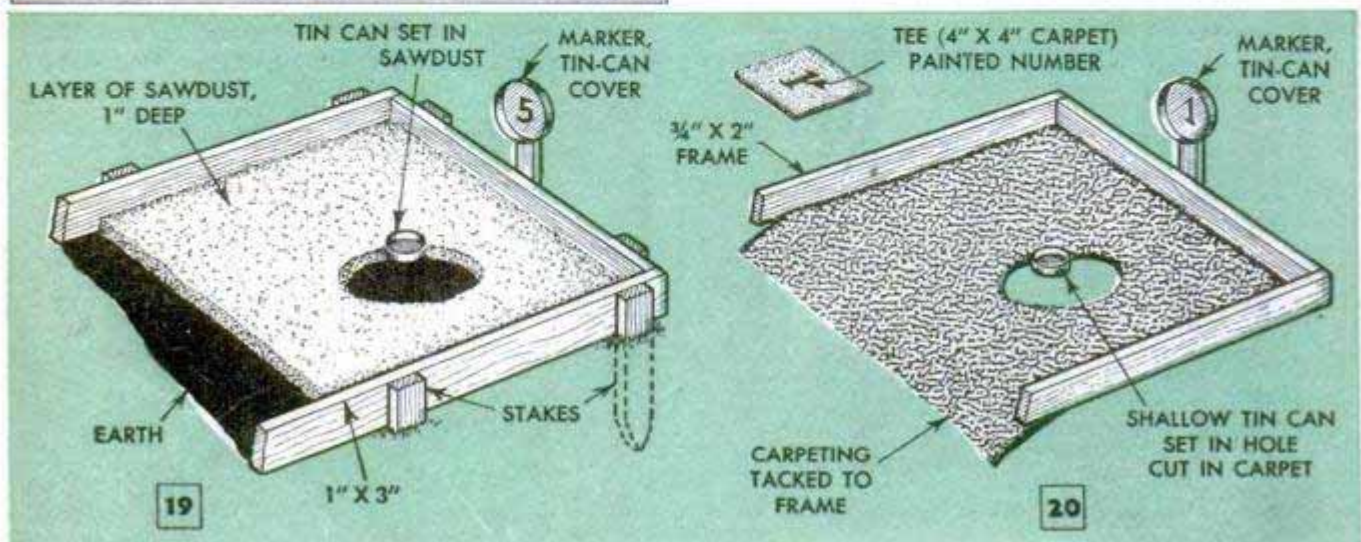




provide the obstacles along the fairway of green No. 12. A bank shot against the right or left-hand side boards is required to make the hole. L-shaped green No. 13 also requires a bank shot to direct the ball to the cup. Here, the player must be careful not to hit the ball too hard as it is easy to overshoot the top of the bank and go out of the green. When this happens the player is penalized one stroke.

Green No. 14 requires a trick shot to make the cup. Three inclined boards, staggered opposite each other, and two vertical obstacles placed across the fairway require rolling the ball up over the inclined pieces to get around the two vertical obstacles. Here, either cleats or a plywood bottom must be fitted to the framework to permit nailing the obstacles in place. Green No. 15 requires another bank shot and accurate aim. The incline, detail B, is formed from sheet metal and plywood and is located the distance indicated from the cup. This can be fastened directly to the carpet. Green No. 16 requires a triple-bank shot to make a hole-in-one. Bank boards are erected along the sides of the fairway at the points indicated.

Sinking a putt on green No. 17 is a lot of fun and requires a good shot to make the ball loop the loop through a section of old auto tire. The ends of the tire are spread apart as shown and screwed in the center of the fairway to a baseboard nailed to the edges of the framework. Wooden baffles are erected at each side of the tire so that the ball must pass through the tire to enter the cup. The fairway of green No. 18 is made V-shaped, with a bank shot being required to sink the putt. A water hazard is installed level with the surface of the fairway so that the ball can roll into it. A triangular shaped pan of sheet metal about 2 in. deep is made to set down into the green. This requires making the frame members wider than actually shown to permit raising the fairway. The bank board is made of a piece of plywood.

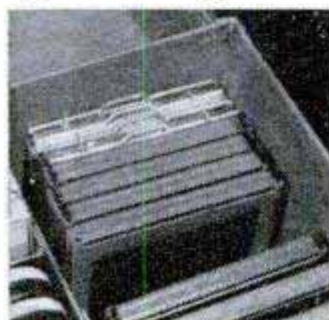


Hand Reflects Enlarger Light When Changing Lens Setting



It isn't necessary to turn on the darkroom lights each time you wish to change or check the diaphragm setting of your enlarger. Instead, turn on the enlarger and cup your hand directly under the lens as shown. This will reflect sufficient light to permit reading the indicator markings.

Keeping Track of Exposed Film By Inverting Holders

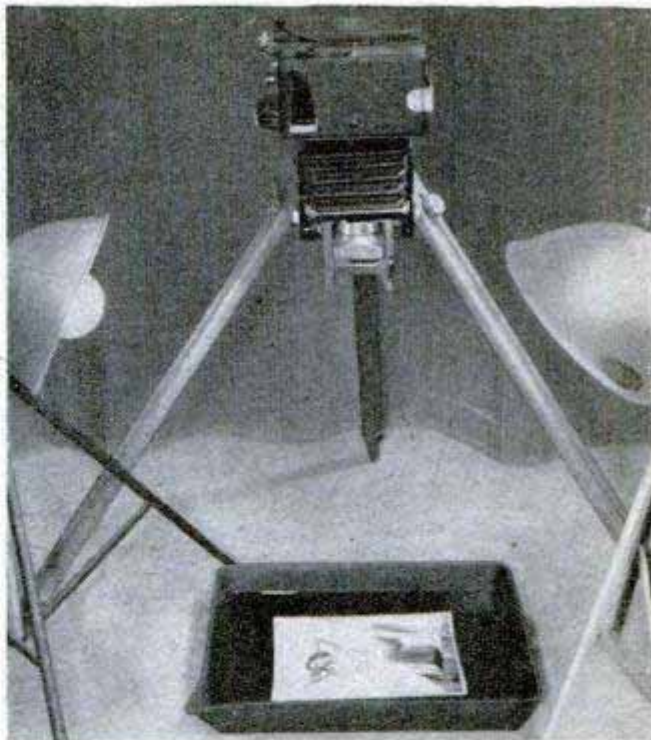
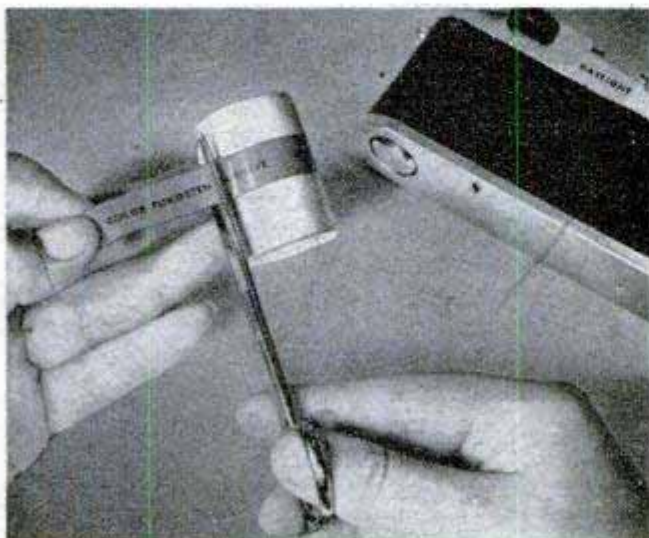


When shooting pictures on location, it's a good idea to save at least one holder of unexposed film for the possibility of a spectacular shot on the way home. To tell at a glance exactly how much unexposed film is left so you can plan the remaining shots, replace each holder upside down in the case after it has been used.

Label Attached to Camera Indicates Film Type

If a 35-mm. camera is usually kept loaded with color film, it is easy to forget whether the film in the camera is daylight or tungsten. To prevent this, cut the band from the film container after the camera has been loaded and attach it to the outside of the camera to serve as a descriptive label.

H. A. Thornhill, Sacramento, Calif.



Copying Prints Through Water Produces Better Negatives

One of the best methods to use in copying a photographic print is to shoot it through water. The resulting copy-negative is not only free of surface texture, but the range of tones of a rough-grained paper will be increased. The photo above shows how the exposure is made. The print to be copied is placed in a tray filled with water and the camera is mounted directly over the tray. When the print is thoroughly soaked, it will lie perfectly flat and, if the print that is being copied should have any previous drying marks that tend to disfigure the subject, the water bath will completely eliminate them in the final copy print.

Virginia Hanson, Santa Monica, Calif.

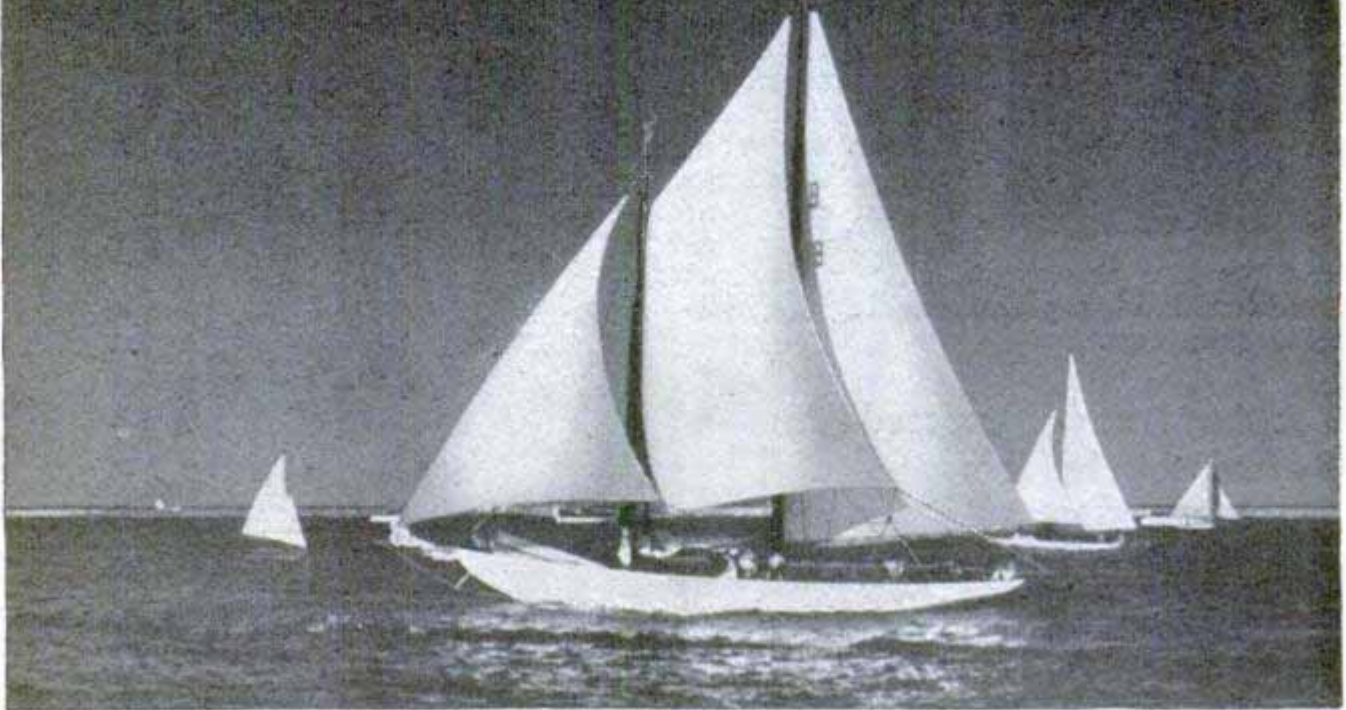
Paper Toweling Forms Blotter Roll For Drying Small Prints

By using a roll of paper toweling and sheets of wax paper, a blotter roll for drying small prints can be improvised in a jiffy. Just unroll a length of the paper towel, cover it with the wax paper and place the prints face down on the wax paper.



Then, roll them into the towel. Dozens of prints can be dried simultaneously in this manner, which takes up little space and produces flat prints.

TITLES THAT SPARK INTEREST

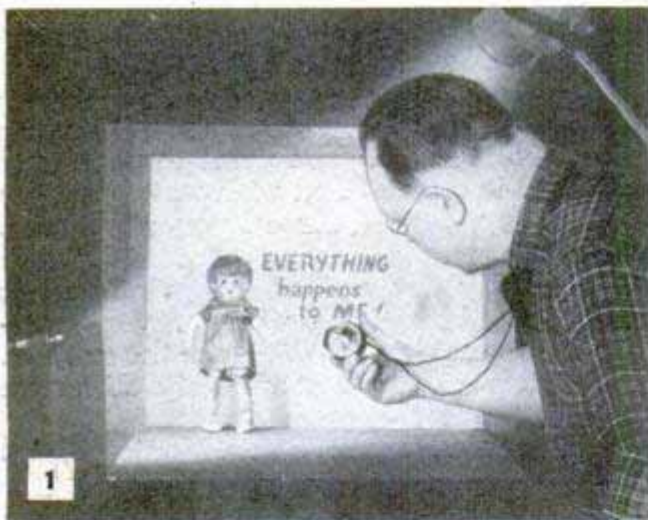


Presenting vacation movies, color slides or albums with catchy, easy-to-read titles gets your evening's entertainment off to a good start

By Alexander Maxwell

THERE'LL be no periods of lagging interest during that first showing of your vacation movies or slides if you plan snappy titles beforehand and carefully run them into the continuity where the action slows a bit or the subject changes. In a general way, the procedures used in making up attractive, unusual and informative titles and subtitles can be applied to any movie continuity as well as albums and color slides on subjects which are entertaining, scientific, industrial or educational. The essential thing is a title cleverly tied in with the picture subject. Ingenuity and imagination used in making up the title sets are what make the sequence interesting and entertaining.

Simple three-dimensional title sets always hold the attention of the audience because of the sense of realism. For some picture subjects, three-dimensional sets will take time to prepare and in any case it's always well to avoid a complex or involved arrangement of the props. The ideal set is assembled in such a way that when photographed and edited into the picture sequence the eye catches both the subject and the title message at a glance. The title set in



1 Above, checking light intensities with an exposure meter before shooting a three-dimensional title set. Below, photo rendering depends on proper lighting

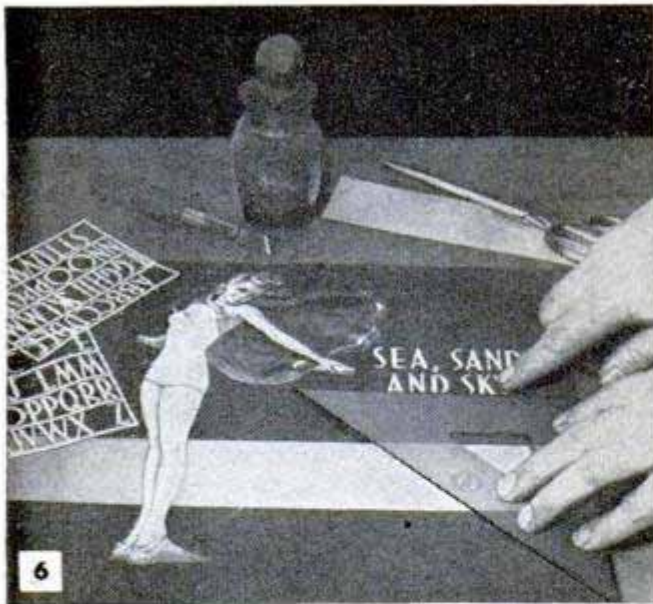




Fig. 1 and the resulting title picture, Fig. 2, is a good example of what to strive for in simple three-dimensional title sets. Dolls like the one shown are effective figure props, as they are so very lifelike when skillfully posed and properly lighted. Remember that in sets like this, lighting does the trick. In the set, Fig. 1, the doll is posed in front of the lettered backdrop in a position to cast a greatly enlarged shadow and the wistful, rather pathetic expression is achieved not only by positioning the arms, legs and body of the figure but by carefully maneuvering the lights to model the face. A spotlight is focused with fairly sharp edges on the lettering and the modeling light is directed from a point slightly below eye level by means of a photoflood reflector having directional flaps. Check the light intensities with an exposure meter before shooting the set, Fig. 1. Another method of making up sets giving a three-dimensional effect is suggested in Figs. 6 and 7. Here, a colored cutout, or clipping, is used as the figure. The cutout is pasted onto a two or three-tone backdrop as in Fig. 6. Lettering is assembled from gummed type characters clipped from monogram alphabets (available from dealers in artist's supplies) and lined up with a draftsman's triangle as shown. The set is then lighted and photographed as in Fig. 1 with the result you see in Fig. 7. Another suggestion, using a metallic-paper backdrop, is shown in Fig. 10. Colored metallic papers in gold, green and red photograph in dazzling brilliance and, in "white," Fig. 10, the metallic-paper backdrop gives a remarkably realistic feeling of a frozen, winter scene through which the schoolgirl (cutout) is happily making her way. Note the three tiny trees placed just below the title to give the shot the effect of depth.

Ordinary photo albums can be made much more interesting if you date picture groups chronologically and add appropriate

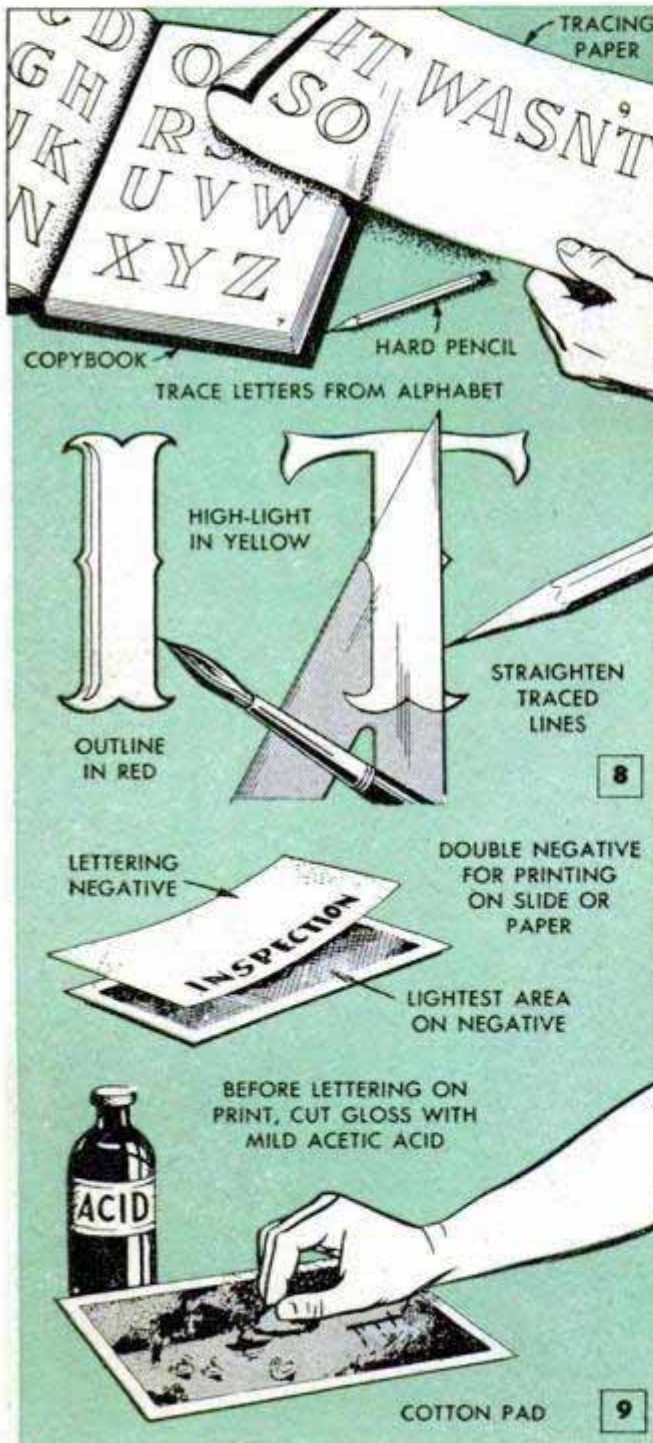




Colored pasteups give the three-dimensional effect



Here's the photo rendering of the colored pasteup



titles as suggested in Fig. 3. These can be simple pasteups, original pen-and-ink sketches if you have artistic ability, or they can be set up in attractive, harmonious colors and color-photographed as already described. The latter procedure is, of course, rather expensive as color prints would have to be made from the transparencies.

During vacation you're always on location, either for movies or still pictures, and Fig. 4 details three ways of making attractive titles either for movies or photo albums. When photographing words scratched in sand or snow, watch the lighting carefully. Of course, you will use natural lighting so form the letters and position the camera in such a way that the light source is slightly above and to the left or right of the line of letters. Otherwise parts of certain letters will not cast a sharp shadow. If you happen to be in "Smoky Canyon" in camp or trailer and there are picture possibilities sufficient to warrant a title, burn the letters into a weathered board and photograph the "set." Welcome signs, highway markers, place names and historical tablets make good title props. Always have them in mind as title possibilities when you're traveling.

In some cases, the titles are more effective if they are lettered directly on the back-drop. This can be done by simply tracing the characters from a copybook or alphabet book of the type used by artists. Trace the required letter outlines on tracing paper as in Fig. 8. Pencil parallel lines on the tracing paper if the letters are to be in precise alignment. After tracing letters for the required number of words, rub the back of the tracing paper with a soft lead pencil, then turn the sheet right side up and register and align it on the backdrop. Tracing the outlines lightly will transfer each letter outline to the backdrop. Next,

straighten and sharpen the transferred letter outlines with a pencil and triangle as in the lower detail, Fig. 8. Finally, fill in the outlines with opaque water colors. One example of this type of work is shown in Fig. 11. In this particular example, each individual letter has been high-lighted, Fig. 8, with a contrasting color.

On posed pictures, it's comparatively easy to make the title by double exposure. The title card, or backdrop, is made up first and shot. Then, without advancing the film, the subject photo is taken. Of course, exposure is a problem, but if you use a card or backdrop with a black matte surface and avoid high lights in the over-all lighting, normal exposure time for the second shot generally produces good results. Making double-exposure slides or movies is more tricky. Some late-model 35-mm. still cameras automatically advance the film when the shutter is wound, a feature precluding the possibility of making double exposures in the regular way. However, by notching the film, Fig. 5, fairly dependable results are obtainable. Shoot the titles first, then rewind and re-register the film for the subject shots. If your movie camera is fitted with a rewind mechanism and a frame counter, Fig. 13, then double-exposed sequences are simple to make. Just note the footage and the starting frame and rewind to that point for the second take. Double-exposure work is not practical with cameras not having the rewind feature, as you cannot rely on a footage counter alone.

To put lettering on a photo or slide already taken, make a negative of the title and place both in the enlarger or printer in exact register. On color slides the black-and-white title negative usually can be sandwiched into the mount without greatly altering color or brilliance. An alternate method is to letter directly on the contact print as in Fig. 9. Before lettering with white ink, cut the gloss on the print with dilute acetic acid as shown. Then rephotograph the altered print.

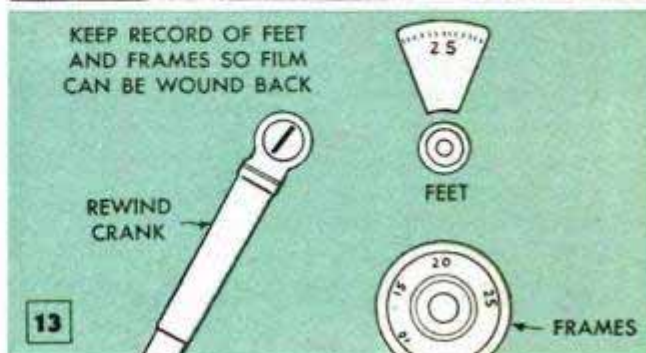
It is possible to produce a variety of title sets by stenciling both the lettering and the figures onto the backdrop. A variety of letter stencils is available, Fig. 12, and for the backdrop decoration there are geometric designs, home-decoration patterns and natural subjects ranging from fish to flowers. A brilliant stencil job, on a backdrop of contrasting color and photographed in color, makes a worthy part of the show and is exceptionally easy to read where several lines of descriptive type are necessary. Other novel treatments that can be used effectively to add atmosphere to certain subjects are lettering stenciled on rough, grainy wood, burlap, canvas and polished sheet metal.

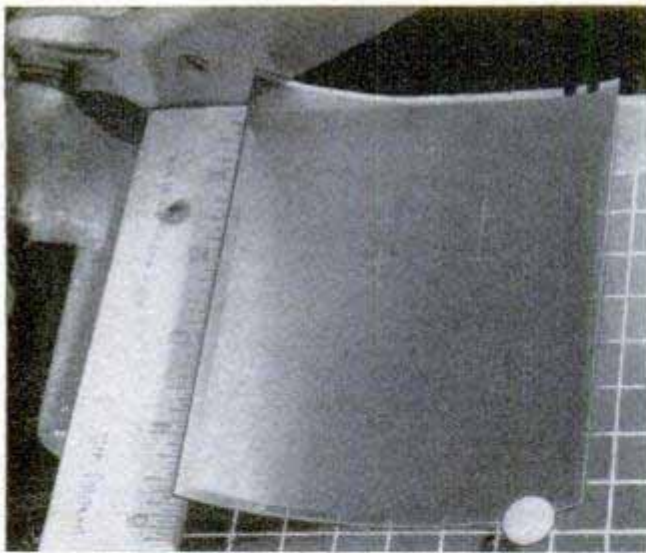


Metallic-paper backdrops in color give a wide range of unusual title sets. The one above, in "white," carries out the thought of winter very realistically



Above, high-lighted lettering is appropriate when titling historical sequences. Letters are traced and then blocked in with opaque colors. Below, stenciled titles are very effective on novelty backdrops



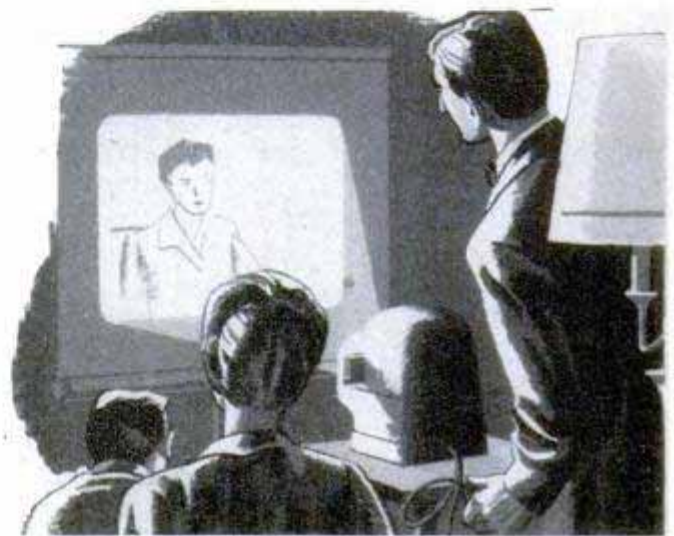


Trimming Film Before Developing To Fit Cut-Film Hangers

Although cut-film hangers are convenient for developing negatives from a film pack, the latter are a little too long to fit in the hangers and must be cut to size. This, of course, must be done in total darkness. To locate the negatives on the trimmer board in the dark, use a sheet of cut film to establish the exact size needed, and press a thumbtack into the board at the edge of the film opposite the blade. Then, when trimming the pack film in the darkness, it is necessary only to push the negative against the thumbtack to be sure that it will be cut to the proper size.

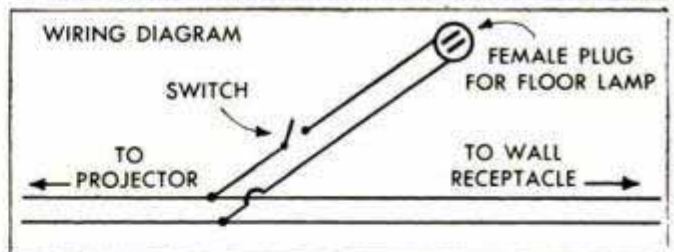
Handy Switch Controls Floor Lamp When Showing Color Slides

Turning a floor lamp on and off as needed when showing color slides is done quickly and conveniently if the lamp is connected to the projector cord. An extension cord for the floor lamp is wired in parallel to the projector cord, as in the wiring diagram, a female plug at the end of the cord receiving the lamp plug. A feed-through switch, which can be held in the projector-operator's hand, permits him to control the floor lamp instantaneously.



Music Box Mounted on Camera Holds Attention of Children

If a small music box is used to hold the attention of child subjects, it is no problem to get a couple of good pictures before the children become restless. A leather case riveted to the back of a reflex-type camera provides a convenient holder for the music box. On other types of cameras, the box can be mounted on any surface where it will not interfere with operating the camera.



Books That Help You Get Things Done

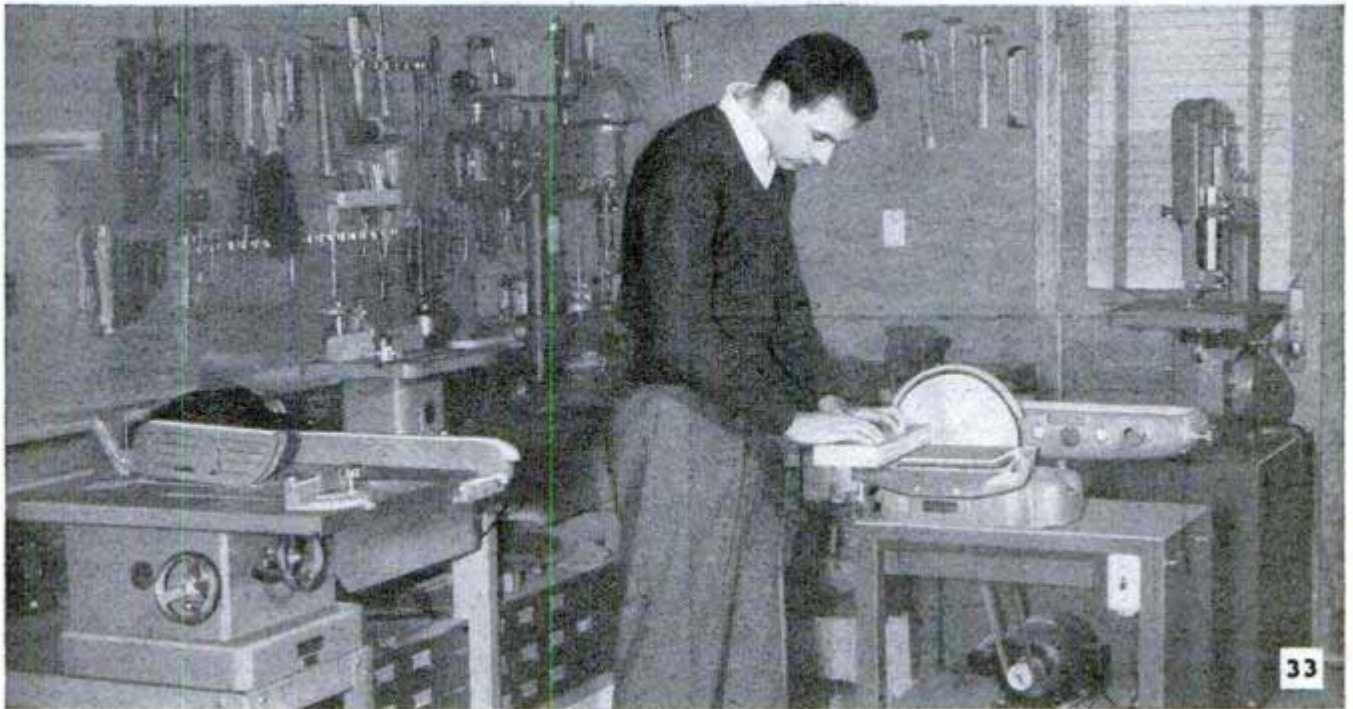
Every man should have a home workshop. To assist the craftsman, Popular Mechanics had Sam Brown prepare a book called "Planning Your Home Workshop" which is available from our Book Department for \$2.50. In the book you will find shop floor plans, basic tools to start a shop, and the tools to add as you go along, as well as efficient shop arrangement, management, lighting and things to make.

