ANC

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN U[illegible] IT

REG'D. TRADE MARK, GREAT BRITAIN, No. 410826

REG. U.S. PAT. OFF.

CABIN CATAMARAN
page 97

Studebaker craftsmen Glen and Harold G. Basey are known as "electricians first class"—a father-and-son team of tool maintenance experts.

Studebaker father-and-son craftsmanship helps to reduce repair bills

As MOST car mechanics will tell you, a Studebaker seldom needs serious repairs if it's treated half-way right.

Men with deep-rooted pride in good work build wear-resisting stamina into every detail of a Studebaker's structure.

These craftsmen come largely from the community where Studebaker has been in business for 99 years.

They're solid citizens keenly aware of their responsibility to the public for maintaining the generations-old Studebaker standards of quality. Impressive numbers of them are members of father-and-son teams.

If you want to get more mileage out of your car—and out of today's dollars as well—decide to do your driving in a gas-saving, repair-saving Studebaker.

You can purchase one that's exactly suited to your needs at a surprisingly low price.

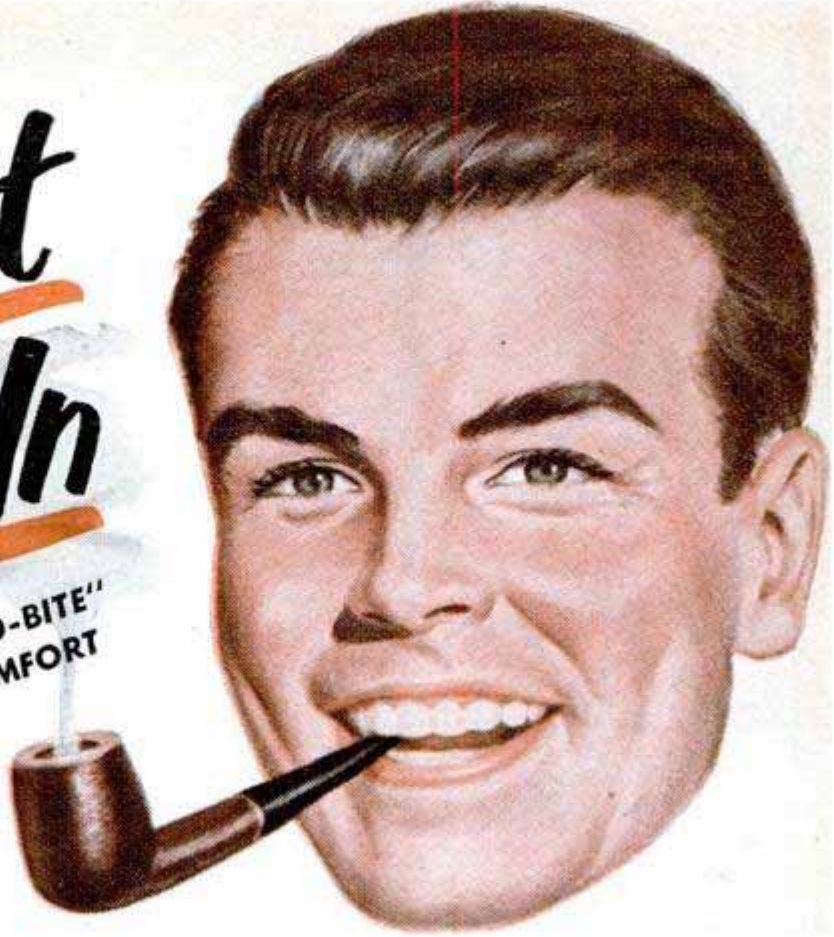
STUDEBAKER

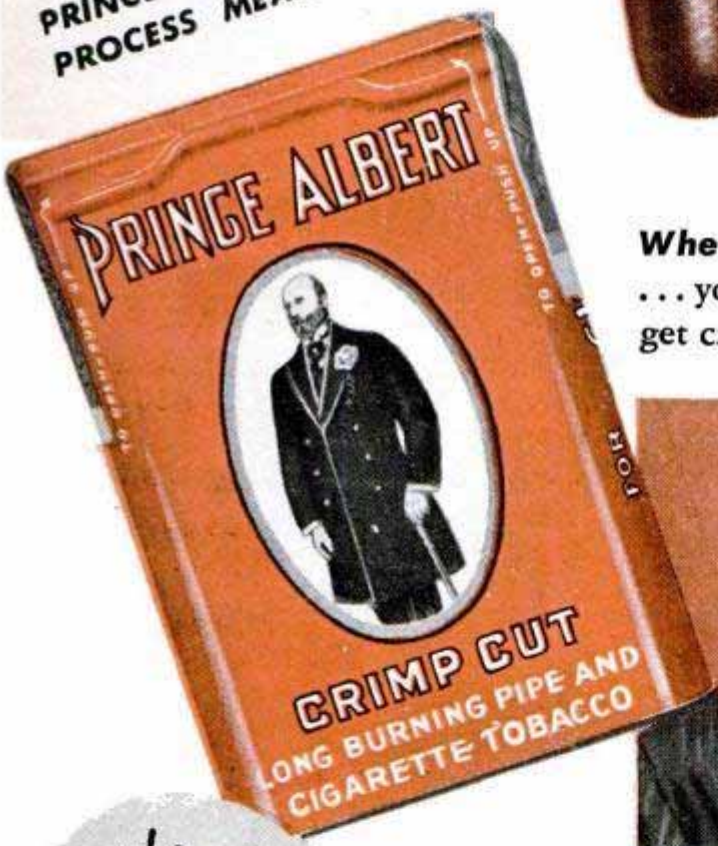
Builder of trustworthy cars and trucks

©1951 The Studebaker Corporation, South Bend 27, Indiana, U. S. A.

Bite's Out Pleasure's In

PRINCE ALBERT'S PATENTED* "NO-BITE" PROCESS MEANS REAL PIPE COMFORT





Whether you smoke a pipe or roll your own ... you're missing a real smoking treat until you get crimp cut Prince Albert.

P.A.'s choice tobacco is specially treated to insure against tongue bite... is rich tasting and mild. It's a favorite with pipe smokers, and men who roll their own, too!

*Process Patented July 30, 1907

the National Joy Smoke

MORE MEN SMOKE

Prince Albert

THAN ANY OTHER TOBACCO

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

This One

This Western Electric employee mounts a transmitter in the test fixture which is swung down to face an artificial mouth at 45-degree angle, just as transmitters are held in use. More than a million transmitters are tested each year.

This mouth speaks to millions

At Bell Laboratories a scientist employs a condenser microphone to check the sound level from another type of artificial mouth, used in transmitter research.

To serve the changing needs of telephone subscribers millions of telephone sets have to be moved each year. Before being put back into service most of them are returned to the Western Electric Company's Distributing Houses where they receive a thorough checkup.

Western Electric engineers needed a rapid method of testing transmitters over a range of frequencies. At Bell Telephone Laboratories, scientists had just the thing—a technique they had devised for fundamental research on transmitters. In co-operation with these scientists, Western Electric engineers developed the practical tester in the illustration.

The transmitter is removed from the handset and put in front of an artificial mouth which emits a tone that swings several times per second over a band of frequencies. A signal lamp tells if the transmitter is good. A test takes 5 seconds.

This new tester illustrates how Bell Laboratories research and Western Electric manufacturing skill team up to maintain your telephone service high in quality yet low in cost.

BELL TELEPHONE LABORATORIES

• EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

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

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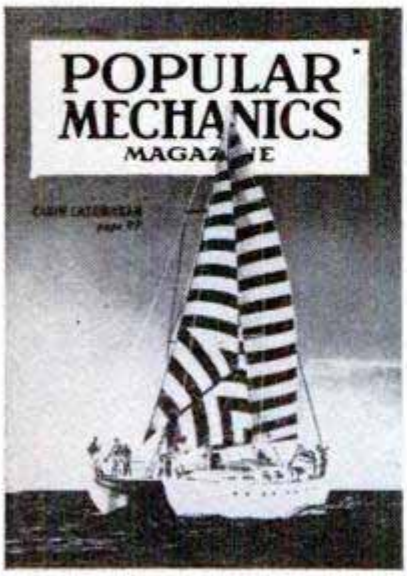

this month's cover

SHE'S A REAL Hawaiian Queen. Launched with an ancient Polynesian blessing, she's as regal and colorful as the name on her bow. She'll glide lazily along the coast of Hawaii or, blazing red-and-gold sails bellied out, race at 20 knots through the waters of the blue Pacific. She's a catamaran, a twin-hulled sailing craft built at a cost of $25,000, one of the most colorful ocean-going ships afloat. The Queen weighs 8½ tons, yet she draws only three feet of water. Though she has neither keel nor centerboard, she heels very little even in the strongest wind, riding gently over the waves instead of plowing through them. Patterned after the ancient Polynesian catamarans, she sports the latest loran navigation gear. Her uncluttered deck is broad enough to dance on, and she's so easy to handle two men can take her to sea. Turn to page 97 and cast off for a most unusual voyage on a most unusual vessel

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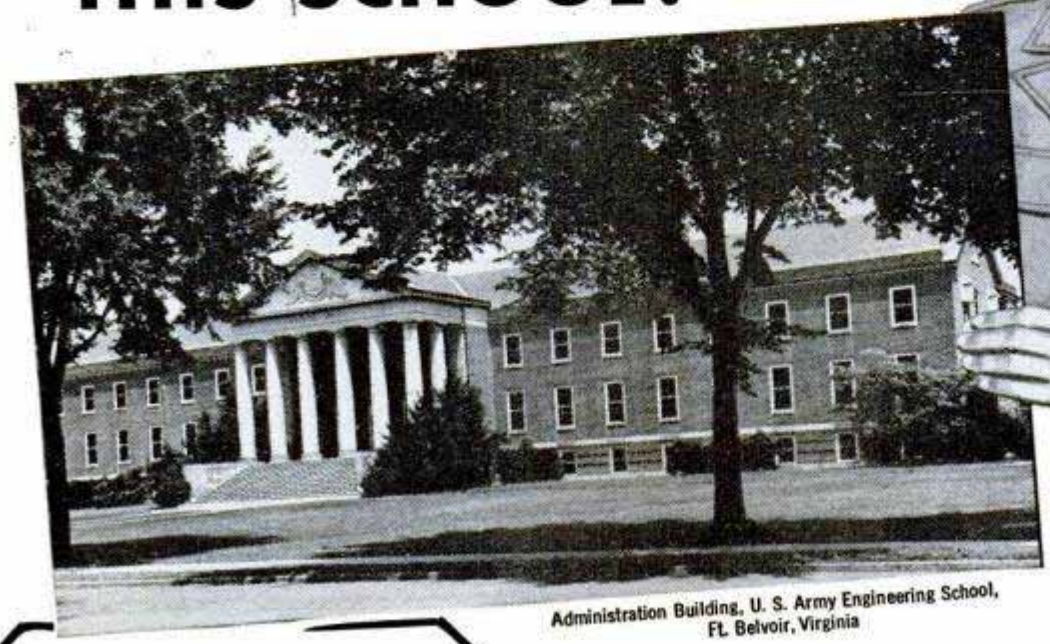
WANTED—
MEN TO ATTEND THIS SCHOOL!



Administration Building, U. S. Army Engineering School, Ft. Belvoir, Virginia

A FEW ARMY-TAUGHT TECHNICAL COURSES

AUTOMOTIVE MAINTENANCE

MEDICAL EQUIPMENT REPAIRMAN

LOCOMOTIVE REPAIRMAN

ELECTRICIAN

TIRE REBUILDER

TELETYPE REPAIRMAN

MAP REPRODUCTION

SURGICAL TECHNICIAN

LEADERSHIP COURSE

CONSTRUCTION MACHINE OPERATOR

WATER SUPPLY TECHNICIAN

—And Many Others

Thousands of intelligent young men are needed now to attend the Army's enlisted technical schools and learn vital, interesting jobs. This chance is waiting for you, too, if you move fast while there's still a need for technically trained men. Typical of the Army institutions is the Engineering School. Here, soldiers graduate into many different engineering fields, from surveying to bridge-building.

Aptitude Tests—When you enlist the Army will test you to find out the field you're most suited for. You'll then be assigned to learn under the world's finest instructors and develop your special skills. When you graduate, you'll find opportunities for promotion waiting—and you'll proudly wear the uniform that's "the mark of a man." Get the facts at your U. S. Army and U. S. Air Force Recruiting Station.

RECRUITING U.S. ARMY U.S. AIR FORCE

U. S. ARMY

See how YOUR GRAPHIC CAN GROW!

Amazing Range of Graflex Quality Accessories Gives Versatility PLUS... at budget cost!

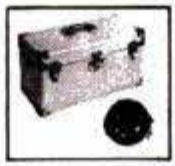
GRAFLITE FLASH. It's the multiple circuit flash unit that fits almost every camera; doubles the opportunities for every photographer, because it lets you shoot in bad weather, indoors, at sports, and improves shadow control even in sunshine!

GRAFLOK BACK. Now standard equipment on all Graphics; can be fitted to earlier models. Provides a spring loaded Graphic Back for sheet film or film packs — a slide lock back for the Graflarger, roll film holders, Grafmatic holders.

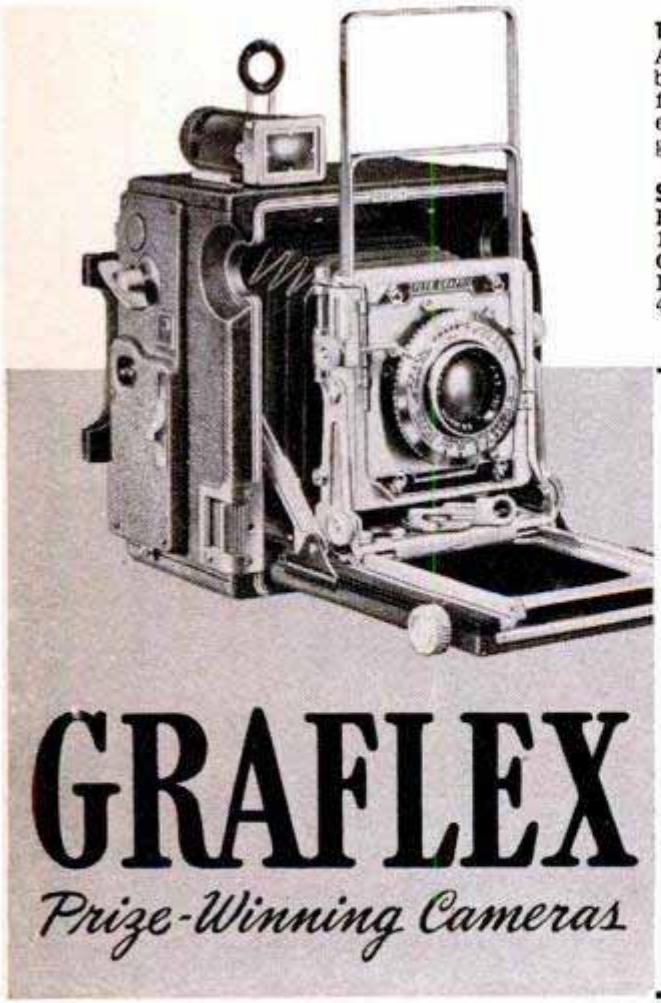
120 ROLL HOLDER. Fits all Graflex and Graphic cameras up to 4 x 5. Lets you convert quickly to economical 120 roll film . . . B&W or color. Takes eight 2¼ x 3¼, or twelve 2¼ x 2¼ pictures. With autometering film control and automatic exposure counter.

GRAFLARGER. With Aristo Cold Light. Attaches to any Graphic or Graflex camera to make a home, or portable enlarger; doubles as a retouching stand, a transparency viewer. Underwriters' Laboratories approved.

GRAFMATIC HOLDER. For all 2¼ x 3¼ and 4 x 5 Graphic, the Grafmatic will give new speed and freedom of action. No thicker than a film pack adapter, yet it holds six sheets of film . . . permits mixing of emulsions and rapid-fire sequences!



LENSES AND ACCESSORIES. Lenses of all kinds —portrait, wide-angle, telephoto—film holders of many types . . . leather and vulcanoid carrying cases . . . the famous Graphic Pan-Tilt Tripod Head . . . "Graphic Graflex Photography," by Morgan & Lester.



THE FAMOUS GRAPHICS
All-purpose cameras that can be used as *easily* as an ordinary folding-type . . . yet meet every challenge the expert can give them!

SPEED GRAPHIC
Focal plane shutter, speeds to 1/1000th.; built-in flash sync.; Graflok back with Ektalite Field Lens. 2¼ x 3¼; 3¼ x 4¼; 4 x 5.

CROWN GRAPHIC
Same as Speed Graphic, without focal plane shutter. Lower price.

CENTURY GRAPHIC
Lowest in price . . . but with many Graphic features including built-in flash sync.; Graflok back with Ektalite Field Lens; coated f/4.5 lens.

Graflex Inc., Dept. 109
Rochester 8, N. Y.

Please send me details on:—

- ☐ Speed Graphic
- ☐ Crown Graphic
- ☐ Century Graphic
- ☐ Graflite Flash
- ☐ Graflok Back
- ☐ 120 Roll Holder
- ☐ Graflarger
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Name _____

Street _____

City _____

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TREAT your car to PYROIL

Treat your car to Pyroil — and treat yourself to improved lubrication, less maintenance and added miles.

Pyroil contains the special property of making oil adhere to important engine parts. It prevents friction between piston rings and cylinder surfaces. Pyroil means easy starts. Pyroil cleans your motor and keeps it clean.

Your favorite service station has Pyroil. Next time you stop for gas or oil — treat your car to Pyroil — treat yourself to added miles for your car.

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Use Aircraft Pyroil B for lubricating oil, Aircraft Pyroil A for gasoline.

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

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I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

Name_____

Address_____

City or Town_____ State_____

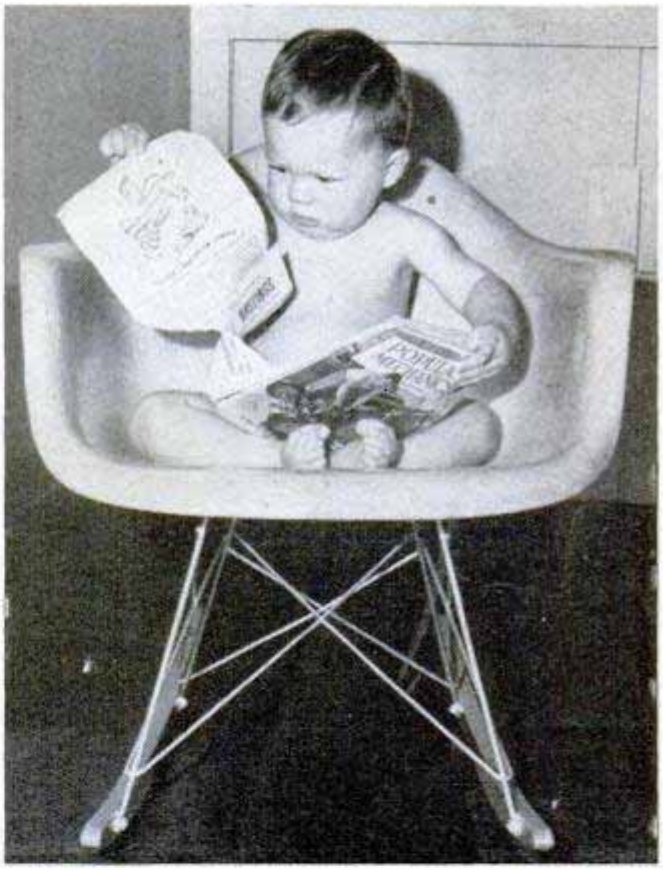
in this corner..... THE EDITORS

NOW THAT the TV-microwave relays are carrying television programs from coast to coast of the United States, why not go all the way around the world?

It can be done, says Brig. Gen. David Sarnoff in next month's *Popular Mechanics*. The chairman of RCA has written a special article illustrated with drawings by Leydenfrost, the noted artist, disclosing how "repeater" stations on land, air and sea could bring you the news on the TV screen as it happens in Paris, Hong Kong and Capetown, South Africa.

★ ★ ★

Another December feature you won't want to miss is the four-page gift section, with pictorial hints of new things on the counters this year for Christmas shoppers.



Young Man on a "Tear"

When the first of Tom Riley's articles on our plywood ranch house in Portland, Ore., appeared last May, young Roderick Craig Riley immediately became an avid reader of *Popular Mechanics*. By the time the third article in the series was published, the proud son could hardly wait to find his daddy's current installment. Witness the

(Continued to page 8)

IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of $4,000 to $10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex — soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

Over 3500 Certified Public Accountants among LaSalle alumni

You cover accountancy from the basic Principles right up through Accountancy Systems and Income Tax Procedure. Then you add C. P. A. Training and prepare for the C. P. A. examinations.

As you go along, you absorb the principles of Auditing, Cost Accounting, Business Law, Statistical Control, Organization, Management and Finance.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

Write For This Free Book

For your own good, don't put off investigation of *all* the facts. Write for our free 48-page book, "Accountancy, The Profession That Pays." It'll prove that accountancy offers brilliant futures to those who aren't afraid of serious home study. We'll also include "Ten Years' Promotion in One"—a book which has helped many men. Send us the coupon *now*.

Other LaSalle Opportunities

- ☐ Higher Accountancy
- ☐ C.P.A. Coaching
- ☐ Bookkeeping
- ☐ Law: LL.B. Degree
- ☐ Business Management
- ☐ Salesmanship
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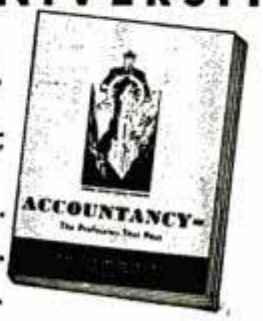
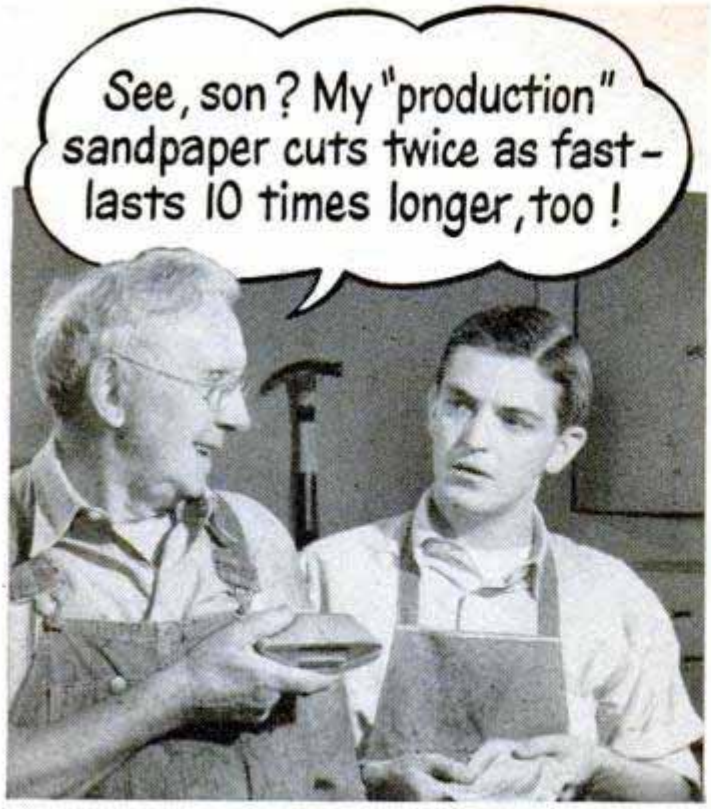
I want to be an accountant. Send me without obligation, "Accountancy, the Profession that Pays"—also "Ten Years' Promotion in One."

Name.....*Age*.....

Address.....

City, Zone & State.....





Professional craftsmen prefer it!

It's the world's toughest sandpaper!

Christian Jorgensen, professional woodworker for over 59 years, says, "The best all-around mineral coating for sandpaper that I know is aluminum-oxide. It's good for hand work or on machines because it stays sharp longer—gives you a lot of wear for the money. I swear by it."

And now, *for the first time*, this super-tough "Production" Sandpaper is pre-cut to fit most *home* power tools, plus the popular 3M Sanding Block. Packaged in fine, medium and coarse grits for easy selection, too.

Look for this completely new home workshop sandpaper the next time you're in your hardware store. Bright yellow packs identify it. Stock up now—handle any sanding job *right* with 3M Home Workshop Sandpaper!

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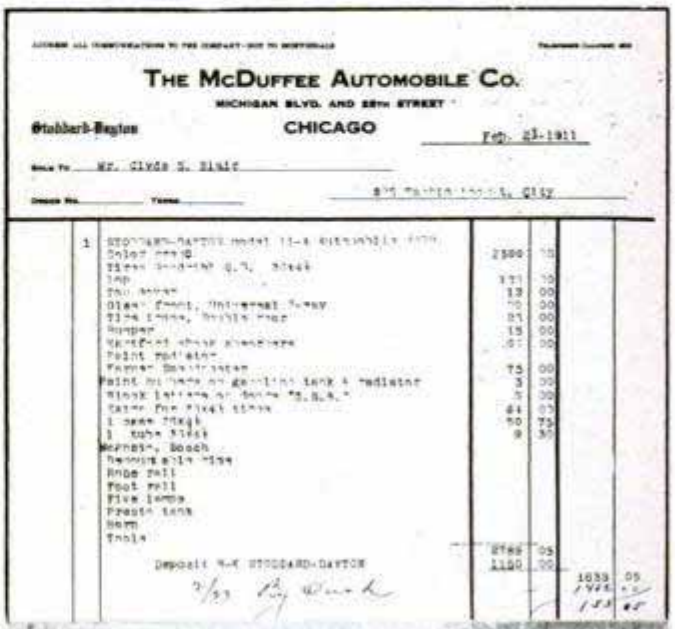
HOME WORKSHOP
SANDPAPER

Made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Adhesives. General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Minn. Mining & Mfg. of Canada, Ltd., London, Canada.

(Continued from page 6)

young rascal eagerly tearing off the back page of the July issue. Incidentally, we note that the Rileys have gone in for modern furniture; looks to us as if this chair might convert nicely into a bathinette rocker. We hope to read further chapters in the "Adventures of Rod Riley" as time marches on.


THE McDUFFEE AUTOMOBILE CO.
MICHIGAN BLVD. AND 28th STREET
Stabbert-Bayles
CHICAGO
Feb. 23-1911
Mr. Clyde S. Blair

Veteran Ad-Man Remembers His Old 1911 Stoddard-Dayton

Probably the most-thrilled person on the curb as the ancient Stanley Steamer and Stoddard-Dayton started their Race of the Horseless Carriages from Chicago to New York September 10, under this magazine's sponsorship, was Clyde Blair. Clyde started selling advertising for *Popular Mechanics* in January 1907, and he hasn't stopped yet.

When he first heard of the race, Clyde came bursting into the editor's office. For the rest of the day we listened. That Stoddard-Dayton was the same model he bought way back in 1911, and here was his bill of sale with everything itemized down to the $3 charged for painting his license number on the gasoline tank and radiator. He paid $2789.05 for the 1911 gas buggy, and turned in his previous model for $1150. In the picture, Clyde is at the wheel and son Clyde, Jr., on the running board.

(Continued to page 10)

Give yourself an even break!

I. C. S. training is a key to advancement. Here's how three men cashed in on these down-to-earth home study courses.

"After serving with the U. S. Army Air Forces in World War II, I went to work for a sign company. Decided to take an I. C. S. course in Show Card and Sign Lettering to get ahead. Soon after beginning the course I became a partner in another sign company, and after finishing my I. C. S. training, I started my own sign business in California."

"When I enrolled for my I. C. S. Aeronautical Engineer's Course, I was an Aircraft Crew Alert, Grade 10, Step 2, but now I'm an Aircraft Service Mechanic, Grade 15, Step 3, at Scott Air Force Base, Belleville, Illinois. My advancement brought an increase in salary of 45.2%. The Progress Reports sent my employer played a very important part in my promotion. Many a time, your lessons went right on the job with me!"

"I signed up for I. C. S. training while working in a plant. Right away things happened. You might say that promotions outstripped my ability to keep up with my I. C. S. lessons. Recently I was made foreman of the welding setup and Assembly Department, and now I'm in charge of training three other men for promotion. Naturally, I'm determined to finish my I. C. S. training."

You, too, will find that I. C. S. home study pays off in better pay and better jobs. Why not fill out and mail the coupon below—right now?

INTERNATIONAL CORRESPONDENCE SCHOOLS

60th Anniversary

BOX 5514-L, SCRANTON 9, PENNA.

Without cost or obligation, please send me full particulars about the course BEFORE which I have marked X:

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- ☐ Air Conditioning ☐ Heating
- ☐ Plumbing ☐ Refrigeration
- ☐ Refrigeration, Domestic
- ☐ Refrigeration & Air Conditioning
- ☐ Steam Fitting

Aeronautics Courses
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- ☐ Engine Mechanic

Automotive Courses
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- ☐ Auto Body Rebuilding & Refinishing

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- ☐ Bridge and Building Foreman
- ☐ Building Estimating
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- ☐ Contracting and Building
- ☐ Highway Engineering
- ☐ Reading Structural Blueprints
- ☐ Sanitary Engineering
- ☐ Structural Drafting
- ☐ Structural Engineering
- ☐ Surveying and Mapping

Communications Courses
- ☐ Electronics
- ☐ Practical Telephony
- ☐ Radio, General ☐ Radio Operating
- ☐ Radio Servicing ☐ Television
- ☐ Telegraph Engineering

Electrical Courses
- ☐ Electrical Drafting
- ☐ Electrical Engineering
- ☐ Electric Light and Power
- ☐ Lighting Technician
- ☐ Practical Electrician

Diesel Engines Courses
- ☐ Diesel Engines
- ☐ Internal Combustion Engines

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- ☐ Forging ☐ Foundry Work
- ☐ Heat Treatment of Metals
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Industrial Metallurgy
- ☐ Machine Shop
- ☐ Mechanical Drafting
- ☐ Mechanical Engineering
- ☐ Mold-Loft Work
- ☐ Patternmaking—Wood, Metal
- ☐ Reading Shop Blueprints
- ☐ Sheet-Metal Drafting
- ☐ Sheet-Metal Worker
- ☐ Ship Drafting ☐ Ship Fitting
- ☐ Tool Designing ☐ Toolmaking
- ☐ Welding—Gas and Electric

Railroad Courses
- ☐ Air Brake ☐ Car Inspector
- ☐ Diesel Locomotive
- ☐ Locomotive Engineer
- ☐ Locomotive Fireman
- ☐ Locomotive Machinist
- ☐ Railroad Section Foreman
- ☐ Steam-Diesel Locomotive Eng.

Stationary Engineering Courses
- ☐ Power Plant Engineering
- ☐ Stationary Fireman
- ☐ Stationary Steam Engineering

Textile Courses
- ☐ Cotton Manufacturing
- ☐ Loom Fixing ☐ Rayon Mfg.
- ☐ Textile Engineering
- ☐ Woolen Manufacturing

Business and Academic Courses
- ☐ Accounting ☐ Advertising
- ☐ Bookkeeping
- ☐ Business Administration
- ☐ Business Correspondence
- ☐ Business Law ☐ Cartooning
- ☐ Certified Public Accounting
- ☐ Commercial ☐ Commercial Art
- ☐ Cost Accounting
- ☐ Fashion & Book Illustration
- ☐ Federal Tax ☐ First Year College
- ☐ Foremanship
- ☐ Good English ☐ High School
- ☐ Higher Mathematics
- ☐ Industrial Supervision
- ☐ Motor Traffic
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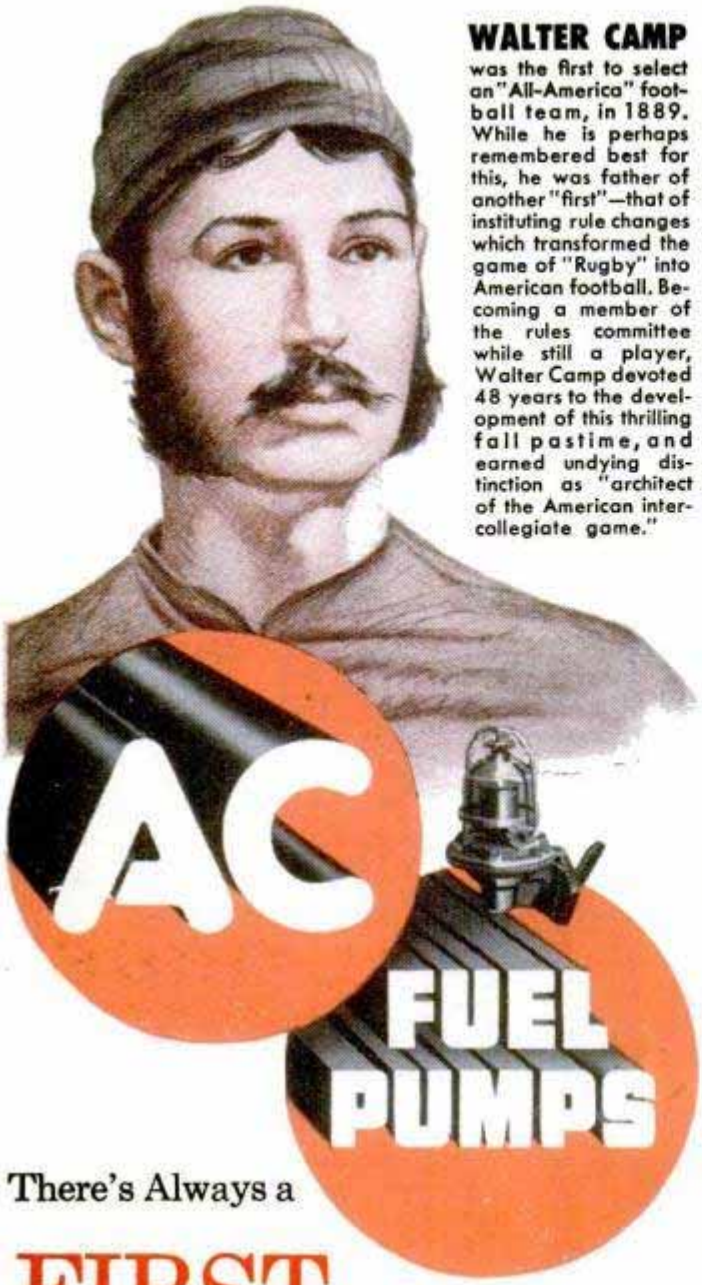

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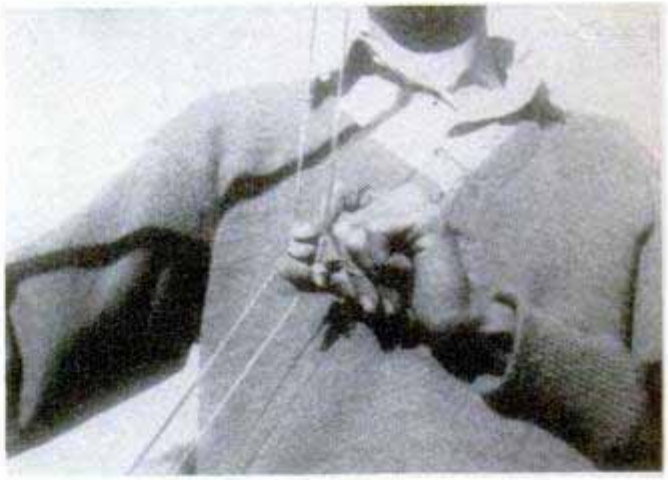

Burmese Bow

In the mail from Burma come these pictures of a pellet bow with which Burmese farmers bombard birds and small rodents that eat up their crops. Shaped like a longbow, it throws small, round clay pellets like a slingshot. Two cords string the bow, and a pellet holder of woven string is fastened between them about six inches above the midpoint. At the instant the left hand releases the missile, the right hand must be pulled out of the pellet's path. This takes considerable practice, but the Burmese farmer becomes amazingly accurate with the weapon.

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Arthur A. Sebring

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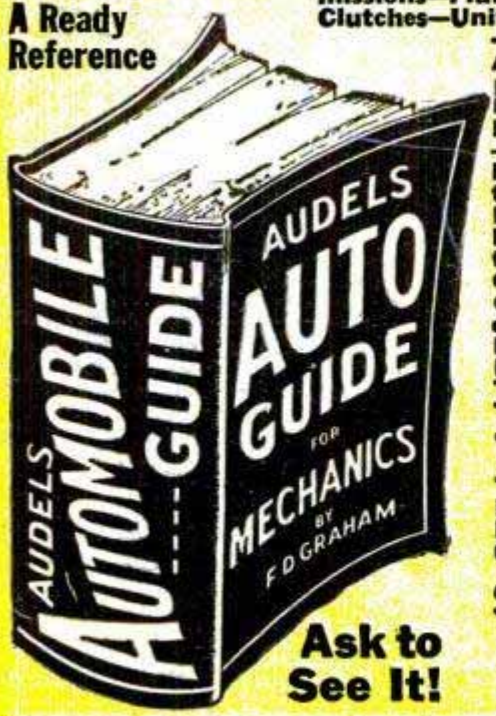

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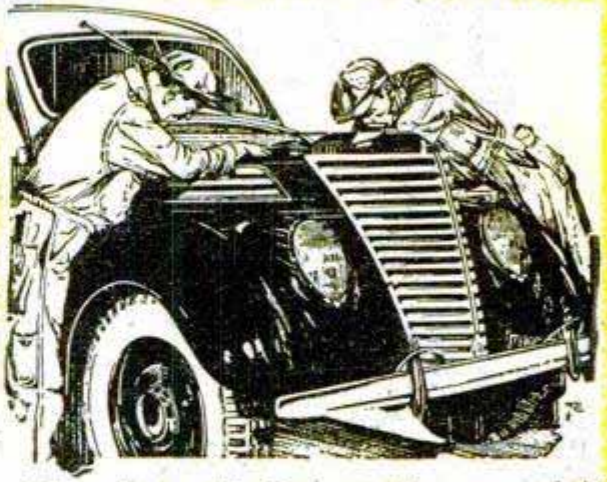

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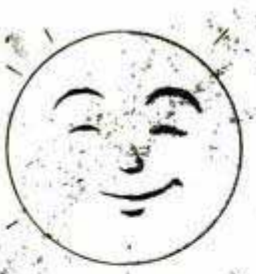

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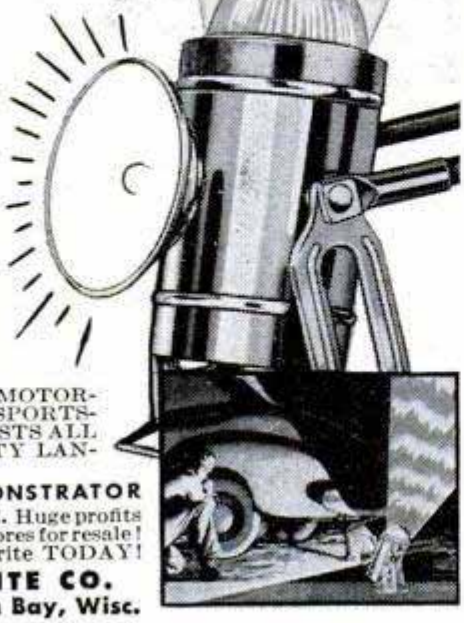

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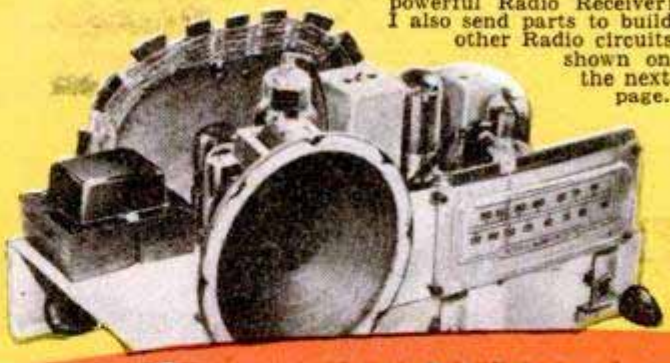

READ Other Side, Too!

BE A RADIO-TELEVISION TECHNICIAN

I WILL TRAIN YOU AT HOME

Learn Servicing or Communications Practice With Many KITS You Get

Do you want good pay, a job with a bright future and security? Would you like to have a profitable shop or store of your own? If so, find out how you can realize your ambition in the fast growing, prosperous RADIO-TELEVISION industry. Even without Television, the industry is bigger than ever before. 90 million home and auto Radios, 3,100 Broadcasting Stations, expanding use of Aviation and Police Radio, Micro-Wave Relay, Two-Way Radio for buses, taxis, etc. are making opportunities for Servicing and Communications Technicians and FCC-Licensed Operators.

Make $10 EXTRA a week in Spare Time

Keep your job while training. Learn Radio-Television principles from illustrated lessons. Get Practical Experience experimenting with circuits common to Radio and Television. Many students make $5, $10 a week extra fixing neighbors' Radios in spare time while learning.

Have your Own Business

Let me show you how you can be your own boss. Many N.R.I. trained men start their own business with capital earned in spare time. Robert Dohmen, New Prague, Minn., writes, "Am now tied in with two television outfits."

Training Features Television

Both my Servicing and Communications training include up-to-date lessons on TV principles. My graduates are filling jobs, making good money in both Radio and Television. Remember, the way to a successful career in Television is through experience in Radio.

EXTRA PAY IN ARMY, NAVY, AIR FORCE

Knowing Radio, TV, Electronics can help you get extra rank, extra prestige, more interesting duty at pay up to several times a private's base pay. You are also prepared for good Radio-TV jobs upon leaving service. Mail Coupon TODAY.

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New, special TV kits furnished to build high-definition SCOPE . . . RF OSCILLATOR with flyback power supply . . . complete TV SET . . . many other units. You see pulse, trapezoidal, sawtooth wave forms. Get valuable PRACTICAL EXPERIENCE locating and correcting TV troubles. Mail coupon for facts, pictures and prices.

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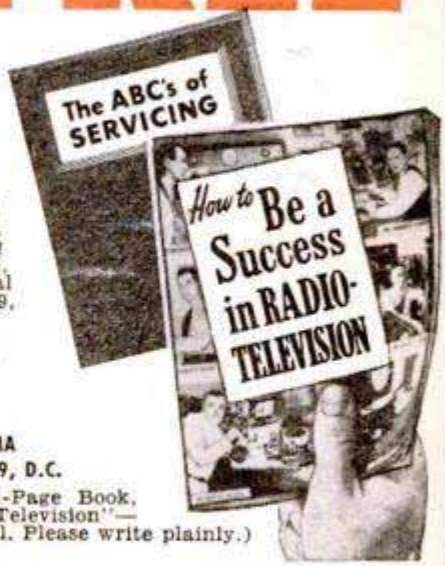
ACT NOW! Send for my FREE DOUBLE OFFER. This card entitles you to Sample Lesson on Servicing; shows how you learn Radio-Television at home. You'll also receive my 64-page book, "How to Be a Success in Radio-Television." You'll read what my graduates are doing, earning; see photos of equipment you practice with at home. Cut out and mail card now! No postage needed. J. E. SMITH, President, Dept. 1MA, National Radio Institute, Washington 9, D. C. Our 38th year.



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$10 WEEK IN SPARE TIME

"Before finishing your course, I earned as much as $10 a week in Radio servicing, at home in my spare time."—S. J. Petruff, Miami, Fla.

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"Word traveled fast in regard to my N.R.I. training. Have been doing Television installations and servicing." . . . H. B. Mills, Washington, Ohio.

NRI-TRAINED MAN HONORED

"The N.R.I. Diploma is something to be proud of. People honor the N.R.I.-trained man. They say if you are trained by N.R.I. you know Radio repair business." . . . P. Purkiss, Pangburn, Ark.

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"Am employed with WLPM as Broadcast operator. Your NEW communications course shows the kind of equipment we use in our station." J. Bangley, Jr., Suffolk, Va.

I Will Train You AT HOME for Good Pay Jobs in RADIO-TV

Television Is Today's Good Job Maker

In 1946 only 6,000 TV sets sold. In 1950 over 5,000,000. By 1954, 25,000,000 TV sets estimated. Over 100 TV Stations now operating. Authorities predict 1,000 TV Stations. This means more jobs, good pay for properly trained men.

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With both my Servicing Course and my NEW Communications Course I send you many Valuable Kits of Parts for PRACTICAL EXPERIENCE with circuits common to both Radio and Television. They "bring to life" theory you learn in my illustrated texts. Some equipment from both courses is shown at right. As part of my Servicing Course, you build a complete, powerful Radio Receiver, a Set Tester useful in earning extra spare time money, an A.M. and F.M. Signal Generator, etc. In my Communications Course, you assemble a low-power Broadcasting Transmitter that shows how to put a station "on the air," a Wavemeter, an Electronic Multitester for measuring voltage, current, resistance, impedance, etc. This and other equipment you build with Radio Kits I send is yours to keep.

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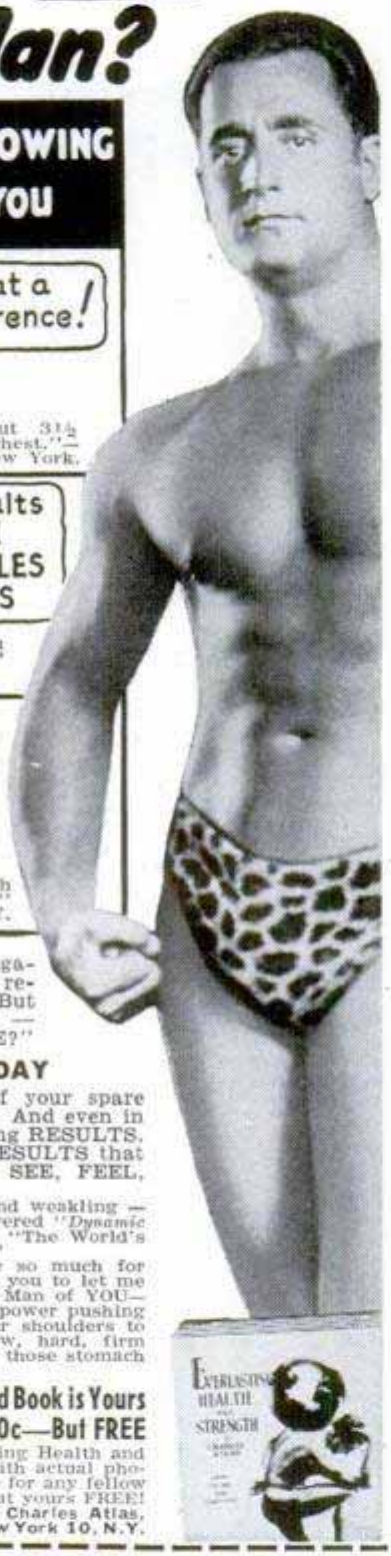

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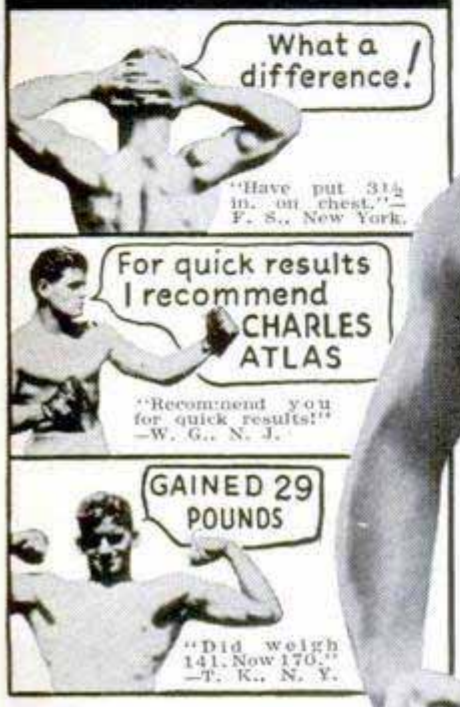

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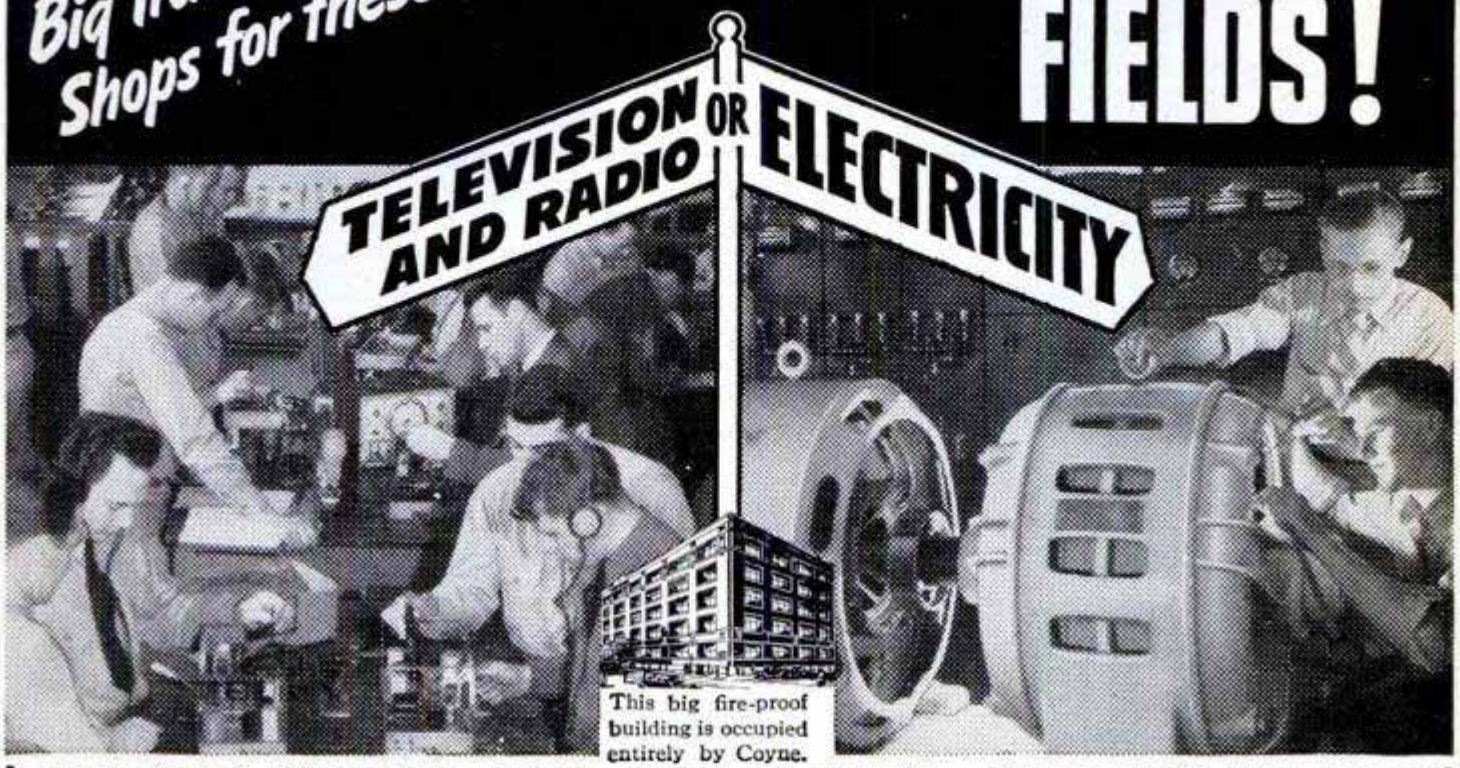

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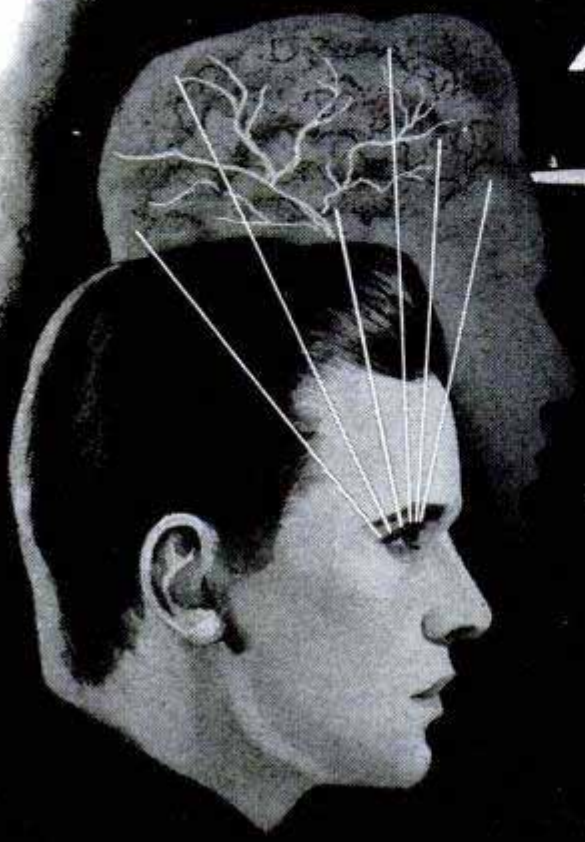

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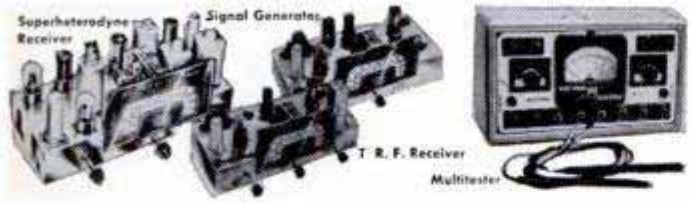

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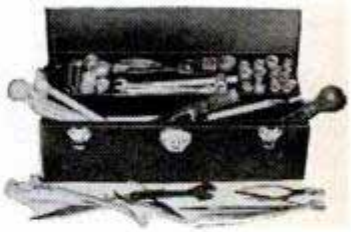

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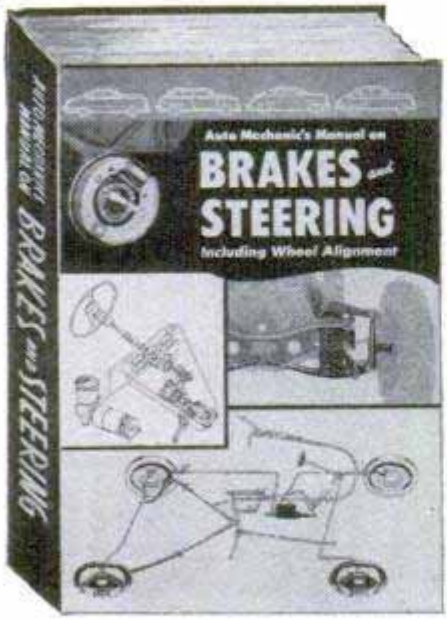

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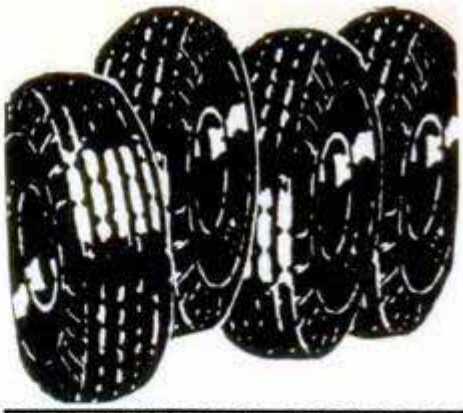

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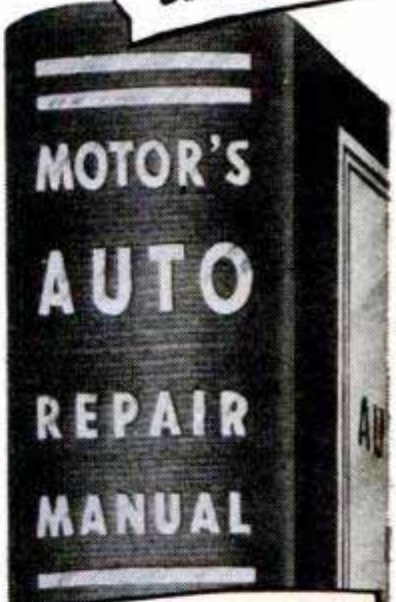

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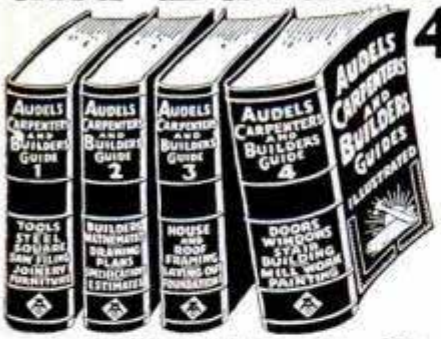

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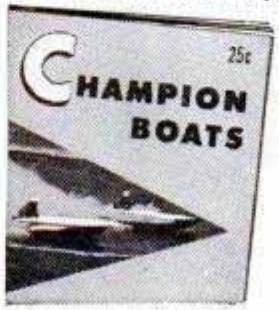

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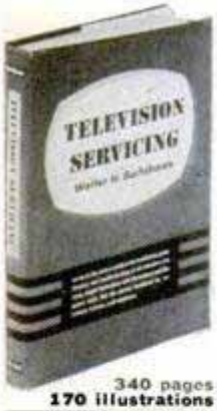

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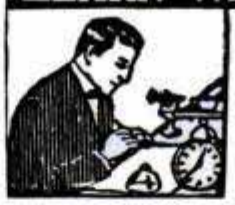

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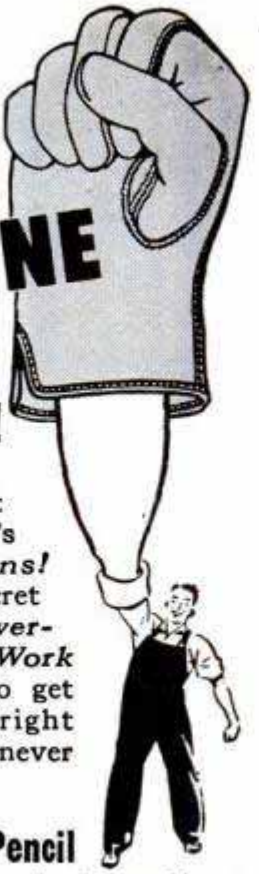

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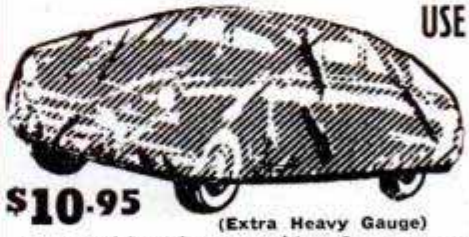

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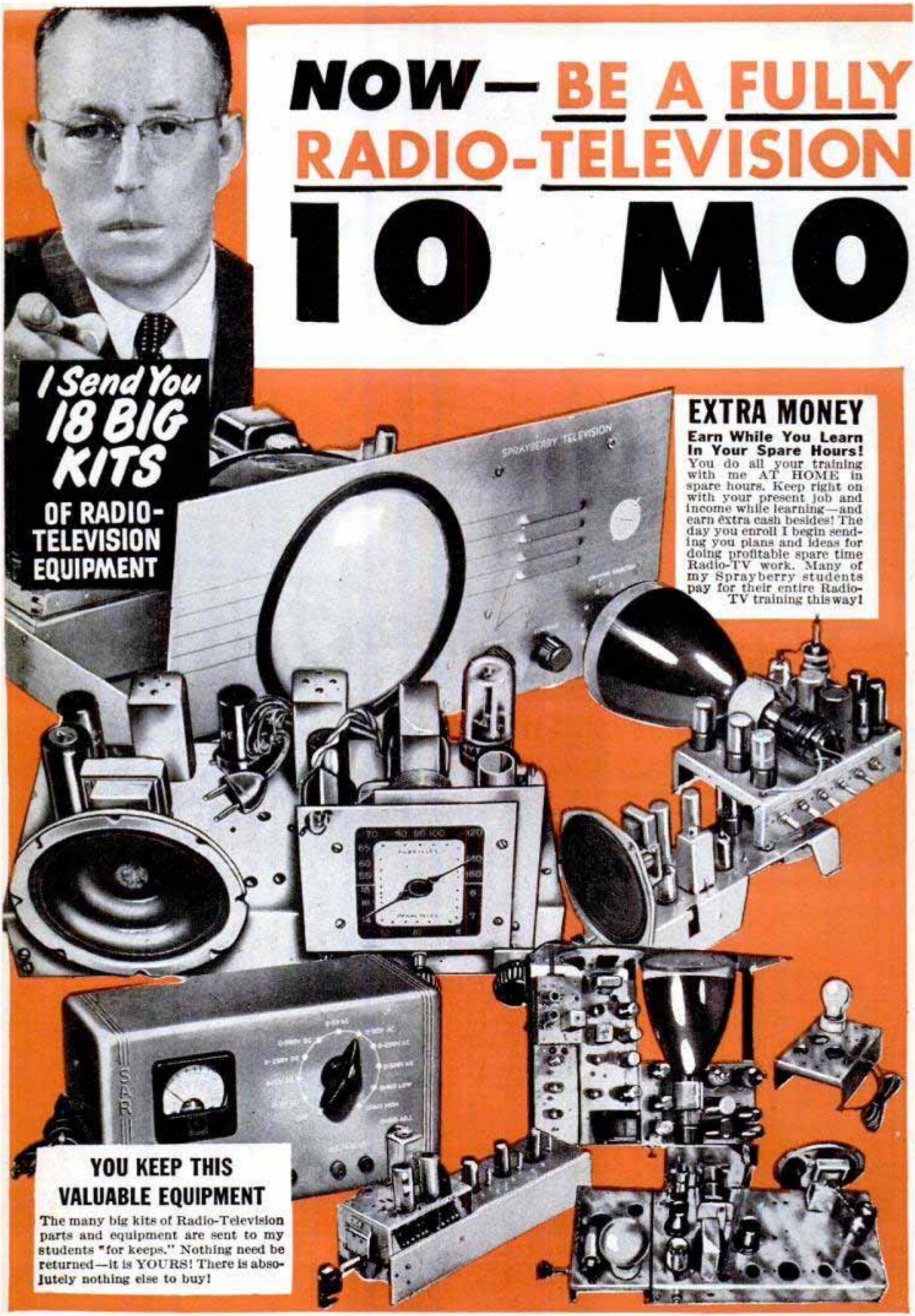
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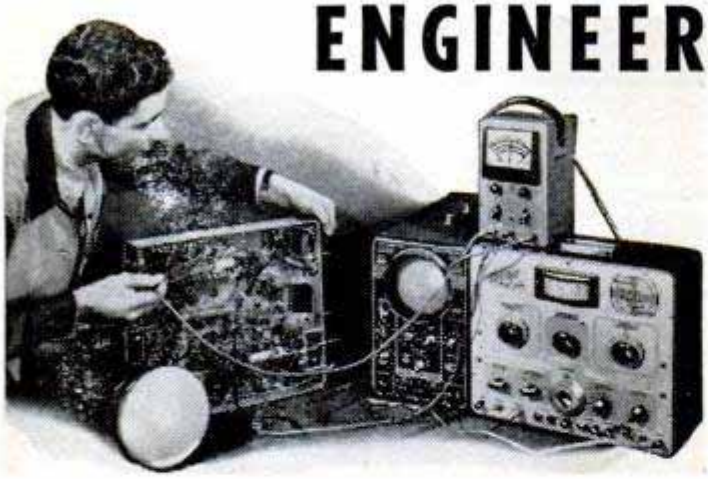

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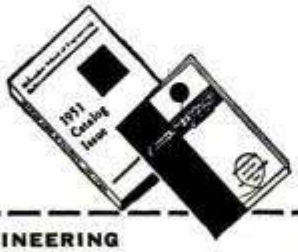

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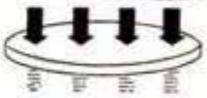

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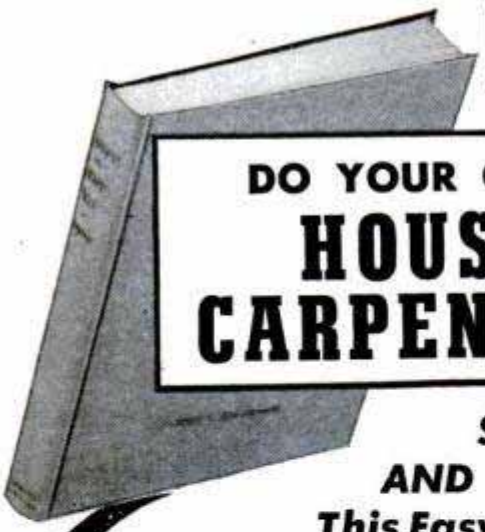

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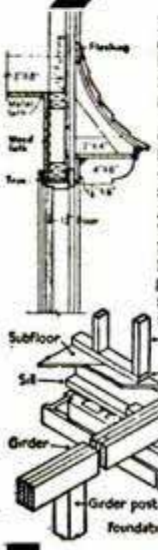

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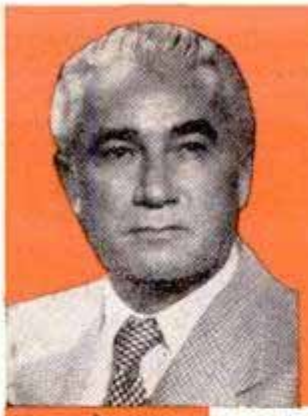

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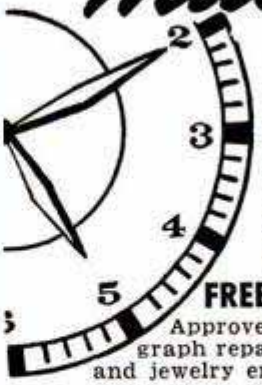

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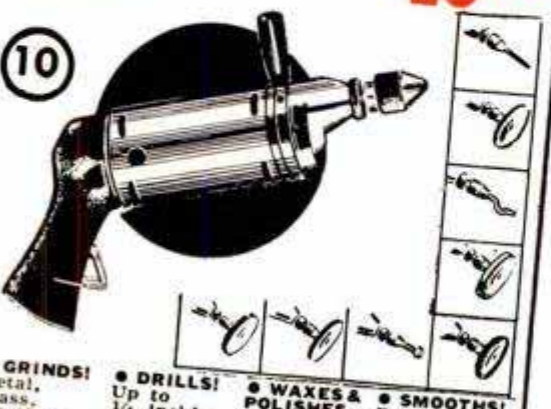

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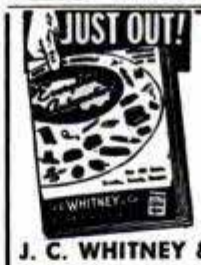

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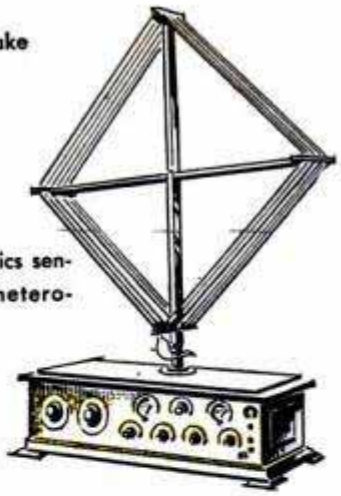

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OWN Night school business. $85 gross profit from every $100. Famous home study school teaching popular course in understanding people expanding with local privately owned night schools. Exceptional opportunity for ambitious men and women, full or spare time. Man-wife opened school October 1950, now want ten schools. Tell about yourself in longhand. Sample lesson, details free. IGAS, Inc., 800 Wilhoit Bldg., Springfield, Mo.

FIX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write: Typewriter, 1115 Corbet, Tarentum, Penna.

BOOKKEEPERS Earn $100 week. Operate bookkeeping-tax service. Details free. Universal, Box 664-M, Springfield, Mo.

"SCHOOL Students" soliciting in your own neighborhood, some making $1.50 per hour. Let us teach you how. Harry Walters, Mediapolis 2, Iowa.

YOUR Own catalog store. Stamped envelope brings free booklet. Associated Thriftway Stores, Box 1011, Glendale 5, Calif.

BOOKKEEPERS, Earn up to $520 month serving small firms part or full time. Proved plan; simplified system. Particulars free. Tax Saver System, Dept. A, Ft. Worth 2, Texas.

OPERATE Profitable mail order business. Splendid opportunity. For details write Walter Bitterman, 133-A Boren Ave. N., Seattle 9, Wash.

EARN Money at home with your typewriter. Spare time! Details free. Edwards, Publisher, 3915-PM, 12th, Des Moines 13, Iowa.

STOP Wage slavery. New publication tells "Seven Ways to Start a Private Business Without Capital." Particulars free. Write Reliance Business Service, 15a Park Row, New York 38, N. Y.

SELL By mail from your home—Everything handled for you. Terrific possibilities. $100 or more needed. Free booklet. NMD Agency, Box 88-A, Dorchester 22, Mass.

COLLECT Cash without selling! Every business place a location for "Wishing Well." Free plan. Industries 13, Box 929, Long Beach 1, Calif.

BIG Money and fun growing live miniature Ming trees on your window sill. Write for free rare tree seed and plan. National Nurseries, 8620A Ruthelen, Los Angeles 47, California.

$2000 MONTHLY One-man business. Car required. $45 starting capital. $1.25 sample 50c (refundable). Cummings Co., 1321 Arch Street, Philadelphia 7C, Penna.

MAKE Money with Merritt. Sell Davis air cushioned shoes, dress, work, heavy duty. Popular priced. Advance commissions. Cash bonuses. Experience unnecessary. Write to Geo. Merritt Shoe Co., C-71, Brockton, Mass.

TELEVISION: Make big money. Repair sets. Our "Television Book" tells all in simple language. $1.00. Money back guarantee. Leary's, 56 East Hennepin, Minneapolis, Minn.

START Your own business at home. Sell subscriptions to leading magazines spare time. Liberal commissions. Supplies furnished. Get set now for profitable Xmas season. Write Paramount Reading Club, 512 Palace Bldg., Minneapolis 1, Minn.

FIGURINE Molds and many others, liquid rubber, statuary plasters, flock finishes, etc. Illustrated catalog and "Plastercraft" manual free. Blue Rapids Supply, Blue Rapids, Kansas.

SUCCESS—Your own profitable business by mail order from your home. No special training or knowledge necessary. Details free. Bowden Business Service, Box 2204, San Diego 12, Calif.

NATURAL Molding Latex. Extra thick. Free sample. W. Wooley, 115-A Donald, Peoria, Ill.

WANTED—Unused U. S. postage stamps. Small discount. Advance Stamp Co., 24 East 23rd Street, New York 10, N. Y.

MAKE Rubber stamps, repair dolls, repair sewing machines. Learn invisible reweaving. Catalogue of "40 Ideas" free. Universal, Box 1076-A, Peoria, Ill.

$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471-A, Cleveland 12, Ohio.

SPECIAL Rubber for making molds. Literature and sample free. Universal, Box 1076-A, Peoria, Ill.

$250 WEEK Reported! Free book "505 Odd, Successful Businesses." Work home. Expect something Odd! Pacific, Oceanside, Calif.

MOLDING Rubber $2.95 quart, $9.95 gallon prepaid! Plastercraft Supply Company, 3051 St. Clair Avenue, Cleveland 14, Ohio.

FREE Booklet "How to Make Backyard Profits!" Pickett's, Florence, Kentucky.

YOU Can have a steady lasting income with my copyrighted system in the mail-order business, right at your own home. Write me, I'll tell you how. F. Little, R.D. 1, Glenshaw, Penna.

MAKE Money. Have fun. Work at home. Preserve live flowers, leaves. Rich, untapped market. Easy, pleasant work. Pays immense profits. Very simple to do with our process. $1.00 brings you our "easy to follow" instructions. S. Butowsky, 1918 North 32nd Street, Philadelphia 21, Penna.

BOOKKEEPERS. Operate simplified bookkeeping service CPA designed, double entry system. Instruction manual $1.00. Kern, 4942 Vineland, North Hollywood, Calif.

FREE Mailorder plan. Write Lucas, 4857-C Terrace Drive, Seattle 5, Wash.

YOUR Own business in your basement. New industry. Write for full information. Ward Patterson, 2518 Beaver, Des Moines, Iowa.

$150.00 WEEKLY! Men and women! Exceptional business! Douglas Service, Cambridge 3, Minnesota.

MAKE Gifts, novelties, jewelry, from sea shells, fish scales, plastics. Secret pearlizing, bronzing, luminizing, metalizing, dyeing, tinseling processes disclosed. No tools or experience needed. Book of 165 beautifully photographed designs $1.00. Giftcrafts, Box 4550-MX, Coral Gables, Florida.

ESTABLISH Your own business. Free information. Arrow Press, Box 933, Buffalo, N. Y.

SELL By mail; free details; instructive booklet 25c. Manhattan House, P.O. Box 51-M, St. Albans 12, N. Y.

MAKE Money at home as renewal headquarters for all magazines. Big Christmas sales profits now. Liberal commissions. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500B, Mount Morris, Ill.

WATERLESS Hand cleaner. Cleans thoroughly. (No ammonia, no kerosene.) Easily prepared. Good profit. Formula $1.00. Nelko Chemical Service, 3462-WH Merchandise Mart Sta., Chicago 54, Ill.

TO $35.00 Weekly. Spare time, home operated mail order business. Successful small "beginner's" plan. Everything supplied. Lynn, 5710-M Bankfield, Culver City, California.

OPERATE Profitable mailorder business. Particulars free. George Lenhoff, Lincoln 8, Nebraska.

HOW And where to obtain capital, details free. Star Service, Wapakoneta, Ohio.

EARN Big money at home. Make genuine rubber molds, plaques, figurines, etc. Complete line of Dresden-Craft supplies. Catalog free. Ken-Dor Studio N, Lake Geneva, Wisconsin.

START Your own mailorder business. Work at home. Details free. Contax Service, 6621-A Bishop, Chicago 36.

BEST Tested moneymakers. Over 40,000 words 25c. Business secrets, formulas, wholesale supply, sources galore. Money-back-guarantee. VeeJay, Box 14707M, Los Angeles 18, Calif.

EARTHWORM Breeding? First, get unusual story, "An Earthworm Turned His Life." Free. Earthmaster, Dept. 14, El Monte, Calif.

NEW Exceptionally profitable plans — ideas for home operated mail business. Rush name. Miller, 1772-P Carlyon Road, East Cleveland 12, Ohio.

MONEY In new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

YOU Can make $42 cash profit selling 24 religious necklaces. Miraculous, sacred heart, etc., medals encased in everlasting plexiglas. 18" gold plated chain. Gift boxed. Sample $1.00 (Retails $2.50) sent first class mail. Money back guarantee. Free money-making catalog. Stephen Products, 1947 Broadway, Dept. P, New York 23.

$46 FROM Square foot plywood; jigsaw necessary. Literature free, write today. Woodarts, Bridgewater, Mass.

MAKE Tough, durable plastic—1c pound. Makes attractive floors, walls, built-ins, roofs. Build good home, $150.00 room. Bays Laboratory, Oklahoma City 9.

WHERE To buy at wholesale 100,000 articles. Free list. Also extra-income literature. Maywoode, 1133 Broadway, New York.

GROW Mushrooms. Cellar, shed. Spare, full time. We pay $3.00 pound. Free book. Mushrooms, 2954 Admiral Way, Seattle, Wash.

BOOKKEEPERS, Keep books, small firms spare time. Manual latest technique by C.P.A., $3.00. Modern Business, Box 406, Youngstown 1, Ohio.

MAKE Money spare or full time casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. "Cash-in" on holiday orders now being placed. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

START A venetian blind laundry. Profit opportunity for lifetime business. New machine method. Free booklet on request. F. C. Co., 442 N. Seneca St., Wichita 12, Kansas.

INCOME From local information. No selling. Write Neherco, La Verne, Calif.

MAKE Flexible molds! Cast plaques, bookends, figurines! Free sample! H. Tooker, 630-R Chestnut, Hamilton, Ohio.

NEW Profitable home business repairing zippers. Thousands of customers waiting. No experience required. We furnish everything. Write Texas Specialty Company, 204-B Texas, Texarkana, Texas.

UNPAINTED Bookends, plaques, statues, figurines. List. Haverty Products, 822-17th St., Altoona, Penna.

YOUR Own profitable home business. Preserve live flowers to last for years. New simple discovery. Enormous demand all year 'round. Tremendous profits! Light fascinating work. Send $2.00 for working equipment, instructions, and valuable sales plans. Satisfaction guaranteed or money promptly refunded. Alfred Hermansen, 210 Fifth Ave., Suite 1102A, New York 10, N. Y.

START Mailorder bookshop — Everything furnished. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, N. Y.

THOUSAND Articles wholesale, "Supply Source Directory" 10c. Ideal Service, Park Ridge 30, Illinois.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

DOLLARS In personalized baby record books. Sell by mail. Use same literature we do. No-Co-Ro, Oakland 6, Calif.

FABULOUS Earnings—Fascinating pastime. Growing genuine, living miniature (ming) tree. New sensational business or hobby. Astounding information free. Dwarf Gardens, Box 355B, Briggs Station, Los Angeles 48, Calif.

BRUSH Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

COMMERCIAL Deep frying course. Mock chicken legs, potatoes. New and proven methods. Learn about this money-making field. $2.50 p.p. Concession, Toledo 13, Ohio.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

MADE $24,500 Using money making plans from Schemer Magazine, world's oldest mailorder publication. Box 275M, Canfield, Ohio. Year $2.00. Sample 20c.

MINK Raising information free. Complete. Lake Superior Mink Farm. Superior, EE1, Wisconsin.

POPCORN And potato chip equipment. Long Eakins Company, 5160 High, Springfield 99, Ohio.

COPUBLISH Leading m.o. paper. Latest copy Mail Sale Advertiser, details, dime. Vanroy Shirk, Lebanon, Penna.

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

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription $2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

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

MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordan Publishers, Box 23, Pawtucket, R. I.

MEN—Women. Everybody likes candy. Learn to make professionally. Our 40th year. Ragsdale Candies, D5, East Orange, New Jersey.

MECHANICS, Increase income. Become machinery broker. One paycheck starts business. Carefully prepared information will convince you. $1.00 p.p. Homecraft Company, 1538 W. Clinton, Fresno, Calif.

MONEYMAKING OPPORTUNITIES

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 911-CM, Pleasant Hill, Ohio.

HOBBIES That make money. Free details. Cornell, 421 Ocean Ave., Lynbrook, New York.

EXTRA Money at home casting silver rings. Details. Western Silvercraft, 623-1A North, Great Falls, Mont.

SPARETIME Cash, home, with America's finest folios. Terrific! Sample, catalog 25c. Merill, 9 Stoddard, Glens Falls, N. Y.

EARN Extra money, spare time. Write—D'Yarmett, 245 Church, Newark, Ohio.

EARN Extra income in spare time at home. Our information reveals how. Only 30c. Business Bureau, Dept. 52-L, P. O. Box 2224, St. Louis, Mo.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minn.

READ "The Fair" for pleasure or profit. Dime brings copy. Orwat, 1243 South 54th St., Philadelphia 43.

WIN Cash, cars in prize contests! Write for copy filled with current contests, winning hints and tips. Send only 30c. Wright Contest Digest, Dept. 17-M, P.O. Box 2266, St. Louis 9, Mo.

ASSEMBLE And sell Swiss musical churches. Complete kit $3.95 postpaid. Piltzecker Imports, Wood-Ridge, N. J.

INCOME Opportunities increased 200% with new copyrighted P.D.Q. Answer ads easily, quickly with arm chair convenience. No letters, no post cards necessary. Amazingly different. Sample free. New World Enterprise, East Hampton, Conn.

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

MEXICAN Feather pictures. Terrific Christmas item, sell gift shops, etc. Adelphi, Box 57-B, Bellerose 6, N. Y.

OUR Representatives make big money. So can you, at home. Spare or full time. No experience required. Write M. T. Associates, 26 Potters Lane, Great Neck, N. Y.

MAKE Money with frogs! Particulars free. Specialties House, Whiting 12, Ind.

OWN Your mailorder business, envelopes, bags. Big profits. Omaha Envelope, 4721-E California, Omaha 3, Nebr.

OPERATE Money-making mail order business. Information free. Olsen, 1231-D East Third St., Duluth 5, Minn.

$100-$200 WEEKLY. No selling or manufacturing. Part or full time. Mahaffey, 3032-B Weldon, Los Angeles 65.

SENSATIONAL Hot item! Brand new 1½" miniature plastic phony ponies propelled by live Mexican jumping beans! Real horse race thrills and competition. Rush $1.00 for sample. Doz. $8.00 f.o.b. Los Angeles. Quantity discounts. Sudler Co., 1000 S. Manhattan Pl., Dept. PM, Los Angeles 19, Calif.

"TIP Top salesman" made for you 10c. B-533, Baseline, Michigan.

WE Pay you highest rates for hand-decorating greeting cards. Work home. Experience unnecessary. No selling required. Greetings, 108 Madison, Detroit 26.

TIE-Breaker picture puzzles exposed, $1.00. Wenograd, Box 1495, Philadelphia 5, Penna.

FREE Nationwide advertising, publicity! Advertise your products to 51 million readers thru 77 national magazines, free of charge! Broadcast on 400 radio stations without risking a penny! Send 25c for details today! Treasury, 149 Storer, New Rochelle 2-L, New York.

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

BE An arm chair farmer. An investment of $60 can return as much as $500. Let the farmer do the work for you. Repeat as often as you like. Complete plan $1. Surefire. Sabetha Enterprises, Box 111, Sabetha, Kansas.

SCHOOL Seniors—Sell classmates America's most beautiful graduation name cards. Largest selection. Highest commission. Outsells all others. Free sample kit. Printcraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

RESILVER Mirrors at home. Formula 25c. Ideal Service, Park Ridge 6, Illinois.

BE Appointed State Notary Public now! Details: Stationers, Helotes, Texas.

GROW Mushrooms. Cellar, shed. Spare, full time. We pay $3.00 pound. Free book. Mushrooms, 2954 Admiral Way, Seattle, Wash.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as $1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord, Nebr.

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

EASILY Made—Easily sold. Attractive bulletin board for stores, service stations. Purchase materials locally. Real money maker. Plans $1.00. Chafin, P.O. Box 666, Bremerton, Washington.

FORMULAS, PLANS, ETC.

YOURS. Free catalog profitable formulas. Consultants, Box 201, Cincinnati 14, Ohio.

FORMULAS For big profit, fast-selling products. Free literature. Majestic, 530½ S. Main, Elkhart, Indiana.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

FORMULAS. Latest, best. Catalog and chemical instruction sheet 10c, (refundable). Nelko Chemical Service, 3462-F Merchandise Mart Sta., Chicago 54, Ill.

MAKE—Sell cleaners, soaps, polishes, flavors, cosmetics. No machinery. Formula literature free. Kemico, Park Ridge 16, Illinois.

FORMULAS, Trade secrets, for nearly everything. Catalog free. Creative Publishers, Winnetka 6, Illinois.

TESTED Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

PLASTICS

LEARN Plastics at home. Small cost—spare time. Dime brings sample plastic, three experiments, full details. Plastic Projects, Box 5151, Detroit 35, Mich.

NEW Liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for wholesale catalog and new sales manual, showing how to make money at home. Castolite, Dept. M-101, Woodstock, Illinois.

HI-PROFITS. Gifts, jewelry. Free catalogue, details. Pilot Plastics, 67C Fulton St., New York City 38.

PLASTIC-Crafters supplies wholesale. Literature 20c. Cosmopolitan, Box 176-PM, New York 8, N. Y.

LUCITE, Plexiglas, acetate; casting, molding plastics, findings. Dye manufacturer. Quantity prices. Special bargain lots, immediate shipment. Complete catalog 10c. 25c airmailed. Gem-O'-Lite, Box 6863, North Hollywood, Calif.

LUCITE. Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", $1.20; ⅛", $1.40; 3/16", $1.75; ¼", $2.08. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

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

CHEMISTRY

SAVE Money! Supplies catalog 15c, refundable. Laboratory Sales, Box 161, Brighton, Mass.

CATALOG Of chemicals, apparatus, kits, minerals, uranium ore, 10c. Rex Laboratories, 2849-A Birchwood, Chicago 45, Ill.

LABORATORY Apparatus, chemicals, microscopes, complete chemistry sets, minerals, uranium ore, 10c brings catalog. Porter Chemical Company, Hagerstown 1, Maryland.

SPECTROSCOPE For quick chemical analysis $3. Kutting Sons, Los Altos, Calif.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology. 10c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

HELP WANTED

TIRED Of no money, second rate jobs? Like to start a real career with a lifetime of high salaries? Write me about two growing fields that really need men. Ed. Howes, Chief, 456 W. Santa Barbara Avenue, Los Angeles 37.

AGENTS WANTED

MAKE Money selling ties. Free catalog. Write to Philip's Neckwear, Dept. 838, 20 West 22 St., New York.

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

NEW Plastic mending tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Kristee 136, Akron, Ohio.

UP To $75 weekly. Amazing pencil, writes four colors, red, blue, green, orange, sample 25c; 20 year guarantee given with beautiful $1 size ball point pen, brilliant metal cap; sample, 25c. Or eight samples, four pencils, four pens, $1 postpaid. Louis Balogh, 1703M Roosevelt, Valparaiso, Ind.

MAKE Wedding profits. Sell invitations, napkins, matches. Samples free. Dunbar's, Middlebush 3, N. J.

100% PROFITS. Free goods. Money back guarantee. Vaporine Medicated Oil, 1512 Chamberlain, Chattanooga 4, Tenn.

EXQUISITE. Service for six. Nationally advertised silverplate tableware. Write Murphy-Yale, Meriden, Conn.

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

GET Into toys! Big money. Show free toy-gift line, full or spare time, take orders, pocket juicy profits. Styleco, Dept. 221, Cincinnati 10, Ohio.

I'LL Put a "Shoe Store Business" in your pocket! Nation's leader trains you to make big money! Fit men, women. Free sample outfit. Write today! Consolidated Shoe System, Dept. 335-F-14, Chippewa Falls, Wis.

AMAZINGLY Different razor. Makes shaving fun! Quick, easy seller. Prospects everywhere. Write: Kenmore Distributors, 3819-C Kenmore, Chicago 13.

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

"FOG-Stop" Windshield cloth. Instantly removes blurry mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee 137, Akron, Ohio.

BUY Wholesale — 25,000 items. Catalogue 25c. Matthews, 1472-B4 Broadway, New York City.

300% PROFIT—Postage stamp photos from negatives or prints, perforated sheet form, gummed backs. Free details, samples. National Photostamp Co., 1418-H Third Ave., New York 28.

IS $210 A week worth a penny postcard to you? Then rush card with name and address for special free trial plan that sells amazing new automatic refrigerator defroster "Like hot cakes!" Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. B-102, 6 N. Michigan, Chicago 2, Illinois.

PART Or full time, all year round selling that pays you well. Sell our products to gasoline stations and garages. Excellent repeat business. Territory available for experienced district sales managers. United States Petroleum Company, 104 Lakeview Avenue, Clifton, New Jersey.

LOOK—Big profits, free samples. Personalized Christmas cards, personalized napkins and personalized stationery. G. M. Dunn Co., 484 Broadway, Newark, N. J.

COUNTY Agents. Gas-electric mowers. Wood saw. Sickle bar. Sell dealers. Farm Products, FR, Excelsior Springs, Mo.

FAST Xmas seller. Perfume beads. Sensation. Particulars free. Mission, 2328PM West Pico, Los Angeles 6, Calif.

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

RAT-Deth franchise (home-office). Sales-service bulletin free. Farm Products, PC-51, Excelsior Springs, Mo.

NYLONS At wholesale prices. Fields Hosiery, 99-G Chauncy, Boston, Mass.

ULTRA-Blue stock signs — 7c, sell 35c. 2000 slogans, 7" x 11", comedy, religious, general. 15 samples, $1.00. Lowy, 812-MV Broadway, New York 3.

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

NYLONS! New! Fancy heels! Guaranteed! Earn $1.00 box. Roma Hosiery, 833 Columbus Avenue, New York City.

HOW Would you like to get paid for "giving away" first quality nylon stockings at 49c? That's all they cost if they run within guarantee period to three months! Advance cash; big bonus. No experience needed. Just write orders. We deliver, collect. Postcard brings you free sample stocking and sales outfit prepaid. Kendex Corp., Babylon 23, N. Y.

PAINTS, Varnishes, roof coatings, flooring, automobile undercoating. Sell ready-made accounts. Earn up to 30% commissions—time, territory your own. Big season ahead. Scott-Leed Paint Co., Box 701-PM, Cleveland, Ohio.

YOUR Own business—Used overcoats 50c; mackinaws 34c; shoes 12½c; ladies' coats 30c; dresses 10c. Enormous profits. Catalog free. Moro, 558-AA Roosevelt, Chicago 7.

BUY Wholesale thousands nationally advertised products at big discount. Sent free "The Wholesale Plan." American Buyers' Service, 629-R Linden, Buffalo, N. Y.

SALESMEN—Add popular, big-profit cosmetic item to your line. Sell to stores under your label. Get details now. Moore's Products Co., Pleasant Plain, Ohio.

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

HI-Profits. Gifts, jewelry. Free catalogue, details. Pilot Plastics, 67C2 Fulton St., New York City 38.

BE A money maker. Represent magazines year around. Wonderful home work. Big Christmas profits now. Liberal commissions. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

OWN A big moneymaking new and used clothing business. Men's used suits $2, pants 35c, topcoats $1.25, jackets 60c, shoes 20c. No experience necessary. Free wholesale catalog. Superior, 1250-A Jefferson, Chicago 7.

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

CHRISTMAS Cards at jobbers prices! Large selection dollar assortments 35c each in hundred lots. Imprint cards, money folders, gift cards, pictures, etc. Make more profits selling our line! Catalog free! Three sample boxes $1.00. Elfco, 438 North Wells, Chicago 10.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog, free. Pickcraft, M19 Bank, Attleboro, Massachusetts.

DRESSES, Used 18c; Coats $2.00, blouses 35c. Free catalog. Crown, 164-P Monroe Street, New York.

$50 WEEKLY Selling finest razor blades, other items. Free details. Edison, Department 274, Far Rockaway, N. Y.

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

PHOTO-Salesmen, agents. Sell beautiful hand colored plastic enlargements and sensational new photo compacts, rings, bracelets, lockets, etc. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

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

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

WANTED—Purchasing agents. No money or experience required. Write Dept. C, Purchasing Manager, 2719 Lawrence, Chicago, Ill.

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

AGENTS Wanted: In United States and Canada for collision indicators. See advertisement on page 295.

HIGH-GRADE SALESMEN

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

REPRESENT America's largest factory selling advertising pencils. High commissions. Attractive line. Union Pencil Company, 389 Broadway, New York City.

UP To $50.00 in a week spare time and tailored suit for yourself without paying one cent. Write for plan and free sample case. W. Z. Gibson, 500 S. Throop, Dept. Z-517, Chicago 7, Ill.

PORTRAIT Salespeople, finest hand colored 8x10 enlargements. Guaranteed nontarnishable gold frames. You keep deposit! Broadway Portrait, 2770 Broadway, New York.

EARN Big money fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. 5311, Rochester, Ind.

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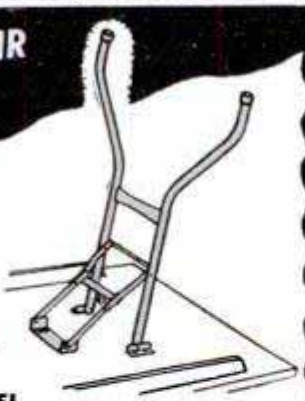

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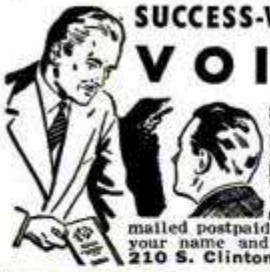

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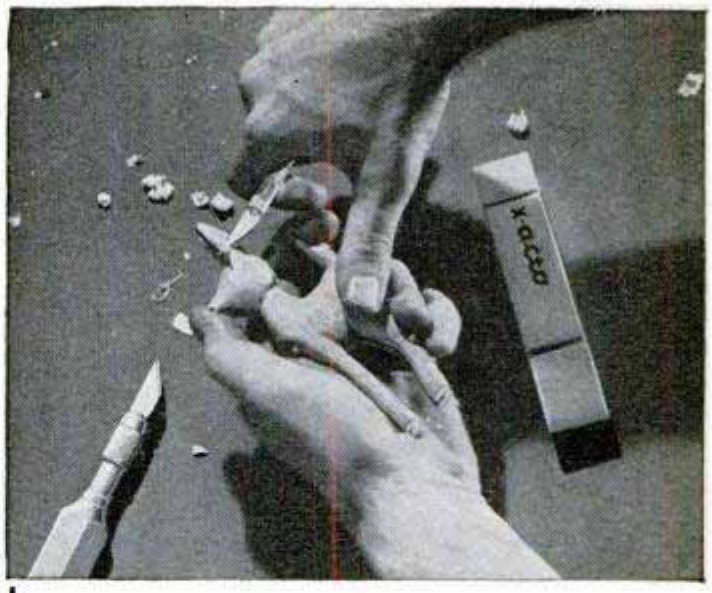

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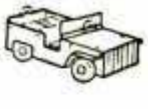

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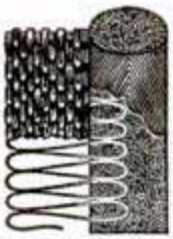

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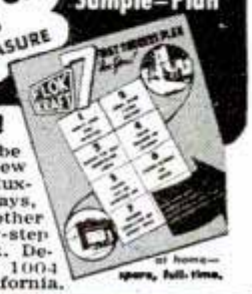

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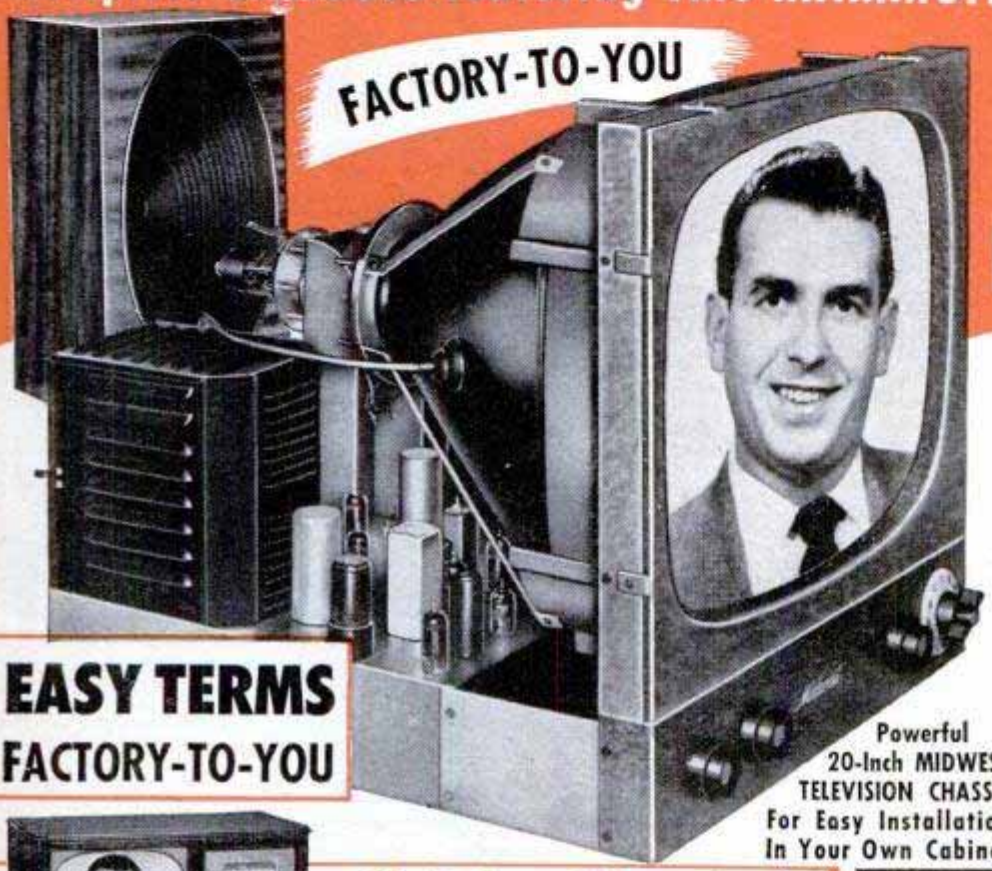

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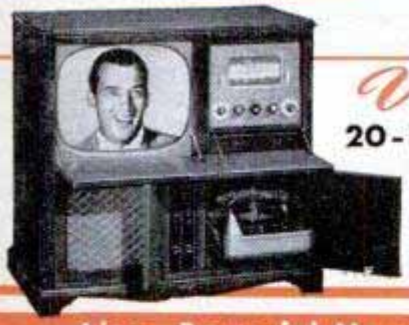

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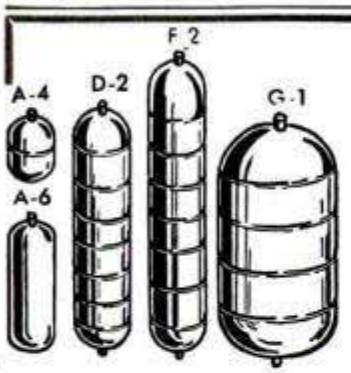

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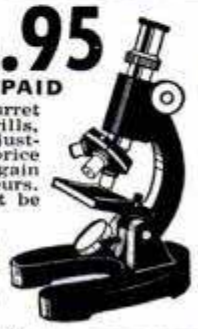

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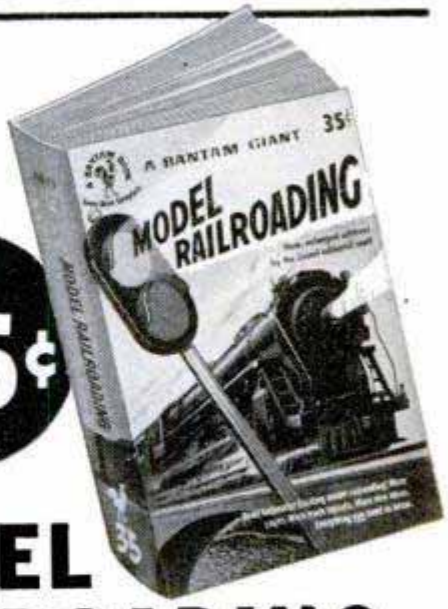

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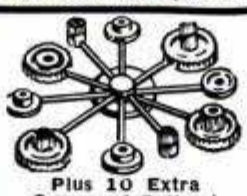

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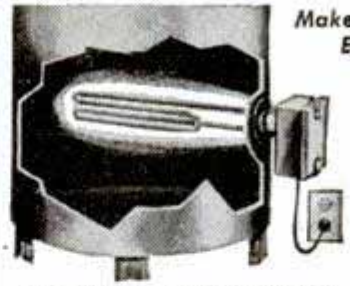

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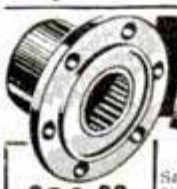

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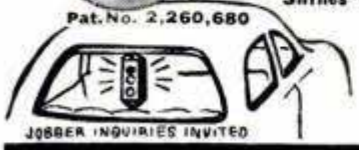

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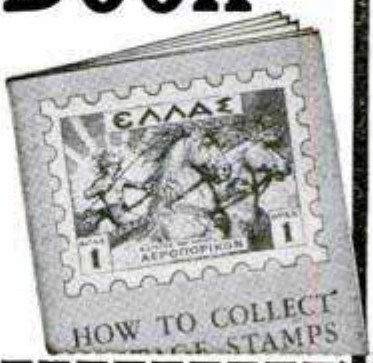

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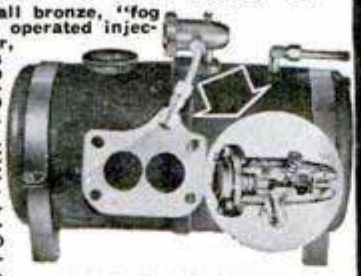

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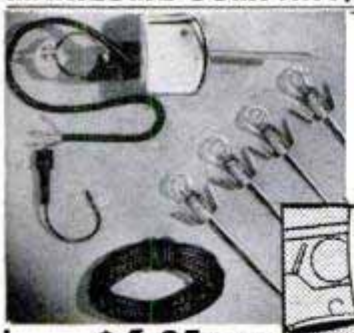

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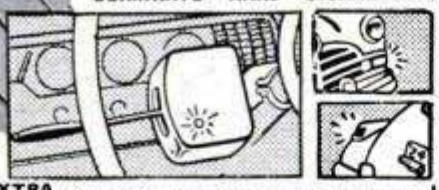

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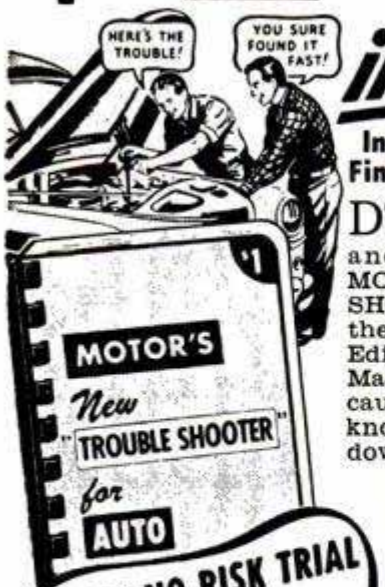

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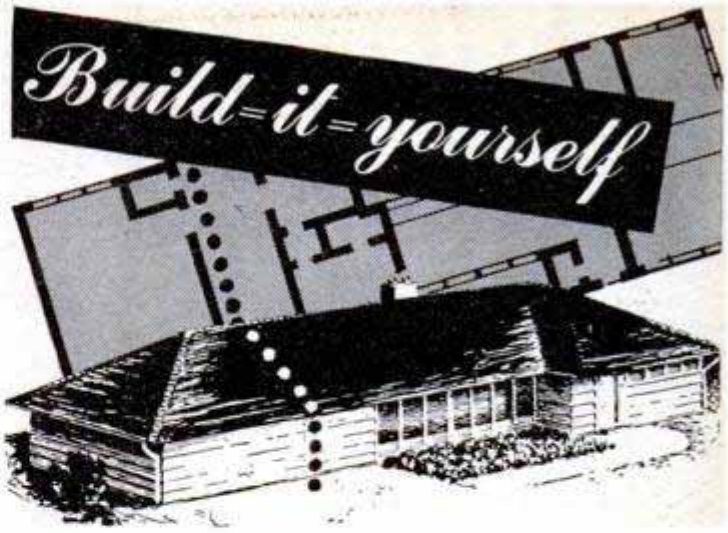

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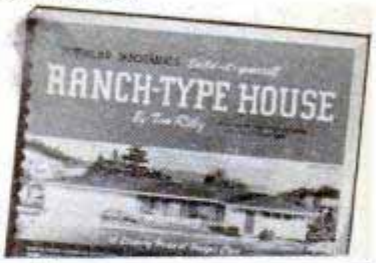

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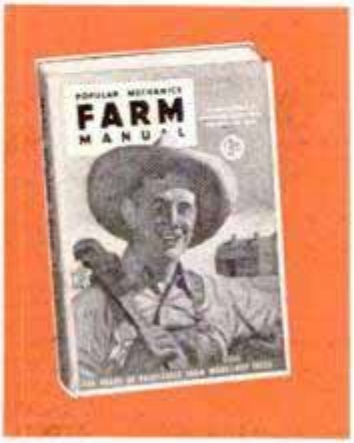

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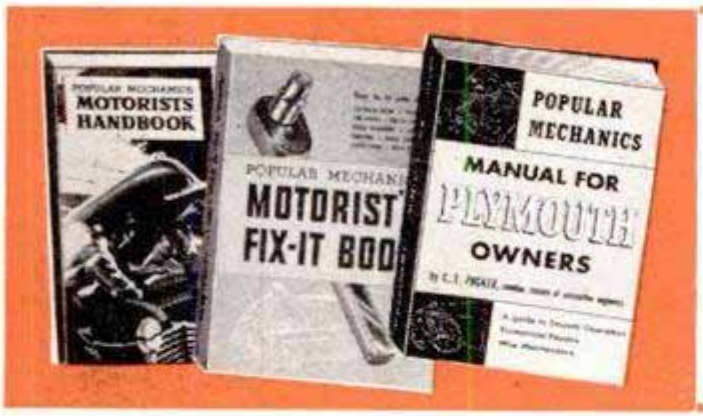

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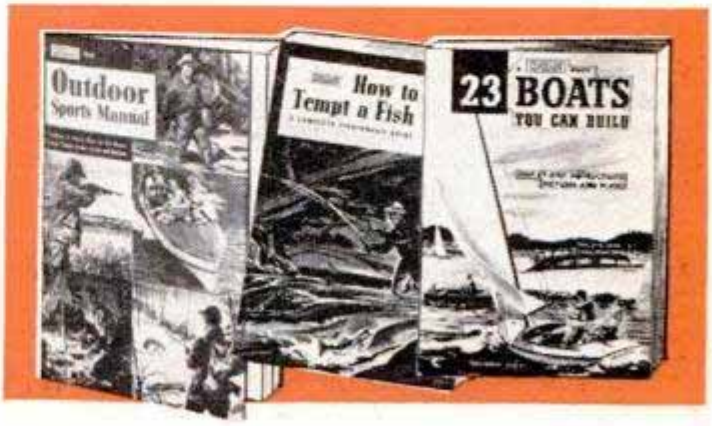

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POPULAR MECHANICS NOVEMBER 1951
WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 96 NO. 5

OUR NAVY GIRDS for the ATOM AGE

By Capt. Frederick L. Oliver
U.S.N. Ret.

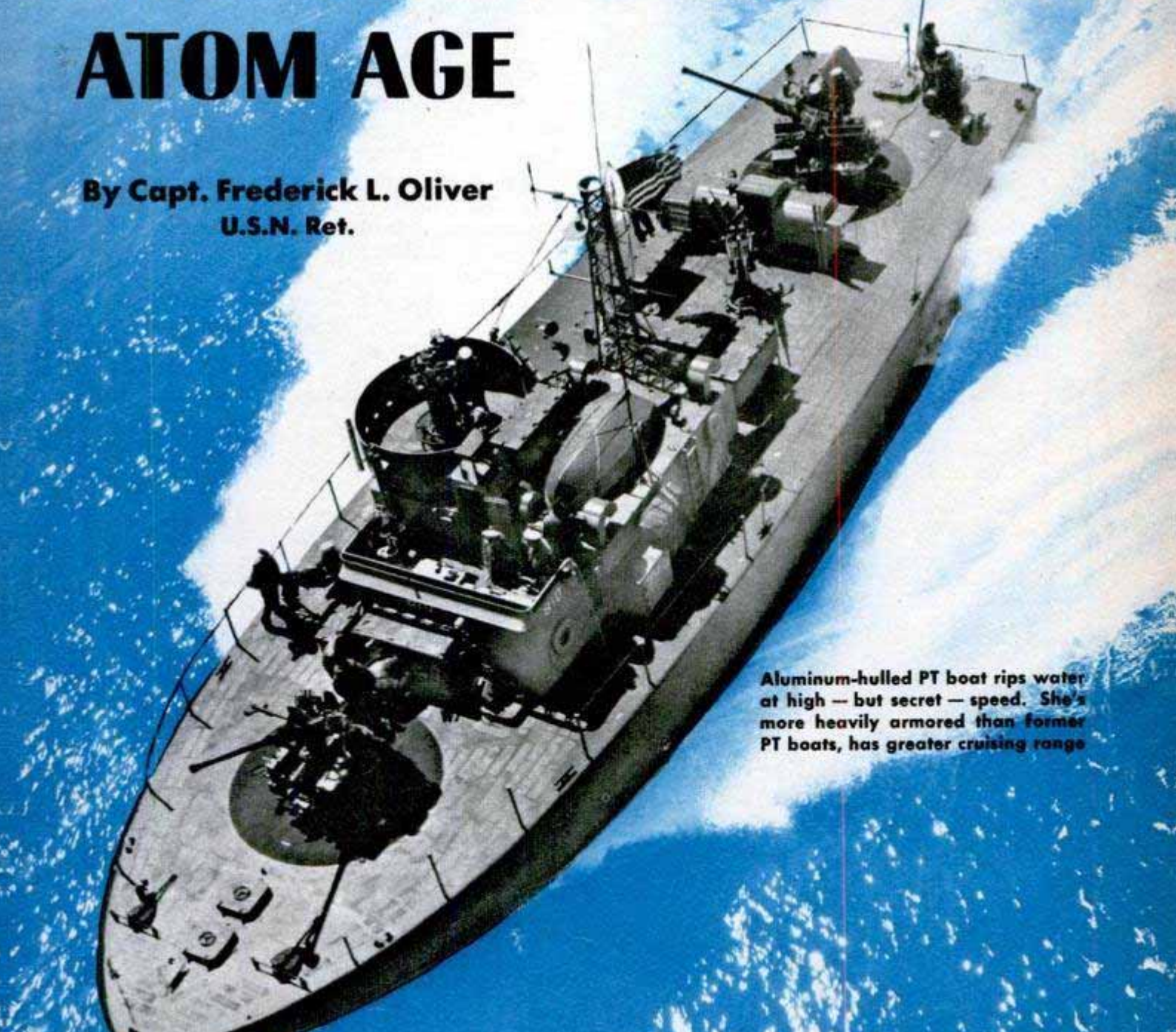
GALAXIES OF STAR shells burst over Malta one night last April, floodlighting a natural stage for what probably were the most fantastic naval war games ever seen in history.

On the steel flight decks of the king-sized carriers Coral Sea, Franklin D. Roosevelt and Saipan—lurking somewhere out on the black waters—ruddy fire shot from jet tail pipes as 12 waves of attack planes roared into the night to liquidate the "enemy."

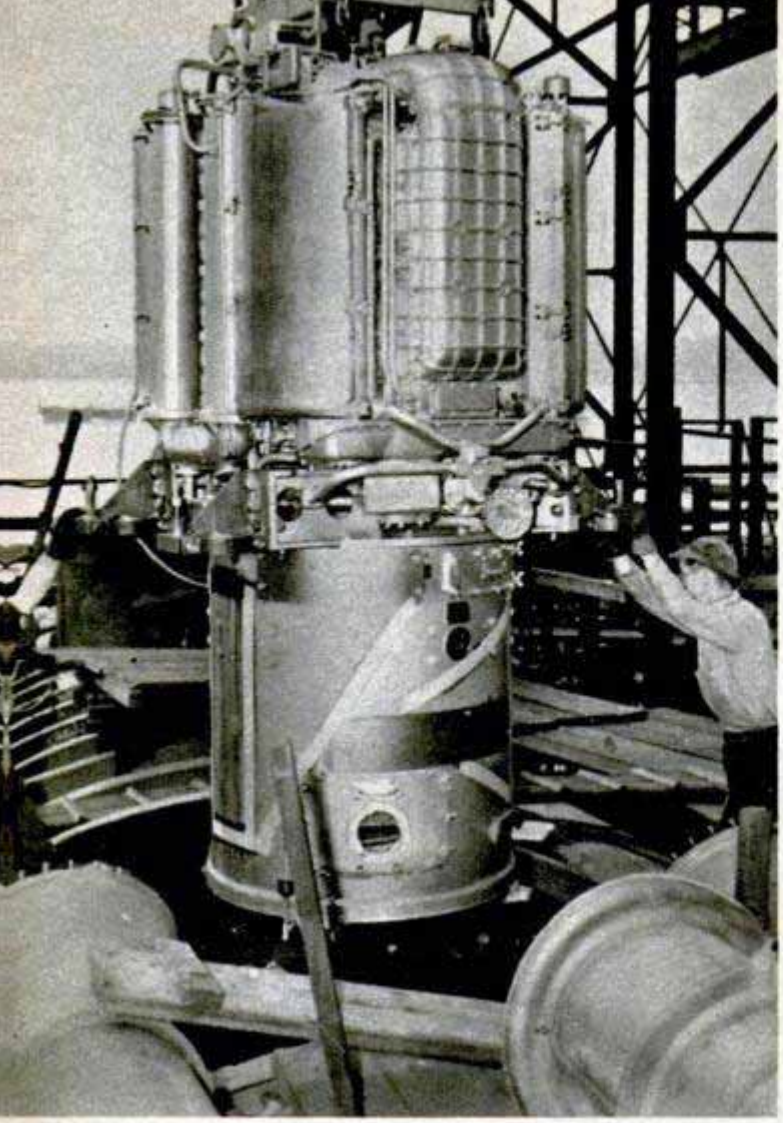
On board big cruisers and destroyers of the 6th Fleet, which lay fanned out off the shore, radar controls automatically found targets, then aimed and fired batteries of big guns that rained a curtain of advancing fire ahead of 1600 Marines who charged from the surf up over the beach.

All during the attack, "black" lights blinked from ship to ship, carrying invisible messages back and forth within the task force. In the electronic atmosphere of CIC rooms, countless radarscopes crawled with moving patterns of green light, and radios sputtered in the red fluorescent glow of huge Lucite plotting boards.

Results of all the "chatter" could be seen



Aluminum-hulled PT boat rips water at high — but secret — speed. She's more heavily armored than former PT boats, has greater cruising range



Radial-type diesel engine is lowered into the hull of the submarine Trout. Engine is about one third the size and weight of previous submarine engines

over the battlefield. Parachutes bloomed in the sky, lowering ammunition and other materiel of war as the Marines ran short and called for more. Special jet missions, carrying rockets and napalm bombs, whipped in from the carriers as requested to wipe out pockets of strong enemy resistance. Fleet helicopters, or "aerial Jeeps," hovered like dragonflies over the entire area, radioing pin-point target fixes for the seagoing batteries of radar-controlled guns, evacuating wounded, carrying critical supplies or personnel back and forth from ships to battlefront.

Everything went like clockwork, and when it was all over this much was certain: a brand-new kind of U. S. Navy rides the seas today.

The Marines' complete knowledge of that beach they hit was due to big advances in underwater-survey techniques and equipment. Electronic fire control is no longer "pot luck," but a vastly intricate pin-point business that works. Helicopters are increasing Naval efficiency daily. Long-range jet planes, instead of putting the Navy out of business as some critics predicted they would, are adding a new and startling punch to seagoing defenders of liberty.

Too often, the fathers of new weapons become overenthusiastic about their brain children, and immediately want to discard as obsolete all other weapons. Our Navy has had to weather a storm stirred up by just such critics, who have claimed that air power, the atomic bomb, the snorkel submarine and the guided missile would put surface ships out of business.

Fortunately, the Navy took these accusations in stride, as it has in times past.

Actually, these "new" weapons have

P2V, the Navy's big twin-engine aircraft, operates from the largest carriers and can deliver an atom bomb

Indian rope trick? No, a Navy blimp in need of fuel snares a gasoline hose from the deck of a carrier

Blimp flies same course and speed as the ship. Pump forces gasoline up the hose to fill the blimp's tanks

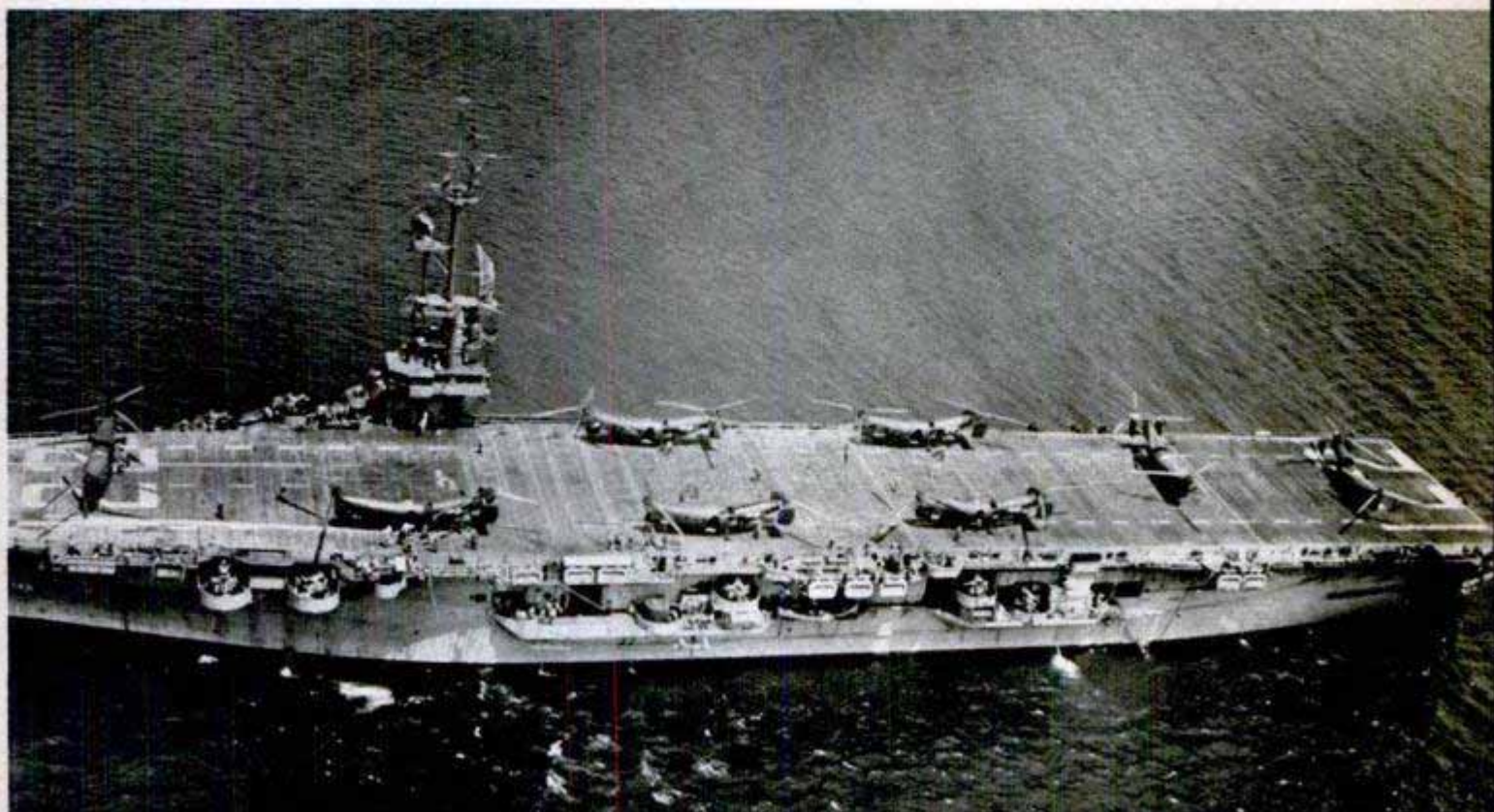
served to strengthen the Navy, because no time was lost incorporating features of the new ideas right into the Navy itself.

The impact of aviation completely changed the status of the battleship, and sent the tactics of battle-line formations to oblivion. The Navy emerged from World War II with the carrier task force as its standard unit of fighting ships.

Today, the carrier task force remains basically the same. But tremendous strides in new weapons, tactics and equipment have bolstered it to make it something to reckon with in modern warfare.

About the only effect of the atomic bomb on the Navy was to spread it out. Today, the carriers, battleships and cruisers of a task force look from the air like a few

"Flying Jeeps" roost on a flattop, ready to pin-point targets or whirl troops and equipment to the battlefront



When "eyes" of the Navy spot a submarine, destroyers race to the target area with powerful depth charges

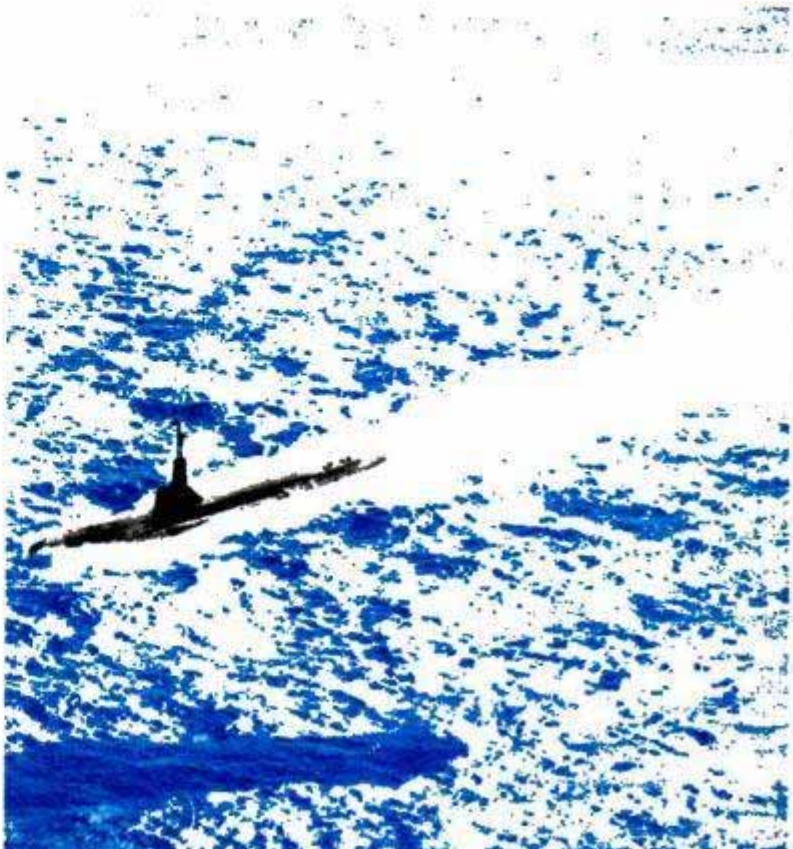
specks of pepper on a desk blotter—dispersed to such an extent that the explosion of a bomb could not damage more than one ship, and atom bombs are too scarce to be used for single-ship targets.

Is the day of the battleship over? No one can answer that question. Our possession of a fleet of these mammoth vessels, superior in strength to all other battleships afloat, dampens the need for any new ships of this type right now. All that is necessary is to maintain our battleships in good condition and equip them with modern devices. Some are becoming so modern you wouldn't recognize them. The battleship Kentucky, on which work was stopped at the end of the war when little more than half completed, is mentioned as being destined for use as a huge, portable, rocket or guided-missile launcher.

The carrier is a different story. Before long the bow of a new behemoth, the likes of which the world has never seen, will cleave the seas. The Navy's proposed supercarrier, which touched off a furious interservice row that resulted in temporary cancellation of the project, has been revived. A 57,000-ton aircraft carrier is now under construction at an estimated cost of $237,000,000.

What will this new monolithic flattop be like? Unfortunately, most of the fascinating facts about it are secure in Pentagon files whose tightly locked drawers carry big red "classified" signs tucked in the handles. This much is known: She'll take a lot more pier space than the three 45,000-ton Midway-class carriers. But from a distance at sea, she'll look something like them, and not much bigger. Her topside will have the profile of a marble slab because she'll be a "flush deck" carrier. No projections will reach above the level of the flight deck. Hence, big planes with huge wingspans will be able to operate from her deck without taking part of the "island" with them. The usual island, or bridge that juts from the starboard side of every carrier for conning, radar towers and navigation will not be eliminated on the new ship. She'll have one in the same place. But during operations, when her brood of planes is taking off or landing, it will vanish down into the side of the ship, until its topmost peak is at flight-deck level. It's something like having a steel house on an elevator that can be raised or lowered at will.

Her vast belly will be big enough, and



After blimp locates sub, it drops magnetic detection device, follows sub's course while destroyer moves in

her armor-plated flight deck stiff enough, to handle heavy, long-range planes capable of delivering an atom bomb. King-sized catapults will toss into the air planes that never before found space to operate from a carrier. In fact everything aboard will be outsize—elevators, arresting gear, hangar deck—to handle not only the Navy's new long-range reconnaissance plane, the P2V, which tips the scales at 37 tons loaded, but also the new jets and fighters. Jets use five times more fuel than propeller-driven planes, and it must be stored somewhere. Fighter planes are getting bigger and heavier, have longer range and carry bigger loads. The new flush-deck carrier is the Navy's answer.

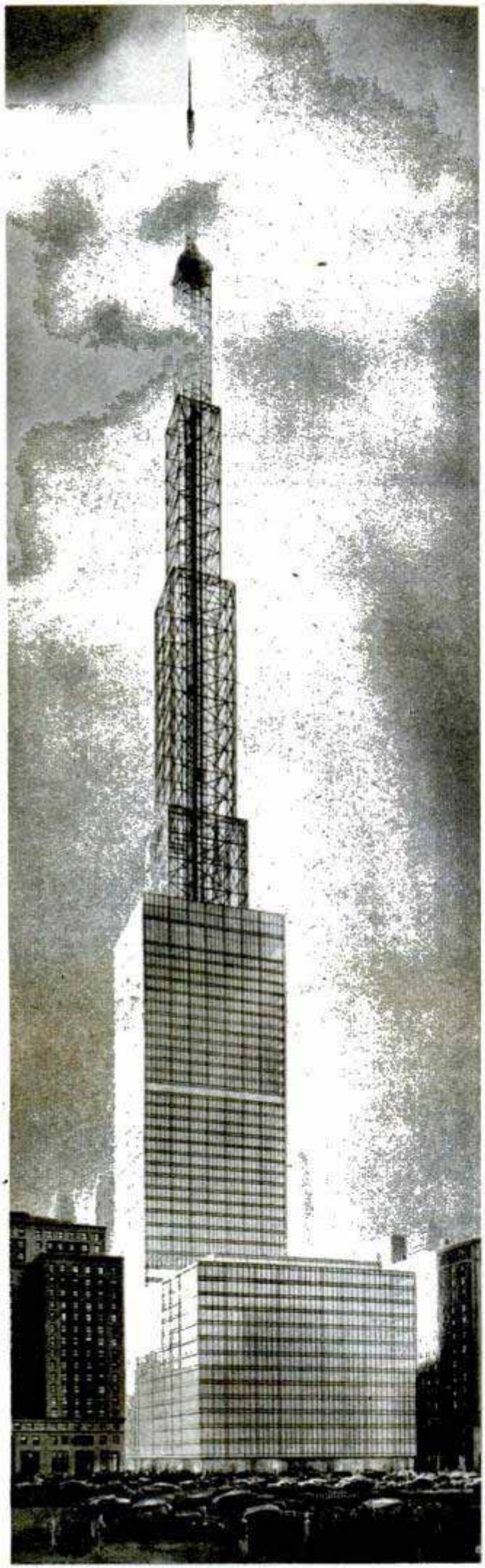
Meantime, at shipyards throughout the country, steelworkers are crawling over our big 33,000-ton Essex-class carriers, rebuilding them from stem to stern. Flight decks are being armored with heavy steel plates. Big new elevators are going into them; below decks, bulkheads are moving outward to enlarge magazines. Huge catapults, heavier arresting gear, larger fuel lines are being installed to service new planes like the AJ-1, which can also deliver an A-bomb, but isn't quite as big as the P2V. The revamped Essex-class carriers will handle the AJ-1 easily, and P2Vs will be able to take off from their new decks. But the latter will have to land at shore bases, or "home in" on the supercarrier after a run.

To bolster the carriers, several extra-large cruisers have been completed since the war's end. New features on them include unique eight-inch turret guns with tremendous power. Shells pop into them in a continuous stream via a machine loader that doubles their rate of fire over hand loading. This, and a three-inch dual-purpose weapon that operates like a machine gun, form a double-barreled development in naval armament.

What about the menace of snorkel subs against "vulnerable" carriers? Today, there are several answers.

Sitting spraddle-legged on the Navy's air station at Quonset Pt., R.I., are the strange, pot-bellied planes of VC-12, a highly secret all-weather squadron almost as big as an

(Continued to page 236)



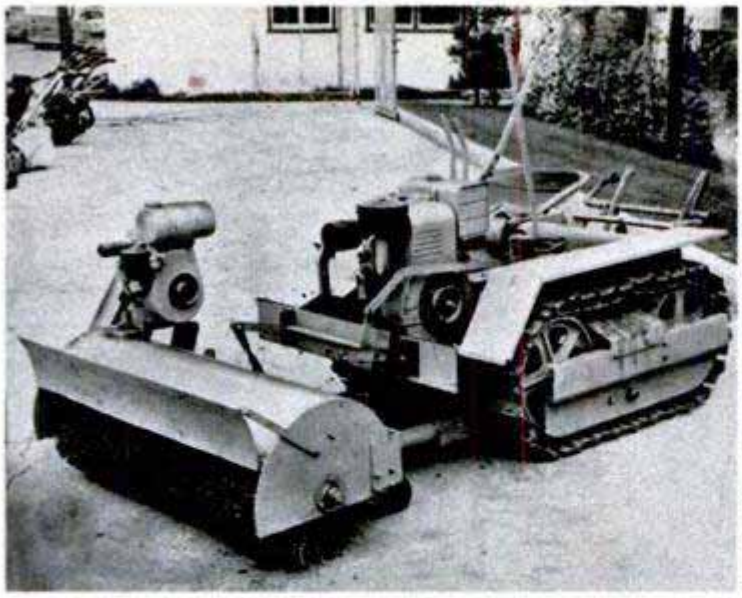
World's Tallest Structure?

Tentative plans are being made to erect the tallest structure in the world on the site of the present Hotel Marguery in New York City. William Zeckendorf, president of the real-estate firm planning the building, says the structure might consist of a 44-story office building topped by a 1000-foot open steel framework which would support an observation tower and a television mast. The top of the antenna would be 1580 feet from the ground—108 feet higher than the antenna now installed atop the Empire State Building. No architectural plans have yet been made, but the real-estate firm has released an artist's sketch which shows the form the building might possibly take.

Wet Blaster Cleans Small Parts

Designed for small shops, a new wet blaster hurls a stream of fine abrasives and water against metal parts to clean them. There are no moving parts in the small machine. The operator holds the workpiece with one gloved hand and manipulates the spray nozzle with the other. Compressed air sucks up the abrasive and fires it from the nozzle. The operator watches his work through a window in the cabinet. The unit can be used to remove scales from metal, deburr machine parts and clean metal surfaces for plating or oil retention.

¶An electronic machine that sorts lemons by color has successfully completed a trial under packing-house conditions.

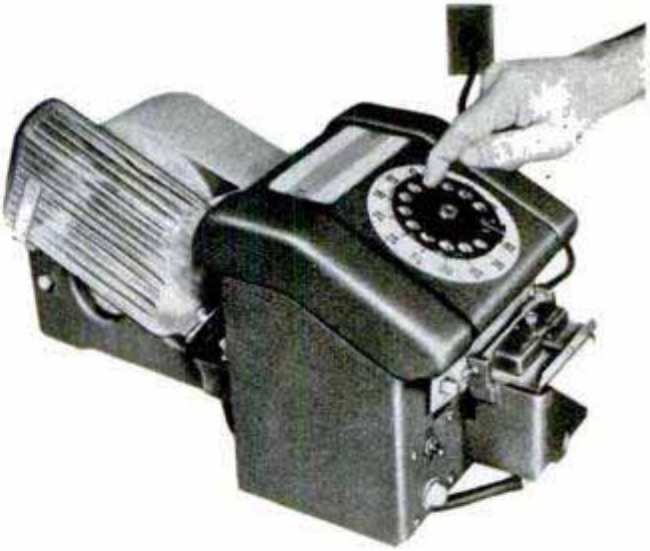


Bucket and Broom for Miniature Tractor

With two new attachments—a bucket and broom—a miniature tractor can do light excavation and cleanup work. The crawler-type tractor is only six feet long and is designed to work in restricted areas where larger tractors can't be maneuvered. The hydraulic bucket has a capacity of six cubic feet and can lift earth or debris from four inches below track level to a maximum height of 34 inches. With the rotary broom, which is driven by an auxiliary two-horsepower motor, the midget tractor can be used to remove snow, clean ramps and docks and sweep out rail cars.

TWO-YEAR-OLD Kathy Manson of New Orleans inspects a marsh buggy used to haul oil-exploration equipment over the Gulf Coast marshlands. The buggy was part of an open workshop put on recently by the department of geology of Tulane University

¶Starting this winter, De Havilland Comet jet airliners will replace piston-engine planes on the London-Rome-Cairo route of the British Overseas Airways Corporation.



Dial-Operated Tape Dispenser

Dialed like a telephone, an automatic gummed-tape dispenser speeds package sealing. You dial the number of inches of tape you need and the electric machine delivers that amount, moistened with warm water and ready to use. The warm water softens the glue, permitting a quicker seal between the tape and carton. The unit has a built-in water heater. The machine takes tapes from one to three inches wide.

If you do not find the information you need in the index on pages 12, 14 and 16, sources of further information are available without charge from *Popular Mechanics*. Write to the Bureau of Information, 200 East Ontario Street, Chicago 11, Illinois

There's no escape from the cold. Each breath deposits more frost on face mask

Perpetual night begins again on Greenland's Ice Cap, 10,000 feet high and 90 degrees below zero, where indomitable Frenchmen pursue their quest for scientific lore. Theirs is the . . .

