

POPULAR MECHANICS

MAGAZINE



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Today—with *all* tires made of the same Government synthetic rubber (GRS)—it is *skill and skill alone* that gives a tire extra toughness and longer wear!

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WASHINGTON

...Cool, moisture-laden breezes sweeping in from the blue Pacific temper Washington's climate and give virile life to its abundant vegetation.

Washington tops all states in apple production. From its sunlit orchards, fertile farms, cattle ranches and great fisheries... its vast forests and rich mines come foods, lumber, ores and minerals shipped by the trainload over Union Pacific's Strategic Middle Route, uniting Washington with the mid-West and the East.

The state's citizens confidently look forward to further peacetime progress aided by the renewed spirit of individual enterprise. The Columbia River provides adequate irrigation

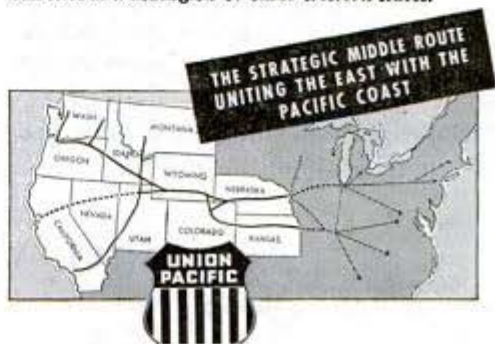
and power for future agricultural and industrial expansion. Raw materials, seaport and rail facilities, healthful living conditions—all are available in Washington. These advantages provide opportunities for postwar industries and enterprising homeseekers.

As in the past, Washington again will be host to thousands of vacationists. And Union Pacific will provide unexcelled transportation to the beautiful Pacific Northwest empire wherein may be found so much of the scenic splendor of *your America*.

NOTE: Write Union Pacific, Omaha, Neb., for information regarding industrial or business sites in Washington or other western states.

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● Listen to "YOUR AMERICA"—
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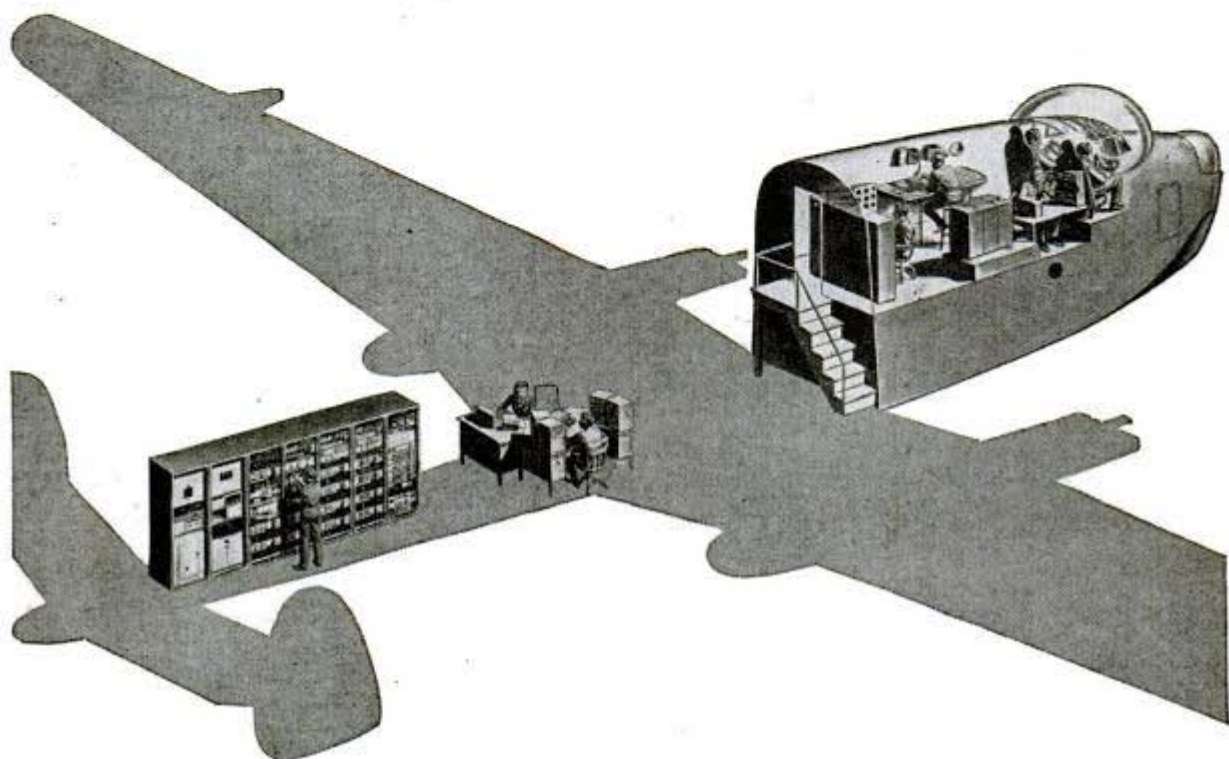
This One



KNQX-20N-YCZC

Музыкальный издательский дом "Мелодия"

THIS SEA-GULL LIVES ON THE GROUND



This is a "flight trainer"—an electronically operated replica of the PBM-3 flying boat. It was conceived by the Bureau of Aeronautics and developed by Bell Telephone Laboratories to train Navy bomber crews on the ground.

The new crew climb a few steps to get in and from then on it is like being in a big plane at night. Controls tug against the pilot's grasp and "engines" roar in response to the throttle. From his desk, the instructor creates every situation of real flight — even to iced-up wings, and conked-out engines. Pilot and crew get the feel of danger without the hazard.

Once the control dials are set, the various effects are automatically organized and set in motion by concealed machinery which includes 200 vacuum tubes, 60 motors, loudspeakers and hundreds of associated parts. Twenty Laboratories engineers worked more than a year developing the project. Drawings covered an area equal to 15,000 square feet.

This is only one of the 1200 projects in which our experience has been able to help the Armed Forces. What we have learned in devising electronic circuits to train flyers will help build better telephones.



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Popular Mechanics Magazine

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H. H. WINDSOR, Jr., Editor and Publisher

Next Month

BOOM TOWN that's here to stay is Winslow, Ariz., styled the "Diesel Capital of the World." In the brief span of four years since the first big Diesel-electric freight locomotive rumbled through the town, Winslow has doubled its human population of 3500 and has become an important railroad center. It's now home to 78 main line Diesel-electric freight engines. The fascinating story of a modern boom town appears in the September issue.

RADIO helps the weatherman in charting conditions before cargo planes take off on long hops. New equipment detects severe thunderstorms 100 miles away, helping collect weather information for Pacific flights. This is one of many AAF developments in radio told in a September article.

LOTS of people have bought the Brooklyn Bridge, but Uncle Sam got a bigger bargain back in 1801 when, for \$5, he bought a 42-acre tract of land on the Brooklyn waterfront for a navy yard. An article next month tells of the colossus that grew in Brooklyn.

AROUND the world in half an hour, to the moon and back between daybreak and dark. It's fantastic now, but aircraft designers are eager to tackle a rocket ship, designed to fly 100,000 miles an hour, which would bring those journeys within the realm of possibility. This space ship of the future is described in September.

BLIMP Squadron X invented its own air-sea rescue gear to haul marine disaster survivors to safety. It also has its own Lieutenant Peter Culbertson, USN, hero of a desert rescue that couldn't be done. First chapter of two, "It's Impossible—But We'll Try It" appears next month.

Volume 84

AUGUST, 1945

Number 2

Managing Editor.....	Roderick M. Grant
Assistant Managing Editor.....	Wayne Whittaker
Shop Notes and Crafts Editor.....	E. R. Haan
Radio and Electronics Editor.....	Frank L. Brittin
Art Director.....	Frank Beatty
Associate Editors.....	James R. Ward, William E. Taylor

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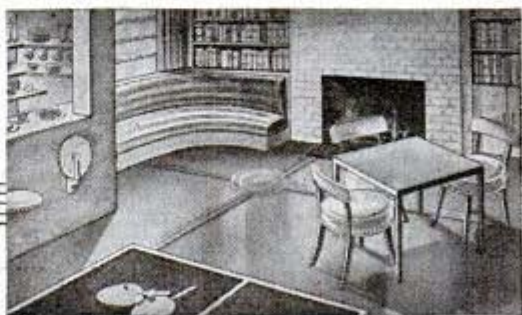
Other items, and manufacturers of available products described, are listed on pages 8A and 10A

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HEAT *that flows*

TO EVERY NOOK AND CRANNY



Is your bedroom colder than you like it on winter mornings? Is your bathroom as warm as you would like it for the early morning shower or the evening tub? Are your halls drafty and cold? Chances are that your home suffers from one or more of these discomforts, which are impossible to cure with the present "on and off" control of heat supply.

But cheer up! There is good news ahead. Moduflow, the amazing new control system developed by Minneapolis-Honeywell, will provide a continuous flow of modulated heat to every nook and cranny of the modern home. It can be easily and inexpensively installed in your present automatic heating system, whether coal, gas or oil.

Before you build your new postwar home, or modernize your present one, be sure to investigate Moduflow. Mail the coupon today for the interesting booklet, "Heating and Air Conditioning the Postwar Home."

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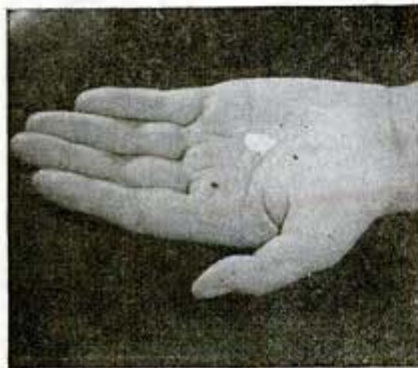
A G-E SCIENTIST, winner of the Nobel prize, studies oil films on water. From this research comes a clue to make glass invisible, metals stronger, to create fog by machine.

Engineers working with certain radio waves run a temperature. A G-E fever machine utilizes this principle, so doctors can treat patients with artificially created fevers.

This page of pictures isn't one-hundredth part of what is going on at G.E. But you will see a few ways in which G-E scientists make life easier, healthier, happier. *General Electric Company, Schenectady, New York.*

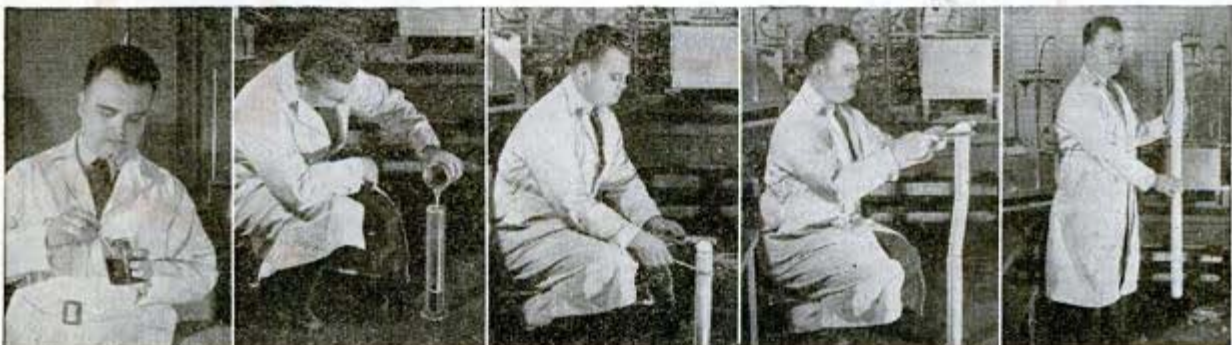


Worst weather in the world is found atop Mt. Washington, N. H., where ice feathers like these sometimes grow three feet in a single night, and where G-E scientists are conducting cold weather research for the Air Forces. General Electric devices are helping the Signal Corps, the Weather Bureau, and the Air Forces predict the weather all over the world. Accurate weather prediction aids troop movements, saves crops, protects you.



Ever see pure vitamins? These three pinches of vitamin crystals in the hand of a G-E scientist are enough carotene, vitamin C, and thiamin for the average man for a day. Research at G-E Consumers Institute helps improve diet, make food taste better.

Picture of gold made by shooting electrons through gold less than a millionth of an inch thick was made by G-E scientists in studies to improve metals.



You can actually see it grow. New G-E foam plastic grows at the rate of an inch a second from a liquid resembling molasses. Lighter for its size than a loaf of bread, it promises to have many uses after the war.

★

Hear the G-E radio programs: *The G-E All-girl Orchestra*, Sunday 10 p.m. EWT, NBC - *The World Today news*, Monday through Friday 6:45 p.m. EWT, CBS - *The G-E House Party*, Monday through Friday 4:00 p.m. EWT, CBS.

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GENERAL ELECTRIC





To mend a working plan or
A blueprint torn in two,
Transparent Texcel's just the thing—
It fixes things like new.

(Texcel mends securely—the "stickum's" bonded on!)

To seal a picnic box up tight
And guard the contents' flavor,
Use Texcel Tape—it's strong, it's neat,
It's quite a paper saver.

(Texcel holds and holds—the "stickum's" bonded on!)



For wrapping packages and gifts,
And making them look dandy—
For these and countless other jobs,
Some Texcel's mighty handy.

(Texcel means no gummy edges—the "stickum's" bonded on!)



Yes, Texcel is an improved tape
Whose "stickum's" bonded on.
It won't come off, it won't dry out,
It holds with lots of brawn.



Today most Texcel Tape that's made
Is being used for war,
Buy Bonds and Stamps till Victory
Returns it to your store.

Texcel Tape

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Instead you can take a shorter cut to accountancy success—a shorter cut that will give you accountancy training and fit you for more money and a better job in a comparatively short time.

The demand for accountants is great. You need only scan the "Help Wanted" columns to prove this for yourself. And while the demand is increasing, the shortage of capable accountants is becoming more acute.

Taxes—Social Security, the Withholding Tax, Victory Tax—changes in plant structure, the many and varied reports heads of business must have to know the status of their companies quickly and accurately, the many and varied reports which have to be made to government, rapid turnover of labor—

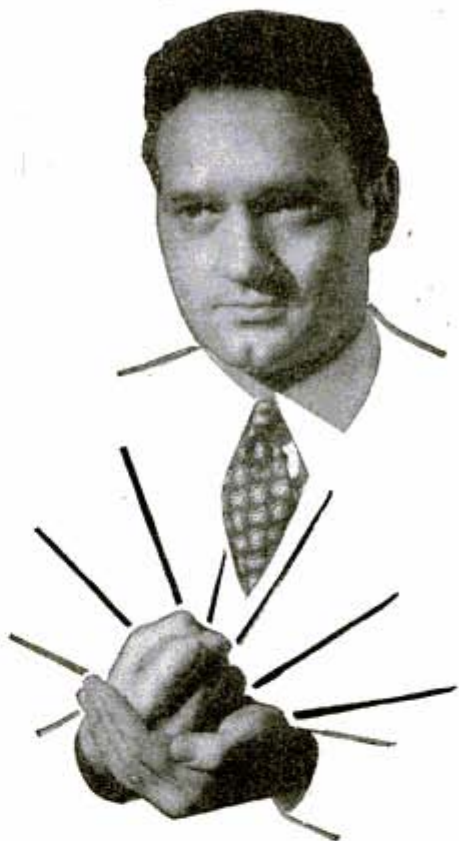
All these and many more factors make the demand for competent accountants far exceed the supply—and promotion comes fast to the able man who knows the whys and wherefores of accountancy.

Under the LaSalle Problem Method you can acquire a thorough knowledge of Accountancy—you can master its fundamental principles and become expert in the application of those principles. You learn by doing—and without losing any time from your present work.

You train directly under the supervision of a competent staff of Certified Public Accountants—and you can train as quickly or as slowly as you choose.

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**I'm going to be an Accountant
—and make REAL money"**

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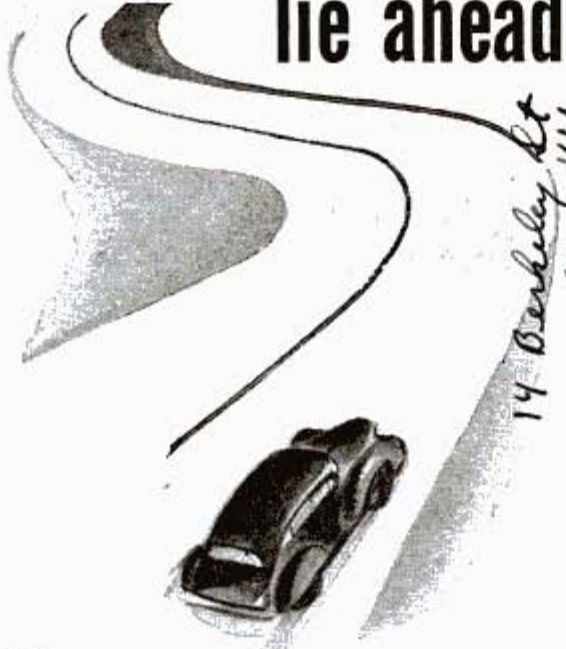
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A clean motor -- free from sludges, carbon formations and gums would help. Pyroil does it!

Better ask your gas station attendant to add life to your car. Simply say Pyroil!

Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 58 Pyroil Building, LaCrosse, Wis.

PYROIL adds life to your car



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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.

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Manufacturer's name and address appear in parentheses directly after items believed by us to be commercially available

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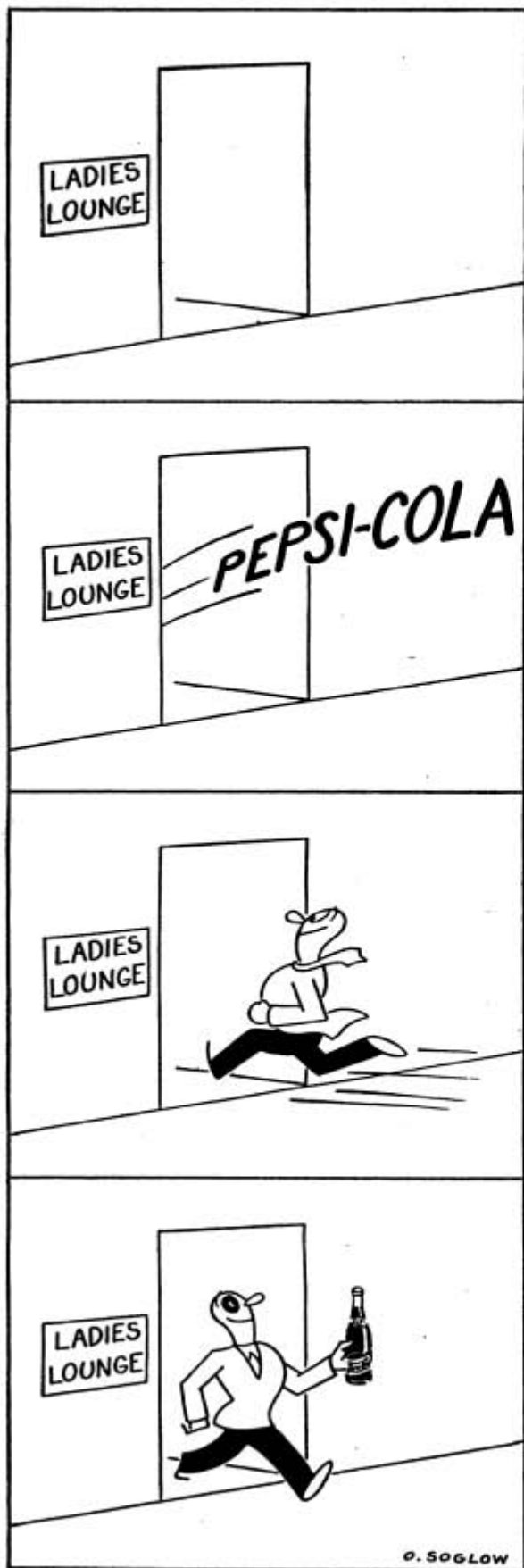
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O. SOGLOW

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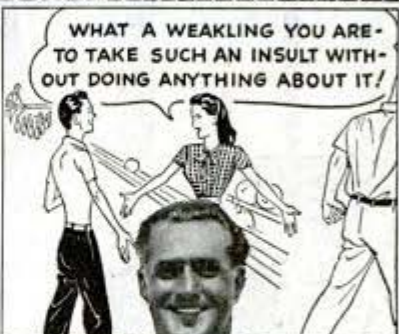
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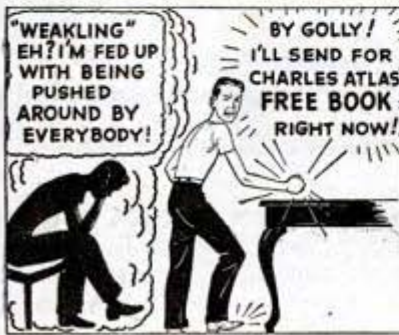
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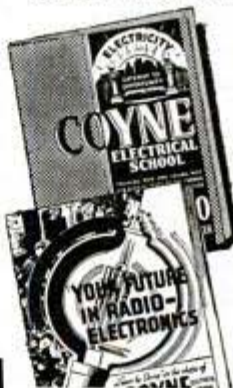
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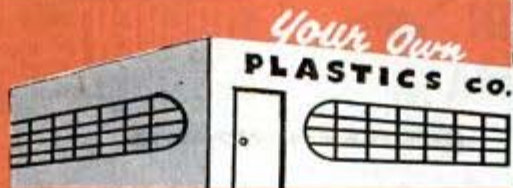
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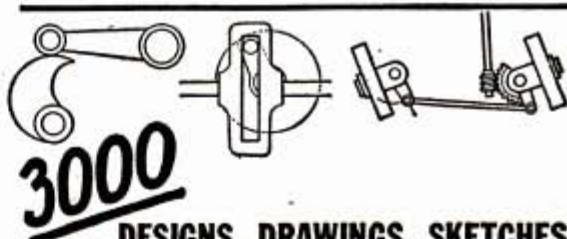
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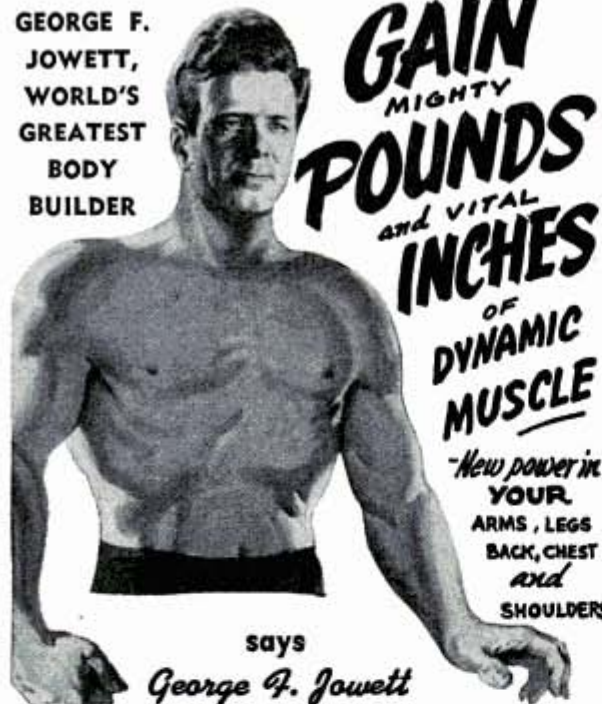
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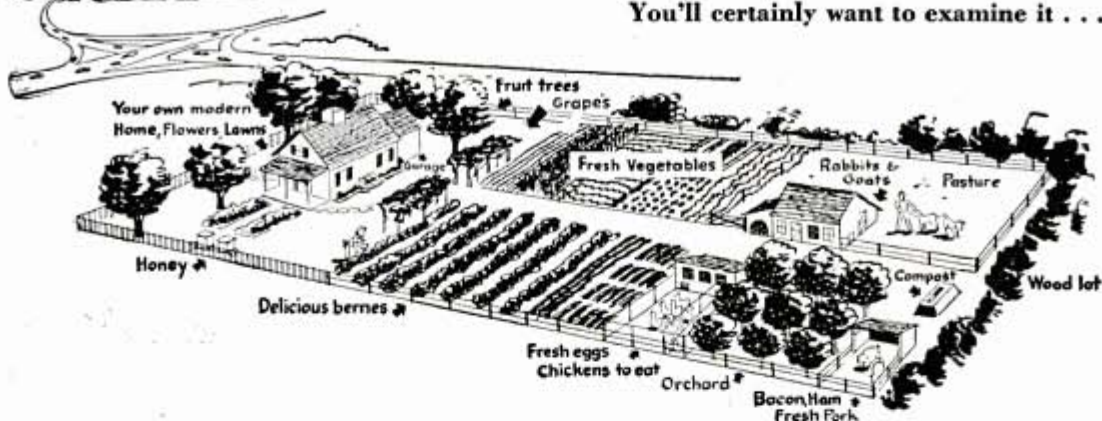
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Mrs. Robinson, Jackie, and I aren't selling any land nor promoting anybody's products. We only want to tell you how we've learned to have more fun, more health and more security than 99% of this world's families has ever had.

This morning for breakfast I had fresh berries and cream, a mouth-watering order of ham and eggs, raspberry jam and toast and coffee. The toast and coffee we bought at the store. The rest we raised on our little "Have-More" Homestead.

That breakfast, to me, is just a sample of part of the difference our "Have-More" Plan makes in the way people can live.

The strictly city dweller who buys everything he eats is liable to have a toast-and-coffee life.

The family which does as we are doing gets the "cream"—and the berries and the ham and eggs and the jam. I guess this sounds boastful, but I don't mean it so. It is just the *enthusiasm* Mrs. Robinson and I have for the Plan we've worked out. We call it our "Have-More" Plan because that's how it works for us . . . we have more of just about everything that makes life worth living! Our "Have-More" Plan is the true story of how we Robinsons moved from the city to our small place in the nearby country to find a "little land and a lot more living" while I kept a regular full-time job.

It tells how we grow most of our family's food in spare time—have fun doing it—have better living—more sunshine and fresh air—more peace and quiet—more security and independence—in fact, as I said before, *more* of just about everything!

All The Details

My "Have-More" Plan contains over 50,000 words, 73 illustrations, many actual photographs of our own place. And I've kept the price as low as I could, only \$1.00.

It tells just how we do things—all our shortcuts, ideas, labor-saving methods—how it takes us only an hour or so of spare time a day to have tender chicken to eat, plenty of really fresh eggs, a wonderful garden, delicious rabbit meat, rich milk, butter, cream from our miniature dairy, tasty ham, pork, bacon, sausage, geese, turkeys, squab, spring lamb, honey bees, fruit trees instead of shade trees, luscious grapes, raspberries, strawberries, etc.—how we use the latest, easiest preserving methods, including quick freezing. (Note: No one family should start all of these projects at once. But we describe them all so you can take your pick.)

No "Magic" About It

Now please, don't get me wrong. This is no "crack-pot theory" on how to make an easy living! I suppose that if you absolutely had to, you could live a long time entirely off a small place like our two acres. But that would be just existing, not really living.

You've got to have some *cash* income—from a job or a pension or something. What I'm saying is that with my

"Have-More" Plan you can make a *small* cash income into the best and happiest kind of a living any man could want. That's *why* we call it our "Have-More" Plan. Furthermore, you and your wife have to be real partners and *enjoy* working together. If either of you think of the housework and the chores as just drudgery, you better go live in a boarding house or a two room apartment. Personally, we wish we *could* spend more time working around our place—it's so interesting.

Will You Join Us?

A friend said, the other day, "Ed, why do you bother with other people? Why don't you settle down and just enjoy your own job and your 'Have-More' Homestead? Why try to spread it all over the country?" I may sound silly trying to tell you why. This is *my* job now. I am putting full time into gathering information on country living . . . for ourselves and others. I feel, somehow, that in the years to come the U. S. is going to need all the help it can get toward happiness and peace and security. We aren't always going to have a war boom going on. I've got a boy I want to see grow up in a good country, and if ten or twenty million American families can get set as well as the Robinson family is, I don't think anything can hurt this nation.

Do you see what I mean? That's why I've worked so hard putting this Plan together. That's why I was so *careful* to be truthful and sensible in everything we put in it. And that's why I've kept the price as low as I possibly could—only \$1.00, postpaid.

Now It's Up To You!

So if you are one of our kind of people, if you want to have a look at our "Have-More" Plan, just fill in the coupon here and send it to me. When you get the Plan—by return mail—look it over. If you are disappointed in it in any way, or if it doesn't suit you, put it right back in the package and return it to me. I'll give you your dollar back and send you a dime for your postage.

On the other hand, if you like it, and I am sure you will, help me by showing it to your friends and getting them to start a "Have-More" Homestead also.

Yours for "a little land and a lot of living"—

Ed Robinson
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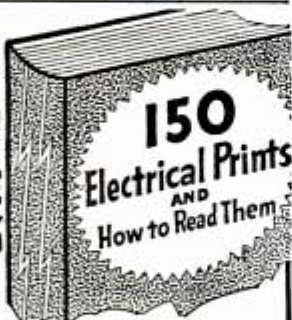
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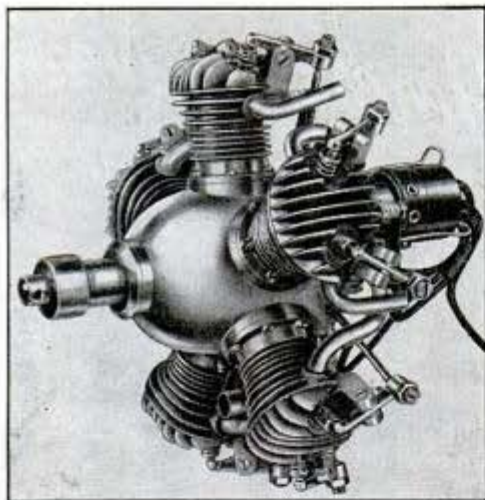
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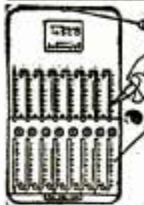
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RCA radio-relay towers—like those above—will give post-war television far greater range.

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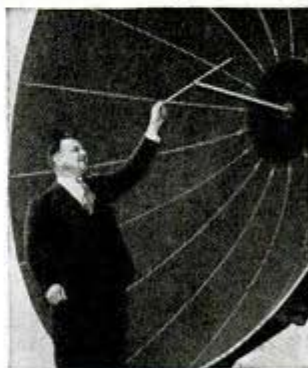
For a long time it looked as though post-war television might be confined to local stations. That was because the ultra short waves that carry television do not bend with the curvature of the earth. They go in a straight line out to the horizon—and then into the sky.

But today, this handicap has been overcome—by RCA scientists and engineers.

The *radio-relay* was developed—a tower that "bounces" television programs to the next tower 30 to

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This is but one more example of how RCA research constantly "makes things better." Such research is reflected in *all* RCA products. And when you buy a television set, or radio-phonograph, or anything made by RCA, you enjoy a unique pride of ownership. You can be sure it is one of the finest instruments of its kind that science has achieved.



C. W. Hansell, RCA specialist in transmitters and relays, is shown here with a new and enlarged radio-relay reflector that can "bounce" radio messages, radiophotos and Frequency Modulation programs at the same time that it relays television from coast to coast!

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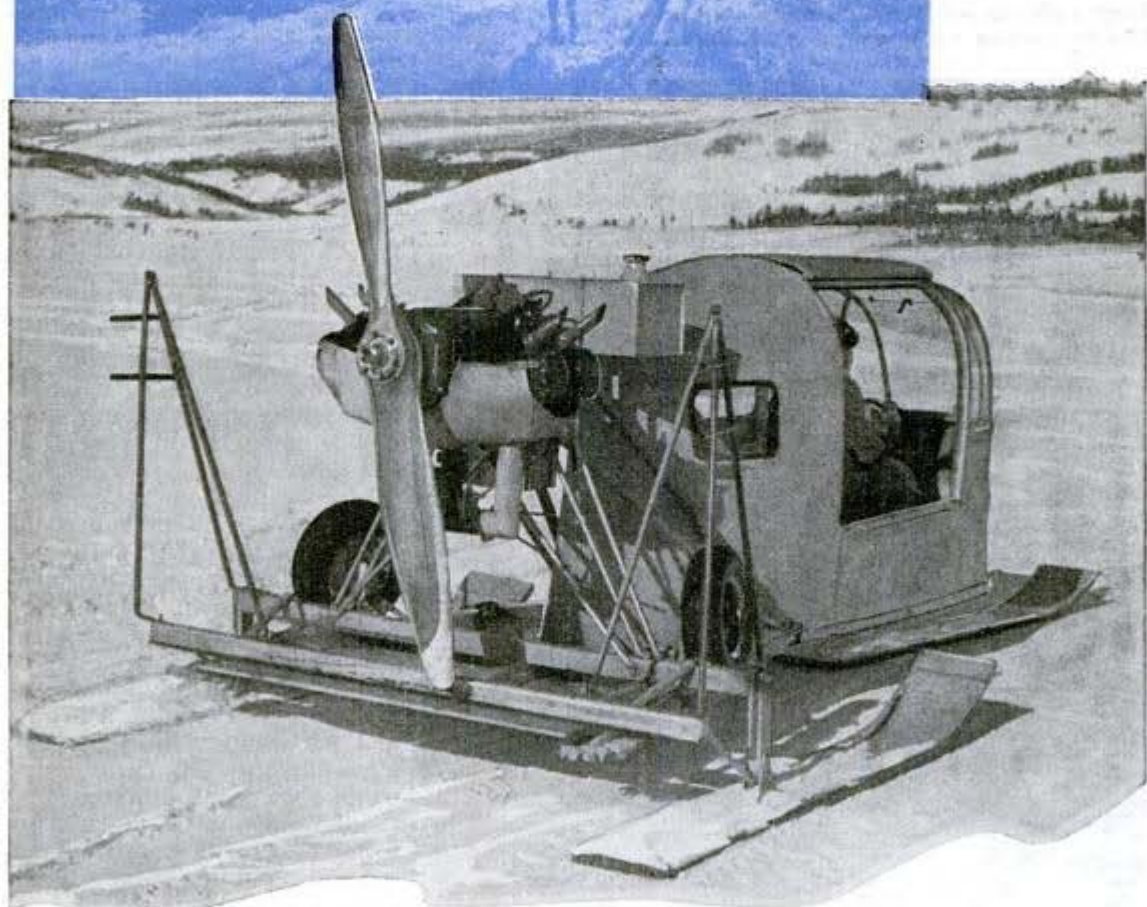
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AUGUST, 1945

No. 2

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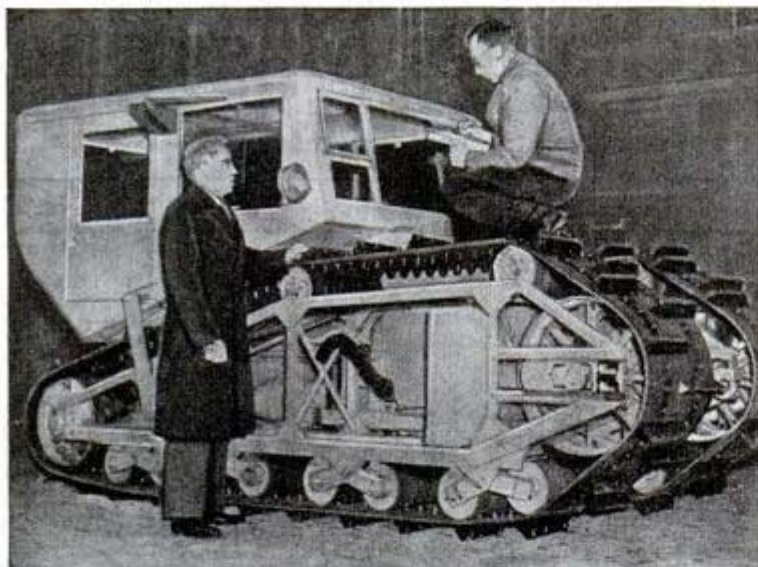
By James V. Lloyd

Superintendent, Lassen Volcanic National Park, Calif.

IF YOU EVER spent your vacation in a national park, you probably remember the ranger as a rugged, sun-browned guide and host who answered all your questions with friendly patience. Silhouetted against

the grandeur of the wilderness, perhaps he seemed to be the spiritual descendant of America's legendary Indian scouts, as self-reliant and resourceful as nature itself.

In a sense the national park ranger is all of that. But thanks to the ever-changing developments of science he now has to be a jack-of-all-trades as well. The ideal



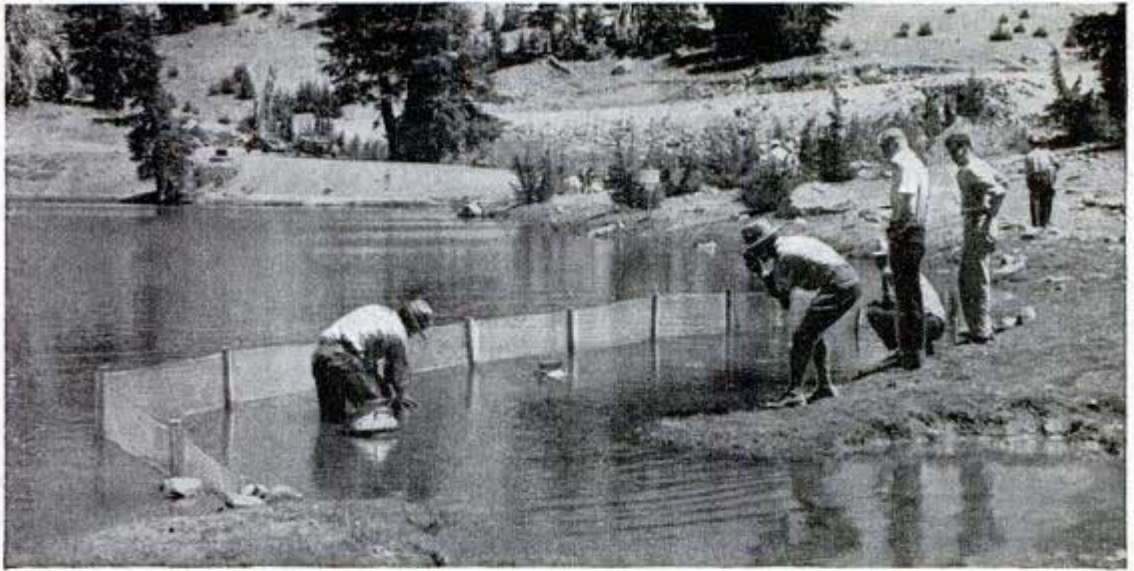
Rangers plan to use four-part Army snow tractor that disassembles for air transport. Right, snow sampling tube to measure water content is suspended from scales. Below, clearing a lane to fight a forest fire.



ranger is a combination forester, fisherman, mountaineer, policeman, fireman, geologist, meteorologist, radio operator, veterinarian, cook, mechanic and botanist. Maybe it's ironic that the ranger can best "protect" nature's beauty spots from civilization only by borrowing some of civilization's ingenious mechanical aids.

Thirty years ago, when I broke in as a park ranger, our modes of operation were still relatively primitive. For transportation we relied entirely on horses and our own legs. When we slept outdoors we rested on the pack animal's tarpaulin thrown over some fir boughs, instead of the sponge rubber mattresses in use today. The only motorcar available in Yosemite National Park was for the park superintendent. In fact, you could always tell our superintendent by the black ring of soot around his mouth. You see, automobiles didn't have suction feed pumps in those days so in order to force more gasoline into the carburetor on grades you had to blow into a vacuum to get the fuel moving faster, which usually left a smudge on your face. Techniques for fighting fires and making rescues, too, were slow and inadequate.