Once your shop is established the Popular Mechanics series called "What to Make" and "Shop Notes" will keep you going indefinitely. There are eleven volumes of "What to

Make," and each one contains hundreds of things to make in your shop. The four issues of "Shop Notes" contain, in addition to things to make, hundreds of helpful ideas for the shop worker, farmer and garage-man.

For the fisherman, Popular Mechanics' "How to Tempt a Fish" is unbeatable. Not only does it contain 128 fact-packed pages, with 20 in brilliant full color, but also instructions for making fishing rods, nets, etc. There are many pages covering fly fishing, bait casting, and fresh and salt-water fishing. Three chapters are written by Joe Godfrey, Jr., world-famous authority on fishing.

What to Make, at \$1.75; Shop Notes, at \$1.00 per copy, and How to Tempt a Fish, at \$2.00 per copy, are available from our Book Department. Send for free complete catalog.



33

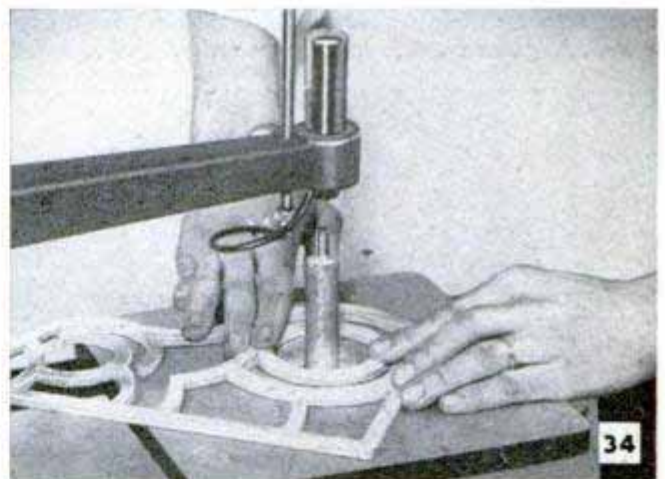
Photos and technical service courtesy "3M" Coated Abrasives Division, Minnesota Mining & Mfg. Co., St. Paul, Minn.

Use The Right ABRASIVE Part III

By W. Clyde Lamme

MOST HOME workshops now are equipped with at least one power tool that can be adapted to sanding, either with ready-made attachments or with those you can make yourself. As described in Part II of this story, hand-sanding methods can be relied upon to produce a very fine finish on cabinetwork, both on new projects and on old work. You can do the same thing by machine sanding and do it faster. Also, in its more general application, the power sander is an aid in shaping, squaring and smoothing a variety of small parts made from wood or metal. Small portable and stationary sanding machines are available for use in the home shop. These are of three general types, the disk sander, oscillating sander and belt sander. Disk and belt sanders are made in both the portable and stationary types but the oscillating sander is made only in the portable type. Besides the power-driven sanders, there are a number of attachments and accessories designed for other types of machines to adapt them to sanding operations.

In finishing new or old work by machine sanding, it usually is necessary to use the same abrasive-grit sequence as is used in

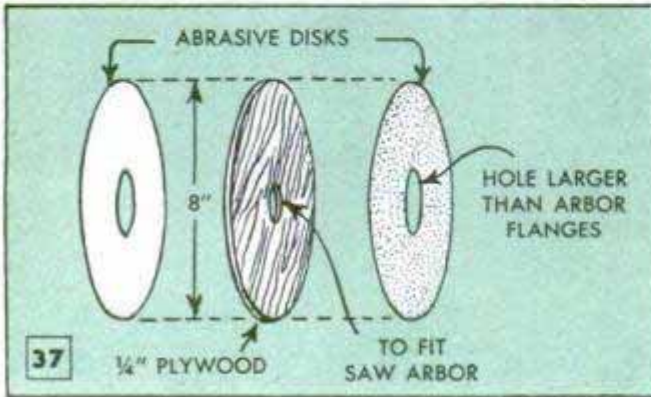
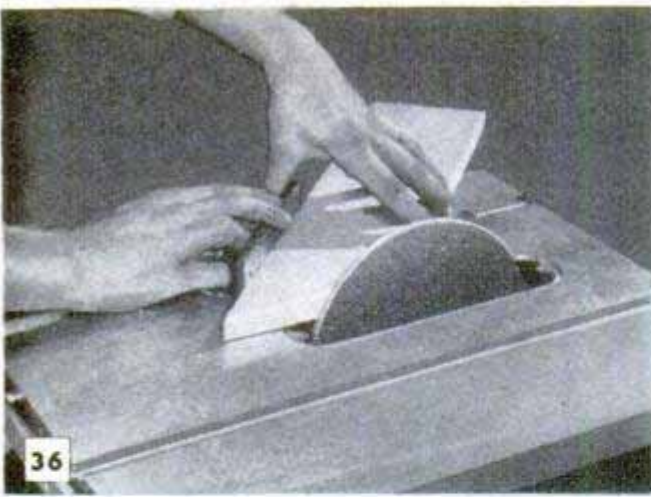


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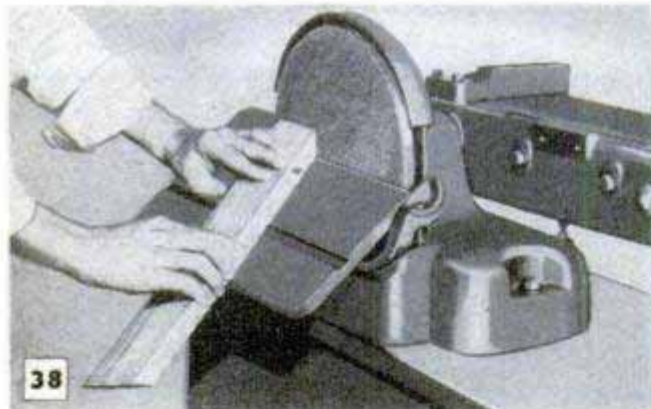
Above, this handy sanding attachment is available for small jigsaws. One face is convex and the other flat. Below, the small oscillating sander is just the thing needed to smooth narrow rounded edges



35



It's easy to make a disk sander for use on your circular saw by gluing abrasive to a disk cut from plywood. Angular work is quickly smoothed and squared



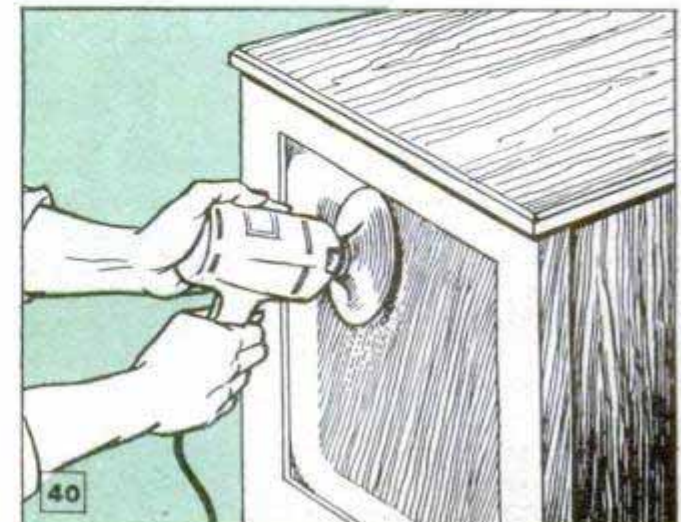
Above, compound angles can be formed on a machine like this. Below, flexible-disk sanding machine is useful for preliminary operations on wood and metal

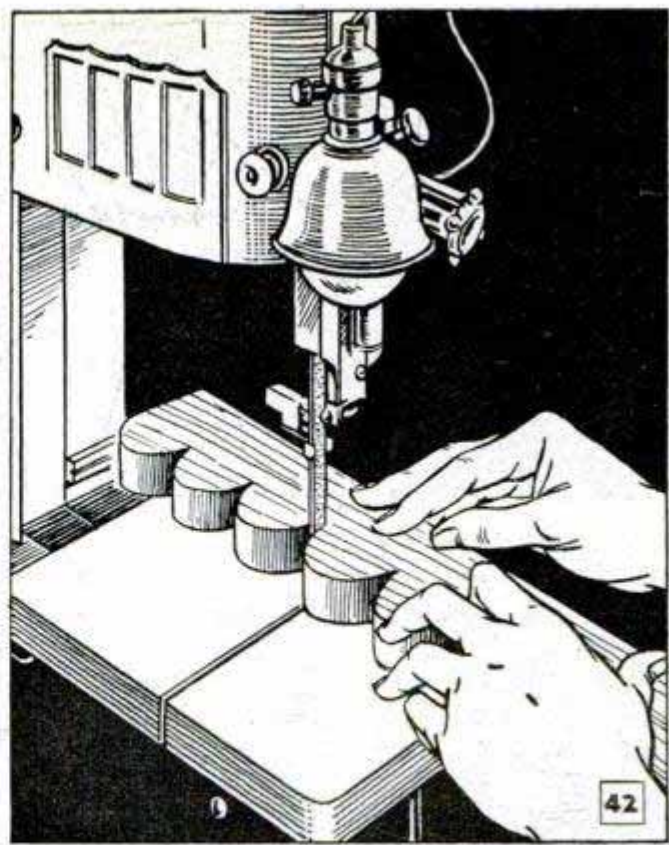
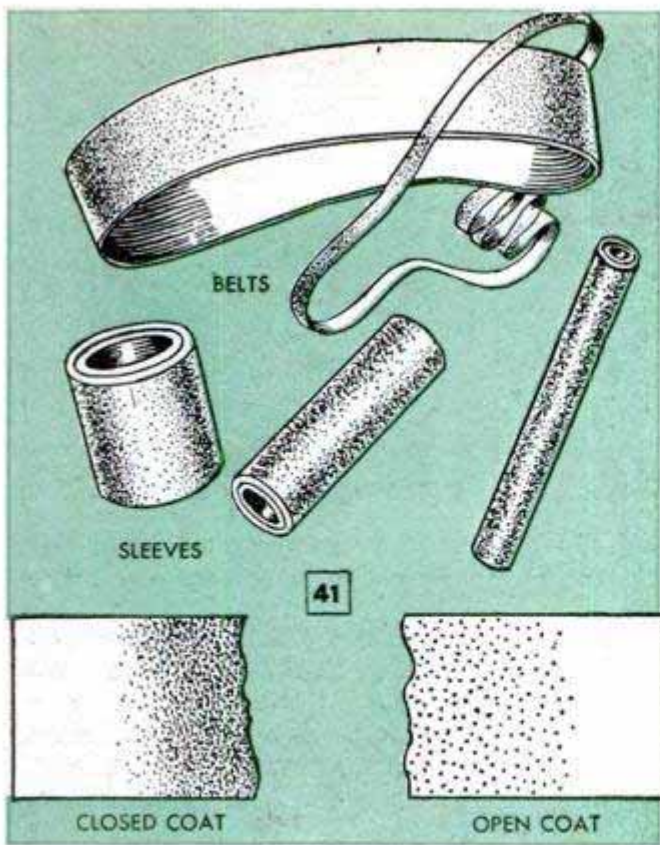


hand sanding, that is, begin sanding with the coarse grade and progress to the finer grade. However, it should be kept in mind that on the machine, regardless of type, the individual abrasive grains are driven across the surface at much higher speeds than is possible in hand sanding. Owing to the overlap of the cuts made by each individual abrasive grain on the same area of the surface, machine sanding with the coarser abrasives will produce a somewhat smoother surface than the same grade of abrasive when used in hand sanding. Because of this characteristic of the cutting action, it is possible to produce a very smooth surface by first using a coarse abrasive to level and true the work and then following with a fine abrasive. Thus it is possible to produce a creditable job in two passes instead of three or four, as required in handwork.

Fig. 33 pictures a combination disk-belt sander, with the craftsman using the disk on a typical squaring operation on end grain. The rigid sanding disk is especially effective on this particular work, as it will square and smooth end grain ready for finishing in one operation if a medium grade abrasive is used. Fig. 38 shows the same type of combination machine with the disk being used to true a compound miter. Note that the machine table is tilted the required number of degrees. Home craftsmen who do not have this combination machine can utilize the circular saw as in Fig. 36. Simply cut a disk from plywood to 8 in. in diameter for an 8-in. saw and center-drill it to fit the saw arbor, Fig. 37. Then cut two abrasive disks and glue one to each side of the plywood disk. If desired, two different grades of abrasive can be used on the same disk. *Caution:* When operating this disk on the circular saw protect your eyes with goggles. Note in Figs. 33 and 38 that the sanding is done on the "down" side of the disk. Although it is permissible to sand narrow

The flexible disk works close to a raised edge such as that found on recessed panels. Owing to high speed and flexibility of the disk, it cuts very fast





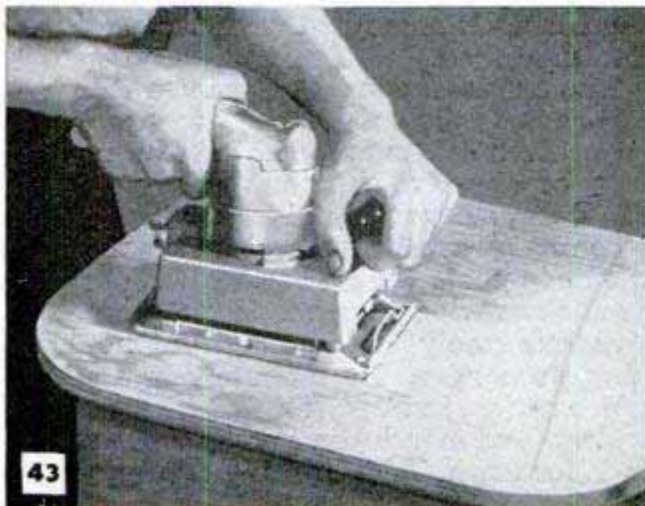
pieces on the "up" side and it also is necessary to use both sides of the disk when sanding end grain on wide work, the surface produced will not be quite as smooth as that sanded only on the side of the disk going down.

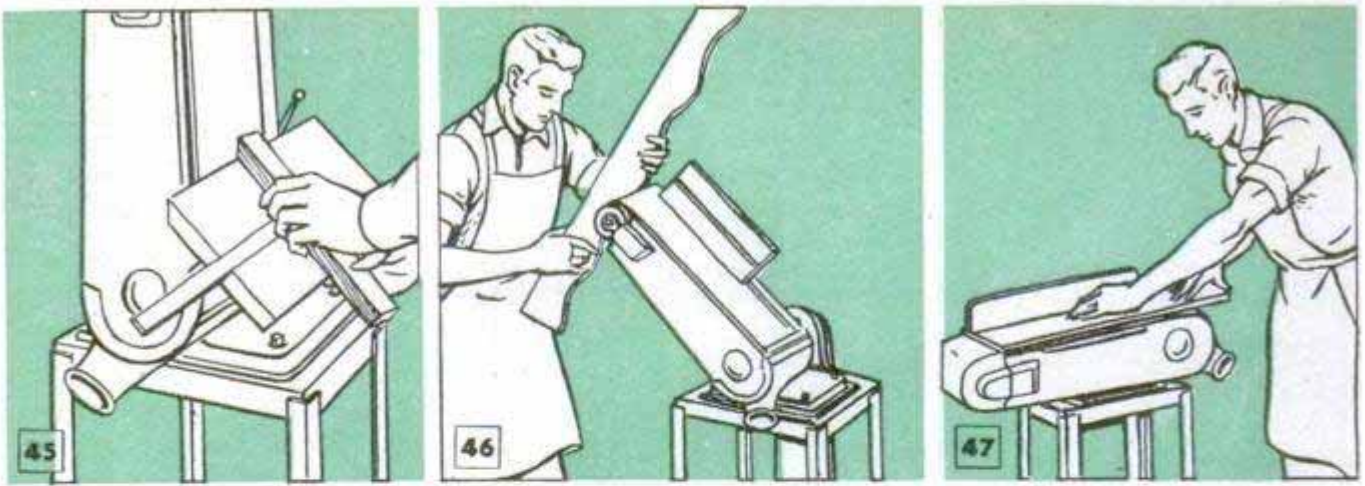
One of the handiest accessories for the owner of a jigsaw is the tiny sanding attachment shown in use in Fig. 34. One side is convex and the other is flat so that you can sand concave, convex or flat surfaces with equal facility. Fig. 34 pictures a typical operation on scrolled work. The small size of the drum, less than 1 in. across the flat face, enables the operator to get into corners and small openings such as are found in fine scrolled work. Another handy tool for the craftsman who specializes in

fine cabinetwork and model construction is the small oscillating-type sander pictured in Fig. 35. The sanding pad on this little machine is driven by a vibrating coil housed in the body. The sanding stroke is about $\frac{1}{16}$ in. and the pad is driven at a speed of over 7000 strokes per minute. At this speed, fine abrasive produces a glass-smooth job either on edges, which are difficult to sand, or on flat work. It will work effectively on both metal and wood but is designed only for light work. Other oscillating-type sanders, which operate with the same sanding action but are motor driven, are shown in Figs. 43 and 49. One, Fig. 43, consists of a frame and movable shoe, or pad, and is designed for attachment to a small portable drill. The drill motor drives

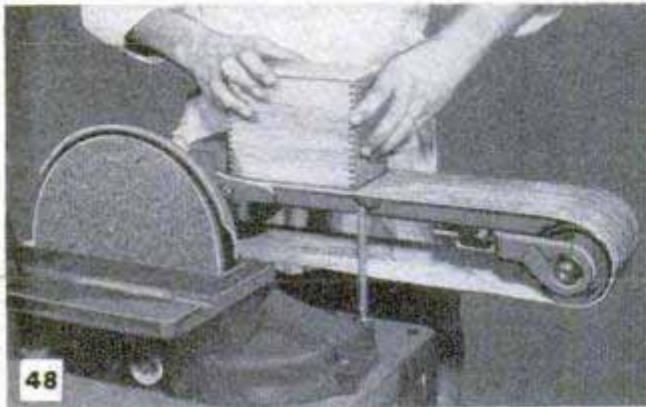
This oscillating sander unit is designed to be driven by a $\frac{1}{8}$ -in. portable electric drill. Machine leaves a smooth surface without ripples or long scratches

Small drum sanders are available as accessories in a wide range of sizes for use on shapers and drill presses. When driven at high speeds they sand fast

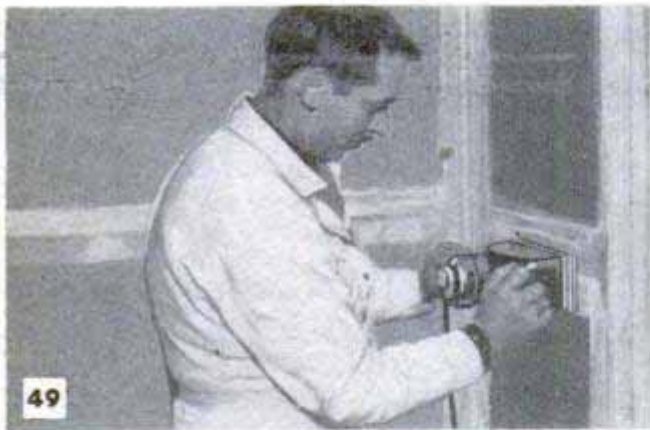




Stationary belt sanders of the type shown in the three views above are versatile machines widely used in small shops. The unit is fitted with a tilting table which is detached when sanding long pieces



The combination machines are well adapted to finishing operations. The belt is used vertically also



Standard-size oscillating sander has direct drive. Here it is shown being used to smooth taped joints

a special linkage which imparts an oscillating motion to the sanding pad. The other machine, typical of several which are available, has a direct-connected motor which drives a sanding pad of approximately the same size as that on the one just described. In the photo, Fig. 49, the machine is being used by a builder to smooth taped joints on plasterboard walls. Oscillating sanders are especially useful in preparing large surfaces for finishing, as they do a smooth job free from scratches or swirl marks.

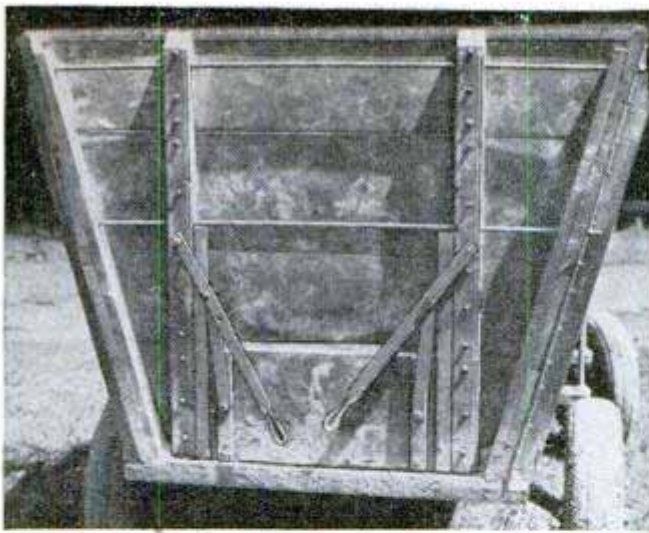
Small rotating drum sanders with removable abrasive sleeves are designed for

attachment to various machines such as shapers, and drill presses. Fig. 44 shows one in operation sanding the edge of a piece of fairly heavy stock. The abrasive drum cuts very fast and the stock must be kept moving continuously while in contact with it as, otherwise, marks will be left on the surface. It can be worked on straight flat surfaces or edges and inside any opening having a radius greater than that of the drum. The drums are available in various lengths and diameters and suitable abrasive sleeves, Fig. 41, are readily obtainable.

Portable flexible disk sanders, such as those shown in Figs. 39 and 40, are widely used on a variety of sanding and grinding operations. The flexible disks with short built-in spindles for attachment to flexible shafts and drill chucks, are available as accessory units. Ready-cut abrasive disks are furnished in a variety of sizes for use with these units. In use, the flexible disk sander is tilted slightly so that only one side contacts the surface. It is moved over the surface in a dual motion, back and forth and forward simultaneously. The exception is shown in Fig. 40, where it is necessary to sand close to the edge in a recessed panel. Here the disk is tilted and the sanding progresses in one direction around the edge of the panel. Then the unsanded portion in the center is smoothed with the dual motion described.

The bandsaw sanding attachment in Fig. 42 converts the small bandsaw into a fast, accurate belt sander utilizing the narrow belt, or abrasive "ribbon," shown in Fig. 41. Belts, sleeves and disks for the various machines are quite generally available. On the open-coated type, Fig. 41, the abrasive grains are widely spaced to give the abrasive extremely fast-cutting and nonclogging properties. Belt sanders of the two types shown in Figs. 45 to 48 inclusive are widely used in industry and by home craftsmen for diversified finishing operations.

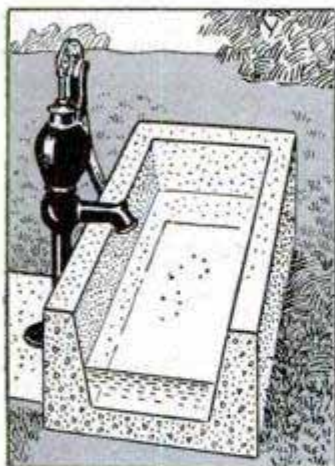
THE END



Unloading Gate in Trailer Box Is Lever-Controlled

To simplify the unloading of small grains from a tank-type trailer box at the farm elevator, one farmer fitted a lever-controlled unloading gate over an opening cut in the rear endgate. The arrangement makes it easy to control the flow of small grains into the elevator hopper when unloading from the trailer. The gate is a single piece of selected hardwood, sliding in angle-iron guides which are attached to the endgate cleats. Levers made from flat iron are attached to the ends of the gate by flat-iron links and small bolts. Raising both levers simultaneously lifts the gate. When the gate has been raised to the required height, one lever is held stationary while the other is forced down lightly. This movement wedges the gate in the guides and holds it securely in position until released by a reverse movement of the levers.

W. T. M. Concrete Design of Concrete Stock Tank Resists Damage From Ice



Small concrete stock tanks of conventional design are likely to crack if the water in them freezes solid, especially if the water level is low. One farmer found by experiment that monolithic concrete tanks with sloping inner sides and ends were extremely

resistant to damage, even when the water in them froze solid. All that is necessary in making this type of tank is to construct the form with sloping sides and ends. The slope should be about 5 to 7 deg. If desired, the form can be dug out of firm soil.

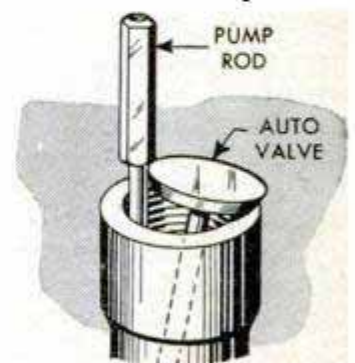


Furrower Spaces Potato Rows For Tractor Cultivation

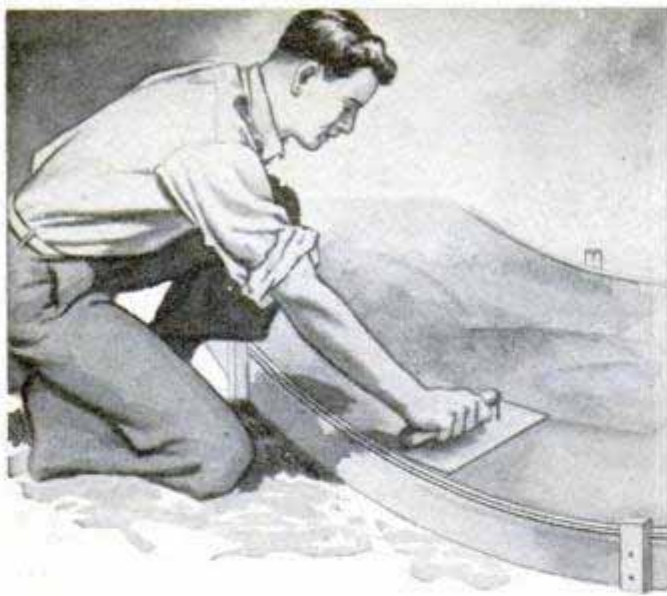
A perennial problem confronting Corn Belt farmers who do not have potato-planting equipment is laying off rows in the small potato patch to equal widths so that, later on in the season, the plants can be cultivated with a mounted tractor cultivator. One farmer solved this problem by removing the beam spacer from an old horse-drawn two-shovel cultivator and cutting off the ends of the shovel beams to shorten them. Then he welded new spacers between the beams to space the shovels to the required center-to-center distance. The original wooden cultivator handles were retained in the new assembly as pictured. In use, a helper guides the furrower and holds it at a uniform depth by means of the handles. For one-man operation, the shovel beams are pivoted so they can be raised and lowered by the tractor hydraulic lift.—L. H. Houck, Jefferson City, Mo.

Auto Valve Holds Loose Pump Rod

A disconnected pump rod is kept from dropping into the well pipe by wedging an old auto valve between the rod and the pipe. The valve is removed easily when the pump is installed.



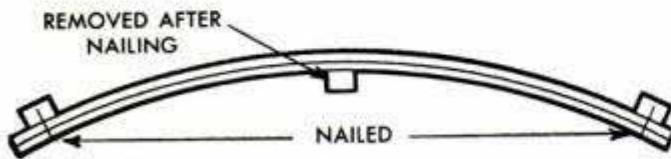
☐ Dry yellow ocher mixed with boiled linseed oil forms a durable putty for patching eaves trough, metal roofs and tanks.



Two-Piece Sidewalk Forms Are Bent Readily

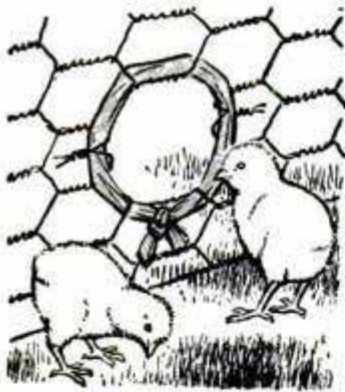
Two thin strips are better than one thick one when staking out forms for a curved walk or driveway. In this way, a smaller radius is possible and a more natural and uniform curve is produced. As shown in the drawing, an inside stake is used to force two 1/4-in.-thick strips into position. Then, when the desired curve is had, the ends of both pieces are nailed to outside stakes and the inside stake is removed. If you wish, short nails can be driven through the pieces here and there throughout the curve to give added rigidity to the form.

W. H. McClay, Pasadena, Calif.



Easily Made Baby-Chick Creep

Baby chicks, penned in small enclosures because of lack of yard space, will develop faster if they are allowed to run at large

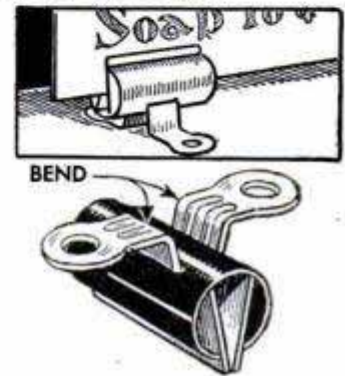


during a part of the day. To permit the chicks to pass in and out of the pen at will, cut one twisted strand of the woven-wire netting, as indicated, and bend the ends back. Then weave a strip of white cloth around the opening. Guided by the white

cloth ring, the chicks quickly learn to find their way in and out of the enclosure through the enlarged hole in the netting.

Stand for Small Display Sign Improvised From Paper Clips

Needing some method of propping a small display sign on top of the cash register in my store, I hit upon the idea of using spring-type paper clips to provide a stand for the sign. I simply bent the arms of the clips outward to form a wide base and snapped the clips to the lower edge of the sign.—Robert L. Gromer, Taft, Calif.

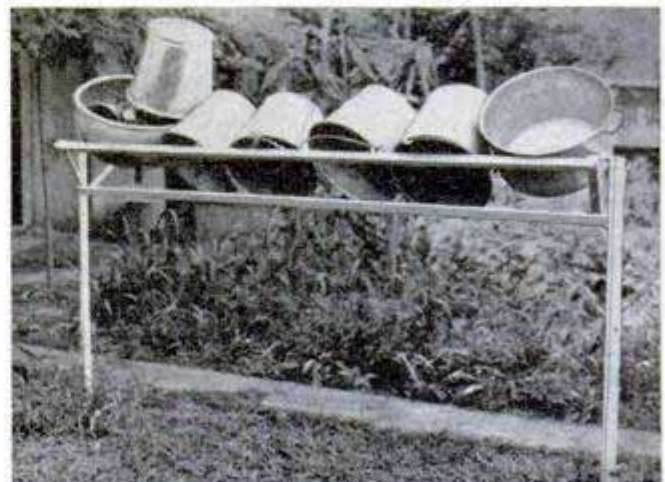


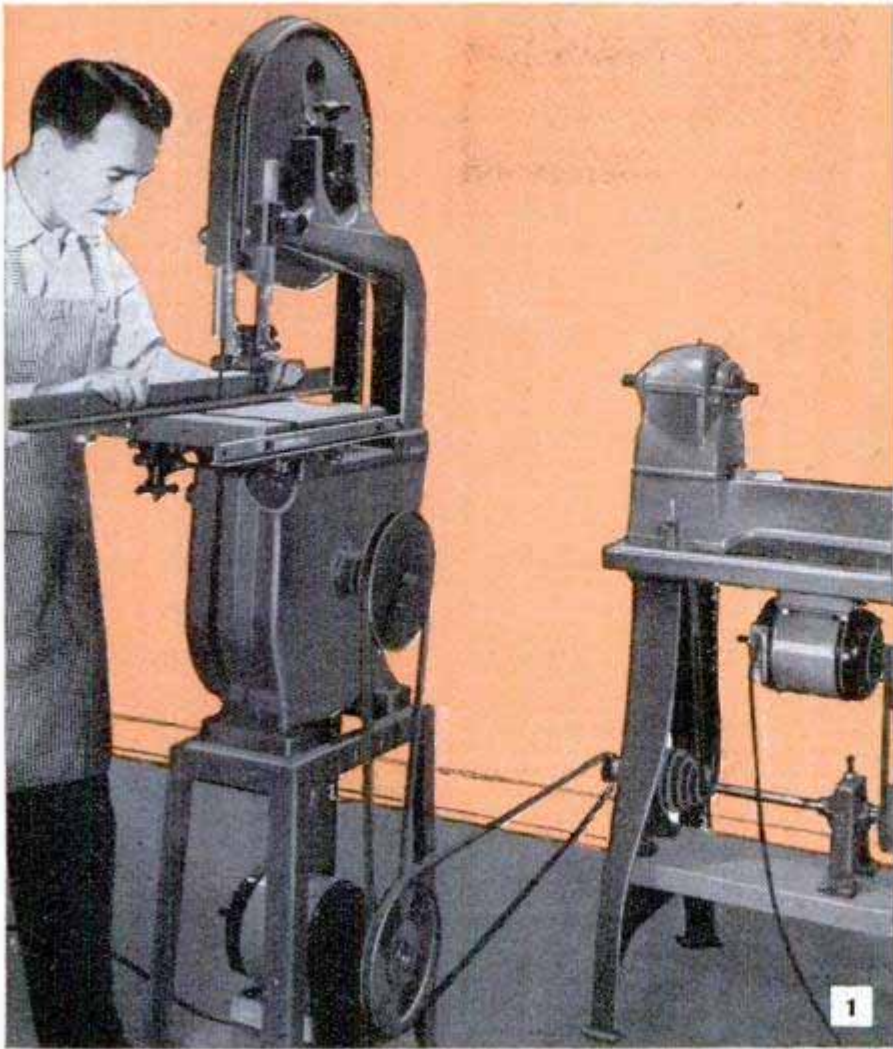
Floating Landing-Net Frame Utilizes Tennis Racket

Using an old tennis racket to provide the frame for a fisherman's landing net results in a sturdy, long-lasting net that will float in case it is dropped into the water. Remove the strings from the racket and simply attach an ordinary landing net to the racket frame.—Harold E. Cripe, Racine, Wis.