COLDEST LIFE ON EARTH

By Clifford B. Hicks

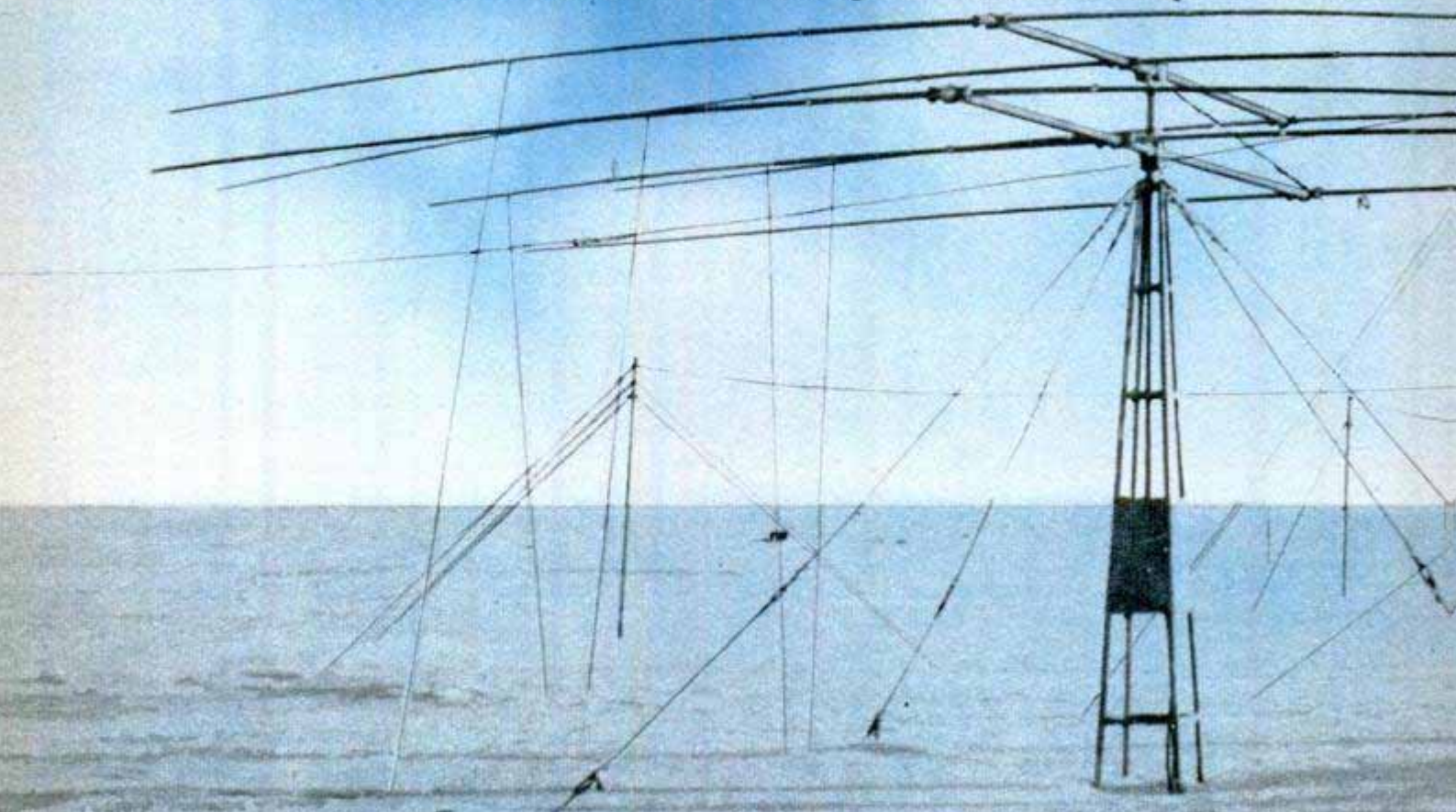
Rapho-Guillumette pictures

THE VAST INTERIOR of Greenland, known to be colder than the North Pole itself, is covered by the Ice Cap, the world's largest glacier, which blankets five sixths of the island with an icy mantle 8000 feet thick.

Scientists have long believed this huge cake of supercooled ice has a profound effect on the weather of the world. Now, for 3½ years, a small band of intrepid, bearded Frenchmen has been confirming the weathermen's theories. They have literally lived inside the vast glacier, crawling stiffly from their ice-walled caves to send up weather balloons and transmit weather reports. It's not unusual for the thermometer to slide down to a frigid 86 degrees below zero. The men have the coldest job in the world, and they've stuck at it through the midnight sun of summer and the everlasting darkness of winter.

The project is called the French Polar Research Expedition, and its leader, Paul E. Victor, is a modern example of a special breed of men—the arctic explorers, the Pearys, Amundsens and Byrds, who have left their footsteps across the snow-covered wastes of the world.

At the age of 25 Victor organized his first expedition to Greenland, and in 1936 he managed to cross the island's Ice Cap. During the war Victor came to the United States where he was commissioned in the Air Force, doing intelligence work in the arctic areas. While in the service he helped develop the current technique of arctic



Map shows site of Ice Cap station. Right, it takes men and machines 48 hours to dig out after six-day blizzard

rescues by parachute, used by the Air Force.

But after the war Greenland beckoned again, and Victor became haunted by the idea of establishing a scientific-research station squarely in the middle of the great Ice Cap.

With French-government backing and the permission of Greenland, Victor laid his plans to conquer the glacier. He recruited a band of scientists representing various fields, a group well-balanced to obtain the information set down as the goal of the expedition: Accurate measurements of the Ice Cap itself; studies in glaciology, gravity and atmospheric physics, and climate and weather information. In 1948 a preliminary expedition set sail from France to prepare the ground for the main expedition the following year.

On June 1 the ship carrying the preliminary expedition dropped anchor in a fjord on the west coast of the island. The 25 men of the expedition and their 60 tons of equipment were deposited on the bleak shore, and the scientists immediately set out for the heart of the Ice Cap. To transport the expedition across the glacier, Victor had five war-surplus weasels—Jeep-type vehicles with endless tracks — and 15 duralumin sleds. Three of the sleds were outfitted as permanent laboratories for the scientists.

Plane bearing supplies swoops low over the station's antennas. Food and fuel are dropped by parachute

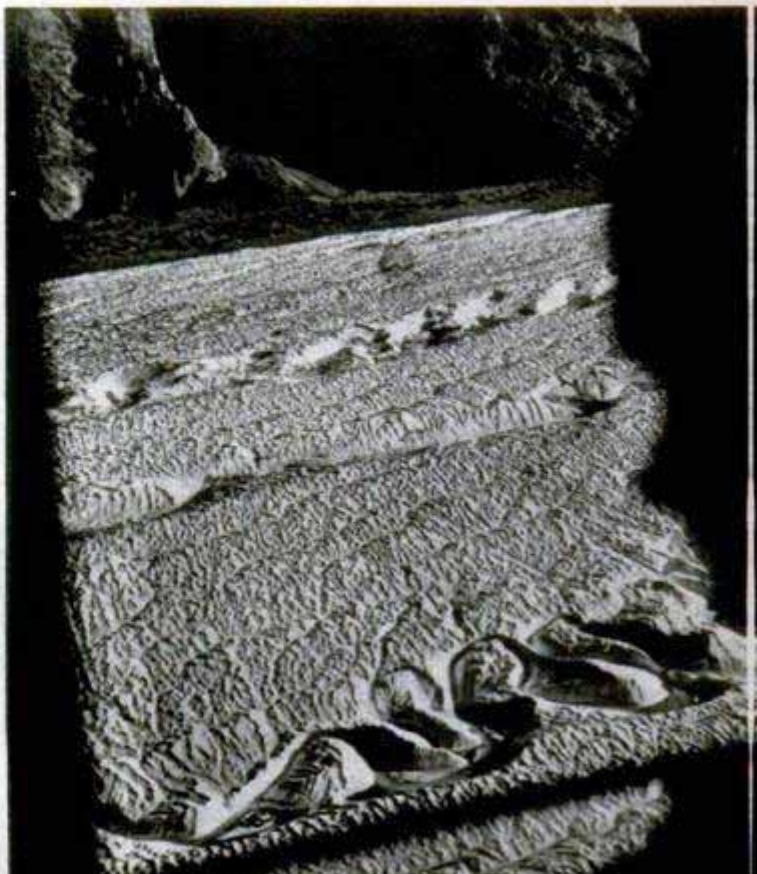
Stove exploded while scientists slept, burning a workshop and threatening the entire station with disaster

Other equipment deposited on the desolate beach included such diversified items as 5000 gallons of gasoline, three winches, 12,000 feet of metal cable of various diameters, radio transmitters, tools, repair sheds and spare parts. While this equipment was being stacked near the beach, a reconnaissance party consisting of two members of the expedition and five Eskimos started inland to scout out a trail to the top of the Ice Cap. This group first marked off a road to the bottom of the cliff which rose sharply toward the Cap.

To surmount the cliff, Victor had previously prepared a cableway in France. Now, at the site, detailed measurements were

Though they literally live inside the world's largest glacier, men celebrate a birthday, complete with cake

Desert of ice: aerial photo shows treacherous glacier, slashed by ice valleys, which expedition conquered



made and radioed to France where the cableway manufacturer made necessary calculations and transmitted back the instructions for setting up the lift. Installed, the cableway was 2500 feet long and made a vertical ascension of 700 feet. All the gear was lifted in loads of 1000 to 1500 pounds.

Then the group carried, pushed, pulled and slid the equipment the remaining three miles across treacherous terrain to the top of the Ice Cap, where another camp was set up. Soon they were ready to plunge across the glacier itself. For weeks the party struggled inland. Weasels broke down, glacial valleys cut everywhere in front of the explorers. At last they reached their goal well into the heart of the glacier, where they stored their equipment and returned once more to the beach, then by boat to France where they planned the main expedition for the following year.

Late in May of 1949 a ship deposited Victor and his men once again on the western shore. By successive stages, setting up permanent storage camps along the way, the party struggled inland, reached the equipment they had cached the year before, and managed to move 254 miles farther inland to the site of the central Ice Cap station.

Though it was midsummer, the temperature dipped frequently to 40 below and seldom climbed above zero. Patiently, with picks and other tools, the scientists chipped away the ice, digging the entire station into the great Ice Cap. They erected a prefabricated house beneath the surface and installed various laboratories, powerhouses and storerooms.

During the summer an airplane made 13

Though observation tower is only a few yards away, there's a rope to guide scientists in darkness of winter

Below left, member of the expedition operates an instrument for measuring thickness of the ice crust

Below, in the ice beneath the surface of the glacier, scientists carved storerooms for their fuel and food

In the fall most members of the expedition start the hazardous trip to the sea, their packs filled with scientific information about Greenland's Ice Cap

flights from Iceland to parachute an additional 70 tons of equipment, fuel and food to the research station. Then, late in August, the main expedition departed, leaving eight scientists to spend the lonely winter on the heart of the Ice Cap, 9900 feet above sea level and 250 miles from the edge of the glacier.

Each spring, now, a group of men struggles across the Ice Cap to reach the central station. The eight winter-duty men are relieved, and by fall, when the main group departs, another eight have taken up the lonely vigil.

The men live in the insulated house buried in the ice. A system of snow tunnels 330 feet long connects the living quarters and the various laboratories and storerooms. Three generators provide power for the station.

For a few minutes each day the men don 14 layers of clothing and climb up to the surface of the Ice Cap where they make measurements, gather samples and read thermometers and other weather instruments. Balloons are launched daily to carry instruments high in the air for meteorological readings. Within an hour the results are radioed to the outside world, where they are available to all airfields north of the equator.

It isn't easy to live in this coldest of all lands. It takes three hours just to thaw out a jar of jam for lunch. A single night lasts all winter on the Ice Cap, and though the observation tower of the station is only a few yards from the tunnel entrance, the men have to feel their way along a guide rope or they'll find themselves lost on top

Early in the spring they return to relieve the eight men who have stayed on the Ice Cap all winter. During first days of Greenland's summer the snow melts rapidly and weasels and sleds bog down in the icy rivers

Ship which carried the expedition to Greenland put into many fjords before finding one suitable for landing

of the biggest block of ice in the world. Water? Snow is cut from the walls of the tunnel and melted on a stove.

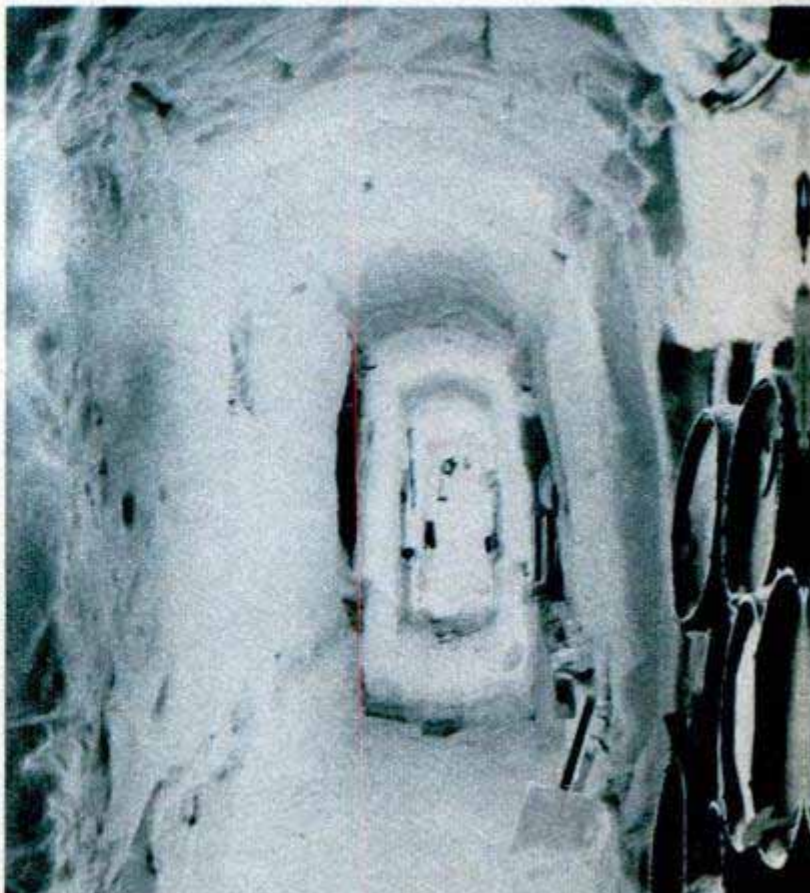
For 10 months the eight Frenchmen make their home in quarters that gradually become encrusted, covered, then buried yards deep in snow. Each time they go outdoors they dig themselves out. Their work of scientific and meteorological research keeps them busy part of each day. When they aren't at work they play the record player and keep up radio contact with the world they haven't seen for many months.

Whenever weather conditions permit they stand by for a parachute drop. Then the plane swoops low over the camp and four tons of food and stores come plummeting down. The damage from the drops has been incredibly low—less than two percent of the material has been destroyed.

The health of each man is carefully checked, and the lack of sunlight is countered by ultraviolet lamps. A toothache? The dentist's chair is a wooden box and the

Sled-mounted trailer bearing scientific gear follows a weasel over the forbidding terrain near the coast

Prefabricated home, storerooms, workrooms and laboratories are connected by system of snow tunnels



Men keep as fit as possible during the long vigil. Ultraviolet lamps counter the lack of sunlight through the black winter

drill is improvised from a windshield wiper.

Other members of the expedition arrive on Greenland in the spring, and spend the summer making measurements and gathering samples. The Ice Cap has been actually examined for the first time, its thickness and weight measured, its movements charted. Until recently the map of Greenland was only a bare outline of its coast. Now, through seismic studies, a great deal is known about the inland areas. Buried under the supercooled ice are the mountains of Greenland.

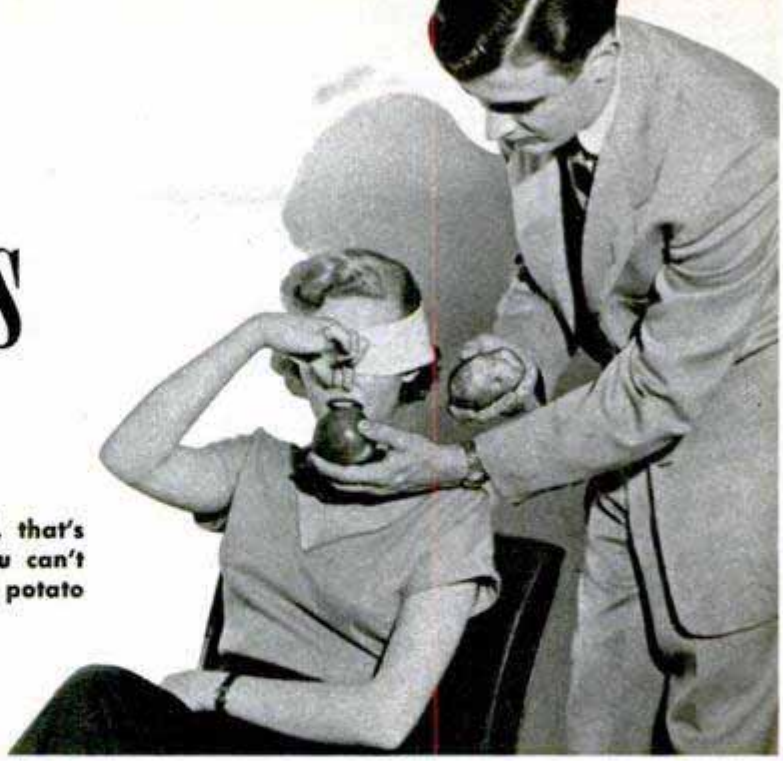
Final scientific conclusions can't be made even on the basis of years of work, but the station's research apparently bears out the thesis of the weathermen: Weather is manufactured above Greenland, and if the patterns can be learned, weather reports for most of the Northern Hemisphere, especially Europe, will be more accurate.

Thanks to Paul Victor and his hardy band of arctic scientists, a foothold has been planted on Greenland's Ice Cap, one of the world's few unexplored areas.

To obtain drinking water, the scientists simply carve big blocks of snow from the tunnel walls and melt them over a stove

Tracks on the weasels frequently broke as expedition crossed the jagged terrain. Ice had to be chipped away to make repairs

TRICK YOUR SENSES



Think your taste is all in the mouth? Well, that's not so. With eyes and nose sealed shut, you can't tell the difference between an apple and raw potato

Below, both ears are important. With eyes bandaged and one ear plugged, it is almost impossible to tell where the sound of a ticking clock is coming from

Below, want to taste "nothing"? An empty zinc spoon on top of your tongue and an empty silver spoon beneath it make a bitter vitriolic taste in the mouth

Below, what does a clean stick taste like? Touch a stick to the base of your tongue and it tastes very bitter because you stimulate the bitter taste buds

Below, touch the same stick to the tongue tip and it tastes sweet. Your sweet taste buds are there. The stick is tasteless and you're tricking your senses

Stilts for Tractors

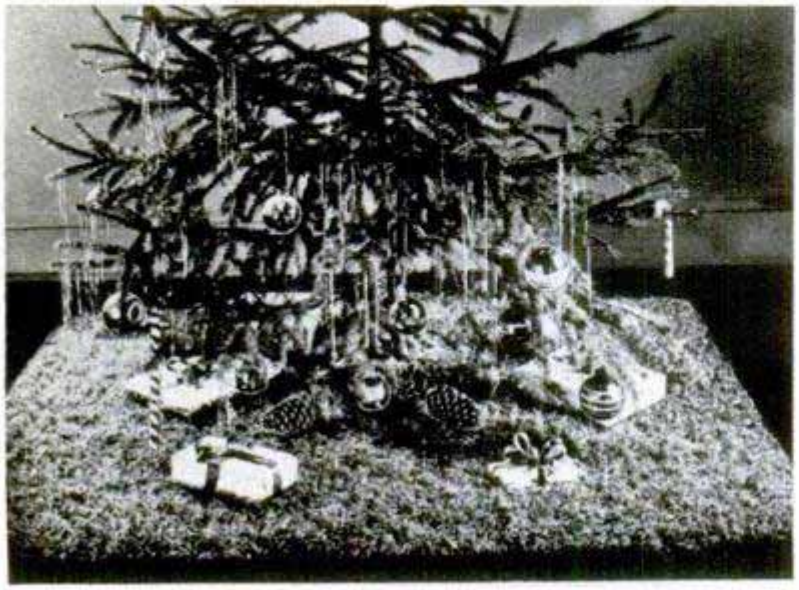
Special stilts boost a tractor high in the air to clear tall crops such as corn and cotton for spraying, dusting and detasseling. The stilts are available in models to fit most standard tractors and are simply bolted to the axle and frame. Power is transmitted by a chain drive. The operation of the tractor remains the same, including the power take-off. The rear-wheel tread can be adjusted to fit most row crops.

Window Boat

Tourists will have unlimited viewing opportunities on the Hari-Maru, Japan's first postwar excursion boat. The 600-ton craft, which accommodates 1000 passengers, has four spacious banks of windows extending up almost from the water line.

Extra-Fine Glass Fiber

"Fine as silk" is coarse when compared with a glass fiber produced for the Navy. This glass fiber, three times finer than any previously produced, is smaller in diameter than the shortest wave length of visible light. One pound of the fiber, if stretched out in a single strand, would make a line 10 million miles long, enough to circle the world 400 times.



Artificial-Grass Mat For Christmas Tree

Increasing the realism of the Christmas tree, a mat of artificial grass provides an attractive background for gifts. It makes the tree appear to be growing in your living room. Flameproof, mothproof and rotproof, the mat will last for many seasons.

¶Stanford University experiments indicate 55,000 pounds of protein for human nourishment could be raised in a year from an acre of algae, compared with 880 pounds from an acre of soybeans.

Sleek new craft carries 1200 square feet of blazing canvas in her sails

CABIN CATAMARAN
the new HAWAIIAN QUEEN

By Richard M. Botts

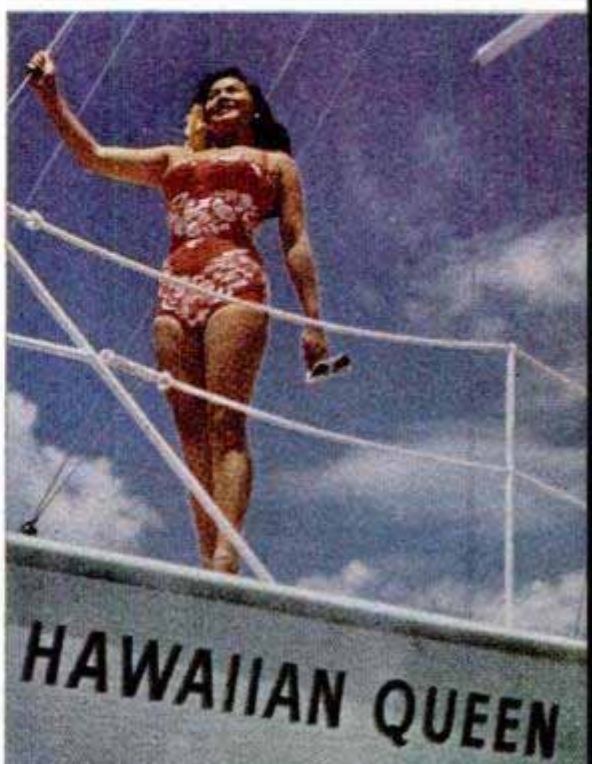
Photos by Howell-Ebert

LAST YEAR, on the Beach at Waikiki, Don the Beachcomber handed me a slick-looking ship model. "Dick, what do you think of it?" he asked.

In my hands was one of the oddest sailing craft I'd ever seen. Its long, smooth form literally cried "speed."

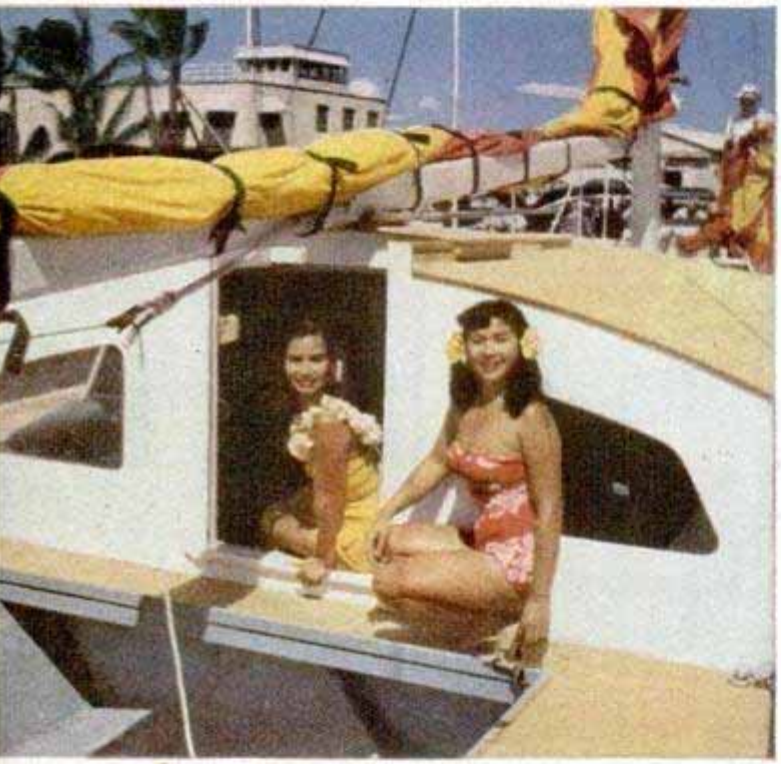
While I was turning the model over, Don pointed to the sleek twin hulls. "She'll be a 'supercatamaran,' Dick, an ocean-going craft capable of speeds up to 25 knots!"

Don's idea of building a supercatamaran came partly from the success of the speedy Hawaiian catamaran,



One of Hawaii's "queens" is among the first passengers on the "cat"

Deck is broad, with plenty of room for tropical sunbaths. Ship can carry 30 passengers and sleep 10



Just one step from the roomy cockpit is the doorway leading to the main compartment. Below, staterooms have built-in bunks and drawers of native koa wood

"Sea Bird" (see *Popular Mechanics,* July 1948), and partly from his own studies of huge ancient Polynesian catamarans at Honolulu's Bishop Museum.

Here he discovered a fact few people know. In the eleventh through fourteenth centuries the Polynesians sailed the Pacific in huge seagoing catamarans capable of speeds over 20 knots. These ships ran from 60 to 120 feet in length and carried as many as 60 men, women and children, their dogs, fowl and household items. As food and water were their main problems, the crew was specially trained to get by on very little food and water for many weeks at a time. Food was cooked on a fire built on a bed of sand in the middle housing platform.

"If the oldtime Polynesians could build fast seagoing catamarans successfully, why couldn't we?" reasoned Don. "We decided to build a modern supercatamaran entailing all the comforts of home—radio, lavatories, shower, galley and staterooms—and yet capable of tremendous speed when under full sail."

To build such a craft, Don teamed up with Francis "Skip" Creger, a man with a flair for designing, building and sailing ships. Skip not only designed the craft according to Don's ideas but in a year's time built her with very little help at a cost of $25,000. Skip estimates roughly it would cost $50,000 to have the vessel built professionally.

Not long ago the 50-foot Hawaiian Queen was launched amid ancient and modern ceremonies. In ancient manner, a Hawaiian *kahuna* (priest) gave a Polynesian blessing and sprinkled some salt on the bow. In modern manner, the wife of world-famous Duke Kahanamoku broke the traditional coconut across the ship's bow. The Hawaiian Queen was ready for sea!

A few days later I boarded the Hawaiian Queen to get a firsthand report on the world's largest and fastest catamaran.

At Waikiki we watched, fascinated, as Skip Creger slipped the Hawaiian Queen's 8½ tons nicely over the reef and slid silently up to shore. Despite its size and weight, the catamaran draws just over three feet of water. The shallow draft, plus the fact that neither keel nor centerboard is used, makes the Queen an ideal craft for shallow-water operations as well as running up on a beach. For added protection each hull has a metal bottom 30 feet long and 15 inches deep.

Once we were aboard, Skip turned her bow and headed out to sea. The Hawaiian Queen, light for its size, does not plow through the waves as a heavier ship would, but rides gently up and over—just like a cork.

One of the first things we noted about the Queen was the lack of loose gear generally

Ocean-going Hawaiian Queen probably will make 25 knots in good winds, has already been clocked at 20 knots

found on a ship's deck. "The decks are wide and spacious enough to dance on," Don points out. He estimates the ship can easily carry 30 passengers and has sleeping space for 10.

She carries 1200 square feet of red-and-yellow striped sails on a 63-foot mast. Sailing the huge ship is a breeze. "She can be sailed easily by two men," Skip told us, "although she would need about seven to handle her properly in a race."

The Hawaiian Queen is built mostly of ¾-inch-plywood sheathing, with mast and frames of spruce. Over 80,000 brass and bronze screws were used to fit the vessel together.

The ship is divided by five main bulkheads, with the fore and aft crash bulkheads watertight. These are three inches thick with additional steel bracing across the wing section, or between the pontoons in the wing area.

"She is put together like an airplane," Skip says, "light in weight, yet very strong."

The hulls are curved to offset any leeway that might ordinarily occur. Thus the ship needs no keel or centerboard. The craft heels very little because of its 18-foot beam and its double hulls. The lower portion of each hull is divided into three compartments which can be flooded with as much as 2000 pounds of sea water for ballast. A pumping unit can shift the water into and out of any of these compartments.

As we picked up speed and rounded

Colorful catamaran, in a race with a conventional sailing craft, heels very little and handles easily

Diamond Head, Skip and Don began to point out some of the unusual facts about the craft. First, there are no engines. Engines in the stern of each hull were planned at first; now both boys seem happy none was installed. "She's so easy to handle and responds so quickly that an engine would not only be useless but would add weight," they say.

To handle their lighting system, pumps and running water, machinery was built into the forward and after part of the ship. For instance, just behind the cockpit is a four-kilowatt generator which is used for the electrical system throughout the vessel. Right next to it are the ballast tanks and bilge pumps. Batteries, too, are located in this area, as well as an 80-gallon water tank for the fresh-water system. This is all found in the stern of the ship in spaces that would otherwise be too small for anything else.

Up in the bow are two more water tanks, each holding 100 gallons, which supply the forward showers, washbasin and head. In the bow also is a 38-gallon gasoline-supply tank for the stern generator. The gas supply is placed forward in the generator area in

Helmsman sits in an open-air cockpit. With the wheel he controls two rudders, one in each of the hulls

Striped sail can be handled with ease by two men, though normally the Queen carries a crew of seven

case of fire. All machinery areas are painted with fireproof paint.

The cockpit is large, self-bailing and open air. A normal "wheeled" helm in the open cockpit is connected to rudders in each hull. Two rudders must be used so the vessel can be controlled at high speed, should one hull come out of the water.

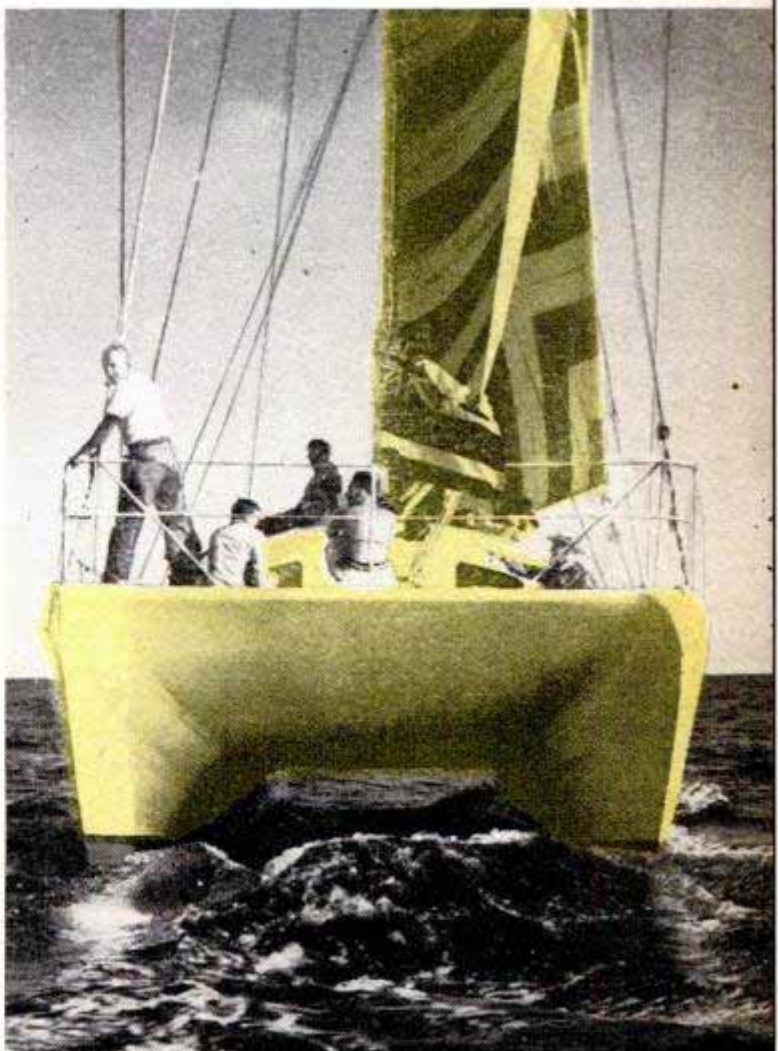
At this point we were leaving Diamond Head behind and the craft seemed to be almost flying through space—all we could hear was the bow cutting water. We estimated we were doing 19½ knots. A few minutes later Don showed us below.

A short step below the roomy cockpit is a "doghouse," built in the center of the ship. The doghouse contains settee-type bunks, navigation and radio room, and large permanent Plexiglas windows. The radio room has all the latest aids to navigation: two-way transmitters, radio-direction-finder, radio telephone and even loran—the latest navigational aid. All told, the radio equipment cost about $5000—a pretty sum in any ship's language.

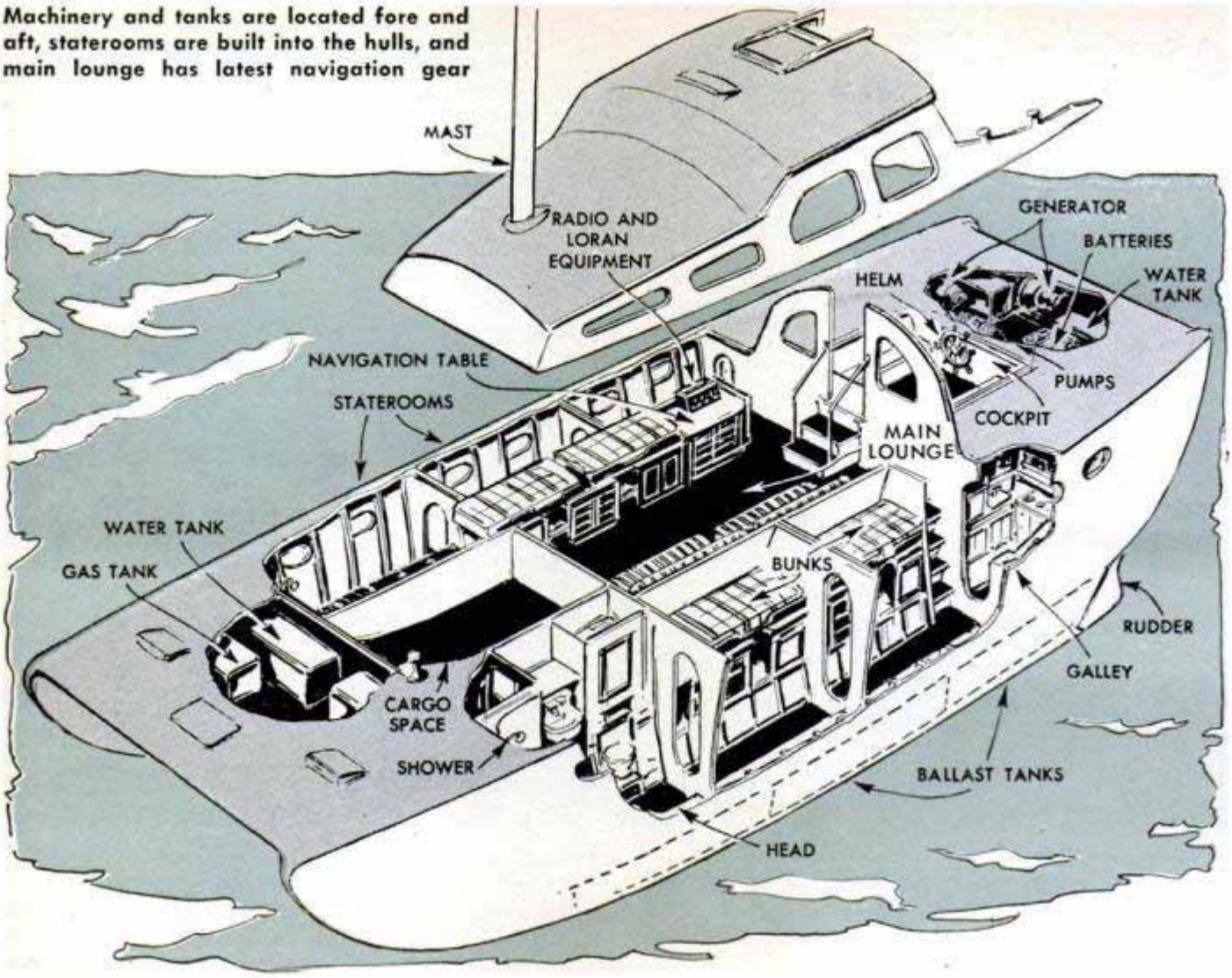
On both the port and starboard sides of the after end of the doghouse is a companionway that leads to the living quarters below. Two sets of stairs are necessary as the hulls are not accessible below and this is the only method of reaching either hull. If you want to go from the galley, which is on the port side, to one of the cabins on the starboard side you climb out of the port hull into the doghouse and then down the opposite stairs into the starboard hull.

Craft is launched with colorful Polynesian ceremony. She's built of plywood sheathing and rides the waves like a cork, drawing less than 3½ feet fully loaded

Stern view shows how the craft "rides on air." Twin hulls give her stability without keels or centerboard



Machinery and tanks are located fore and aft, staterooms are built into the hulls, and main lounge has latest navigation gear



Dropping down through the port companionway, Don took us through the living spaces. Each cabin has two permanent Plexiglas portholes. "We use a blower system for ventilation in each cabin and a suction system in head and galley," Don explained. He led us into the galley which is in the stern of the port section. Don himself designed the galley, putting his many years of restaurant experience into planning the small space. A four-cubic-foot refrigerator with a completely sealed 110-volt system is used. The four-burner stove and oven use natural gas supplied from a gas unit on deck.

Just forward of the galley are two staterooms with built-in bunks and drawers made out of Hawaiian koa wood.

Beyond these two rooms is an ultramodern bathroom containing shower, washbasin and toilet. Shower water drains into ballast tanks below and can be pumped when wished. All other waste water drains through the side of the vessel. Climbing back to the main lounge, we dropped down into the starboard hull. Here are three other staterooms and a lavatory.

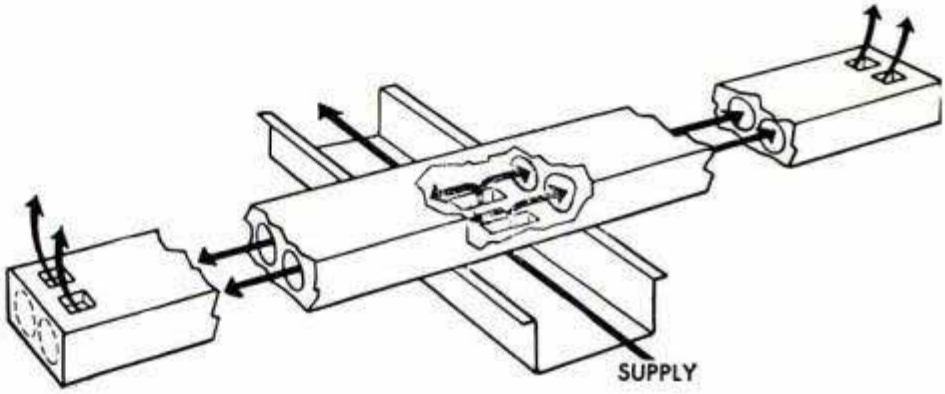
When we came up on deck, Skip had already brought the Hawaiian Queen about and was heading back to Waikiki.

Don himself summed it up very nicely as we stepped ashore at Waikiki: "Those who love boats haven't enjoyed sailing completely until they've sailed a 'cat.' They sail easily, respond quickly, 'out point' any other type sailing craft, are fast to windward and fast to come about. Sea-going catamarans are the coming thing."

Chart room contains special radio and loran equipment. Queen is prepared for long-distance voyages

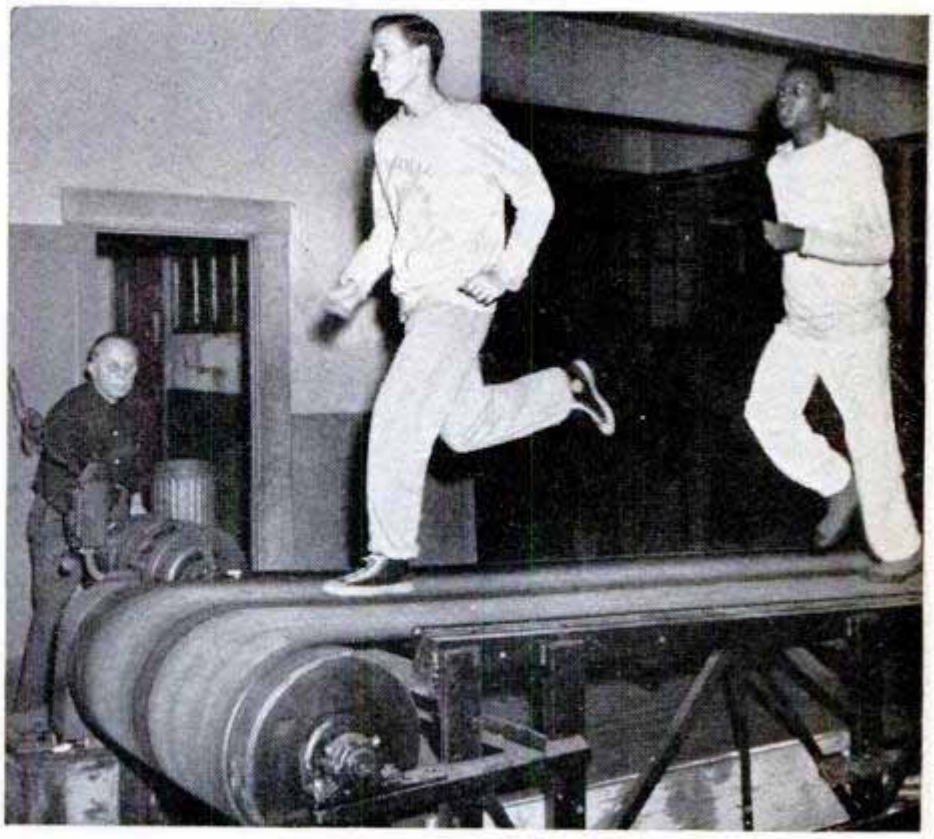
Combination Radiant and Forced-Air Heating System

Advantages of both radiant heating and the conventional forced-air type are combined in a new warm-air split system. The air is circulated from a furnace near the center of the house through a three-sided duct fastened to the basement ceiling. It moves upward from the duct through holes in the underside of a flooring made of hollow-concrete slabs, flowing both ways to the ends of the slabs. After warming the floors, the air enters the rooms through adjustable baseboard grilles or slots, blanketing the window areas and eliminating cold drafts. It returns to the furnace through a centrally located grille. An expected use of the system is in solar-type homes, where closed-system radiant-panel heating has been limited by a slow response to rapid temperature changes. The concrete slabs may be used for ceilings, too.



Homemade Treadmill Means Practice—Rain or Shine

Bad weather never halts track practice at Cincinnati's Central Vocational high school. On rainy days the runners grind out yardage indoors on a homemade treadmill that coach Art Reisner can regulate to demand any pace of them from a slow trot to a fast sprint.

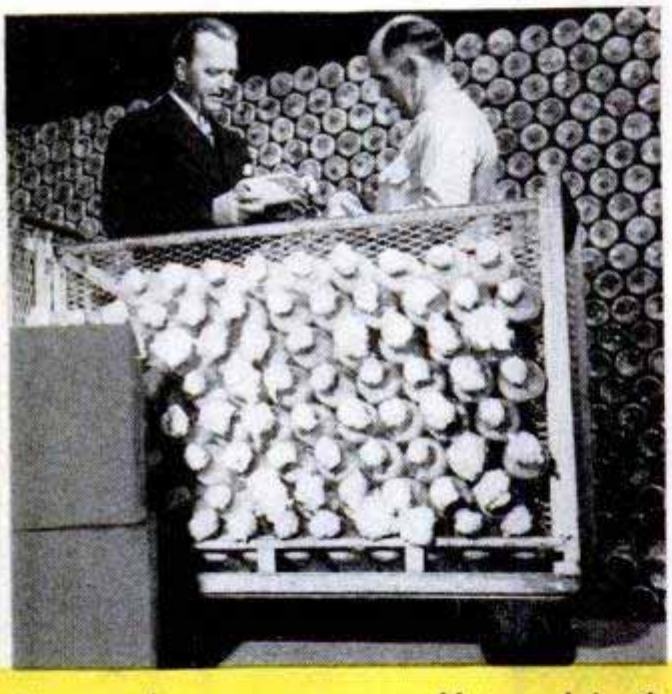


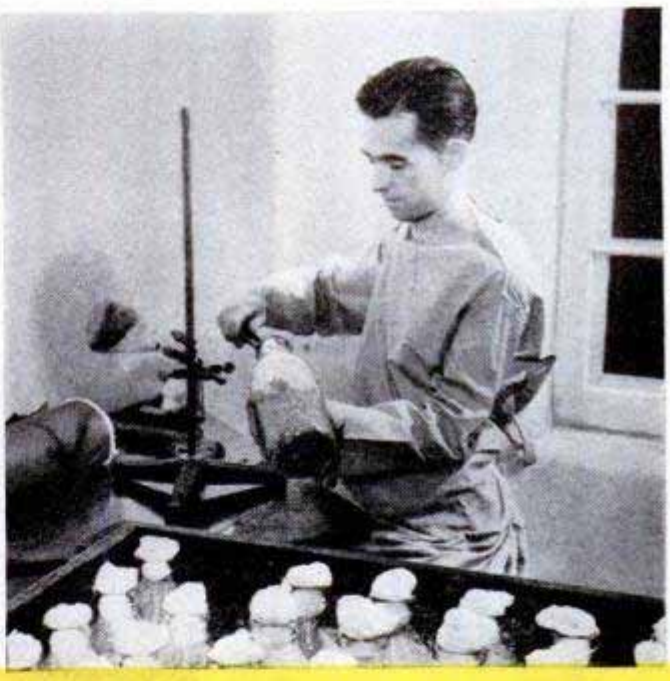
"Bubble" Concrete

Air makes up 45 percent of a lightweight concrete in which bubbles replace the sand. An aerating agent in the mix causes a foaming action, producing the air cells. Still experimental, the concrete was developed by the National Bureau of Standards.

Unmatched in flavor, the mushroom has delighted epicures for centuries

Harvest of the





Above, mushroom spawn, comparable to seeds in other plants, is grown inside sterilized bottles. Below, machine-washing of "buttons," best part of the plant

Above, mushrooms are born in the lab. Incubated in glass tubes, plant cuttings develop spawn. Below, stems and pieces are being inspected before canning

He may look like a coal miner, but he's not. He is harvesting mushrooms

Darkroom

Not select enough to be sold as buttons, these tops are washed and fed into the machine at left which cuts them into slices prior to the canning operation

Mushrooms are carried from one machine to another by conveyors. Sorting is done, as here, while they float in tanks. These are buttons of finest quality

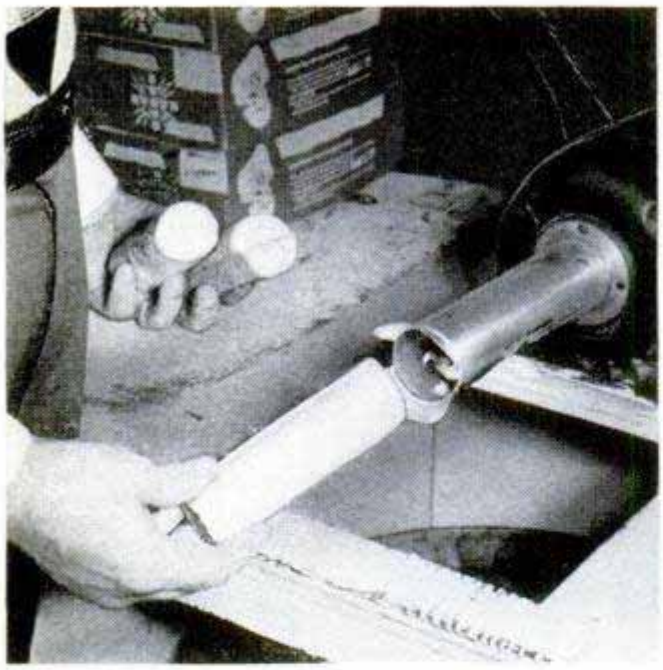
MOST FARMERS have a bronzed, healthy look resulting from hours of work in the sun, but not mushroom farmers. They do their work in the dark. Their crop, mushrooms, is a plant of darkness, growing best when no light is present.

The mushroom is one of the simplest forms of plant life. It lives on decaying vegetation. Having no chlorophyll, the pale, fragile plant cannot make its own food as green plants do. But, weak as it looks, the mushroom is a fast-maturing plant. Six weeks after the spawn (as its seeds are called) have been set out, the plant is ready for harvest.

One of the world's largest mushroom-growing establishments is the Keystone Mushroom Company near Philadelphia. In dark, gloomy buildings, racks and racks of steaming compost produce bushels of the primitive plants.

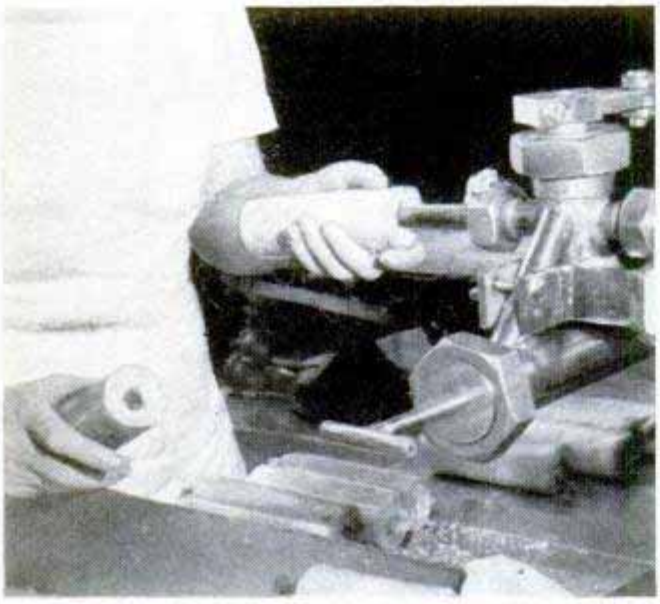
The beds produce in "flushes"—with almost all of each crop coming up at the same time. After the first flush, a few latecomers straggle up and then several days elapse with no apparent growth. Suddenly, another flush breaks through. There are four such flushes in quick succession. Thereafter, although the beds continue to produce, they do so more slowly.

Factory-Made Sandwiches

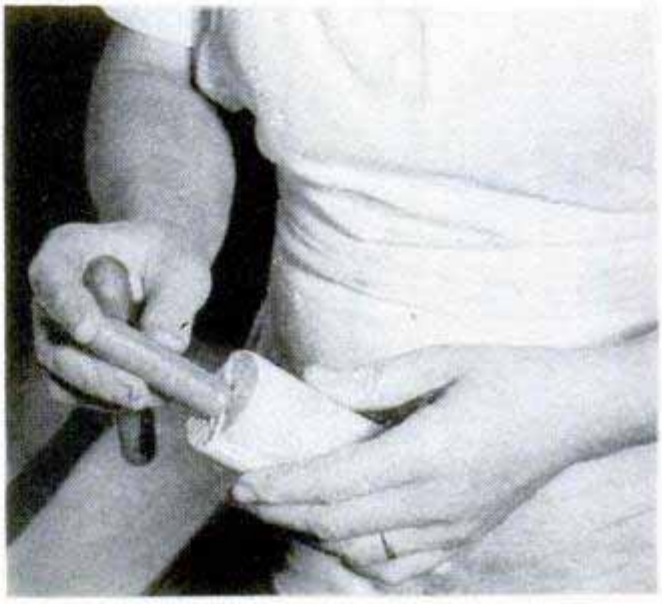


When the rolls come from the oven they are solid. The cavity for the filling is drilled by an auger

THERE'S almost no limit to what a cylindrical bun can become in this streamlined age. Filled with a wiener, it's a hot dog. Ground-beef filling makes it a hamburger sandwich. Stuffed with pecan mix, it becomes a pecan roll or with pie mix, a pie. The filling is done in a modern factory that turns out thousands of the versatile sandwiches daily. After they've been stuffed, the buns are wrapped in a cellulose envelope for delivery to stores, restaurants or amusement parks. When it's time to eat, the roll, wrapper and all, is slipped into a special toasting machine that quickly heats the roll and its precooked mix. Housewives find them handy, too. A supply can be kept in the refrigerator and when a snack is needed, it takes only a few minutes to have them ready for the guests.



Pneumatically operated, this machine forces a precooked meat mix into the cavity to make a sandwich



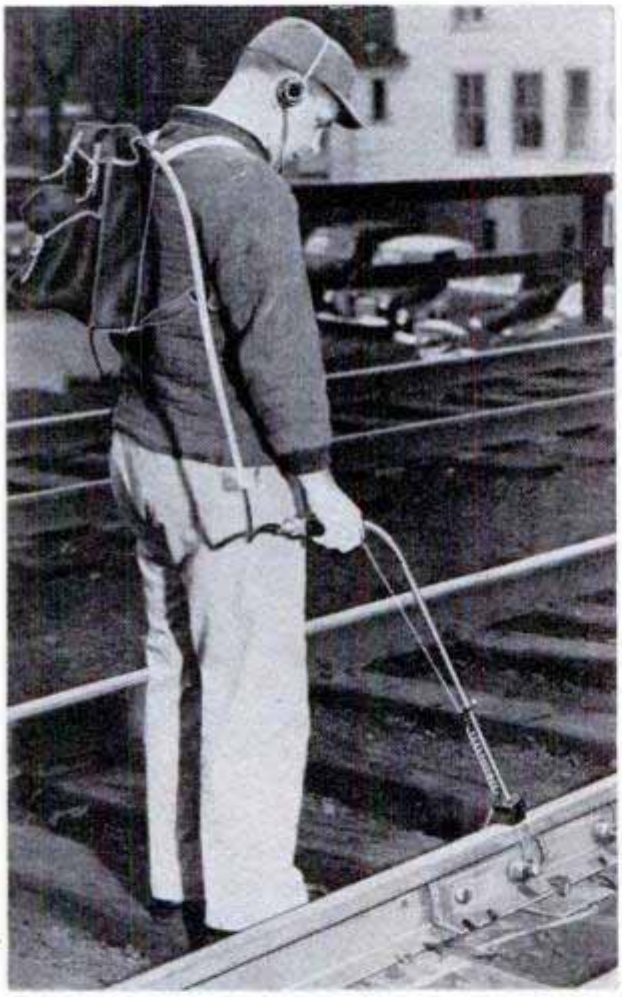
Wieners are inserted in the cylindrical rolls by a hand operation. Mustard is injected into the bun also

For the home or small shop, this one-roll toaster is used. It heats the wrapped sandwich automatically

When volume is needed in a hurry, this and larger models are available. The rolls rotate as they heat

Automatic Top

You can leave your convertible with the top down and have no worries about rain when it is equipped with an automatic rain cell invented by Jimmy Long of Miami, Fla. About the size of a shoe-polish can, the control is mounted on any flat surface of the car. The first drop of water on the screen-covered cell starts the top-lifting mechanism. It can be used on any convertible that has a power-driven top.



Sound Checks Rails

High-frequency sound waves are being used to check railroad rails and switches for metal flaws. The detecting instrument is a small crystal vibrator mounted on the end of a handle. The operator wears a battery power pack and earphones. High-frequency waves from the crystal are transmitted into the top of the rail. As long as no defect exists, the operator hears a high-pitched signal, but when a flaw is present there is a definite change in pitch.

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Detroit Listening Post

By Siler Freeman

JUST as research and experience have established the high-compression V-8 in the forefront of power plants for automobiles, so have constant experimentation and improvement shown the trend in automatic transmissions toward the torque converter.

Charles A. Chayne, vice-president in charge of engineering for General Motors, sees the torque converter eventually winning out over the Hydra-Matic or planetary-gear transmission. Chayne might be a trifle prejudiced because of his previous association with Buick as chief engineer.

While with Buick, Chayne helped design and bring into production that division's Dynaflow transmission. But, as head of GM's vast engineering section, which works on various mechanical devices and improvements for all divisions, he must take a disinterested and scientific view.

In the new GM Technical Center, just outside Detroit, Chayne's section has set up shop and is hard at work. It is the first part of what started as a $25,000,000 project, but will probably cost at least one third that much more.

There, in one of the three buildings under Chayne's jurisdiction, are the various automatic transmissions now on the market. They are spread out, bit by bit, even to the tiny springs and screws, for comparison of their weights, number of parts and prices.

Packard's, Ford's and Studebaker's lie beside the Dynaflow, Powerglide and Hydra-Matic. They have been studied thoroughly and tested on the many machines and instruments which comprise the scientific evaluation of a product.

"Our studies are far from complete," Chayne said, "but there is a slight trend toward the torque converter over the other types. Of course, nothing can be done so long as the machine and tool-shop situation remains as it is."

It is the same for the engine program. Research and development go on but progress is stymied by the defense program. The 300-horsepower engine, which GM developed for Harley Earl's experimental Le Sabre and Buick's XP-300, stands in the center of one of the workshops in the engineering building. It is of aluminum, a metal into which there is considerable delving at the present time, both for engines and bodies.

Whatever the progress has been, it means little to the automobile buyer for a while. Only those engines for which tooling has been completed some time ago are ahead. More are probably being brought right up to the tooling point than will be put in production this year and next. Actual production must await the day when defense machines have cleared the shops.

The tool and die-room barrier will result in 1952 models which will look very much like what is now on the market. The important changes have been deferred and the 1952 cars which will appear this month and next will have only a new grille, fender line or door handle to distinguish them from their predecessors.

However, most of the sales officials look hopefully toward the 1953 models. Hope springs eternal and one of the "Big Three" officials said recently:

"Barring all-out war, we are going to do all the things in 1953 which we had hoped for in the 1952 cars."

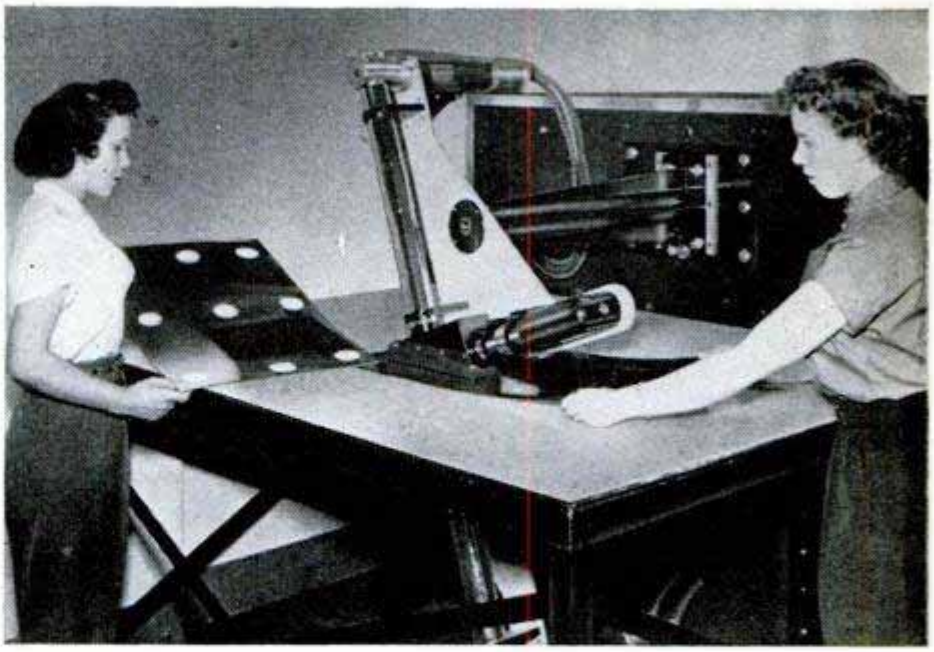
Right now, however, there will be fewer automatic transmissions installed in cars than heretofore. Until the aluminum picture is clear, these devices will be rationed to the customers, especially in the lower-priced field.

The warlike aspect of the peaceful auto plants is becoming more noticeable as the year draws to a close. More and more weapons are taking their place beside cars and trucks.

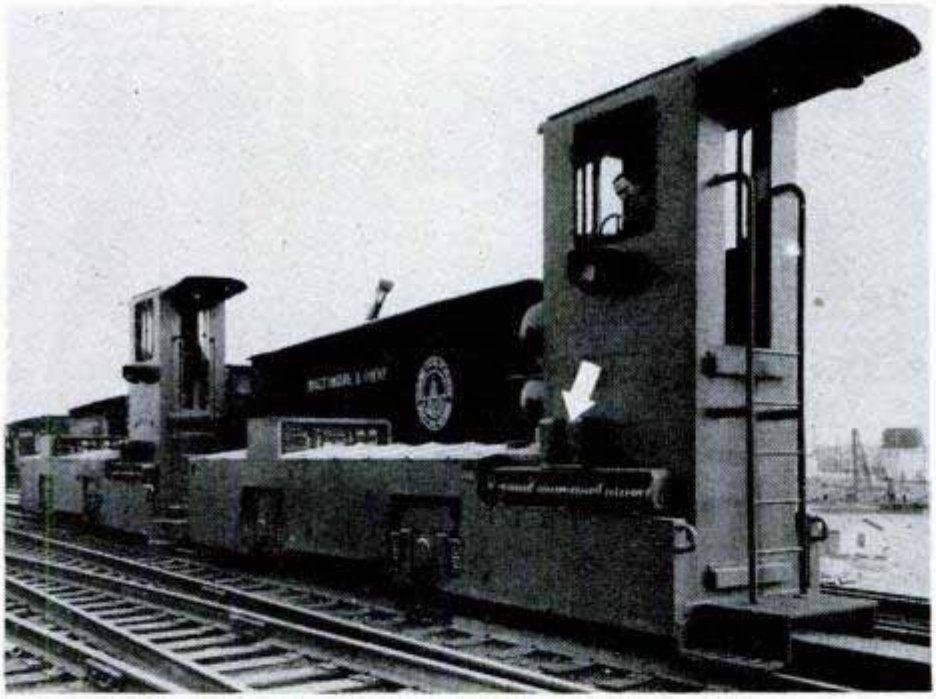
New buildings are going up throughout the Detroit area, designed specifically for jet engines and tanks. In the meantime, where possible, the present plants are taking in work to keep their work forces together until the new assignments begin.

The automobile shortage, which was first used as a sales weapon, may become an actuality before long. Price increases may help keep the market in balance, but nobody knows for how long.

Design Instrument to Save Million Tin Cans Per Year



Geiger counters and X rays have been combined in an instrument which determines the thickness of tin coating on sheet metal. The instrument was developed by U. S. Steel scientists, who estimate that in a single mill it will save enough tin plate annually to manufacture 1,000,000 tin cans. Tin coating on steel formerly was measured by stamping four-inch disks out of a sample sheet. These test sheets became scrap. The new instrument, which eliminates test disks and a resulting loss of tin, consists of two X-ray tubes, one mounted above the test sheet and the other below. The strength of the reflected X-ray beams from the sheet is measured by Geiger counters, and the recorded readings show the thickness of the tin.

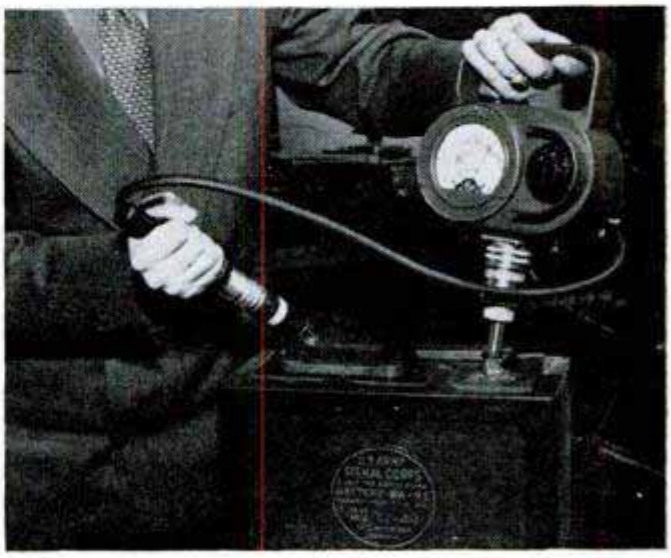


Side-Pushing Locomotives

Pushing from the side instead of from the back, a narrow-gauge locomotive can move two strings of freight cars simultaneously along two different tracks. Pincer-shaped arms, one on each side of the operator's cab, spring out to hook onto the freight cars. The locomotive moves along its own tracks between the standard tracks. Because it runs on separate tracks, the locomotive can move back and forth independent of other traffic.

Battery Tester

With a new electrical instrument the "health" of a storage battery can be checked instantly. Developed by Grenville B. Ellis of the Signal Corps, the instrument tells whether there is enough "juice" to start the engine, at what temperature the battery will freeze, whether the battery is getting too much charge from the generator and whether an extra load is dragging the battery below the danger point. In an automobile, the dial of the instrument could be mounted on the dashboard. In central depots a tester can check hundreds of batteries in a fraction of the time of former instruments.



The OWNERS REPORT

The true test of an automobile begins when the owner takes the wheel. This is another report from owners of cars who answered questionnaires sent by P.M. to 1000 Packard owners

Left, on test trip Clymer stops in New Mexico to interview Robert W. Epps of Jacksonville, Fla. Epps gets 15 m.p.g. at high speed

Below, one of the questionnaires filled out by a Packard owner who likes his car after 5428 miles and says he will buy another

E POPULAR MECHANICS MOTOR SURVEY
CONDUCTED BY FLOYD CLYMER

I am the owner of a 1951 Packard. Model: 200 ☒ 300 ☐ Patrician 400 ☐
I have owned it about 5 months. Speedometer mileage is now 5428

I use only regular gasoline ☐ - I use premium (high test) gasoline ☒ _____

My approximate gas mileage in the city is 12 MPG, in country, 17 MPG
Gas mileage INCREASE by using overdrive is about _____ MPG.

I CHANGE OIL ☐ every 1200 miles; I ADD OIL ☐ NO - one quart every _____ miles.

My car has: Standard Transmission ☐ Overdrive ☐ Ultramatic Drive ☒

How does the car handle on the road? Good
Maneuverability seems to be: Excellent ☒ Average ☐ Unsatisfactory ☐
Acceleration is: Outstanding ☐ Very good ☒ Fair ☐ Poor ☐
Curb and road clearance is: Satisfactory ☒ Too high ☐ Too low ☐

Why did you buy a Packard? Appearance - Performance
Do you like Packard's straight-eight, "L" head engine? yes
What features about the car do you especially like? Visibility, Long life

Do you like the riding qualities? yes ; the length of wheelbase? 122 , the road-visibility over the front end? Good ; the interior and instrument panel? Good
What is your opinion of the body styling? Good - Interior could be improved.
What do you dislike about the car? Rear deck lock - Inside door locks.

Have you ever owned a Packard before? No If so, how many? _____

Would you buy another Packard? Yes ☒ Possibly ☐ No ☐ _____

Do you secure good dealer service? Yes ☒ Fair ☐ No ☐ _____

How would you rate your new Packard? Excellent ☐ Good ☒ Average ☐ Poor ☐

GENERAL INFORMATION

What type of engine would you prefer in your car of the future? In-line ☐ V-type ☒
Cylinders: 6 ☐ 8 ☒ _____ Valves: Side ☒ Overhead ☐ _____
Based on my present experience, I want my next car equipped with: Standard Trans. ☒
Overdrive ☒ Ultramatic Drive ☐ Other type of automatic transmission ☐
Please state reasons: Gas mileage - Saves wear - Smoother
Do you like the new low-pressure, super-cushion tires? yes
Do you carry the recommended pressure? Yes ☐ No ☒ How much more? 26 x 28 lbs.

Please check the answer boxes (☐). Your reply will be held in strict confidence.

Please mail promptly to:

FLOYD CLYMER

My Name: [redacted]
Address: [redacted]

on the PACKARD

Clymer, behind the wheel of test car, has a good word for Ultramatic Drive even in stretches of deep sand

By Floyd Clymer

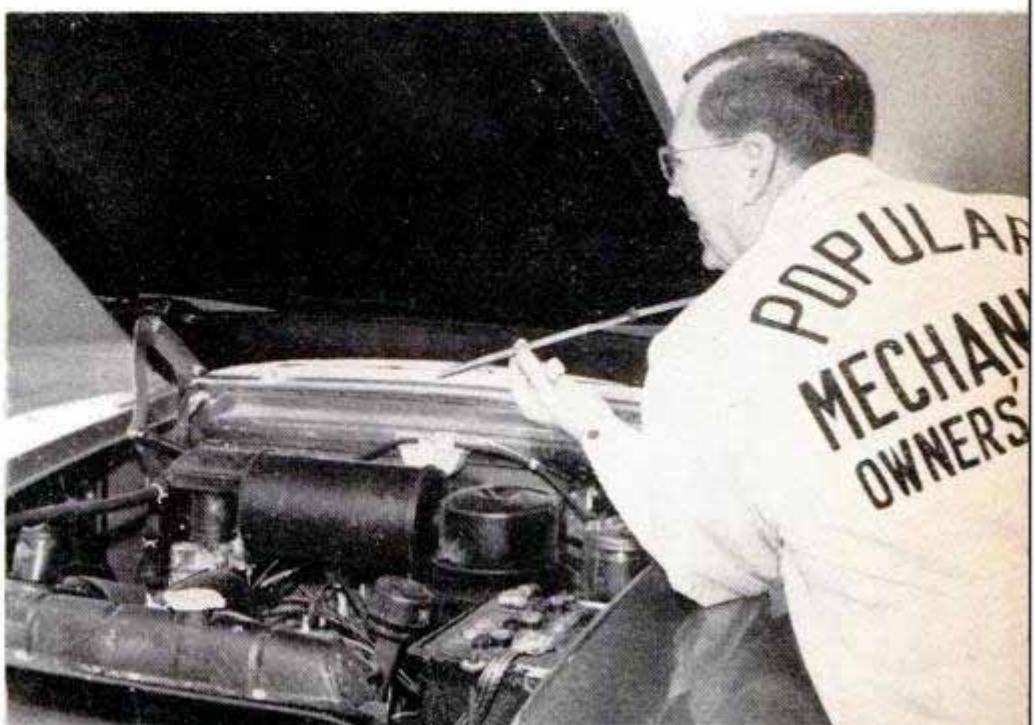
"ASK THE MAN WHO OWNS ONE" has been Packard's famous slogan for many years, and that's exactly what we did to find out what 1000 owners from coast to coast think of their '51-model Packards.

Results of the survey show that pride of ownership is still a strong selling point for Packard, as it has been for four decades. This is specifically indicated by the fact that more Packard owners responded to our request for information than owners of any other make of car.

Expressing his personal opinion about the car in answer to the question, "Why did you buy a Packard?" an owner from Pratt, Kans., put it this way: "Like to drive good cars. . . . I used to drive Pierce-Arrows." A Detroit, Mich., owner had his mind on value and gave as his reason "Good trade-in, and a good car for the price." "Reputation good" was the answer given by a Teaneck, N. J., owner, and a questionnaire from El Paso, Tex., read, "Because I believe it's the best car on the market." A Port Angeles, Wash., reply shared the same opinion: "I feel it is the finest automobile available." And, a High Point, N. C., Packard owner gave his reason for buying the '51 Packard as, "Its good reputation."

A Newburgh, N. Y., woman put it like this: "I love everything about the car except the price. If the car were only $500 less, I'd love it even more."

A Racine, Wis., doctor said his Packard is the cheapest car on upkeep he has ever owned. "I had three V-12s of another make previously," he wrote. "Their upkeep was considerable; the upkeep on the straight-eight Packard is practically nil."



The oil dip stick reveals good news to Packard owners. Clymer reported his test car to be a "miser on oil at all speeds"

Percentages from P. M. Poll

Owners of 200 models	84%
300 models	10%
Patrician 400 models	6%
Average gasoline mileage in country	16.1 m.p.g.

(Owners with overdrive cars reported an average increase of 2.9 m.p.g. in country use)

Average gasoline mileage in city	13.1 m.p.g.
Use premium gas	90%
Use regular gas	10%
Owners who change oil	99%
Average mileage for change of oil	1422
Owners who add oil (and also change periodically)	3%
Average mileage for adding oil	950
Maneuverability excellent	91%
average	9%
unsatisfactory	0
Acceleration outstanding	34%
very good	56%
average	9%
poor	1%
Road clearance satisfactory	94%
too low	6%

Best-Liked Features

Riding qualities	96%
Length of wheelbase	96%
Visibility offered	99%
Interior finish	82%
Straight-8 L-head engine	95%
Body styling in general	92%

(These percentages are based on the answers to direct questions on the questionnaires)

Owners' Rating of Car

Excellent	64%
Good	29%
Average	6%
Poor	1%

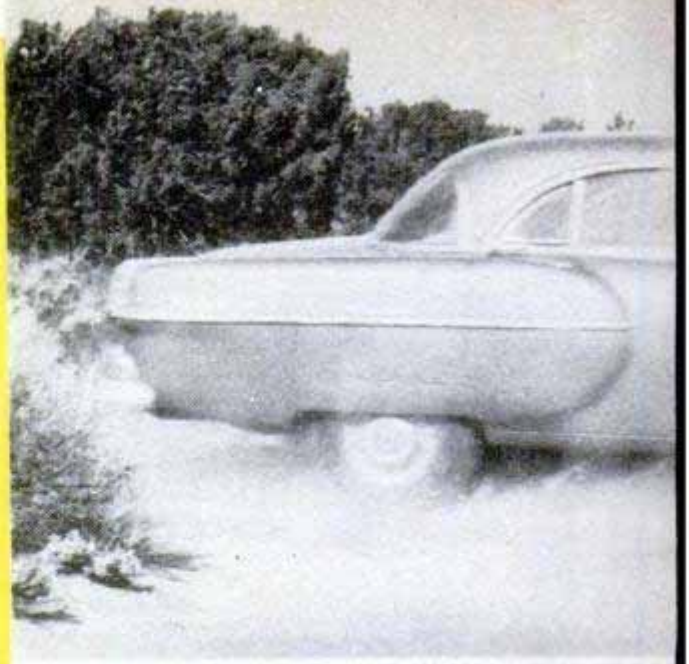
General Information

Prefer in-line engine	64%
Prefer V-type engine	36%
Prefer eight cylinders	98%
Prefer six cylinders	2%
Prefer side-valve arrangement	57%
Prefer overhead-valve system	43%
Prefer automatic transmission	73%
Prefer standard transmission with overdrive	23%
Prefer standard transmission only	4%
Prefer Ultramatic Drive	94%*

*(The above figure means 94% of the 73% preferring automatic transmissions)

Prefer makes other than Ultramatic Drive	6%
Owners who like low-pressure tires	85%
Owners who inflate above recommended pressure	48%
Average lbs. above recommended pressure	3.9 lbs.
Previous Packard owners	33%
Will buy another Packard	68%
Might buy another Packard	29%
Will not buy another Packard	3%
Dealer service good	69%
average	22%
poor	9%

Most frequent objections:
1. Instrument-panel design; 2. body fitting; 3. trunk lock



Clymer drove test car above from the factory in Detroit, via Indianapolis and Pueblo, Colo., to Los Angeles—2861 miles over a variety of roads including side trips into the desert

Below, large folding center armrest on back seat gives loungelike comfort. Ninety-six percent of owners in poll approved Packard's riding qualities; 82 percent liked interior finish

Bottom photo, ash tray and lighter are conveniently located on back of the front seat. There are also two ash trays in front. Both pictures below indicate roominess of the car

ACCELERATION TEST

1951 Packard 300 four-door sedan with Ultramatic Drive

¼ mile from zero	Drive range only	— 21.90 sec.
	Drive and low	— 20.90 sec.
½ mile from zero	Drive range only	— 33.80 sec.
	Drive and low	— 32.60 sec.
0 to 30 m.p.h.	Low range only	— 4.90 sec.
0 to 60 m.p.h.	Drive range only	— 18.10 sec.
	Drive and low	— 17.70 sec.

Clymer says: "Acceleration up to 50 miles an hour is about average for a car of its weight and engine size, but at medium speeds acceleration was quite good and at high speed was a great surprise to me"

The favorable impression made by the 1951 Packard is shown by the fact that 33 percent of the owners replying were previous Packard owners. An amazing 97 percent said they definitely would or might buy another Packard; while an infinitesimal three percent said no more Packards for them. Quite a few said they bought their first Packards this year because the car was "recommended by friends."

A Texas man was frank to say that he bought a Packard because he "could not get delivery on Cadillac." He went on, however, to state: "I now think Packard is the greatest car on the road."

A Madison, Wis., man typified the sentiments of quite a few owners when he said he bought a '51 Packard because "I had driven my 1941 model 296,000 miles satisfactorily." From New Orleans, La., came an echo to this: "I have a 110 Special which was 10 years old in June. Ask the man who owns one."

A Des Moines, Iowa, woman gave the feminine viewpoint when she wrote that her Packard is "luxurious, economical and easy handling for a lady." She particularly liked "the new streamlined look" and thought the '51 body styling is "a very great improvement." From the same city, an enthusiastic owner wrote, "All Packard cars I have ever owned ran about 90,000 to 100,000 miles with no trouble." He had bought six previous Packards.

Speedometer-calibration device used on Packard shows speedometer is a bit off but better than many, reports Clymer

AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA
REPORT OF SPEEDOMETER CALIBRATION

23379 — DATE 8/2/51

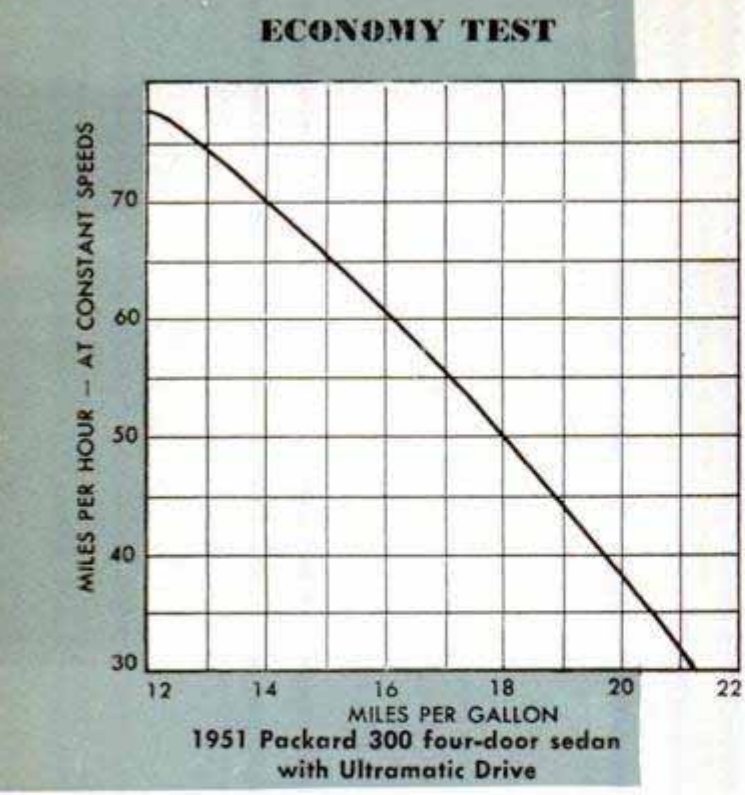
Packard 51 (CAR) — Calif. (LIC. NO.) — 30 (TIRE PRESS.)

SPEEDS REGISTERED BY YOUR SPEEDOMETER	25	30	35	40	45	50	55	60
CALIBRATED SPEED—ACTUAL MILES PER HOUR	24	28	33	37	42	47	51	56

Odometer Registers	Calibrated Actual Miles
100.0 Miles	97.0

SPEED:	20	30	40	50	60
STOPPING DISTANCE, FT.:	42	78	124	175	241

MODERATE SPEED IS AN IMPORTANT FACTOR IN HIGHWAY SAFETY



1951 Packard 300 four-door sedan with Ultramatic Drive

A Winchester, Va., man listed among the features he especially likes, "Excellent vision and riding qualities, body style, large trunk, headroom, excellent paint, good workmanship and car parts that fit well." However, he tempered his praise by stating that he dislikes, "Instrument panel (speedometer especially), front seat sags and is uncomfortable on trips, car rattles, pickup in overdrive on hills is poor, emergency brake should be located at right of steering column. . . . I would prefer an automatic transmission which would shift smoothly and give good gasoline mileage. While I like the overdrive transmission, the region where I travel is too hilly and mountainous for me to enjoy overdrive."

Like every other car in the survey series, Packard drew its share of criticism. A Ft. Wayne, Ind., man said: "The new Packard embraces so many cost-reduction shortcuts that it does not represent a good value. For example, there are no ash trays or armrests in the rear of my four-door sedan. [Packard has eliminated the rear ash trays and armrests in the 200, but they still appear in the 300 and 400.] My windshield creates double vision, the top has come unwelded at door posts and front brakes emit a grinding noise."

Several owners complained that the car's gas tank takes too long and is too difficult to fill. Among these was a Tampa, Fla., man who wrote: "I have five cars and have driven all makes. The 1951 Packard is no improvement except perhaps in looks. It has the old Packard reliability of chassis, but the body, heater and gas tank were changed for the worse."

A West Hartford, Conn., owner said: "I like ample trunk space, but it seems overly so in my Packard 200. However, too much is a better fault than too little. I don't like the idea of the trunk always being locked when closed."

Some other minor faults noted by owners: "Front end is too low when just one person is in the car." — Hoquiam, Wash. "Paint does not appear to have been applied by a journeyman painter."—Shreveport, La. Like many owners of cars with automatic transmissions, a New York City owner said, "The Ultramatic Drive is a gas hog." "The new oil and generator gauges do not indicate anything to the driver."—Mason City, Iowa. "The steering wheel is too close to the seat. . . . Cannot

(Continued to page 264)

"I am not an actor," Mr. Clymer says, "but the expression on my face is supposed to register the fact that I am impressed with Packard's smooth-operating doors and the good lock arrangement"

Although the minimum charge for wrapping is only 20 cents, a masterpiece of gift wrapping can cost 10 dollars

Sidewalk Package-Wrapping Service in Hollywood

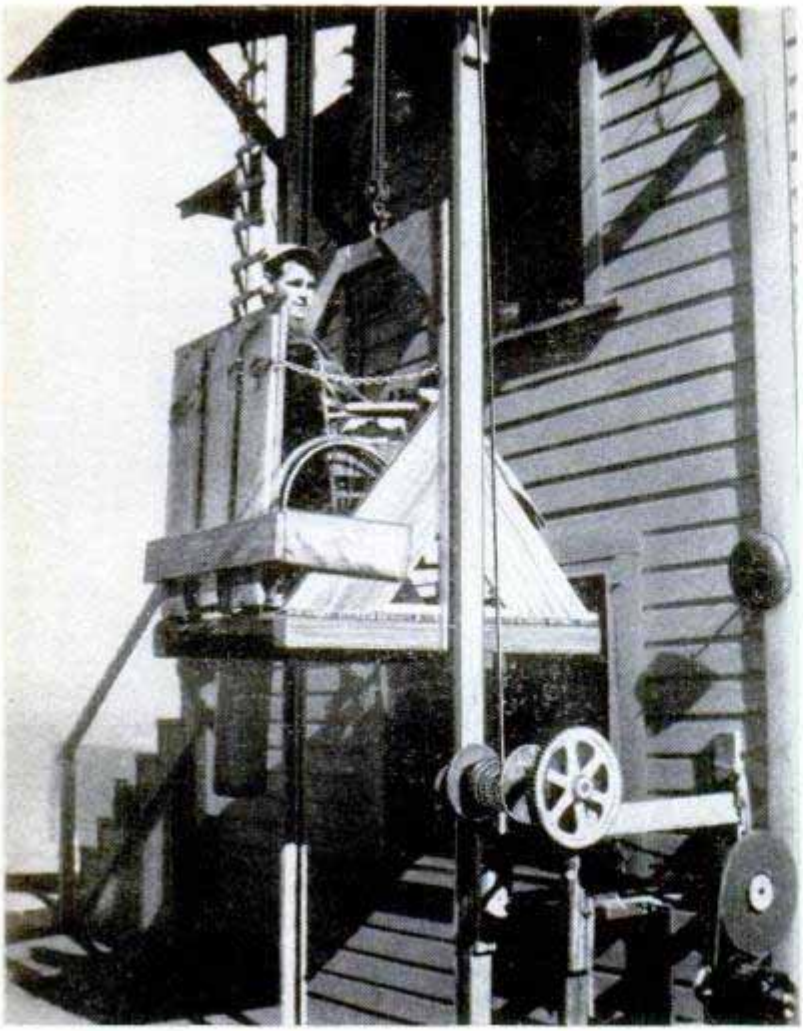
Wrapping packages for the public is big business for Joe Rotell, whose establishment is right across the street from a branch post office in Hollywood. For a fee he will wrap a package in corrugated board and metal straps ready for mailing abroad, or make up a decorative wrapping for a gift that you wish to deliver yourself. A simple wrapping costs 20 cents and the sturdier protective wrapping for a package going overseas is 35 cents, but you can spend as much as 10 dollars for the ornate decorations of a gift package, depending on the materials you select. Rotell's service includes delivering the packages to the post office or having them picked up by express or trucking concerns. In his specially designed building he maintains large stocks of various wrapping papers, corrugated boards, steel strap, ribbon and twine and boxes and cartons. Probably the smallest item Rotell has wrapped was a wedding ring. The largest shipment was a number of aircraft-beacon lights intended for the Aleutians. A quarter of his business comes in during the Christmas season, but even in the slack summer months there's enough demand for his services to keep two or three employees busy. Many neighborhood merchants use Rotell's service.

Tipproof Stand For Christmas Tree

Holding seven quarts of water, a steel Christmas-tree stand not only keeps the tree fresh longer, but also provides a sturdy, nontipping base for trees up to eight feet tall. The water is completely enclosed to reduce evaporation. No tools are needed to set up the tree; a special knob adjusts the stand to any trunk size.

British Rain Was Once Ice

Almost all of England's rain begins to fall as ice, regardless of the time of year, according to Dr. A. W. Brewer, Oxford University meteorologist. Drops of supercooled water at high altitudes freeze and grow rapidly because of the low vapor pressure of ice. Fracturing, they form more particles which also grow until they become large enough to fall. The warm lower air changes them to the rain for which England is famous.



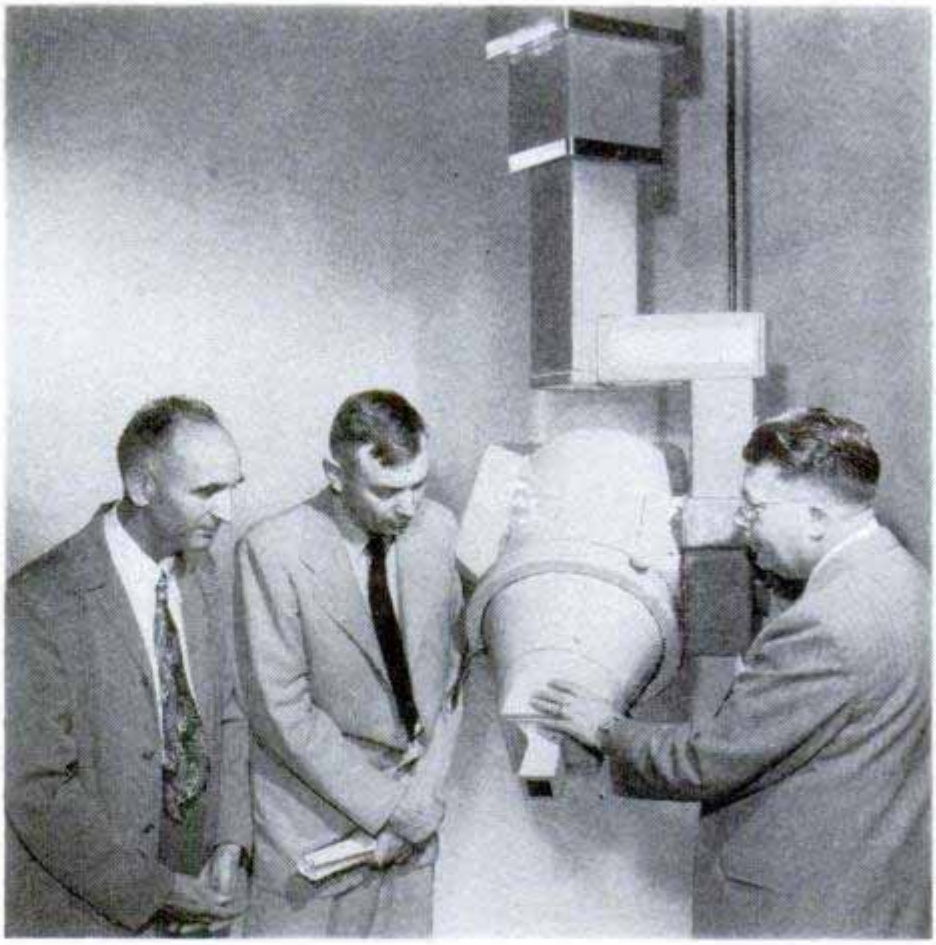
Amputee's Elevator

When Laverl Johnson of Pocatello, Idaho, lost both legs and an arm in an electrical accident upon his return to civilian work, his landlord solved his housing problem by building an outside elevator. The landlord, Lamoni H. Tolman, improvised the elevator using such unrelated items as an old bedspring, an ice-cream can and a few discarded pulleys. Powered by an electric motor, the elevator raises Johnson and his wheelchair to his second-floor apartment.

Alaska Grows Tomatoes

Alaska's short growing season makes tomato-growing difficult, but research at the University of Alaska has discovered ways to make such crops possible. Sun reflectors are set up around each plant to concentrate light and heat. Rows are planted in an east-west direction and the soil is darkened with coal dust to absorb more heat, thus speeding up growth.

Radioactive Cobalt Joins Cancer War



Emitting radiations equivalent to X rays of about 1,200,000 electron volts, a cancer-therapy machine requires only an extremely small quantity of cobalt 60 as its radiation source. The four cobalt wafers, each less than one inch square and 1/8 inch thick, emit radiations equivalent to those of $26,000,000 worth of radium. The new machine, constructed by General Electric, will make it possible to direct the rays over sizable areas from a distance and to reach deep or otherwise inaccessible cancers. The cobalt is encased in a housing made of a tungsten alloy which is denser and therefore less "transparent" to radiation than lead. Radio-cobalt takes 5.3 years to lose half of its effectiveness — the rate at which it is said to "decay" — which is comparatively slow as isotopes go, thus making it well adapted to continuous use without frequent correction of calculations by the radiologist. The Oak Ridge Institute of Nuclear Studies developed the treatment.

Radio Tubes "Pilot" Bomber

Electronic pilots are now flying for the Air Force in the nation's first pilotless-bomber squadron. The new unit is equipped with Martin Matador B-61 pilotless bombers controlled by radio. Instruments in the plane respond to radioed orders to stay on course. The controller, who transmits the orders to the plane, follows it by radar. Where the range of the plane is extremely long, a series of radar and control stations, several hundred miles apart, is necessary. Or, the plane can be controlled from a piloted mother plane kept safely out of range of the enemy. The B-61 bombers, loaded with explosives of various types, can be used for antiaircraft fire, long-range artillery fire and bombing missions.

Above, the B-61 leaves the launching platform with the help of a rocket. Below, the rocket drops away when exhausted and the turbojet engine takes over

Electric Throttle

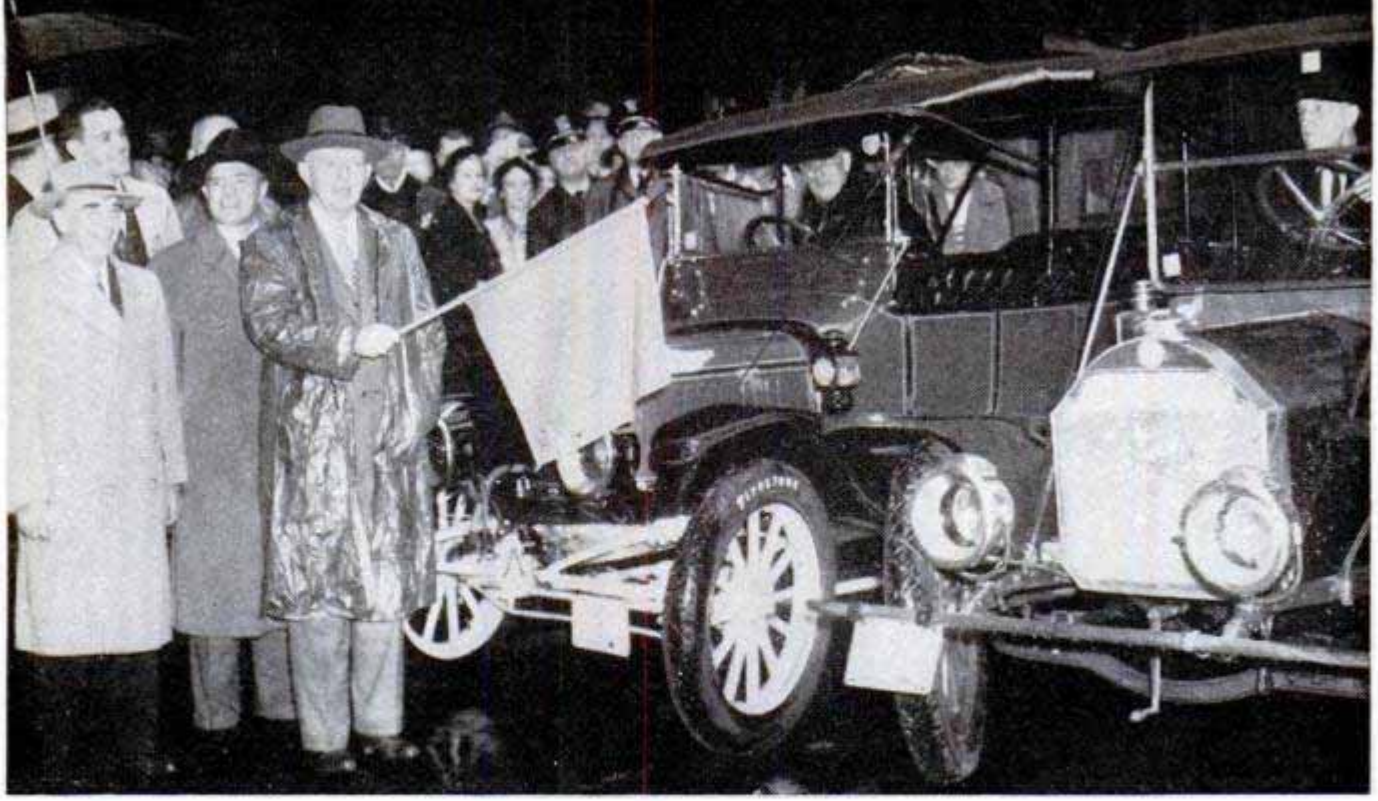
With a new electric throttle the motorist can maintain a constant speed without keeping his foot on the accelerator. The heart of the throttle is a solenoid mounted between the carburetor and the accelerator linkage. A toe switch is installed on the floorboard and an electrical connection is made with a switch on the brake. When the driver attains the desired speed, he presses the toe switch and the throttle automatically is held in position. When he wants to resume foot-control, he trips the toe switch again. If the brake pedal is depressed, the throttle is instantly released.

Power Brakes May Stop Cars in 1952

Eliminating the usual brake pedal, a new power-braking system may be used on some 1952 passenger cars. Developed by Bendix, the system features a "reactionary" force which gives the driver the normal feel to the brakes, enabling him to judge the proper amount of braking at all times. To move from the accelerator to the brake-control treadle, the driver simply pivots his foot on the heel, reducing travel time 25 percent. This factor alone will reduce stopping distance by five feet at 60 miles an hour. The additional force of the power system will further reduce stopping distances. The brakes are controlled by a treadle similar to the accelerator pedal. No conventional master cylinder is used in the new power system.

Discovered in Switzerland, a new insecticide effectively knocks down and kills flies that are resistant to DDT.

Dr. Robt. Wiegmann



Major Lohr (left), owner of the cars, watches as Mayor Kennelly of Chicago waves flag starting the race

MANHATTAN, WE ARE HERE! or,

PM's Race of the Relics from Chicago to New York ends with the Stanley Steamer (vintage '13) edging out the 1911 Stoddard-Dayton by 37 minutes

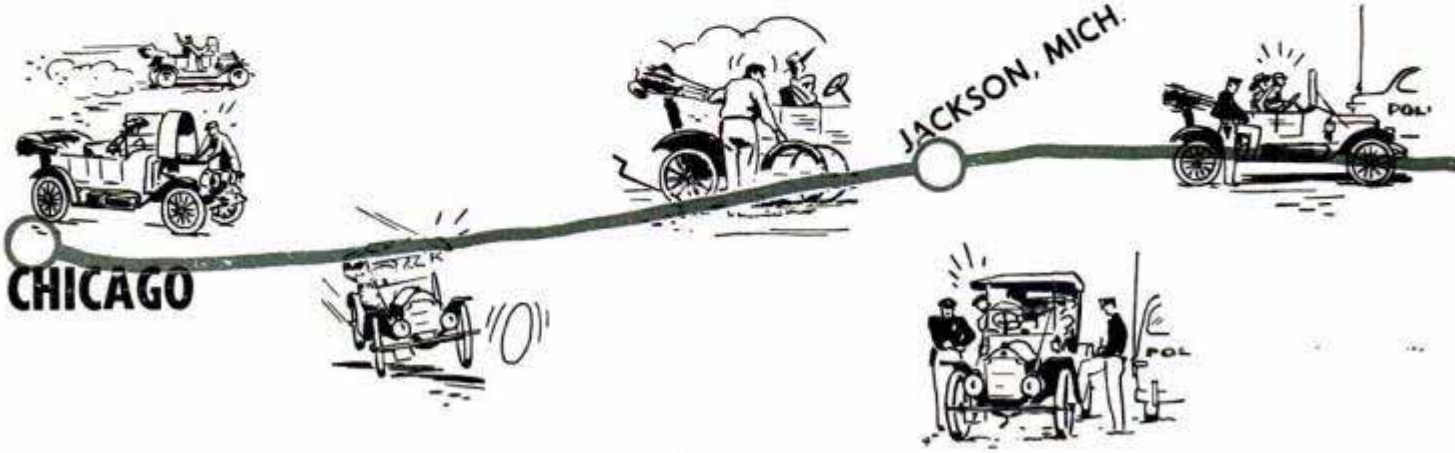
By Roderick M. Grant

THE RACE of the Relics was ended. The affair of the horseless hot rods, the feudin' and fussin' over the supremacy of the steam buggy or the gas car were finished.

Trailing a plume of white vapor and whinnying triumphantly with its 38-year-old whistle, the 1913 Stanley Steamer chuffed up to the finish line at the city gates of New York and came to a panting halt before a battery of magazine, newspaper and newsreel cameramen.

"Some fellow's been following me all the way from Chicago in an old pile of junk," grinned Jack Brause, just twice as old as

At left, Rube DeLaunty and Eleanore Hall are interviewed in Stoddard-Dayton. Drawing below shows stops each night and some incidents along the way



Manhattan, we are here! Checkered flag greets cars at finish line, a tollgate at entrance to New York City

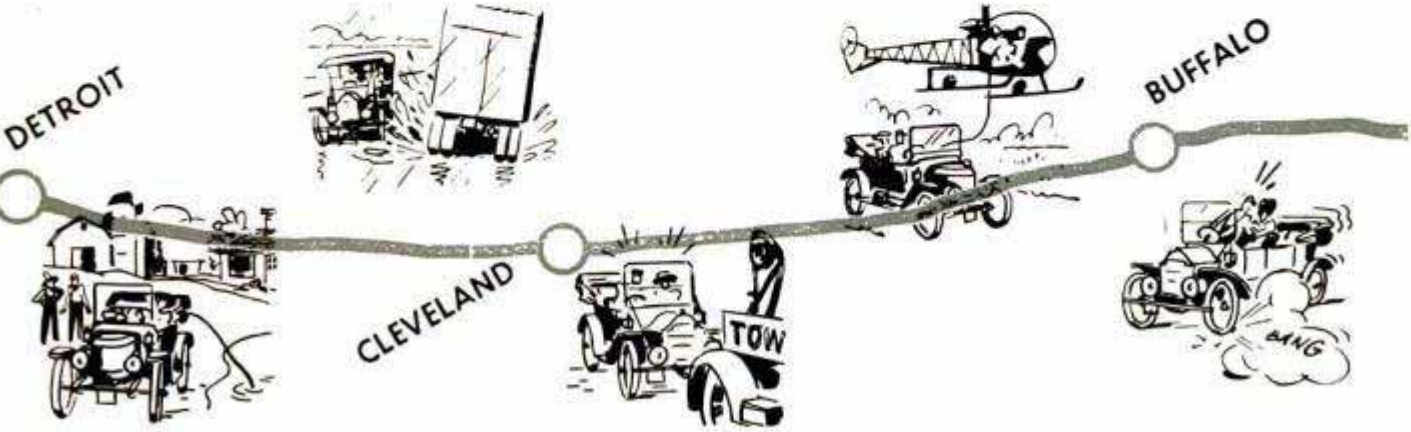
The Hare Beats the Tortoise at Last

his car but not looking it. "He ought to be along any time now."

The checkered flag waved Brause in, the winner of the Chicago-New York antique-car race sponsored by *Popular Mechanics,* opening event of the magazine's 50th-anniversary celebration which will be observed next January with a special Golden Anniversary issue.

Minutes later a 1911 Stoddard-Dayton came scorching down the Saw Mill River Parkway to the tollgate, all four cylinders throbbing out a 40-year-old tune. Rube DeLaunty, fellow-worker with Brause in the antique-car shop of Chicago's Museum of Science and Industry, pulled up alongside his rival and punched his rubber-bulb horn in a series of hoarse but defiant burps.

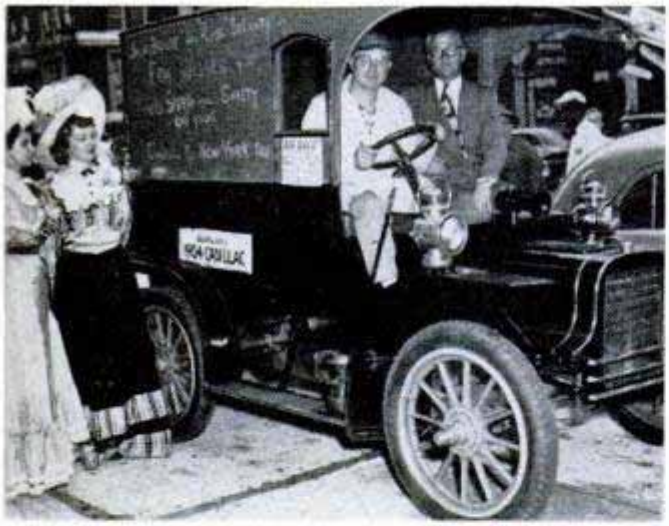
"I don't know how you made it in that leaky old teakettle," he jeered. Rube is the younger of the two, a kid of 70, and can lick a balky automobile several times his size. He had a chance to prove it right then, when the aging Stoddard-Dayton that had just tucked a 1000-mile sprint under its crankcase refused to get up and finish the parade downtown to Rockefeller Plaza in Manhattan. The picture taking over, Rube twirled the old hand crank, but nary a sputter came. The crowd gave it a push, and still the shiny antique balked. Again Rube talked to the brass crank handle, got a few answering mutters, and with a little more wheedling all four cylinders got back into the argument and away the procession moved down Riverside Drive past gaping New Yorkers who taunted, "Get a horse!" or called, "Hang on to your hats!"—or just whistled at the two girls in vivid period gowns and plumed hats, who had ridden with the septuagenarian drivers for the 1078.6-mile distance.



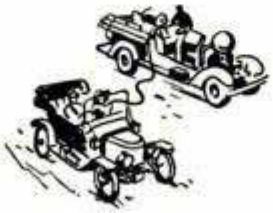
Jack Brause and Margaret Harris in Stanley Steamer stop for a TV breakfast-club interview in Cleveland

The Stoddard-Dayton and Stanley Steamer lead a procession of cars down Riverside Drive toward midtown Manhattan. Below, a 1904 Cadillac presents greetings to the ancient cars and their drivers at Erie, Pa.

Just out of Buffalo, a Bell helicopter poised over the steamer to give it a running refill of its 40-gallon water tank. Below, DeLaunty gets "out and under" when he reaches Buffalo with soaked magneto



AVON



AMSTERDAM

POUGHKEEPSIE

NEW YORK

© Time, Inc.

At Ypsilanti, Mich., Jack Brause leaves the road to drop his rubber tube into a stream for a tankful of water

"Bright, dimpling girl," the *New York Times* described the young lady who egged Jack Brause on to victory and compelled him to stop every 30 miles ere his water tank ran dry. (Bright? Yes; she's my secretary. Dimpling? Can't really say.) She is Margaret Harris, erstwhile a resident of Hibbing, Minn.

In the Stoddard-Dayton to boost Rube's morale in his dark hours of tire trouble and drowned magneto was Eleanore Hall, late of Columbus, Neb., now secretary to the Chicago museum's Norbert Hildebrand. He sparked the idea of the race after discovering the long-standing feud between Rube and Jack over steam and gas.

The two cars are the personal vehicles of Maj. Lenox R. Lohr, president of the museum. In the seven-day derby that ended with the Stanley 37 minutes ahead in elapsed running time (53 hours and four minutes for the winner, a scorching average of 20.46 miles per hour), everything happened — but not nearly so much as would have befallen those cars on the mud roads of their youth.

Tire trouble dogged the Stoddard-Dayton along the way, but it was not the fault of the brand-new Non-Skid tires Firestone specially molded for the cars just four days before the start. The old-style rims and liners caused pinched tubes and punctures, and it took an all-night session in Firestone's Cleveland shop to eliminate the liner problem.

Jack's fire-breathing "steed" ran about a mile to the gallon—of water. He had only

(Continued to page 278)

Rockefeller Plaza is jammed with spectators who crowd around the old cars as they finish the race

The 40-year-olds pay respects at a Firestone shop. Firestone molded their tires four days before race

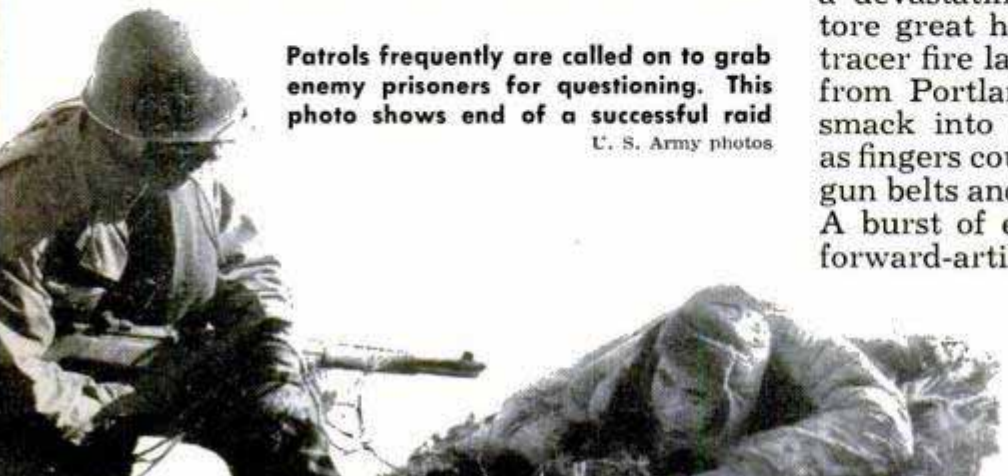
I Fought with Combat

By Sgt. John Hecimovich
United States Army

ABLE 3, THIS is Fox 6. About 300 Reds moving in on us from ridge opposite my position. . . ." "Able 3, this is Easy 6. Two machine-gun and mortar companies closing in on us from the west. . . ." "Able 3, this is Zebra 6. We're 'bugging out.' Estimate about four companies assaulting us. . . ."

All across the dusk-dimmed Korean ridge, rugged, nine-man combat patrols had made contact with the enemy and were using their back-pack radios and handie-talkies to send back the important dope that they'd deliberately drawn Red fire to get. Each of these patrol reports, received at the battalion command post in a Korean farmyard behind the lines, gave the staff officers a clearer picture of the foe — his numbers, weapons and positions. A few minutes more and the picture was complete. The Reds, thinking the little patrols were their only opposition, fell into the trap and launched a full-scale attack into the waiting jaws of a whole U.N. battalion. Terse orders rang out in the farmyard and in an instant all hell broke loose.

Green flares blazed from the enemy ridge. Whistles blew, and down the slopes they came. Because those combat patrols had done a job, U.N. forces were ready for them. The unsuspecting Reds plunged into a devastating curtain of mortar fire that tore great holes in their ranks. A rain of tracer fire laced the air around them. Men from Portland, Tulsa and Brooklyn fired smack into their strongest points as fast as fingers could trigger rifles, feed machine-gun belts and drop shells into mortar tubes. A burst of enemy fire cut down the U.N. forward-artillery observer, but not before he directed fire on the enemy's encircling flank and saw it torn to shreds. The ragged remnants of the Red



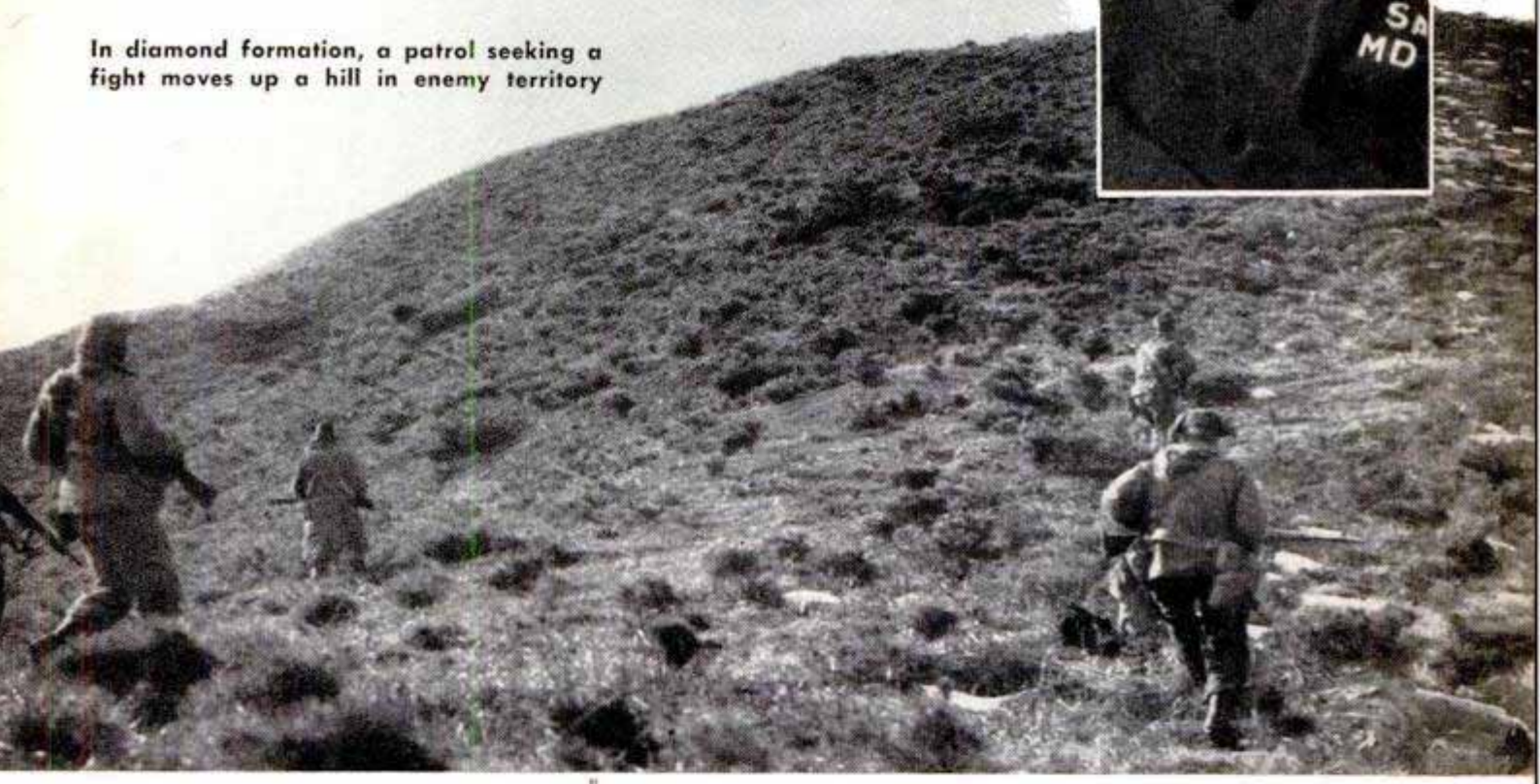
Patrols frequently are called on to grab enemy prisoners for questioning. This photo shows end of a successful raid
U. S. Army photos

ready to knock down any enemy who might run from native hut he set afire with a grenade

Right, the author has led dozens of combat patrols in his 12 years of Army service. Last spring while on patrol he was wounded by a Red rifle bullet and now is recuperating in Walter Reed Hospital

Patrols in Korea

In diamond formation, a patrol seeking a fight moves up a hill in enemy territory



force, waving sabers and and wielding gun butts, were cut down as they ran into American bayonets and grenades that popped from foxholes like a thousand bouncing pingpong balls.

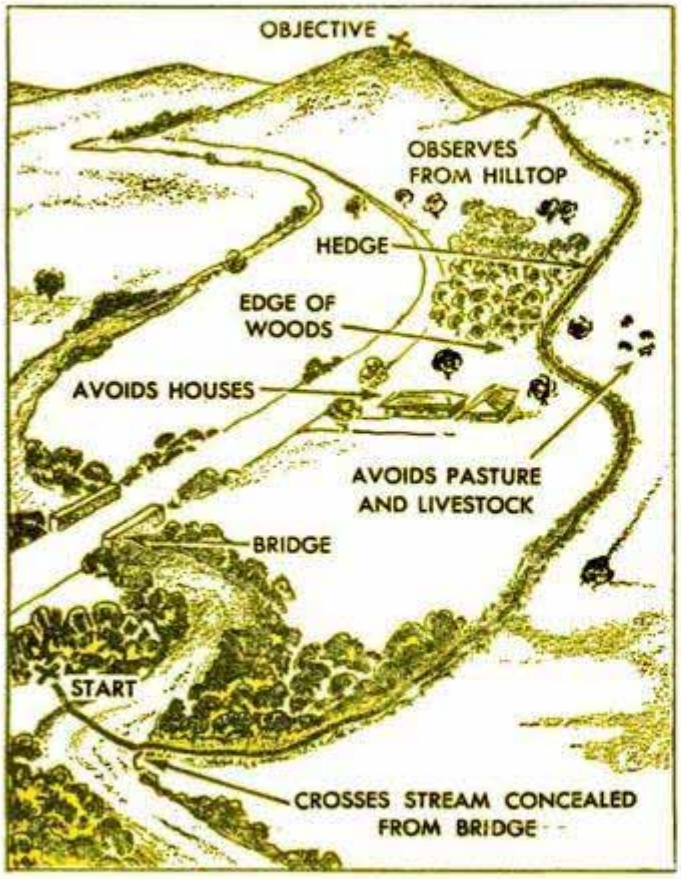
Though I wasn't in on that action, it's the best example I know to illustrate the importance of hard-hitting combat patrols —those tiny, probing advance guards of a big fighting force.

There are several kinds of patrol in the Army: Intelligence and reconnaissance patrols that sneak through enemy lines to gather information, but avoid contact if possible, and security patrols that guard and warn the flanks and forward point of a large unit against attack. But a combat patrol, according to the manual, "is one that expects to fight."

Until a Red rifle bullet got me last year, I was a platoon leader for Company I, 5th Cavalry Infantry Regiment of the 1st Cavalry Division in Korea, and I was tagged for a total of 30 days of combat-patrol duty—enough to know that the manual isn't exaggerating. If there's a dirty job to be done, a combat patrol is the kind that's made up to do it. It may be an ambush. It may be a mop-up operation to dig snipers out of an enemy town. Our little patrols, armed only with rifles, a machine-gun or two, a small pile of grenades and a fair share of guts, have been sent out in advance to capture and occupy key terrain until the

Well-dispersed patrol crosses the Naktong River in Korea. Men are scattered and staggered so they can't all be hit with one burst of enemy fire. Heavier weapons and radio usually travel in the center of the formation

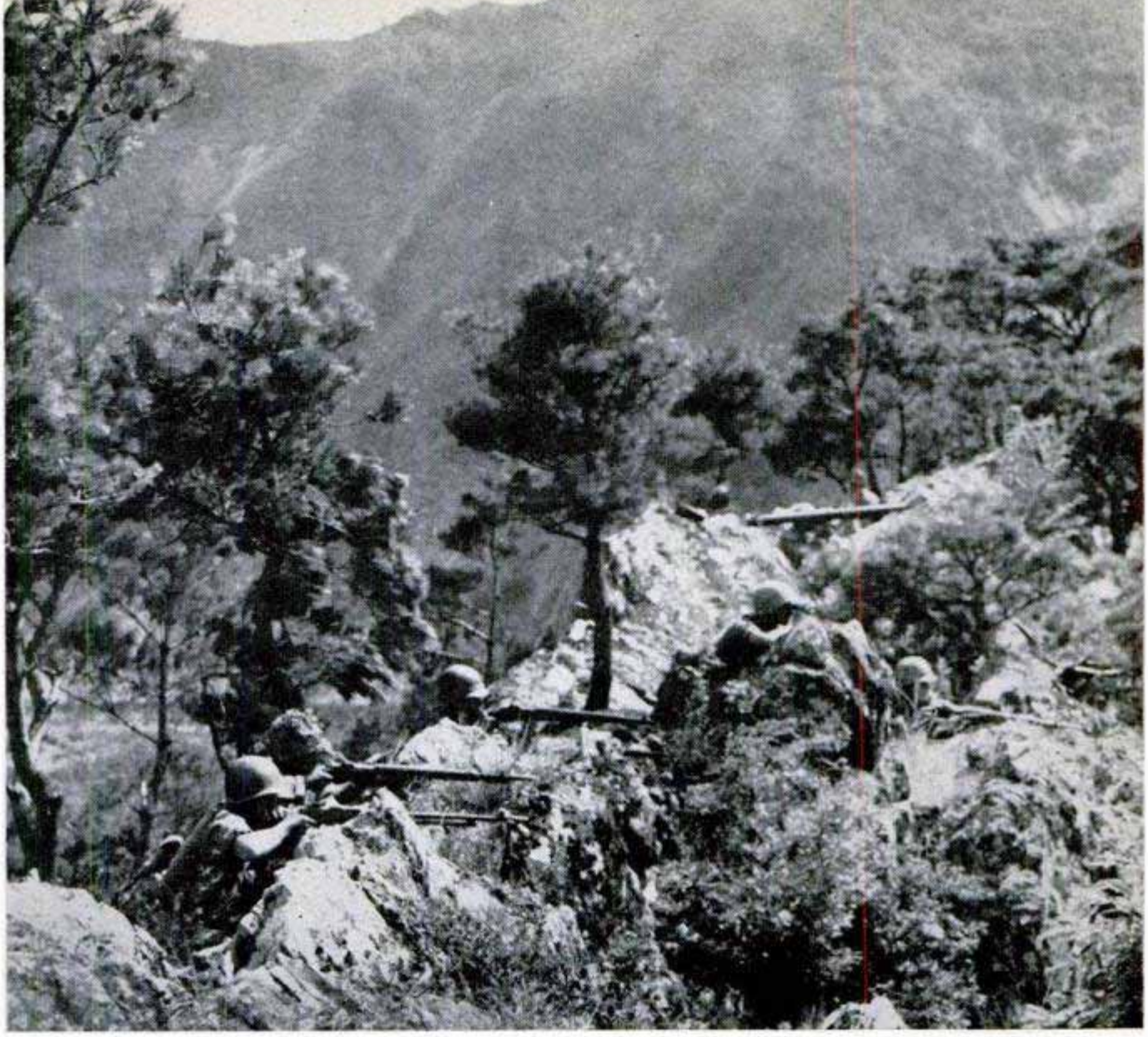
Combat patrols, chosen from ordinary infantrymen, often move into villages ahead of main body to draw fire



main attacking force was able to get there.

I've been on dozens of combat raiding patrols—surprise attacks on large enemy forces. The Army loves them because of their demoralizing effect on the enemy, and they pay off in valuable intelligence. Our missions might be to capture prisoners right from the enemy's stronghold and bring them in for quizzing, to capture or destroy important installations like bridges, gun emplacements, vehicles, command posts and communications centers. Or, as we did one day, to rout out the enemy from a village seven or eight miles north of Waegwan. Nine of us sneaked through enemy lines and, keeping cover as well as possible, slipped from house to house setting fire to the entire place with Thermite grenades. Roughest of all are the little raiding patrols that deliberately strike into enemy territory to draw his fire and make him disclose his fire power and deployment. There's no hiding or digging in on this duty.

Typical route of a combat patrol shows how the men take advantage of terrain features to reach objective



Patrol opens up on enemy from behind a Korean ridge. Object is to draw fire, make enemy disclose his position

You may be five men against a regiment, but the idea is to stand there and shoot at him until he shoots back with everything he's got. Then, if you're still alive, you sneak back and make a report. Try sitting in front of a target on a busy rifle range some day and you'll get the feeling.

A combat-patrol mission starts with an order from the unit commander. You know it's coming when the officer in charge strolls around the company area, handpicking men. Some of the boys evaporate. That's okay, because the officer wants only fellows who won't fold up in a tight spot. Men with colds are left out. They might cough at the wrong time. If there's a river to cross, he picks only men who can swim. Depending on the job, he may need a patrol as small as five men or as big as a company. For most of our missions, a rifle squad and a platoon turned the trick. We might also take a forward-artillery observer, an "aid" man and a man from G-2 for intelligence work.

The area bustles with soldiers making preparations. Some men may be camouflaging each other's faces with paint and draping foliage over their helmets. Others jump up and down to check themselves for jangling equipment. Dog tags are taped so they won't clank. Canteens and cartridge belts are padded and tightly strapped down. All glittering objects are left behind. A good officer sits down and briefs his men thoroughly for the job. Some even build a model terrain map out of the soil on the ground, marking out all the terrain hazards to and from the objective so the men get a complete visual picture of what they're up against. Overlooking the smallest thing can spell death. The day I got my wound, the Reds were on a hill across a shallow river and it was our job to get them off. A patrol had reconnoitered the situation the night before so we thought we knew what to expect. They forgot to tell us one important thing—the river bottom had quicksand. Half way across, we hit it. One by one, men sank up to their knees. I yelled at them to keep moving, but many were too scared. We watched a quarter of our fellows sink lower and lower until

Sniperscope, in use on night patrol, casts invisible infrared light to show soldier what's ahead of him

Powered by batteries, sniperscope produces a silhouetted image which is seen through oversize rifle sight

finally their heads went under. That one mistake cost us the mission and marked the end of my Army career. As we began climbing the hill, our lieutenant was hit by shrapnel from a grenade. Since I was second in command, I tried to take the rest of the hill with what remained of the patrol. I was positioning the men at the top of the ridge, when a Red rifle shell burrowed into my leg and exploded. That was that. Someone carried me back when we "bugged out."

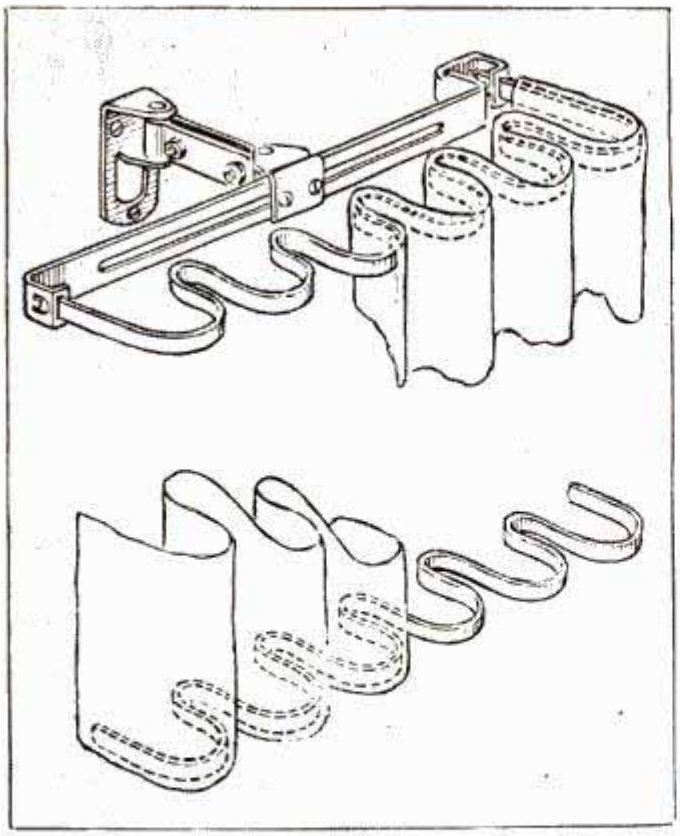
Since most of our patrols were day patrols, our outfit almost always used the diamond formation—point man up front, getaway man in the rear and riflemen on the flanks. The radio and heavier weapons were in the center. This dispersed the men, gave good security, protected us against being wiped out by a single burst of enemy fire and put us in position to deliver a lot of fire in any direction.

Patrol which has sized up an enemy force calls via radio for artillery fire to blast the target area

Weapons, of course, depend on the mission, but all combat patrols travel as light as possible. Our .45-caliber automatics usually went along, our rifles, a few BARs and perhaps a machine gun or a bazooka. If we were out to get a bridge or an emplacement we'd take demolitions. For tanks and pillboxes we'd load up with antitank grenades and rocket launchers. Thermite grenades are great fire-starters for village raids, such as the one I mentioned earlier. The blinding white flame from one of them, well placed, can set half a dozen native huts burning.

The Army's new experimental light rifle,

(Continued to page 256)



Wiggle-Shaped Hanger Holds Drapes in Folds

Drapes are held in deep folds from top to bottom by a wiggle-shaped drapery hanger. A curved metal form is threaded through the top hem of the drape and the protruding ends are slipped into a bracket on the window frame. Another of the curved forms is threaded through the bottom hem. The two forms hold the drape in long folds. The hanger can be moved from side to side after installation to any position desired, and can be adjusted so the drape will hang against the wall or a few inches from it. The metal forms will accommodate material from 46 to 50 inches wide. As no permanent pleats are required in the drape, the material is easily washed, ironed or dry-cleaned.

California Seaweed May Furnish New Source for Miracle Drugs

Certain species of seaweed found along the California coast have the same effect against disease-bearing bacteria as the so-called miracle drugs, and they may furnish a source for these drugs in the future. Research to determine the efficacy of seaweed has been carried on by the California College of Pharmacy. Of 1200 species tested, 12 seaweeds were found to have a definite antibiotic effect against three common types of bacteria harmful to man. Although scientists have not identified the chemical substance that causes the antibiotic reaction in seaweed, they know the results are not related to the iodine content.

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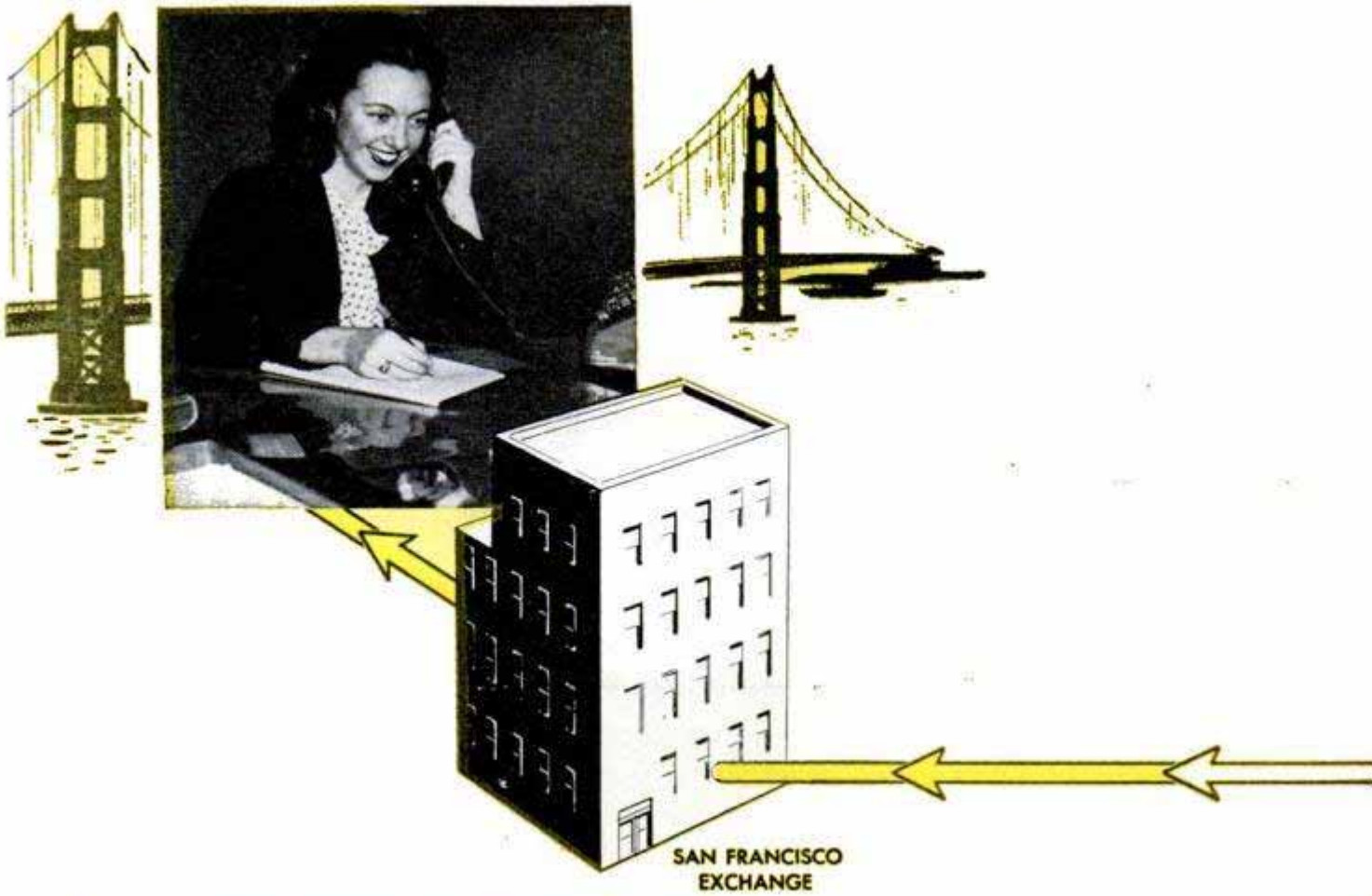


"ENGLEWOOD, N. J., DIALING SAN FRANCISCO"

By Richard F. Dempewolff

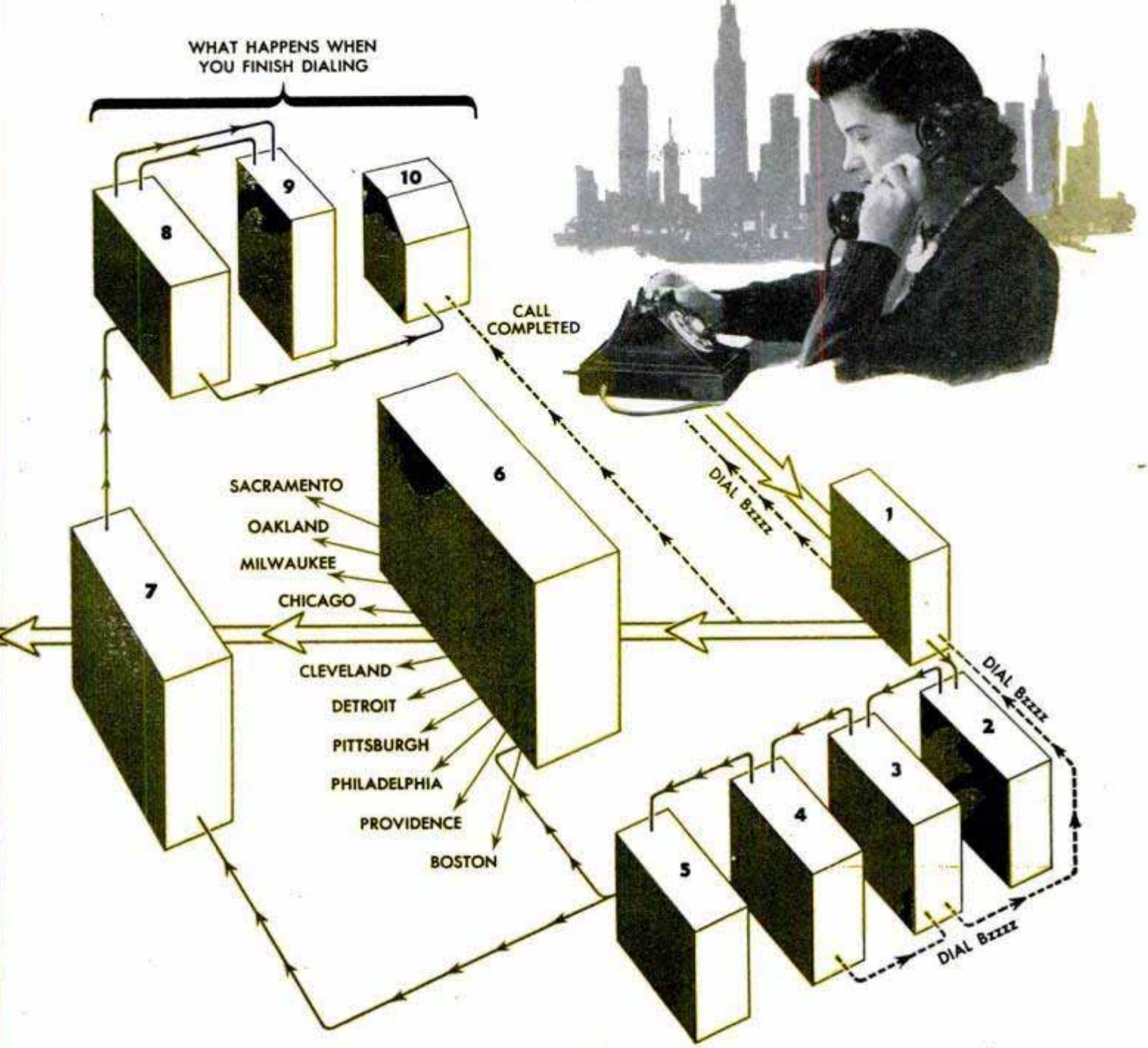
SOME 10,000 LUCKY telephone subscribers in suburban Englewood, N. J., just across the Hudson River from Manhattan's skyline, can call friends in San Francisco as simply, and almost as quickly, as most people call the corner grocery store. All they do is dial the friend's number in the usual way—preceding it with three new numbers which automatically route the call to the proper geographical area. In as little as five seconds, the distant telephone starts ringing.