Now we cover the immense



Two-inch rainbow trout planted by rangers in Emerald Lake, Lassen Volcanic National Park, a natural aquarium, are protected from cannibalistic parents by wire screen. Artificial feeding hastens growth of the fish

distances in the park much more quickly with motorcycles, station wagons, passenger cars and the handy 1½-ton pickup truck. However, horses and boots are still the only means by which some of our high mountain trails can be negotiated. Good mobility is especially important during wartime. With most of the younger men in military service the reduced ranger corps might otherwise find it well nigh impossible to cover a beat of 11 million square miles in the 27 national parks. Even so, an emergency sometimes makes it imperative for the ranger, who is on duty 24 hours a day, to hike 30 miles in a single day. Also, only a small portion of any national park is accessible by roads.

After the war we expect to be much better equipped mechanically to perform our duties. The rangers plan to capitalize on devices just perfected by the Army which we never had the money or the facilities to develop ourselves. For example, rangers will be able to traverse the deep snows more easily on the ski-mounted caterpillar tractor used by the 87th Mountain Infantry division. Incidentally, this division includes a large number of our rangers on military leave. The tractor can't



Ranger directs fire fighters by portable radio. Below, an injured skier is brought in on one-man rescue sled with a special brake



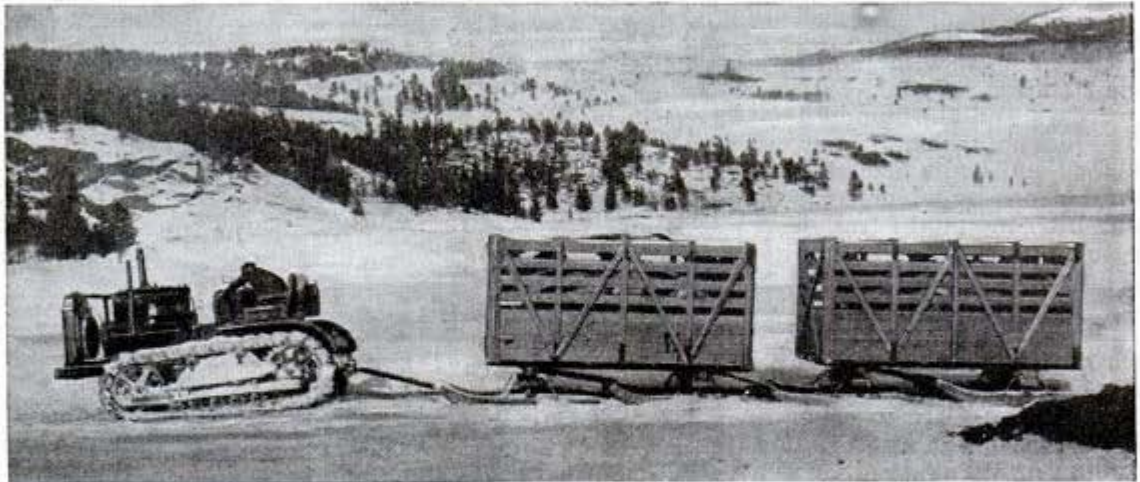


Ranger looks down on top of telephone pole buried in deep snow which slows maintenance work in Lassen Volcanic Park

has to be done with only hand tools.

The motor sleds used by the ski troops will be valuable in searching for and rescuing fellow rangers or visitors incapacitated through accident or sickness. Once a ranger on skis had to drag a sled for 30 miles over frozen ground in hauling from the depths of Yellowstone the body of a ranger who had been stricken with food poisoning.

One of the World War II devices we are most looking forward to is the walkie-talkie radio developed by the Army Signal Corps. In the severe winters of the Far West we often get SOS calls over the radio telephone from park caretakers snowbound in a distant lodge or camp. But the stationary radio telephone is not available when a ranger is caught in a sudden snow-



U. S. Department of Interior photo
Sled train moves live elk from ranch in Yellowstone Park.
Below, "smokechaser" pack includes map, compass, fire tools

be stopped or stalled by such formidable obstacles as steep slopes and tortuous ravines and can carry more supplies than the sturdiest horse or dog team.

One version of the snow tractor is a tanklike vehicle built in four parts—cab, two tracks and motive power section—which can be disassembled for transportation in a medium-sized plane. It has room for two stretchers in addition to the driver and three passengers, and can be equipped with a two-way radio. Resting on broad tracks, the machine can pull 4000 pounds over deep snow and up heavy grades.

The Army's small, extremely maneuverable tractors should make it easier to clear a firebreak or lane in the forest when it is necessary to isolate rapidly spreading flames. This is strenuous work when it



storm en route to or from a camp.

The walkie-talkie could help, too, in rescuing inexperienced and overconfident hikers who sometimes leave well-defined trails on a canyon rim, such as in Yosemite National Park, and attempt a short cut down to the floor of the valley 3000 feet below. Rangers sometimes literally hang to the face of sheer cliffs, risking their lives to reach a climber who may be badly bruised or dead. In cases like this a trained observer with field glasses could supervise the rescue work by walkie-talkie, saving time and effort by keeping the rescue party out of blind pockets or gullies that terminate in precipitous drops.

I believe a walkie-talkie would have been useful last summer when Ranger Ed Laws, an experienced old-timer, led a rescue party to three Army flyers who had bailed out over the Grand Canyon. The stranded flyers and their parachutes could be seen on the first plateau within the canyon but how to get to that inaccessible spot was a problem. After eight days of study, Ranger Laws selected a never-before-traveled route that permitted him to reach the men and guide them safely out over the breath-taking cliffs of the Grand Canyon.

Fighting fires is one of the ranger's most important jobs. Fires not only scar our wooded regions but also leave whole areas denuded, inviting insects and fungi to attack trees which have been weakened but not killed by the blaze. Once destroyed by fire, forests like the 3000-year-old giant Sequoia groves found in three of California's four national parks might not reproduce again.

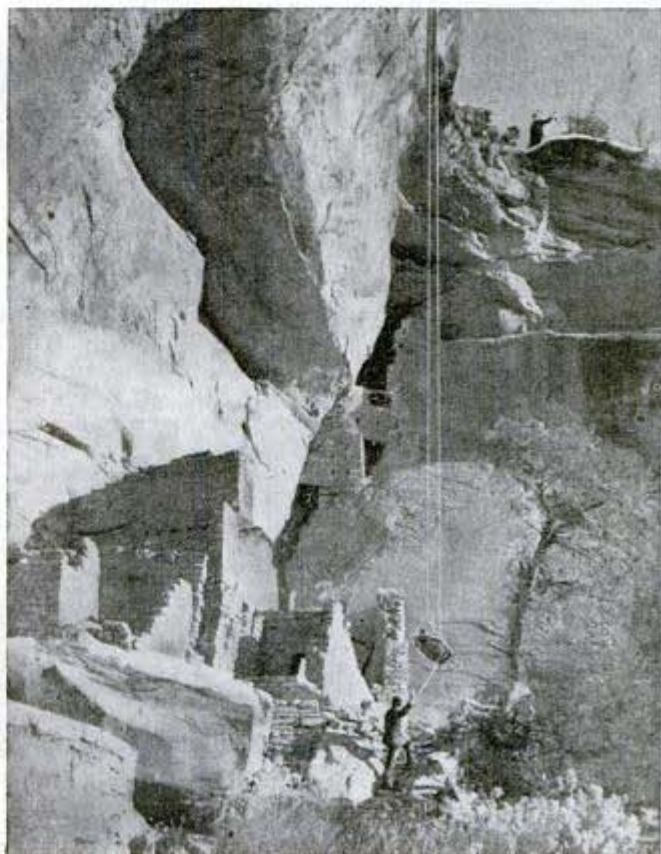
After the war we may introduce some radically new methods to combat this threat. Many of our present lookout stations, isolated and difficult to man and equip, may be abandoned; instead, wherever it is feasible, we may have frequent airplane patrols. Unlike the lookouts, planes would not be handicapped by blind spots—high peaks and ranges which screen fires from view.

Last year in Lassen Volcanic Park rangers searched for several weeks for a fire which had been

(Continued to page 158)



Rangers at Mesa Verde Park hope they never have to use this rescue litter. Here they practice lowering dummy over cliff.



Mobile Farm Service Station Goes Right Into the Fields

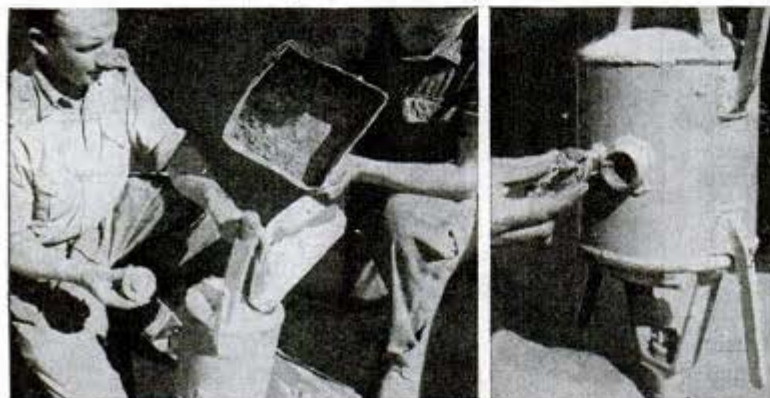


Portable power lubrication for farm machines is supplied by a mobile service station that has its own air compressor driven by a gasoline motor. The versatile unit, which can be mounted on a light truck or used as a trailer, supplies both high and low pressure lubrication for machinery or vehicles, inflates tires and dispenses gear lubricant or motor oil. The tubular base on which the unit is mounted serves as an air storage tank. With air furnished by the compressor and tank a spray gun can be used to apply paint, rust preventive or other surfacing material.

Bren Gun Floats Across River On Oil Cans

When it was necessary to transport a Bren gun carrier across a river in Burma for the battle of Mandalay, British engineers strapped empty oil cans and a wooden rudder to each vehicle. As soon as there was sufficient buoyancy, the carrier was waterproofed and tested on the river, then paddled through the water by its own caterpillar tracks.

British engineers attach wood rudder to guide gun carrier across river

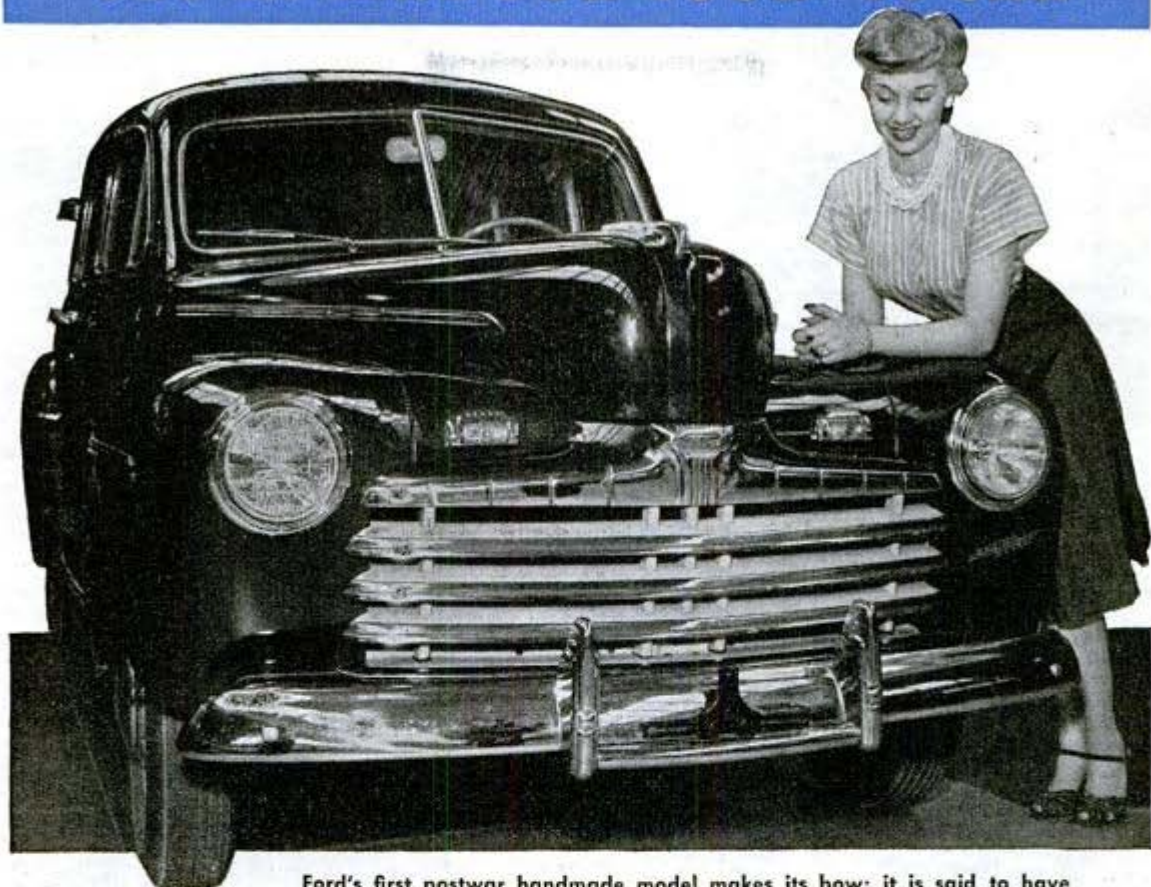


Yanks pour powder into captured Jap mine. At right, fuse fits into side

Sea Mines Planted On Land by Japs

Cumbersome mines designed for beach or ocean were pressed into use as land mines by the Japanese in their retreat from Burma. Nine inches long and weighing 35 to 40 pounds, the mines held 500 grains of gunpowder and often were hooked by wire to 75 and 105-millimeter shells to explode them as well.

GET IN LINE FOR YOUR '46 CAR



Ford's first postwar handmade model makes its bow; it is said to have 100 improvements and represents greatest change in Ford models since '32

RIGHT around Labor Day an event is scheduled to take place which will be as exciting to most Americans as the first transatlantic flight or the invention of the self-starter.

The long-awaited event is the production of the first civilian passenger automobile since February, 1942. Six million persons, according to a conservative estimate by the automotive industry, are standing in line to buy that first car.

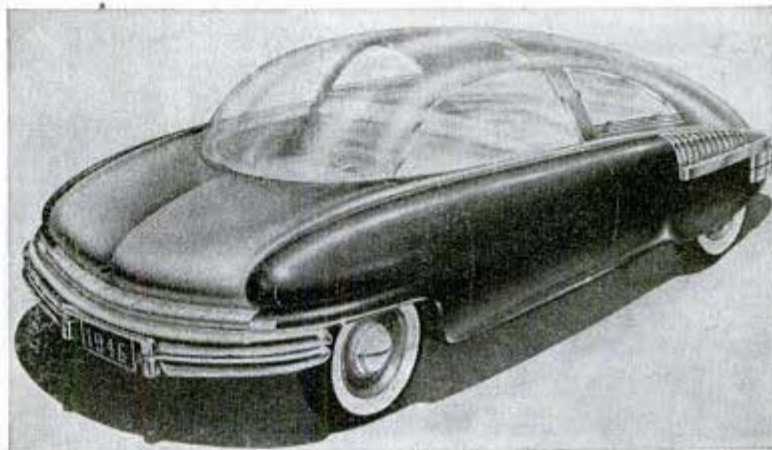
By this time the average car owner is resigned to the fact that his first so-called postwar car will not be of teardrop design with transparent plastic top and jet propulsion. He not only is resigned, but probably a little relieved.

The industry discovered long ago that what the public likes is an

Plastic-topped "car of the future" designed by George W. Walker may be our "post postwar" car, but the American public will have to wait for it

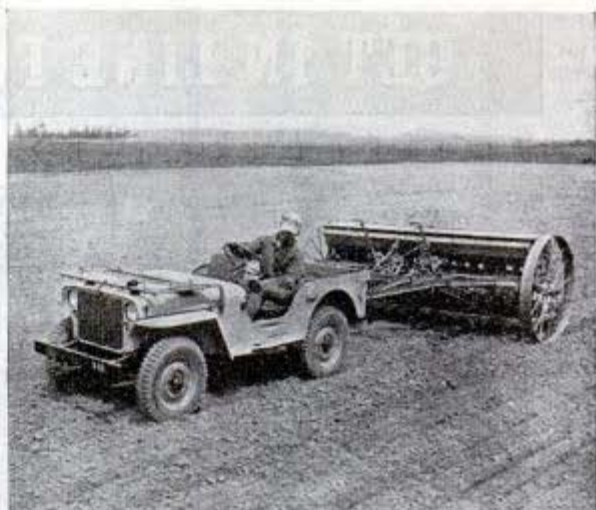
"evolutionary" and not a revolutionary car. Besides, the 1942 models turned out by most companies were excellent automobiles which have stood up well under wartime strains. These strains included a "diet" of some of the most unsuitable gasoline ever fed into a complaining engine.

The dependability of the prewar American-built automobile is attested to for all time by the fact that the average age of cars on the road today is eight years.





Power takeoff on postwar jeep operates tree spray



Changed gear ratio slows jeep for pulling a seeder



Postwar jeep pulls trailer loads up to 5500 pounds. Below, power takeoff delivers 30 h.p. to buzz saw



Postwar post holes—power takeoff operates auger. Below, jeep helps paint barn by powering a sprayer



Aside from the merits of the 1942 models, there are many practical reasons why the 1946 cars will bear a close resemblance to the prewar product. Foremost is the necessity for getting into production as quickly as possible. This both eases a serious transportation problem and furnishes jobs during the reconversion period. In addition, car-hungry Americans are extremely eager to hear that musical squeak of a new automobile and to smell fresh enamel and hot metal. They would prefer a "face-lifted" 1942 model rather than wait a couple of years more for a completely new automobile.

The Ford Motor Company, which appears to be out in front in the race to turn out the first car, reports that its 1946 model is as different from the '42 as the '43 probably would have been. The new Ford is said to have more than 100 improvements and represents the greatest change of any model over its predecessor since 1932.

Like many other manufacturers, including General Motors and Nash-Kelvinator, the Ford company considers the hurry-up car, known as the 1946, as the "immediate postwar" car. Most of the companies plan to build this car in only one model. Unless something unforeseen occurs, the 1947 model will be the real postwar car and after that will come the post postwar car of possibly unconventional design.

Interior view of 1946 Ford which features simplicity of controls



AUGUST, 1945



Side view of 1946 Nash 600—parking lights are moved to new location and grille work is heavier; it weighs 500 pounds less than '42

The Ford 1947 model, a sample of which already has been constructed by hand, has mostly exterior changes over the 1946. The 1947 Ford will be low and rakish in appearance and is said to "ride like a feather."

The normal required time for redesigning and retooling to produce a new model is about 12 months and the time necessary to produce a totally new model is 18 months to two years. The first 1946 cars are being turned out in 60 to 90 days—a herculean task of reconversion. That is why your '46 car will have the same general lines as the '42, will have about the same weight (with the exception of the new Nash 600) and length and the same number of cylinders. The engines will be in the accustomed place under the hood and not in the rear. The chief exterior differences will be in the grille work. The new Ford has a heavy bar horizontal front-end grille which is easily distinguishable from the '42 model. The same holds true for the Nash and probably will prevail throughout the industry.

Many engineering improvements, developed during the war and subjected to severe military tests, will be incorporated in the '46 cars. These include better car-



Prewar Packard "tests" proving ground; soon no grass will grow here

buretion, braking systems and oil filters; improved engine ventilation, hydraulic drives with minimum friction losses and better placement of parts for servicing.

At the request of Army Ordnance, Ford has developed "tri-alloy" bearings which wear three times longer than conventional bearings. The new alloy consists of about 40 percent lead, 5 percent silver, a small percentage of iron and the balance copper. It replaces cadmium, widely used as a bearing metal before the war. Tri-alloy bearings on heavy trucks operating from Ford's Willow Run bomber plant showed no appreciable wear after 50,000 miles.

Another feature of the '46 Ford is improved lubrication of the 100-horsepower V-8 engine. This is done by increasing oil volume and pressure, an expedient found desirable on military trucks. Cooling of valve seats has been improved by a slight change in design that increases the amount of coolant at these points. Ford engineers predict that greater control of surface smoothness of metals will lengthen the life of an engine. A profilometer, which measures deviations from a straight line in millionths of an inch, helps the engineers gauge a degree of smoothness that still permits the surface of a moving part to retain an infinitesimal film of oil.

Other Ford features are strengthening of parts by shot peening, nonglare glass on the instrument panel, an improved jack and weather-resistant synthetic enamel.

Nash-Kelvinator will manufacture two 1946 or "immediate postwar" cars. They are the Nash 600 and the Ambassador. The new 600, designed for the low-priced field, carries six passengers comfortably. It promises 25 to 30 miles on a gallon of gasoline and weighs 500 pounds less than the

'42 model. The saving in weight is accomplished by "unitized," or single unit, steel body-chassis construction. The engine is said to have many improvements based on Nash's wartime experience in building airplane engines. The new springs on the 600 provide individual coil suspension on all four wheels.

General Motors, builders of the Chevrolet, Pontiac, Oldsmobile, Buick and Cadillac, is launching a 500-million-dollar immediate postwar program. GM will build 95,096 cars between now and December 31—more than one third of the production ceiling of 241,916 cars set by the War Production Board for the entire industry during this period.

Next in line is Chrysler Corporation with 49,635, Ford with 39,910 and Studebaker Corporation with 9275. Production ceilings of 8000 cars each have been assigned to the Hudson Motor Car Company, Packard Motor Car Company, Nash-Kelvinator Corporation, Willys-Overland Motors, Graham-Paige Motor Corporation and Crosley Corporation.

The WPB quota for the industry for the first quarter of 1946 is 449,102 cars. Incidentally Ford's 1945 quota could have been turned out in less than 10 days back in 1941. In that year of peak production the industry built 3,744,300 passenger cars and the automobile "population" of the U. S. was 27,700,000.

General Motors has announced that its 1946 models will be "face-lifted" '42s and that it will not produce an entirely new car until 1947.

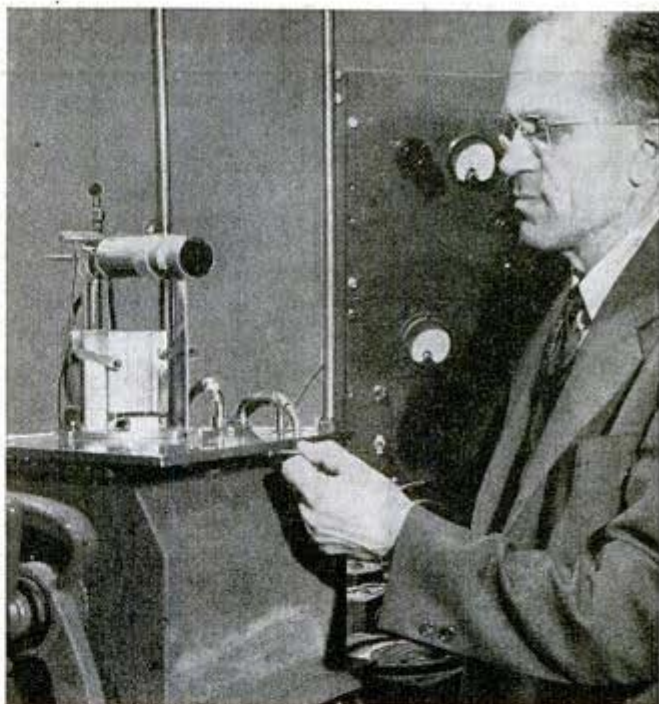
Many of the '46 cars, however, are expected to offer innovations in the use of plastics, light metals and synthetic rubber. The United States Rubber Company has developed a plastic upholstery, known as Naugahyde, which is made in a wide range of colors. This is expected to ease the textile shortage, a major problem in producing the '46 car. The average prewar passenger car used 56 yards of textiles ranging from burlap and cotton sheeting to broadcloth, mohair and carpeting. Another colored plastic, Vinylite, may replace the familiar black rubber edging around windows and windshields.

The light metals, aluminum and magnesium, will be used in many postwar cars,

(Continued to page 154)

X-Ray Atom Counter Identifies Elements

By shooting a beam of X-rays into an unknown substance its elements can be identified easily with a photoelectric X-ray intensity meter developed in the General Electric Research Laboratory. The X-rays furnish a means of counting and identifying the atoms by which they are being absorbed. The solid or liquid sample is placed in a glass cell three quarters of an inch in diameter and six inches long. The cell is in a vertical position above the X-ray tube, which sends a narrow pencil of rays through it. The rays then fall on a fluorescent material painted on the glass envelope of a phototube. This material becomes luminous where the rays strike. The current from the phototube is amplified and its intensity read on a meter. Comparisons are made of the absorption of the cell with and without the sample. Filters made of various metals can be placed in the X-ray beam to obtain radiation of different wave lengths. Light energy equal to a ten billionth of a



watt can be measured accurately in this way. If the X-rays are passed through a pile of 100 sheets of paper a notable difference in absorption is caused by the addition or removal of a single sheet.

Gobs of Ice Cream for 7200 Gobs Packed Every Hour

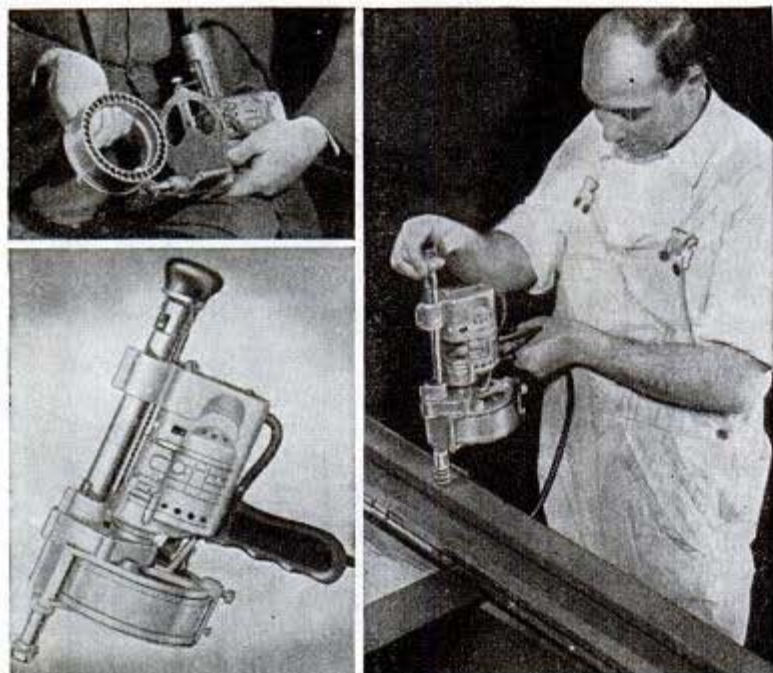
More than 7200 paper cups are filled with ice cream hourly at Sampson Naval Training Center, N. Y., by a machine which pumps into three cups at once. A paper disk covers each cup as it leaves the machine. It's sanitary and convenient, navy men say.

Portable Oxygen Unit Flown to Outposts

Supplies of oxygen vital for air operations in the Pacific are being produced by a portable generating unit which can be delivered by plane. Previous plants were heavy and bulky and required chemicals and drying agents. The new unit has a small, highly efficient expansion engine operating on 100 pounds of air pressure. Heart of the unit is a six-foot cold box in which oxygen is produced by liquefying ordinary air, then allowing the liquid to boil so its oxygen and nitrogen vaporize separately. Using only gasoline, oil and a little water, the generator can be set up in 24 hours.



Screw Driver Has a Self-Feeder



Magazine of self-feeding screw driver is detached and replaced quickly

To save time and labor, an automatic screw driver operated by air or electricity allows almost continuous operation without hand feeding. A preset gauge on the spindle drive cuts off the torque so screws can be driven to the exact depth desired. The rotation of the blade is stopped, protecting screw heads and the work surface against marring. Screws are fed automatically from a magazine into channels for driving. The unit, which weighs only six pounds with the magazine full, can be used as a portable or fixed tool.

Jap Push-Button Mask Makes Own Oxygen

Japanese troops use an electrical mask that generates its own oxygen. Translation of instruction plates on a captured mask by the Air Technical Service Command at Wright Field reveals how it works. The unit contains a battery, two electric buttons, a container for two special chemical oxygen generators, a gas meter, the mask and rubber tubing connecting generator, meter and mask. The generators are inserted in the container through a door at the top. Pressing on one electric button ignites one generator and oxygen begins to flow in five seconds, continuing for 75 minutes.

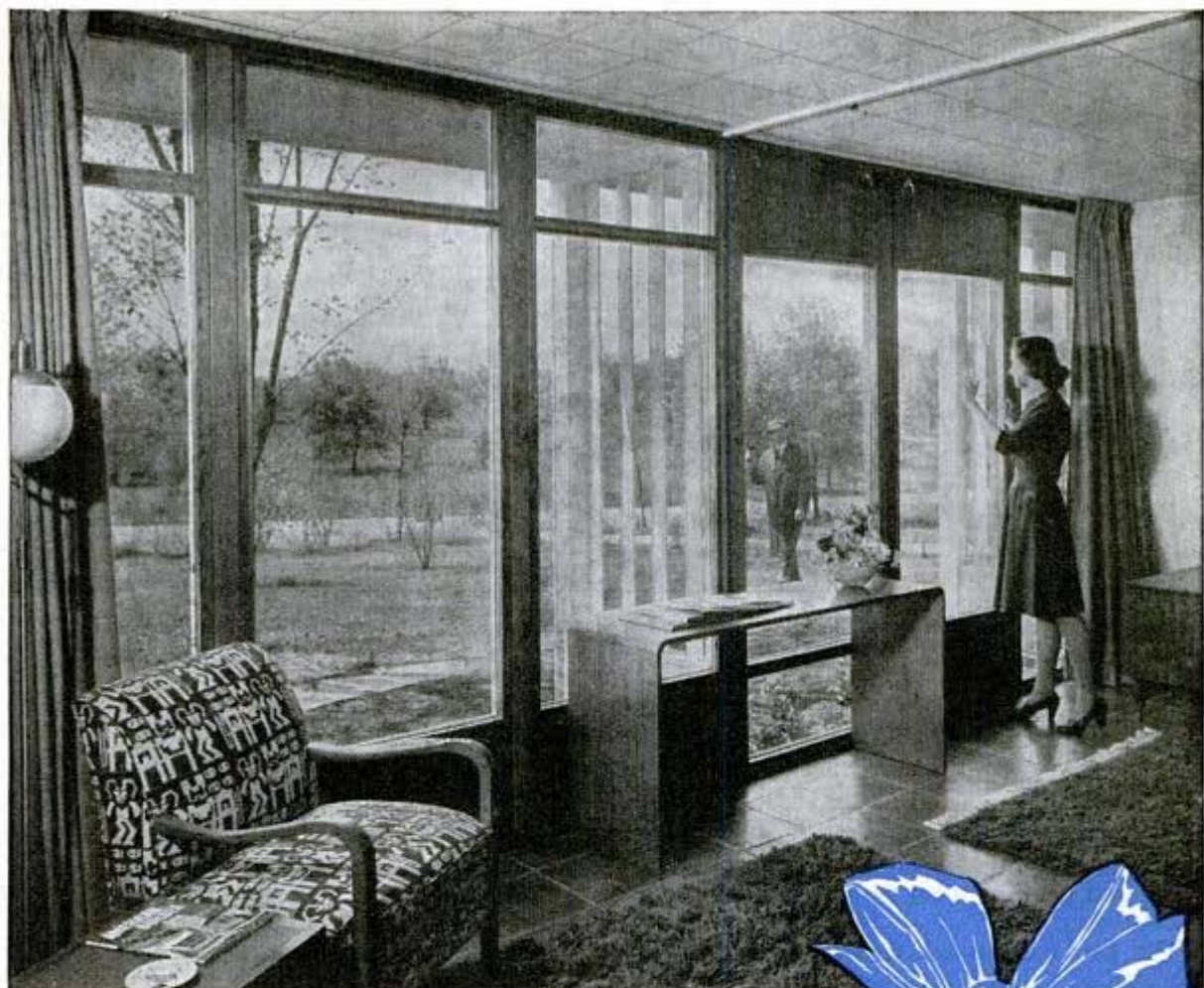
Both generators produce enough oxygen to last a man about two hours. The meter shows how much oxygen is being fed. The Japs also use the compressed gas system in which prepared oxygen is stored in metal cylinders until needed.

Light Freight Cars Made of Aluminum Towed by Jeep

Designed for low cost, high speed service, aluminum freight cars are so light they can be towed by a jeep. The cars, which are lightweight only by comparison, weigh from 37,000 to 42,900 pounds, in contrast to regular steel boxcars which weigh 46,000 pounds. In spite of their reduced weight, the aluminum cars are said to be undiminished in strength and capacity in comparison with conventional cars.



Gleaming aluminum car's lighter weight makes it easy to pull



**YOUR SOLAR HOME
IS ALL WRAPPED UP**



Pretty as a picture is this view from living room of prefabricated Solar Home. Complete in package form, this home will be delivered to you by truck

By William E. Taylor

NESTLING against a gentle slope in Rockford, Ill., is the first prefabricated Solar Home actually to come out of the factory, fully equipped and designed for a new kind of living.

This house also is a monument to the perseverance of a man with an idea. A decade ago, George Fred Keck, Chicago architect, walked into the glass "House of Tomorrow" he had designed for the Century of Progress Exposition in Chicago and walked out with the germ of that idea. Today it has come to fruition in application of

the solar principle to large-scale production of better, brighter, easily heated homes.

Lots of glass meant loss of heat, according to old building theory. Yet, on the cold winter day that Keck visited his World's Fair house, the workmen inside were in shirt sleeves, sweating profusely. The only heat was from the sun. Why couldn't this energy be harnessed to help heat a house and also banish dark, gloomy interiors? Keck moved slowly at first, adding more glass, a window at a time, to the south side of houses he designed for individual clients, getting bolder as heating bills decreased. Finally he had a house with a full



A touch of the toe turns on lights. Partitions next to bookcases close off living room to form extra bedrooms

sweep of windows on the south side. The owners were delighted with the light rooms, the ability to cut the furnace off entirely during a bright cold day and still luxuriate in warmth.

Since then Keck has designed many solar houses. In St. Paul a custom-built solar house cost a third less to heat than the estimated cost for a conventional house of similar size.

The prefabricated house takes full advantage of solar principles. The house is oriented so that all main rooms face south. Windows of these rooms, so large that they virtually are transparent walls, also face south. Above the windows, the roof projects to a 3½-foot overhang, shutting out direct rays of the high summer sun and keeping the interior cool. When the sun

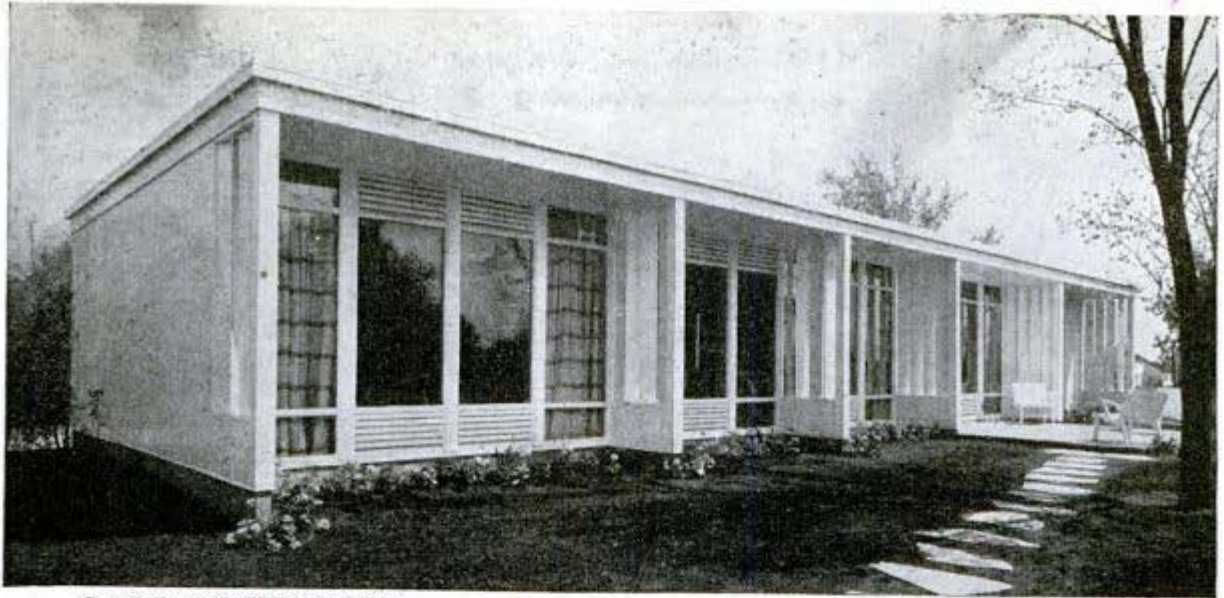
swings low on the southern horizon in winter, however, direct rays slant in under the overhang and flood the house with heat and light, supplementing mechanical heat. In spring and fall, the direct rays enter to a lesser degree.

Sides of the prefabricated house are standardized wall panels or modular units, each three feet three inches wide. On the outside, the solid wall panels have external plywood and vertical siding, and on the inside, interior plywood and birch. Three inches of blanket insulation are sealed between the two surfaces. The wood panels are bolted to iron anchors in the concrete foundation and are firmly connected to each other by a metal locking device.

Glass panels of the same width for the front of the house are made of two sheets

First construction stages, below. Warm air from heat lines, left, is forced through tile floor ducts, right





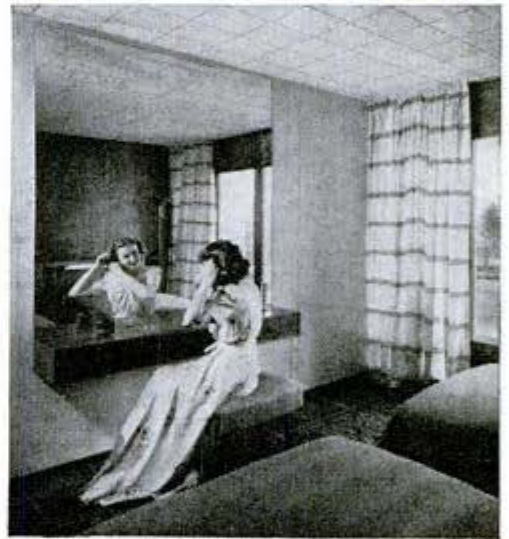
Green's Ready-Built Homes photos

Facing south, windows of major rooms form a wall of glass that banishes dark corners, helps to heat house

of heavy plate glass with a sealed, dehydrated three-inch space between to prevent steaming or frosting. These are fastened the same as the side panels. Some front panels contain louvers at top and bottom which can be opened for ventilation. Permanent, rustproof screening covers the louvers.

Other standard panels contain doors and frosted windows for bathrooms. Panel standardization permits construction of the prefabricated homes in a wide variety of designs. Rooms and bathrooms can be added with ease. Roof panels, also standardized, are of stressed skin construction, glued plywood eight and a half inches thick with great strength and insulating qualities. Over the panels is applied a built-up tar and gravel surface.