Outdoor Milk-Pail Rack Permits Drying Containers in Sun

To promote cleanliness in handling milk and also to save himself time, one dairyman built this outdoor drying rack for milk pails and cream-separator parts which must be regularly washed and dried. The rack is located so that the sun will shine directly into the pails when they are placed in the rack with the open ends up. The legs supporting the rack are of angle iron set into the ground about 18 in. and anchored in concrete. The rack consists of three pieces of light angle iron welded to angle braces and to the legs as shown. The horizontal members are spaced so the pails can be inverted to permit draining.

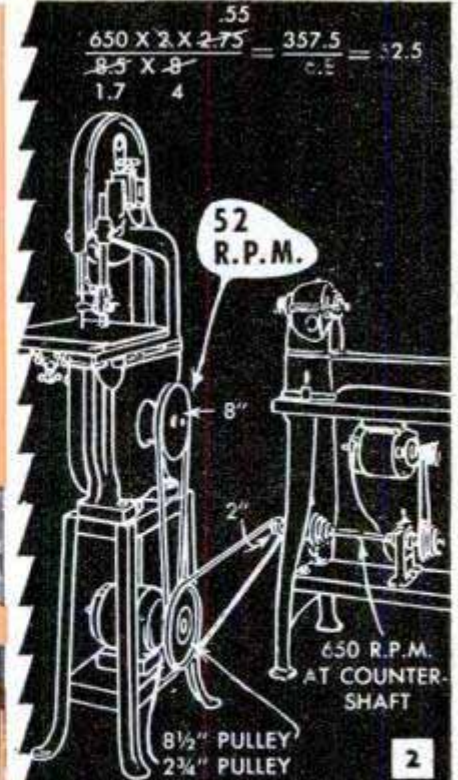




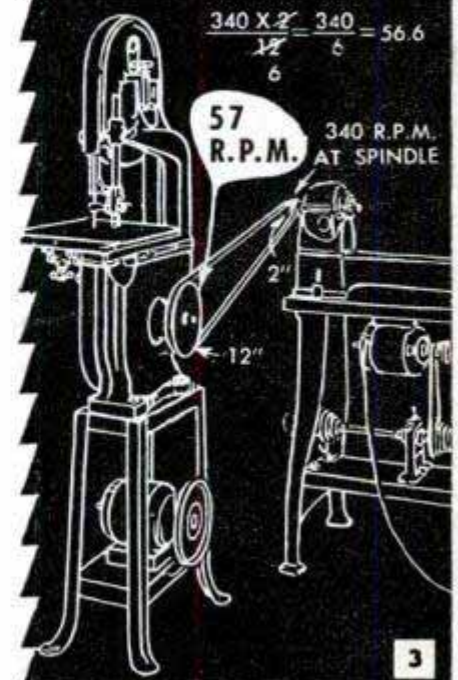
By Sam Brown

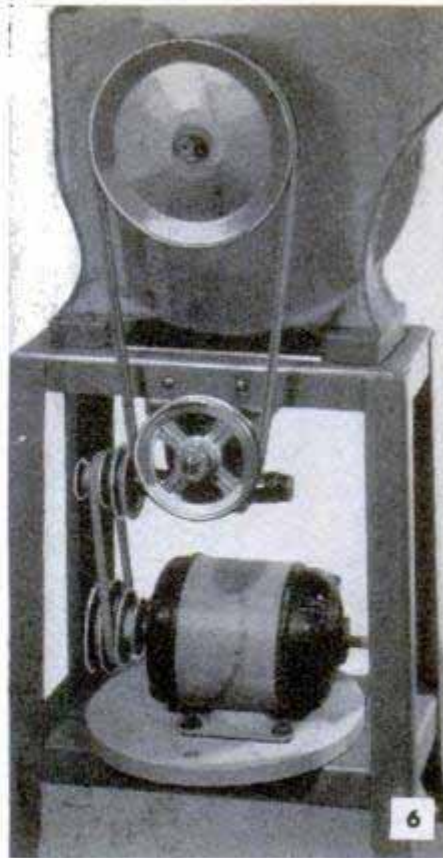
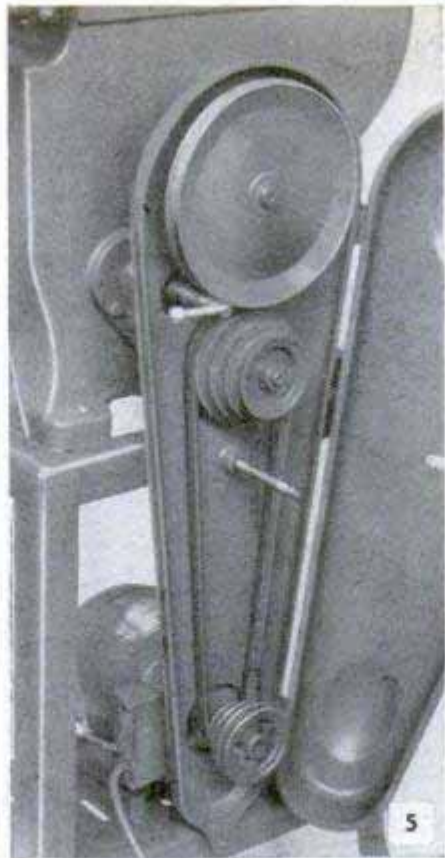
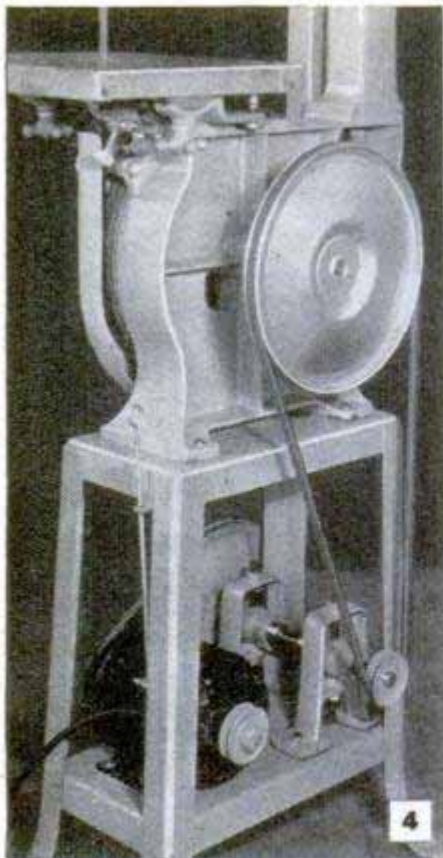
WITH METAL-CUTTING blades now available in sizes and gauges suitable for use on small bandsaws, home craftsmen having metal to cut into lengths or shapes can convert these small machines into power-driven band hacksaws. Any wood-cutting bandsaw having band wheels 9 in. or more in diameter can be used for cutting metal. Of course, the smaller machines are suitable only for light work on small pieces of metal. The metal-cutting bandsaw blade makes a square, smooth cut with no ripples or ridges and it does the job in a fraction of the time required in hand hacksawing.

Reducing blade speeds: Average blade speeds for wood-cutting bandsaws range from 2000 to 3000 f.p.m. (feet per minute) although some later-model machines operate with blade speeds up to 4500 f.p.m. In cutting metal, especially when cutting steel and other hard materials, it is necessary to reduce the blade speed to an average of 200 f.p.m. to avoid undue heating and clogging of the blade. Fig. 1 shows one way to do this by utilizing the lathe countershaft for the first reduction. The pulley hookup and the ratio of pulley-sizes is detailed in Fig. 2. The second reduction is made through a 2-in. pulley on the outer end of the lathe countershaft driving an 8½-in. pulley on the bandsaw motor which serves as a second jackshaft. The third reduction, as you can see, is made through a 2¾-in. pulley on the motor shaft driving an 8-in. pulley on the bandsaw. This reduces the band-wheel speed to 52 r.p.m. In this speed-reduction arrangement, the lathe motor is used to drive the setup. Fig. 3 details an alternate hookup giving 57 r.p.m. at the bandsaw pulley. In



SAWING METAL on Your BAND SAW





COUNTERSHAFT MAKES A CONVENIENT SETUP. THE USUAL PULLEY ARRANGEMENT IS 2" TO 10" AND 2" TO 12" WHICH GIVES APPROX. 60 R.P.M. (ABOUT 225 F.P.M. WITH 14" BANDSAW)

$$\frac{350}{1750} \times \frac{2 \times 2}{10 \times 12} = \frac{350}{58.3} \text{ R.P.M.}$$

STANDARD TYPE OF METAL-CUTTING BANDSAW, SHOWN ABOVE, USES A BUILT-IN GEARBOX GIVING FOUR SPEEDS OF 125, 175, 250 AND 340 F.P.M. DIRECT DRIVE IS 2200 F.P.M. GEAR-DRIVE BANDSAWS COST SLIGHTLY MORE THAN SIMILAR SINGLE-SPEED MACHINES.

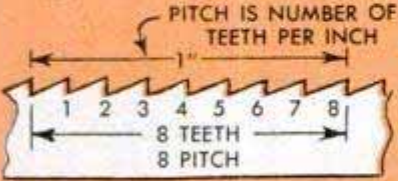
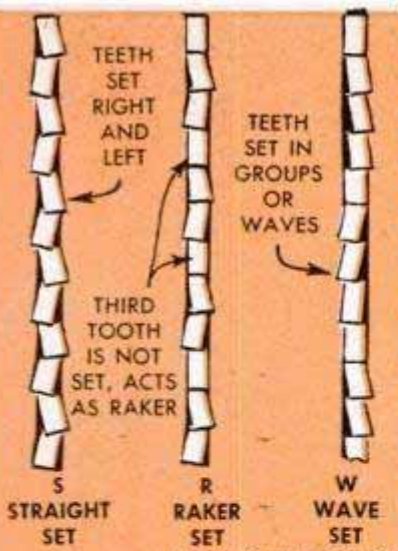
RELATIVELY INEXPENSIVE GEARBOXES CAN BE USED. THE SETUP SHOWN USES 30 TO 1 RIGHT-ANGLE DRIVE, AND WITH FOUR-SPEED CONE PULLEY GIVES SPEEDS OF 70, 110, 150 AND 250 F.P.M. A DIRECT DRIVE FOR WOOD SAWING IS OBTAINED BY TURNING MOTOR WHICH IS BOLTED TO A PIVOTED WOODEN BASE.

either arrangement, you have the advantage of the speed reductions available through the lathe countershaft. Referring to Table II you will see that the 52-r.p.m. speed of the bandsaw pulley, Fig. 2, gives the desired 200-f.p.m. blade speed on 14-in. band wheels. Although not indicated, the installation shown in Fig. 3 should either be bolted to the floor or to a spreader board for best results. This is not necessary with the type of arrangement shown in Fig. 2. Other speed-reducing drives are shown in Figs. 4, 5 and 6. The drive shown in Fig. 5 is the regular speed-reducing unit supplied with a well-known make of metal-cutting bandsaw. Others shown in Figs. 4 and 6 are improvised from standard machine parts.

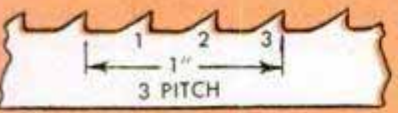
The metal-cutting blade: Select the blade for the work according to the data given in Table I. This table is merely representative. It does not include the recommendations of all manufacturers of metal-cutting bandsaw blades. Of course, you can do a lot of ordinary work with just one blade, about 18-pitch with a raker set. The main thing to keep in mind in blade selection is the thickness of the work in relation to the number of teeth per inch. There must be at least two teeth in contact with the work

at all times, otherwise you will have trouble with blade breakage. If fast cutting is required, use the coarsest pitch and the widest blade the work will permit. For a smooth finish and slower cutting, use a medium or fine-pitch blade. Use the standard-tooth blade on steel and other hard materials and the buttress, or skip-tooth, blade on soft, nonferrous metals and wood. Note the details at the left of Table I. A good all-around blade combination for home-shop work consists of a $\frac{3}{16}$ or $\frac{1}{4}$ -in., 6-pitch buttress blade for wood and soft metals and an 18-pitch standard-tooth blade of the same width for steel. Where possible, use wood and metal-cutting blades of the same gauge and width.

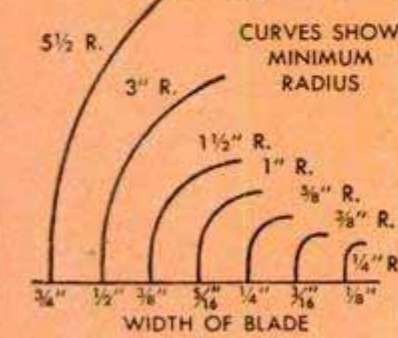
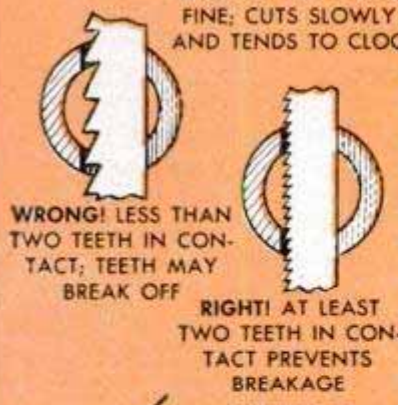
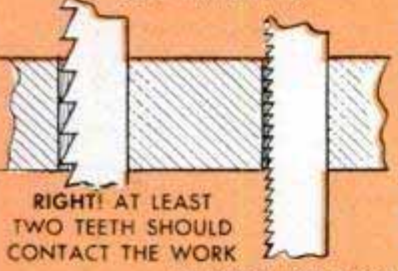
Cutting tubing and bar stock: One of the principal uses of the bandsaw fitted for cutting metal is cutoff work on metal tubing and also round and square stock. To prevent round stock from turning while being cut, it is necessary to provide some means of holding the stock securely. Suitable clamping arrangements can be improvised easily as in Figs. 10, 11 and 12. The hardwood V-block, Fig. 12, is the easiest to set up and is, in some respects, the best for average work. It is guided by a wood or



STANDARD TOOTH SHAPE
(USED FOR METAL CUTTING)



BUTTRESS TOOTH SHAPE
(USED FOR WOOD AND OTHER SOFT MATERIALS)



USE THE WIDEST BLADE WHICH WILL MAKE THE CUT

Table I BLADE SELECTOR FOR ALL MATERIALS (1)

MATERIAL	SAW PITCH AND SET (2)				SAW SPEED IN F.P.M. (3)			
	WORK THICKNESS				WORK THICKNESS			
	1/16"	1/4"	1"	3"	1/16"	1/4"	1"	3"
ALUMINUM	18S	10S	8S 4B	6S 4B	2400	2400	2000	1500
ASBESTOS SHEETS	24R	14R	8R	4B	2000	1800	1500	1200
BABBITT OR LEAD	14R	10R	8R 4B	6R 4B	2400	2400	1800	1500
BRAKE LINING	10R	10R	6R	4B	2000	1500	1000	1000
BRASS	18S	14S	10S	8S	2400	2000	1500	1200
BRONZE	18R	14R	10R	8R	500	300	200	140
HARDBOARD	10S	8S	6S 4B	6S 4B	3000	2400	2400	2400
SOFTBOARD	10S	8S	6S 4B	6S 4B	3000	3000	2400	2400
COPPER	18S	14S	10S	8S	1200	800	500	300
CAST IRON	18R	14R	10R	8R	200	160	100	75
MAGNESIUM	14S 8B	10S 6B	10S 4B	8S 4B	3000	2400	2400	2400
PLASTICS	18S	14S	8S	6S 4B	2400	2400	2400	2400
PAPER	10S	10S	8S	6S 4B	1500	1000	1000	1000
HARD RUBBER	24S	18S	8S	6S 4B	3000	2400	2400	2400
SLATE	24R	18R	14R	10R	300	200	160	100
CARBON STEEL	24R	18R	10R	8R	250	200	180	140
MILD STEEL	18R	14R	10R	8R	250	200	180	140
STEEL SHAPES	24R	18R	10R	8R	180	140	120	100
STAINLESS STEEL	24R	18R	10R	8R	100	75	50	50
STEEL TUBING	32W	24W			180	140		
WOOD	14S	10S	8S 6B	6S 4B	3000	3000	3000	2400

(1) ADAPTED FROM TABLES BY DOALL AND OTHERS (3) SPEEDS LISTED ARE NEAR MAXIMUM - LESS SPEED IS SATISFACTORY AND SIMPLY MEANS LOWER CUTTING RATE.
 (2) CAN BE VARIED WIDELY; 18-PITCH, RAKER-SET METAL-CUTTING BLADE IS BEST FOR GENERAL USE.

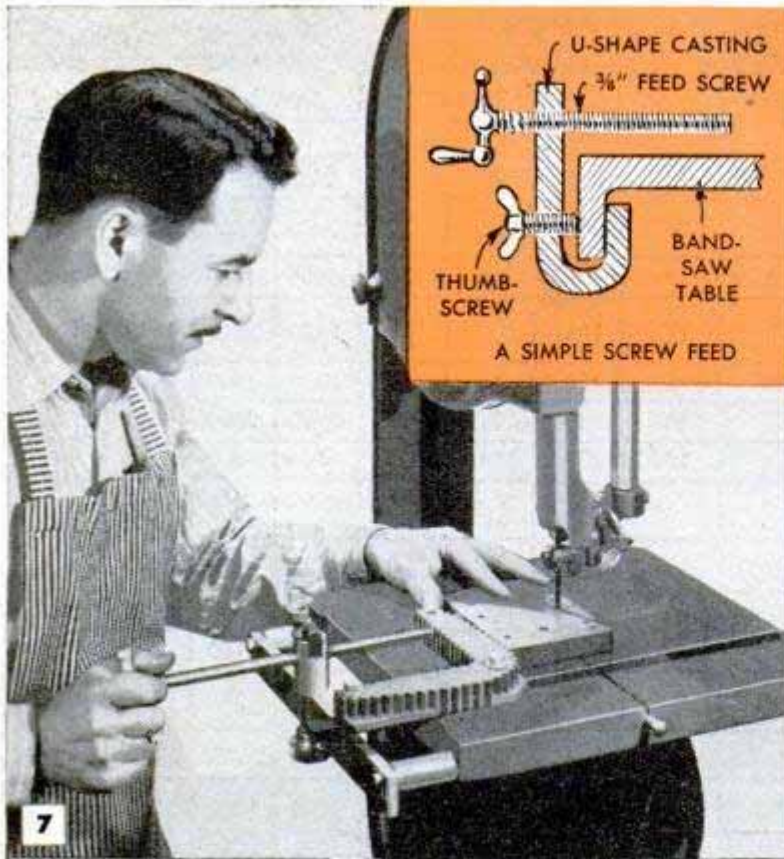
Table II BANDSAW SPEEDS-F.P.M. TO R.P.M.

WHEEL DIAMETER IN INCHES	FEET PER MINUTE										
	100	120	140	160	180	200	250	300	400	2400	3000
	REVOLUTIONS PER MINUTE										
9	42	51	59	68	76	85	106	127	170	1015	1270
10	38	46	54	61	69	76	95	115	152	920	1150
11	35	42	49	55	62	69	87	104	138	832	1040
12	32	38	45	51	57	64	80	95	128	764	955
13	29	35	41	47	53	59	73	88	118	706	883
14	27	33	38	44	49	54	68	82	108	695	819
15	25	31	36	41	46	51	64	76	102	611	764
16	24	29	33	38	43	48	60	72	96	573	716
18	21	26	30	34	38	42	53	64	84	510	637
20	19	23	27	31	34	38	48	57	76	459	574

EXAMPLE SHOWING USE OF TABLES: 14" BANDSAW CUTTING MILD STEEL 1/2" TO 1" THICK

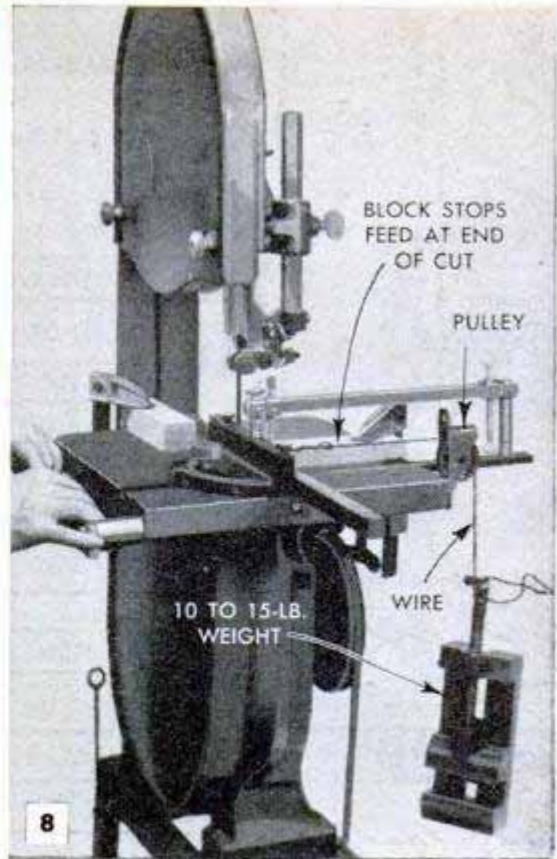
FROM TABLE I { BLADE SHOULD BE 10R (10 TEETH PER INCH, RAKER SET).
 I { SPEED SHOULD BE 180 F.P.M.

FROM TABLE II { 14" BANDSAW TO RUN AT 180 F.P.M. MUST ROTATE AT 49 R.P.M.
 II



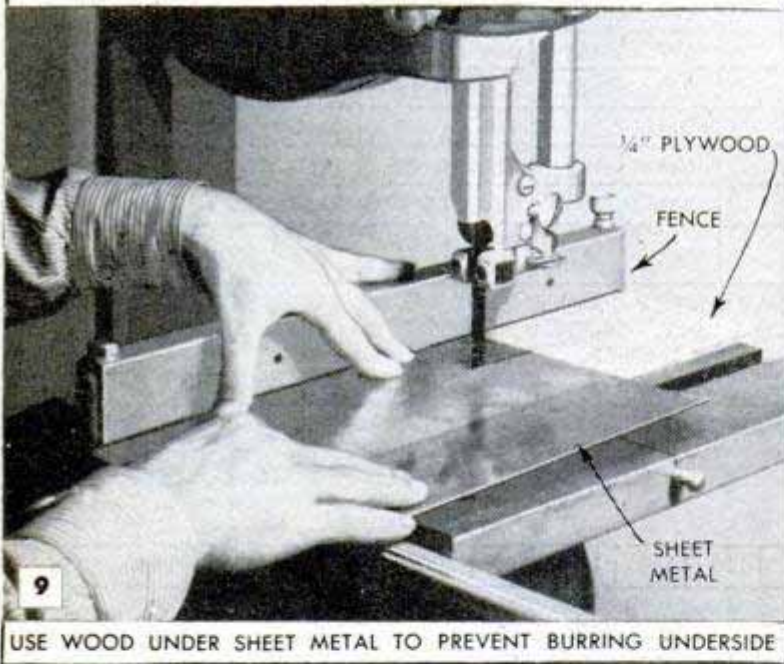
7

A SCREW FEED SAVES EFFORT WHEN SAWING THICK METAL



8

WEIGHT PROVIDES STEADY, UNIFORM FEED



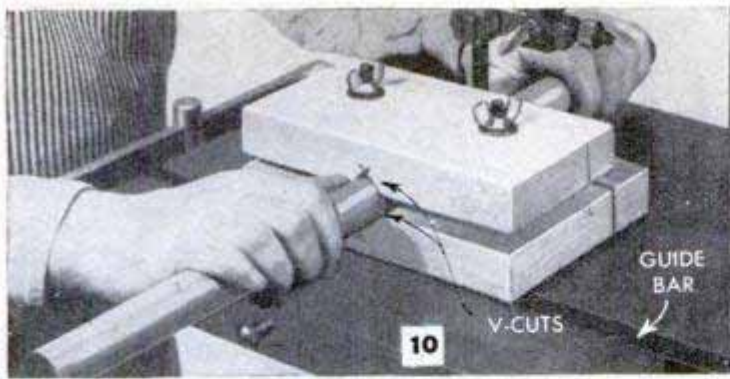
9

USE WOOD UNDER SHEET METAL TO PREVENT BURRING UNDERSIDE

metal bar which fits in the miter-gauge groove milled in the saw table. Another similar device which is quite convenient on small work is pictured in Fig. 10. This also is controlled by a guide bar. On tables not milled for the miter-gauge guide, an ordinary drill-press vise can be used with the guide setup shown in Fig. 11. The vise holds the work and slides against a wooden guide clamped to the machine table. Note that the wooden guide also supports the work to prevent it from tipping under the stress of sawing. Of course, the drill vise must be of the type having both sides milled flat, without any projections.

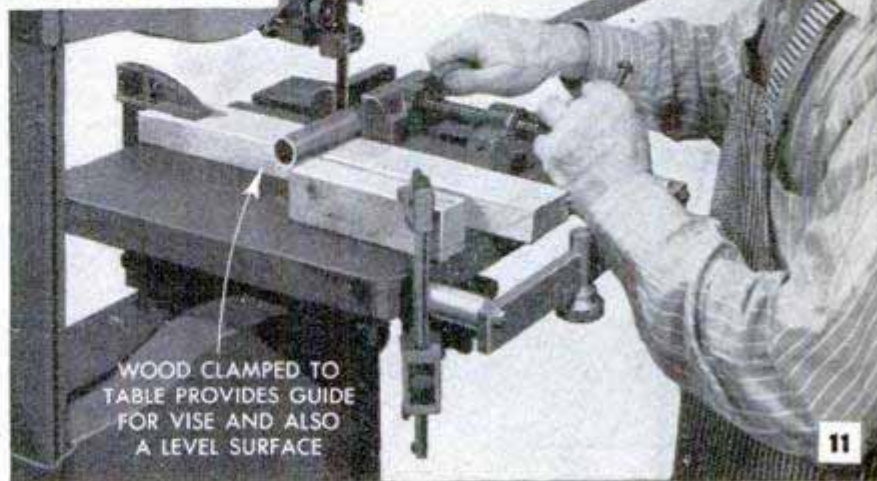
Mechanical feed: When cutting round

stock, the feed usually is freehand, but this can get pretty tiresome when long cuts must be made in heavy, flat stock. Ready-made mechanical feeding devices are available for most small machines and it also is possible to improvise several that work very well. One type of standard attachment for metal-cutting bandsaws is pictured in use in Fig. 7. The feed is controlled by a hand-actuated screw and the unit can be adjusted to make either straight or curved cuts. The V-shaped jaw, shown bolted to a guide bar in the setup in Fig. 7, also can be used free on small pieces which the "V" will span. In this application, the work is set with its corners in corresponding notches on the edges of the "V" and the feed screw is run up until it bears against the back of the jaw. Turning the screw in forces the work against the blade. By placing the point of the screw successively in adjacent notches as the cut progresses, it is possible to produce cuts of a regular curve. The inset detail in Fig. 7 shows how a similar feeding device may be improvised. A small U-shaped casting is drilled and tapped for a 3/8-in. feed screw and a small thumbscrew as shown. This unit is clamped to the lip at the edge of the machine table. For light work the device serves the purpose very well, but it is not suitable for heavy work where the feeding pressures

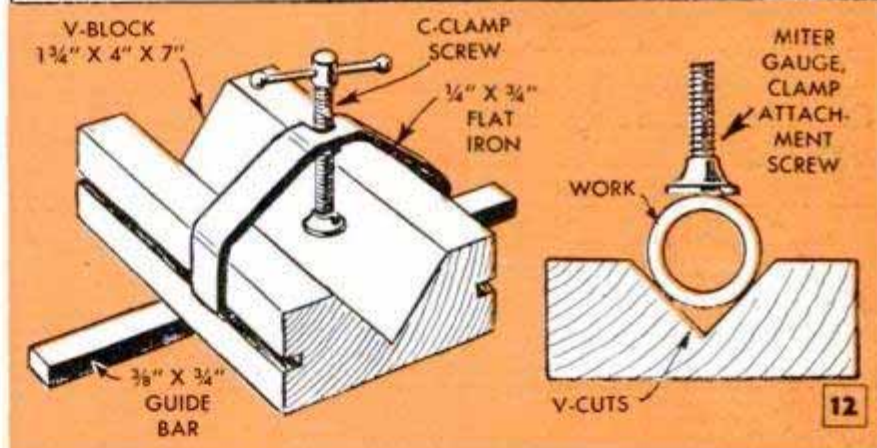


are quite high. Perhaps the best feeding arrangement of all for average use is the weight feed which automatically maintains a uniform tension on the work. On a small bandsaw, it is possible to improvise a satisfactory weight feed as in Fig. 8. A 10-lb. weight provides the correct feeding pressure for cutting steel up to 1 in. thick. Fifteen to 25-lb. weights are about the limit on small bandsaws as heavier weights will cause rapid wear and possibly breakage of the blade guides. As you can see, the setup is simple. A pulley (a window-weight pulley will do) is bolted to a corner of the machine table. A cord or wire is attached to the miter gauge and passed through the pulley to support the weight, which can be anything available that weighs the correct number of pounds. The miter-gauge clamp locks the work in place and stop blocks are clamped to the machine table as indicated. In use, the work is located and clamped in place and the machine is started. No further attention will be necessary until the cut is completed.