Secrets of the new system, developed by the Bell Telephone Laboratories and known as FACD (for fully automatic customer dialing), lie in the spotless, dustfree, electronic labyrinths of the Englewood exchange under the watchful eye of wire chief William Frylinck. "It's a far cry," he points out, "from the days when rows of operators, handling scores of jack plugs, scoured a switchboard for idle trunks and promised to call you back in 20 minutes."

Out in the cavernous tiled room beyond his office, huge banks of softly clucking switching apparatus make long corridors as they stretch away to the opposite wall. Tall, thin electronic brains busily open and close thousands of minute, hair-triggered contacts with lightning speed as they record, remember and pass along numbers being called and the numbers of the callers. Other electrical wizards chatter noisily as they run down a series of contacts, automatically seeking an open trunk line for each call coming through. In another section of the exchange, a group of automatic machines collects the data on every call, remembers it and punches out a readable record for billing purposes.

A huge array of button lights blinks and flashes on a trouble board as electronic eyes follow every call to completion to see that the millions of switch contacts are all working in good order.

Actually, toll dialing became a reality be-



When an Englewood, N. J., caller dials San Francisco, batteries of electronic brains route dial pulses and make an automatic connection. Here's how it works: A line-link frame (1) drops a relay and tells dial-tone marker (2) to take over. Dial-tone marker connects through trunk-link frame (3) with originating register (4), gives it caller's location and tells it to send him a dial tone. Originating register receives dialed number, stores it with caller's location until it finds an idle completing marker (5) to receive all the information. Completing marker knows, from three-digit national-area code, that this is a long-distance call, so it seeks an idle trunk-link frame (6). A main circuit is set up between caller and trunk-link frame, which analyzes the code, links caller with through trunk to San Francisco and passes the information to a sender (7) for relay to destination. Sender also passes all information to billing office where a transverter (8) stores called number, but passes caller's location to translator (9), which converts location code to caller's actual number and passes this back to transverter. The transverter gives this information to a recorder (10), which punches a tape telling date, time, caller's number and called number. When call is over, a pulse goes to the recorder which punches elapsed time so caller can be billed the proper amount

fore 1945. But so far, only some long-distance operators have been able to do it—punching out a national-area code number and the local number on a set of buttons like an adding-machine keyboard. Last fall, on the 75th anniversary of the Bell Telephone System, marked the first time customers could do the whole job themselves.

"The Englewood installation is the first one," Frylinck explains. "I guess we were chosen because we had the most modern switching system, which makes the change-over easier."

Right now, only Englewood subscribers with one or two-party lines are able to turn the trick, and no one outside the area will

Microwave relay tower in transcontinental link can carry many channels in each direction simultaneously

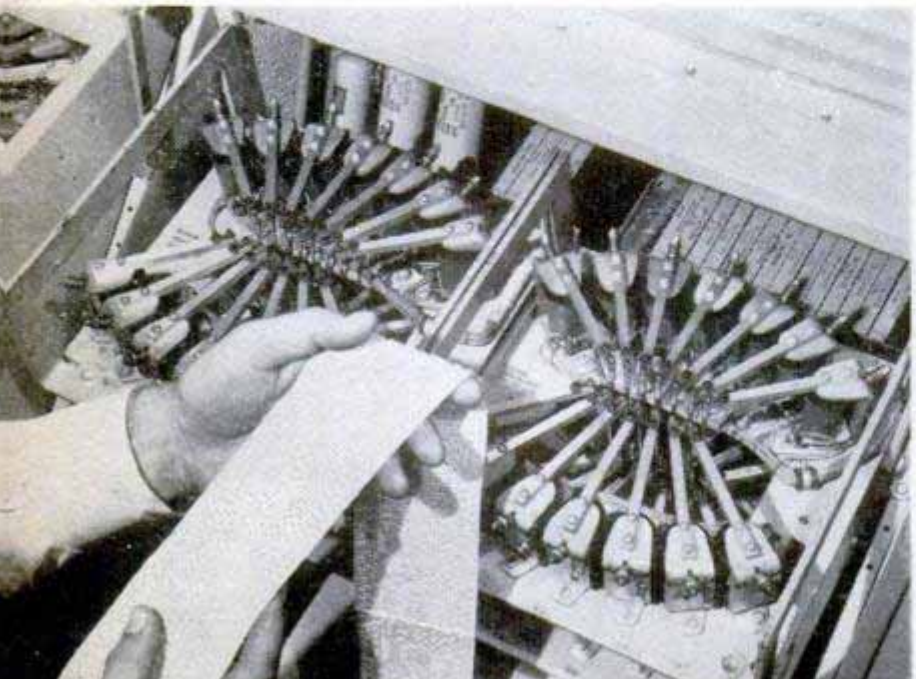
be able to dial long distance to an Englewood telephone. However, plans for expanding coast-to-coast dialing to other dial areas with modern equipment are afoot.

To pave the way, the whole United States and parts of Canada already have been divided into more than 80 national exchange areas. Each area, including your own, has been given a three-digit number. These are the national-area codes you will someday dial before spinning out the local number you want in a distant city. For instance, if a caller someplace in the East wants a San Francisco number—say GArfield 1-9950—he'll look up the national exchange code for the San Francisco area, and find it's 3-1-8. Then, he'll simply dial 318-GA-1-9950. In a matter of seconds, he'll have his party. Similarly, a Boston number would be preceded by the code 6-1-7.

Until the huge job of modernizing old equipment—and adding extra relays to handle the new national-area digits on existing dial switchers—is completed, the Englewood pioneers will be busy proving the new system.

"With the tips of their forefingers," says Frylinck, "they can connect up with any one of 11,000,000 telephones in about a dozen distant cities and their suburbs. Besides Boston and San Francisco, they can dial Philadelphia, Providence, Pittsburgh, New York, Cleveland, Detroit, Chicago, Milwaukee, Oakland and Sacramento."

Just how a dialed coast-to-coast call wanders through the switching nightmare of the Englewood exchange, and comes out intact on the other end, is about as simple as trying to explain the inside workings of a four-story electronic brain. But Frylinck, who takes tremendous pride in his complicated charge, can lead a neophyte around by the hand, point out the major routes of the flying impulses and make it sound easy as pie.



Toll calls are recorded automatically by machine at left which translates electrical impulses into code by punching holes in tape. Reading machines, right, translate punched tape into words and figures so clerks can make out the bills at end of each month

"Suppose," he says, "an Englewood subscriber wants to dial a pal in San Francisco, at that number we mentioned—GArfield 1-9950. The instant he lifts his phone from the hook, things begin to pop in here." The wire chief walks to a long bank of cross-bar switches that are clicking away like mad. "This is a line-link frame," he explains. "Each telephone in the area is connected to it. When our man lifts his phone from its cradle, he triggers the particular magnetic switch hooked to his line. Another brain named a "marker" is called in on the play.

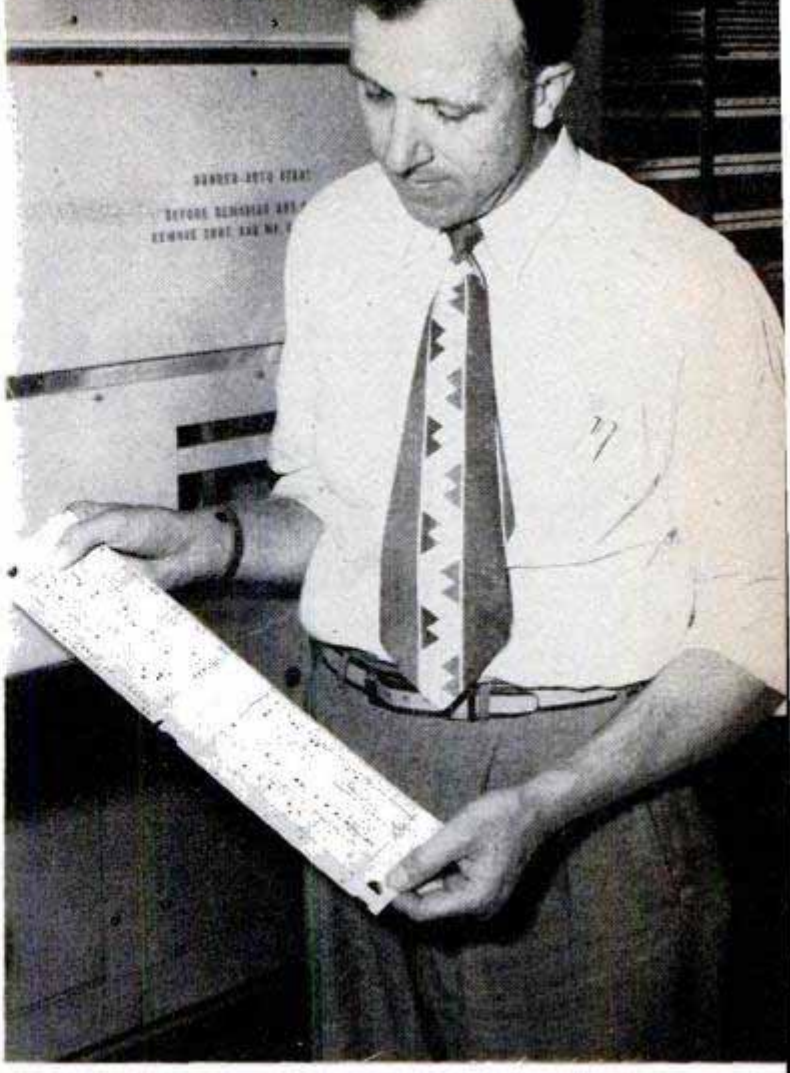
Thus, a whole chain reaction is started as one huge electronic brain seeks another that isn't busy and passes on its information. Circuits are made and broken faster than you can bat an eye. Each brain actually decides what circuit should handle a call and enforces its decision through switches in the next brain. Each brain has its own job and adds its own data toward completion of the call.

"The marker," explains Frylinck, "calls in an 'originating register,' connects it with the caller, and tells it to give the man a dial tone. The originating register buzzes the subscriber, tells him to go ahead and dial his number and makes a note of the number on its switches—3-1-8-G-A-1-9-9-5-0."

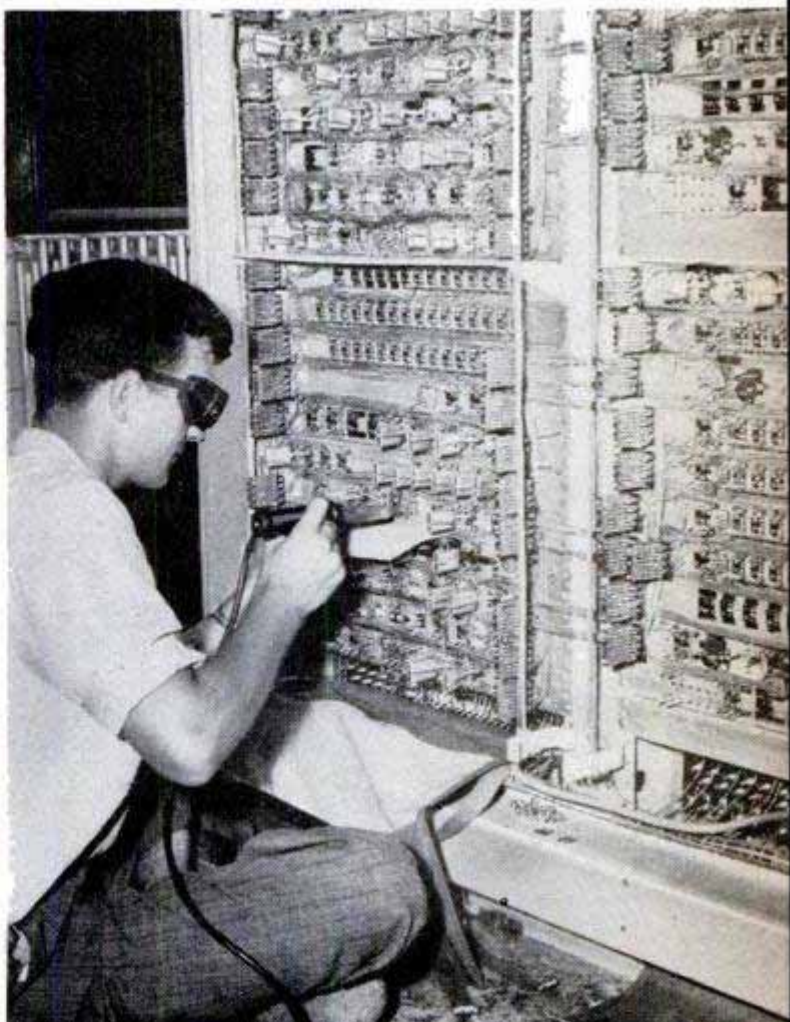
From the originating registers the code of our coast-to-coast call whisks to another marker which recognizes the first three digits as the national code and as Frylinck puts it, "says to itself, 'aha, long distance!' " The marker immediately seeks a trunk-link frame on which there is an idle trunk to Pittsburgh. The marker also associates a sender with this trunk and spills into it the information of the called number. As soon as a clear line to Pittsburgh has been picked, the sender dumps all of its information into the equipment at Pittsburgh.

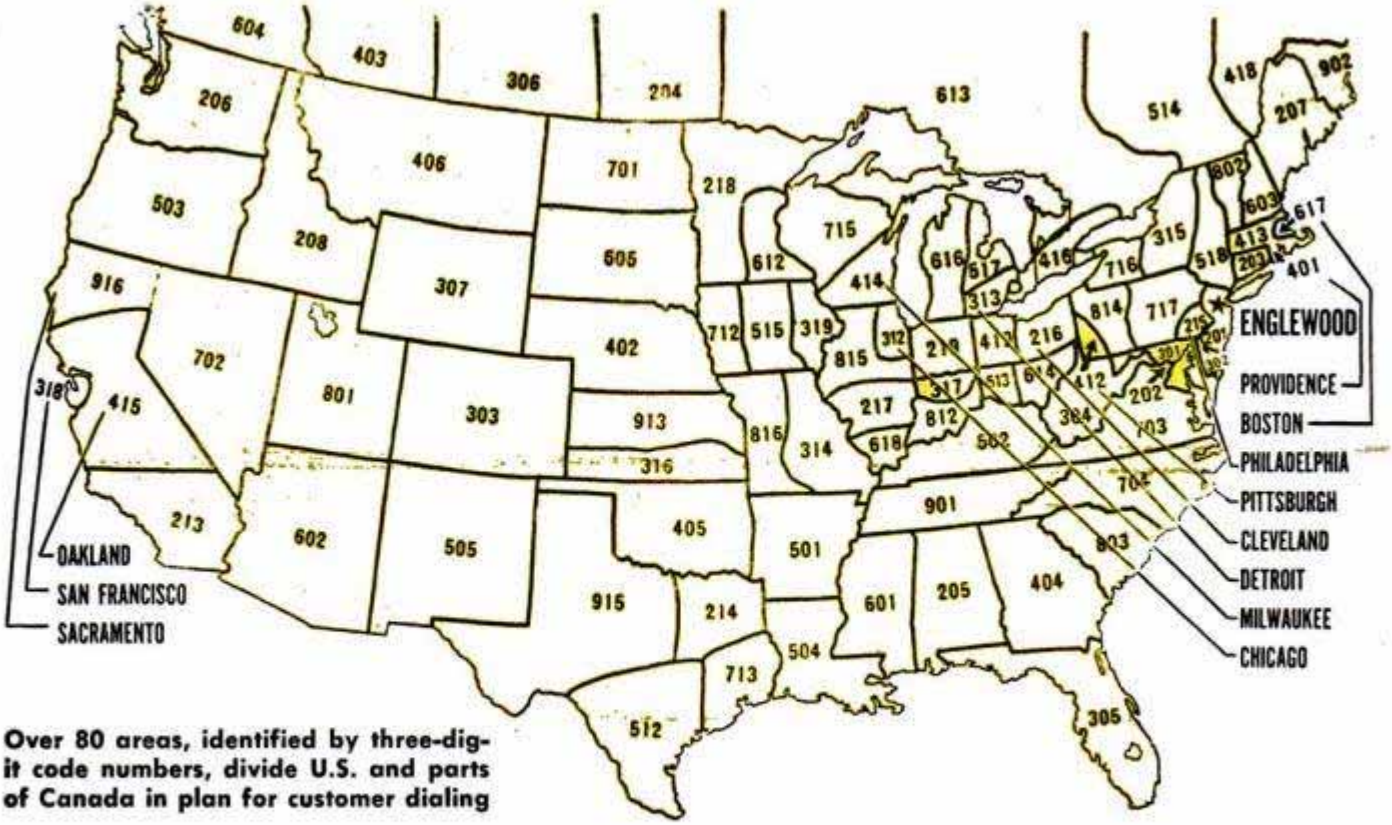
As they leave the sender, the dialed numbers are immediately transformed into a series of musical tones, or "beeps." Actually, these are electronic voices—each tone representing a different letter or number—that will wander off through the maze of circuits and issue commands to all the other brains involved in the routing of the call. People dialing into exchanges where operators could dial long-distance numbers used to hear these beeps. They sounded like the musical notes in a radio station. "We used to get complaints from people who thought their wires were being tapped," says Frylinck, "but with the new equipment, no one will hear them anymore."

If Pittsburgh's wires are all busy, the sender will automatically by-pass it and find another route. With all the numbers and codes translated into musical tones, it's no trick at all to send the dialed information out over the new microwave radio-relay



Trouble board, above, keeps a watchful eye on every long-distance call, punching an information card for engineers. Originating register, below, being fitted with more relays to handle coast-to-coast dialing





Over 80 areas, identified by three-digit code numbers, divide U.S. and parts of Canada in plan for customer dialing

network, and many coast-to-coast calls from Englewood could wing their way westward through the ether—from antenna to antenna atop the 108 towers that can now carry more than 100 simultaneous telephone conversations plus a TV program in each direction.

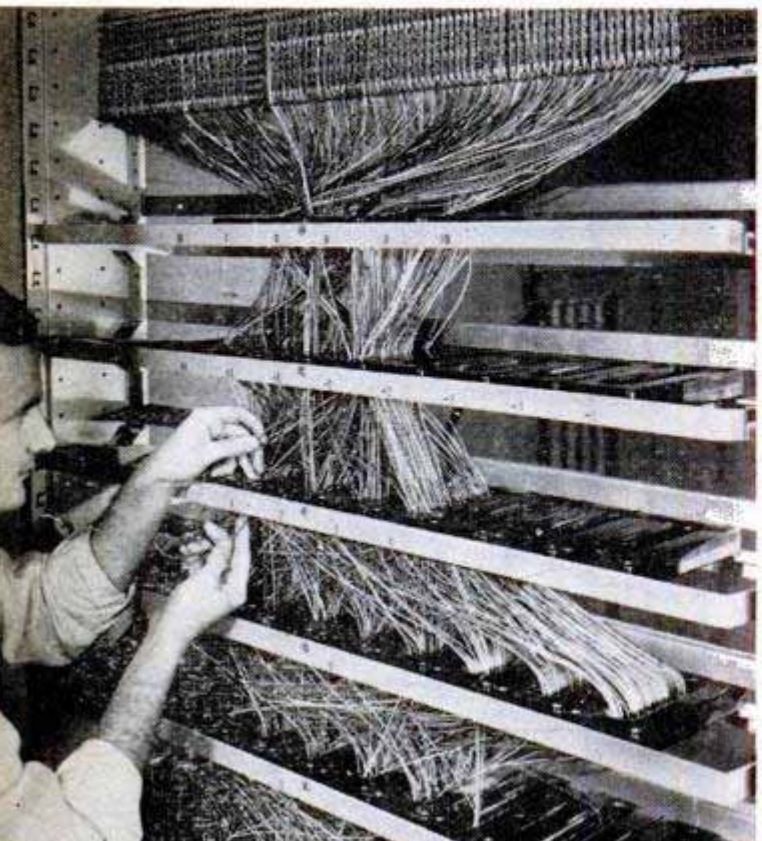
Once the dialed number arrives in San Francisco, it no longer includes the national code number. This was dropped off at the last switching point. The San Francisco brain channels the last seven digits as it would any local call, and presto! Someone's phone rings in the Golden Gate city.

And that whole, complicated process takes as little as five seconds!

Customer toll dialing is no overnight miracle. American Telephone and Telegraph has been working with the Bell Laboratories for more than a dozen years, and has spent millions, to speed up long-distance calls. It used to take five operators about 14 minutes to place a single call back

(Continued to page 274)

Maze of wires, each representing a subscriber's phone, converts equipment number into caller's phone number



Instead of spinning a conventional dial to set up a number, long-distance operators merely push a button

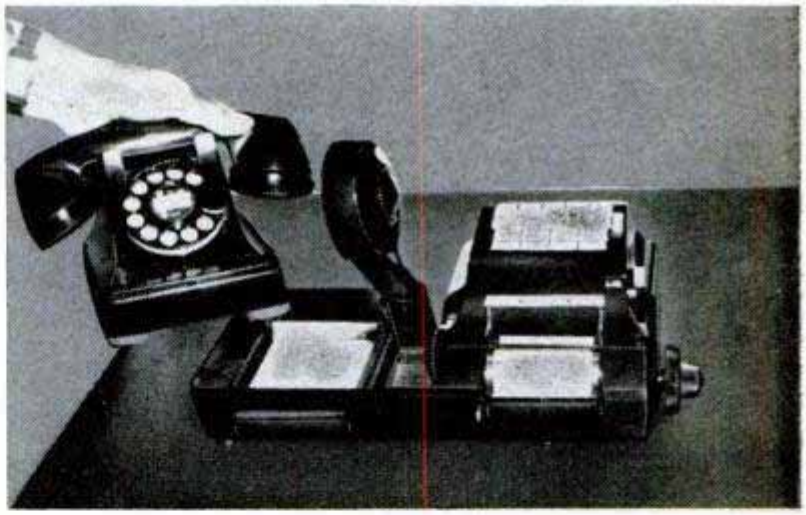
Trouble shooter uses his two-way radio to inform headquarters that stalled trolley is ready to move again. Right, 130 time switches record the location of every streetcar and trolley-bus along 600 miles of track and road

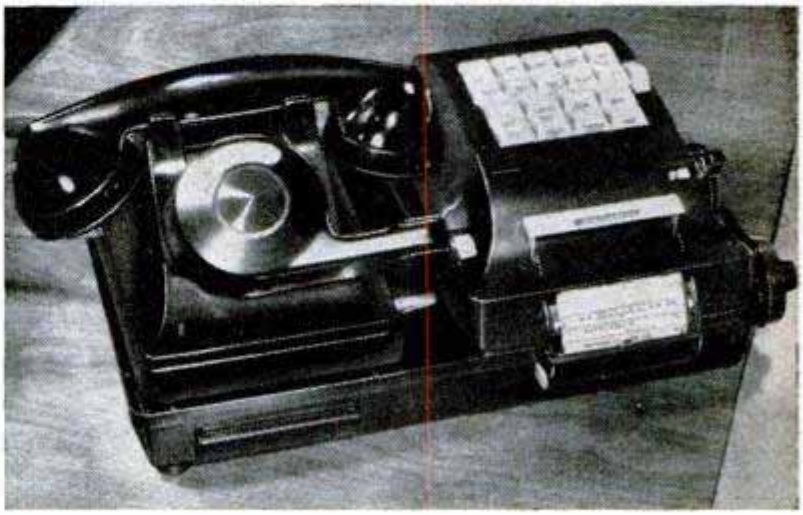
Philadelphia Installs Trolley-Tracking System

In Philadelphia, a new monitoring system pin points the location of every trolley and trackless coach on 600 miles of track and road. In the transportation-company's headquarters, 130 time switches control a two-way radio system. One man can tell from these switches just what distance separates two trolleys. When there is a long interval between cars, warning lights and a bell indicate that something is wrong. Distributed along the routes are 42 trouble-shooters in touch with headquarters by radio. The dispatcher sends the nearest trouble-shooter to check on the late trolley. Since the system was installed, complaints about delays have been cut 50 percent.

Automatic Dialer Records 500 Numbers

Attached to a telephone, an automatic mechanism dials a desired number when a single button is pushed. An arm fits over the dial of the telephone, which then is actuated by a rubber finger. Five hundred telephone numbers can be recorded on an index tape, which is rolled into position by a knob. The operator rolls the desired name into view, presses a button and the instrument completes the call. Atop the instrument are eight buttons for emergency calls or for numbers most frequently called. Another series of buttons duplicates the letters and numbers on the telephone dial, making it possible to call numbers which are not listed on the index tape.





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1. GARDENER'S TRAY goes right along with him as he works. The round tray is attached to a sharp metal stake that is pushed into the ground easily. Spring clips around the rim hold the tools and other equipment. The tray is convenient on a picnic, too

2. PIE-TOP CUTTER gives the decorative effect of a crisscross pie top and does it easily without effort. A quarter-circle cutter removes eight clover-leaf patterns from the pie dough and trims the edge, too. Just press it down four times and the top is ready

3. STICK-UP CLOTHESLINE makes the bathroom a "drying yard' for 25 feet of laundry. The line is held up by four big suction cups that stick firmly to any smooth surface. Fine for travelers, the line can be put up in seconds and can be taken down as quickly

WHAT'S NEW FOR Your Home

4. RAKE SQUEEGEE, next page, is a rubber blade that fits on the teeth of any standard garden rake to convert it into a squeegee. It speeds the chore of washing the basement or garage. Fine for moving slush, too, it makes the rake an all-year implement

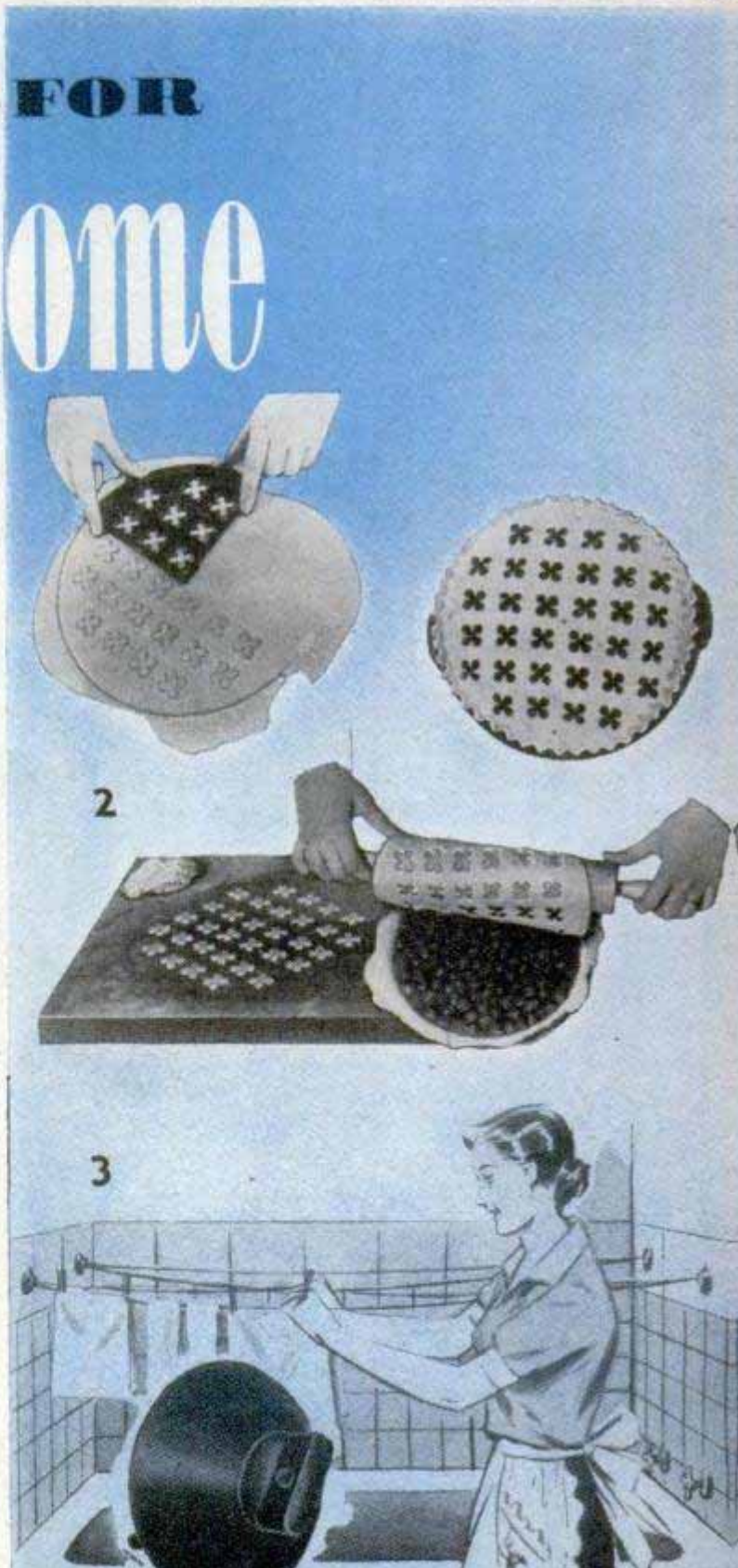
5. HOSE CONNECTOR fits a wide range of faucet sizes and stays on even though the faucet is smooth and unthreaded. Back pressure of the water prevents coupling from coming off. Device provides a simple means of attaching washing-machine or garden hoses

6. SUPERCHARGER prevents the pressure tank of an automatic water system from getting "waterlogged," a condition in which the tank fills completely with water, leaving no air to create a pressure cushion. The supercharger keeps air in the tank at all times

7. SPACE HEATER that burns oil is especially designed for installation in front of a fireplace. Its low flue opening makes the unattractive stovepipe connection to the chimney invisible. Automatic in its operation, the heater will keep a small home comfortably warm

8. CADDY WAGON for tank vacuum cleaners makes it easy to move the equipment around the house. It has a rack for all accessories. A glide bar, inset, lets you slide the cleaner up and down stairs with no lifting. The new wagon solves the storage problem, too

9. DISHWASHER works in any sink with no complex installation. Simply mount detergent container on the wall, slip hose over faucet and you're ready to do dishes the easy way. Sprayed with detergent, the dishes and silver are rinsed and allowed to air-dry



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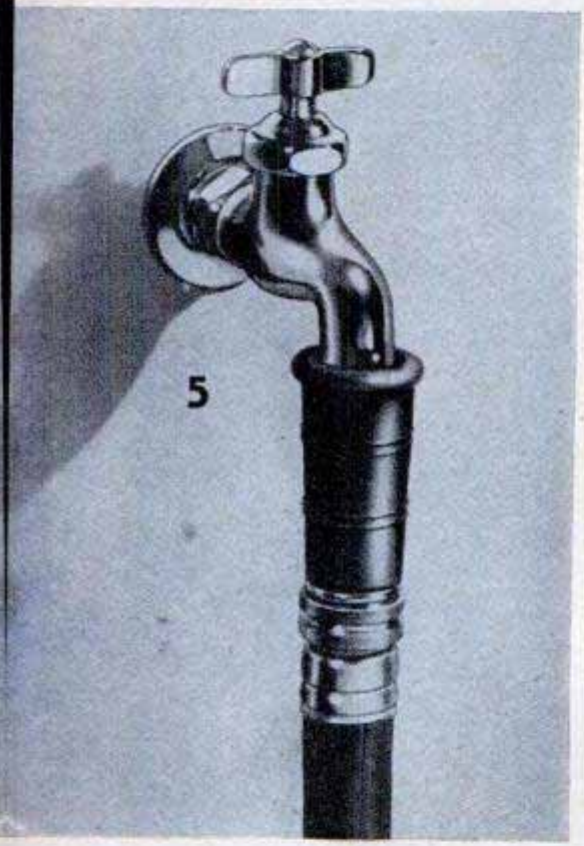

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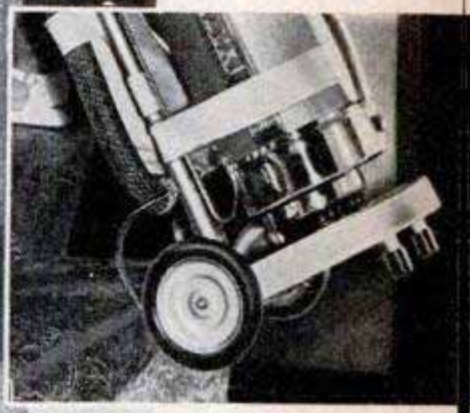

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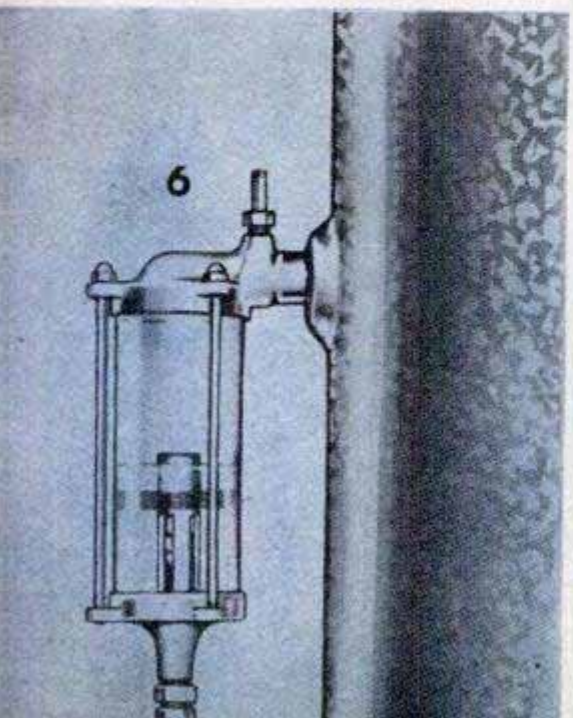

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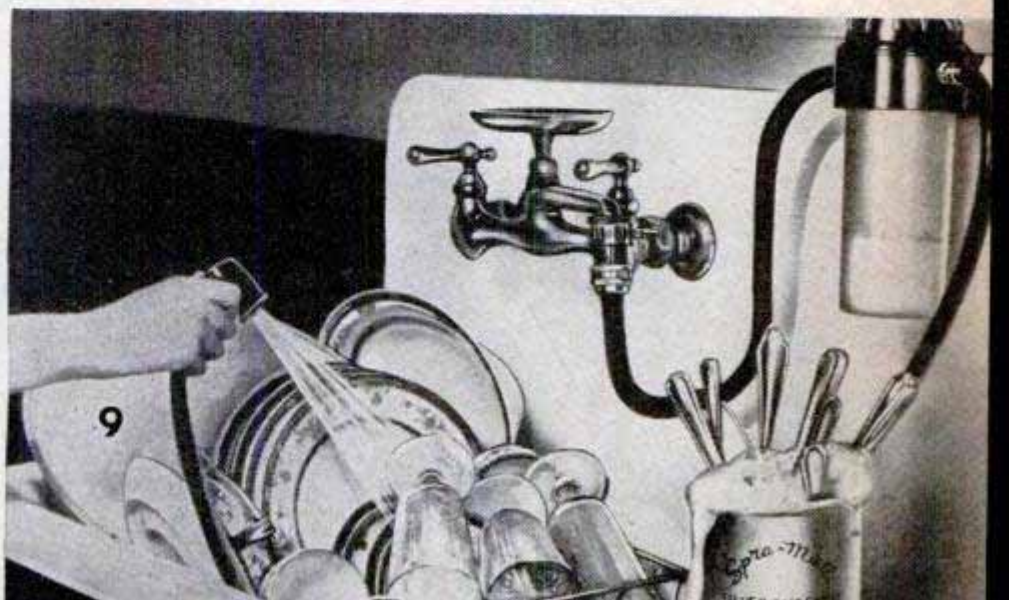

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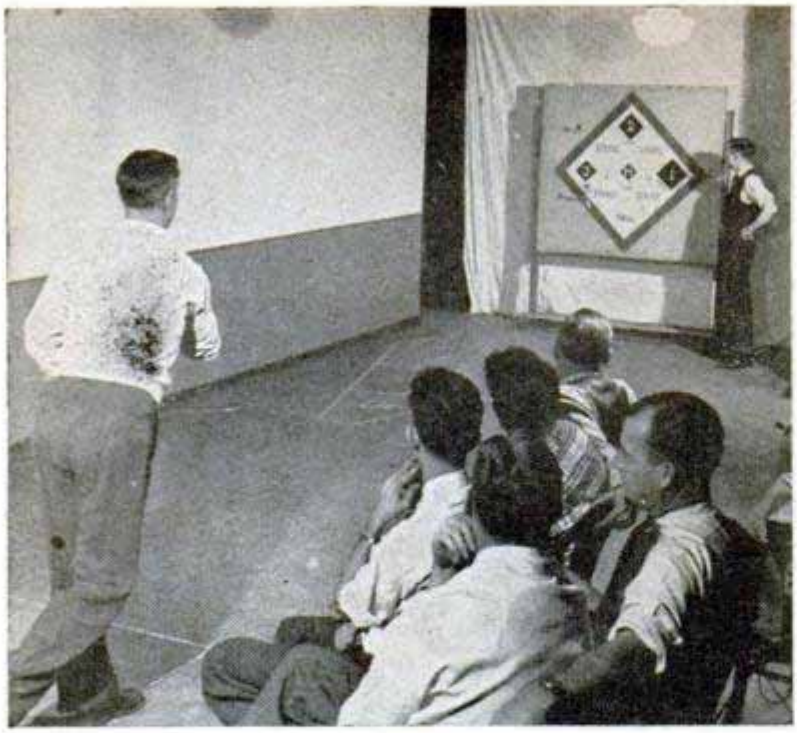
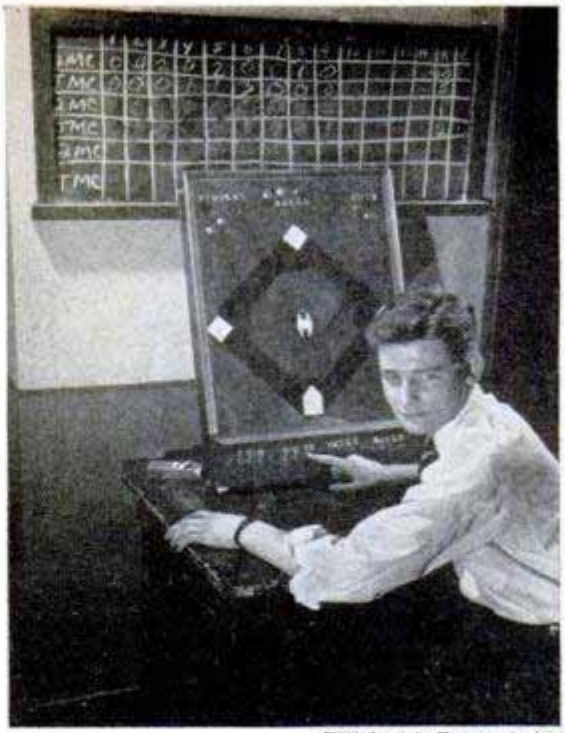


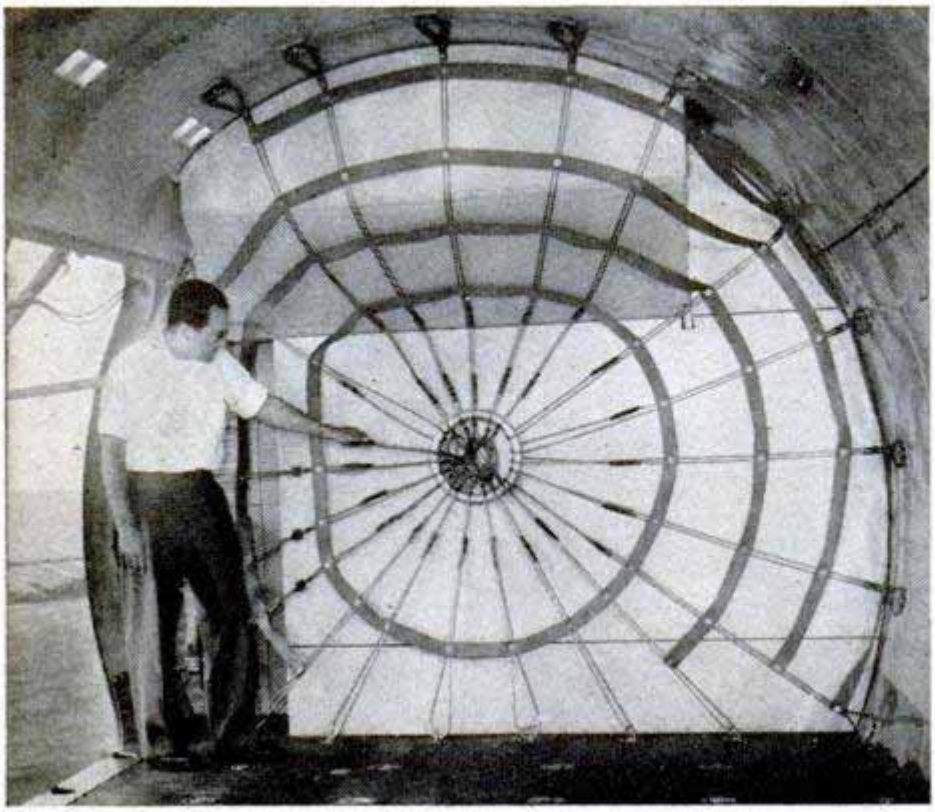


Pittsburgh Press photos

Underhand tosses, left, pierce the target 25 feet away. An electric scoreboard keeps tab of each inning's total

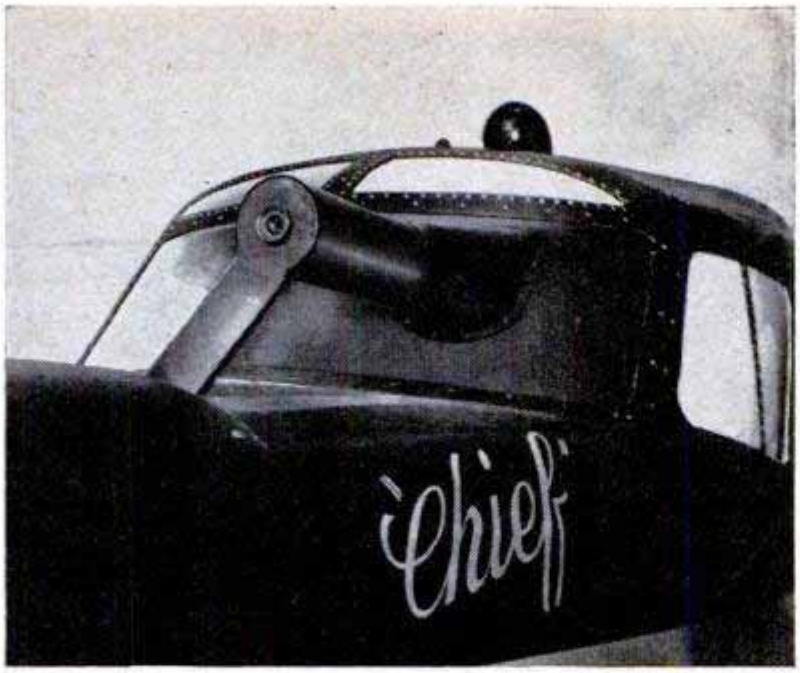
Dartball Combines Two National Pastimes

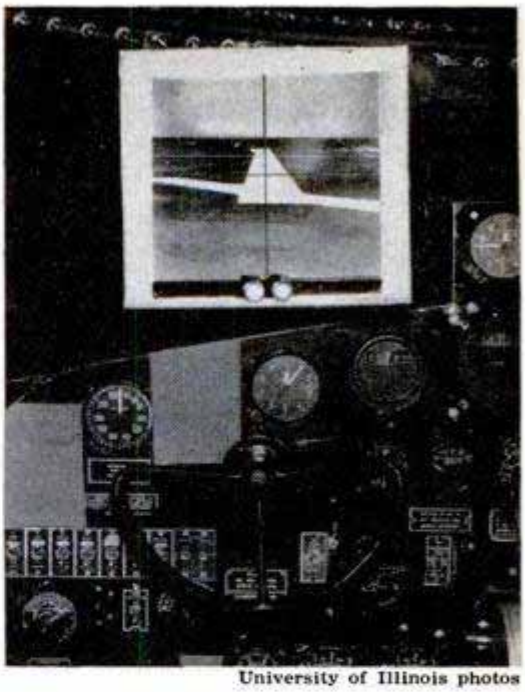
In Pittsburgh, there's a league of indoor athletes that specialize in a game with an international flavor. It's called Dartball and it combines darts, the British favorite, and baseball, the American national pastime. Men from 13 churches meet one night a week to compete in team play. Nine players make up a team and the target is diamond shaped, unlike the round style used in England. The darts are thrown with an underhand motion that would also look strange to an Englishman. The "pitcher's mound" is 25 feet from the target. Darts landing inside the diamond are hits, strikes or balls, depending upon exactly where they land. Outside the diamond limits, the throw is an "out." Singles, doubles, triples and home runs are possible with the size of the target area getting smaller as the hit becomes longer. Certain players specialize in getting singles and the batting order brings up the home-run sluggers in the cleanup spot. Another feature of the league is an electric scoreboard on which the play of the game is flashed to keep everybody informed.



Steel Net Yields On Cargo's Impact

In rough or emergency landings, or during unusual maneuvers in flight, a new ¼-inch steel expansion net stops airplane cargo from crashing forward into the pilots' compartment. Its cables, pulling forward against the greater lengthwise strength of the fuselage instead of inward, will hold back an impact of 30,000 pounds hitting at six times the force of gravity. A 10-inch ring of tubular steel at the net's center distributes the load equally to all cables during expansion. Nylon straps hold the cables in place.

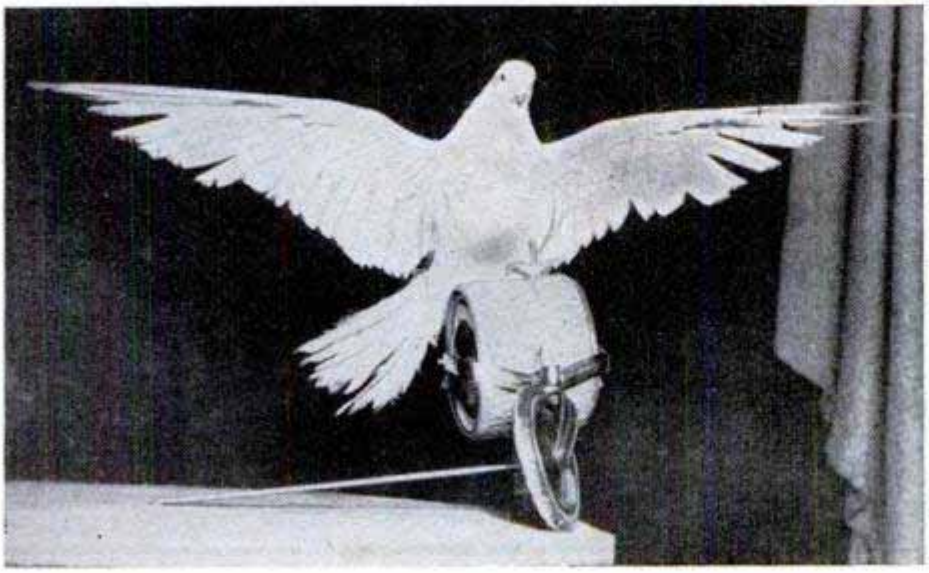




University of Illinois photos

Periscopes May Eliminate Windshields in Planes of Future

Pilots fly as capably when "seeing" their way on an 8-inch-square screen showing reflected periscopic images as they do with contact visibility, tests at the University of Illinois indicate. Designers want to eliminate projecting windshields in tomorrow's supersonic aircraft because they mar the sleek surface and produce both friction and heat. Dr. Stanley N. Roscoe, who has been studying the problem for the Office of Naval Research, installed a periscope on a small plane and blocked off certain instruments and the windows. Eleven different test pilots had to depend on the screen image for information about what was ahead. The screen was blocked off to various sizes down to four square inches during the experiments and the periscope's optical system was manipulated for various degrees of magnification. The pilots flew an instrument pattern of turning, climbing and gliding.



Cycling Pigeon

Over in Sweden there's a pigeon billed as the only bicycling bird in the world. A veteran circus performer, the pigeon hops up on her own bicycle and "pedals" around a platform. In order to keep her balance she has to walk atop a broad wheel. This wheel, in turn, spins the rear wheel of the bicycle.

Blanco's first step in training the pups is to show them the rod and reel. When the bird wing is attached, school begins for the pointer pups

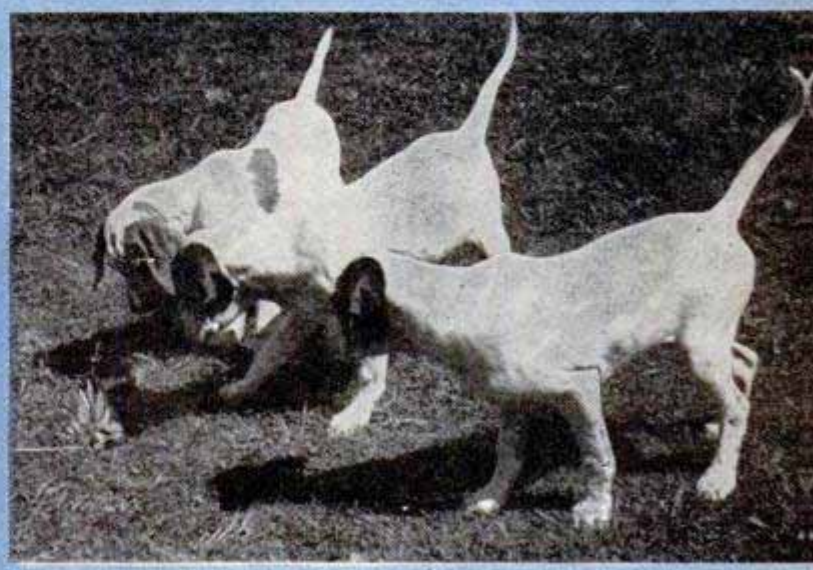
By Shep Shepherd

HE TRAINS POINTERS WITH ROD AND REEL

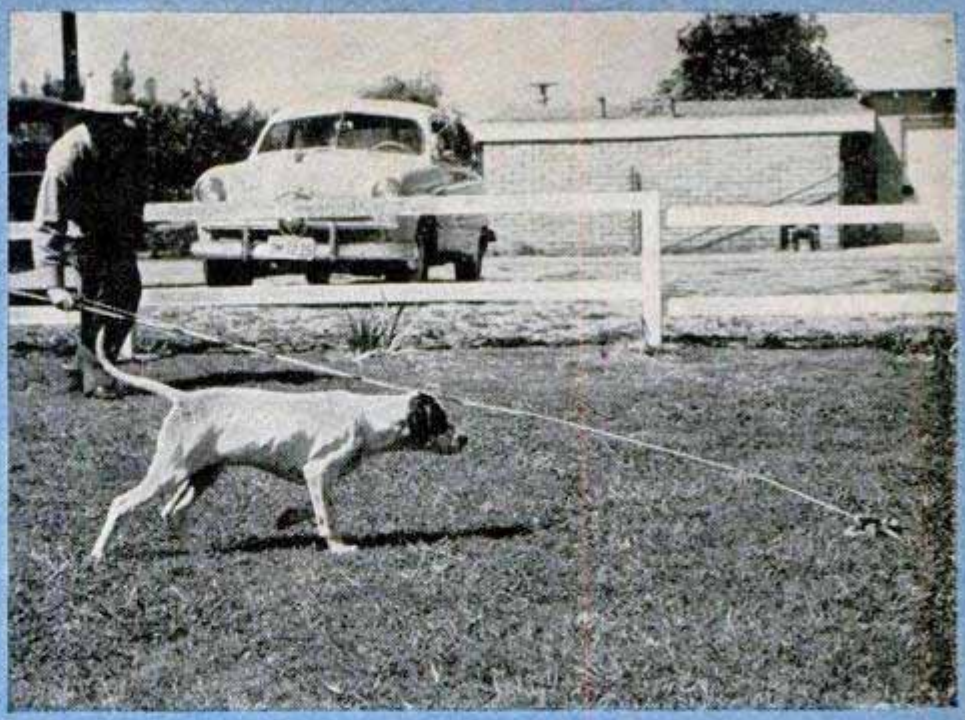
RAY BLANCO of Culver City, Calif., uses a fishing rod and reel to school his pointer pups. The training technique pays off, too, in the form of game limits. When the pups are about three months old, Blanco rigs up a casting rod and line and attaches a bird wing. Then he casts the wing to various points in the yard and the pups are permitted to run to it, but not allowed to pick it up. Eventually, he lets them touch the wing, one at a time, upon his command. From the rod, reel and bird wing the pups are graduated to live birds in the field, and it is here that their training proves itself.

Wing is cast in various directions and the pointers are allowed to run after it but not to touch it

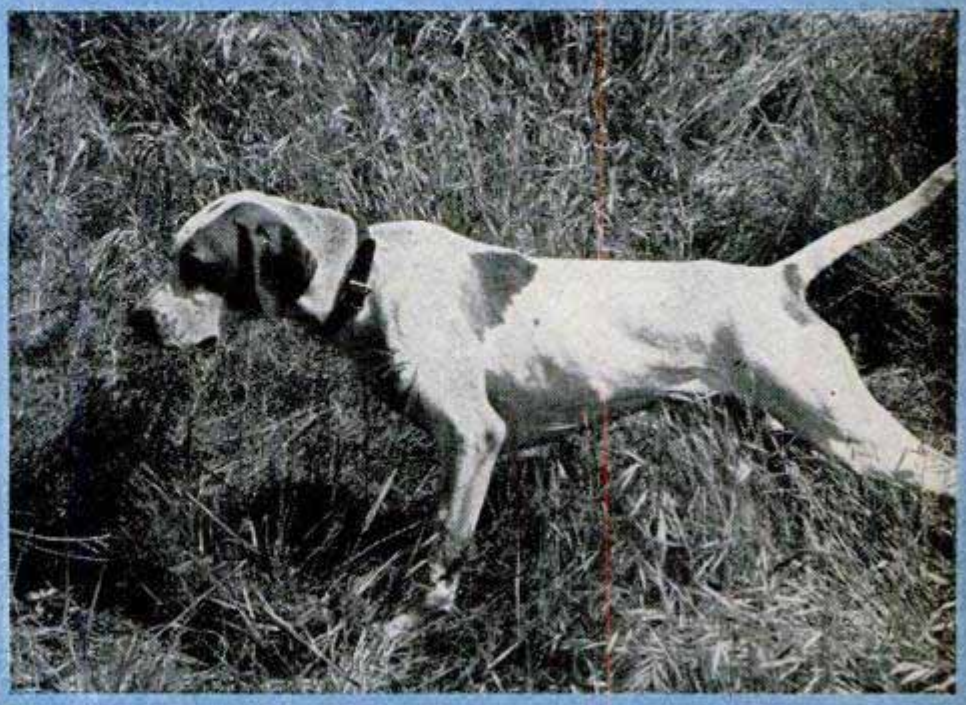
As they learn more, one pup is held out while three work together. They now touch wing upon command



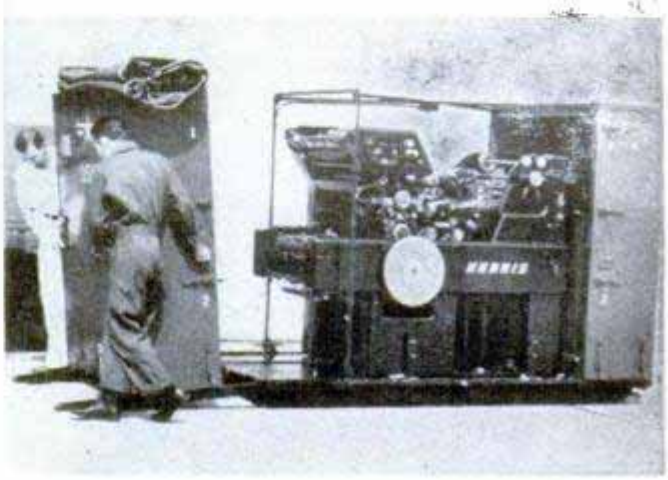
In later stages of the training the dogs are taught one at a time and learn to work a little farther from wing until they're ready for field



Here's Amigo, 14 months old, holding a covey of quail until his master slowly comes toward him for the flush



In his few months of field work Amigo has had more than 250 birds shot over him. At seven months, he was helping Blanco bag his limit of pheasant every day of the season



Airborne Printing Press Ready in Two Hours

On-the-spot reproduction of aerial charts, maps and reconnaissance photographs is possible with the Armed Forces' new airborne printing press. Designed for advance bases and air strips, it can be operated two hours after it is unloaded from the plane. Conventional equipment takes days or weeks to set up. The 8000-pound package contains a Harris offset press and all the tools, auxiliary equipment and printing supplies needed. The shipping container is made of panels and cabinets that break down to form all the pressroom facilities needed for immediate operation.

Fly-In Movie Theater

Two runways guide flying patrons to their "seats" at an outdoor movie theater in north Texas. Each plane is supplied with a loudspeaker on a flexible cord. The theater also has conventional parking spaces for 200 automobiles.

Sources of available products described in this issue are listed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge simply by writing the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Illinois

OUR EYES ALOFT
Spy Out the Enemy

Part II

By Col. George W. Goddard
Chief, USAF Photographic Laboratory

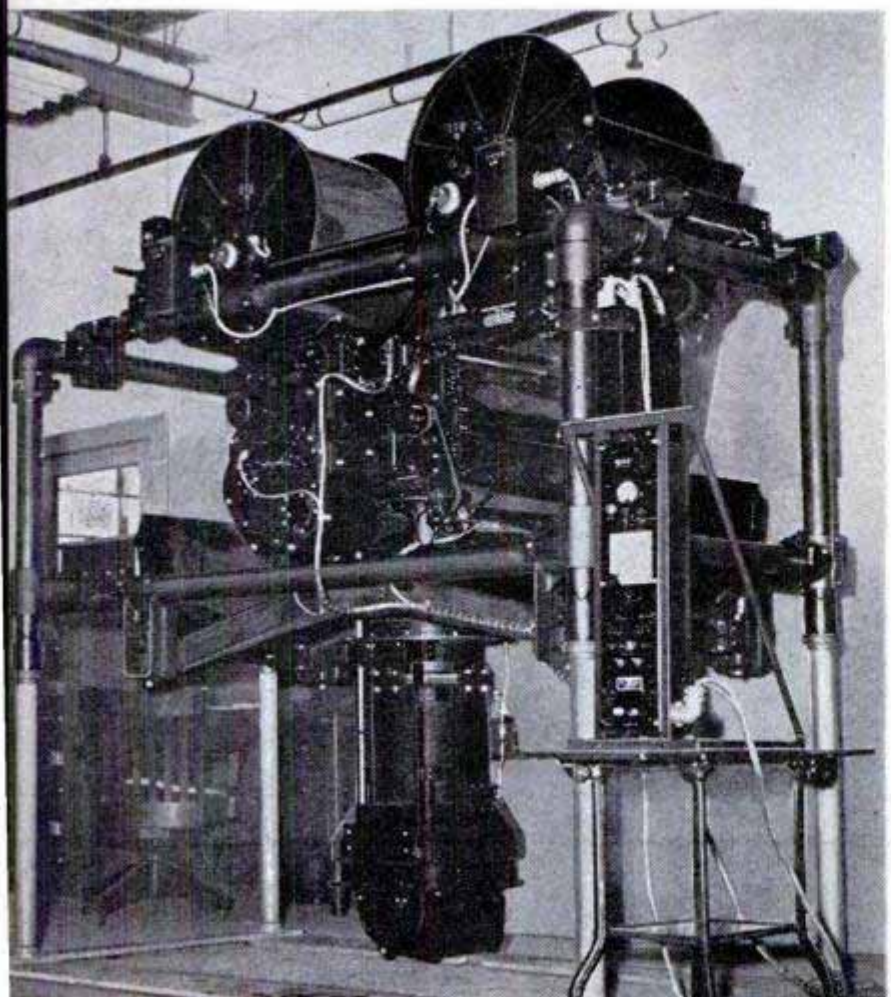
SINCE THE ADVENT of aerial photography many improvements have been made in lenses to obtain greater definition, wider coverage and longer focal lengths. In modern strategic aerial-reconnaissance operations, the photographic airplane must obtain the maximum picture coverage with the minimum amount of flying.

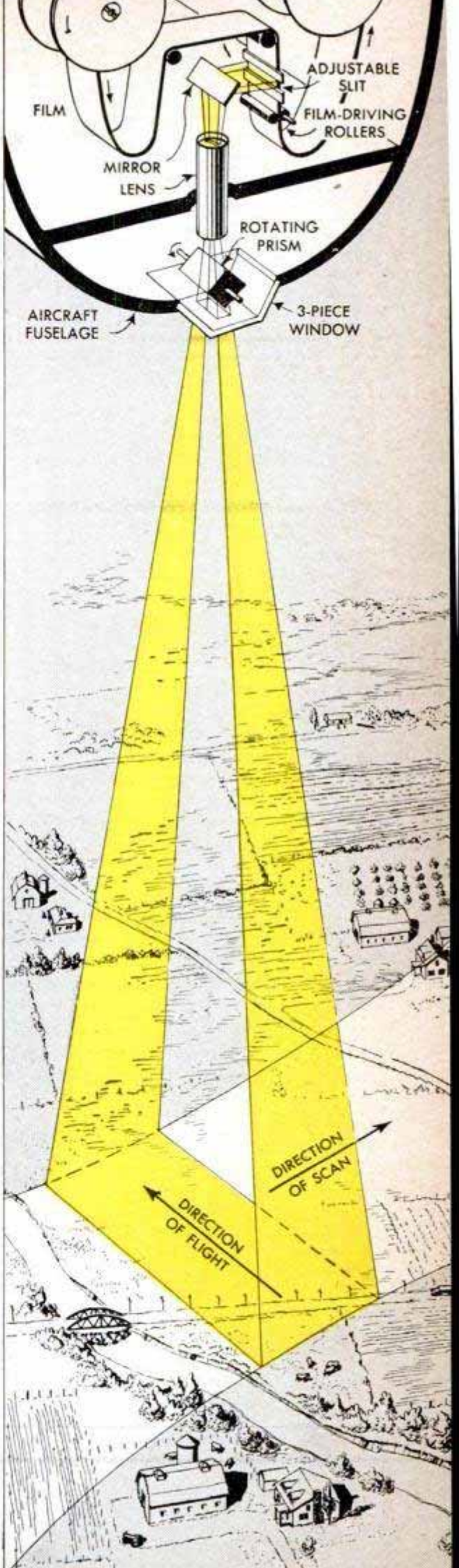
In most cases, in order to avoid antiaircraft or enemy pursuit aircraft, the pilot is restricted to a single one-way flight across enemy territory. On this flight he is required to photograph as much territory as possible, depending, of course, upon the amount of gasoline, cameras and film which may be carried by the aircraft.

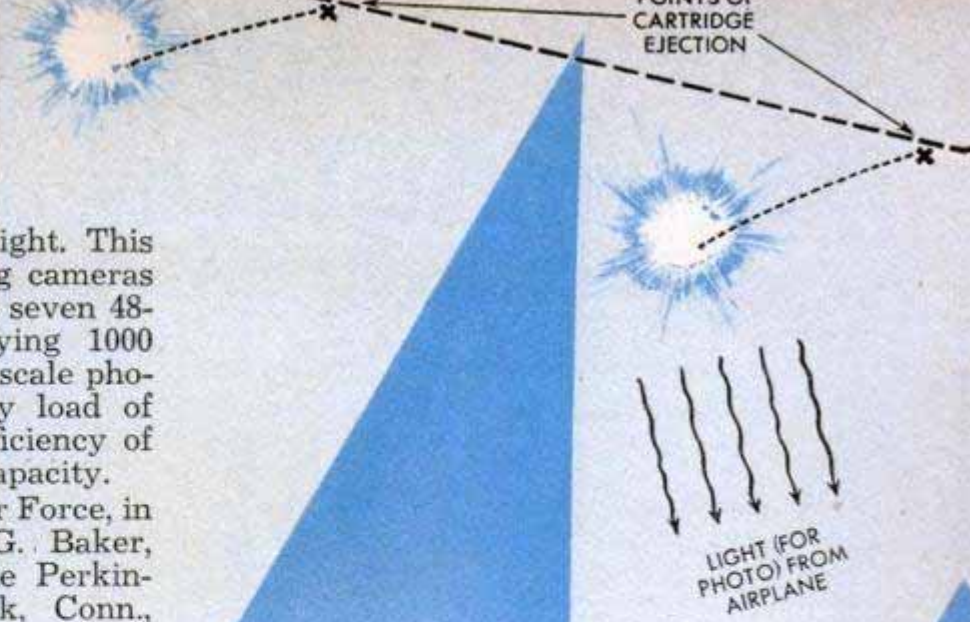
To satisfy both mapping and intelligence agencies, a large and small-scale set of pictures must be made of the ground from horizon to horizon at

Pivoted above a three-piece window in the belly of plane, the Perkin-Elmer camera's scanning prism, right, sweeps across the terrain from horizon to horizon in one complete motion

Huge spools in the Air Force's new giant aerial camera hold film that is 18 inches wide and a mile long. The unit weighs only a third as much as the battery of cameras it replaces







right angles to the direction of flight. This requires three separate mapping cameras for the small-scale coverage and seven 48-inch-focal-length cameras carrying 1000 feet of 18-inch film for the large-scale photographic coverage. This heavy load of cameras greatly reduces the efficiency of the airplane by restricting fuel capacity.

For the past three years the Air Force, in cooperation with Dr. James G. Baker, noted optical specialist, and the Perkin-Elmer Corporation of Norwalk, Conn., producers of precision equipment, have developed and tested a transverse panoramic camera which does the work of the seven large-scale cameras. This development has also resulted in increasing the range of the aircraft through the substitution of fuel for camera load.

The transverse camera is mounted in a vertical position with the lens pointing through an opening in the floor of the airplane. Directly beneath the lens is a rotating prism shielded from the elements by a three-piece window. This prism rotates across the line of flight of the plane to any degree desired from left to right horizon. At the top of the camera there are two film spools which pay out and take up the 5000 feet of 18-inch film weighing 400 pounds.

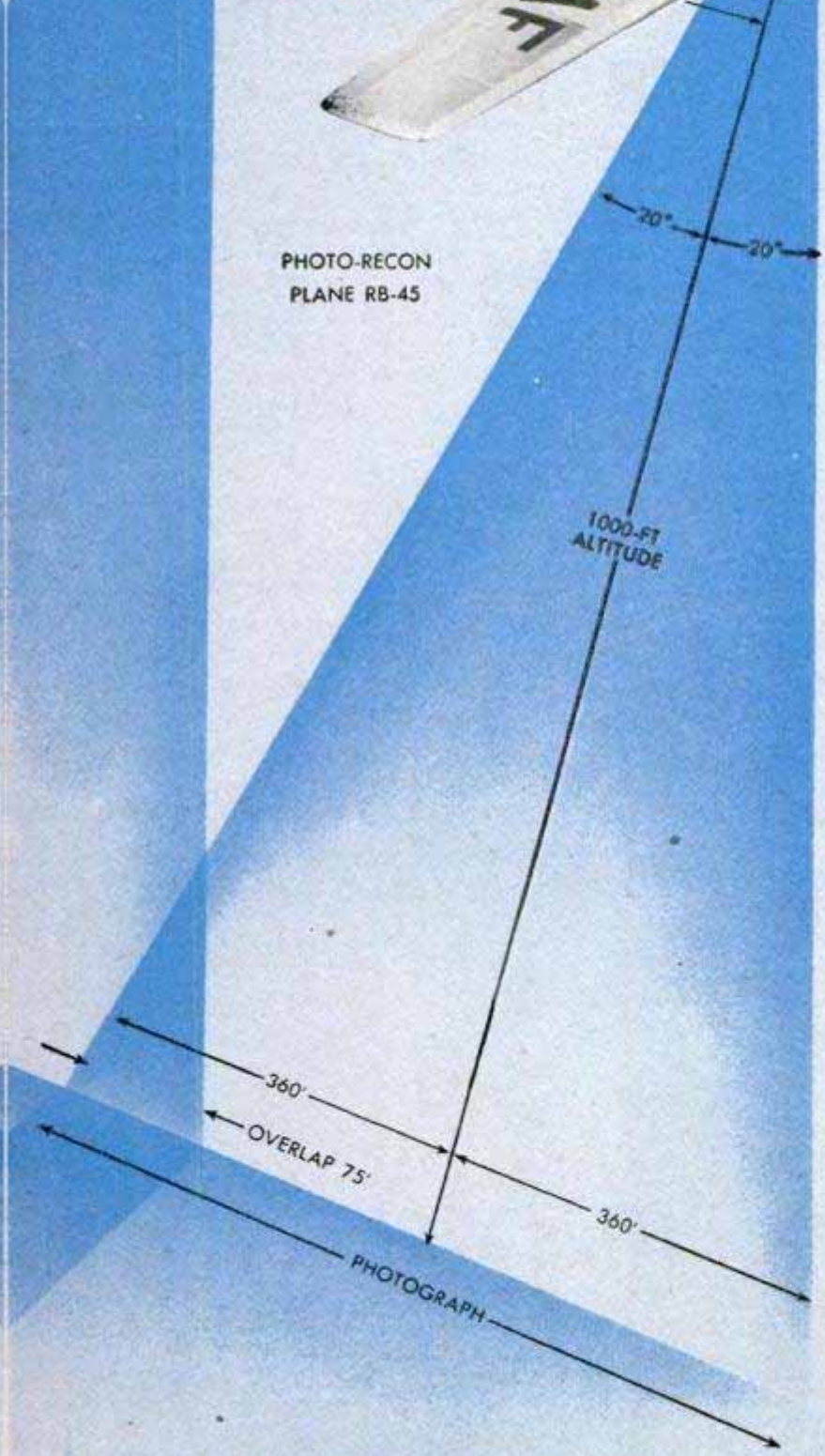
In operation, one spool containing unexposed film is turning constantly. When the prism is in position to begin a scan, the film is rapidly drawn across an adjustable slit where the exposure is made in perfect synchronization with the scan of the prism. Exposed film is taken up on a second spool. At any one instant only a two-inch strip of the film is exposed in front of the slit, but 12 feet can be exposed in less than two seconds. Exposure is controlled by varying the width of the slit, eliminating complicated shutter mechanisms.

As for operation, the prism may be compared to a swinging mirror. When we hold a mirror up to our eyes and slowly turn it, we can scan a large part of the scene about us without moving our eyes. As the prism in the transverse panoramic camera turns, it too picks up and transmits to the film a small fraction of the scene below the speeding plane. By the time it has completed its sweep the prism has covered the terrain below the airplane—from horizon to horizon. Like a swinging mirror, the prism must come back to position before it can resume scanning. Hence during half of its rotation no exposure is being made, and no film is moving across the exposure slit, which is approximately .004 inch wide for bright-weather operation and is adjustable for various light conditions.

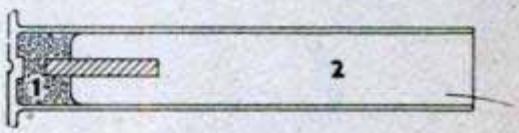
The development of this equipment is actually an ingenious modification of the Air Force's strip-camera principle, which was accomplished years ago and applied very successfully to low-altitude, high-speed-jet-aircraft aerial photography during World War II, and recently in Korea.

Night shots like this are generally more revealing because the foe relies on darkness to hide his moves

Colonel Goddard, left, and an assistant inspect a flash-cartridge discharger mounted on recon plane

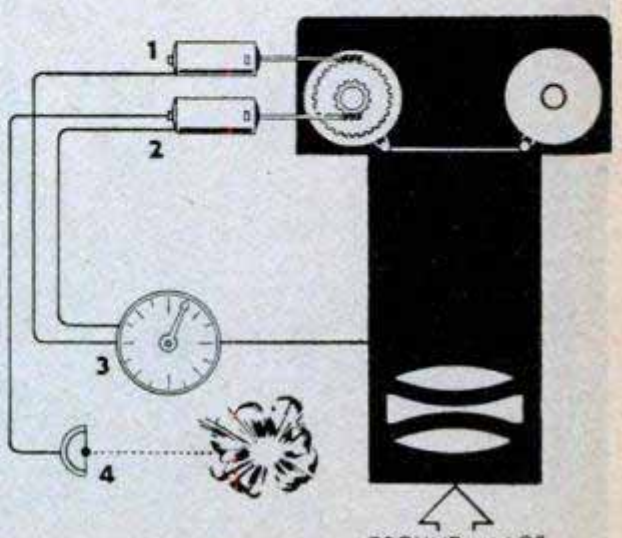


Precise timing is essential in the Air Force's night-photo-recon missions. When the photo navigator (3) sights a target he presses a button that starts an intervalometer. After a preset number of seconds, while film in the camera (6) is synchronized with the movement of objects on the ground, a cartridge (2) is fired which flashes below and behind the plane. This process is repeated until a continuous strip of overlapping air photographs is completed. In addition, a motion-picture camera (4) is also in operation. The camera's angle of rotation is 50 degrees (5). Fig. 1 is the view finder



In a photoflash cartridge, above, the propelling charge (1) ejects section with magnesium compound (2), causing it to burst and flood the sky with light of almost one billion candlepower

While the night photos are being taken, upper motor (1) rotates film spool at low speed as it is synchronized to ground-image motion. A second motor (2) shifts new section of film into position to take picture upon receiving the signal from the photocell (4), which is actuated by cartridge burst. Both motors and the camera shutter are controlled by an intervalometer (3)



This air view of Los Angeles was taken at 40,000 feet from a jet RB-45, one of the types used early in Korea. City's key points are easily recognized

The continuous-strip camera, unlike conventional cameras, does not have a shutter. It operates by moving film over a slit in the camera, "wiping" an image of the terrain on the sensitized film as the airplane speeds over the ground. By synchronizing the speed of the film to the ground speed of the airplane, a perfect picture is secured along the flight path of the airplane.

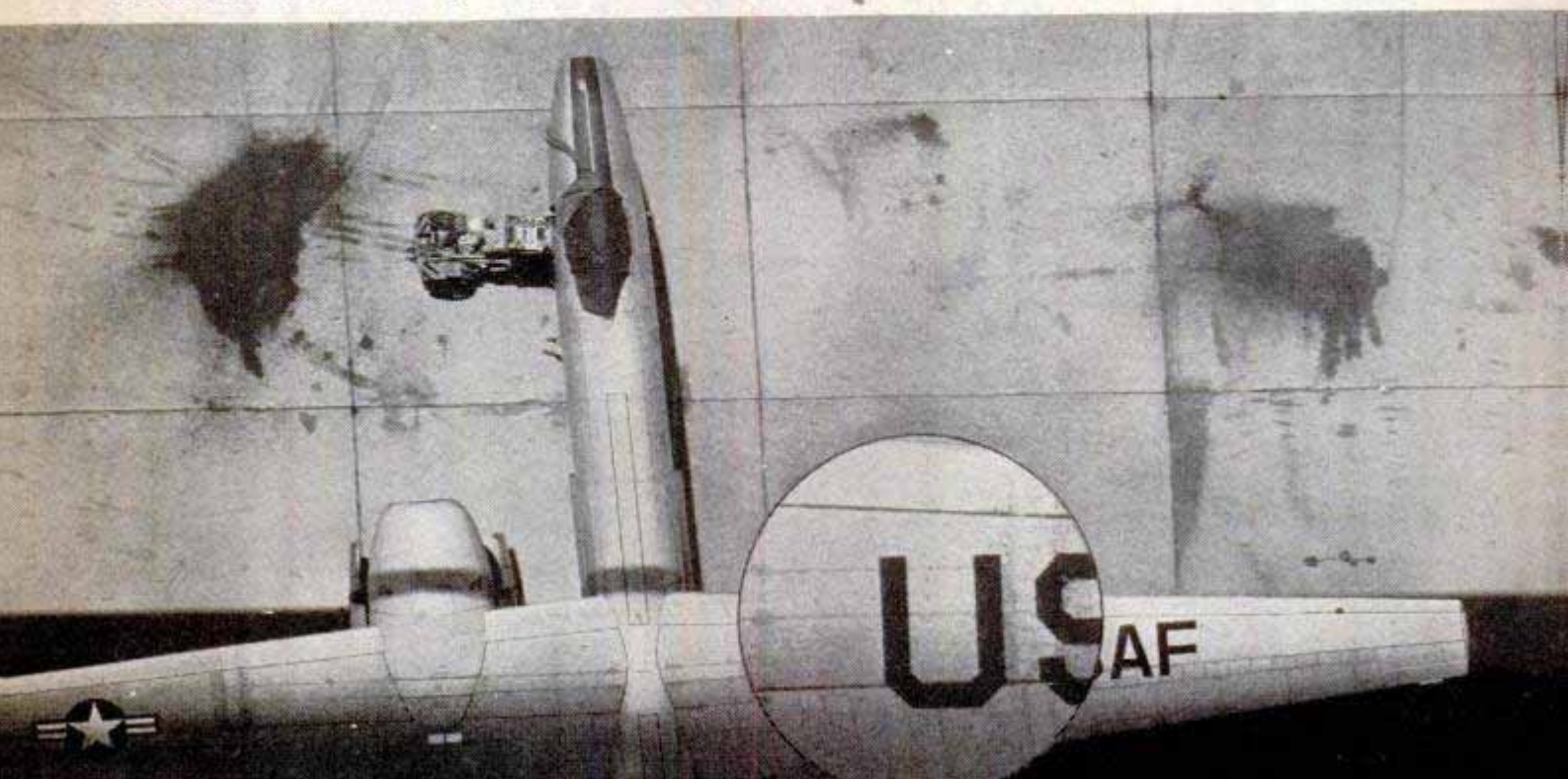
The Perkin-Elmer transverse panoramic camera, however, scans across instead of along the flight path of the airplane. It depends on successive, overlapping sweeps of the prism to photograph the path of flight of the airplane and get a continuous scene. The prism itself, made of the finest optical glass, is a precision-aligned assembly of two right-angle prisms.

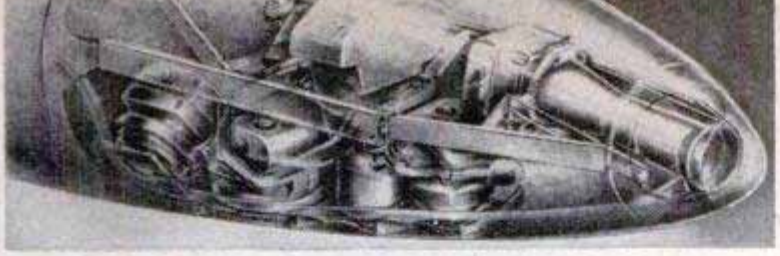
The most difficult design problem in the development of the camera was the synchronization of the film movement to the ground-image motion. The prism and film drives are absolutely uniform to insure perfect reproduction of the microscopic detail which is so necessary in military aerial photography. Secondary corrections were found necessary to compensate for drift of the image due to forward motion of the airplane during the exposure. This factor is further complicated by different rates of drift at different prism positions. Drift is at maximum when looking straight down below the airplane and is reduced almost to zero at the horizons.

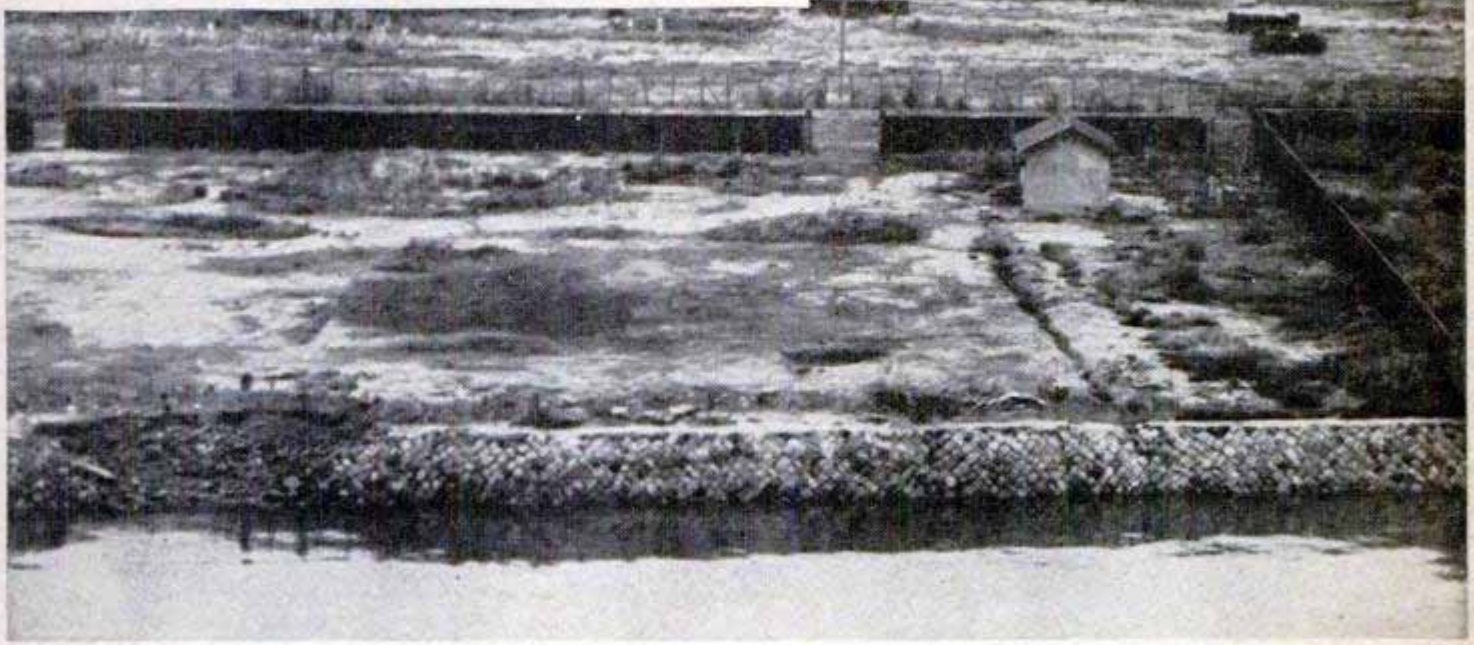
The controls for the camera are semi-automatic. Before a flight is made, speed and altitude of the plane are set on the camera's control panel outside the light-tight compartment in which the camera is housed. A computing mechanism determines the speed at which the prism turns and the interval between the scans.

The optics for the giant new camera were

Parked bomber was photographed by a strip camera in a plane flying 500 m.p.h. only 50 feet above. Quarter-inch rivets in wing, inset, can be counted







Cameras in the nose of an F-80, placed like those at upper left, made this low-level picture of the Inchon, Korea, sea wall in a drizzling rain. Estimates of wall's heights were found later to be correct within a foot

designed by Dr. James G. Baker of Harvard Observatory, a Perkin-Elmer consultant. The 48-inch lens and prism are theoretically capable of recording such minute ground detail as pole shadows and railroad ties from a height of six miles. The prism is the largest of its type and quality ever constructed. Both it and the lens were polished in Perkin-Elmer's optical workshop.

The transverse panoramic camera in its present size was designed for high-altitude long-range daylight strategic reconnaissance operations of the U. S. Air Force. These special reconnaissance airplanes have an unusual range of operation and are also equipped with night-photographic equipment which facilitates round-the-clock photography from both high and low

(Continued to page 246)

Body styles of automobiles are distinguishable in low-level shot of parking lot made during 500 m.p.h. flight

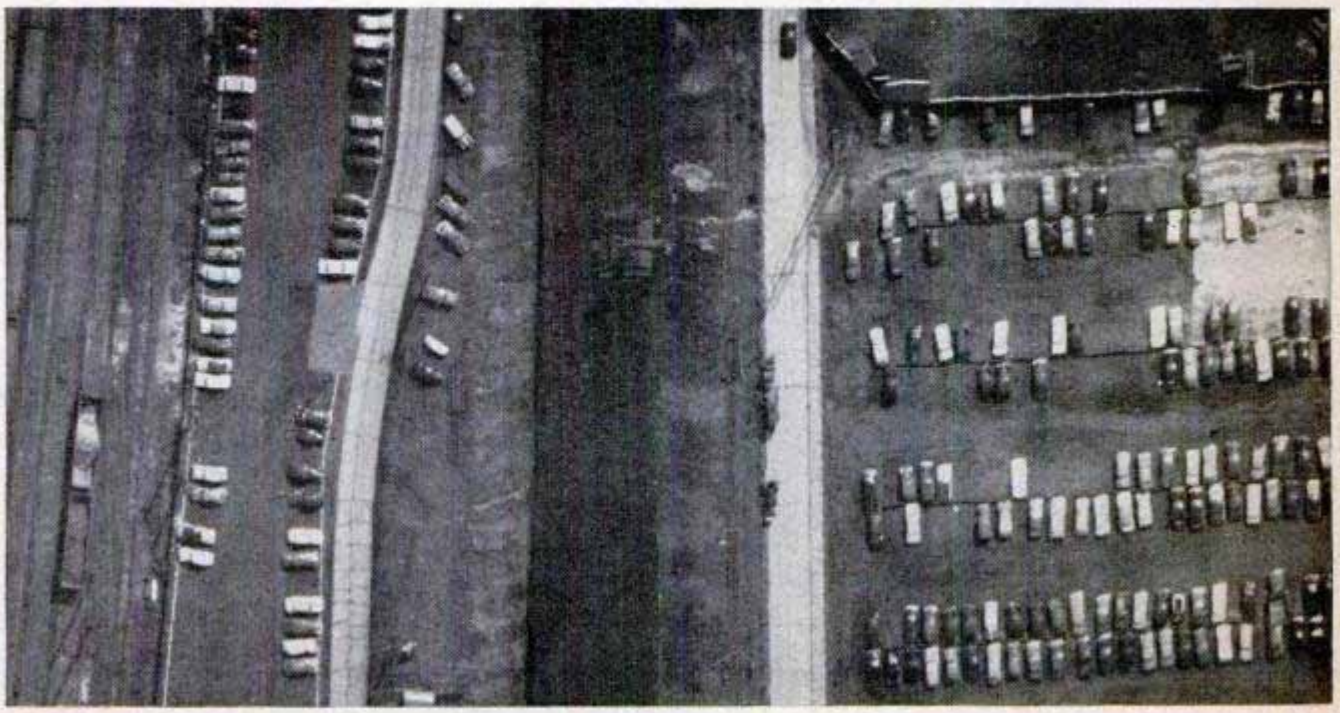
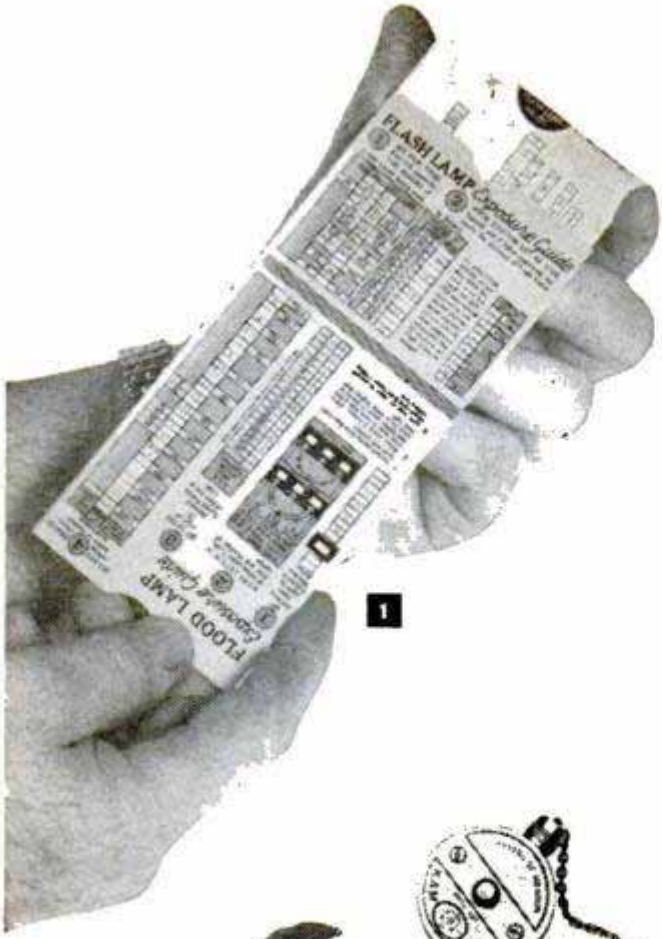


Photo Foursome



1

GOT EXPOSURE PROBLEMS?

1. Designed and used like a slide rule, a pocket-size plastic chart tells you what exposure to use with any type of film and under any light condition. One side, shown here, is charted for exposures made in artificial lighting, both flood and flash. Turn it over and you will find a guide for determining the proper exposure under natural lighting conditions. A listing of various film speeds is also included on the chart

ALL THUMBS WITH A TRIPOD?

2. Anyone who has ever tried to remove his camera from a tripod in a hurry to catch an "on the fly" shot will love a new accessory. It enables you to join or separate your camera and tripod in a split second. It comes in two parts. One part fastens to the camera, while the other fastens to the tripod. They dovetail together securely. To separate the camera and tripod, you just pull on a short chain and slide them apart

2

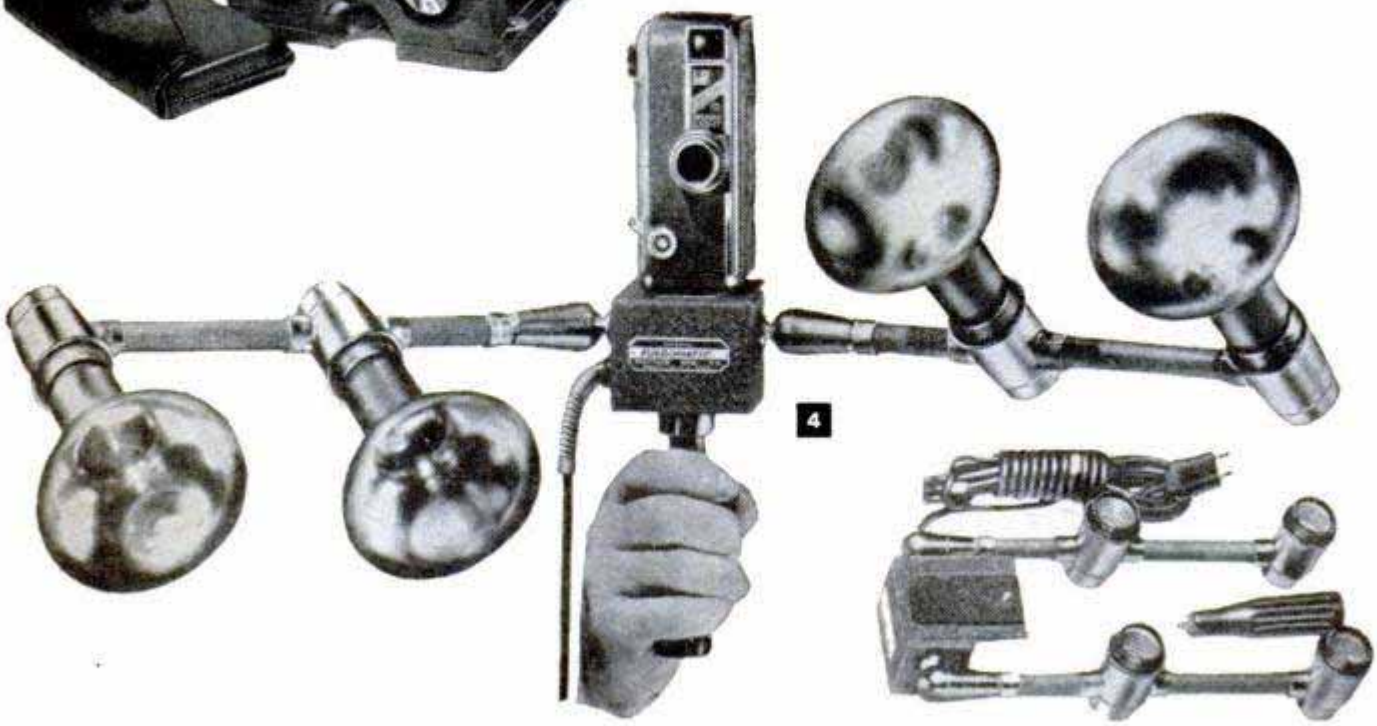
ARE YOU A STEREO FAN?

3. If you, like thousands of other photographers, have taken up stereophotography, you'll find it very convenient to have a folding viewer that you can carry around to entertain your friends. It weighs only 3½ ounces and when folded is not much larger than a pair of spectacles. It takes all standard-size stereo mounts and has both eye-spacing and focusing adjustments. The lenses are of polished optical glass

TRIPPING OVER LIGHT STANDS?

4. There's no need for movie makers to be bothered by troublesome light standards. A folding lighting arm on which the camera is mounted takes four bulbs that shine wherever you aim the lens. Three degrees of brightness are provided by a dimmer switch that is built into the center portion of the light unit. The arms move in any direction and can easily be rotated through almost a full circle. The unit weighs 2½ pounds

3



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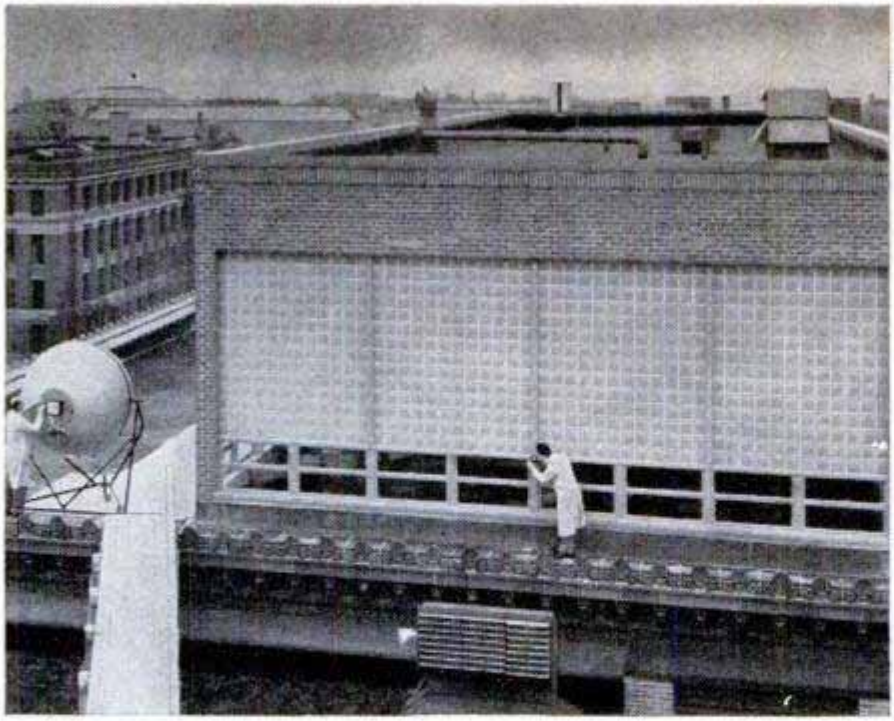
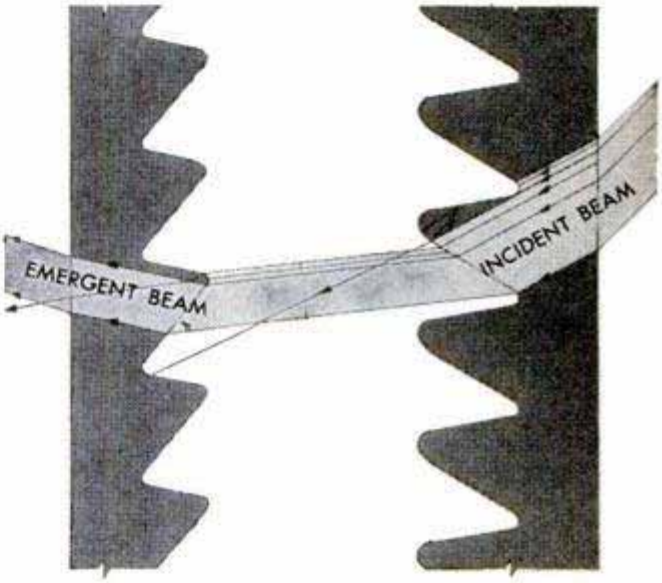


Prismatic-block wall at lighting lab, above. Right, section of block. Below, rays are "bent" by prisms

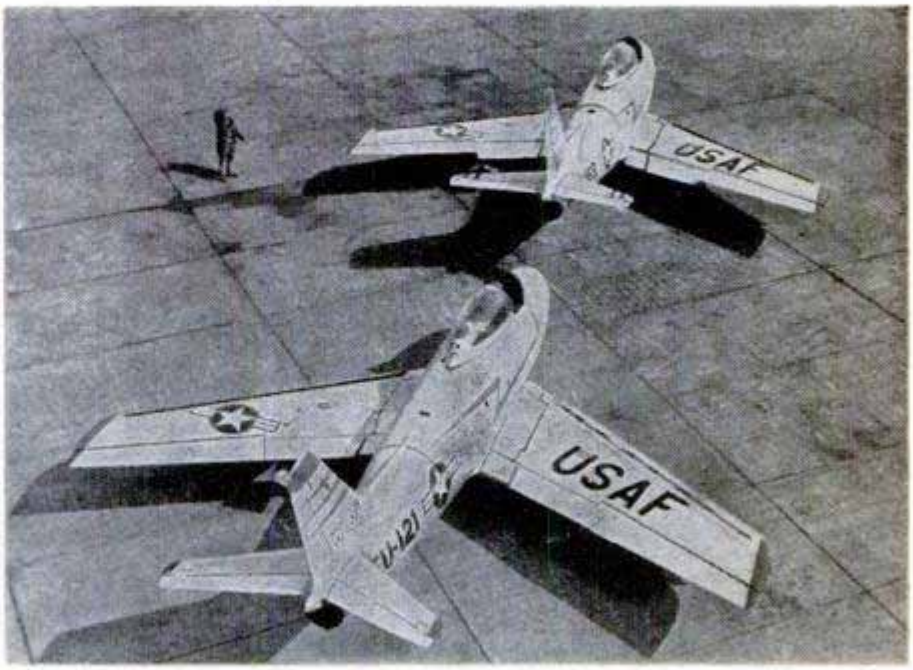


Prismatic Glass Blocks Give Light Without Glare

By directing light rays upward to the ceiling, a prismatic glass block provides even, indirect lighting with no glare. The ceiling, painted a light color, reflects light down to all portions of the room. Because of the prismatic design, there is no glare on the inside faces of the blocks. A narrow strip of clear-glass sash is installed in the block wall to provide ventilation and vision. These new blocks, developed at the University of Michigan, are to be used in school classrooms.

Jet Engines Started by "Artificial Respiration"

Jet airmen in Korea are applying "artificial respiration" to start engines where the plane's battery isn't working and auxiliary power units aren't available. The tail pipe of a jet already operating is aligned in front and some distance ahead of the air intake of the plane to be started. Acceleration of the lead plane to full power "windmills" the second craft's power-plant blades to more than initial firing speed and a normal start is made. The technique is also helpful in cold-weather combat zones.



His engine ailing, the customer gets an expert diagnosis from Jim Fulton, left, at the self-service garage

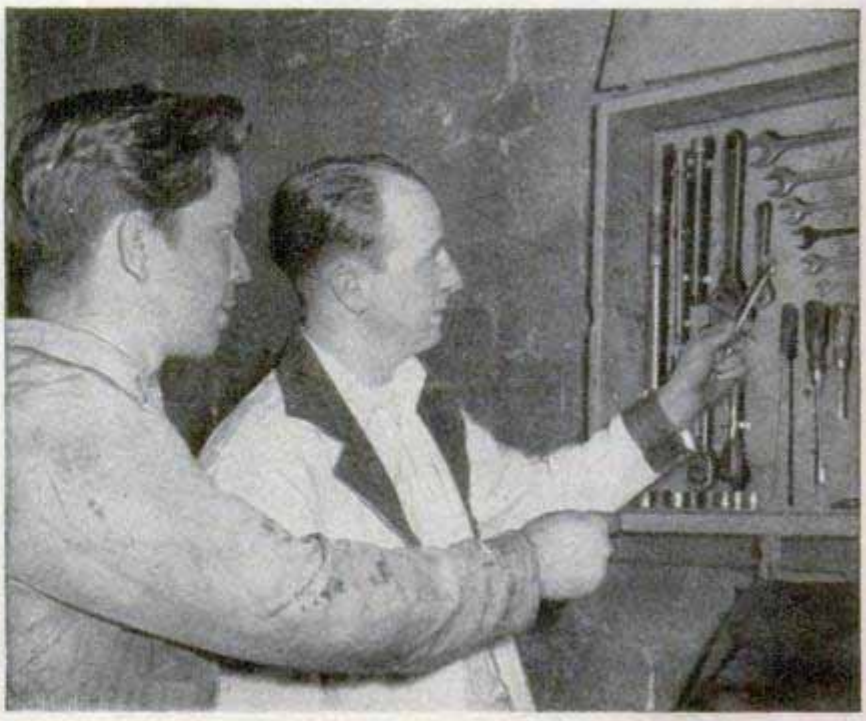
FIX-IT-YOURSELF GARAGE

DOES YOUR CAR need a ring job? Or a new clutch? Or perhaps your brakes should be relined? Well, if you live in Cleveland, Ohio, and can tell a spark plug from a fan belt, you can do it yourself and save money.

Just off famed Euclid Avenue on 90th Street, there's a garage that hires no mechanics. Mechanics aren't needed because the customers do the work themselves. The proprietors simply provide the place, the tools and the supervision—plus, as Robert J. Capstick, president of U-Fix-Ure Car Co., explains, "a little encouragement when things look bad."

When a customer drives up with an ailing engine, one of the three partners looks it over and diagnoses the trouble. The car

Left, one of the three proprietors reams a rod for a customer. Right, each customer gets a kit of hand tools



New parts are bought through the garage. John Sokol sells a customer a length of wiper hose for his car

is then assigned to one of the 20 stalls and the owner is given the key to a toolbox and he goes to work. He pays 75 cents an hour for the tools plus $1 a night for storage.

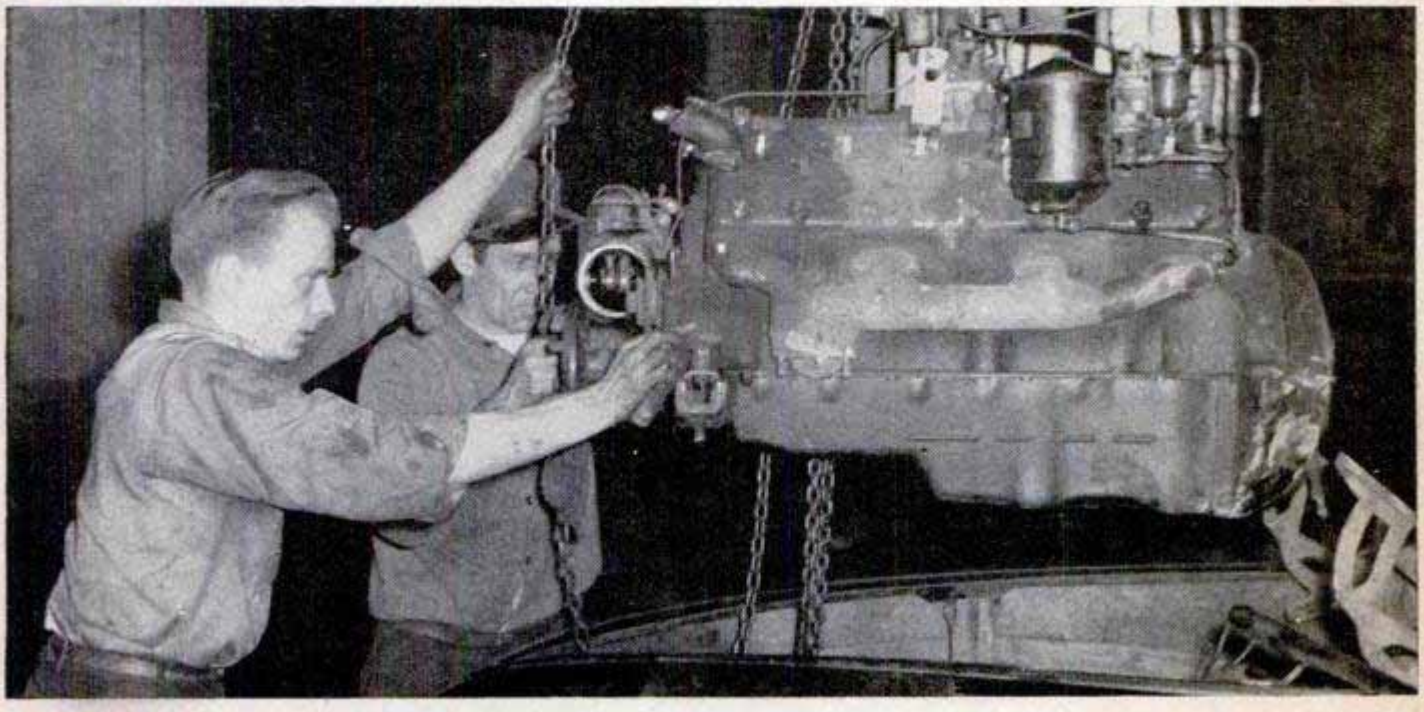
A complete machine shop in one corner of the garage is "off limits" to customers.

"That equipment is too complicated for the novice," explains John J. Sokol, vice-president. "When a customer wants some valves faced, a block rebored or brake drums turned, one of us does it for him at a reasonable price."

Most of the jobs are major operations. One customer put a new frame in his 1938 Ford. Another did a complete body-rebuild job on a 1942 Chrysler. Brake relining and clutch replacement are common.

"Some fellows get discouraged before the job is finished," comments Jim Fulton, secretary, "and we have to use a little psychology to keep them at it. But when they get the parts back and the engine runs you should see them beam! After that they come back whenever the car needs any kind of work. They save money and have a lot of fun."

Major jobs are common. These men came over after work to install a reconditioned engine in their Lincoln



Developed by Carpenter, this air gun is actually a rifled revolver and it fires eight darts or pellets

Can openers are a favorite item with most inventors and Carpenter has made two improved models himself

He Builds Inventions to Order

By Weldon D. Woodson

YOU THINK IT UP and he will make it. That's the role Edgar O. Carpenter of Van Nuys, Calif., has assigned himself. Scores of inventors have gone to him (an inventor in his own right, by the way) with an idea they hope will bring them a fortune. Proof that some of his clients have made money is found on the walls of his reception room where he has hung magazine advertisements of products that he designed.

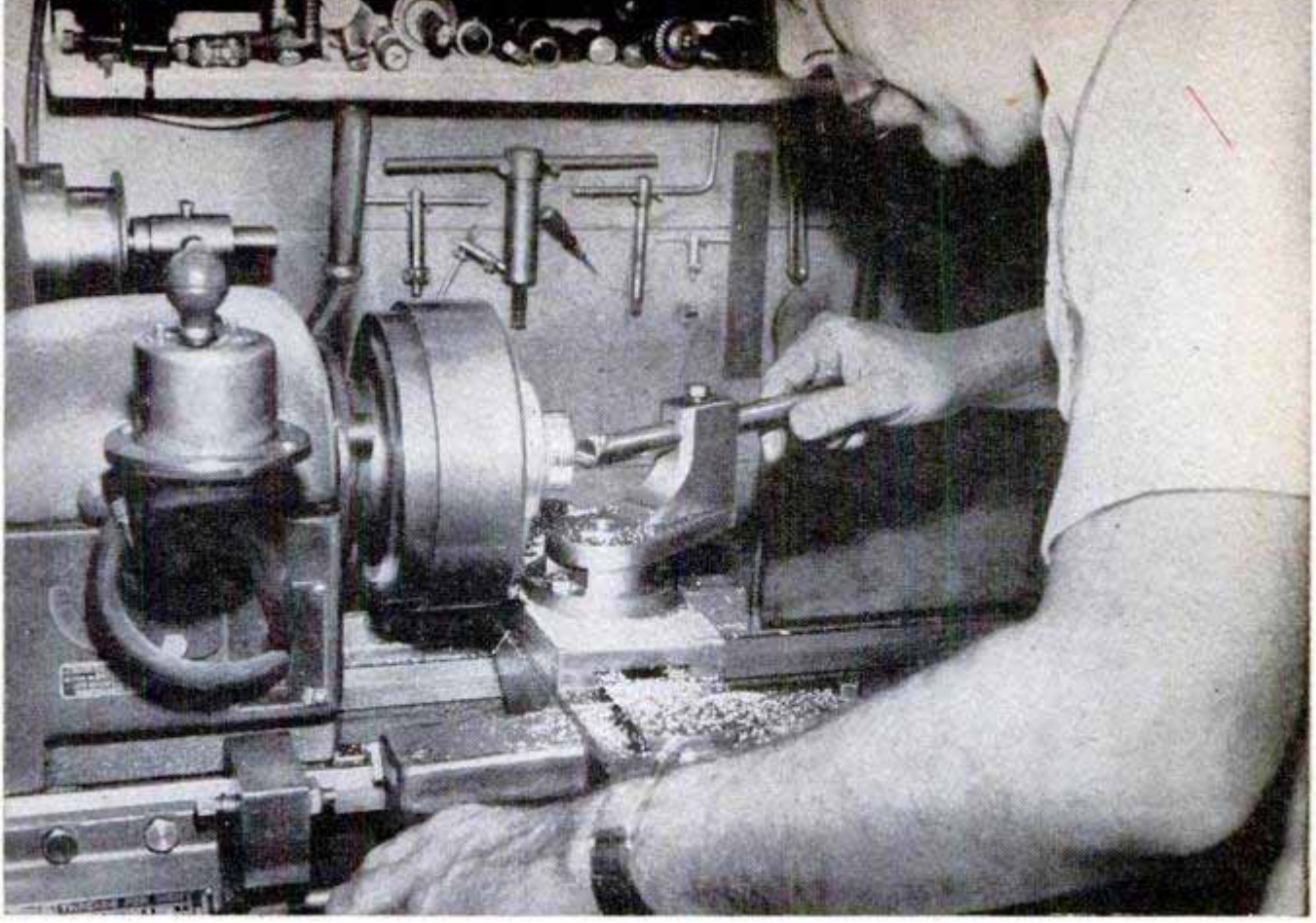
Of the many inventions he has worked on, however, only a few have brought big dividends. But it makes no difference to Carpenter. He never loses, since he builds the models for a fee which is not at all dependent upon its public reception. Often the person seeking his help has only a vague impression of what he wants, and by the time the product is finished it is as much Carpenter's as the client's.

It all started back in 1946 when he was a supervisor in a machine-tool section of Lockheed aircraft factory. In his spare time, he tinkered in his shop and made handy devices to make his wife's housework easier. He turned out a cheese slicer that regulates the depth of the cut, a can opener that retains the lid until it is dropped into a receptacle, a one-piece stopper for the bathtub with no metal ring to pull out and a toilet silencer that eliminates refilling noises by spraying water into the tank and holding a slight back pressure on the valve. And, by the way, he's the man who made the rolling pin with built-in containers for salt and flour so that it dispenses these ingredients as it rolls.

Once while he was away from home for several days, his wife started to set out some gopher traps in their lawn, but she couldn't figure out how they worked. Neither could the neighbors. When Carpenter returned, she asked him to make a trap simple enough for her to set. Shortly thereafter, from his shop came a device similar to a pair of pliers or tongs. Rather than having to set the trap before placing it in the tunnel, you insert Carpenter's model in the hole uncocked and by pressing the handles open the toothed jaws against the sides of the tunnel. The gopher walks unsuspectingly over the undisturbed floor of his runway until he touches the trigger plate—and he's caught!

As wives do, Mrs. Carpenter told her neighbors of his handiwork and they passed the word to others. Soon, he had such a backlog of orders for the traps that he gave up his aircraft job. From then on, his workshop has taken his full time.

One of his clients evidently had given much thought to the maxim, "Make a better mousetrap and the world will beat a path to your door." This customer brought a metal mousetrap to Carpenter and asked that it be improved. With its two pins, two springs and various small parts, the trap



To help him in his shop work, the California machinist developed an unusual radius attachment for his lathe

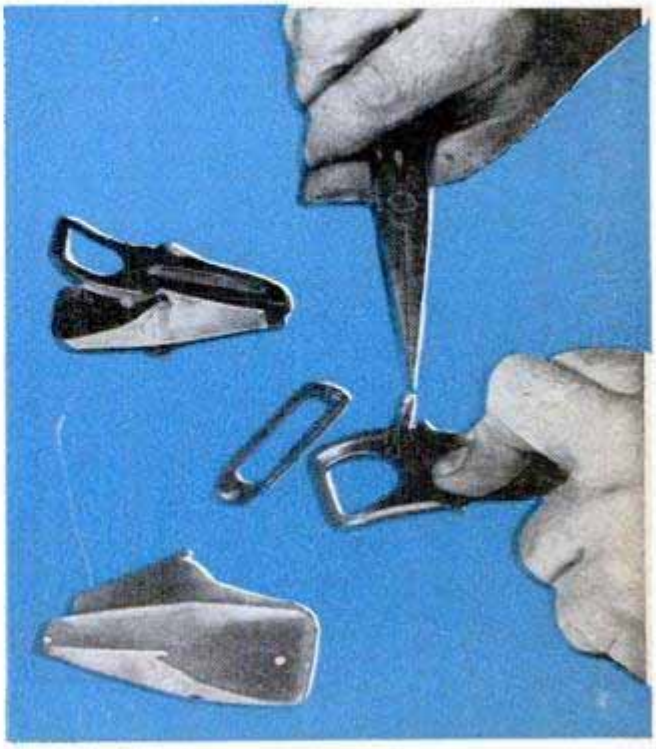
presented a manufacturing problem that Carpenter thought could be simplified. He rebuilt it so that it had no pins or riveting. The new design consisted merely of three parts and a single spring. This spring holds it together, sets the trigger and does the killing. However, its success is summed up by Carpenter in this manner: "I built a better mousetrap, but I'm still working for a living."

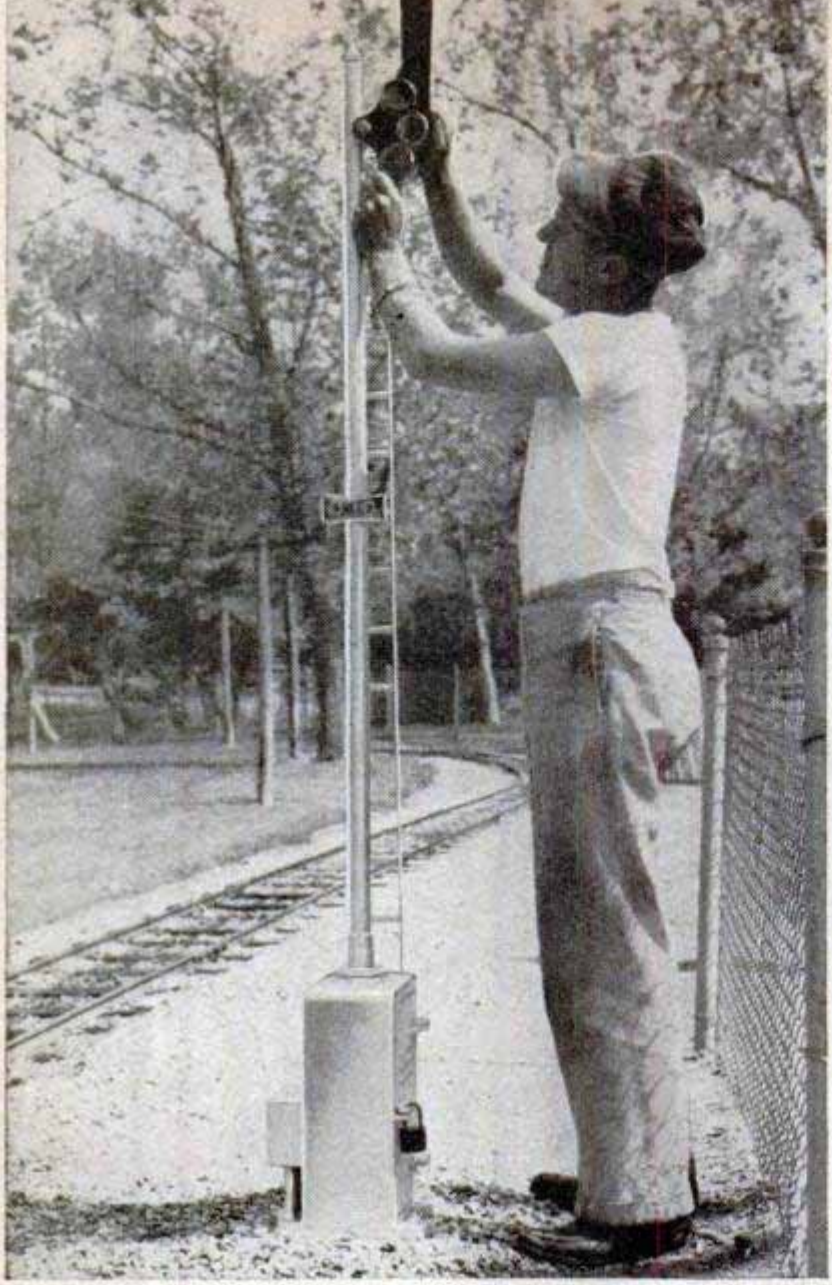
He has produced a mechanical bank that releases different denominations of coins, a device for the ceiling that gives an alarm when fire breaks out, a cigarette snuffer that attaches to the car windshield and a pipe tapper, which, so the advertisement goes, puts an end to dirty, burned fingers and flying ashes. On order, he made an automatic lighted-cigarette dispensing unit for the car. Push a button and out comes a lighted cigarette all ready for a busy driver to smoke.

A fellow Californian came to him with an idea for a Western-style pneumatic revolver for target shooting in the limited space of the living room or rumpus room, or for accurate shooting at longer range outdoors. Carpenter worked the idea into actuality. The air gun was made of blue-plated cast metal and had a bone-plastic handle. It shoots darts or pellets and has these features: safety button, rifled barrel, easy pumping action because of a special air-check valve and a silent action.

When a Kansas City firm installed a model-train layout for youngsters at Los Angeles' Griffith Park, it hired Carpenter to design and set up exact-scale semaphore signals to keep the train running safely and on time. With signal arms, colored lights, aluminum relay boxes and inspection ladders, the signal models are precisely

Really simple is the mousetrap formed of three parts and a spring. The top assembly is a completed trap





like the full-size models although they are scaled down to a height of 6½ feet. They operate by remote control through electrical impulses from the rails to the relay boxes.

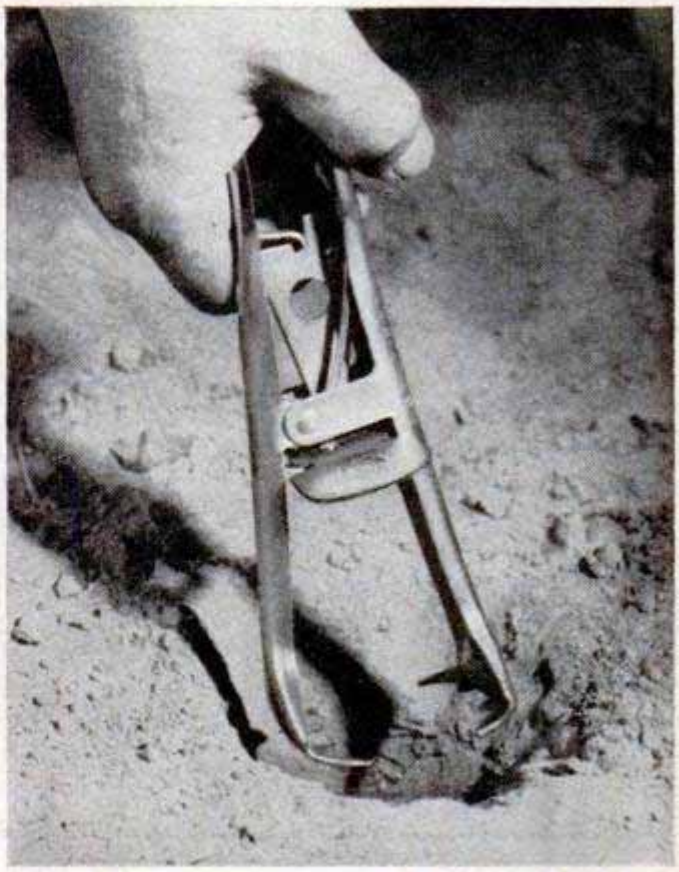
Carpenter's fame has spread to the movie colony at Hollywood. When Bob Topping, husband of Lana Turner, had a de luxe $22,000 custom automobile built, he hired Carpenter to make the instrument panel of shiny steel decorated with a swirl finish.

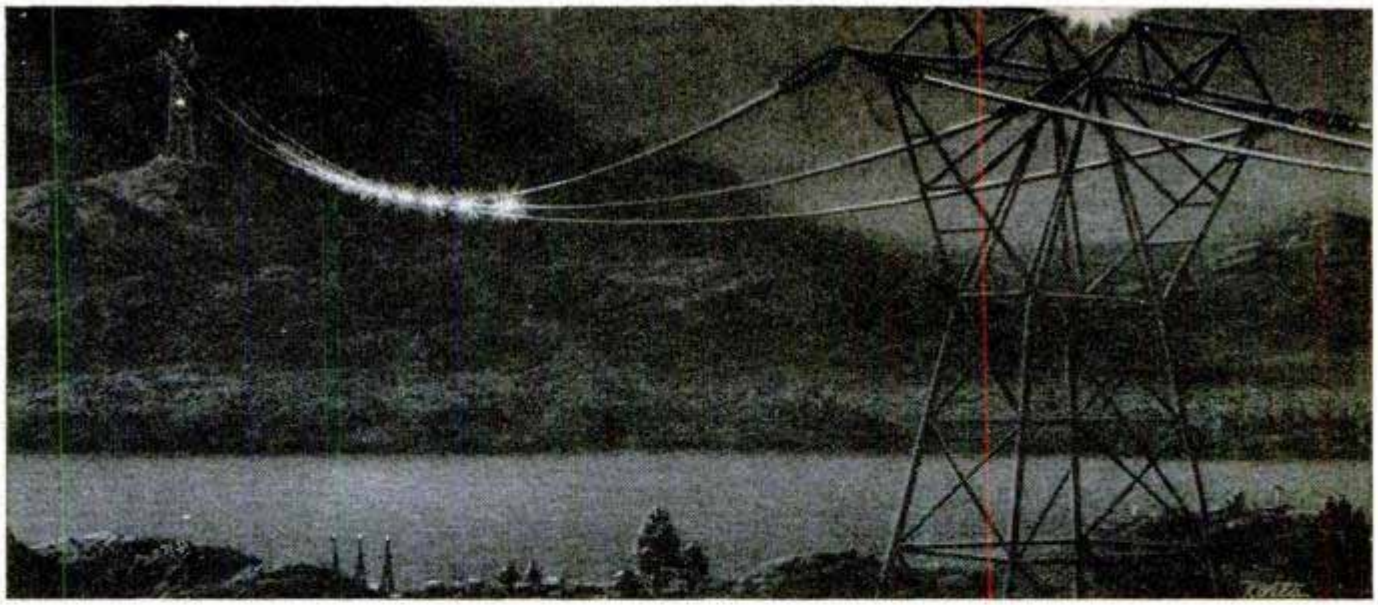
Among the latest models he has made for a client is a never-lose cap for a toothpaste or shaving-cream tube. To expel the cream, you don't have to remove the top. You simply squeeze. When through, you give the cap a slight turn and it locks. For this, the client has been offered $50,000. When describing this model, Carpenter's face brightens. Not that any of the money is his—but should the cap go into production, he will be the one who makes the machinery for producing the caps in quantity.

Scaled down to miniature-train size, a signal tower operates realistically

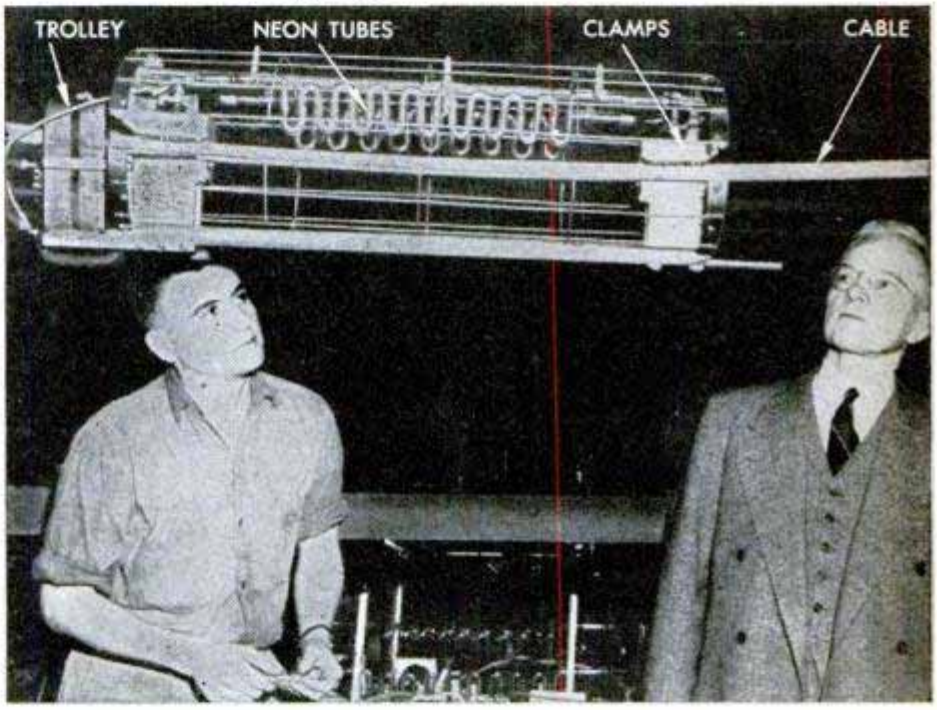
Below left, Carpenter also developed a thermostatic switch that warns of fire

Below, easy to set, the gopher trap is cocked simply by squeezing the handles



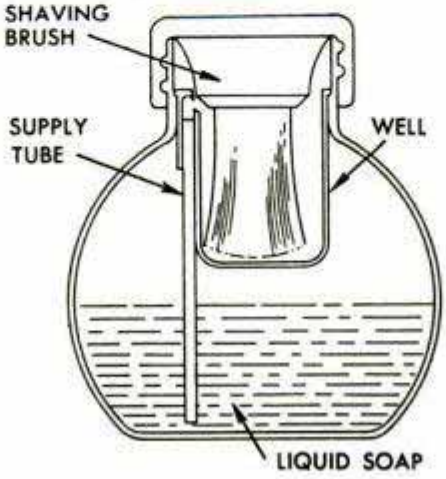


Neon Lights Mark Cables for Low-Flying Aircraft

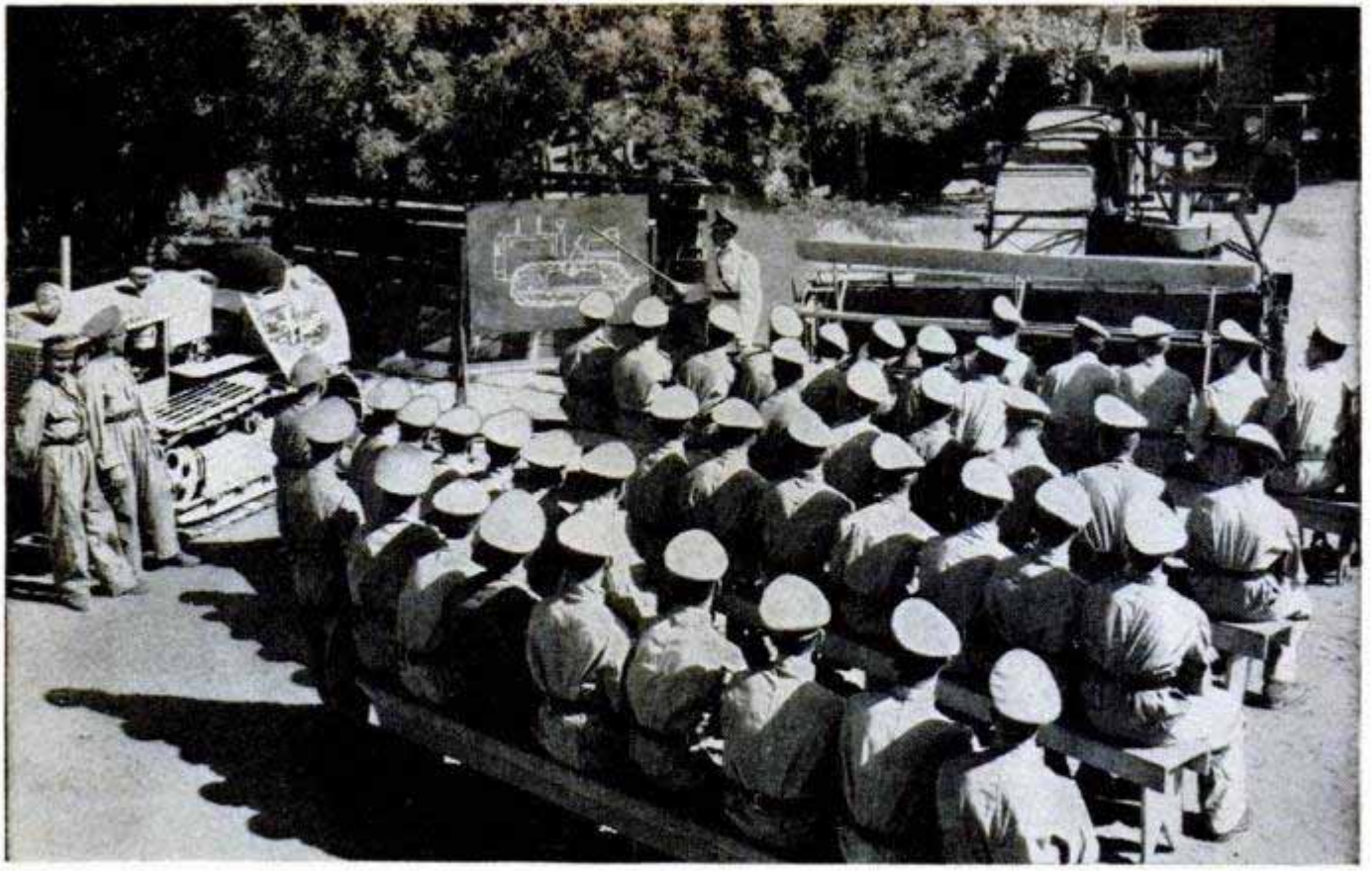


Getting its power by electromagnetic induction, a neon marker light will warn low-flying aircraft of high-voltage power lines on river crossings near airports. Developed under the supervision of Prof. Homer J. Dana of Washington State College, the light is enclosed in a cylindrical cage about a foot in diameter. The 48-inch neon tubes are folded in a series of S-shapes. An electric trolley propels itself and the light along the suspended conductor on rubber-covered pulleys. When the proper position is reached, the power-driven trolley disengages itself from the light and moves back to the tower. Clamps on the light unit lock around the conductor, holding it securely in place. When maintenance is necessary, the trolley runs out and returns with the light fixture. With several such lights suspended on the cable, it will be well marked for approaching pilots.

Flexible-Plastic Bottle Has Built-In Well for Liquid Shaving Soap



Small amounts of liquid in a flexible-plastic bottle are drawn up into a well for dispensing without exposing the main supply to contamination. The well, or reservoir, is fitted into the neck of the bottle and is connected to the bottle interior by a long tube. Among possible uses is as a liquid-shaving-soap dispenser with the small well, graduated for measuring, serving as a built-in mug.



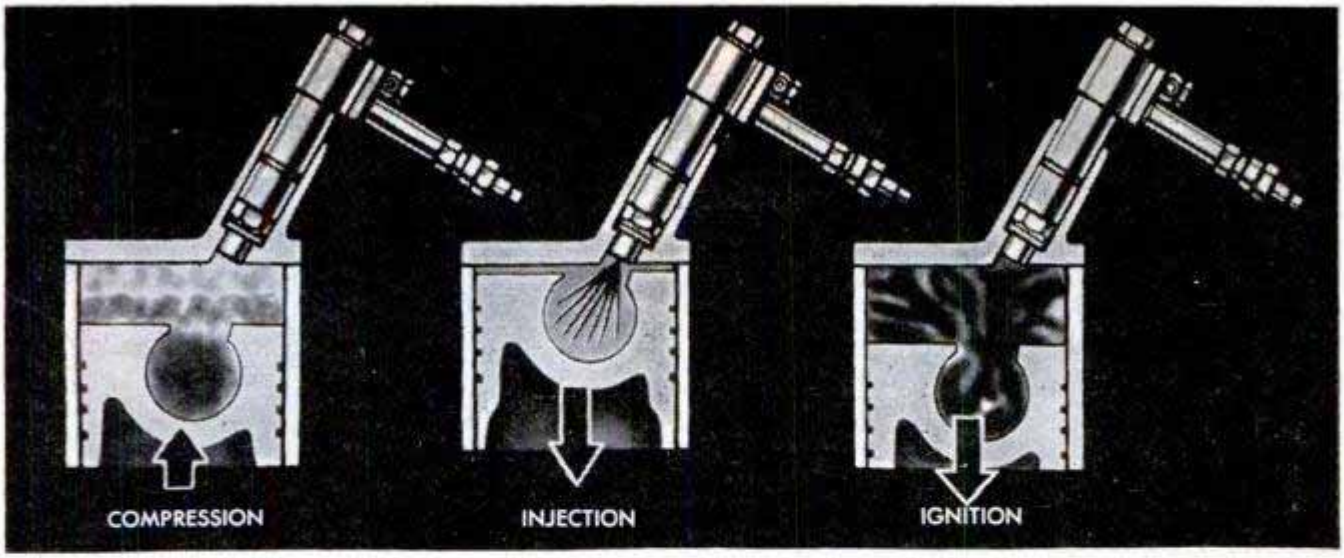
Chilean Soldiers Learn Farming

Military training is compulsory in Chile and the soldiers take part in a new program designed to increase crop yields by mechanizing farms. The soldiers study operation and maintenance of tractors and other farm equipment, most of which come from the United States. They also work in the fields, planting and harvesting crops. With the new equipment, Chile harvested a record rye crop.