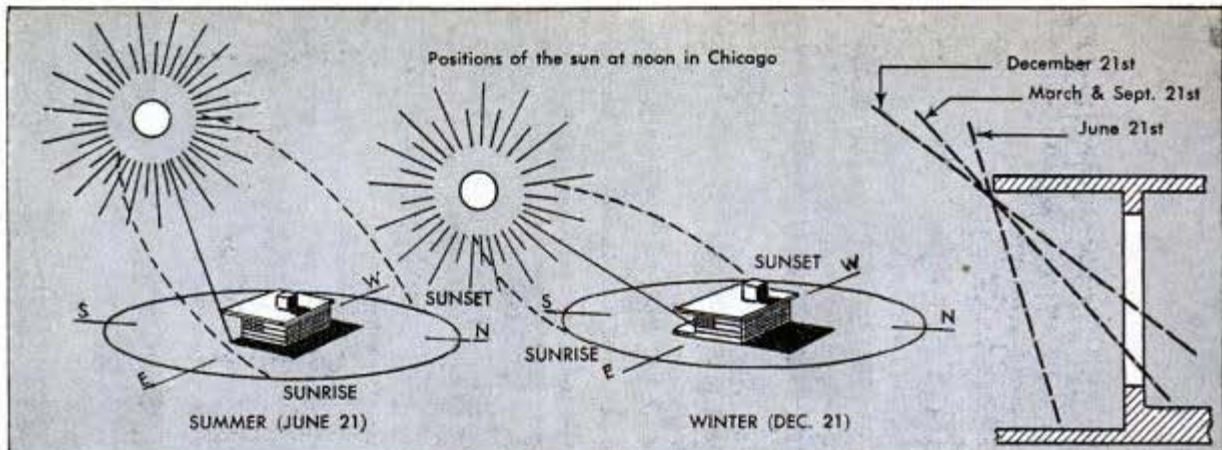
The flat roof has a purpose, too, as does everything in this functional house. In summer it is



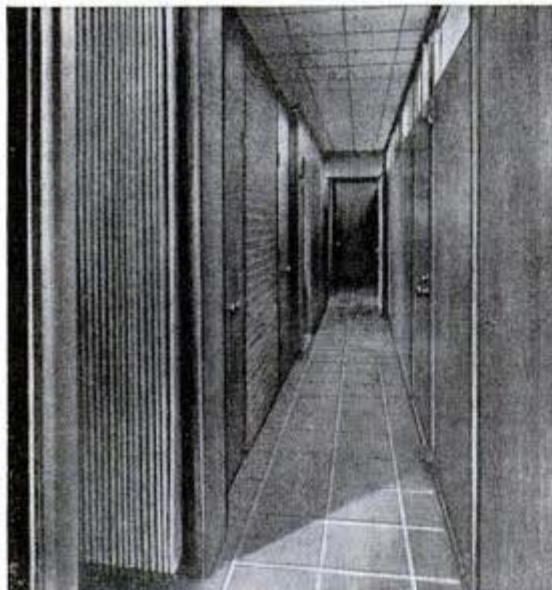
Vanity and mirror are built into master bedroom. Below, louvers of glass panels open to admit air. Screens are permanent, rustproof

Raising a roof panel of prefabricated model home





This is the solar principle back of the Solar Home. Overhang keeps out summer sun, lets in winter rays



Hallway along north side connects rooms. In kitchen are washer, garbage disposal unit, a built-in stove



covered with an inch of water from a valve in the utility room and evaporation keeps the house comfortably cool, much as a wet bathing suit cools the skin of its wearer.

All panels, built-in wardrobe cabinets, book cases and similar equipment are constructed in a Rockford factory. Complete material for the Rockford house was moved to the foundation by truck and the house erected in weatherproof condition in just 14 hours. Weather was unfavorable or construction could have been completed in daylight hours.

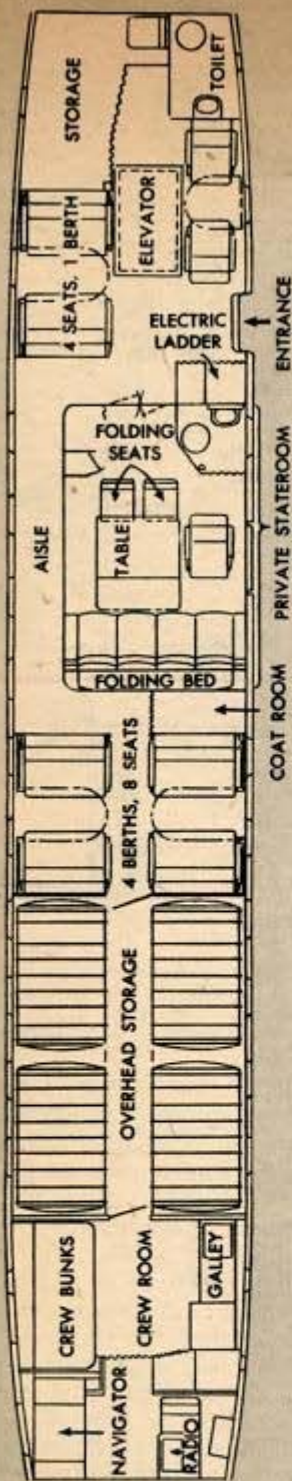
Extending below the frost line, the poured concrete foundation has a 12-inch base graduating to eight inches and then to four inches wide above ground.

Outstanding is the heating system, to which the sun is an auxiliary. Warm air, forced through triple ducts in each tile of the floor, provides radiant floor heat. The heating plant is in the utility room on the north side of the house and may be gas, oil or coal fired. Supply lines from the heater extend along the north side and are perforated on top. Forced directly into the

ducts of the floor tiles from the supply lines, the warm air actually travels through the floor and enters return lines on the south. Back in the heating plant, the air is reheated and recirculated. Supply lines rest on a layer of gravel within the foundation. The remaining space is built up to the level of the supply lines with cement. Floor tiles then are placed on a thin layer of grout with pencil rods for reinforcement. Floor temperature can never rise above 85 degrees and that high only in the coldest weather. Brickwork also is laid for an open fire-

(Continued to page 160)

WHITE HOUSE PLANE



Private stateroom in Presidential plane is 7½ by 12 feet and seats seven persons. Within reach of swivel chair are oxygen mask and telephone; out of sight on walls are maps, compass, altimeter. Couch folds into bed

Left, sketch shows interior arrangement of special Douglas C-54 Skymaster. It carries 15 persons and has flown 5000 miles in one day. President Truman uses it for various missions; it carried President Roosevelt to Yalta and has broken many records. Among its innovations, which hint of postwar luxuries for air travelers, is a battery-operated elevator (right). It lifted Mr. Roosevelt's wheel chair to the level of corridor in passenger section. Interior color scheme is tan and blue; walls are gabardine and leather. Plane sleeps six, not including crew



DIESELS TO THE FRONT



Caterpillar Tractor Co. photo
Diesel power moves an 80-foot "mountain" to eliminate railroad tunnel. Below, lowering 6-cylinder Diesel to salvage boat
Cooper-Bessemer Corp. photo

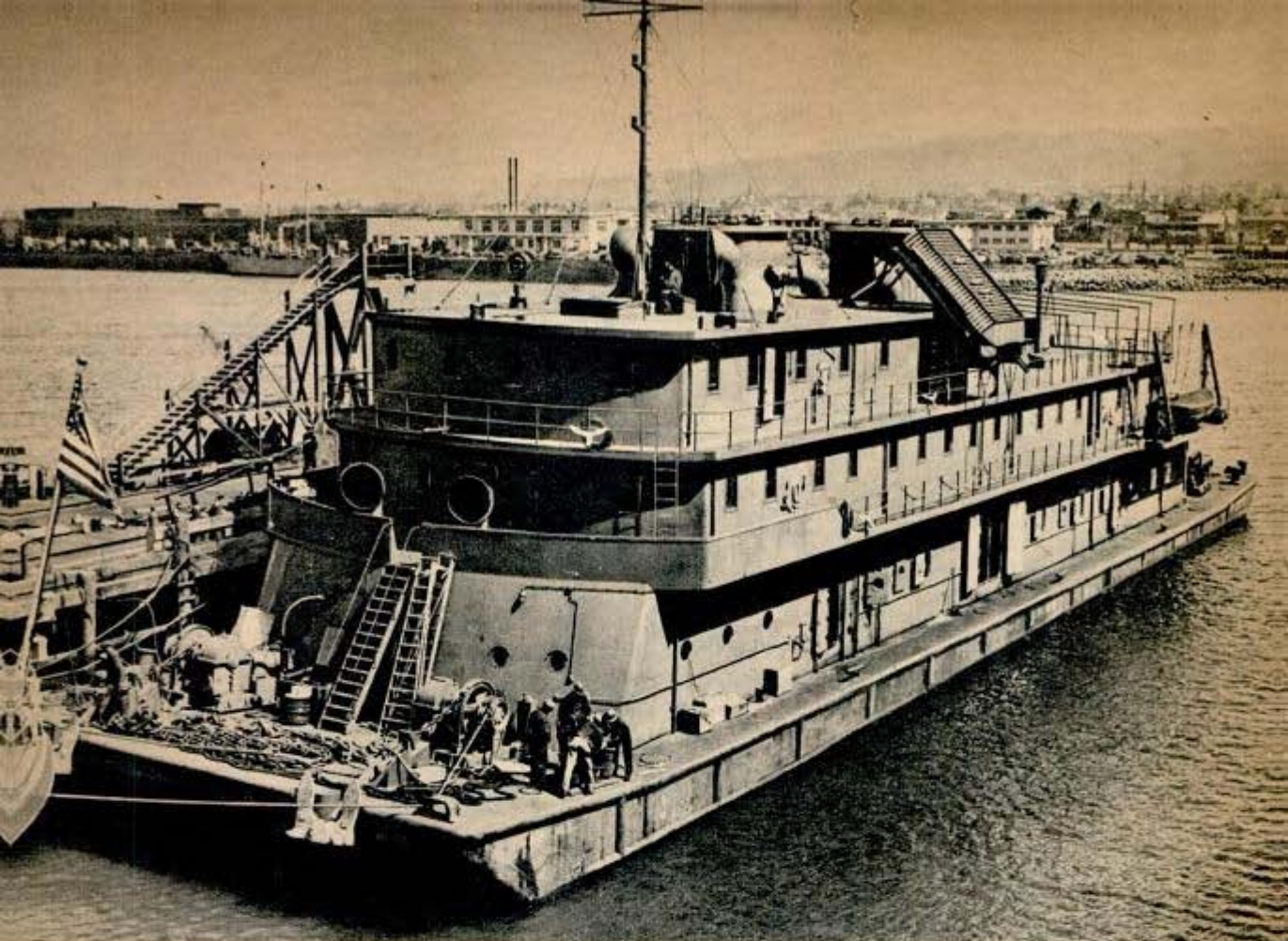


By Wayne Whittaker

A CROSS the green waters off Okinawa, wave after wave of invasion craft roar toward the beach. Farther to the north, beneath the watery front yard of Hirohito, U. S. submarines relentlessly stalk Jap merchantmen and troop transports. On Tinian Island, mountains of white coral are shoved around by bulldozers to smooth out landing strips for the B-29s. Off the coast of Greenland, an icebreaker on patrol pushes through Arctic ice. Hundreds of miles away, a destroyer escort and a baby flat-top keep pace with a convoy of Victory and Liberty ships and tankers. On the home front, a fast freight hurls itself into a Rocky Mountain railroad tunnel in a cross-country dash to deliver vital cargo to a West Coast port.

All of this roaring, shoving, pushing and hurling is being done with Diesel power. Away back in 1934 a Diesel-powered train was such a novelty that it almost caused traffic jams on either side

POPULAR MECHANICS



U. S. Army engineers use power barge *Electra* to run electric dredges; it has eight 16-cylinder GM Diesels

of a crossing. Today a Diesel engine evokes no more comment from a GI or sailor than a stick of chewing gum in his rations. Civilians are not on such familiar terms with the Diesel. The reason? Because the Diesel engine, like many GI Joes, became of age during the war and marched off to fight to the tune of millions of horsepower.

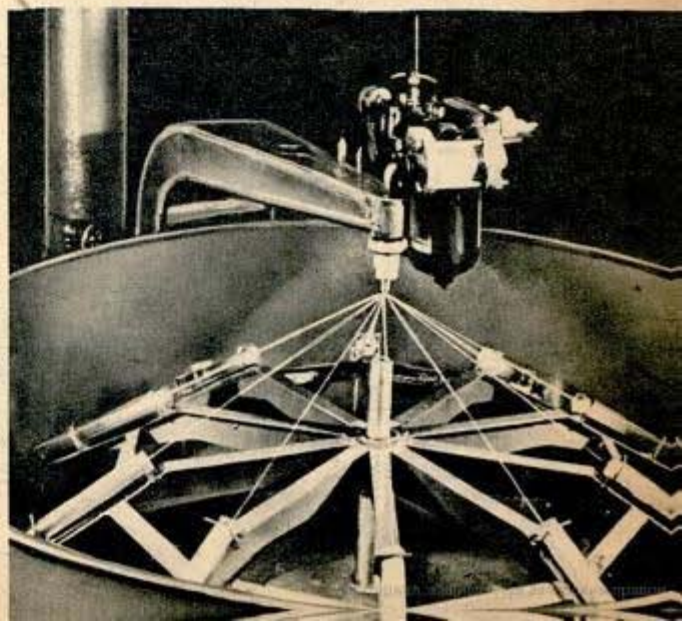
You don't have to be an Information Please expert to know that America's aircraft industry has grown faster than any other during World War II. Number 2 on the list is the Diesel engine industry which last year, alone, did a billion dollar business with an output of more than 35 million horsepower. This is more Diesel power than was produced during the 40 years preceding Pearl Harbor.

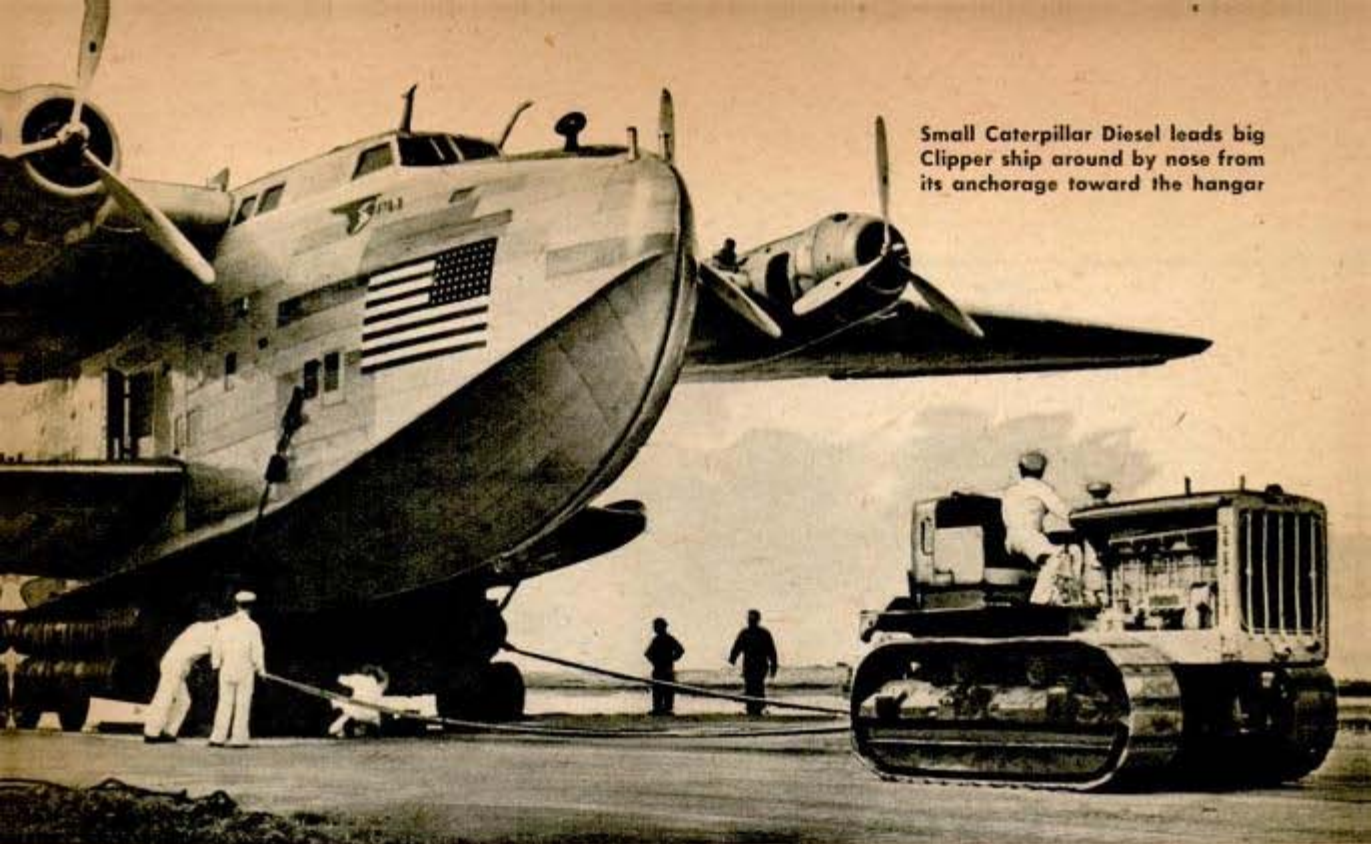
Virtually all of this tremendous Diesel output is being absorbed by the Navy, Coast Guard, Merchant Marine and the Army. Since we entered the war the Army has acquired thousands of Diesel trucks, tractors and tanks and built up its own Diesel-powered navy of about 8000 vessels.

During World War I the Navy Diesel horsepower totaled 150,000, mostly in submarines. Today the figure exceeds 33 million, with the Diesels surpassing steam for the first time in the history of our Navy. When you consider that battlewagons of

the Iowa class have steam turbines delivering 200,000 horsepower compared with the 12,800 horsepower of the largest Diesel vessel in our Navy, that 33 million represents a sizable number of craft. Some require only a few hundred horsepower and the total of Diesel-powered vessels in the Navy is probably well over 100,000. This includes all types of landing craft.

Test machine for Diesel engine fuel spray nozzle which must deliver proper amount of oil into tubes





Small Caterpillar Diesel leads big Clipper ship around by nose from its anchorage toward the hangar



Why all the sudden courtship of the high compression Diesel when steam turbines and gasoline engines had been giving apparently satisfactory service for years? One reason was the need for building up a streamlined and highly maneuverable fleet with an amphibious arm composed of many small craft. Steam turbines lend themselves to large installations such as are required by a battleship or huge generating plant. It wasn't economy of operation or a dislike for spark-plugs and carburetors that caused Navy engineers to choose the Diesel in preference to the gasoline engine. It was some-

Left, Diesel engines are ideal power units for tugboats. Below, Caterpillar pulling sled train of logs — total weight 1192 tons





Submarine tender is largest Diesel-driven ship in U. S. Navy; its GM Diesels have 12,800 horsepower rating

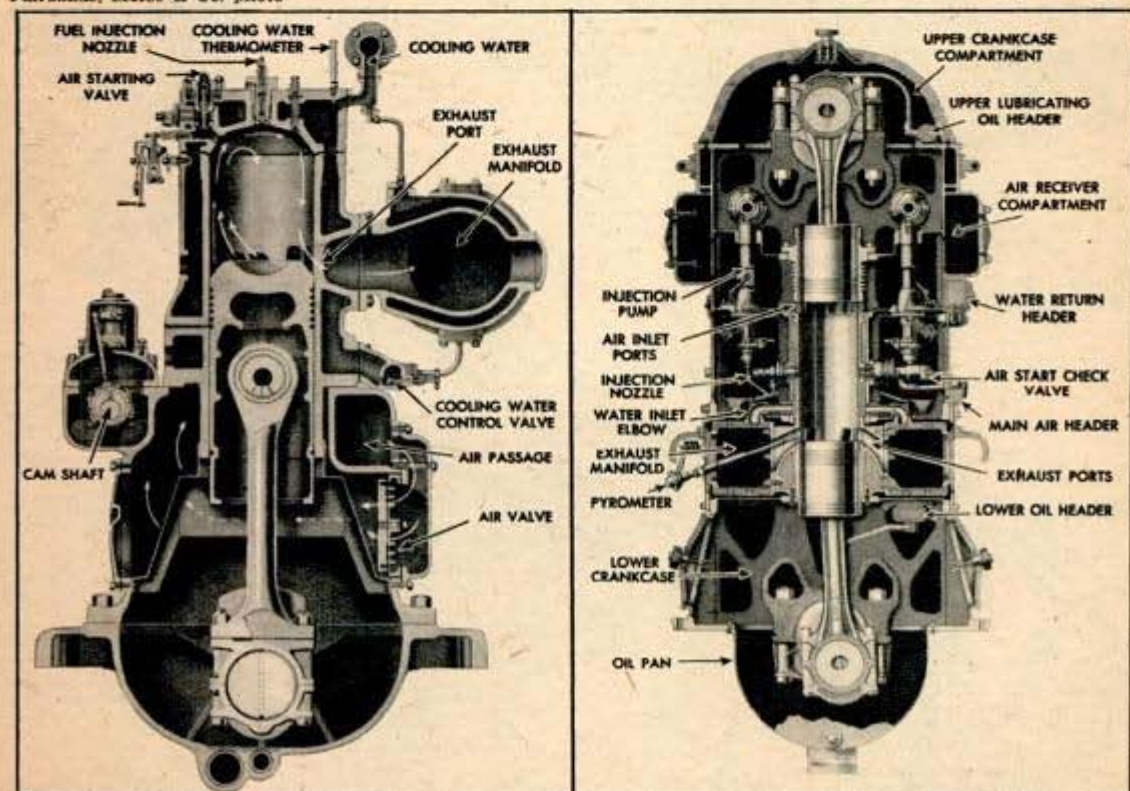
thing these engineers call "availability."

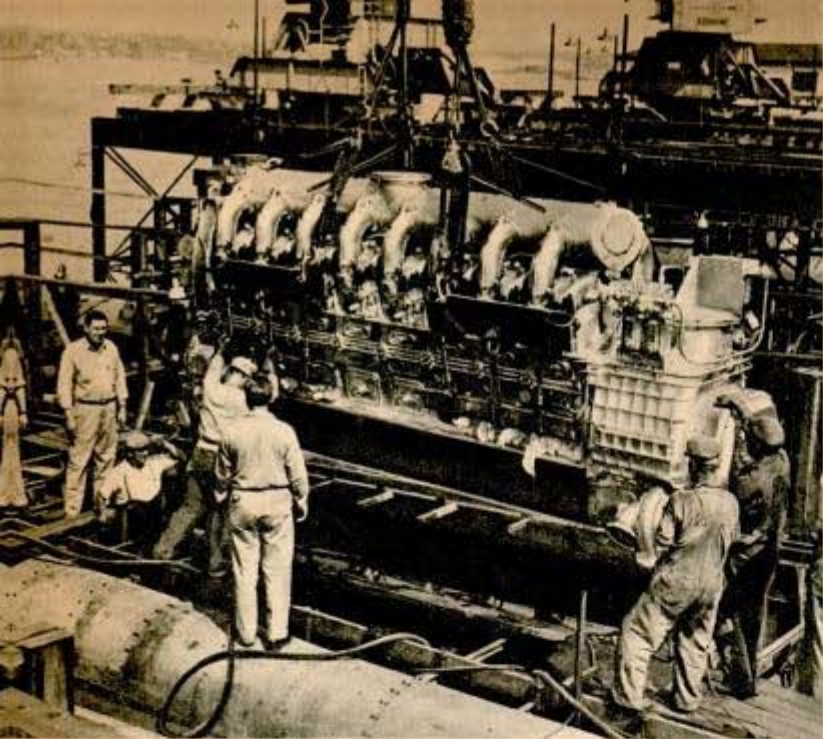
For several years before Pearl Harbor, Navy engineers such as Rear Admiral H. G. Bowen, former chief of the Bureau of Engineering, were studying the operation of Diesels—not only in the Navy's submarines but on the railroads or wherever Diesel engines were at work. To sea-minded engineers, the infrequent trips of a Diesel-electric locomotive to the roundhouse meant longer "cruising range." One Diesel-electric locomotive built by General Motors has covered more than a million miles since December, 1941, with availability of 99.4 percent. To a submarine crew, or the crew of any other vessel operating thousands of miles from home bases, availability in the power plant is a potent factor.

The early Diesels, which made their appearance in this country just before the turn of the century, were cumbersome "three-story" units. The first one built for commercial purposes weighed 450 pounds per horsepower. Compare that with the General Motors "pancake" Diesel in a patrol vessel which has a Navy rating of four pounds per horsepower. This is a high speed 16-cylinder two-cycle engine that delivers a maximum of 1200 horsepower. The two-cycle engine delivers one power impulse for every two strokes of the piston compared with one in four for the four-cycle type. In the two-cycle Diesel, air is introduced into the cylinder by a specially designed external blower or pump.

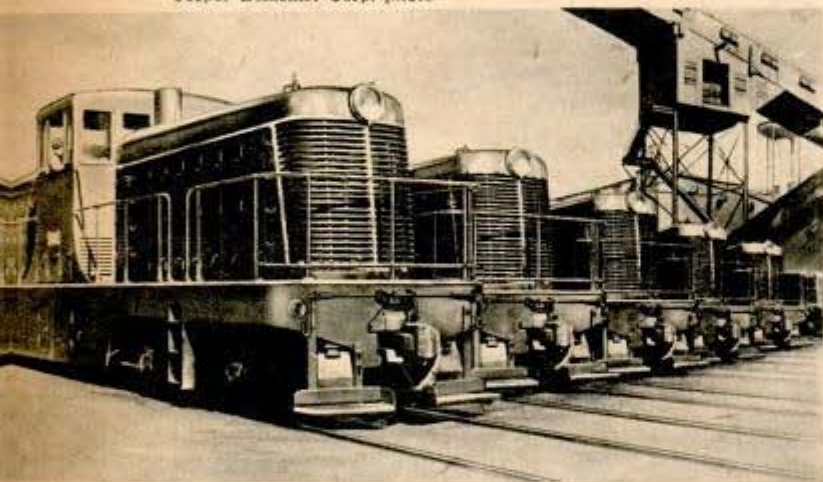
Diesel engineers have argued for years over the merits of the two-cycle vs. the

Cross sections below show Diesel engine of conventional type at left and opposed-piston type at right
Fairbanks, Morse & Co. photo

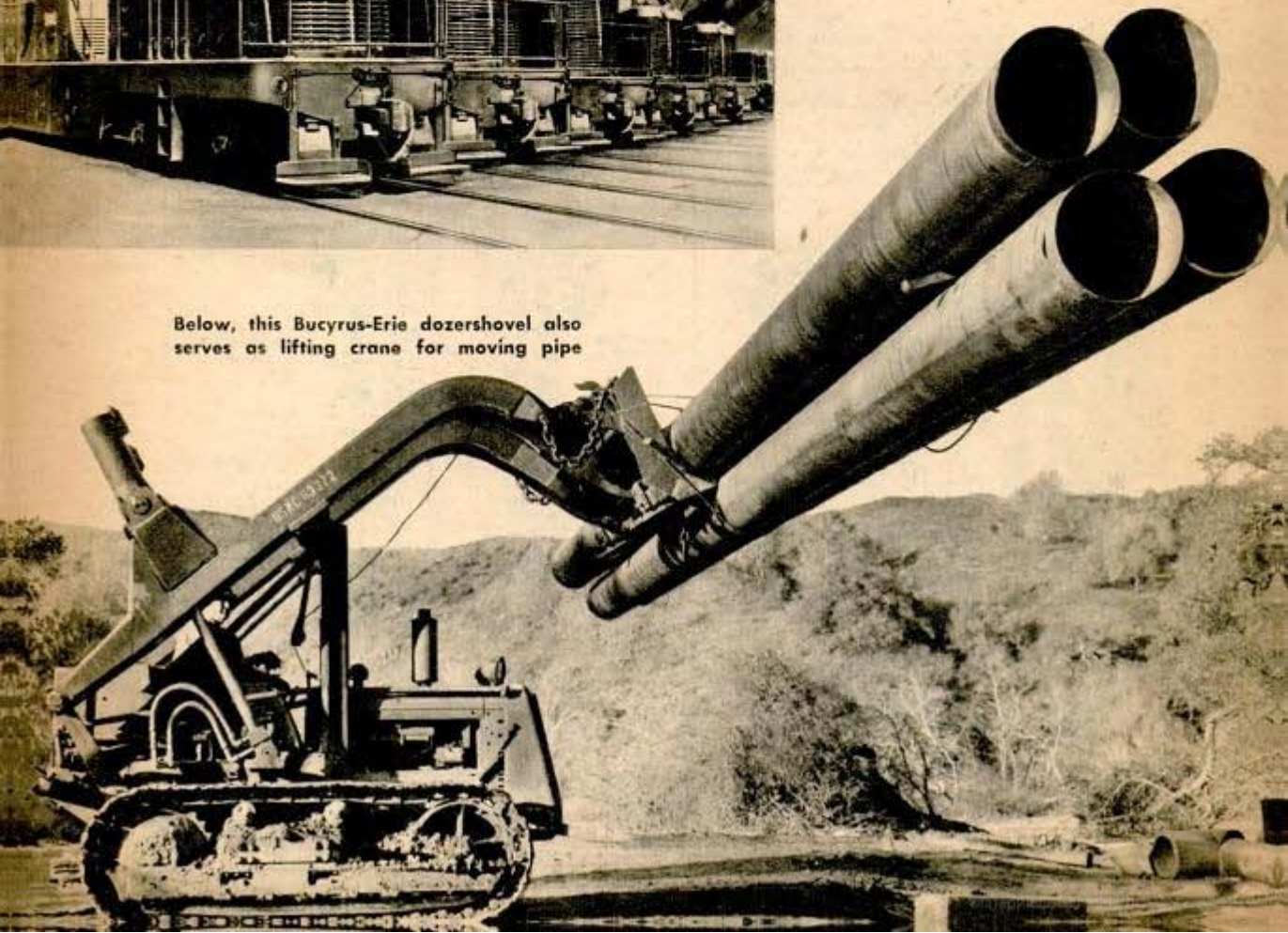




General Motors photo
Diesel engine of 2000 horsepower is lowered into hull of sub.
Below. Diesel switching locomotives — there are 3000 in use
Cooper-Bessemer Corp. photo



Below, this Bucyrus-Erie dozershovel also serves as lifting crane for moving pipe



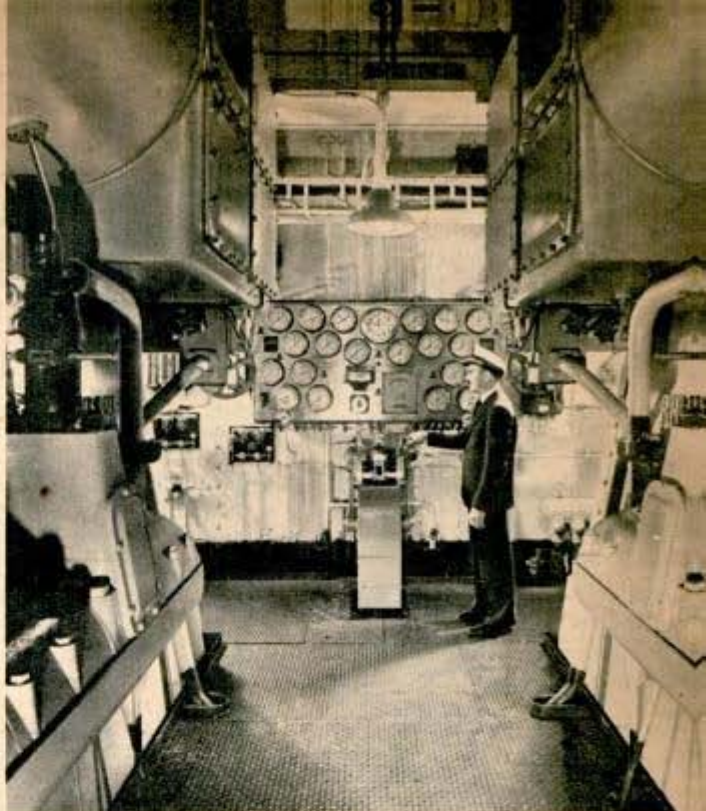
four-cycle engines. The war has ended this argument, according to Capt. Lisle F. Small of the Bureau of Ships, who says there is a definite place for both types in the Navy program. Ships' power boats, for example, are equipped with four-cycle engines, while the new submarines and most of the invasion craft have two-cycle engines.

The imposing list of Diesel-powered naval craft includes the famed LST, the LCI and LCVP, the comparatively new LSM (Landing Ship, Medium), destroyer escorts, minesweepers, rescue vessels, tankers, small auxiliary aircraft carriers, tugs, barges, submarine tenders or "mother ships" and many others.

The largest Diesel-driven ships in the U. S. Navy are the submarine tenders. These 18,000-ton vessels are 529 feet long and are propelled by Diesel-electric engines with a Navy rating of 12,800 horsepower. (The largest marine Diesels ever built were 54,000-horsepower units for German pocket battleships.) Each of our sub tenders has eight Diesel generators for propulsion and five

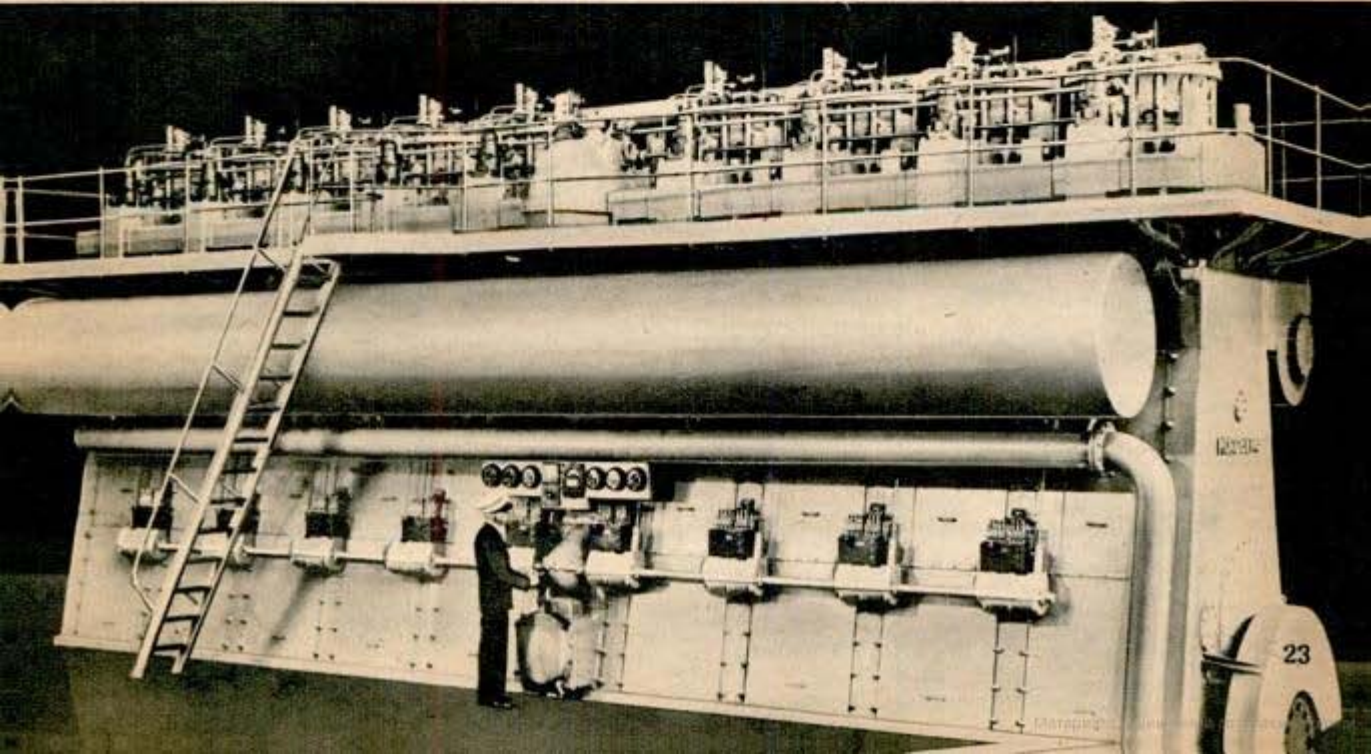
auxiliary units. These floating machine shops, complete with welding, tin, carpenter, instrument and electrical repair departments, and which carry an enormous store of submarine parts and supplies as well as a crew of about 1500 men, have played an important role in the Pacific. Submarines "mothered" by these ships are credited with sinking two thirds of the Jap vessels that have gone to the bottom.

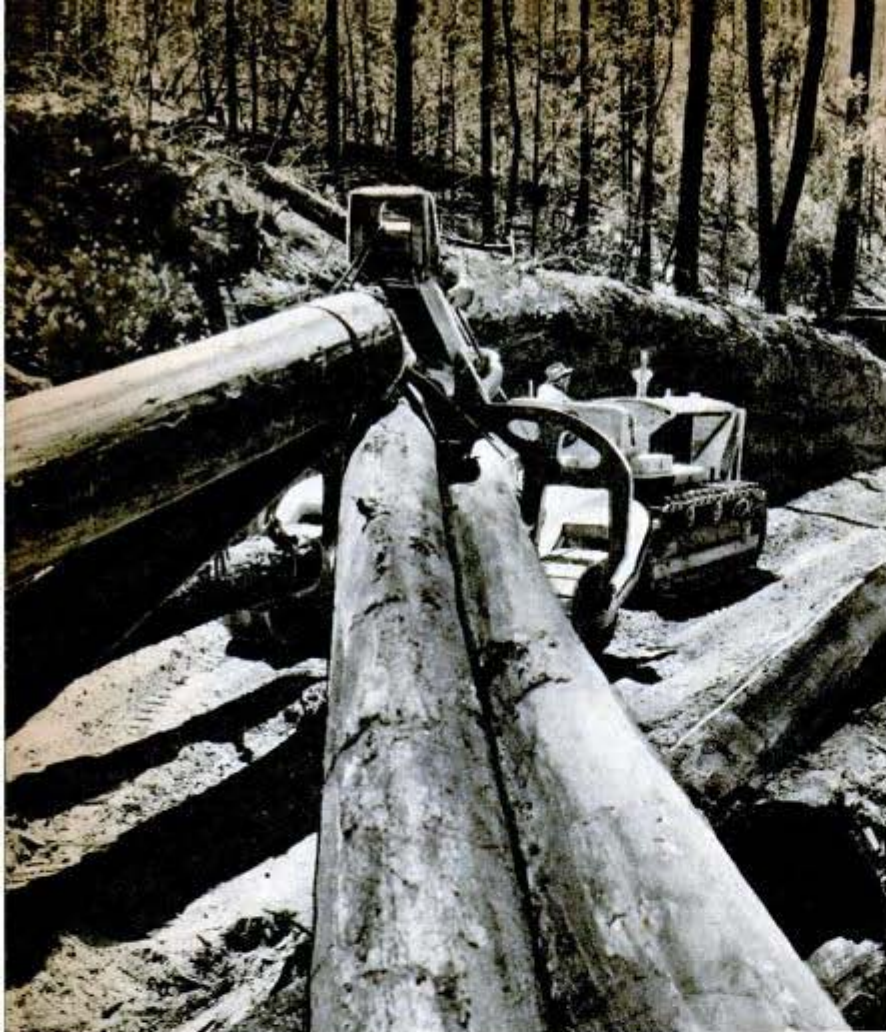
Many of our new submarines use a type of Diesel engine for which Fairbanks, Morse & Company predicts a bright post-war future. This is a two-stroke-cycle, opposed-piston type engine that can be made in various sizes from three to 10 cylinders. It has an open-end cylinder in which combustion takes place in the center between two pistons. As the fuel ignites in the heat of compressed air at 1000 degrees Fahrenheit, the pistons move away from each other. As they move out, one uncovers the exhaust ports and the other the air inlet ports, thus eliminating all valves. An upper and a lower crankshaft are connected by a vertical shaft and gears to maintain proper timing. With a pair of pistons in each cylinder, the 10-cylinder engine becomes a 20-cylinder engine. Fairbanks-Morse already has built a forerunner of its



Nordberg Engine Co. photo

Twin Diesels on new cargo ship are operated from a single control stand. Below, shaft for 6000-horsepower marine Diesel is 42 feet long and weighs 40 tons; beneath it is shown the nine-cylinder engine





Diesel-powered Caterpillar tractor handles logs like footpicks

postwar locomotive equipped with an engine of this type.