Sawing thin stock: Thin sheet metal cut by bandsawing has a tendency to form high burrs on the underside. This can be minimized by placing the work on a piece of plywood as in Fig. 9. On thin sheet metal a fine-pitch blade (24 or 32) with a wave set gives the best results. However, for an occasional job in sheet-metal cutting, you can use a coarser blade by feeding slowly with a very light pressure. As a rule, sheet metal is cut by friction sawing but, of course, this method requires a machine capable of very high wheel speeds. The minimum blade speed required in friction sawing ranges from 3000 f.p.m. upward. Best results will be had with blade speeds ranging between 4000 and 5000 f.p.m. This



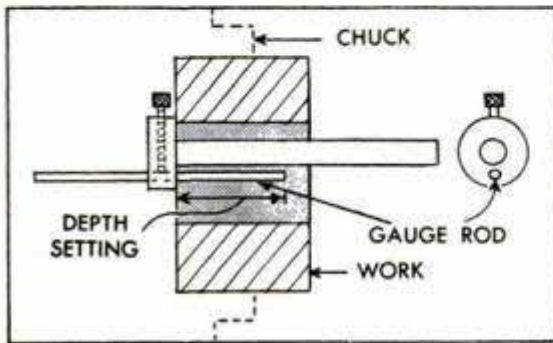
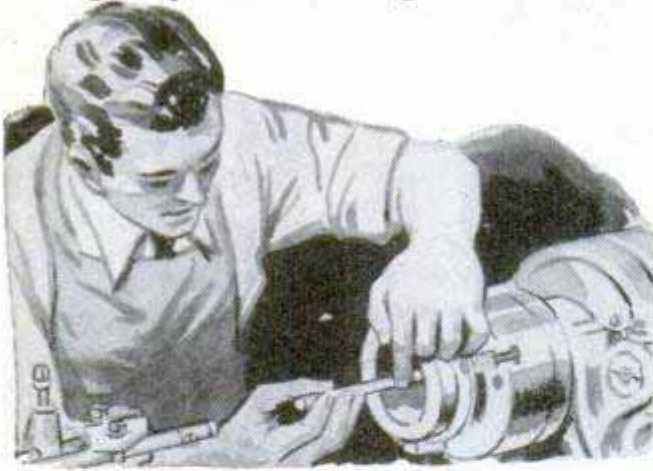
TUBING SHOULD ALWAYS BE SECURELY CLAMPED TO AVOID ROTATION



would mean that a 14-in. bandsaw would have to be run at wheel speeds up to 1200 r.p.m. Many small machines are not designed to withstand the required wheel speed with a sufficient margin of safety. For this reason, it is recommended that if friction sawing is done on the small machines the drive be arranged so that blade speeds do not exceed 3000 f.p.m.

General sawing technique: If you are accustomed to operating a bandsaw, you will have no difficulty in cutting metal with the same machine. About the only difference is that in metal cutting the machine operates at a greatly reduced speed and more pressure is required to keep the blade cutting uniformly. Start the cut slowly with light pressure. After the blade is "bedded" in the stock to its full width, the feeding pressure can be gradually increased. It is important to keep the blade cutting uniformly, as otherwise it will tend to heat and clog.

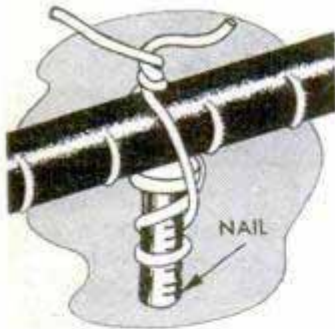
Gauge Speeds Setting Lathe Tool When Facing Bored Work



This simple gauge provides a quick, accurate way of setting a lathe tool to make the finish facing cut on bored work. The body of the gauge is a short length of steel shafting having a flange set over one end in a force fit. The flange forms the required shoulder and saves the waste of turning down a suitable part from solid stock. The flange is drilled longitudinally to take a length of drill rod which has been faced at both ends to serve as a gauge rod. The flange also is drilled and tapped transversely to take a knurled setscrew which is tightened on the gauge rod to hold it in place. In use, the rod is set to the required finish depth by measuring from the shoulder with a rule and extending or retracting the rod. After setting the rod to the correct dimension, the knurled setscrew is tightened to hold the rod in place. Now the gauge is inserted in the bore and the shoulder is placed in contact with the back of the work. Then the lathe tool is run up until the cutting edge comes in contact with the end of the gauge rod.

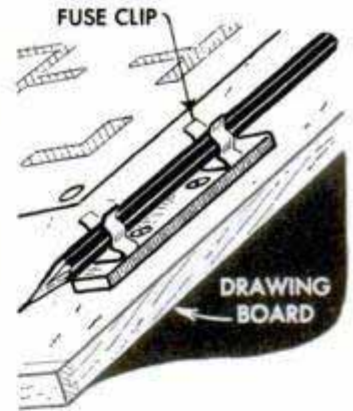
"Floating" Reinforcing Rods

Reinforcing rods for a poured-concrete floor are anchored at the proper depth before the floor is poured by floating them on the heads of nails driven in the sub-flooring. This assures a stronger job than laying the rods directly on the subfloor and also eliminates the messy job of immersing the rods in the wet concrete. The rods are wired to the tops of the nail-heads as shown in the drawing. — Grover Brinkman, Okawville, Ill.



Fuse Clip Holds Pencil on Board

A pencil can be attached to a clip board or slanted drawing board without danger of rolling off, by pressing it in a fuse clip which has been fastened to the board. Use wood screws to attach the base of the clip to the board and, if the clip has metal tabs intended to keep the fuse from slipping, break them off or bend them out of the way. R. W. Kainulainen, Spokane, Wash.



Drums Filled With Water Provide Weights for Land Roller

Under average conditions a large land roller requires variable weights in order to do its best work. Frequently, it is necessary to add weight to the roller before the field is finished, especially on a windy day when topsoil dries fast. Wet areas in fields will require lessening the weight to prevent packing the soil. To save time and avoid the necessity of lifting heavy weights, such as stones or bags filled with sand, some farmers use ordinary 55-gal. steel drums filled with water. These fit into the weight racks of most rollers as pictured and the amount of water in the drums can be varied to add only as much weight as necessary.



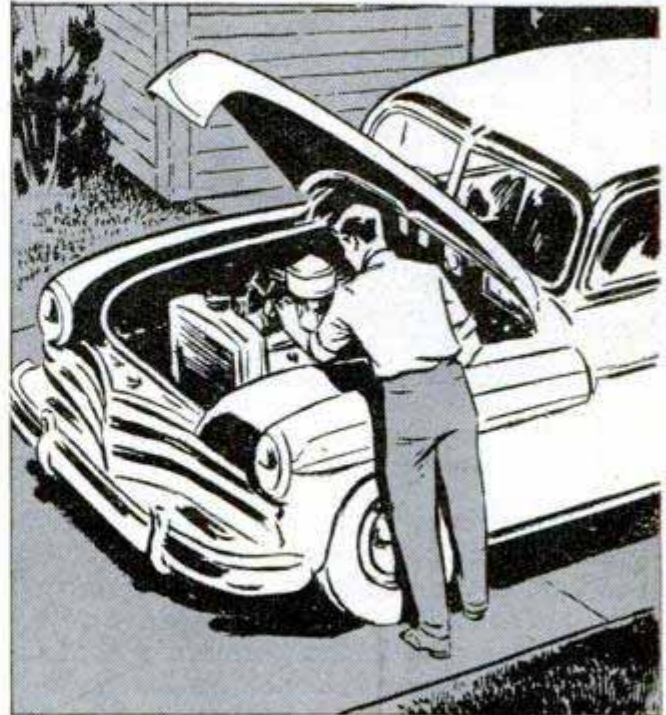
Periodic checks of the compression give a good over-all picture of the engine's operating efficiency

By Ed Packer

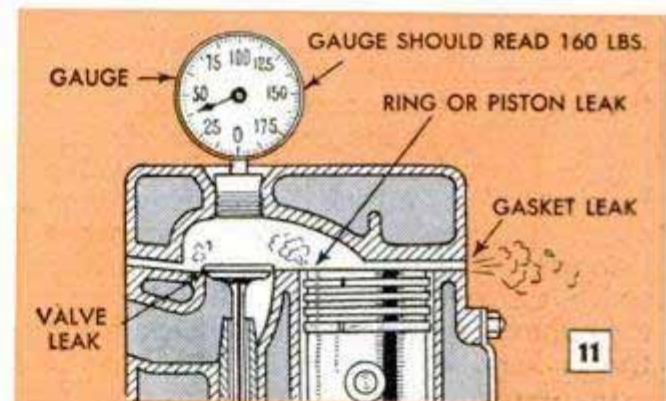
ALTHOUGH auto servicemen usually rate the fuel system first in seasonal tune-up checks (see Part I of last month), the engine itself also comes in for a thorough going over. To a greater extent than car owners generally realize, the loss of engine smoothness and operating efficiency is due to slowly accumulating deposits of hard carbon, gum and crankcase sludge. Short runs in cold weather, long trips at slow speeds and neglect of oil changes and general servicing of the engine contribute to fouling of the crankcase, upper cylinders, pistons and rings. The carbon and gum deposits not only adhere to these vital parts but circulate throughout the lubricating system and cause rapid wear. Regularly changing the oil-filter cartridge may help, but this precaution alone is not sufficient to correct other causes of engine inefficiency due to bad driving practices.

Lately the use of solvents has become so important in connection with general engine tune-up that many mechanics use these chemicals regularly in tune-up jobs on engines which are rated in good mechanical condition. Solvents for sludge and carbon are used in three ways: added in measured amounts to the fuel, introduced directly into the air inlet to the carburetor and combined with the crankcase oil. It's a general practice, after adding the solvent, to operate the engine for at least 30 minutes at fast idle. Following this desludging, or "limbering," treatment, the crankcase is drained and flushed, the oil-filter cartridge is changed and the crankcase is refilled with new oil.

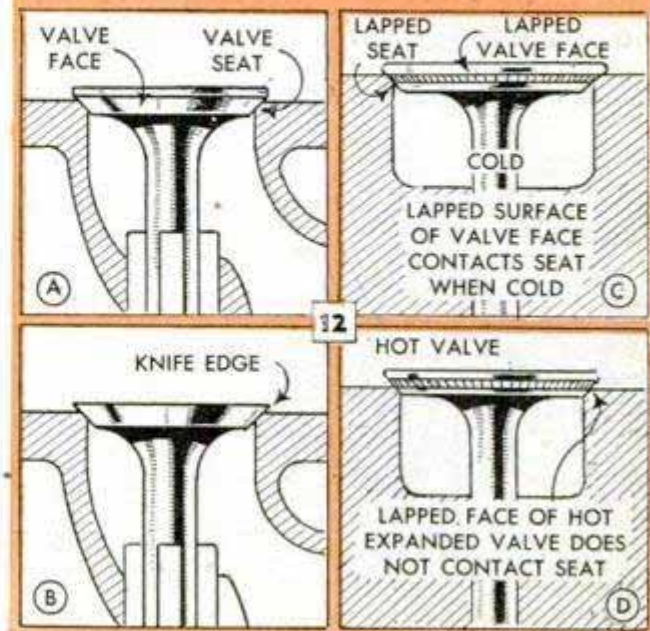
One of the best quick checks of general engine mechanical condition is made with a compression gauge, Fig. 11. A variation of more than 10 lbs. pressure between cylinders indicates the presence of mechanical faults which need further investigation. The test always should be made with the engine at operating temperature and the throttle and choke in the wide-open position. Two faults commonly turned up by a compression check are bad rings and valves. To determine whether the valves or rings are at fault without removing the cylinder head, unscrew the spark plug and place about a tablespoonful of heavy oil on

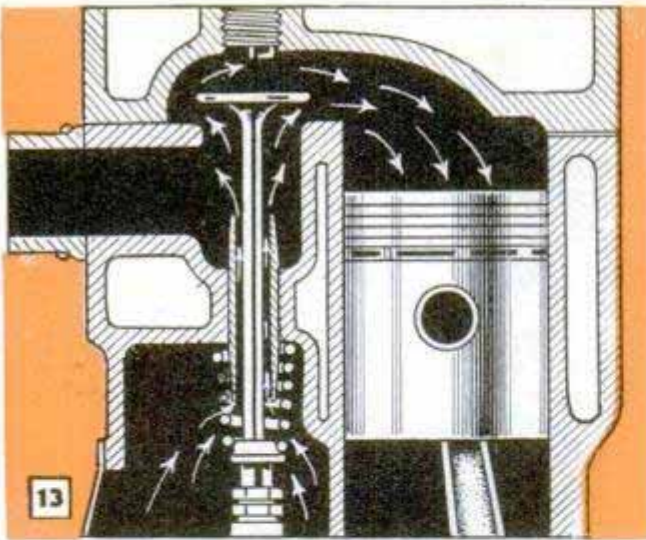


Driving at moderately high speeds for an hour or so will "tune up" an engine that is in good condition



One of the best quick checks of engine condition can be made with a compression gauge

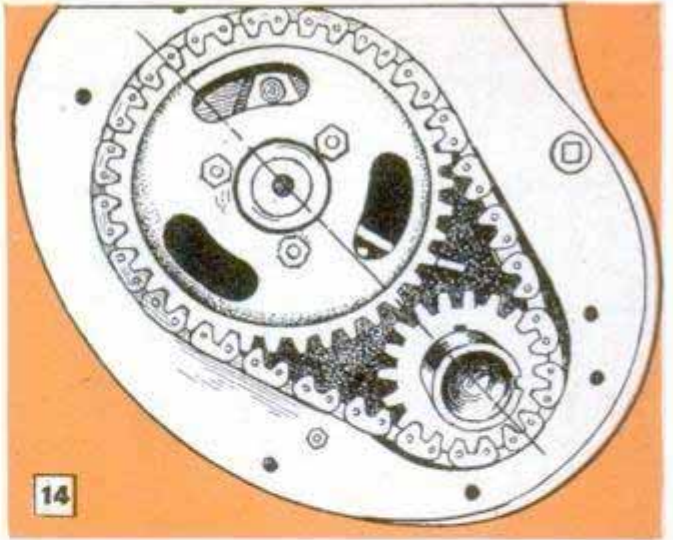




Oil leaks through the intake valves are due to worn guides. Replacement of guides usually is necessary

top of the piston to form a temporary compression seal. Replace the gauge and repeat the test. If the gauge comes up to normal, it is safe to assume that the rings are defective. There also is the possibility that either the piston or cylinder wall is at fault. If no change in the reading results from the second test, then the trouble probably is due to faulty valves. Sometimes a head-gasket leak is the cause of a low reading in one cylinder but this is comparatively rare. If the result of the tests indicates valve trouble, an experienced mechanic will listen carefully at the carburetor air intake and tell you in a moment which valve is leaking in the faulty cylinder. How does he do it? It's simple, when you know what to listen for. A leaking intake valve makes a sharp, distinct hissing sound, but a leak at the exhaust valve cannot be heard because the leakage is into the exhaust manifold.

If the engine has a history of poor performance, then the compression check is likely to be only the start of the job. On older cars, hand grinding and lapping valves and valve seats is a common procedure, but on later-model cars with high-com-

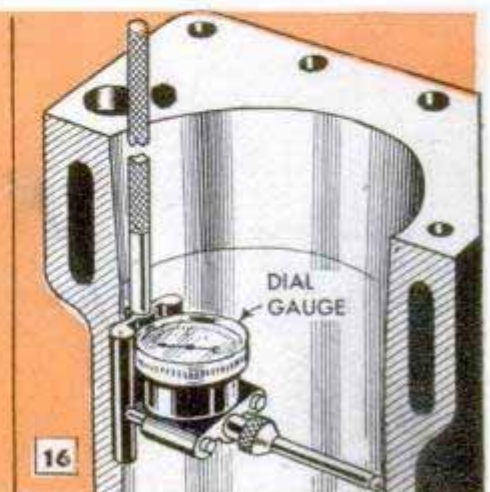
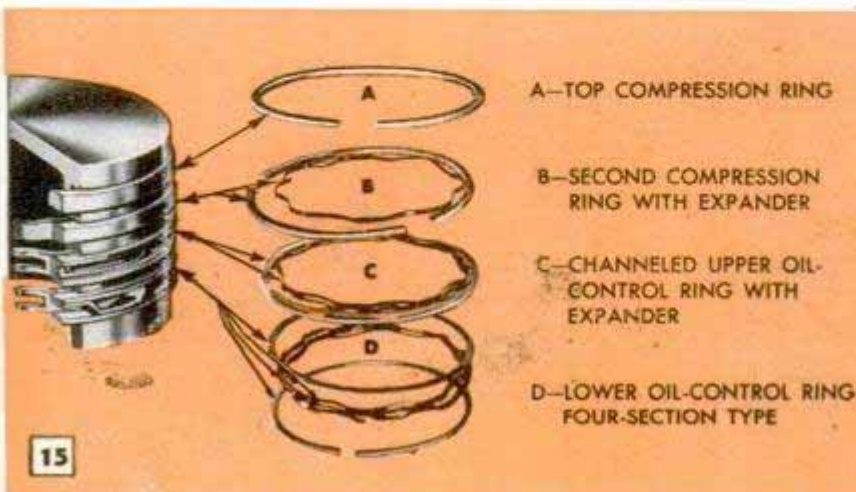


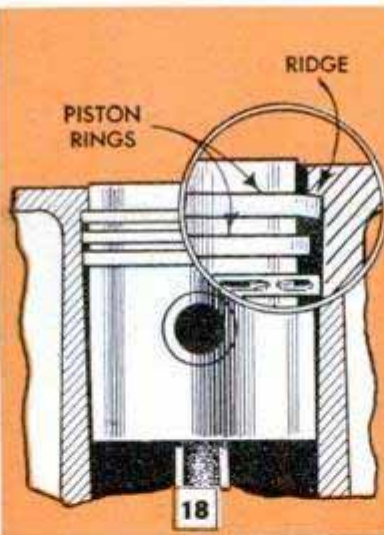
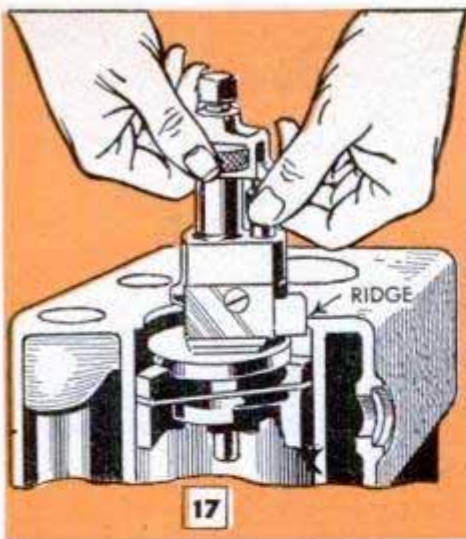
Check the timing chain, or gears, for looseness due to wear. This can cause late timing of the valves

pression engines the valves and valve seats must be reconditioned with special equipment. It is possible, of course, to form a gas-tight joint between the valve and its seat by hand lapping. Of necessity this must be done when the parts are cold, detail C, Fig. 12. When the parts expand as a result of heat, the lapped surfaces no longer make contact, D, Fig. 12. When the valve and seat are ground at the same angle on equipment made for this purpose, the tight-fitting job shown in detail A, Fig. 12, is the result. Never machine or grind old valves to a knife edge as in detail B. When the valve gets hot, the edge may become incandescent and cause what is known as pre-ignition.

Before opening an engine, let it idle for at least 10 minutes, as the high vacuum resulting from idling will tend to draw oil up around loose pistons and worn valve guides. As soon as the cylinder head has been removed, look for oil on the piston heads and on the undersides of the intake valves. If there is oil on the valves, it indicates that oil from the crankcase is being drawn up through the valve chamber and into the cylinder as in Fig. 13. As a rule, this con-

In any new ring job, the cylinder bore should be checked with a dial gauge after the piston has been removed





Before removing a piston, cut away the ridge at the top of the cylinder bore with a special reamer

A new ring should roll freely all the way around in the ring groove as, otherwise, the ring may stick

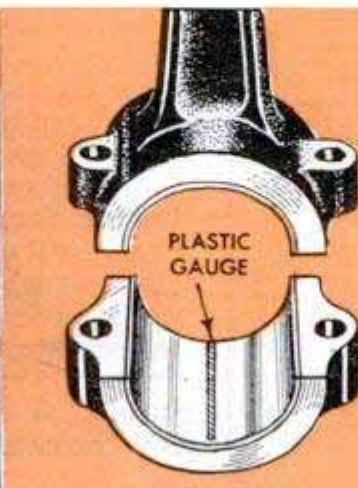
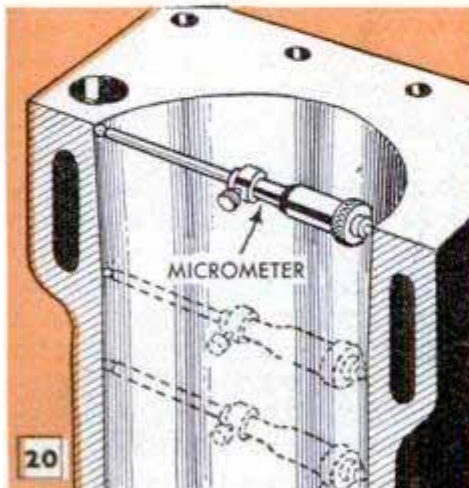
dition calls for replacement either of the valve or the guide, or both. While the engine is open, check the timing chain for looseness resulting from wear. Slack in the chain or wear in the camshaft gears has the effect of late valve timing, Fig. 14. If the intake valves open after the pistons have passed the top dead center, oil will be drawn through loose valve guides into the cylinders. Of course, this condition will be encountered more often in engines of the L-head type.

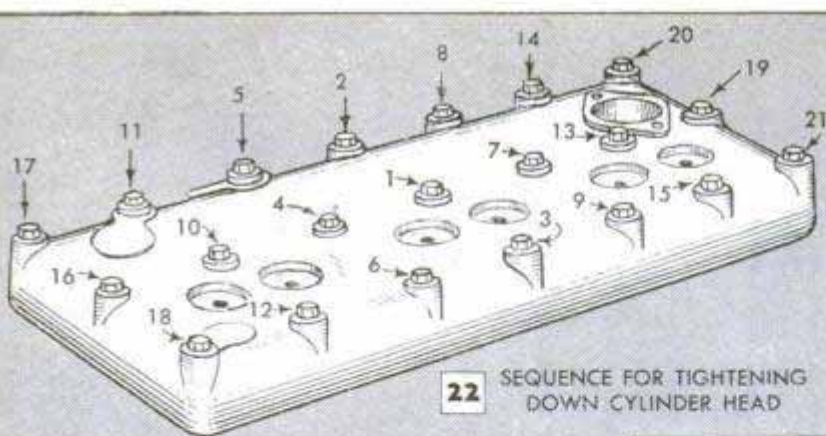
Before pulling the pistons on any engine which has been subjected to considerable wear, always remove the ridge, or overhang, at the top of the bore with the special reamer shown in Fig. 17. Otherwise, you will have difficulty removing the pistons, Fig. 18. After the pistons have been removed, careful mechanics mike the bores as in Fig. 20, or use a dial gauge as in Fig. 16, and jot down the readings. If these readings show that a rebore job is necessary, it's a general recommendation that the cylinder walls be honed both parallel and round within .0005 in. When installing oversize pistons be sure to follow the manufactur-

er's recommendations for clearance per inch of diameter. This is important and usually the instructions are specific.

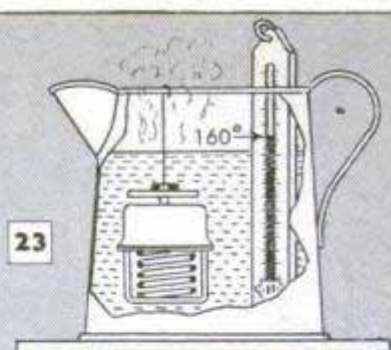
When installing piston rings, check each individual ring for up-and-down clearance in its own groove, Figs. 15 and 19. The ring grooves are always cleaned and rigidly inspected to make sure that each ring will roll freely all the way around the groove, Fig. 19. End gap is just as important as the up-and-down clearance. A general recommendation ranges from .006 to .010 in., depending on the type of ring and the diameter of the cylinder bore. In bores larger than 3 in. the recommendations range from .010 to .014 in. In any case, a ring job cannot be considered complete until the connecting-rod bearings have been carefully inspected for looseness. Loose crankpin bearings can completely upset the function of the oil-control rings by throwing an excess of oil on the cylinder walls. Mechanics check bearing clearances with a simple plastic gauge, Fig. 21. This is laid on the bearing cap as in the left-hand detail. The cap is fitted in place, tightened, and then removed. Because of the precise diameter

Plastic gauge makes it easy to check crankpin-bearing clearance. If clearance is too great, oil pumping results





22 SEQUENCE FOR TIGHTENING DOWN CYLINDER HEAD



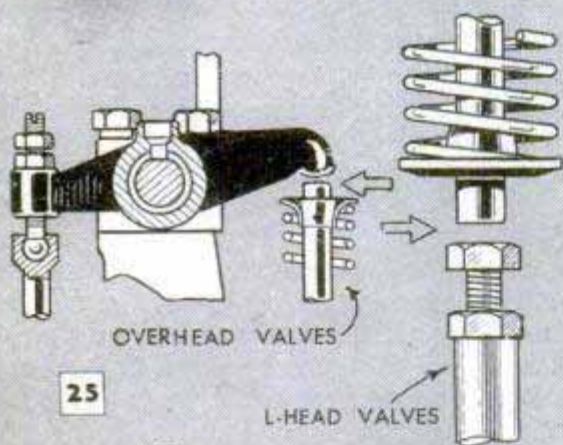
23 SIMPLE SHOP TEST FOR CHECKING THERMOSTAT OPERATING UNIT



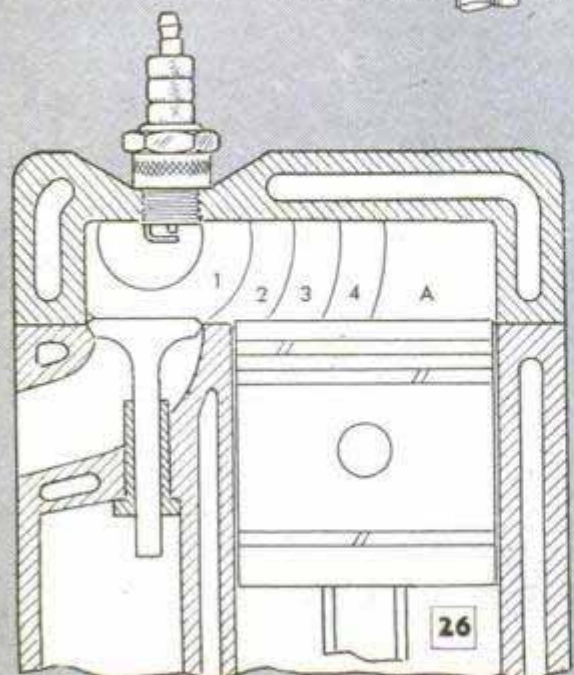
BURNT VALVES



SCORED PISTON



25



26

of the plastic gauge, the amount it is squeezed, or flattened, can be read in thousandths of an inch of bearing clearance by means of a printed chart which is held against the flattened plastic at the widest point, right-hand detail Fig. 21.

In any major overhaul job where the engine has been opened, always flush out the block and the cylinder head. Sediment may collect and clog water passages causing burned valves and scored pistons, Fig. 24. Check the thermostat, Fig. 23, before replacing it. If the thermostat is functioning properly, it will open in the 160-deg. water bath. A high-temperature thermostat used with permanent antifreeze solutions will begin to open at 175 degrees. Use a new gasket under the cylinder head. The tricky part of reassembling an engine is tightening down the cylinder head. It is of the utmost importance that the tightening sequence be followed precisely as instructed by the manufacturer of the car. The sequence given in Fig. 22 is only general; it will not apply to all makes of cars with L-head engines. However, the sequence in nearly all recommendations begins with the center bolt, No. 1 in Fig. 22, and progresses from the center to the ends of the head. It's best to use a torque wrench and tighten the bolts by stages. Instructions for the final tightening vary, of course, but a common recommendation is to tighten all bolts uniformly to a 50-ft.-lb. tension. After tightening the head, check the valve clearance, as illustrated in Fig. 25.

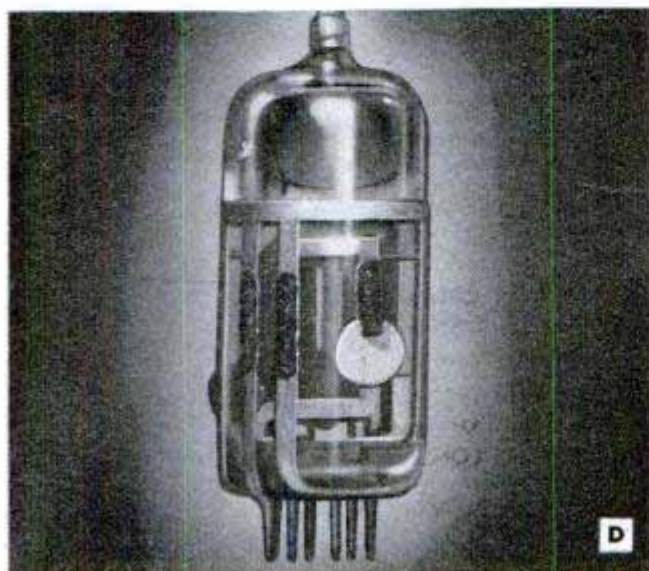
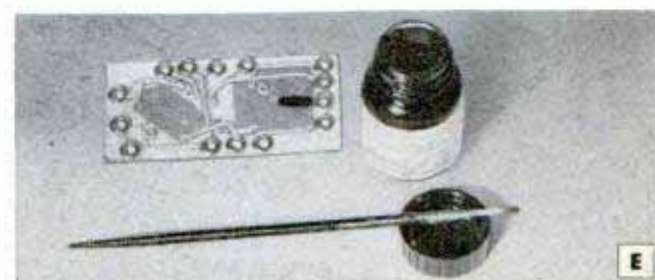
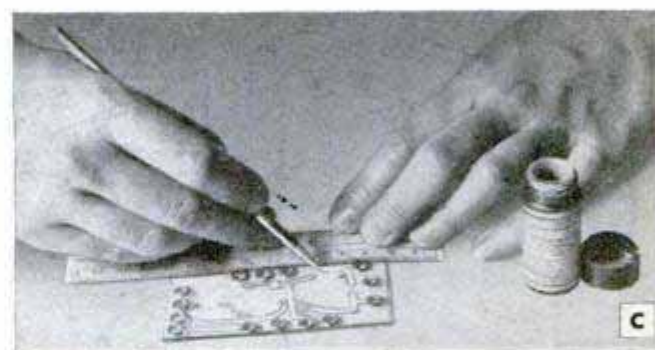
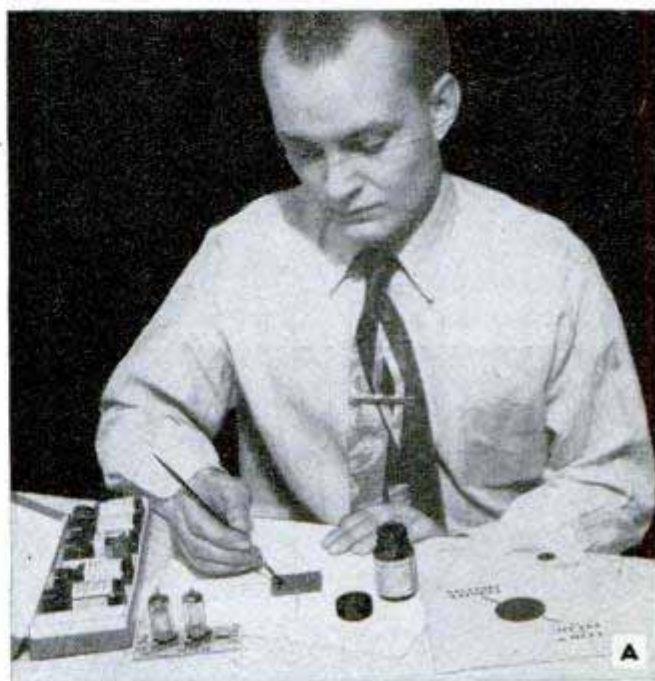
Detonation, or ping, as it is called, is a secondary ignition, or explosion, that follows normal combustion of the fuel charge. With the piston at top dead center, Fig. 26, or a little below it, ignition takes place progressively through areas 2 to 4 inclusive. Unburned fuel in area A explodes violently as a result of heat and pressure created by the normal ignition. In addition to low-grade fuels, other causes of pinging are a lean mixture, spark too far advanced and an engine running above normal temperature. If an engine gives trouble from pinging, the causes should be corrected.