Meteor Camera

Meteors as small as buckshot are tracked and photographed by a new type of camera. It records about 40 times as many "shooting stars" as sky cameras now in use, and "sees" a tenth of the visible sky at once. When operated in pairs several miles apart, the cameras permit scientists to calculate the height and speed of meteors. The buckshot-size particles from space can be photographed because they burn with a brilliant light upon entering the earth's atmosphere. Research on meteors yields information about the upper atmosphere.

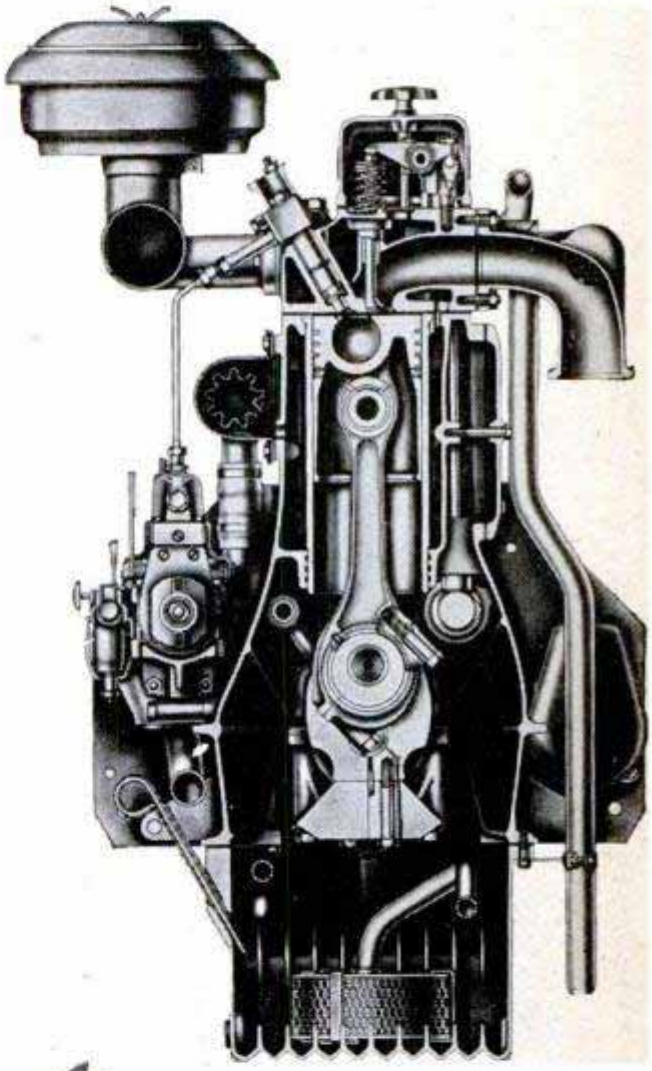
¶ As an abrasive for high-pressure blasting, a reddish-garnet sand quarried in Idaho is 50 percent more effective and lasts longer than white silica sand, according to the Ryan Aeronautical Company.



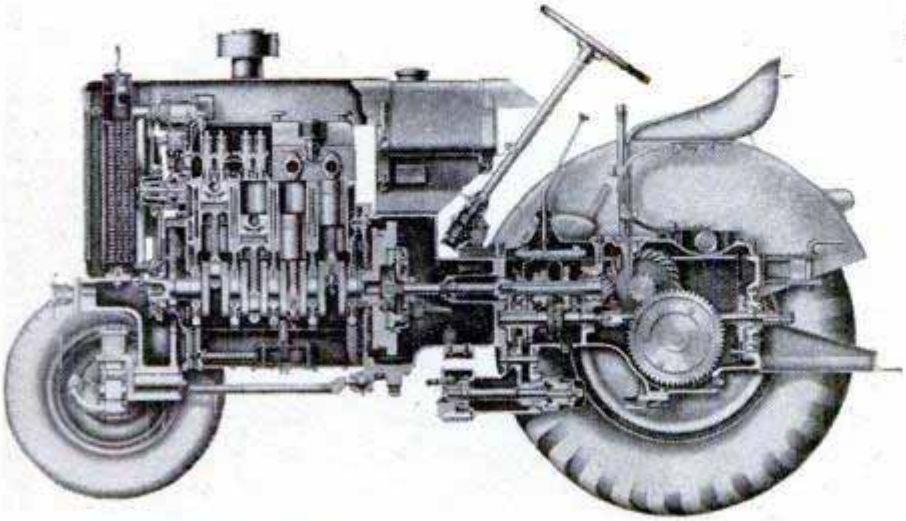
Drawings show power stroke of diesel piston with a spherical combustion chamber. In upstroke, compression takes place, heating the air. Fuel is injected straight into the spherical chamber. Extreme heat inside chamber ignites fuel, driving the piston down

Spherical Combustion Chamber In German Diesel Engine

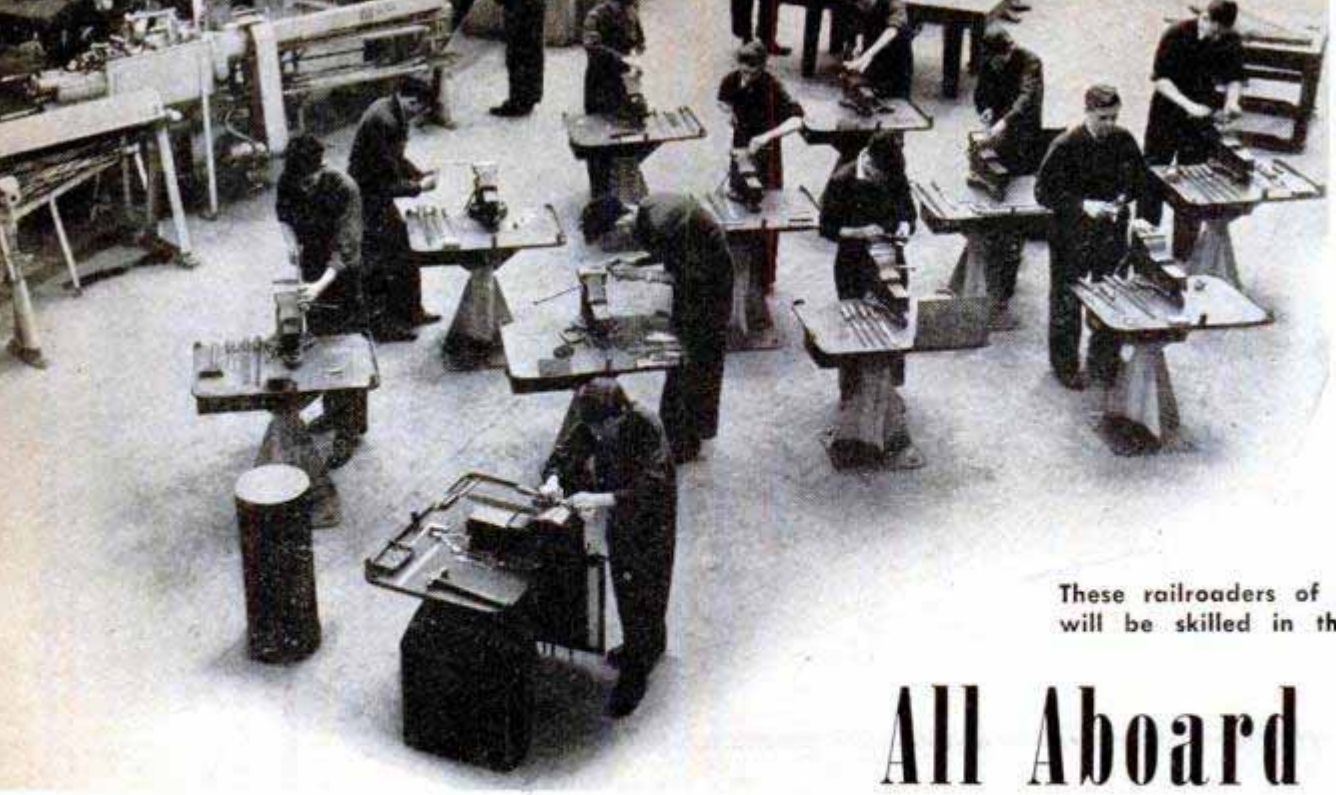
Developed in the same German shop where Rudolf Diesel invented the engine that bears his name, a spherical combustion chamber increases the efficiency of the diesel. It accomplishes this by reducing heat loss, thus assuring low fuel consumption. The hollow sphere is part of the piston head. Because a sphere has the least surface per unit of volume of any shape, the spherical combustion chamber reduces heat radiation to a minimum. Also there is no contact between the combustion chamber and the engine-cooling system. With this engine no ignition plugs, no glow plugs or preheating devices are needed.



Above, a cutaway drawing of the engine clearly shows round combustion chamber. Very high heat develops in chamber due to its shape and location in piston



Left, a tractor powered by the new engine is shown in cutaway. The German-produced vehicle has been designed for simple conversion to four-wheel drive



These railroaders of tomorrow will be skilled in their trade

All Aboard for SCHOOL IN A LOCOMOTIVE YARD

BRITISH LADS who plan to be railroad engineers start learning early. At Derby, 100 boys of around 15 years spend 12 months rubbing elbows with the practical side of railroading.

Two thirds of their time is spent in the train sheds where they watch and take part in engine building and repairing. General courses, like geography, history and English, are taught during classroom hours that make up the rest of their schedule.

The boys are paid at the standard "junior" rate, plus a bonus for good work. Report cards are sent to parents and upon graduation the learners are taken on as apprentices to serve their time.

Just starting for these boys is a year's training in railroading. They are being introduced to a locomotive

Photos copyright Keystone

Railroading is a complex trade, involving all kinds of skills. This boy is learning to work at a hearth

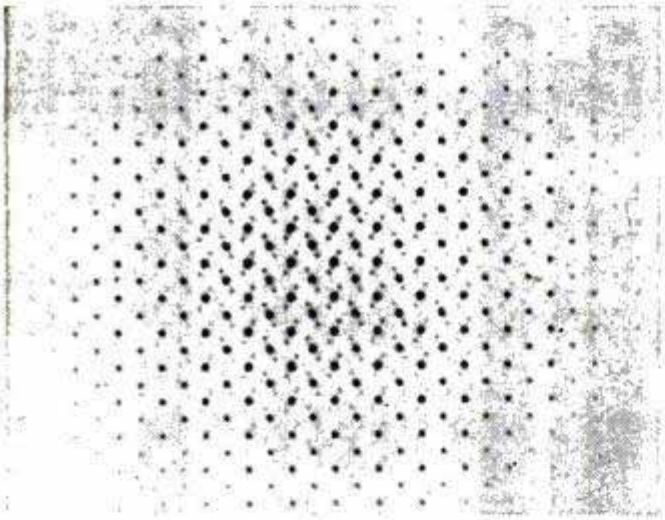
It'll be old stuff a year later, but now everything is new to this group on its first tour of the train yards

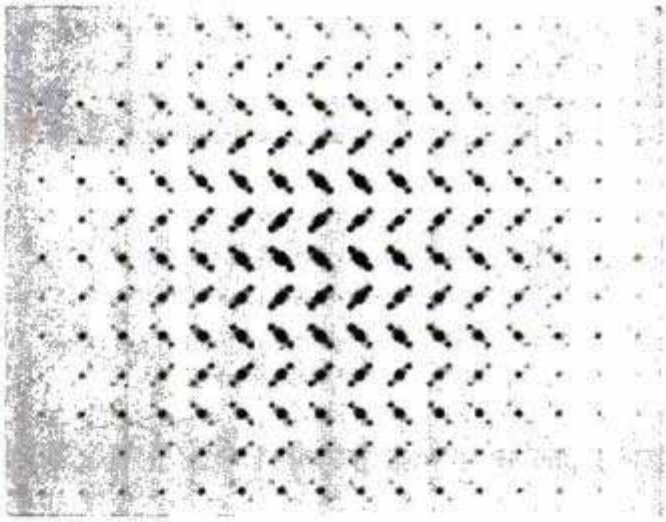
Book learning is not neglected, but the practical side of training is emphasized in the British apprentice plan

Trainees study more than repair work at Derby. Here they make new parts for an engine by casting them

Bottled-Gas Tanker

As the demand for liquefied petroleum gas increases, shipowners are converting cargo vessels to haul the high-pressure liquid. Strict safety regulations complicate the conversion, but at least two conversions have been completed. The tanks that hold the LPG during the voyage are more than 50 feet long and weigh more than 50 tons empty. Elaborate piping systems are required to take on and discharge the liquid under pressure. One converted cargo ship, the S.S. Ultragaz, carries 17,100 barrels of liquefied petroleum gas from Texas to South America regularly. She was converted in the Beaumont, Tex., shipyard of the Bethlehem Steel Co.





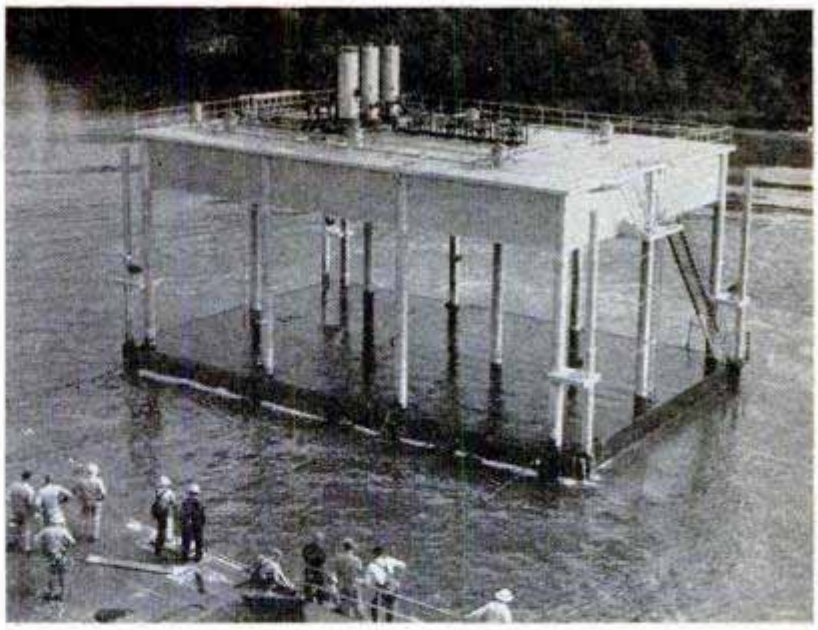
Above left, atoms in marcasite crystal. Above, atoms in pyrite. Dark spots are iron; light ones are sulphur

Below, optical equipment in the center of the photo makes 2,000,000-time enlargements shown above

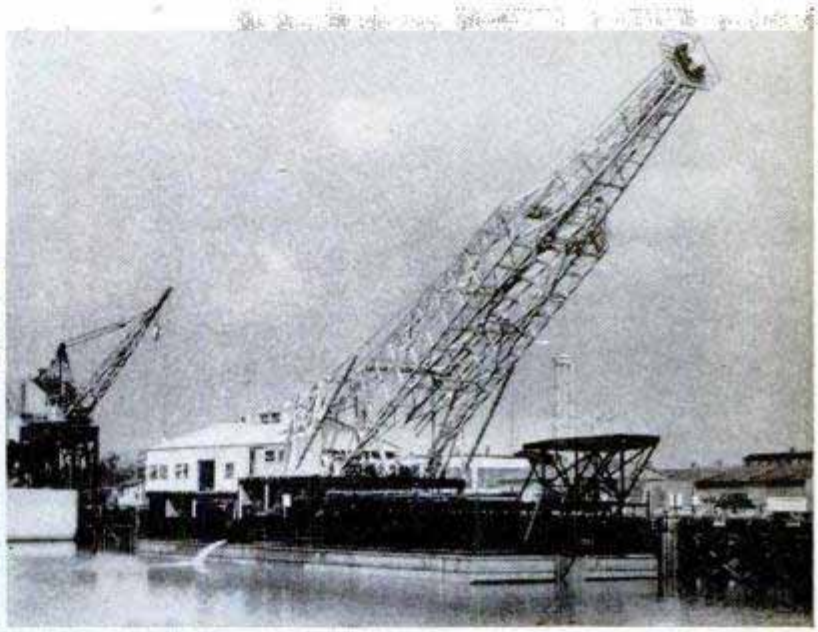
Atom Has Its Picture Taken

Magnifications of millions of diameters are making it possible to photograph the structure of atoms within a crystal for the first time. X rays and ordinary light combine to achieve the tremendous magnification. The diffraction pattern formed when the crystal is irradiated with X rays is given mechanical expression by a perforated plate in the microscope. This pattern is then photographed with visible light. Dr. Martin J. Buerger of Massachusetts Institute of Technology designed and built the new microscope with which he has photographed the atoms in pyrite and marcasite.

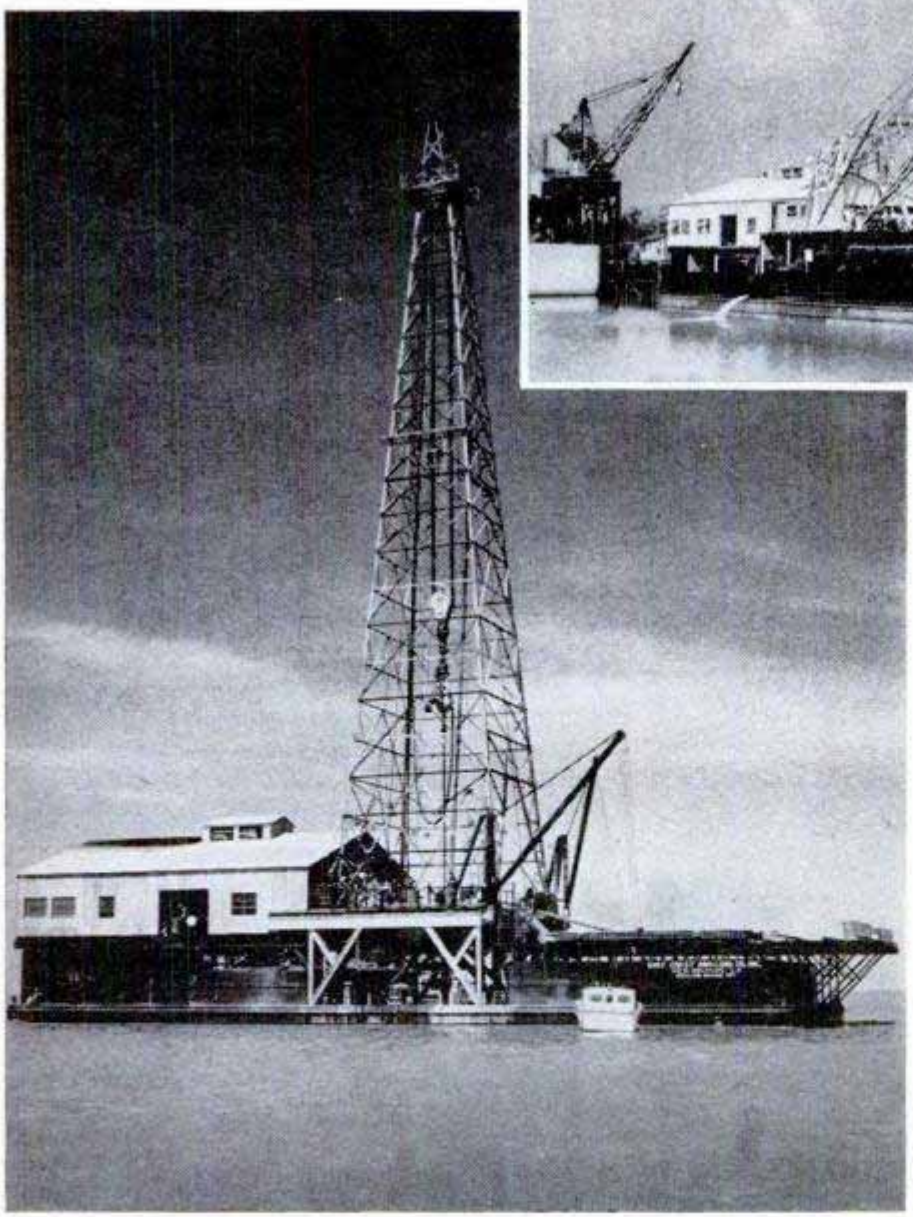
Storage tank, resting on ocean bottom, can be refloated for move to new site



BIG DRILL BARGES and storage tanks are being sunk in the Gulf of Mexico to aid in the recovery of offshore oil. The equipment is designed so it can rest on the bottom until the job is done, then refloated and moved to a new location. A new oil-drilling barge replaces the old platforms which had to rest on elaborate pilings. The 140-foot barge is towed to the drilling site, then submerged to a maximum depth of 10 feet. Upon completion of the well, the flooded compartments are pumped out, raising the barge. Another new barge has an 800,000-pound jackknife derrick 136 feet high, which can be folded down to rest on a cradle in the event of a hurricane. Still another new piece of equipment is a submersible tank barge for oil storage.

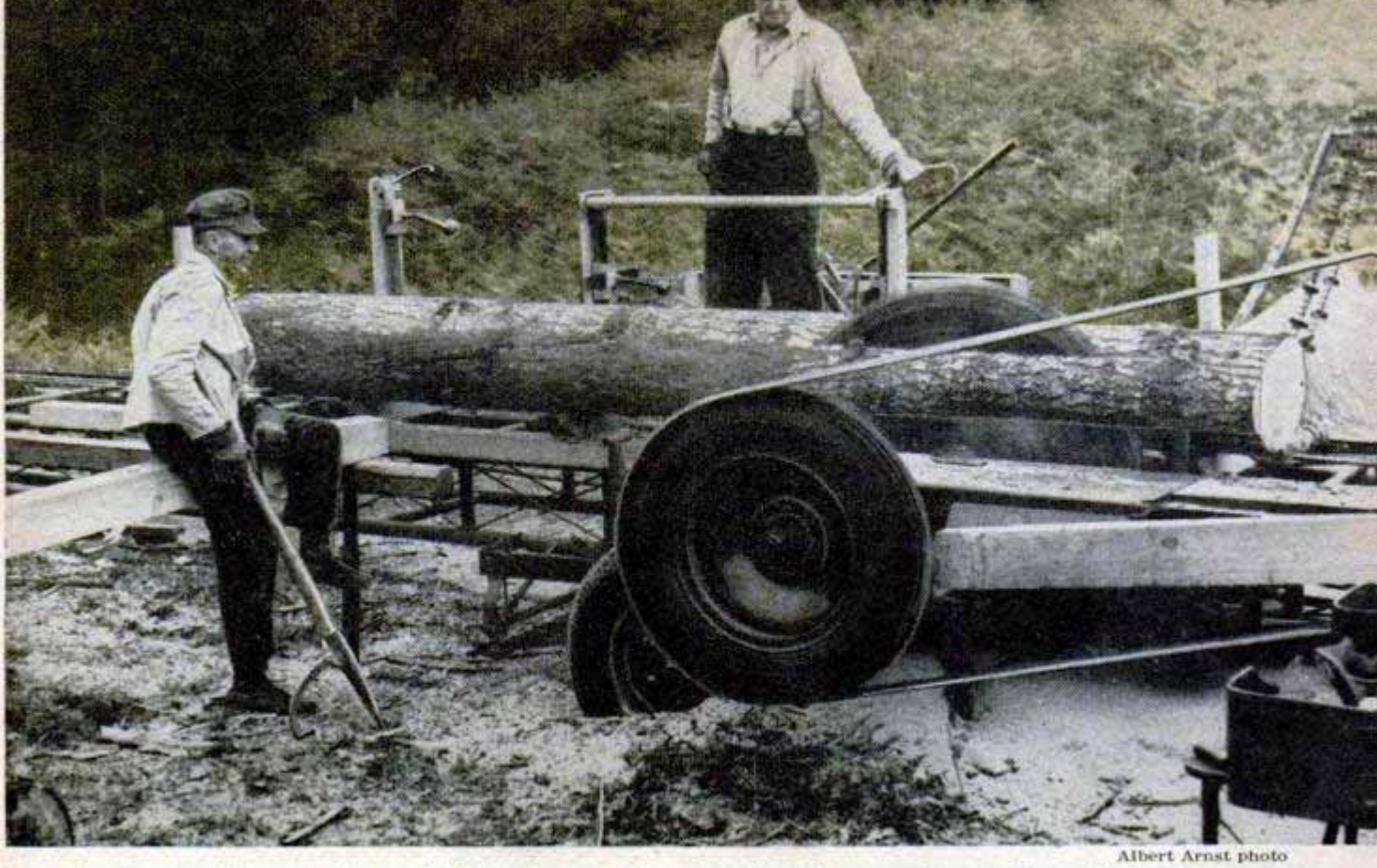


136-foot derrick can be jackknifed to the deck of its floating barge in event of hurricane



Sunken Barges Pump Black Gold

Drilling barge is towed to the site, then submerged to a maximum depth of 10 feet. Job done, the flooded compartments are emptied and the barge moved



Albert Arnst photo

Long the dream of foresters is a mobile rig that can be set up in a hurry and yet will cut lumber precisely

MOBILE LUMBER HARVESTER

For accurate sawing, the rig must be level. Six jacks are built into the welded steel frame of the machine

SAWYER Charles La Rue stopped sawing boards and bundled up his sawmill, coupled it to the rear of a truck and rolled it down the road. In about an hour, he had the rig set up and operating in another part of the Oregon forest.

La Rue's trailer sawmill, or harvester, is no larger than a house trailer, and can travel over mountain roads to areas dotted with "waste" logs. These waste logs were left behind by big-time operators because their size or location made them unprofitable. The mobile harvester used by La Rue is turning these previously wasted logs into dollars and recovering a vast amount of lumber for the nation. Proof of the value of such a rig is a survey by Washington's Institute of Forest Products which discloses that more than 100 million cubic feet of usable wood leftovers are available on logged forests of that state annually. It is this tremendous natural resource that La Rue and others like him in the Northwest are turning into a national asset. Making it possible is the highly mobile saw rig, or lumber harvester.

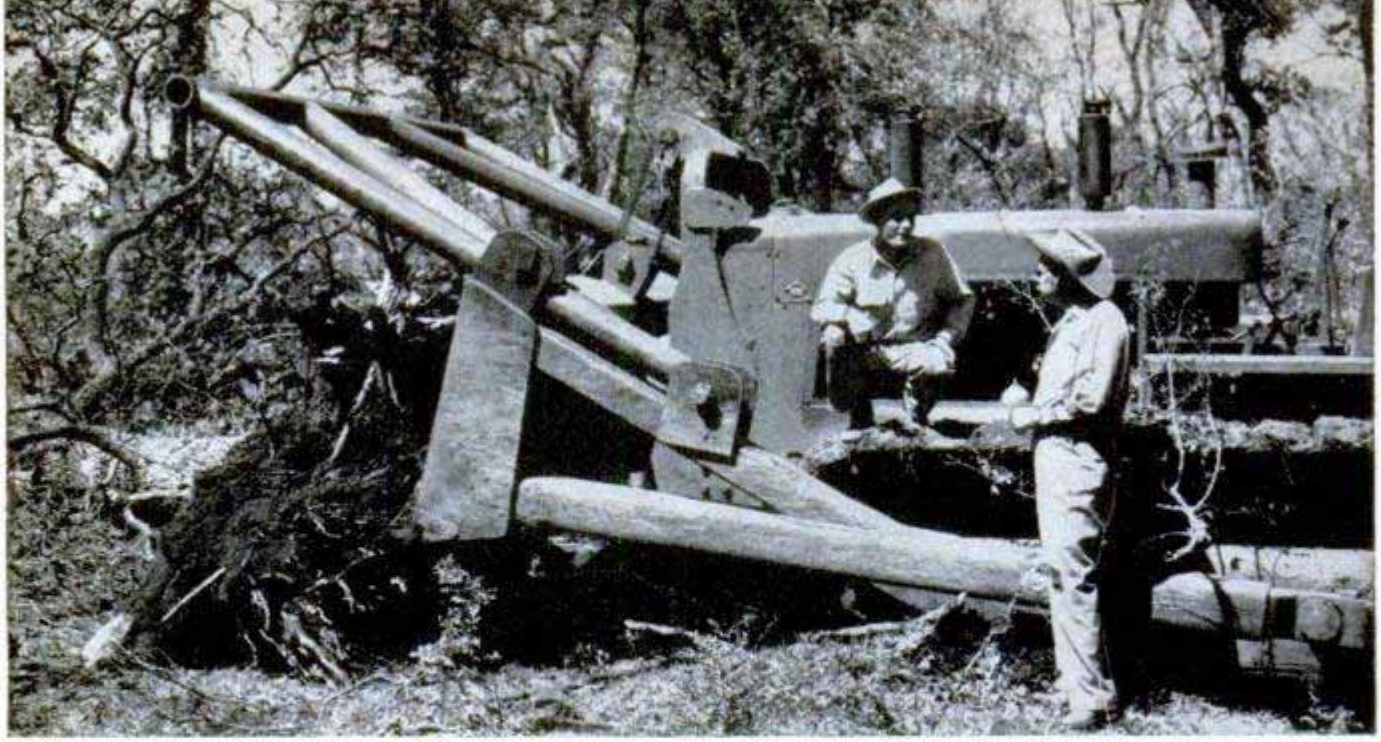
Unlike many previous sawmills, this new rig has amazing precision. The rigid frame of tubular welded steel maintains positive alignment, allowing sawing of lumber to within .005 of an inch accuracy.

In the South and East, the sawmill is used to cut small timber tracts selectively. This has long been the dream of foresters. Before mobile mills were used, it was often necessary for small woodland owners to cut all their trees to make the cutting pay off with a profit. With the mobile rig, a smaller amount of timber from any particular area can be sawed economically. This permits selective cutting. Trees are removed only when "ripe" and the "green" timber is left standing to grow until it is mature enough to harvest.

These rugged but mobile harvesters can do a good day's work despite their small size. They sacrifice little for mobility. Earl M. Stringfellow, Alabama lumberman, produced 60,000 board feet in four days. Others report cuts of 1700 board feet an hour with the rig.

Sawyer, right, controls the gouger, seen on the log, which knocks stones and dirt out of path of blade

Folded up and ready to roll to the new location, the mobile harvester is about the size of a house trailer
Ted Cowin photo

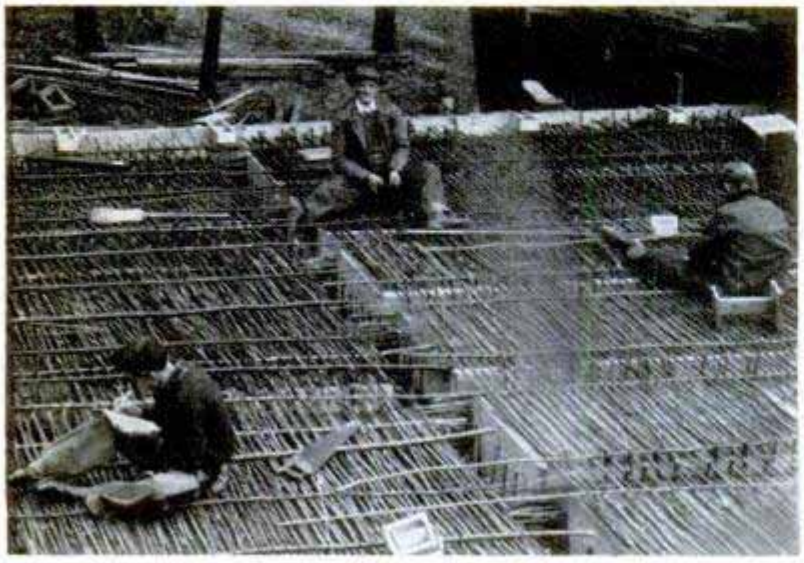


Big trees topple after one shove from a bumper on the front end of a bulldozer

Made of 4-inch pipe, the bumper, right, strikes the trunks 12 feet above ground

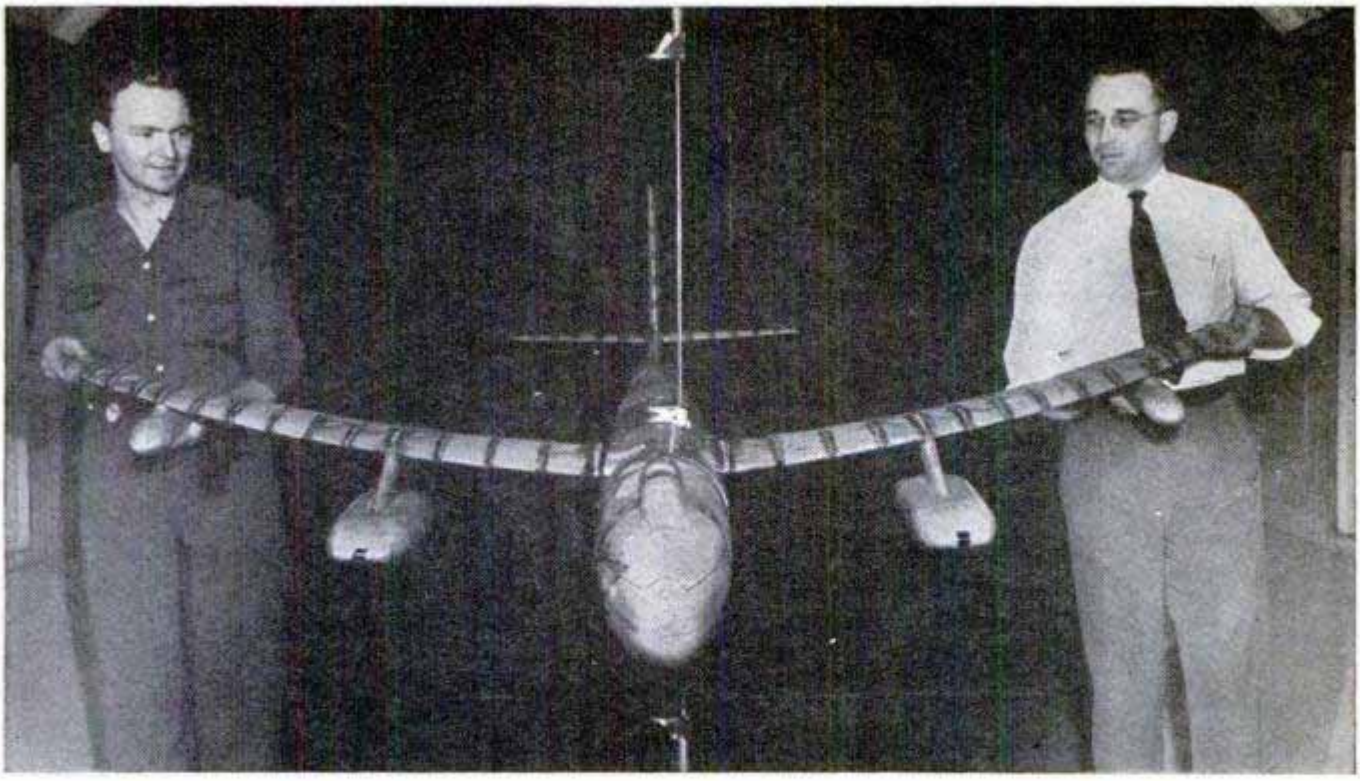
'Dozer-Bumper Topples Big Trees

To clear 3600 acres for grazing, a Texas rancher built a bumper attachment for his bulldozer that makes it possible to push over big trees with one shove. The bumper gains its great leverage by extending high enough to strike the trunks about 12 feet above the ground. It was made by welding 4-inch pipe together and fastening it to the 'dozer frame by pins, which can be readily pulled when regular 'dozer work must be done.



Bamboo-Reinforced Concrete

Tests conducted by engineers at Clemson College in South Carolina show that bamboo can be used as a satisfactory reinforcing material in portland-cement concrete. These studies become especially important at this time because of the increasing demands for steel in our defense program. No attempt was made to compare the relative merits of bamboo and steel in the tests, but it was established that bamboo makes a satisfactory reinforcing material when it has been properly waterproofed.



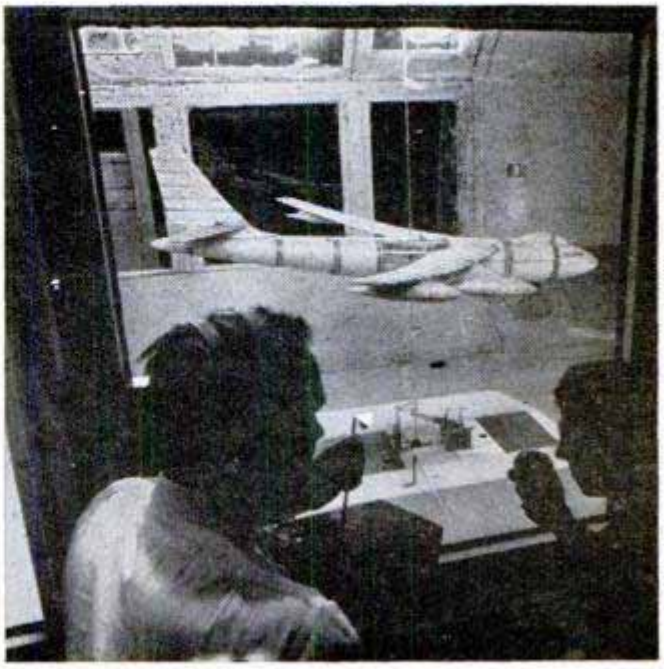
In the Boeing test tunnel, engineers demonstrate how the Stratojet's thin, swept-back wings bow up in flight

Stratojet's "Waving Wings" Inspire New Testing Technique

BOEING AIRCRAFT had to "throw away the book" and devise a new kind of wind-tunnel testing for the world's first jet bomber. Accepted proving techniques wouldn't work for the radically different B-47, slated from the drawing boards to be the fastest bomber in the world. The Stratojet's success, or failure, had to be keyed to a wing that was thin, sharply swept back and able to flex up and down several yards at the tips yet sturdy enough to support huge bomb loads. Wind-tunnel models had always been more rigid than the airplanes themselves, but the B-47 miniatures were built to behave in the tunnel as the real plane would in flight. Their wings' slender aluminum-alloy spars are so precisely constructed, the bending, torsion and chordwise stiffness simulate the full-scale version. Balsa-wood sections duplicate the plane's actual contours. A new technique of free flight was likewise designed to make the tunnel trials more realistic. Attached to a vertical rod, the model has full freedom of vertical movement, pitch and yaw. A human "pilot" operates its control surfaces remotely, using an electric motor within the fuselage.

As well as simulating actual weight of the fuel load, colored fluid in tanks reveals its sloshing effects

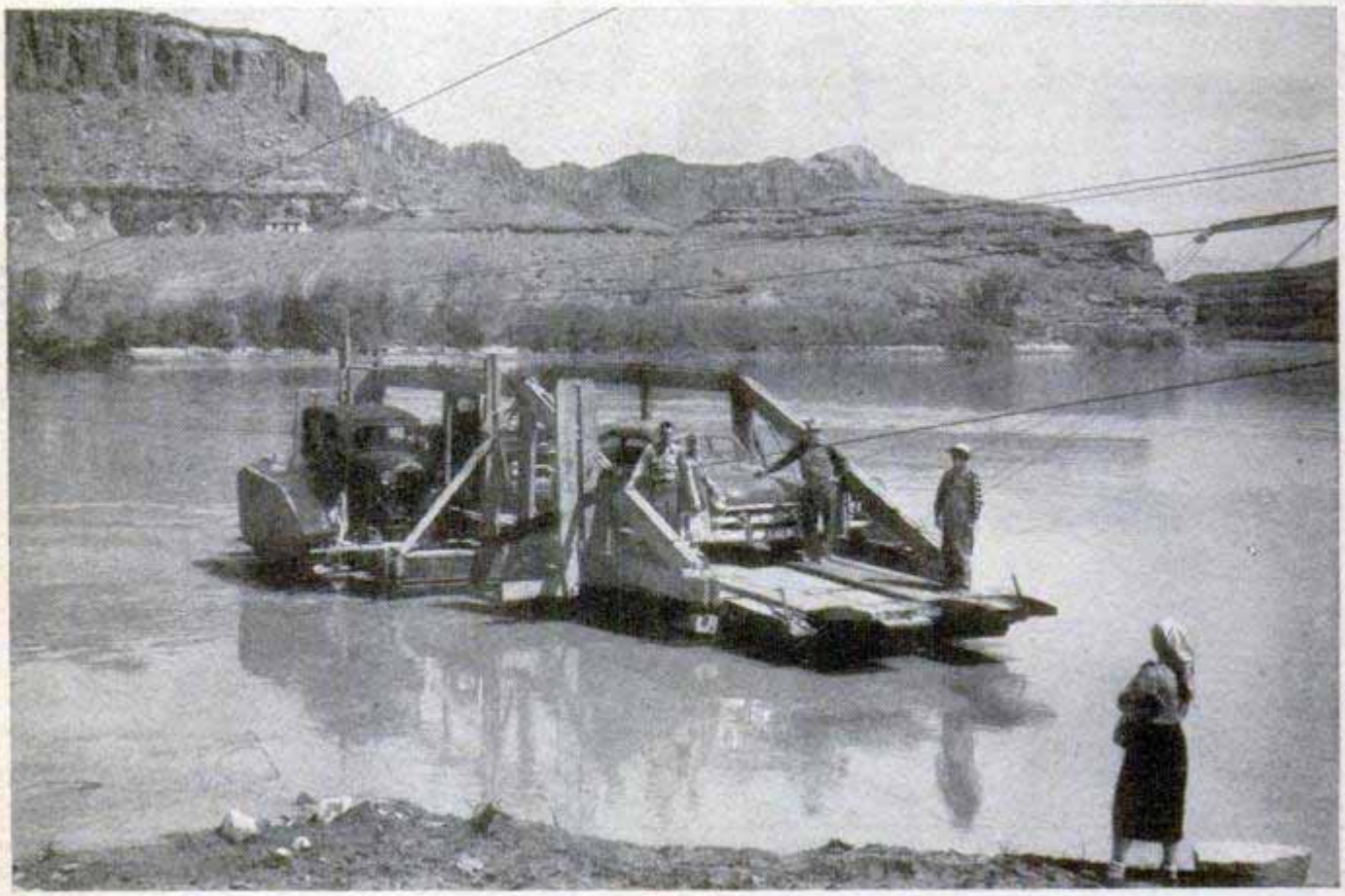
With "pilot" in left foreground at the controls, a B-47 Stratojet model flies in tunnel's onrushing air stream



Model-A Ferry

If you want to cross the Colorado River between Moab, Utah, and Navajo Bridge, Ariz., 300 miles downstream, you'll be taken across the river by a 1928 Model-A Ford sedan. The Hite ferry in Glen Canyon is the only way you can cross the winding Colorado along that 300-mile stretch of rough country. The strange-looking ferry pulls itself by cable across the 600 feet of brown water. Bolted to the deck to do the work is a 1928 Ford, minus its front wheels. A 20-inch pulley, or sheave, replaces the original wheel on the left rear axle. The pull cable that stretches across the river winds over the sheave and as the wheel turns, the ferry is pulled to the opposite shore. Other cables prevent the ferry from drifting downstream. The only major change in the Ford was the replacement of the conventional rear end with a truck type to increase its power.

Below, bolted to a platform on the near side of the ferry is the power plant, a Model-A Ford. Top right, closeup of the owner, Art Chaffin, and the ferry "engine room." Right, Chaffin installed a truck rear end to operate the 20-inch sheave



Rocket Coaster

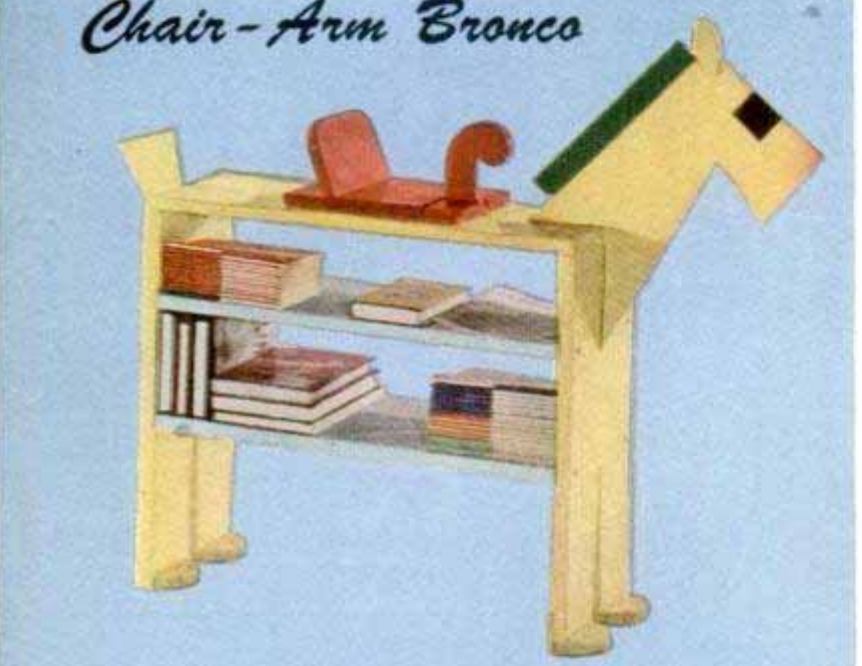
9 Toys for Santa's Pack

By Marvin Reid Hartley

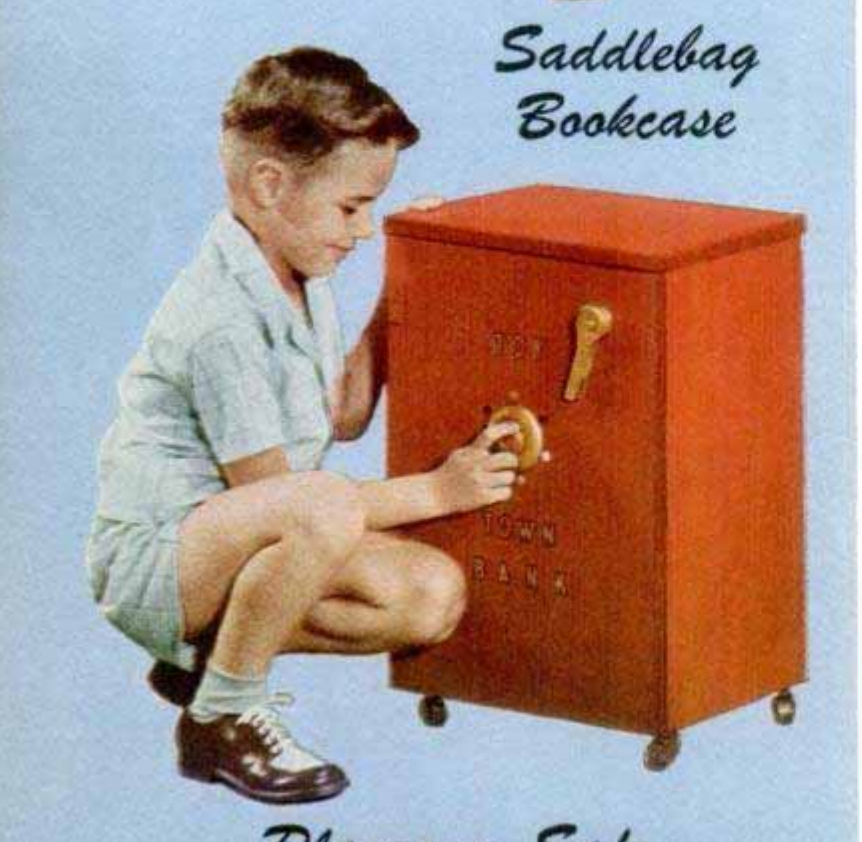
A QUICK LOOK at Santa's plans for '51 reveals several toys that are especially suited to construction in the home workshop by craftsman fathers having only a few tools. Speed-minded youngsters will get a big thrill out of the rocket coaster or the sidewalk sled, and it's easy to picture the delight of a little miss with the electric stove which has been designed for play kitchens. Of course, it's not really electrically operated; the burners merely glow realistically when a switch is turned on. There's no danger of burns as the glow is furnished by a small electric bulb located under the top of the stove. Indoor toys include three galloping horses of the broomstick type, a chair-arm bronco for young TV cowboys and a saddlebag bookcase which is really a unit of playroom furniture. For little tots there's a somersaulting monkey, and for playroom storekeepers there is a safe with a novel combination lock.

Most of the smaller toys are simple hammer-and-saw projects, the parts being joined with nails or screws in accordance with the quality and durability of the job which is desired. A bandsaw helps on the curved cuts and its accuracy adds materially to the professional appearance of the finished work, especially if you plan to make the toys for sale. But you can get by with a coping saw, as a little extra work with sandpaper on the curved parts will produce a creditable job. Such projects as the stove, playroom safe, and the rocket coaster are no more difficult to build than are the smaller toys, except that the construction involves the cutting and fitting of larger parts, and it's necessary to do a fairly accurate job on the steering mechanism of the coaster and on the combination lock of the playroom safe. In many instances, materials readily at hand have been used in the construction. For example, the flowing mane

Chair-Arm Bronco



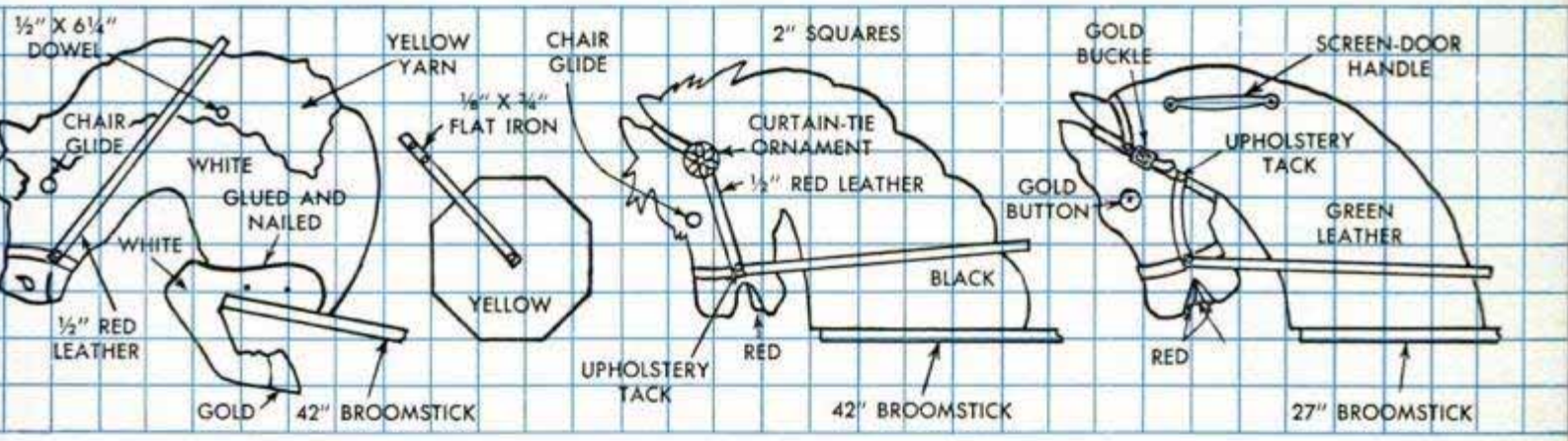
Saddlebag Bookcase



of one of the horses is made from yellow wool yarn cut into short lengths and fastened in place with screen staples. The eyes are either sliding casters (chair glides) or gold-colored buttons. Curtain-tie ornaments make good bridle rosettes, and red and white artificial leathers are used for bridles and reins. The body of each horse is a hardwood broomstick cut to 42 in. in length and attached to the head-and-neck cutout with screws. One of the designs is fitted with a hexagon roller, or wheel, which simulates the sound of galloping hoofs when used on the sidewalk or basement floor. If the hexagon shape is distorted somewhat, that is, two flats made slightly longer, the sound will be much more realistic. Two of the horses pictured and detailed on the opposite page are fitted with handles made from dowels, but the one having the "sound" wheel is equipped with screen-door handles, one handle being placed on each side of the cutout as shown. The door handles give better control. After sawing the cutouts to the pattern lines, smooth the edges with sandpaper and round them slightly. Then the white and black cutouts are painted, or sprayed, with two coats of enamel, preferably of the nontoxic type, and the finish details are attached. One cutout is covered with green artificial leather as noted in the details on the opposite page. Although not shown, a mane of black wool can be added if desired. Note that when laid out on 2-in. squares the cutouts will range from 16 to 18 in. long. When cut from ¾-in. stock, heads of this size will be a little too heavy for tiny tots, but you can easily reduce the size of the cutouts by laying out the patterns on 1 or 1½-in. squares. The same thing is true of the somersaulting monkey. The cutout can be made in two sizes simply by changing the size of the squares. In this case, the size of the squares is not given on the detail. Use ½ or 1-in. squares as desired. Either pine or poplar may be the first choice in wood for the construction of the smaller toys and also for the cabinets of the stove and safe. Parts of the rocket coaster and sled that are subjected to strain, such as the body, wheel supports, and seats, should be made from birch or maple. Oak is a good substitute for either of these hardwoods so far as strength is con-

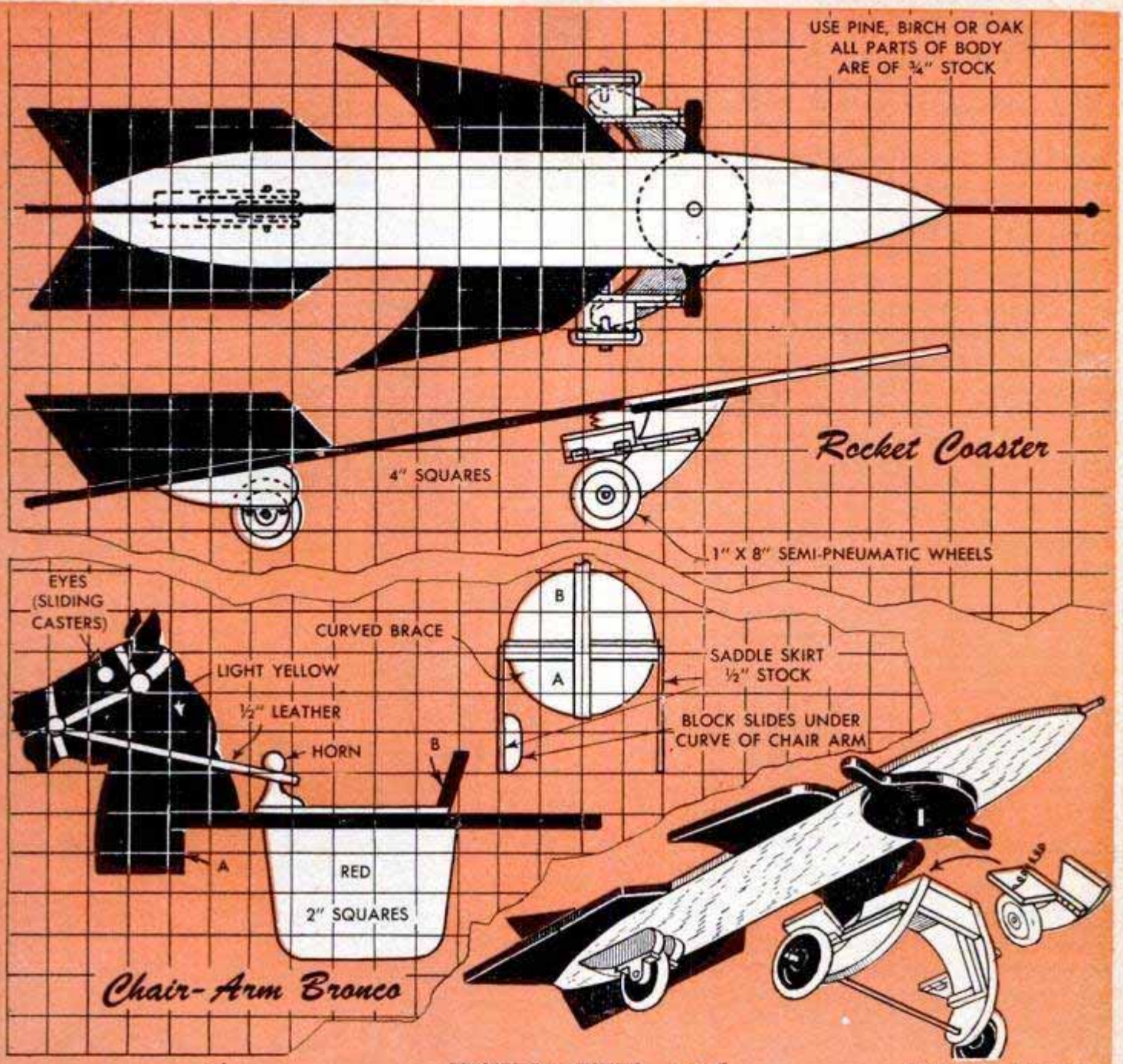
cerned, but the open grain of oak complicates the job of finishing with paint or enamel. Where plywoods are specified in the details, such as the runners of the sled, the best job will be obtained by use of birch-faced plywood. Outdoor fir plywood is the best substitute.

Taking the details on the following pages in order, the construction of the rocket coaster comes first. Make the body, or platform, of hardwood such as birch, oak, or maple. Use the same wood for the wheel struts and the steering turntable or fifth wheel. All other parts, such as the wings and the fin, or rudder, can be made of pine or poplar. Join the wings to the body with dowels and waterproof glue. Then cut the pieces to the profiles according to the full-size pattern. The fin, or rudder, can be joined with glue and screws driven up from the underside of the body. The curved rear-wheel mounting



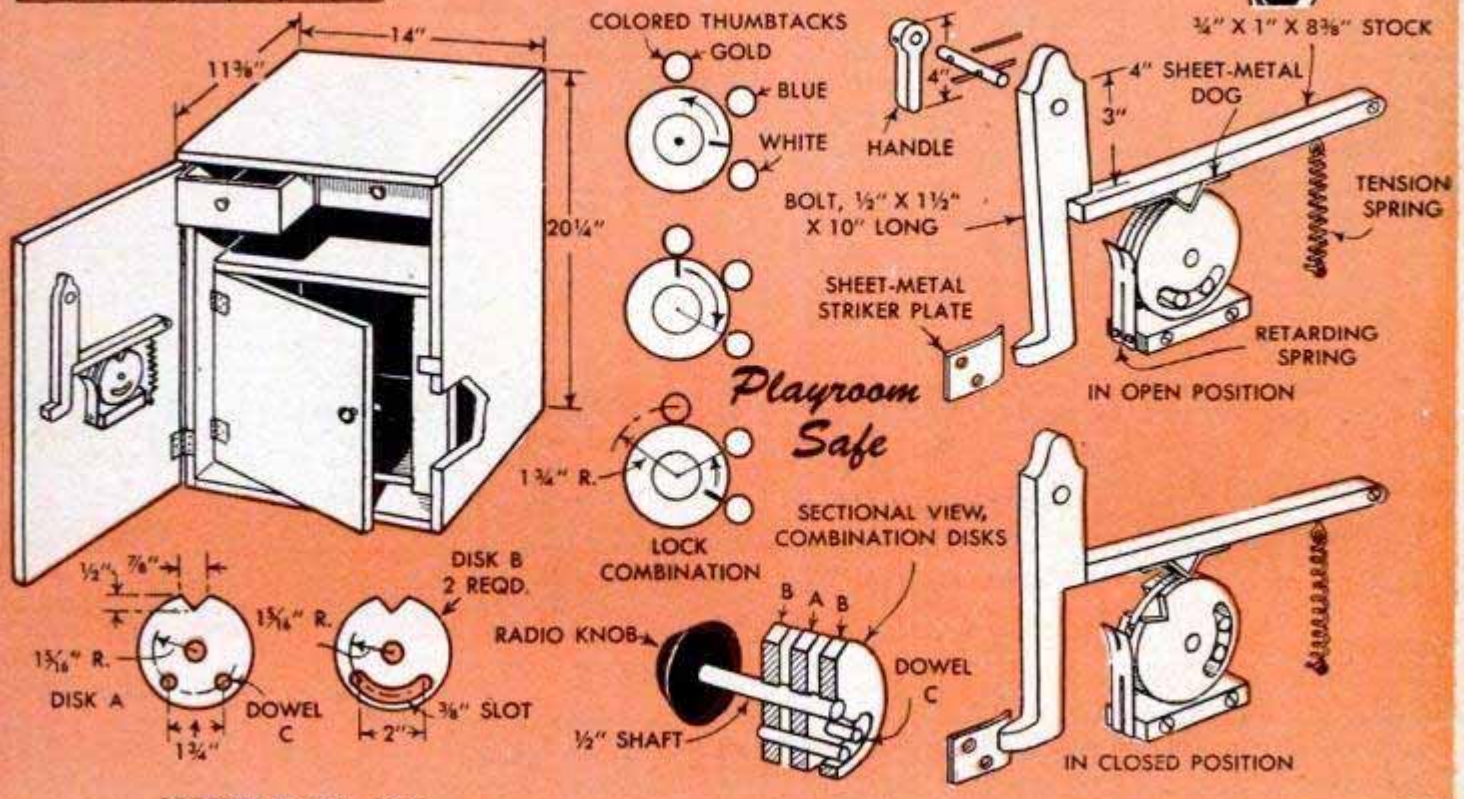
bolt. Then saw a disk from ½-in. plywood, center-drill a ½-in. hole and attach steering handles to the bottom of the disk. Now screw the disk to the top of the block to which the wheel struts are attached. Drill a ½-in. hole through the body and insert a bolt, placing a fiber washer between the body piece and the disk. Draw up the nut on the bolt just tight enough to take the play out of the steering unit, then run on another nut and draw it tight to hold the adjustment. Use metal washers under the head of the bolt and under the nuts. Provide semi-pneumatic wheels in the size specified. Fit the axle in holes drilled through the struts at an angle and drill the axle transversely for cotter keys which hold the wheels in place. The simulated antenna detailed on the front of the coaster body is optional. It is made from a 24-in. length of ⅜-in. dowel and has a small wooden ball fitted over the outer end. Wooden parts of the coaster can be painted or enameled in colors as specified, or the hardwood parts can be varnished in the natural color. Use two coats of spar varnish. There are several types of brakes for a wheeled toy of this type but the one shown is the simplest to build. It consists of two hinged blocks which bear on the tires when pressed down by the driver. The blocks are held in retracted position by small coil springs. It also is possible to fit a similar brake shoe to operate on the rear wheel. In this case the shoe is actuated by a short lever and connecting link. To add to the realism, a friction-drive bicycle siren can be mounted to operate from the rear wheel. The chair-arm bronco is clearly detailed on the opposite page and the construction is so simple that no comment is necessary. The safe, also detailed on the opposite page, can be built mostly from ⅝ or ¾-in. plywood joined at the corners with screws and glue. The dimensions given are only close approximations as some fitting of the doors and doorframes will be necessary. As detailed, the safe has an inner door which closes a separate compartment. The two drawers are optional but, if made, they should be a loose fit in the compartment so that they are easily removed and replaced.

blocks are cut from 1⅛-in. stock and are streamlined by rounding over the outside faces. They are attached to the underside of the body with screws and glue. Be sure that the blocks are spaced correctly so that the wheel does not bind between them. The wheel is mounted on a short shaft, or axle, inserted through holes drilled in metal brackets attached to the blocks. The shaft is held in place with cotter keys. Use oak for the front-wheel struts, attaching the upper ends of the struts to a hardwood block having the ends beveled to give the proper amount of flare to the parts. Use glue in the joints. Center-drill the block for a ½-in.



Rocket Coaster

Chair-Arm Bronco

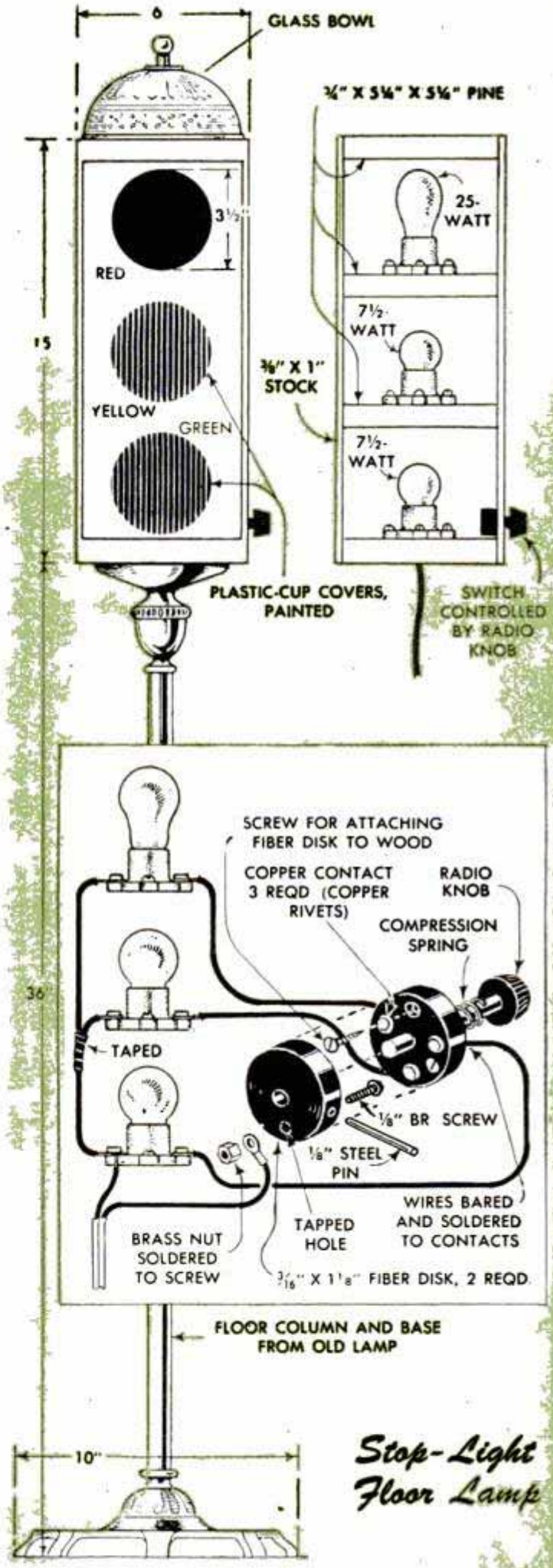


Playroom Safe

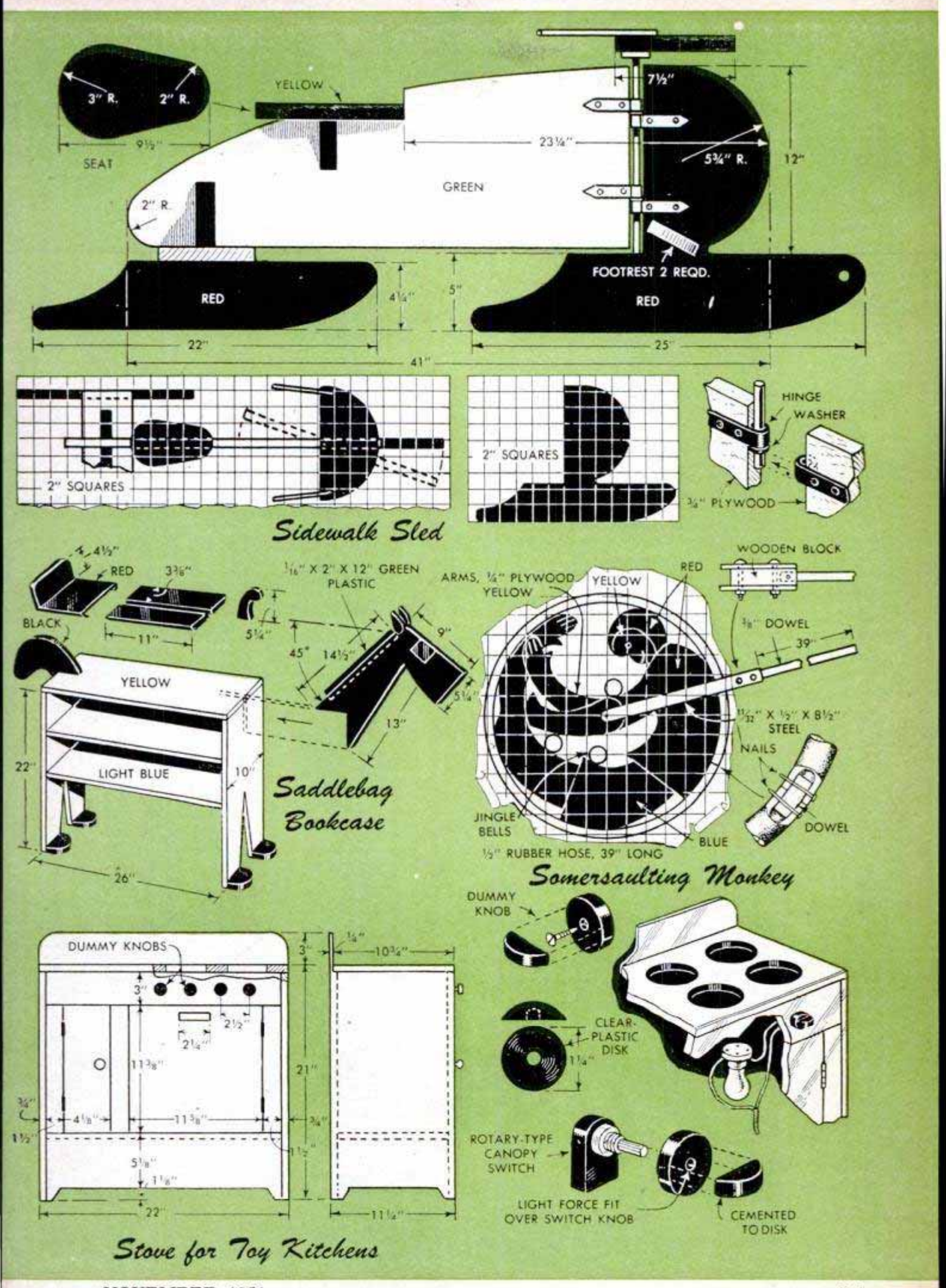
The main parts of the combination lock are three hardwood disks, each of which is notched at one point on the circumference. Care should be taken to make the notches of a uniform size. The two disks, B, also are slotted as indicated in the sectional view, and are mounted on the dial shaft with the disk A at the center. Note the position of the parts of the lock in the closed and open positions and check this with the three movements of the dial which are necessary to work the combination. First the index mark on the dial is turned to the left at least one full revolution and stopped at the gold-colored thumbtack. Then the index mark is turned to the right and stopped at the white thumbtack. In the final movement it is turned left to the blue thumbtack. This brings the notches in the disks into alignment directly under the metal dog on the locking bar, permitting the bar to drop down and release the hardwood striker.

A novel stop-light floor lamp for playrooms is detailed at the right. It's made from odds and ends of material and can serve as a stop light for playroom policemen and also as an indirect night light. Traffic-light changes are made by turning a switch of the rotary type detailed in the wiring diagram. You can, of course, substitute a standard ready-made switch which will serve the same purpose. Use plastic cup covers for the colored light reflectors and paint two of them red, two amber (use yellow paint), and two green. Then install them in 3½-in. holes scroll-sawed in opposite sides of the light housing, using a few drops of quick-setting glue to hold the covers in place. Finish up by fitting the lamp to an old column and base from a discarded floor lamp, and install porcelain sockets of the surface-mounting type for the 7½ and 25-watt lamp bulbs. Light from the 25-watt bulb shines through a 4-in. hole in the top of the lamp housing and out through a dome reflector improvised from the cover of a glass candy dish.

Construction of the other toys detailed on the opposite page is so very simple that most of the details have been left to the builder. Note that the front-runner assembly of the sidewalk sled is made from a single piece of plywood. By using 1-in. squares, the sled can be made half size for little tots. The dummy stove "burners" are made from red, plastic cup covers of the same size as those in the stop-light floor lamp, and they are fitted in holes scroll-sawed in the stove top in the same manner. The dummy knobs can be made of clear plastic as specified, or they can be made of colored plastic if desired. Use a canopy switch to operate the 25-watt bulb, which is installed in a porcelain socket under the stove top.



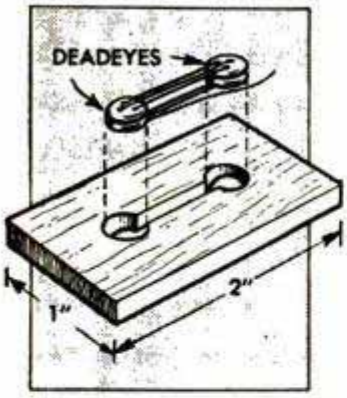
Stop-Light Floor Lamp


3" R.
2" R.
9½"
SEAT
YELLOW
7½"
23¼"
5¾" R.
12"
GREEN
2" R.
FOOTREST 2 REQD.
RED
4¼"
5"
RED
22"
25"
41"
2" SQUARES
2" SQUARES
HINGE
WASHER
¾" PLYWOOD
Sidewalk Sled
4½"
RED
3⅜"
BLACK
11"
5¼"
1/16" X 2" X 12" GREEN PLASTIC
45°
14½"
9"
5¼"
13"
YELLOW
LIGHT BLUE
22"
10"
26"
Saddlebag Bookcase
ARMS, ¼" PLYWOOD YELLOW
YELLOW
RED
WOODEN BLOCK
⅜" DOWEL
39"
11/32" X ½" X 8½" STEEL
NAILS
DOWEL
JINGLE BELLS
BLUE
½" RUBBER HOSE, 39" LONG
Somersaulting Monkey
DUMMY KNOBS
3"
3"
2½"
2¼"
11⅜"
21"
¾"
4⅛"
11⅜"
¾"
1½"
1½"
5⅛"
1⅛"
22"
¼"
10¾"
11¼"
Stove for Toy Kitchens
DUMMY KNOB
CLEAR-PLASTIC DISK
1¼"
ROTARY-TYPE CANOPY SWITCH
LIGHT FORCE FIT OVER SWITCH KNOB
CEMENTED TO DISK

"Traction" Sand in Small Containers Is Easily Spread Under Car Wheels

To provide traction under car wheels in case you get stuck on an icy street, carry along a box containing several small cans filled with sand or cinders. Women drivers especially will find the cans of sand easier to handle and spread under the wheels than if it had to be shoveled out of a larger container.—Ed Packer, Chicago.

Jig Simplifies Reeving Lanyards



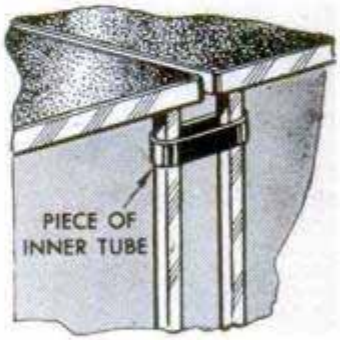
Ship modelers will find this simple jig a real help in the tedious task of reeving lanyards. It consists of a block of wood drilled to take the two deadeyes and slotted to permit the removal of the finished lanyard. In use, the block is held in the hand and the button thread, commonly used for the lanyard, is threaded through the deadeyes from each side of the block. A short length of fine wire is often better than a needle for this job.

Wood Putty Used as Filler To Conceal Edge Grain

The difficulty of sanding the edges of plywood smooth enough to prevent the plies of the wood from showing after they are painted can be overcome by first filling the pores of the wood with a powder-type wood putty. Use a putty knife to press the mixture into the grain, and, if one application is not enough, apply a second one. Let each coat dry thoroughly before sanding it down. The important thing is to build up a perfectly smooth surface for the final finishing coats.

R. F. Donovan, Guttenberg, N. J.

Tables Joined Temporarily With Large Rubber Bands

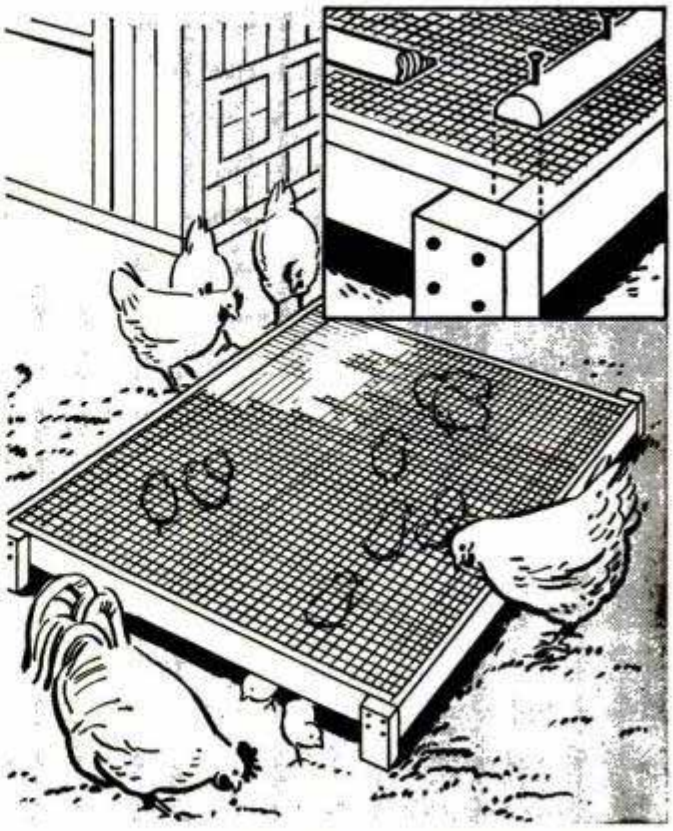


When two or more small tables, such as card tables, are placed side by side to provide a large serving or playing area, they can be held together firmly with large rubber bands cut from an inner tube. Just slip the bands around the adjacent legs of the tables as illustrated.

Improvised Baby-Chick "Creep" Keeps Older Birds From Feed

By using this special "creep" for baby chicks, it will not be necessary to separate them from the older chickens at feeding time. The creep can be made by mounting a frame of 1 x 2s on legs just high enough to permit the chicks to walk under it, and covering the top with ½-in. wire mesh.

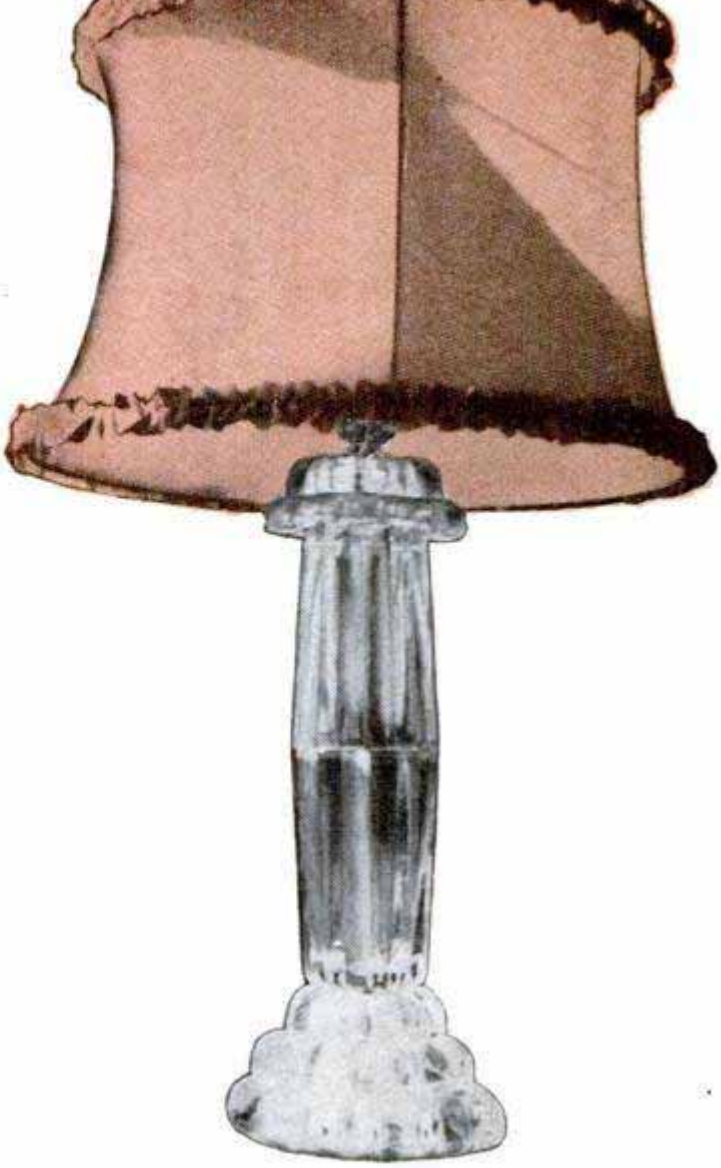
Ervin L. Strayhorn, Beebe, Ark.



'CRYSTAL' LAMP *from glassware*

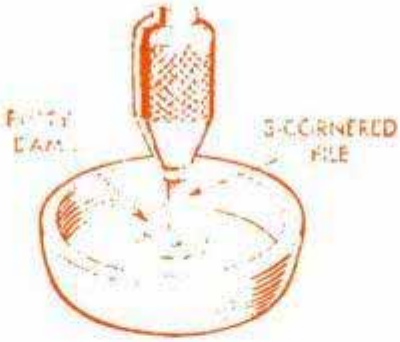
By Freda Graham Bundy

IT'S SURPRISING how closely you can imitate a beautiful crystal lamp with inexpensive glassware—five ash trays and two glass tumblers. Naturally, the better the quality of the glassware, the better the imitation, but you can even produce a lamp of striking appearance with dime-store glassware. The ash trays and tumblers are assembled with a length of 1/8-in. threaded brass fixture pipe and three fixture nuts. In the lower detail, the sectional view shows how the parts are assembled after drilling holes for the fixture pipe in each of the trays and tumblers. The holes should be of a uniform size—about 7/16 in. in diameter for 1/8-in. pipe. The holes are easily drilled by first scoring the bottom of the tray or the tumbler with a glass cutter and using a three-cornered file for a drill bit. Note that a small dam of putty is built around the hole after starting the drill. This retains an abrasive and the turpentine which serves as a lubricant. Holes can be drilled in some kinds of glass without using an abrasive. With the same method, also drill a small hole through the side of the lower tray for the lamp cord. Ream all holes drilled in the glass parts as shown, and assemble the parts as in the lower detail.



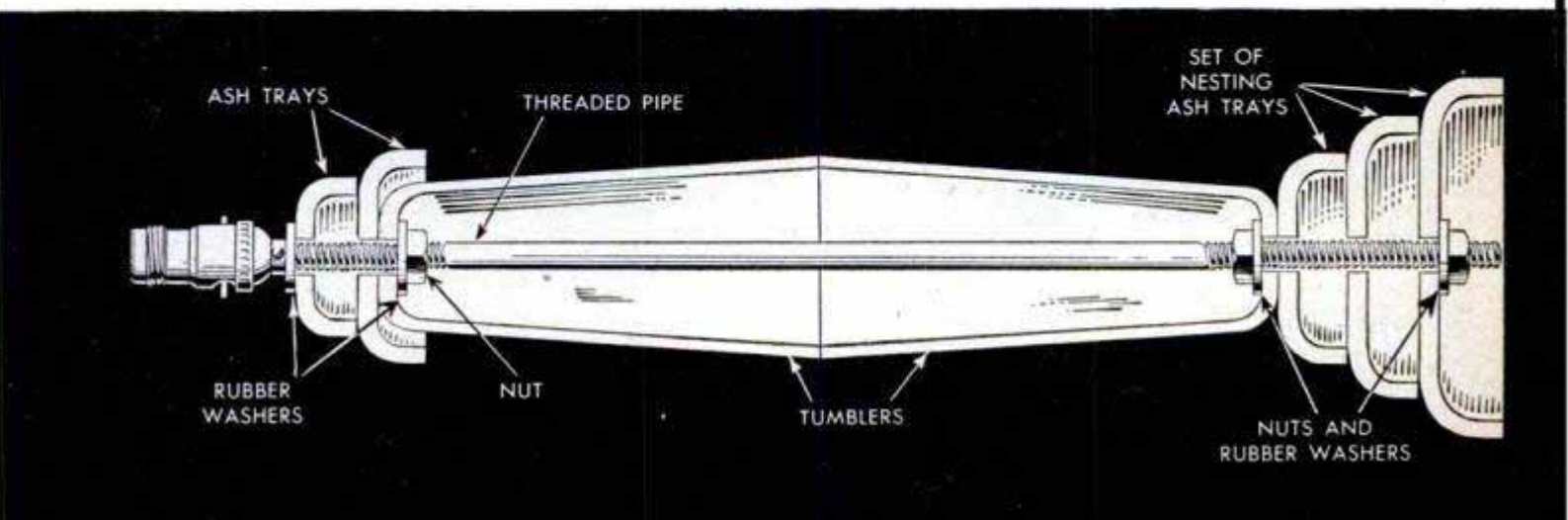
Two glass tumblers and nesting glass ash trays form the base and column of this attractive table lamp. Parts are held in place with a length of brass pipe

SCORING

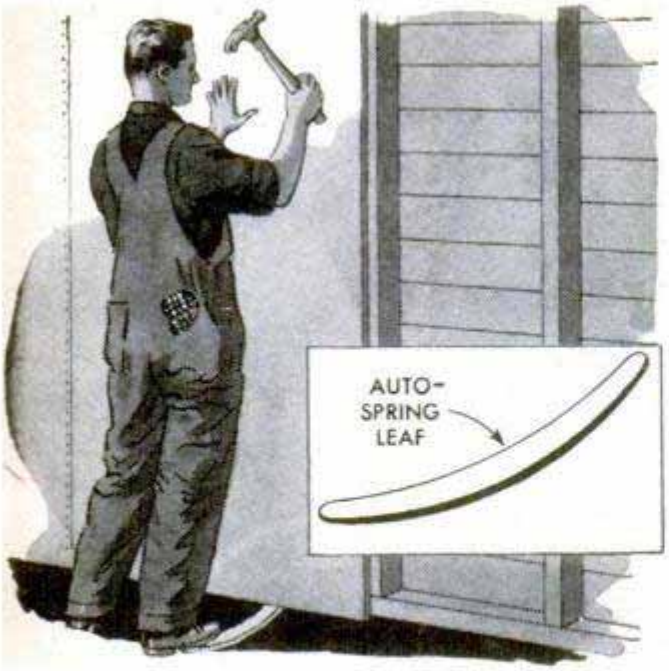


DRILLING

REAMING



Wallboard Held for Nailing With Auto-Spring Leaf



The difficulty of holding a cumbersome panel of plywood, softboard or other wallboard in place against the wall for nailing can be overcome by using a leaf from a car spring as a jack. Just lean the panel against the wall and insert one end of the leaf, convex side down, under the edge of the panel. Then lift and hold the latter by stepping on the other end of the leaf.

Os Johnson, Spokane, Wash.

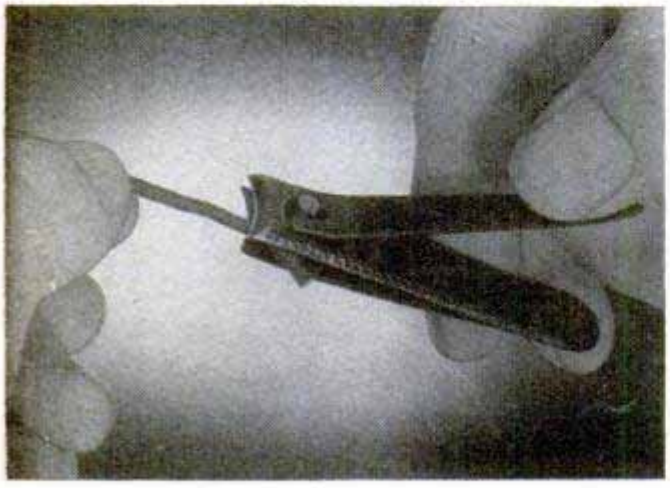
Preventing Drawers From Sticking

If the drawers in your dresser stick when the weather becomes damp, wait for a good dry day and then cover the inside and outside surfaces with a coat of fresh shellac. This will help prevent the unfinished wood of the drawers from swelling.

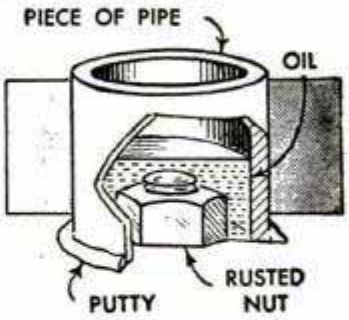
Stripping Tool for Small Wires Provided by Fingernail Clipper

An inexpensive fingernail clipper of the type pictured makes an excellent stripping tool for small insulated wires. To prevent cutting too deep, file a notch in one of the blades to receive the wire. In use, the insulation first is cut by turning the clipper around the wire, after which the wire is stripped by pulling on the clipper.

Richard Hanscom, Elmhurst, Ill.



Loosening Badly Rusted Nuts



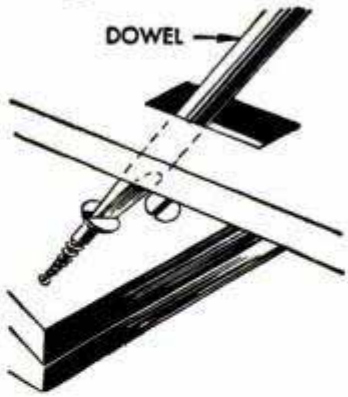
Rusted nuts, that cannot be removed even after oiling in the usual way, often can be loosened in the following manner. A short piece of pipe or tubing is placed over the nut and the lower edges sealed with putty or modeling clay to make a "tank." Then the nut is covered completely with penetrating oil and left for an hour or so. If a suitable piece of pipe is not available, the tank can be formed entirely of putty.

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

Heat Reflectors Cut Fuel Costs

Owners of homes which are heated by radiators can cut their fuel expenses by using reflectors behind the radiators to minimize the amount of heat wasted through absorption by the walls. The reflectors can be made by stapling sheets of aluminum foil, slightly smaller than the radiators, to similar-size sheets of asbestos, and are simply leaned against the walls behind the radiators where they reflect heat into the room.—Sid Corlin, Chicago.

Starting Screws in Tight Places



When working on a project where a number of screws must be driven in hard-to-reach places, time can be saved by making this "starter" from a length of dowel. Just whittle the end of the dowel to the shape of the screwdriver blade, but leave the edge thick enough so that screws must be forced onto it and will be held by friction. Use this tool to start screws in their holes and finish driving them with a screwdriver.—William Lane, St. John's, Newfoundland, Can.

¶Green coloring which often appears on copper tubing can be removed by rubbing it with a paste made of soap and ammonia.

Photos and information courtesy Kentile, Inc.

By Frank N. Stephany

Part II

COLORFUL, long-wearing floors of resilient tile can be yours for less than you might think, and installing the tile is not nearly so difficult as the eye-catching results would make it seem. Asphalt tile is an all-purpose floor covering that is inexpensive and easy to maintain and, as the coloring extends through the entire thickness of the tile, normal wear is unnoticeable. In addition to the color and wearing quality of asphalt tile, rubber tile features extra resiliency. Both tiles are available in a wide selection of interesting colors that affords endless design possibilities. The photos on this page and the full-color illustrations which appeared in Part I, last month, offer a few suggestions on design treatment and color combinations. Harmonizing base molding, feature strips and special insert designs are available in rubber and asphalt tiles. Cork tile, in its natural color, forms a beautiful, durable floor

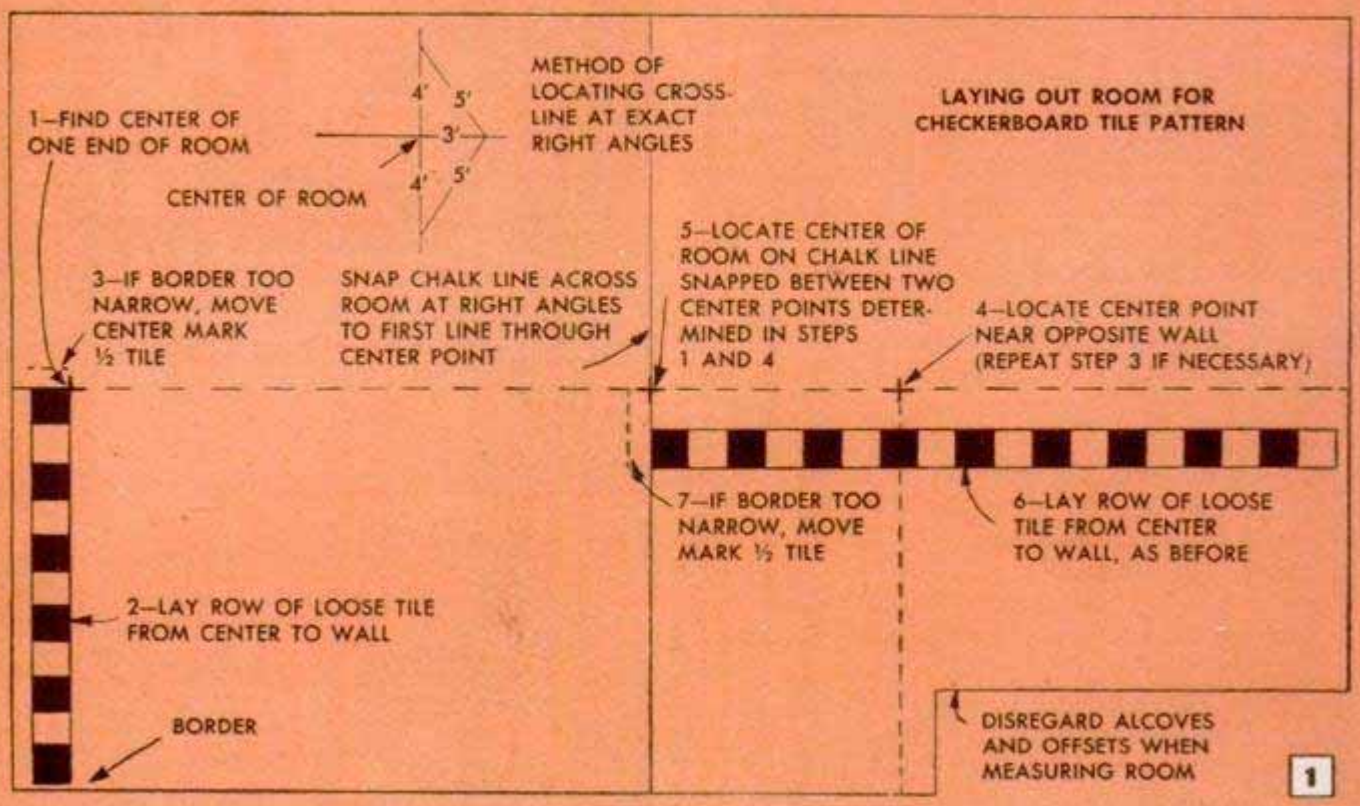
Snapping chalk line through center points of room, above, forms guide lines for tile. Below, measuring to make sure border will be over a half tile wide

covering that is extremely quiet underfoot.

Asphalt tile can be used in any room of the house, and is especially suited to basement recreation rooms and workshops, as it can be laid on concrete which is in direct contact with the ground. Rubber tile also is suitable for use throughout the house, with the exception that it should not be laid on a concrete floor of a basementless house unless there is a crawl space under the floor. This also applies to cork tile, which lends itself especially well to living rooms, bedrooms and bathrooms, but is not recommended for installation in kitchens, foyers or utility rooms.

Particularly on new construction, it is imperative to check a concrete floor for dampness before laying rubber or cork tile. A simple moisture test can be made by forming a ring of putty, about ½ in. deep and 3 in. in diameter, on the floor and then sprinkling ¼ teaspoonful of dry calcium chloride in the center of the ring. Press a sheet of clear glass over the putty ring to keep outside air from coming in contact with the calcium chloride. If the calcium chloride is still white and dry after eight hours, the floor is sufficiently free from moisture to permit laying the tile.

A smooth, clean surface is essential for installing all types of resilient tile. The subfloor must be free from grease, wax and loose paint and, of course, all old floor coverings should be removed. Fill holes and smooth out uneven spots in concrete floors with a special patching material available from the tile manufacturer. For satisfactory results when installing tile on a wood-

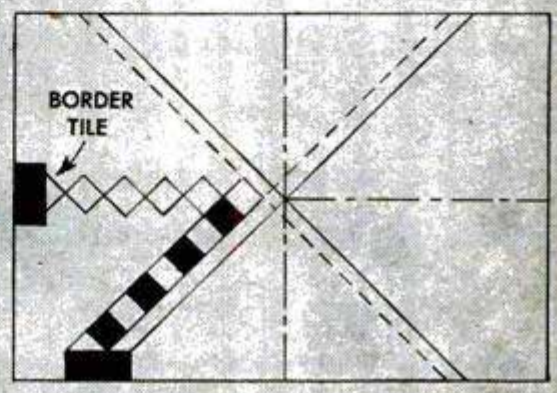


en floor, be sure there is at least 24 in. of well-ventilated air space between the ground and the floor joists. Nail down all loose boards, replace any broken ones and, if the floor boards are over 3 in. wide, badly worn or there is no subfloor under the boards, apply an underlayer of plywood or special hardboard over the floor. Both rubber and cork tile can be cemented directly to the underlayer, but if the latter is not used, a layer of asphalt-saturated felt should be cemented to the floor before laying these tiles.

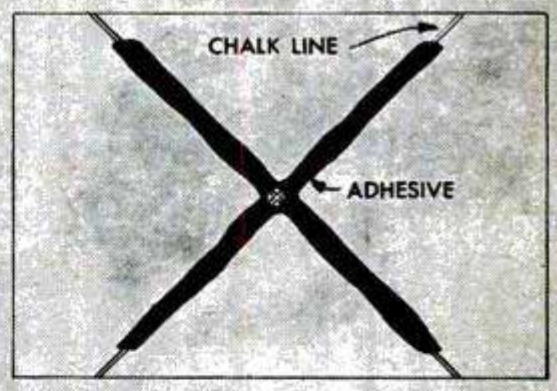
After preparing the floor, the next step is to mark off the room so that the tile can be laid true regardless of the irregularity of the walls. This is done as shown in Fig. 1, which describes the checkerboard pattern. This method is a basic one used for all patterns in which the tile runs parallel with the walls. The layout for a diagonal pattern is made simply by extending diagonal lines from the center of the room, Fig. 2, after the center has been located in the same way as for the checkerboard pattern. Note in Figs. 1 and 3 that test rows of loose tile are laid from the center point to the walls to check the width of the border. If the test indicates that the border will be less than a half tile wide, the chalk lines are relocated a half tile. Where using a diagonal pattern with two contrasting tile colors, it is best that the half tile butted against the border contrasts with the color of the border tile.

Spread adhesive over the final chalk lines with a notched trowel, leaving the intersection and ends of the lines exposed,

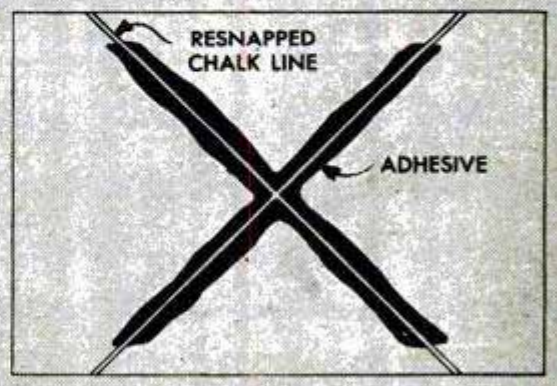
After adhesive is applied to first half of room, tile is laid by working outward from center point



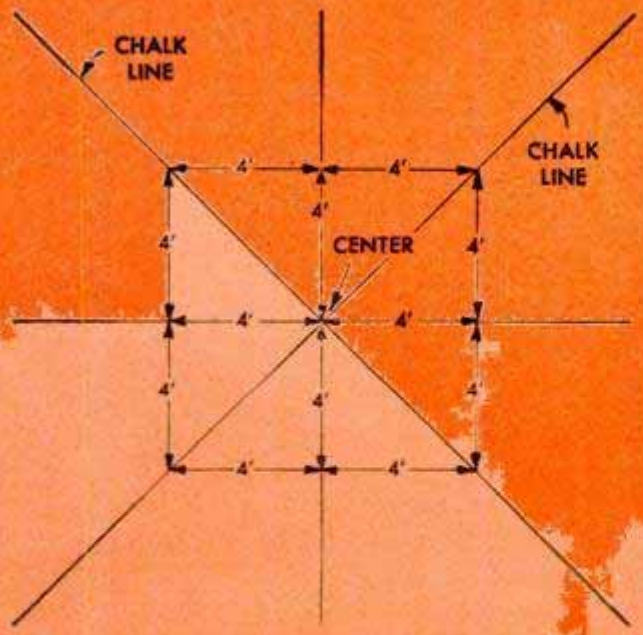
Lay rows of tile to adjacent walls and relocate diagonal lines ½ tile, if necessary



Cover diagonal chalk lines with adhesive, leaving the ends and intersection exposed

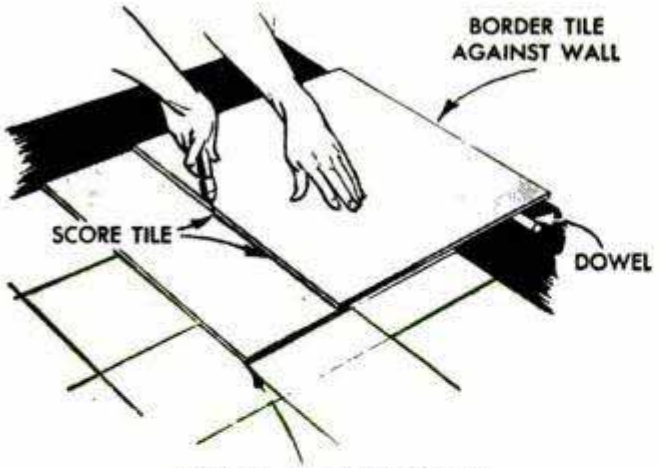


When adhesive strips become tacky, carefully resnap chalk lines over the adhesive 3

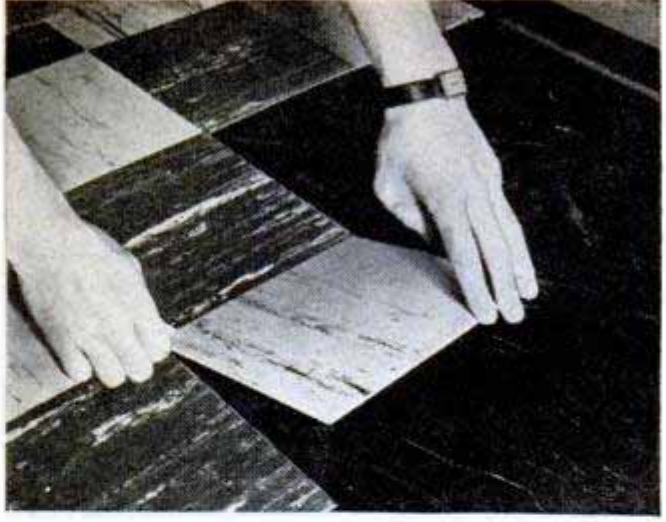


FIND CENTER OF ROOM AS FOR CHECKERBOARD, MARK OFF 4' SQUARES FROM CENTER AND SNAP DIAGONAL CHALK LINES

LAYING OUT ROOM FOR DIAGONAL TILE PATTERN 2

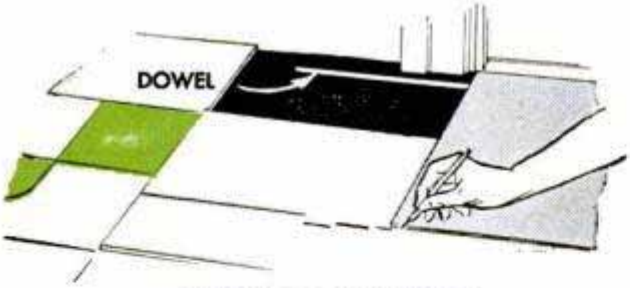


BORDER TILE PLACED ALONG SECOND SEAM OF FIELD TILE

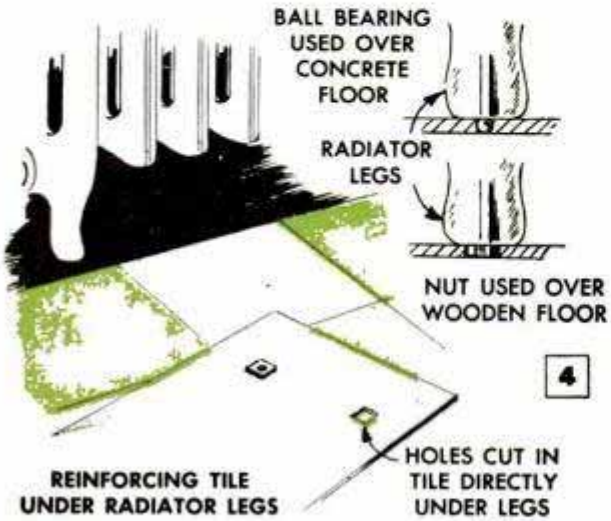


Edge of tile is held firmly against adjacent piece, as above, and tile is lowered into adhesive. Sliding tile in place causes adhesive to ooze from joints

INSTALLING BORDER TILE



MARKING BORDER TILE TO FIT AROUND DOOR CASING



REINFORCING TILE UNDER RADIATOR LEGS

as in the center detail, Fig. 3. When the adhesive becomes tacky (about ½ hour), resnap the chalk lines. Next, without covering the chalk lines, spread adhesive over half of the room. Even though it may take from ½ to 4 hours, allow the adhesive to become tacky before laying the tile. Test the adhesive by pressing it with your finger. If the adhesive does not stick to the finger, you can begin laying the tile. There's no hurry, as the adhesive can remain on the floor for two or three days, if necessary, before the tile is laid. Spreading the adhesive evenly over the floor is extremely important. The adhesive never hardens, and if it is too thick in spots it will ooze up through the tile seams. In addition, a layer of adhesive that is spread evenly but too thickly will produce a cushion under the tile so that furniture legs and casters will cause depressions in the tiled floor. On the contrary, a tile which is not cemented completely may crack after it is on the floor only a short time. For best results, use the notched trowel specified by the tile manufacturer and bear down hard on the trowel when spreading the adhesive.

Start laying the tile at the intersection of the chalk lines and work outward in a semicircle from the center line toward the walls. Be sure that each course of tile is started exactly on the chalk line to keep the rows straight. In laying the tiles, alternate the direction of the marbleized pattern, and carefully place each succeeding tile firmly in the angle formed by the two adjacent tiles. Don't slide the tile in place, as this will cause the adhesive to ooze up from the joint. Instead, place the tile firmly against the edge of the adjacent tile and lower it into position. After finishing the field tile on half of the room, spread the adhesive over the other half. While the adhesive is drying, you can lay the border tile around the first half of the room.

The three upper details in Fig. 4 illustrate the method of installing 18 x 24-in. border tile when 9 x 9-in. field tile is used. Score the border tile with the grain, as in the upper detail, and snap the tile apart, starting at one end of the score line. Then, sand off the burr along the snapped edge and lay the tile in the adhesive. Fitting border tile around door trim is done by using a second piece of border tile as a straightedge for transferring the irregular contour to the tile being fitted. Keep the straightedge parallel with the tile being marked, and score the tile at the widest point marked. Snap off the tile along the straight score line, heat the back of the tile with a blowtorch until pliable, and then cut the tile with a linoleum knife, following the contour marks. If you are using field tile instead of the larger tile for the border, which is sometimes recommended, place the tile to be marked along the first instead of the second seam of the field tile. To fit the tile around pipes and radiator legs, mark the tile, heat in the same way as above and cut to fit. If a radiator can be raised, slip the tile under the legs, first reinforcing the tile with a nut, washer or ball bearing as shown in the lower detail, Fig. 4. Otherwise, the heat from the radiator will soften the tile and the weight will crack the tile around the legs.

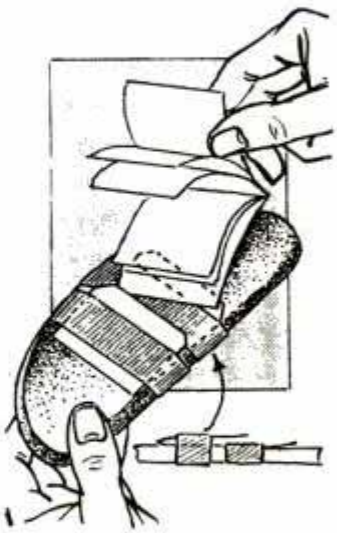
Both cork and rubber tile are installed in much the same way as the asphalt tile. However, where an underlayer is not used, asphalt-saturated felt should be laid before snapping the chalk lines across the room. Don't apply more than 6 or 8 sq. ft. of the adhesive at a time, and lay the tile immediately after applying the adhesive.

To remove adhesive smudges from the face of asphalt tile, wipe with a wet cloth dipped in scouring powder and then rinse with clear water. But don't use scouring powder or harsh soap to clean the tile after installation. Use only warm water and a mild soap, and polish with a good grade of self-polishing wax. Do not wash a rubber-tile floor until after the tile has been in place for two or three days. To keep the floor clean, wash with warm water and a detergent, rinse with clear water and dry with a clean mop. Wax occasionally with a self-polishing floor wax. Take care of the cork floor in the same way as the rubber tile, and be sure to leave no puddles of water on the floor after washing. Certain types of paste wax may be used on cork tile, but never use paste wax or waxes containing mineral-spirit solvents on asphalt or rubber tile. By following the directions of the manufacturer on the care as well as on the installation of his particular tile, your floor will give maximum service and retain its original beauty for many years.

Wire Holder in Medicine Cabinet For Storing Shaving Brush

To assure keeping the bristles of your shaving brush straight, always store the brush so that the bristles hang downward. An easy way of doing this is to make a wire hanger like the one pictured in the detail. It can be screwed inside the medicine cabinet where it will be out of the way. The wire used to make the holder should be fairly stiff so that the bends will hold their shape when the brush handle is forced into the holder.—Rhys B. Boaden, Moline, Ill.

"Pocket" Taped on Spectacle Case Carries Book of Lens Tissues

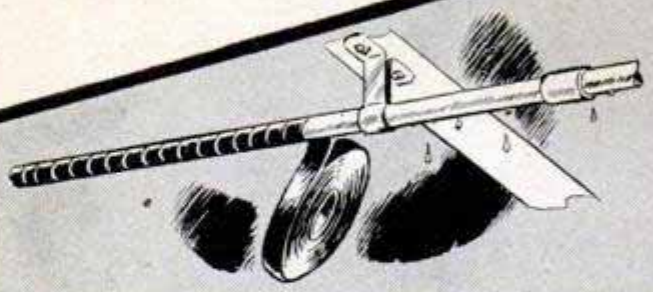


A book of tissues for cleaning eyeglasses can be stored conveniently in a "pocket" made of cardboard and attached to the case with cellulose or masking tape. Just fold a flap on a thin strip of cardboard of suitable width and tape it to the case as detailed. By using a longer strip than shown and turning a second flap under from the opposite end of the cardboard you will have a place to carry an extra book of tissues.

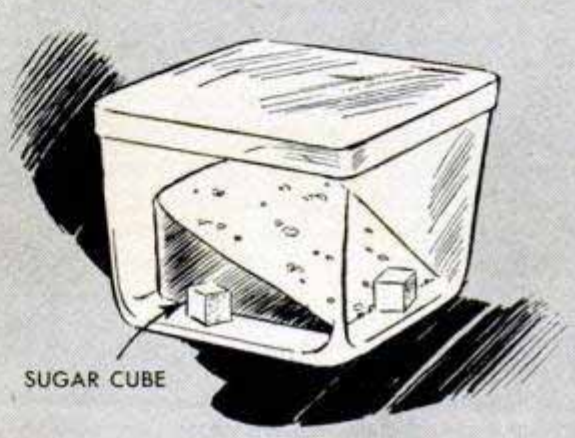
John Augsburger, Chicago.

Solving HOME PROBLEMS

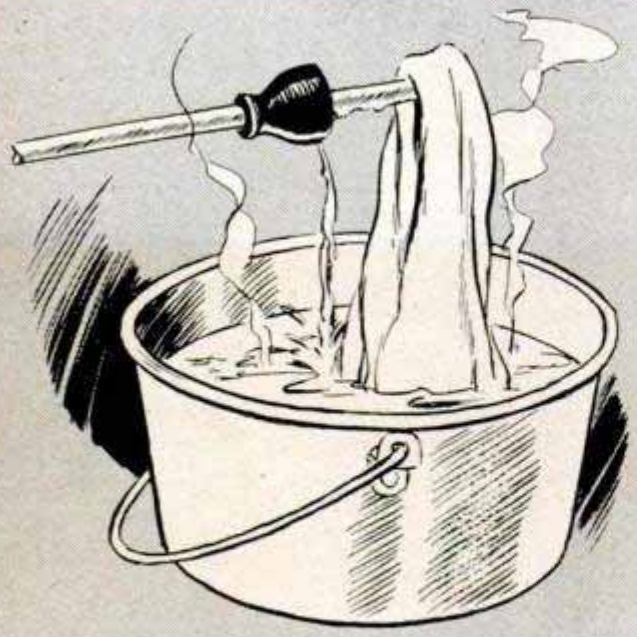
SWEATING OF COLD-WATER PIPES is stopped by wrapping with friction tape. When wrapped spirally around pipe with slight overlap at each turn, tape forms inexpensive condensation shield



OBJECTIONABLE PURPLE STAIN left on the hands after sanding walnut or mahogany woodwork is removed by washing the hands in lemon juice, followed by soap and water

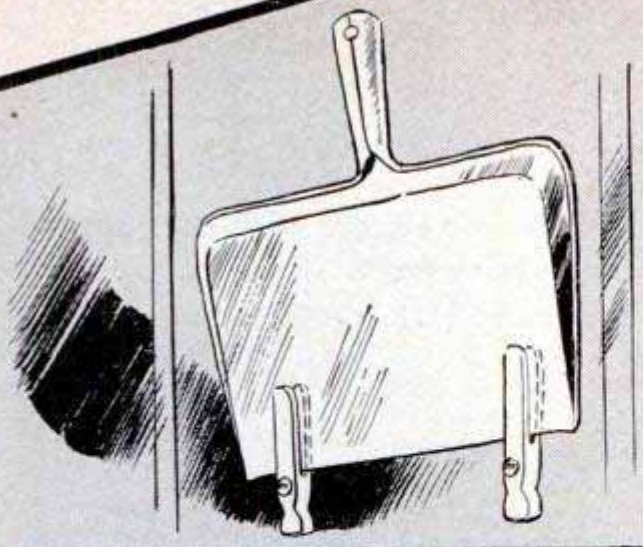


TO ELIMINATE CHEESE MOLD, store the cheese in a covered container together with a couple of lumps of sugar. This not only keeps mold from accumulating but removes mold already formed

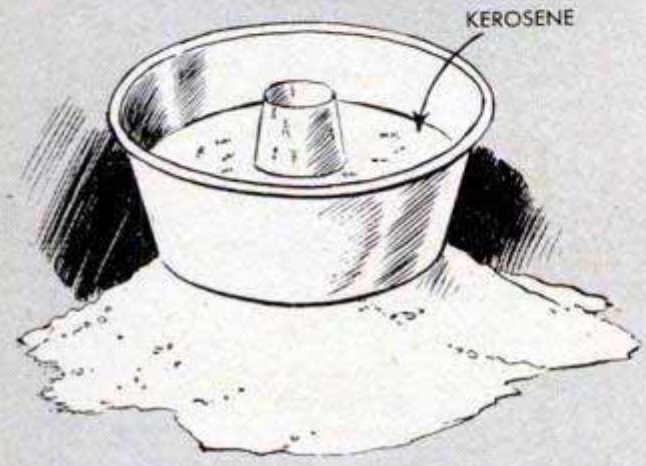


ELECTRIC-PLUG SHELL pressed over a dowel protects hands from hot solution when dyeing fabric. Rubber shell diverts dye which may run down the dowel when the fabric is lifted

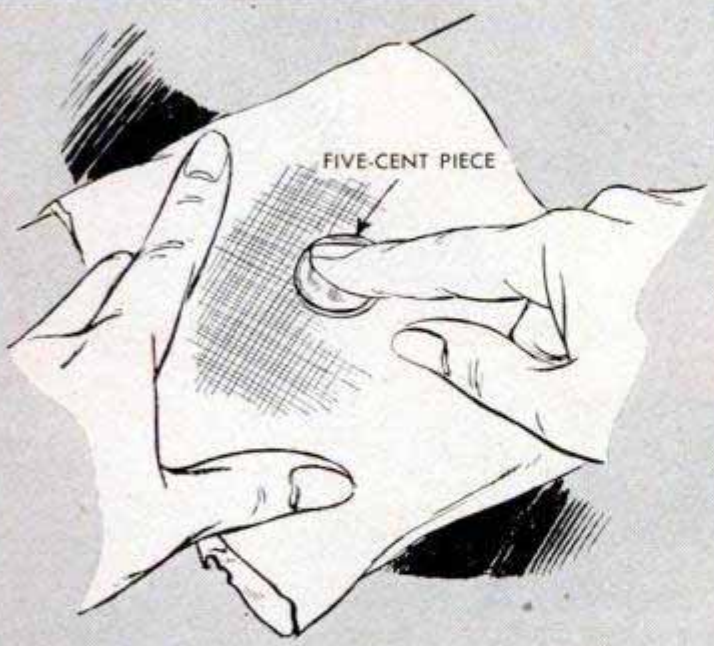
ART REPRODUCTIONS more closely approximate original varnished paintings if they are coated with pure white shellac. Apply one or two thin coats of shellac to the picture before framing



TWO WOODEN CLOTHESPINS screwed to inside of a broom-closet door provide a convenient dust-pan holder. Clothespins of type having flat sides are best and are fastened upside down as shown



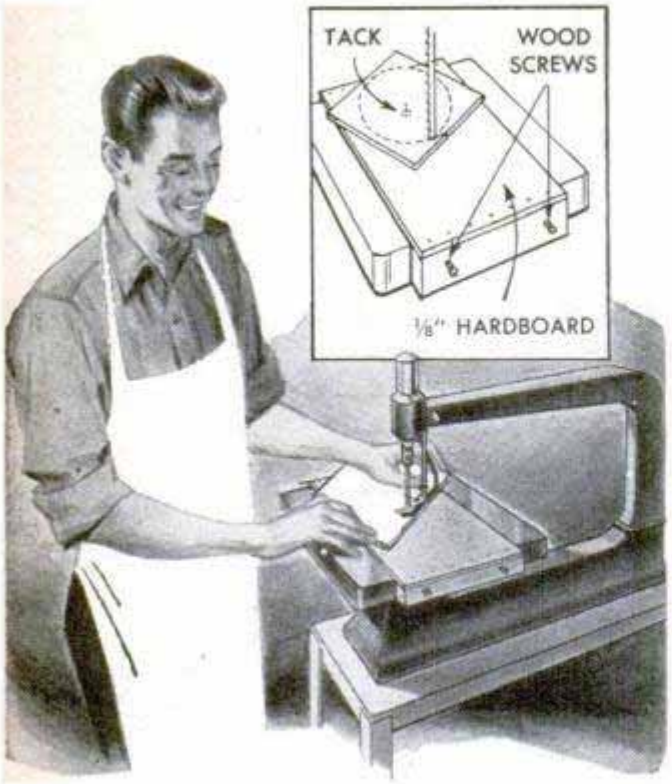
RED ANTS ARE DESTROYED by kerosene placed in angel-food-cake pan, which is centered over the hill. Keep pan on hill overnight, and repeat as necessary to exterminate newly hatched ants



PORTIONS OF CLOTHING scorched slightly during ironing can be renewed quickly with a five-cent piece. Spread the fabric taut on the ironing board and rub the scorched area with the coin

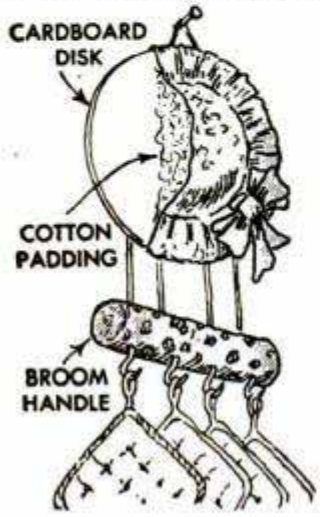
CURIOUS TODDLERS can be kept from opening kitchen-cabinet drawers while mother is busy if the drawers are "locked" with a broom handle. Open drawers and insert handle downward through pulls

Auxiliary Table for Jigsaw Speeds Cutting Disks



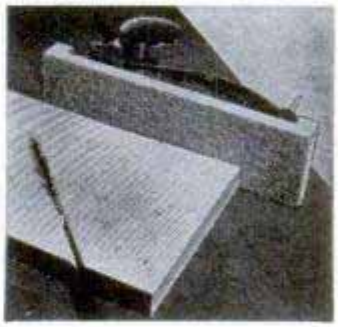
When you have occasion to cut a number of wooden or cardboard disks, an auxiliary table, or jig, such as this one will permit you to make quick work of the job. To make the jig, nail a cleat to each end of a piece of hardboard so that it will just slide over the saw table. Then, cut a slot in the jig for the saw blade and drive a tack through the hardboard from the underside, locating the tack at a right angle to the side of the blade and spacing it from the blade a distance equal to the radius of the disks to be cut. The tack should extend approximately ⅛ in. above the surface of the hardboard where it will serve as an axial point for the work, which is pressed down onto it and rotated to cut the disk. Note that the jig is locked on the saw table by two wood screws driven through each cleat.

Decorative Pot-Holder Rack



Give your little girl a cardboard disk, a short length of broomstick and some scrap cloth, oilcloth or other material, and let her make this useful as well as ornamental rack for pot holders. The disk is padded with cotton and covered with the material, which may be pleated around the edge and adorned with a bow. Four strands of yarn will suspend the broomstick (also covered with material), and as many screw hooks as needed are driven into the stick for hanging the pot holders.

Miter Gauge Faced With Sandpaper Keeps Work From Slipping



To prevent work from slipping when held against the miter gauge of your saw, cover the face of the gauge with a piece of coarse sandpaper. This stunt is especially helpful in sawing a compound angle. Cement of the type used to attach abrasive paper to a disk sander is excellent for fastening the sandpaper.

Louis Hochman, Sherman Oaks, Calif.

Copy on Onionskin Paper Made Easy to Read

The difficulty of reading copy that is written on thin, translucent paper, such as some airmail stationery or onionskin paper, can be overcome by placing the sheets over a piece of white cardboard. This will provide a suitable contrast, against which the copy will become legible.

Helen Lemberger, Chicago.

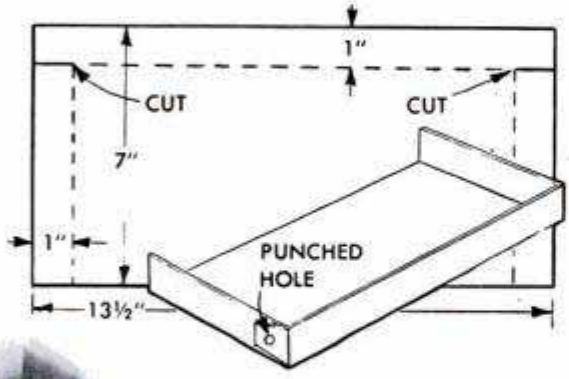
Pocket Comb and Thumbtack Provide Emergency Compass

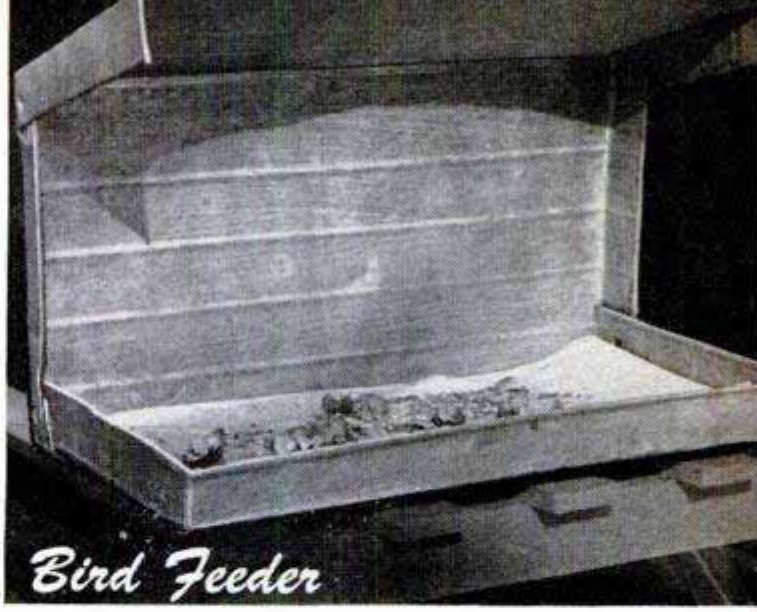
In the absence of a compass, a pocket comb can be used to make a circle. Just drill a small hole in one end of the comb and insert a thumbtack or pin to serve as a pivot. Then place the point of a pencil between the comb teeth and draw the circle.

George Kapitan, Bronx, N. Y.

Made from a

By Evelyn Bailing Findley



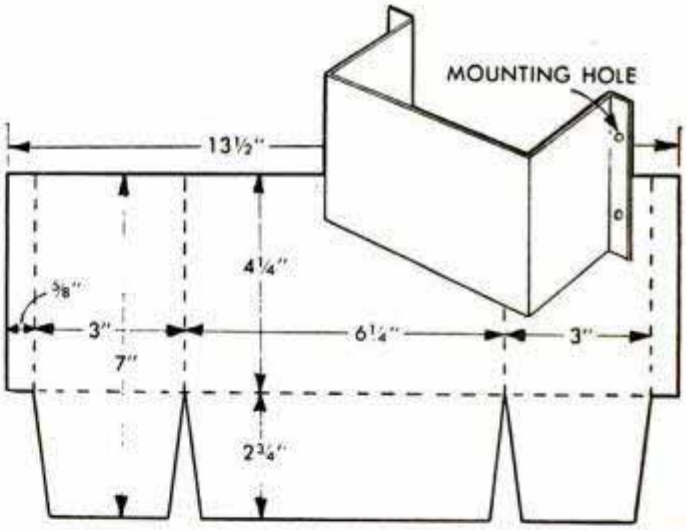


Bird Feeder

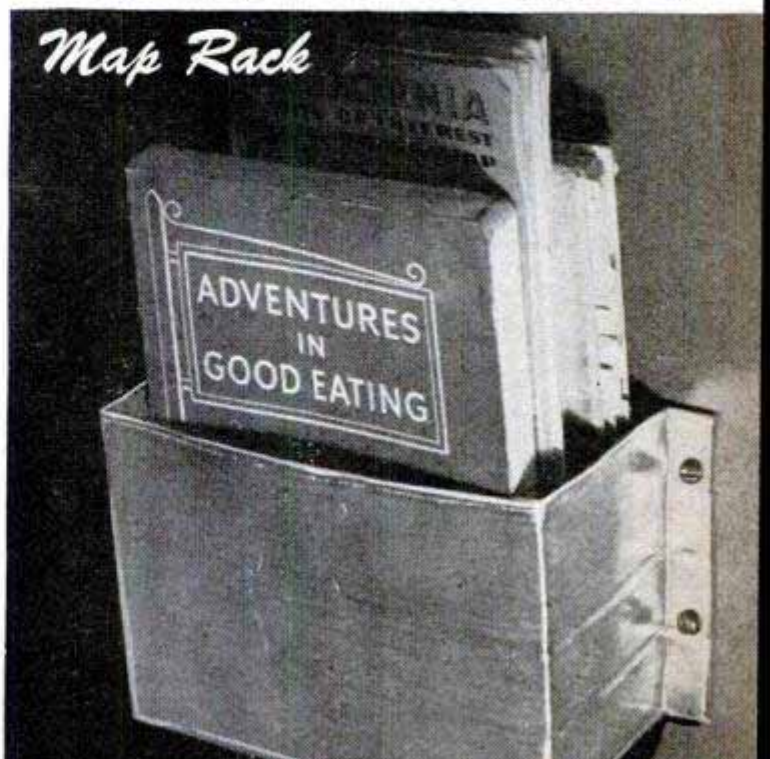
Three large fruit-juice cans, flattened and folded as shown at the left, are used to make the bird feeder pictured above. Each piece of sheet metal is bent upward on three sides, the corners being "riveted" together by punching the metal with a large nail. After punching, burrs are peened over to hold parts in place. The three sections are joined in the same way and the bird feeder is mounted on a tree or post

Clothespin Holder

The handy clothespin holder shown above is simply a fruit-juice can fitted with a wire hook. The end of the can is removed with a rotary-type opener and the sides are punched near the rim to permit attaching a double strand of copper wire used for the hook. Paint the finished holder to make it more attractive

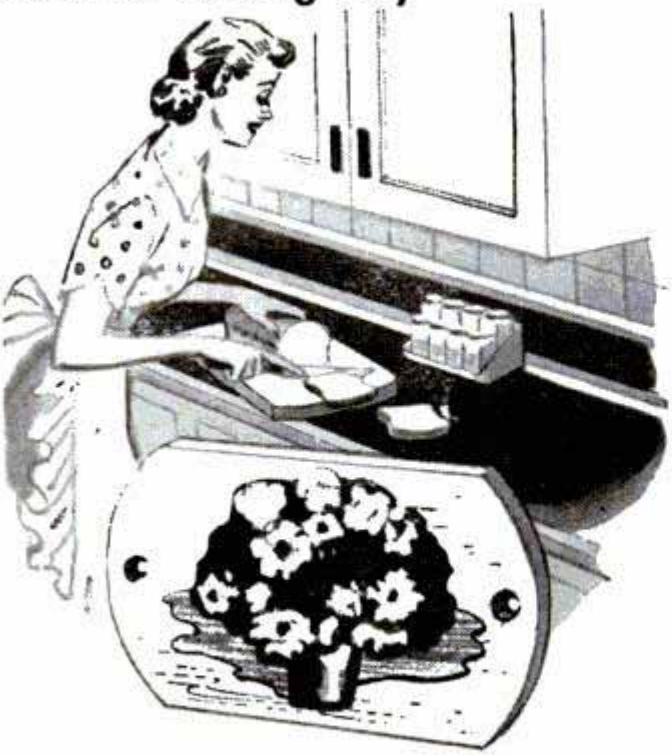


Map Rack



A sheet-metal map or book rack for use in the car or workshop is easily made from a single fruit-juice can. Cut and bend the can as indicated in the center detail and punch two mounting holes in each side flange. Drive a nail through the overlapping bottom tabs and peen over the burrs to rivet tabs together

Hand-Painted Breadboard Used for Serving Tray



Either maple or birch is an ideal wood to use for making this attractive breadboard, which doubles as a serving tray and, when not in use, as a decorative wall plaque. The shape of the board illustrated can be altered if desired, and the picture hand painted after the board has been sanded. A decalcomania may be applied instead. Finish the decorated side of the board with a coat of clear shellac, but leave the breadboard side natural. Holes are made at each side to permit hanging the board.

Norbert Engels, South Bend, Ind.

Improved Method of Ironing Pleats

The tedious job of ironing pleated skirts can be simplified by using strips of cellulose tape, instead of numerous pins, to hold the pleats in place. Press the portion of the skirt not covered by the tape, then remove the tape and complete the job. Do not bring the iron in contact with the tape as the heat will cause the adhesive to melt and soil the skirt.

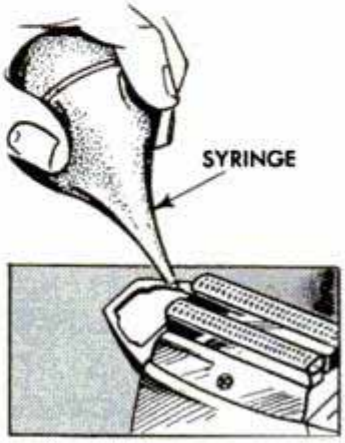
G. E. Hendrickson, Argyle, Wis.

Blowtorch in Camper's Gear Is Handy on Rainy Trips

One sportsman carries a blowtorch on camping trips and finds it very useful during rainy weather. Damp firewood can be ignited quickly by playing the flame from the torch on it, and when set on the floor of a cabin or tent with its flame directed against a large rock, the torch serves as an excellent heater and dehumidifier or to quicken the drying of wet clothes or blankets hung near by. However, when used in this manner in a tent or other confined area, adequate ventilation should be provided so that there will be no danger of campers inhaling fumes from the torch.

A. B. Altwater, Pittsburgh, Pa.

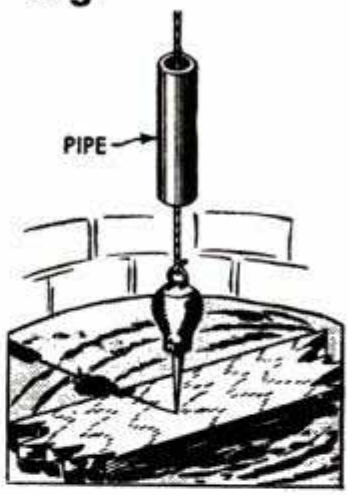
Ear Syringe Cleans Electric Razor



You will find an ear syringe of the type shown ideal for cleaning an electric razor. The narrow neck of the syringe permits directing air into parts of the razor that otherwise would be inaccessible, such as the motor and the cutting blades. Ear syringes of this type are of various shapes, but you should obtain one that has the longest possible neck.

Harry Radzinski, New York City.