The Nordberg Manufacturing Company has developed a 6000-horsepower Diesel for Victory ships of the U. S. Merchant Marine. This is America's largest single-acting Diesel suitable for direct drive of one propeller. During tests, one nine-cyl-

inder giant of this type was run continuously for 15 days at top speed. This engine has a 29-inch bore and a 40-inch stroke. The crankshaft, which is slightly more than 42 feet long, weighs 80,000 pounds.

The trend of wartime development in Diesels, however, has been toward small high speed engines which can be hooked up in series to provide the amount of horsepower required. An engine of this type, used in thousands of landing craft as well as in tanks, tractors and trucks, is the General Motors "twin" and "quad" series six-cylinder

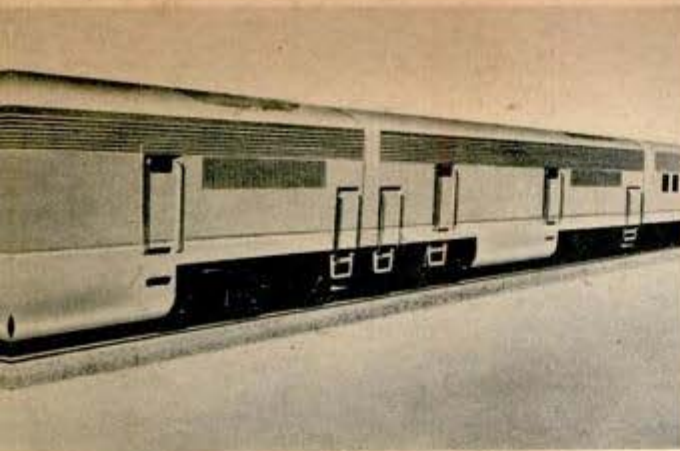
engine. The commander of one sub-chaser reported that the twin Diesel on his ship had seen "more than 7000 hours of rugged duty with only minor repairs."

These engines are coupled together to deliver double power to a single drive shaft. Eight of them form two "quads" to propel the LCI with 1800 horsepower. Some of the smaller craft are powered by single units.

The disabling of one engine in these multiple installations will not affect the power production of the others, according to John Dickson, chief engineer in charge of development at General Motors Detroit Diesel Engine Division. Failure of one engine on a ship would not necessitate an expensive towing job and weeks of delay, but would merely cut down its speed until the ship reached port. The installation of a new engine would be just an overnight job. Dickson predicts wide use of these Diesel units after the war, not only as marine



Sixty thousand pounds of coal can be carried in this Diesel six-wheel truck; a telescopic hydraulic hoist raises the body



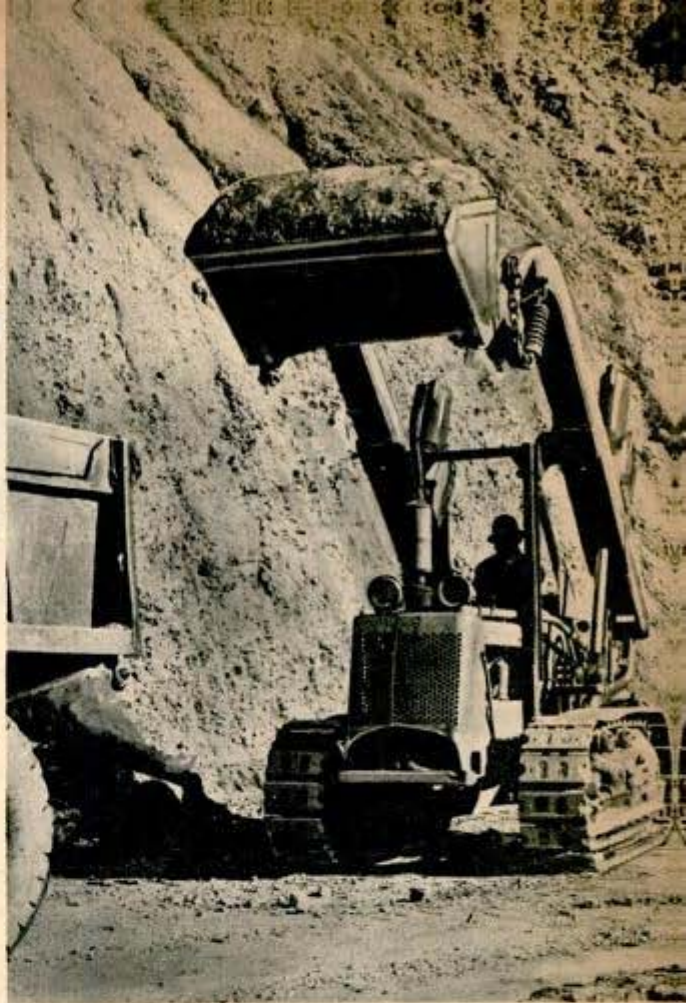
Fairbanks, Morse & Co. photo
Newest Diesel locomotive is this streamlined unit equipped with opposed-piston engine used in subs

engines to propel such craft as fishing vessels or tugs, but to supply power wherever it is needed and in the desired amounts.

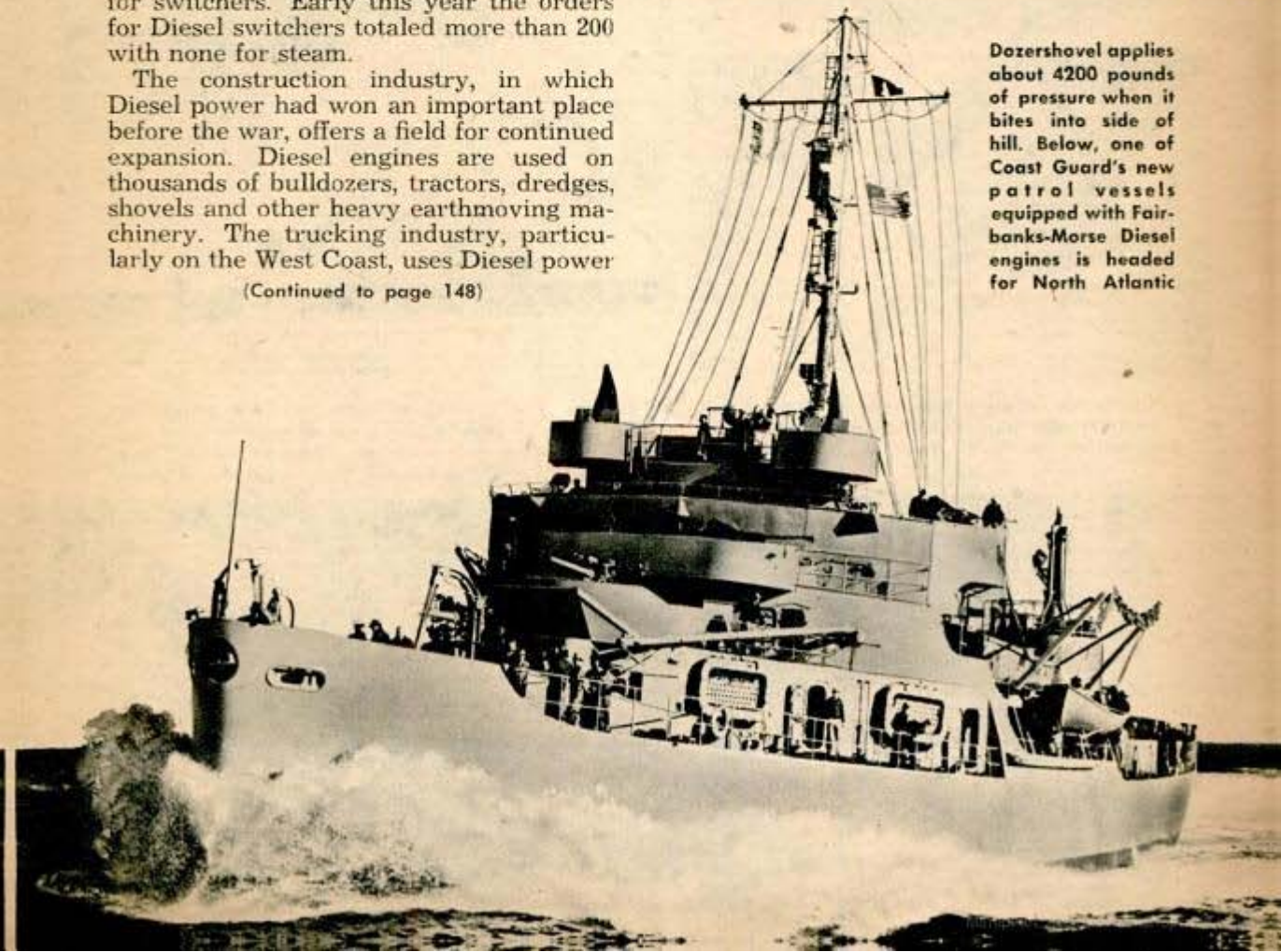
Aside from marine Diesels, which came into their own during the war, the greatest postwar development is predicted in the fields where Diesels were getting a firm foothold before Pearl Harbor. The Association of American Railroads reports that there are about 43,000 locomotives of all types now in use and 3000 are Diesels. Orders placed for Diesel-electrics far exceed those for steam locomotives, particularly for switchers. Early this year the orders for Diesel switchers totaled more than 200 with none for steam.

The construction industry, in which Diesel power had won an important place before the war, offers a field for continued expansion. Diesel engines are used on thousands of bulldozers, tractors, dredges, shovels and other heavy earthmoving machinery. The trucking industry, particularly on the West Coast, uses Diesel power

(Continued to page 148)



Dozers shovel applies about 4200 pounds of pressure when it bites into side of hill. Below, one of Coast Guard's new patrol vessels equipped with Fairbanks-Morse Diesel engines is headed for North Atlantic



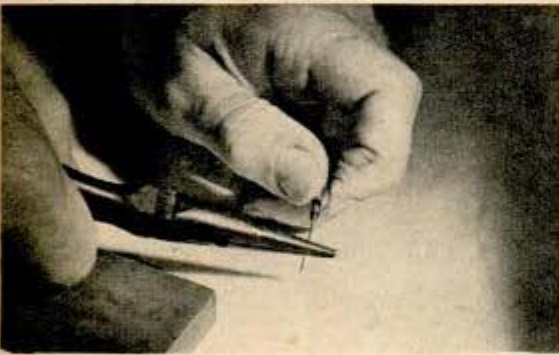


Equipment for drafting pen made from hypodermic needle includes compass, syringe and the needle

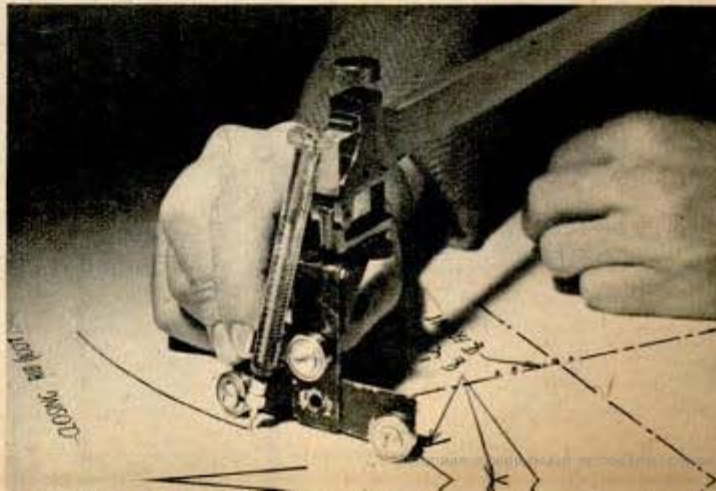
DRAFTING GETS SHOT IN ARM WITH "HYPODERMIC" PEN



"Hypo" pen made by engineer in aircraft plant is filled with lacquer-type ink, hard to smear but easy to erase. Below, pen makes a sharp line which dries quickly



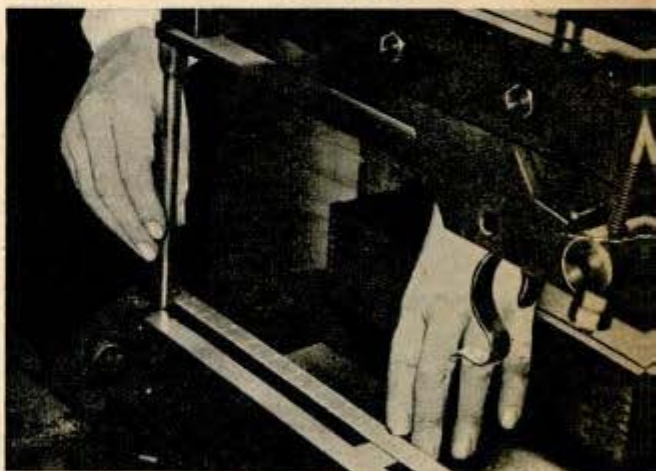
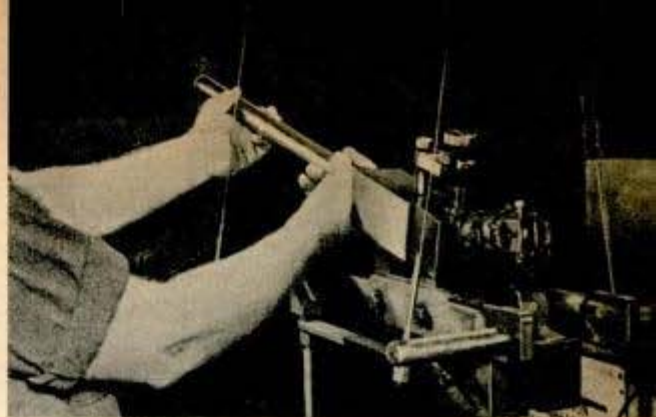
Pictures above show first steps in converting needle to pen. After nicking with file, needle is broken off short. Needle stub is then rotated across whetstone (below) until smooth and small enough to make line of desired thickness. Below right, special attachment for making arcs or large circles in varied colors
Consolidated Vultee Aircraft Corp. photos



Gun Hanging From Wires Makes 5 Tests in One

Five different tests are made simultaneously with one shot-shell by using a gun suspended from four wires that swings like a clock pendulum when fired. The five tests, devised by the Winchester Repeating Arms Company to save 80 percent in aerial gunnery test ammunition, are velocity, "time-up-the-barrel," chamber pressure, recoil and shot pattern. A slender copper wire, .003 inch in diameter, is stretched in the path of the shot six inches from the muzzle of the barrel. An electric timing instrument records the time elapsed between the pellet's breaking the wire and striking the target, translating it into feet-per-second to give the velocity of the shot. The "time-up-the-barrel" test to determine the speed and uniformity of the primer is a variation of the velocity test, being confined to the time it takes the shot to pass through the barrel. The gun hangs from four wires primarily so that it can test recoil. It is suspended directly above a double track gauge. A pointer connected with the gun carriage moves back between the double track when the gun is fired and carries before it a sliding marker, which stops at the farthest point reached by the pointer. To test chamber pressure, a piston bearing a lead cylinder which records the pressure is placed in a tiny hole drilled through the barrel one inch from the breech. When the shell is fired, the upward movement of the piston compresses the cylinder and the amount of compression is translated into pounds per square inch of pressure. Pattern-testing consists of shooting at a paper-covered target and counting the number of perforations within a 30-inch circle.

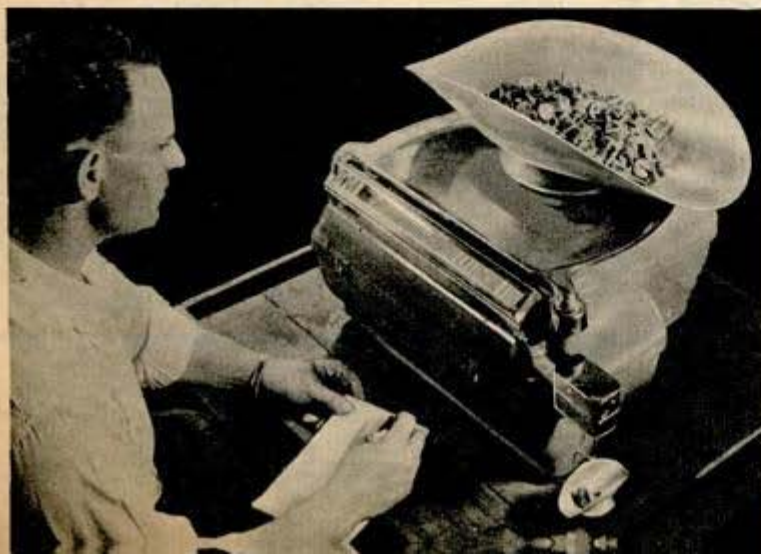
After barrel is inserted (top), pendulum gun is loaded with a shell with which five tests will be made at same time. Pointer (right) indicates recoil on gauge



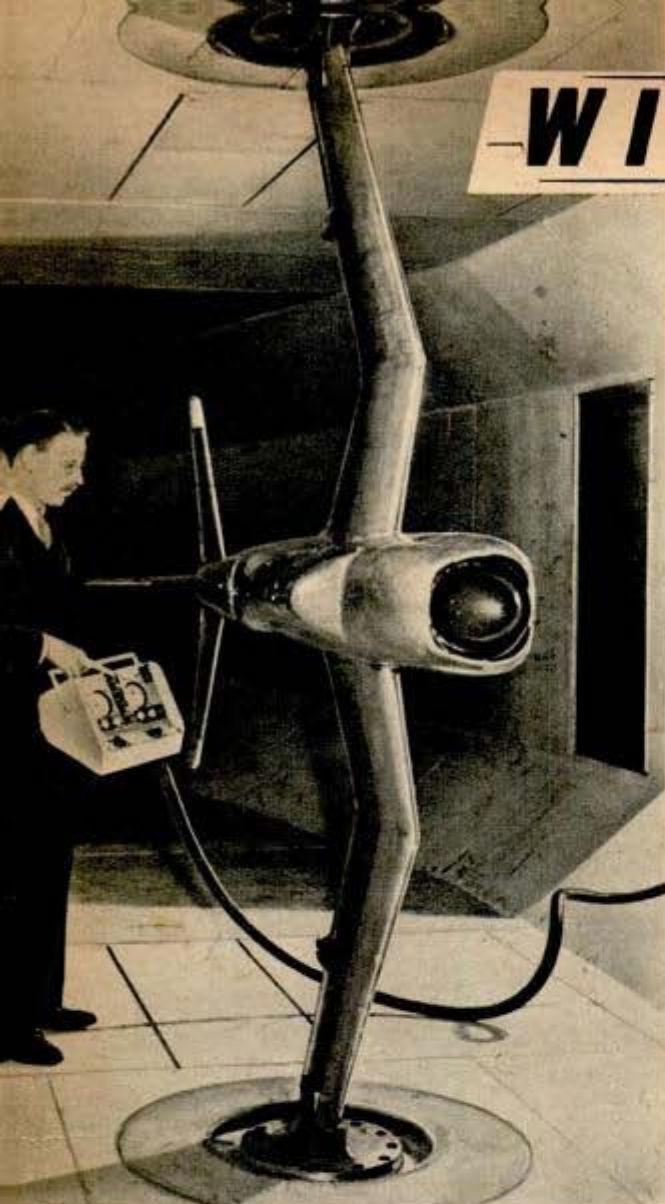
Scale Counts Parts in a Second by Direct Dial Reading

Any factory employee can count a binful of parts in a second by reading a new dial scale. Instead of counting them one at a time, or using ratio or other slow measuring methods, he simply places them on the scale and glances at the dial for a direct reading. In war plants the scale saves time and helps solve inventory problems after contract terminations.

□ The new 10½-pound Army bazooka, 42 percent lighter than the standard model, can be handled as easily as a rifle.



WIND WITH THE



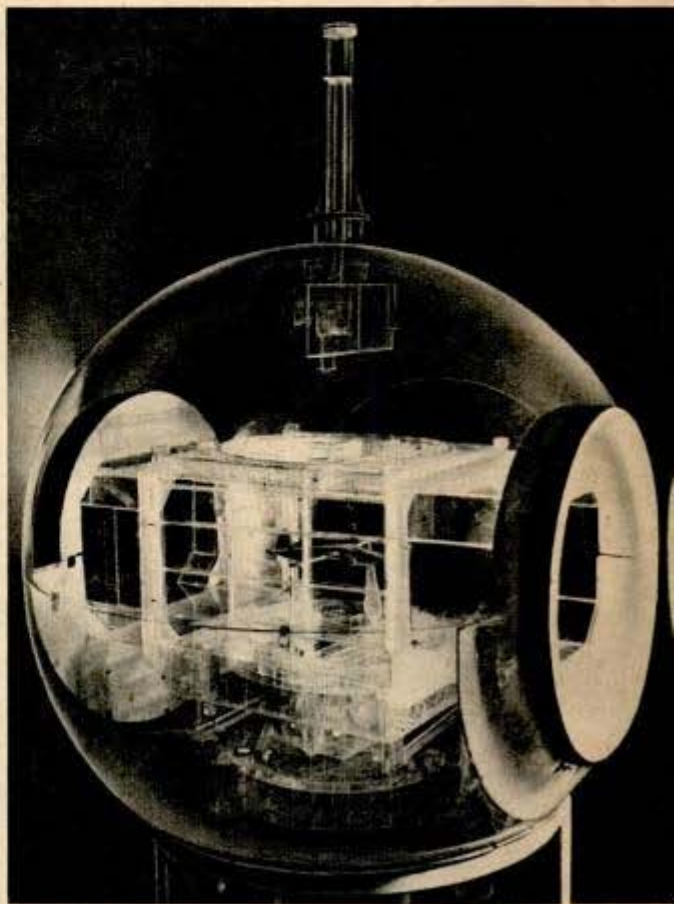
Dr. Clark B. Millikan, director of Pasadena wind tunnel, adjusts model for test. Below, "console" of twin tunnel in Buffalo, N. Y., has 587 signal lights Curtiss-Wright Corp. photo



WHO would pay \$5,000,000 to solve a mystery? The answer is: several aircraft companies. The mystery, which has long baffled aeronautical engineers and threatened to hold up the development of postwar jet-propelled craft, concerns what happens when an airplane hurtles through space at the speed of sound. When a plane travels 750 miles an hour, the old rule books on aerodynamics are tossed aside.

This speed-of-sound mystery is about to be solved by two wind tunnels of the same basic design. One is being completed by the Curtiss-Wright Corporation at Buffalo, N. Y., and the other is the recently dedicated Southern California Cooperative Wind Tunnel at Pasadena, sponsored by several companies. The California Institute of Technology helped design the tunnels, each of which cost \$2,500,000.

The Pasadena tunnel, almost identical with its Buffalo twin, consists of a rectan-



Plastic scale model of "throat" in tunnel shows miniature plane in position for testing. Air locks at each end permit "servicing" during pressure test

SPEED OF SOUND

gular tube of steel plate seven eighths of an inch thick. Near the 22-foot 16-blade fans, which stir up a supertornado, the tube is built to withstand a force of one million pounds. Motors developing 12,000 horsepower turn the fans.

The tunnel is 31½ feet in diameter and contains about 225,000 cubic feet of air. It is housed in a special two-story concrete and frame building. The control room is on a mezzanine just above the second floor, and on the first floor are engineering offices, drafting rooms, photographic laboratory, technical library and other offices.

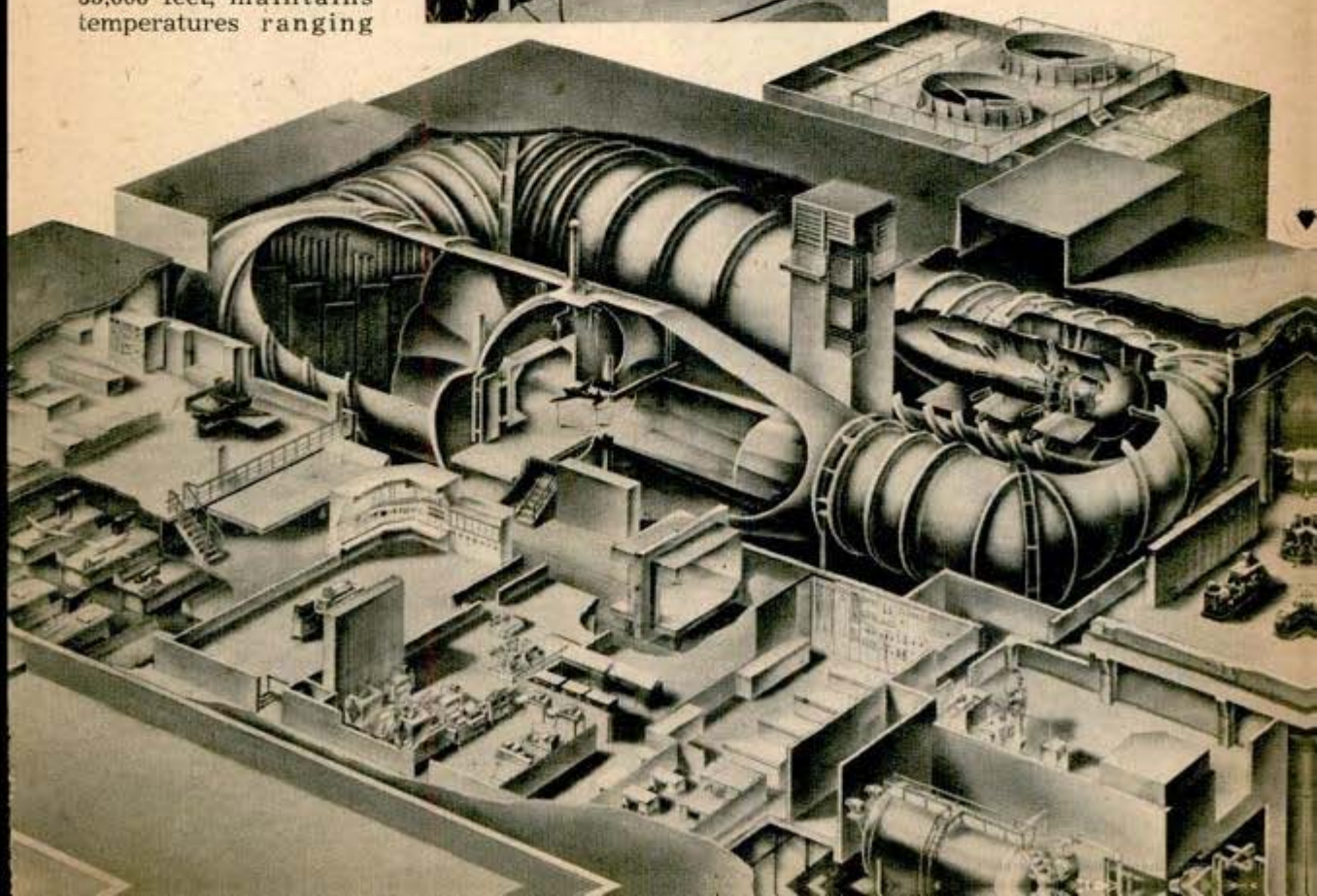
In addition to moving a stream of air at the speed of sound, the tunnel simulates substratosphere pressures up to 35,000 feet, maintains temperatures ranging

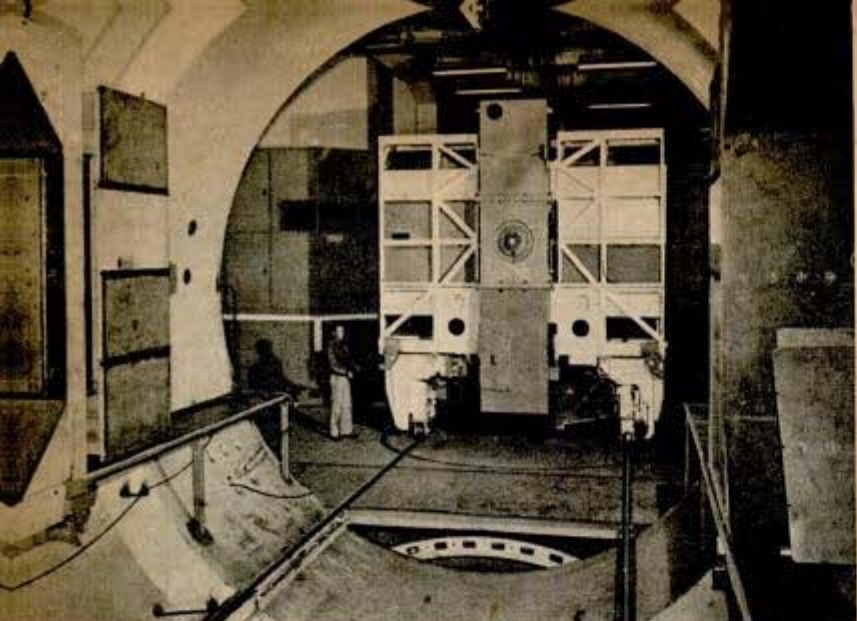


Built to one thirtieth scale of giant new wind tunnel, plastic model can close its air locks or stir up a "cyclone"

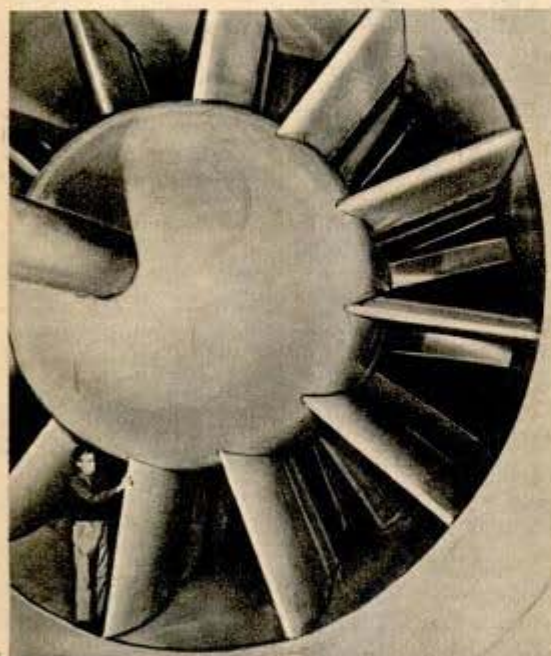
Left, adjustable vanes at corners of tube turn wind at 90-degree angle

Below, cutaway of Curtiss tunnel which holds air enough to fill 16 six-room houses. Note power plant, huge fan, plane in throat of tunnel, model shop and control board





Testing mounts holding models move on rails from model rooms to tunnel. Below, closeup of tandem fan installation in Pasadena tunnel which dwarfs man



from 40 to 125 degrees Fahrenheit, and various degrees of humidity.

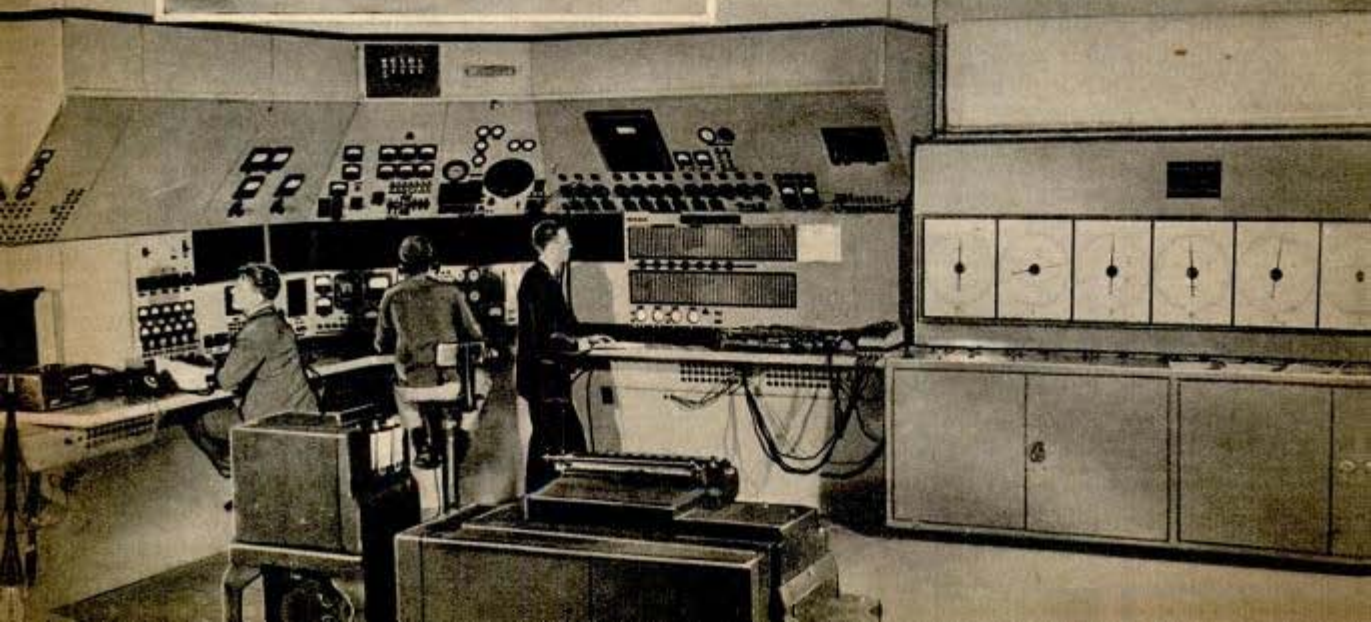
An outstanding feature of the tunnel is a spherical decompression chamber, or air lock, which encloses the "throat" section where models are placed for testing. This enables engineers to make adjustments on the models during pressure tests without releasing all the air in the tunnel. With the decompression chamber, only one tenth of the air in the tunnel is released and the time required to close off the chamber and resume testing at the original pressure is only seven minutes.

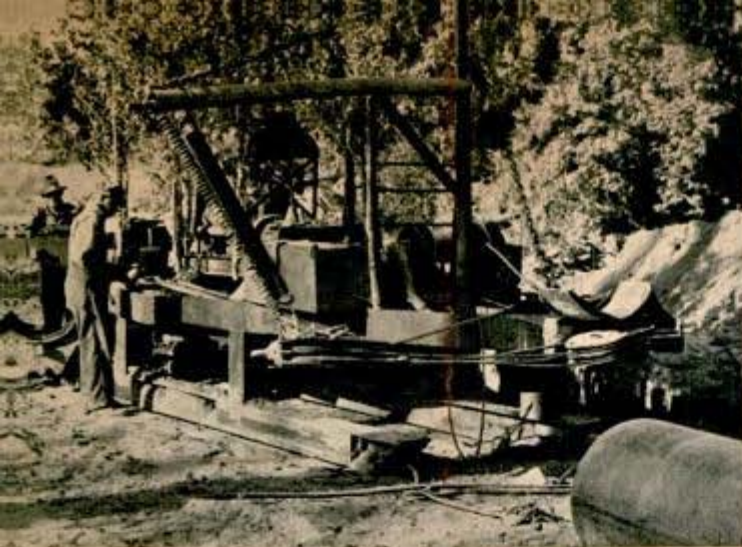
Formerly this process took several hours.

Several types of mountings for models move on steel rails from model rooms directly into the testing chamber. After a model is positioned in the throat of the tunnel, it is attached to a sensitive measuring system floated upon oil films. The slightest movement of the model caused by the air stream or a change in pressure is relayed to gauges in the control room. An automatic machine records instrument readings on perforated recording cards at the rate of 80 columns of figures in a few seconds. This recorder, designed by International Business Machines, is the only one of its kind.

The Pasadena tunnel was built by Consolidated Vultee, Douglas, Lockheed and North American aircraft corporations and the California Institute of Technology. Dr. Clark B. Millikan, professor of aeronautics at the institute, is director of the tunnel.

Below, master control room of Pasadena tunnel shows movements by dials and lights; readings are automatically recorded on special machine in foreground





V-8 Auto Engine Pulls Oil Pipe Into Shape

Powered by a V-8 automobile engine, a pipe-bending machine literally pulls thin-walled oil pipe line into shape for the ups and downs it follows. Although the pipe is 24 inches in diameter, its walls are of such thin steel that unusual care is necessary in bending to prevent distortion or reduction of the wall thickness at any point. The machine, mounted on a skid, puts a bend or wrinkle in the pipe by applying a powerful pull to the end of a pipe joint clamped in an anchoring device. Engine power is multiplied through two transmissions set in series so as to provide slow motion and leverage is further stepped up through blocks and cables. The wrinkles are spaced 15 inches apart and the change of direction attained by each one is about three degrees.



Spring-Lock Fastener Adjusts To Material Thickness

Only a quarter turn with a screwdriver is required to lock or unlock a one-piece fastener which adjusts itself automatically to varying thicknesses of material. Without mating parts such as nuts or receptacles, the unit can be used for blind fastenings in place of blind rivets. Spring pressure holds the fastener securely.

☐ About 400,000 nerve endings of the optic nerve are found in the retina of the human eye, according to Better Vision Institute.



Air Belt Guards Blood Vessels From Gangrene



By applying the correct pressure to blood vessels through a pneumatic tourniquet, it is possible to prevent gangrene sometimes caused by conventional tourniquets used in operations. The new tourniquet consists of an inflatable rubberized fabric tube several inches wide and reinforced on the outside by a longer rubberized fabric belt. The tube and belt protect a wide surface of the blood vessels with a soft cushioning action. Readings on a dial, attached to the end of a rubber hose into which air is pumped by a hand bulb, make it easy for even unskilled operators to apply the proper pressure.

Water Hose Softens Frozen Soil

Digging for gold in the Arctic is easier once the ground has been thawed by a one-inch water hose. First, pipes with outlets for water are driven to the depths desired. The surface ends of the pipe then are linked by the hose to cold water which is pumped into the ground. The cold water retains sufficient caloric heat to soften the ground so that it is workable with hydraulic equipment in 10 or 15 days.

Boy Builds 7-Foot Eiffel Tower With 36,000 Toothpicks



If a toothpick shortage should occur in Highland Park, Ill., the neighbors of 13-year-old Peter Ohlwein know where they can find 36,000 of them. They were used by the young model builder along with some glue and thread to construct a seven-foot reproduction of the Eiffel Tower in Paris. The toothpicks cost only five dollars. With blueprints supplied by the National Pick Builders' Club, Peter glued together 19 separate sections of the tower and then assembled them from the underside out. He worked three hours a day for three months to complete the job, which won a special award at a hobby show.