(To be continued)

MAKE YOUR OWN PRINTED CIRCUITS

NOW YOU CAN experiment with "printed" circuits. A kit containing air-drying conducting and resistance paints is available to the student and experimenter for the construction of miniature radio and electronic circuits. The process consists of determining on paper the size of the painted components and their most compact arrangement, transferring the layout to a suitable base of sheet polystyrene or fiberboard, as shown in photo A, and then drawing the lines and areas of silver or copper paint which act as wires and condensers. Connected areas of carbon and graphite paint serve as resistors.

Photo C shows the "Microcircuits" kit and a small model of a two-tube pocket receiver that appeared in a student construction article in Popular Mechanics Magazine some time ago. The components, such as the variable tuning condenser, audio transformer, batteries and other parts that cannot be painted, are fastened to the case in the conventional manner. The polystyrene base shown in photos C and E is only 1½ by 3½ in. and was fitted into the end of the case enclosing the set. Hearing aids and similar small units can be constructed. A manual of tables comes with the kit so that the user can easily determine the length, width and area of resistors to obtain the proper resistance and wattage values. There are also tables for fixed condensers and inductances. Photo D shows a two-stage amplifier painted on the glass envelope of a twin-triode miniature tube.



PORTABLE KNOCKABOUT SUPER

By Alex Adler

SPECIALLY designed for vacation days at the beach, camping, boating or other outdoor use, this rugged knockabout four-tube battery-operated portable is small, light in weight, and easy to build from inexpensive standard radio parts. It may also be used on a bicycle with an ordinary 3 to 4-ft. auto antenna. Good reception of local broadcasting stations may be expected with a telescoping rod antenna of this description. In localities remote from broadcasting stations a longer antenna will bring in the distant stations with excellent clarity and volume. The circuit includes automatic volume control.

The sheet-aluminum chassis base detailed in Fig. 1 should be punched and drilled before bending to shape between blocks of wood clamped in a vise. Any metal lunch box of the dimensions given in Fig. 2 may be used. The tuning dial shown in Fig. 1 is full size and may be cut out of the magazine and cemented to the front of the

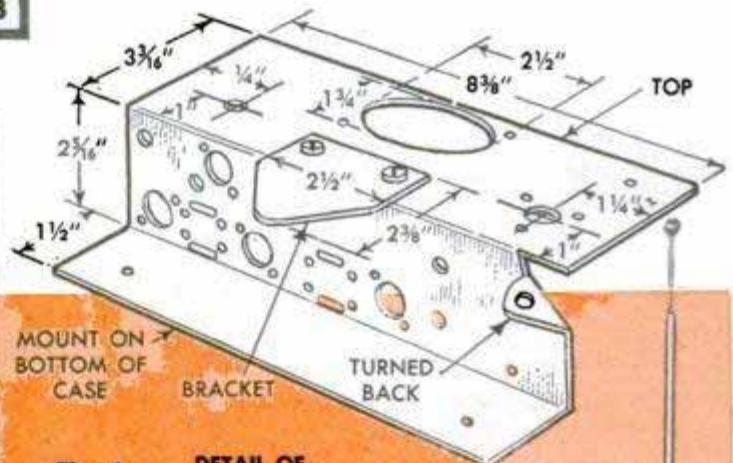
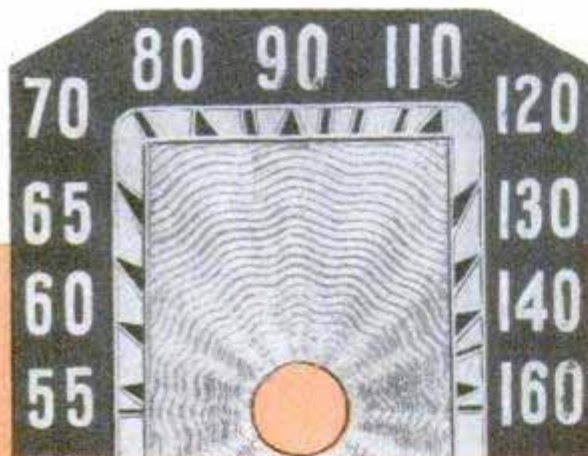
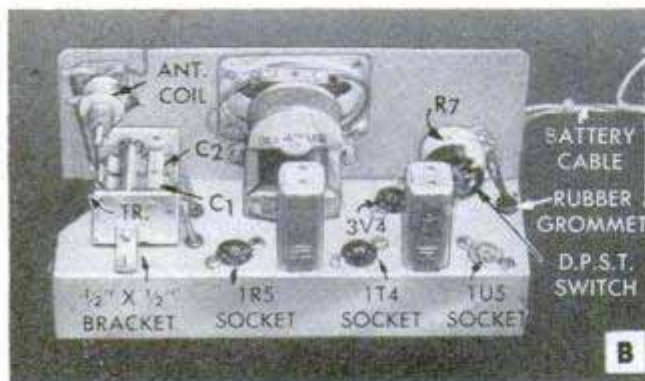
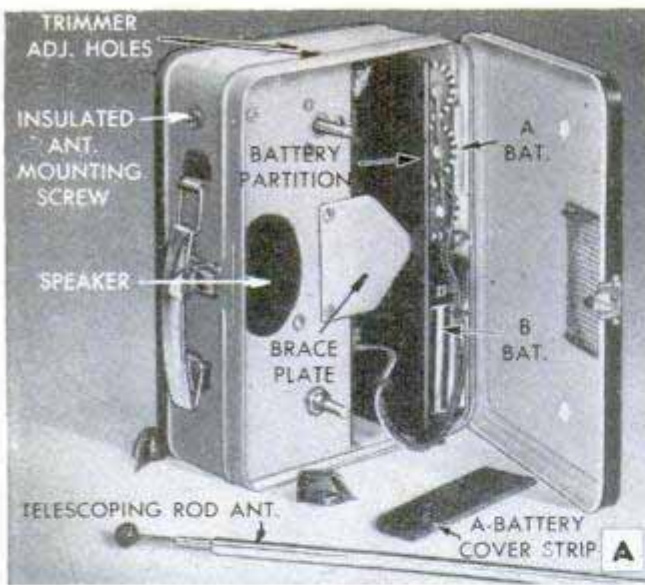


Fig. 1 **DETAIL OF CHASSIS BASE** ALL SOCKET HOLES $\frac{7}{8}$ "

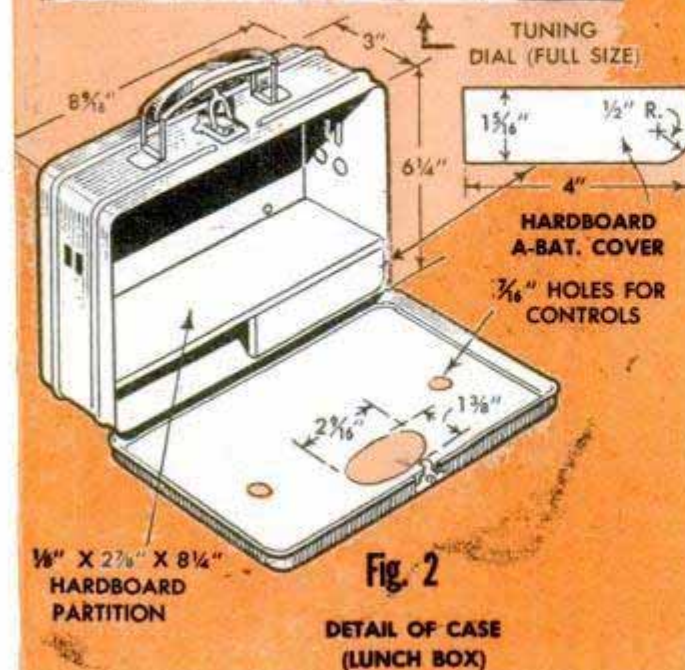


Fig. 2 **DETAIL OF CASE (LUNCH BOX)**

- RESISTORS**
- R1=100,000 ohms, 1/2-watt carbon
 - R2=15,000 ohms, 1/2-watt carbon
 - R3=68,000 ohms, 1/2-watt carbon
 - R4=10 megohms, 1/2-watt carbon
 - R5=4.7 megohms, 1/2-watt carbon
 - R6=1 megohm, 1/2-watt carbon
 - R7=2-megohm volume control midget audio taper (Mallory type MR55)
 - R8=3.3 megohms, 1/2-watt carbon
 - R9=820 ohms, 1/2-watt carbon
 - R10=1 megohm, 1/2-watt carbon



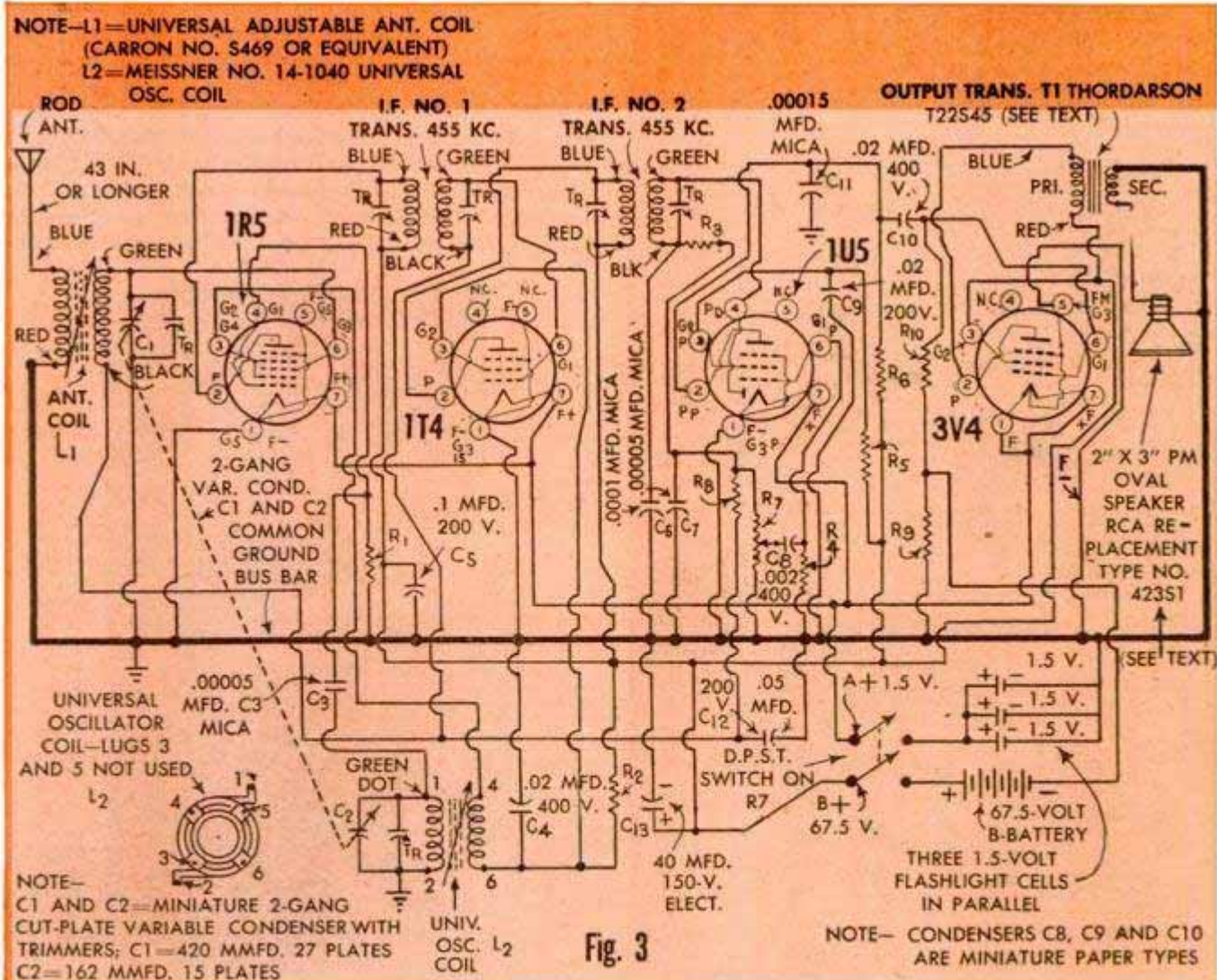
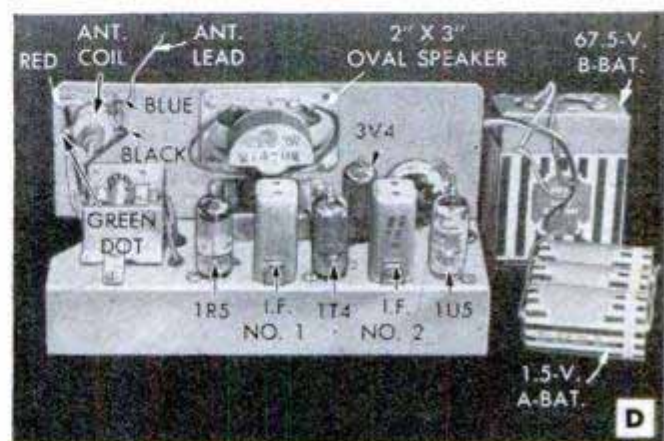
Fig. C

BUILT IN A LUNCH BOX . . .

case as shown in photo C. The speaker grille opening in the front of the case should be backed by a small piece of heavy wire screen. Photos A, B and D show various views of the completed set; photo E is an underside view of the chassis base. When mounting the tube sockets, rotate them to the position that provides the shortest possible circuit connections. The terminals of the i.f. transformers are color coded as indicated in the schematic circuit diagram, Fig. 3.

The 1R5 tube serves two purposes simultaneously. It amplifies the received signal and mixes it with the signal from the oscillator section of the 1R5 to produce the intermediate frequency of 455 kilocycles. The output transformer specified matches the 3V4 to the R.C.A. type 423S1 replacement-type speaker. If any other type of speaker is used it will be necessary to change the output transformer. Select a transformer which has an 8000 or 10,000-ohm primary, and a secondary to match the voice coil of the speaker used. Any midget two-gang cut-plate variable condenser designed for

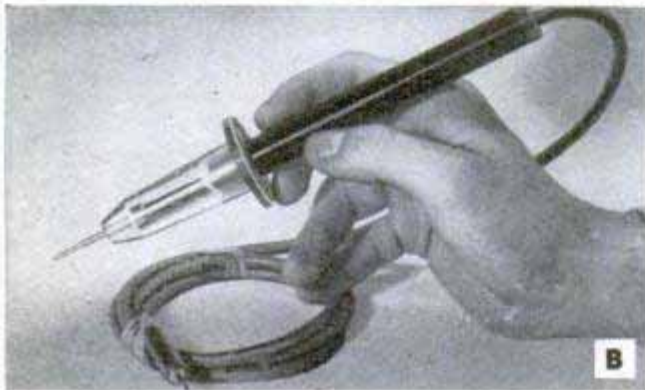
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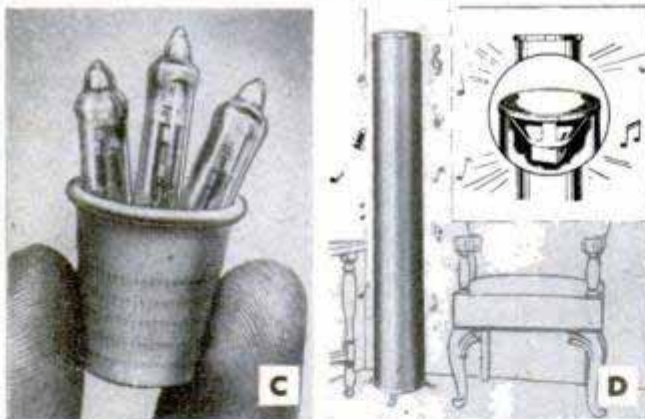
TV and ELECTRONICS TODAY



A—Tube-shaped hearing aid is carried in your pocket like a pen or pencil. It employs ultra-miniature tubes in a printed circuit and the tiny miniature batteries are matched in size resulting in a compact one-piece hearing aid that is only a fraction over five inches long and only $\frac{1}{2}$ inch in diameter

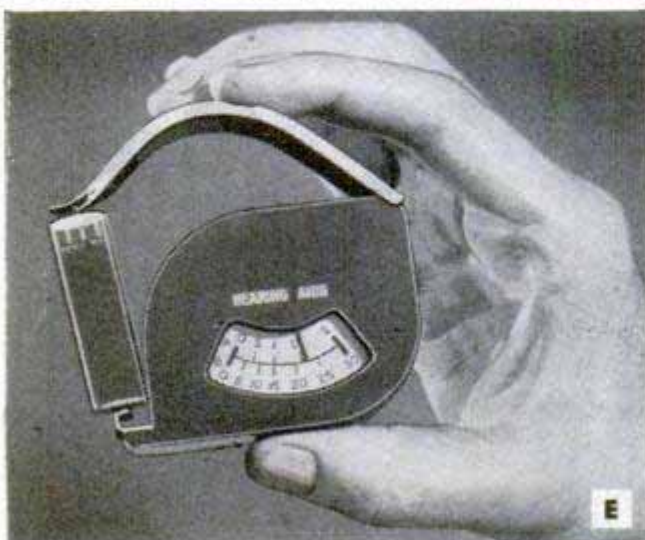


B—Multiplier probe extends the usefulness of existing d.c. voltmeters into the high-voltage television range. The device is ruggedly built with a phenolic barrel and clear Lucite nosepiece providing protection against high TV voltages. In effect it is claimed to add 15,000 volts to scale readings



C—Tiny sub-miniature tubes for hearing aids, so small that three of them fit into an ordinary thimble, have been introduced recently by an English manufacturer. They are claimed to increase the life of the A-battery by operating efficiently on a small filament current requiring only 15 milliamperes

D—"Sound Fountain" speaker radiates sound to all parts of the room through a plastic tube. It is claimed to have 30 times the sound-radiating area of a conventional 8-inch loudspeaker. It reproduces sound from any radio or electrical phonograph. The unit can be mounted on the floor, wall or ceiling



E—Simple voltmeter for testing hearing-aid batteries eliminates dangling cords. Either A or B-batteries may be tested, and there is no danger of connecting the batteries to the wrong terminals. The voltmeter has the same electrical drain as a standard hearing aid and thus insures accurate voltage readings

F—Giant-size TV receiver is designed for use in restaurants, theater lobbies, schools and clubs where a large TV picture of good quality is desired. It provides a 27 x 36-inch picture which is claimed to be equally satisfactory whether seen up close or from 75 feet away. Can be tuned by remote control



"DAD--WE NEED A MONTAMOWER TOO"

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MontaMower is a new, efficient kind of lawn mower that literally "sells itself."

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How to Enjoy Your Son's Vacation:

☆ Envy those lazy months of summer vacation your boy's looking forward to? Too bad that you can't trade places.

But there is a way you can share at least part of his fun. That's by making this summer a time to introduce him to your home workshop. Those long summer evenings and week ends, with no school work to take up his time, are ideal for both of you to work together in your shop.

Don't worry about his being too young. There's no better time to teach a boy the rudiments of good craftsmanship. Start him out with easy projects and basic tools, and then let him progress at his own speed.

You'll get a kick out of watching him discover the satisfaction of working with tools. It's, as you know, a fine hobby, excellent training in concentration and control, and the best lure I know for keeping boys off the streets, short of actual constraint. And the things you can give

him a chance to learn this summer will long outlast his vacation.

So look over your workshop now, before his vacation starts. Stock up on the things that you find in short supply. Add the tools you have been meaning to buy — if you wanted them for yourself, you certainly will want your boy to have them.

Get all set for a summer of companionship with your son—a vacation which you'll probably enjoy as much as he.

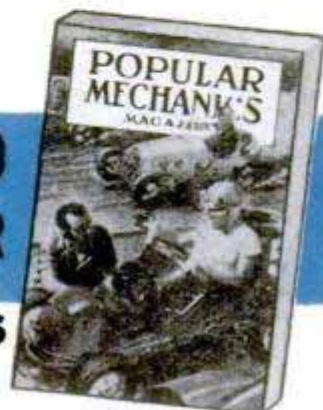
Jim Ward
CRAFTSMAN EDITOR

P.S. I'd appreciate knowing about your experiences along the above lines—why not write? Simply mark the envelope: Room 511.

JIM

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A. Kodak Auto-Release— Lets you get in the picture; snaps it for you about 10 seconds after setting. Fits any camera that has cable release socket. Double spring insures shutter tripping. Grips cable release firmly. \$4.25.

B. Kodak Metal Cable Releases—Take shot after shot without jarring camera. Excellent for time and bulb exposures. Non-stretching braided metal won't kink. 7- and 12-inch, \$9.99 and \$1.17, respectively.

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D. Kodak Service Range Finder—Good-by to guesswork in focusing. Just look through eyepiece, adjust knob until split image becomes single unit. Read scale for focusing distance. Split-field-type finder permits close adjustment even in poor light. With case, \$14.58.

E. Kodak Carrying Cases— Here's smart appearance and protection—the Kodak Snapsack, for Kodak "Tourist" models and many similar folding cameras. \$3.95.

F. Kodak Field Cases— You "wear" your camera 'round your neck for instant use without removal from the case. Illustration shows field case on Kodak Flash Bantam f/4.5 Camera. Prices of field cases start at \$2.50.

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Care and Feeding of Engines

BY S. P. CORP

FACTS ABOUT FAN BELTS

Hot weather. Millions of poor little dead fan belts littering highways. Why? Many were not installed right. Bad belt installation will ruin a lot of water pumps this summer, too. If a fan belt is too tight, the constant pull on the shaft wears out bearings, distorts shaft hole in the pump body, disturbs pump seal, causes leaks.



If belt is too loose, pump won't drive properly, water will not be properly distributed, and engine will overheat. When installing a fan belt, don't use the "crowbar" method (Fig. 1).



Take time to loosen generator bracket bolt. Then adjust fan belt until thumb pressure in center of longest span deflects belt about half an inch, then tighten bolt. Check for slack after running engine a few hours. In all cases, follow manufacturer's specifications.

manufacturer's specifications.

HOW TO SAVE \$300 TO \$500

By changing engine oil at regular intervals and changing the oil filter when it becomes dirty, you can operate your car for 3/10 to 5/10 of a cent less per mile than if you neglect lubrication. That's not much on a per-mile basis, but figured over 100,000 miles of driving, it means a saving of from \$300 to \$500! Oil can do its job only when clean. Change oil regularly. Change the filter when it's dirty. You can't lose! A postal to "Sealed Power, Dept. G-6, Muskegon, Mich.," will bring you a helpful book: "7 Ways to Save Oil."



RINGS THAT RING THE BELL

Sooner or later your engine will need new piston rings. When it's time to re-ring, use the best rings you can get—the rings that ring the bell—Sealed Power Piston Rings. The amazing new Sealed Power MD-50 Steel Oil Ring is the best ring ever made for oil control. It is the only ring with the FULL-FLOW SPRING. It controls oil even in badly tapered and out-of-round cylinders. It gives you double the drainage with half the drag. Your dealer can furnish a Sealed Power ring set specifically engineered to do the best possible job in your engine, whatever the make, model, or cylinder wear condition. Ask him today!

Portable Knockabout Super Built in a Lunch Box

(Continued from page 223)

a 455 to 465-kilocycle intermediate frequency may be used. The oscillator coil specified is a Meissner 14-1040 and this should be used. It comes complete with a terminal chart showing the numbering arrangement indicated in Fig. 3 at the lower left. Any universal-type antenna coil may be used if the builder should have difficulty in obtaining the Carron type S469 specified. Fixed condensers of any standard voltage rating may be used, for example, 200, 400 or 600-volt types.

Wire the filament circuit of the tubes first; use a small soldering iron and make all connections to the tube-socket terminals carefully as the sockets for these miniature-type tubes are quite small and the rosin-core wire solder should be used sparingly in order to avoid shorts. Make all leads as short and direct as possible. Note that all points which are grounded are connected to the common ground bus-bar wire that runs the length of the chassis base. The small circular tube that is in the bottom center of each miniature-tube socket acts as a shield between the socket prongs, and should be connected to the common ground. Connections to the three flashlight A-batteries are made as shown in photo D and in diagram Fig. 3. By connecting them in parallel, the useful life of the batteries is greatly lengthened and the voltage remains at 1.5 volts as specified. The type 3V4 tube is provided with a filament midpoint connection indicated in Fig. 3 as "FM." By using this midpoint connection, the 3-volt tube can be operated on 1.5 volts as shown. Connections to the 67.5-volt portable-type B-battery are made with standard B-battery "button type" snap clips. Terminal 4 on the 1T4 and the 3V4 tubes, and terminal 5 on the 1U5 tube do not connect to any internal portion of the tubes and may be used as convenient tie points when wiring the circuit. Note that all tube sockets shown in Fig. 3 are bottom view.

After the wiring is completed, the batteries connected and the tubes inserted in their sockets, connect a temporary antenna wire, turn on the set and advance the volume control halfway. Then adjust the variable condenser until a station is heard. Next adjust the iron core in the oscillator coil with a small screwdriver until a station around 600 kc. can be received with the variable condenser set at a point 15 or 20 degrees from the fully closed position. Now, without changing the setting of the tuning

(Continued to page 228)

A MILLION DOLLAR SECRET !



There's a million-dollar secret behind the spectacular performance of the new AC Spark Plugs: It's *CORALOX*, AC's patented Insulator.

But there's no secret at all about the easier starting, surer firing and longer life of these new AC's with *CORALOX* Insulator.

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AC spent years of scientific research and development work in perfecting *CORALOX*, yet you can have its extra benefits at the price of ordinary spark plugs. Your AC Service Dealer has the new AC's now—to save you time, fuel and money.



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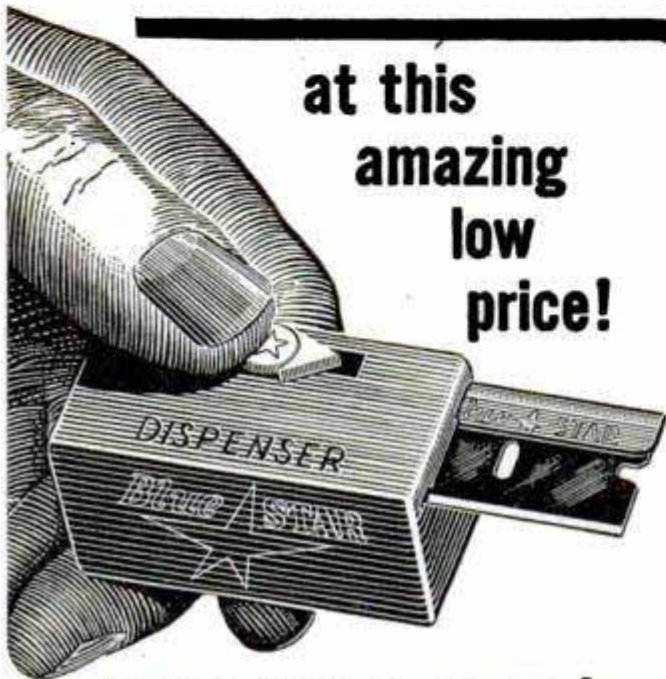
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
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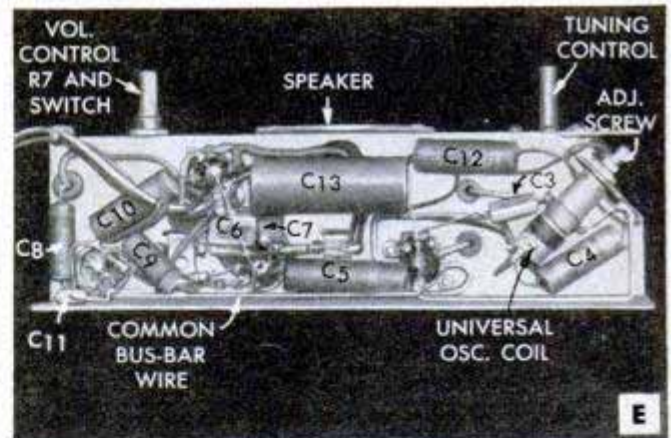
SINGLE EDGE DOUBLE EDGE

PRECISION  PRODUCTS

AMERICAN SAFETY RAZOR CORP. BROOKLYN 1, N. Y.

condenser, adjust the iron core in the antenna coil for maximum volume. Secure the antenna-coil adjusting screw in this position with a drop of cement or by tightening the locknut, if one is provided. The i.f. transformers are factory set and only a slight adjustment will be necessary. Tune the variable condenser to a station at the high-frequency end of the band and then adjust the i.f. transformers very slightly for maximum volume. Never touch these i.f. adjusting screws until the set is operating correctly. Lack of operation at the first test indicates a wiring error, or a defective part. Once the factory setting of the i.f. transformers is lost it is impossible to align the receiver without the use of a signal generator.

The antenna mounting terminal on the top of the case must be insulated from the case. It is made with two fiber washers, a soldering lug, and a 6-32 x 1/2 or 5/8-in. machine screw and a hex nut. A 1/4-in. hole is drilled in the case and the machine screw is inserted from the inside of the case so as to provide an insulated terminal for the antenna lead from the chassis; the threaded stud protruding from the top of the case may be used as a binding post for a wire antenna or the threaded end of a telescoping-type auto antenna. If the rod antenna is not drilled and threaded for the 6-32 screw



you can have it done at any machine shop. Now place the chassis in the case and determine the proper place to drill the two holes in the side of the case so that the two trimmer condensers on the two-gang variable condenser may be adjusted from the outside with a screwdriver after the case is closed. For final adjustment, tune in a station at the extreme high end of the dial and adjust the trimmer on oscillator section C2 until the station comes in at its correct dial setting; then adjust trimmer on C1 for maximum volume. Detailed student material list R-390 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

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New FASTWIN 14 H.P.*

New FLEETWIN 7.5 H.P.*

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Write today for free full-color catalog of Evinrude's 1950 lines of fishing motors and Hi-Power models for largest outboard boats. Address EVINRUDE MOTORS, 4497 N. 27th Street, Milwaukee 16, Wis.

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Wake up, clean up, tune up your engine with Casite. Casite's cleansing action quickly removes gum and goo, frees sticky valves and rings, leaves the motor clean and free-running, lets the power zoom through.

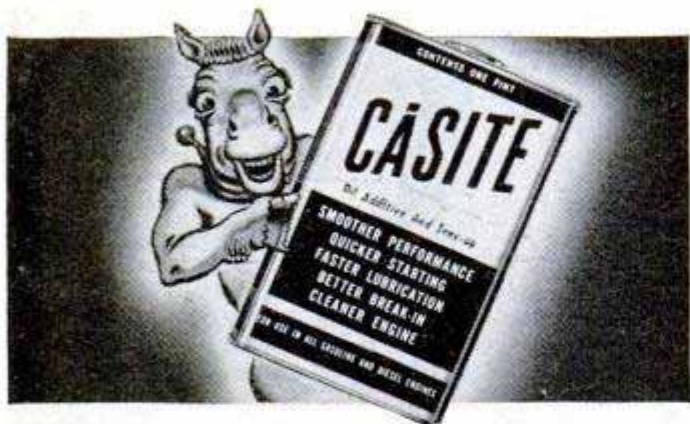


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Get it from your garage, service station or car dealer today. Only 75c a pint.

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**Better and Smoother Performance
OR DOUBLE-YOUR-MONEY-BACK**

Heap Big Wooden Indian

(Continued from page 81)

The first wooden Indian is reported to have appeared in America in 1770 in Lancaster, Pa., before the tobacco shop of Christopher Demuth. By 1780, there was a whole tribe of wooden Indians in Baltimore. Then New York tobacconists took up the advertising medium, and the demand for wooden Indians was heavy. They reached their greatest vogue through the nation from 1850 to 1880. Independent artists usually carved them, and sold them directly or through dealers.

When the market dropped out of figure-heads for sailing ships, the men who made these turned naturally to wooden Indians. It was once a common sight to see several logs being swung aboard a ship setting off on a long voyage, and sailors would carve Indians during their idle moments.

Hundreds of wooden Indians were destroyed in the fires which swept Chicago, San Francisco and Baltimore. Woodpeckers, they say, got some. Sidewalk whittlers took care of others. But probably most of them were simply carted off to attic or junk heap for the reason Robertson gives—they just weren't good-looking enough to keep around.