Scrap Wood Removed From Cistern By Using Awl as "Gig"

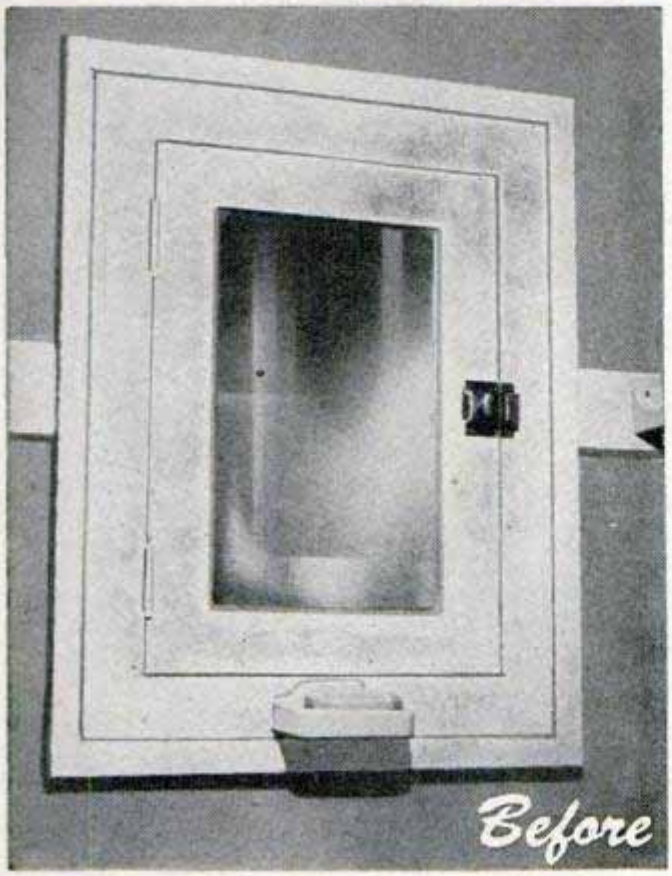


Unable to snare a piece of wood with a rope to remove it from his cistern, one man improvised a "gig" from an awl. A long cord was attached to the handle by means of a screw eye and the awl lowered into the cistern so that the pointed end rested on the wood. Then a short length of steel pipe was slipped over the cord and dropped down to strike the awl and drive it into the wood. Thus impaled, the wood was lifted out.

PATENT NOTICE

The repeating crossbow, featured in an article by Austin H. Phelps in the August 1951 issue of *Popular Mechanics Magazine,* is covered by Patents 1,985,079 and 2,554,966 owned by Mr. George Stevens of Marcella, Ark.

Modernize Your Medicine Cabinet

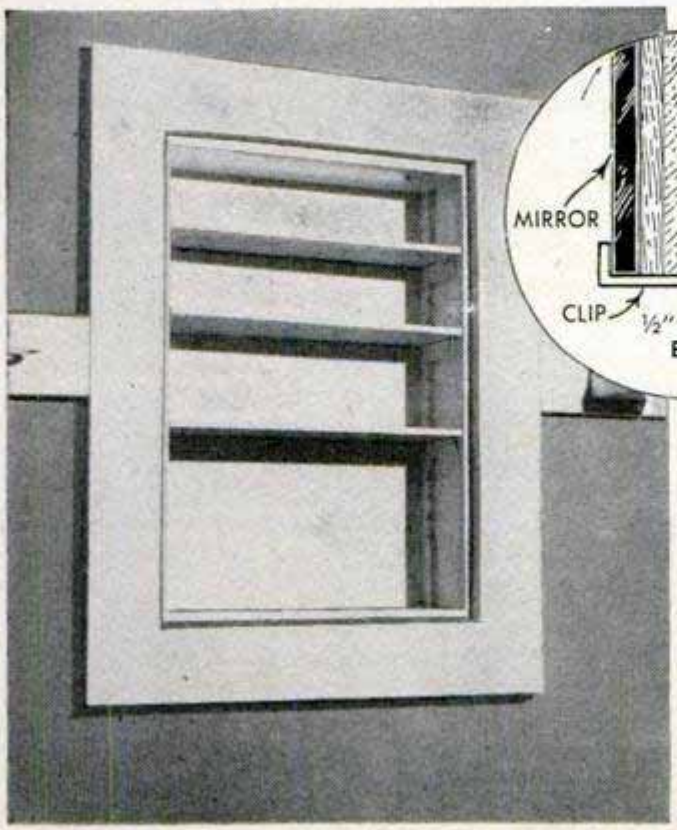


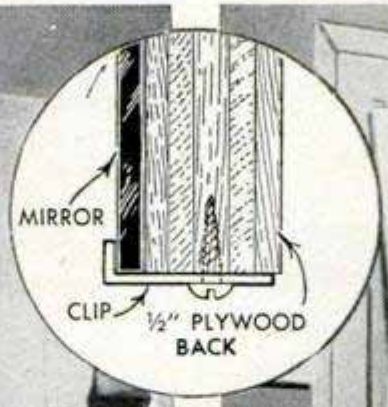
An old medicine cabinet often can be modernized quite simply by fitting it with a hinged plywood panel to support a full-length mirror. In the one shown above, the door, inner frame and trim are removed

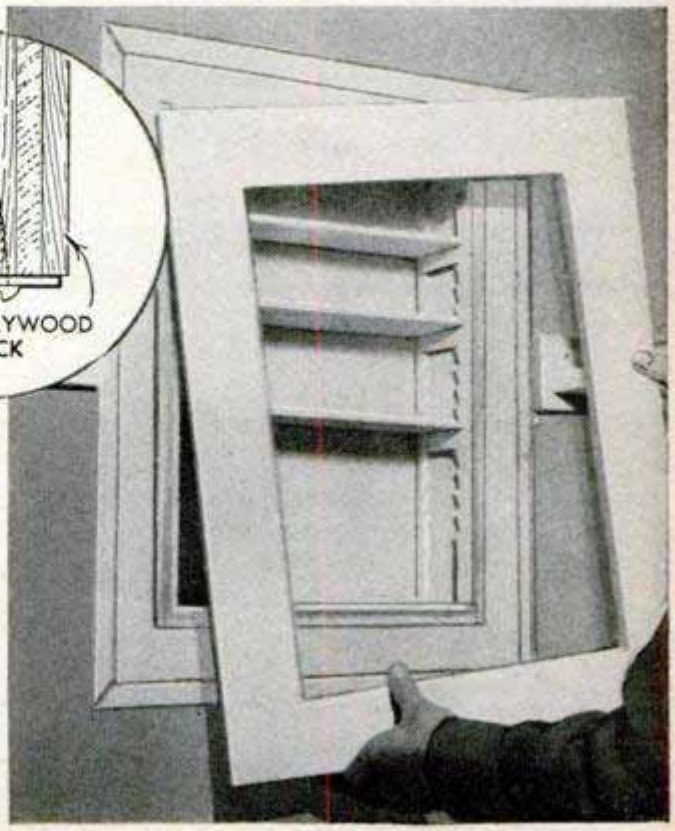
Here's the cabinet at the left after fitting subframe, mirror panel and new full-size mirror. Exposed edges of plywood frames are filled with paste white lead and enameled. Mirror is held securely by metal clips

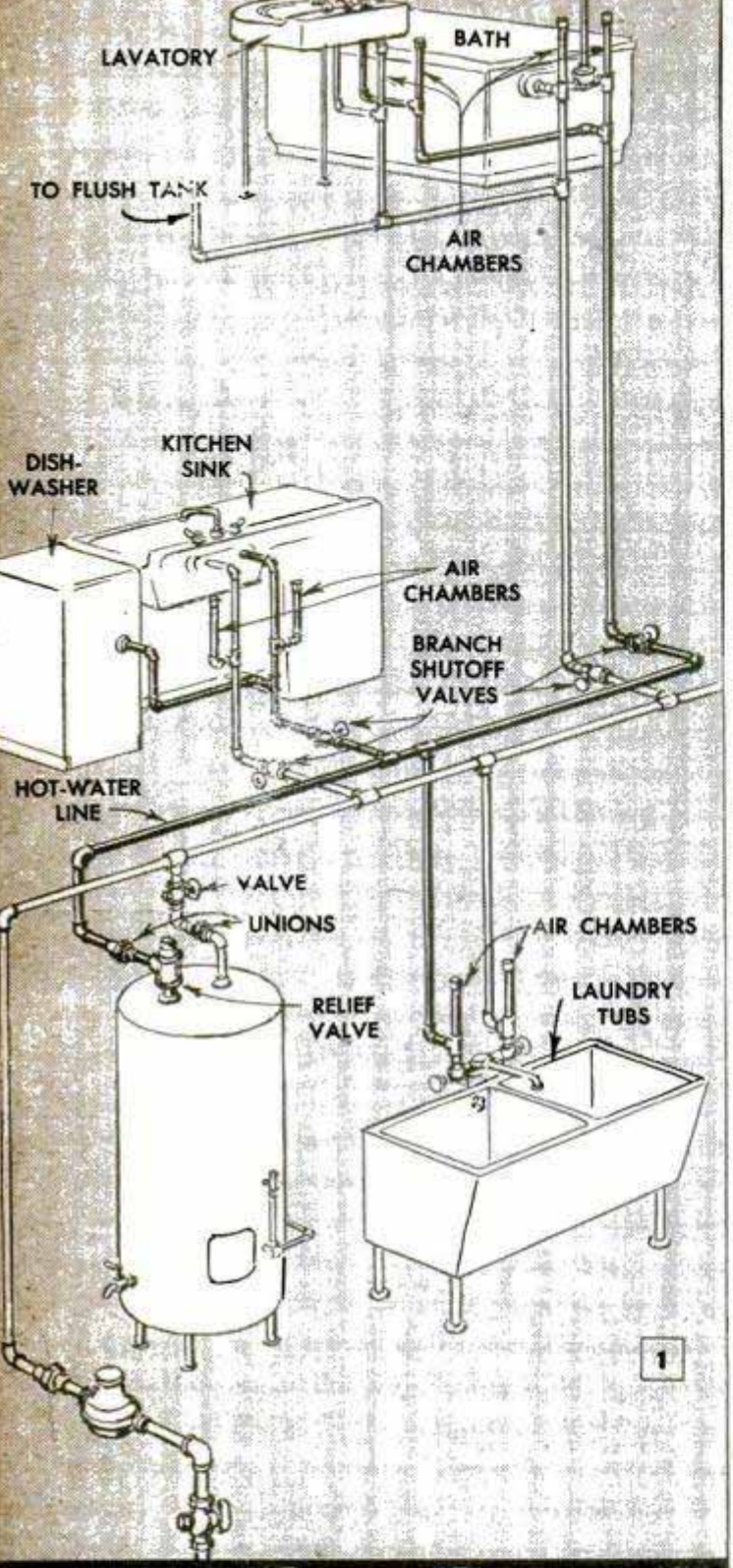
Photo below shows the plywood subframe fitted after removing the original mirror door and trim. In some types of built-in cabinets a subframe may not be necessary. Be sure subframe is exact size of new mirror

Where a subframe is required in addition to the mirror-backing panel it must be cut carefully to assure an accurate fit over the built-in portion of the original cabinet. Attach mirror to backing as in detail

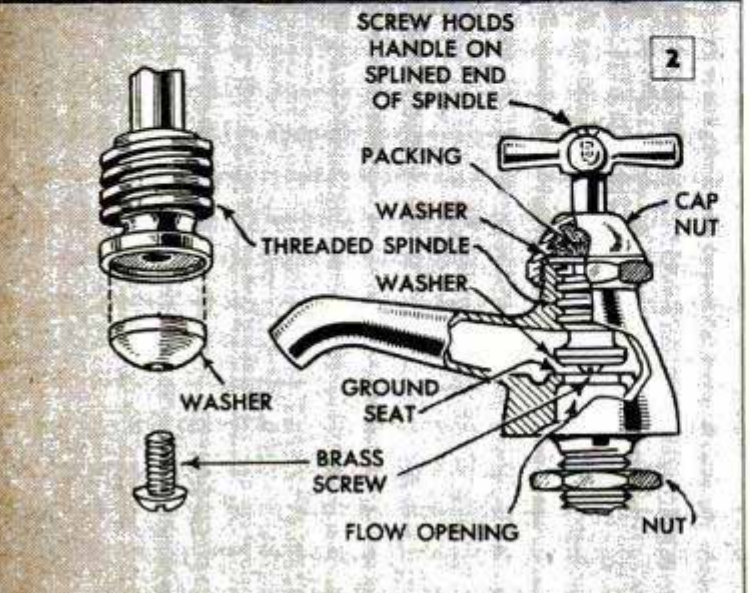




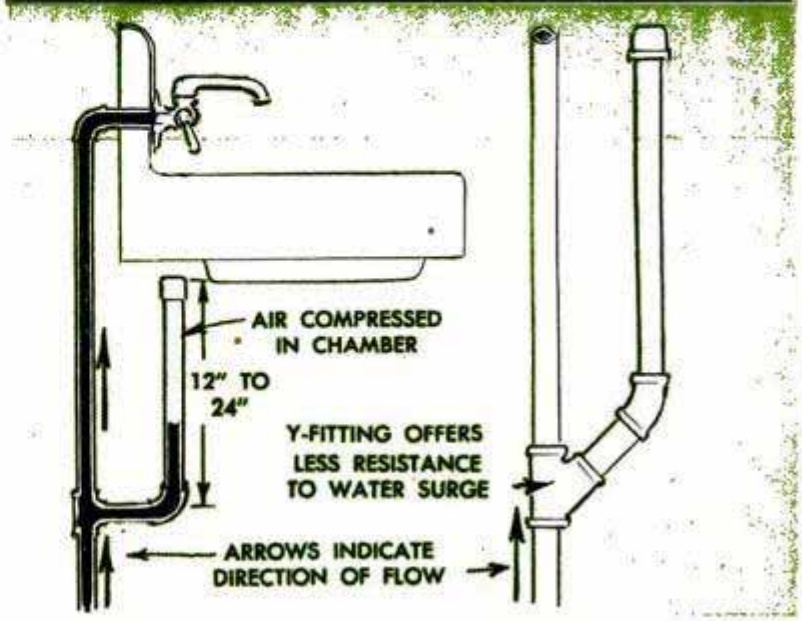




Loose Faucet Parts



Curing Troubles in ....

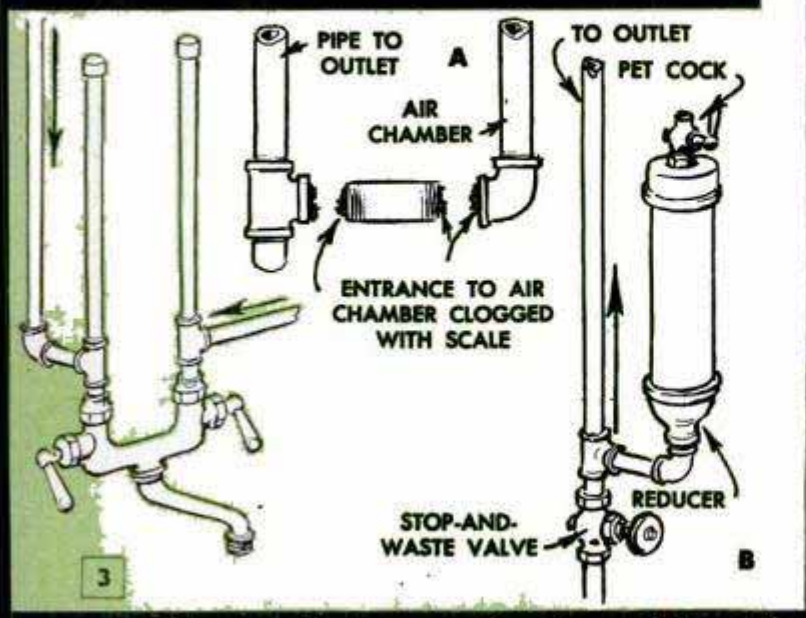


What you can do about "singing" or chattering faucets, water hammer in pipes, "summer drip," freezing of pipes and corrosion

DO YOUR FAUCETS "sing" or chatter when they are opened slightly? Do pipes pound violently when faucets are turned off? Are you troubled with cold-water pipes sweating and dripping during humid summer months? Maybe there is an exposed pipe in danger of freezing when cold weather sets in. You can prevent and cure common water-system troubles such as these just as easily as stopping leaks in the water system, as described in an article in the June 1950 *Popular Mechanics.*

Noisy faucets: A typical home water-supply system including various outlets, air chambers and valves is shown in Fig. 1. When a faucet of the compression type, which is shown in Fig. 2, becomes noisy or chatters, look for loose or defective parts. First see that the cap nut is tight, using a suitable wrench after wrapping the nut with cardboard or cloth to protect its chrome or nickel finish. If this does not help, turn off the water supply at the main or a branch valve, and back off the cap nut entirely. Then unscrew the spindle assembly in the same direction as when opening the faucet, until it can be lifted out. Check the small screw holding the washer on the end of the spindle. If loose, tighten it so that the washer is seated firmly. If the washer is worn, replace it with a new one.

WATER SYSTEMS



Installation of Air Chambers Prevents Water Hammer

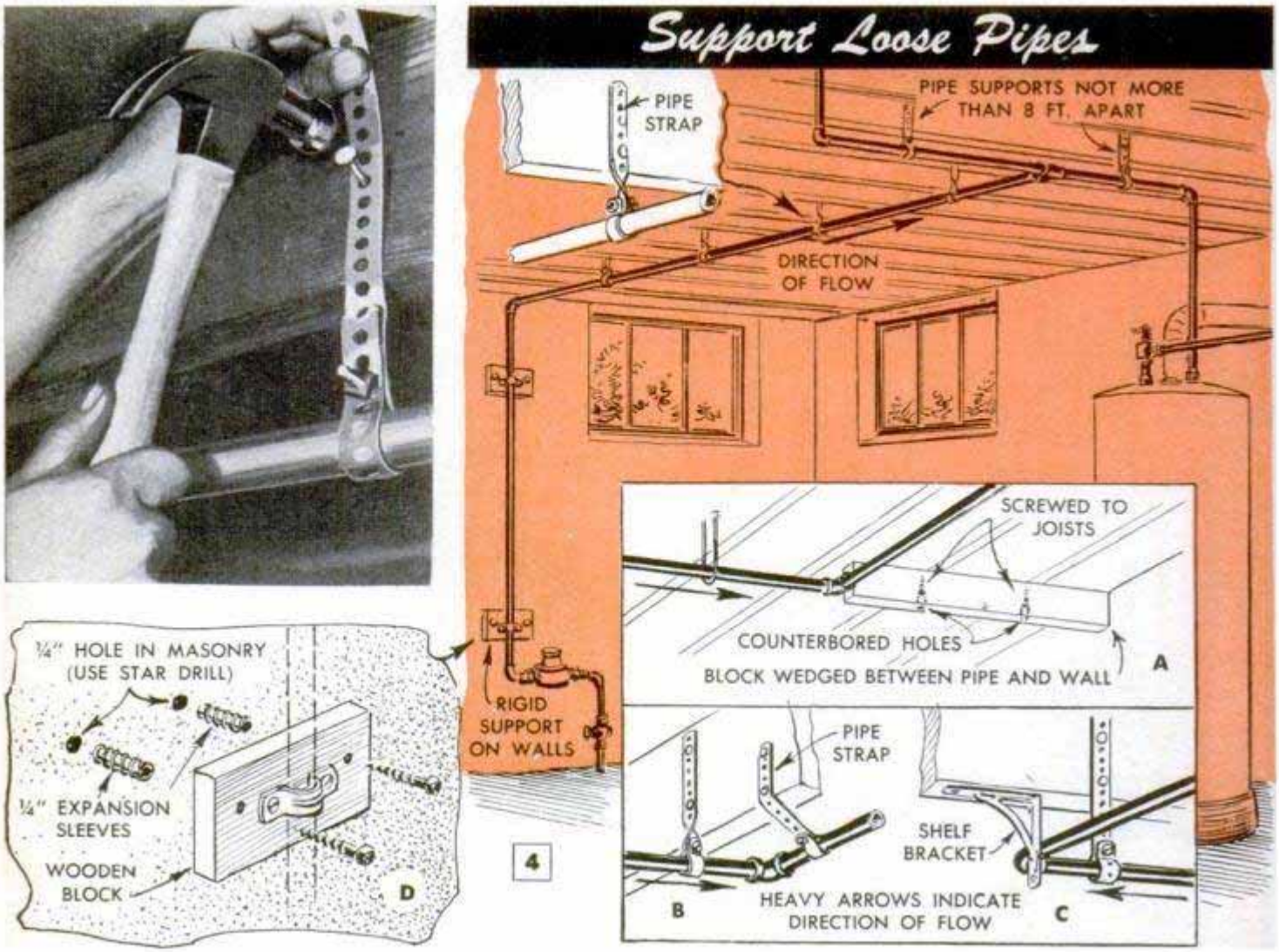
When you screw the spindle assembly back into the faucet, carefully note whether there is any up-and-down play caused by wear on the threaded parts. If so, you'll need a new faucet unless you're able to obtain a replacement spindle especially made for repairing such defective faucets.

When noise or chattering occurs in a Fuller-type faucet, now practically obsolete but still found in old plumbing systems, the body of the faucet is unscrewed from the tailpiece. The ball inside may be loose and require tightening, or the ball shaft and spindle eccentric may be worn, permitting the assembly to rattle. Replacement parts are available or a new faucet of the compression type may be installed.

Water hammer in pipes: Water systems often are provided with air chambers near faucets to prevent violent pounding called water hammer when faucets are turned off quickly. Air chambers may be special devices or merely vertical lengths of pipe capped at the end as in Fig. 3. When a faucet is turned off quickly the moving water tends to rush into the air chamber where it compresses the air and comes to a gradual stop without a knock.

Air chambers become ineffective when the air is lost and they are filled with water; the air is absorbed gradually by water under pressure or it may leak out at the cap if this is not tight. To renew the air cushion, the system must be drained. First shut off the water supply at the main valve and open all the faucets, including the drain outlet at the bottom of the hot-water tank, so that the water will drain down to the level of the lowest faucets. Do this after turning off the heater. If the main valve near the meter is of the "stop and waste" type (one having a drain opening), open the drain to let the rest of the water out. Otherwise disconnect the pipe at the meter or a near-by union. See Fig. 1. Next, remove the cap from the air chambers that are accessible as shown in the photo on the opposite page. If your plumbing system is old, it may be wise at this time to unscrew the air chambers as in detail A, Fig. 3, to see if they are clogged, which also can make them inoperative and result in water hammer. If the obstruction cannot be removed, new parts will be needed. After replacing the air chambers, screw the caps on tightly, using pipe-joint compound. Always apply it to outside threads —not to internal threads of a fitting since the surplus may then get inside of the pipe, which may cause an obstruction to form or taint drinking water. If a pipe cap fits too loosely, wrap the threads with a strand of cotton string or No. 40 cotton thread before screwing on the cap.

If a particular air chamber needs such reconditioning frequently, you can avoid the job of draining the entire system by installing a stop-and-waste valve just below the chamber, and a pet cock at the top as in detail B, Fig. 3. This arrangement

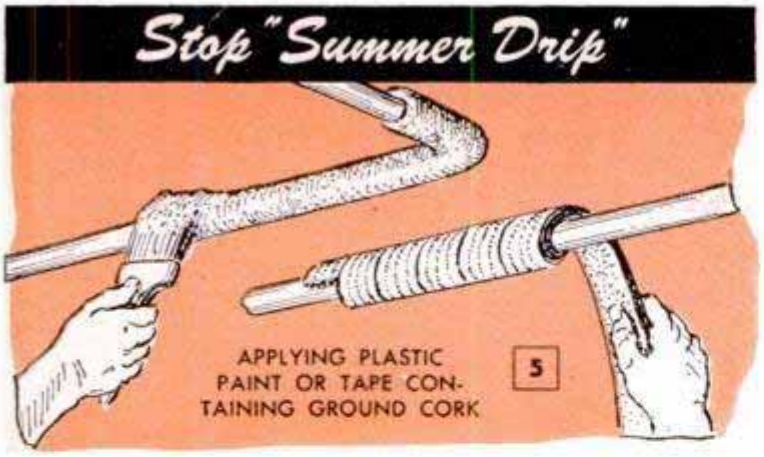


permits draining the air chamber and renewing the air in a few minutes time. When the supply of water to an individual faucet can be shut off with a valve located just below the air chamber, but the air chamber is not provided with a pet cock, remove the air chamber at its base, and then replace it. Water in the pipe to the faucet is drained away through the drain opening of the valve.

Loose pipes: If water pipes are not supported adequately, rattling and pounding can result even though the air chambers are working properly. The space between supporting hangers on a horizontal pipe should not exceed 8 ft. When joists above the pipe are exposed, additional hangers can be installed as shown in the photo in Fig. 4. If pipes move when faucets are shut off quickly, particularly long horizontal lengths of pipe, damage may result at the threaded joints and cause water leakage. The movement can be stopped by applying such simple measures as shown in details A, B and C, Fig. 4. Vertical lengths of pipe next to walls can be held in position securely as illustrated in detail D.

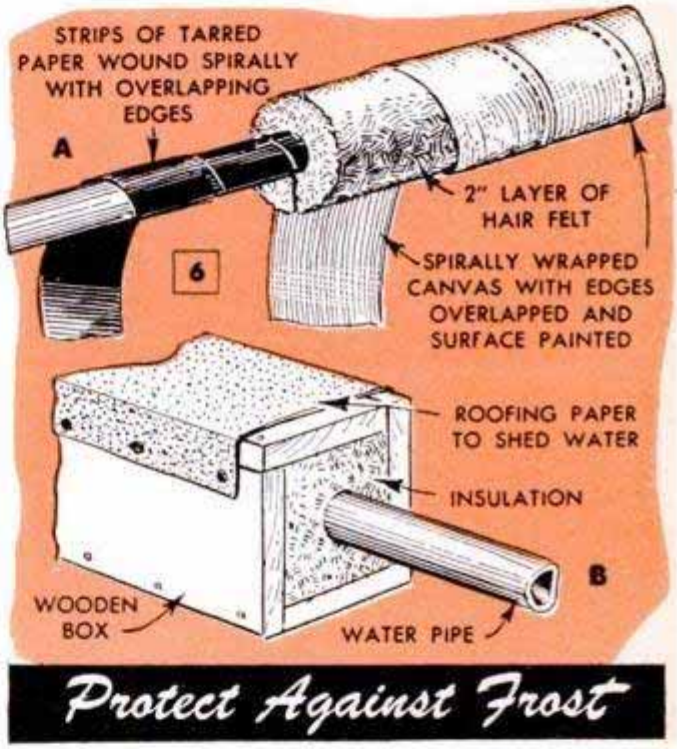
Noise at water heaters: Rumbling noises at hot-water tanks often are caused by water being overheated. For ordinary household purposes the water temperature need not exceed 140 deg. F. The water should never be allowed to boil, and the tank should be provided with a safety relief valve. Hammering and cracking noises usually are caused by water being forced through passages which are restricted by "liming" of the heater coil, water back or connecting pipes. This condition should be corrected as explained under the paragraph entitled, "Clogged pipes." Pounding noises also can be caused by a faulty connection between a heater or water back and the storage tank. The hot-water pipe from the heater to the tank should be of adequate size and should slope upward to the tank, never downward toward it, and it should be connected to the top of the tank. Water backs should always be perfectly level to avoid pockets where steam can collect.

"Summer drip:" In many localities humidity during summer causes cold-water pipes to sweat and drip, particularly in basements. The dripping water may cause damage to wooden floors or to anything stored below the pipes. You can correct this trouble by coating the pipes with a thick plastic paint containing ground cork, or by using other types of covering designed for the purpose. See Fig. 5 and accompanying photo. One type is a plastic



tape containing cork. It is wrapped spirally around the pipe. Most coverings are tubular, split lengthwise for easy attachment, and come in 3-ft. lengths. One kind consists of two separate tubes, the inner one being coated with asphalt inside and out.

Insulating against freezing: Where exposed water pipes are subject to freezing, an insulating cover of asbestos hair felt over a layer of asphalt-saturated wool felt is effective against both condensation and freezing. Similar protection must be provided at all joints, elbows and connections, and the entire covering must be continuous without air gaps between adjoining sections. Exposed water pipes that are located outdoors or in unheated buildings can be insulated as in detail A, Fig. 6. Strips of tar paper are wrapped spirally around the pipe, then a 2-in. layer of hair felt or mineral wool held in place by a wrapping of canvas which is coated with asphalt cement to waterproof it. Or, you can enclose the pipe in a watertight box filled with sawdust, ground cork, mineral wool or other suitable insulation, detail B, Fig. 6. The thickness of the insulation around the pipe should be at least 2 in. Underground water pipes should be laid below the local frost line.

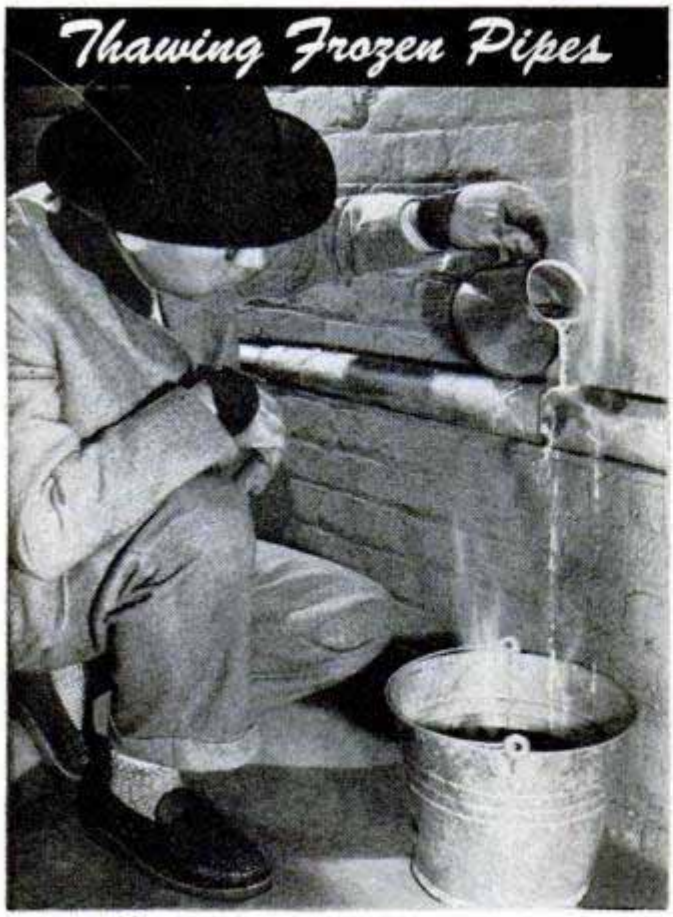


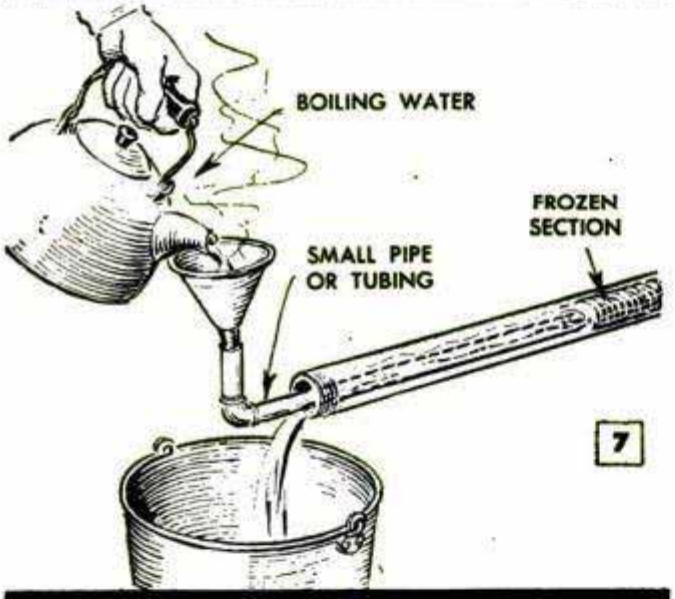
Thawing frozen pipes: When thawing out a frozen water pipe, be ready to turn off the water in case the pipe has been cracked. Where electricity is available, the simplest way to thaw out a frozen pipe is by means of a plumber's pipe-thawing transformer. The clamps on the ends of the heavy cables are connected to the pipe on either side of the frozen section as in Fig. 8. An electric current flowing through the pipe between the clamps heats the pipe and melts the ice. If a pipe-thawing transformer is not available and the frozen section of pipe is accessible, you can apply heat externally by holding an electric iron against the pipe, or by placing an electric heater near it.

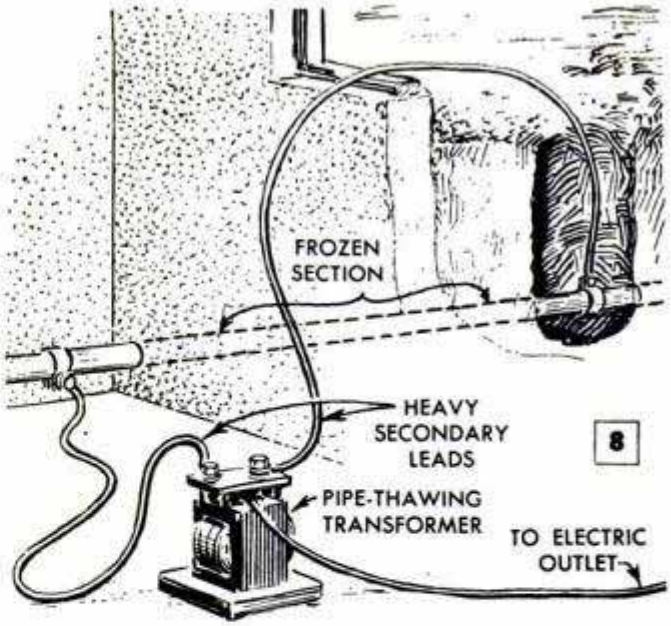
When the frozen section of pipe is accessible, but electricity is not available, heat can be applied in other ways. The middle of the frozen section should not be thawed out first since the expansion of heated water confined by ice, or possibly the formation of steam, may burst the pipe. Start thawing on the faucet side and work toward the supply, keeping the faucet open so that you will know when the ice has melted. About the simplest effective method is to wrap the pipe with twisted rags or burlap to obtain a suitable thickness, and then keep the wrapping saturated with boiling water. A blowtorch will give quick results where the pipe is accessible and not close to wood, paper or other inflammable material, although a sheet of asbestos board can be used as protection.

Another method is to run boiling water inside the pipe if part of the pipe can be removed as in Fig. 7, or if you can start working from an outlet. In horizontal lengths you run the boiling water through a small pipe so that it flows against the ice, and the cooled water drains off into a pail.

Thawing Frozen Pipes







In vertical lengths of pipe you can use a rubber tube in the same way, keeping its end against the ice. A jet of steam works still faster.

Scale and corrosion: Corrosion and formation of scale on the inside of water pipes are two forces that cause most damage and will eventually clog them completely. The rate at which scale and corrosion form varies with the chemical properties of the water and also its temperature. Hard water that contains alkaline salts is not so corrosive as soft water. A 40-deg. rise in temperature about doubles corrosion activity and greatly hastens scale formation. Therefore, the life of hot-water pipes is considerably less than that of cold-water pipes. Scale forms faster on the rough surface of galvanized-iron pipe than it does on the smooth surface of brass pipe and copper tubing. It also forms faster wherever there is resistance to the flow of water, as at elbows, tees and other fittings. Rust in galvanized pipes starts at the threaded joints where the bare metal is exposed. Since rust "grows" to more than ten times the volume of the iron on which it forms, this alone tends to clog pipes. Enough rust is often released in pipes to discolor the water and stain fabrics.

Clogged pipes: When the flow of water from faucets is greatly diminished, the inside of the pipe is probably caked with scale and corrosion. Replacement of the fittings alone may restore a satisfactory water flow for some time if the pipes themselves are not heavily coated. If the pipes are badly caked they also should be renewed.

When it takes a long time to heat water, the heating coil, or water back, as well as all connecting pipes, may be badly caked. The scale acts as insulation, preventing maximum heat transfer, and, consequently the flow also is small. As soon as sluggish results are noticed in a water heater, un-

Adequate Pipe Sizes

WATER-PIPE SIZES

	PRESSURES		
	High	Medium	Low
Distribution mains	¾"	¾" - 1"	1"
Hot-water tank and heater connections, sill cocks, sinks, laundry tubs and bathtub	½"	½" - ¾"	¾"
Lavatories, toilet tanks	⅜"	⅜" - ½"	½"

Branches longer than 25 ft., or supplying two or more outlets, should be ¾" pipe

screw the coil and inspect it. Generally it's better to replace badly caked coils and water backs than to attempt to remove the scale. However, this can be done sometimes when the scale is caused by limestone, which can be softened and removed by using a muriatic-acid solution. This consists of muriatic acid, 1 part, slowly stirred into water, 4 to 7 parts, depending on the thickness of the scale. *(Caution: Do not get the acid on the skin or clothes as it causes burns, is corrosive and poisonous.)* After closing the lower opening of the coil or water back, pour the solution into it and let it stand for 4 to 6 hours. Then pour out the solution and flush the coil with hot water to remove all traces of the acid. If one treatment does not remove the deposit, repeat as necessary. Deposits other than limestone (gypsum, for instance) are not appreciably affected by this solution.

When a limestone-caked pipe is located in a wall or other place where it cannot be removed easily for renewal without causing considerable damage, the acid treatment can be tried.

Brass pipe and copper tubing: Brass pipe and copper tubing are often used in water systems and generally last as long as the house. The smooth inside surface offers less resistance to the flow of water than galvanized pipe. This causes less scale formation and also enables using pipe of the next smaller size than galvanized pipe to get the same volume of flow. Thus, in spite of its greater initial cost, brass and copper pipe are economical because of longer life and the use of smaller sizes.

Much of the cost of tearing up walls occasioned by replacing water pipe can be prevented by using soft copper tubing. It can be drawn between studs and joists, and only a few sections of baseboard and flooring need be removed. Horizontal runs can be installed in notches cut in the studs behind a baseboard, and the tubing can be run around obstructions easily.

Adequate pipe sizes: Noise in a water system can be caused also by water traveling at a high velocity through pipes that are too small, or have become smaller by scale formation. The addition of extra household conveniences such as automatic dish and clothes washers may overload water systems that were originally adequate, causing insufficient delivery of water at some outlets. For instance, a suddenly diminished supply of cold water at a second-floor shower may result in someone being scalded. To minimize such troubles, check your water system for correct size of pipes as given in Fig. 14. When a water system is installed, spending a few dollars more to assure the right pipe sizes may avoid expensive replacement later.

Vertical Latch on Garage Doors Remains Closed by Gravity

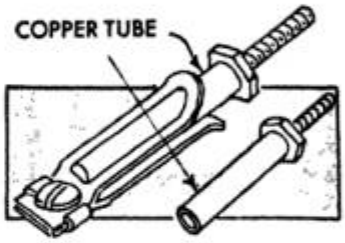
A vertical-type latch for double garage doors can be made from two lengths of flat steel. One piece is drilled and bolted onto the lapping door, where it can be turned into a catch, which is formed to resemble a drawer pull and bolted onto the doorframe. A latch of this type prevents the doors from "bulging" at the center, and is held closed by its own weight. If desired, the vertical piece can be made short enough to be out of the reach of small children.

Hot Vinegar Removes Old Glue

Before regluing a piece of furniture or other item, use hot vinegar to wash off the old glue. Then, allow the wood to dry thoroughly before applying fresh glue.

Blanche Campbell, Las Vegas, Nev.

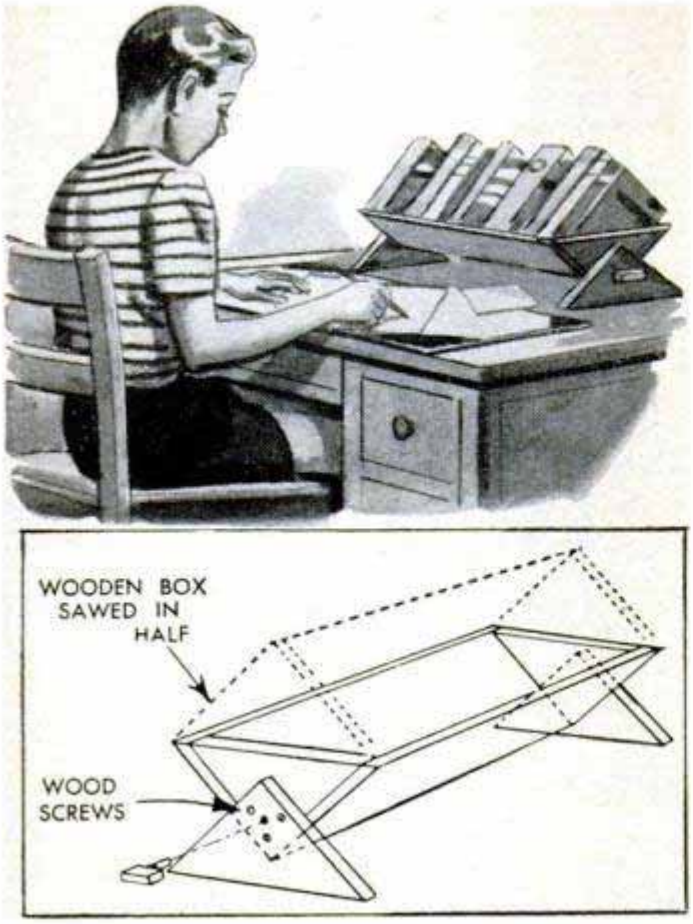
Repairing Electrical Terminals



Burned and pitted male terminals on electrical appliances can be repaired by bushing them with short lengths of copper tubing. The latter should be just large enough to be press-fitted over the terminals and the edges rounded at one end for easy insertion in the plug.—C. W. Philpot, Laurens, S. C.

¶An eyeshade or billed cap kept in your clothespin bag will always be at hand to wear to protect your eyes from the bright sun when hanging up or taking down clothes.

Book Trough for Boy's Desk Made From Wooden Box



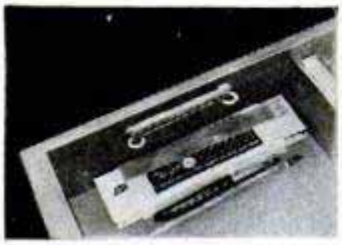
All that is needed to make this simple book trough is a common wooden box, which makes it an ideal project for the boy craftsman as part of it is already made beforehand. First, one side of the box is removed and then, with the box left intact, the ends are sawed in half diagonally, producing the trough part of the project. The triangular-shaped waste pieces left from the ends previously cut are screwed to the trough to serve as feet. After gluing a disk, block or knob over the screwheads at each end to serve as handles the trough is sanded and given a coat of bright enamel.

Pulling "Frozen" Nails

Nails that are difficult to pull often can be removed easily if they are first loosened by striking them a couple of times with a hammer. This will break the "seal" around them formed by acids in the wood.

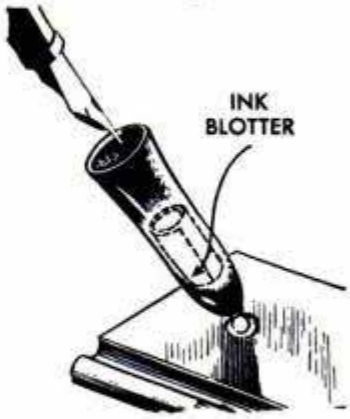
W. B. Kennedy, McCool, Miss.

Screw Hooks Store Rubber Bands



Instead of having a number of rubber bands scattered through the contents of a drawer in your desk, sewing machine or other piece of furniture, drive a couple of screw hooks into one side of the drawer and stretch the bands over them. Spacing of the hooks will depend on the length of the bands.

Blotting-Paper Tube in Penholder Prevents Soiling Finger Grip



In order to keep the finger grip of his desk pen free of ink, one office worker placed a short tube of blotting paper in the bottom of the penholder. The tube was just large enough to take the pen point but not the grip. This prevented the accumulation of ink drippings or leakage, which otherwise would soil the grip.

R. M. Woodbury, Natick, Mass.

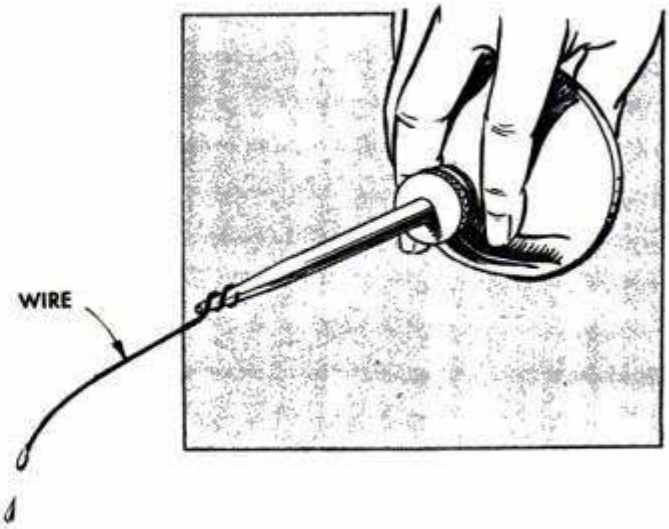
Marble Plugs Balloon When Tying

The difficulty of holding an inflated balloon with one hand and tying a string around the neck with the other can be overcome by plugging the neck with a marble. Just insert the marble, tie the string and then squeeze out the marble.

Richard Wright, Willimantic, Conn.

Wire Extension on Oilcan Spout Reaches Tight Places

To direct oil into a tight place that cannot be reached with the spout of an oilcan, attach a wire extension to the can as shown.



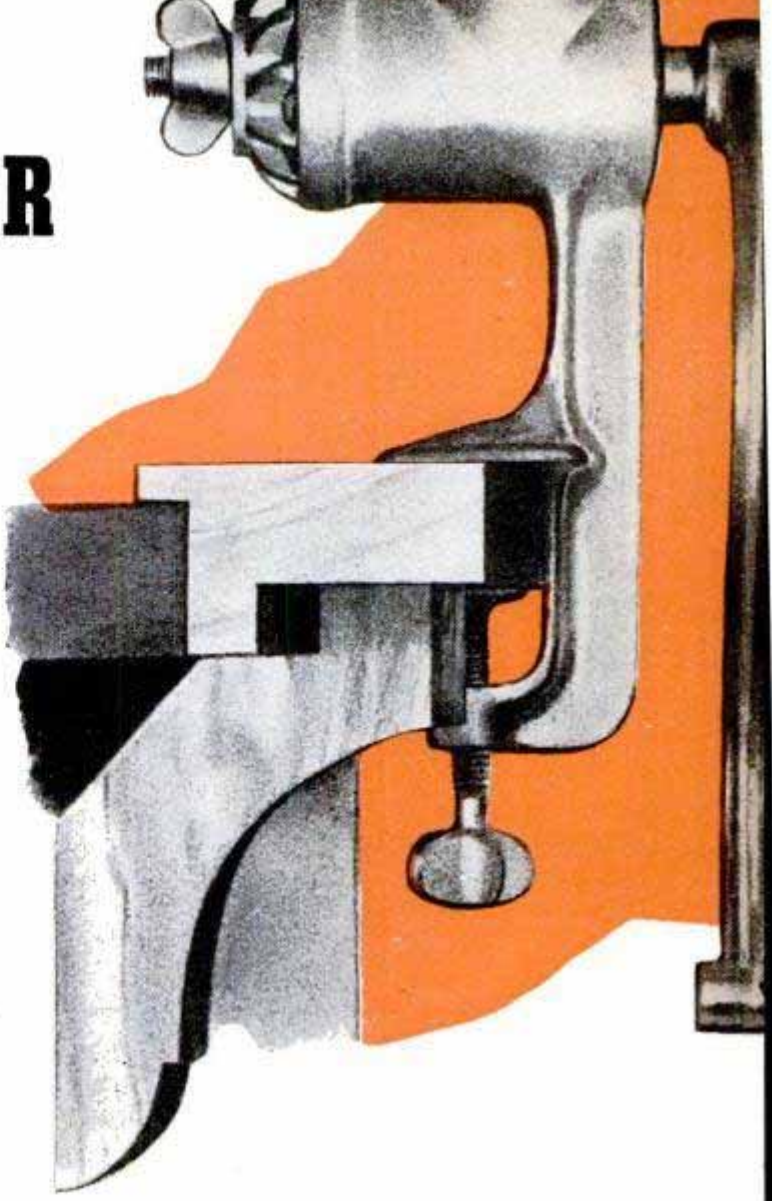
Just wrap the wire in such a manner that it is held under the spout opening, and the oil will run down the extension.

Hugh Lineback, Stillwater, Okla.

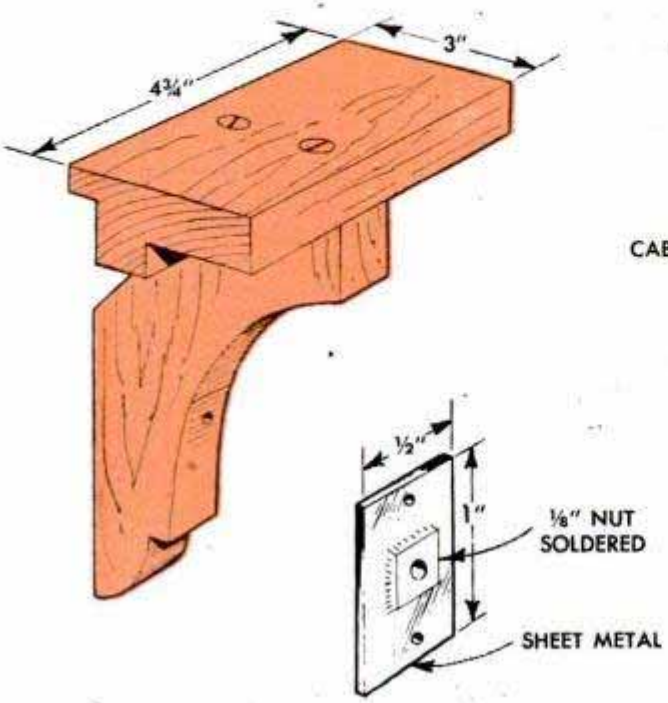
KITCHEN FOOD-CHOPPER BRACKET

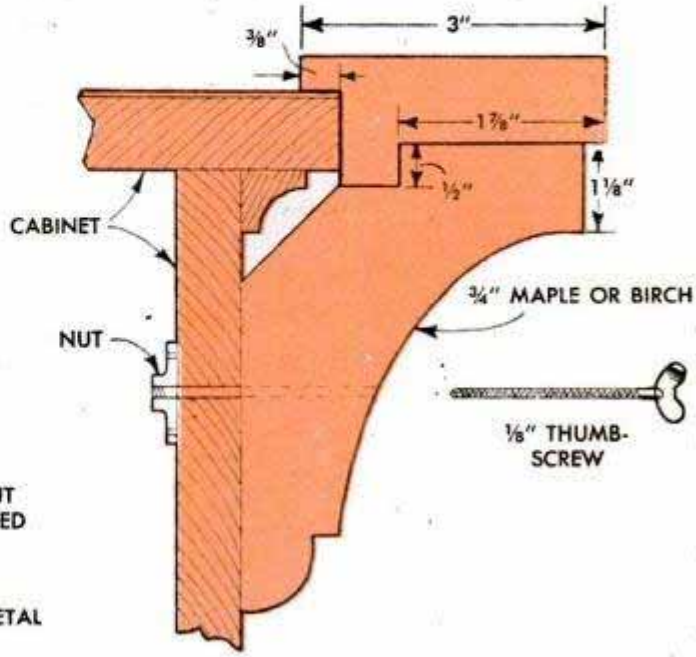
By J. Hugh Capron

HERE'S THE ANSWER to the question of where to clamp the food chopper—a simple two-piece wooden bracket that clamps firmly to the side rail of a kitchen counter or table. The bracket prevents marring of linoleum or plastic work surfaces and is attached or removed by means of a single thumbscrew. The lower member of the bracket, which serves as a support, is made from ¾-in. maple or birch, and its design and size will depend to some extent on where it is placed, either on the side of a table or cabinet. In any case, be sure that you have the measurements correct before cutting stock. Make the curved cuts with a jigsaw or coping saw. Then cut the top piece to over-all size and cut the two rabbets on the front and back edges. Join the two parts with screws and waterproof glue. Then solder a ⅛ or ¼-in. nut over a hole drilled in a small plate cut from heavy sheet metal. Drill two holes through the plate near opposite ends for small screws and screw the plate to the inside face of a kitchen cabinet or table rail as shown in the sectional view. Locate and drill the hole for the thumbscrew through the lower member of the bracket and also through the cabinet rail as shown. The food chopper is clamped to the top member of the bracket.



There's no danger of marring the finish of a table or cabinet top with this food-chopper bracket, as it attaches to the rail with a single thumbscrew. The chopper clamps to the top member of the bracket and is held firmly in position while being operated



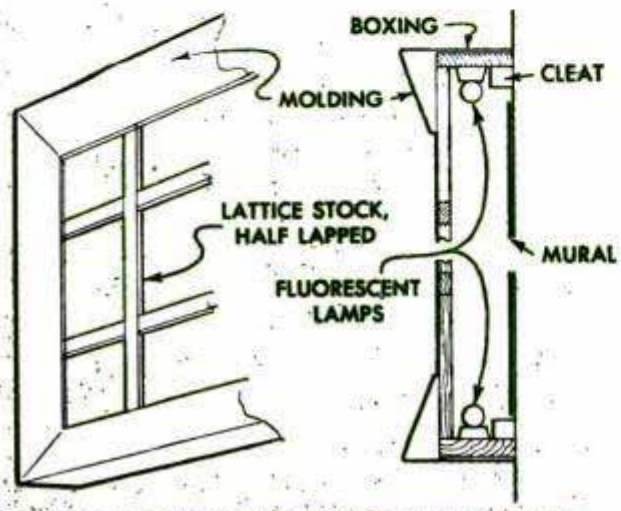


From Bare Walls to PICTURE

D-1-Y #9

SCENIC window walls created by photo murals that permit you to "gaze out" at a majestic snow-capped mountain, the fascinating skyline of a bustling city or a sleepy seacoast village, are the perfect answer to the question of what to do with dead wall surfaces. When framed with draperies or scrolled cornices, or recessed into the wall for indirect lighting, these low-cost murals take on the appearance of real picture windows. You can have suitable murals made from your own prize negatives or you can purchase them in a wide range of sizes. The prints can be obtained in black and white or tinted, as desired.

Unmounted prints are attached to plastered walls with ordinary wallpaper paste. First, determine the exact location of the print on the wall by means of penciled lines, working from a base line which has been leveled, either horizontally or vertically, with a carpenter's level. Moisten the print on both sides with a sponge and apply paste to the back. Then place the print on the locating lines previously marked on the



SIMULATED PICTURE WINDOW OR SHADOW BOX

WINDOWS

wall and smooth it quickly with a wallpaper brush. Wipe the print with a damp sponge to remove excess moisture and any paste which may have gotten on the face of the print. When hanging unmounted prints containing two or more sections, note that the sections will be marked from left to right and the matching ends will be trimmed to allow a ¼-in. overlap.

Mounted prints usually are attached to plastered walls with nails or screws. If the plaster has been applied over wood lath, the screws can be driven through the print and plaster and into the lath. On some types of plastered walls it will be necessary to use wooden anchors (½-in. dowels will do) driven into holes drilled in the plaster. Small, flat-headed nails are then driven through the print and into the wooden anchors. The exposed nail or screw heads can be blended into the print by coating with opaque water colors.

Lighting of the "windows" can be done in several ways but the details above suggest a practical method of wide application.

Record of Slip-Cover Yardage Tacked to Bottom of Chair

If you make slip covers for your furniture, or even reupholster it, make a record of the yardage of material required for each particular piece. Mark this data on individual shipping tags or gummed labels and attach them to the bottom of the seat. In this way, the information will be readily at hand when the time comes to reupholster the piece.

Diamond Appraised With Dry Ice

Should you desire to determine the authenticity of a diamond, you can test it yourself with a small piece of Dry Ice. Rub the ice gently against the stone and if the gem is genuine, the rubbing will produce a squeaklike sound. In handling the Dry Ice, avoid touching it with the bare hands.

Jar Ring Under Lamp Base Prevents Marring Desk Top

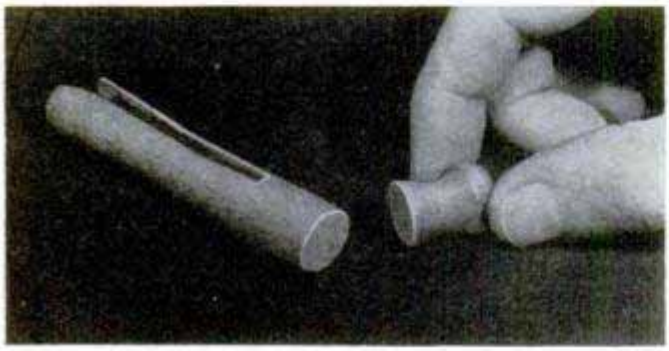
A fruit-jar ring cemented to the bottom of a small desk lamp, ash tray, vase or other similar item, will serve as an ideal pad to prevent scratching of furniture. The rings will provide non-slip surfaces and are less expensive than the felt material ordinarily used for this purpose.—John J. Rea, Urbana, Ill.

Sealing Fractures in Windshield

Although a small, cone-shaped fracture in a car windshield, such as is caused by a flying pebble, usually penetrates only the outer layer of the glass, the windshield can be ruined as a result of the fracture if it is not sealed against moisture. Moisture will seep through the cracks and gradually cloud the middle layer of plastic sandwiched between the glass. To seal the fracture, first wash the area around it with ammonia water. When this has dried completely, apply a coat or two of transparent cement of the waterproof type.

R. W. Bradford, Syracuse, N. Y.

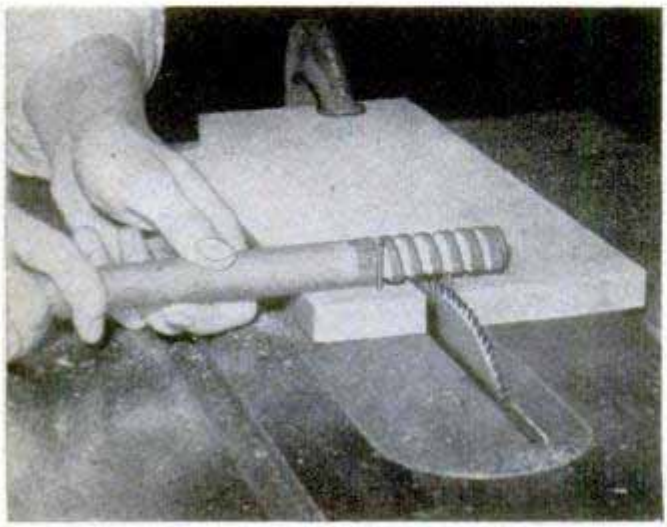
Heads Cut From Clothespins Used as Small-Drawer Pulls



Needing a number of pulls for the small drawers in a supply cabinet, one home craftsman found that heads cut from wooden clothespins were ideal. The heads also are useful when building toy furniture, either as drawer pulls, doorknobs or simply as decorative turnings.

Simple Jig Clamps on Circular Saw For Rethreading or Cutting Spirals

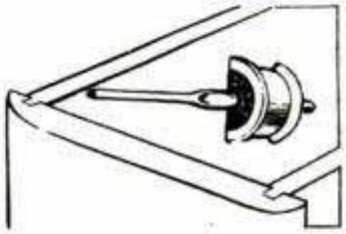
With the aid of this simple jig, a circular saw can be used to rethread handles on push brooms, mops, etc., or to cut decorative threads or spirals on various projects.



To make the jig, slit one end of a wooden block to take the saw blade, as pictured, and clamp it on the saw table. Drive a nail into the board on one side of the blade in position to serve as a rest for the work. Then drive a second nail, which has had the head removed and the end rounded, on the other side and as close to the slit as possible. This should be placed in position to engage a pattern thread cut in the work so that, when the latter is rotated, it will be fed horizontally into the blade. If rethreading, the old threads can be used as the pattern. Otherwise, at least two threads of the type desired should be cut in the work by hand. In use, take only shallow cuts, controlling the depth of cut in the usual manner. Various pitches of spirals can be cut by driving the finishing nails into the wooden block so that they will hold the work at a smaller or larger angle to the saw blade.

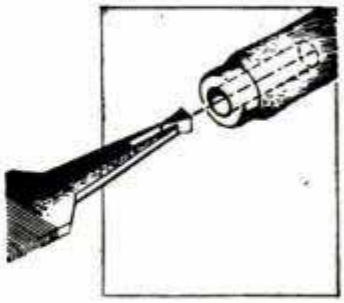
Melvin Ham, Chateau, Mont.

Half of Wooden Thread Spool Forms Crochet-Hook Holder



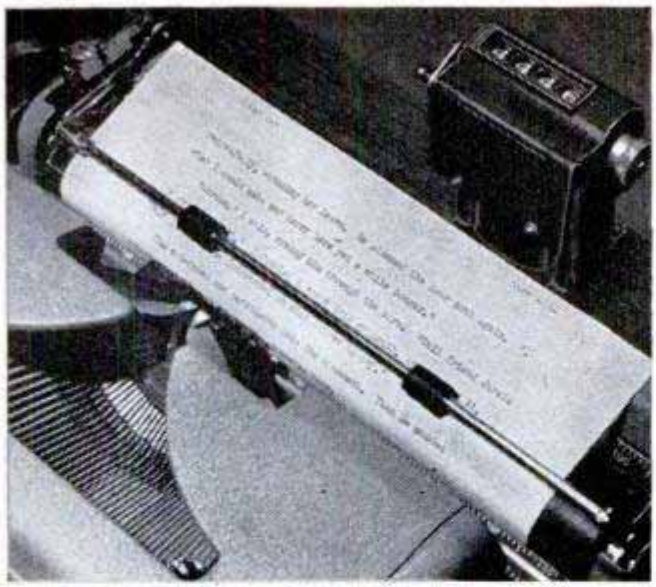
There is little possibility of injuring your fingers on a crochet hook when it is stored in this simple holder. It consists of an empty thread spool cut in half lengthwise and one of the halves glued to the inside surface of a drawer. If several hooks are to be stored, drill holes in a hardwood block and rip it through the centers of the holes to produce two holders which are glued to the drawer. An easier way, if you have a circular saw, is to run several cuts in one side of a suitable block.

Anchoring File Handle Permanently



The annoyance caused by a loose file handle can be overcome permanently by slotting the tang to take a small metal wedge. When driving on the handle, the wedge contacts the bottom of the hole and spreads the slotted portion of the tang against the sides of the hole.—Herbert Fey, New Braunfels, Tex.

¶A couple of oven grates carried in the trunk compartment of your car will come in handy if you get stuck in the snow and something is needed to place under the rear wheels to provide traction.

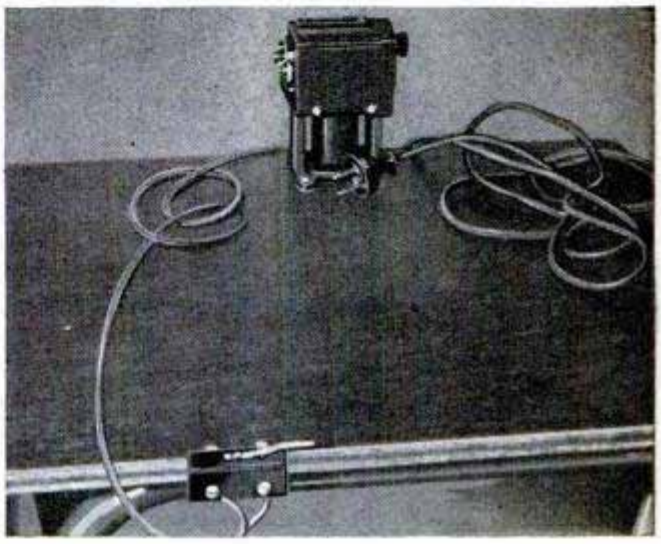


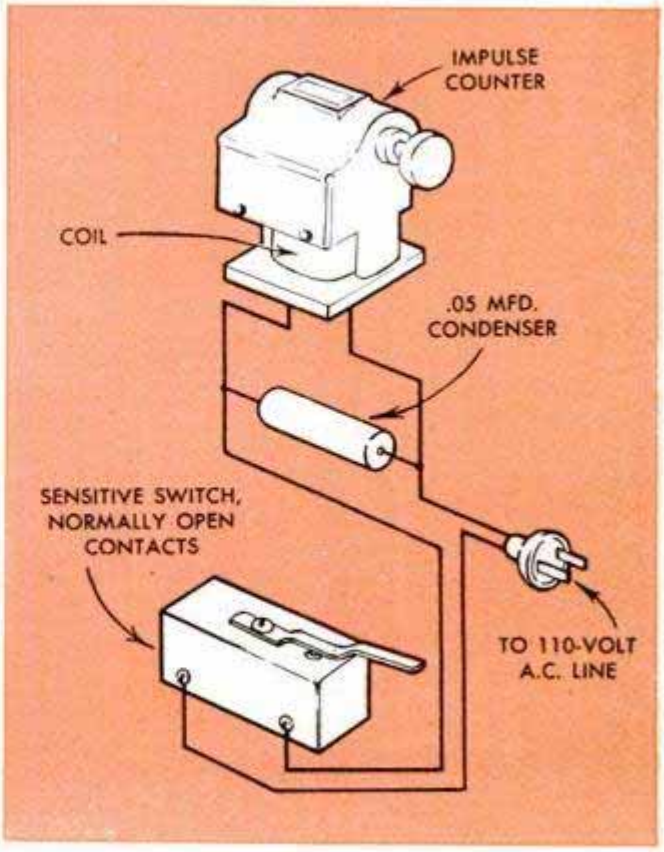
Sensitive switch is mounted on front edge of typewriter table, as above, and counter is located at rear of table to allow room for typewriter, as below

AUTOMATIC WORD COUNTER

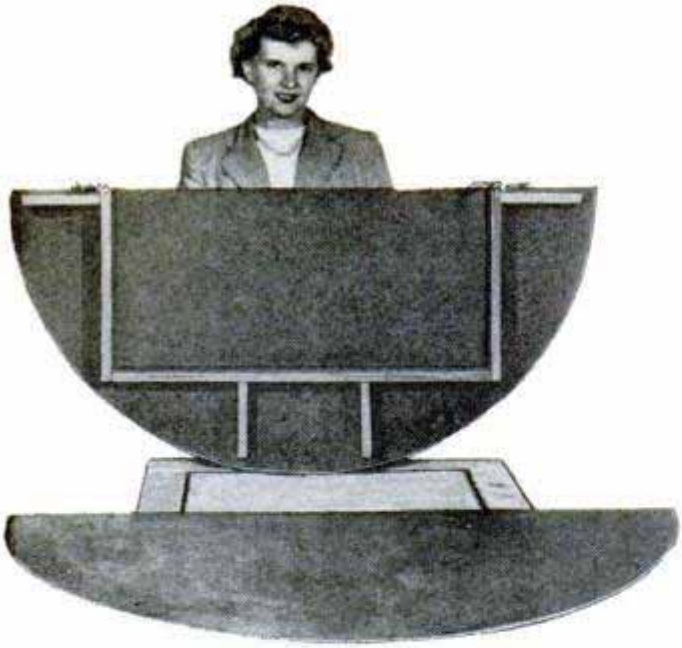
By Guy Slaughter

WRITERS and students who frequently total the words in typewritten manuscripts will find this labor-saving word counter worth many times the few dollars spent for parts. With the counter preset at "zero" before typing is begun, a quick glance at the counter dial gives the exact total of words typed, as each time the typewriter space bar is depressed, the counter advances one digit automatically. Depressing the space bar closes a sensitive switch, thus actuating the coil of an electric impulse counter. The switch, which should be of the normally open type, is screwed to the front edge of the desk or typewriter table, and the impulse counter is mounted at the rear of the table. The switch is located so that it is directly under the space bar when the typewriter is in position on the table, and as there are no parts attached to the typewriter itself, the machine can be removed without disturbing the circuit. The switch and counter are wired in series and connected to the house current, as in the lower right-hand detail, a .05-mfd. radio-type condenser being wired across the coil leads of the counter to prevent excessive arcing at the switch contacts. When the circuit is wired, all connections should be taped carefully to prevent any possibility of shorts or electric shock. As an extra precaution if the parts are mounted on a metal typewriter table, both the switch and counter should be insulated from the table with strips of sheet rubber, pieces of plywood or other nonconductive material. Switch, counter and condenser are obtainable from radio-supply dealers.





What to Make With HARDBOARD

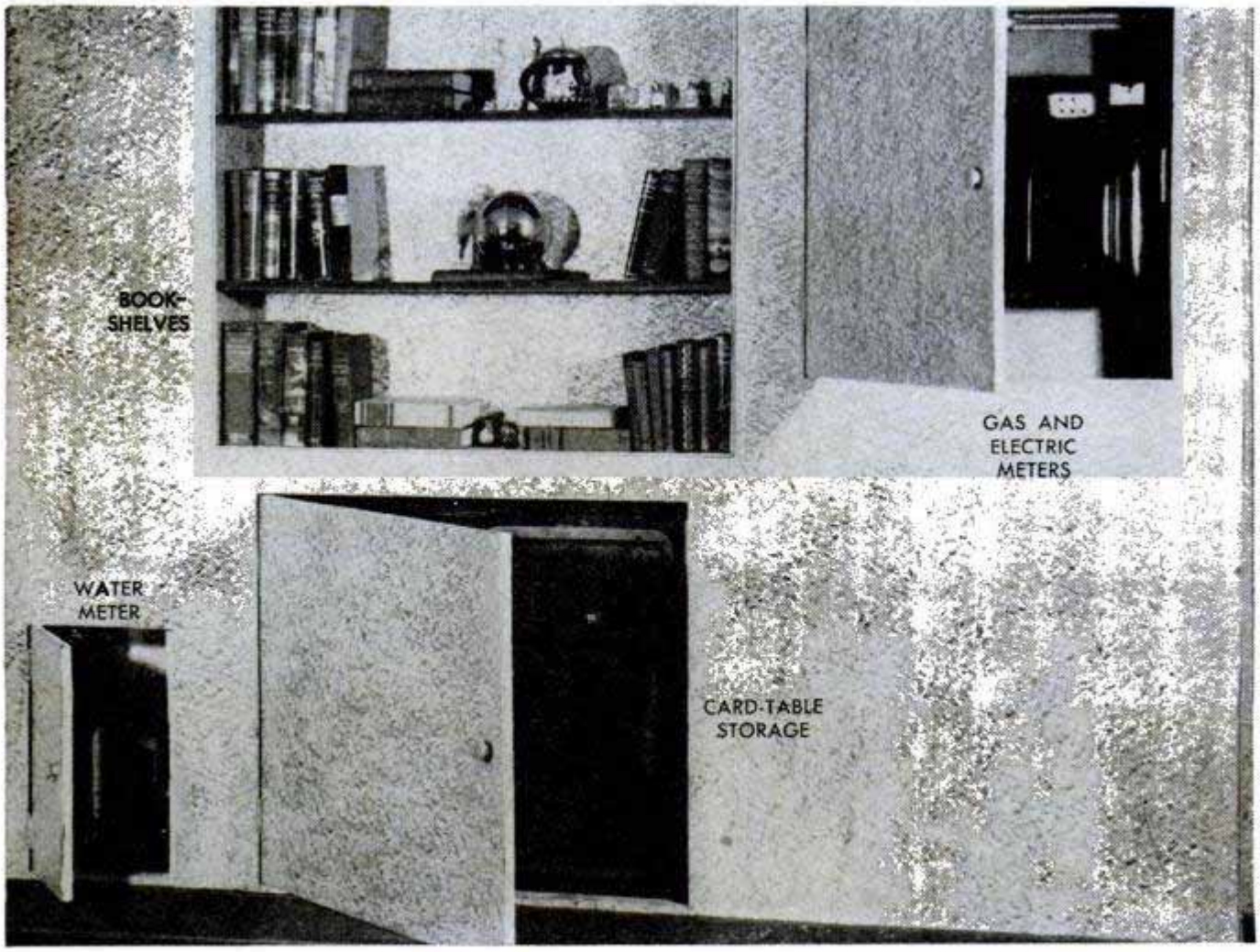


Auxiliary card-table top enlarges table for informal dining or Canasta. Two-piece top is easy to handle and store, the pieces being held together with screen-door hooks when in place. Hardboard top is 48 in. in diameter and is braced with a frame of 1 x 2s which also holds the top in position on the card table

BECAUSE OF its low cost, workability and easy-to-finish surface, hardboard has become one of the favorite home-workshop materials. The six applications shown on these pages are typical of the varied projects to which the material lends itself. Having characteristics similar to plywood, tempered hardboard is excellent for many types of paneling jobs and can be fastened with screws, nails or glue. Hardboard is exceptionally strong and, as it has no grain, there is no danger of its splitting or cracking. However, unlike plywood, nails or screws will not hold if driven into the edge of hardboard and, for this reason, panels must be installed over a wooden frame or held together with glue blocks.

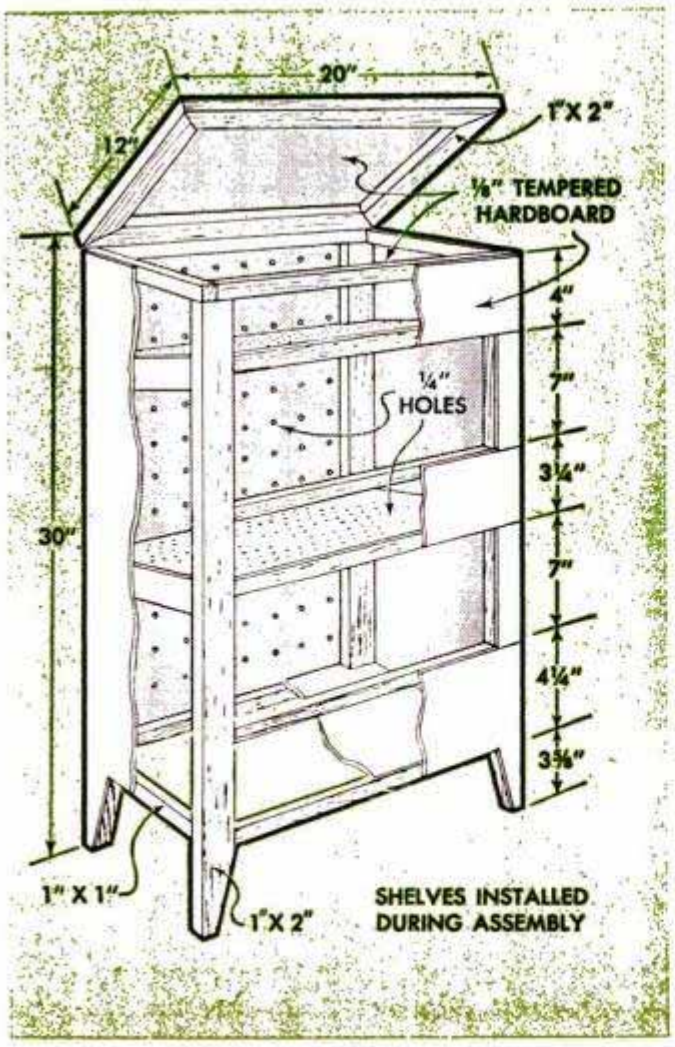
The smooth surface of hardboard does not require sanding and will take most of the different finishes, including water-emulsion paint, oil paint, decals, stain and varnish. As in the case of wood, a penetrating or surface-type sealer must be applied before finishing. Hardboard may be stained with a non-grain-raising stain,

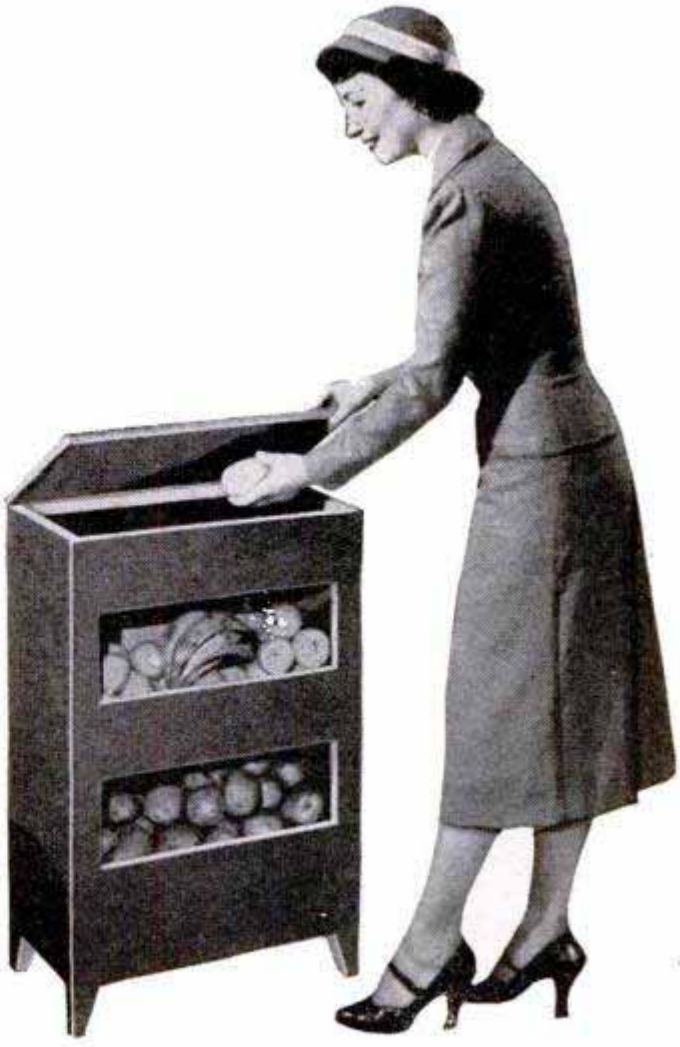
If utility meters detract from the appearance of a basement recreation room, here's a way you can hide them and provide extra storage space. Build a hardboard wall in front of the meters, using 2 x 4 studding. Fit the wall with access doors for the meters and storage cabinet, and include a built-in bookshelf



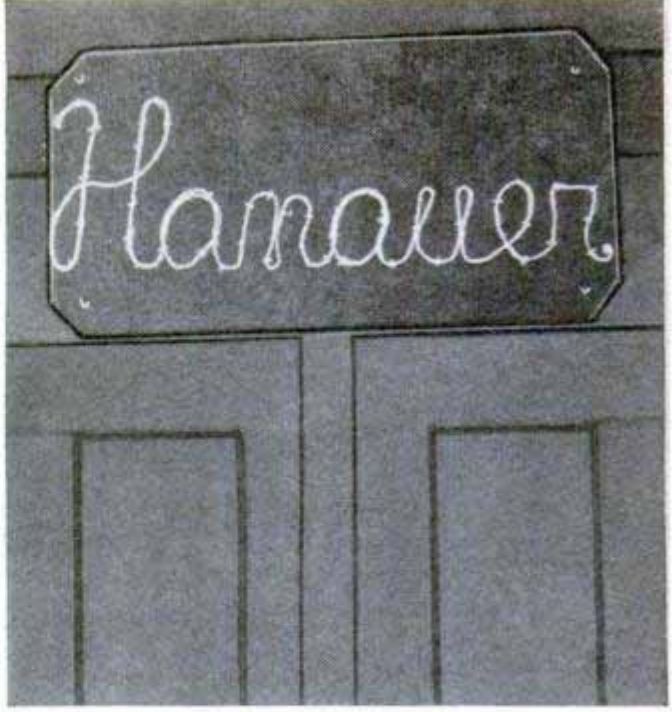
Bolting a 24 x 32-in. sheet of hardboard to the arms of matching porch chairs, as shown above, forms a handy chairside table. Wing nuts permit easy removal

The handy vegetable bin detailed below is made by covering a framework of 1 x 2-in. stock with hardboard panels. Shelves are perforated for ventilation





Mounting a hardboard panel on a kitchen wall provides just the thing for jotting down reminders. Seal panel and apply heavy coat of blackboard paint



Fastened over door of an attached garage, this novel varnished name plate was made by stapling twine to a piece of hardboard. Use insulating-blanket stapler

color-in-oil thinned slightly with turpentine, or with a dry pigment or color-in-oil mixed in a clear penetrating sealer. Tinted effects also may be attained by applying oil paint and wiping the surface with a cloth before the paint dries.

When building a hardboard wall like the one shown on page 198, the edges of the openings should be framed with 1 x 2-in. stock. The doors also should be made by mounting the hardboard over wooden frames. The hardboard used on the wall pictured has a simulated-leather surface. A two-tone effect is obtained by sealing the surface and then painting with an enamel or lacquer of the desired over-all color. After the base coat dries, a glazing liquid containing the desired pigment is applied to the hardboard and wiped off so that the colored liquid remains only in the depressions of the surface. The original was given a yellow base coat followed by a brown glazing liquid. If desired, a coat of clear varnish or lacquer can be applied to the wall to protect the finish.

(Photos and information courtesy Masonite Corp.)

Circular Drill-Press Work Held Safely by Hand With Aid of V-Belt

To hold disks or other small pieces of work on a drill press, use a V-belt as a clamp. The belt is merely looped around the work and held with one hand while the other hand is left free to lower the spindle. The belt provides a safe way of holding the work by hand.

D. J. Murphy, Springfield, Mass.

File Used as Burring Tool

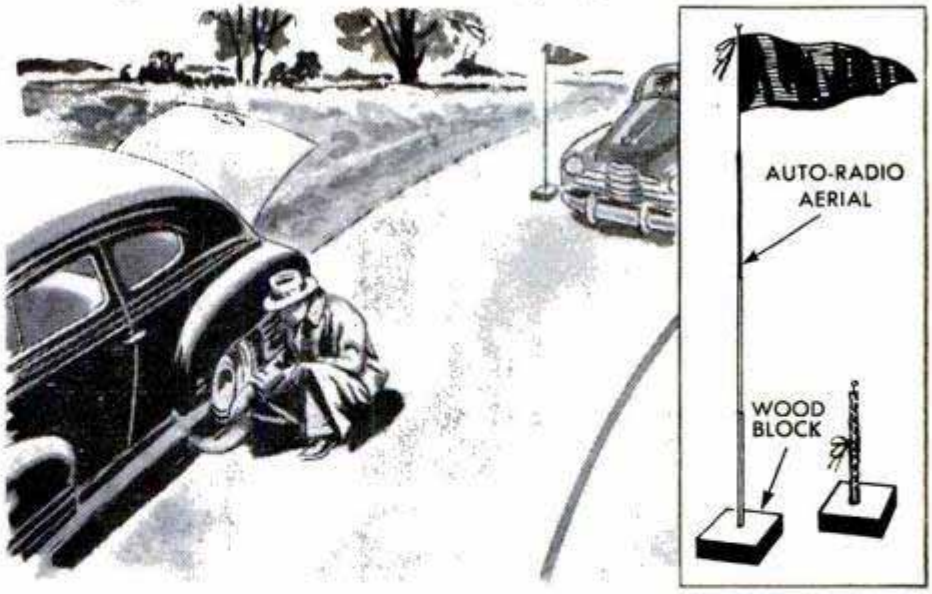
A three-cornered file can be used as a burring tool if the teeth are ground off the faces near the end. Grinding the end to a point permits using the tool on very small holes, and it also can be used to countersink holes in wood or soft metal.

George J. Berkwitt, New York City.

¶One or two coats of white enamel on the inside surfaces of the trunk compartment of a car will reflect light into the compartment and make it easier to find tools.

Collapsible Standard for Motorist's Warning Flag Improvised From Telescoping Car-Radio Aerial

When you are forced to stop along a highway, a warning flag tied to this standard made from a car-radio aerial will be seen easily by approaching motorists. It supports the flag higher than usual standards and, being slender, will sway the flag in a light breeze, thus attracting attention from a greater distance. To make the standard, force-fit the aerial into a hole drilled in a heavy base block. The standard is collapsed easily and the flag can be wrapped around it for storing in the rear deck.



Tire Chains Installed Quickly When Wheel Ramp Is Used

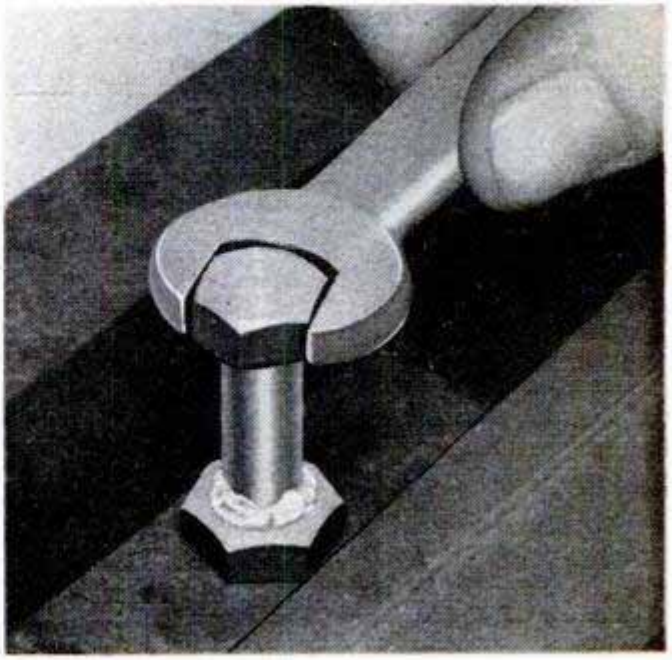
Tire chains are installed in a jiffy by using a wheel ramp made from a board about 8 in. wide and 30 in. long. One end of the board is beveled and hardwood strips, 1½ in. square, are spaced on 4-in. centers and nailed crosswise to the top face. To use the ramp, place it in back of the car in line with one rear wheel. Lay the chain on the ramp with the cross chains between the strips and back the car until the wheel is in the center of the ramp. Then, pull the chain up around the tire and fasten in the regular way. Follow the same procedure with the other wheel.

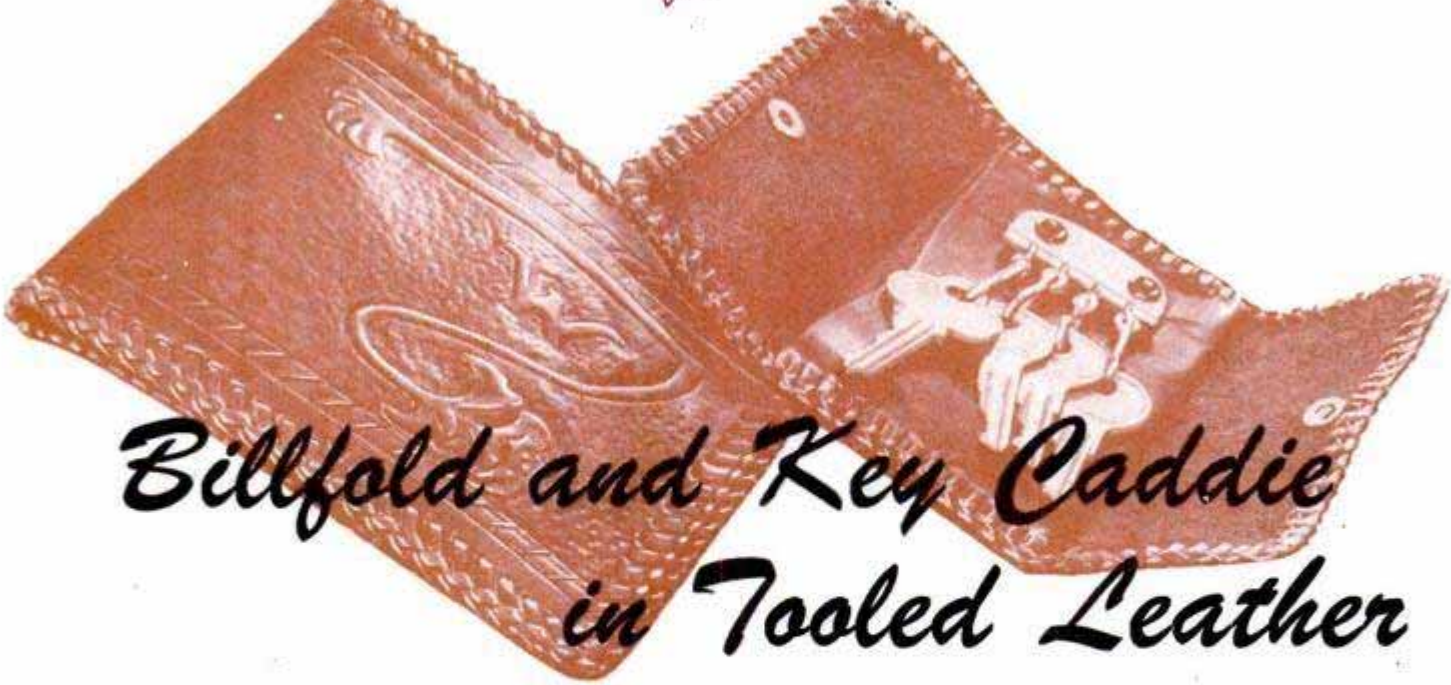
Circular-Saw Push Stick Equipped With Barb

A push stick can be improved by driving a brad into the face and filing it to a point to project about ⅛ in. This will permit holding thin pieces of work on edge as they pass the saw blade, thus preventing them from falling into the blade. In addition, when crosscutting a number of small pieces, the stick is handy for pushing them away from the blade.

Stub Extension on Cap Screw Permits Easy Adjustment

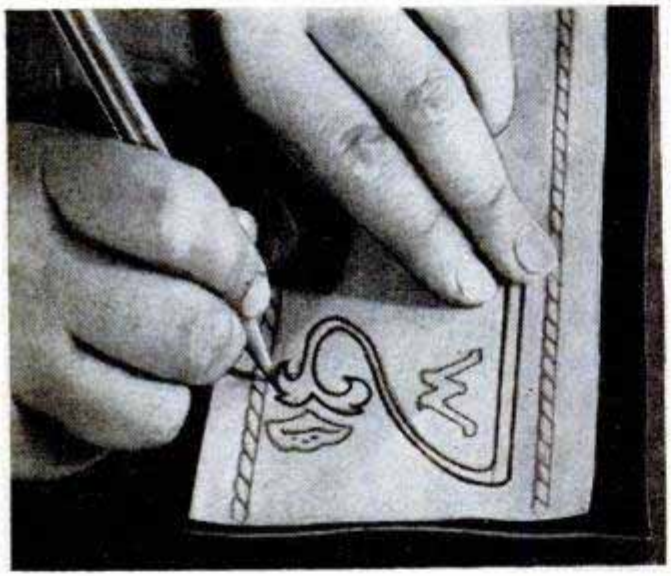
The difficulty of turning a cap screw that is located in an inaccessible place on a machine can be overcome by brazing a stub extension to the head of the screw. Thus, not only does the extension make it convenient to adjust the screw with an end wrench but it also minimizes the chance of injury when it is necessary to make adjustments near moving parts.





Billfold and Key Caddie in Tooled Leather

By Elma Waltner

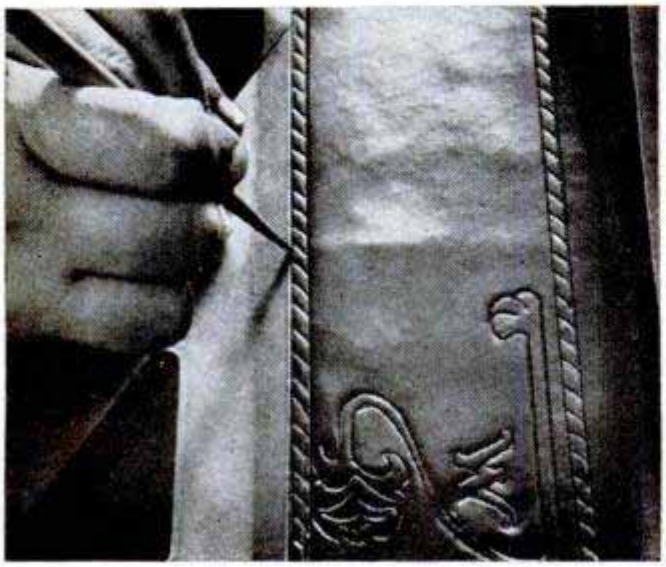


Tooling pattern is transferred to dampened outside piece of billfold by tracing over pattern lines with blunt pencil. Straightedge helps to do a neat job

MADE from tooled calfskin, the billfold and matching key caddie pictured above form ideal Christmas gifts. The tooled design incorporates a personalized monogram, and the edges of both pieces are bound with leather lacing. Although dark-brown calfskin was used for the original set, other lightweight tooling leathers can be used with satisfactory results. The billfold contains an inner flap for separating bills of large and small denominations, a plastic identification-card window stitched to a leather frame and a card pocket.

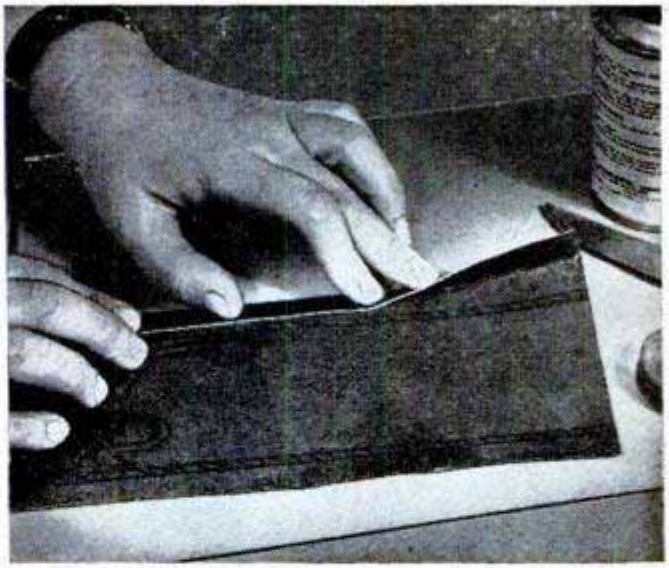
The patterns for the billfold are penciled on the leather, following the details on the opposite page, and the leather is spread on a sheet of hardboard which serves as a cutting board. Cut out the five pieces with a leather-cutting knife or razor blade. Then lay out the tooling design full size on heavy wrapping paper. Place the outside piece of

Curved end of spoon modeler deepens lines traced on leather. Tool is held at approximately normal writing angle and is worked over each line several times



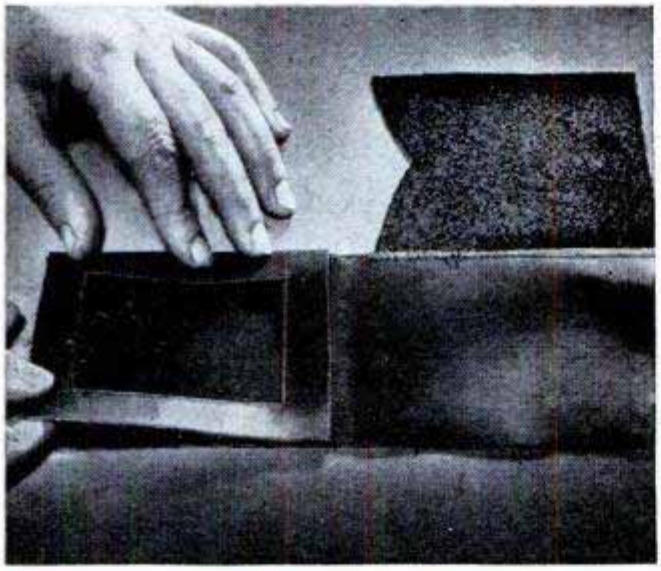
Leather background adjacent to the lines of the design is worked down with the spoon end of the modeling tool. This makes the design stand out in relief

Interesting stippled effect is applied to the leather by tapping background with ball-point modeler. The modeling tool is held in an almost vertical position

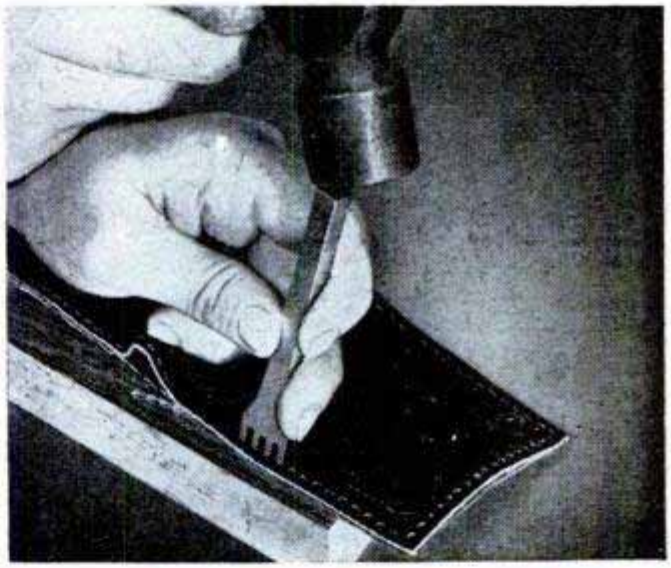


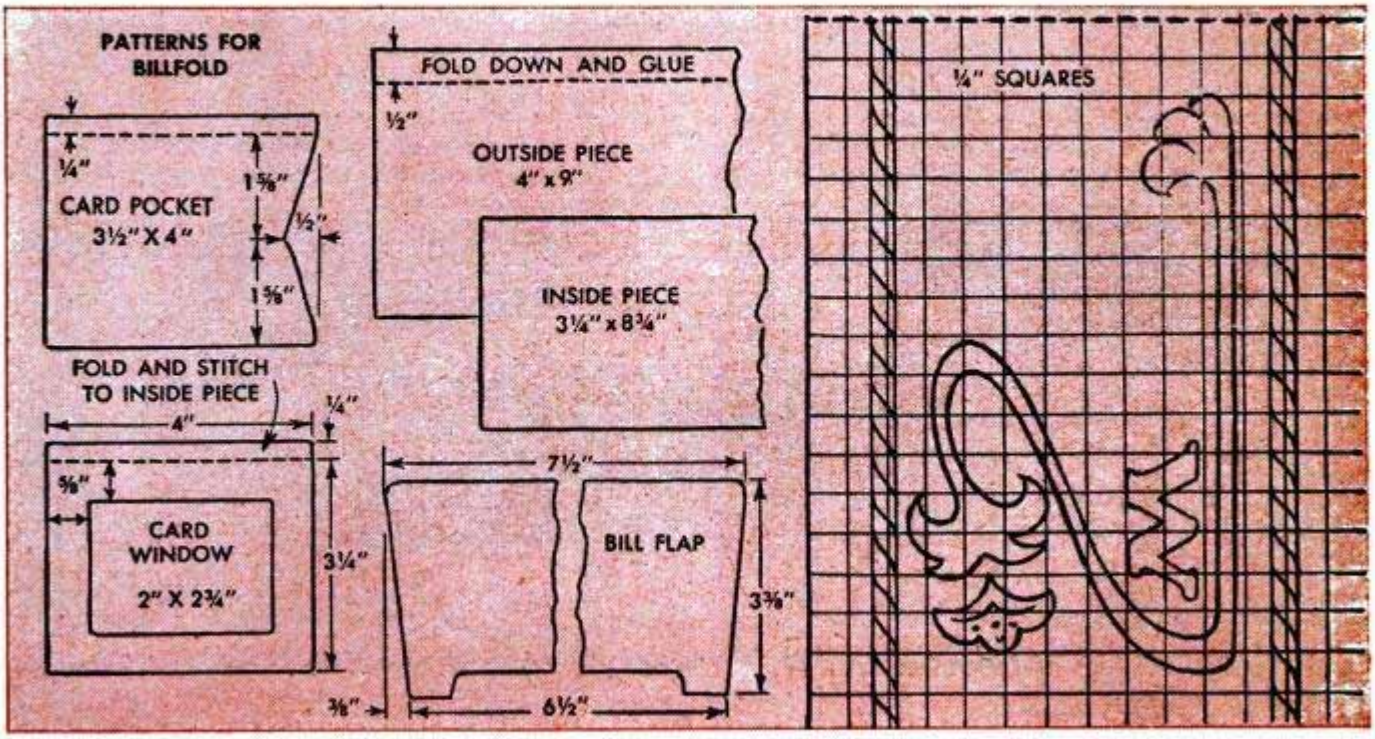
Spread the tooled leather on a flat surface and, after it has dried completely, fold it over ½ in. from the top edge. Then cement the leather fold in place

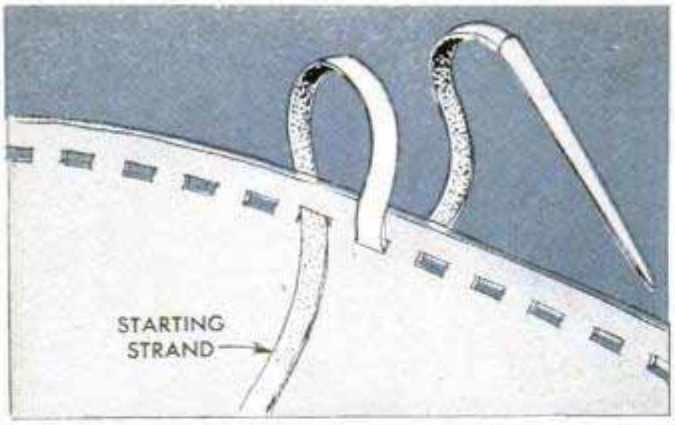
The card window and pocket are stitched to the top edge of the inside piece and folded over. Note that the pattern allows ¼ in. of leather for stitching



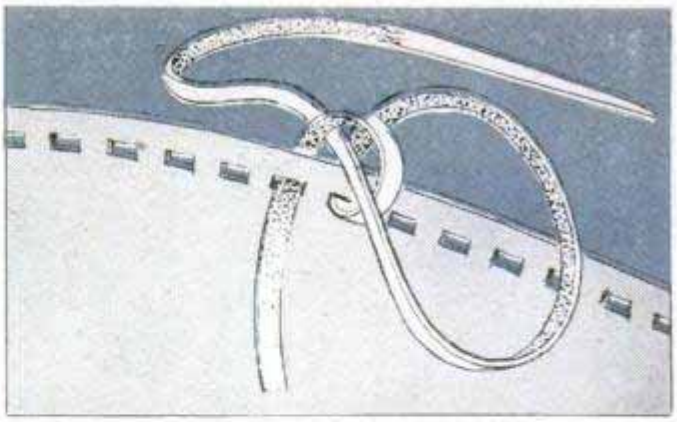
The outside piece, bill flap and inside piece are cemented together lightly and punched with a 4-prong lacing awl. Punch the leather on a hardwood block



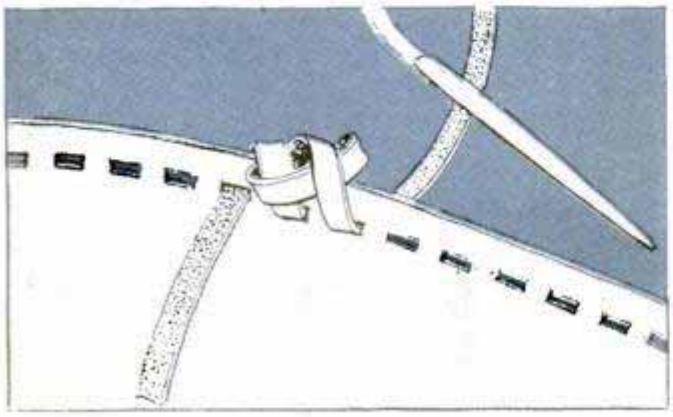




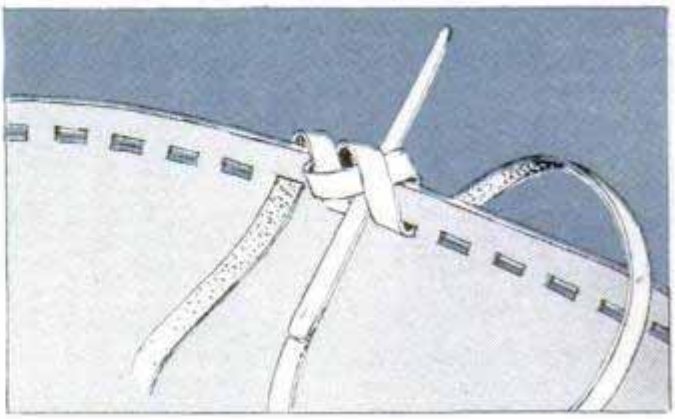
Begin lacing billfold at center of bottom edge. Pull all but a few inches of starting strand through first hole, bring across edge and pass through second hole



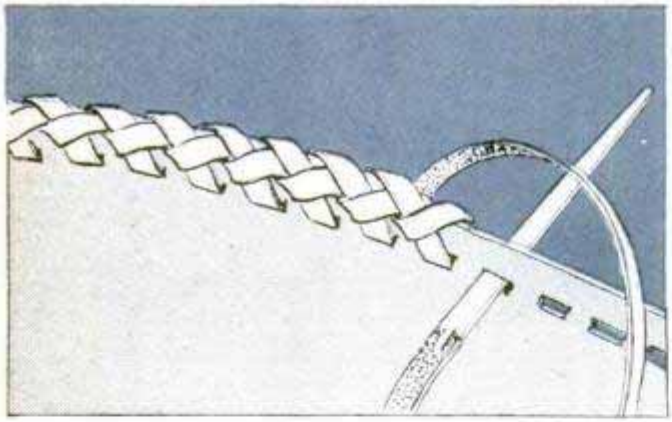
After needle is brought through second hole, bring lacing over leather edge and pass through first loop. The working strand should pass to the left of itself



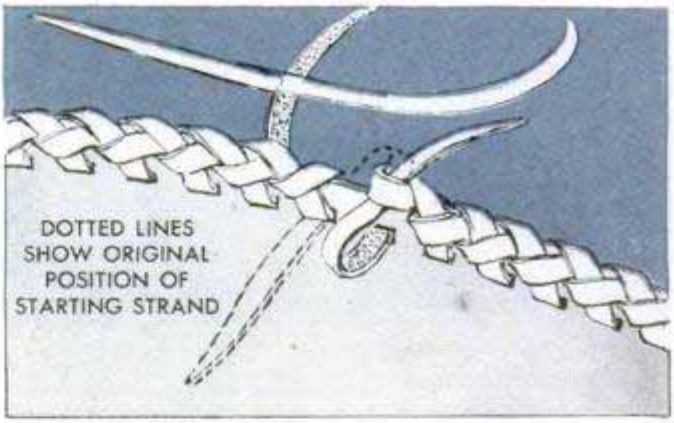
Pull on the right-hand loop to draw the first loop tightly against the leather. Then bring the lacing across top of loop and insert it through next hole



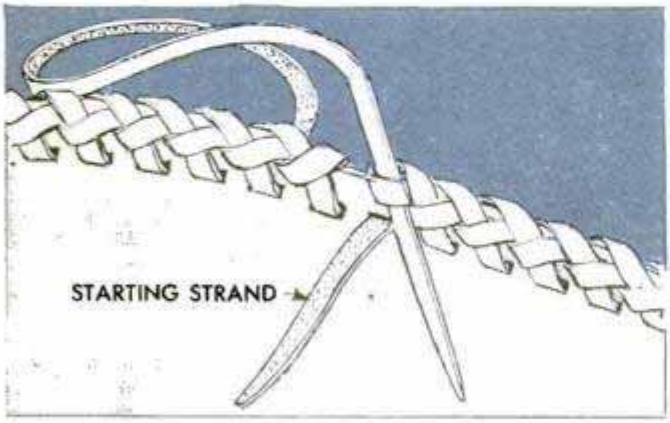
Again bring the lacing over the edge of the leather and pass the needle under the crossed strands which form the loops. Draw lacing tightly against leather



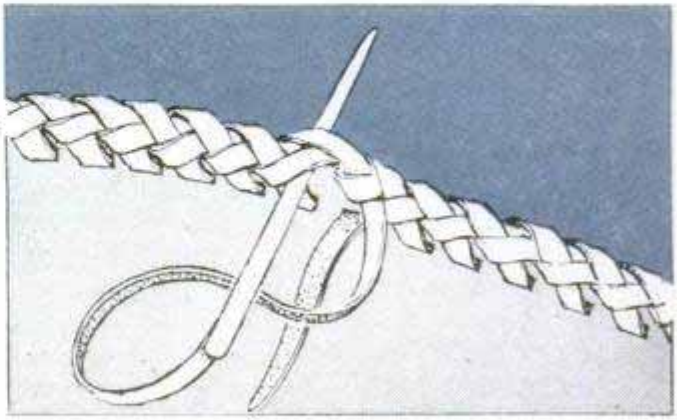
To repeat stitch, pass the lacing through the next hole, bring around and draw through crossed strands as before. Splice additional lengths of lacing as needed



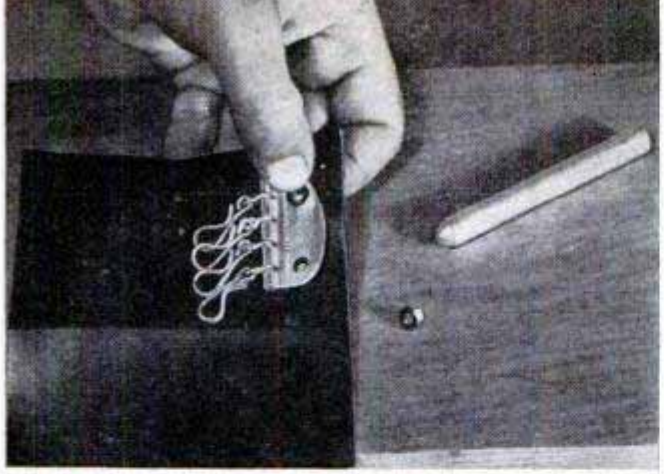
To join the lacing after completing the circuit of the billfold, pull end of starting strand back through the first hole, as in drawing, and stitch through this hole



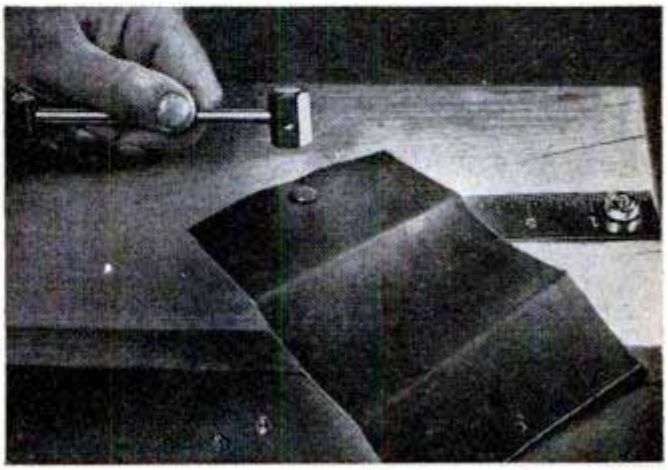
Pull starting strand from end loop and draw the lacing through the loop from above. Pass the needle under the crossed strands, as shown at the right



Bring lacing down through end loop a second time and draw lacing tight. Then insert both ends of the lacing between the billfold pieces and cement them in place



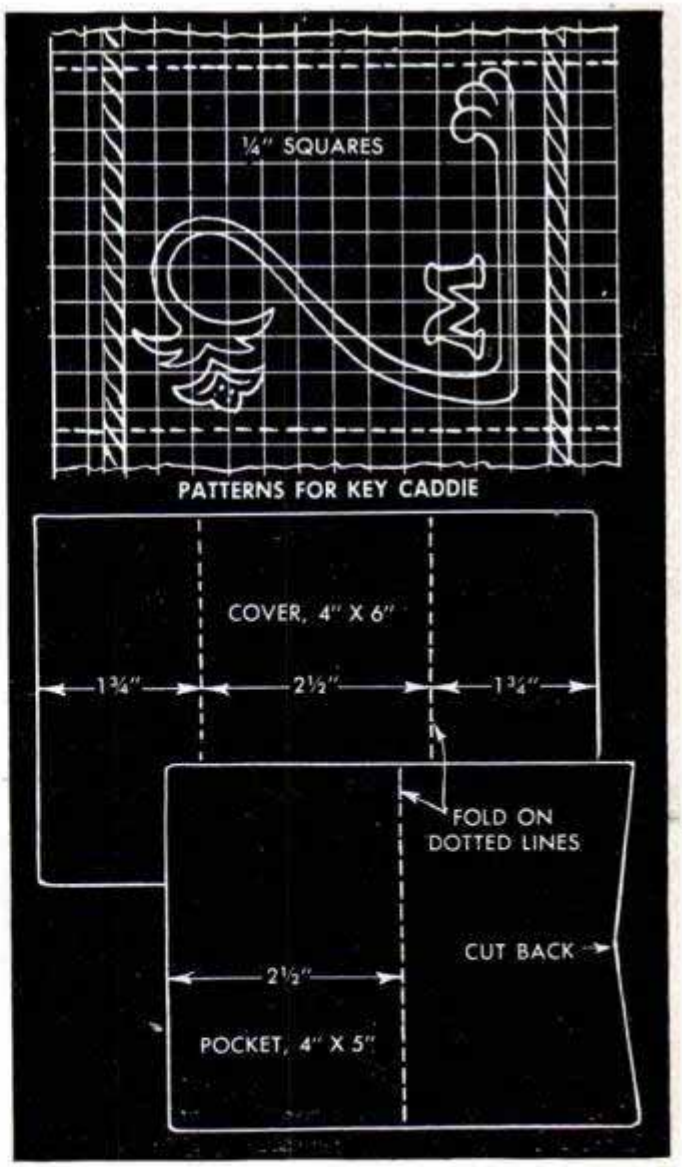
To fasten the key plate to card pocket of key caddie, as above, insert eyelets through holes in the leather and spread split ends of eyelets with an eyelet setter, as in upper right-hand photo. Snap fastener is attached to cover with standard tools, right-hand photo



the billfold, flesh-side-up, on a flat surface, and dampen the leather with a sponge which has been immersed in cold water and wrung out. Now, being careful not to mar the surface of the moist leather, place the piece, grain-side-up, on a sheet of glass or other hard, flat surface. Then position the paper pattern on the leather and carefully trace the design with a blunt pencil, using just enough pressure to make a clear line on the leather. Again dampen the flesh side of the leather in preparation for tooling. If the leather is sufficiently moist, the tooled line will be uniform and permanent. However, if the leather is too damp it will not retain the impression, so, in this case, wait until some of the moisture evaporates before tooling.

After tooling the leather as shown in the photographs on the preceding pages, allow it to dry. Then fold and cement the top edge of the outside piece, as indicated, and sew the card pocket and window to the inside piece. Fasten the bill flap to the back of the outside piece by applying cement to the tabs at the lower edge of the flap. Place the inside section, with the card pockets, over the flap and cement the edges lightly to the outside piece. Then punch the lacing holes around the edges of the assembled pieces, using a 4-pronged lacing awl. Lace the billfold as shown in the drawings on the opposite page and flatten the finished lacing by tapping with a wooden mallet.

The key caddie, which consists of a tooled cover and an inside pocket, is tooled and laced in the same way as the billfold. The key plate is attached to the pocket with eyelets, as shown above. The snap fastener is mounted on the cover before tooling the leather, and the pocket is cemented lightly to the cover to hold it in place for punching and lacing. The tooling pattern for the key caddie is shown at the right.



Spillage of Photographic Solutions Minimized With Plastic Spouts

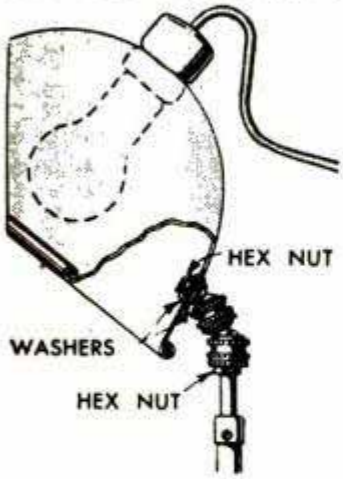
Fitting photo-solution bottles with plastic spouts practically eliminates spilling and affords better control of the quantities dispensed. These are especially handy when pouring solutions into a developing tank. The spouts can be obtained in most department or variety stores and are equipped with suitable stoppers.

Ivan Grosvenor, Richmond, Ind.

Avoiding Underdevelopment

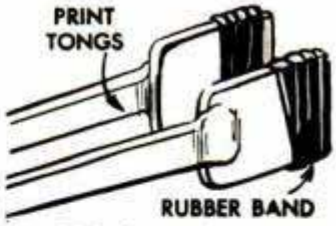
By keeping a record of the size and number of negatives developed with each bottle of solution, photographers will be able to tell when the fluid has become too weak for further use. A label cemented on each bottle is a handy place to keep the record for quick reference.

Tilting Photoflood-Lamp Mount Utilizes Electrical Swivels



Two dime-store ball-and-socket swivel joints of the type used on electrical fixtures can be used to provide a very efficient tilting mount for attaching photoflood lamps to stands. The telescoping tube of the stand is threaded to receive one of the joints which is locked on the tube with a hex nut. Then the other joint is turned onto the first and joined to the lamp shade with washers and a hex nut, as shown. An aluminum bowl with holes cut in it to take a light socket and the mount makes an ideal shade.

Rubber Bands Pad Print-Tong Jaws



To prevent the possibility of prints being damaged by the jaws of stainless-steel tongs, wrap a rubber band around each jaw as shown. Padded in this way, the tongs can be used in the usual manner, but the rubber, rather than the metal, will contact the prints.

Virginia Hanson, Los Angeles, Calif.

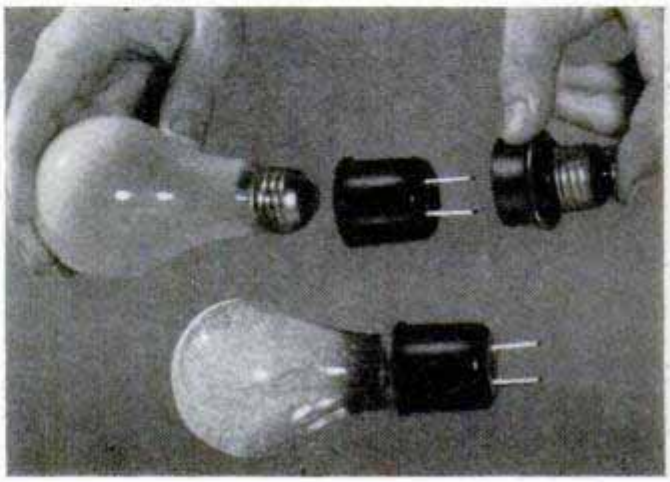
Funnel for Dry Chemicals

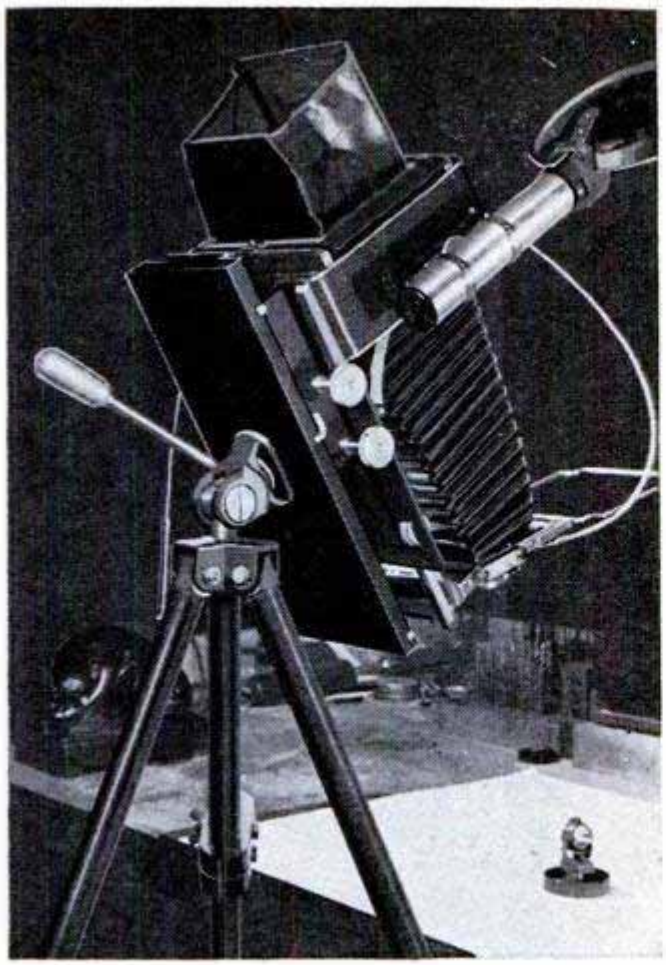
A funnel for use in pouring dry chemicals into narrow-necked bottles can be improvised from an ordinary envelope. Just seal it, tear it in half and then tear off one corner. Chemicals placed in the half envelope will run slowly through the hole torn in the corner.

Flash Bulbs Changed Quickly By Using Socket Extenders

When working with a multiple-flash setup, you can change bulbs in a fraction of the usual time and with less danger of disturbing the reflectors by using these simple socket extenders. First, fit all the reflectors with threaded plugs to take the prongs of the extenders shown in the photograph. Then, after turning a flash bulb into the socket of each extender, all that is necessary to replace the bulbs is to pull the used ones from the reflectors and plug in the new ones. Be especially sure, however, that the switch is off before replacing the bulbs. If photoflood bulbs are used when focusing, fit them in the same way to speed changing the floods over to flash. For the sake of convenience when three flash exposures are taken of the same shot, have four extenders for each reflector so all the bulbs can be prepared in advance, including the photofloods used for focusing.

Paul T. Hutchinson, Wheaton, Ill.



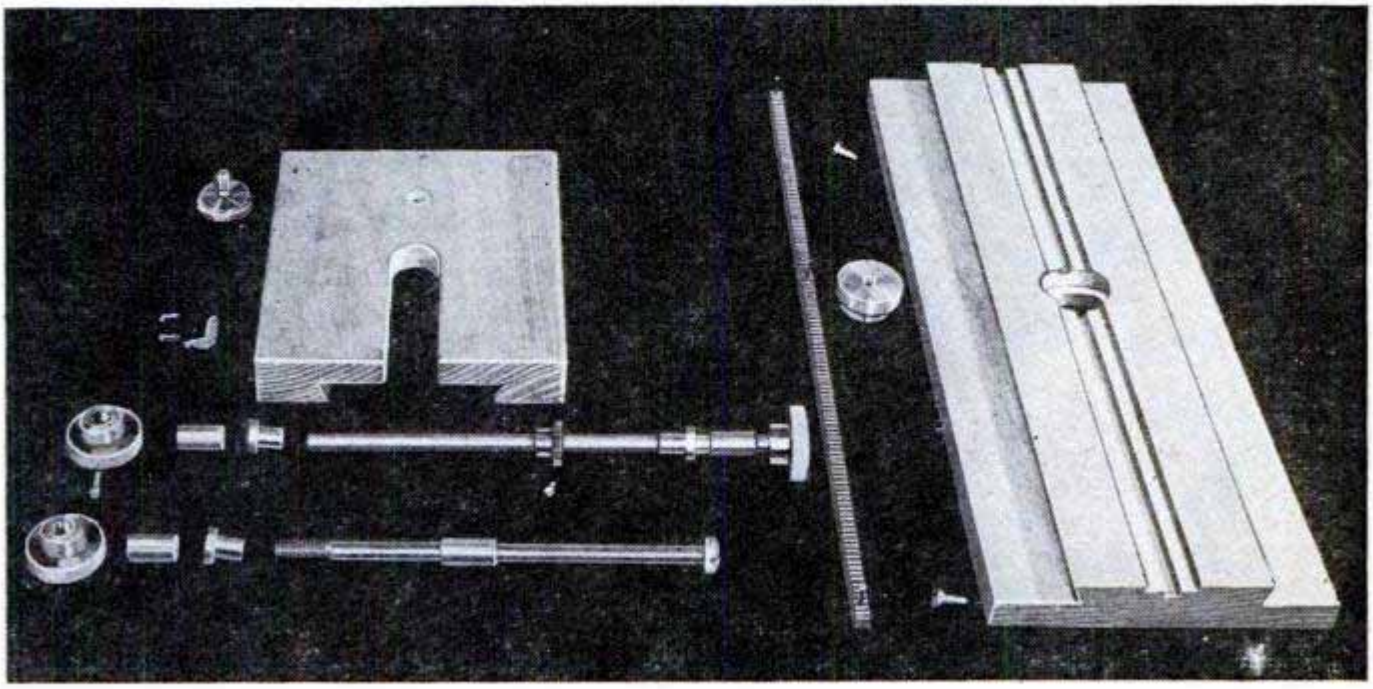


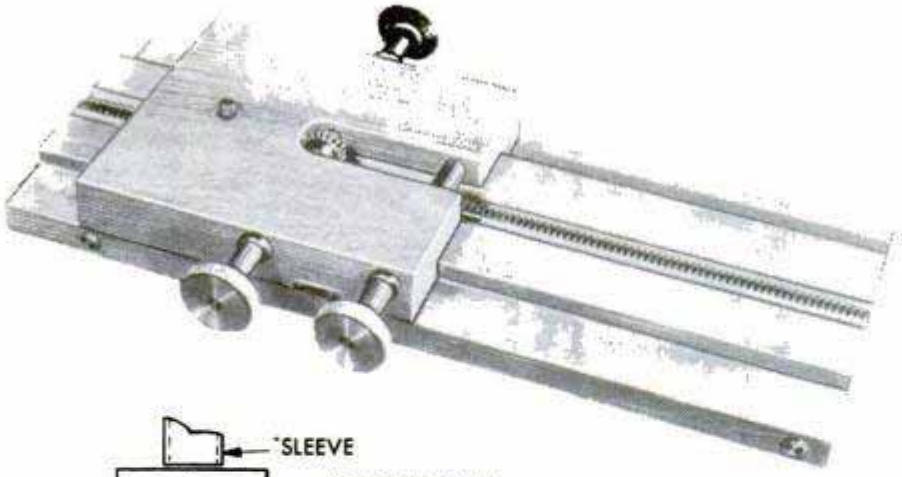
Adjustable TRIPOD TABLE

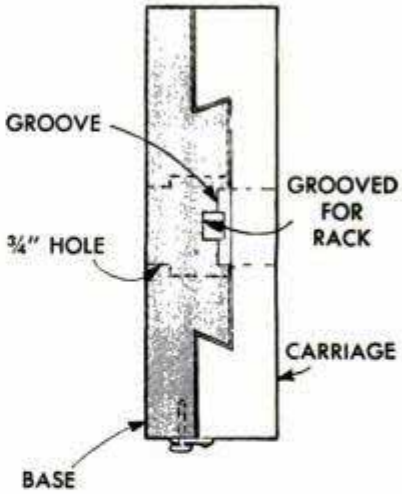
By Herbert R. Pfister

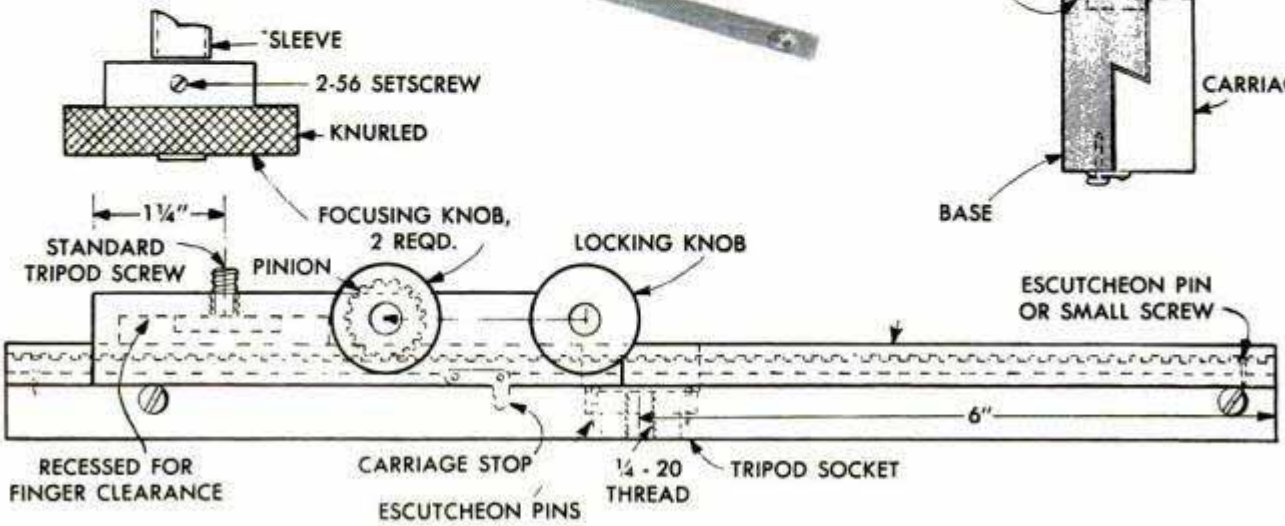
NORMALLY, a camera fitted with a long extension bellows is adequate for ordinary copy work and for shooting most close-up table-top shots. But, if the object is unusually small, sometimes even the long-bellows camera when mounted on the conventional tripod does not permit getting close enough to focus the image as large as the photographer would like. Thus, to provide a means for advancing the camera closer to the subject than otherwise possible, I designed and built this auxiliary table which is fitted with a rack and pinion to advance the camera beyond the normal tripod-mounting position. Used in conjunction with the pan head of the tripod, as shown at the left, convenience in angle adjustment is retained, and the rack and pinion provide the ultimate in fine-focusing adjustment. In the photo below, and in the construction details on the following pages, it will be seen that the base piece is rabbeted and the shoulders are undercut to form a long dovetail slide, and that the center is grooved to two depths. Widths of the grooves are not given, as these must be determined by the sectional size of the rack and the tripod screw. The rack should be a close fit in the groove, but the teeth should project above the bottom of the wider groove. Only the rack and the

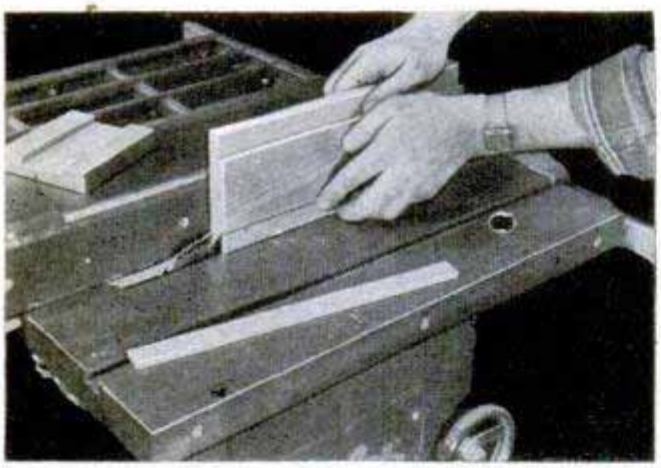
Photo below pictures all parts of tripod table. Metal parts are made from brass; other parts of hardwood



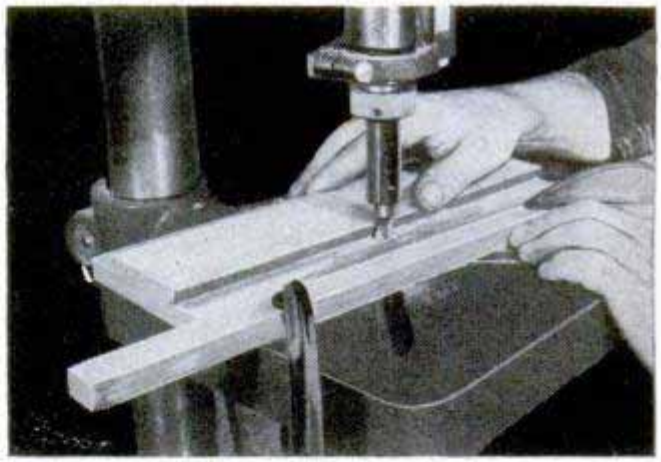






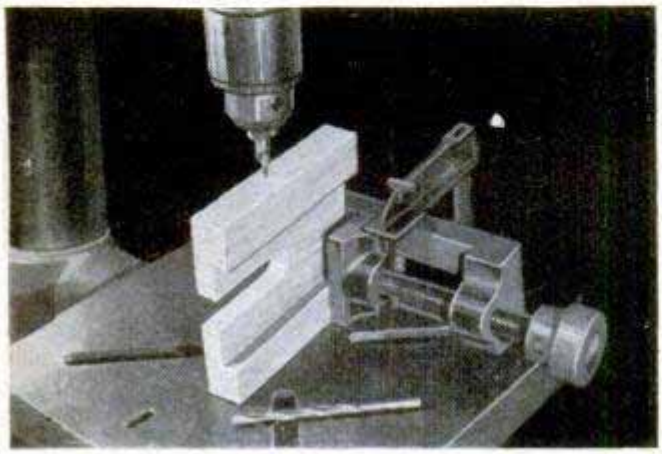


Cutting the wide rabbets in the hardwood base to form the wide dovetail. Care is taken to work to precise dimensions, as otherwise parts will not fit properly

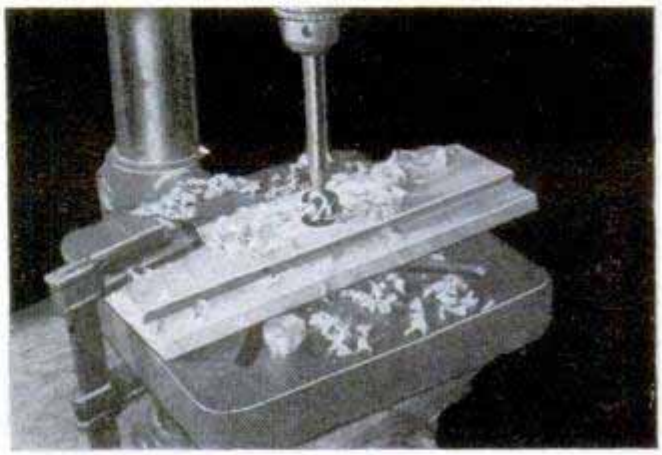


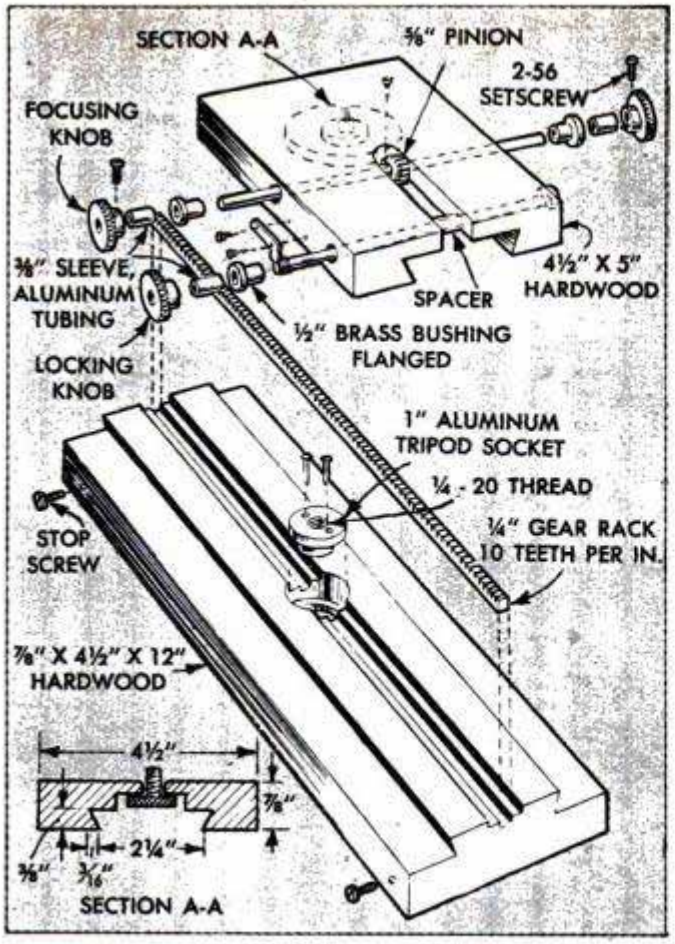
Shoulders of the rabbets are undercut with a dovetail cutter mounted in the drill press. Note the guide clamped to drill-press table to assure accurate work

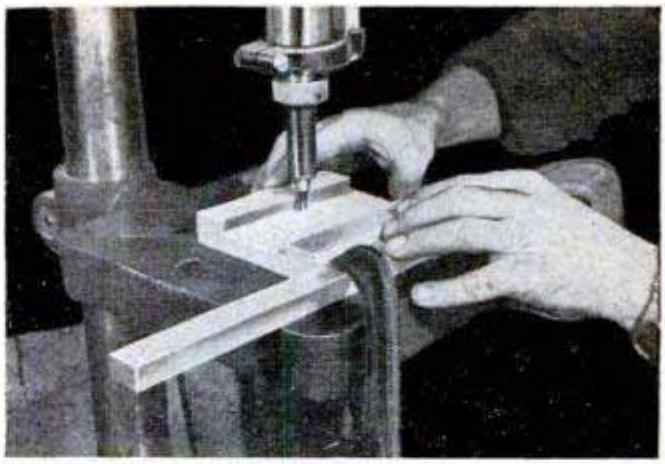
Center-drilling the holes for the locking and focusing screws to assure that drill bit will start accurately. When clamping drill vise, be sure work does not shift

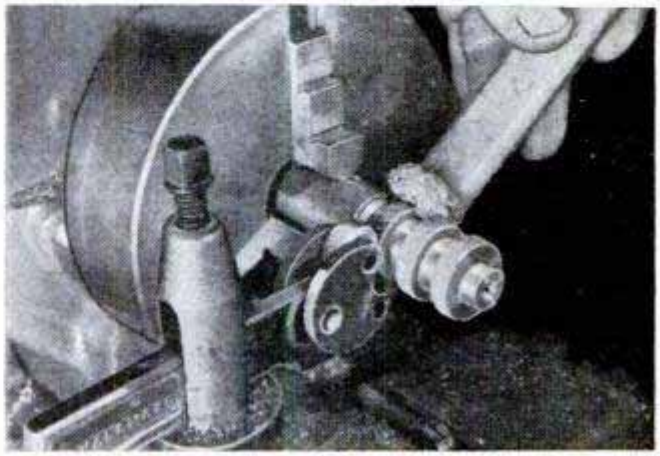


Counterboring base for the flanged tripod socket which fits under rack when parts are assembled. Be sure counterbore is deep enough for clearance







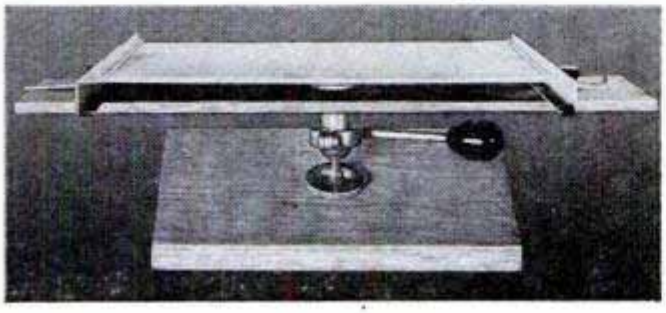


Construction details, at the left above, show how the parts of the table are assembled. Upper photo at the right shows how the wide groove in the slide is undercut, while the lower photo pictures knurling operation

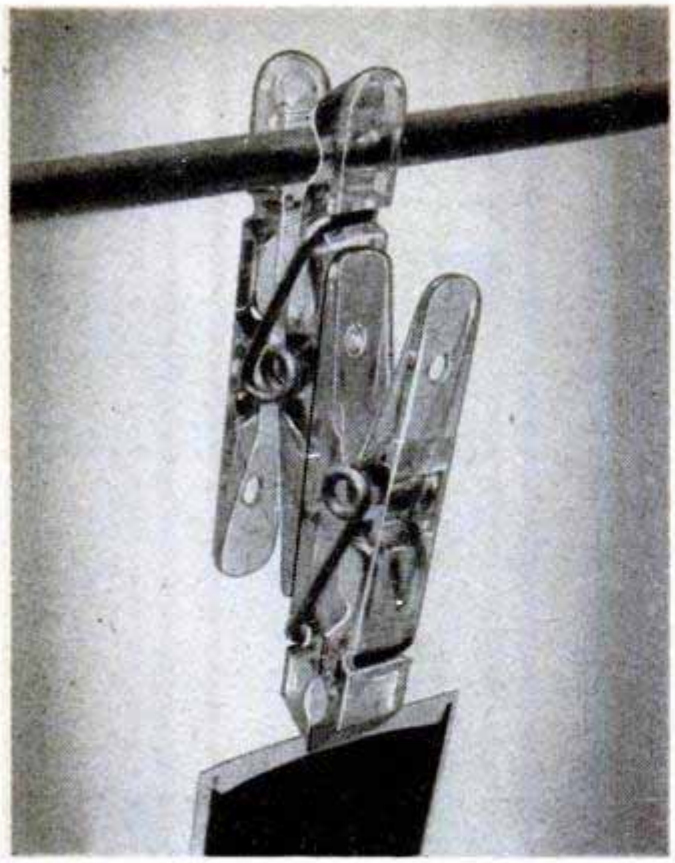
pinion are purchased ready-made; all other parts are made in a metal lathe from stock materials. After the base has been made from hardwood, such as maple, cut the slide to over-all size from the same material. Cut the wide groove and undercut the sides to form the long dovetail socket. Use care to assure an accurate fit. Note also in the details at the left that the slide is slotted approximately half its length. The width of the slot is determined by the thickness of the pinion, plus the length of its hub. Holes for the adjusting and locking screws are drilled oversize to take flanged brass bushings. Note that the holes must be located so that they pass through the slide at a point above the bottom of the dovetail socket. The center spacer on the locking screw must be cut to a length slightly less than the normal width of the slot so that when the screw is tightened the dovetail will be locked onto the base. After the screws have been fitted with the flanged bushings and spacers are in place, turn and knurl the focusing and locking knobs from round brass stock.