Static From Ignition Wired Out

Elimination of radio interference from aviation and automobile engines without loss of operating efficiency is claimed for a new system of ignition wiring and shielding invented by Victor Welge, electronics expert for Consolidated Vultee Aircraft Corporation. The system confines radio-frequency disturbances to the engine by providing an isolated return path for the sparking current which ignites gasoline in the cylinders. Consolidated Vultee intends to make the system available to other aircraft and automotive manufacturers.

National Pickbuilders Club
157 W. 57th St.
N.Y., N.Y.



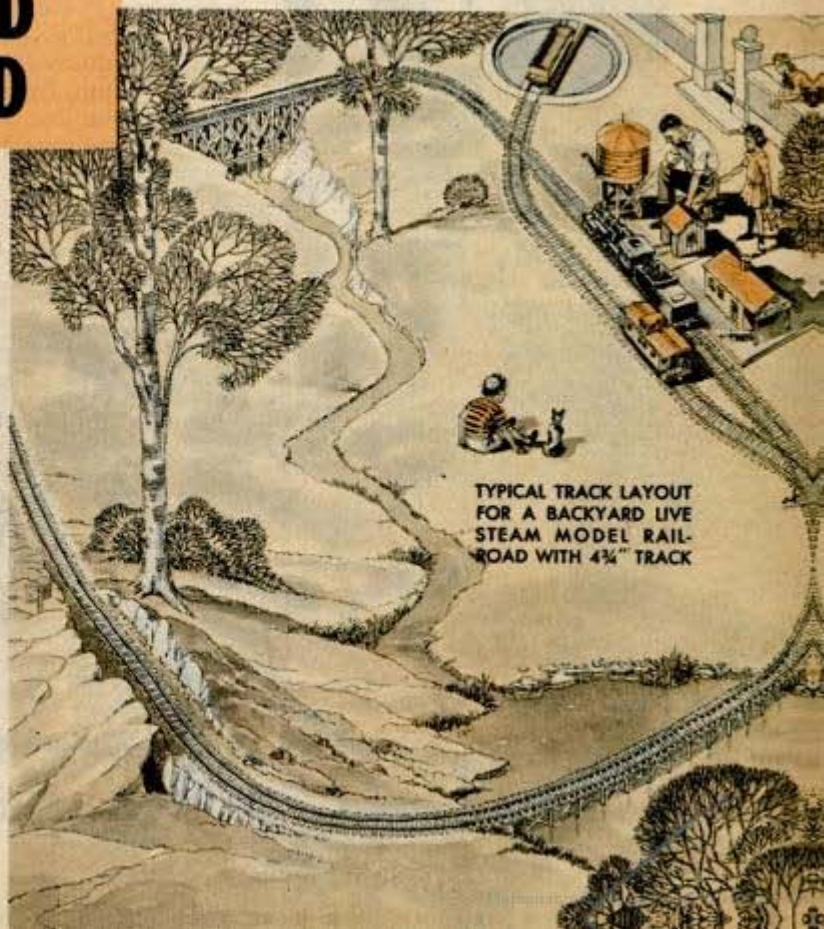
Steam up on the **BACKYARD RAILROAD**

Happy railroad "tycoon" lowers spout from model water tower to replenish tank in engine's tender

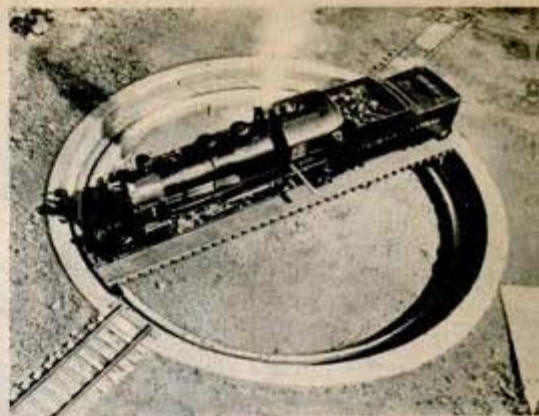
THE KINGS of the model railroad fraternity are the "live steam" enthusiasts who can fire up the boilers of their tiny scale model locomotives, whistle for a clear track and move out on the rails just as if they were operating on a full-sized railroad.

Smoke pours from the stack, steam pops the safety valve and cinders fly back in your eyes just like the real thing. A bucket of coal will keep one of the baby engines moving all day. Some are equipped with the engineer's seat on the tender and foot bars that project from the sides of the cab. Passengers are carried on seats placed on sturdy scale model flatcars.

These models are no toys. Built on a scale of $\frac{1}{4}$ inch, $\frac{1}{2}$ inch, $\frac{3}{4}$ inch or one inch to the foot,



TYPICAL TRACK LAYOUT FOR A BACKYARD LIVE STEAM MODEL RAILROAD WITH $4\frac{1}{4}$ " TRACK



Live steamer of "Colorado Central" rides turntable. Left, engineer for "Wildcat R.R." climbs aboard locomotive; air pump for brakes is on the tender in foreground

they are working replicas of actual locomotives in all details except the number of boiler tubes. Instead of scores of tubes, one of the midget boilers may contain only a dozen to 20 tubes. Steam and water can't be scaled down with efficiency. Starting with cold water, it takes about eight minutes to raise steam in one of the engines. The average working pressure is 100 pounds per square inch.

At present there are in the neighborhood of 1000 live steam model locomotives in the United States. Some of them have taken years to build. Two enthusiasts have been at work for 10 years on a 1/2-inch scale live steam model of a Hudson type locomotive of the Chicago, Milwaukee, St. Paul & Pacific, scaling down their own drawings from the original blueprints.

Most of the live steamer enthusiasts who already have built their engines have had to make their own patterns and castings. After the war it is expected that full sets



Left, pumping water from tender tank to boiler of one-inch-to-foot live steamer. Below, seven full-sized passengers flout wartime priorities



of castings and other parts will be made up into kits ready for finishing and assembling.

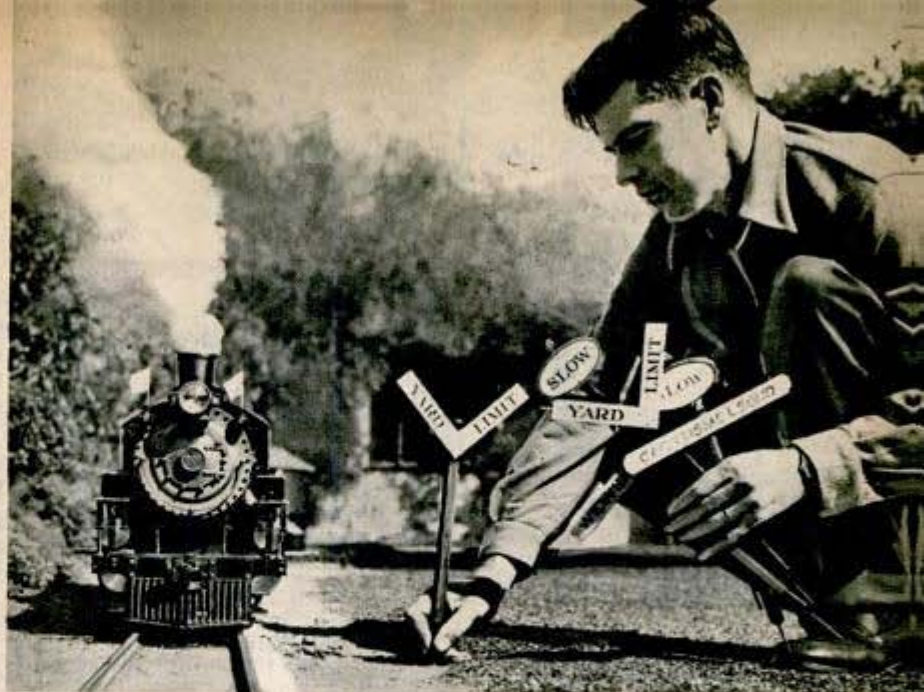
Part of the fun of railroading with live steam is the fact that you can't buy such engines or rolling stock. Each unit has to be made by hand, down to the last coupling pin, and the finish of the workmanship is a pretty good indication of the skill and patience of the builder. A small lathe and a small drill press with a milling attachment are necessary tools.

Clubs such as the Southern California Live Steamers with 37 members and 15 working engines have been formed for this kind of model railroading. Members swap engineering data, use each others' tools and cooperate in building elaborate track systems. Live steaming is essentially an out-of-doors hobby.

A 1/2-inch scale model live steam locomotive weighs about 40 pounds and uses a 2 1/2-inch gauge track. It is capable of pulling a load of several hundred pounds. A one-inch scale locomotive may weigh 300 pounds, operates on 4 3/4-inch track and can pull a ton or more. The boiler capacity of one one-inch scale size locomotive is 1 1/2 gallons of water. Its tender carries four gallons in its tank plus 10 pounds of coal. It has an electric headlight, a two-tone steam whistle, a working injector, water glass and steam gauge in the cab, safety valves and a standard set of operating controls that are reached by means of a hole in the roof of the cab.

A good example of a complete live steam railroad system is the "Colorado Central" built and operated by R. B. Jackson of Beverly Hills, Calif. Everything is built to a scale of

Scale model handcar (right) is one inch to foot and operates just like the original. Below, 250-horsepower oil burner runs on 2000-foot track



Warning signs are set out along right-of-way of backyard railroad empire. This locomotive runs on "Colorado Central," in Beverly Hills, Calif.

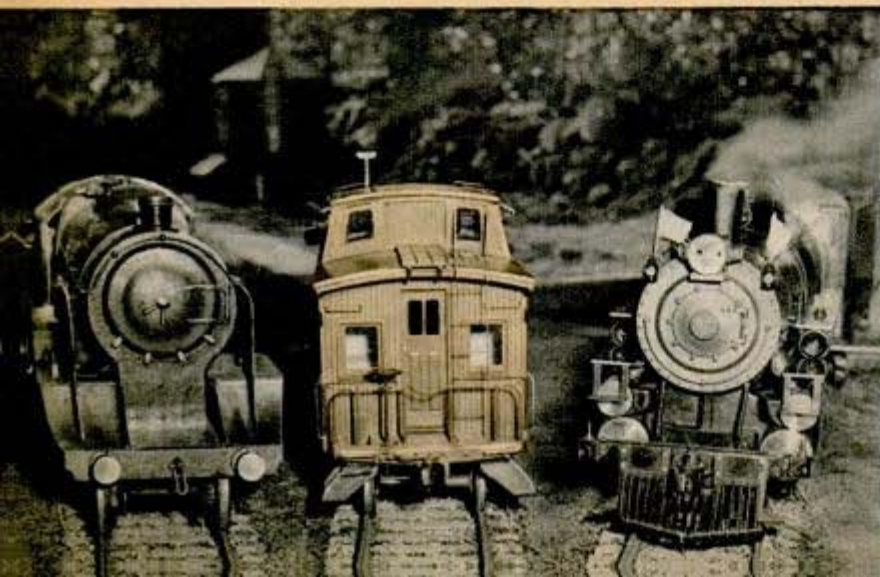




Building passenger and freight station is cinch compared with locomotive; two model makers have been building one steamer for 10 years



Smoke pours from stack and steam pops safety valves as live steam model pounds over wooden trestle of miniature railroad system. Below, left to right, English type engine, scale model caboose and an American live steamer. Track gauge of the system is $4\frac{3}{4}$ inches



one inch to the foot. The ballasted roadbed makes a circuit of his backyard, spanning a fish pond by means of a girder bridge, maintaining grade over a low spot near the vegetable garden by means of a wooden trestle and using a cut to get through a miniature mountain at the end of the yard.

At the model railway town of "Cactusmelsgud," an abbreviation for "cactus smells good," Jackson has installed a long passing track, a turntable, a water tank and a tool shed that contains a handcar that can be pushed out on the main line and operated. Scaled-down hand-operated switches control the passing track and the turntable.

Jackson is currently working on a typical freight and passenger station that will be complete down to 6000 shingles on the roof and a set of miniature telegraph instruments in the office. The spout of his water tank is operated by a standard set of pull chains.

The rolling stock of the "Colorado Central," in addition to an eight wheeler and tender, includes two gondolas, two flatcars and a caboose. The interior of the caboose is fitted with seats, a coal-burning stove, lavatory, oil lamps and overhead bunks. Its doors open, its windows operate and its hand brakes function.

Model railroad men insist that their miniature equipment must operate exactly as if it were full size, if practical at the small scales they use. Jackson is finishing the construction of a set of semaphore signals and, in keeping with the model railroaders' ideal, he is making each part in exact imitation of a real semaphore. The small red and green light lenses, for instance, are made from the glass of real railroad signals cut and ground to shape, even to the tiny concentric Fresnel rings on the inside surface of each lens.

(Continued to page 148)

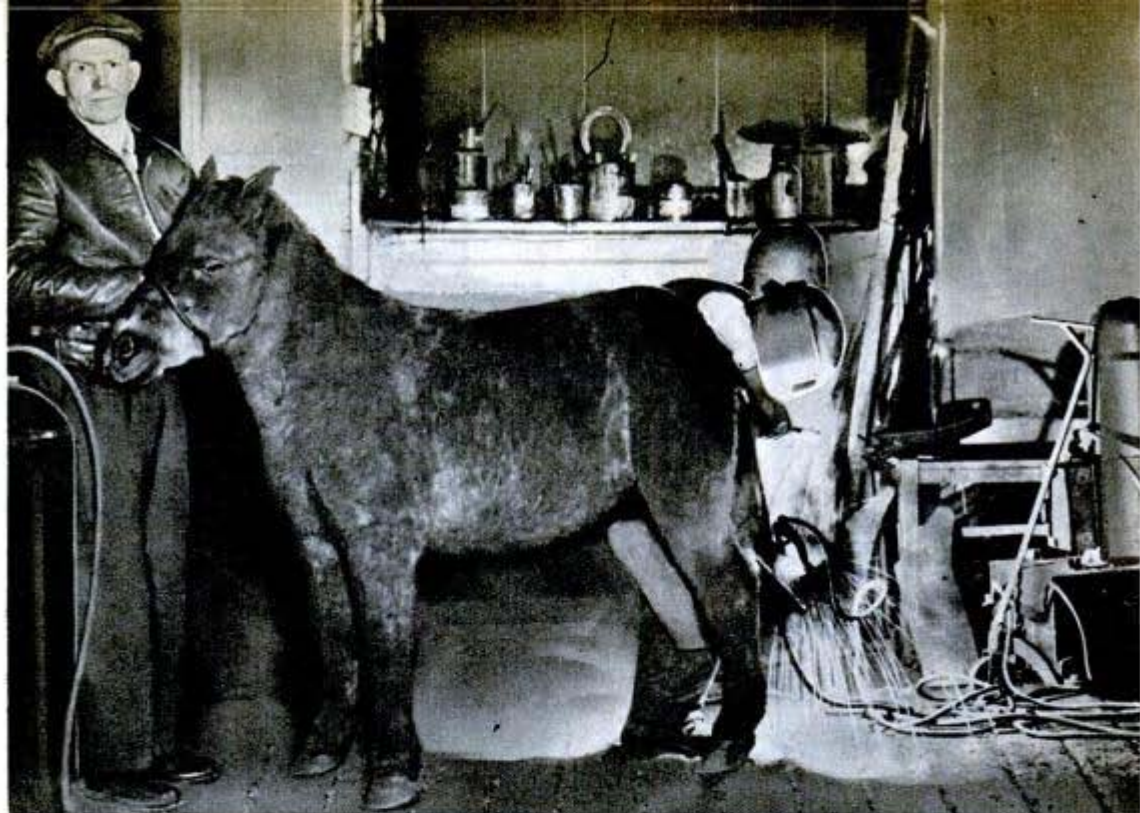
FLYING TOASTERS



Conquering the subzero cold up in the wild blue yonder of the substratosphere is a trick done with wires. Electrically wired flying suits, gloves, blankets and covers for delicate instruments such as the automatic pilot and bomb sight are plugged in just like your toaster. Above, General Electric engineer tests copper robot wired to reproduce body temperatures. Above at left, gloves are plugged into latest wired suit shown below it



This is how insulated wires are sewed into a flyer's jacket; layer of rayon covers them



Lincoln Electric Co. photo

"Smithy" Repairs Shoes on Horse by Electric Arc Welding

Building up worn shoes by electric arc welding without removing them from the horse has been proved feasible by Charles H. Chism, veteran blacksmith of Coshoc-ton, O. Shoes worn down on icy or paved roads can be resurfaced satisfactorily several times by this method. Chism uses a

lightly coated, high carbon electrode $\frac{1}{8}$ inch in diameter, specially designed to resist shock and abrasion. After the welding operation, the hoof is cooled with water. If the horse is high-spirited and is scared by the flash, a blanket thrown over its head will make it stand quietly, Chism says.



"Northern Lights" in Tube Created by Electrons

Artificial "northern lights" in color are created in a four-foot glass tube in Chicago's Adler Planetarium. The tube has two electrodes which throw off electrons and a pump which evacuates most of the air from the tube. Only a half millionth of the normal amount of air remains, corresponding to conditions several hundred thousand miles above the earth. A switch is turned, shooting 6000 volts into the tube. As electrons zip away from the electrodes, they strike the trace of air, whose molecules give off pinkish and greenish white rays similar to those of the Aurora Borealis. The display shows how real northern lights are produced by electrified particles emitted from the sun.

Beams of red and green spotlights can cross without changing the color or path of either.

POPULAR MECHANICS



"Battleball" Line Locks Shoulders As Game Starts

Developed as physical training for Army and Navy recruits by Major Walter L. Rice of the Army, former football coach, "battleball" may become a favorite postwar sandlot and playground game. It offers opportunity to indulge in the rugged tactics characteristic of football without uniforms and with little danger of injuries other than bruises and sore muscles. Instead of tagging the ball carrier, as in touchball, the "tackler" pulls a short length of rope from a tucked in position on the back of the ball carrier. For postwar use an inexpensive harness has been designed for actually stopping the player. Battleball uses football rules except for a few important exceptions. One is the scrimmage line-up, in which the opposing linemen gain a shoulder to shoulder contact before the ball is snapped. This eliminates the need for shoulder pads and the likelihood of broken collar bones and shoulders.

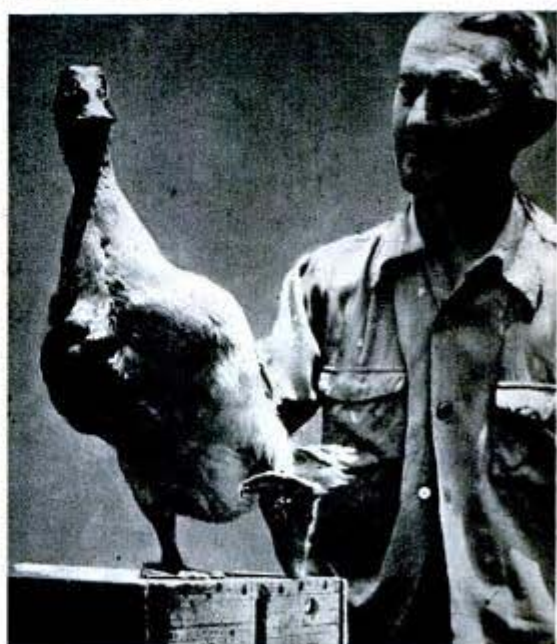


Duck Walks on Wooden Stump

Ever see a peg-leg duck? There's one in North Hollywood, Calif. When the left leg of an eight-months-old duck named Stumpy became paralyzed after an accident, the bird's owner improvised a wedge-shaped underpinning by means of which the duck manages to get about almost as well as usual.

Self-Sealer for Uncoupled Pipe Keeps Dirt Out and Gases In

Pipes can be disconnected without losing a drop of inflammable liquids or gases, or allowing dirt or air to get in, with the aid of a self-sealing coupling. Two automatic valves seal off the ends of the line as they are uncoupled. As the outer ring of the coupling is unscrewed, springs inside the unit gradually force synthetic rubber valves into valve seats, sealing off the two ends before they are uncoupled. Bore of the coupling ranges from $\frac{1}{4}$ inch to 12 inches. The coupling withstands pressures up to 200 pounds per square inch.



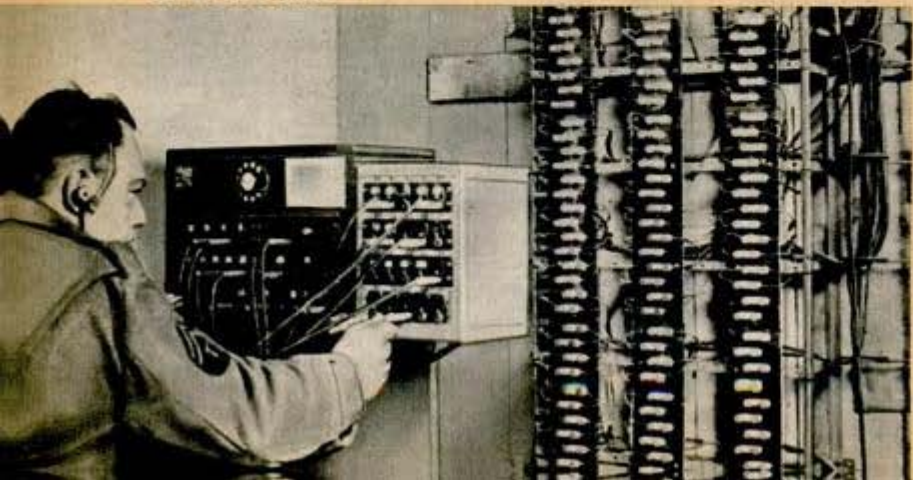
CABLE SPLICERS



Jobs like this—splicing badly damaged telephone cables—provided civilian workers with practical know-how which helped our Army cross Europe



Working in manhole, splicer uses exploring amplifier to locate particular pair of wires by tone testing. Below, service group switchboard for 9th Air Force shows one small part of vast network of military communications
9th Air Force photo



ONE of the untold stories of the historic drive by Allied troops across Europe concerns the part a group of 30 U.S. civilians played in keeping communication lines open. These men, who are expert Bell Telephone cable splicers, were rushed to the front by plane after an SOS from the War Department. They worked side by side with Army cable splicers and were often under fire.

Dressed in uniforms with special arm bands provided by the Army, the civilian splicers arrived in France to find GI splicers up to their knees in mud and trouble. The soldiers had been working for three or four days, menaced by snipers, trying to repair cross channel cable. They were in no mood to welcome civilian experts. Their skepticism melted away quickly, however, when the Bell splicers went to work and located the trouble in just half an hour. Two hours later a new piece of cable was cut in and ready to speed military messages to headquarters.

As the Allies advanced they found important cables smashed on all sides. Along the railroad from Le Mans to Chartres the splicers worked day and night for five weeks cutting in about 33,000 feet of cable. Twenty-two splices were made in one half mile of the London-Paris cable. It seemed that anything the Germans missed destroying had been smashed by the Free French Forces.

Danger followed the civilian splicers at almost every turn. Bridges were

TO THE RESCUE



These expert splicers kept vital military messages moving in Europe. Below, two-way radio set at 9th AAF headquarters
9th Air Force photo

blasted by the retreating Nazis and cables torn loose. Dangling from wires, the experts joined the broken lines. Most of the German military cable was buried two or three feet. The Nazis attempted to sabotage this by pushing sharp probes through the soil and pouring an acid solution onto the cable. In most cases the cable was found badly eaten but not severed. Hand grenades also had been used to wreck cables.

In addition to locating the route of the buried cables, the workers had to establish their own feet per ohm on all lines; there were no prints or layouts. They also had to make their own induction wheel—damaged once by saboteurs—for verifying the route of the cable.

The civilian splicers stayed on their important job until victory was assured. Then they quietly returned home and took up their less exciting task of helping provide the U. S. with the best communication system in the world.





Portable Greaser for Aircraft Generates Its Own Pressure

Airplanes, trucks, gun carriages and other heavy equipment can be greased under load easily with the aid of a portable greasing machine. The greaser generates its own pressure with an ordinary storage battery that supplies current for an automobile starting motor which drives a reciprocating pump operated by a scotch yoke through 1 to 20 reduction gears. Pressures from 1000 to 12,000 pounds are obtained by adjusting a current cutout.

Sandblaster Dons Hooded Mask So He Won't Get "Stung"

To permit the sandblaster to breathe pure air while protected from abrasive dust, a waist-length safety suit is provided with a long, lightweight hood topped by a face piece which looks like an iron gas mask. The hood protects the upper parts



of the body from the stinging effects of dust caused by shot and sandblasting. Heavy gloves protect the hands.

Six Tons of Supplies Per Plane Sent Overseas Each Month

Six tons of equipment are shipped overseas each month by the Air Technical Service Command's supply division for every airplane in service. The department stocks and ships more than 620,000 different items—everything from pilots' goggles to giant cranes and portable hangars—in comparison to a leading mail order company which handles about 150,000 items. Last year the materials moved by the ATSC Supply Division would have filled every car of a freight train extending from New York to Minneapolis.

Fruit Sack With Open Bottom Unloads Contents Quickly



Citrus fruit with nicked or bruised skin is subject to decay, so pickers carry open-bottom sacks in which the open end folds up into a flap and is fastened to hooks on the side. When the bag is full, the picker places it in a field box and releases the fastener. The bottom of the sack falls open, letting the fruit roll gently into the box, neither scratched nor bruised.

YOUR PAPER HELPS A SOLDIER TWICE

Life-saving blood plasma must reach our men in the Pacific in perfect condition, protected by a tough cardboard box made from waste paper. Local organizations can sell paper to provide many extras to aid wounded veterans. Help today!



Steel Arms on Tractor Pull Fumigation Tent Over Trees

"Tent pullers"—long, collapsible steel arms mounted on a tractor or truck chassis—speed the fumigation of California citrus groves during the labor shortage. The most laborious part of fumigating citrus trees under cover is the transfer of the canvas cover from tree to tree to form an enclosure which will permit hydrocyanic acid gas to kill all the scale insects. While some

"tent pullers" are operated hydraulically, the majority are mechanical, having a concrete block for counterbalance and a horizontal rotating shaft placed above and parallel to the chassis. The two long arms are attached to the ends of this shaft, which is operated by a power takeoff from the truck engine. A single machine can cover 80 trees in an hour.



Robot Plane Tows Flak Targets

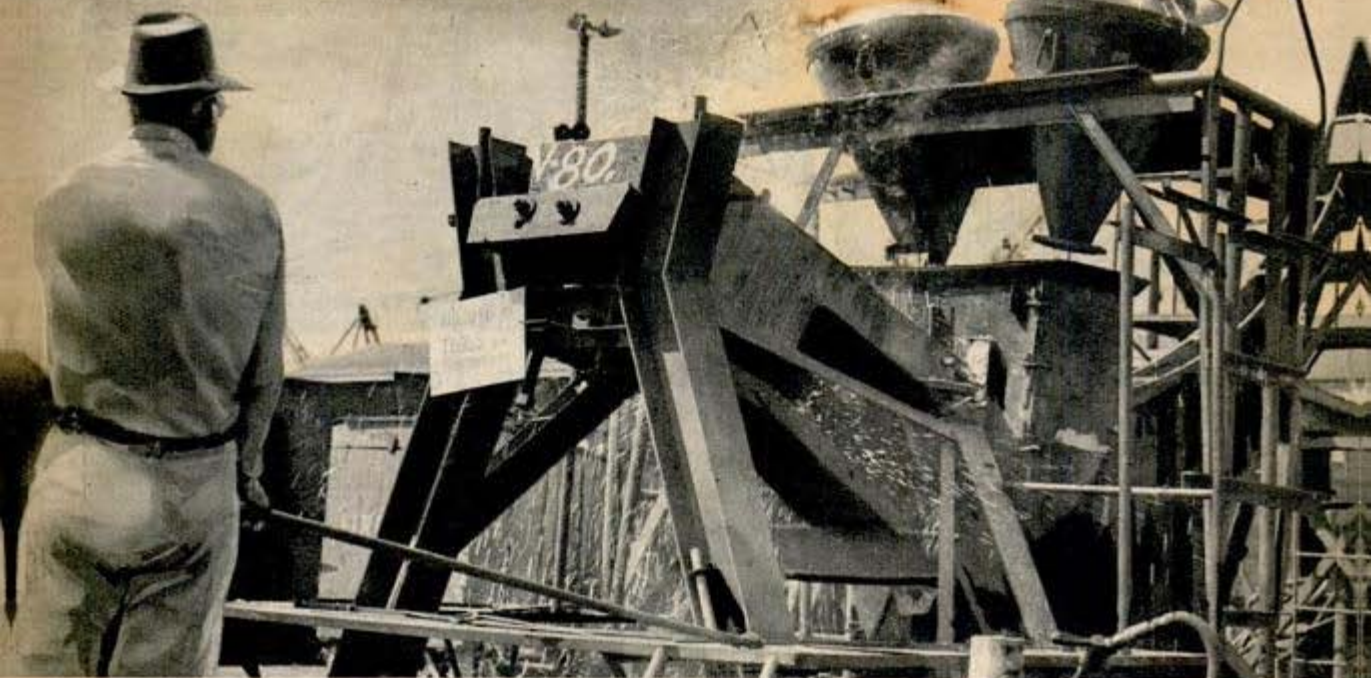
Artillerymen of the Seventh Army kept up their skill at anti-aircraft firing by using a radio-controlled plane to tow targets. The plane was mounted on a ramp for takeoffs. The targets made excellent clay pigeon substitutes for vanishing Axis pilots.

Fireboat Sprays Self As It Nears Flames

To protect itself from flames, a new 40-foot Coast Guard fireboat showers its own decks with a fine spray. This affords greater fire-fighting efficiency by permitting a closer approach to a burning craft or building along the waterfront. The boat, which is as powerful as three fire engines, was assigned to Manila and other ports recaptured from the Japanese.



BABY VOLCANOES IN A SHIPYARD



BECAUSE 37-ton steel frames for Victory ships are too wide for flatcars and too high for railroad tunnels, welding engineers at a big West Coast shipyard found themselves in a tough predicament. Stern frames were arriving by rail in four or five sections. Before the shipyard could build Victory ships for the Maritime Commission

Twin crucibles emit smoke and flame as burning aluminum oxide melts steel for welding ship frame



Left to right: Acetylene torch trims frame edges for welding; edges are aligned; gap is filled with wax

and Victory-type attack transports for the Navy, some method had to be worked out for welding those sections together quickly.

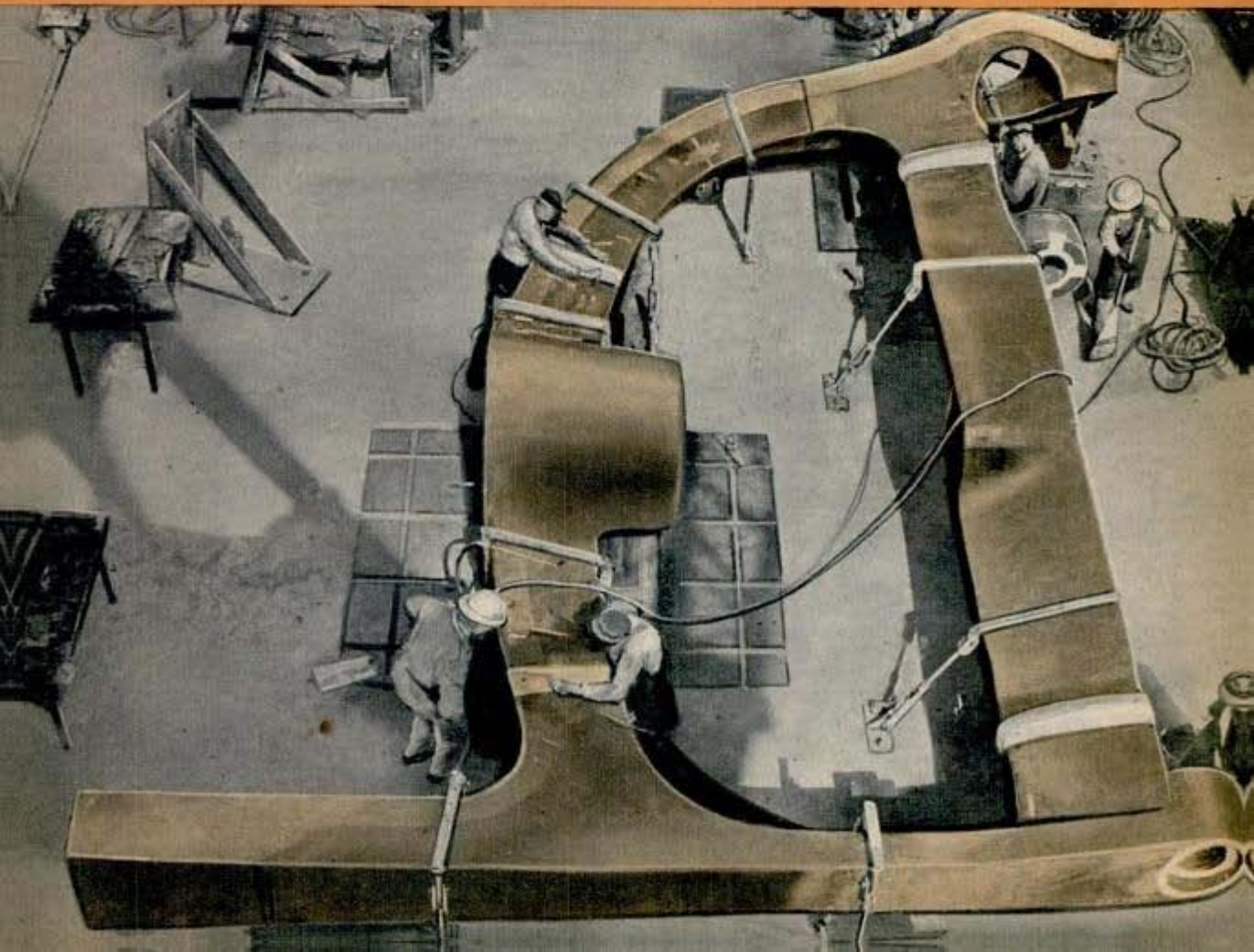
Engineers went into a gloomy huddle. It was a difficult job, any way you looked at it. The time factor was urgent. Someone proposed thermit welding. It hadn't been tried on a comparable operation, although thermit welding is far from new.

"It's no good for this job," experts said. "Every time you make one of those welds, heat will warp the castings out of line. Then you'll have to straighten before the next weld. With four or five welds per stern frame, that'll take two weeks."

Two weeks was impossible. The shipyard needed the stern frames to meet production schedules at the rate of three or four a week.

On the back of an old blueprint a quiet man named Al Landess did some private figuring. He sketched a stern frame and marked where the sections must be welded. The whole stern frame assembly, which surrounds the ship's

Right, pneumatic ram packs sand in mold which is subjected to heat of 5400 degrees. Below, looking down on assembled stern frame requiring welding





Mold box with pouring gates located at each end is built over each joint to be welded; hot steel is poured in this basin and funneled into gaps between ends of castings. Below, a portable crucible filled with aluminum particles and iron scale gets ignition charge



At left below, workmen thrust hot irons into flash powder and match heads in crucible to start chemical reaction which produces white hot steel (right) flowing from crucibles after heating 20 seconds

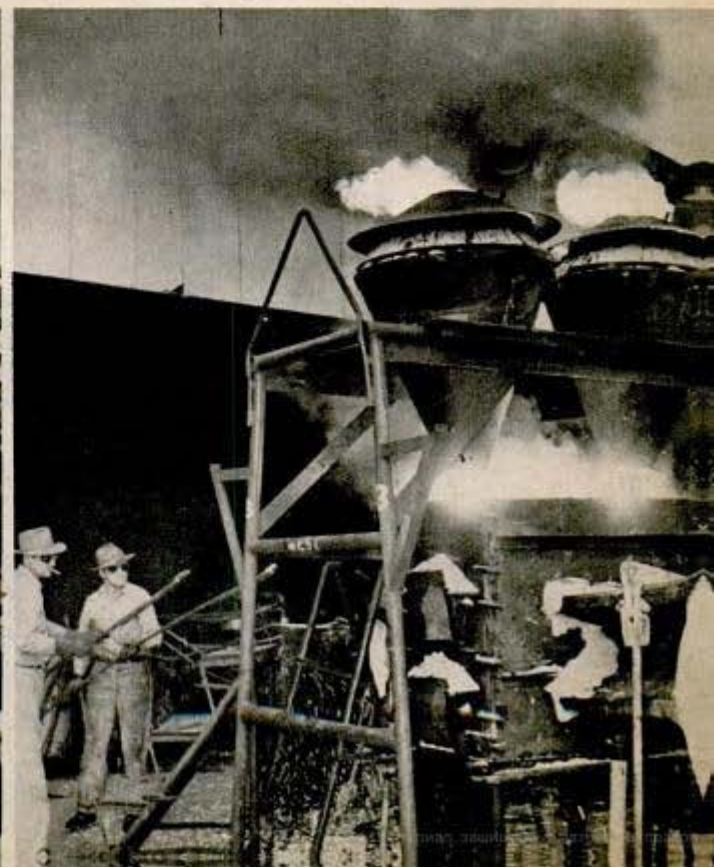
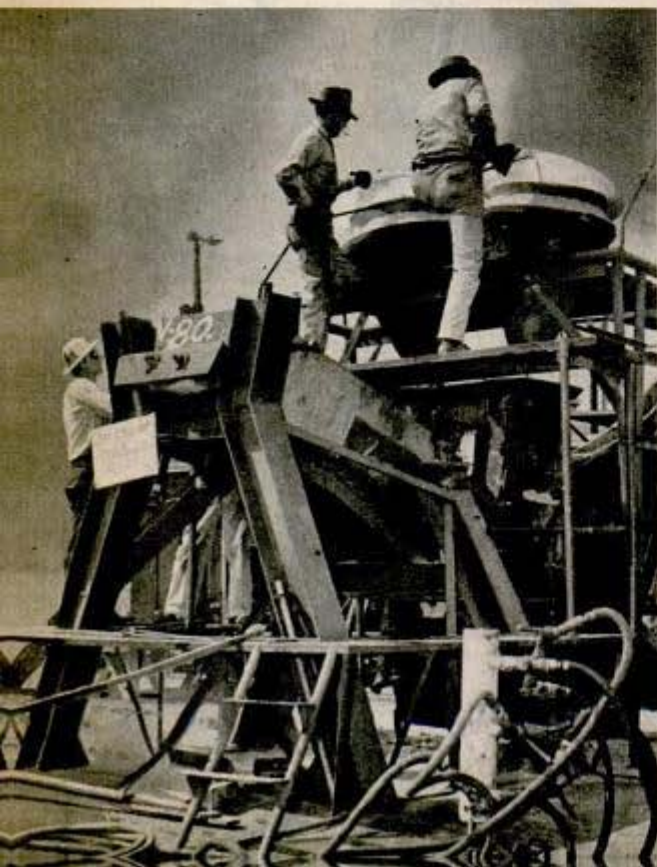
propeller and mounts the ship's rudder, is roughly circular. Landess noted that the joints to be welded corresponded somewhat to the lugs on an automobile wheel.

"I'd like to try an idea," he said. He showed his sketch to engineers. Welding experts still were dubious. But Calship engineers, who have put many a new idea into use in order to build more than 400 big ships, agreed with Landess that the experts might have overlooked a good bet.