Still, the wooden Indian is dyed-in-the-wool American. Mention of one today—even in termite terms by a wise-cracking radio comedian—stirs in many a man a feeling of distinct nostalgia.

Matter of fact, this nostalgia caused the formation some years ago of a unique organization known as the Society for the Preservation of Wooden Indians. Founder and president is Miller Freeman, widely known Northwest publisher and industrialist, who was aided and abetted by such dignitaries as Governor Sam McKelvie of Nebraska and Representative Frank Horton of Wyoming. There are no dues nor duties, except to seek out wooden Indians and see that they are treated with the proper respect due such mementos of early America. The society also holds national conventions annually at which tomahawk throwing and smoke signalling contests are conducted, members with toupees are scalped, and conversation is in Chinook, a sort of Indian Esperanto. Robertson is the patron saint of the society.

"Things haven't been the same since they hauled in wooden Indians," President Freeman commented recently. "Who knows but what the return of wooden Indians chieftained by Robertson may be a stabilizing influence on men's minds. The Indians may even bring back some of the good old days."

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tests appliances such as • REFRIGERATORS
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ALL MOTORS — single phase, multi-phase, universal, squirrel cage, induction, in fact every type of motor from fractional H.P. to 2 H.P.

- Will measure the actual current consumption of any appliance or utility either A.C. or D.C. and will measure it while the unit is in operation. The reading will be direct in amperes. The appliance or utility may be plugged directly into the front panel receptacle. A special pair of insulated clip-end leads is included for motors, etc.
- Incorporates a sensitive direct-reading resistance range which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range will enable continuity checks and tests for shorts and opens.
- Will indicate excessive leakage between a motor and a line up to 10 Megohms.
- Will indicate when a three phase motor is running erratically due to a "blown" fuse.
- Will measure the actual voltage and indicate whether the current is A.C. or D.C. and if the frequency is 25 cycles or 60 cycles.
- Will test Thermostats under actual working conditions.
- Is the ideal trouble-shooter as it will instantly locate opens, shorts and grounds.
- Will test all bulbs, radio tube filaments, pilot light lamps, all fuses including cartridge, screw, etc., fluorescent bulbs, etc.
- Will test condensers for both opens and shorts.
- Will accurately check and locate the exact cause of failure in 3 way heat control switches.
- Will check field coils for opens and shorts.
- Will indicate when one side of an appliance or motor connected to the line under test is "grounded."

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TRY BEFORE YOU BUY! Yes, you need send no money with order or pay anything on delivery. Simply fill out this order form and mail it today. Try the Model 50 for 10 days. If completely satisfied, remit \$13.90. If not, return the instrument—no explanation necessary.

The Model 50 Utility Tester comes housed in a round cornered molded bakelite case.

Compact—Measures 3 1/8" x 5 7/8" x 2 1/4"

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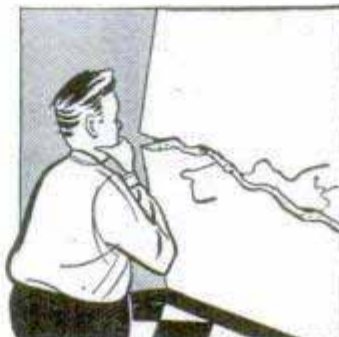
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Tipping Wall

Q—My basement walls are of poured concrete and on the north side of the house the wall is cracked lengthwise about 24 to 30 in. above the floor and nearly the full length. It seems to be bulging inward. What is the cause of this?

D.A., Reading, Pa.

A—It is not possible to say definitely what has caused the wall to crack along the length and bulge inward as you describe. If there is poor drainage of the area adjacent to the wall, then the break probably is due to frost action. Also, there is the possibility that the footings are inadequate in sectional size to support the combined weight of the basement and house walls. There are also other causes of this trouble, but they are much less likely than those just outlined. There is no practical way to force the wall back into the vertical position and, of course, ordinary mortar will not hold in the crack. You can brace the wall temporarily to prevent it from tipping farther inward. However, we believe that the only permanent remedy is to take out the old wall and pour new footings and a new wall of adequate sectional strength. Of course, this is a major repair job but we feel sure that in the long run it will pay to have the job done.

Buckling Shingles

Q—My home is less than a year old and already the roof shingles are buckled in places on both sides of the ridge. I did the roofing job myself and I was very careful to follow the instructions. What has caused the shingles to buckle and what can I do about it?

B.S., Chicago.



A—Usually shrinkage of the roof boards causes the shingles to buckle as you describe. Either the roof boards were wet by rain before the shingles were applied, or the lumber already contained too much moisture. In either case, as the boards dry

(Continued to page 234)

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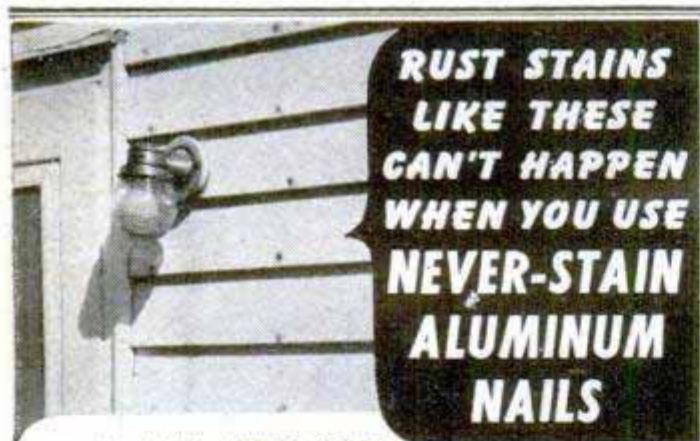
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(Continued from page 232)

they shrink in sectional size and any course of shingles nailed to one board will buckle as shrinkage of the board lessens the distance between the nails. It also should be noted that buckling can be caused by the swelling of the roof boards due to absorption of excess moisture in the attic. In this case, buckling will occur where the shingle course happens to be nailed to adjacent boards, one of which may be of a high resin content and, therefore, less absorptive than the other. One board swells (expands) and this has the effect of shortening the distance between the nails. Usually buckling caused by swelling of the roof boards will correct itself if excessive moisture is eliminated from the attic by adequate ventilation. Buckling caused by shrinkage of roof boards can be corrected only by carefully removing the nails holding the buckled shingles, flattening the shingles and then renailing. After renailing, the old nail holes should be filled with asphalt roofing cement to prevent leakage.



Insects on Paint

Q—Last summer I painted several houses on contract and on two jobs I had trouble with tiny insects alighting on the fresh paint and sticking fast like flies on fly-paper. I had no trouble with the first coat; it was only during application of the second coat that the insects appeared. Is there any way to prevent this?

G.O., Louisville, Ky.

A—Some painters troubled in this way mix a small quantity of insect repellent with the paint. This is said to be quite helpful. However, we could not recommend the procedure unreservedly as it is possible that certain ingredients of insect repellents would affect the durability of some paints. In most localities, trouble with insects can be avoided without the use of repellents. As a rule, painting on clear, cool days in late spring or early summer after a period of dry weather gives best results as drying conditions are ideal and insects give very little trouble, especially during the morning hours. Under good drying conditions the paint will set insect-free in a short time.

Painting Varnished Woodwork

Q—All the woodwork in my home is varnished in a dark color. Now I would like to paint the woodwork in three rooms to match a new scheme of decorating, but I would like to know beforehand what preparation of the varnished surface is necessary before painting. It seems to me that the paint is likely to peel from the smooth varnished surface. What should I do in the way of preparation?—W.S., Salem, Ore.

A—Assuming that the varnish is in good condition, without checks or large cracks or other surface defects, about all that is necessary is to cut the gloss by going over the surface with steel wool, No. 1 or No. 2 grade. In doing this part of the job, it will pay to be thorough so that no glossy areas are left on the edges or flat surfaces of the woodwork. In the kitchen and bath and on doors and trim where the hands normally touch the surface, wash thoroughly with a mild solution of trisodium phosphate. Then go over these areas with steel wool. Next, apply a prepared undercoater and allow it to dry thoroughly. Follow with one or two coats of gloss or semigloss enamel in the color desired. If you are refinishing woodwork in the kitchen or bathroom, it generally is best to use a gloss enamel. In other rooms, a semigloss enamel is usually more attractive. If you apply two coats of enamel, it's good practice to sand the first coat lightly before applying the finish coat. Another and shorter finishing process is the use of what is known as a spirit enamel for the first coat. Its principal advantage is that there is less danger of peeling or bleeding when it is applied over varnished, dark-stained woodwork.

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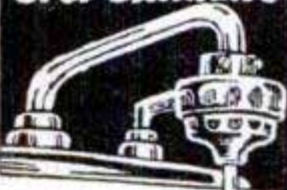
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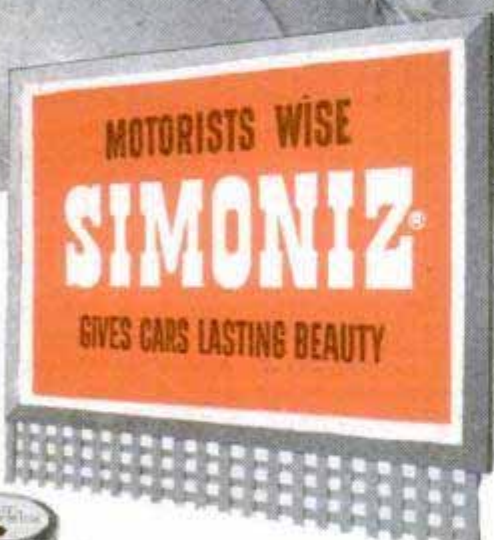
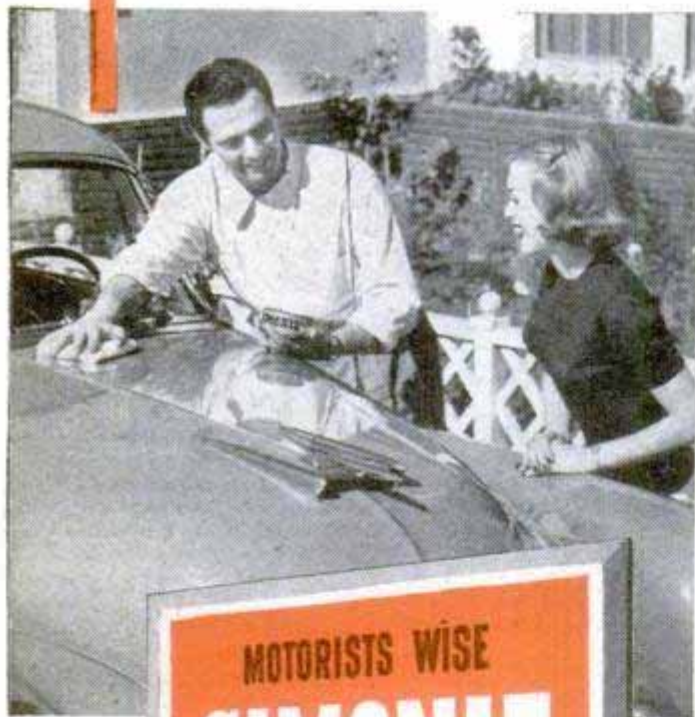
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High-Speed Splinter

(Continued from page 140)

sports. Annual dory races were held on the Thames in England as early as 1716 and it was a rough sport even in its early years. Friends of some oarsmen would stand on the bridges that spanned the course and would pour water or drop heavy stones into the boats of competitors. Other "spectators" tried to maneuver large craft in front of struggling dorymen to stir up the water and make the rowing more difficult.

The sport gradually spread to most parts of Europe and across the Atlantic. The first races in America were held on the Hudson around 1750, when crews from various ships raced in whaleboats or in ships' boats. Racing by private clubs and colleges started some 75 years later and the traditional Harvard-Yale boat races began in 1852. Meanwhile, professional oarsmen practiced at training camps, issued challenges and engaged in match races for large purses.

The present fast, lightweight shells began to evolve in the middle-1800s. Outriggers were one of the first improvements, then the English colleges developed the keelless hulls that are in use today. The sliding seat was an American contribution that came in the late '50s. Gradually, the present shells that are built and tuned virtually like violins came into being.

Another American contribution to the sport is the famous Hiram Conibear "comfortable" stroke, now used by virtually all crews, that combines speed with enough relaxation to permit a fast pace all through a long race. Conibear developed his stroke while coach at the University of Washington early in the century.

Pocock hulls and the Conibear stroke, plus continued good coaching, have made Washington the strongest rowing school in the United States. Washington won eight of the last 20 intercollegiate rowing regattas at Poughkeepsie, using the eight-man boats over a four-mile course. And in the 20 regattas Washington placed first, second or third a total of 19 times.

The Navajos Hunt Big Game

(Continued from page 92)

hospital. My trading post is practically the only local link with civilization.

The result is that the Monument Valley Navajos are living just about as they did a century or two ago. Their only houses are crude "hogans" that are built of brush and mud, with perhaps a piece of stovepipe stuck through the roof. Men and women alike still wear their hair long, bound up in

(Continued to page 238)

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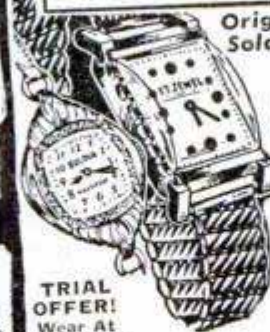


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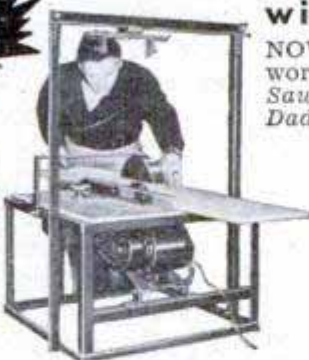
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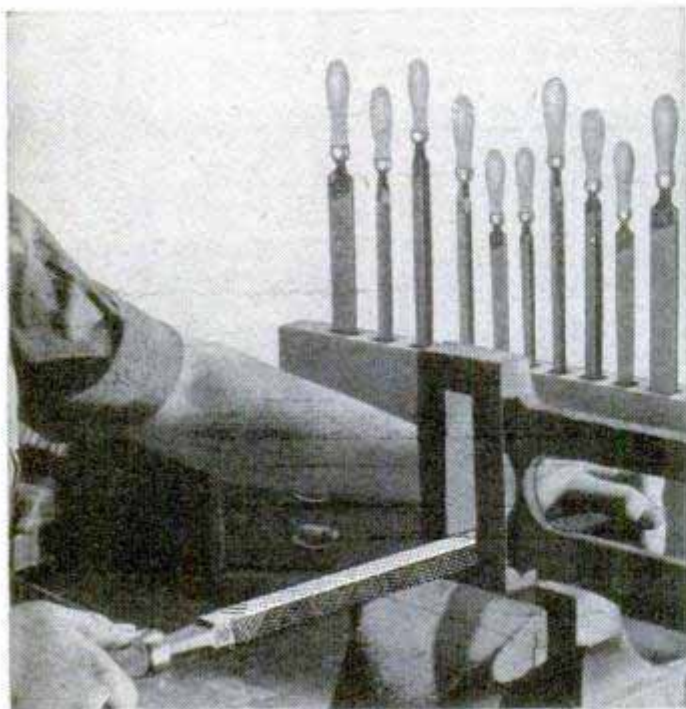
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a knot behind. Because of their natural love for color you find the Indian women always dressed in gaudy clothes no matter whether they are visiting the trading post or are tending sheep out on the desert.

The Navajos still weave their rugs and blankets on crude outdoor looms from balls of dyed yarn. The wool comes from their own flocks. They still grind their corn on a flat rock and they still make their jewelry from silver and turquoise ore.

Living under these primitive conditions, the Indians are a fascinating sight to visitors. Everyone who drives through the country takes snapshots until they run out of film. But there is another side to the picture. No more than three percent of the Indians around Monument Valley speak English, because of the lack of schools.

When one of them is desperately ill and word reaches me in time I try to rush the patient to a hospital. The long, arduous ride over dusty dirt roads and trails doesn't help the patient. Then, if he reaches the hospital alive and eventually recovers, he has to walk back home. There is no other means of transportation.

Their primitive life is not by their own choice. Besides local schools and hospitals, they need irrigation water, brought possibly from the San Juan River. With adequate water they could become industrious farmers, for the soil would support a good agriculture. The only water that's available now comes from a few springs and seeps and provides only enough for drinking and bathing purposes. Indianlike, none of the Navajo families will camp beside a spring. They prefer to camp a mile away, out of sight of the spring, and carry the water they need all the way to camp. This leaves the spring open for use by the coyotes and other wildlife in the vicinity.

Another thing that the Indians need is a paved road, with a bus line. This would allow them to move back and forth, to leave the reservation in search of jobs and to return home when the jobs end.

An Indian trader is more than a simple storekeeper. As a matter of fact, money rarely passes over my counter. Rugs, jewelry and other products are traded in for dungarees, staple foods, tools, saddles and what other necessities the Indians can afford. In turn I sell their products to visitors or through regular channels.

I'm also an interpreter, amateur doctor, general adviser, intermediary on legal matters, lodge operator, prospector and a one-man chamber of commerce.

I operate a modern lodge at my trading post because about 1000 visitors a year drive into the valley and there's no other

(Continued to page 240)

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place for them to stay. Incidentally, visitors should never regard the Indians as mere exhibits. They are living their own lives and one should not invade their privacy by photographing them without permission. I tell Indians and visitors alike that a half dollar fee should be paid for the privilege of making pictures.

As a prospector I'm interested in finding mineral deposits that might help the inhabitants. As a white man I can't stake a claim or own a mine on the reservation and there is no reward for making a discovery. Any income or royalties goes direct into tribal funds.

Possibly you never heard of Monument Valley until now but there is a good possibility that you have seen pictures of it. It has served as the background for a number of Western movies. Each year I make a trip to Hollywood to try to get the studios interested in making pictures in the valley. The resulting income is one the biggest financial helps that the Indians have received. The tribe gets a fee for the use of the land and the individual Navajos draw wages for serving as actors. Portions of "Stagecoach," "Darling Clementine," and "She Wore a Yellow Ribbon," among other Western pictures, were filmed in Monument Valley.

It takes a real expedition to make a movie here. Sleeping tents, set materials, lighting plants, water, food and every incidental must be brought in by truck. Actors and crews come in by special busses and aircraft. For the time being we have two-way communication with the rest of the world. Each location group keeps in touch with its home studio by short-wave radio. The motion-picture sets that are erected in the valley are built for permanence and become the property of the tribe. They may be used, for an additional fee, by the next studio that comes in.

The scenic attractions of Monument Valley are so great that eventually, perhaps soon, it will have to be turned into something like a national park. More and more tourists are visting us every year. My hope is that the valley will never be taken away from its inhabitants and turned over to some agency for operation. The valley is the property of the Navajo tribe and if it is to become a public attraction the Indians themselves should be trained in park operation and should be allowed to manage it.

After all, the land was given to them as a reservation because it was considered worthless for any other purpose. No one dreamed, then, that it contained a big percentage of our uranium reserves and that because of this it actually is one of the most valuable areas in the country.



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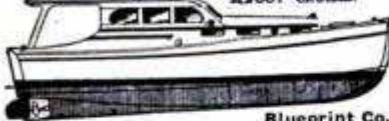
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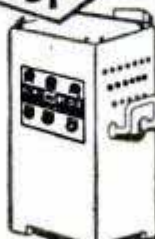
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Bring on Your Inventions

(Continued from page 159)

Gettlefinger of Cincinnati who has invented a broom attachment he calls the Water-finger. This began when Gettlefinger had to move several times in one year and in each house found a dirty basement to clean. He experimented by tying a hose to the broom and finally made a clamp from a piece of scrap iron and a one-inch section of pipe. Milburn redesigned the attachment from Gettlefinger's crude model and used aluminum casting to hold down the cost of initial tooling. Since then Gettlefinger has set up his own plant to manufacture the device. He has been packaging and selling it in limited quantities.

R. J. Byrum of Grand Forks, N. D., came to Milburn with his idea for a "Dent-L-Aid," a plastic cylinder containing two tubes. One holds a toothbrush and the other a supply of powder. The cylinder seals tightly and can be carried in a woman's purse, glove compartment of a car or pocket in an overnight bag.

Joseph Gastright, a construction engineer of Florence, Ky., recently got annoyed by the poor construction made by erecting joists by toe-nailing them together. He designed a metal joist fastener which was engineered by Milburn and is made from a single metal blank in one forming operation. (See illustration, page 159.)

Marshall E. Butler of Raleigh, N. C., invented something for people who are annoyed by the radio when they are using a telephone. The telephone sits on the device and when the receiver is lifted an automatic switch turns off the radio and at the same time turns on a small light over a writing pad.

Another man designed a plastic cone to protect young plants from frost. A man with arthritis got tired of eating the ground meat prescribed by his doctor. He said it was too dry so he invented a new roller-type meat grinder that turns out a juicier hamburger.

Milburn says working with the small inventors is a lot more fun than engineering for industry. During the war he worked with defense plants, redesigning machinery to boost production.

"Some inventors have to learn the facts of life about production costs," said Milburn. "When they present a manufacturer with their invention and ask \$5,000, \$20,000 or \$100,000 for it plus royalties there is usually no sale. If more inventors would offer manufacturers their brainchildren for 5 percent of the manufacturer's gross—which I think is a fair figure—many more inventions would get into production."

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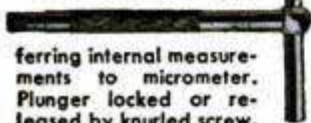
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Prairie Oil Boom

(Continued from page 129)

handle 95,000 barrels a day at the start. Later, this can be increased with additional pumps and storage facilities. Storage tanks at Superior will be built to hold 1,500,000 barrels during the winter months when the tankers are frozen in port. The pipe line will be a common carrier—available to all companies operating in Alberta.

Special machines are helping rush work on the pipe line. Specially designed pipe wrappers and coating machines, bending equipment to shape the pipe to the contour of the ground, the biggest ditchers Canada has ever seen, "side-boom cats" (tractors with hoisting booms on their sides) and other steel giants are creeping across the countryside. The big ditchers can trench over a mile a day to a depth of five feet.

When the pipe line and Sarnia refinery are going full blast, a big step forward will be made toward supplying Canada with the 300,000 barrels of oil a day consumed in the country. This oil now comes from the U. S., South America and the Near East. One pipe line from the East Coast to Montreal brings oil from the ocean-going tankers; another pipe line from the Middle West takes oil into Sarnia. It is believed that the Montreal refineries can never be supplied with Alberta oil as cheaply as it can be brought in by tanker and pipe line. However, Canada's annual oil-import bill calling for an expenditure of \$300,000,000 of her limited dollars is expected to be reduced to \$170,000,000. In other words, the Canadians will have \$130,000,000 more each year to spend for things other than oil. This is more than the total cost of the pipe line, which will make the dollar saving possible. Furthermore, if the reserves surpass expectations, the Alberta refineries may pipe oil and natural gas into western U. S.

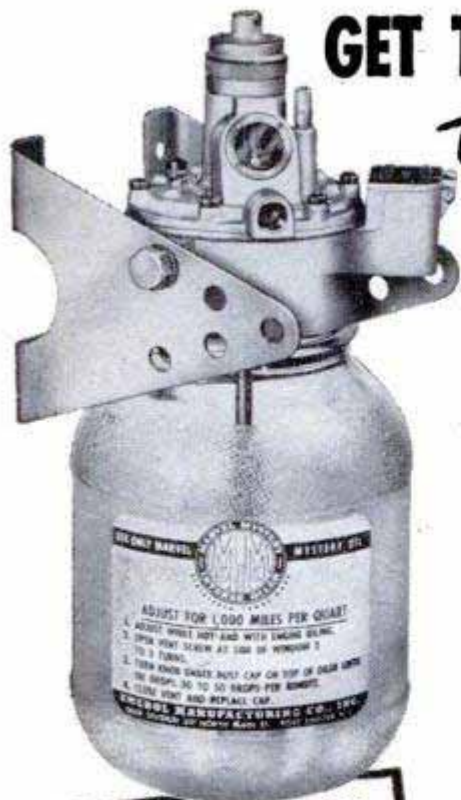
Although interest is now focused on Edmonton, Canada's oil and gas picture is not limited to that area. Away back in 1914 natural gas was discovered in Turner Valley, southwest of Calgary, Alta., and in 1936 an important oil field was found there which is now down to its last 25,000,000 barrels. Two hundred and forty miles north of Edmonton are the Athabasca Tar Sands which contain the world's greatest oil reserves, estimated as high as 200 billion barrels. At present the cost of processing the sands to obtain oil is too high to compete commercially with other petroleum sources. In the Far North is Norman Wells which was brought into production in wartime at tremendous cost to supply Alaska bases. The operation at Norman Wells is

(Continued to page 246)

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Despite the lack of a western Canadian market and a finished pipe line, oil-exploring parties are moving right along in Canada. Some 60,000,000 acres are under lease in Alberta and about the same amount in Saskatchewan. At the last count there were 102 geophysical crews looking for oil in the region. This is second only to Texas where 143 such parties are at work. The Canadian crews include 81 seismograph, 20 gravity meter and one magnetometer party. Last winter the exploring parties worked through temperatures of 50 degrees below zero. They found that it is an advantage to work the swampy muskeg regions when frozen solid—also, there were no complaints about mosquitoes.

In their quiet manner, the Canadians—farmers, bankers, manufacturers, storekeepers and professional men—highly approve of their oil boom. They wonder what Americans think about it, and the barber on Jasper Avenue in Edmonton philosophizes on the situation.

"The big American oilmen can't kick very hard without kicking themselves because they've likely got a stake in Alberta, too. The military men ought to be happy because our oil reserves are a nice nest egg in case of trouble and if there is any trouble the U. S. and Canada will probably be in it together. And the ordinary guy who drives a car and buys gasoline shouldn't kick, either, because the more oil available the greater chances are that prices might get lower."

Canada's well-controlled oil boom is a quiet but happy affair from every angle.

College in the Tall Timber

(Continued from page 87)

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(Continued to page 248)

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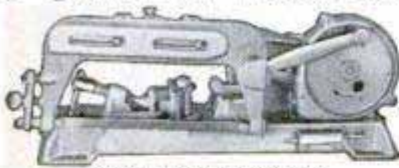
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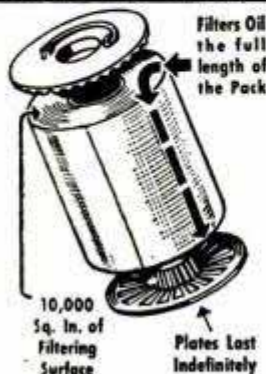


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NEW YORK 17, N. Y.

This desire to get out in the woods where a man has to struggle to conjure a mean thought is universal, for the camp's roster has listed men from England, Norway, India, the Philippines, Finland, Paraguay and China. The University of Idaho is primarily an institution for Idahoans, but its school of forestry is an exception. One year it attracted students from 42 other states. A surprising number come from the tree-shy plains of the Midwest, from the five boroughs of New York City where trees are equally scarce.

Life in the woods can be tough at times, but it is surprising how tough the students can get. When flames began sweeping the tree tops of the Bergdoff area one evening, the students were playing softball. Professor Wohletz ran onto the diamond shouting. "We roll."

The bat thudded on home plate, and players and spectators raced for trucks. Three nights later, the students—soot and sweat and dirt-blackened—returned to camp. One of them walked over to the diamond, picked up the bat and thumped it on the plate.

"Hey!" he said. "Who was up?"

Spray Bomb and A-Bomb

(Continued from page 150)

water in the high-school electrolysis experiment. The fluorine is collected in heavy steel tanks.

In action the cell sounds like a miniature thunderstorm. It crackles and rumbles as it starts up, and lets go with a periodic bang, even after it is working smoothly, just to let you know it is still there. The crackling is caused by air seeping into the cell, and the bangs are bubbles of fluorine recombining with hydrogen. But the noise threatens nothing. An ingenious system of automatic vents—one of the many safeguards which have kept lost-time accidents down to zero—dissipates explosions before they can build up.

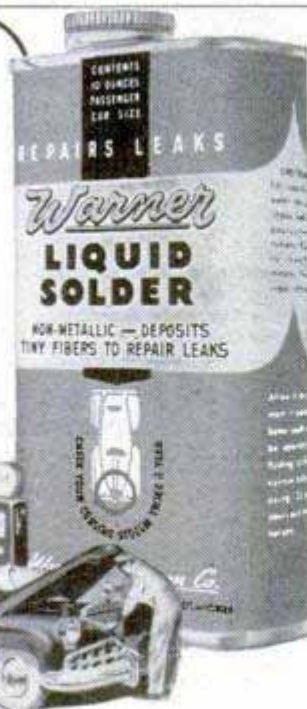
Penn Salt is selling fluorine produced at Whitmarsh to rival researchers at cost. The motive is not Quaker charity, but speeding the arrival of a spate of fluorine products to guarantee a market for a new fluorine plant. The largest in the world, the plant is now being built in Calvert City, Ky. In any case, Canadian and American laboratories, month by month, are adding to the gas' repertoire. Here are some of the more striking things it is already doing, or foreseen for it by the experts:

Beside priming the production of atomic fuel, fluorine is giving electrical engineers a host of remarkable new materials to work

(Continued to page 250)

Your car...

... can be seriously damaged by a leaky radiator. Don't take chances—take care! Use Warner Liquid Solder... it's non-metallic, deposits tiny fibers to repair leaks anywhere in the cooling system. Fast, sure and easy to use—just shake... pour... and fret no more.



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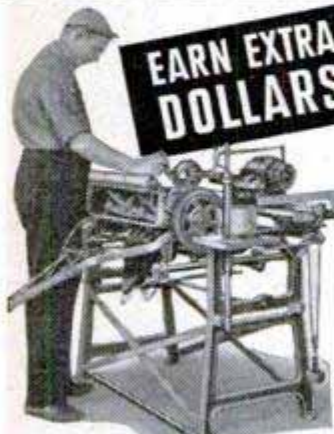
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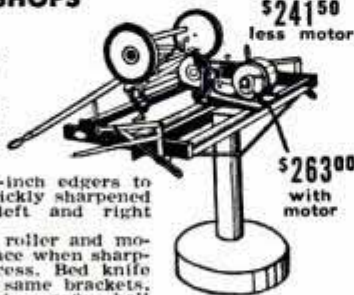
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with. These promise cheaper electricity and better electrical equipment of all kinds, from power plants to household appliances.

A heat-resisting fluid made from fluorine, for instance, is leading to hotter, more efficient turbines. Engineers have been aware for three decades that more energy could be wrung from power-plant fuel—whether coal or the atom—if the turbine "windmill" turning the electric generators were spun by something like mercury vapor instead of steam. Since mercury has a higher boiling point than water, efficient high temperatures would be easier to reach. Experimental mercury turbines have been built to prove the point. Unfortunately, the liquid metal is scarce and expensive, making the mercury turbine an impractical dream. The new fluorine liquid, which has a boiling point near mercury, brings the mercury turbine down to earth.

Another fluorine derivative, a colorless gas made from sulphur and fluorine, is the best insulation yet found for the huge transformers that take juice from power-plant generators and step up its voltage for transmission to home and factory. Thanks to it, smaller transformers will carry bigger loads. Still another fluorine material, Teflon, a waxy substance originated by Du Pont, has a combination of resistance to oil, heat and electricity that makes it near ideal for proofing electric motors against short circuits. Teflon will lead to lighter, more compact and more powerful motors.

A new family of super-durable plastics related to fluorothene is a second prospect offered by the wonder-working gas. Unlike fluorothene, which was designed for industrial use, the newer fluorine plastics will be adapted primarily to everyday articles. They will be less expensive and easier to produce, yet will have fluorothene's virtual immunity to flame, heat and chemicals. They will be useful for all sorts of articles, from protective aprons to baking ware, beyond the reach of present plastics.

Fluorine is also making possible rubber that won't deteriorate with age and is unaffected by oil and acids. About a dozen years ago, Du Pont created the first synthetic rubber, Neoprene, by mixing a small amount of chlorine with an oily liquid obtained originally from natural rubber. Neoprene has now been made with fluorine instead of chlorine. A fluorinated form of "GR-S," the synthetic rubber used in tires, has also been whipped up in researchers' test tubes.