Before installing the rack, counterbore the base to take a flanged tripod socket. Be sure the counterbore is deep enough to assure that when the parts are in place the tripod socket will clear the bottom of the rack. Install the rack and make a trial assembly of the parts to see that they operate smoothly. Then locate and install stop screws on the base and fit a lug on the slide, or carriage, to engage the screws and limit travel of the slide. Finish the wooden parts with wax. Do not use shellac or varnish, as this may cause the moving parts to bind. As dimensioned, the table is suitable for use with any 4 x 5 press-type camera or a reflex camera of similar size.

Pan Head Under Enlarger Easel Permits Tilting to Correct Distortion



Tilting an enlarger easel to correct negative distortion is simple when the easel is mounted on a pan-tilt tripod head. A piece of 1-in. stock provides a base, and a piece of ¼-in. plywood supports the easel on top of the pan head. The easel is clamped or bolted to the plywood which fits over the camera mounting screw where it is held with a nut.—Wayne A. Ward, Watertown, N. Y.



Two Clothespins Cemented Together Make Better Negative Clip

Clips for hanging photo negatives can be made by cementing together plastic clothespins. The jaws of one pin should be filed or sanded flat to grip the film while the other pin is clamped to a rod or line. Clipped securely, there's little chance of the film falling to the floor.

Narrow Lens Parts Unscrewed With Electric-Cord "Wrench"

Tight lens-hood segments can be unscrewed by using a rubber-insulated electric cord as a wrench. Wrapped around the narrow unit and held as shown, the cord also can be used on other parts of photographic equipment, such as lens adapters, 35-mm. film cans or similar parts that are too narrow or smooth to permit getting a good handgrip.—Jack Wilson, Hollywood, Calif.

Hanger for Camera Tripod Provided by Wing Nut

To make a hanger for your tripod, drill a hole in each wing of a ¼-20 wing nut and attach a piece of wire to form a loop as illustrated in the drawing. If desired, the hanger may be tied to the tripod to prevent losing or misplacing it when it is not in use.

Arthur Trauffer, McClelland, Iowa.

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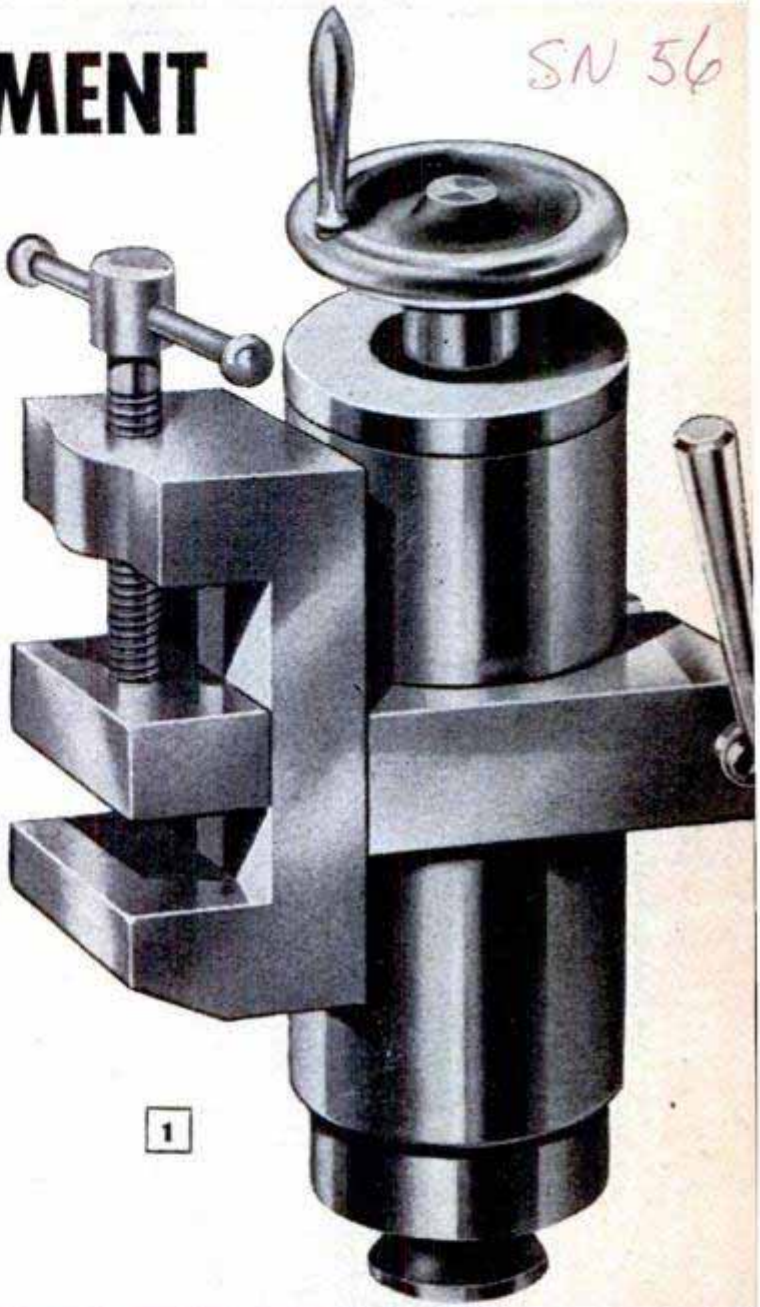
SN 56

MILLING ATTACHMENT *for your lathe*

By C. W. Woodson

ON MANY JOBS involving a variety of machine work, a milling attachment for the lathe often can take the place of an expensive milling machine. The main advantage of this milling attachment is that it can be built entirely of stock materials as no castings are required and all machine work can be done on the lathe on which it is to be used. The unit is mounted on the cross slide of the lathe and an ordinary drill-press vise with a V-grooved jaw is used to hold round or square work. The vise is mounted in the vertical position as in Figs. 1 and 5. It is attached to a split clamping collar which travels with the sleeve, D, Figs. 3 and 4, and can be adjusted to any position required on the sleeve by loosening the clamp screw, Fig. 2. The sectional view, Fig. 3, shows the relationship



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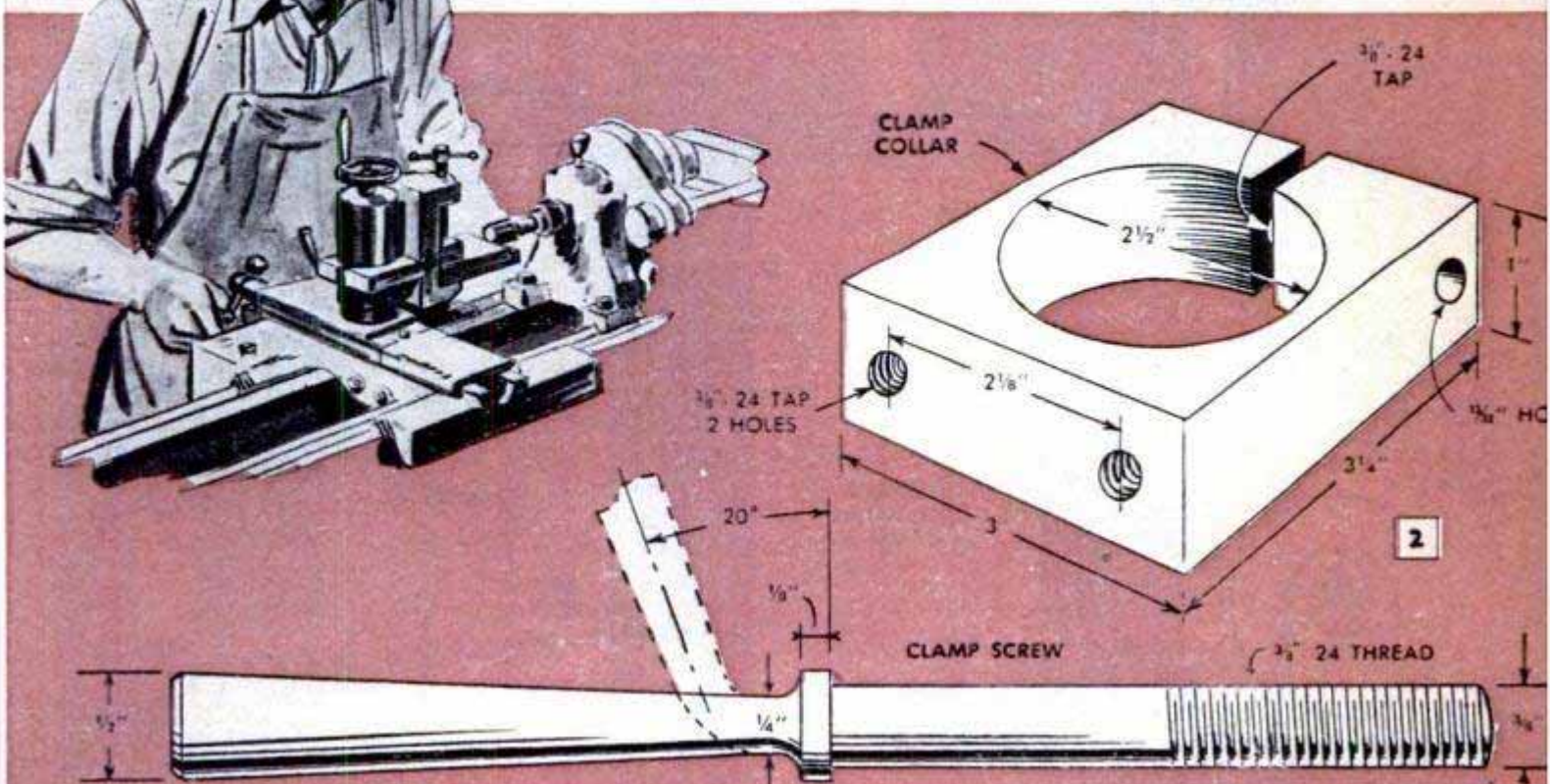

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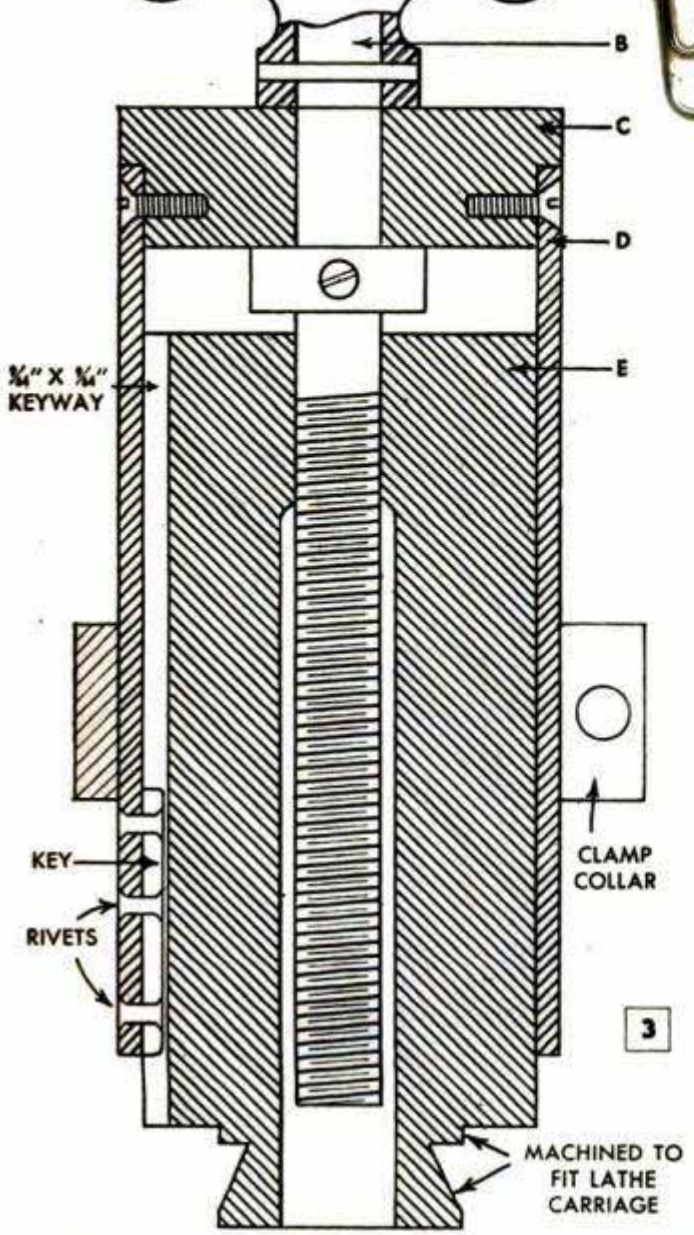
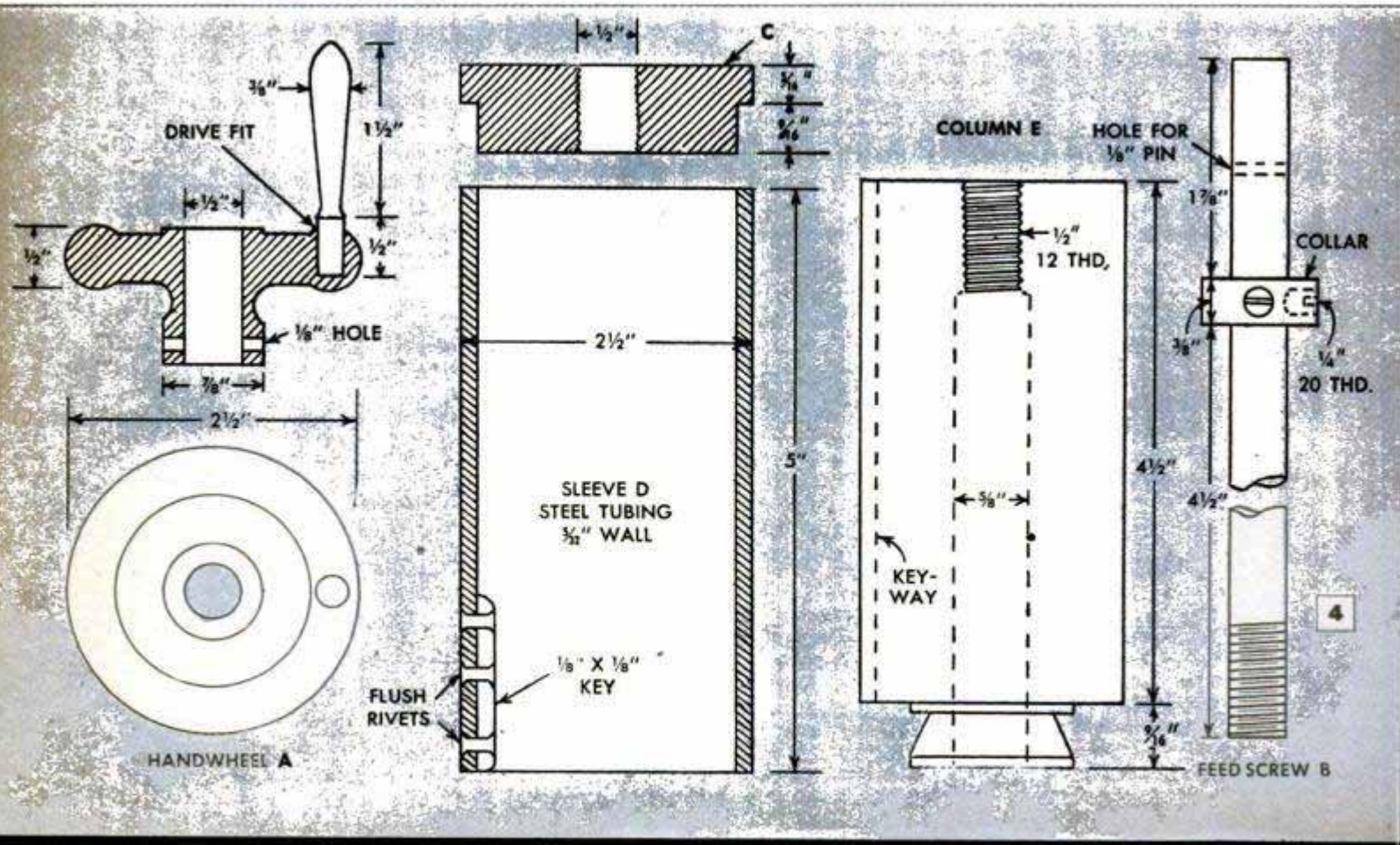
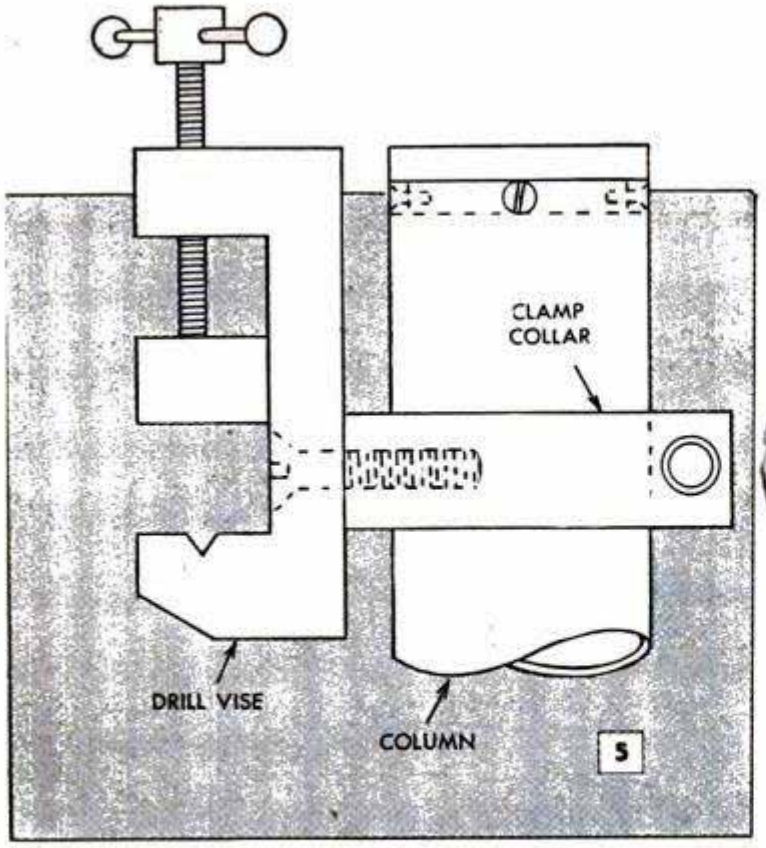


9 and 10-in. swing.

of the parts are exacting jobs in the entire assembling the column, E, inside the sleeve, D, and the precise fitting of the sliding key, which is riveted to the sleeve and slides in a keyway cut in the column. The accuracy of the unit depends on precise fitting of these parts, as there are no take-up gibs. The lower end of the column is turned down to an exact duplicate of the lug on the base of the compound. Turn and grind the body to a smooth, sliding fit inside the sleeve. Break all corners 1/64-in. at a 45-deg. angle. Counterbore and tap the column for the feed screw, and cut the keyway the full length of the column. The fit of the sliding key should be carefully checked before riveting it to the sleeve. If the standard key is slightly loose in the keyway, upset the metal by laying the key on an anvil and striking it lightly with a hammer along the length. Then lap the key to a smooth, sliding fit in the column keyway. This can be done by simply rubbing opposite sides of the key on a piece of fine abrasive cloth tacked to a flat surface, or rubbing on a flat slipstone.

Now, square the ends and break the corners of a ½-in. steel rod and thread approximately 4½ in. of its length to make the feed screw, B, Figs. 3 and 4. Fit a ⅜ x 1-in. collar and drill and tap the collar for two headless setscrews as shown in Fig. 4. Turn and drill the flanged top piece, C, and drill six equally spaced holes around the shouldered portion. Tap these holes for 3/16 x ½-in. flat-headed machine screws. Then drill and countersink registering holes near the top end of the sleeve to take the six screws as in Fig. 3. The handwheel, A,

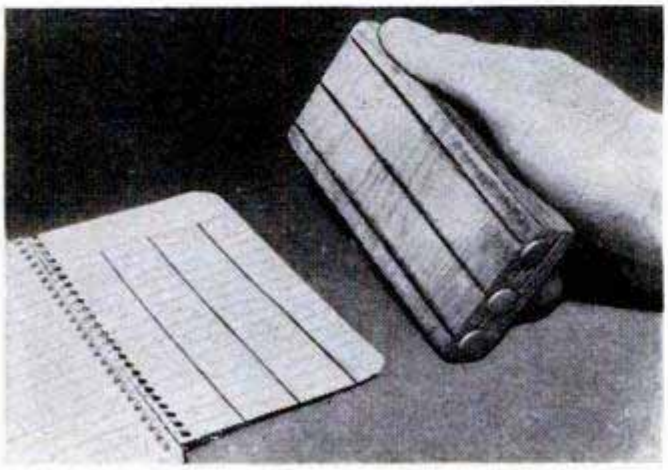




Figs. 3 and 4, finishes the sliding unit. A stock handwheel, or one taken from a discarded machine, usually can be adapted to the purpose. If a suitable handwheel is not available, make one as detailed in Fig. 4. After turning to the profile given in the sectional view, center-drill for the feed screw, drill the rim to take a stock handle, and drill the hub transversely for a 1/8-in. steel pin. Then assemble the feed screw and top piece as in Fig. 3.

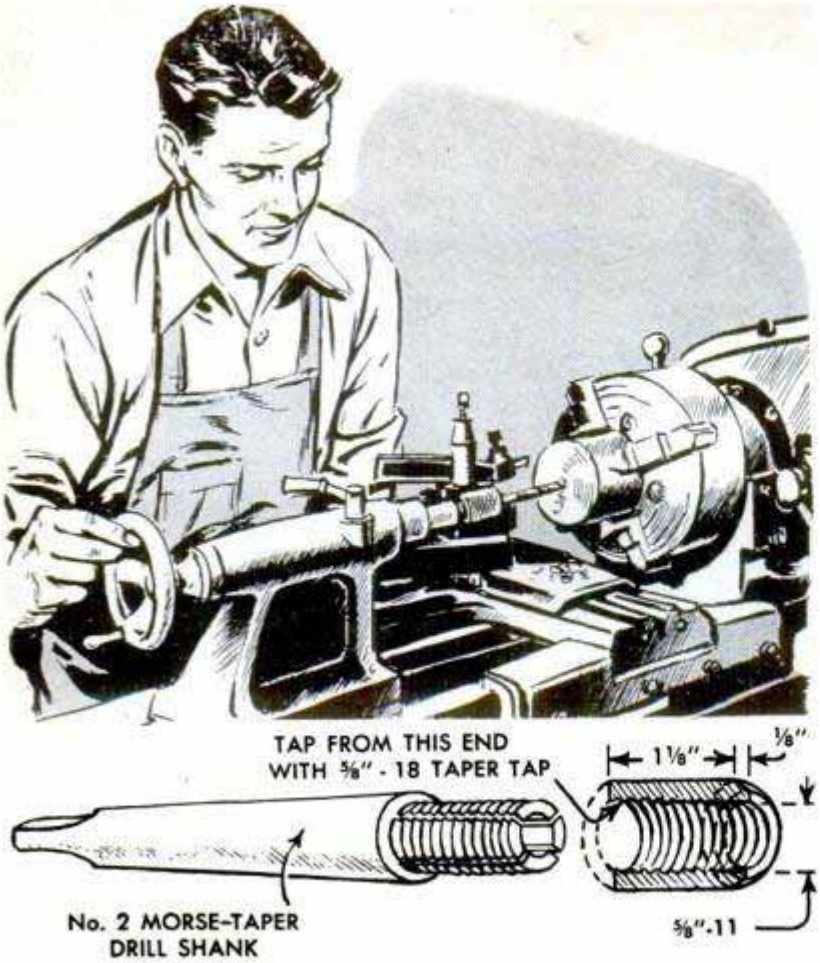
Cut the clamp collar from 1 x 3-in. flat steel to 3 1/4 in. in length and center-bore to 2 1/2 in. in diameter, Fig. 2. Then drill a 13/32-in. body hole to the center line of the piece and continue the hole to accommodate a 3/8-24 tap. Using the same drill bit, locate and drill holes into the opposite end for the 3/8-in. flat-headed machine screws which hold the vise. Tap the three holes with a 3/8-24 tap. Now, slot one end of the piece on the center line with a hacksaw and widen the slot with a file to approximately 1/8 in. Then turn the clamp screw, Fig. 2, and bend the handle as indicated. Finally, drill and countersink holes through the frame of the drill-press vise so that it can be attached to the clamp collar with flat-headed machine screws as in Fig. 5 Be sure that the holes are correctly located so that the fixed jaw of the vise will be parallel to the horizontal center line, or axis, of the lathe when the unit is in position on the lathe carriage. Always brush away metal chips before mounting the unit.

Rubber Bands and Block of Wood Provide Stamp for Inking Lines



When you want to add vertical lines to the pages of a notebook, or when ruling blank paper, the job can be done quickly and easily by using this special rubber stamp. It can be made from a block of wood and three or four narrow rubber bands. The latter are stretched across the block and held at each end by thumbtacks as shown in the photograph, the tension of the bands determining the thickness of the lines. Use a regular stamp pad for inking.

¶Use the heel of your hand to pack filler into wood grain. Then wipe with a cloth.



Lathe Collet Chuck Made From Drill

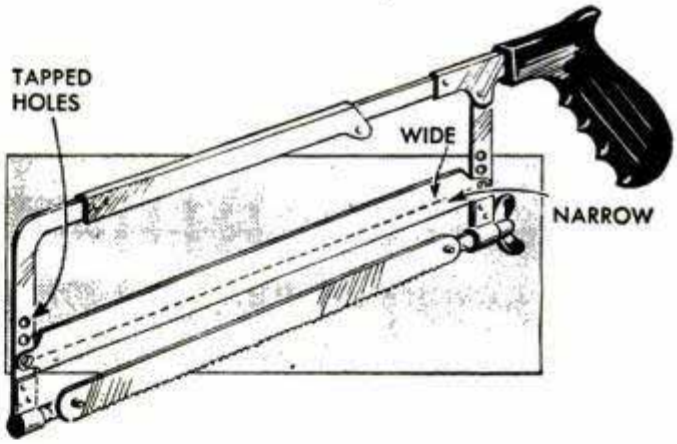
If you need a collet chuck for your lathe, an excellent one can be made for practically nothing by utilizing the tapered shank of a broken twist drill. After facing off the end and then shouldering and threading it as in the detail, "jaws" are formed by drilling a hole in the end and splitting the threaded portion crosswise. The threaded hole in the knurled sleeve must be tapered and provide a wringing fit so that it compresses the chuck jaws as it is tightened over the threaded end.
C. W. Woodson, Miami, Fla.

Layout-Ink Container

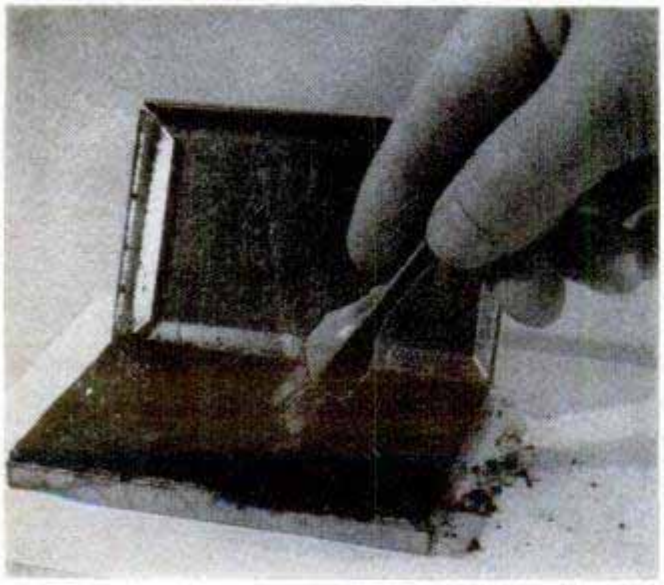
The type of bottle having a dauber attached to the stopper, such as a liquid shoe-polish bottle, makes an ideal container for layout ink used on metal surfaces. The dauber, of course, is used as an applicator.

Depth-Gauge Attachment for Hacksaw Has Variable Adjustments

Mechanics who frequently have slotting jobs calling for a fair degree of accuracy will find a hacksaw can be used effectively for the purpose if equipped with this inexpensive depth gauge. It is made from a strip of sheet metal, which is drilled near the ends slightly off-center with the center line of the strip. Thus, in use, a fairly fine adjustment can be obtained simply by turning the strip over. For additional adjustments, holes are drilled in the saw frame to permit raising or lowering the gauge.—Fred Lettino, Astoria, L. I., N. Y.



Occasional Brushing Freshens Inking Surface of Worn Stamp Pad



The occasional brushing of inking pads for rubber stamps will aid in getting the latter to print clean and sharp. A typewriter brush is ideal for the job and also is useful for cleaning the type on the stamps.
Ken Murray, Colon, Mich.

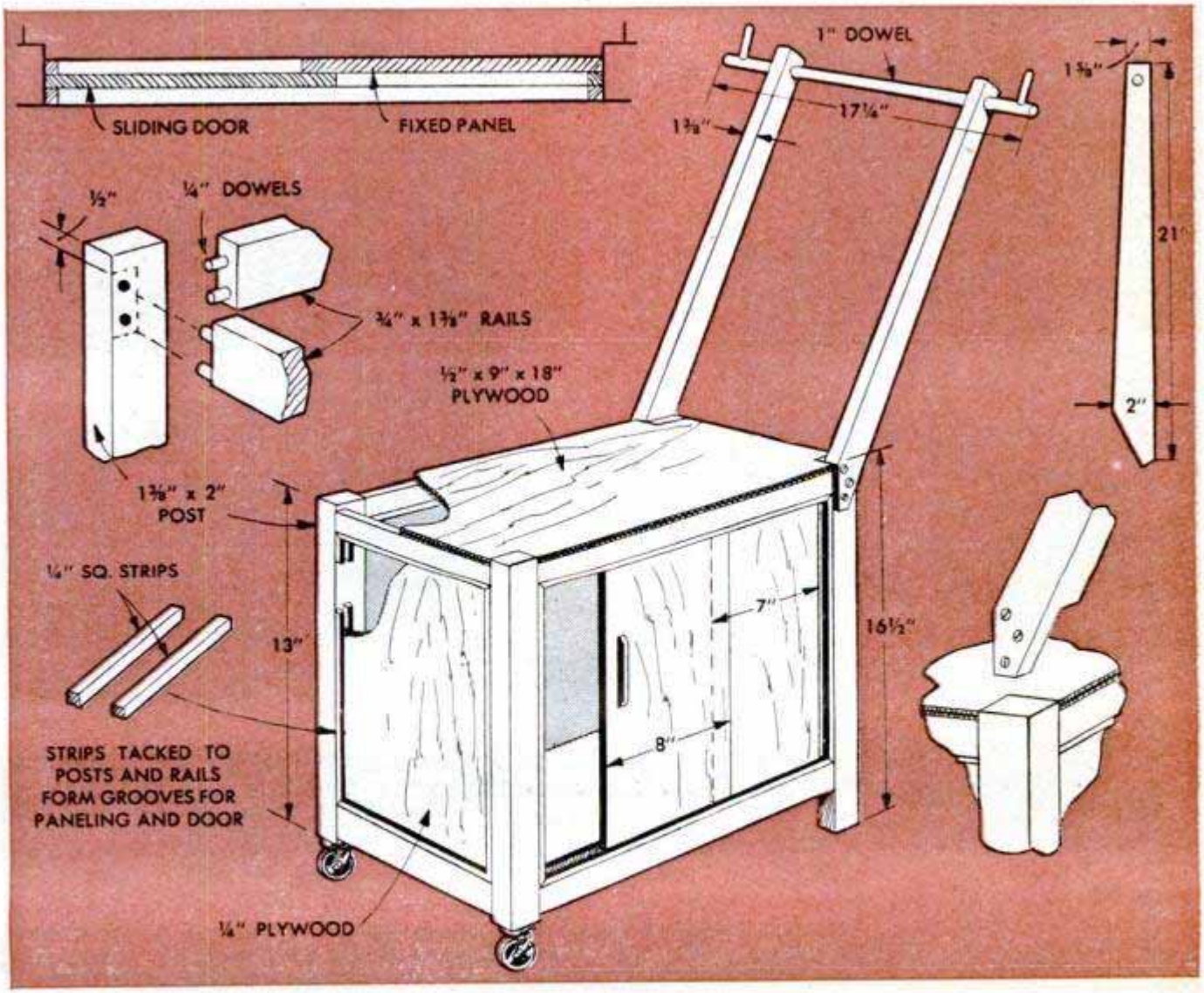
Repairing Leaky Carburetors

A leaky carburetor float can be repaired temporarily with common straight pins and fingernail polish. First, remove the gasoline that has seeped into the float by punching a pinhole in one corner and blowing into it to force the liquid out through the leak hole. Then, plug both holes with pins and use nail polish as a sealer.

STORAGE CART
for air compressor

By Dick Hutchinson

EASY PORTABILITY for your motor-driven air compressor plus safe storage for the spray gun, dusting nozzle and extra paint containers is provided by this handy cabinet stand. Before cutting stock for the cabinet frame, measure the base of the compressor unit to determine the size of the cabinet top required. The front posts of the cabinet are fitted with swivel casters, and the back posts extend to the floor. Allow for the height of the casters when cutting the front posts, and join the crossrails and stretchers to the posts with dowels and glue. Then fit plywood panels in the openings at the ends and back, and nail ¼-in.-square strips to the posts and rails to hold the panels in place. Fit a sliding panel and a fixed panel in the open side of the cabinet as in the sectional view. Cut and fit a cabinet bottom and top of ½ or ⅝-in. plywood and, if desired, install a shelf in the cabinet. Attach the swiveling casters to the short legs with screws. Finally, make and attach the handle as detailed, using a 1-in. dowel for a handle bar. Drill ⅜-in. holes near the ends of the handle bar and drive in short lengths of ⅜-in. dowel to provide hangers for the motor cord and pressure hose.



"Magnetized" Rubber Stamps Stored on Steel Plate

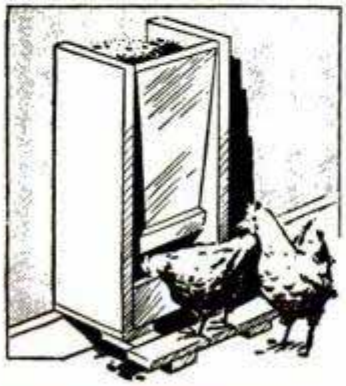
To improve the troublesome method of hanging his rubber stamps on individual hooks, one shipping clerk glued a small magnet to each stamp by which they can be "hung" on a steel plate screwed to a wall. As the magnets are placed on the sides of the stamps opposite the labels, the latter are in full view at all times for rapid identification.

Blackboard-Paint Formula

As blackboard paint made from the following formula can be used on almost any smooth surface, it is especially suitable for painting a section of a shop wall on which bulletins, production notations, etc., can be chalked. To make the paint, mix lampblack, 2 oz., fine pumice stone, 8 oz., boiled linseed oil, 16 oz., and enough turpentine to make four pints. When applying the paint several coats will be required. Let each coat dry and then sand it smooth before applying the next.

Frank M. Butrick, Jr., Alma, Mich.

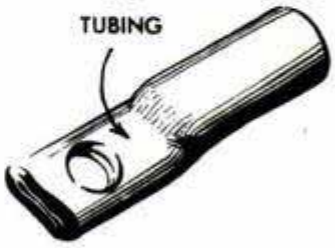
Special Self-Feeder Supplies Grits To Large Poultry Flock



This large self-feeder, or dispenser, holds approximately 100 lbs. of mixed grit, such as granite and oyster shell. Two 1 x 10 x 36-in. boards form the sides and 1 x 12s are used for the front and back. Note that the front piece is shorter than the sides and that its lower end slants inward about 5 deg. to form the self-feeding hopper. A cleat nailed in crosswise provides additional support for the lower end of the slanting member. Another crosspiece is nailed between the sides with its top edge about 1 in. above the lower end of the slanting member to form the outer side of the hopper. When completed, the unit is attached to the wall of the poultry house with the bottom 8 to 12 in. above the floor. If desired, a perch can be provided as shown.

A. M. Wettach, Mt. Pleasant, Iowa.

Terminal Lugs From Copper Tubing

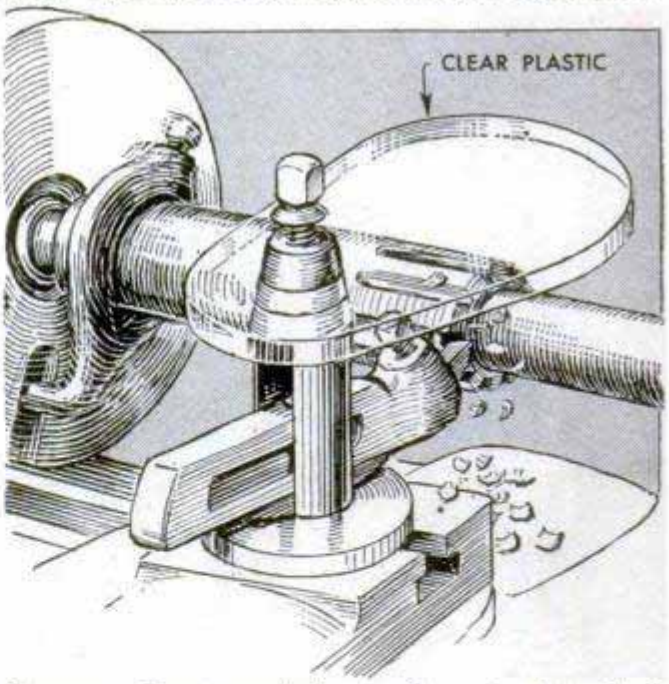


Terminal lugs for electrical wires can be made easily from copper tubing. Saw off suitable lengths and flatten and drill them as indicated. The wires are inserted in the open ends of the tubing and held either by soldering, or by crimping the end.

Harold Autenreith, Jr., Pittsburgh, Pa.

Transparent Shield for Lathe Permits Full View of Work

Made from clear plastic, this safety shield for a lathe protects the operator from flying chips, but at the same time permits full view of the cutting tool. A hole is drilled near one end of the plastic and tapered to



fit over the top of the tool post. Attached in this manner, the shield can be turned out of the way when changing tool bits or making adjustments.

¶If an inner-tube valve core sticks, heat the stem with a match or two. Sometimes the rubber part of the core sticks to the valve seat and can be loosened with heat.

"Magnetized" Rubber Stamps Stored on Steel Plate

To improve the troublesome method of hanging his rubber stamps on individual hooks, one shipping clerk glued a small magnet to each stamp by which they can be "hung" on a steel plate screwed to a wall. As the magnets are placed on the sides of the stamps opposite the labels, the latter are in full view at all times for rapid identification.

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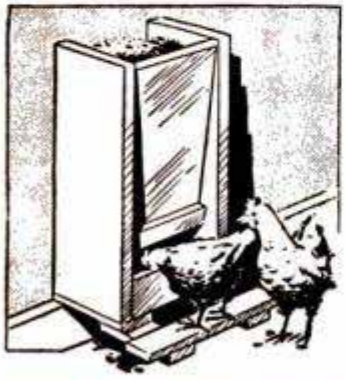

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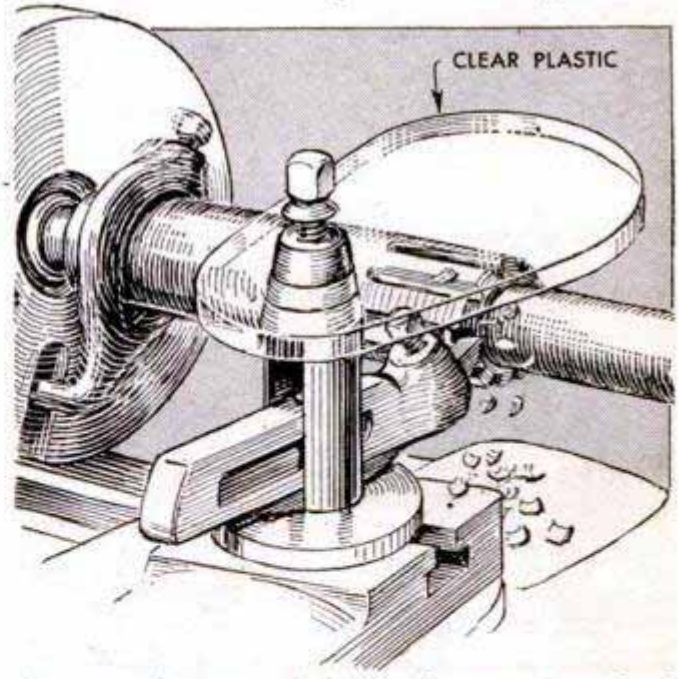

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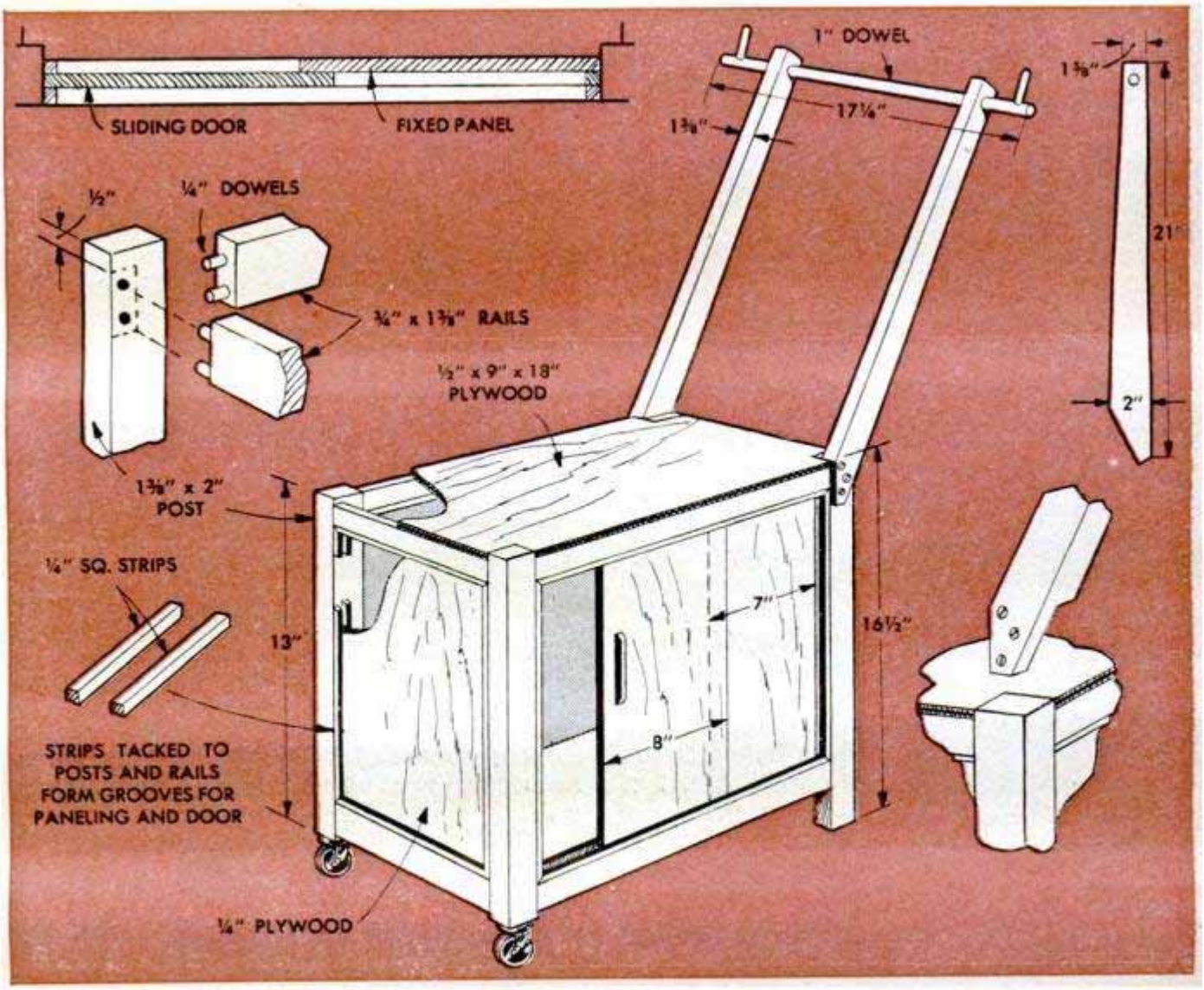
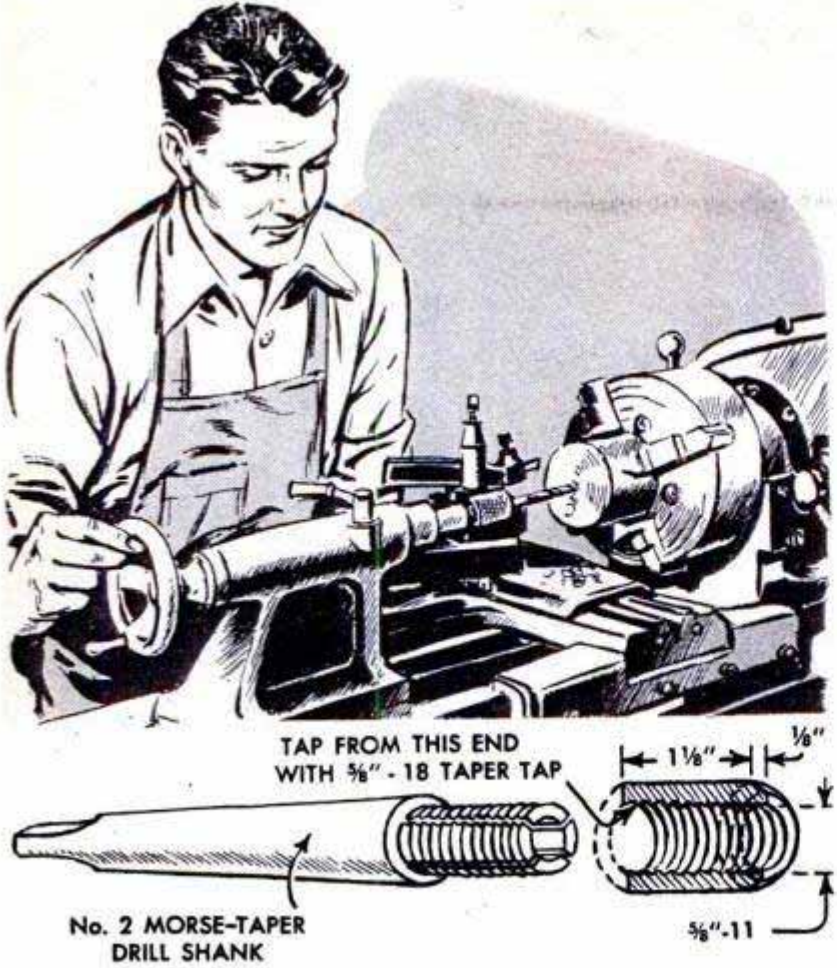
STORAGE CART
for air compressor

By Dick Hutchinson

EASY PORTABILITY for your motor-driven air compressor plus safe storage for the spray gun, dusting nozzle and extra paint containers is provided by this handy cabinet stand. Before cutting stock for the cabinet frame, measure the base of the compressor unit to determine the size of the cabinet top required. The front posts of the cabinet are fitted with swivel casters, and the back posts extend to the floor. Allow for the height of the casters when cutting the front posts, and join the crossrails and stretchers to the posts with dowels and glue. Then fit plywood panels in the openings at the ends and back, and nail ¼-in.-square strips to the posts and rails to hold the panels in place. Fit a sliding panel and a fixed panel in the open side of the cabinet as in the sectional view. Cut and fit a cabinet bottom and top of ½ or ⅝-in. plywood and, if desired, install a shelf in the cabinet.

Attach the swiveling casters to the short legs with screws. Finally, make and attach the handle as detailed, using a 1-in. dowel for a handle bar. Drill ⅜-in. holes near the ends of the handle bar and drive in short lengths of ⅜-in. dowel to provide hangers for the motor cord and pressure hose.





Lathe Collet Chuck Made From Drill

If you need a collet chuck for your lathe, an excellent one can be made for practically nothing by utilizing the tapered shank of a broken twist drill. After facing off the end and then shouldering and threading it as in the detail, "jaws" are formed by drilling a hole in the end and splitting the threaded portion crosswise. The threaded hole in the knurled sleeve must be tapered and provide a wringing fit so that it compresses the chuck jaws as it is tightened over the threaded end.

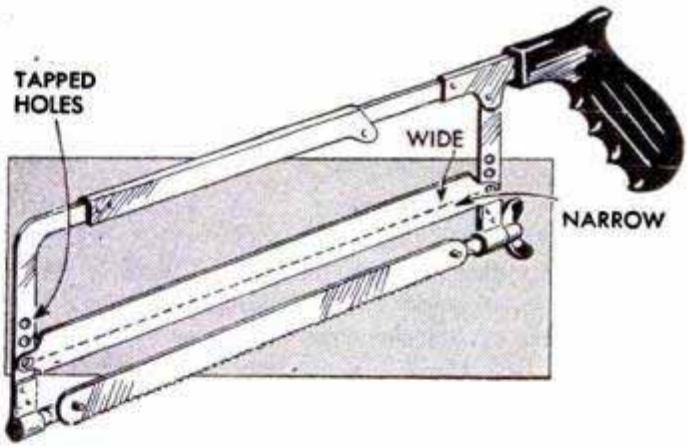
C. W. Woodson, Miami, Fla.

Layout-Ink Container

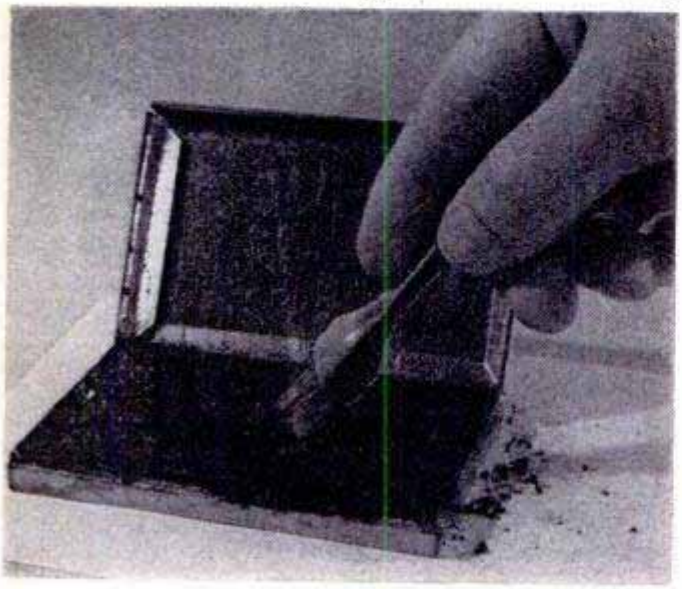
The type of bottle having a dauber attached to the stopper, such as a liquid shoe-polish bottle, makes an ideal container for layout ink used on metal surfaces. The dauber, of course, is used as an applicator.

Depth-Gauge Attachment for Hacksaw Has Variable Adjustments

Mechanics who frequently have slotting jobs calling for a fair degree of accuracy will find a hacksaw can be used effectively for the purpose if equipped with this inexpensive depth gauge. It is made from a strip of sheet metal, which is drilled near the ends slightly off-center with the center line of the strip. Thus, in use, a fairly fine adjustment can be obtained simply by turning the strip over. For additional adjustments, holes are drilled in the saw frame to permit raising or lowering the gauge.—Fred Lettino, Astoria, L. I., N. Y.



Occasional Brushing Freshens Inking Surface of Worn Stamp Pad

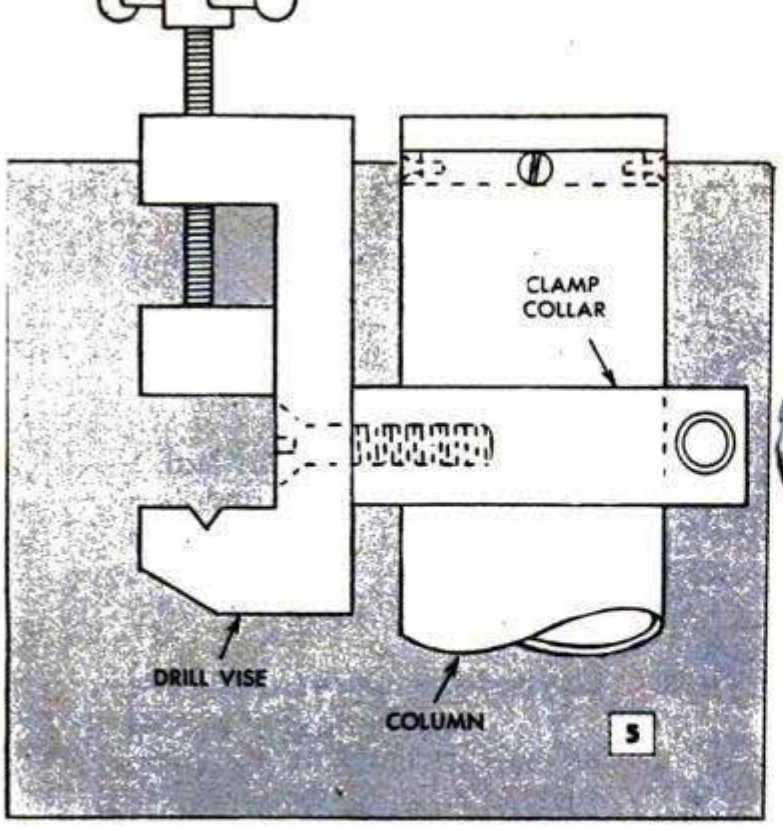


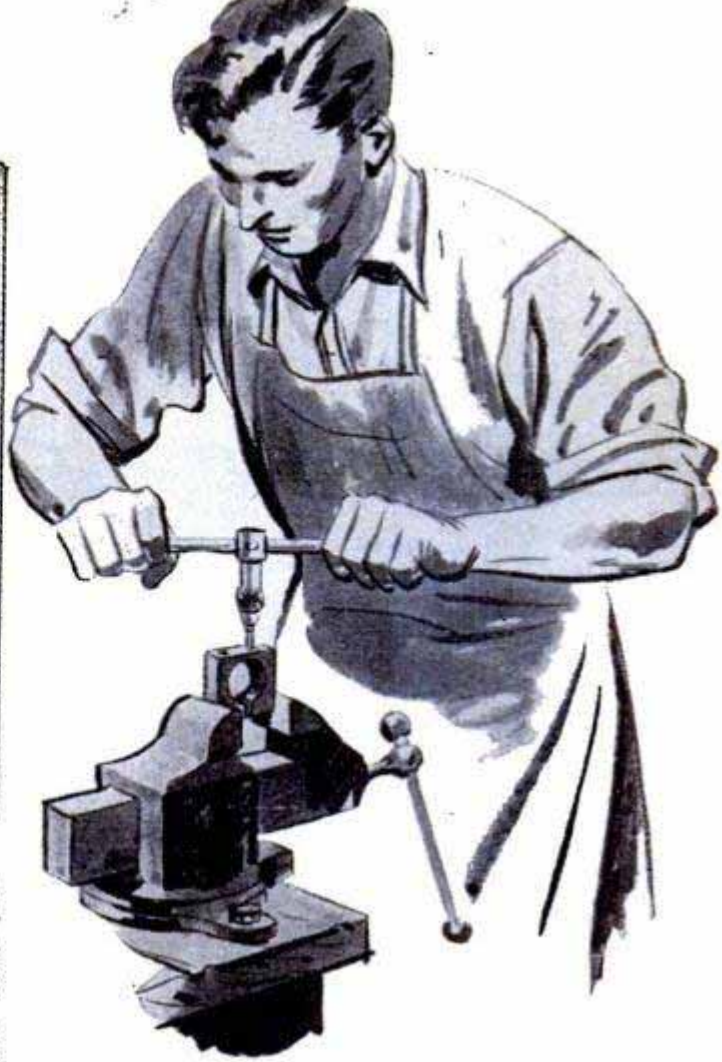
The occasional brushing of inking pads for rubber stamps will aid in getting the latter to print clean and sharp. A typewriter brush is ideal for the job and also is useful for cleaning the type on the stamps.

Ken Murray, Colon, Mich.

Repairing Leaky Carburetors

A leaky carburetor float can be repaired temporarily with common straight pins and fingernail polish. First, remove the gasoline that has seeped into the float by punching a pinhole in one corner and blowing into it to force the liquid out through the leak hole. Then, plug both holes with pins and use nail polish as a sealer.

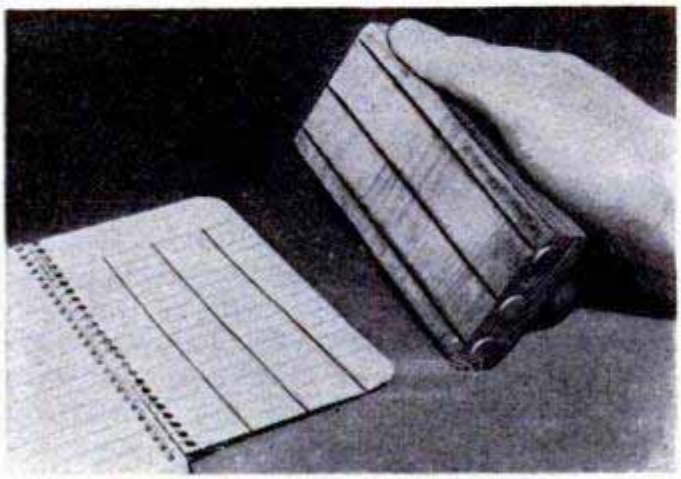




Figs. 3 and 4, finishes the sliding unit. A stock handwheel, or one taken from a discarded machine, usually can be adapted to the purpose. If a suitable handwheel is not available, make one as detailed in Fig. 4. After turning to the profile given in the sectional view, center-drill for the feed screw, drill the rim to take a stock handle, and drill the hub transversely for a 1/8-in. steel pin. Then assemble the feed screw and top piece as in Fig. 3.

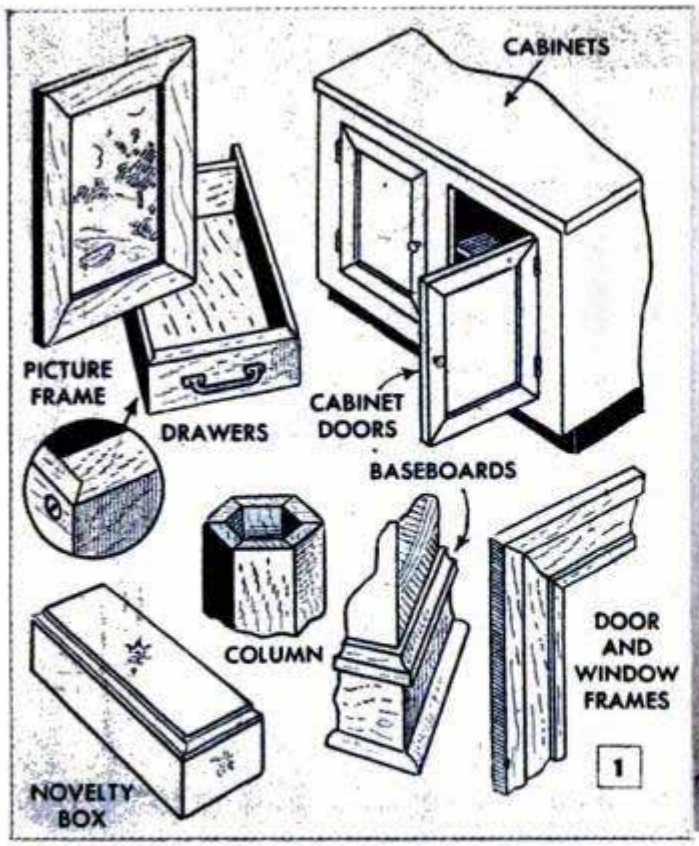
Cut the clamp collar from 1 x 3-in. flat steel to 3 1/4 in. in length and center-bore to 2 1/2 in. in diameter, Fig. 2. Then drill a 13/32-in. body hole to the center line of the piece and continue the hole to accommodate a 3/8-24 tap. Using the same drill bit, locate and drill holes into the opposite end for the 3/8-in. flat-headed machine screws which hold the vise. Tap the three holes with a 3/8-24 tap. Now, slot one end of the piece on the center line with a hacksaw and widen the slot with a file to approximately 1/8 in. Then turn the clamp screw, Fig. 2, and bend the handle as indicated. Finally, drill and countersink holes through the frame of the drill-press vise so that it can be attached to the clamp collar with flat-headed machine screws as in Fig. 5 Be sure that the holes are correctly located so that the fixed jaw of the vise will be parallel to the horizontal center line, or axis, of the lathe when the unit is in position on the lathe carriage. Always brush away metal chips before mounting the unit.

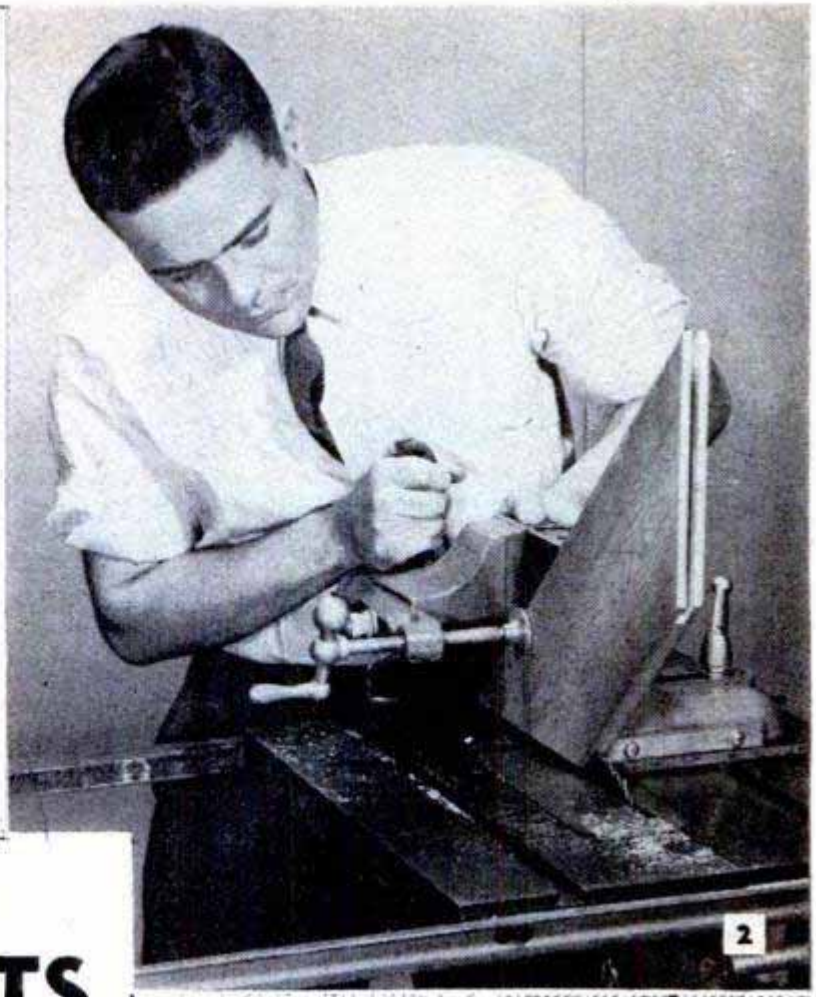
Rubber Bands and Block of Wood Provide Stamp for Inking Lines



When you want to add vertical lines to the pages of a notebook, or when ruling blank paper, the job can be done quickly and easily by using this special rubber stamp. It can be made from a block of wood and three or four narrow rubber bands. The latter are stretched across the block and held at each end by thumbtacks as shown in the photograph, the tension of the bands determining the thickness of the lines. Use a regular stamp pad for inking.

¶Use the heel of your hand to pack filler into wood grain. Then wipe with a cloth.





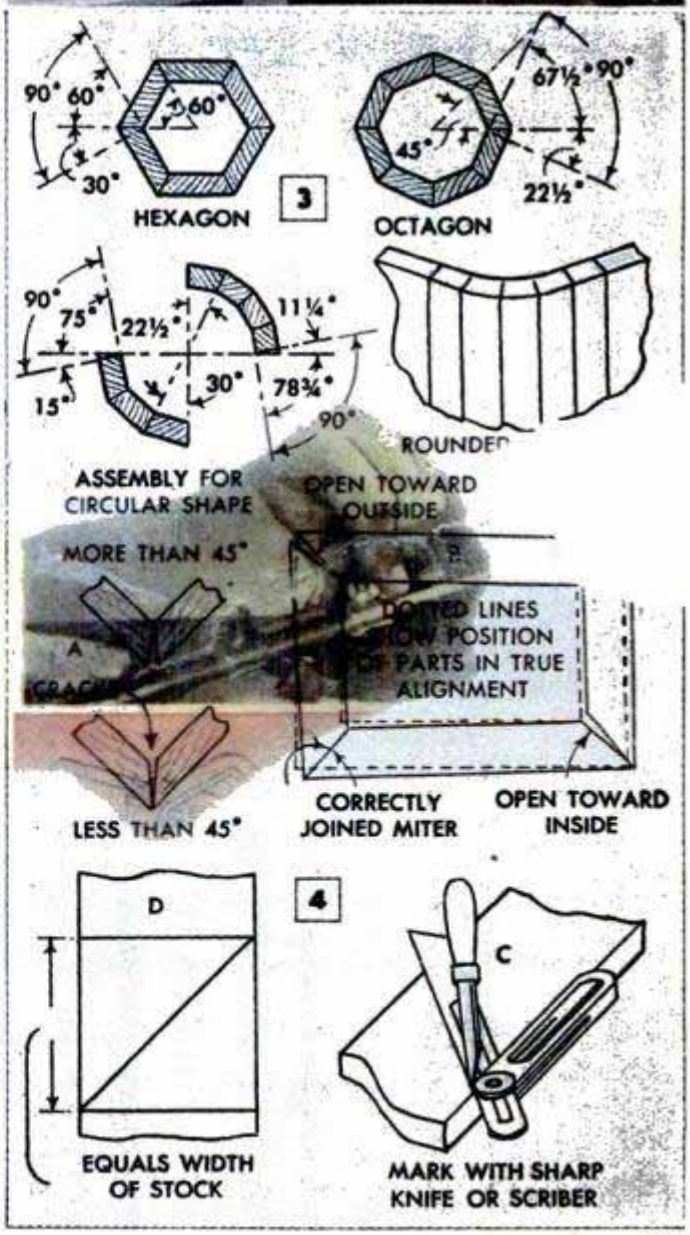
how to make MITER JOINTS

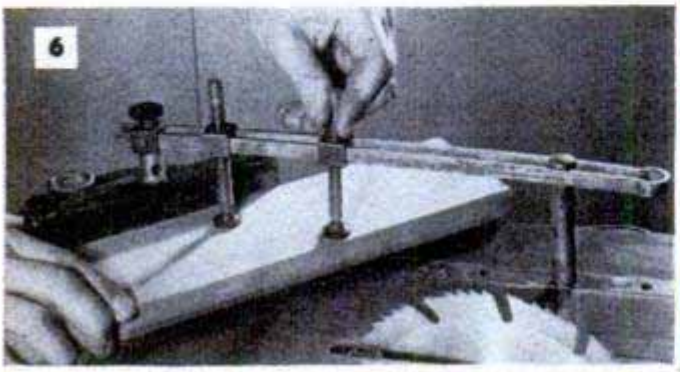
Measuring, cutting and locking to get tight joints. Also, simple sawing jigs and clamping methods

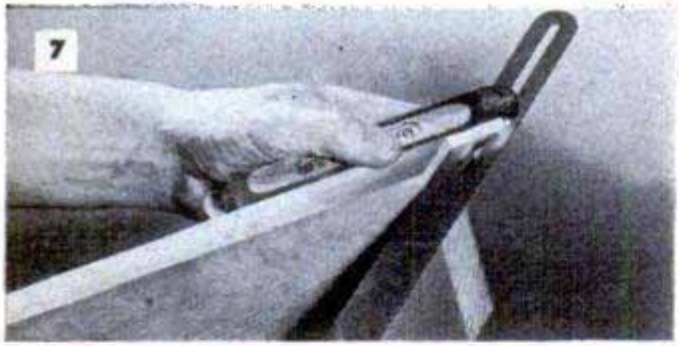
By E. R. Haan

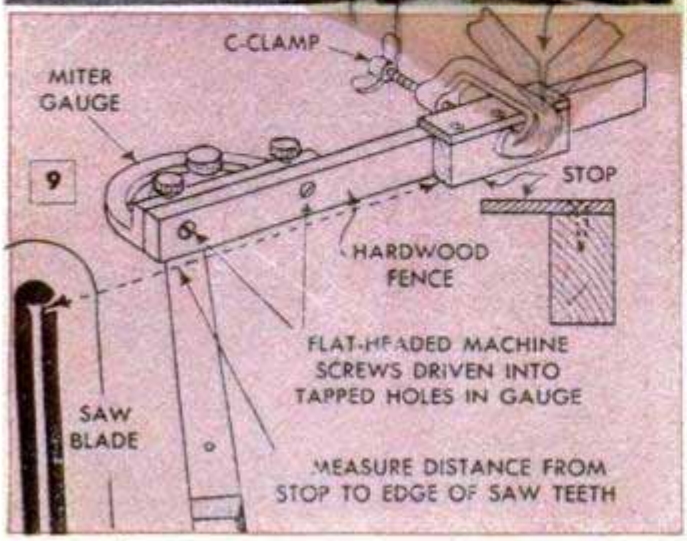
MITER JOINTS are employed in woodwork and cabinetwork for the principal purpose of concealing end grain of the wood. In some cases, miter joints are required by the design itself, as in certain types of molded picture frames and in shapes which are to be built up and turned round, such as pattern work and large wooden columns. When joining square or rectangular frames, the miters are cut at 45 deg. When building shapes such as columns or half columns, the angles will vary, and when joining the hopper-type frame a compound miter is used. Common applications of the miter joint are detailed in Fig. 1 and typical variations are shown in Fig. 3.

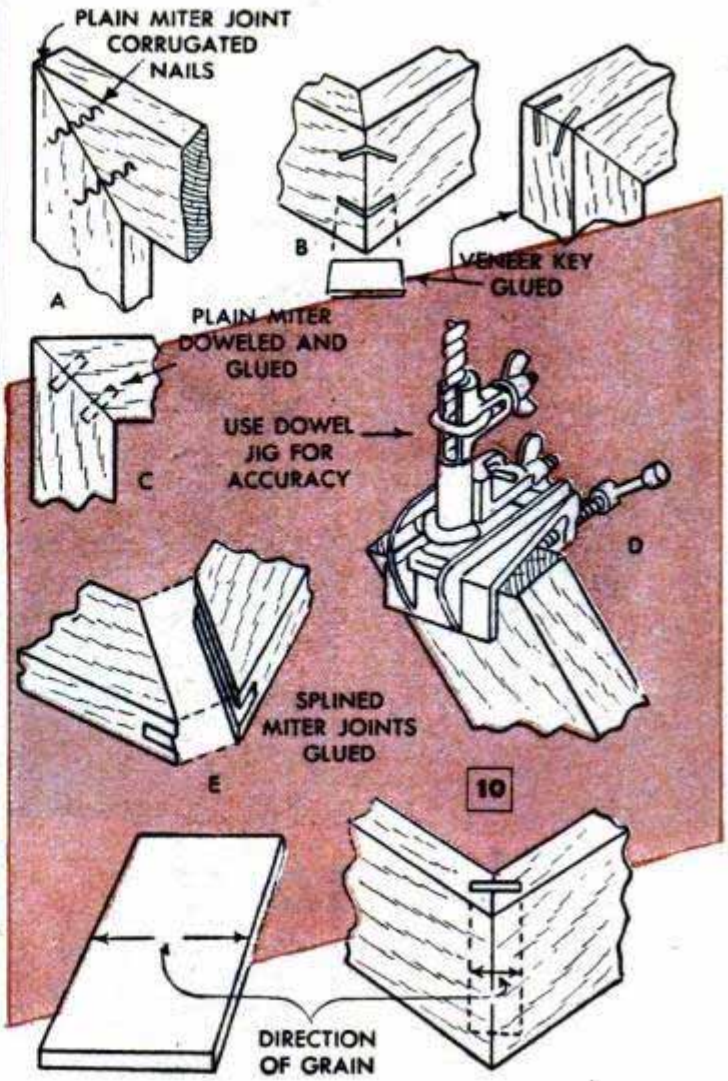
Exactness required: Precise measuring, marking and careful cutting of stock are essential. For example, mitered picture frames are easy to join if the two pairs of sides are exactly equal in length. If the angles vary, even slightly, cracks will appear at the joints as in Fig. 4A. If you use a coarse saw, the joint will lack a uniformly smooth surface necessary for good gluing contact. If, when joined, one piece extends







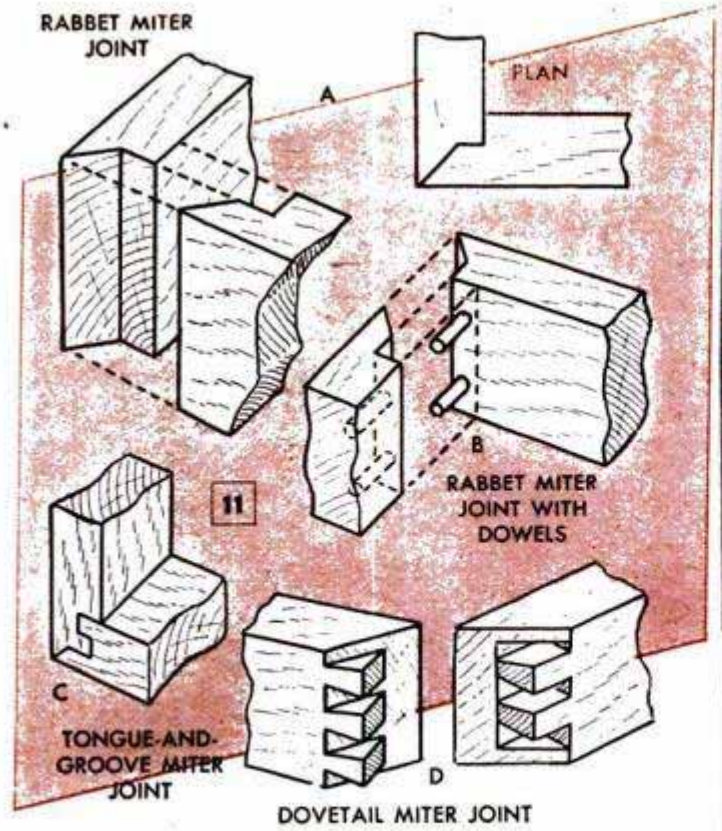


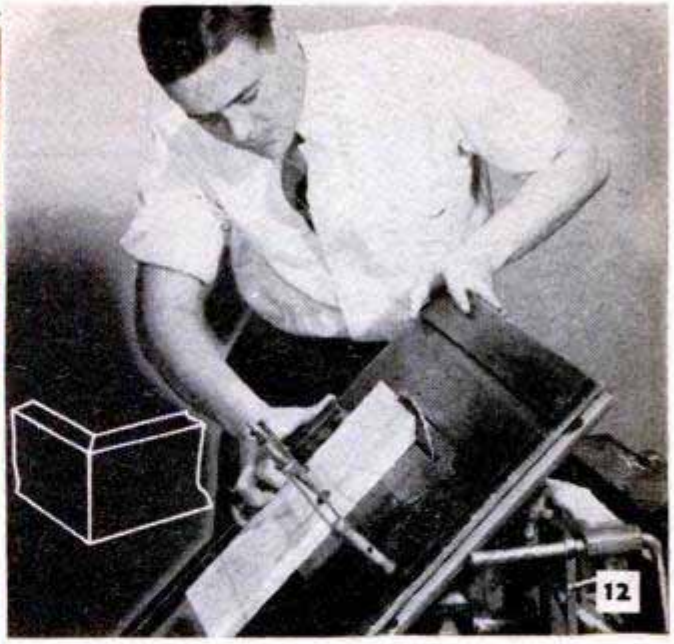


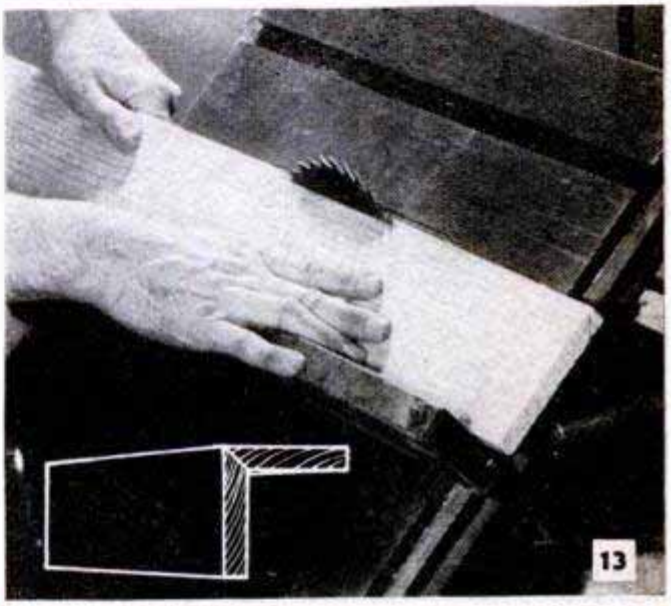
past the end of another, even though all pieces are of correct length and have perfect 45-deg. miters, cracks will appear and the frame will not form a true rectangle as indicated by the dotted lines in Fig. 4B. For accurate work in mitering, hairline marking is necessary. Use a sharp knife edge or scriber, Fig. 4C. The saw cut should be at the edge of the line in the waste. A true 45-deg. angle is cut along the diagonal of a square having sides equalling the width of the stock, Fig. 4D.

Cutting miters on circular saw: A circular saw and jointer enable you to cut miters with ease, accuracy and speed, although they also can be cut by hand. Various types of miters and the methods of joining them are shown in Figs. 10 and 11. Use a hollow-ground blade on the circular saw. Plain miter cuts across the face of stock are made with the setup shown in Fig. 5. The saw blade must be at perfect right angles to the surface of the saw table. Set the miter gauge to the desired cutting angle and attach a miter-gauge clamp as in Fig. 6 to prevent the work from creeping away from the blade which often results when it is held by hand. Make the first cut on a piece of waste stock and check the angle with a bevel, Fig. 7. The bevel is set correctly with a protractor.

Cut stock slowly and with uniform feed.



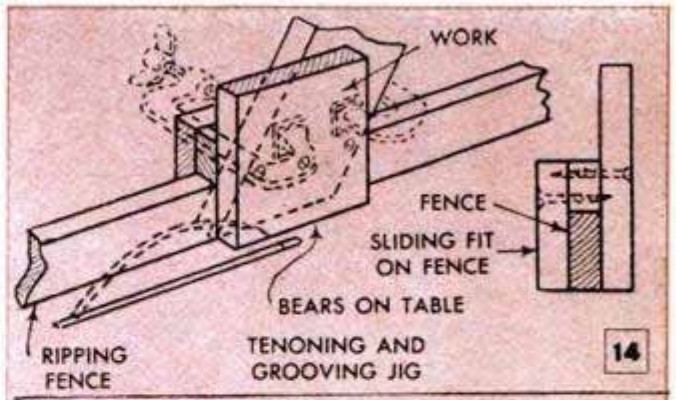


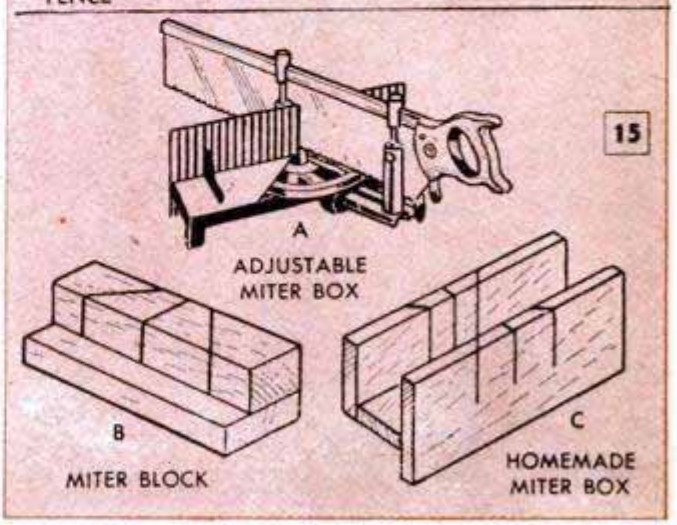


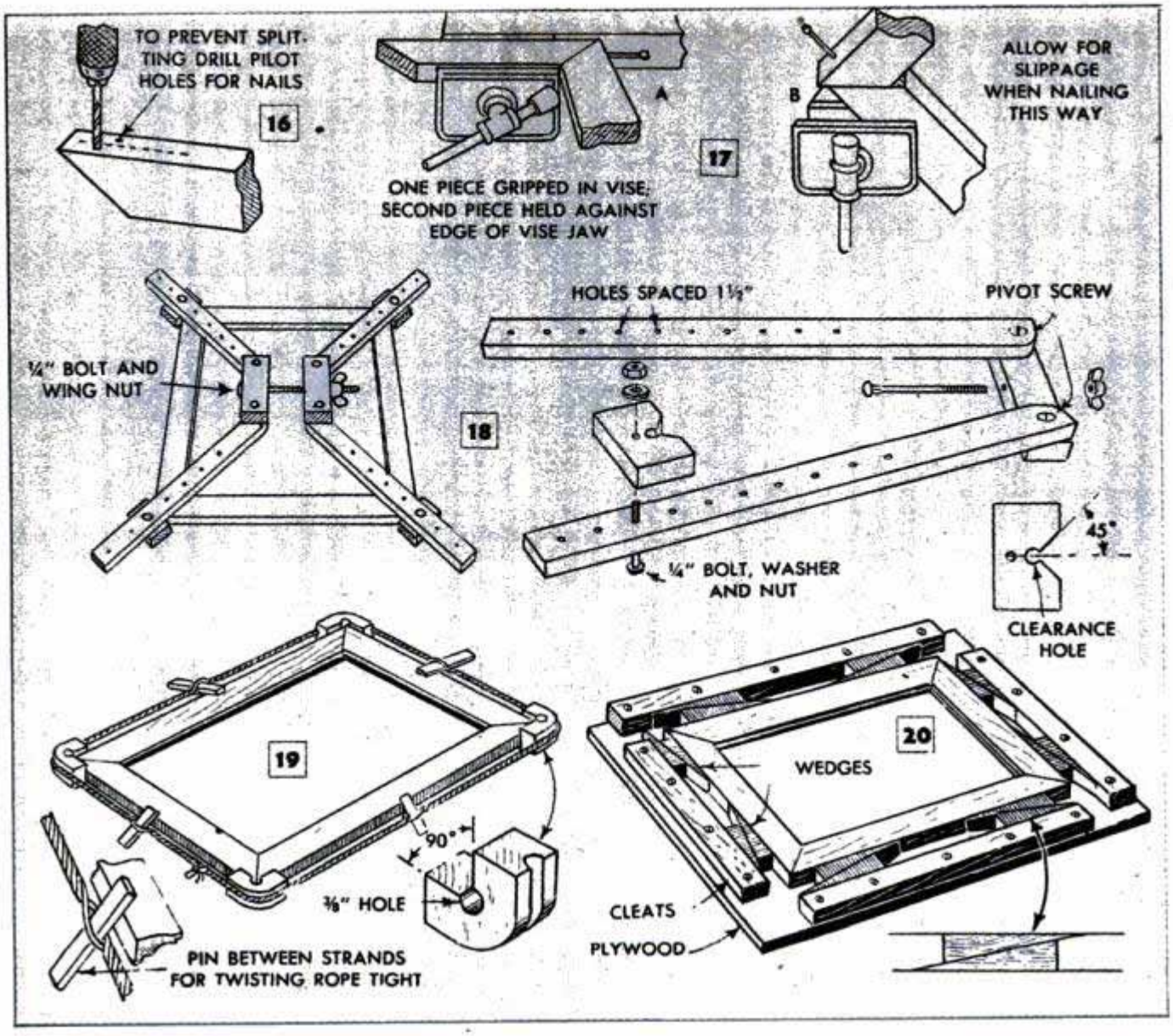
To assure exact length of duplicate pieces, use a stop on the miter gauge, Fig. 8, or improvise a stop, Fig. 9. In making duplicate pieces, first miter one end of the pieces with the stop set about 1/16 in. over the finish length. Then reset the stop to exact length, and miter the other ends of the pieces. When adjusting the stop, measure to the edge of the saw teeth as in Fig. 9. Then make a trial cut on waste stock and check the dimension. When making miter cuts on a tilting-table saw, Fig. 12, always check the accuracy of the setting by making a trial cut on a piece of waste. To cut miters with the grain, as in Fig. 13, tilt the table and rest the work against the rip fence. Don't saw long miter cuts to the finish line, but make allowance for finishing on the jointer. Set the jointer fence at the same angle as the cut, and have the front table adjusted to bring the stock to the finish dimension at one pass.

Miter cuts that form the sides of a long dovetail are made by elevating the saw table so that the cutting edge of the blade—or dado cutter—will project above it a distance equal to the required depth of the cut. Then the work is guided along the rip fence or is clamped to the miter gauge. Use a tenon-cutting jig for cutting grooves accurately in the mitered ends of the stock as in Fig. 2. This is done when the miter joints are to be splined. A substitute for the tenon jig can be made as in Fig. 14.

Cutting miters by hand: For accuracy in hand-cutting miters on narrow stock and molding, use a miter box, Fig. 15A, or use an improvised miter block or box, Fig. 15 B and C. For delicate cutting of small stock,







use a 12-in. backsaw which usually has 14 teeth per inch. To start the cut, pull the saw backward slowly. Planing miters freehand is difficult to do accurately, but an improvised attachment on the plane to guide it at the correct angle will be of help. Special miter cutters are used when much picture-framing work is done.

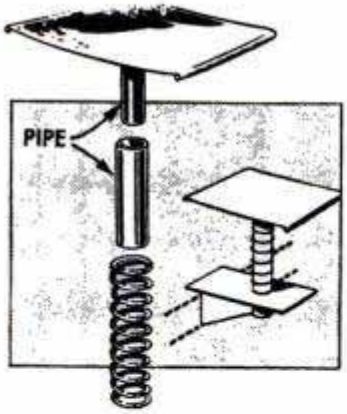
Fastening miter joints: Plain miters usually are glued and nailed, although light frames such as picture frames often are nailed without gluing. To prevent splitting the wood, drill pilot holes for the nails as in Fig. 16. When two nails are used, locate the holes on each side of the center line as shown. When nailing mitered frames by hand, adjoining pieces will not slip if arranged as in Fig. 17A, but allowance for slip must be made when the pieces are held as in detail B. You can obtain specially made vises for clamping picture frames. Other devices for clamping mitered frames are shown in Figs. 18, 19 and 20.

Corrugated nails often are used on mitered joints, Fig. 10A, for joining window-screen frames. Miter joints also are strengthened by keys, dowels or splines, Fig. 10B, C and E. To bore dowel holes accurately, get a jig shown in Fig. 10D. When splines are used they should be of hardwood and the grain should run across them, Fig. 10E. For splines, you can use ¼-in. plywood or tempered hardboard. Saw cuts for veneer keys, or feather slips, Fig. 10B, are cut at a slight angle as indicated. Rabbeted miters, Fig. 11A, may be glued only, or glued and doweled, Fig. 11B. Rabbeted miters, as well as tongue-and-groove miters, Fig. 11C, are stronger than plain miters because of added gluing surface. Having still more gluing surface, the blind dovetail miter, Fig. 11D, is sometimes used. Dovetails can be cut accurately with a dovetail cutter used in a drill press.

Milk Pail Holds Gunny Sack For Painting Identification

When lettering initials on grain sacks for easy identification, one farmer stretches the sack across the bottom of an inverted milk pail. The sack is drawn taut by placing a large rubber band around the pail and over the ends of the sack. Thus, in the manner of cloth stretched across embroidery hoops, the sack is held flat for lettering.

Spring-Cushioned Tractor Seat



Desiring a comfortable riding seat on his homemade tractor, one farmer made the seat shown. It consists of a suitable metal seat welded to a piece of pipe which telescopes into a second piece of pipe, the latter being welded to a plate for attaching to the tractor frame. A large coil spring is then slipped over the pipe assembly to hold the seat a few inches above the lower pipe. In this way, weight of the driver is carried entirely on the spring, the second piece of pipe serving only to keep the seat in position.

L. H. Houck, Jefferson City, Mo.

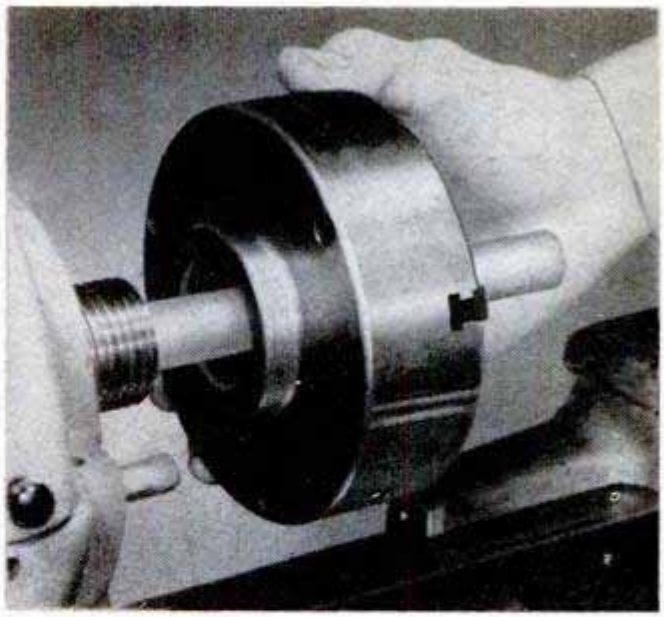
Rubber Holds Screws in Faceplate

To hold the screws in a lathe faceplate when not in use, engage the screws in a square of inner-tube rubber placed on the plate. Although a piece of cardboard is sometimes used in the same manner, rubber will not wear out as quickly and will hold the screws securely because of its resilience.

Arrows on Ratchet End Wrench Indicate Direction of Action

Red arrows painted on the sides of a ratchet end wrench, such as the one shown, will indicate at a glance the direction in which the wrench acts. This eliminates the annoyance of placing the wrench on a nut or bolt wrong-side-up and then having to turn it over.

¶When an oilstone becomes so saturated that it will no longer work effectively, the excess oil can be removed by using powdered chalk. Warm the stone slightly and bury it in chalk for several hours. If necessary, repeat the process.



Dowel Aids Handling of Lathe Chuck

To aid in mounting and removing a lathe chuck, insert a length of hardwood dowel in the hollow spindle. This will provide a rest on which you can steady the chuck when engaging the threads. It will also prevent the chuck from damaging the ways if it is dropped when being removed.

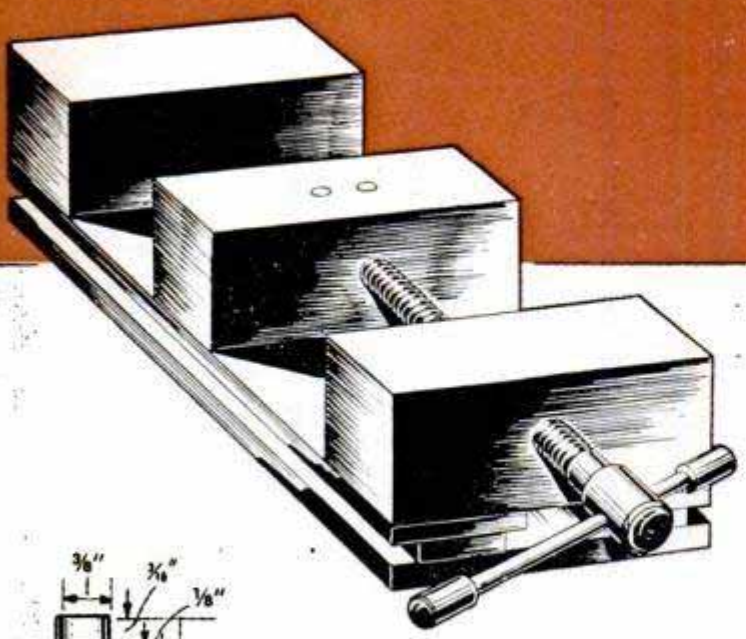
Pencil Eraser Protects Thermometer

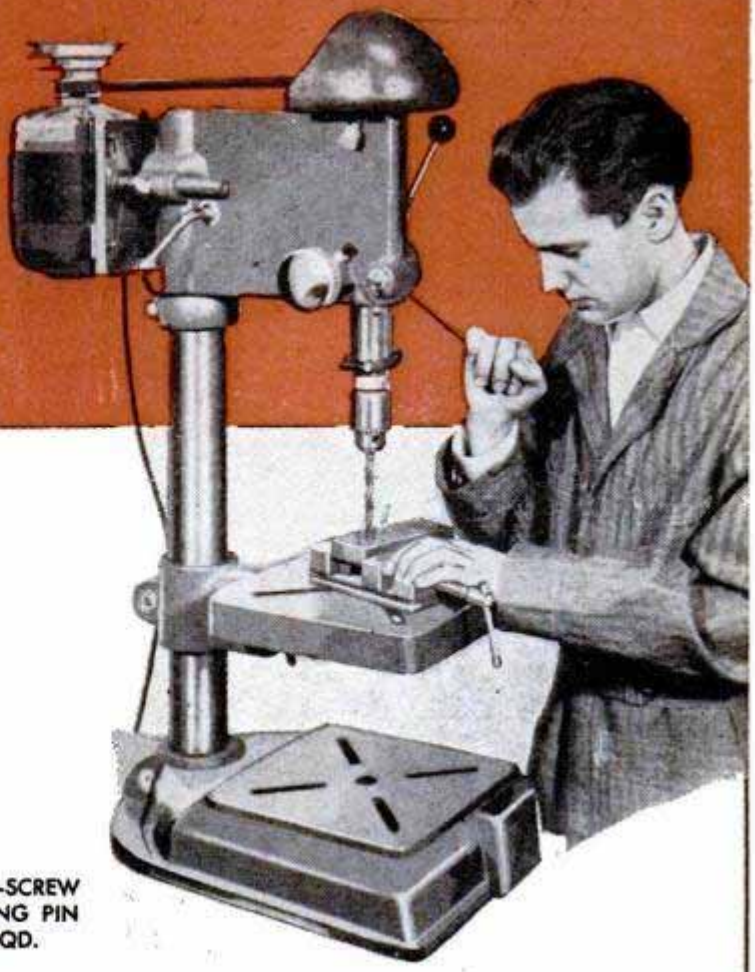
A rubber eraser, such as those designed to fit over the end of a pencil, makes a good protector for a thermometer of the type used in dairies. Pressed over the end of the thermometer, the eraser guards against breakage when the thermometer is placed in a tumbler or beaker. The eraser also prevents it from rolling off a table or shelf.

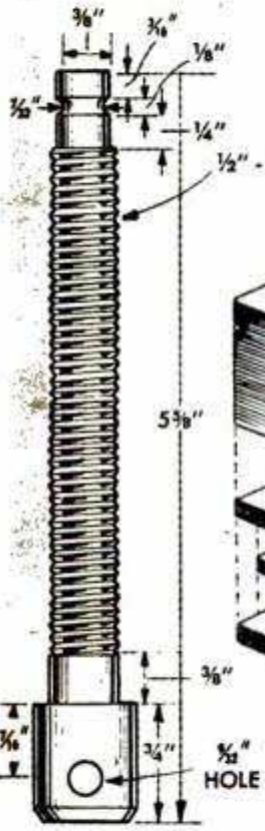
"Window" Cut in Leaky Steam Pipe Permits Making Quick Repair

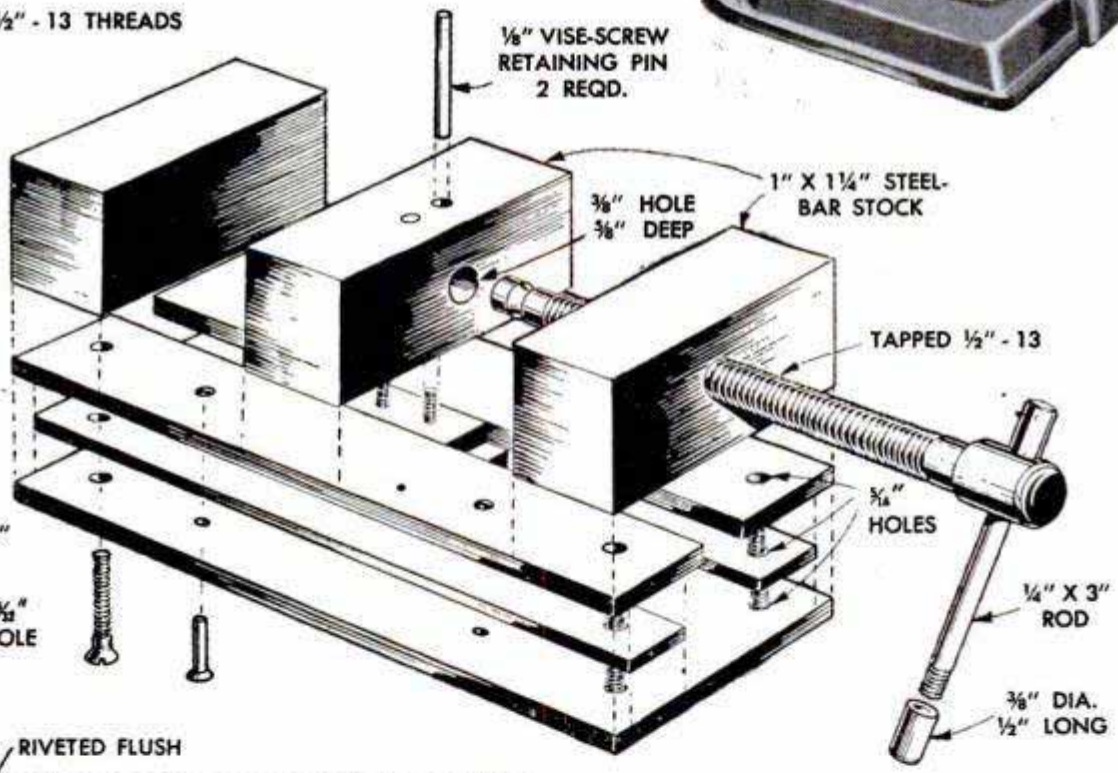
The head pipe fitter of a Canadian sugar refinery was faced with the task of making a quick repair in a 6-in. vertical steam pipe, which had developed a leak on the side facing a corner of the room. Access was impossible and it would have meant stopping production to uncouple and turn the leaky section in order to make the repair. However, the problem was solved by cutting a square section from the pipe opposite the leak, making the repair through the hole and then welding a patch over the "window" — all in 45 minutes. — Laurence Bourne, Hollyburn, B. C., Can.

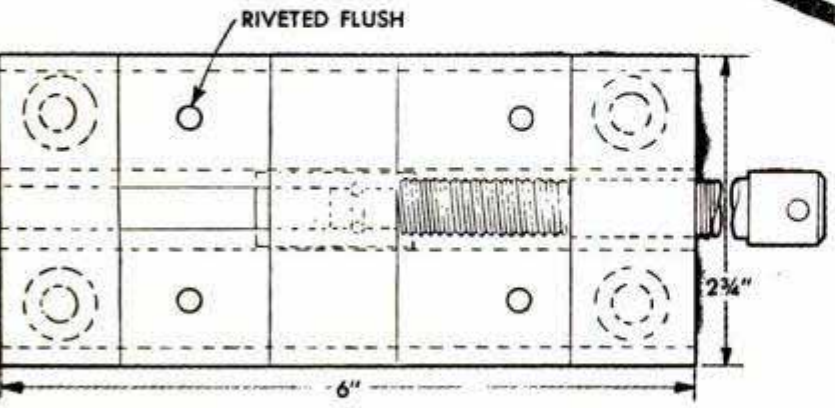
Assembled vise



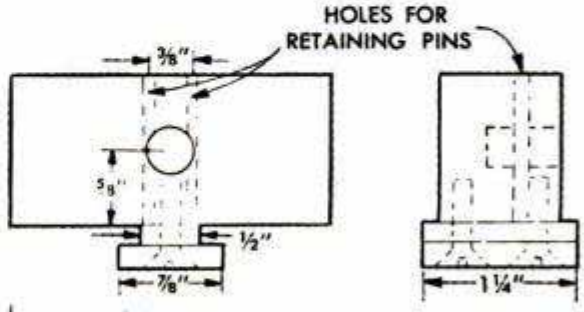


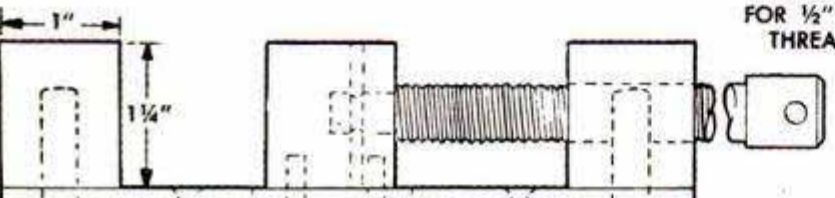


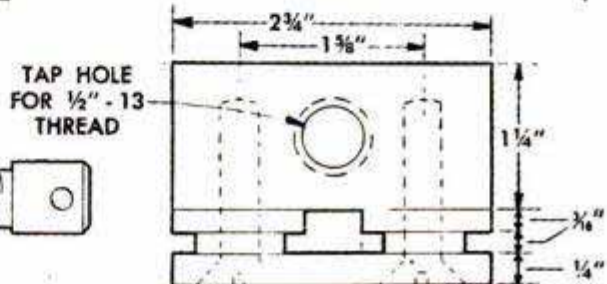




TOP VIEW







DRILL-PRESS VISE

NO CASTINGS are required in the construction of this handy drill-press vise. It's made from short pieces of flat steel, and the parts are joined with flat-headed machine screws and rivets. Begin by cutting the base to size from ¼-in. flat stock. Then stack two widths of bar stock near each edge of the base to form the T-slot. Note in the details on the opposite page that the narrow pieces are placed on the base first, then the wider pieces on top. Align the parts carefully, clamp them in position and drill four body holes for 3/16-in. rivets. Countersink the holes from both sides. After riveting the pieces in place file the peened ends of the rivets flush. Cut the movable jaw to length, blind-drill from one face for the shouldered end of the vise screw and drill ⅛-in. holes for the retaining pins. The lug, or T-slide, on the lower edge of the movable jaw is attached with two flat-headed machine screws and consists of two short pieces of flat steel 1¼ in. long and ½ and ⅞ in. wide. Light filing may be necessary to assure that the jaw will slide smoothly in the T-slot formed in the base. Next, lay out and drill holes in the base for the screws that hold the fixed jaw and the vise-screw block. Drill and tap blind holes in these parts for the threaded ends of the screws. Countersink the holes in the base, and drill and tap the screw block for the vise screw. The screw is shouldered, grooved for the retaining pins and threaded in the lathe from ¾-in. cold-rolled stock. Make the screw handle by shouldering a 3-in. length of ⅜-in. rod to form one cap. Thread the small end of the rod and then turn, drill and tap a separate piece for the removable cap as shown. Turn the screw through the screw block, and bring up the movable jaw so that the shouldered end of the screw enters the blind hole. Then drive in the retaining pins. If desired, a V-groove can be milled in the fixed jaw before assembly. You can have this job done at a local machine shop. With the fixed jaw V-grooved the vise will hold either round or square work. By grinding one side of the vise at right angles, it also can be used in the vertical position.

Slipping of Compass on Sheet Metal Prevented by Placing Point in Wax

When drawing circles on sheet metal or other hard surfaces the difficulty of preventing the compass point from slipping can be avoided with a drop of wax. Melt the wax and drop it directly over the mark where the stationary leg of the compass is to be placed. When pushed into the wax, the point of the compass will not slip and the wax can be removed easily when the job has been finished.

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

Tool-Kit Oilcan Kept From Leaking With Cork Stopper

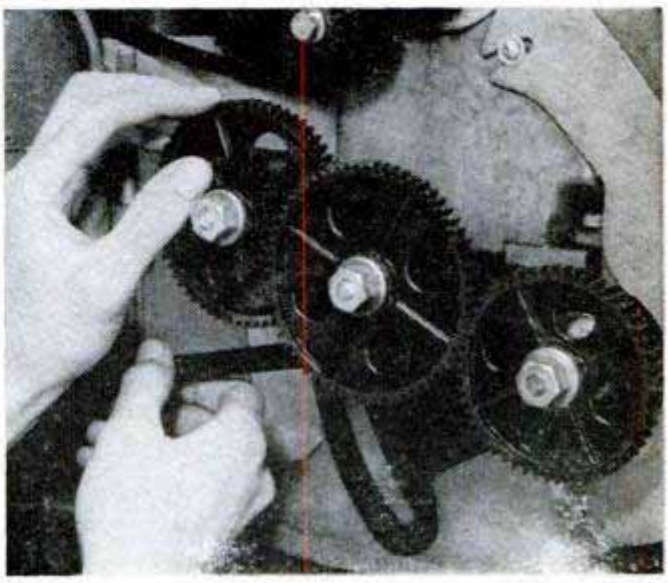
An oilcan that is carried in a tool kit can be kept from leaking if accidentally tipped over, by removing the spout from the can and inserting a cork stopper in the large end of the spout before replacing. If desired, the stopper can be inserted in the bottom part of the oilcan and the spout left off to provide more room in the tool kit.

L. H. Hubbard, Hartford, Conn.

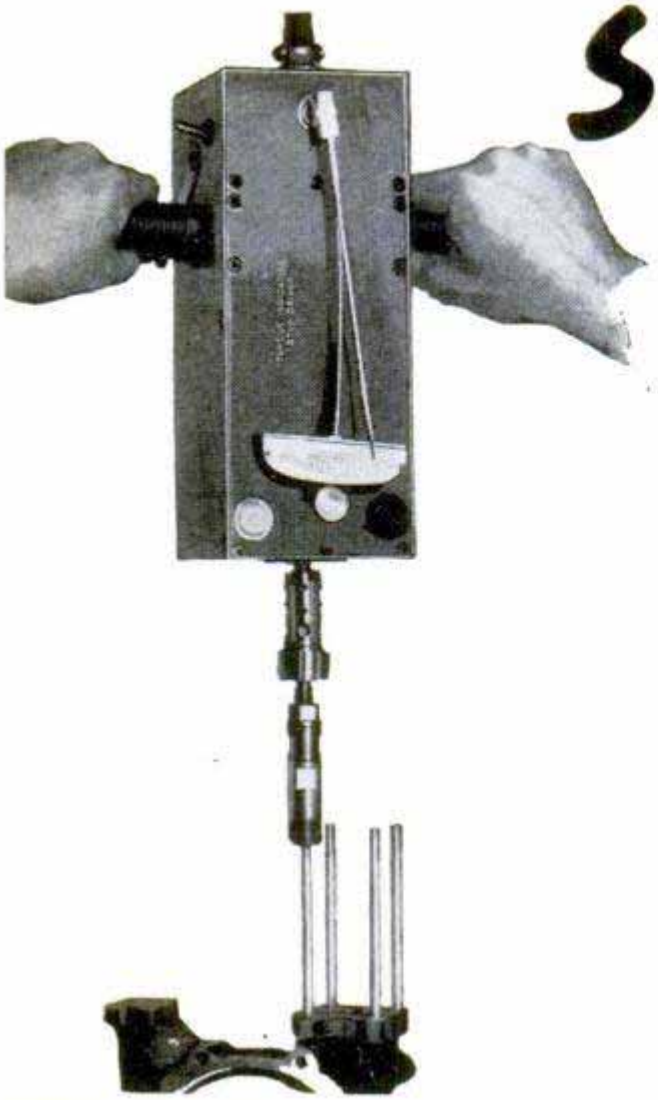
Preventing Lathe-Gear Wear

If a considerable amount of work is done on a screw-cutting lathe without use of the power feed, wear on the gear train, as well as any distracting noise it may make, can be avoided simply by disengaging the gear train. Usually, all that is necessary is to loosen a clamp nut on the gear bracket.

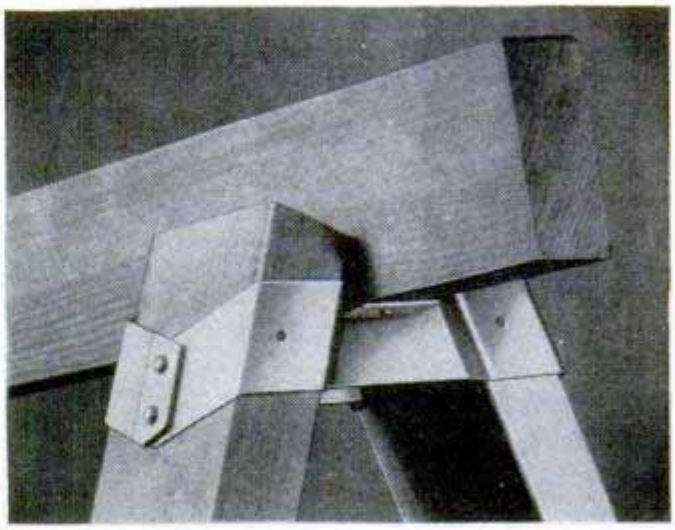
Henry Hanscom, Elmhurst, Ill.



SHOPPING

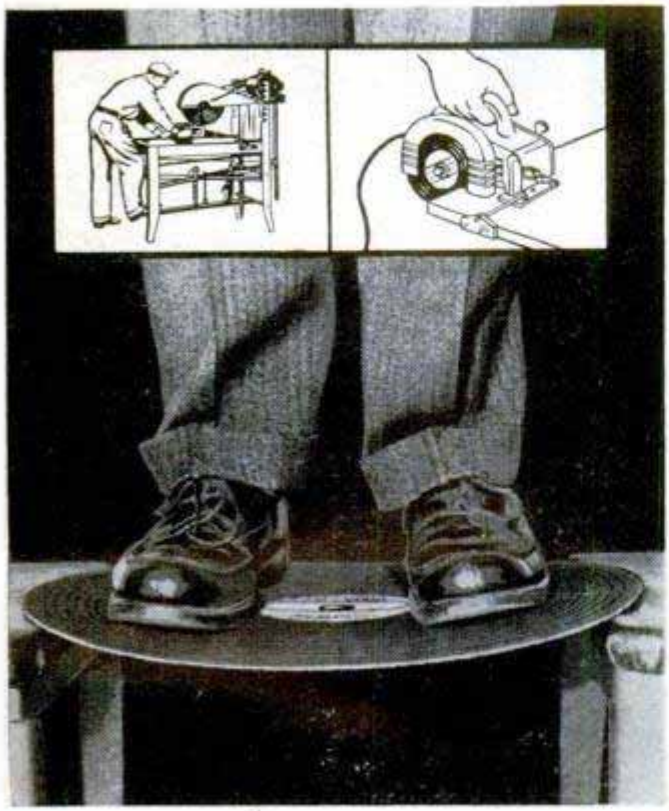


TORQUE-INDICATING DRIVER, above, automatically measures torque when driving studs, nuts, screws and fasteners. In operation, minimum torque is indicated by wrench and also by a green light. Maximum torque is indicated by wrench and a red light. Lights and torque scale are located on front of unit where they are easily seen by operator. Small sizes are portable



SAWHORSE BRACKETS, above, enable carpenters, bricklayers, painters and others to build sturdy sawhorses right on the job. After cutting ordinary 2 x 4s to required lengths for legs and horizontal members, each horse is set up simply by tapping wooden members in place in the brackets. Each bracket is formed from heavy sheet metal, zinc-coated to prevent rusting, and is designed to dissipate stresses uniformly. Builders who make sawhorses suited to each job find that these units save time, labor and material on job

DOUBLE-WELDED POWER-HACKSAW BLADE, above, combines outstanding performance with safety in high-speed production when cutting tough materials. High-speed-steel cutting edge is welded to a medium-hard-steel center. Latter is then welded to a tough steel back. This multiple-part construction results in a blade having extremely high impact resistance and one that is practically shatterproof. Comes in standard power-hacksaw sizes with 4, 6 or 10 teeth per in.



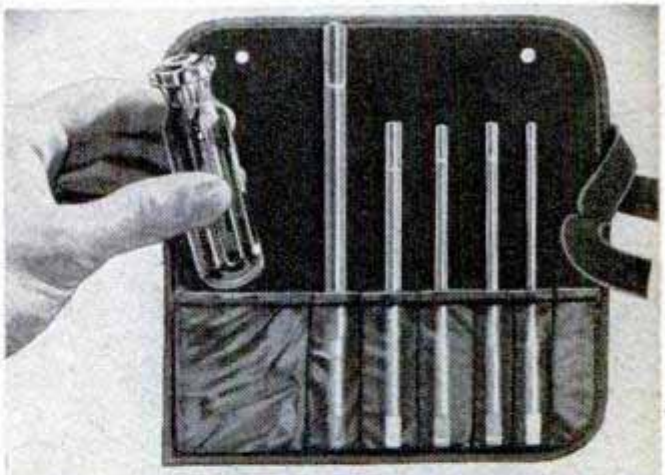
BREAK-RESISTANT ABRASIVE BLADE, left, for cutting masonry materials is built up with a number of layers of glass-fiber cloth which is then impregnated with certain resins and a silicon-carbide abrasive. Designed for cutting the softer masonry materials such as limestone, sandstone, light-aggregate concrete products and dry-press refractories, the blade gives outstanding efficiency when used on builders' power saws, either of the hand-operated or the radial types

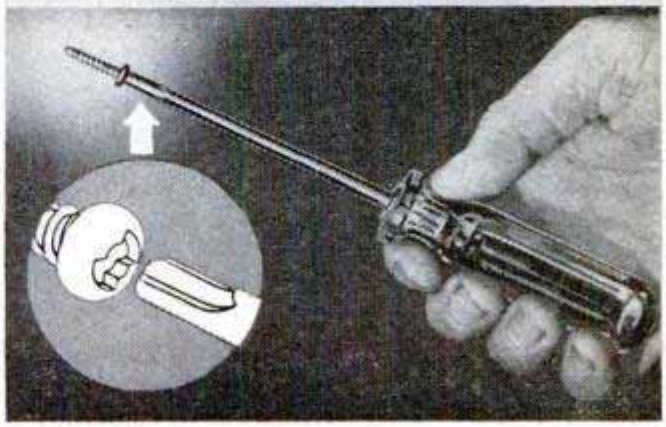
FOR TOOLS

ALIGNER FOR TAPS AND REAMERS, above, prevents breakage of tools in hand-tapping and reaming operations. The aligner acts as a jig, maintaining positive alignment with the hole. Unit consists of guide base and sliding tap holder which is hardened and ground to accurate fit in base. Guide base is ground square with sleeve to hold tap true

ONE-HALF-TON WINCH, above, is powered by an electric drill of 1-in. capacity. Winch is fitted with a special holder which supports the drill rigidly while it is serving as the drive. The winch is designed for either permanent mounting or for use as a portable unit and is suited to one-man operation. Lifts a 1000-lb. load at the rate of 10 ft. per minute. Winding drum is provided with a hand brake that gives the operator safe control of the load when raising or lowering

POWER-GRIP WRENCH, above, of unusual design is operated in a manner similar to pliers. A simple rack arrangement provides for adjustment of jaws for different openings. Compressing handles exerts pressure on the lower jaw which slides on the upper fixed jaw. Pressure on the handles is multiplied by a camming device, giving the lower jaw a very powerful grip on the work. Tightens or loosens square or hex nuts, also holds round, hexagon and other shapes firmly





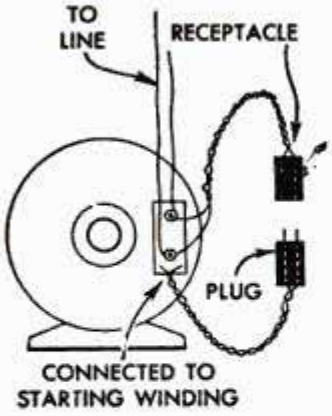
SERVICEMAN'S KIT, right, for driving the new clutch-head screws has five interchangeable blades which fit a single clutch-type handle of durable plastic. The larger blade has a flat ground near the upper end so that a small wrench may be used to supplement the regular handle when removing large clutch-head screws found on steering-post supports and on door hinges of certain late-model cars. The kit is furnished with an imitation-leather tool roll

Large-Capacity Stock Feeders Improvised From Scrap Parts

By utilizing parts from a scrap pile, one stock raiser made three, large-capacity, portable stock feeders at practically no expense. One was made by cutting the hub and spokes out of a rear wheel from a tractor. One side of the wheel was covered with boards to serve as a floor, and steel runners were formed from pieces of auto chassis and welded to the wheel. Two more feeders were made by cutting a water-storage tank in half lengthwise and welding chassis-formed skids to each half.

Simple Reversing Switch For Small Motors

Here is a simple means of providing a switch to reverse small motors of split-phase or capacitor type. The leads to the starting winding are connected to a standard attachment plug and a short extension cord, with receptacle for the plug, is connected to the motor terminals. To reverse the motor, simply reverse the attachment plug in the receptacle. If a neater job is desired, the receptacle may be bolted to the terminal cover plate on the motor.

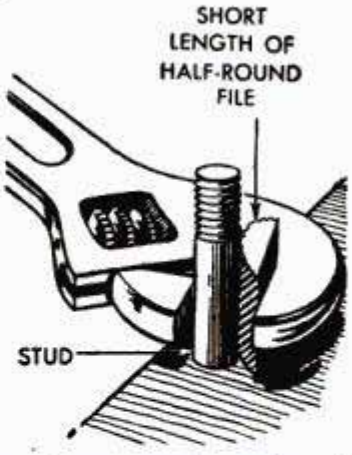


L. O. Hendry, Rockyford, Alta., Can.

¶If forced to stop your car on a highway after dark, use the turn signal as a warning flasher. It can be seen more easily than a steady light.

Section of Half-Round File Makes Emergency Stud Puller

In the absence of a stud remover or a pipe wrench, studs can be turned out of a motor block by using an adjustable wrench and a short length of half-round mill file. The piece of file is placed on end next to the stud, with the teeth of the file against the stud. Then the wrench is closed over both the file and the stud, as shown. When the wrench is turned, the round surface of the file tends to "climb" on the stud and thus becomes a wedge between the stud and the wrench, the teeth of the file furnishing the necessary friction to turn the stud. In some cases, a full length file can be used in this manner.



Hidden Trap Outwits Rats

When setting steel rattraps, they can be concealed from the rodents by the following method: Pour wheat or oats in a pail to a depth of 2 in. and place it in an area frequented by the rats. Leave it undisturbed until it can be seen that the rats have been helping themselves to the grain. Then, without moving the pail, set a trap and place it in the pail, covering it lightly with the grain. Proper springing will be assured if a wad of cotton is placed under the pan of the trap after setting.

STEEL TRAP COVERED WITH GRAIN

Renewing Typewriter Ribbon

An old typewriter ribbon can be renewed by utilizing the ink that it retains near the edges. To spread this ink through the ribbon, rub glycerin on the inside surfaces at the top and bottom of a ribbon can and place the ribbon in it. After several weeks have passed, the ribbon will be reconditioned and ready for added use. The process can be hastened by heating the can and ribbon for a few minutes in a warm oven.

Mrs. Hannah L. Miller, Philadelphia, Pa.

CAR-HOP ORDERS SPEEDED BY WALKIE-TALKIE

SHORT ORDERS by short wave enables two girl car hops in Milwaukee to do the work formerly done by five girls taking orders with pad and pencil. Equipped with 8-lb. walkie-talkie radios, these girls circulate among the customers in a 136-car drive-in parking lot. The drive-in customer makes selections from an attractive walkie-talkie menu; the car hop writes the order on a special order blank, gives the customer a copy and then broadcasts the order to a girl dispatcher in the firm's kitchen, as illustrated in photos A, B and C. She then places a key car number on the customer's windshield, corresponding to the order number broadcast.

The dispatcher in the kitchen writes down the order, tears off a slip at the bottom, noting the car number, price of order, etc. Three delivery girls who take the orders to the designated cars present the slip for payment. Meanwhile the attractive car hops are busy taking orders from other customers. The Federal Communications Commission has designated station KA 8931 for the Ace Foods, Inc. This broadcasting system includes two mobile sets and a control dispatcher.

Up to 950 customers are served nightly from 5:00 p.m. to midnight on the drive-in parking lot, photo D. This is about a 30-percent increase over the old system.

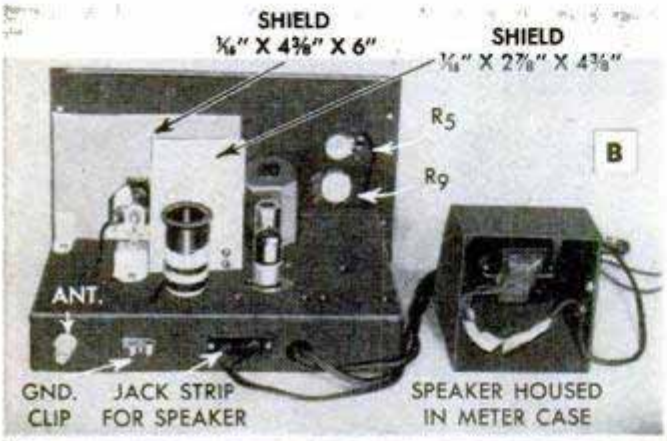
A

B

C

D

BATTERY-OPERATED FIVE-BAND RECEIVER



THIS MULTIBAND battery-operated receiver is set No. 2 in the progressive series for experimenters that began in the May 1951 issue. Practically all of the same parts can be employed, with additions. This final No. 2 receiver is a complete unit in every detail. Therefore, it is not necessary to build the first set unless you wish to do so as a student project.

Battery-operated radio receivers are in demand today. The main reason, of course, is the fact that battery sets are independent of power lines, a necessary factor stressed by those planning civil-defense programs. This receiver is especially designed for advancing experimenters and purposely employs hand-wound plug-in coils for this reason. Plug-in coils are highly efficient in short-wave receivers, and they are not difficult to wind. This is an excellent DX short-wave student set and can be used almost anywhere as the 1½-volt A-battery and 90-volt B-batteries are self-contained.