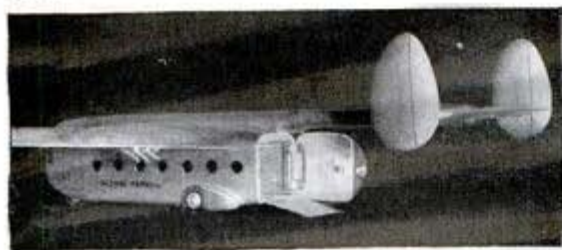
"Go ahead and try it," Landess was told.

That was the start of a sensational method by which stern frames have been welded successfully for 30 big attack transports and scores of Victory ships at the Calship yard alone. Other yards have adopted this method. The process uses the science of aluminothermics, superheating steel by the chemical reaction of iron rust and aluminum.

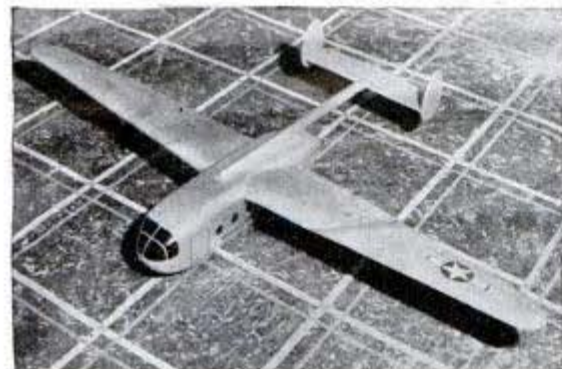
In twin crucibles poised over the anchored sections of a stern frame, several hundred pounds of steel get a quick heating from air temperature to 5400 degrees Fahrenheit in only 20 seconds. Spouting smoke and brilliant



Rocket-Launched Glider Will Carry 50 Riders



Model of J-19 shows rear loading doors. At right it is held at angle at which it will be towed into the air assisted by six rocket units held under the wings



Electrically fired rockets will help a twin-engine tow plane launch the J-19 Skyway Express, a giant cargo and passenger glider designed for postwar travel. Three jet takeoff units will be installed under each wing. When the plane's snatching hook connects with the glider's tow

rope, a switch will close automatically, firing the rockets and sweeping the glider off the ground in less than 500 feet. A tow plane as large as the C-47, C-53 or C-46 may be capable of snatching and towing two or three J-19s at the same time. Constructed of plywood or some other lightweight material, the glider will carry 50 passengers or a five-ton payload of cargo with a crew of three. To simplify loading, four light stowing bins will be attached to loading boards that will slide into position on roller racks on the fuselage floor. Locking pins in the racks will secure the cargo containers after they are in position. The J-19 is expected to sell for about \$65,000.

Beverage Jug Maintains Constant Pressure in Stratosphere

With a stainless steel beverage jug you can serve yourself hot soup or ice-cold drinks while cruising through the stratosphere. The liquid is poured through a push-button spigot made to accommodate even thick soups. The jug keeps a constant pressure on the liquid regardless of change in altitude. It has a special compartment to keep drinks cold with Dry Ice; in a five-hour test at 130 degrees F. temperature of the contents increased only nine degrees.

Fluorescent Light in Greenhouse Helps Root Plant Cuttings

Windowless rooms in a greenhouse are forecast by a successful experiment reported by workers of the U. S. Department of Agriculture. With fluorescent lamps substituting for daylight, basement rooms were used for rooting cuttings of woody plants. This method may effect savings for nurserymen, for it is easier and more economical to control heat and humidity in rooms with solid walls than in glass houses.



SUPERSERVICE *for* SUPERFORTS



B-29 servicing never ends at Central Pacific base in Marianas. Bombs above are for Tokyo. Below, flight engineer controls B-29 engine



ALTHOUGH she soared proudly as an eagle, the great silvery B-29 was in trouble. She'd lugged several tons of bombs to Tokyo as her installment on the debt of Pearl Harbor. But after steely death and fiery destruction had cascaded down on the Japanese the bomb bay doors failed to close.

The bombardier tried everything but he couldn't get the huge doors to swing shut. The terrific drag on the streamlined plane was cutting speed and eating gas at an alarming rate. About 600 miles south of Tokyo the pilot switched to emergency tanks and faced another crisis—the hydraulic fuel system to the auxiliary tanks failed to function.

"Prepare for ditching..." the pilot said grimly through the interphone.

The crew prepared to cheat the uncompromising law of gravity and the unfriendly green sea of 10 lives and a \$600,000 airplane.

"How much longer can you hold out, Ray?" the navigator asked.

"Only about 100 miles."

"How about stretching it to Iwo? I think we can just about make it. Save us getting our feet wet."

"O.K., Bernie," said the pilot. "You

act as if you didn't know there's a war on down there . . . but we'll try it. Chart your course for Iwo. Radioman—try to contact somebody down there and let them know we're coming in. . . .”

The message crackled through to the little, sulphurous, steaming island best described as a nightmare in hell. Savage fighting still was raging on the island. Of greater interest at the moment, however, was the fact that the first B-29 was going to make a landing on the newly conquered Motoyama air strip. Word spread faster than a peace rumor. And soon war correspondents, photographers, Marines and Seabees lined the dusty field to watch.

With little more than gasoline vapor in the tanks and Japanese mortar shells occasionally pocking the far edge of the runway, the Superfort glided in. As the big wheels touched the ground, the brakes were locked and the giant plane skidded down the short runway to a smoking stop.

The crew set about repairing the bomb bay door mechanism and putting the fuel lines in working order. Four hours later the B-29 lifted into the clean, blue skies and headed south for its Tinian base.

That was No. 1.

A few days later another Superfort with two feathered props and fuel transfer troubles limped in from a strike on Nagoya. Hit by anti-aircraft fire, she was in bad shape. This was a major repair job, not just a bit of skillful tinkering.

But these emergencies had been foreseen. On D-plus-14, March 5, a hand-picked B-29 repair and maintenance crew went ashore on Iwo—ready to give mechanical first aid and fuel transfusions to Superforts in trouble. The ground crew shared dangers and hardships with Marines and Seabees already on shore—sleeping in foxholes, choking on volcanic dust, eating K rations, dodging enemy fire.

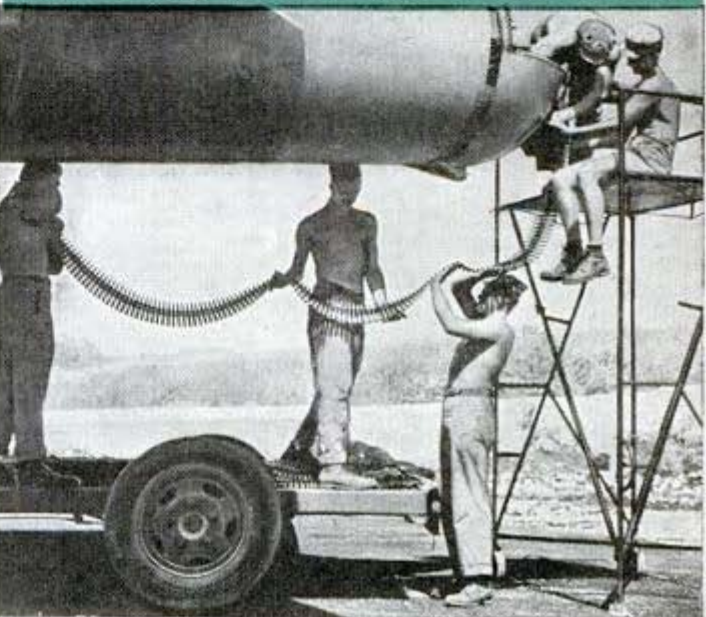
Working from sunrise to dusk, sleeping inside the plane



It's a night-and-day job, this superservice for Superforts. Here an engine gets careful attention after dark



Iwo Jima airstrip provides emergency haven for B-29s. One takes off while another, damaged, rests beneath it. Below, loading .50-caliber shells into the tail turret





Insect gun acts as oil spray for turbosupercharger

at night, the repair gang had the big bomber ready for a takeoff in four days. The last bolt was tightened after dark and shortly thereafter the B-29 took to the skies—the first night takeoff from Iwo.

These two incidents symbolize important reasons for the bloody conquest of Iwo Jima—defended to the death by almost 25,000 Japanese and taken at a cost of approximately 5000 dead and 15,000 wounded United States Marines. Since then many another B-29, crippled over Japan, has found a haven on this barren island. Casualties incurred in its taking already are saving the lives of other brave men.

Iwo gives Army and Navy air forces a



huge, stationary aircraft carrier anchored 660 miles south of Tokyo. It is a super-service station for Superforts. Seabee bulldozers, steam shovels, trucks, scrapers and graders have enlarged the existing Japanese airfields and by now shops and hangars should be in use. Present plans do not call for Iwo's use as an operational base for a B-29 wing although it is 625 miles closer to Japan than Saipan, 740 miles closer than Guam. The island is vulnerable to air attack by the Japanese from the Bonins and the land area just isn't large enough for all the buildings and facilities needed for a complete wing installation.

But other factors make it extremely valuable for B-29 operations:

It offers the only emergency landing field for crippled planes struggling down the long, overwater route from the Japanese empire.

It eliminates the threat of Japanese reconnaissance and bombing of the expanding Marianas bases.

It provides a base for fighter planes.

It provides facilities for Navy Air-Sea rescue work.

Before Iwo was captured, B-29s taking off from Saipan, Tinian and Guam had to make the 3000-3400-mile round trip entirely over enemy patrolled waters and enemy held territory. Pilots and crews feared the 14-17-hour hop as much as they did Japanese fighter planes and antiaircraft fire. In the first few months of long-range bombing from the Marianas, operational accidents took almost as large a toll as did enemy action. But that hazard is being reduced with Iwo in our possession.

In the first three months after organized resistance on Iwo ended, over 1000 Superforts had landed on its dusty airfields. It is believed that many of these planes and at least half their crews of 10,000 men would not have been saved without Iwo.

During November, December and January last winter, B-29 installations on Saipan and Tinian were bombed regularly on moonlit nights by Japanese planes that presumably came from Iwo. The raids usually were of strictly "nuisance" caliber, but planes on the ground were smashed and men killed. Now our B-29 facilities in the Marianas can be developed to maximum usefulness without fear of enemy raids.

Until Iwo was conquered, B-29s fought a grim battle without fighter escort over Japan. In addition to the long, overwater flight, Superfort crews had to beat off swarms of Japanese interceptor planes over the target. The efficiency of the giant bombers has increased markedly now with the protection of fighters based on Iwo.

Flotation gear for aircraft salvage gets a patching

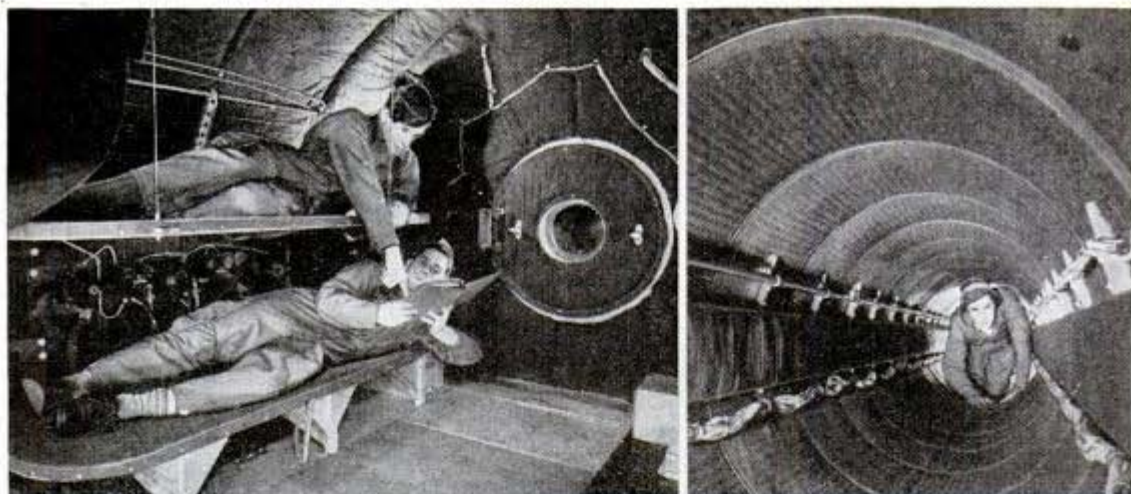


Doing liaison work for floating aircraft repair unit in the Pacific, helicopter lands on its sea base



Liberty Ship above is the floating aircraft repair unit, with helicopter on flight deck fore. Seabee below operates 21-ton "Cat" and earthmover on new Marianas base as Superforts sweep low over scene





Left, crew compartment of B-29, pressure bulkhead and hatch at rear. Right, pressure tunnel over bomb bays

As one pilot put it:
 "Boy, it's good to see fighters in the air that you know aren't going to try to shoot you down!"

Before the Marines took Iwo, one unit of the Navy's far-flung Air-Sea rescue organization was based on Saipan. Now, based on Iwo, the searches and patrolling of this life-saving service have been extended to the very shores of Japan. Navy Dumbos and speedy destroyers range hundreds of miles in all directions from Iwo to pick up bomber and fighter pilots that cannot reach the island.

Iwo represents joint effort by all branches of U. S. armed forces. The Navy softened up the island's fortification with ships' gunfire and carrier bombing; the Coast Guard helped to operate the APAs, AKAs and landing craft in the assault; Marines braved

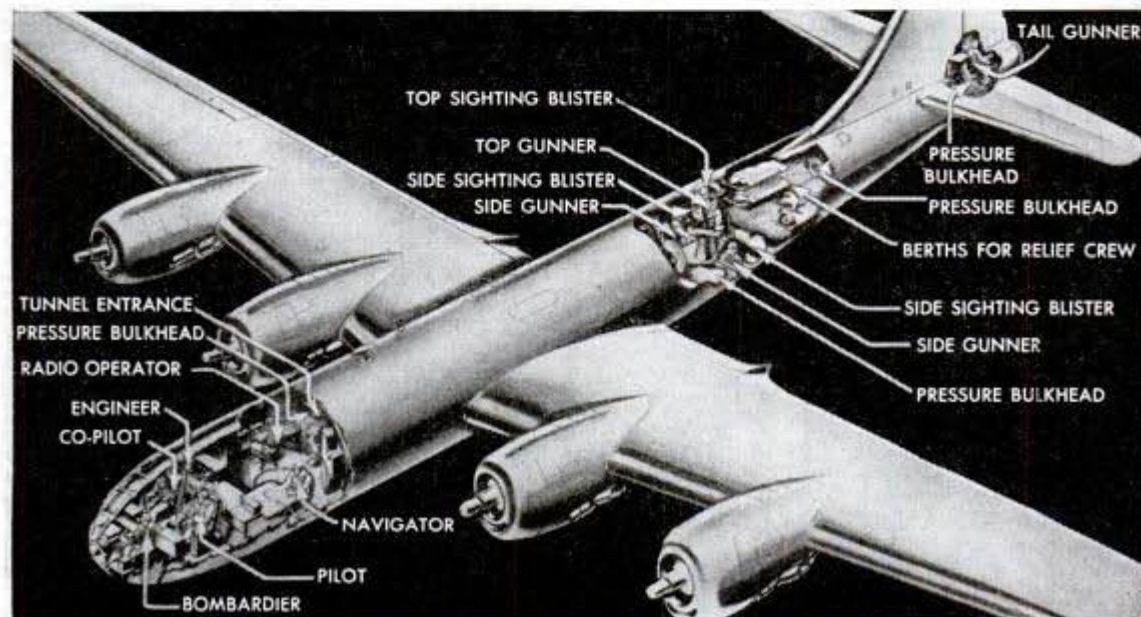
bloody mortar and small arms fire to seize the land; Seabees set about rebuilding the island for our use before the last shots had been fired and Army and Navy aircraft will use it as an air base to devastate and burn the Japanese home empire.

Generous credit for making Iwo a haven for the Superforts should go to the repair and maintenance crews. They make it possible for the giant bombers to fly again and again over Japan. Dirty-faced and grimy-handed, the enlisted men with the wrenches and hammers are helping America to win this war of machines.

Soon after the beaches were secured, B-29 repair crews went ashore. Demand for their services was so acute that additional crews had to be obtained at once. One crew on the way to the forward areas

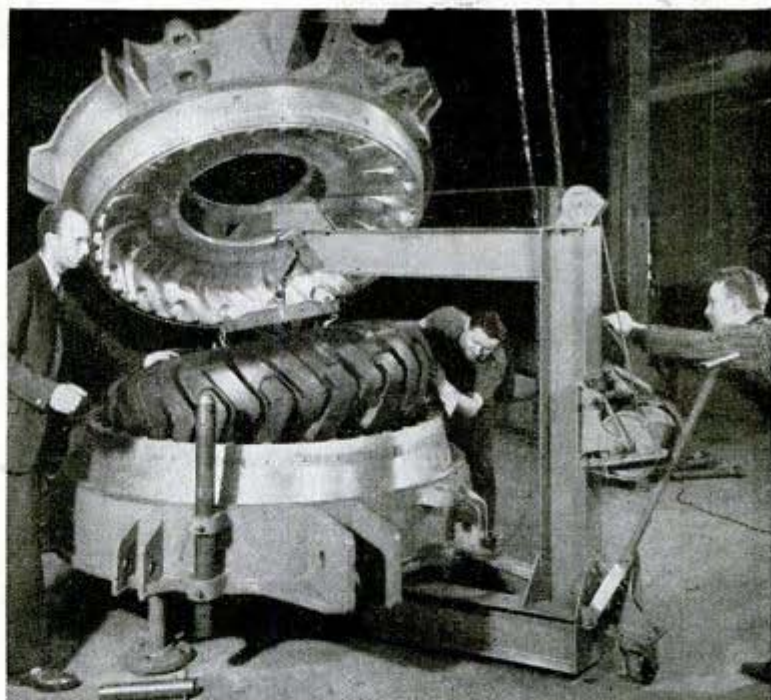
(Continued to page 152)

This first complete cutaway drawing of B-29 reveals location of crew. Tunnel links nose and mid-section



Retread Mold for Bulldozer Tire Weighs 12,000 Pounds

Mammoth bulldozer, airplane and tractor tires—up to 68 inches in diameter and weighing 900 pounds—are refinished in one of the largest retread tire molds in the world at Pueblo, Colo. As much material as goes into 12 ordinary-sized molds went into this giant, which weighs 12,000 pounds and has a matrix requiring a ton of aluminum. It controls surface heats to within one degree. The mold cures 165 pounds of tread, the equivalent of 23 passenger car tires, in 3¼ hours. It makes sidewall repairs simultaneously with new tread cures and handles tires with diameters from 45 to 68 inches.



Heat 'Beamed' Into Frozen Food Defrosts It in Few Minutes

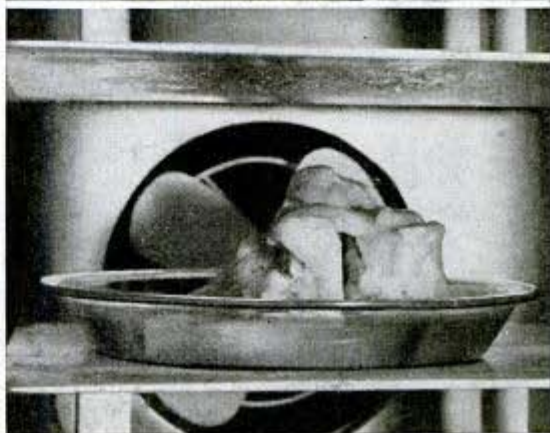
By harnessing high-frequency heat in an electronic defroster, restaurants can thaw quick-frozen foods in bulk almost instantly while preserving taste, texture and nutritive value. The electronic oven transmits a beam of heat through a solid block of frozen food, defrosting it in minutes instead of hours or days. The floor and ceiling of the oven are metal plates connected to a high-frequency generator. The heat thus reaches the core of the frozen substance as well as its surfaces and induces uniform thawing. If the food is allowed to remain in the oven after it is fully thawed, it begins cooking. Electronic defrosting is achieved so rapidly that there is no chemical breakdown in the structure of the food such as occurs under normal thawing.

Block of frozen peaches at right is thawed to original texture after nine seconds in electric oven



'Sandwich' Acts as Carbon Sheet

Carbon paper has competition in the form of a "paper sandwich" which consists of two gelatin or cellulose sheets with layers of colored liquid between. When the point of a pencil or typewriter key strikes the sandwich, the sheet on the back side of it is ruptured, releasing the liquid onto the under sheet. This produces a localized stain in the shape and size of the mark made by the pencil or type.



Rebuilding BATTLEWORN MUSCLES

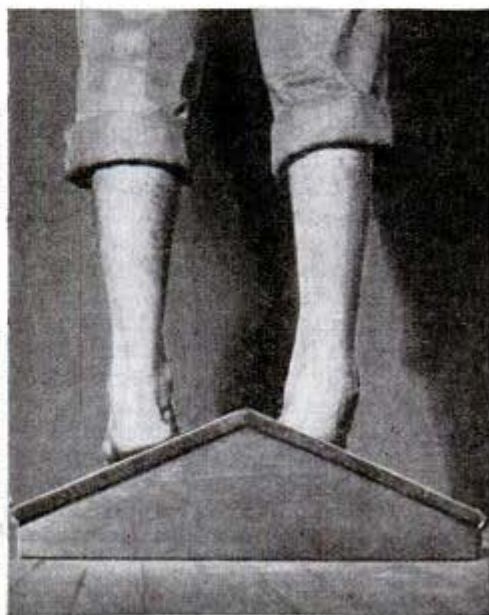


When stationary bicycle broke at Swarthmore Naval Hospital, this device was built by training officers to give same kind of exercise.

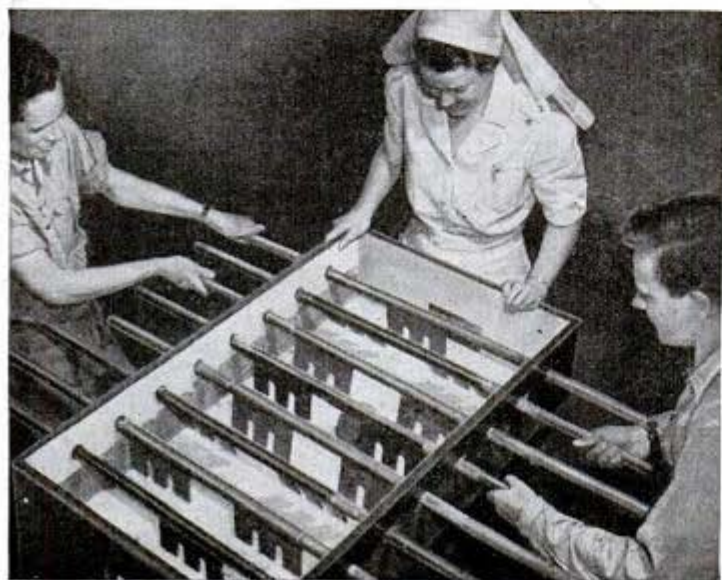
Added improvement is separate weight adjustable for each leg



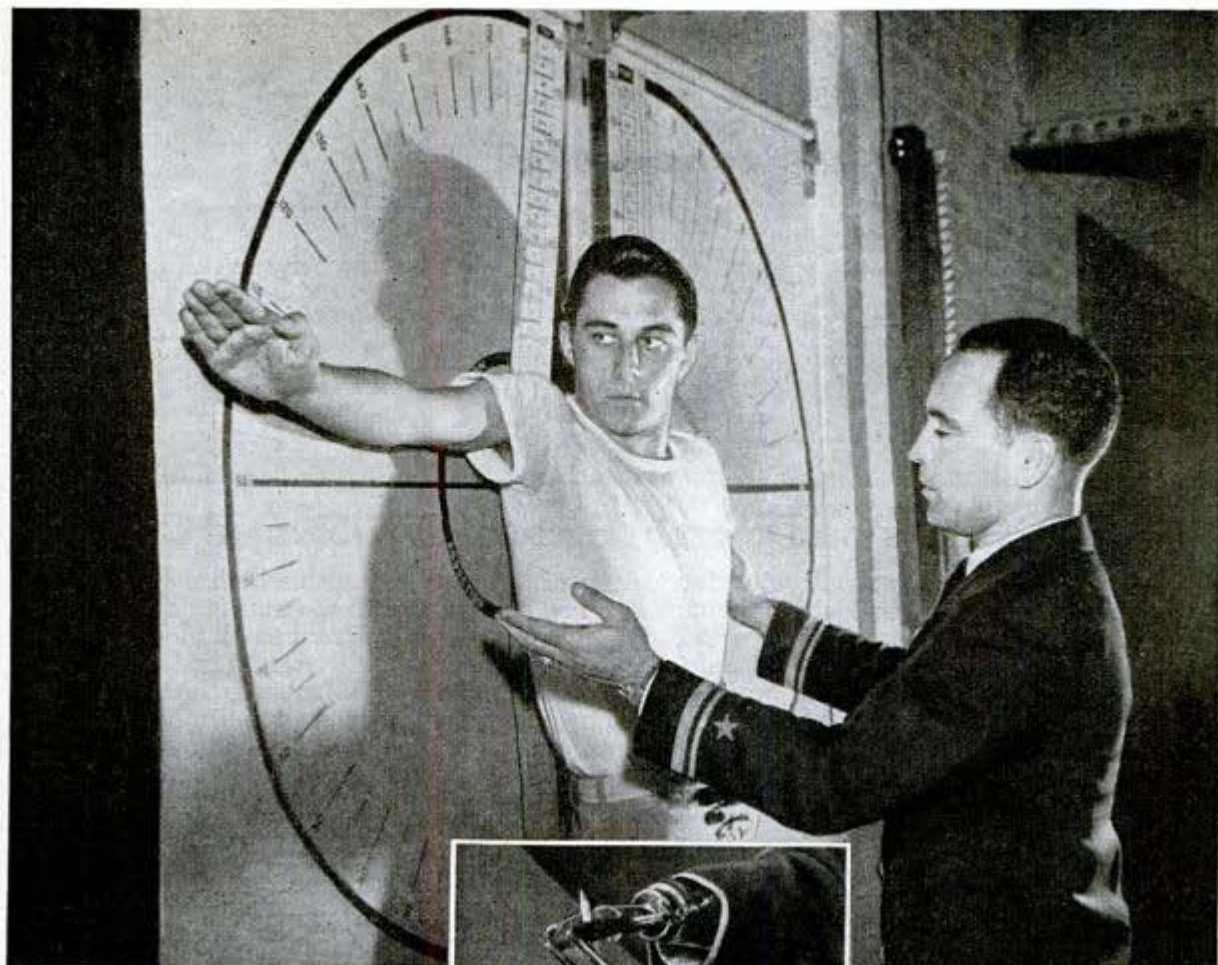
Wounded naval men help themselves toward recovery with simple, homemade devices. Moving the wooden gadget above from side to side, the patient exercises his wrist and measures progress at same time



Ankle muscles are strengthened by walking to and fro on roof-shaped object, known as supination board. Use of the device increases flexibility



In Canada, wounded veterans have fun and strengthen arms and wrists by playing table hockey game, left Canadian National Film Board photo

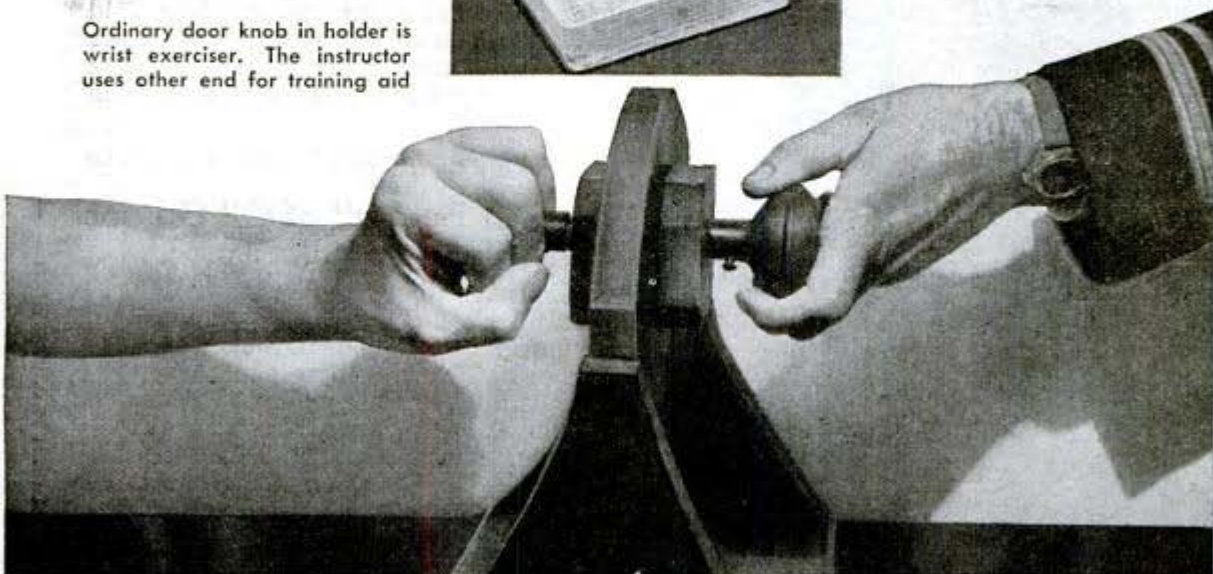


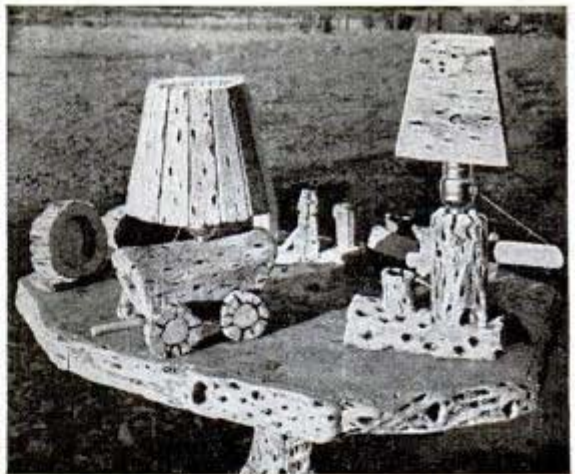
Magnet-tipped pencil and metal tabs staggered in dictionary-style enable handless veteran to turn the pages of his rate book with facility. Handicaps vanish before Yankee ingenuity

Ordinary door knob in holder is wrist exerciser. The instructor uses other end for training aid



Painted on window shade, motion chart lets patients measure arm and shoulder movement. Chart is adjustable to height of veteran. Patient above finds he can move arm 100 degrees, is encouraged by progress record





Furniture 'Grows' on Desert in Form of Odd-Shaped Cacti

Desert cacti have a practical value for Herb Wood, of Tucson, Ariz., who fashions them into chairs, tables, lamps, cradles and other household furniture and ornaments. He chooses only the "in between" cacti—neither green nor decayed. The excess pulp is driven from the interior and the bark is stripped off. Next he cleans the

cactus inside and out with a high pressure hose and lets it dry in the sun for a year. Tiny lamps are made from small pieces of peculiar formations, while desks and larger furniture come out of squares of cholla cactus glued together in a definite pattern onto a pine wood base. In making lamp shades out of cholla cactus, Wood cuts small pieces singly and joins them with wire. Glue is used to hold larger pieces together. He uses an electric saw to cut through the durable wood.



Vacuum Speeds Coating of Lens To Cut Down Reflection

Coatings which help eliminate reflection are applied by a time saving vacuum unit to lenses in gunsights, binoculars, submarine periscopes and cameras. It consists of an evaporator operating on a vacuum principle and is said to increase efficiency of the lenses. Another adaptation is the production of mirrors by evaporating metals such as aluminum, chromium, silver, gold and rhodium on the surface of glass. Silver may be evaporated on the surface of quartz in such a way that wires may be soldered to the coating.

← Studying binocular prisms in vacuum evaporator

"Drop in Bucket" of Oil Output Makes Enough Rubber for U. S.

Sufficient synthetic rubber to satisfy U. S. annual needs can be made from only two days normal petroleum output, according to Bruce K. Brown, general manager of research and development for the Standard Oil Company of Indiana. This "drop in the bucket" amounts to about 7,200,000 barrels and would produce 558,000 long tons of synthetic rubber. That is about the amount of natural rubber used in a normal year before the war, Mr. Brown points out.

Norman Sper, Jr., national men's champion, rehearses front dive

TIPS FOR SPRINGBOARD ARTISTS

By Fred Cady

Coach of American Olympic Diving Teams

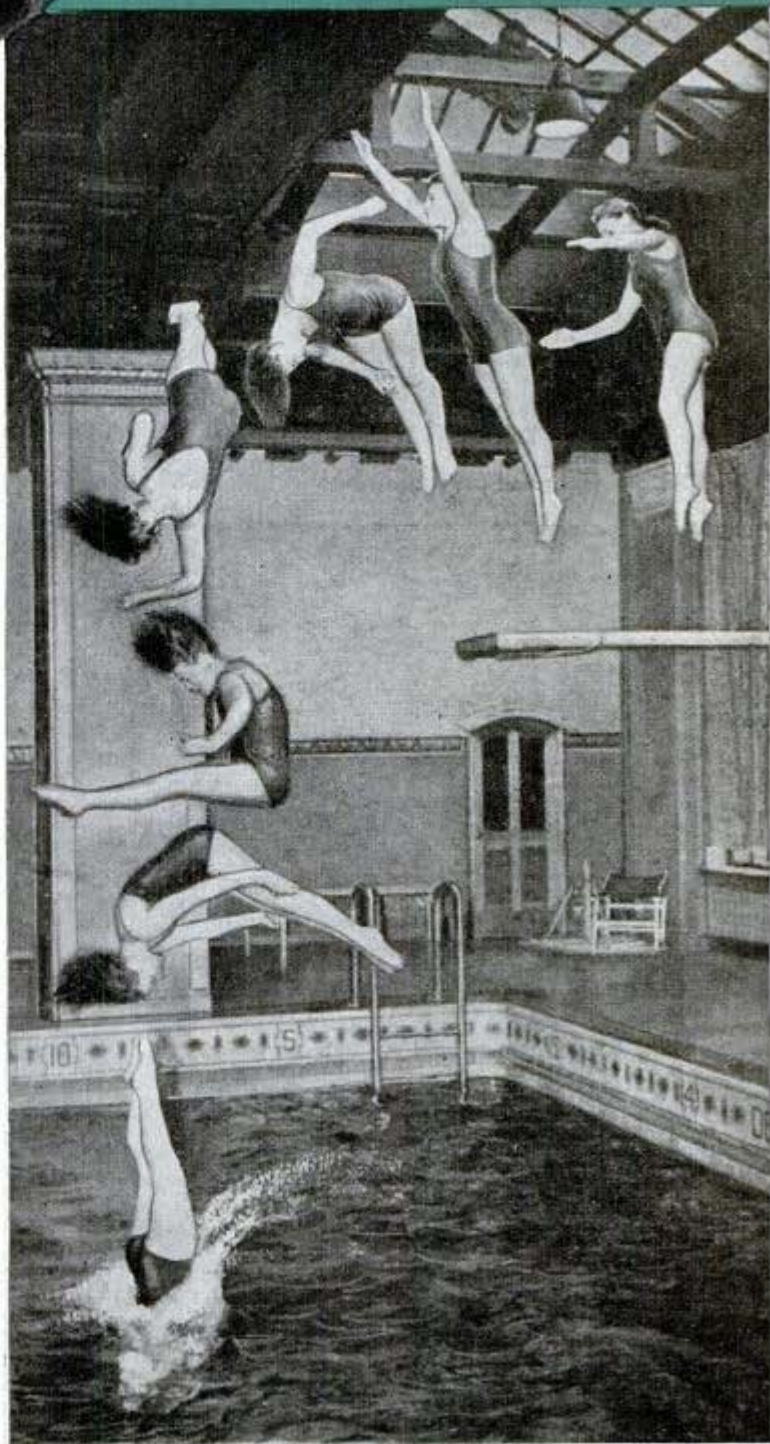
YEARS of training go into the making of a good exhibition springboard diver and yet the principal thing that sets him apart from the average sloppy diver can be learned in an hour.

A good dive depends more than anything else upon launching yourself properly from the springboard. You are bound to improve in timing and grace as soon as you take advantage of this simple fact.

That is, a good diver knows how to "ride the board" while a poor diver simply hasn't learned how to make the board work for him. The novice is apt to kick down on the board as he hits it, killing its action. He may leave the board too soon and lose the catapultlike impetus that the board can produce. Properly used, the board can spring you five feet up into the air, giving you the altitude and time that are needed for a graceful dive.

The regulation springboard is 16 feet long, 20

Camera catches Zoe Ann Olsen in stages of 1½ somersaults, full twist





Thrown-back head, arched body turn diver in air. Below, undersea dance



inches wide, three inches thick at the butt and tapers to 1½ inches at the forward end. It rests on a fulcrum that may be moved back or forth to produce a slow or a fast action. Competitive diving is performed from a low springboard that is three feet above the water and from a high springboard 10 feet above the water. Depth of the water under either board is 10 feet.

Thirty-five different standard dives may be made from these boards, ranging from a simple but graceful front dive to such complicated aerial maneuvers as the one that is known as the "running half gainer half twist cut-away one and a half." In this dive the diver springs forward and upward from the board, lets his head and shoulders come back and then does a half twist so that he is facing the water, then he tucks his arms around his legs and does one and a half forward somersaults before straightening out and entering the water. I don't recommend this one for beginners!

All dives start with the approach. From a standing position about midway on the board take three running steps forward and then a hurdle jump, landing at the end of the board and taking the shock on the balls of your feet. The knees are very slightly flexed. For maximum action you should land with your toes about one inch from the end of the board. The balls of your feet touch the board just a fraction of a second before your heels come down.

Ride the board while it bends under your weight and then rebounds. Your takeoff must be timed to the board's action and your upward spring is

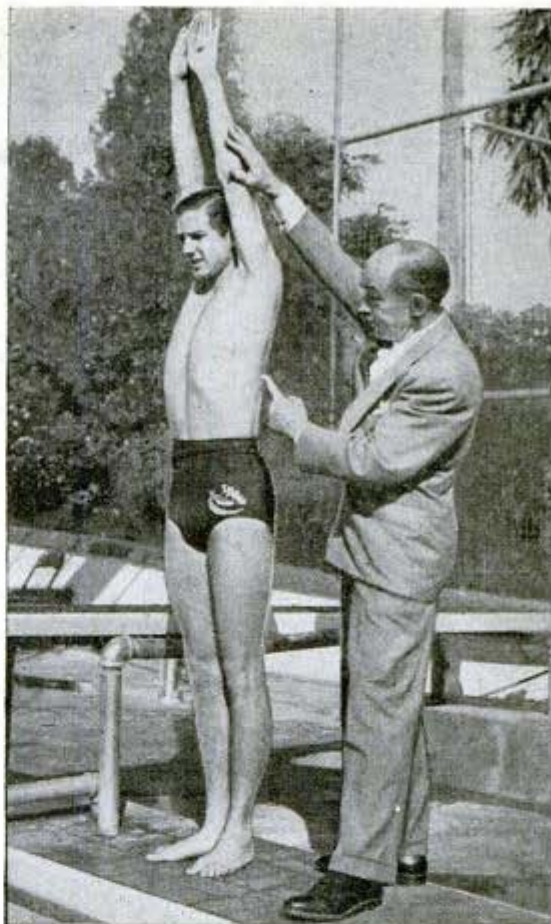
made just as the board is reaching the top of its rebound. The spring consists of an upward push from the balls of your feet, helped along with a slight knee action and a shoulder lift.