Prof. Herman Mark of the Brooklyn Polytechnic Institute, a top expert on plastics and synthetic rubber, calls the fluorine rubbers the most remarkable materials he

(Continued to page 252)

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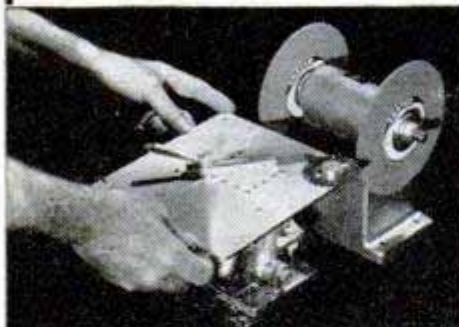
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has ever seen. About the only thing that will wear them out is scraping along a pavement. Nylon and other synthetic textile fibers have likewise been treated experimentally with fluorine, with equally beneficial results.

Still another gift of the new genie is a line of colors that has fashion specialists and textile designers excited. Incorporated in dyes, fluorine brings out pastel tones of a brilliance and delicacy never achieved before. Fluorinated dyes, moreover, are extraordinarily fast to light. Flagmakers are using the first fluorinated dye to achieve livelier, longer-lasting reds for the Union Jack and the Stars and Stripes.

Fluorine is already making a sizable contribution to medicine. The most effective drug dental researchers have turned up for guarding teeth against decay is a gray-green powder, sodium fluoride, which grandma used to spread around the kitchen to kill roaches. It is either added, in minute quantities, to the water supply or painted on children's teeth every six months. Either way, it halves the number of cavities the children would have as adults.

Another medical fluoride, named DFP, saves eyesight in glaucoma, which has been a leading cause of blindness among older people. During the war, researchers at Edgewood Arsenal, the U. S. Army chemical warfare center, prepared DFP as a possible poison gas. Though unsuitable for military purposes, an alert eye specialist noticed that it had an odd effect on the eyes. He shrewdly guessed that it might help reduce the pressure of the watery humor within the eye. If this pressure rises too high—as in glaucoma—delicate internal membranes are crushed and sight is destroyed. DFP keeps the pressure down to safe levels in nine out of ten patients. If they use the drug faithfully, they are assured of vision for the rest of their lives.

Other fluorine preparations are under investigation as anesthetics. Completely non-inflammable, they may end the tragic operating-room explosions that occasionally attend the use of ether. With a larger margin between the clinical and fatal doses, they will elevate surgery to new standards of safety.

When hydrogen combines with fluorine, sufficient energy is set free to generate 6000 Fahrenheit degrees of heat, easily enough to weld jet alloys and copper. Tungsten and boron carbide are also made plastic, opening the way to new methods of fabricating these diamond-hard materials into industrial metal-cutting tools. The hydrogen-fluorine combination, furthermore, packs more power than any known fuel except

(Continued to page 254)

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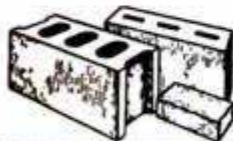
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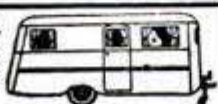
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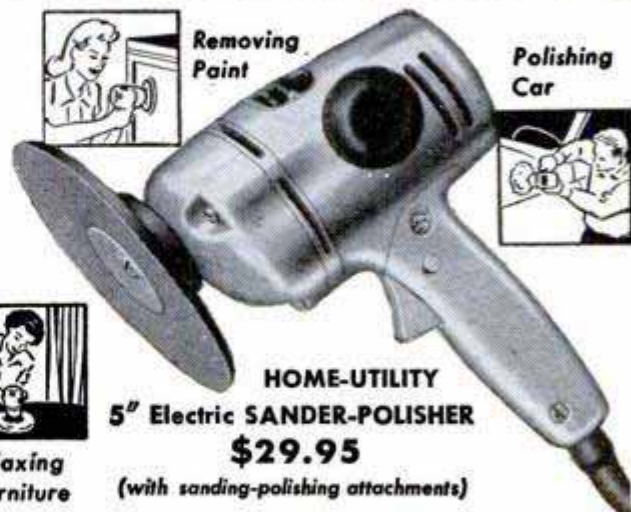


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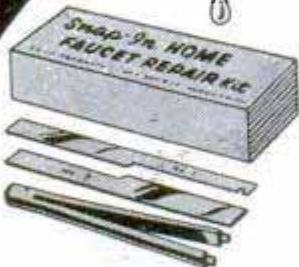
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U-235 and plutonium. Since the experts are doubtful about atomic fuels as rocket propellants, the new mix will probably drive tomorrow's biggest rockets.

In spite of the fact that their cost has dropped, over 90 percent in some cases, during the past 10 years, fluorine and fluorine products are still comparatively expensive. Many applications are potential rather than actual for that reason.

"What we have to do," explains Doctor Gall, "is whittle away at costs. Fluorine products, however, will never be what I would describe as cheap, because of the large quantities of power and elaborate equipment required for preparing and handling fluorine. Nor do they have to be. Take DFDT, our new insecticide. DFDT is twice as expensive as DDT, but it is more poisonous to insects, so less is needed, and it has important safety advantages as well. DFDT will be a bargain at double the price of DDT per pound. Of course, where the fluorine product does something never possible before, price per pound is even less important."

Doctor Gall's point is underlined by the fluorine industry's phenomenal growth. When the astronomical wartime demand for aviation gas ended, fluorine chemical output fell sharply off. It dropped back nearly to the prewar level, when the industry's wares were limited to a few products like crude hydrofluoric acid for glass etching and Freon, made by an expensive, now obsolete process, for refrigerators.

Now, the fluorine industry has zoomed back to the wartime peak, and growth continues apace. Half a dozen companies beside Penn Salt are building new fluorine facilities: Du Pont in West Virginia, the M. W. Kellogg Company in New Jersey, others elsewhere. The earth's crust contains inexhaustible resources of fluorine, locked away not only in handsome fluor spar, but in plebeian fluo-apatite, the common rock from which comes the farmer's phosphate fertilizer. It is a safe prediction that the inexhaustible ingenuity of the chemist will make the pungent gas one of the stellar performers of this chemical age.

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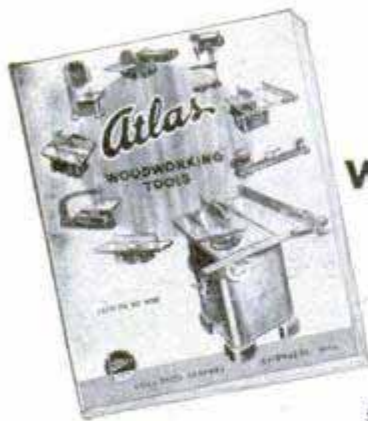
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They Jump for Other Men's Lives

(Continued from page 114)

the ground. The chute is strong enough at such speeds, although test jumpers find that their helmets and shoes sometimes are torn from their bodies by the force of the wind when they leave their planes.

One of the goals of the research is a parachute that will open safely at the speed of sound, some 760 miles per hour, and that will have minimum shock when opened at that speed. Something better than the mere deployment bag is needed to reduce the tremendous jerk that would occur. Normal human tolerance for opening shock is about 16 Gs and it is believed the shock could go as high as 30 Gs with safety if proper protection is devised. The answer may be a full parachute suit that will distribute the shock, instead of the present webbed harness.

A speed-of-sound chute won't be needed for some time yet. The present ejection seats of transsonic aircraft adequately slow a man down before his chute opens. And except at minimum altitudes a jumper can deliberately refrain from opening his chute until he slows down to a safe speed or to his terminal velocity. This velocity depends on his weight and altitude, and ranges from 120 to 135 miles per hour. An airman ejected from a craft traveling at the speed of sound would slow down to his terminal velocity in about five seconds.

In seeking better parachutes the El Centro research unit tests all of the new ideas of manufacturers and experiments with a lot of its own ideas. One novel design is the ribbon parachute that consists of cloth strips or ribbons woven into the shape of a canopy. A ribbon chute can withstand a high-speed opening but it is heavy, bulky and descends too rapidly for the jumper's safety. It is ideal as a brake chute for slowing down aircraft, however.

Another experimental design is the pressure-relief type. This consists of an ordinary canopy with its center or crown cut away and then reattached with short, strong elastic cords. Stretched open during a high-speed opening, the crown allows much of the air to spill out around it, reducing the shock. When the chute slows down and air pressure is reduced, the cords pull the crown back into place and the jumper descends at a safe speed.

The pressure-relief canopy works perfectly but there is one fundamental objection to it. In the frigid temperatures of high altitude, its elastic cords would become brittle and snap. Until some desirable material can be found to replace the

(Continued to page 258)



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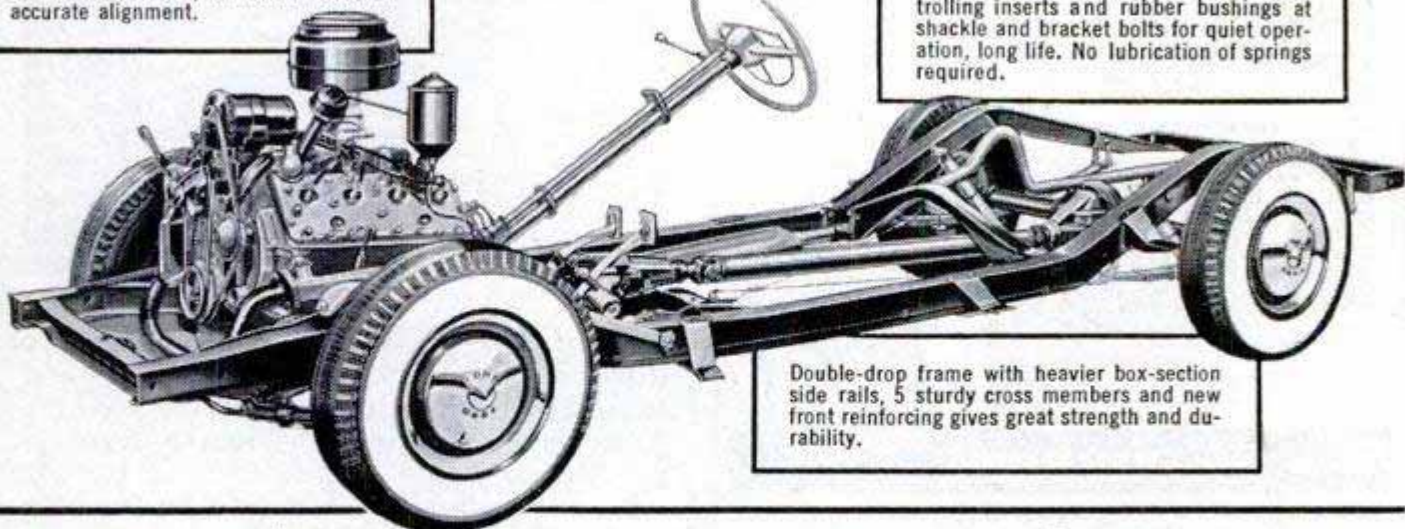
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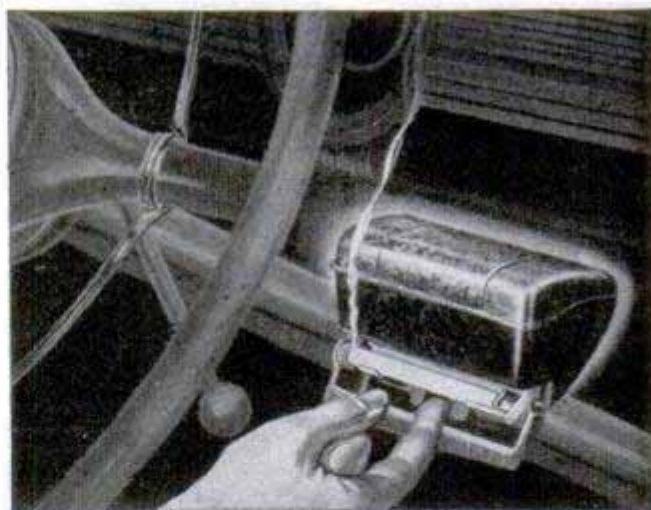
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cords, the idea has to remain on the shelf. Research likewise is being done on the problem of getting a chute to open in minimum time and distance, a vital necessity to the flyer who finds that he must leave his plane while only a hundred feet or so above ground. One idea that is being explored is to release a charge of compressed air or gas under the canopy as soon as it becomes partly distended. If the compressed air can speed up the opening, it may enable men to jump safely from altitudes that are too low for safe jumps with present equipment.

All the veteran jumpers at El Centro have a word of advice for everyone who wears a parachute and who sometime might have to use it. Devote both hands, they say, to the job of leaving the plane. This applies no matter whether you vault up from the cockpit or leap from a side door. There have been instances in the past when an airman jumped with one hand and pulled his rip cord with the other, the usual result being that the canopy fouls on the tail surfaces and the airman falls to his death.

When both hands are used to leap free of the plane the jumper is safe. It takes only a second, then, to reach the rip cord and pull it, and in that time the jumper has moved entirely away from the plane and has begun to slow down.

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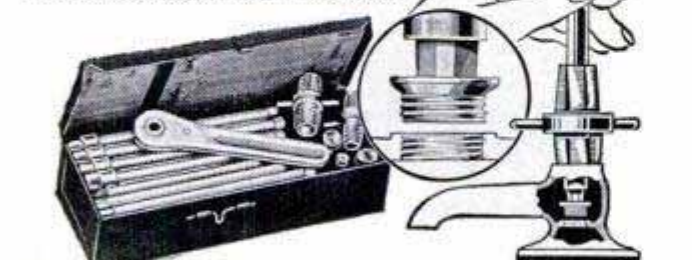
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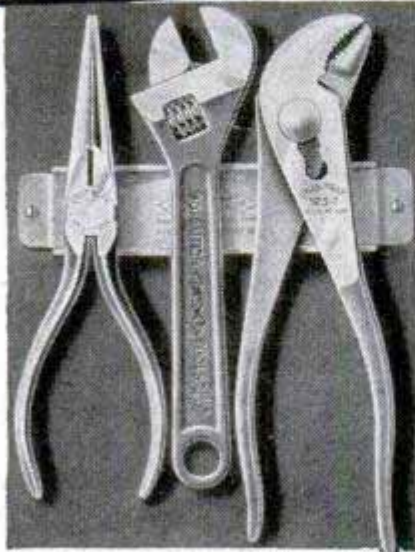
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1950 Catalog—over 100 modern designs by famous naval architects. Racing classes, cruisers, inboard, outboard, sail, 6 to 35 ft. Plywood-Steel-Plank. Construction plans, full-size patterns. Send 35c for catalog or \$1.00 for catalog and helpful booklet on "Boat Building."

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WITH Infinitely VARIABLE SPEEDS, Clutch and INSTANT REVERSE—OUTPUT TORQUE ADJUSTMENT UP TO 180 inch POUNDS

This positive displacement Hydraulic Torque Converter is the ideal fluid drive with thousands of uses . . . Output Speeds Infinite 0 to 550 R.P.M. . . . in either direction . . . Change Speeds WHILE RUNNING . . . Control and Transmit your power this SMOOTH Oil-Way . . . Will handle 1/4 H.P. to 1 1/2 H.P. Motor. Industrial or Home & Farm Use . . . Cost government \$300. High Quality Precision Workmanship. Buy this unit to get the most for your money. Case measures 7 1/2" long 7" high 6 1/2" wide. Input & Output Shafts 5/8" dia. Beautiful Red Crackle Finish Case.

FINGER TIP CONTROL



Shipping Wght. 25 pounds

Only **\$54.50**

PREPAID

If C.O.D. is requested a 10% deposit must accompany order and we ship F.O.B. Chicago.

1 1/2"-8 thread lathe
Chuck Adapter, \$3 extra

2 quarts oil included FREE

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DO MORE PLANING JOBS WITH LOW-COST BELSAW \$195.



AMAZING 12 1/2-IN. PLANER Does All Ordinary Planing Mill Jobs. Provides attachments for Jointing, Rabbeting, Tongue, Groove, Matching. 12 1/2 x 6-in. capacity, 3-knife solid round all-steel cutterhead. Power feeds at 24 feet per minute, 42 cuts per inch. Provides for full line of accessory attachments—Grind and Joint knives IN THE CUTTERHEAD WITHOUT REMOVING.

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Mention year and make of your car, truck or tractor. **RECLAIMO MFG. CO., Inc., 5083 N. Euston Ave., Dept. 32, Chicago 30, Ill.**

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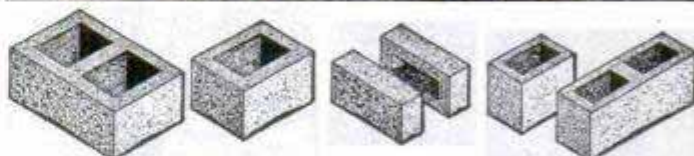
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New superior method makes square, true, easy-to-lay units which will pass any building code. Small investment, high production, big profits. One \$30.00 machine will make four 5"x8"x12" blocks per minute—1000 per day. Pays for itself in a few days. Sell blocks or save 2/3 building cost by making and laying your own.

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AUXILIARY ELECTRIC GENERATING PLANT

**FOR GENERAL UTILITY AND EMERGENCY USE
2500 WATTS · 115 VOLTS · 60 CYCLES A.C.**

Penty of current to operate your: Oil Burner, Sump Pump, Refrigerator, Home Freezer, Power Saw, Lights, Radio and Television, Home Water System Pumps. Complete integrated heavy duty electric power plant, Signal Corps Model PE-75, driven by Briggs & Stratton, one cylinder 6 1/2 H.P. Model ZZ, 4-cycle engine with killer button, oil bath air cleaner, governor, muffler, starting rope, and radio interference filter. The self-excited Leland or Westinghouse generator is rated 2500 Watts, 115 Volts, 60 Cycle A.C. single phase, belt driven, with guard and duplex receptacle.

(Item #88)

When generator is not in use, you can use the engine separately to power other equipment. Mounted on adjustable steel skids, notched for carrying poles. Net wt. 310 lbs. Shpg. wt. 440 lbs. Dimen. 36"x19 1/2"x24". 12 month guarantee. \$726.00 value. NOW

295.00

Aircraft Quality HYDRAULIC CYLINDERS

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes . . . including actuating and double action cylinders, control valves, tanks, pumps, fittings, hose, and data on hydraulic applications. Use these positive, highly efficient, smooth pressure hydraulics on presses, arborers, lifts, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #4—All steel double action hydraulic cylinder, 1 1/2" bore, 2 1/2" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. F.O.B. Chicago. . . . **4.95**

ITEM #33C—Double action hydraulic cylinder, 1 1/2" bore, 4 1/2" stroke. Clevis mountings at both ends. Uses 1/4" pipe fittings. . . . **8.95**

ITEM #32—Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A \$45.00 value. . . . **10.95**

ITEM #41—Double action hydraulic cylinder, 2" bore, 6" stroke, clevis mounting at base and end of shaft. Overall length closed 12 1/2". Has 3/4" stainless steel shaft, uses 1/4" tubing fittings. Will lift up to 3100 lbs. with 1000 P.S.I. line pressure. Weight 7 Lbs. Postpaid. . . . **12.50**

ITEM #16—Double acting cylinder, 1 1/2" bore, 27" stroke. Will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 8 lbs. A \$55.00 hydraulic cylinder value for only Postpaid. . . . **12.95**

ITEM #15—Double acting cylinder, 3" bore, 8 1/2" stroke. All steel hydraulic cylinder, will lift up to 7000 lbs. with 1000 P.S.I. line pressure. Wt. 12 lbs. A \$78.00 value. Postpaid. . . . **19.50**

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ITEM #6—Double action, 3" bore, 23" stroke, hydraulic cylinder will lift 7070 lbs. with 1000 P.S.I. line pressure. Especially suited for farm and construction machinery. Clevis mounting for easy use. Wt. 22 lbs. A \$154.00 value. F.O.B. Chicago. . . . **27.50**

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HI-PRESSURE FITTINGS for cylinders and valves available at 35c ea. for 3/8" pipe and 50c ea. for 1/2" pipe.

LOGAN HEAVY DUTY HYDRAULIC PUMP

For operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 HP. Has 1/2" pipe thread ports. Rotate in either direction. Also use as hydraulic motor. 3/4" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value. FOR ONLY F.O.B. Chicago

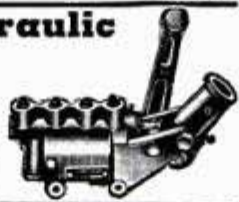


(ITEM #29) **22.50**

Hand Hydraulic PUMPS

Item #11— Postpaid. . . . **8.95**

Item #83—Hand hydraulic pump with built-in transfer valve. Postpaid. . . . **12.95**



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Light, powerful, compact, pistol grip, trigger control. Ideal for shop use or where air pressure is available.

ITEM #80—Ingersoll-Rand. Equipped with 1/4" Jacobs key chuck. Overall dimen.: 6 1/2" long, 5" high, 1 1/2" thick. Wt. 3 lbs. F.O.B. Chicago. . . . **14.95**

ITEM #81—Chicago Pneumatic. Larger Size. Model A, equipped with 1/4" Jacobs key chuck. Overall dimen.: 7 1/2" long, 5" high, 2" thick. Wt. 4 lbs. F.O.B. Chicago. . . . **19.95**



LOGAN HEAVY DUTY HYDRAULIC CONTROL VALVE

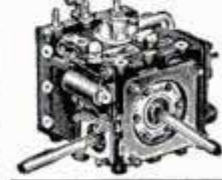
Has built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or a reversible hydraulic motor. Valve handle latches in neutral position. Made of rugged cast aluminum alloy. Open center unloads the pump in neutral position. Throttling control allows operator to regulate the speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes, 3/8" pipe thread connections. Overall dimen.: 12 1/2" H x 8 1/2" D x 8" W. Ship. wt. 17 lbs. Govt. Acquisition Cost over \$100.00 An Excellent Buy. F.O.B. Chicago

(ITEM #37)

21.95

VICKERS HYDRAULIC TRANSMISSION

MODEL AA16801A



Ideal for lathe drive, miniature cars, power machinery, gearing, etc. Rated 2 HP maximum input at 3750 RPM. Output speed continuously variable from 0 to 1/2 of input speed in either direction. Self contained reservoir. All controls external. Even power at all speeds. Complete with two 1/2" shafts with flat for pulley attachment. Shpg. wt. 20 lbs. Gov't. acquisition cost \$325.00. A tremendous value at (ITEM #85) F.O.B. Chicago

25.00

Vane Type - Manganese Bronze INSECTICIDE PUMP

For spraying DDT, 2-4D, sulphur compounds, arsenic, oil solubles, etc. Pressures up to 200 P.S.I., delivering 5 gallons per minute at 1200 RPM, 8 gals. per min. at 1800 RPM. Will not rust, pit, foul or freeze up. Standard 1" pipe thread ports. Rotation—either direction 9"x6"x7". Shpg. wt. 10 lbs. Gov't acquisition cost \$42.00. . . . NOW Free: Comp. etc. instructions and performance data with each pump. F.O.B. Chicago



(Item #50) **15.00**

A.C. GENERATOR

750 WATTS 115 VOLTS
(Item #67) **60 CYCLES**

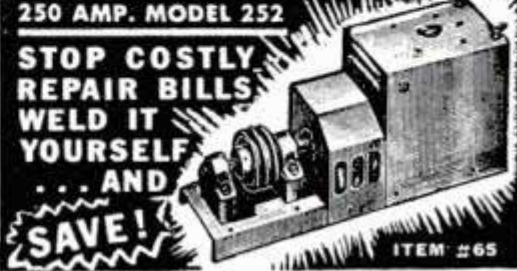
Manufactured by Eicor, rated 750 watts at 1800 R.P.M. Complete with voltmeter regulator; 1" shaft, with keyway for direct or belt drive, carried in one bronze and one ball-thrust bearing. These units, built to exacting Signal Corps specifications, are the answer to your lighting needs. Shipping wt. 60 lbs. F.O.B. Chicago



59.50

NEW STATIONARY OR PORTABLE D.C. ARC WELDER

250 AMP. MODEL 252



STOP COSTLY REPAIR BILLS WELD IT YOURSELF AND SAVE!

(ITEM #65)

FOR ANY WELDING JOB, LIGHT OR HEAVY

Designed for many years of trouble-free service. Handles anything from light gauge sheet metal to 1/2" plate.

This precision-engineered Direct Current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly, where and when you need it.

The War Surplus generators for these Arc Welders were built by General Electric, Westinghouse, and Delco-Remy at a cost of over \$300.00. They are light in weight; have oversized lifetime grease-sealed ball bearings; air-cooled commutator; dial type rheostat for easy pinpoint control; high-low range switch; reactor coil for even arc; handles 1/16" to 3/4" rods, Run welder at 2500 R.P.M. from drive pulley or power take-off of tractor, a 7 1/2 H.P. electric motor or a 10 H.P. gas engine. Use two V-belts, or flat belt (on pulley). Continuous welding rating—200 amps.; Intermittent rating—250 amps.; 0-30 volts. Now . . . AT A FRACTION OF ITS VALUE. Price includes double V or flat belt pulley and instruction book. Ship. wt. 107 lbs. Only one or two jobs will pay for entire welder. F.O.B. Chicago

99.50

ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp, and 5 lbs. of assorted welding rods. (ITEM #66) F.O.B. Chicago **10.50**

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The perfect oil filter to keep your motor oil or hydraulic fluid clean at all times. Protect your pump or engine. Just turn the handle and the element is clean. Standard 3/8" inlet and outlet ports to accommodate 12 gallons per minute. Shipping wt. 4 lbs. A \$13.00 value. (Item #70) **4.95** postpaid



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APPLICATIONS: Oil burners, aquariums, fluid metering, fuel pump, tool post grinder, coolant pump, pressure lubricating pump, general industrial, etc. **MOTOR MFD. BY BLACK & DECKER:** Double ball bearing series wound, continuous duty, 1/30 H.P. electric motor, rated 12,000 R.P.M. Transformer included for use on 110 V AC current. Also applicable for 24-32 V DC. **PUMP MFD. BY WELDON TOOL CO.** with standard 1/4" tubing ports; rated 2 G.P.H.; remove pump and use motor as high speed grinder. **OVERALL DIMENSIONS:** 7 3/4" long x 3 1/4" wide x 3 1/4" high. Approx. wt. 5 lbs. \$51.00 value. (Item #1) postpaid



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MAKES LAWN MOWING FUN**

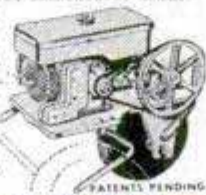


Equip your hand mower with a LeJay MidgeTractor. It snaps on in a jiffy. It's ready to go! Backs up and maneuvers amazingly easy. Costs far less than regular power mowers. Unheard of low price—Only \$54.95 complete. Or, \$29.70 less engine... use your own engine (any make 3/4-1 1/2 HP or 3/4 HP electric motor). Free literature. Guaranteed with money back 5-day trial offer. Order your LEJAY MidgeTractor from this ad, do it today. (Sold by mail order only.)

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as featured in
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pages 52-54

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Now the fast, brilliant "Sailfish" comes knocked down for easy home assembly at a big saving! Safe-T-Plane hull can't sink or swamp. Carries conveniently on car top. Precision pre-cut and pre-formed parts of high quality materials go together quickly. All hardware included. **HULL KIT**, \$69.75. **SAIL KIT**, with centerboard, rudder, spars, rigging and finished sail, \$49.75. **ASSEMBLED BOAT**, factory-finished and complete with sail, \$189. All prices are f.o.b. Waterbury, Conn. Illustrated literature on request.

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Heavy springs coiled around axle cushion every shock... distributes any load evenly on both springs... assures maximum safety through even load and low center of gravity. Write for details on our complete line of axles.

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DON'T let this happen to your child!

A sudden turn — Sally fell against the door . . . it swung open.

Fortunately Sally will live . . . and later she'll be able to walk again.



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Send \$12.35 for a postpaid—easy to apply—complete, ready to install set of **MAGICON** electrically-operated, ignition-controlled Auto Door Safety Latches. (\$6.95 for Coupes—right door only.) Replacement guarantee on factory workmanship and material. In Calif. add 3% State Sales Tax. C.O.D. accepted (U.S.A. only) if \$1.00 deposit accompanies order—(F.O.B. Oakland).

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Size	Polished	Unpolished	Bore				
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A must for airmen, mountaineers, firemen, paint shop workers and others who on occasion need extra oxygen. This popular "demand" type oxygen outfit requires no technical knowledge for use—just breathe into the mask provided and the regulator automatically delivers the oxygen you need as you breathe into the mask! Complete set includes D-2 type shatter-proof steel bottle 6x24 inches; demand type regulator AN-6022-1; 0-500 lb. oxygen gauge and type A-10 demand oxygen mask with hose. Net weight 7 lbs. Shipping weight 10 lbs. Outfit as described above but with empty tank shipped parcel post each \$7.95. With oxygen filled tank (available by express only) \$9.95. Refiller hose, orifice and valve for charging tank with oxygen \$2.00. 6 foot flexible extension hose with fittings \$2.00. **PORTABLE AIR SUPPLY OUTFIT:** Oxygen set minus mask only \$6.95. By adding hose and air chuck (not furnished) you have portable source air for auto tires, garden sprayers, etc. F.O.B. Houston.

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LOTS OF 6 — 20%
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Plans for making six useful, decorative projects packed with each Dremel Electric Coping Saw.