If you built the May 1951 two-tube set, R-400 in this series, remove all previous wiring and drill the new holes required for mounting the additional tubes and parts. Complete chassis-base and front-panel details are shown in Fig. 3. Note that the small variable condensers C11 and C12 shown in circuit diagram, Fig. 2, serve for

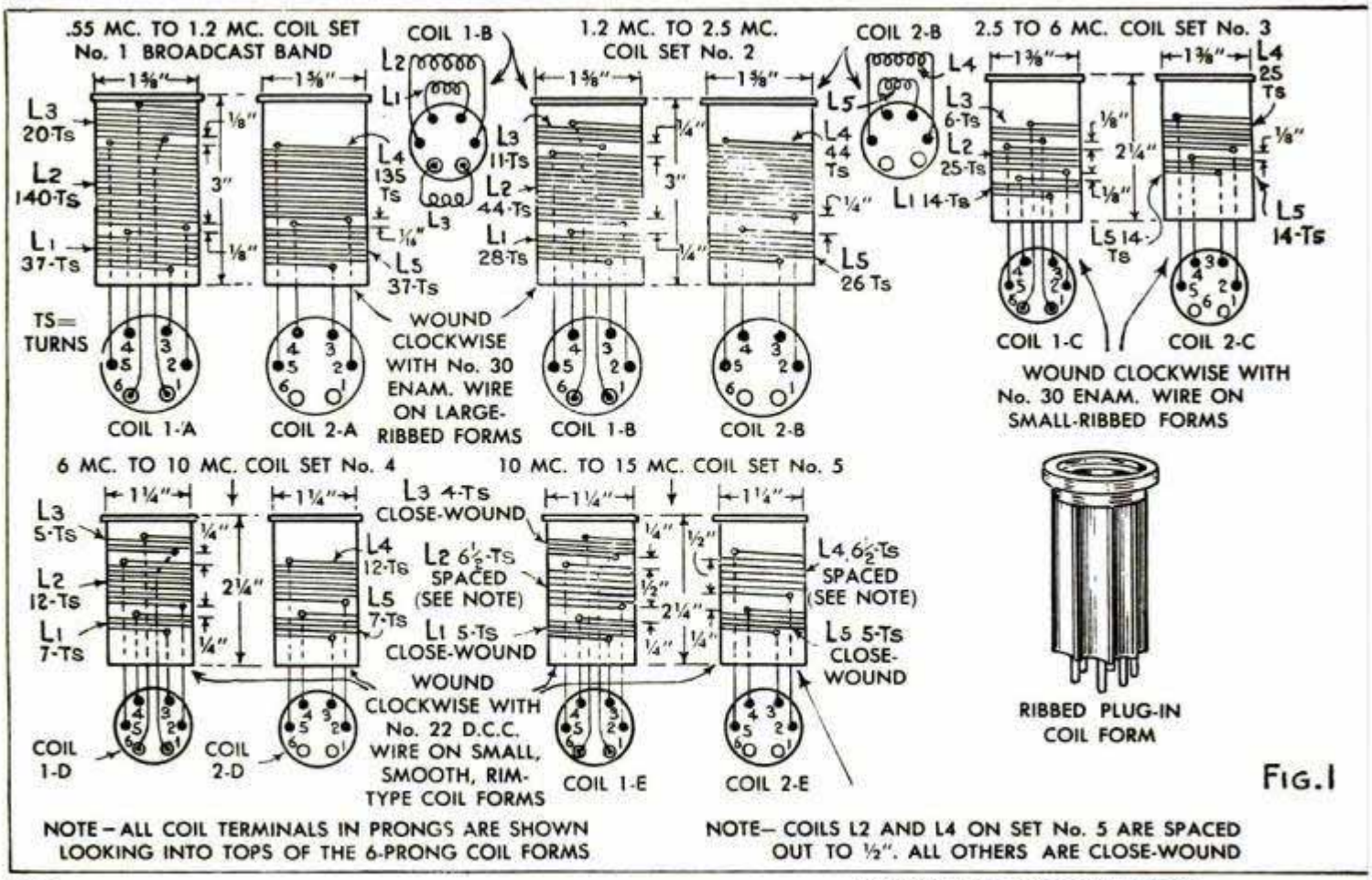
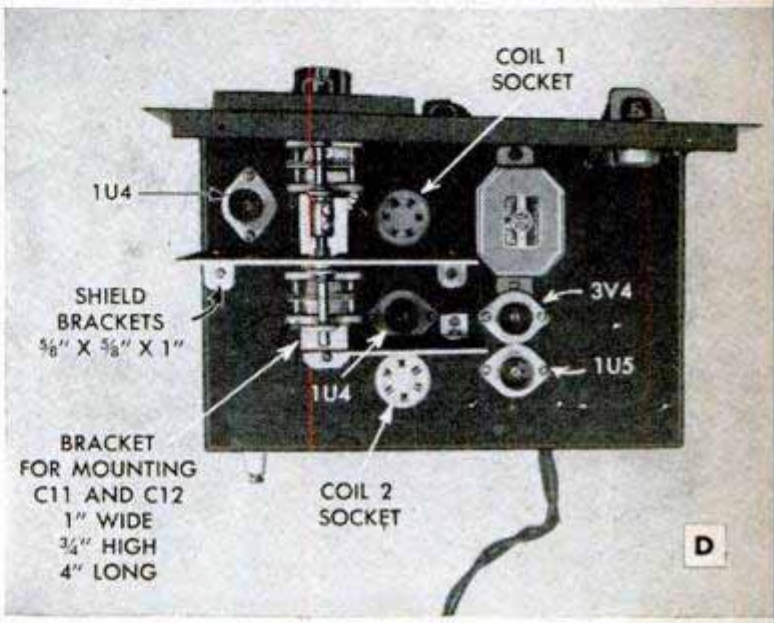


FIG. 1

FOR EXPERIMENTERS

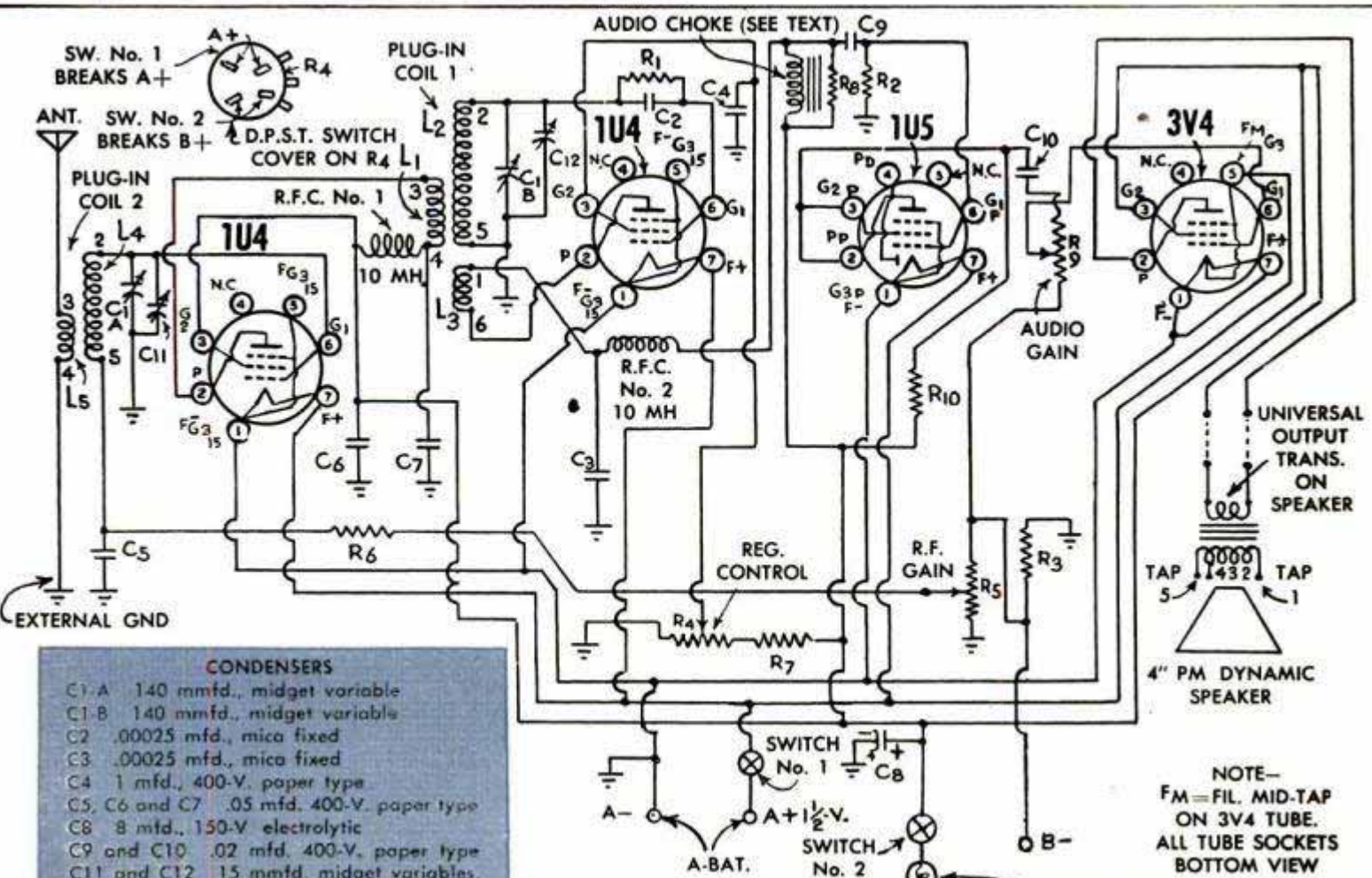
bandspread tuning. Photos D, G and H show these condensers mounted on a small metal strip on top of the chassis base. This bracket strip, indicated in photo D, raises them clear of the chassis and places them in the proper position. The bandspread dial is a vernier type, which simplifies tuning on the short-wave bands. Wiring is not difficult but should be done very carefully, keeping all leads as short as possible. The audio choke is the same as the one used in the first set; it can be any 500-hy. type such as the UTC S-23 or a similar unit. Any standard 3 to 1 ratio audio transformer can be substituted by connecting the primary and secondary windings in series.

All of the plug-in coils are clearly detailed in Fig. 1; they cover all bands from .55 megacycles to 15 megacycles, thus including the standard broadcast band and



RESISTORS

R1 = 2-megohm, ½-watt carbon
R2 = .5-megohm, ½-watt carbon
R3 = 470-ohm, ½-watt carbon
R4 = 50,000-ohm volume control, linear taper, with D.P.S.T. switch cover
R5 = 50,000-ohm, R.F. gain control, linear taper
R6 = 100,000-ohm, ½-watt carbon
R7 = 30,000-ohm, ½-watt carbon
R8 = 250,000-ohm, ½-watt carbon
R9 = 500,000-ohm, volume control, audio taper
R10 = .5 megohm, ½-watt carbon



CONDENSERS

C1-A 140 mmfd., midget variable
C1-B 140 mmfd., midget variable
C2 .00025 mfd., mica fixed
C3 .00025 mfd., mica fixed
C4 1 mfd., 400-V. paper type
C5, C6 and C7 .05 mfd. 400-V. paper type
C8 8 mfd., 150-V electrolytic
C9 and C10 .02 mfd. 400-V. paper type
C11 and C12 15 mmfd. midget variables

NOTE—
FM = FIL. MID-TAP ON 3V4 TUBE.
ALL TUBE SOCKETS BOTTOM VIEW

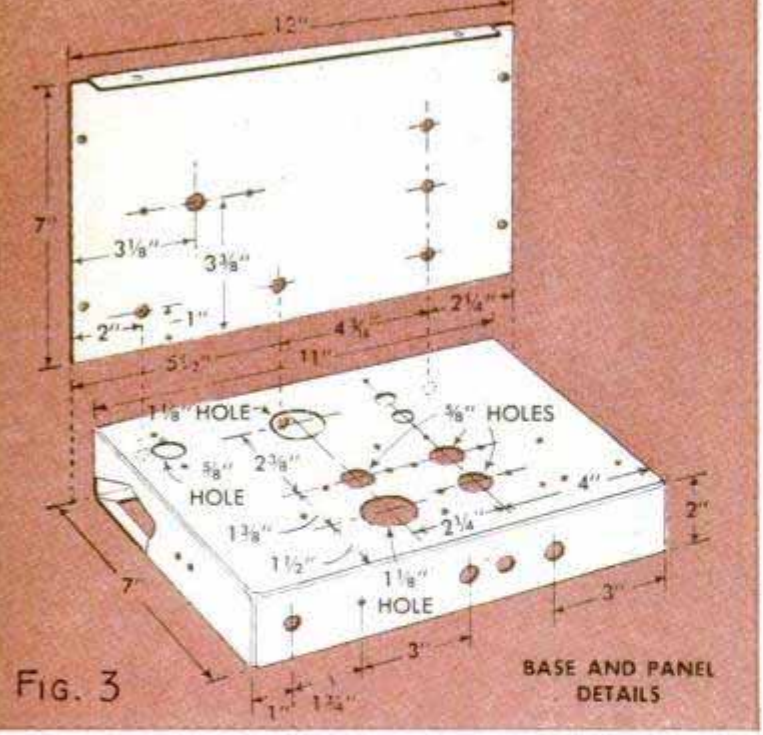
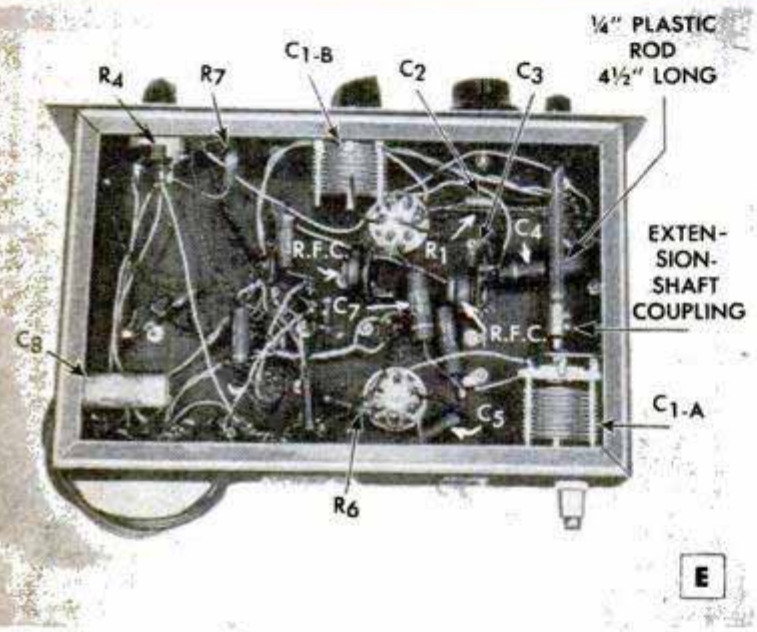
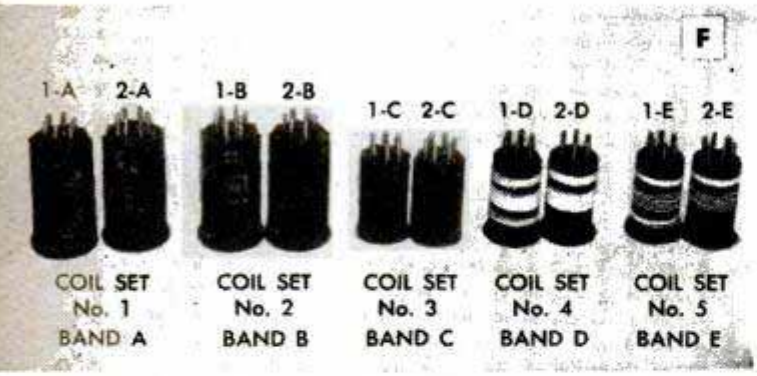
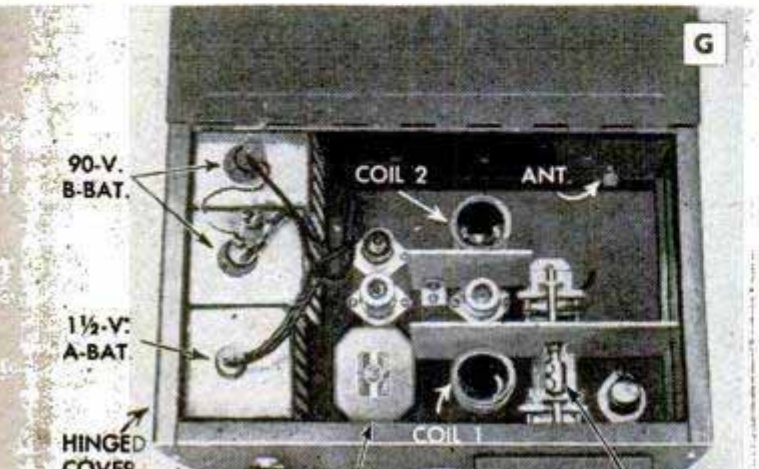


FIG. 3

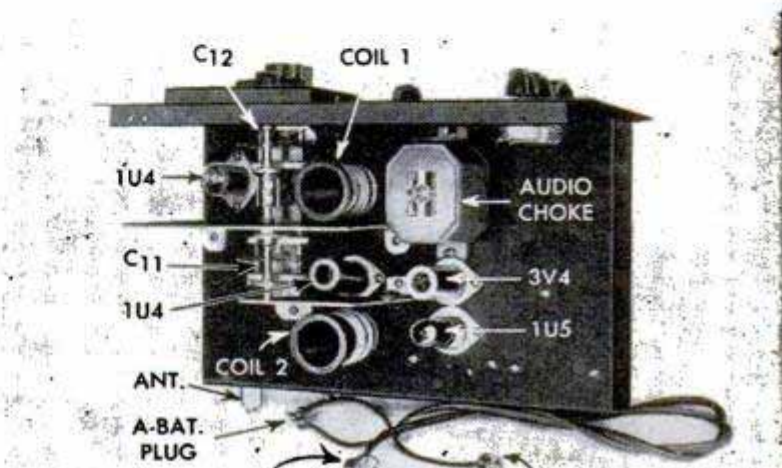






the important short-wave bands. There are 10 plug-in coils, and two of them are used for each band covered. Each pair is made up in the same way although different sizes of coil forms and windings are employed. The completed receiver fits into a standard hinged-lid metal cabinet which is available from all large radio-parts houses. All parts specified are standard and easily obtained. Having the small speaker as a separate unit eliminates microphonic troubles, and also makes it possible to plug in headphones. The speaker and its output transformer can be mounted in any small wood or metal case. In order to keep the coil winding simple, no effort was made to gang the tuning of the larger variable condensers C1-A and C1-B. Therefore, on the broadcast band, stations should be selected by rotating C1-B and then peaking the station up with C1-A, the R.F. peaking control indicated in photos A and E. The regeneration control is advanced far enough to hear the whistle as the station is tuned in, then is backed off until the signal is clear. The other two controls are audio and R.F. gain. Be sure to use the shields indicated in photo B, and also use tube shields on tubes 1U4 and 3V4 as shown in the top-view photos G and H.

Tuning on the short-wave bands is easy. Set the bandsetting condenser to about the center of the band that is to be covered, and turn peaking control knob for maximum signal. Then do all fine tuning with the main tuning dial. Once the band has been set, only a slight adjustment of the regeneration control is required. The R.F. gain control is useful if you have strong stations near by. It can be backed off to prevent overloading. Use a short indoor antenna for local broadcast-band reception, then shift to a high outdoor antenna for short wave. The use of the external ground will depend upon local conditions. It will increase sensitivity but will reduce selectivity in the broadcast band. The ground clip is mounted directly on the chassis base at rear. Detailed student material list R-405 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

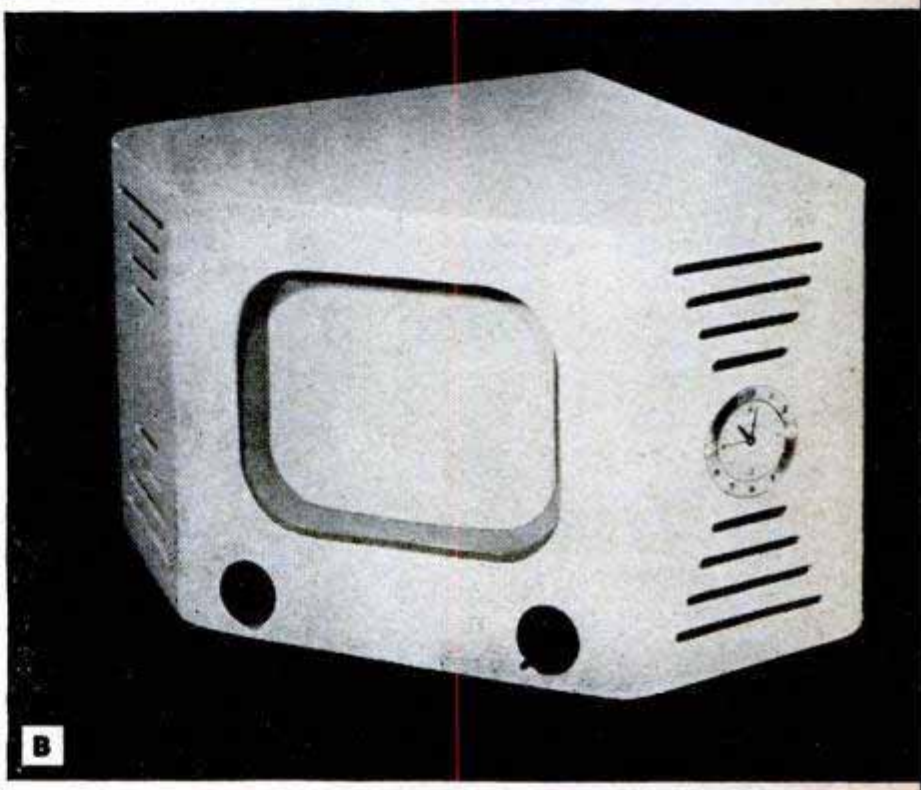


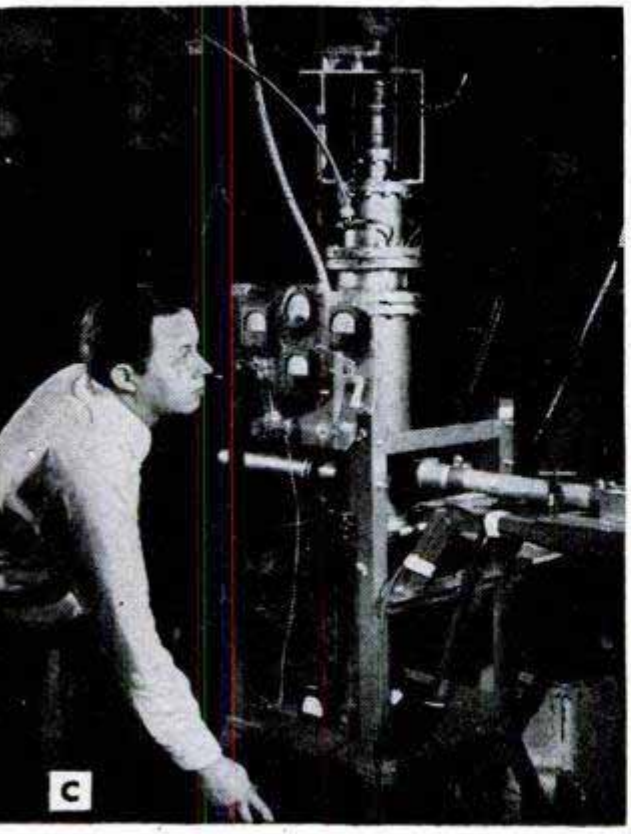
TELEVISION TODAY

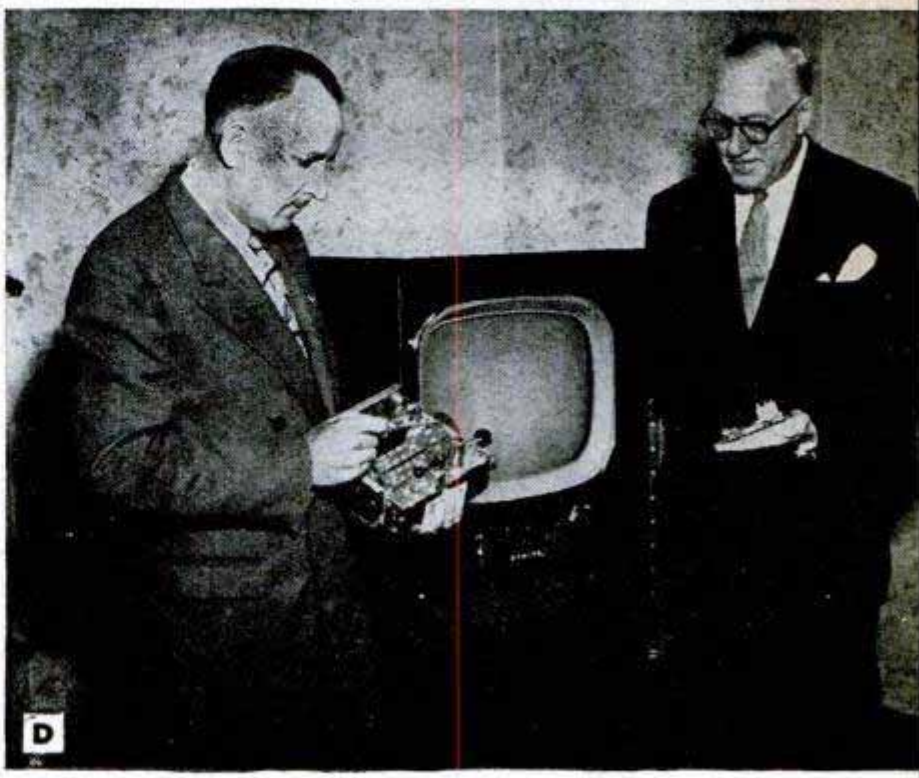
NATURALLY, if we expect mother to stay in the kitchen long enough to get hot meals, we should provide her with a television receiver like the one shown in photos A and B. This special-purpose TV set solves installation problems in small apartments and is shaped to fit into any convenient corner. Some of these ultramodern TV sets include an electric clock, as illustrated in photo B.

A war-born electronic tube, once used to jam German radar units, is now being groomed to serve as a high-power transmitter for color television. Photo C shows one of the Westinghouse research-laboratory physicists testing the tube which is called a reflex Resnatron. Although still in the laboratory stage, scientists claim that it will provide greater range and better reception for ultra-high-frequency (UHF) broadcasts, particularly in the field of color television. In laboratory trials, the tube has already delivered approximately 1500 watts of power. Also looking forward to UHF-TV broadcasts in the near future, the Zenith officials shown in photo D recently demonstrated their easily converted turret tuner that has been built into all of their television receivers.

A


B


C


D

HOW TO PUT YOUR NOVICE-BAND STATION ON THE AIR

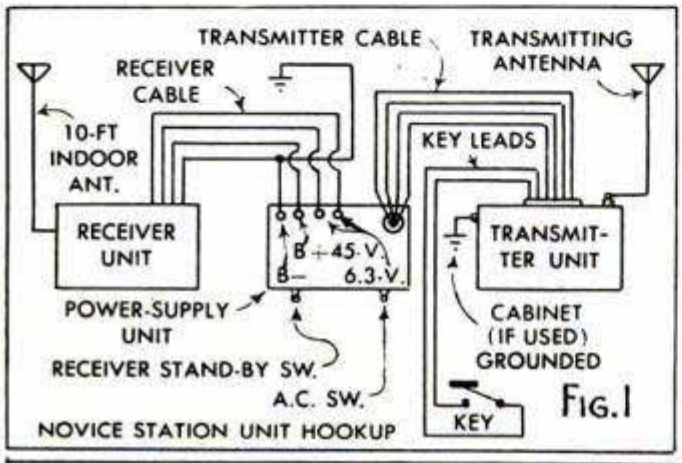


FIG. 1
NOVICE STATION UNIT HOOKUP

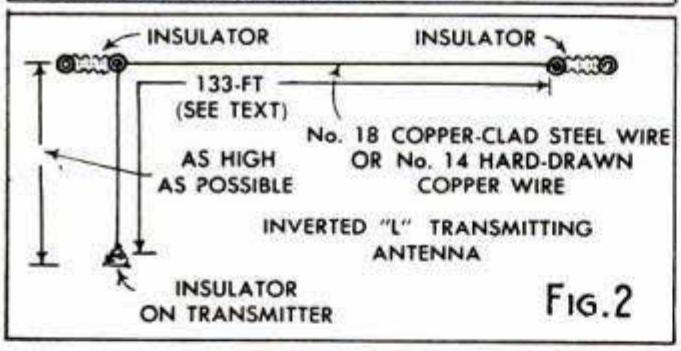


FIG. 2

By S. A. Johnson WØLBV

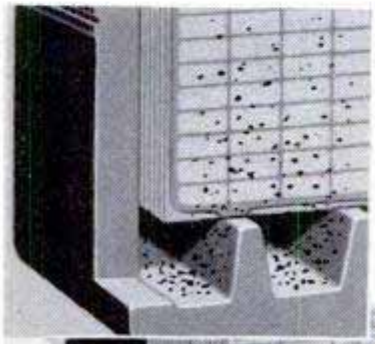
Part II

NOW THAT the proud holder of a license to operate in the new novice ham band has completed the transmitter R-404 described in the October 1951 issue of this magazine, he is ready to assemble his amateur radio station. A suitable receiver for this new novice ham band appeared in the September 1951 issue. These combine to form a complete novice-band ham station.

When the complete station is assembled, the power supply for the receiver is obtained from the transmitter power-supply unit; a stand-by switch on the power unit cuts the negative-B supply to the receiver to silence it while the operator is transmitting. The station assembly is shown in Fig. 1. The operating table should be placed near a window so that it will be easy to connect to the transmitting antenna. The receiving antenna can be a short (10 or 15-ft.) length of insulated hookup wire attached to the wall of the room with cellulose tape. The receiver referred to is R-403.

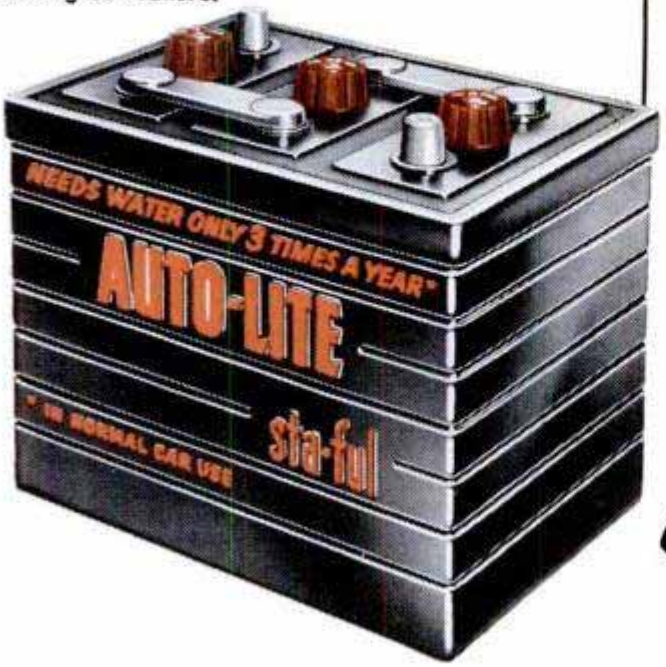
An ideal transmitting antenna for this particular transmitter is the one detailed in Fig. 2. If this is not possible on account of space, the wire can be as short as 66 ft. For best results a good ground is highly important. It can be made on a cold-water pipe, or by driving a row of 6-ft. rods along the shaded side of the house and then connecting them all together. The antenna wire should be No. 18 copper-clad steel wire, or No. 14 hard-drawn copper. Bring the lead-in through a porcelain or polystyrene tube inserted in a hole drilled through a board placed under the window sash. Now with the power unit, transmitter and key connected, and the receiver cut off with the stand-by switch, you are ready to tune the transmitter. Turn the right-hand control on the transmitter to maximum capacity—then rotate the left-hand control. The dial light on the transmitter will go out at some point in the dial range. Next, open up the right-hand condenser a small amount at a time — each time "redipping" with the left-hand control. As you slowly open up the right-hand condenser and retune with the left, the transmitter begins to "load up." Eventually a setting will be found at which the bulb only flickers ever so slightly as you tune through resonance with the left-hand condenser. At this point, loading should be sufficient. Now, if the transmitter follows the key as indicated by the panel light, you are on the air and ready to call your first station.

The inside story of your battery- See how it works!

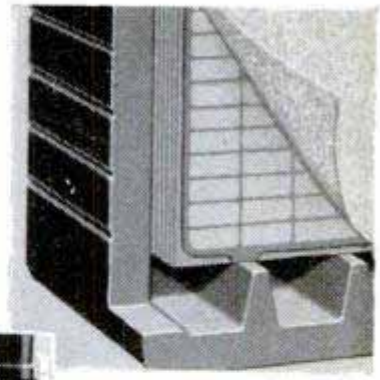


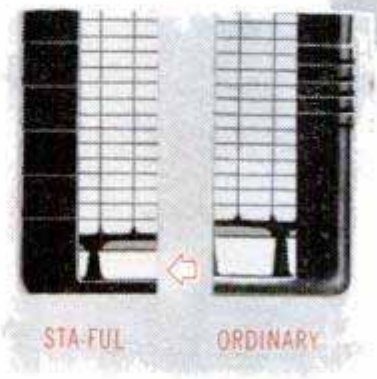
1 In ordinary batteries, small particles keep flaking off positive plates, so ordinary design batteries must have large sediment wells at bottom of case to hold these particles.

2 If sediment wells in ordinary design batteries aren't big enough to hold flaking particles from positive cells, particles pile up and short circuit cells, causing cell failure.

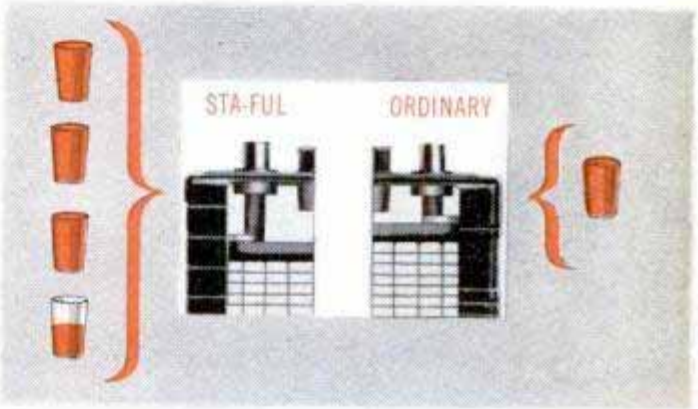


3 In the Auto-Lite "Sta-ful" Battery, every positive plate has a Fibreglass retaining mat protecting it and holding the active materials in place to reduce shedding and flaking.





4 Side-by-side view shows that the "Sta-ful" Battery doesn't need all the extra space at bottom as ordinary design batteries do. So extra space in "Sta-ful" Battery is moved to top where . . .



5 . . . extra space can be used to hold more battery electrolyte, giving room for over 3 *times the liquid reserve* in the "Sta-ful" as in ordinary batteries. That's why the "Sta-ful" needs water only 3 times a year in normal car use. "Sta-ful" Batteries give longer life, too, in tests conducted according to minimum life cycle standards.

AUTO-LITE BATTERY CORPORATION

Toledo 1 Ohio

Auto-lite sta-ful *...needs water only 3 times a year*

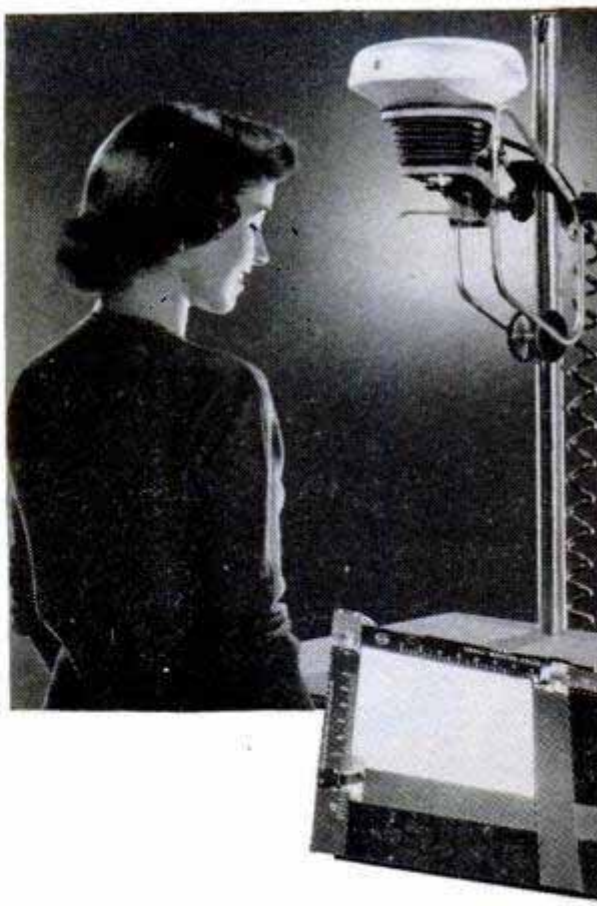
IN NORMAL CAR USE

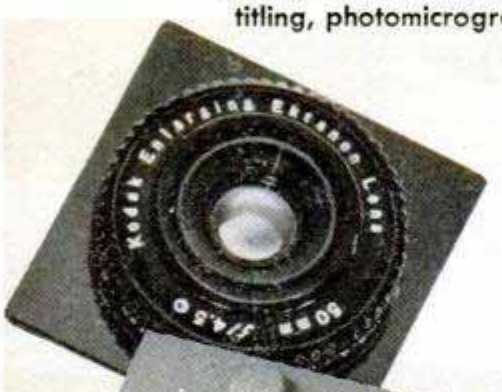
Ideal for beginners—Kodak Hobbyist Enlarger, only $49.50, is offered complete with lens. New cold light protects your negatives—flashes on at the touch of a button attached to the cord. New negative carrier simplifies loading of negatives up to 2¼x3¼ inches. Compact, light, the Hobbyist is ideal for use where space is limited.

HOW TO MAKE DARKROOM DREAMS

Ever daydream about setting up a darkroom? The Kodak equipment shown on these pages can help make those dreams come true. It's such wonderful fun to develop, print, and enlarge your own pictures ... and quite simple, too. And the expense need not be great. Let your Kodak dealer help start you off. Or, if you already have a darkroom, he'll be glad to suggest ways to improve it. His professional knowledge can probably save you time and money in the long run. Be sure to see him soon.

Designed for salon quality—Kodak Flurolite Enlarger gives even, fast, high-contrast illumination with integrating-sphere light source. Focusing and elevating knobs may be used at the same time. Rotary negative carrier for easy loading. Lighttight cabinet in base for paper storage. With accessories, quickly converts to view camera for copying, cine titling, photomicrography. $112.50 (without lens).



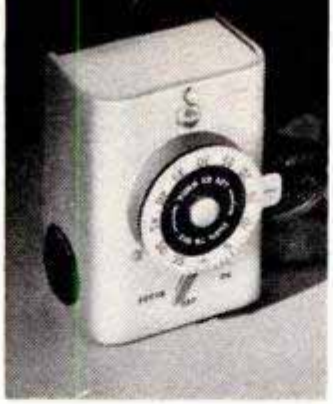


New Kodak Enlarging Ektanon Lens, 50 mm. f/4.5, for the "Flurolite" and other enlargers. All elements are Lumenized. Iris-type diaphragm with click stops down to f/16. $15.75

Other Kodak enlarging lenses for the Flurolite range up to Kodak Enlarging Ektar Lens, 4-in. f/4.5, for negatives up to 2¼x3¼. Prices from $25.75

Kodak Masking Easel, 11x14 masks prints up to 11x14 inches, adjusts for ¼- to ¾-inch margi Design assures right angles, fa itates one-hand loading. $11.25

Time your work up to 60 minutes—Kodak Timer with tilting base. "Start-and-stop" switch permits stopping without resetting hands. $6.75



Controls printing time to the second—Kodak Electric Time Control. Automatic, 1 to 57 seconds. Printer or enlarger plugs into control. $13.50

Keep your hands free—Kodak Utility Footswitch leaves your hands free to handle equipment. Safe neon light glows through slots to mark location. $10

A safelight lamp is a "must"—Popular Kodak Adjustable Safelight Lamp above is $8.25; bracket, $.60. (Brownie Darkroom Lamp, Model B, only $1.15.)

COME TRUE

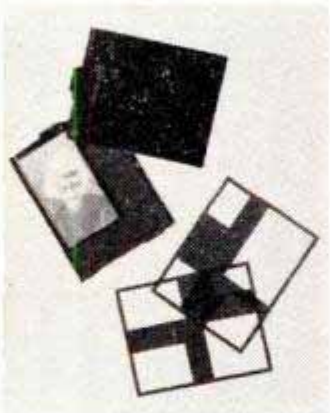
Dry your prints quickly, without curling—The Kodak Blotter Roll allows for free circulation of air for rapid drying. Capacity —60 prints of average size. $2.75

Complete kit for prints, only $4.85—Kodacraft Printing Kit. Trays, printing frame, Velite Paper, chemicals, graduate, thermometer, stirring rod, instruction book.

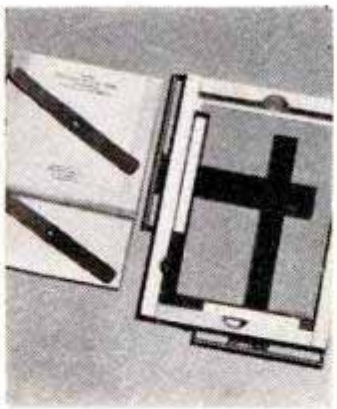
Everything you need to develop and print—Kodacraft Photo-Lab Outfit includes new Kodacraft Roll-Film Tank, trays, printing frame, chemicals. $8.50

Complete outfit, including metal printer and roll-film tank—Kodacraft Advanced Photo-Lab. Also contains everything else included in kits at left. $13.95

For roll-film developing—Kodacraft Roll-Film Tank. After loading, can be used in lighted room. Takes 620, 120, 616, 116, and 127 films. $2.95



For contact printing—Kodacraft Printing Frame. Includes glass plate, masks for 9 popular negative sizes. Accepts paper up to 4¼x5½ in. $1.50



Takes negatives up to 4x5½ in.—Kodak Auto-Mask Printing Frame. Graduated scales on 2 sides give even margins and serve as paper guides. $3.25

Wash film and prints in tray automatically—Kodak Automatic Tray Siphon attaches to water tap. Water is siphoned out at same speed at which it enters. $5.25

Prices subject to change without notice and include Federal Tax where applicable.

Your Kodak dealer will be glad to demonstrate this equipment for you. See him for *all* your photo needs.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Kodak
TRADE-MARK

Care and Feeding of Engines

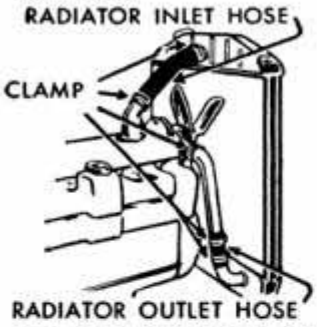
BY S. P. CORP

CARS SOMETIMES LEAK, TOO

Radiator hose leaks can be expensive, if they let your antifreeze escape—or even if they let plain water escape and cause engine damage through overheating. Here's how to check your hose to guard against leaks before winter catches up with you: Grip each section of radiator hose and squeeze it. There are usually three sections. Don't think it is in good shape just because the outside looks good. Hose rots from the inside, due to greasy hot water passing through it. Rotted hose particles flowing into your radiator can clog the water passage. If the hose feels soft when you squeeze it, it probably needs replacing.

REMOVE AND REPLACE WORN HOSE

Drain radiator and loosen hose clamps. If hose sticks to connections, work it back and forth to break it loose. Slide it as far as it will go on one connection, permitting you to remove other end. Look inside. If interior is soft and rusty, it needs to be replaced with new hose.



Be sure you use the same size and length of hose for replacement. Always clean radiator tube while hose is off. Open clamps so they will slip freely over hose; be sure clamp screws turn freely. Wetting hose connections will allow new hose to slip easily over connections. Last but not least, make sure clamps are near end of hose and grip connections firmly all around.

IF YOUR CAR LOAFS TOO MUCH

No pep on a hill? No pick-up on the level? Get new Sealed Power Piston Rings! Sealed Power MD-50, the best steel oil ring ever made, controls oil even in badly tapered and out-of-round bores! Your dealer has Sealed Power Rings or can get them for you. Write to Sealed Power, Dept. G-11, Muskegon, Mich., for free copy of helpful illustrated book, "7 Ways to Save Oil." It can save you real money!

Our Navy Girds for the Atom Age

(Continued from page 85)

air group. Known as the "eyes of the fleet," VC-12 planes are really flying radar stations—probing fingers that can reach far out around the perimeter of a task force at sea and spot not only enemy aircraft but snorkel subs and surface craft as well. Their chief mission is airborne early warning, or AEW. The great bulges, like inverted 10-foot-diameter mushrooms under their bellies, are known to the men as "guppies." They protect highly sensitive radar antennas.

The planes are the biggest single-engine craft in the skies. The AF Guardian, with a load of gasoline, weighs more than a DC-3. Newer ones like the AD Skyraider, and A2D Skyshark, with its three-bladed contrarotating props, are just as big, but faster and more compact.

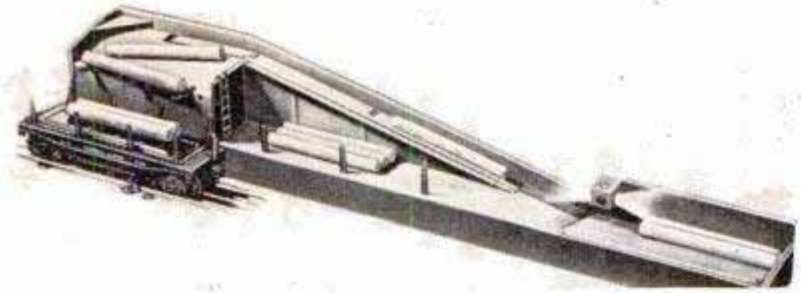
Working off the carriers of a task force, these big planes range out from their mother ships, their scopes aglow in sealed cockpits. Anything that sticks out of the water is spotted and the word immediately relayed to the fleet. Within moments, "killer" planes are zooming from carrier decks toward the "fix."

The pilot is the only one with a view. The radar men are sealed off in a tiny compartment amidships, with little ports that are zippered up in flight. Here they watch the maze of dials and scopes in front of them and acquire what they call "parachute spread." Patrols seldom last less than four hours.

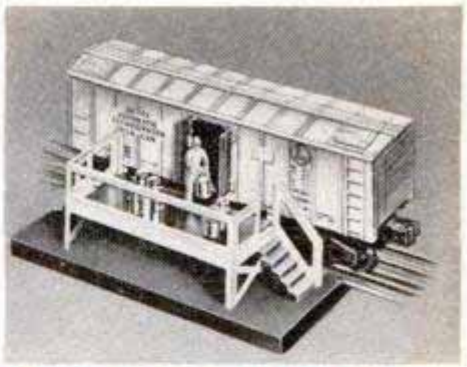
Already these squadrons, operating over Atlantic and Pacific, have proved themselves a vital adjunct to "hunter-killer" teams, in which blimps or patrol planes do the sub "spotting" and fleet killer planes move in on the enemy. Radar teams have worked like a charm in the Korean conflict and are being studied for use in the air-defense net of the U.S.A.

They have other uses, too. Since big storms show up on their scopes, they can help task forces to avoid such areas. They've even been responsible for some startling rescues. Recently, a torpedo-bomber pilot flying a mission on a stormy night lost all power for his lights and radio. He was hopelessly lost over the Atlantic. But a few miles away, a Quonset-trained AEW radar crew, flying routine patrol in their AF Guardian, picked up unanswered radio signals from the carrier to the lost bomber. After an 80-mile search, a wandering "blip" crossed their scopes. The pilot "homed in" on it and, in the black fog, came close enough to see the exhaust

(Continued to page 242)



Push remote control button and conveyor belt starts moving, picking up logs one at a time and raising them slowly to upper platform, from which they tumble automatically over tilting stakes into waiting car. No siding needed!



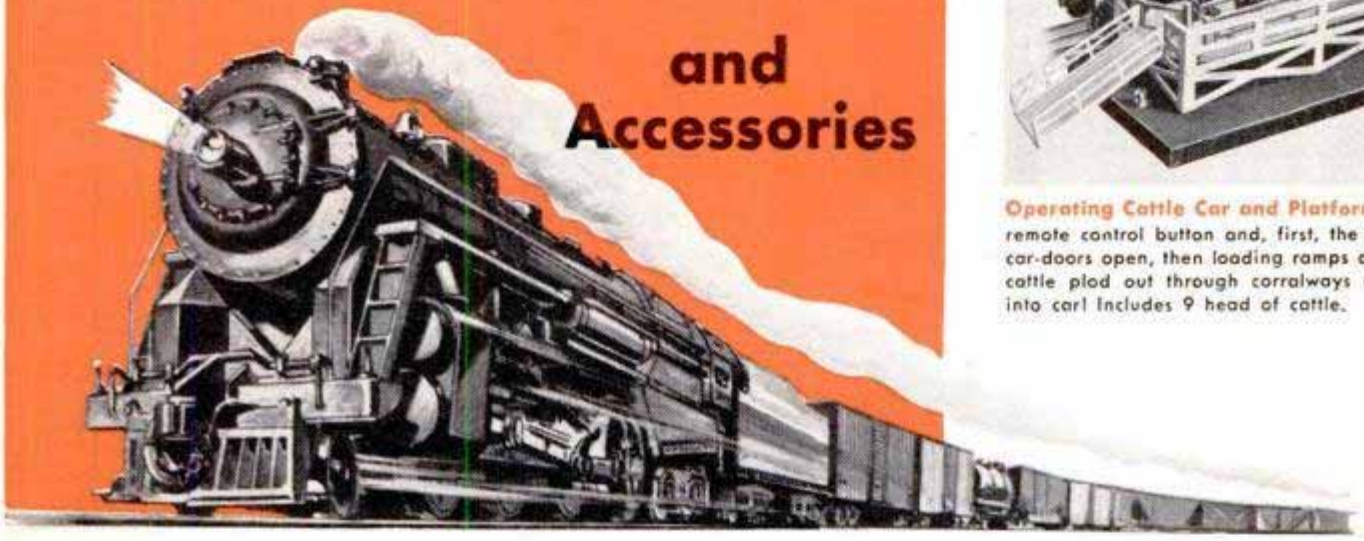
Operating Milk Car and Platform – Press remote control button and doors open, milkman picks up dairy cans one at a time, puts them on platform. (Tiny magnets in bottoms of cans hold them upright!) Pure white car with real "reefer" detail. Stainless steel platform.

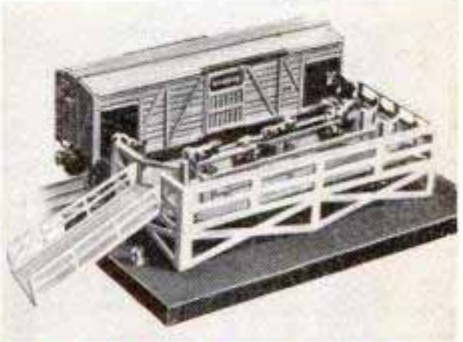
Build a Bigger Railroad...

Real as Life with Your

LIONEL TRAINS

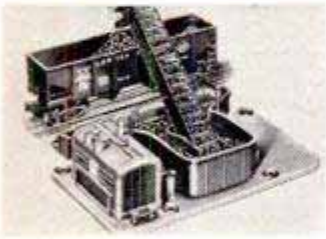
and Accessories





Operating Cattle Car and Platform – Press remote control button and, first, the overhead car-doors open, then loading ramps drop, then cattle plod out through corralways and back into car! Includes 9 head of cattle.

Operating Coal Ramp and Hopper Car – Three remote control operations after you switch hopper car onto ramp! Press first button and train uncouples from hopper car, to roll away. Press second button and hoppers open, coal unloads into bin. Press third button and hopper car uncouples, to roll back to lower track. Includes ramp, hopper, coal.



Diesel Type Operating Coal Loader – Remote control switch loads car with artificial coal carried up in conveyor buckets. Operates anywhere on track, no sidings needed.

SPECIAL COUPON OFFER!

See Lionel trains in the catalogue! Hear them in action!...whistles, bells, horns and railroad sound effects on this record.

LIONEL — FOR REALISM

Build a bigger railroad...add realism, action and thrills — make it complete — with varied and realistic LIONEL accessories. Match the real-life performance of your LIONEL TRAINS with dramatic action all along the way...more fun, more excitement every mile. See these sensationally real LIONEL ACCESSORIES *in action* at your dealer's. Or send for special coupon offer below—New LIONEL catalogue plus R.R. sound effects record plus 10 billboards.

Remember, only LIONEL makes such complete railroading possible. Only LIONEL, makers of the world's finest model trains for 50 years, offers you such a wonderful choice of realistic accessories. Send coupon now.

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Madison Square Station, New York, N. Y.

Please send me special Lionel Train catalogue offer, postage prepaid. I enclose 25¢ to cover postage and packing.

① The new 36-page full-color Lionel catalogue. ② The new 5½" double-faced record* of whistles, bells, railroad sound effects and Diesel horns. ③ 10 full-color miniature billboards.

Name_____

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*Plays on all 78 RPM phonographs except some fixed spindle or automatic changers.

Magic Clips Attach Chains To Auto Wheels Instantly

Pat. Pending

Get Out of Trouble After Your Car is Stuck

On Ice, In Snow, Mud or Sand

An amazing new invention . . . **PRESTO Emergency Tire Chains** are snapped on to wheels **instantly after your car is stuck** . . . not before. This assures a savings in fuel, tire wear and time . . . you drive smoothly along with complete confidence of having efficient traction to **get out of trouble** from wheels spinning next to the curb, in ruts, on ice at intersections, getting up that sloping driveway, off wet and muddy highway shoulders, in mud or snow. Chains are used only when needed and therefore give years of service. There are no straps to tighten . . . no jacking up the car . . . no loss of time, fuel and tires because you can get your car out of trouble instantly, this easy PRESTO way:—

Magic clips are inserted between the tire and rim (like wheel balancers) and chains are attached instantly when needed. Wheels stay in balance and the clips are unnoticed. One box of four Chains (enough for one car) assure trouble-free driving.

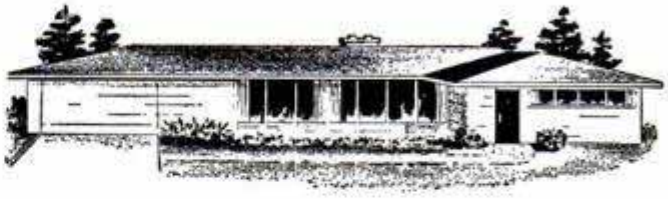
Order direct for two weeks trial on our money-back guarantee of your entire satisfaction. Postage prepaid if payment in full is sent with order, or write for free circular.

No. 1 Size (for one car) fit 5.25 to 7.20 tires, $5.95.
No. 2 Size (for one car) fit 7.60 to 8.20 tires, $6.45.

Dealers, Agents Wanted

PRESTO CHAIN CO. 213 W. 7th St., Des Moines 2, Iowa

Clinic for



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

Repairing Bench Top

Q—I have an old cabinetmaker's bench which I'm planning to use in my home shop. A number of small holes have been drilled in the top. Most of these go only part way through. Apparently they were drilled in the top for holding stops. I'd like to fill these holes, but how? R. S., Ark.

A—You do not describe the bench, but we are assuming it is of the type made with head and tail vises and having an open stand and a heavy top of hard maple or beech. One simple way is to fill the holes with wooden plugs cut from dowels. If the holes to be filled are enlarged or elongated, then it will be necessary to counterbore them with a drill of larger diameter in order to obtain a tight, neat fit of the plug. Of course, plugs made from dowels will finish with the end grain showing. If this is objectionable, use oak boat plugs which are cut with the grain running horizontally. Or, if you have a plug cutter for your drill press, make the plugs from the same wood as that used in the bench top. Coat each plug with thin glue before driving it into the hole. Then refinish the entire bench top by sanding and waxing.

Painting Kitchen

Q—I want to paint the ceiling and walls of my kitchen. I think enamel was used for the last painting and, although rather discolored now, it is still shiny. Will new paint stick to it? How does one start painting a ceiling? Must the walls and ceilings be washed, sized or otherwise treated before painting? N. S., Ore.

A—If the original paint is in good condition and there are no wide or offset cracks in the plaster or wallboard, then it is necessary only to wash both the ceiling and walls before repainting, using a medium to strong washing-powder solution. If a high-gloss enamel has been used, then it also is advisable to go over the whole painted surface with medium (No. 1) steel wool. This will cut the gloss still more than will the washing solution, and will provide a reasonably good foundation for the new paint. If, as we have already said, the original paint, or enamel, is in good condition—that is,

(Continued to page 240)

GET A DU PONT ANTI-FREEZE NOW

. . . but before you put in anti-freeze, have your cooling system checked and serviced

Cooling System Specialists
CARE WILL SAVE YOUR CAR

Go to an expert. The dealer who displays this emblem offers you a *special* winter service. Make a date with him early for anti-freeze and for a thorough cooling system check-up before the anti-freeze rush jams his driveway.

*Reg. U. S. Pat. Off.
†O.P.S. Retail Ceiling Price

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BETTER THINGS FOR BETTER LIVING
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FINISH THAT ATTIC YOURSELF!

with cheerful WESTERN PINES*

ISN'T it about time you did something to that unfinished attic? Sure you can do it—with a little planning and ingenuity, and the help of the popular Western Pines*. Think what it will mean to have that idle space in use—an extra guest room, perhaps, or a bunk bedroom in real western style for your young buckaroos . . . a sewing-room for Sis, or a combined study and platter paradise for the teen-agers.

It's no trick at all to finish off an attic—or basement, for that matter—with paneling and built-ins of easy-to-work, decorative Western Pines*. These soft-textured, fine-grained woods are practical and enduring; they respond to a variety of finishes and endow any room with their own friendly, cheerful charm.

FREE Idea Packet No. 313-N contains scores of helpful how-to-do-it suggestions for reclaiming idle attics or basements for extra living space. Included also is a copy of the colorful booklet, "Enchanting Homes of Western Pines," with 71 illustrations!

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Portland 4, Oregon

These are the Western Pines
*IDAHO WHITE PINE
*PONDEROSA PINE
*SUGAR PINE

(Continued from page 238)

adhering firmly to the surface over the whole area—then it will not be necessary to do any further preparatory work. Nor will it be necessary to apply an undercoater. When painting the ceiling, start in a corner and make two brush strokes at right angles, each stroke about 15 in. long and the full width of the brush along each wall. Then paint in the V-shaped space formed by the two strokes, using a short, curved stroke to spread the paint. This procedure gets the fresh paint away from the corner quickly and out onto the ceiling area without smearing or spattering the paint on the walls or floor. Continue across the ceiling to the opposite wall, covering a strip about 30 in. wide all the way across. When one strip is finished, move back to the starting point. Don't paint another strip in the opposite direction. Always move back to the starting point. In this way you can bring the fresh paint up to the wet edge of the strip previously applied, making it easy to keep the laps brushed out. Once you start painting, on either the ceiling or walls, don't stop until the job is finished. This is the only sure method of avoiding unsightly laps on walls and ceilings. Use an oil-base interior paint of the grade known as semigloss. When covering a lighter or darker color it may be necessary to apply two coats. Be sure the first coat is thoroughly dry before applying the second. Also, it's a good idea to go over the first coat with fine steel wool to smooth the surface.

Cleaning Rush Seats

Q—Recently I purchased several secondhand chairs having rush seats. These were in fairly good condition and I found refinishing them quite easy, except the seats. Several of the rush seats were badly discolored, and so far I have found nothing that will remove the discoloration and restore them to their original color. I was told to use alcohol, but this proved unsatisfactory. It did, however, dull what was left of the original finish. What to do? V. H., Fla.

A—Although you did not describe the chairs, it is probable that inasmuch as you purchased them secondhand, they are quite old. Older rush chair seats were commonly finished with linseed oil applied in several successive coats. In some cases the seating material was finished with linseed oil before weaving. On chair seats finished with linseed oil, alcohol probably would have the effect you describe. If the discoloration is merely caused by embedded grime and is not the result of a stain, then it should be possible to restore the original finish by cleaning with a heavy soapsuds. Build the suds in a pan and apply with a scrubbing brush, dipping the brush in the suds only, not in the water. If more than one application is required, build a new suds for each one, and wipe the surface dry after rinsing with a small quantity of clean water.

Finishing Log Siding

Q—I'm planning a summer home to be built sometime next year. The exterior walls are to be of natural log siding. How can this material be finished to prevent damage from weathering, dampness and insects? S. B., Mich.

A—It is assumed that you are referring to a prepared log siding and that by "natural" you mean that the siding is to be finished in the natural color. It is suggested that you first treat the wood (if it has not already been so processed) with a wood preserver containing the chemical pentachlorophenol. This is available in the ready-mixed form and can be applied to the bare wood with brush or spray, preferably the latter method. Then follow this application with a specially prepared log-siding finish, which also is available in the ready-mixed form. This material leaves a natural finish on redwood, cedar and pine and is resistant to discoloration by weathering over fairly long periods of time.

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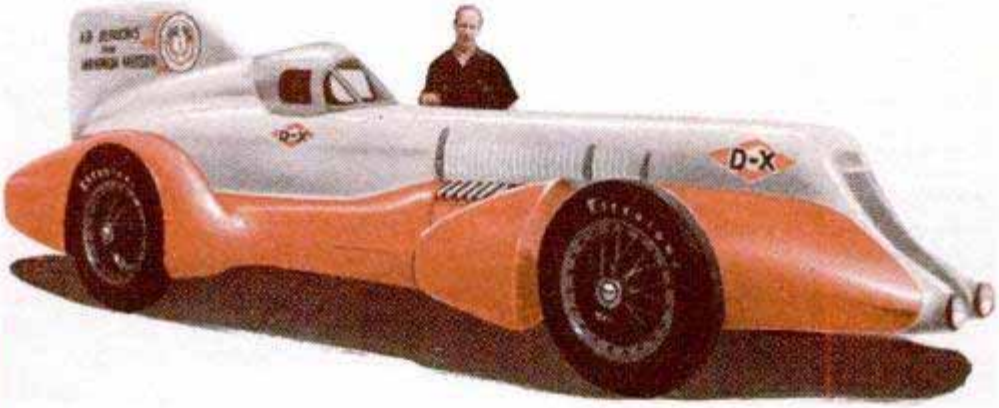
Tells Why He Recommends

Champion Spark Plugs

for Every Engine!

AB JENKINS,
World's Speed King and former Mayor of Salt Lake City, Utah



As the holder of more World and American speed records than any other man, I believe I can speak with authority on spark plugs. In over 30 years of racing against the clock you acquire a lot of practical knowledge about the equipment that will give you top performance and dependability. At 200 miles per hour my spark plugs take more of a beating in an hour than the spark plugs in your car do in over a year's normal driving. From my own experience Champion Spark Plugs have no equal and I've tested them all. I hold hundreds of American and World speed records and just recently added 24 new ones, all made with Champions. I unqualifiedly recommend Champion Spark Plugs. Ab Jenkins

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fire of the blacked-out bomber. Signaling with his own lights, he led the crippled TBM back to the carrier for a landing.

Besides radar planes, other things are afoot. Recently, pedestrians in New Jersey stopped in their tracks to watch the strange antics of a huge Goodyear blimp flying over their heads. The ZPN, with an 875,000-cubic-foot gas envelope and a two-decker, 83-foot control cabin to house its crew of 14, was doing everything but standing on its ear. Despite a heavy wind, it sat and hovered in mid-air, motionless as a rock. It scooted forward, stopped, backed up.

Secret of the blimp's odd behavior was a new propeller, recently designed by Curtiss-Wright for the Navy's lighter-than-air ships which form a vital part of the hunter-killer groups used in spotting and destroying enemy submarines. Known as a "zep-prop," the propeller is a big, hollow, three-bladed affair that swings in a powerful 18-foot arc. On the ZPN, two of them are mounted on outriggers, receiving power through gears and shafts from two 800-horsepower engines housed in the cabin. Either engine can drive both propellers, to conserve fuel on long patrols, or both can be used for higher speeds. Versatility of the propeller lies in its electrically operated transmission, built into the hub. By shifting levers, the pilot can change the angle of the prop blades from high pitch for forward speed, to "neutral" for hovering without shutting off engines, or into "reverse" pitch for slowing down, stopping or backing up.

There are many other Navy answers to any submarine challenge an enemy might throw our way. An entirely new breed of U. S. submarine called the "killer" slid into the water at Groton, Conn., last March. Known as the K-1, the killer is designed for the specific purpose of hunting down and destroying other submarines. Unlike the lean, sharklike proportions of standard fleet subs, she has a stubby, grotesque profile—patterned for underwater speed. Her special snorkel will allow the killer continuous submerged operation. Only 195 feet long (against 311 feet for a standard sub), she displaces 750 tons, as opposed to 1500 tons for the older fleet subs. Her crew of 39 officers and men is less than half the complement of a normal crew. She will wait quietly under the sea, move in on the kill with great stealth, strike like lightning, and escape. She can carry rockets, or a new kind of torpedo that seeks its target. Her sonar "ears" are so sensitive that engineers say they'll pick up the breathing of a crew in a near-by submarine.

Besides the "killer" class, six stubby "trigger" class submarines are now in the

(Continued to page 244)

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in your house

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by doing it yourself

save more

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SPECIAL OCTOBER–NOVEMBER OFFER

$49.50 for a Plankweld wall in Genuine Philippine Mahogany

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water. These are 1600-ton stub-nosed mammoths, with all the latest gear. There's an SST (target) sub of small dimensions for training antisub crews, and a new 250-ton midget sub for experimental work. Some of the new attack subs are powered by revolutionary radial-type diesel engines. Compact, half the weight of former power plants, these 16-cylinder, 2-cycle engines are ideally suited to submarines.

While all this is going on, the Navy is also helping to find a means to power a submarine with nuclear fuel. A nuclear-powered ship, or sub, that could cruise indefinitely without refueling would have a formidable advantage in modern naval warfare. To this end, the Navy has been busy, with industry, in devising a pilot atomic engine that may one day operate submarines of the fleet.

The new all-aluminum PT boat, with a speed considerably faster than the World War II craft, may prove outstanding.

Though the four new craft are called "PT" (for Patrol Torpedo) boats, old PT men would hardly recognize them as sisters to the 80-foot wooden-hulled World War II boats.

The new ones, with lightweight aluminum hulls, part welded and part riveted, range from 95 to 105 feet long. Their torpedoes are bigger and more accurate. Their guns throw an array of bigger and heavier shells, and the power plant below decks includes four aircraft-type engines that will make their top speed faster than any destroyer afloat. Their cruising range far outdistances the old boats.

Unlike the old 80-footers, in which the engineer sat in a sort of tractor seat above one of the engines and shifted gears by hand, an engineer on the new boats has a built-in "office" in the engine room, electrically shifting gears, and a scientifically arranged instrument panel.

One old PT boater who saw the new demons remarked succinctly: "The only thing here that looks like the PT boats I knew is the steering wheel."

And, in a way, that's about how it is with the United States Navy in general today. As far as can be gathered from the meager information released from time to time, our Navy is utilizing every new development on the sea, under the sea, and in the air to insure that we will have a Navy capable of fulfilling its mission.

The opinions expressed in the above article are those of the author and are not to be construed as reflecting the views of the Navy Department or of the Naval service at large.

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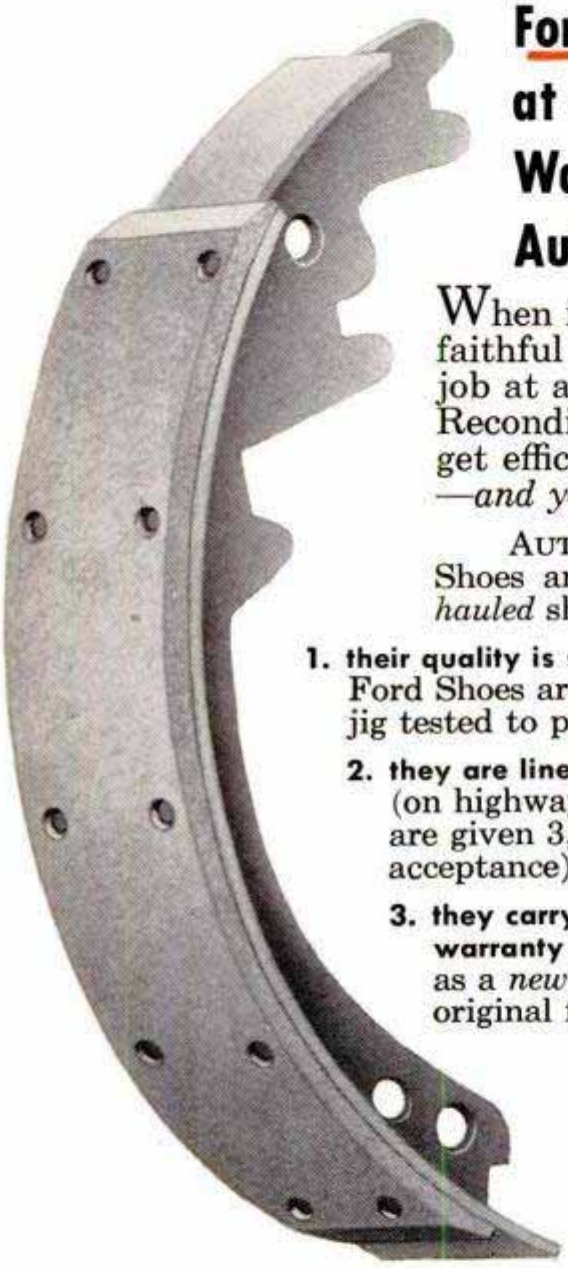

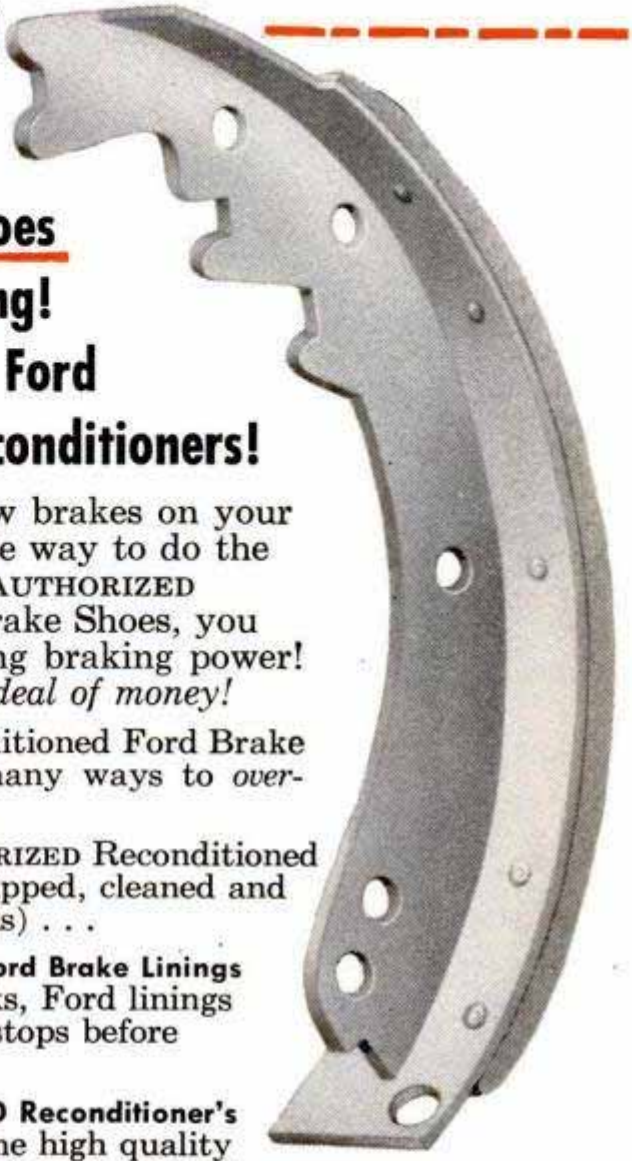

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When it's time for new brakes on your faithful Ford, here's the way to do the job at a saving! With AUTHORIZED Reconditioned Ford Brake Shoes, you get efficient, long-lasting braking power! —*and you save a great deal of money!*

AUTHORIZED Reconditioned Ford Brake Shoes are superior in many ways to *overhauled* shoes:

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3. **they carry the AUTHORIZED Reconditioner's warranty** assuring the same high quality as a *new* shoe (all brake shoe parts meet original factory specifications).

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Save dollars, too, *with other* AUTHORIZED Reconditioned Ford Parts . . . Carburetors . . . Fuel Pumps . . . Distributors . . . Voltage Regulators . . . Generators . . . Starting Motors! All carry Reconditioner's warranty.

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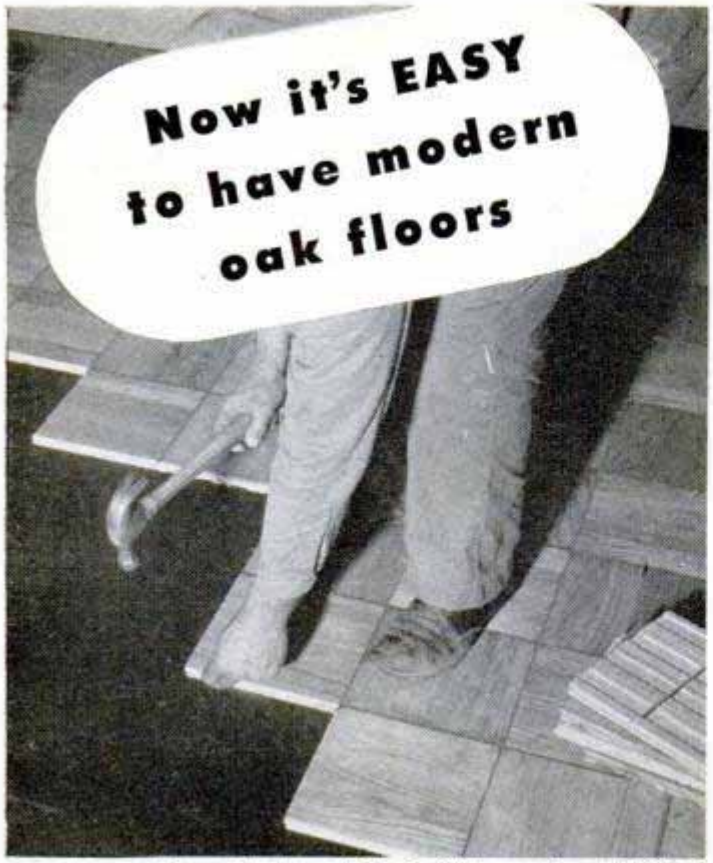
THE BIGGEST RECONDITIONED "PART" OF ALL! An AUTHORIZED Reconditioned Ford Engine has over 150 new or completely reconditioned Genuine Ford Parts . . . gives you new-engine power for about half the cost of a new engine!



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You can give your home new beauty at low cost with a prefinished Bruce Hardwood Floor. Completely finished—even waxed—at the factory, this highest quality oak flooring can be nailed right over old floors. No sanding or finishing . . . no mess or smell. Ready for use as soon as laid. Made in strip or block (parquet) design.

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The "Scratch Test" (left) will prove to you that this durable finish does not scratch or chip or mar like an ordinary floor finish.

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Our Eyes Aloft Spy Out the Enemy

(Continued from page 145)

altitudes, depending on good weather conditions. On many occasions during World War II, areas which were obscured by clouds during the daylight hours were clear for one or two hours at midnight and then the aerial photographers accomplished their job. Night photographs generally are of greater value to the photo interpreter in that they disclose the enemy ship, rail and road movements of troops and equipment, also airdrome activities, bridge and road construction, antiaircraft locations and preparation of his defenses.

Gen. George Patton, on several occasions, forwarded personal letters of thanks to U. S. Air Force night-photographic squadron commanders for supplying him with timely night aerial photographs of the German operations. Strategic photographic-reconnaissance units are mainly concerned with taking night photographs deep in enemy territory of prospective targets, generally of factories, railroad yards, harbor installations and military works. They also take night photographs to show the extent of damage done following strategic bombing operations.

For high and medium-altitude night photography, the Air Force uses flash-powder bombs which are quite similar to the standard types of bombs. As the airplane approaches the area to be photographed, the flash bomb is released, and it explodes approximately at two thirds of the distance to the ground. The flash rapidly reaches peak illumination of over a billion candlepower, which lasts no more than one sixth second. The light from the flash, on its way up to peak illumination strikes a photoelectric cell located in the tail of the aircraft, which, in turn, actuates the special camera shutter, making the exposure and rewinding the film for the next exposure. The bombardier-photographer is only concerned with the release of the bombs over the proper area and at intervals which will produce overlapping aerial photographs so that the interpreter can view them in third dimension.

The Fairchild K-19 night aerial camera, which is equipped with a Kodak Ektar fast f/2.5 lens and high-speed supersensitive film, is entirely automatic and needs no attention during the operation. When the bomb explodes, it is in approximately the same position as the sun when taking daylight pictures. The shadows of buildings and trees are approximately the same, so that it is difficult at times to distinguish between the night and day photographs.

(Continued to page 248)

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No other make of spark plug can offer Chevrolet owners this great engineering advantage.

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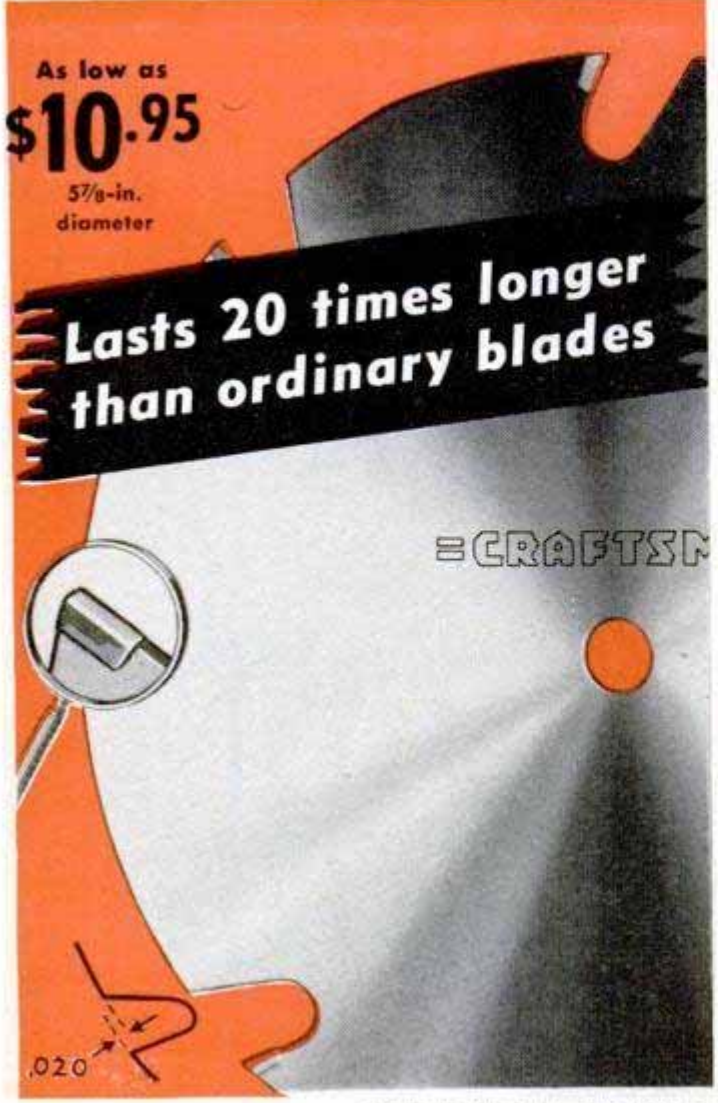

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Don't confuse it with ordinary 8-tooth all-steel blades on the market! Actual tests prove this CRAFTSMAN Saw has a wider range of performance. It's safer, too! The 8 carbide-tipped teeth project only .020 inch above the non-cutting edge. Special saw steel blade, heat treated. Cuts smoother, faster, easier. No need to resharpen at frequent intervals. Does ripping, crosscutting or mitering. Cuts all types of wood, plastics, formica, plywood, masonite, wallboard, abrasive building materials, transite, asbestos, aluminum and asphalt siding and roofing. (Do not use to cut masonry, steel, iron or other ferrous metals.) Comes in 11 sizes and arbor hole shapes. See this sensational new saw at your nearest Sears Retail Store TODAY!

Diameter	Arbor Hole	Fits these saws	Price
5⅞ in.	diamond	6-in. Skil-saw	$10.95
6⅛ in.	1⅛ in. round	6-in. Black & Decker	10.95
6 in.	square	Mall; DUNLAP hand saws	10.95
6½ in.	½-in. round	CRAFTSMAN 6½-in. hand saws; bench saws	10.95
6 in.	⅝-in. round	Porter-Cable: bench saws	10.95
7 in.	diamond	Skil-saw	11.95
7 in.	square	Mall	11.95
8 in.	½-in. round	CRAFTSMAN 8-in. hand saws; bench saws	12.95
8 in.	⅝-in. round	Bench saws	12.95
8 in.	diamond	Skil-saw	12.95
10 in.	1-in. with step-down bushings	Bench saws; builders' saw; radial saw; and swing saw	14.95

CRAFTSMAN by SEARS, ROEBUCK and CO.

Whenever necessary, the aerial bombs are timed to explode close to the ground in order to produce long shadows to reveal the shape of objects on the ground, particularly objects which do not have much height.

In modern warfare, the enemy, if he is opposed by superior air forces, moves most of his troops and equipment at night. It is, therefore, necessary to photograph his front and rear areas continually throughout the hours of darkness at all altitudes depending upon weather conditions. This is a mission of the tactical air force — a part of the Air Force which is assigned to work with the Army ground units and, at times, with the Navy.

Tactical night airplanes are equipped to take night photographs from all altitudes, depending upon weather conditions and the type of photograph desired. The flash bomb and camera system previously described is used for high and medium altitudes, and a recently developed flash-cartridge system is used for low altitudes when the cloud ceiling is too low to permit the use of bombs.

When the ceiling is low, a series of flash cartridges is ejected at short intervals to insure the taking of stereoscopic overlapping photographs. Each cartridge produces a very brilliant flash for .001 second. The film in the camera is synchronized with the movement of objects on the ground, and as each cartridge flashes, it actuates a second film-winding motor which advances the film at a high speed to eliminate double exposures.

This equipment is usable in high-speed jet aircraft, and the amount of photography is governed by the number of cartridges which may be carried in the airplane. The cartridge-and-camera operation is entirely automatic, and it has been designed to operate efficiently, if required, far beyond present-day jet-aircraft speeds.

Using the RB-45 equipped with 800 cartridges, each weighing 14 ounces, together with three night cameras — one mounted vertically and two in the oblique position— it is possible to photograph a two-mile-wide strip from Sandy Hook, N. J., to West Point, N. Y., in 14 minutes. The tri-camera pictures would show in clear detail all ships in New York Harbor and also in the Hudson River. The flash-cartridge system was introduced in Korea last year and hundreds of valuable intelligence photographs showing North Korean troop and equipment movements have been made. These pictures have materially assisted the United Nations ground, naval and air forces.

(Continued to page 250)

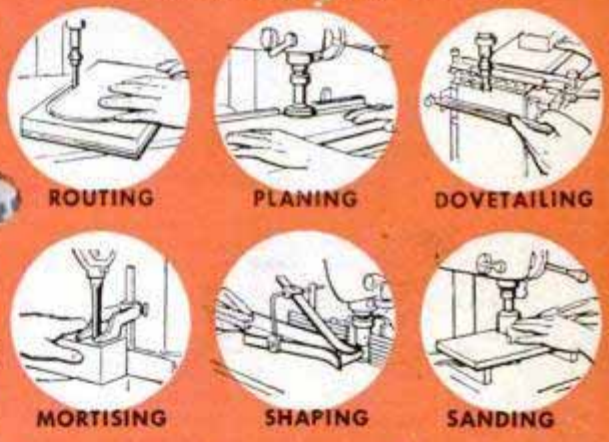
Buy CRAFTSMAN
REG. U. S. PAT. OFF.

America's most dependable low cost Drill Press!

Outstanding for its Industrial Accuracy!

Equipped with Jacobs improved Safe-Lock chuck; can't fly off . . . absolute SAFETY!

CRAFTSMAN flexibility makes possible dozens of operations like these!



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$82.50* Cash
Without motor
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You can also cut keyways, do milling . . . and numerous other operations. Versatility like this means More For Your Money . . . because with your CRAFTSMAN Drill Press and proper accessories you can do hundreds of industrial operations like these.

The only industrial-type drill presses we know of with ALL these features . . *at anywhere NEAR these low prices!*

- Drill to center of 15-inch circle; maximum spindle travel 4 inches; 9 speeds, 610 to 5000 R. P. M.
- Jacobs improved "Safe-Lock" key-chuck, 0 to ½-inch capacity. No. 33 Jacobs taper at chuck.
- "Perma-coil" quill-return-spring; longer lasting; permits greater range of tension adjustment.
- Pulley and bearing sleeve are ONE piece . . . more accurate.
- Pre-loaded bearings . . . reduce spindle end-play.
- 4 sets of precision ball bearings; lubricated for life.
- 10x10-inch table tilts 0 to 90 degrees right or left. Scale shows angle of table tilt.

See these sensational CRAFTSMAN Drill Presses at your nearest Sears, Roebuck and Co. Retail Store TODAY!
*Prices slightly higher south of the Ohio and west of the Mississippi rivers.

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Famous for fine quality . . . precision performance . . . low price!

$34.50

Makes dull, tiresome jobs fun. With this professional, motor-driven, orbital-motion SpeedSander, you can quickly and easily re-surface and refinish furniture, woodwork, walls or metal . . . can sand-off old paint, stain, enamel, rust or corrosion; smooth rough plaster; or buff, burnish or rub to a "piano finish." Operates with wet or dry abrasives. Three 4½"x6½" covers cut from 9"x11" sandpaper or abrasive sheet. Your local dealer will gladly demonstrate.

No. 150K SpeedWay SpeedSander Kit

Everything you need in fitted steel carrying case—18 each of 5 grades of sheet abrasive, 2 free abrasive felts, thick neoprene contour pad, steel surfacing plate, lambs wool polisher and cover template.

$49.50

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Far advanced in design and construction these new SpeedDrills are lighter, handier, yet more powerful and faster-drilling than more costly old type drills. Drill steel, wood or concrete. Quality built for lifetime service, of die-cast aluminum with cast-in air cooling system and self-lubrication. Heavy cut-steel gears. Ball thrust bearings. Your SpeedWay Dealer will point out the many other superior features.

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Any craftsman or "Mr. Fix-it" will be thrilled with a SpeedDrill Kit that drills, grinds, sands, buffs, polishes. No. 79 Kit provides a No. 79 ⅜" capacity (in steel) SpeedDrill, a SpeedStand, wire brush, sanding discs and backer plate, cloth and lambs wool polishers, paint stirrer and 5 steel drills—31 pieces in all in fitted steel carrying case, complete $32.50

No. 200 Kit. (Not illustrated) Similar to No. 79 Kit but with No. 200 ¼" capacity (in steel) SpeedDrill and 28 accessories in fitted case, complete 22.50

GA Kit. 20,000 r.p.m. SpeedWay No. 129 Hand Grinder with 16 mounted cutters, brushes, and wheels, complete in leatherette case. $14.50

Bench SpeedGrinders—$16.50 to $32.50—Ask your dealer to show them to you.

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So much for the Air Force's mission of night photography. The greatest improvement in daylight photography has been in the development of image-motion-compensation cameras. Camera fans are well aware of the fact that they must hold their ground cameras steady when they make a photograph, and the high-speed between-the-lens or focal-plane shutter will stop motion of objects up to .001 second.

In the past, aerial cameras had similar high-speed shutters, but upon the introduction of high-speed jet airplanes such cameras became obsolete. It was found impossible to hold the film stationary and trip the shutter fast enough to stop motion and still obtain a full exposure with maximum definition. This problem was solved by moving the film over the focal plane synchronized with movement of objects at ground level.

In one camera, the continuously moving film type, the focal-plane shutter with a .004-inch opening is held stationary in the center of the focal plane. But instead of moving the shutter, film moves over the shutter or slit at the desired speed. Because of the considerable ratio between the length of the light rays approaching the camera lens to those passing from the lens to the sensitized film, a large reduction in image-motion speed is effected.

Although ground-image motion may be hundreds of miles per hour, film movement in the camera, perfectly synchronized, may be only a few feet per second. Film and ground, photographically, are traveling at the same speed. and an image is continually wiped from the slit onto the surface of the film.

Synchronization is accomplished automatically by a recently perfected device which scans the average pattern of ground motion and reduces it to an electrical frequency by a double-grid and photocell system. The frequency is amplified and matched to a frequency established for the film-moving mechanism, increasing or decreasing film movement as is necessary. Hand synchronization of the camera is possible; however, its greatest use is in high-speed single-seater reconnaissance aircraft where the pilot does not have access to the camera or time to make the necessary speed and altitude settings.

Some remarkable test flights have been made with this camera in the vicinity of Wright-Patterson Air Force Base at Dayton, Ohio. An officer reclining on the ground face upward was photographed from a speeding RF-80 Shooting Star jet airplane at 50-foot altitude at 500 miles per hour. The portrait photograph of the man

(Continued to page 252)

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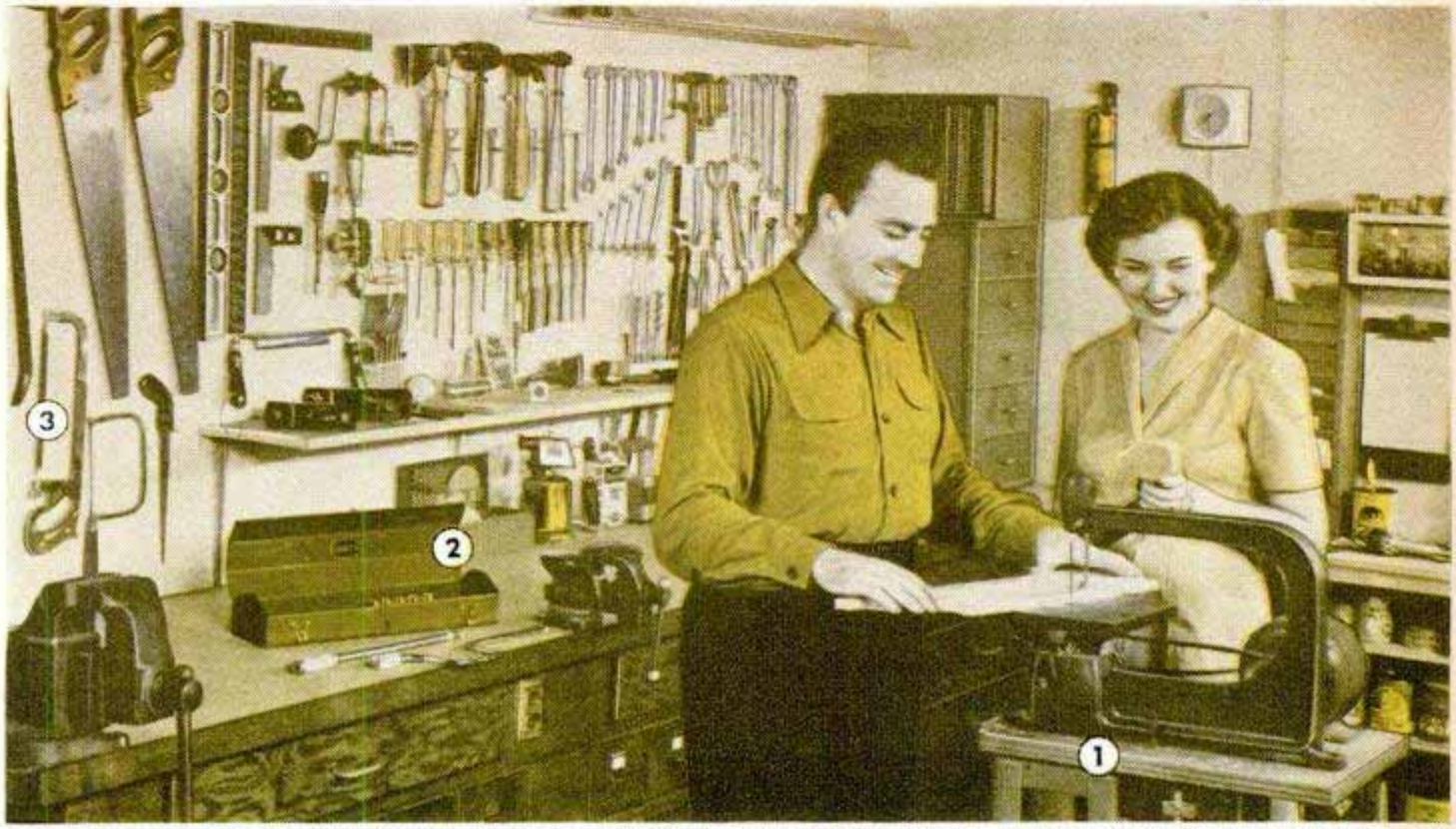

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8-Point Crosscut Saw, 26", 4-gauge double tapered blade. Precision tempered...(4HR6329) **$4.79**

Screwdriver, alloy steel, chrome-plated, 4" square blade. Positive-grip handle.....(HR1361) **89¢**

7" Lobster Claw Plier. Patented design gives 50% more gripping power.....(HR1125) **$1.29**

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was as sharp as if it had been snapped with a ground still camera mounted on top of a 50-foot stepladder or tripod.

On another test, the strip camera was flown over another airplane, parked on the ground, at 50 feet at 500 miles per hour. The detail in the strip picture permitted counting the ¼-inch rivets in the wings. Another picture was taken with the camera jet plane passing over another jet plane flying in the opposite direction 500 feet below at 500 miles per hour. At this combined speed of 1000 miles per hour, the photograph of the lower airplane was so sharp it showed the pilot, his controls and individual rivets in the wings.

The strip camera permits the taking of relatively slow exposures bordering on time exposures, even from airplanes speeding along at 600 miles per hour. With a minor change in the gear system of the present standard continuous-strip camera, it will be possible to photograph objects on the ground quite clearly at speeds up to 3000 miles per hour above 1000 feet. Higher speeds are quite possible when required.

On the first actual mission with this camera in Korea, clear stereoscopic photographs were made 15 minutes after sunset when all standard cameras without moving film had been stored away for the night. The camera, equipped with a pair of stereoscopic lenses, was used with great success prior to the Inchon landing by the United Nations Forces last year. The flight was made in a drizzling rain at 300-foot altitude at 500 miles per hour. Data obtained from the pictures disclosed the necessary tide information, location of gun emplacements, trenches, obstacles and the approximate height of the Blue Beach sea wall which, during the invasion, was scaled by the Marines.

When the camera is used to record stereoscopic strip pictures, it is equipped with a pair of matched lenses, which photograph two 4½-inch tracks on aerial film 9½ inches wide and 200 feet long. The lenses are set with the optical axes located on the right and left sides of a .004-inch slit in the camera, over which the film travels, synchronized with the speed of the airplane.

As the airplane flies along, taking vertical continuous-strip photographs, the left lens photographs the left side of a building on the left 4½ inches of the film track and several hundred feet beyond; the right lens photographs the right side of the building on the right 4½-inch track of the film. When the film is viewed in a special viewing machine, objects are viewed in their natural or exaggerated third dimension, their appearance depending, of course, upon the

(Continued to page 254)

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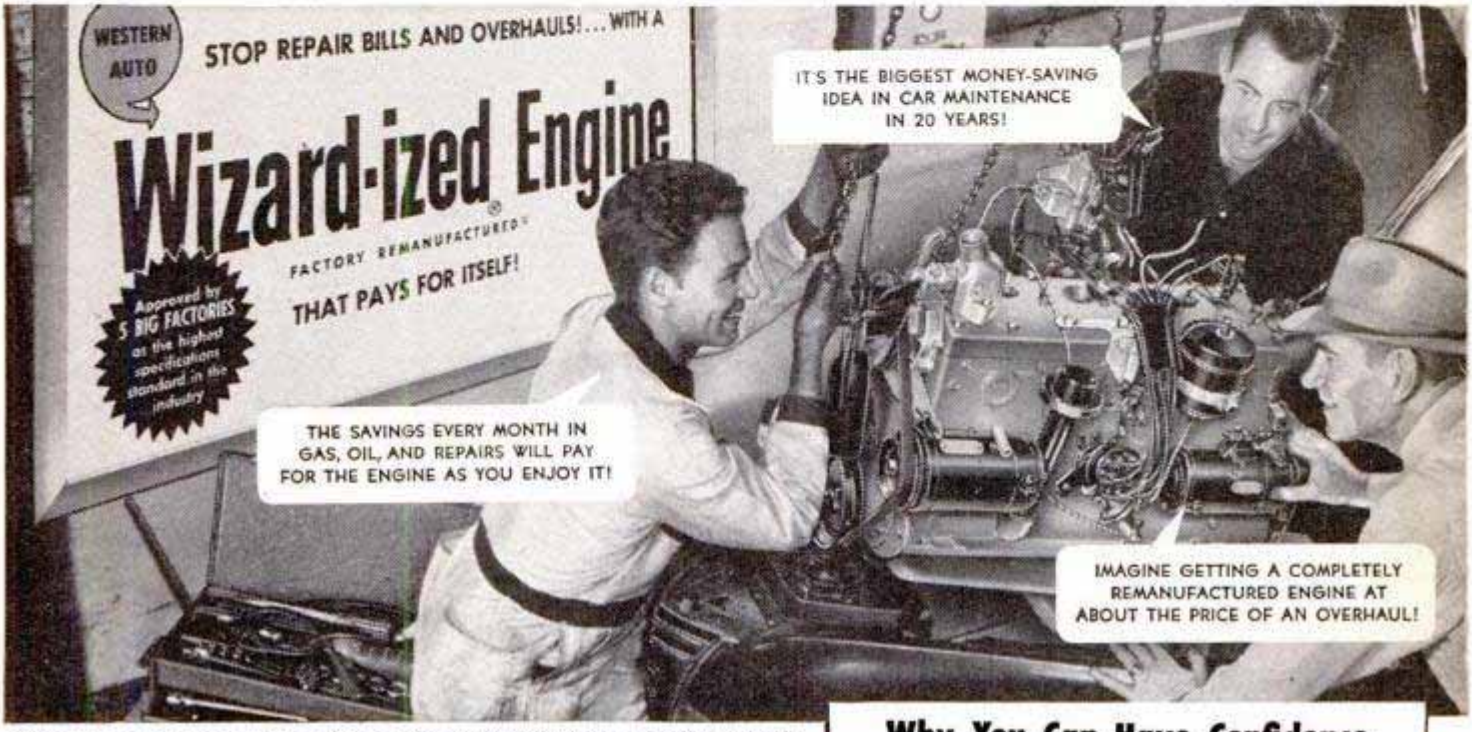

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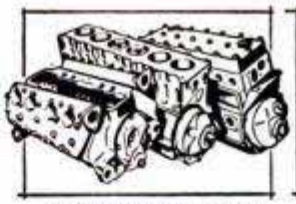

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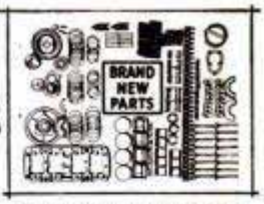

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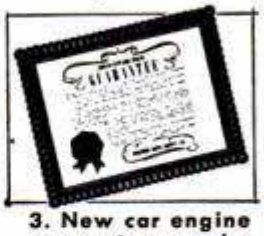

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parallax setting of the two camera lenses.

To see, stereoscopically, on the ground, the left and right of close-up objects, eyes have a separation of about 2¾ inches.

If the parallax angle of the two lenses in the continuous-strip camera is known, together with the altitude, determined by exact measurement with a radio altimeter, and the rate of film travel over the focal-plane slit, it is possible to determine fairly accurately the height of objects on the ground. With the newly developed Air Force depth-plotting equipment, and using a refraction table, it is possible to measure the depth of water and beach gradients to a depth of 25 feet depending, of course, on the clarity of the water. Using this equipment prior to an amphibious invasion, a sea wall was estimated to be 6 feet 7 inches. After the invasion, the actual measurement was found to be 6 feet 5 inches.

The continuous-strip camera has been quite successful in taking side oblique color photographs. Such photographs are of considerable military value for briefing and bomb-damage-assessment purposes. Such color pictures can be projected through a special twin-lens projector on a metallic-surface screen and viewed in third dimension through Polaroid glasses. Unlike motion pictures, the oblique strip pictures can be stopped or slowly projected on the screen, which is ideal for briefing purposes.

The projected film is a 200-foot lantern slide that projects on the screen perfectly sharp without the flicker which is so objectionable in projecting motion-picture film. Using this stereoscopic color film, the commander can show his paratroopers the actual terrain in perfect relief where they and their equipment will be dropped. Such areas can be studied days in advance of the mission. It has the same value to the doughboys, ground reconnaissance forces, tank units and pilots engaged in low-level bombing missions.

In addition to the strip camera, the Air Force has adapted the Land one-minute camera to meet high-speed photographic requirements.

In daylight photography of enemy movements and positions, it is highly essential that the infantry and artillery receive the photographs in the shortest possible time. Experiments with the Land Polaroid camera are making it possible to produce 9 by 9-inch photographs in one minute. A demonstration was recently made of this equipment for Mr. Charles Wilson and his mobilization team during their tour of the laboratories at Wright-Patterson. The most important aerial photographs required by our ground forces will, in time, be made with this or similar processing equipment.

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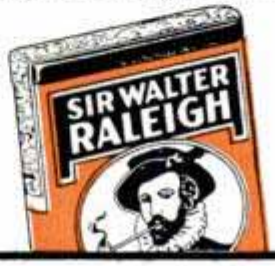

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I Fought With Combat Patrols in Korea

(Continued from page 126)

if and when perfected, would be a natural for combat patrols. A single squad equipped with these guns would have more fire power than a combined light-machine-gun crew and complete Browning automatic-rifle team, as long as the ammunition held out. It would have come in mighty handy on several occasions I think of offhand. So would the new electrically operated .60-caliber machine gun. This new gun is an air-cooled affair that can be placed anywhere and fired by remote control, with the gunner sitting in a foxhole many yards away.

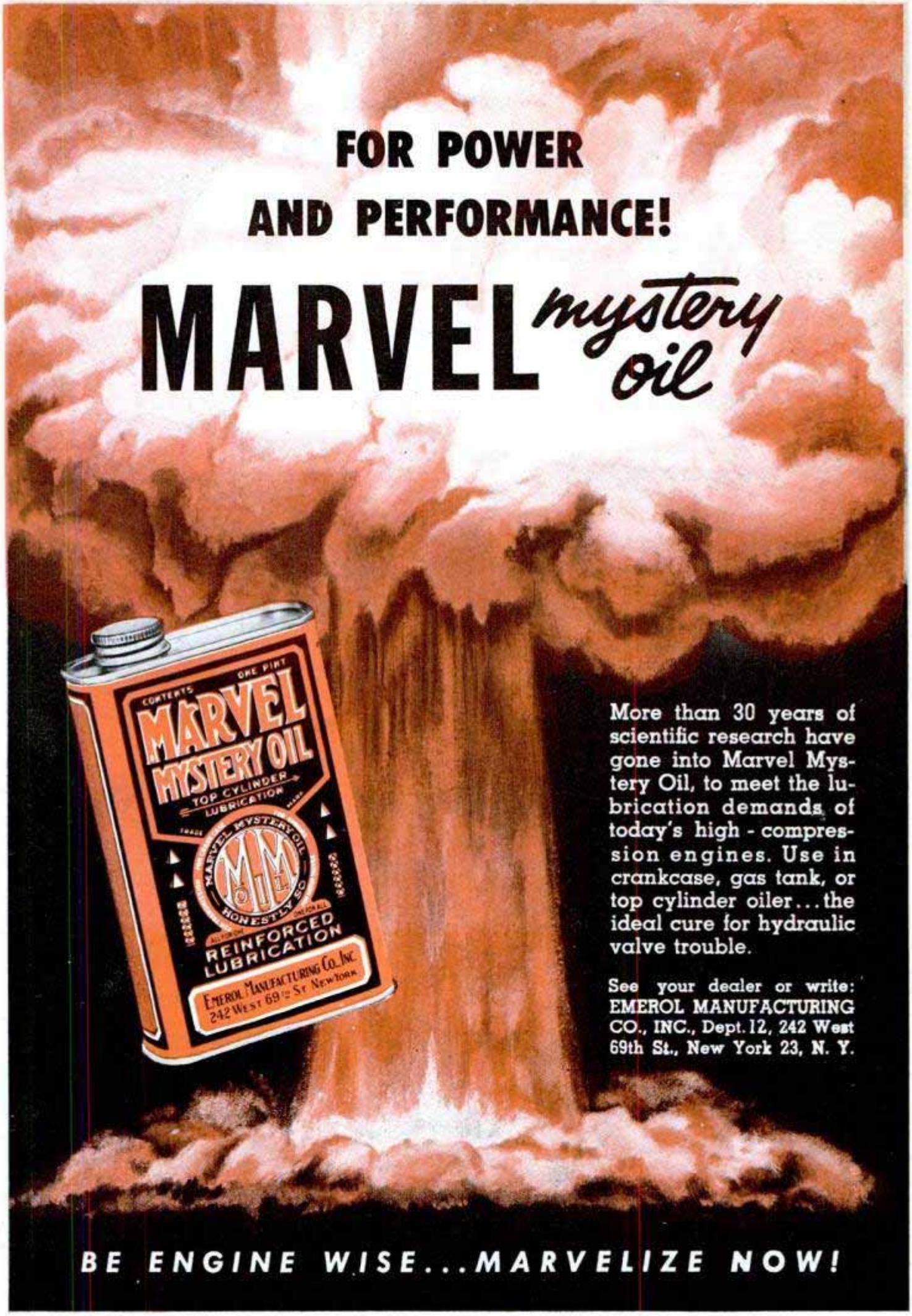
Probably the best-protected man in our patrols was the soldier with the walkie-talkie on his back. Most of the time we used the SCR-300, a bulky, 35-pound back-pack radio. But just about the time I left, the SCR-536 was beginning to show up. It looks like a slim storage battery, about 12 inches wide, 18 inches long and three inches thick. It weighs only 25 pounds and fits more comfortably than a knapsack on the soldier's back. With it, patrols will be able to maintain two-way contact up to five miles from the base. Tubes in the set are half the size of a cigarette. Its tiny transformer coils are actually less than ¼ inch deep and ½ inch in diameter.

On one occasion, eight of us were told to get a North Korean machine-gun outfit that had crossed to our side of the Naktung River during the night. Not one of them was to get back, the orders said. We moved out through the woods, sneaking from tree to tree like Indians. We found them all right. There were 12 of them out by the river shore in wide-open country, well beyond range of our rifles. We took a bearing on them and our radioman called back, giving their exact position and asking for 4.2-mortar support. Within seconds we heard the heavy *whoom* of our mortars. Puffs of smoke appeared out where the Reds were. When it cleared away, nothing was left but barren river shore.

Another time the radio came in handy we were out to size up an enemy force in the mountains. We set out in diamond formation, camouflaged and stripped down to bare essentials, picking our way carefully through the woods.

Daytime combat patrols always take the worst route possible, plunging through swamps, staggering or crawling along ditch bottoms, beating through the edges of forests, brier patches, stone walls and hedgerows. It may not be the quickest route or

(Continued to page 258)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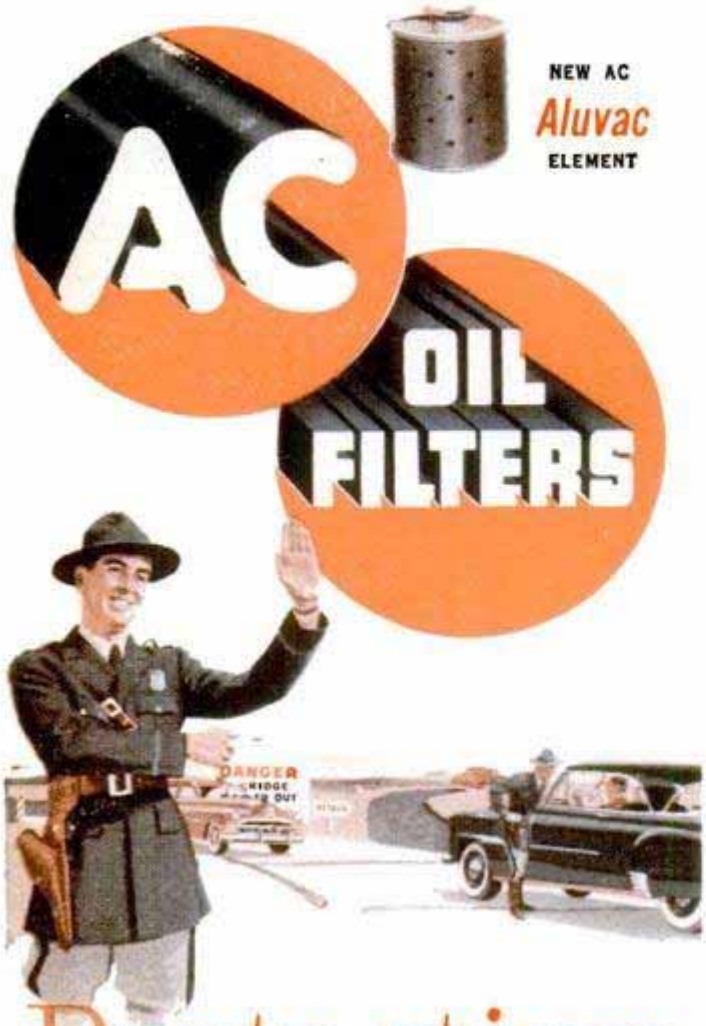

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AC SPARK PLUG DIVISION GM GENERAL MOTORS CORPORATION

the most comfortable, but it offers the best concealment and that's what you need if you expect to surprise the enemy.

In crossing open areas, roads or streams, for instance, the men line up along the edge of the woods. One or two "security" men scramble across first. If no one shoots at them and they give an all-clear signal from the other side, the rest of the patrol, in a single broadside line, rushes across in one swoop. Thus if the enemy is around he gets only a few seconds to aim and shoot. Bridges are seldom used to cross streams, and boats are always returned to the original shore and left under guard. More than one combat patrol that left a boat on the enemy's shore for use in getting home, returned to find the boat gone, and themselves ambushed.

To keep from getting lost, we used compasses, our watches and the sun. Some patrols even call back for prearranged supporting artillery fire, watch where the stuff lands and figure out their whereabouts that way.

Our patrol was lucky that day. We met no one, until suddenly we topped a ridge and saw them — a whole army of them. They were moving artillery into position on their hillside. An attack was coming up! We knew it was suicide to fire into that crowd and there wasn't time to get back to our outfit with the word. So, once again, our radioman went out to the base over his back-pack set. We called for "W.P.s" — white phosphorus shells—and told the boys just where to lay them down. A few minutes later there was nothing left but a scorched hillside.

Night combat patrol is not so frightening as you might think. Lt. Joseph Greene, from Siler City, N. C., who is also recovering from severe wounds in a hospital ward not far from mine, led dozens of missions through the Korean night before the Reds shot him. "You're the one on the move," he says, "and the darkness is protection. The enemy is sitting there not knowing what will happen."

What's more, the Army is using a very neat weapon for night combat-patrol work —the sniperscope. This consists of an infrared light source and an electric telescope, powered by batteries that are carried in a pack on the user's back. The unit sits atop the rifle like an oversized telescopic sight. If there's a noise in the darkness ahead of you, you aim your gun at the sound, turn on the juice, and a silhouetted image of whatever made the noise is reflected into the sights of the rifle. Another version is the snooperscope, which is a similar device attached to the soldier's helmet. Of

(Continued to page 260)

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course, the enemy has infrared equipment too.

Night patrols move to the silent beckoning of the leader, usually in platoon formations in which the men are only as far apart as they can see. Theirs is a stealthy job, and the routes they pick are usually over roads and open country, since any sound like the cracking of twigs would give them away. They may carry walkie-talkies for intracommunication, but most frequently they communicate by lightly tapping stones against their rifle butts. I've heard that some infantrymen used bird calls, but quit when too many were giving calls of birds that didn't exist in those parts.

Lieutenant Greene could stand your hair on end with stories of night patrols. Probably one of his wildest nights came after the Reds unexpectedly attacked U.N. forces just outside Seoul. Greene was ordered to take out a 20-man night patrol, bring back prisoners, find out where the enemy was and in what force.

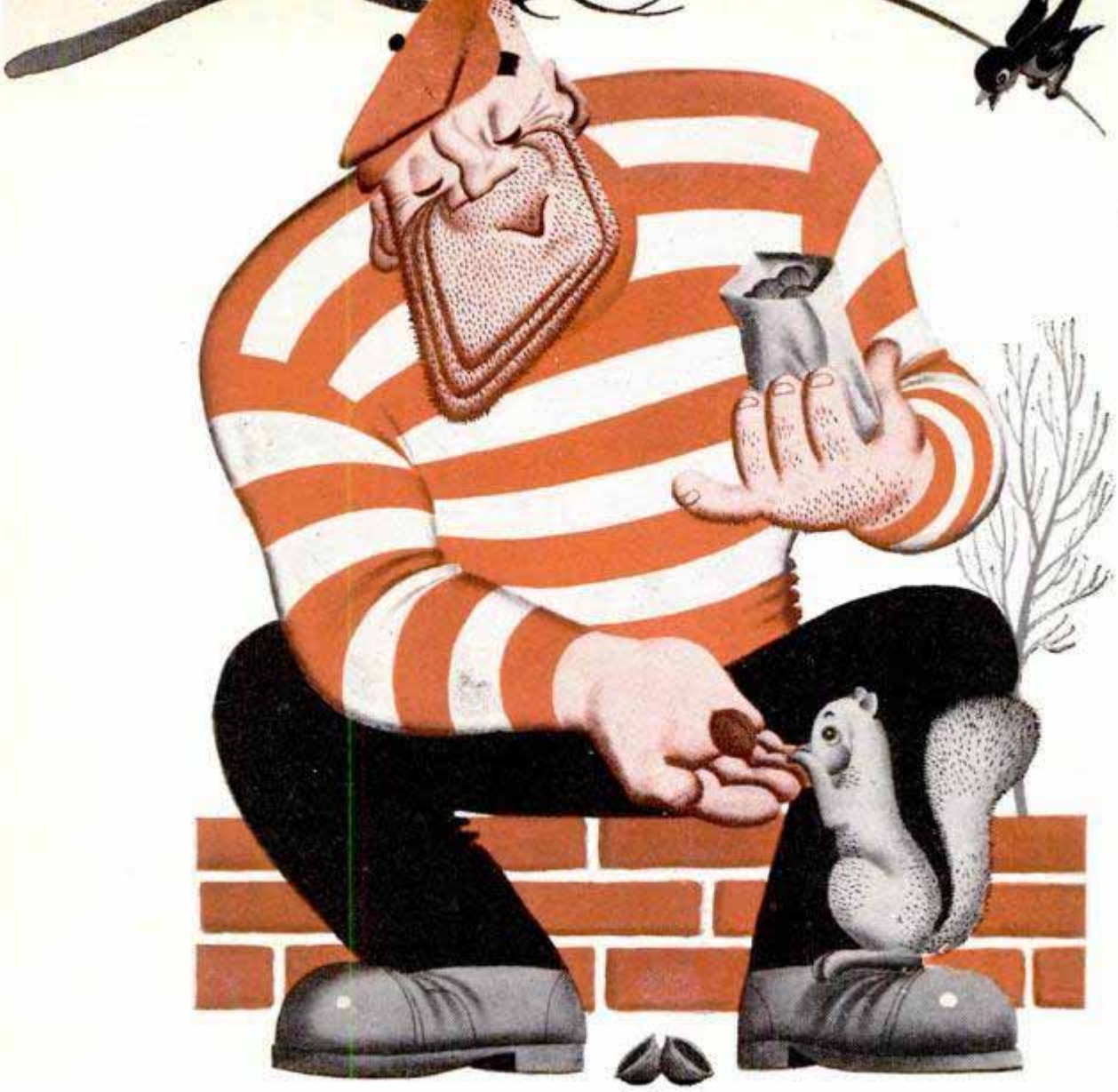
"We set out about one a.m. on a cold, dark morning," he recalls. "We carried automatics, carbines, some M-1s, a few BARs and one light machine gun. We were to be back by four. We always set a return time so the outfit would know if we were wiped out.

"We crept along quietly on rubber-soled shoes, about 10 yards apart. In very dark areas, the men touched each other's shoulders to stay together. We were in columns of twos, since it was too dark for diamond formation, and had two scouts out—one up ahead, the over covering the flank. We'd gone about 600 yards down a road, when the scouts spotted two North Korean sentries up ahead. I ordered them captured with as little noise as possible because I knew the main forces couldn't be far off. My squad leader took three men and sneaked around behind the sentry post. At a given hand signal, they plunged together, knocked the sentries rolling and got them without a peep.

"With our prisoners of war in the center of our group, we continued down the road to probe the main force. We hadn't gone far when suddenly the scouts were fired on. We fired back with everything we had to draw them out. For 15 minutes the night was a riot of fireworks. One of our scouts was killed, two other men were wounded. But from their firing we knew they had at least two machine guns, several automatic rifles and plenty of rifles. We figured it for an infantry platoon, since there was no flanking movement.

"We picked up our wounded, backed down the road and off to the right across

(Continued to page 262)



TOUGH..but oh so gentle

TOUGH ON OIL-PUMPING • GENTLE ON CYLINDER WALLS

When your car first starts using too much oil, look out for worn-out piston rings. They cause oil-pumping . . . loss of power . . . destructive engine wear.

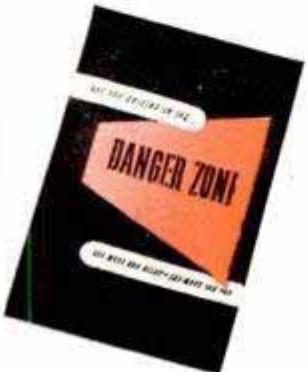
Fortunately, it's comparatively easy and inexpensive to replace worn-out piston rings—but the more you delay, the more you pay.

At the first sign of oil-pumping, replace your rings with Hastings piston rings. They're engineered for *replacement* service. They *stop* oil-pumping, *check* cylinder wear, *restore* engine performance.

It's the best money you can spend on your car.

Keep your car out of the
DANGER ZONE

Ask your motor service man for a Danger Zone check-up. And write for the free Hastings Danger Zone booklet which shows you how to save money on engine repairs. Dept. P, Hastings Manufacturing Co., Hastings, Michigan. Hastings Ltd., Toronto.

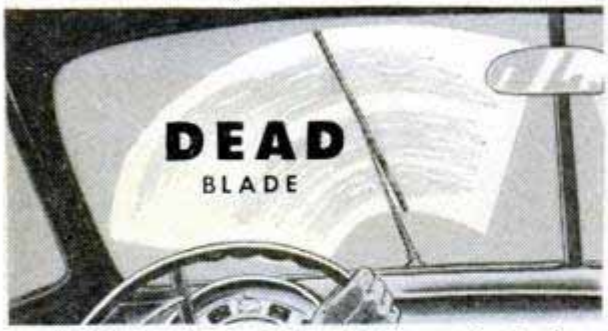


HASTINGS

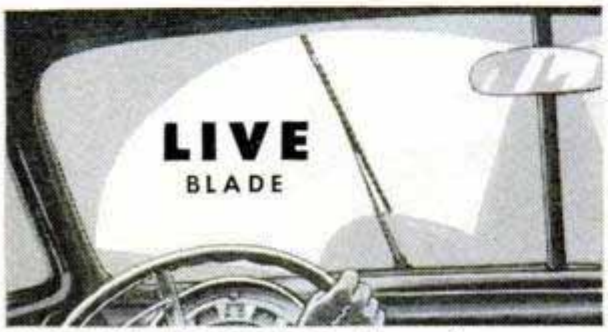
STEEL-VENT PISTON RINGS

PISTON RINGS • SPARK PLUGS • OIL FILTERS • CASITE • DROUT

DEAD BLADES MAKE DEAD DRIVERS



THIS DEAD WIPER BLADE still may look okay but it streaks glass dangerously. DEAD blades make DEAD drivers!



THIS LIVE ANCO BLADE wipes clean . . . clears rain . . . clears muck . . . lets you SEE. Protects you and your loved ones from smashups.

Get Live New ANCO Blades . . . *Fit Your Car Quickly . . . At More than 260,000 Service Stations*

Even the best wiper rubber goes dead . . . from exposure . . . often in six months or less. Don't be a Dead Blade Driver. Don't risk facing criminal negligence charges, after a needless storm-bred smashup, with dead blades found on your car.

Come Clean! Replace at once your Dead wiper blades with LIVE new ANCO Blades. They are best for most miles of quicker, cleaner wiping. Get yours today.

ANCO RAIN-MASTER model for Flat windshields. Fits all cars. World's largest selling replacement blade.

ANCO CLEAR-FLEX model for Flat or Curved windshields. Fits all cars having Curved windshields . . . best for Flat windshields, too.

THE ANDERSON COMPANY
Gary, Indiana, U.S.A.

the rice paddies for ½ mile. The medical man stayed with the wounded while we went in again. This time we got all the way into Seoul's suburbs without meeting resistance. We'd found a hole in their line!

"Once more we backed down through the darkness and crept across country ½ mile to the left of our original probe. Then we turned in again. We hadn't gone far when the scouts, peering through the night, spotted two more sentries. These boys were on their toes, however, and they got away. So we kept going. Soon we heard a spatter of firing ahead of us. We broke out our shovels and dug in. Then, we opened up in their direction with our entire arsenal to see what would happen. It was like lobbing shells on a munitions dump. At least four machine guns poured tracers at us. Dozens of rifles and submachine guns spat red fire across the blackness. This was at least one company. At last the firing died down. We waited for a counterattack, which didn't come. Then, bedraggled, weary and reduced in numbers, we crawled back to our lines with our information.

"Next day, we knew just where to zero in our mortars and artillery. Which we did. And after the barrage, we were able to move our outfit into Seoul and clean up the remnants."

Day or night, combat patrol is rough duty. The patrols seldom are heard about. But without them, no army could function on a battlefield.

Bicycle Lock Bolts on Frame

Convenient to use and virtually theft-proof, a new type of bicycle lock bolts to the frame. When the bicycle is being used, the jaws of the lock are withdrawn, allowing the rear wheel to revolve. To lock it, the locking lever is depressed, causing the jaws of the lock to encircle the wheel so it cannot be turned. The key can be removed only when the lock has been locked. Should a would-be thief unbolt the lock from the frame, the bicycle still cannot be used as the jaws of the lock circle the wheel, preventing it from turning more than a fraction of a revolution.

YOU GET MORE FOR YOUR MONEY WHEN YOU BUY A HARLEY-DAVIDSON

It could be you...HAPPIEST MAN IN '52!

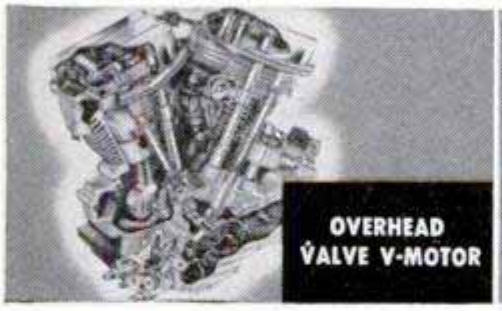
Ride the finest of them all

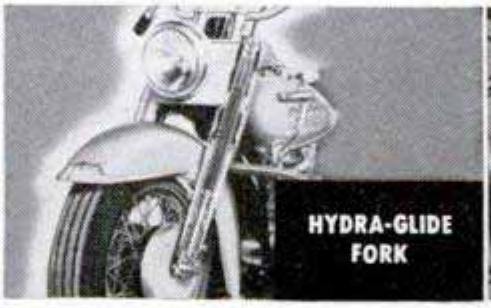
1952 HARLEY-DAVIDSON

HYDRA-GLIDE®

This is *your* baby . . . a dream on wheels! *So thrilling!* A touch of the throttle and you're off like a comet. *So dynamic!* Steepest hills vanish beneath you. *So smooth!* Roughest roads level out like boulevards. *So comfortable!* Far-away places seem only minutes away. Dozens of engineered advancements feature this 1952 model, including 4-speed foot shift-hand clutch, power-boosting, low-toned muffler, Parco-lubrized valves, flatter, wider tread tires for longer life and smartly colorful styling. Plan now for happy days ahead . . . for a happier *you* in '52. See and ride, this newest, finest Harley-Davidson. Now on display at your local dealer.

Most Powerful! Most Comfortable! Easiest to Handle!





MAIL THIS COUPON HARLEY-DAVIDSON MOTOR CO., Dept. P, Milwaukee 1, Wis.

Send me free copy of ENTHUSIAST Magazine filled with motorcycle action pictures and stories; also literature on 1952 models.

Name.....

Address.....

City.....State.....

DEALERS WANTED: A few valuable franchises still available for the full line of famous Big Twins and the 125 Model. Write today.

Your Car Deserves the Winter Safety of BOWES Radiator Chemicals

☆ Use BOWES Radiator and Cooling System Chemicals if you want "smoother motoring" during the coming frigid winter months. You'll get much higher motor efficiency . . . and save on anti-freeze if your radiator and cooling system are properly prepared for winter driving thru the use of these BOWES Radiator Chemicals.

BOWES KLEN-ZUR

Amazingly efficient, acid-free cleaner . . . breaks up rust, scale and lime formations. Flushing then cleans out these dangerous heat retainers and prevents overheating which wastes anti-freeze.

BOWES RUST-ROUT

Protects cooling system by preventing accumulation of rust, also lubricates water pump. A "MUST" for all motors without grease fitting on water pump.

BOWES STOP-LEAK

Stops leaks in radiators and cooling systems, and minor cracks in motor blocks. Don't lose your expensive anti-freeze —use Bowes "Stop-Leak" now and be sure.

☆ It takes so little time to condition your cooling system for winter driving . . . yet it can be so costly and troublesome to neglect it. Don't delay — prepare NOW for winter with BOWES Cooling System Chemicals!

DRIVE IN Where You See This Emblem

BOWES SEAL FAST

BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, IND.

The Owners Report on the Packard

(Continued from page 114)

read speedometer at night." — Wilmette, Ill. "Cheaply finished inside, and I have to use premium fuel." — Cincinnati, Ohio. Although nine percent of the owners reported "poor" service from their Packard dealer, 91 percent indicated they were satisfied, which speaks well for Packard's service. A Milwaukee, Wis., man wrote: "Probably the real reason I bought a Packard is because a dealer for another make (I had bought four cars from him) took me for granted. I stopped in the Packard place casually and they displayed an interest in me—demonstrated the car in a snowstorm and acted like they would like to sell me a car. I am a salesman and appreciate salesmanship. That's what really sold me the car."

"I have had less mechanical trouble with my Packards than any other cars I have ever owned," wrote a Kent, Wash., man. This was the sentiment of several owners in the poll. Others liked Packard from the start, such as a Miami, Fla., man who said: "Thirty minutes' driving and I was sold."

Asked if they wanted Ultramatic Drive on their next car, 94 percent of the replying owners said they did. A mere six percent liked another make of transmission better than Packard's Ultramatic. A Madison, Wis., man said "My wife would prefer Ultramatic, but since Ultramatic is rather new, there is no telling how long it will go without service and you can't get service on it just anywhere. It is complicated, as all automatic shifts, no doubt, are."

A Ft. Worth, Tex., man said that in his next Packard he wants overdrive for the country and Ultramatic for the city.

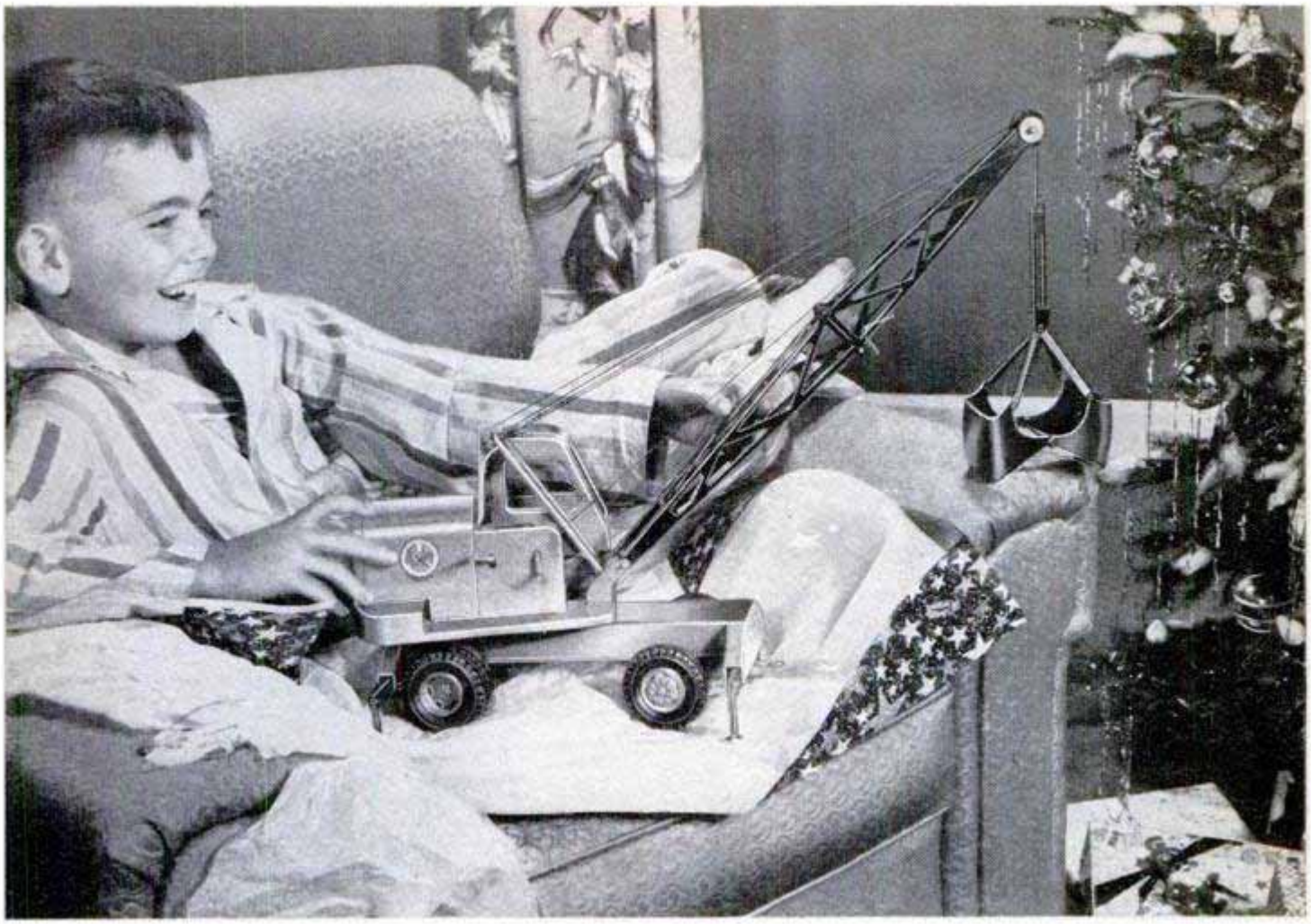
A Los Angeles owner said, "My 300 will trim 90 percent of the so-called 'hot' jobs. Ultramatic is by far the best transmission—it's smoother and has less slippage. Body is good, doors fit tight, vision is the best, tremendous luggage space, but I don't like the trunk lock. And, unlike other makes I've owned, no water leaks in."

The pay-off, however, came in a response to the question, "Why did you buy a Packard?" A Texas man replied: "Inherited money—wife with big ideas!" And a Washington man, asked "What do you dislike about the car?" answered: "My wife."

And now for my test of the Packard:

The test car was a 155-horsepower model 300, Ultramatic-equipped, 127-inch wheelbase, four-door sedan. I drove it from the factory in Detroit, via Indianapolis and Pueblo, Colo., to Los Angeles, totaling 2861 miles, which included some tough tests

(Continued to page 268)



This year, make your boy's BIG gift a MODEL Toy

Here is the Model Unit Crane – an exact working model of the huge Unit Mobile Crane. The cab swings in a 360° circle while cranks control boom, clam shell and sheave block cargo hook. A tow bar attached to the steerable front wheels permits towing by other Model toys. Extension jacks and removable engine housing (for counter-balance weights) enable the Crane to lift more weight than any comparable toy! Price, 13.95 – 11 Western States, 14.75.

MORE FUN WHEN YOU OWN THEM ALL
The Road Grader scrapes up earth, the Crane loads it into the Euclid Truck which dumps it for the Heiliner-Scraper to pick up.

The Model Unit Crane is one of five Model Toys to choose from – each an authorized working reproduction of a famous giant machine. Big in size, big in play possibilities – summer or winter, indoors or out. Constructed of welded, heavy-gauge steel with baked enamel finish, Model Toys will actually outlast other toys 3 to 1.

The Chas. Wm. Doepke Mfg. Co., Inc.
Rossmoyne, Ohio

Model TOYS

AT ALL STORES WHERE BETTER TOYS ARE SOLD

"We're really saving on gifts this Christmas!"

"SHOPSMITH is saving us over $50 on Christmas gifts this year. We're using our SHOPSMITH to make everything — table lamps, children's blocks, place mats, salad bowls, *even our Christmas cards.* It can be set up (in less than a minute) to do almost any job—a lot of them jobs you can't do with any other power tools. And when it comes to accuracy, capacity, precision features, SHOPSMITH ranks with the best! Here are six of the many reasons why we're so enthusiastic about SHOPSMITH."

FIVE-TOOL UNIT COMPLETE EXCEPT FOR MOTOR*

$189.50

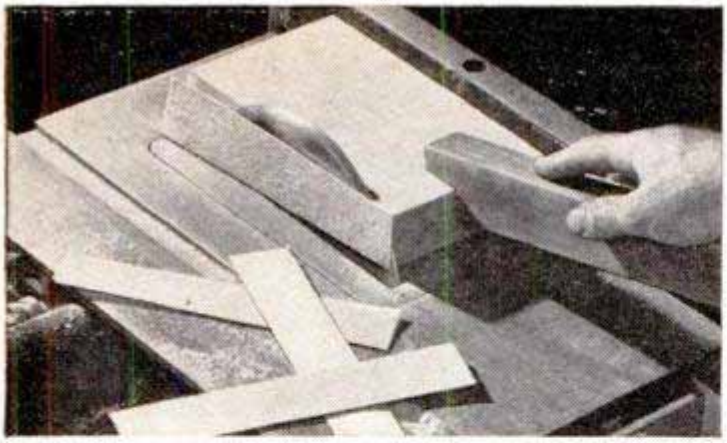
Special ½-hp., capacitor-type motor...* **$34.50

SHOPSMITH is a complete power workshop

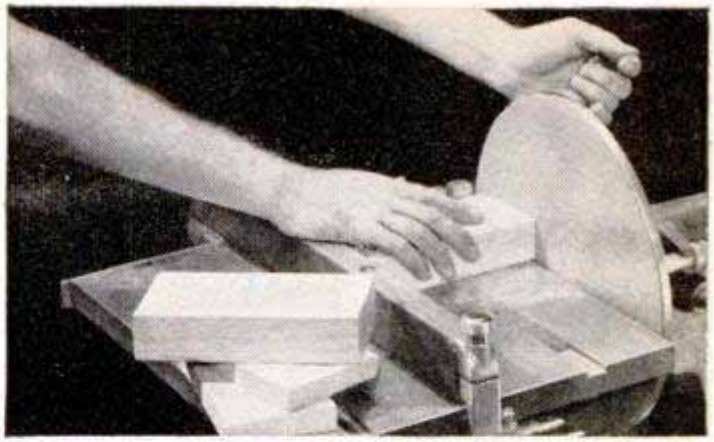
- 8" circular saw
- 15" drill press
- 12" disc sander
- 33" wood lathe
- Horizontal drill

SHOP SMITH

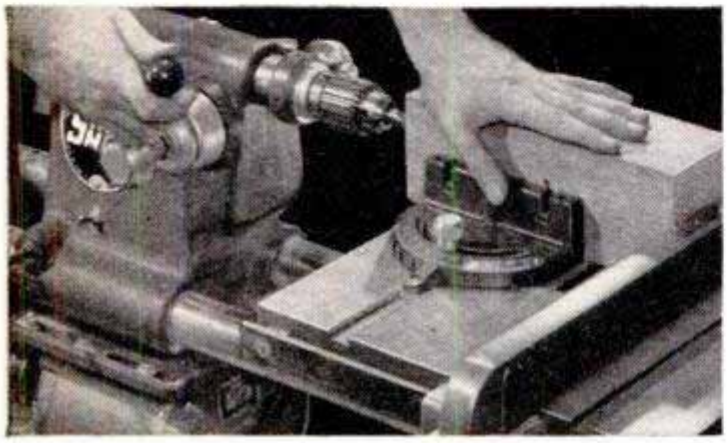
SEE SHOPSMITH DEMONSTRATED AT LEADING HARDWARE AND DEPARTMENT STORES OR ANY MONTGOMERY WARD STORE. WRITE FOR FREE CATALOG →



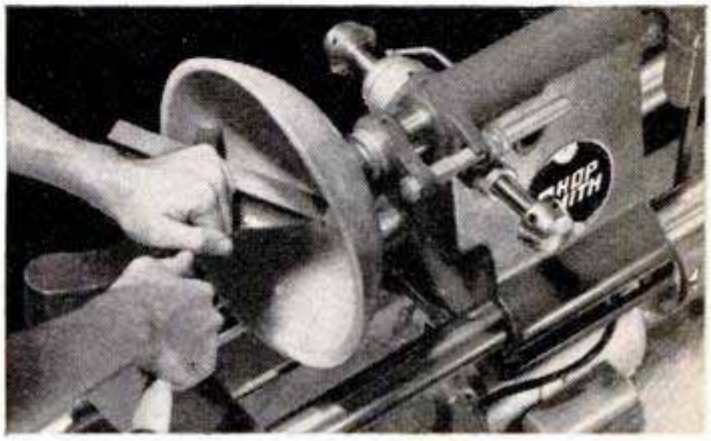
1 "**THIN STRIPS** sawed from scrap lumber can be woven into attractive place mats. SHOPSMITH'S unique micro-quill adjustment permits extremely accurate blade-to-fence settings. Saw takes extra-big work, thanks to unique table extension."