Perfect balance is the secret of success. From the time you start your approach all of your actions must be easy and free so that you can maintain balance. The three running steps must be natural and deliberate. The hurdle leap must be high so that your body has time in the air to get into position to hit the board. A low hurdle leap will land you at the end of the board before you have time to get your legs into position, spoiling your balance.

When you hit the tip of the board, hold your body upright, in balance, and ride it until it is ready to spring you away. If you lean backward your dive will be short and awkward, while if you lean forward your hips and legs will be lifted too soon, again spoiling the dive.

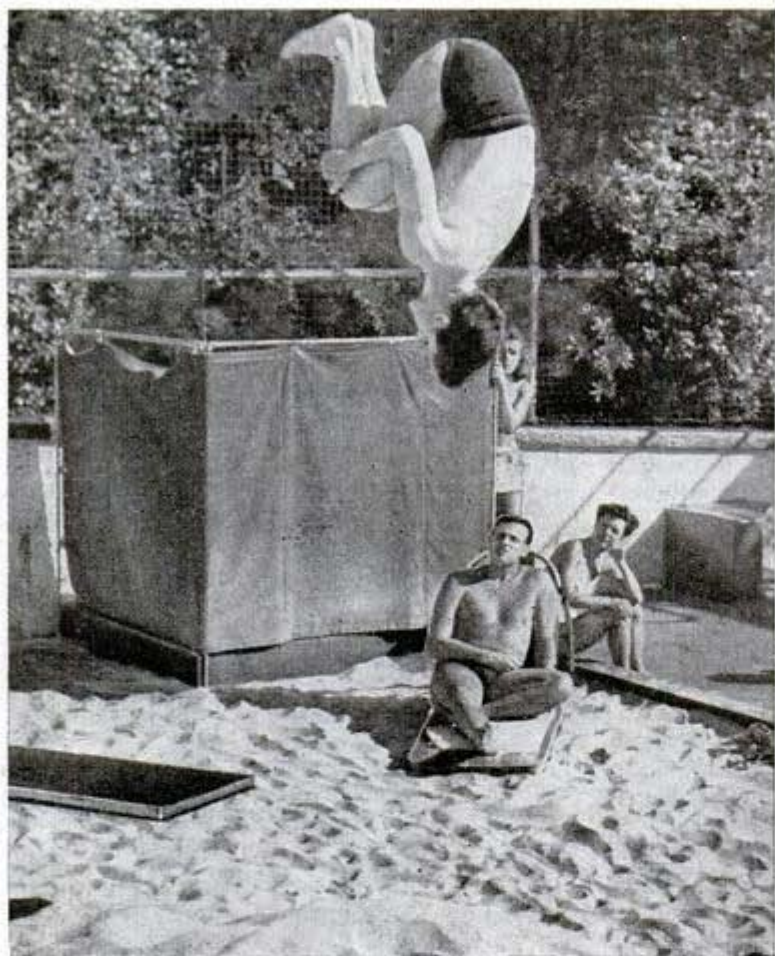
The approach, ride and takeoff aren't all there are to a dive, of course, but no dive can be executed properly if these preliminaries are done incorrectly. Lack of balance and lack of knowing how to ride the board are the reasons why most divers are mediocre.

I'm not going to tell you, step by step, how to make any particular dive but I suggest that you begin with the simplest ones



Coach Cady puts Norman Sper into flat, extended position essential to end of dive, before entering water. Below right, Sper uses a springboard and sandpile to rehearse, lands feet first. Left, turning in the air





Here Sper practices forward somersault from springboard over sandpile. Below, Cady demonstrates low tuck, by which hands help twist the body



and work up gradually to the more complicated maneuvers. Learn them first on the three-foot board before trying them from the 10-foot altitude. In all dives your body should be fully stretched and extended at the take-off and at the finish. In all straight dives your body should be stretched throughout the dive. Timing as well as graceful appearance is dependent upon this.

In performing any dive the head is used as the control mechanism. That is, your head is a heavy weight and by throwing it forward or backward you can change the attitude of your body in the air. Correct use of the head is one of the big factors in a good dive.

When you get to the point where you are ready to try somersaulting in the air you may find it hard to spin fast enough to complete the somersault. Here is a point to remember. It is not merely the throw of the head that causes the body to spin but it is also the way you perform the tuck or the grasping of the lower legs. The grip for the forward somersault is just above the ankles and the pull of the arms is backward and upward. This helps pull the hips high and back, tumbling you forward. Combined with the forward throw of your head it makes you spin.

For a back somersault the grip on the legs is higher, just below the knees, and the pull is upward so as to bring the hips forward and upward. This tips you over backward. This action plus the head being thrown backward spins you in the air. The only way to get a fast spin, forward or backward, is to use the proper arm pull in the tuck

as I've described it.

In all forward dives except the forward jackknife you should plan to enter the water at an angle of 85 degrees, just a little off the vertical. The forward jackknife itself finishes up with a vertical entrance. If you try to extend your travel you will be still moving ahead when you hit the water, causing a splash.

Always remember that you are trying to dive into the water and not onto it.

Your body should be stretched out into a straight line at the end of the dive so as to produce a clean entry. Fingers, head and toes must conform. And don't collapse at the instant you enter the water because that spoils the grace of the whole dive. To avoid such a collapse, carry your dive to the bottom of the pool and keep your body stretched in its straight line until your hands touch the bottom.



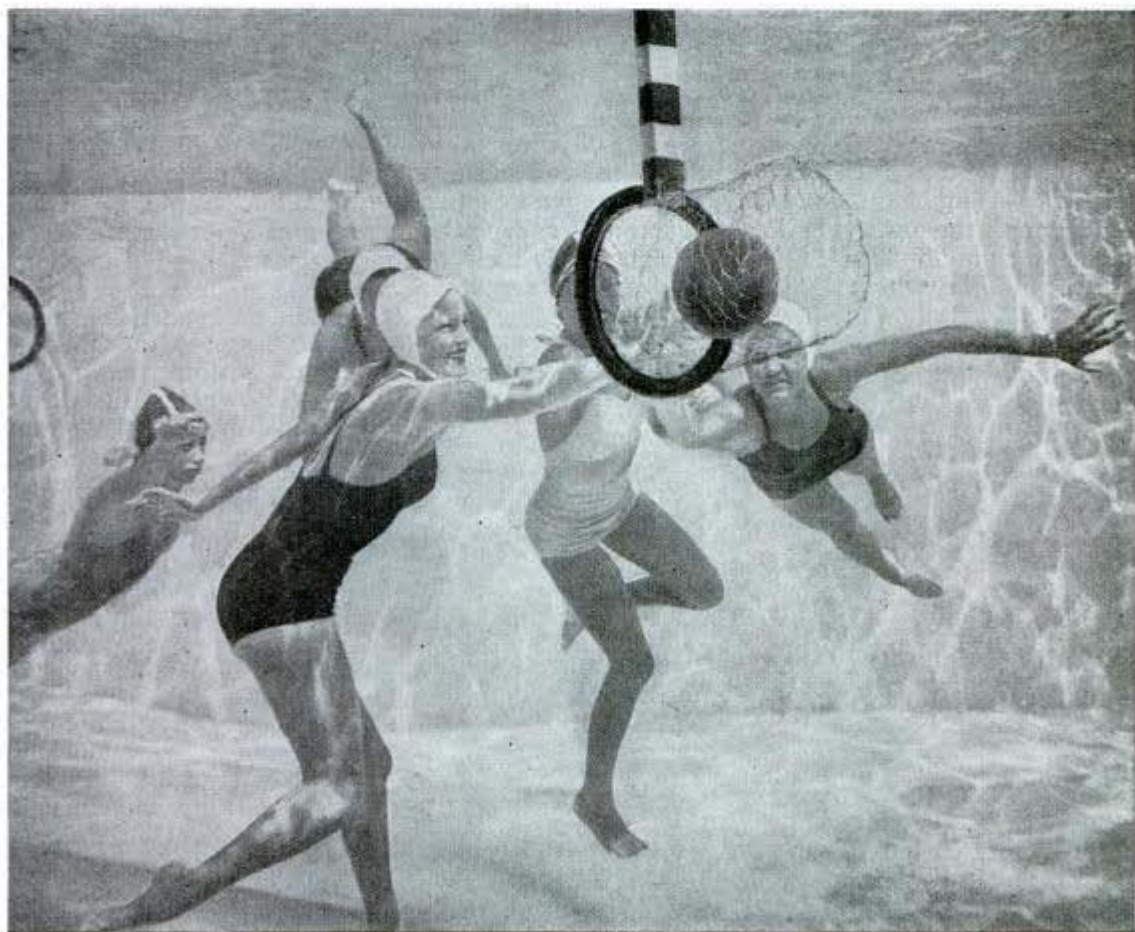
Girl exhibition star shoots arrow from bow in dive

Competitive diving is one of the youngest of all sports. It was "invented" by salt workers in Germany about 45 years ago. Then the Swedes worked out the standards that make it a competitive sport. It has been developed to its highest perfection here in America.

Perfect diving requires years of practice and most of the world's great divers began by the time they were 12 years old. Norman Sper, Jr., for example, the present national men's champion, was 10 years old when I first began to train him. He's 18 now.

That shouldn't be discouraging because most improvement comes at the start. After that it's a matter of polishing.

Feminine team of underwater swimmers demonstrates a submarine game of water polo. Lots of thrills in this



Plastic Steering Wheel Guides Postwar Bicycle



Plastics are in and handlebars out of the streamlined bicycle, hailed by its developer as the first example of built-in streamlining applied to bicycle engineering. Outstanding is the substitution of a double steering wheel for the old handlebars. This interrupted-type wheel reduces bulkiness and weight and permits use of a plastic covering for thermal insulation. The hood is a housing for the steering universal, the horn and batteries for horn and lights. First vehicles will be equipped with a two-speed transmission coaster brake, but a new type drive, free wheeling and brake system is being developed. A motor-driven machine also will be introduced. Safety features are emphasized in the streamlined bicycle, with the feet in reach of the ground at all times.

B-29 Sheds Bombs for Cameras as Photo "Recon" Plane

Converted from a B-29 Superfortress into a photo reconnaissance plane, the Army Air Force's "flying camera" retains all of the Superfortress' firepower. The F-13-A, as the plane is designated, carries six cameras and two more crewmen than a B-29 because of the complex photo equipment. One is responsible for operating the cameras, setting the intervalometer which determines time intervals between exposures and changing film. Lights on a signal panel show him which cameras are oper-

ating and the intervals between pictures. A photo navigator, who supplants the usual bombardier, lines up the targets and keeps the camera operator informed by interphone, buzzers and lights. Most complex installation is the trimetrogon station with three wide angle lens cameras. With these an area more than 20 miles wide can be mapped as the plane moves along. In the split vertical station are two cameras with 40-inch telephoto lenses used for photo interpretation work. Their pictures will

"Doghouse" protects workers as B-29 is converted into super photo plane



show railroad ties from a 20,000-foot altitude. In the third station forward a single vertical camera with 24-inch lens covers a wider area than the split verticals. A vertical camera may be replaced by a K-19-B night camera, operated by a photoelectric cell when a flash bomb explodes and illuminates the area below. Cameras are housed in a special pressure compartment. Defroster tubes blow hot air over glass windows at high altitudes. All the F-13-As have been turned out by the Continental-Denver Modification Center operated by Continental Air Lines in Denver.

The ROCKETY ROAD TO TOKYO



Japan is the eventual target of rockets being fired by torpedo bomber above on test range of desert Navy Ordnance Station

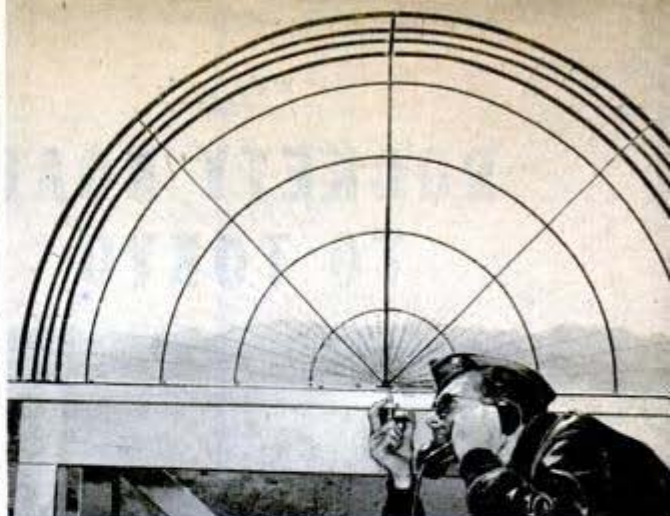
By Thomas E. Stimson, Jr.

VAST STRETCHES of desert wasteland near Death Valley in California are shuddering today under the impact of new rocket weapons being developed by the Navy for use against Japan. Thousands upon thousands of rockets are being fired at the Inyokern Naval Ordnance Test Station in an intensive program of research and improvement. In one part of the desert proving ground, larger than Rhode Island, rockets are fired against armor plate targets representing the sides of Jap warships. Nearby, airplanes hurl rockets against reinforced concrete "bombproofs."

A rocket projectile is nothing more than an artillery shell propelled by a rocket motor instead of being discharged from a gun. Like an artillery shell, it can be of the fragmentation, high explosive, or armor-piercing type. It can be built in any practical size.

Loaded aboard a jeep with special fittings, rockets will be carried to Mojave Desert hills for firing. Testing of new weapons is carried on without a halt





Wire "harp" gives angle of rocket-carrier's dive. Flame trails light up rocket-firing jeep at the left

Rocket shells can be launched faster than artillery shells of equal caliber. They are discharged from lightweight launching rails instead of heavy guns. Lack of recoil permits their use by aircraft, motor vehicles and small surface craft.

On the other hand, rockets are a relatively short-range weapon and are not so accurate as shells fired from a rifled cannon. Such objections are being overcome by the development of high-velocity rockets that approach the speeds of artillery shells and by improvements such as "spinner" rockets equipped with canted nozzles. The nozzles impart a spin to the projectile similar to the rotation provided by the rifling of a cannon barrel, making for straighter, more accurate flight.

Both Allies and Axis have used rocket projectiles. The largest, of course, was the giant V-2 with which the Germans bombarded London. This was a special purpose weapon designed for the one use. The United States is concentrating on rockets of smaller caliber that can be adapted to its own particular military needs.

Our Navy has found rockets most effective for paralyzing enemy shore defenses just before an amphibious landing. Launched from landing craft, as many as 8000 beach barrage rockets may be dropped on a couple of thousand yards of beach in a few minutes. Each rocket carries a 4.5-inch fragmentation shell packed with TNT. Showers of these projectiles have killed thousands of Japs. Heavier demolition rockets are used to destroy underwater obstructions and beach obstructions preliminary to an amphibious landing.

High-velocity rockets aimed from a moving airplane are now our most effective air weapon against "pin-point" targets on the ground, being more accurate than bombs dropped from level flight or from a dive.



Various types of rocket shells, above left. Loading and firing of rockets from tank is pictured at right

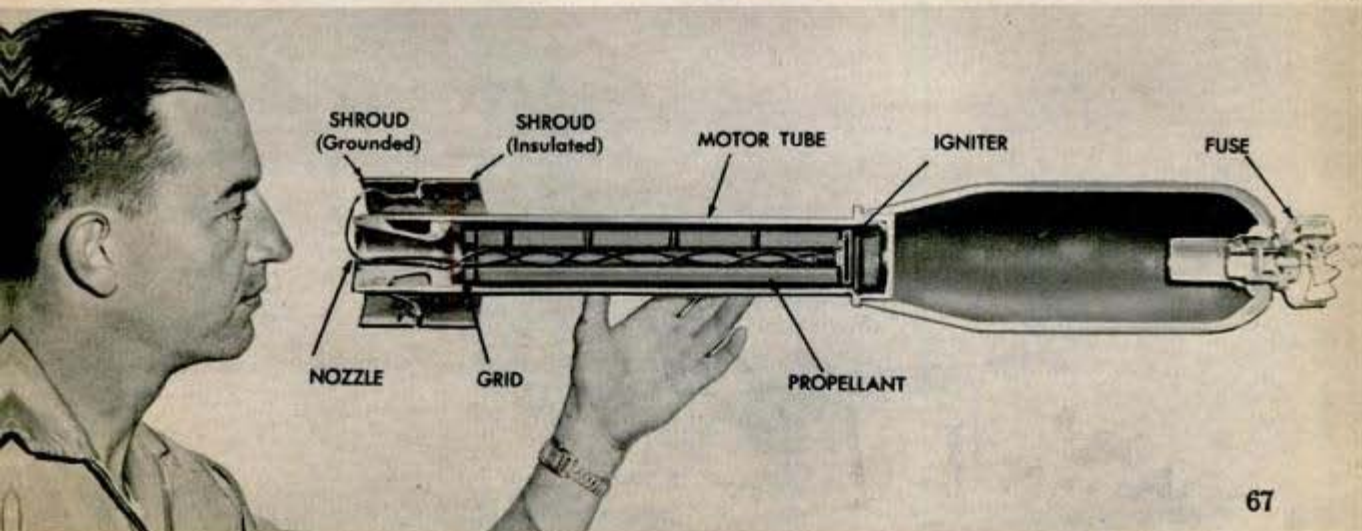
An airplane that carries eight 5-inch high-velocity rockets has a firepower comparable to that of a light cruiser and is capable of sinking heavy surface ships.

Rockets have been used as anti-aircraft weapons and even in air combat. They have been an effective weapon against submarines and also are useful for discharging flares and smoke.

So important a weapon have rockets become that this year the Navy is spending

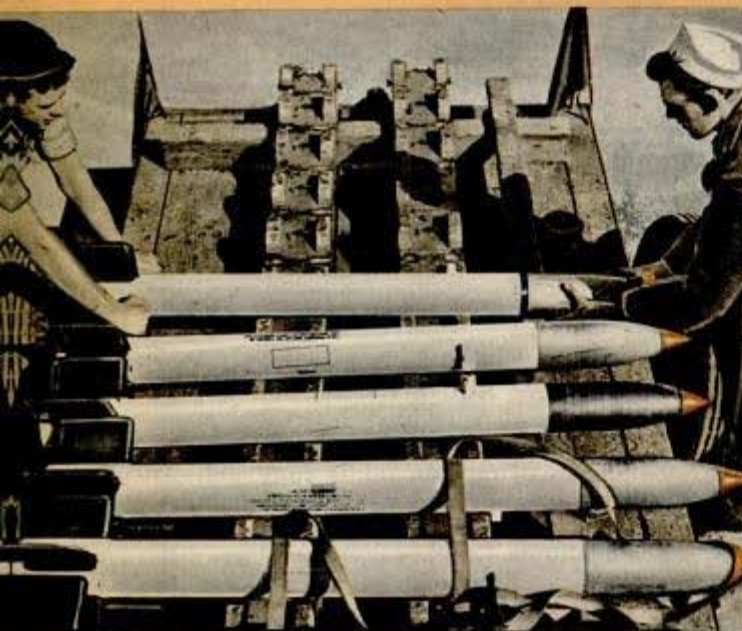
about \$100,000,000 per month for their manufacture. Still in their infancy, modern rockets already have become a necessary complement to tubed artillery weapons. Future improvements may increase their importance materially. For instance, no airplane now in use has been designed specifically as a rocket carrier. Part of the research at Inyokern has to do with the testing of new designs of rocket launchers, new aiming devices and the working out

Cross section of beach barrage rocket with 4.5-inch shell. Tens of thousands have been fired at the Japs





Rocket projector with 32 barrels being loaded above had big role in crushing Nazis. Twelve projectors laid down withering barrage. Below, fitting rocket shells to motors



of new techniques for using rockets. Scientists of the California Institute of Technology are participating in this work with Naval Ordnance experts.

A rocket motor is simply a tube, open at one end, filled with a fast-burning powder or some other fuel. It operates by the same reaction that is the principle of the jet propulsion airplane. That is, when gas pressure is built up inside a closed cylinder that has an escape orifice at its stern, the cylinder moves forward. This movement is not caused by the push of the escaping gases against the outside air but rather by the internal pressure against the front end of the cylinder. If the cylinder were completely sealed there would be no movement until it eventually burst from the pressure inside it. When an opening is made at one end the pressure is relieved in that direction, allowing the pressure inside to act against the opposite end. This principle is the same no matter whether the "motor" is a true rocket that consumes its own fuel or is of the gas turbine type that takes in air and then heats it to create the internal pressure.

A rocket projectile consists of an artillery shell attached to the front end of a rocket motor tube filled with jet propulsion gunpowder and with an open nozzle at its rear end. The fuel burns furiously when ignited, creating gas pressure that drives the rocket and projectile ahead. Stabilizing fins attached to the rear help guide the rocket.

Flame-tipped rockets streak toward Jap lines on Okinawa from Landing Ship Medium, Rockets





Naval ordnance men fit high-velocity rockets to rack of rocket-carrying plane for test run at desert range

A rocket takes off with an earsplitting hiss comparable to the noise of 10,000 blow torches. A large trail of gas and flame is ejected from its nozzle. The firing crew must stand to one side or at a distance to escape its blast of extreme heat.

Contrary to what you might think, the rocket motor does not operate throughout the flight of the projectile. The fuel is consumed in a few tenths of a second but in this short space of time the rocket accelerates to a high speed. During the rest of its flight it follows a curved trajectory just as if it had been shot from a gun.

Some rocket projectiles such as the Army's famous bazooka shell have a wallop

Observers use mirror panels to watch effect of high-powered rocket against target behind them in desert



out of all proportion to their size. The bazooka has the punch of a 155-mm. shell and can blast through the heaviest tank armor. Its terrific penetration is caused by the "hollow charge" contained in the projectile. Back in 1900 it was discovered that if a quantity of explosive that is ineffective against armor is formed into a hollow cylinder and then exploded, its blast has some 10 times the penetration power of a solid charge. This is because the blast of a solid charge is in all directions, whereas in a tubular charge the internal shock wave is compressed into a concentrated blast.

Rockets are one of the oldest of all gunpowder weapons. They seem to have been first used in the 13th century, before invention of the smoothbore gun. Guns were so much better than the crude rockets of the time that use of the latter was dropped until Congreve developed an improved type about 1800. For the next 50 years rockets were an important weapon. In one battle the British launched 25,000 rockets against the Danish fleet and Copenhagen. The fleet was sunk and the city burned to the ground in the one action. A representative rocket of the last century was the Hale spinner with a range of 4000 yards and a bursting charge of three pounds of wet guncotton in a steel or cast-iron shell.

Rockets again went out of use with development of the rifled cannon. This see-saw history of the rocket probably has reached its end. The new uses for these flaming weapons make it appear that rockets will occupy a place in our military arsenal from now on.

LUMBERJACKS' SKYRIDE



Traveling on a cable tramway, a self-propelled overhead lifting machine carries logs from site of felling to nearest stream or log loading point. Two lifting drums of the Skyhook operate independently, as shown at right. One line has hoisted a long log, other line reaches out for its load. Side view of machine, above, shows how traction cables run through the sheaves. Fitted with tires, as below, it runs on the ground



Three long logs dangle from machine, left, as it carries them to pile near power plant. Below is cable support, attached to tall tree top to let carriage through



Flexible Shaft for Drill Works in Tight Spots

Standard portable drills can be converted into more versatile tools with the addition of a flexible shaft which permits drilling "around corners" and in tight spots. The shaft fits into any portable drill chuck and is available with both straight and angle heads and offset spindles. Operated with one hand, it comes in four lengths from 18 to 48 inches and can be bent double without lessening the drilling speed. It fits into the drill chuck with a permanent grip and has a tough, protective case with firmly attached end pieces.

Robot Does Three Jobs For Pursuit Pilot

Combining three separate engine control operations in one, an automatic engineer simplifies a pursuit pilot's job and allows him more time for fighting. Regardless of changes in altitude, the robot maintains the power output previously selected by the pilot, adjusting the throttle, engine speed control and manifold pressure regulator whenever necessary. The unit insures smooth operation of the turbo power plant and safeguards the turbosupercharger by limiting its maximum operating speed. This is sometimes necessary at extremely high altitudes or because of battle damage.



Offset spindles and straight, 45-degree and 90-degree angle heads permit drilling around corners and in hard-to-get-at spots

Sander Polishes Odd Contours With Revolving Brushes

Odd and irregular contours and hard-to-get-at corners are sanded, finished and polished easily with a brush-backed sanding wheel that can be used on stationary and flexible shafts or portable electric tools. Designed to meet the various needs of cabinet makers, automobile and furniture finishers and owners of work shops, the sander can be used on wooden, metal, plastic and rubber. When the sandpaper backing the brushes is worn out it is replaced by a twist of a spool inside the wheel.

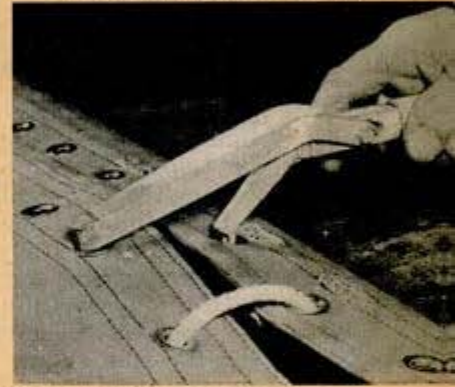




KP duty is a cinch to Sgt. Calvin L. Smith of Iowa City, Ia., ever since he built this electric potato peeler. Roughened interior of drum does work
AAP photo



Douglas Aircraft Co. photo
Tool invented by war worker closes like jackknife, holding canvas taut for lacing



GI fashions steel bow to hurl grenades farther than possible by hand. Below, Sgt. Reuben Cole, Decatur, Ill., with "M-2" apple corer he invented to speed pie making

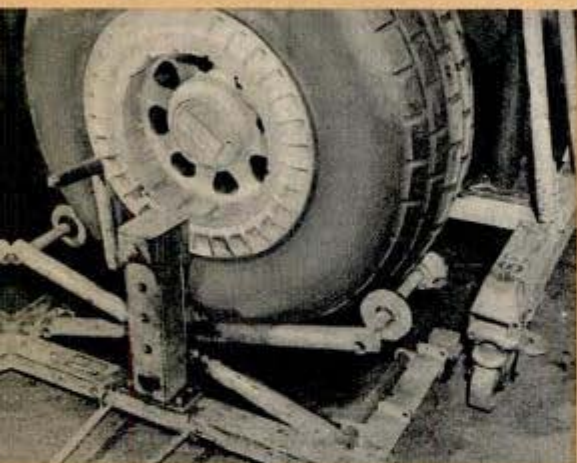


Clever, These





Saving one hour per plane, hoist invented by Douglas Aircraft mechanic lifts wheel for attachment to landing gear and permits rotation



Douglas Aircraft Co. photo
Aircraft worker devised squeeze yoke he uses with pneumatic gun for riveting end of wing. It eliminates need for bucking. Below, Navy officer turns coconut sculptor

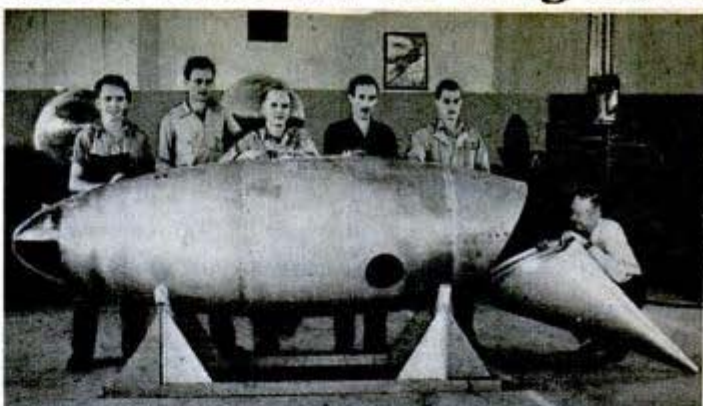


Yankees



Below, German self-propelled gun carrier was used to help clear the rail yards in port city

Hitchhikers Ride to Air Base in P-38 Wing Tank



Long before transport and bomber planes are able to land, ground crewmen and their equipment are rushed to a newly captured airfield in the P-38 Lightning's special wing tanks. The tanks, which carry a maximum of five cramping occupants each, are similar in size and shape to the 300-gallon auxiliary drop tanks which hold fuel on long

distance flights. The noses of the tanks are transparent to give the passengers light and counteract the feeling of confinement on long hops. The tanks also are used to fly stretcher cases to base hospitals and in the future may be used to carry fully equipped infantrymen or paratroopers at pursuit plane speed to surprise the enemy.

Stationary "Runt" Trainer Has A-20's Wings and C-54's Pilot Section



Called the "runt" because of its radically functional design, a trainer which is half transport and half bomber aids in the teaching of ground crews at the Santa Monica, Calif., Army service school. The hybrid mockup combines the pilot section of a C-54 with an A-20 bomber's outer wings. Almost every operation from prop feathering to mixture control can be simulated on the nonflying trainer. By correcting operational errors on the "runt," students avoid trouble later on real planes.

Blackout Tent Shelters Medics Giving Plasma and First Aid Under Fire

For the administering of plasma and other first aid at the front, a small lightproof tent has been developed by the United States Navy Bureau of Surgery. Illumination is furnished by a flashlight suspended above the medical corpsmen while they work. The tent is aluminized on the inside to intensify the light. Made of barrage balloon fabric and coated with synthetic rubber, the tent weighs less than nine pounds and can be folded up quickly and carried in the duffel bag of a corpsman. Rain and mildew proof, it is sometimes used as a waterproof blanket or to catch rainwater.



27-Ounce Engine for Model Packs One Horsepower

Weighing only 27½ ounces, a model airplane engine built by Marine Pvt. Elmer Beers, of Seattle, Wash., has seven cylinders and generates one horsepower. The four-cycle, radial-type engine acts on a 14-inch, two-position, three-bladed propeller. The fuel, a mixture of five parts gasoline to one part lubricating oil, passes from the gasoline tank to a carburetor that has an adjustable metering jet and thence to the crankcase, which thus becomes the intake manifold. The mixture then passes into the lower part of the cylinder and reaches the upper chamber through the intake valve in the top of the piston, the intake valve opening through suction on the top of the valve. A battery system is used for the ignition. The marine built the complete unit with the exception of parts of the electrical system such as battery and sparkplugs. It took him 2000 hours.



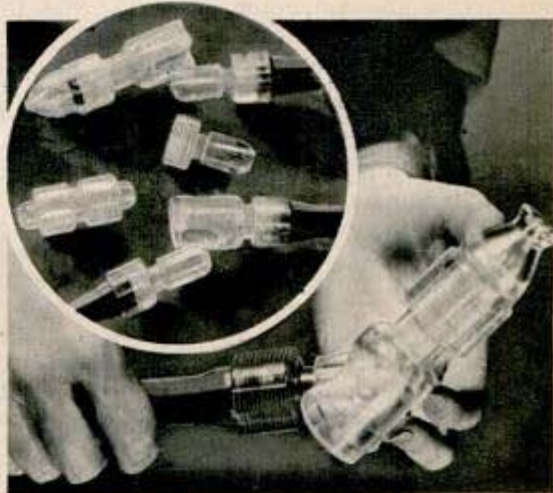
Rubber Clamp Seals Bullet Hole In Less Than 30 Seconds

Thousands of gallons of fuel and water are saved on the battlefronts by a synthetic rubber patching device which plugs bullet holes in less than 30 seconds. The device consists of a ring of spongy synthetic rubber and a patented spring clamp. The soft rubber conforms to any shape and works on both cylindrical and irregular shapes; it also resists the deteriorating effects of oil and gasoline. One end of the clamp is inserted through the hole and two metal fingers open up to grip the inside of the tank, drawing the patch tight to the outside. The patch usually serves as a temporary seal and is removed when welding equipment is available to make permanent repairs. It can plug holes ranging in size from one half to four inches in diameter.



Plastic Coupling Locks Hoses On Ball-Socket Principle

Lengths of garden hose can be joined swiftly by an all-plastic coupling consisting of a ball and socket locked together by a lip and flange device. The couplings are locked together with a twist of the wrist and they can be "broken" by disengaging the lip and flange. The coupling is attached to the hose by placing a knob over a coupling sleeve and locking this with a large hexagonal nut. Locked, the fittings remain watertight under 80 pounds of pressure. Other devices made with similar locking arrangements are faucet attachments, nozzles and repair fittings.



RIDE 'EM, FERRY PILOT!



WHEELS of the Flying Fortress were just leaving the ground when the instructor in the copilot's seat reached over and cut the ignition to one engine. The plane swerved hard, only 10 feet off the ground.

Sweat pouring from his face, the pilot corrected with the rudder, then reduced his angle of climb. Slowly, carefully, he worked the big bomber up to a safe altitude on its three remaining engines.

But his ordeal wasn't over. A minute later another engine died when the instructor turned off its switch. Only two motors were working now, both on the left side, and for a moment the bomber again was almost out of control. The pilot adjusted his controls, called the tower for permission to land and began a slow turn back to the field. Closely watching his altitude and air speed he put his wheels and flaps down and settled in to a safe landing.

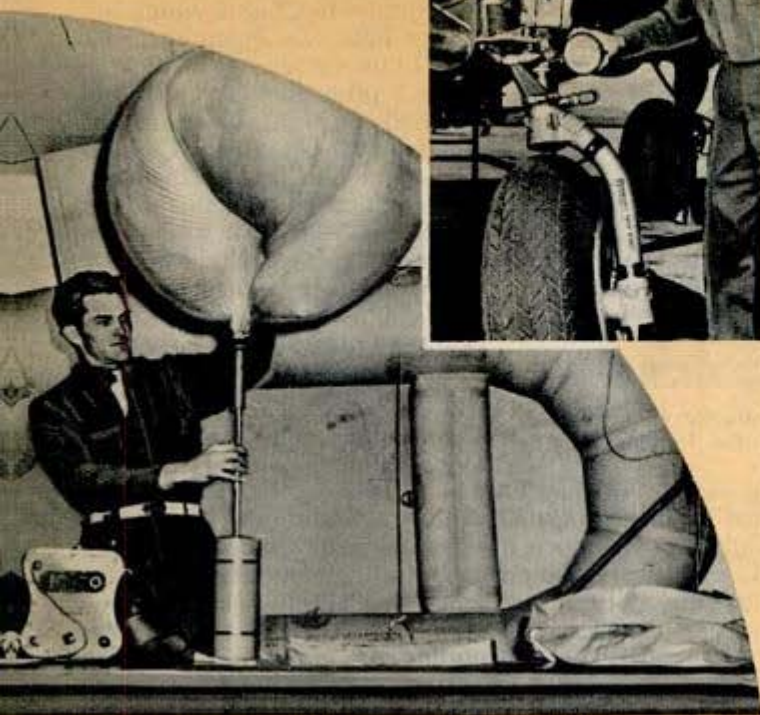
This nightmare procedure, to train a pilot to overcome the unexpected, is part of the training program that the Ferrying Division of the Air Transport Command gives its pilots. It's typical of the rigorous training that all Air Force pilots receive.

Twin-engined pursuit pilots have crashed because they didn't know what to do when one engine failed; bomber pilots have lost their ships on takeoffs because they hadn't learned the correct pro-

Ferry pilot above prepares to fly a new P-51 Mustang from plane factory, checking carefully to be certain everything's in order. Tomorrow he might be called on to pilot a B-25 or P-38, or even a B-29



Small but powerful landing lights of P-61 retract into fuselage with nose wheel



Portable hydrogen maker inflates balloon used to raise aerial life raft radio on overwater hops, above. Student pilot at left, below, looks on as instructor starts engine of a B-25



Bomblike outboard fuel tanks under wing supply Black Widow ferry power

AUGUST, 1945



cedure when a partial power failure occurred at that critical point. By doing the right things rapidly in such emergencies a pilot can almost always bring his ship and himself down safely. Ferry pilots in particular are trained to handle emergencies because they fly brand-new airplanes that are still in the shakedown stage.

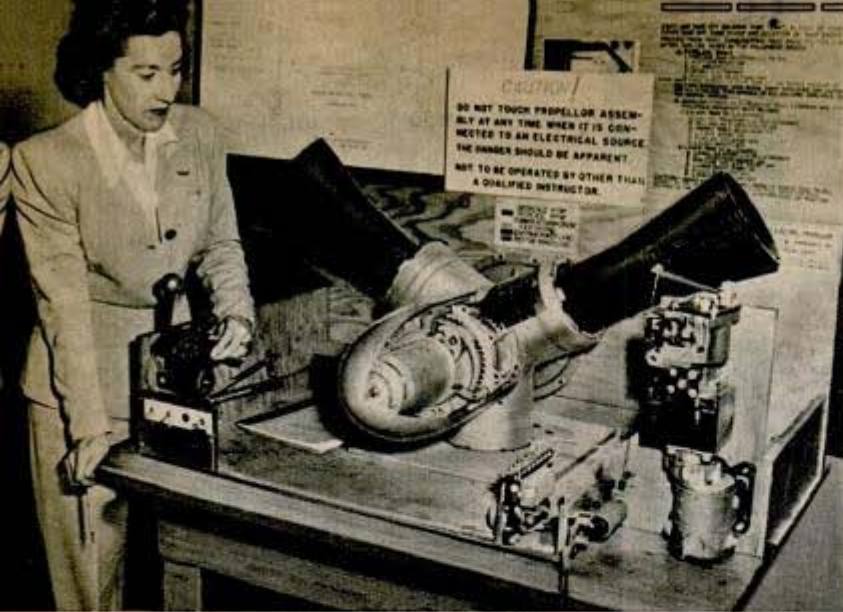
They learn to make safe single-engined landings with two-engined airplanes, they learn how to land without the use of flaps or brakes, they are instructed in what to do if the landing gear fails and they learn how to recover and climb away again if they overshoot a field in attempting to land.

The average combat pilot knows how to fly four or five different planes. An average ferry pilot is able to fly upwards of 20 or 30 different types. This versatility is necessary because he may be called on to fly half a dozen or more different kinds of planes in a single week. Even a veteran ferry pilot, consequently, spends considerable time as a student, learning to fly types with which he is not yet familiar as well as studying the new models that come from the production lines. Each type behaves differently and must be handled differently from another.

Thus a ferry pilot must remember to get his nose wheel on the ground if he is landing a B-24 but he must remember, if he happens to be flying a B-17, to keep the nose up and allow the plane to settle on its tail wheel instead.

He has learned that the tricycle





Girl instructor explains details of the electrically operated variable pitch propeller to student pilots of the Ferrying Division

landing gear of a P-38 allows him to make a cross-wind landing without hazard and he also has learned that another fighting model, a lighter, single-engined tail-wheel plane, can be landed safely only against the wind and must be closely controlled until its wheels have stopped rolling.

He learns that an A-20 is landed by making a flat approach to the field with power off. But if he is landing an A-26, that superficially resembles an A-20, he must make a steep approach with the nose wheel down and must maintain considerable power while coming in. He knows that in a heavy P-61 Black Widow he can come in flatly with power on or, by using the various flaps, he can make a short steep approach and come to a stop in a very short distance.