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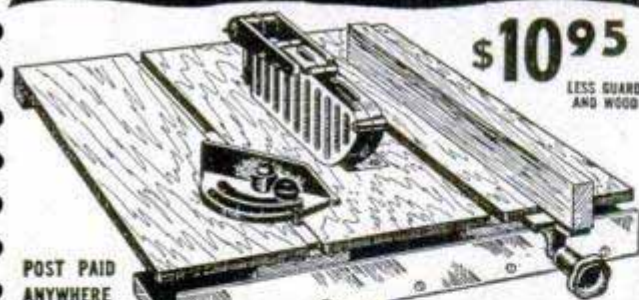
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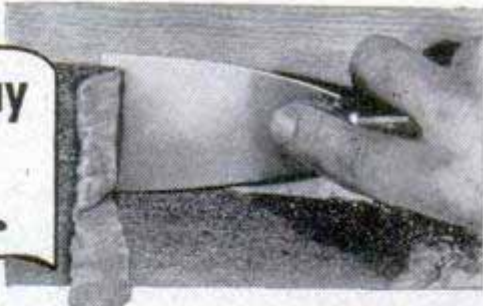
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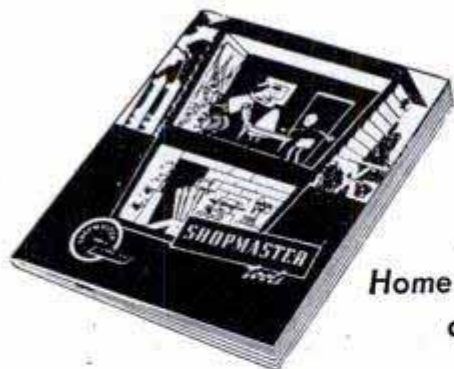
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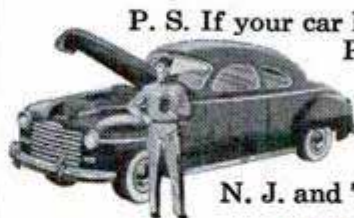


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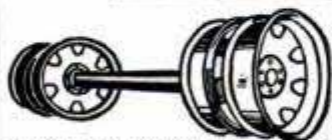
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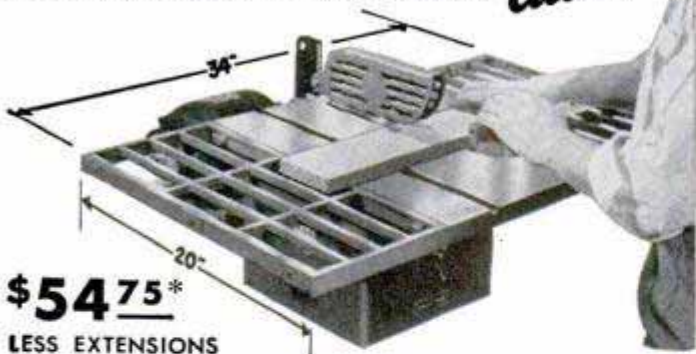
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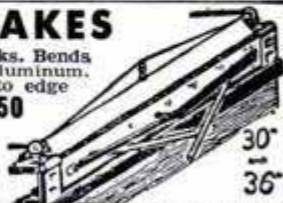
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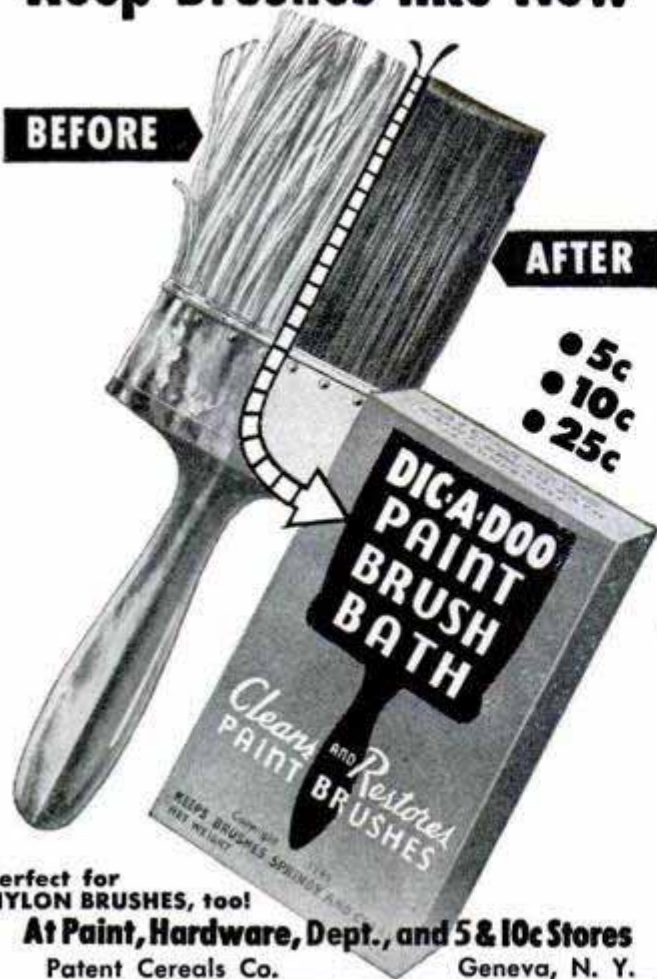
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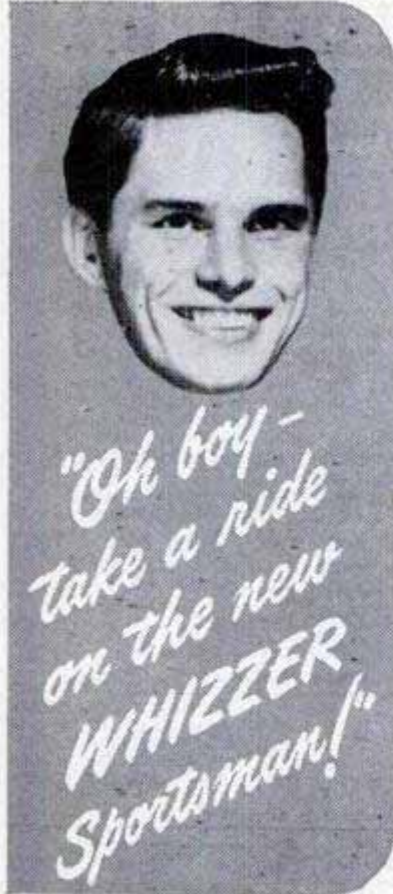
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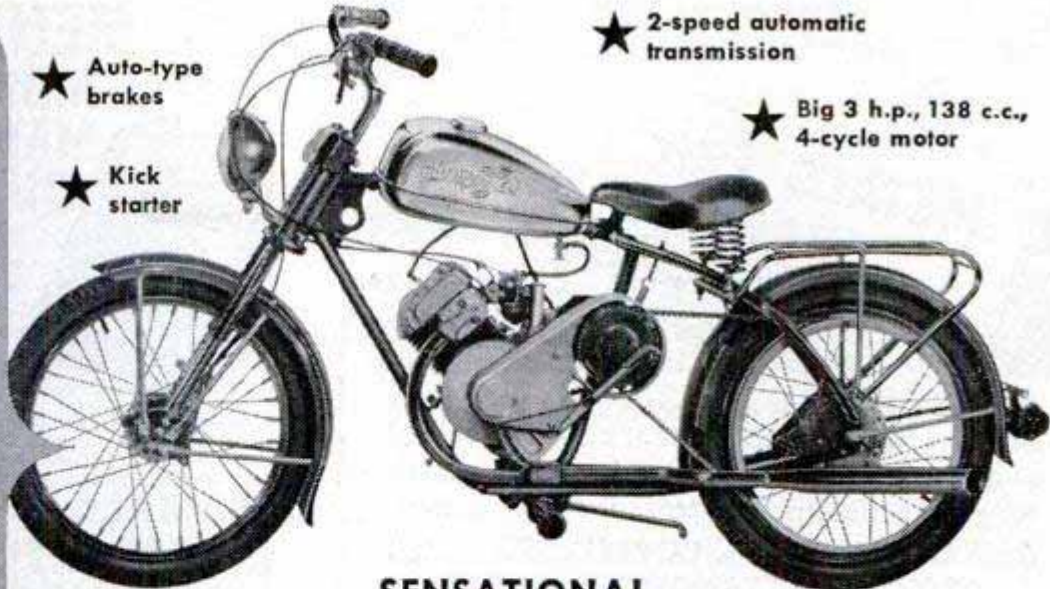


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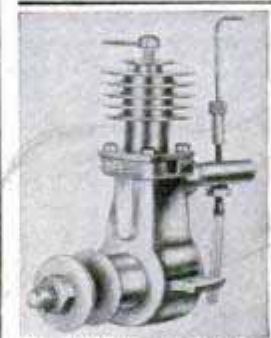
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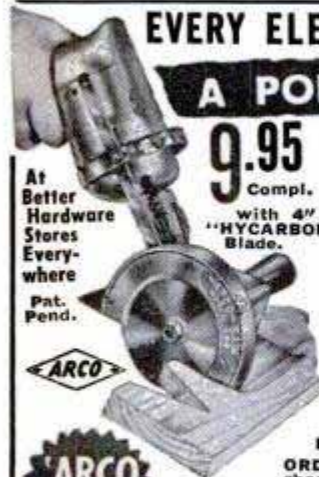
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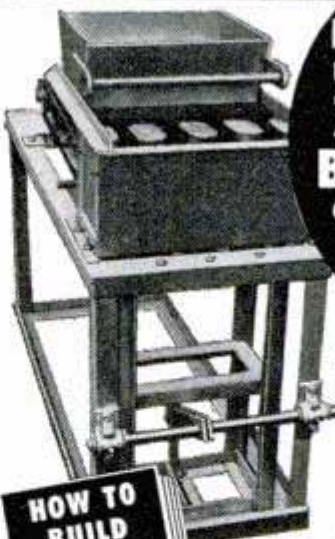
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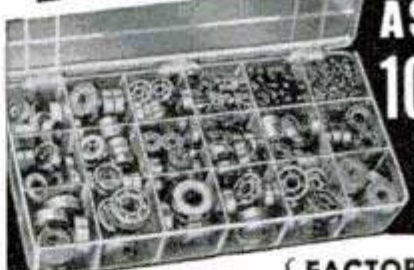
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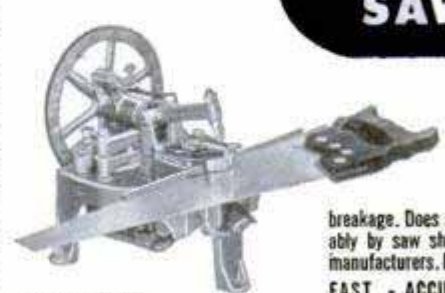
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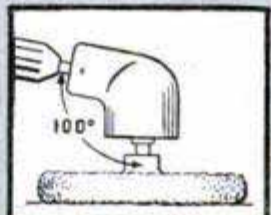
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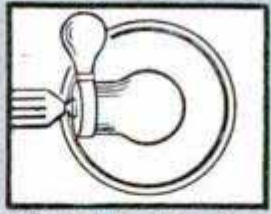


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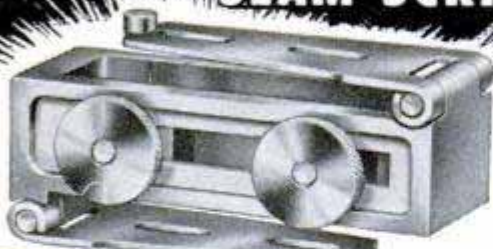
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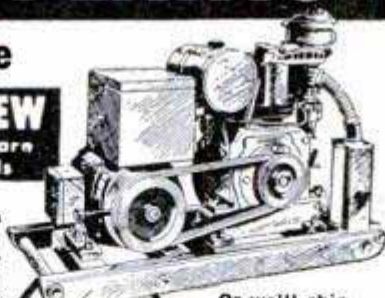
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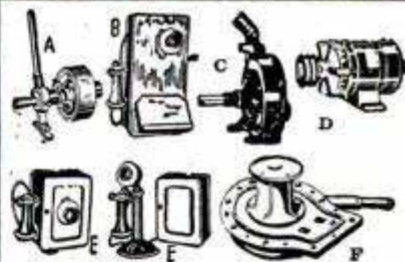
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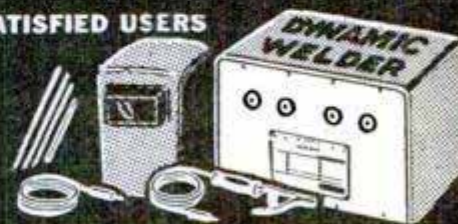
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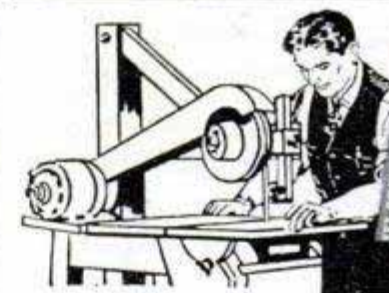
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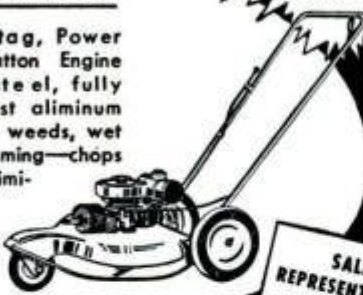
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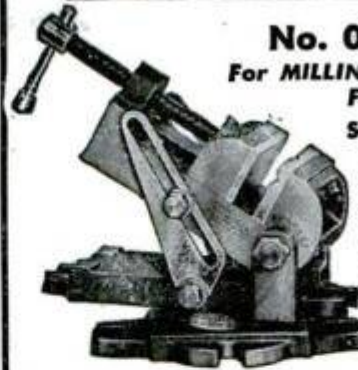
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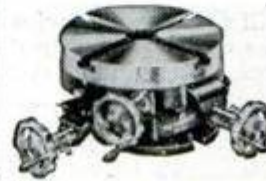
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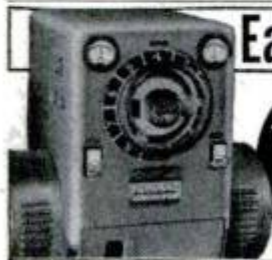
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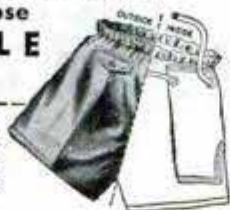
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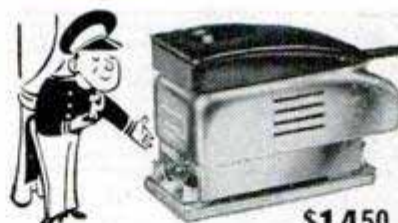
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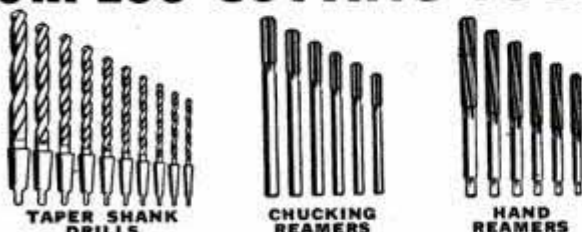
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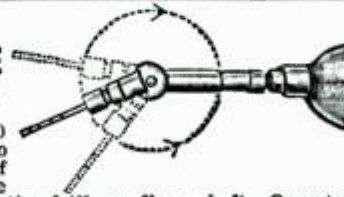
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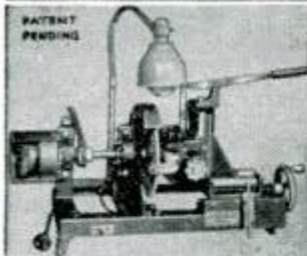


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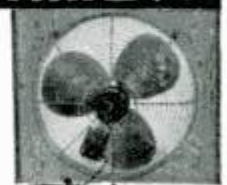
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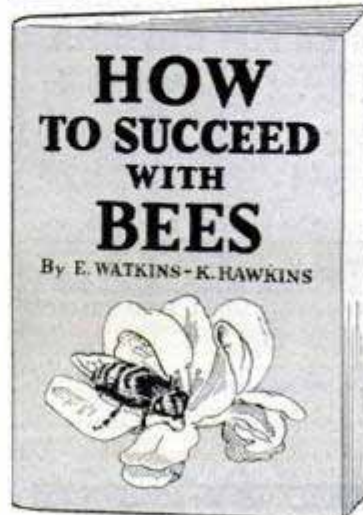
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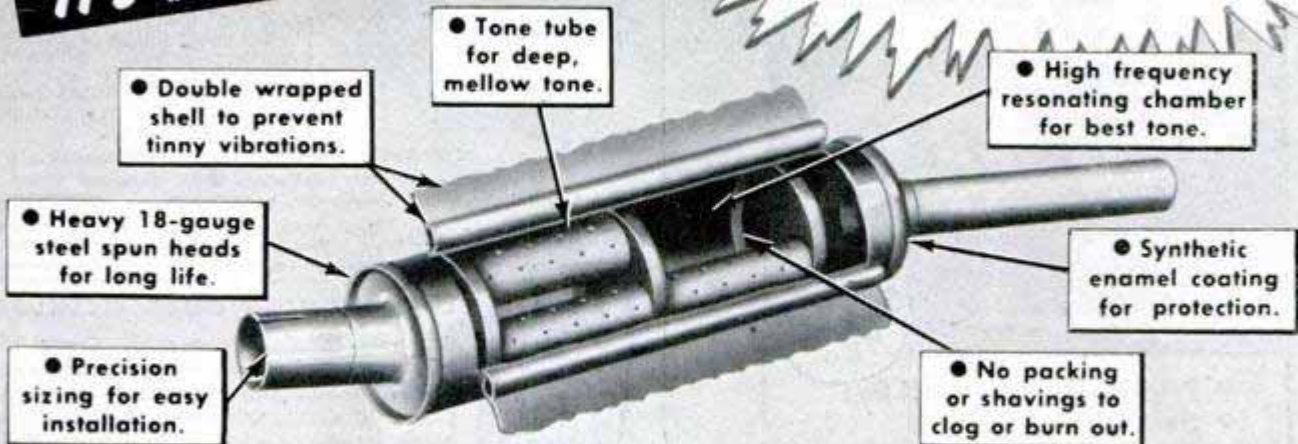
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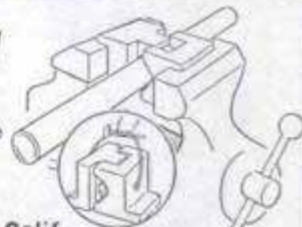
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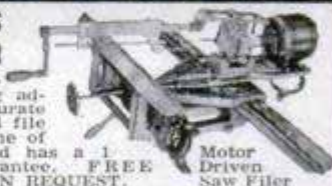


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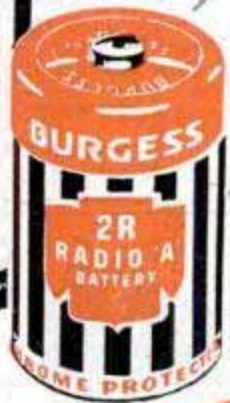
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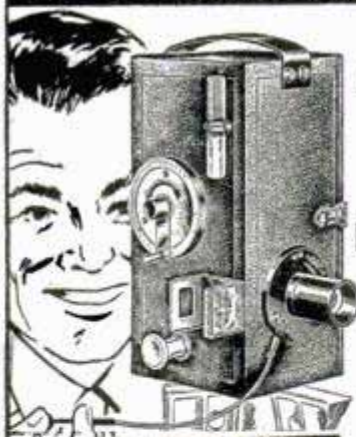
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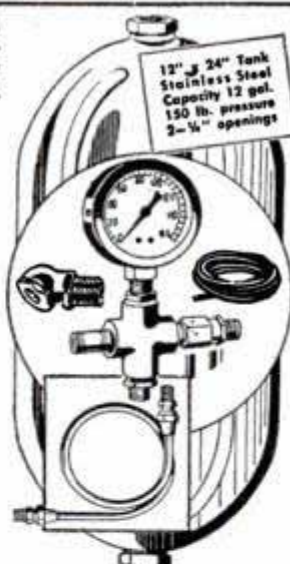
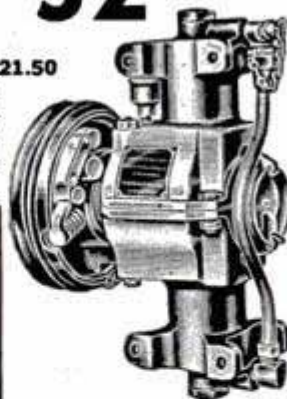
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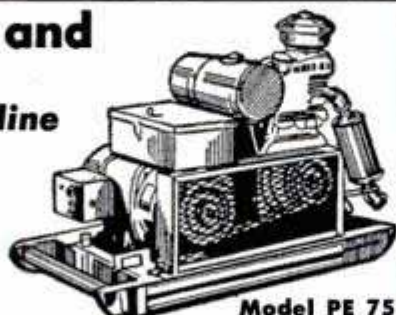


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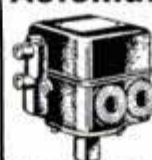
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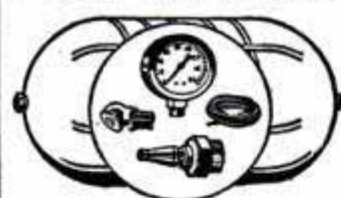
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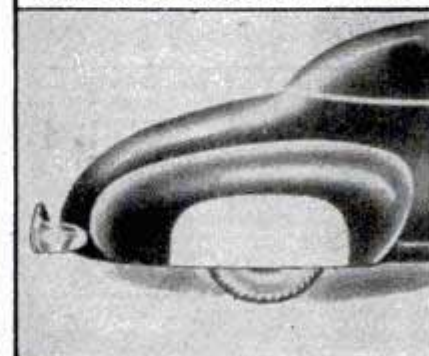
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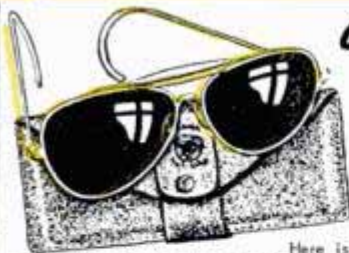
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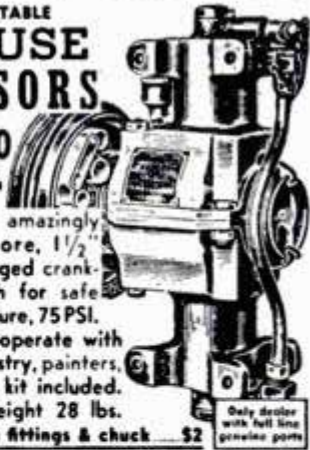
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NEW TARPS - HEAVY CANVAS

Mildew & Flame Resistant. Cheap Outside Storage. They are Really Moving at These Prices.

5' x 7' **\$3.95** 16' x 32' **\$39.95**
8 1/2' x 10' **\$8.50** 16' x 22' **\$29.95**
Rubberized Linen 7' x 11' NEW **\$5.95**

Only 3 lb. light weight yet waterproof. Ideal for outside car storage.

16 POCKET VEST

Sturdy, Yet Light Wt. Satin Lined with Tie Straps, 14 Outside Pockets, Plus Knife, gun, or Tool, Leather Holder, 2 large 11" x 8" Pockets

Inside, Wonderful Hunting, Fishing, or Mechanic. A Steal **\$2.49**

FOAM RUBBER

Molded & pre-shaped. Can be cut to fit your Chair seat, Boat, Auto, Truck or Trailer Seats. Ideal for all Sports Events.

4 1/2" x 18" x 22" **\$5.65**
4" x 18" x 22" x 23" **\$4.95**
4 1/2" x 15" x 16" **\$4.95**
25" x 62" x 1 1/2" **\$6.45**
25" x 65" x 2" **\$3.45**
25" x 65" x 1 1/2" **\$7.45**

PLEXI DOME

Overall length 21" - Width at widest point 11" - at base 4". 6" deep. For Fish & Flower Bowls - Cab Roof - Lights. **1.89**

AIR CORPS BRIEF CASE

This is a genuine piece of AAF equipment. Made of best grade Brown Leather or in a handsome Pebble finish with a light canvas liner. Has two full length map or paper compartments and three smaller pockets. An ideal case for students, salesmen, artists, etc. Full heavy duty zipper closure. 12" x 16". Shpg. Wt. 3 lbs. ONLY **2.95**

AAF CASE
Genuine top grade leather. Multi-compartment. Lock and Straps. Ideal for Artists, Students, Salesmen etc. Used, good condition. **7.95**

HUNTING KNIFE

6" polished vanadium blade handle, leather grip. In leather sheath

\$5.98 Value for ONLY **1.69**
With Parkerized black Finish **1.49**

LEATHERETTE

to cover Chairs, Patio Furniture Nooks, Auto Seats, etc. 10 colors at a BARGAIN PRICE.

WIDTH	COLORS (per runyd.)	PRICE
36"	Grey, Brown, Black	\$1.19
36"	Li. Green, Dark Green, Blue	1.65
54"	Red, Grey, Lt. Blue, Ivory, Yellow	1.89

PLEXIGLASS & NASCOLITE clear plastic shts.

NASCOLITE - Full sheets app. 1/8" x 37 1/2" x 49 1/2", app. 10 1/2 lbs. each **\$12.50**

NEW PLASTIC RAIN JACKET

A 100% WATERPROOF Jacket that keeps you warm and dry in all rainy weather. Will not crack or rot... has hermetically sealed seams and Nylon stitching. Feather line, full zipper front and 2 roomy pockets. Sizes: Small, Medium, and Large. **NEW 2.95**

BOLO KNIFE

10" x 2" Parkerized blade. 5" Gripp'd Handle. Weight 1 1/2 lbs. ... Ideal for Hunting, Clearing Brush or Trails. With Case **1.19**

PLASTIC LEATHERETTE

Waterproof, Heat Resistant plastic covering. In Yellow - Chinese Red, Green, Grey, Chartreuse, Brown Yacht Blue, 54" Width. ONLY **1.95**

GOOSENECK LAMP

Consists of 24 volt control box with dimmer switch, 18" flexible extension & frosted glass shade. Can be used on 110 volt current. **2.49**

AIR CORPS HELMET

Fine grade leather - Chamois lined with chin cup on straps. Intermediate weight. Ideal for summer wear. **NEW ONLY 1.59**

COMPASSES

No. 152 - MATCHBOX Jewel & Floating dial. **39c**
No. 153 - JEWEL Watch pocket. **1.59**
NEW!!
No. 154 - WRIST STRAP type. **69c**
No. 155 - Navy POCKET CARD TYPE. **89c**

RADIO HEADSET

Low impedance. Ideal for amateur radio, crystal sets, or professional use. Adjustable ear phones. Used and in excellent condition. **1.59**

MS-30U - Two Magnetic Type receivers in watertight brass case. Soft rubber inserts in each receiver to fit into wearers' ear. Pliable steel head band. Ideal for communications, divers, workers in noisy compartments, etc. **NEW 1.59**

NAVIGATORS LAMP

A handy light for desk, work bench, chart table, engine room, etc. Can be used on 6-12-24-110 V by changing bulb. 3 ft. shaft has 4 joints to adjust position... ONLY **\$2.95**

PLASTIC PARALLEL STRAIGHT EDGE

with knobs and rubber pads for non slippage on each section. A must for navigators, mechanics, draftsmen, and engineers... You've never seen 'em at **97c**

MESS TRAY

6 Compartment - Stainless Steel - Rustproof, Wonderful for Outdoor Serving, Barbecue etc. Saves dish washing. Ideal for use in the home, hospital, 'roughing'. 311A - Used but in excellent, Serviceable Condition. **79c**

Loose Leaf BINDER

3 metal post. Cylindrical locking heavy duty 3/16" fabricated hinged cover. End identification window. Ideal for price books, salesmen catalogues, photo albums, students, publications, Reference books, etc. Will hold 500 sheets, 8" x 11" **59c**

NAVY Sealed Beam LAMP

U.S. Navy Portable Pistol Grip light. Has sealed beam and aiming sight. Ideal for search, spot or Emergency light on auto, boat, farm etc. **2.95**

12 Volt light, 4" lens **2.95**
24 Volt, 5" lens & carry case **3.49**
Set of 3 filters, Red, Grn, Amber (specify type lamp) **99c**

New Navigators Magnetic Compass

Type D-12 - Size 7" dia. by 4 1/2" deep. Rubber lined rotating verge range ring... calibrated in 1° from 0-360°

2 parallel grid wires for alignment with N-S line. **\$14.95**

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With heavy duty reflector guard, all-rubber covered socket with built-in switch and female outlet. **NEW**

With 25 ft. extension cord. **\$2.29**
With 50 ft. extension cord. **\$3.09**

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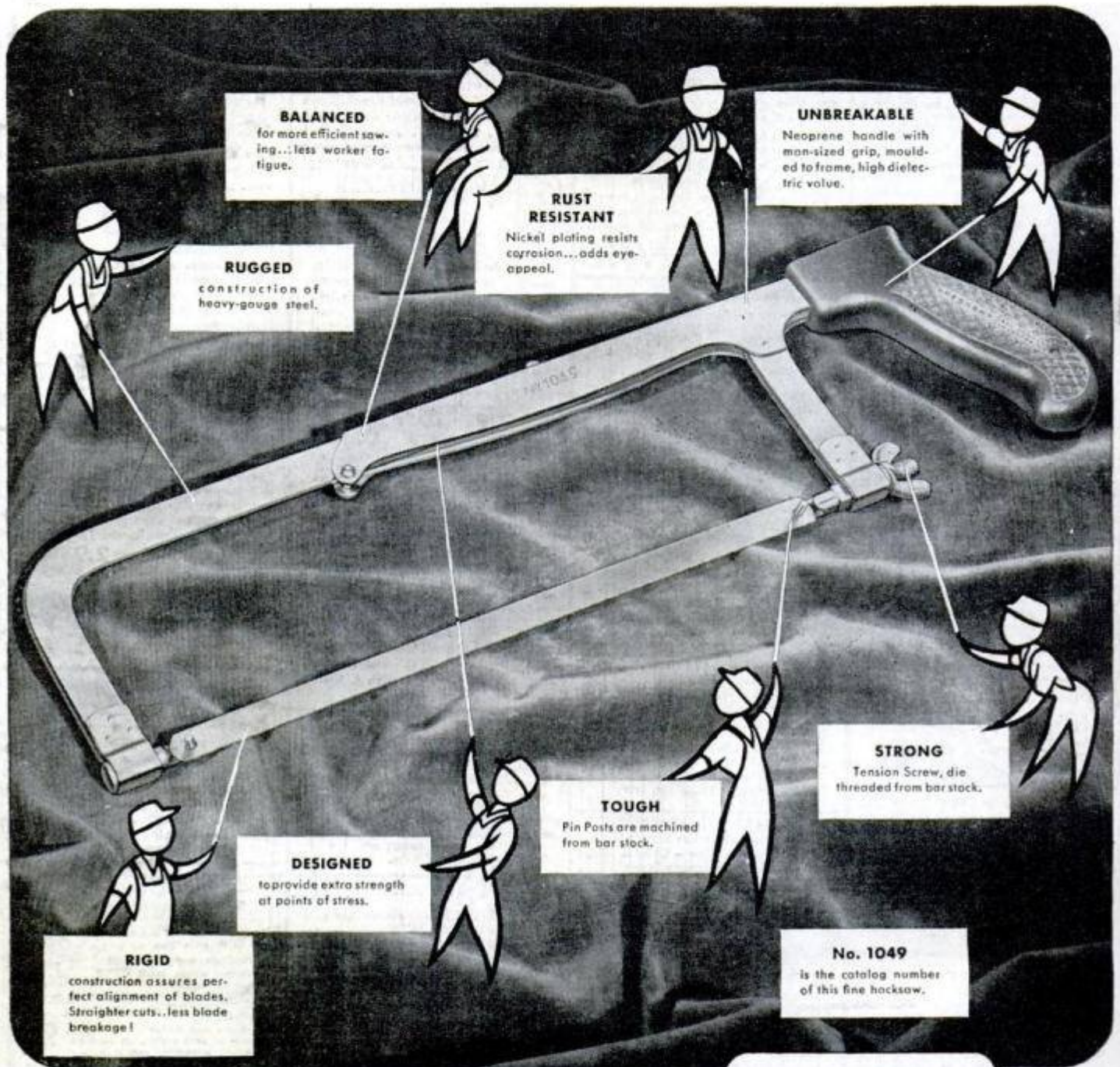
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Driving into the Danger Zone

WARNING ZONE

Engine loses pep ...

DANGER ZONE 1

Engine begins to smoke ...

DANGER ZONE 2

Engine pumps oil badly ...

DANGER ZONE 3

Destructive wear sets in ...



Needs a tune-up

Clean, adjust and re-time ignition. Clean fuel supply and carburetor screens. Adjust carburetor. Adjust tappets and fan belt. Check compression and vacuum readings for symptoms of ring wear.

Needs new piston rings and minor engine repairs

Replace piston rings. Align rods. Adjust rods or replace rod bearings. Reseat and reface valves.

Tune engine.

These repairs are comparatively inexpensive and put the engine back in peak condition for thousands of economical miles. Delay puts the engine in Danger Zone 2.

Needs new piston rings and major engine repairs

Replace piston rings. Replace piston pins. Adjust—probably replace—main bearings. Align rods. Adjust rods or replace rod bearings. Reseat and reface valves. Tune engine.

These repairs naturally cost more than those needed in Danger Zone 1, but they put the engine back in condition for thousands of additional miles of satisfactory service. Delay leads to costly Danger Zone 3.

Needs new piston rings and complete overhaul

Repairs cost three or four times as much as in Danger Zone 1.

Remove engine. Rebore cylinders. Replace pistons, pins, rings. Replace main bearings. Align rods, refit or replace rods, or replace rod bearings. Overhaul valve lifters, rocker arms. Replace timing chains or gears. Reseat, reface valves. Replace guides and springs. Replace camshaft bearings. Clean oil lines. Overhaul oil pump.

Clean, re-install and tune engine.

The more you delay - the more you pay!

Piston rings should be replaced ... *at the first sign of wear!*

You'll be money ahead if you replace your piston rings when your car first gets into the Danger Zone. But if you delay until the second or third Danger Zone, repairs cost two to four times as much.

In any Danger Zone, ask your motor service man

for Hastings Piston Rings. They *stop* oil-pumping, *check* cylinder wear and *restore* performance.

It's the best money you can spend on your car.

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