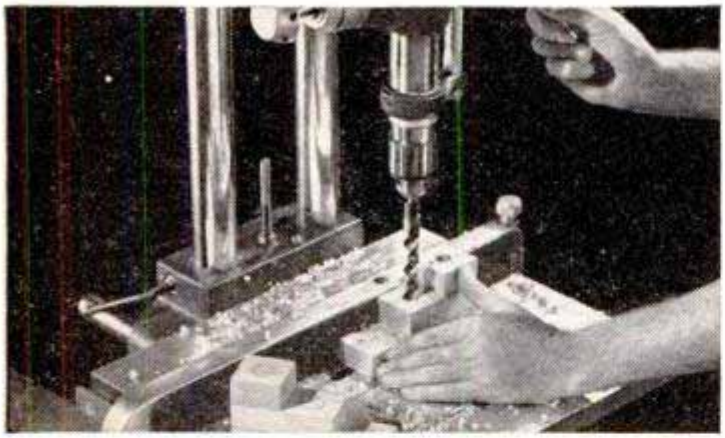
2 "**CHILDREN'S BLOCKS** are easy to make on SHOPSMITH. After blocks are sawed, they can be sanded to identical lengths by setting stop-depth nuts and feeding disc into work. Rip fence and miter gauge serve as accurate jigs for a host of sanding jobs."



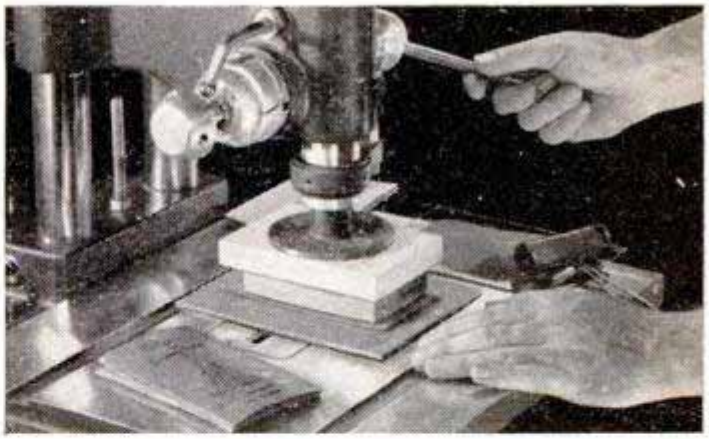
3 "**DRILLING LAMP BASE** shows advantages of SHOPSMITH as horizontal drill. Work lays flat on table. Drill feeds in from side. Horizontal drill has unlimited workpiece capacity, 4" quill feed, variable speeds. Spindle floats on *four* sets of ball bearings."



4 "**SHOPSMITH AS LATHE** turns work up to 15" in diameter, 33" long. Sliding headstock to end of unit lets you face the work while turning bowls and other flat or hollow objects. Versatile tool rest adjusts quickly, slides parallel to workpiece."



5 "**IN VERTICAL POSITION,** SHOPSMITH becomes a drill press second to none. Its maximum chuck to table clearance is 27"; chuck to floor, 55". Extra-large, tilting table. Jacobs key chuck, 5/64" to ½", is standard equipment. Speeds from 800 to 3600 rpm."



6 "**IT'S A PRINTING PRESS, TOO.** We found SHOPSMITH ideal for printing our linoleum block Christmas cards. In fact, there's almost no limit to the things you can do with SHOPSMITH. And you've never seen a tool that is more beautifully engineered."

MAGNA ENGINEERING CORPORATION
Dept. 190-B
at factory nearest you:
12819 Coit Road, Cleveland 8, Ohio, OR
Menlo Park, California

Please send me free 16-page SHOPSMITH catalog.

Name _____

Address _____

City _____ *State* _____

...with these Wizards with Wood

Mending something that needs gluing? Making something that needs finishing? If it's made of wood, ask for Firzite, Satinlac and Weldwood Glue at hardware, paint and lumber dealers—or mail coupon for leaflets.

Glue That's Stronger than Wood

To make things or fix things, use Weldwood Glue for all wood-to-wood bonds. Makes joints stronger than the wood itself. Mixes easily with water. Stain-free, rot-proof...highly water-resistant!

WELDWOOD®
PLASTIC RESIN GLUE

A MUST for Finishing Fir Plywood

Tame that wild grain with FIRZITE. Virtually prevents grain raise or checking... readies the surface satin-smooth for paint, stain or enamel. (For blond, pickled, or tinted effects on soft or hard woods, use White Firzite).

FIRZITE*

Newer than Shellac or Varnish

Pints, Quarts, Gallons

For "natural wood" finishes on furniture, panelling or woodwork, there's nothing like Satinlac. Brings out natural grain and color beauty of any plywood or solid wood. Avoids that "built-up" look; will not turn yellow or darken with age. "Water-clear," easy to brush or spray, dries ready for next coat in 2 or 3 hours.

SATINLAC*

*Trade Marks

United States Plywood Corporation,
Dept. 336, 55 West 44th St., New York 18, N.Y.

Send me free leaflets on Weldwood Glue, Firzite and Satinlac.

NAME_____

ADDRESS_____

over side roads in the mountains and sandy desert. There are five outstanding features that I like about Packard and I especially want to comment on them.

Packard's automatic transmission—they call it Ultramatic. It has a torque converter and a direct-drive clutch. It's a dandy. Smooth shifting, no jerking and, by releasing the throttle above 15 miles per hour, you're in a solid, slippage-free, direct drive —an excellent feature. Both converter and gears boost torque at getaway, but they automatically disconnect in "high" when the drive is direct. Under 55 miles per hour you can step on the accelerator hard and you're automatically back into the power-

1951 PACKARD SPECIFICATIONS

	200	300	400
ENGINE			
Type	L-head, in-line	L-head, in-line	L-head, in-line
Bore and Stroke	3 1/2 x 3 3/4 in.	3 1/2 x 4 1/4 in.	3 1/2 x 4 1/4 in.
Piston Displacement	288 cu. in.	327 cu. in.	327 cu. in.
Brake Horsepower	135	150	155
Comp. Ratio	7.00 : 1	7.00 : 1	7.80 : 1
Transmission	3-speed conv., Overdrive or Ultramatic opt.	3-speed conv., Overdrive or Ultramatic opt.	Ultramatic automatic trans.
GENERAL			
Weight (4-door Sedan)	3665 lbs.	3875 lbs.	4115 lbs.
Wheelbase	122 in.	127 in.	127 in.
Tread, Front	59 1/2 in.	60 in.	60 in.
Tread, Rear	60-23/32 in.	61-7/32 in.	61-7/32 in.
Height	62 5/8 in.	62 7/8 in.	62 7/8 in.
Over-all Width	77 7/8 in.	77 7/8 in.	77 7/8 in.
Over-all Length	209 3/8 in.	217 3/4 in.	217 3/4 in.
Interior Dimensions (4-dr. Sedan)			
Front Seat Width	62 3/4 in.	62 3/4 in.	62 3/4 in.
Rear Seat Width	62 in.	62 in.	62 in.
Legroom, Front	43-13/16 in.	43-13/16 in.	43-13/16 in.
Legroom, Rear	43 1/2 in.	46 1/2 in.	46 1/2 in.
Headroom, Front	36 in.	36 in.	36 in.
Headroom, Rear	35-3/16 in.	35-3/16 in.	35-3/16 in.
Tire Size	7.60 x 15	8.00 x 15	8.00 x 15
Recommended Tire Pressure	24 lbs.	24 lbs.	24 lbs.
Road Clearance	6-11/32 in.	6-17/32 in.	6-17/32 in.
Turning Radius	21 1/2 ft.	22 1/2 ft.	22 1/2 ft.
Steering Wheel, Lock to Lock	4 3/8 turns	4 3/4 turns	4 3/4 turns
Steering Ratio	20.4 : 1	22.3 : 1	22.3 : 1
CAPACITIES			
Oil	7 qts.	7 qts.	7 qts.
Water	20 qts.	20 qts.	20 qts.
Gasoline	20 gal.	20 gal.	20 gal.

ful torque converter. There is no slip in the transmission once it becomes positive and no gear-shifting time lag or clashing gears. It also goes into reverse better than most others and there is a "parking" position on the lever, which is good. It's a continuously smooth-operating unit and, for my money, it's the best automatic drive of them all. Overdrive is optional on the 200 and 300 models.

The brakes are smoother by far than on most cars. No tendency to fade, and the brake-pedal pressure is extremely light. Since the clutch pedal was eliminated with Ultramatic, I'd like a wider brake pedal.

(Continued to page 270)

MARFAK MADE HIS CAR RIDE SO CUSHIONY HE'S SPOILED

When your car is due for a lubrication job, be sure to get *Marfak* chassis lubrication. *Marfak* is scientifically compounded to fight wear and friction for 1,000 miles or more! Resists wash-out, jar-out, squeeze-out. Start enjoying "cushiony" driving today! Get *Marfak* lubrication from your Texaco Dealer, *the best friend your car ever had.*

MARFAK Lubrication

TEXACO

THE TEXAS COMPANY

TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America

TUNE IN . . TEXACO STAR THEATER starring MILTON BERLE on TV every Tuesday night. See newspaper for time and station.

be SURE of STARTING in any kind of weather!

...install the AMAZING NEW
Redi-Warm
TRADE MARK
AUTOMATIC ENGINE TENDER

Thermo Stop-Start Engine Warmer

A.

MAIN UNIT

At last the luxury of knowing your car will start as easily on a sub-zero morning as it will on a summer day. With a Redi-Warm Automatic Engine Tender in your car, it makes no difference where you park — how long you park. No outside electrical connections necessary — no smudge pots — no spark boosters. Just touch your starter, and you're off in a jiffy.

Widely acclaimed by automotive engineers, Redi-Warm is a marvel of simplicity. It consists of only three small units — a thermostatic control which clamps easily to the engine head; a neutral switch which permits Redi-Warm to operate only while the car is in neutral; and a dash switch with which to put Redi-Warm in operation.

B.

NEUTRAL SWITCH

Saves Engine Wear—Saves Gas

It is a well-known fact that the most wear on an engine occurs during the minutes required to start it. Redi-Warm, by keeping the engine at normal temperature — regardless of weather conditions — insures quick, easy starting — preserves the motor, saves on gas. Besides the comfort and convenience it affords, Redi-Warm will more than pay for itself in a few cold weather months.

C.

DASH SWITCH

Why risk loss of time — loss of temper — expensive towing charges? If your local dealer does not have Redi-Warm in stock, send for it direct from the factory. It costs only $24.95 postpaid; comes with complete instructions for the simple wiring. Do it yourself, or ask your neighborhood serviceman. Sold on an absolute guarantee of full satisfaction or money refunded.

only $24.95 postpaid

- KEEPS ENGINE ALWAYS AT STARTING TEMPERATURE REGARDLESS OF WEATHER.
- CAR CANNOT BE STARTED WHILE REDI-WARM IS SET FOR OPERATION; THIEF-PROOF — FOOL-PROOF.
- SAVES WEAR ON ENGINE; SAVES GAS ORDINARILY USED IN CHOKING.
- SAVES TIME — SAVES TEMPER — ELIMINATES COSTLY TOWING CHARGES.
- PAYS FOR ITSELF OVER AND OVER.

Agents Wanted

CRAY-LINCOLN
Eng. & Mfg. Co., Inc.
CRAY OIL BLDG.
North Walpole, N.H., U.S.A.

The body is solid. My tests showed no squeaks or rattles, or leaks in six hours of rain. Doors open and close easily and with little effort.

Roadability is excellent. The car is low, hugs the road and handles wonderfully well on corners and over the rough stuff. (You can corner fast with this car with very little sidesway.) The snubbing is good and the front end is quite free of "floating" and gives a good ride. Steering is easy, and there is no backlash. The top of the steering wheel is low enough so that it does not obstruct vision, something short persons will like. Tire squeal seems less in Packard than in most other cars, possibly due to good chassis design, balance and weight distribution. I hit strong side and head winds in Arizona, yet the car handled well. In our survey, 91 percent of the owners reported maneuverability as excellent, nine percent said average and not one owner reported it unsatisfactory — a remarkable tribute to Packard's road-holding qualities.

Roominess is wonderful. Lots of space for a tall person with a hat on to get in and out. A very comfortable sitting and driving position, with lots of legroom. Seats are of foam rubber and the position is extremely comfortable. Visibility is outstanding, as there are few blind spots, which makes for safety. The windshield is curved and one piece. Packard's straight-eight engine is longer than the V-8 type, yet the hood vision directly before the front wheels is better than in most makes with the shorter V-8 engine.

I drove the test car over all kinds of roads, in the high Rockies to the long, open stretches of the hot desert. Its top speed by speedometer was 108 to 110 miles per hour on long stretches of 5 to 10 miles (as usual, like on other makes, it was fast as compared to stop-watch timing, although I did find Packard's speedometer more nearly accurate than most).

Acceleration up to 50 miles an hour is about average for a car of its weight and engine size (327 cubic inches), but at higher speeds acceleration was quite good and the top speed was a great surprise to me. It is really a fast car with outstanding ability to cover mile after mile at 95 to 100 miles per hour. The engine has a 7.8 to 1 compression ratio (7 to 1 on cars without Ultramatic), very high for a stockcar, especially with an L-head engine such as Packard's. The engine is extremely smooth and there is very little vibration at any speed. It has good "lugging" power at slow speeds. Hydraulic valve lifters aid in making the engine quiet.

I used premium gas most of the time. In

(Continued to page 272)

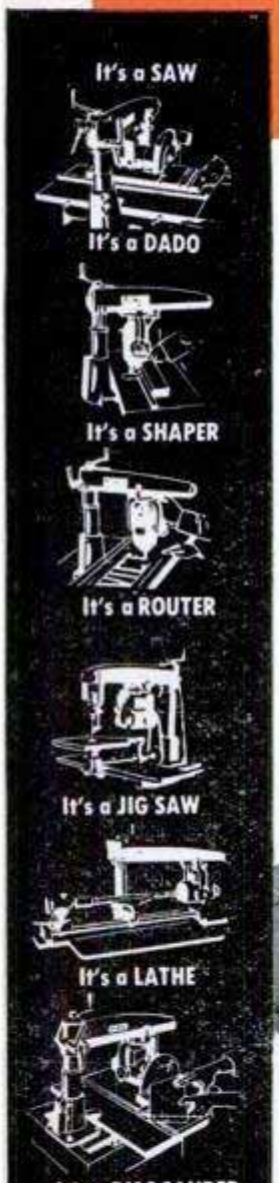
IT'S SUPER FAST! IT'S SUPER SAFE!

It's the ideal machine for home workshops

This versatile, all-purpose, low-cost

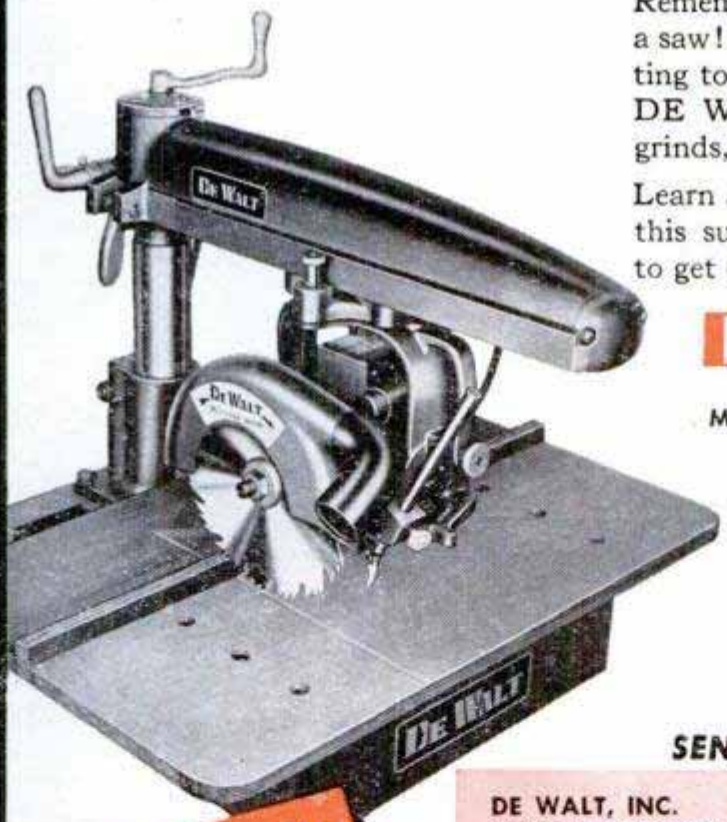
DE WALT "power shop"

does everything in woodworking!



Many times you've probably wanted a machine like this for your home workshop!

It's the world-famous DE WALT radial power saw. It's fast . . . accurate!



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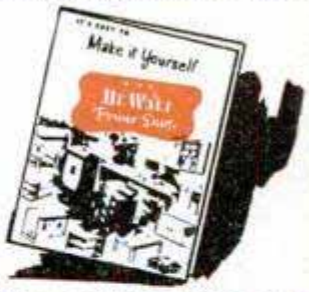

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The fastest, easiest cutting hacksaw blade . . . in the sweetest, smoothest-swinging pistol grip hacksaw frame. Both made by *Starrett* —World's Greatest Toolmakers . . . to save your time, temper and muscle. Get the best . . . ask for Starrett Hacksaw Blades and Frames at your tool dealer or industrial distributor.

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BUY THROUGH YOUR DISTRIBUTOR MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS · DIAL INDICATORS · STEEL TAPES · PRECISION GROUND FLAT STOCK · HACKSAWS, BAND SAWS and BAND KNIVES

spite of the high-compression ratio, the engine runs quite well on ordinary gas, but I prefer premium gas for most uses. (Ninety percent of the owners reporting said they used premium gas.) Owners report an average of 16.1 miles per gallon in country and 13.1 miles per gallon in city for all models under many different driving conditions in different localities. Overdrive-equipped cars gave an average of 2.9 more miles per gallon than the ones with conventional transmissions. The Packard 200 led its class in the 1951 A.A.A. Grand Canyon Economy Run (Los Angeles to Grand Canyon, Ariz., 840 miles) with an average of 22.023 miles per gallon at 40 miles per hour average speed. (The 300 model averaged 20.941 miles per gallon.) I consider my mileage in the test car quite good for the size and weight of the car (see economy chart for figures).

A surprise in the face of recent V-8 engine-popularity increase is that 64 percent of Packard owners prefer the in-line engine. Only 36 percent favor the V-8 design. Fifty-seven percent want side valves, and only 43 percent like overhead valves.

I've never yet found a car without features that I disliked, and Packard was no exception. I like an inside-operated hood lock and Packard has none. The instrument panel is plain, not in keeping with Packard's standards, but I'm told by Packard officials that a newly designed "out of this world" panel will be on the new cars by the time this article is in print. The rear end is wide and massive and luggage capacity (16 cubic feet) is terrific. I believe Packard has more space than any other sedan and, for one with lots of luggage, the idea is great. But — hold your hats — the lock arrangement is the worst I've ever seen on a quality car; but again, Packard officials say that an improved lock will soon be on all their cars.

The starter button is located underneath the throttle pedal and requires depressing both in order to turn over the starter. Some like this arrangement—some don't. Personally, I'm not impressed. The switch key is on the left side of the steering column—I'd prefer right-hand operation. The windshield wiper operates from a button on the steering column, a unique position, and it's okay. The glove compartment is a sliding drawer. I didn't like it at first, but its operation and convenience grow on you. There are two ash trays in front, which will appeal to smokers. The radio I would rate as average. The heating and ventilating system is definitely good, but lever operation could be easier. The parking brake operates easily from the left of

(Continued to page 274)

Which lamp is ready to burn out?

ONE of the General Electric "All-Glass" headlamps on the test car above has just been lighted for the first time. It's at the beginning of its life. The other G-E lamp... the one on the left . . . has been burning day and night for many, many months. Yet when the photo was taken it was impossible to see any difference in the light output of these 2 lamps!

That's because General Electric "All-Glass" headlamps give an average of 99% as much light just before burning out as when new. Both the lens and reflector of the G-E headlamp are made of hard glass, fused together into one piece. Road and laboratory tests prove that this one-piece unit keeps out the dirt and moisture that might otherwise gradually rob the lamp of light output.

Because they DO NOT GROW DIM, G-E "All-Glass" headlamps mean easier, SAFER night driving. Use them to replace burnouts whenever you need a replacement.

G-E "All-Glass" Headlamps DO NOT GROW DIM!

You can put your confidence in—

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BIG MONEY
AT HOME OR
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SYNCRO JIG SAW
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LARGEST AND
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You, too, can use this amazing new, safe jig saw for fun or profit! Make your own Gifts or to sell! SYNCRO SAW is the most powerful, largest of its kind! QUIET, ideal for apartments. SAFE, blade does NOT pull fingers toward it. NO belts, gear or oiling. Adjustable "any length cut" arm. With BUILT-IN New Reactance Type Electric Motor. $22.95 at dealers or postpaid.

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MOTOR INCLUDED

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QUALITY TOOLS

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U. S. A. Model No. 201. 60 Cycle, 110-120 Volt AC. Other Voltages, Cycles available.

World's largest manufacturer of reciprocating electric sanders with double arc motion which gives double the sanding action.

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☐ FREE CIRCULAR. Send new SYNCRO CIRCULAR showing new SAW and NEW SANDER.

WRITE NAME, ADDRESS BELOW — MAIL TODAY!

the steering column by use of a T-handle. The gas tank holds an ample 20 gallons, but improvement in filling could be made.

Generally speaking, I found few faults with the new Packard and I confess that the car is much better than I expected it to be. Styling in recent years lagged some, but the new models are now among the style leaders of the industry. Pioneer inventor James Ward Packard started early in building quality cars—and even in the early days, when precision work and pride of workmanship were evident, there was a well-known statement that the three finest cars in the United States were the three Ps —Packard, Peerless and Pierce-Arrow.

After my exhaustive tests and careful study of the owners' survey, I would rate Packard as one of our three finest mass-produced cars. Packard has regained what it takes to rate as one of the top three!

"Englewood, N. J., Dialing San Francisco"

(Continued from page 132)

in 1925. The first innovation was "step by step" toll dialing in which the operator first had to pick a route before she could dial. If the one she chose was busy, she'd try another. Ten years ago, the five operators were down to two on a long-distance call.

Then came the electronic brains that did all the route picking for the operator in a fraction of a second. By 1949, operators were dialing toll calls to more than 300 areas of the country. By 1960, some officials believe, most customers will be dialing their own. One big job will be to install the extra banks of relays in local exchanges to handle the three extra national-area code digits the customer will have to dial, and to modernize switching points that are now using old-type equipment.

Before customer toll dialing could become a reality, engineers had to turn handsprings on a couple of whopping problems. The originating register, for instance, which takes the number from a caller at every new dial exchange, starts working automatically when the caller finishes dialing his seven digits. It's very fussy about this. If a caller dials four numbers and stops to pick up a pencil, the brain gives him 20 seconds to retrieve it. If he doesn't, it turns him over to an operator. How could it be made to wait for seven digits on a local call, but have enough sense to wait for 10 digits when a long-distance call is dialed?

"A little electronic wizard called a pretranslator takes care of that now," says Frylinck. "It monitors each call, recognizes the

(Continued to page 276)

THE MOST *Versatile* TOOL ON YOUR BENCH!

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In almost any job you can think of—Pliers are necessary—and Channellock pliers are the best you can buy. Whether you are working on your car, electrical repairs, plumbing work or just tightening nuts and bolts Channellock pliers do it better.

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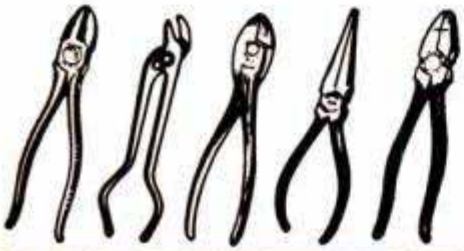

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Middle-age is no barrier to a job at Lockheed; skill and ability, not years, count here.

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Write today for job application blank and illustrated brochure describing life and work at Lockheed in Southern California. Use handy coupon below.

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My Name _____

My Type of Work _____

My Street Address _____

My City and State _____

national code signals and instantly sends a pulse to the originating register which says to it: 'This is a long-distance call. Wait for 10 pulls of the dial.' If 411 comes up, it tells the originating register not to wait for any more pulls of the dial. 'Shoot this to information,' it says; or 'this is a local call—wait for seven digits' if it's an ordinary number preceded by two letters."

Probably the biggest hurdle was billing. How do you time a long-distance call and tabulate all the necessary data on it if no human operators are watching things?

The answer to this loggerhead is a group of fantastic-looking machines that automatically tracks thousands of calls, remembers who made them, what numbers were called, how long they lasted, then compiles and prints all the information.

The incredible system is made up of a maze of wires weaving through magnets that translate electric signals into numbers; a huge bank of switches and relays that "remembers" numbers and calculates charges, and a machine that looks like a modern teleprinter, which converts everything into holes punched on a tape.

All together these gadgets leave nothing to the imagination. They pick up the calling and called information as it takes off on a long-distance line, translate it into the actual number of the caller and the number he's calling. The punch printer beats out the information on a reel of three-inch paper tape. When the called party answers, the starting time of the call is noted by the brain and passed along to the hole puncher for recording. When the connection is broken, the mastermind machines record it within $\frac{1}{10}$ second. Later, other machines sort out the items on the tape and correlate all the data gathered on a single call; still others convert the elapsed time on calls into chargeable units, adding, subtracting, dividing and multiplying to get the right answers for your bill. The "reader," which translates the punched holes into actual figures that can be read on a piece of paper, zips along the tape at a rate of 80 coded digits per second.

With all of this automatic nightmare in full operation, you'd think modern coast-to-coast dialing stood a good chance of blowing sky-high if even one bank of switches went haywire and started connecting people with Bemidji when they dialed Houston.

Out at the Englewood exchange, you can see why this would never happen. Set in a huge board of blinking and flashing lights with scores of jack plugs and banks of buttons is a machine that can tell you just exactly which one of millions of tiny switches

(Continued to page 278)

Why Permaglas

AUTOMATIC WATER HEATERS

outlast all others

Glass-surfaced Steel Tank. That's the secret of Permaglas water heater longevity!

It took years of research and experimentation before A. O. Smith engineers and technicians perfected the glass surfacing that provides the ultimate in sanitation and protection for water heaters.

Heavy mallet blows cannot chip or crack the diamond-tough glass-surfaced steel.

More than 2,000,000 bends by this mechanical giant, yet the glass-surfaced steel "ring" is good as new!

Glass surfacing withstands impact and thermal shocks... has the same expansion coefficient as the steel to which it is permanently fused!

Glasss surfacing pays off in benefits for home owners all over America by giving them water heaters that *can't rust* because *glass* can't rust . . . eliminating stained bath-water, spotted laundry and ruined fixtures!

In Permaglas water heaters you get this positive protection from tank corrosion . . . the cause of frequent replacement . . . and at no extra cost, for *Permaglas* . . .

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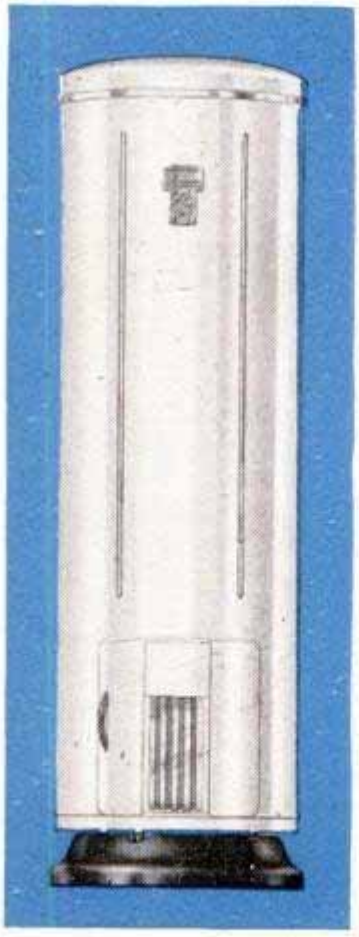
THAN ORDINARY WATER HEATERS!

Contact the merchant plumber, appliance or utility company displaying this emblem and get the whole, interesting *Permaglas* story . . . or use the handy coupon, today.

Sudden shock of ice cold or scalding water does not affect the glass surface of *Permaglas* water heaters.



***Permaglas* Automatic Water Heaters, 20 to 80 gallon sizes, are available in Electric, Gas and LP-Gas types.**

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Send me complete information on your *Permaglas* ☐ Gas ☐ Electric ☐ LP-Gas Automatic Water Heaters, including your illustrated booklet on "Ceramitron" Construction.

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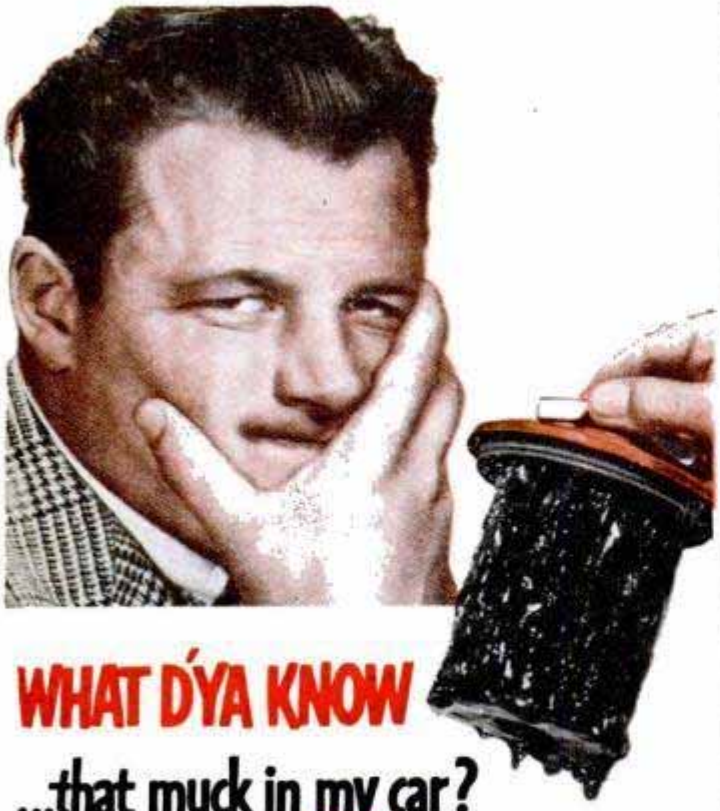

WHAT D'YA KNOW

...that muck in my car?

A mucked-up oil filter can cost you plenty in engine repairs. Get in a new Purolator* Refill—quick!

Checked your oil filter lately? Chances are it looks like this . . . is so clogged up it can't trap all the engine-wrecking abrasives that seep into your oil. Your car may be headed for some costly repairs.

What to do? Don't delay—get in a clean filter refill—fast. **Which make?** Pays to buy the best—a Purolator Micronic*. New accordion-type design gives up to 10 times the filtering area—with pores so tiny they trap particles you can't even see. **Cost much?** Strictly small change—$1.38 to $3.00 depending on car make. Purolator Products, Inc., Rahway, N. J.; Toronto, Ontario, Canada.

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Right you are—it's **JACK CARSON,** now starring in "MR. UNIVERSE"

in the big phone exchange is on the fritz.

This is the maintenance board, where thousands of electric eyes peer continually into the minutest part of the vast system. "We can hook it into any bank of switches in the exchange," says Frylinck, "watch the lights, and tell you just how the calls will go through. If a marker is on the bum, the machine will punch holes in a card telling just where the trouble lies. We can pull the marker out of the system just by putting a jack plug in a socket to by-pass it."

While Englewood pioneers customer toll dialing, more and more cities throughout the country will get dial exchanges, so that when the time comes they can be hooked in on the long-distance set up. And, until mental telepathy becomes commonplace, you can be sure that customer toll dialing will be the fastest possible way to call a friend 1000 miles away.

Manhattan, We Are Here! or, The Hare Beats the Tortoise at Last

(Continued from page 121)

reached the south side of Chicago when he had to lower his hose into a park pond and fill his 40-gallon tank. Rube jeered and drove on. At Michigan City, Ind., the Stanley's burners went out. Rube raced on ahead. But his time came that night at Jackson, Mich., when a rim flew off in the darkness. It could not be found—and hasn't been yet. It looked like a long delay. But by luck, the Studebaker dealer in Jackson, Ralph E. Lewis, had a stable of six old-time horseless carriages and offered the loan of a rim that would fit the Stoddard.

Jackson was the first overnight stop. Next morning, a mile out of town, a tube without a liner was pinched and went flat.

The ancients paid a courtesy call on Detroit the second night, and again the next morning Rube got out his jack and pump as another pinched tube stopped him. At Cleveland, the third night, the Firestone clinic cured the ailing liners and beaded rims, but there had been other delays getting into Cleveland. Sandusky, Ohio, police waved Rube to the curb for a look at his acetylene headlights and jovially fined him $3 for defective lamps. At Lorain, the law caught up with the Stanley Steamer, and Brause was fined $7 for speeding at 63 miles an hour.

"Dern cops," muttered Jack, "they make me go so slow my pilot lights go out."

Crowds lined the whole length of the route. Conneaut, Ohio, schools were let out and the youngsters stood in the rain to wave the old-timers by. That rain was the

(Continued to page 280)

AMAZING NEW LOW PRICED BURGESS ELECTRIC ALL IN ONE JIG SAW—SANDER—FILER!

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BIGGEST BARGAIN YOU EVER SAW IN HOBBY TOOLS!

This amazing power tool is actually a *complete* portable Home Workshop—in one compact unit! It SAWS the most intricate patterns. It SANDS flat or beveled surfaces perfectly! It FILES metal, wood, or plastic. The sander and saw table tilts to 45 degree angle, and the automatic Blower Attachment keeps the work free from saw dust and filings while you work! It saws and sands straight—or at any angle up to 45 degrees. The powerful built-in fractional h.p. motor drives blade at about 3400 strokes per minute—really makes the work fly!

A precision tool, small enough to set anywhere, strong enough to do a real job, low enough priced to make it a big-paying investment!

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Comes complete with 110-125 A.C. motor, UL approved, 6 ft. cord set, push-button switch, extra blades and sanding discs, one jig-saw pattern, and instruction book. Examine this combination JIG SAW, SANDER, FILER—*without risk!* Send no money now—just mail coupon. On arrival, pay postman only $12.95 plus postage and handling. (If you wish, we'll also include 89 different patterns for only $1.00 extra). Try it in your own home—and if *not* completely satisfied, return it within 10 days for purchase price refund! Order NOW—for yourself, or as a gift for any boy from 6 to 60! Mail coupon *today!*

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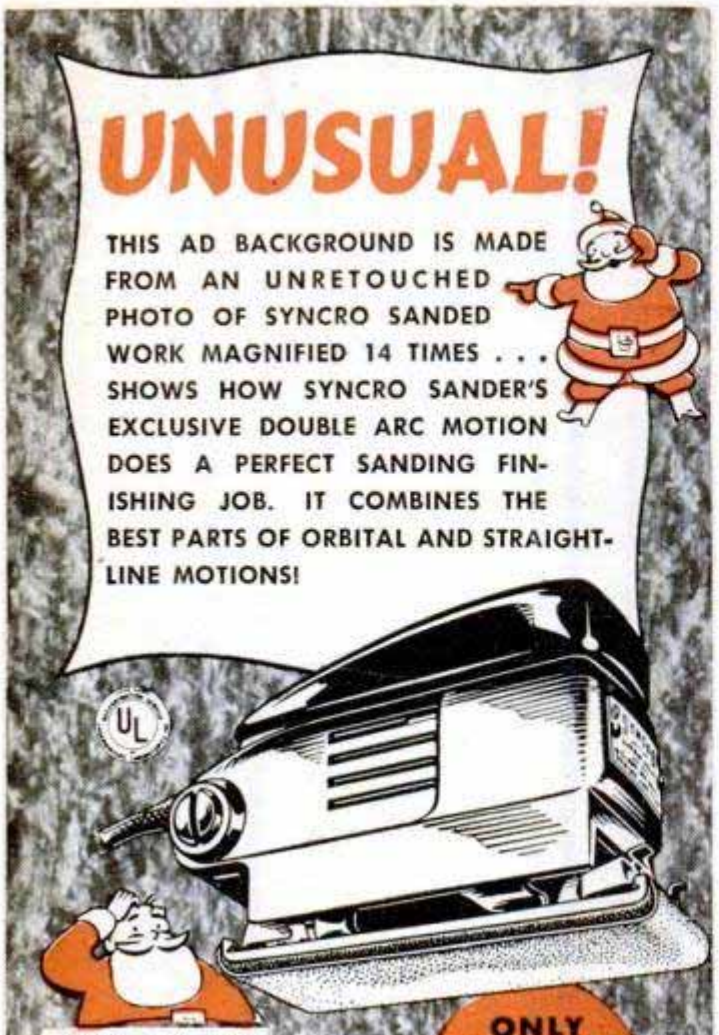

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The amazing new SYNCRO NO. 504 now has DOUBLE its previous sanding action—gives a scar-free, BETTER, smoother finish—twice as fast! Finer finish guaranteed or money back! Simply wonderful for finishing fine furniture . . . ideal for overhead sanding . . . perfect for window sills . . . any hard-to-sand place. Get yours now. COMPLETE with New BUILT-IN Reactance Type Electric Motor, $19.95 at dealers or direct. Operates 60 cycle, 110-120 volt, AC. (Dealers, Jobbers write!)

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turning point of the race. Until then the gas car, humming along steadily while the steamer stopped every 30 miles for water, kept the lead. But the deluge from Ashtabula, Ohio, to Erie, Pa., was Mr. DeLaunty's undoing. It wasn't the rain from heaven that hurt; it was the water splashed by passing trucks and trailers on the Stoddard's unprotected underside. The magneto was soaked. The gas buggy sputtered and died. Once Rube was able to mop it dry and resume, but just 13 miles beyond Erie the magneto was drowned—and Rube and Eleanore nearly so. Aubrey O. Cookman, Jr., our associate editor and official escort in a station wagon, put out a towline and hauled them far enough to get the car started again. The magneto still wasn't completely dry and the Stoddard had to be towed in after a second halt just short of Buffalo. Jack Brause was waiting there.

"Rube's at the end of his rope at last," Jack quipped. It was after midnight when they reached Buffalo. Next morning, after breakfast with Mayor Joseph Mrnk, the tour got a late start and a Bell helicopter came to the Stanley's rescue with a load of water and refilled the steamer's tank via a rubber tube while it rolled along the highway. Water and gasoline were something of a daily problem. The steamer requires white gasoline, and it wasn't always available. And some filling stations couldn't even supply the full 40 gallons of water to fill its maw; once the steamer actually ran dry and rolled five miles on stored steam pressure before it found a farm with a small brook in the back yard to quench its thirst. Rube, using ethyl gasoline and needing only radiator water, had no trouble.

They traveled only 60 miles that fifth day to Avon, N. Y., but made 210 miles the following day to Amsterdam, with only a nail in a tire for interruption. What the drivers and girls and escorts remembered about this part of the expedition were the animals.

"The dogs recognized an antique when they saw one," Cookman recalls. "They paid no attention to our station wagon, but when they spotted the Stoddard or the steamer, they'd bark and chase the old-timers down the road."

Somewhere in the Mohawk valley a placid cow was munching in a meadow when the cars rolled by. She raised her mild eyes, turned for a startled double-take, then with a bellow high-tailed off down the fence line.

At Geneva, the entourage was escorted through the city by William Teague in his 1908 Regal Underslung.

The sixth day's route—the entire route was planned by the American Automobile

(Continued to page 282)

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Association and a Motor Club car escorted the cars down Riverside Drive into New York—was from Amsterdam to Poughkeepsie. On the way, the Hicksville Fire Department chased Jack Brause to Red Hook and pumped him a tankful of water.

Television trucks followed the racers from Poughkeepsie to the finish at New York City September 17, and on this final lap Jack Brause nearly lost his race. The Stoddard-Dayton buzzed right up and down the Hudson River hills but the steamer puffed up in slow motion. On some of the steeper grades its steam pressure, normally 500 pounds, dropped as low as 40 pounds. But down to the finish line Jack rolled at 55 miles an hour.

"Few more hills between here and Chicago and I'd have made you look sick," Rube grumbled.

"Humph! It was dirty gasoline that did it," Jack retorted. "It wouldn't burn right."

The steamer's burners wouldn't stay lighted in slow motion, and by the time the ancients moved through Manhattan traffic into Fifth Avenue, Jack's fire was out. For the last half mile he drove on dwindling steam pressure, but he made it, into the waiting throng in Rockefeller Plaza. There, while the newsreels ground away, he lifted the hood and relighted. The Stanley responded with a loud, triumphant boom that startled the crowd.

At a luncheon next day celebrating the event, H. H. Windsor III, a vice-president of *Popular Mechanics* and son of the publisher, presented the $500 first prize to Brause, then turned to DeLaunty and handed him an unannounced second prize—a check for $499.

"Heck, we were going to split 50-50," said Brause, and handed Rube the difference.

"Would you do it the same if you came to New York again?" someone asked.

"Not me," Jack replied, "I'd rather fly."

As for these newfangled gas cars, he'd have nothing to do with them. He has never learned to drive one.

"When you've worked on cars for 50 years," said DeLaunty, "you get sick and tired of them. I'd rather ride a streetcar."

As for Brause, the winner, "I love that Stanley," he said, "but the steamcar has no future—until they develop an atomic-powered automobile with steam drive."

We especially liked the remark of one man reading the account of the race: "It's a pleasure to read a story that doesn't involve a world problem!"

As one commentator put it, the two veterans had solved for all time a problem that bothered hardly anybody. But they, and the onlookers, and antique-car fans across the land—all of them had a lot of fun.

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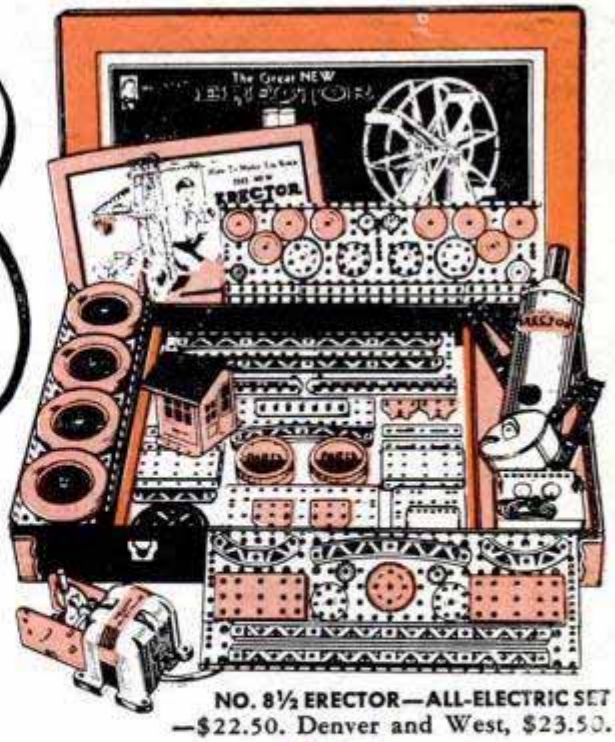

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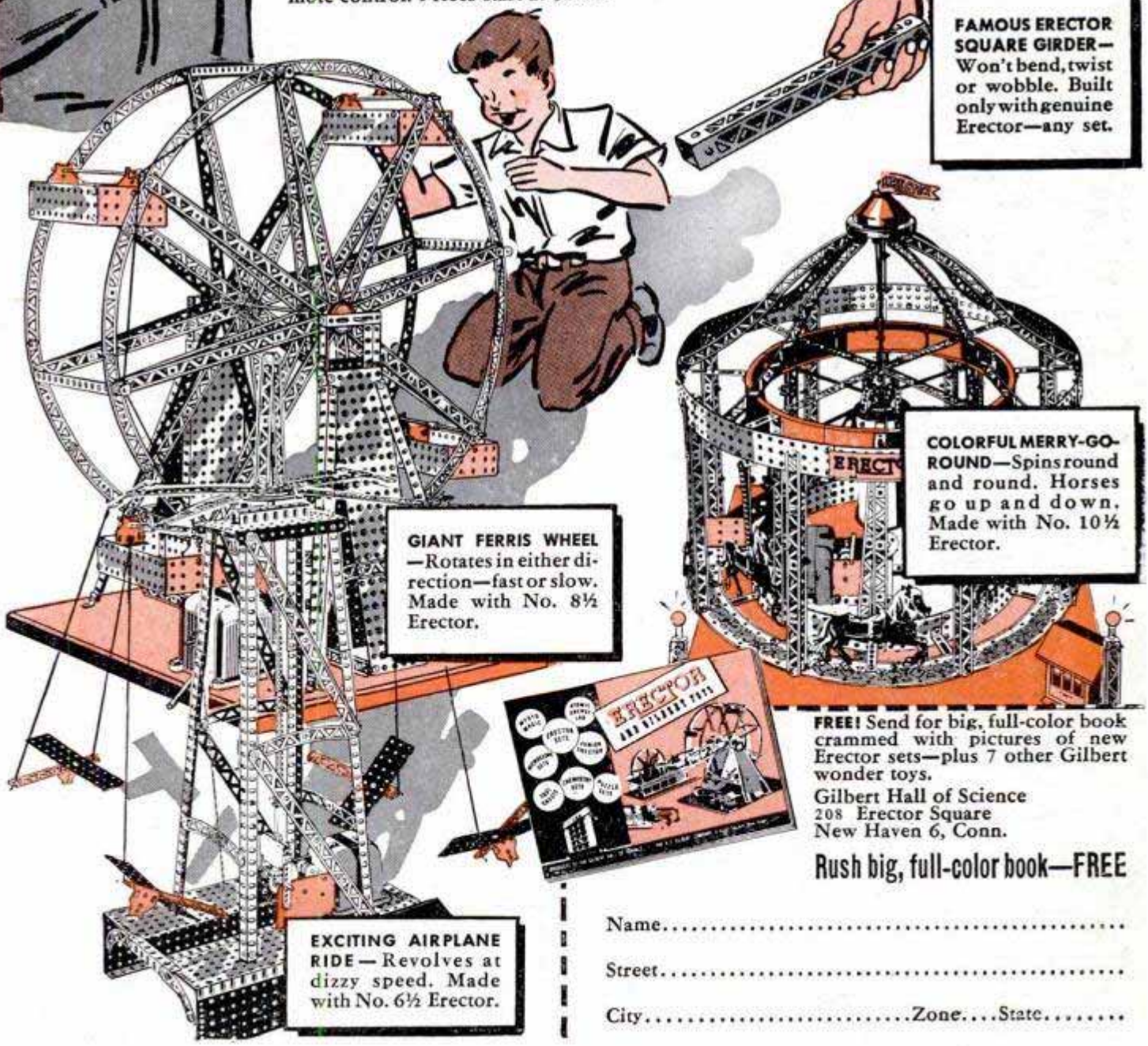

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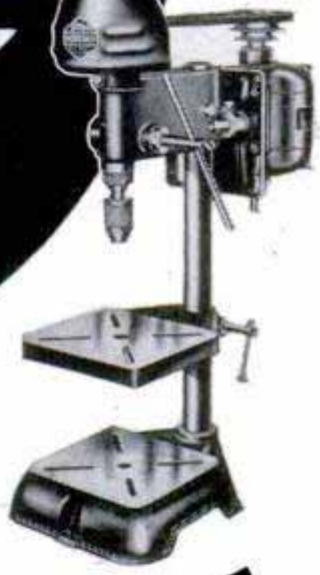

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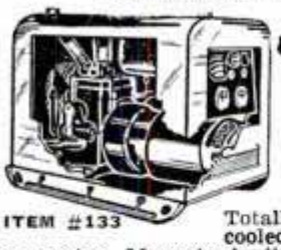

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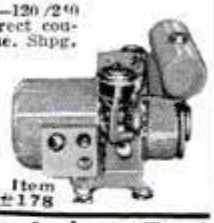

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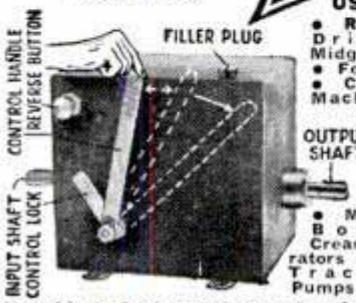

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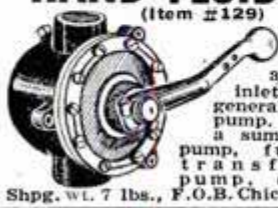

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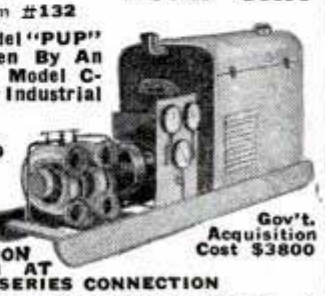

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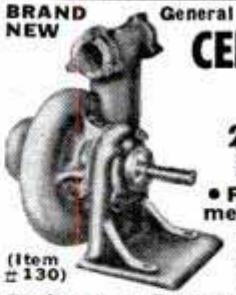

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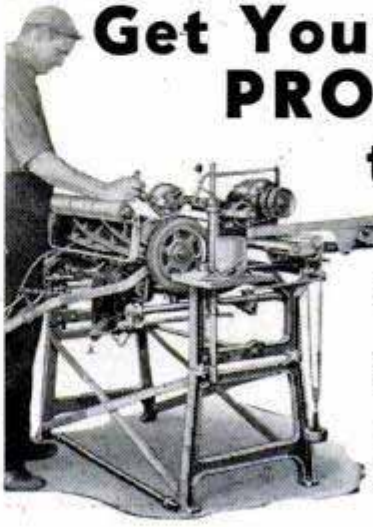

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3 PORTABLE DRILL PRESS—(Uses No. 2 Moto-Tool) Adds versatility to Moto-Tool operations. Ideal for model-making, wood carving, routing, etc. Precision built, 12" high. Price (less Moto-Tool) **Only** **$9.95**

4 MODEL 2000, SANDER-POLISHER—Fastest seller in the field. **Straight-line reciprocating action** guarantees **scratch-free finishes.** A fast-cutting production sander (14,400 sanding strokes per min.) for heavy-duty craft and wood-working projects, refinishing and redecorating. Gives you necessary power—**easy one-hand operation**—and 21 sq. in. of sanding surface for furniture making, boat building or refinishing, resurfacing large areas, building operations such as dry-wall joints, woodwork, siding and exteriors. Does a superb polishing job! Weighs 5 lbs.; needs no oiling; permits 10-second paper change; dustproof. Over-all size 3⅛" x 4½" x 7"; 110-120 V., 60 cycle A.C. With **steel carrying case,** 25 asst'd. abrasive sheets, sheepskin pad, **Only** **$24.50**

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6 ELECTRIC COPING SAW—Safe as a handsaw—cuts scrolls like magic—sands as it saws! For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—smoothly delivers 7200 strokes per min. Saws through ¾" medium-hard wood at foot-a-minute speed. Trigger-touch foolproof action. Only 2 moving parts, never needs oiling. 110-120 V., AC. **Free plans** packed with each saw for **6 useful wood projects,** and for **making your own table-type jig saw!** With 3 saw blades, **Only** **$5.85**

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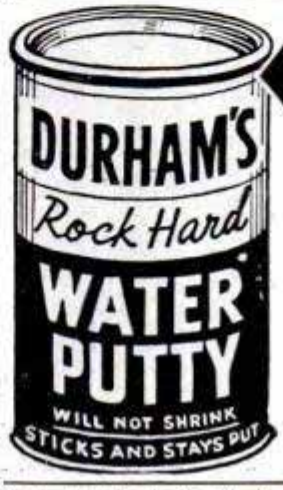

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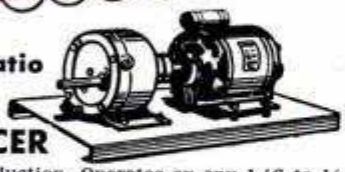

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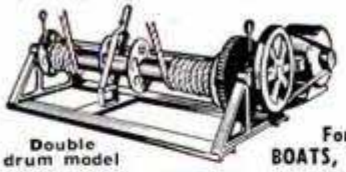

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CABLE, ¼" preformed stainless steel aircraft. 100 ft. or less .....**17¢ /ft.**
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Gas or electric. Awarded from government.

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1½ HP	50 gal. tank	$265.00
2 HP	50 gal. tank	$295.00
3 HP	60 gal. tank	$410.00
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10 HP	80 gal. tank	$775.00

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Fits any 8", 9", 10" furnace pipe. 1500 RPM motor with 6' cord, mounting frame, 7" blade. Motor 110 volt 60 cycle 1550 RPM. Easy to install. Silent operation. Warm those rooms with long runs. **Stock #583.** Regular $11.95. Your price **$6.95**

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Top performance for forced draft, ventilating, exhausting, cooling and drying, 110 volts AC. Intake 3", discharge 2½", 75 cubic ft. per min...**$10.95**
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BE PREPARED for any emergency!

300 WATT 110-220 volt AC, 60 cycle light plant powered by 1 HP gas engine, direct drive, mounted base, wgt. 40 lbs. Ideal for campers, P.A. systems, house trailers, etc. Equipped with handle for easy carrying.....**$99.00**
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To make plant 110-220 add $40.00 for transformer.
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5000 WATT, 120 volt, 60 cycle AC, Hercules 4 cyl. gas engine. Generator mfr'd by Hobart Bros. Unit includes remote control cable, 150' 2-wire #6 and 150' 3-wire #18, exhaust pipe, power cable plug, spare parts, manual, battery, radio and TV filtered. Unit is completely automatic. List price today..$1910. Now priced for you at **$675.** used. NEW.. **$895.** To make plant 110-220 add $72. for transformer.
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18 Inch

Handles all spray booth and air exhausting jobs with absolute safety in atmospheres containing flammable and exhaustive gases. Totally enclosed 1 HP Motor, 220/440, 3 phase, 3400 RPM. Reconditioned **$109.00**

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Made by Minneapolis-Honeywell—a name known for the best in controls. 1000 watts—115 to 220 volts. Element length 10 ft. Range 70° to 212° Fahrenheit. Control fans, motors, furnaces. This control makes an ideal automatic combination when hooked up to the heat boosters at left. List price $16.00. Your price.....**$5.95**

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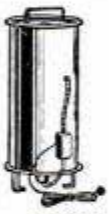

Complete unit consisting of 10 gal. steel tank: thermostatically controlled Westinghouse or Calrod immersion heating unit. 110 v. AC adjustable from 312-625-1250 watts and automatic cutoff valve. Ideal unit for household use, milk-houses, poultry water warmer, etc. Valued at $59.50. Our price **$34.95.**
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IMMERSION HEATING UNIT alone as above, worth $42.50. Only....**$5.95**
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½ HP, 3450 R.P.M., 110 or 220 volt dustproof motor mounted on universal trunnion. Heavy base has a convenient tool tray and large easy rolling casters. Flexible shaft is equipped with both full speed, angle spindle, and straight spindle. List price $172.00. Your price with all attachments **$99.00**

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TRACTOR DRIVEN GENERATOR 110-220 volts with floating mount to keep belts tight **$287.00.** Generator only **$235.00**

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FOR CUTTING WOOD, PLASTIC, or METAL
Actual size. Asst. shapes on 3/32" shank. For die makers, home workshop, etc.

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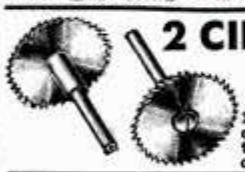

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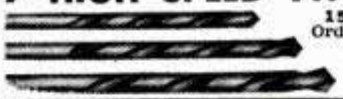

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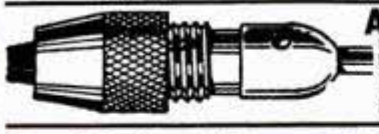

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With 2 interchangeable collets, opening from 3/32" to 0, on 1/8" mandrel. Price each only.. $1.50 P.P.

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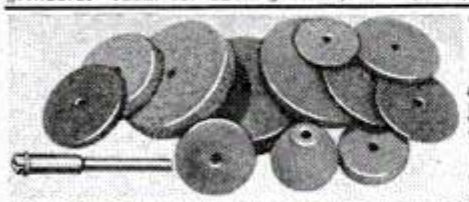
Assorted sizes cutter on 1/8" or 3/32" shank. Will fit all hand grinders. Ideal for cutting wood, metal, or plastic. Brand new.



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and rubber polishing wheels up to 1" dia. $1.00 PP
For grinding & polishing metals, plastic, wood. With one 3/32" mandrel.

10 HIGH SPEED CUT-OFF WHEELS 1 1/2" DIA. WITH 1/8" MANDREL..... $1.00

BUFFING WHEELS—5 for $2.00

8 inch diameter muslin wheels — 1/2 inch thick. Ideal for coarse and fine polishing. Post Paid U.S.A.

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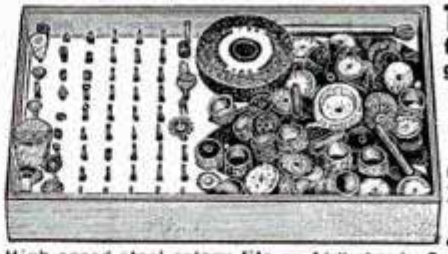

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fits all electric drills and grinders — over 300 pieces FOR CUTTING, SHAPING, GRINDING, POLISHING WOOD, METAL OR PLASTIC.

$50 Value

Complete in sturdy compact container $9.75 P.P. in USA

High speed steel rotary file on 1/4" shank. Grinding Wheels 1" to 3" in dia. Mounted Stones 1/8", 3/32", 1/4" Shanks. Rotary Cutters 1/8" & 3/32" Shanks. Miniature Cutters 3/32" Shank. Cut off Discs and Grinding Wheels. Drum Sander 1/8" Shank. Abrasive Sleeves for Drum Sander. Leather and Felt Polishing Wheels 1/2" to 1" in dia. Felt Polishing Cylinders with Mandrel. Abrasive Sanding Discs 1/2" to 2" in dia. Rubber Wheels 7/8" dia. Speed Drills 3/32" Shank. Mandrels 1/8" & 3/32" Shanks. Bristle Brushes. Wire Wheel Brush. Circular Saw on Mandrel 1/8" Shank. Rubber Cylinders with 3/32" mandrels. High Speed Twist Drills. Many more items—all new and valuable. NOTE: This Master Kit is brand new. No C.O.D.'s please.

20 ABRASIVE ROLLS,

cloth, and 1/8" mandrel for grinding, sanding, deburring metal, plastic, wood or rubber. ONLY $1.00 Post Paid

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Fine Screw Adjustment brings details in sharp focus. Brightly polished nickel. Excellent for Hobbyists, craftsmen, engineers, students. Send Check or Money Order Dept. MP2

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When You Use WRAP-ON ELECTRIC HEATING CABLE

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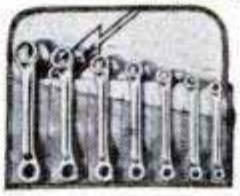

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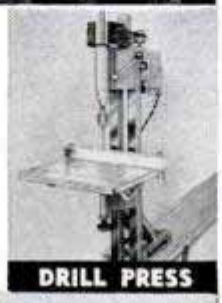

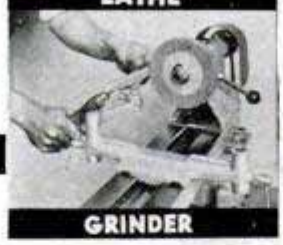

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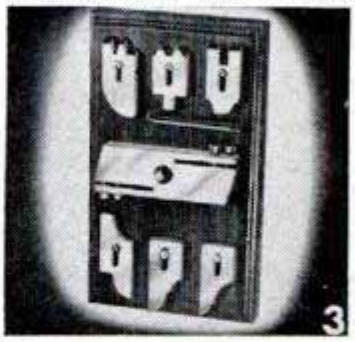

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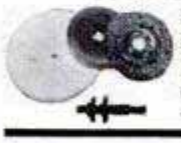

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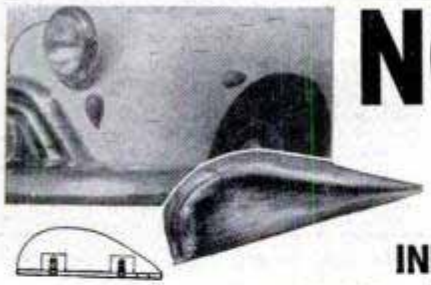

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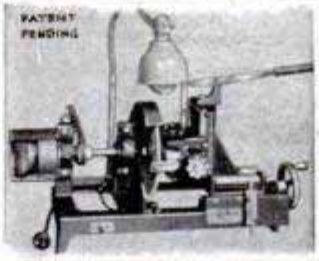

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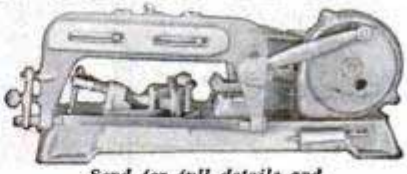

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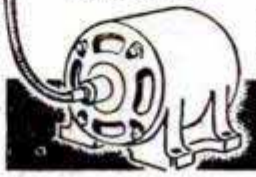

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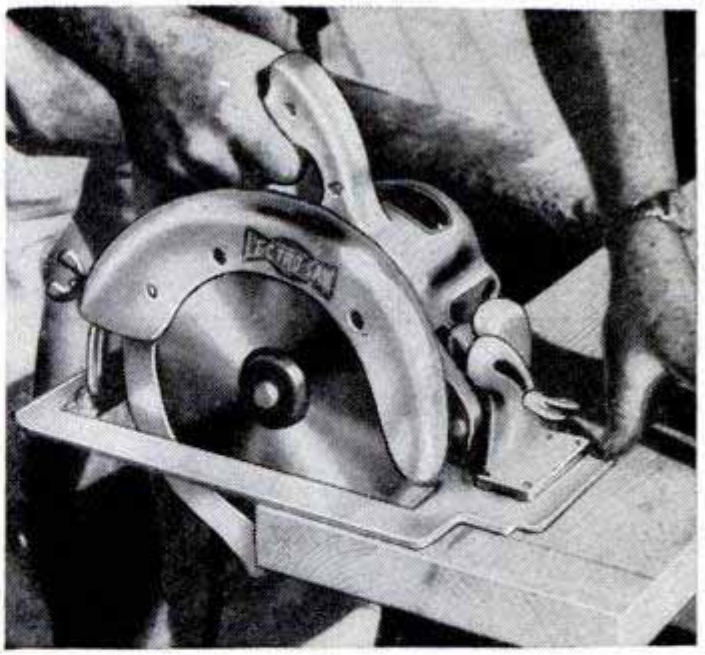

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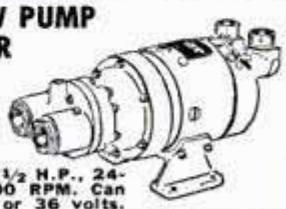

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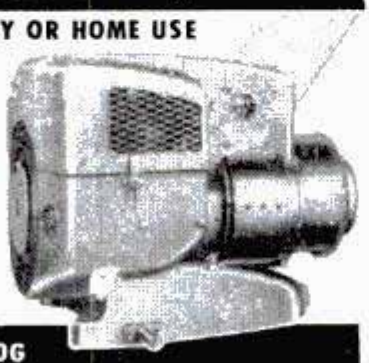

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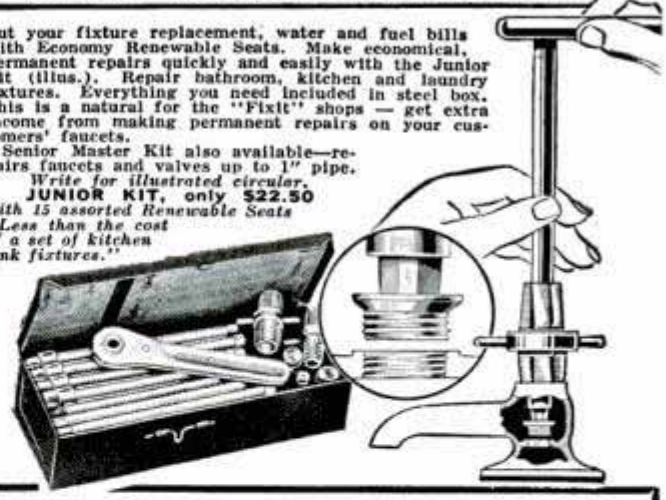

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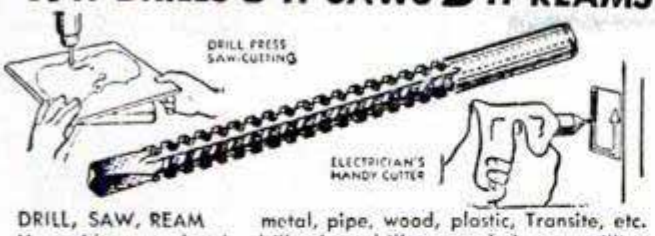

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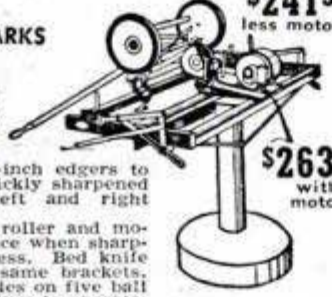

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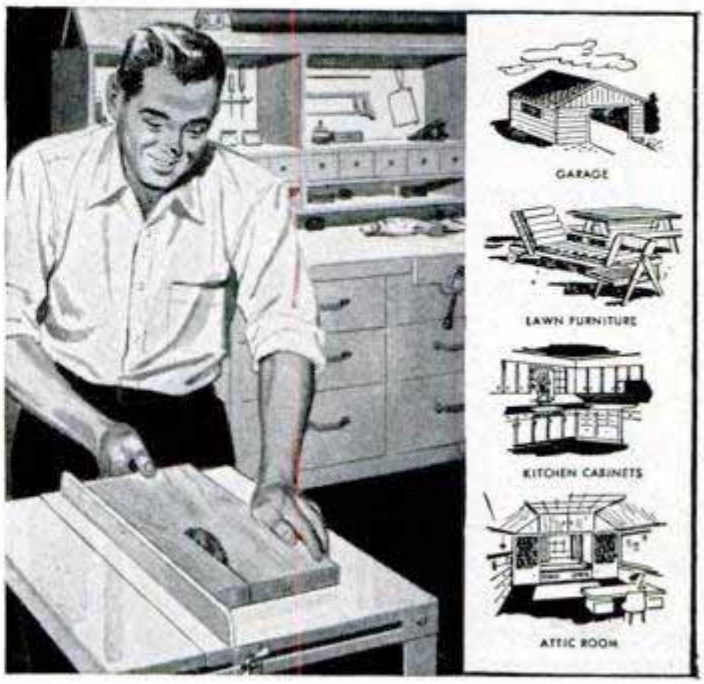

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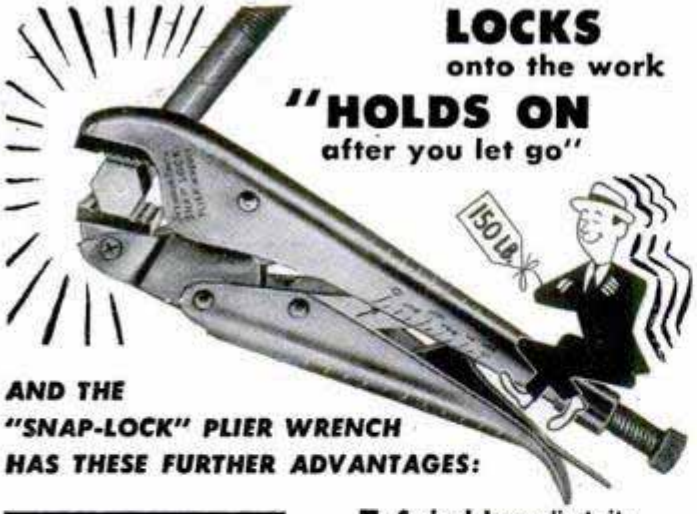

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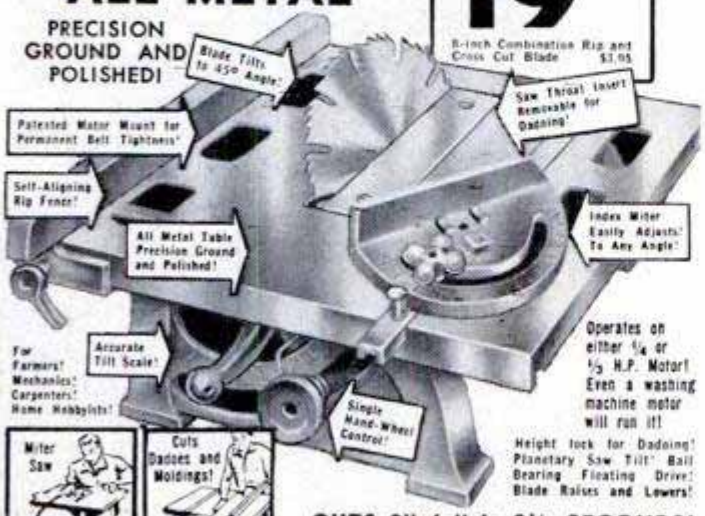

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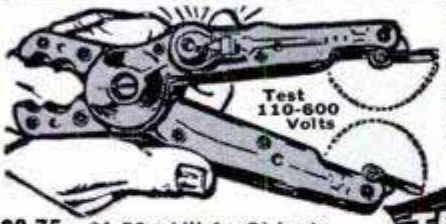

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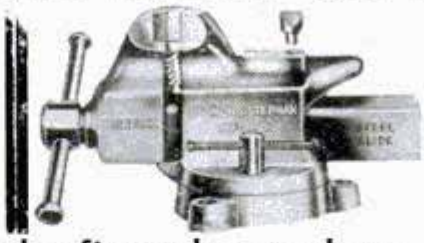

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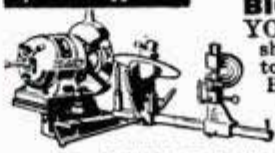

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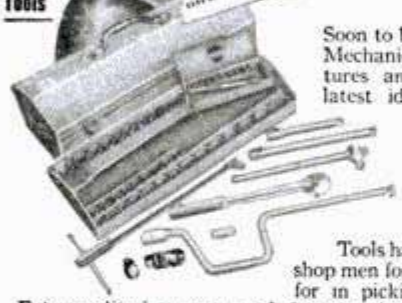

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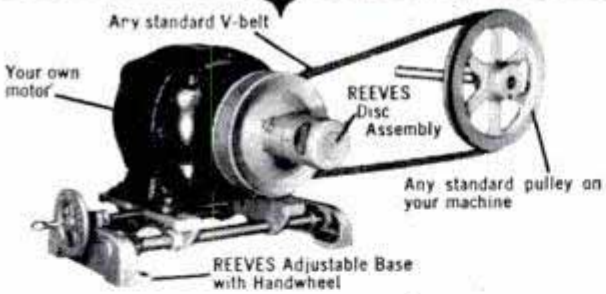

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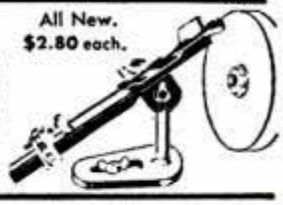

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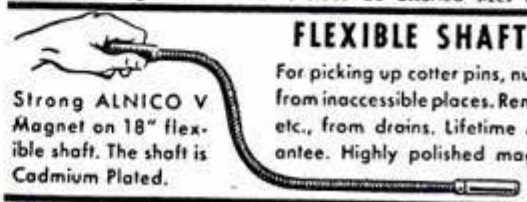

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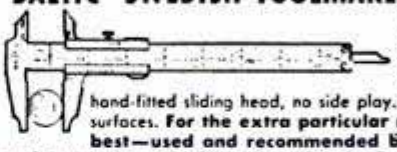

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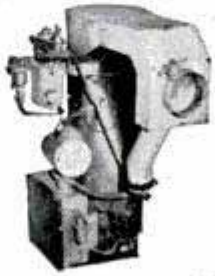

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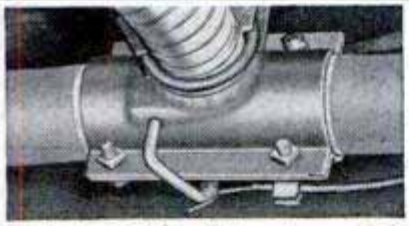

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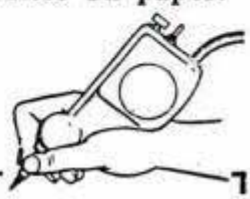

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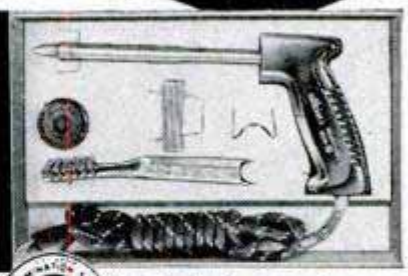

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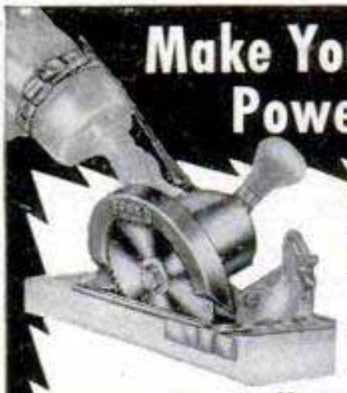

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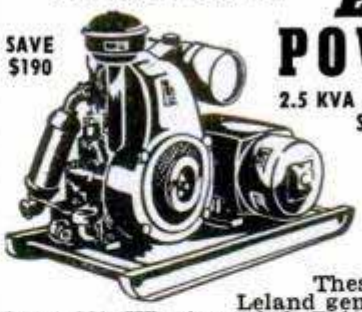

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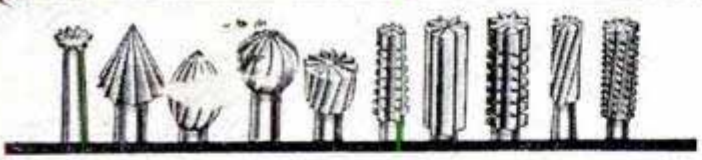

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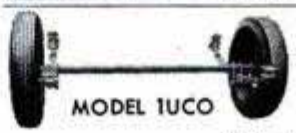

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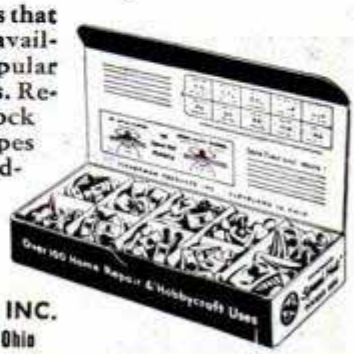

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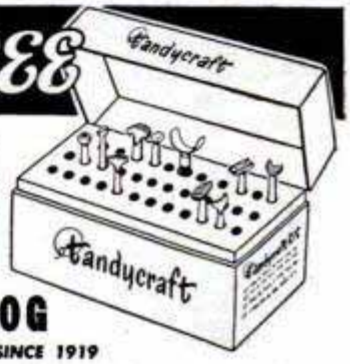

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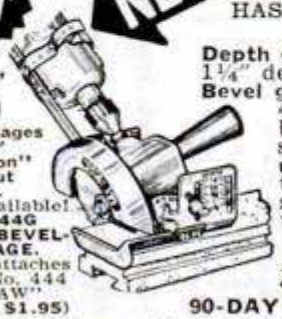

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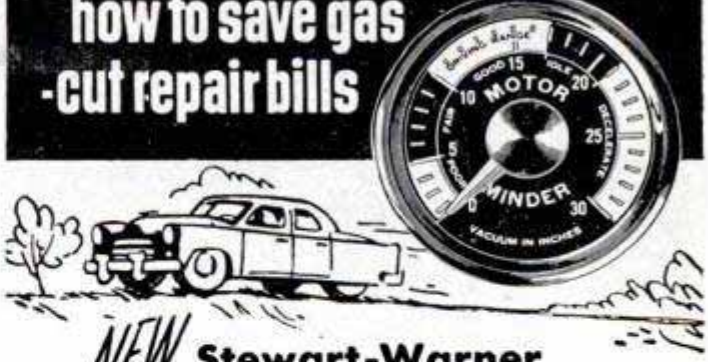

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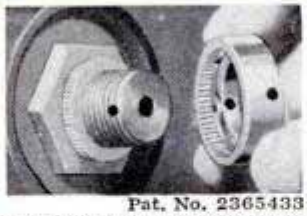

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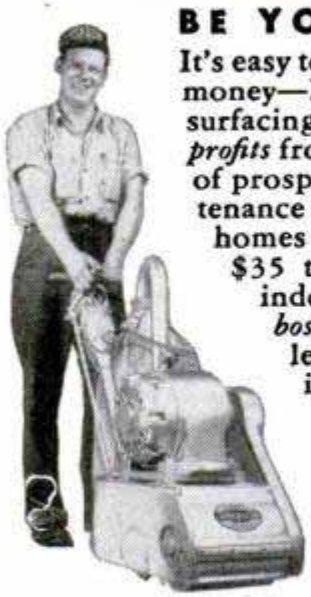

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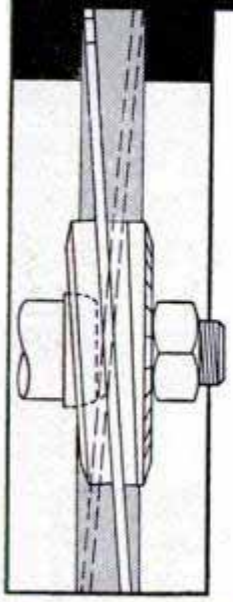

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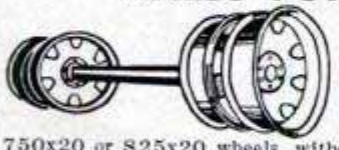


(Surplus) Heavy Duty axles suitable for building of many types of trailers, farm wagons, etc. Standard width straight axle, 2 inch square and is complete with Hubs, Timken bearings, 6 Hole 750x20 or 825x20 wheels, without brakes, only **$69.50**

Dual Wheels . . . . . add **$15.00** extra

All prices quoted good 30 days FOB. Kansas City

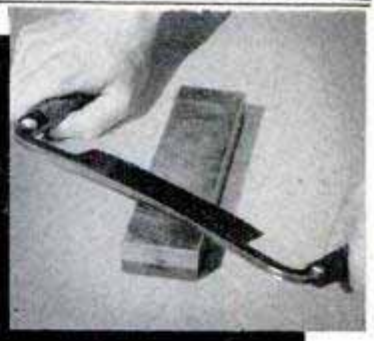
25% DEPOSIT REQUIRED ON ALL ORDERS

American AUTO PARTS CO. INC.

1830 LOCUST — DEPT. PM

KANSAS CITY, MISSOURI

Jiffy-sharp tool edges are easy WITH A . . .



NORTON abrasives

CRYSTOLON® #JB-8

A tool is only as good as its edge, and nothing sharpens tool edges faster than a CRYSTOLON Combination Benchstone. No messy home soaking either, because CRYSTOLON Benchstones are oil-filled at the factory. Professionally-keen tool edges are yours every time with a CRYSTOLON. At hardware stores—or write direct.

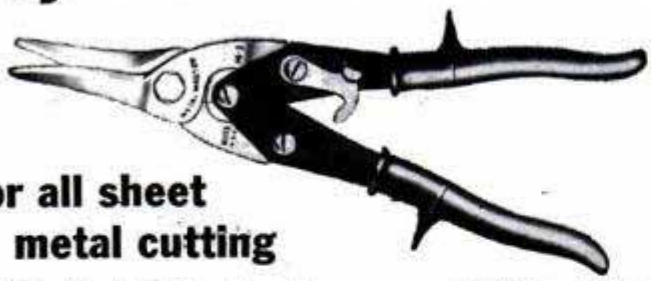
Take all the mystery out of sharpening. For the complete know-how on all shop, garden, and household tools, send for clearly illustrated 32-page "How to Sharpen" Book. Mail only 10c to Dept. PM-11.

BEHR-MANNING • Troy, N. Y.

COATED ABRASIVES

SHARPENING STONES . MASKING TAPES

Buy the Best...WISS!



for all sheet metal cutting

WISS Metal Master Compound Action Snips

#M-3. Easily cuts 18 gauge sheet metal. Cuts curves and circles as well as straight. Ideal for the home workshop. $4.25. Rubber grips recommended, 60¢ extra.

WISS Straight Cut Snips

#9. Crucible steel inlaid blades. The basic snips for straight metal cutting. Gun metal handles. Overall length 12½". $5.25.

WISS Combination Snips

#V-13. Solid steel, with gray japanned handles. Cuts curves and irregular shapes with ease. Handy pocket size. 7" long. Accurately tempered jaws and strong bolts. $1.85.

Prices slightly higher Denver and West

Quality for more than a Century

J. WISS & SONS CO. • NEWARK 7, N. J.

LUFKIN "LEADER" chrome-clad steel tape gives you

EASY TO READ MARKINGS THAT ARE DURABLE

CHOICE OF STANDARD OR FOLDING HOOK RING

Famous Lufkin Chrome-Clad finish on tape line gives non-glare readability—will not chip, crack, peel or corrode. Jet black markings sunk below chrome-white surface. Vinylite covered case protects against water, stains, and scuffs. At all hardware stores.

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If You Own a Schick or Remington Electric Razor . . .

You get a closer shave and greater comfort by preparing your face before you shave. In just three seconds this wonderful lotion "sets up" your face for shaving.

1. It evaporates sticky, razor-clogging perspiration.
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It also lubricates shaver's cutting head for easier action, longer shaver life!

That's Lectric Shave. Only 49¢, plus tax, for 3 oz.—80 shaves. Use with any make shaver. For a free month's supply send name, address to The J. B. Williams Co., (PM-8), Glastonbury, Conn.

LAWN ORNAMENT-NOVELTY PATTERNS

28 Lawn Ornament Patterns, 25c. Other Patterns; 15-20" high; Dutch Girl, Dutch Boy, Pirate, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 10c each. 25 Novelty Patterns, 30c. **All 62 Full Size Patterns, $1.00 Postpaid.** Strother Pattern Service, Dept. CO-8, Box 129, Belington, W. Va.

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WE FURNISH ALL MACHINED METAL PARTS, EVERY SCREW, NUT, BOLT, WASHER, AND COMPLETE PLANS FOR THIS...

BIG 10" POWER SAW

$10.95 LESS GUARD & WOOD

FULL REFUND IF NOT SATISFIED IN 10 DAYS

COMPLETE PLANS 10c

ASSEMBLE IT YOURSELF WITH SIMPLE HOUSEHOLD TOOLS!

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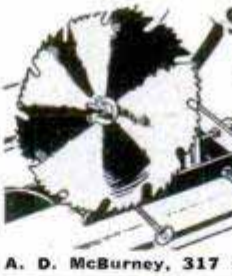
Ever-Ready OIL



SHARPEN YOUR CIRCULAR SAWS

The RIGHT WAY on your own saw table. Sharpens rip, cutoff, hollow ground and combination blades—6" to 10". Saws stay round with correct bevel. Precision made, easy to use. GUARANTEED. Only **$8.95.** Includes $3.00 Grinding wheel.

"TRU-CIRCLE" saw set automatically sets teeth at 10° or more. $2.95

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Amusing Animated WEATHERVANES

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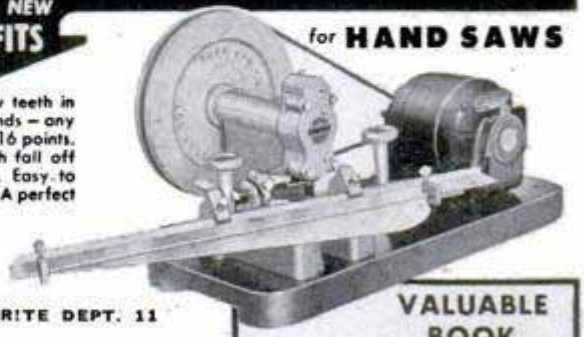
MAKES NEW PROFITS for HAND SAWS

Cuts new teeth in 50 seconds—any size 4 to 16 points. Old teeth fall off as chips. Easy to operate. A perfect job.



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8933 VENICE BLVD.
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VALUABLE BOOK 25¢ Order Burr's Blue Book of Coast to Coast prices for saw shop services

BUY DIRECT - MASTER MECHANIC - UP TO 85% DISC.

Portable LIGHT PLANT

PUSH BUTTON START

500-700 **watts** 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1¾ hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. Be prepared if war or storm knocks out power lines.

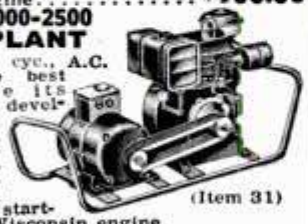
(Item 24)

Reg. $275.00 value..... **$143.50**

700-800 Watt Plant (Item 44) same as Item 24, but greater output... **$169.95**

1000-1200 Watt Plant (Item 45) same as Item 24, but larger generator & engine..... **$199.50**

GIANT 2000-2500 WATT PLANT



110-120 V. 60 cyc., A.C. Absolutely the best made because its heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by 5 h. p. easy starting Briggs or Wisconsin engine —complete with all accessories: engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00. Special at.... **$299.50**

(Item 31)

GENERATOR ONLY and control box. Drive it with your engine or tractor **$169.50**

We Are World's Largest Mail Order Distributors of Light Plants

38 Pc. DRILL KIT

(Item 35) Includes hi-power smooth-running guar. ¼" drill, buffers, polishing bonnet, sanding discs, grinding wheels, wood bits, steel bits, wire wheels, bench stand, paint mixer, burrs. Complete in steel case. Wt. 13 lbs. 38 pc's., all highest quality. Complete kit worth $38.50. Our Spec. only... **$19.85**

ACCESSORIES FOR ¼" DRILL

Make complete workshop out of your ¼" drill, using these practical accessories. Quick change—merely insert shaft in drill chuck. Sturdy, heavy duty tools for real work. Precision built of hardened tool steel. Factory guaranteed against breakage.

POWER HACK or JIG SAW

(Item 64) makes straight or curved cuts easily in plywood, ¾" boards, sheet metal, plastics, etc. Uses broken hack saw blades. Will do filing, jig saw, coping saw and sabre saw work. Compares with $50 tools. Wt. 3 lbs. Special... **$16.95**

ELECTRIC HAND SAW

(Item 66) The famous Arco-Saw converts any ¼" or ⅜" drill into a powerful electric saw. Exclusive features—one hand operation, visual guide bevel and angle adjustments, rip gauge depth gauge. Depth of cut 1-5/16". Self lubricated for life. Wt. 3 lbs. Complete with 4" blade..... **$11.50**

(Item 66)

Power Sander & Polisher

(Item 65) Make quick work of slow tedious sanding jobs. Big 21 sq. in. sanding surface. Produces powerful lengthwise sanding stroke which results in beautiful smooth finish. Built-in rubber pad. Sandpaper held in place by quick-change spring-clips. No messy adhesives. Use felt pad for polishing. Using drill motor for power gives you equivalent of an $85 sanding machine. Wt. 3 lbs. Terrific value at... **$16.50**

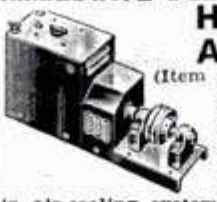
FIRE EXTINGUISHER

(Item 39) Fully charged (at 1,000 lbs. P. S. I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe: keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. $19.50 value. Special..... **$6.95**

LARGE FIRE EXTINGUISHER (Item 57) commercial size, 5 x 14 in. (275 cu. in.) heavy ICC approved steel cylinder charged at 1000 lbs. or more with CO2. Equipped with genuine Kidde Valve. Refillable. Hose incl. Suitable for fire depts., stores, garages, homes, etc. Wt. 18 lbs. $42.50 value. Spec.. **$15.85**

IMMEDIATE DELIVERY ALL ITEMS

HEAVY DUTY ARC WELDER



(Item 38) Use as portable or shop welder. 250 amps, D.C., Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Weld up to ½" plate using ¼" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 10 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. Wt. 110 lbs. A $400 value at..... **$99.75**

MAGIC TERMINAL model same as above but with built-in 3rd terminal for low heat soldering and brazing. Special..... **$119.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.... **$10.50**

28 pc. BENCH GRINDER KIT

(Item 71) A rugged precision Grinder powered by ¼ hp AC 110 v. 3500 rpm heavy duty motor. Equipped with tool rests and non-breakable safety eye-shields. 28 pc. kit incl. 2 grinding wheels, wire wheel, drill chuck, arbor, asst'd drills, 14 sanding and polishing discs, buffs, etc. All highest quality. 1 year guar. Wt. 17 lbs. Drastically reduced..... **$21.95**

CARRY-AIR

(Item 32) Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 10 lbs. Worth $20.00. Our price..... **$8.95**

(Item 55) With big double tank (1000 cu. in.)..... **$11.95**

POTTERS WHEEL

(Item 47) Complete, prof. equip. for making finest ceramics and pottery. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and wedging wire. 16x12" enclosed throwing table—ample area for largest pieces. Req. ¼ hp. motor (not incl.). Can be set up on 20x24" table and stored on edge. Complete with pulleys, belts and instructions. Wt. 26 lbs. $145 value at..... **$59.95**

32 pc. SOCKET SET

(Item 59) Highest quality guar. non-breakable sockets made by Plomb, Snap On, etc. Complete range of 22 sockets from ¼" thru ¾" in ⅜" drive and 7/16" thru 1-1/16" in ½" drive. 2 speeder handles, 2 extensions, 2 slide heads, double ⅜ x ½ in. "L" handle, reversible ratchet, 12" Phillips type screw driver and metal tool box. For professional mechanics who want the best. Wt. 14 lbs. Easily worth $32.50, while they last..... **$15.95**

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TERRIFIC VALUES!

New genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil. Save more than 60%.

(Inside Diam.)	1"	1¼"	1¼"	1½"
Length	10 ft.	25 ft.	40 ft.	30 ft.
Price	5.95	9.25	14.75	14.75

If specified we will send special hose for gas or oil at same prices.

HYDRAULIC HOSE

High pressure, heavy duty, complete with swivel fittings. Pipe thread connections. Ideal for farm equip., bulldozers, grease guns, airbrakes, etc. Any length. Minimum $1 per lgth. INSIDE DIAMETER. ¼" 50c per ft. ⅜" 60c. ½" 80c. ⅝" 90c.

Send 10c for a Big War Surplus Catalog. Included Free with Every Order.

EXTENSION CORD

(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet amazingly flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft. $1.99 Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) $4.95 100 foot length (one piece)..... **$4.85**

WIRE ONLY (Item 50) No fittings, 100 ft. $4.00

TRENCH-LAY WIRE. (Item 51) Anaconda #10—2 cond., for buried service to barns, outdoor lights, etc. Absolutely impervious to soil and moisture. Wt. 25 lbs. per 100 ft. Special surplus price. 100 ft. coils, 19c per ft.; 250 ft., 18c per ft.; 500 ft., 17c per ft.

POWER CABLE (Item 67) #12—2 cond. stranded, flexible, vinyl covered, impervious to everything. 50 ft. wt. 7 lbs..... **$15.95**

TELEPHONE WIRE. (Item 52) Genuine U.S. Army Signal Corps qual. #18—2 cond. reinf. with steel strands for great strength. ½ mile coil, wt. 60 lbs. **$9.95** 2 for **$18.50.**

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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **$6.35**; 9" Fan, wt. 6 lbs. **$7.45**; 10" Fan, wt. 7 lb. **$8.45**; 12" Fan, wt. 8 lbs. **$9.45.**

HIGH PRESSURE HAND PUMP

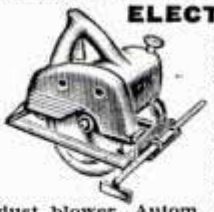
(Item 53) Positive displacement type. Cap. 550 gph. Completely self priming. ¾" pipe thread inlet and outlet. Use for fuel or water transfer on boats, trailers, air craft, etc. Ideal for insecticides, emerg. sump pump or as vacuum pump. Wt. 15 lbs. Govt. cost $95. Our Special..... **$12.95**

VARIABLE SPEED SELECTOR

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. wt. 36 lbs; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Brand new, in Goodrich boxes and guaranteed. Complete installation data included. Unprecedented surplus sacrifice **$79.50, $89.50** and **$114.50.**

(Item 68)

ELECTRIC HAND SAW

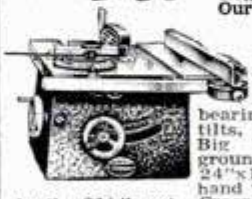


(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides max. power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6¼" comb. blade, ripping guide and 10 ft. hvy. duty cord. Built-in saw-dust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2¼". 1 year written guar. Wt. 12 lbs. Drastically reduced..... **$39.95**

GAUGE TESTER

(Item 27) Precision made of solid bronze and steel by Ashcroft. (Cat. #1300-5). Calibrated weights (incl.) acting against hydraulic piston provides quick accurate testing of all pressure gauges up to 500 psi. Brand new. Wt. 90 lbs. Reg. $318.00. Our Spec..... **$95.00**

8" TILTING ARBOR SAW



Terrific Value. Heavy duty ⅝" double ball-bearing arbor. Saw blade tilts, table remains level. Big 12"x16" precision ground table. (Extensions to 24"x16" avail.) Micrometer hand wheel controls tilt and depth—2½" cut. Cross-cutting, ripping, dadoing, sanding, bevel and angle cutting, all easily performed. Essential for all cabinet work. Motor carriage, mitre-gauge, rip-fence, splitter, guard and blade incl. Compares with saws selling at $89.50. DeLuxe Ball-Bearing model (Item 69) wt. 34 lbs..... **$44.95**

Bronze-bearing model (Item 70) ½" arbor, table 10"x13", wt. 34 lbs.... **$27.50**

All items *brand new*. Prices f.o.b. Chicago area. 10 day Money back guarantee. Send check or M. O.

MASTER MECHANIC MFG. CO., DEPT. 82 Burlington, Wis.

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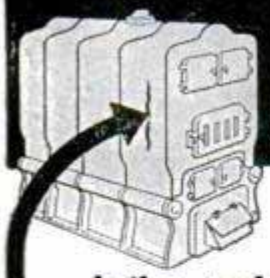
Save Fuel Costs



Seal up every heat-wasting crack, opened seam and other leak in your furnace, boiler, tank, radiators and piping *tight* — as professional repair men do — with Smooth-On No. 1 Iron Cement. Do it yourself — now — and cut this winter's fuel bills. You apply Smooth-On like putty, it hardens like metal, and *stays* tight, because it expands slightly as it sets. Buy Smooth-On No. 1 in 1¾-oz., 7-oz., 1-lb., or larger sizes at your hardware store. If they haven't it, write us.

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Witte Dieselectric Unit ...Model CDREA with engine-mounted condenser type radiator cooling

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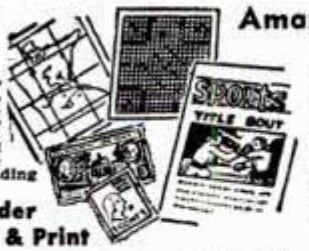

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Large or Small

Copy Any Picture or Object

Project and focus it large or small. Make enlargements of plans or drawings. You'll be surprised how many practical and entertaining uses you can make. Advertising posters, cartoon sketches of friends, etc., etc., etc.

Natural Moving Pictures

Projecting Microscope Gives Live Show

Put ants, insects, flies & other bugs or animated objects under glass & let them walk around. See them in action greatly enlarged and magnified. MOVING on screen. Amazing, real-life scientific motion pictures. Like having a projecting microscope.

Make Photo Enlargements and Copies Without Negatives!

Use Any Photo or Picture

Direct positive photo enlargements and prints without negatives using Eastman direct positive paper. Use any black & white or color picture, colored transparency, etc. Easy to do; excellent results. No complicated dark room equipment. Makes correct copy (same as original), large or small. Also useful for making copies of important papers, plans, documents, stamps, sketches, maps, etc., etc. EASY, FUN, USEFUL, PROFITABLE.

Picture Enlarger and Projector

Project 3-Dimension Pictures

Put on your own show by projecting snapshots, pictures, post cards, photos, comics, clippings, etc. on wall or screen. Fine for school, clubs, talks, home shows, telling about your trip, salesmen, etc. Full color, correct projection, entirely readable & correct. Special device enables you to project real 3-dimension or stereoscopic pictures. Startling, life-like.

Make Money---Machine Pays for Itself

Many ways to make money. Make photo enlargements, photo copies, give shows, make sketches and drawings and advertising signs, etc. Easy to do—the machine does the work.

Different Show Every Night; No Films to Buy; No More Expense; Sports, Girl Beauties, Comics, Etc. Your favorite SPORTS, MOVIE or COMIC PICTURES from papers & magazines. Enlarge action pictures. Project snapshots of your girl, family trip. Project and read comic strips to kids. Large pictures projected in full color!

Educational, Scientific; Real Life Action! Live ants, flies, bugs and small animals can be projected on screen; watch them in real life action, fighting, eating, playing. Great for amateur scientist experimenter and camera fan.

Make Signs, Sketches, Posters, Cartoons, Lettering, Etc. Quick! Easy! In Black & White or Full Color; From Clippings or Copy; Large or Small Make sketch or cartoon of friends. Posters and signs for clubs, stores, dances. Easy to make, large or small. Project picture or rough sketch right on blank drawing paper. Using pen, pencil or colors, sketch OVER PROJECTED PICTURE. Project photos and make funny, life-like cartoons or sketches. Amazing & practical. Be a good artist, even though you never did it before! Lettering and signs easy to do.

Magnifies Stamps, Specimens, Objects for Close Examination; Reader for Weak Eyes Collectors can enlarge objects. Examine in greatly magnified detail. MAGNIFIES ABOUT 50 AREAS. Make photo enlargements direct from objects! Enlarges small type, maps, etc., projecting it for easy reading.

Photo Enlarger; Makes Photo Prints, Photo Copies, Etc.—No Negatives Uses Eastman direct positive paper. Correct true-image photos, large or small, from any photo; or even from color prints & color transparencies. Photo enlargements, copies, etc., done cheaply, quickly, easily. 8x10-in. enlargement costs 12c; sell up to $1.00. NO NEGATIVES. Made by projecting picture on direct positive printing paper. Duplicate copies of blueprints, diagrams, papers; large or small.

3-Dimension Stereoscopic Pictures By special process you can project 3-dimensional pictures and see in startling, life-like realism. So real you expect to reach out and touch them! Project beautiful girl pictures, travel scenes, etc.

No Skill—No Experience—Fun All Year Round Low-priced instrument that quickly pays for itself. No experience and no skill to operate. Just plug into any 110-volt AC-DC standard home socket. Years of entertainment and practical uses for every member of the family. Lasts indefinitely; nothing to wear out, so only cost is low price of MIRACLE PROJECTOR. Schools, shops, offices, artists, etc., all find many uses for it.

Project on Table, Wall or Ceiling—No Screen Necessary Project almost anywhere—even on table. No screen necessary—any blank wall or white paper will do. Wonderful for classroom, clubs and salesmen.

Electric, Optically Ground Double Lens, Enameled Steel Construction Complete except for lamp bulb; use any household 60 to 100 watt lamp bulb. Steel construction, handsomely enameled in brilliant colors. Easy carrying; 7½-in. high, 10-in. long. Optically ground and polished lenses; slide focusing so you can PROJECT FROM VARIOUS DISTANCES to make picture large or small. Takes pictures up to 3¼x4-inches. With illustrated instruction booklet, views, etc. (SPECIAL: 2 for $7.98 or 3 for $11.75, Postpaid) COMPLETE, CASH PRICE ONLY.....(Add 35c Postage)..... **$3.98**

What Users Say: Artist & Signmaker: "Valuable aid; enables anyone to do all kinds of art work without training." Photographer: "Many uses; money maker and money saver." Teacher & Lecturer: "Makes talks ten times more interesting. Teaches faster, more fun." Collector: "Magnifies & illuminates specimens for easy study."

Rush This Coupon Today!

Johnson Smith Co., Dept. 451, Detroit 7, Mich.
(Since 1914 America's Leading Novelty House)

Rush....Projectors — Each $3.98, plus 35c post.
Special: 2 for $7.98 Postpaid or, 3 for $11.75 Postpaid

Enclosed is $.....

Name.....

Address.....

(Sorry, No C.O.D.'s at This Cash Price)

For Better Work—FASTER—EASIER

THE ZEPHYR Electric Drill

only $17.95

Handy . . . Speedy . . . Powerful. Has many uses around the home . . . in the shop . . . on the farm. Built to Last. Full ¼" Capacity.

DRILL STANDS *Add Many Uses for Zephyr Drill*

Horizontal Drill Stand—for Polishing, Buffing, Grinding, etc.

Price $1.00

De Luxe Electric Work Saver Kit

Adjustable Vertical Drill Stand—for drill press operations

Price $10.95

Includes above ZEPHYR Drill, plus 28 accessories for buffing, cleaning, drilling, grinding, mixing paint, polishing, sanding, sharpening, waxing, and wire brushing.

Price $26.35

At Hardware, Implement, and Building Materials Dealers, and Department Stores—or Write Direct

PET TOOLS **PORTABLE ELECTRIC TOOLS, INC.**
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In Canada: Portable Electric Tools, Ltd., 369 Danforth Rd., Toronto 13, Ont.

STOP THAT OIL EATER!

GET NEW CAR PERFORMANCE WITH

PISTON SEAL

WITHOUT COSTLY OVERHAULING

Piston Seal—the amazing compound that forms a self expanding, pliable lubricating seal around pistons that compensates for wear. Eliminates oil burning, restores power and compression. Can be applied in a few minutes.

GOOD FOR 10,000 MILES

SIMPLY REMOVE SPARK PLUG AND SQUEEZE

FOR COMPLETE, FREE DETAILS WRITE TO

RICHIE DISTRIBUTING CO. 1707-H EAST 21st STREET CLEVELAND 14, OHIO

★ Make your paint removing EASIER!

Removing paint is so much easier with WONDER-PASTE. Applied with a brush, it reduces toughest paint, enamel or varnish to a soft mass—*easily* removed with a putty knife. No hard scraping or sanding! Safer and easier than using a heavy torch. At paint and hardware stores.

★ WONDER-PASTE *Write for leaflet*

Wilson-Imperial Company, 119 Chestnut Street, Newark 5, N. J.

HOBBYISTS! SHOPMEN! *Special* ONLY $54.50

PALMGREN "HOBB-E" Rotary, Index, Milling Table
Ideal for Model Parts or Shop Work

Mill-Grind-Drill-Index-Rout curved or straight-Rabbet and Mortise on drill press or lathe. 8" Table, 4" Cross Feed, 360° Rotation, Accurately Graduated. Bolts to table. Order NOW! SAVE $100. Only **$54.50.** Less Rotary Feed **$43.75.** Write for **"HOBB-E"** Tool Circular.

CHICAGO TOOL and ENGINEERING CO.
8365 South Chicago Ave. Chicago 17, Ill.

NEW SAW SHARPENER

Improved #64 Hand Gummer sharpens all types circular saws 4" to 20" diam. Ideal for saw shops. Self-Centering adjustment for quick, easy set-ups. Complete with ¼ HP motor, 1 grinding wheel & cord. $79.50 FOB Portland. Wt. 70#. SEND FOR FREE LITERATURE.

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Dept. P.M.-60, PORTLAND 17, OREGON

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GIVE A HOBBY THIS CHRISTMAS

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Send $1.00 for 60 Plans for wooden wall shelves, bird houses, ornamental toys, fancy cutouts, etc. Make them for Christmas.

Plus big 80-page Hobby Book showing REALLY OUT OF THE ORDINARY CHRISTMAS GIFTS of Handcraft Kits, Tools, Art and Craft supplies, Books on handcraft subjects.

Plus Five beautiful patterns for plastic jewelry box, candy dish, candle holder, earring holder — or send 30¢ for Hobby Book only.

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MAKE Big MONEY WITH THE Universal LAWN MOWER GRINDER!

Enjoy a profitable lawn mower sharpening business of your own. No previous experience needed. Place a hand or power mower on the UNIVERSAL GRINDER. With only **ONE SET-UP** you quickly grind the stationary blade and all the reel blades to proper clearance **WITHOUT REMOVING A SINGLE BLADE** from the mower.

PROOF

G. Spurlock, of Arkansas, writes: "I have my Universal Grinder two months and made a net profit of **$227.00**". C. E. Hardy of Miss. writes, "I am doing a fine business with the Universal Grinder. I spent 40c for a newspaper ad and have done nearly **$500.00** of business." Write today for FREE FACTS about Big Profits in Lawn Mower Sharpening.

ROGERS MFG. CO., DEPT. M-111 LINDSEY, OHIO

Wellworth AIR COMPRESSOR

For Farm and Home Workshop

Compressor has 2" bore, 1¾" stroke, 2.8 cfm up to 150 lb. pressure. Motor required: ¼ h.p. at 100 lbs.; ⅓ h.p. at 125 lbs.; ½ h.p. at 150 lbs. or equivalent gas engine. V-belt drive, intake muffler and cleaner, bronze bearings, splash lubrication. Wt. 16 lbs. Replacement parts always available.. **$20.50**

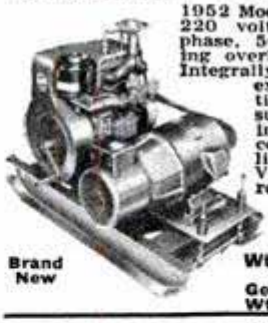
NEW!

COMPLETE OUTFIT. Compressor, pressure tank, air gauge, air chuck, 20 ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. COMPLETE OUTFIT, wt. 30 lbs..... **$32.45**

Equipment less compressor **$12.45**
Tank only, $6.25

All Brand New Equipment

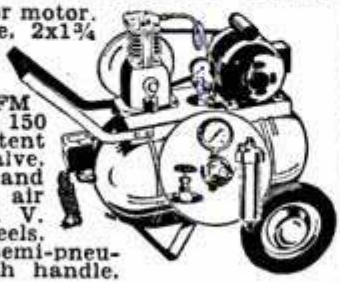
BARGAIN LIGHT PLANT



Brand New

1952 Model, 5000 watts, 110/220 volts, 60 cy. AC, one phase, 50 amps. Takes starting overload up to 87 amps. Integrally mounted separate exciter giving exceptional overload and surge capacity for starting motors. Drip-proof constr. Ball bearing, lifetime lubrication. Voltmeter, 2 plug-in receptacles. Wisc. air cooled, 2 cyl. 4 cy. 10½ HP engine.
Special Price **$525**
Wt. 575 lbs..
Generator only **$325**
Wt. 298 lbs..

AUTOMATIC COMPRESSOR UNIT



⅓ H.P. heavy duty capacitor motor. AC 110/220 volt, 60 cycle, 2x1¾ inch piston type compressor, splash feed lubrication. 12x24 inch tank, automatic pressure switch. CFM 2.8 at 100 lb. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Mounted on 2 wheels, ball bearing, with 2"x10" semi-pneumatic tires. Portable with handle. Shipping wt. 90 lbs.

With ⅓ h.p. motor $160 Value... **$98.50**
With ½ h.p. motor..... **$109.50**
Compressor only..... **$20.50**
Less Motor..... **$79.50**
With 1½ h.p. gas engine..... **$124.50**
Regulating gauge and filter..... **$8.95**

1/12 H.P. MOTOR

Delco 110V, 60cy. A.C., 1 phase 1750 r.p.m. 2 amps., will take 50% overload. Shaft ⅜ x 1¼. Heavy duty, bronze sleeve bearing. Size 6" long, 5" high, net wt. 12 lbs.

List $21.00, Special **$13.50**
Lots of 3, ea.... **$12.50**

GENERATORS
. . . Big Values

500 to 750 watt, A.C., 110-120 volt, 60 cycle, 1 phase output. Also 100 watt D.C. battery charging output. May be used at the same time. Voltmeter, 2 outlet boxes. Wt. 55 lbs.
Price..... **$99.50**
Furnished with 1½ HP Engine with drive..... **$142.50**

RED SEAL CONTINENTAL GAS ENGINE

BRAND NEW. 1½ HP with 6 to 1 reduction gear. Operates at 450 R.P.M. For lawn mowers, scooters, garden tractors, pumps, compressors, generators, etc. List Price $79.50. Shipping wt. 54 lbs. SPECIAL PRICE..... **$47.50**
(BRAND NEW)

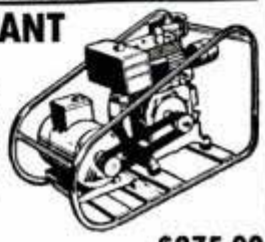
WELLWORTH V-BELT CLUTCH

BRAND NEW

Takes starting load off engines or motors. When speed is reached, a flip of handle shifts clutch from idling to driving position. Handles "A" belts, 2.35" pitch diameter, ⅝" bore. Ideal for use with lawn mowers, garden tractors, home workshop motors, etc. 3¼" long. Safe, easy to mount, sealed bronze bearings, positive action. Shpg. wt. 3 lbs. **$7.50**
BUSHING FOR ½" SHAFT 15c

2000-2500 WATT LIGHT PLANT

Heavy duty windings



110 v., 60 cy., A.C., takes starting overload up to 5000 watts. Floating Base for Automatic Belt Adjusting. 2-Groove Engine Pulleys, V-Belts, Bolts, etc. 5 H.P. Wisconsin or Briggs & Stratton Model 14 Engine. Voltmeter. 2 plug-in receptacles. Portable Tubular Steel Skid Type Carrier. Dim.: L 34⅝" x W 17" x H 20". Wt. 180 lbs.

$299.50

Same unit less mounting base..... **$275.00**
Generator only, with voltmeter, 2 plug-in receptacles. Shipp. Wt. 75 lbs..... **$169.50**

"Wellworth" BLOWER BARGAIN

BRAND NEW

Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13⅛"x11⅜"; inlet 8¾". Height 19". Width 18". Depth 16½". C.F.M., ¼" S.P. 1600; outlet vel. 1575. Wt. 45 lbs. **$27.50**
BLOWER LESS MOTOR AND DRIVE.....
With belt and variable speed pulleys, $2.50 extra.
Special price to dealers in lots of 5 or more. Write us.

LELAND GENERATORS

2500 watts, 110 v. 60 cy. single phase 1800 r.p.m., self excited. Fungus treated for long life. 1951 model. Brand new, in original factory crate. Shipp. wt. 135 lbs. List $375. SPECIAL PRICE..... **$237.50**

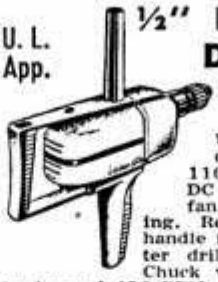
Furnished with 6½ H.P. Briggs & Stratton gas engine (or equal) with drive. Wt. 251 lbs. List $750. SPECIAL PRICE..... **$395**

140 CFM "WELLWORTH" BLOWER

5⅛"x4" mounting flange with 2½" square discharge, 3½" dia. blower wheel powered by direct-connected 1/15 H.P., 110 V. 60 C., A.C. motor with conduit box and 20" leads, 7½" wide less flange by 7¼" H. x 6¾" D. Shpg. wt. 6 lbs. **$16.20**
50 CFM BLOWER, 2½" discharge..... **$10.95**

½" ELECTRIC DRILL

U. L. App.



Streamline Design

Universal air-cooled motor—110/115 V. AC-DC Blower type fan for air cooling. Removable side handle for close quarter drilling. Jacob's Chuck with key. No load speed 450 RPM; full load, 290 RPM. ½" capacity in steel; 1" capacity in hard wood. 10 ft. cord and plug. Shipping wt. 11 lbs.

PRICE ONLY $35.50

Portable Electric HAND SAW

The Zip Sawer With ALL the Features

BRAND NEW

3¼" Diameter saw blade, ½" square arbor hole. Maximum depth of cut 2⅛". (At 45° 1¾".) Minimum depth of cut 0". Angular adjustment 90° to 45°. No-load speed, 5200 r.p.m. Full load speed, 3200 r.p.m. Amperes, full load 8.0. Universal AC-DC motor, 110/220 volt. Dimensions: 11¼" long; 9½" wide (ripping guide removed); 7¼" hi (without blade). Furnished complete with 6¼" diameter combination blade and 10 ft. cord and plug. Wt. 11½ lbs. Price..... **$44.50**

SAVE $10.00 ON A DRILL-O-MATIC

ELECTRIC POLISHER and ¼" DRILL

Polishes floors, furniture, automobiles; does sanding, drilling and buffing jobs. Handy family Work-Aid. Limited number available. Act fast. **IDEAL GIFT.** Drill and Polisher combination. 110 Volt AC-DC. Disc Polishing Bonnet; ¼" Jacobs chuck; horizontal bench stand; 42" polishing handle; wire wheel brush; 2-mounted wheels; 2-drill bits; spindle adaptor; buffing wheel; 6-abrasive discs; 1-grinding wheel; paint mixer; 12 ft. cord & plug; drill handle; steel hinged carrying case with handle and lock clamp. Wt. 9 lbs. **24 Pieces.** IDEAL GIFT. **50,000 were sold at $28.95. Our special price, only..... $14.95**

WELLWORTH PAINT SPRAY UNIT

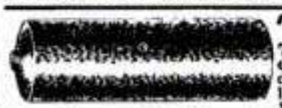
Wellworth 2 cylinder, piston type with 110 volt, 60 cy. A.C.-D.C. Heavy duty motor. Built-in tank provides even air flow; safety valve; syphon type gun with quart aluminum cup; sufficient pressure for continuous spraying of lacquer, enamel, paint, insecticides, etc. at 25 to 30 lbs.; 20 ft. air hose. Complete instructions. Wt. 12 lbs. 1 year guarantee. **$50.00 value.** Price only..... **$27.50**

AIR TANK & ACCESSORIES

NEW!

Brand New steel 6"x24", 400 lb. test. Ideal wherever compressed air is needed. Equipped with 500 lb. combination air gauge and inflation valve with core for retaining pressure in tank; tire chuck, 3 ft. high test air hose. **Ship. Wt. 12 lbs.** **Complete outfit..... $7.95**

"Wellworth" PRESSURE TANK



7"x25" Welded Steel, ⅜" opening on each end. ⅛" and ⅜" opening at centers. Convex Head and Bottom. 100 lbs. working pressure. Shipping wt. 17 lbs.... **$9.75**

Same tank, 9"x27", wt. 28 lbs. **$14.50**

PRICES F.O.B. CHICAGO. MONEY BACK GUARANTEE. SEND CHECK OR MONEY ORDER TODAY. PROMPT SHIPMENT. **WRITE FOR CATALOG. SEND 10c FOR POSTAGE.**

WELLWORTH TRADING CO.

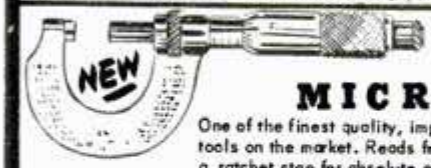
1832 S. WABASH AVE. Dept. D-11 CHICAGO 16, ILL.

PAY-OUT HOLD-ON REEL

SURPLUS WINCH

ONLY 32.50

Originally used by the Navy to control gunnery targets when being towed by an airplane. Ideal for many uses. This winch will pay out, hold or reel in cable or rope. It has a capacity for 4500 feet of 3/32" cable or 2500 feet of 1/8" cable. The rotating drum is gear driven and is operated by a crank handle. Drum may be rotated at 1 to 1 or 8 to 3 ratio. A brake holds drum with with ratchet & pawl to set. Size 29" x 13½" x 13"



NEW

PRECISION GERMAN MICROMETER

One of the finest quality, imported, precision tools on the market. Reads from .001. It has a ratchet stop for absolute accuracy and a lock ring to hold setting secure. Head contains decimal chart.

9.75 NEW

THESE ITEMS ARE TREMENDOUS PRECISION VALUES...

INSIDE-OUTSIDE

VERNIER CALIPER

Measures Inside - Outside & Depth from .001 to 6 in. Reads both English & Metric scales. Specially hardened jaws. Sliding jaw has lock nut to hold setting. Made by one of the leading specialists in precision instruments.

9.75 NEW

6 IN. SOLID STEEL STARRET SQUARE

Has specially hardened beams and edges, accurately ground to insure parallelism and straightness. Made of finest quality materials and highly regarded for its use as a standard square. A PALLEY VALUE for ONLY..

13.50 VALUE 8.72

SPECIAL 125.00 VALUE 59.95

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Originally used in engineering Dept. of one of the leading aircraft plants. Has 24" arms. Head swings 360 degrees. Clamp-on mounting. In excellent cond. Without scales.

PLASTIC PARALLEL STRAIGHT EDGE

A valuable asset to the navigator, engineer, draftsman or mechanic. Has adjustment knobs. Rubber pads prevent slipping. ONLY 97¢

A-N – JC-48

HARNESS WIRE

20, 16, 12 GUAGE

Handy for emergency repairs on radios, aircraft, autos, boats, etc. Sold only in bundles of 6 pounds or more. These bundles are in mixed gauges & lengths, very clean & unravelled. This wire normally sells for 4¢ to 5¢ per foot. Here is your opportunity to have a stock of wire in assorted gauges (approx. ½¢ per ft.) 6 lbs. for ONLY 2.95

CONTINENTAL GAS ENGINE

THAT FAMOUS SINGLE CYLINDER, 4 CYCLE, ENGINE with a GENUINE RED SEAL, Air Cooled 'L' Head. Comes complete with all accessories such as; mesh type air cleaner, flywheel, magneto, float type carburetor, fuel tank, starter pulley, muffler, blower housing, etc. An ideal power plant for small farm machinery, lighting plants, air compressors, power tools, small boats, etc. Weighs only 43 lbs.

49.50

AMMETERS D.C. METERS VOLT METERS

–120-0-120+
0-120 . . 0-240
0-300
Any above ammeters. 3.95

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COMBINATION VOLT–AMMETERS
30 Volt–30 Amp.
30 Volt–60 Amp.
ONLY 4.95

ABOVE AMMETERS HAVE 2" FACE EXCEPT 0-300 WHICH HAS 3" FACE

SHUNTS

IT IS NECESSARY TO USE SHUNTS WITH ALL D.C. AMMETERS.
120 Amp or 300 Amp.
150 Amp. Each . . 1.25

WESTINGHOUSE

AIR COMPRESSOR

1000's now in use for spraying, inflating, air tools, in garages, laboratories, shops & on trucks, tractors, jeeps, etc. Lightweight but powerful. Operates on ½ HP, gas or electric motor Runs either direction. Delivers approx 3.27 CFM at 600 RPM or 6.54 RPM. at 1200 Rpm. Has 2" bore, 1½" stroke. We have motors, tanks and fittings to adapt this unit. 23.95

TINY MITE

WINCH HOIST

This mighty little giant lifts up to 1000 lbs with its 30 to 1 Bronze gear drive. Cable drum is 4" x 1¼". Ratchet handle, safety & release pin. Ideal for Boats, Farm, Factory, Shop. ONLY 12.95

SEE OPPOSITE PAGE FOR TERMS

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DRILL PRESS OWNERS!

HERE'S 1 TOOL WITH 5 DISTINCT USES

THE BARRON MULTI-PURPOSE ROTARY WOOD PLANER

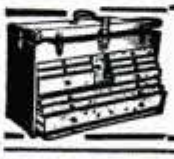
PLANES & SURFACES • PANELS & BEADS
ROUTS & GROOVES • RABBETS • TENONS

$7.50 COMPLETE

Finest precision performance—certainty of skilled workmanship—time-saving, money saving short cuts—yours with world famous Barron Drill Press Tools. Fifteen important operations—all available on any standard drill press—with Barron Accessories. Equip your shop with these versatile exclusively designed tools—and save up to $500. 200,000 Barron owners have bought on our liberal 10 day full money back guarantee. Order, or write for catalog.

FREE Workshop Guide & Catalog

BARRON TOOL CO. INC.
365 Architects Bldg., Detroit 1, Mich.



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Highest Quality for more than 45 years. Free catalog for machinists and toolmakers.

GERSTNER TOOL CHESTS
451 Columbia St., Dayton 7, Ohio

SHARPEN CIRCULAR SAWS LIKE AN EXPERT

THE SUPER GADGET FOR HOME WORKSHOP

Two simple adjustments. Gets hollow-ground, cross-cut or combination saw blades true and sharp. Fits 6" to 12" blades ½" to 1 1/8" centers. Includes file, complete instructions. $6.95 postpaid. (C.O.D. postage extra.) Guaranteed—Money back if not satisfied after 10-day trial. Soon pays for itself. Order today. Free Folder.

$6.95

SURE SHARP MFG. CO., Dept. M-11-1
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TOYS FULL-SIZE PATTERNS

Easy to make. Paste patterns on wood. Cut on jig saw. Presto! 10 exciting toys worth $30. Quacking Duck, Bicycling Monkey, Simplified Rocking Horse, Ring Toss Game, Doll Cradle, Seesaw Pull Toy, etc. All for only $1. Order Packet of Toy Patterns.

Jig Saw Guild 117-M Worth St., New York 13.

LEARN FASCINATING

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Make your own bags, belts, wallets, etc. Learn fascinating, profitable leathercraft in spare time. Send 25c for valuable Catalog, has over 200 photographs. (refunded first purchase).

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CRESCENT TOOLS
Give Wings to Work

ASK YOUR HARDWARE DEALER

Give a MILLION THRILLS

33 FAMOUS MODELS $17.95* UP

FREE — name in gold →

YOUR NAME

XMAS SPECIAL!

at 50% SAVINGS!

Magnify his or her enjoyment at sports . . . hunting . . . theater . . . everywhere! SPECIAL! Cases imprinted in 24K gold—FREE! 30 day return privilege. MONEY BACK GUARANTEE! TERMS!

WRITE TODAY!

*Add usual 20% Fed. Tax

NEW 8 power, 30mm Shur-Grip design Featherlight, COATED. $39.50* $135 Value!

CHRISTMAS GIFTS

FREE! NEW XMAS CATALOG AND "HOW TO SELECT" BOOK

BUSHNELL BINOCULARS
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SAVE UP TO 85% IN WAR SURPLUS from "GADGETEERS HEAVEN"

HYDRAULIC CYLINDER SPECIAL

Gives 20,000 lb. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lb. thrust with 3,000 lb. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1½" dia. piston shaft, 18" stroke, length 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road, farm & shop machinery, presses, etc. Cost Gov't $390.00 **29.95**

We carry the World's Largest Supply of Special Hydraulic Equipment featuring over 20,000 Cylinders in 61 Sizes and Types. Can also supply all accessories such as Pumps, Valves, Tanks, Hose and Fittings. Write for Information.

No. 3 HYDRAULIC CYLINDER

Double action. Bore is 1". Shaft ½". Has a stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push to 1100 lbs. **5.75**

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Double action cylinder. Has a bore of 1-3/8" and shaft of 1". Stroke is 9". Overall length 15¾". Built for 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 2300 lbs. . . . Can be adapted to hundreds of uses **9.75**

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V-9A - - LARGE VOLUME PRESSURE RELIEF VALVE ½" Standard pipe parts. Pressure setting – approx. 1200 PSI. Range 1000 to 2100 PSI. **5.75**

V-17 – Poppet type, pressure balanced. Has piston with built-in relief valve to limit cylinder strokes. Inlet and outlet ports have ½" std. pipe ports. ½" A.C. tube to cyl. (¼" x 18 thread) **9.75**

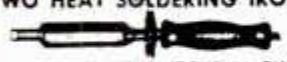
STRATO POWER PUMP

With built-in variable flow control valve in head. Positive displacement piston type. displaces .450 cu. in. per revolution. 2 gal. per min. cap. at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous, 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent maximum 4500 RPM. Rotates either direction without adjustment **19.50**

GEROTER TYPE PUMP

Logan Geroter type. For operating hydraulic systems on trucks, tractors, etc. Delivers 8 GPM at 1200 RPM at 1000 PSI with 5 H.P. Can also be used as Hydraulic fluid motor. 3/8" std. pipe ports, 1/2" splined shaft for pulley or direct attachment. 5½" dia., 7" long. Used but condition guaranteed. **19.50**

TWO HEAT SOLDERING IRON



This is really TWO IRONS in ONE!! A control button in handle selects 150 or 300 watt heat. Full size iron for light & hvy work. Removable, solid copper tip. Complete with cord & tip. **4.95**

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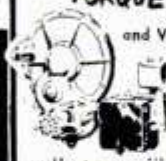
NOW! MAKE YOUR OWN ARC WELDER!

HERE'S A REAL BUY! Finest, Precision built, R-1 Generators, originally used on B-29 Airplanes. These generators cost the Government approximately $400.00 each. Gives from 300 to 400 amps at 27 volts. Ideal for all welding, light & hvy up to 5/8" thickness. Free instructions for converting to welding unit. **27.95**

OTHER AIRCRAFT GENERATORS

E-5A	12 to 15 Volts	50 Amps	$12.95
P-1 . .	27 VOLTS .	200 AMPS	$15.95
1273-1A .	27 VOLTS .	75 AMPS	$15.95
03	27 VOLTS. . .	100 AMPS	$25.00

TORQUE CONVERTER and VARIABLE SPEED UNIT



Consists of a variable speed gear box & a Vickers Hydraulic Transmission unit (as shown below). An excellent power "booster" and speed controller for conveyor belts, feeder lines, drill presses, power lathes, milling machines, small cars, etc. Converts high RPM, low power input into low RPM, HIGH TORQUE OUTPUT. Maximum output, 6 HP. Has 2 take-off shafts, one 4 to 1 & one 16 to 1 ratio. Gear box has worm drive, bronze gears & throw out clutch. Forward and reverse drive. Unit can be separated to use variable speed reduction on other equipment. COMPLETE **59.00**

VICKERS HYDRAULIC Transmission

VT-1 Self contained, 2 H.P., constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output RPM -0 to 1/3 input RPM in both directions. Input RPM 1800 continuous. 4000 intermittent. Dash pot can be removed for greater RPM. Ideal for lathes, duplicator set-up on mills, conveyors, small cars, drives, gearings, etc. **32.50**

4" SPLINE SHAFTS for input & power take-off . . . . . **2.50 PR.**

ELECTRIC MOTORS

LEAR ELECTRIC MOTOR. 24 volt, 6 amps, series wound reversible motor with overload clutch. Motor turns 11,000 R.P.M. Has 11 to 1 gear reduction box turning 1000 R.P.M. at take-off. Adaptable to flex or rigid drive. Limit switch box. Size 10" x 4". **$7.95**

SAMSELL MOTOR 27 volts, 16 amps 1/5 H.P reversible, series wound on motor. 3800 R.P.M., shaft 9/32" diameter. 12-spline. 4-1/8" x 2-3/8". ONLY **3.95**

SURPLUS MOTORS

No. 500 – New ½ H.P. – 27 Volt, D.C.-A.C. This motor can be readily adapted to deliver up to ½ H.P. on 110 Volts, A.C. by the simple method of rearranging armature brush-leads. Free diagram with each order. A sensational value . . **5.95**

No. 500-A – Converted to 110 Volts-A.C. Equipped with plug and 3½ ft. Heavy duty cord . . . **8.49**

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Overall – – Width – – Length –	Price ea.
1¼" - (5/8" side) - 72" alum.	- $1.00
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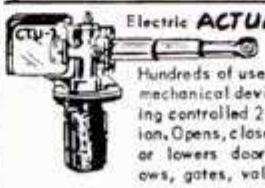
BRASS HINGE - 1¼" (5/8" side - .040 thick) Any length	. . per ft. .29

ATTENTION GADGETEERS

Electric GYRO

Turns up to 50,000 R.P.M. Electric drive motor is integral part of balance wheel. Has double end shafts to drive precision tools or machinery at precise, controlled speeds. Full ball bearing mounted. Operates high or low voltage. A highly precise instrument, ideal for experimental work, science labs, hobbyists, & technical engineers. A tremendous buy **4.95**

Electric ACTUATOR



Hundreds of uses for any mechanical device needing controlled 2-way action. Opens, closes, raises or lowers doors, windows, gates, valves.

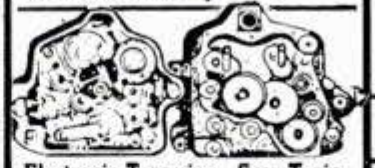
CTU-2 Foote linear actuator. 24 Volt, A.C. or D.C., 8500 R.P.M., 1/6 H.P. – Series wound motor. 4½" stroke in 13½ seconds. Compression and tension loads up to 750 lbs. Adjustable micro-switch for limits of travel. Overall length retracted 11" **6.95**

GEAR HEAD MOTORS

Heavy Duty G.E. Gear Head Motor. 1½ H.P., 24 volt DC, 125 amp reversible motor will drive reduction gear box unit 44.5 to 1, resulting in 168 R.P.M. at 5/8" diameter take-off shaft. Motor contains electro magnetic break.

UNIT COMPLETE **10.95** MOTOR **4.95**

GEAR BOX ALONE **7.95**



Electronic Transmissn. Gear Train

GT-1 – approx. 50 Bronze Spur & Pinion Gears, 3/8" to 4" dia., 5 sets of 7 cluster gears, 2 complete worm and worm gear drive sets, 40 N.D. ball bearings ½" to 1½" dia., watch springs, bushings, posts, face plates, housings, micro switches 2 miniature controlled clutches, etc. . . Gears in multiple size and sequence identical teeth ratio, giving 100's of gear reduction combinations . Wt. 19 lbs. **8.49**

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Ideal for moving radio antenna, television antenna, etc. **Only 6.75**

GEAR BOX – VTG-1 – 90° – bevel gear 1½ to 1 reduction. A lifetime value . . . . . Size: 7" x 6" . . . **3.95**

Has lever control for engaging & disengaging positive clutch. Dust proof housing, pre-lubricated bearings . . . Can be adapted to Vickers Transmission.

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SPRING MIX, No. 206 – Torsion, Compression & Tension Springs. Asstd. sizes. A treasure trove for emergencies. Scores of springs. 5 lbs. for **ONLY**. **1.69**

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PULLEY MIX – You'll want this one around. 10 micarta & metal pulleys ranging from 1" to 5" with ball and one piece bearings. These are aircraft pulleys, the best made – with hundreds of uses. A WONDERFUL BUY! **2.95**

SCREW MIX – 5 lbs., including assortment of wood and machine screws. Many sizes. Save dollars and alway have plenty of screws on hand. . **1.39**

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SUPER COMBO MIX – No. SC2. Here's a real bargain. All ten above mixes for **ONLY** **12.95**

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Rust resistant, alloyed steel. Extra flexible. Pre-formed, 7 x 19 strand. On reels.

1/16" – 4½¢ ft.	7/32" – 10½¢ ft.
5/64" – 5¢ ft.	1/4" – 12½¢ ft.
3/32" – 5½¢ ft.	9/32" – 15¢ ft.
1/8" – 7¢ ft.	5/16" – 16½¢ ft.
5/32" – 7½¢ ft.	3/8" – 18¢ ft.
3/16" – 9½¢ ft.	1/2" – 20¢ ft.

SPECIAL! 3/16" cable, 18 feet long, with turnbuckle ends. . . 99¢

Stainless Steel Cable – Pre-formed

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7/8" . . . . 25¢ ft. 1" . . . . 28¢ ft.

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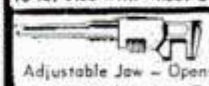

Adjustable Jaw – Opens to 4" Drop Forged. . Auto Type. Black **97¢**

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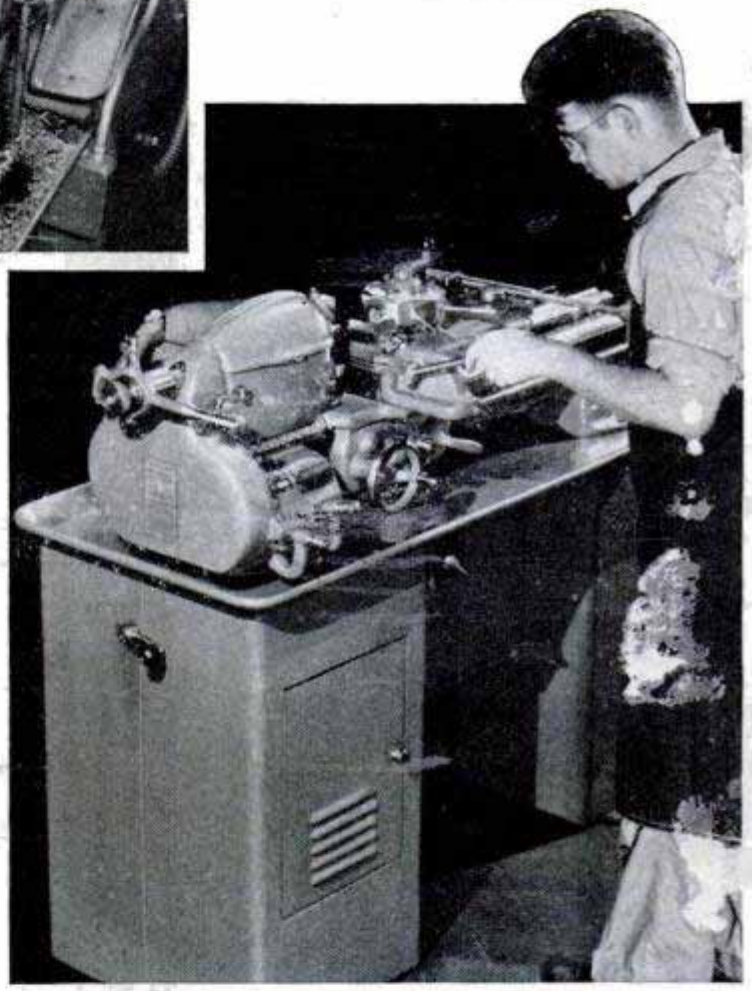
South Bend Precision Turret Lathes keep efficient the machining of small duplicate parts. Their remarkable accuracy and positive controls simplify the holding of close tolerances with only normal machine handling care. Finishes are commonly produced that otherwise would require additional operations. Simplicity of tooling makes job changes quick and economical. Wide ranges of power feeds and thread cutting feeds assure maximum efficiency on every job. They are particularly suited for second operations. Available in 3 sizes: 1" collet —16" swing; 1" collet—10" swing; ½" collet—9" swing.



South Bend CL930-Z Precision Turret Lathe—½" collet capacity, 9¼" swing, 48 carriage feeds, 48 thread cutting feeds, handlever cross slide, handlever turret.

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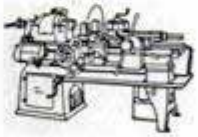

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