Basically there are five different classifications of ferry pilots. Class 1 pilots are able to fly training planes and may also act as copilots on larger craft. A subdi-

vision, Class 1-P, contains the pilots who are qualified to fly single-engined pursuits. A Class 1 pilot may graduate after instruction to Class 2 which includes light two-engined trainers. Later he may qualify as a Class 3 pilot and handle twin-engined cargo ships such as the C-47 and C-60. Class 4 pilots are trained to fly the medium two-engined planes including the B-25, A-26, P-38 and P-61.

Class 5 pilots in addition to all of the above learn to fly four-engined aircraft including the B-17, B-24 and the VHBs (Very Heavy Bombers) such as the B-29.

A couple of years ago the B-25 Mitchell bomber was one of the "hottest" airplanes that the United States had. Today in addition to its combat duties it also serves as a "ghost" plane. At the Long Beach, Calif., headquarters of the 6th Ferrying Group, Major Jack London, Jr., in charge of transitional training, uses B-25s to simulate the characteristics of a number of other planes, including two-engined aircraft that carry no copilots.

In a ghost B-25 an instructor may go aloft with a student and tell him "Today we are in a P-61. No copilot. You will have to do everything yourself." With that he kills the ignition to one engine and watches closely while the student goes through the procedure, 10 steps in all, of isolating the engine, feathering its propeller, shutting off the fuel, closing the cowl flaps and adjusting the flight controls for single-engine operation.

You don't begin to appreciate how much a ferry pilot must know until you follow him through the typical course of instruction that applies to any one type of plane. Most planes such as P-38s or B-24s have their own volumes of operational instructions, a representative book containing 125 pages of basic instructions plus 550 pages of supplemental information. The pilot must pass an examination in the fuel, oil, hydraulic and electrical systems of the type he is studying, understand accident prevention for that type, as well as emergency procedures and ditching, and learn its radio and oxygen systems. He memorizes power

Painted white for Arctic duty, PBV is ready for ferrying from an ATC field



POPULAR MECHANICS



curves and cruising charts of its power plants. He becomes completely familiar with the cockpit, learning to know instinctively the locations of all the instruments and controls.

How to use the fuel system of a large aircraft is a study all in itself. A B-24, for instance, has 12 separate main fuel cells plus six wingtip "Tokyo tanks." Ordinarily the engines take fuel from certain designated tanks but by means of four main fuel selector valves, plus two transfer valves for cross-feeding, various other fuel movements can be made. If an engine goes dead it is possible to transfer the fuel from the cells that feed it into the cells that are connected to the remaining engines. It also is possible, if a fuel cell develops a leak, to save its fuel by pumping it into other tanks that are partly exhausted.

Pilots who are qualifying for a four-engined airplane must likewise learn how to use the turbosupercharger with which it is equipped, how to operate and adjust its automatic pilot and how to use the "formation stick" attached to the automatic pilot and by means of which the plane can be maneuvered with a minimum of effort. Among the other things that must be learned, also, are the manifold pressures and engine r.p.m. settings that are used for taking off, climbing, cruising and landing.

Further instruction in each type of plane includes the various turns in the air and the

(Continued to page 150)



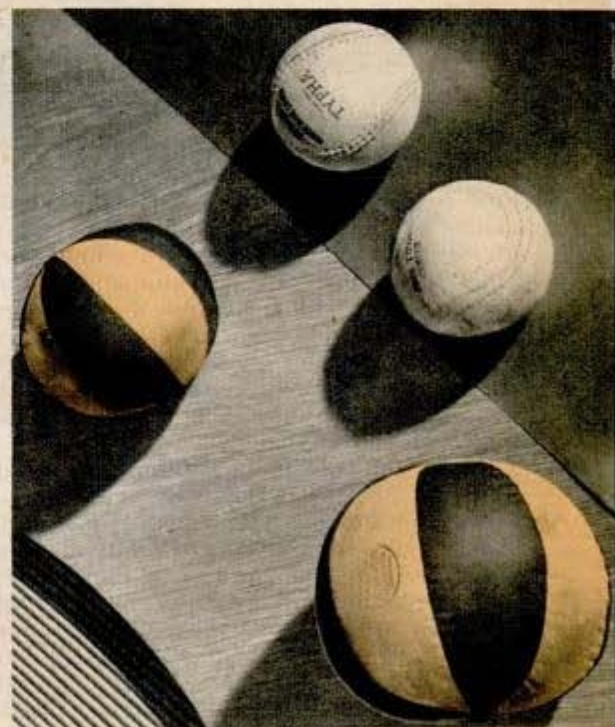
Assembly line workers apply finishing touches to a long line of Black Widows on the flight field, above. Left, ATC girl instructor explains use of fuel control switches on a B-24. Below, instructor in B-25 shows how to employ hand pump to build up pressure for getting wheels down when coming in for landing



"DOWN" from THE MARSHES



Light, downy fluff of common cattail finds demand as upholstery material because it's buoyant, water resisting. Above left, the fluffy material as it prepares to burst out of its cover. Above right, its downlike quality is apparent when it is released from spike. Left, a harvester gathers in spikes. Material is now used in cushions of Ducks and PTs and is a life preserver if the occasion arises



Hard and soft balls, above, are made of Typha, trade name for cattail fluff. With other material, left, it forms insulating slabs or mats

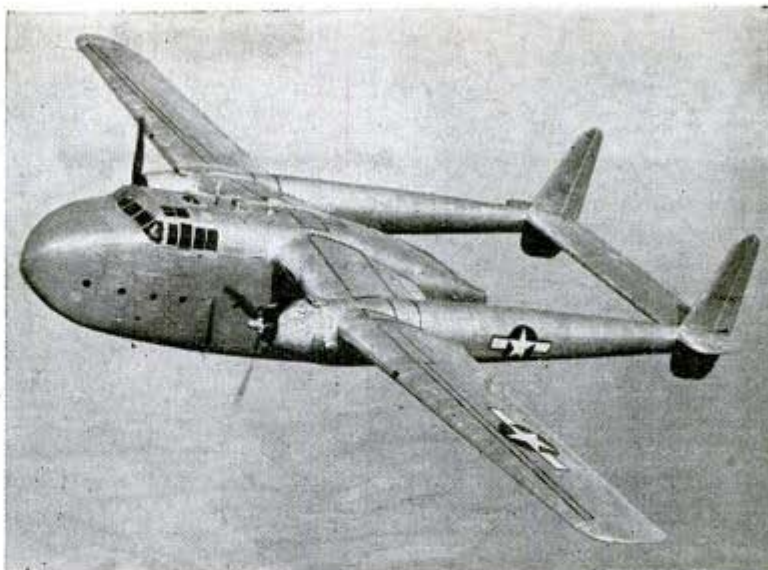


POPULAR MECHANICS

"Flying Garage" Whisks Auto 4000 Miles

Taking your automobile across the continent in a hurry, or from one continent to another, will be no problem at all after the war. You'll drive it right into the fuselage of a cargo plane like the Fairchild Packet. The plane can swallow the car easier than the whale swallowed Jonah and then whisk it 4000 miles as easily as a freight car carries it by rail. The Packet's two engines can do more than 200 miles an hour and haul a payload of nine tons. The fuselage, which measures 2312 cubic feet, has huge rear doors, a square cargo compartment and level floor at truckbed height. Large trucks which haul cargo to the Packet are not too big to nestle under the tail while being unloaded. The plane also has a forward cargo door for loading and unloading smaller packages.

A large auto can be driven into the Packet as easily as into a boxcar for cross-country trip

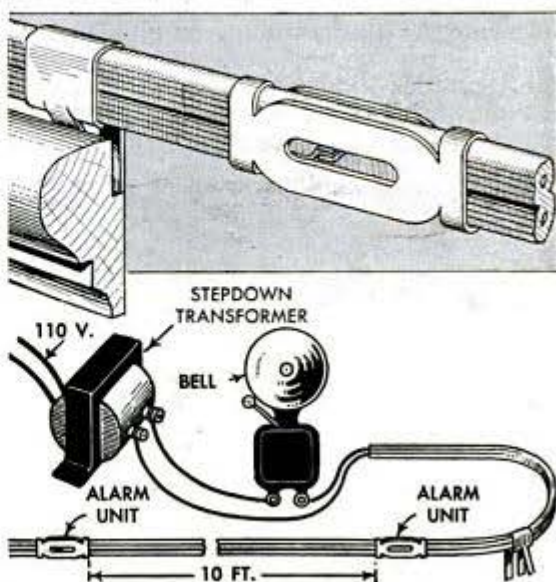


Home Fire Alarm Has Heat-Sensitive Unit Every 10 Feet Along Wire

High school boys in New Jersey manufacture a home fire alarm as part of a Junior Achievement program designed to give teen-agers a chance to learn about business. The heat-sensitive unit, only $1\frac{1}{8}$ by $\frac{3}{8}$ inches, is connected to two ordinary, flat surfaced, rubber covered wires at 10-foot intervals. A temperature of 160 degrees Fahrenheit anywhere along the line springs a unit, closing the circuit and ringing a loud gong. The system may be installed by any home owner.

Ultraviolet Spies on Tropic Fungus

Filtered ultraviolet rays used by the FBI as an electrical spy are proving invaluable also in detecting fungus deposits which attack materiel of the armed forces in the tropics. The harmful organisms fluoresce and glow brightly when exposed to the black ray lamp.





MAIL ORDER HOUSE

By Harry Botsford

WALK briskly if you have the chance to tour one of the world's largest refrigerators. It's four degrees above zero, numbing your feet and legs quickly. Here are tangibles that would take millions of ration points to buy. This is Navy property. Here is room for 39,000,000 pounds of

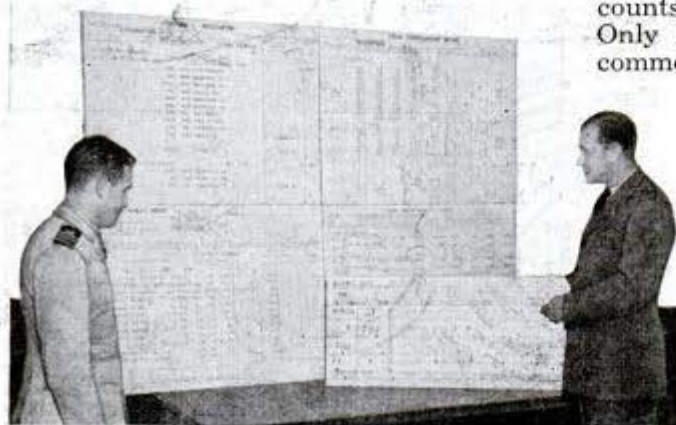
Giant sling speedily swings trucks aboard ships, a task all in the day's work for BUSANDA's experts

frozen meats, 15,000,000 dozen eggs, food for a fighting Navy, just one vital link in the longest supply line the world has ever known—and the most efficient.

This refrigerator is one of the little known operational units of BUSANDA, the Navy's Bureau of Supplies and Accounts, which does things on a grand scale. Only Hollywood, where superlatives are commonplace, could do full justice even to a single Navy Depot.

BUSANDA's job is to receive 700,000 odd items and warehouse or store them—and distribute them as and where needed.

When the Petroleum Pool of a BUSANDA Navy Depot received an order for 366,000 blitz cans of gasoline of a specified type, the 5-gallon cans of fuel were turned



Machines punch cards similar to oversize replica to keep record of all Navy stores



FOR THE NAVY

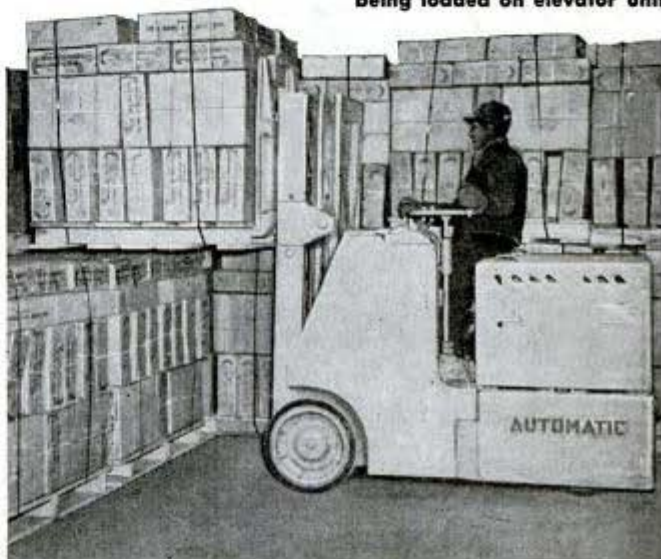
out in jig-time. To the men in the Petroleum Pool, fueling a couple of aircraft carriers is just an incident in a day's work.

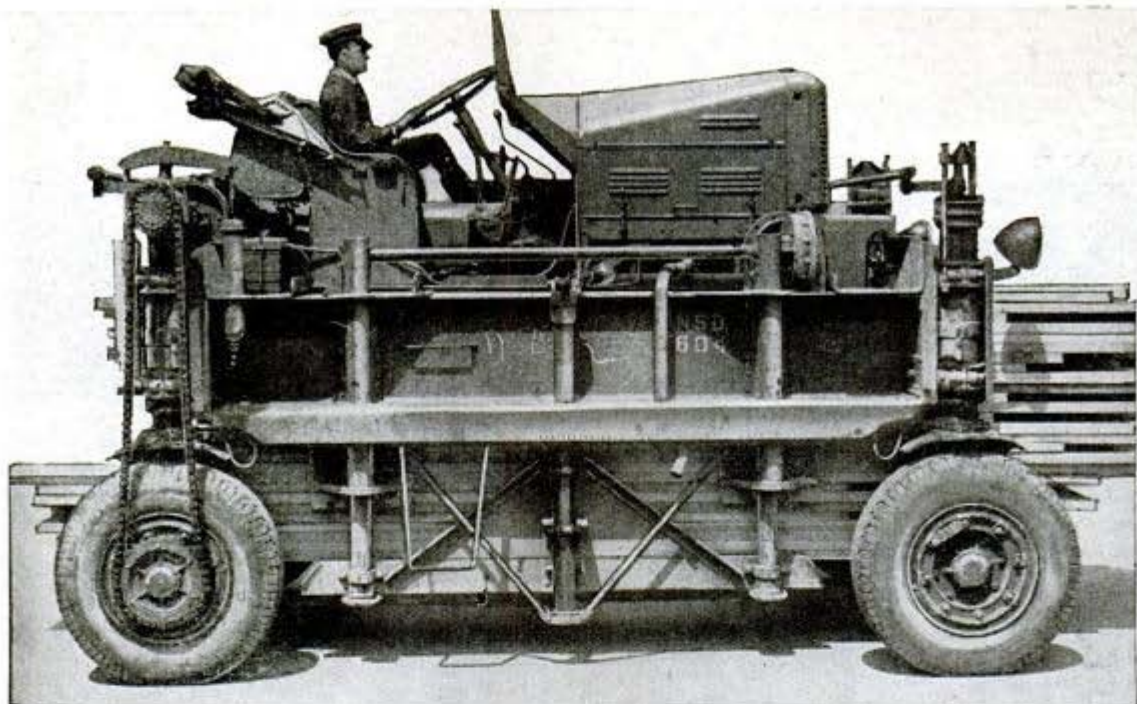
In the early days of the Pacific venture, the then small but highly efficient BUSANDA tightened up its belt, rolled up its collective sleeves and really went to town.

The Jap Navy was frustrated and bewildered when our Navy was able to hit hard and often. BUSANDA made it possible for our combat ships to provision and refuel so fast that the Japs firmly believed that we had double or more the number of ships actually in service.

A ship's capacity for stores lessens every hour the ship is at sea. The radius of fighting ships once was limited to the distance they could cruise from their bases before they had to return for supplies. BUSANDA and other Navy divisions came up with some new supply tricks that give virtually unlimited operating radius.

Above, following Marines on Iwo Jima by a few hours, the Navy lands supplies. Below, even meat is packed on a pallet, standard 4-foot cube being loaded on elevator unit





It looks like a Rube Goldberg invention, but the Navy uses this lumber carrier because it's efficient, fast

What the Navy put in operation was a pipe line of supplies directly to the forward areas. The materials flow into several Navy Depots, some far inland. The Depots store an astonishing volume of materials that eventually find their way to the disbursing coastal establishments. They are the reservoir stations in the vast network of the supply pipe line.

One year's requirements for our Navy would fill a freight train 700 miles long, reaching from Boston to Charleston. The

Navy consumes enough fuel in a year to fill a train of tank cars reaching from New York to San Francisco.

In a coastal Navy Depot you can see logistics in action. It's a dramatic visualization of what can be accomplished by men who are specialists and who are unafraid to experiment. Take Rear Admiral M. G. Slarrow (SC) USN, Supply Officer in Command of the Naval Supply Depot at Norfolk, Va., and his passion for pallets. To most of us, a pallet is something on which

a painter mixes his colors, or a small mean bed. The pallet the Admiral regards with such affection is entirely different; in Navy phraseology, "a rough platform constructed of two facings of hardwood boards, spaced apart and joined by three 2 by 4-inch stringers to form a 48 by 48-inch unit."

The pallet forms the base for a standardized package which is filled with everything from small arms to corn flakes, forming a unit that is a 4 by 4 by 4-foot cube.

Handling is simple, easy and predictable. A fork truck slips long steel fingers under it. The operator flicks a switch and the load is lifted as the tiny mobile unit backs and swings away. An elevator on the unit lifts the cube to the right height and deposits it.

Models of ships and loading equipment are used to work out better stowage methods





Coast Guard photo

Space is at premium as supplies cover deck of LST, Coast Guard manned invasion ship bound for New Britain

One man can load a freight car in 40 minutes. The cubes fit snugly in a ship, plane or truck.

An integral part of a coastal Navy Depot is a Petroleum Pool. Fuel requirements for ships, planes and mechanical equipment are astronomical. The Petroleum Pool of one Depot is on a bleak, wind-swept island. Into it come five different types of gasoline, several varieties of fuel oil and the best Diesel fuel the American oil industry can refine.

The quality of the products must be constant and on a high level. From 1000 to 1400 tests are made each month in a modern laboratory, subjecting the gasoline, fuel oils and Diesel oils to severe and exacting analysis.

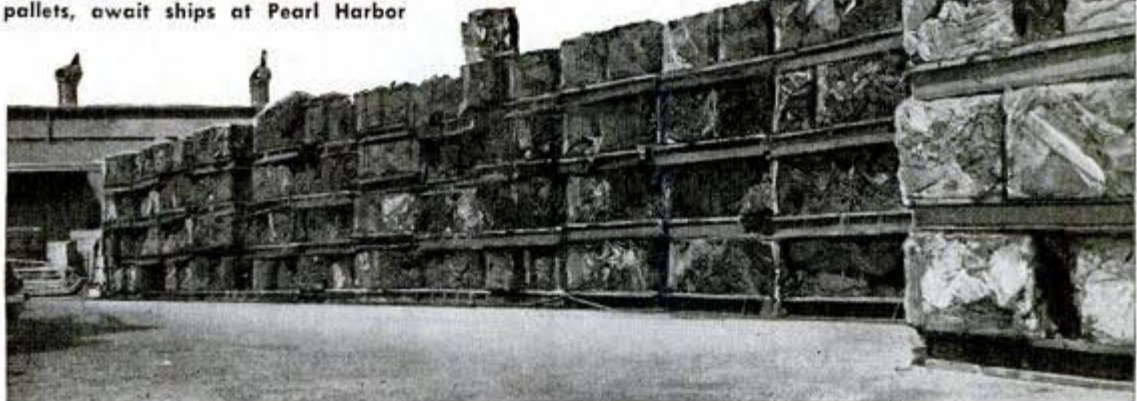
Some of the storage is above ground; much of it is in underground tanks that

are 125 feet in diameter, 20 feet deep and invisible from the air.

In this area there is storage for 2,500,000 barrels of fuel oil, 600,000 barrels of Diesel fuel and 5500 barrels of gasoline. The Pool operates six and a half miles of modern railway and 100 miles of pipe line.

There are five piers stretching out into water 40 feet deep. Nine outlets for each type of petroleum product on each side of the piers guarantee fast loading. The piers and the Pool can handle 300 combat ships a month. Last year 3950 Navy ships fueled there. More than 1,600,000 barrels of petroleum products cross these piers every month, 4,050,000 long tons in a year.

Briquettes of scrap metal, loaded on pallets, await ships at Pearl Harbor





U. S. Navy photos

Electric knife slices copper pipe for salvage at the Pearl Harbor depot

Ships that come in for fuel range from a small launch to a flat-top or battleship. Sometimes there isn't time for the ships to berth, so the Pool operates a dozen big barges for at-sea delivery. Each barge carries only one product, thus eliminating the possibility of any contamination.

Much of the petroleum products arrive at the island in tank cars. Once each tank car was uncoupled and tediously emptied through pipe lines. The delay annoyed the experts. They wanted speed. They have it today, through a daring but highly efficient method. Forty-two tank cars are run over an unloading rack. In seconds, a flood of fuel oil is gushing into the sump; 300 tank

skills and knowledge to work winning the war.

When first Navy units landed in the South Pacific and warehouses were set up close to combat areas, assorted trouble of a serious nature developed. Shoes placed on shelves became mildewed rags in a couple of weeks. Steel parts corroded and became useless.

"We found climate as bad an enemy as the Jap," a BUSANDA official told me.

It didn't take the Navy long to whip it. Today, goods going into certain wet and torrid climates are incorporated in a special package unit. The package weighs about 2500 pounds and is processed, covered with a plastic spray

which forms a moisture-proof film over the individual contents.

The average coastal Navy Depot boasts that it can supply in quantity anything from a tooth brush up to a floating dry dock, from a vitamin pill to a bulldozer.

Retail requisitions at the Depot are filled as carefully as a druggist compounds a prescription. Boxes of standard sizes roll along an assembly line as they are packed. Covers are securely fastened with steel straps and the boxes move along to a section which is an integral part of a big scale. A girl cuts a stencil and the precise weight of each box and

Palletizing supplies saves time and men. Miniatures help in planning



its contents becomes a part of a simple code stenciled on the box.

It's a short haul to the piers where fighting ships await their supplies. Civilian stevedores are employed. As trainees in a stevedore school, they were taught the job by ND experts. Their efficiency is superlative. We load a ship quicker than any other navy ever has been able to do it. That means a quick turn-around, putting the ships back to sea without delay.

BUSANDA is pretty fussy about its coffee, too, and operates five big coffee roasting mills. Our Navy drinks more coffee, per man, than any other navy.

In the main building, which has more space than the Empire State Building, you enter a door from a warehousing activity and find yourself in a modern, compact broadcast studio, furnished in excellent taste and replete with unusual facilities. It is the world's largest sound system, operates 962 speakers scattered strategically around the central Depot. In addition, there are 53 plastic trumpets, five and a half feet in diameter, which function in noisy sectors of the Depot. Soft music is played during the lunch hour; during a change of shifts the station plays quick marches. Night forces prefer jive—and they get it—in quantity, too.

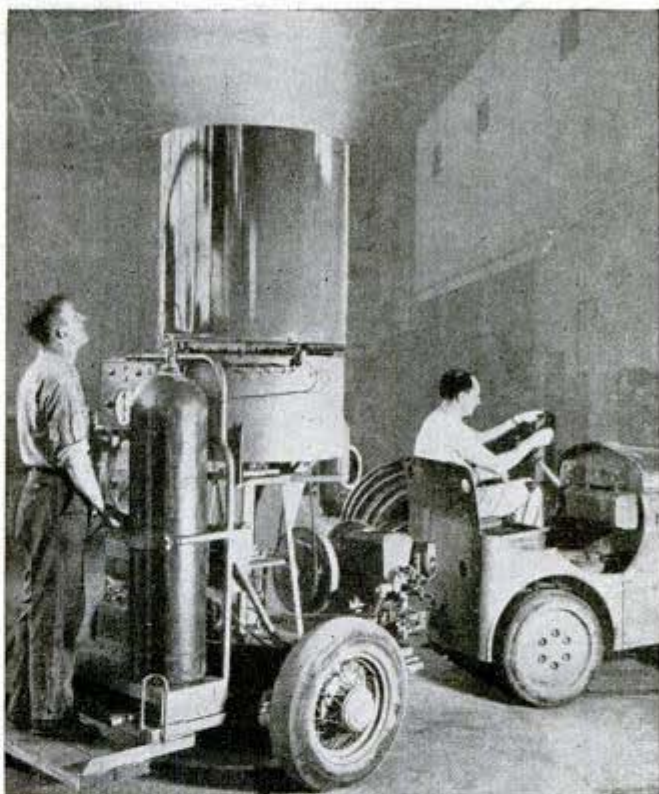
Since the system was installed productive capacity of the workers has increased from 3 to 14 percent. Absenteeism has been curbed sharply.

BUSANDA will own and operate fully 86,000,000 square feet of warehousing by the end of the year. It is steadily increasing its facilities. The warehouses and transit sheds are so large that you don't walk through them, you ride in a station wagon. The new ones will be larger.

Regardless of the tremendous demands of the future, America can rest secure in the ability of BUSANDA's unsung corps to supply the Navy with all its needs, which will be plenty!

ⒸA penetrometer, which records mechanically the pressure required to cut through a sample of meat, reduces human error in U. S. Department of Agriculture ratings for tenderness.

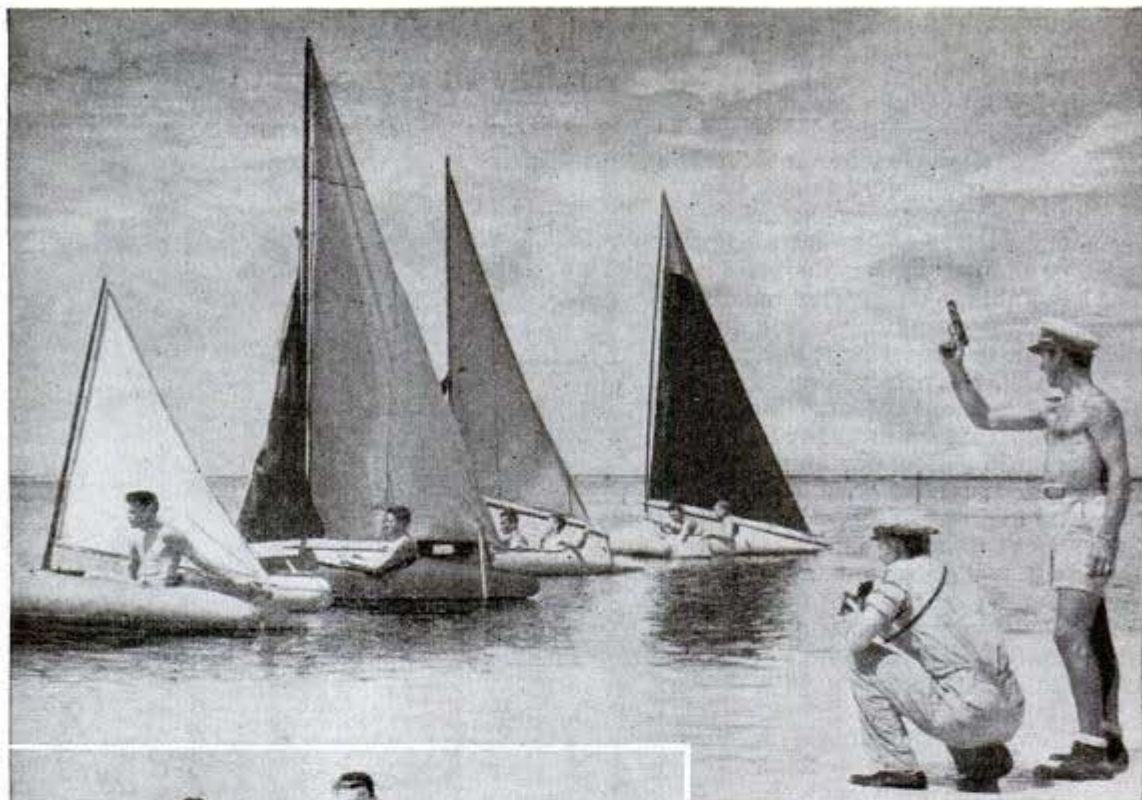
Mobile DDT "Fog Generator" Rids Plant of Mosquitoes



Two-man patrols riding a mobile aerosol dispenser blow clouds of insecticide through the Westinghouse Company's Merchant Marine plant on the Delaware River to annihilate the hordes of mosquitoes bred in neighboring swampland. The blower, powered by a gasoline engine, shoots DDT mixed with solvents and a dispersing agent into the air. The firmness of the droplet particles causes the fog to hang in the air and infiltrate every nook and cranny of the 27,000,000-cubic foot plant.

Science Can Grow Optical Crystals Far Bigger Than Nature's

Making atoms do as they are told is the key to a new process which manufactures optical crystals larger than any produced by nature. Mica is used to control the atoms in the method, developed by Dr. Cutler D. West and Frederick J. Binda, research chemists. It permits large-scale production of optical crystals which can be cut to split a single beam of light into two bent beams, thus making the phenomenon of double refraction widely available to optical engineers. Polarizing prisms can be made of the crystals. Molten sodium nitrate is formed into crystals synthetically, with the mica introduced to control the arrangement of the atoms when the molten mass begins to harden. Surface of the melt next to the mica starts to harden first, the sodium atoms falling into their proper place on the mica. Subsequent layers harden automatically in the desired arrangement.



Belly Tank Outriggers Sailed by Flyers

"Gas tank regattas" are a favorite form of relaxation for 7th Air Force personnel stationed on Pacific islands. The flyers build their own outrigger sailboats from whatever salvage material is available. Favorite items are belly tanks, wing tanks and oxygen tanks, supplemented by old bazooka barrels, broken Army cots and life rafts.

Above, "tin can fleet" begins race. At left, homemade outrigger with gas engine

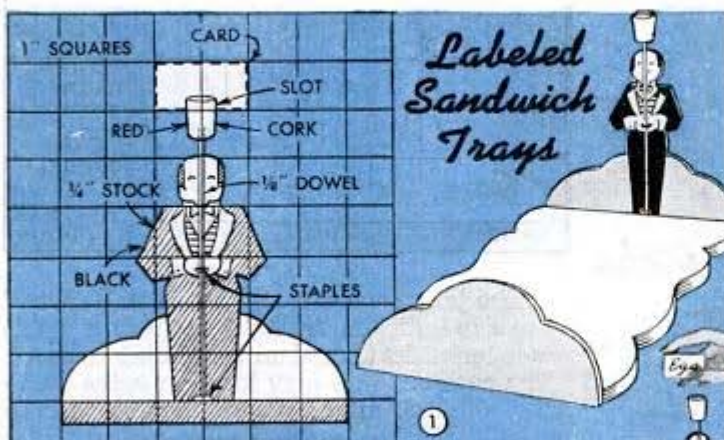
Electric Meter Clocks Actual Hours of Aircraft Engines and Flight

Actual hours of either engine operation or flight of aircraft are told almost to the split second by an electrical meter which measures 3 by 2½ inches, weighs only seven ounces and can be mounted easily on an instrument panel or other convenient place. The meter's largest hand makes a complete revolution in 10 hours, the middle hand a revolution in 100 hours and the



smallest hand one in 1000 hours. Either the ignition switch or a special oil pressure switch is used for engine hour clocking. For recording flight hours a switch on the landing gear starts the meter at the time of takeoff and stops it when the plane lands. The device operates on six, 12 or 24 volts direct current.

☐ Dairy cattle fed a grain mixture containing synthetic urea as a substitute for protein feed gave as much milk as those fed a grain mixture which contained soybean meal, reports the United States Agricultural Research Administration.



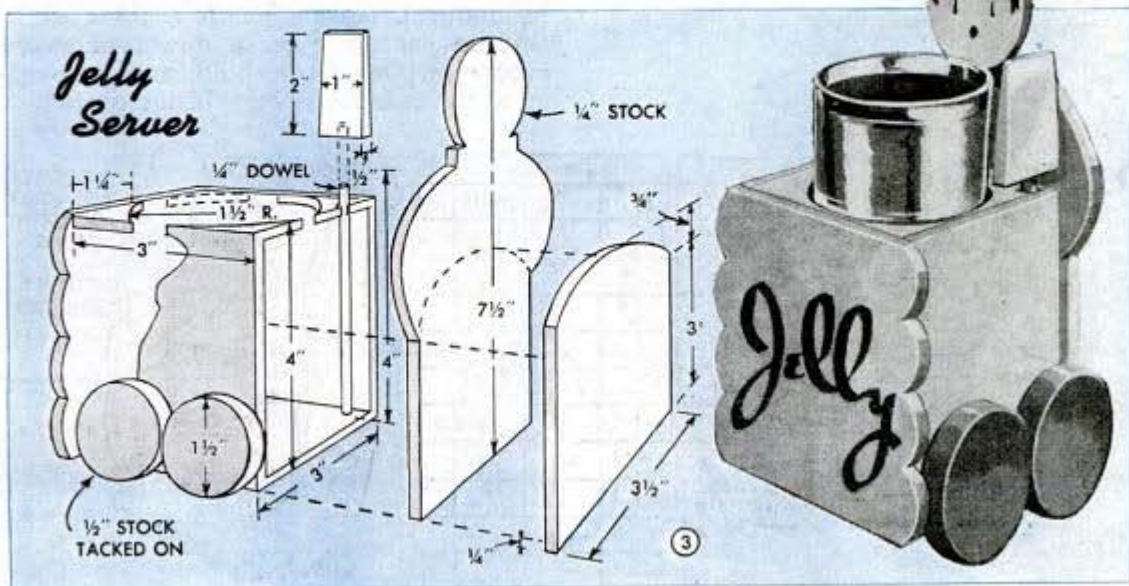
*Labeled
Sandwich
Trays*

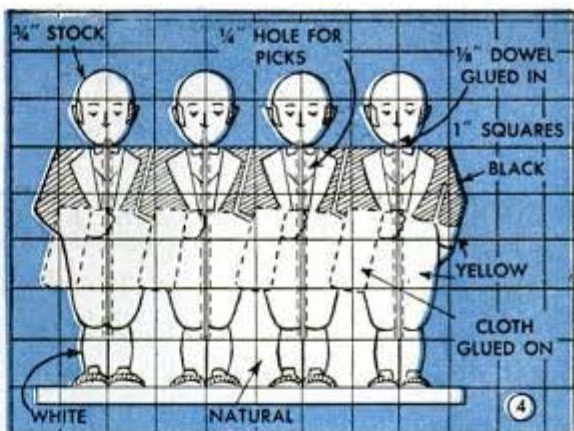
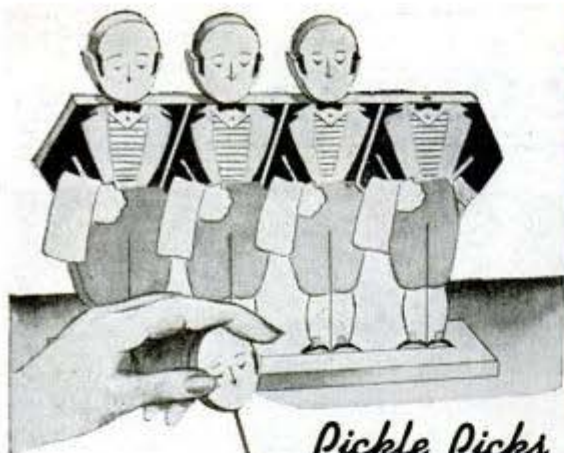


Novel Touches for BUFFET SERVICE

PROVIDING a distinctive touch to your buffet table which guests will long remember, the colorful wooden accessories shown and described in this article can be made from odd pieces of scrap wood. Only a few tools, including a hand coping saw, drill and hammer, are required to do the work. As gifts, these buffet accessories are highly acceptable. Or you can make up a number and put them on the counters of novelty shops, where they will find ready sale at appropriate prices.

The set consists of four items, a sand-





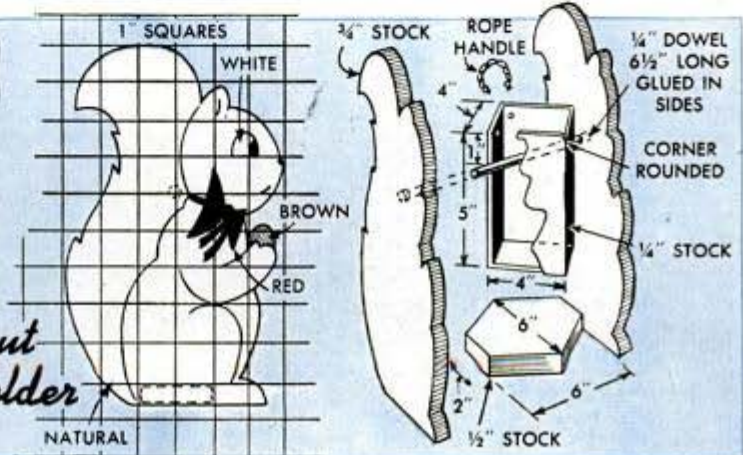
wich tray, a small jam or jelly-glass cart, a set of four midget butlers, whose heads are handles for pickle picks, and a pair of squirrels housing a nut or candy box.

Instead of making just one sandwich tray, make several of them. The tiny butler deftly supervising each tray holds a $\frac{1}{8}$ -in. dowel with a slit cork at the end to take a card which you can use to label the particular kind of sandwiches the tray is to hold. The bottom of the tray has scalloped edges as shown in Figs. 1 and 2. Two round-head staples at the hand and foot positions hold the dowel. The tray bottom may be finished natural, using only lacquer or clear varnish.

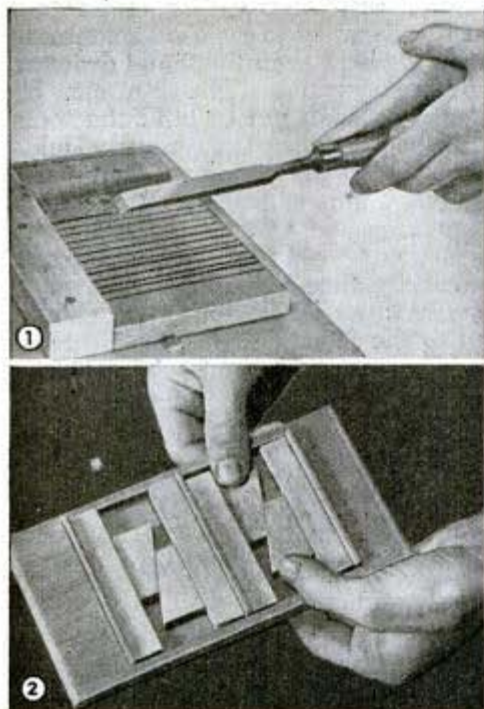
The jelly server is simply a small cart of the size indicated in Fig. 3, with four small wooden disks tacked on to simulate wheels. The cutout figure may have an extra overlay. The circular hole in the top is of a size that will accommodate most jelly glasses and the plain, unfinished "spade," which fits a small hole drilled in the top, provides a harmonizing device for serving.

An unsuspecting quartet of butlers that stand nonchalantly at the pickle dish readily submit to having their heads removed for the convenience of guests. The picks, which are slipped into holes drilled vertically, may be either $\frac{1}{8}$ -in. wood dowels pointed at the ends, or they may be darning needles. The design and dimensions of this piece and also the colors suggested are given in Fig. 4. An interesting touch is furnished by the small towels of real cloth that are glued on to hang over the forearms.

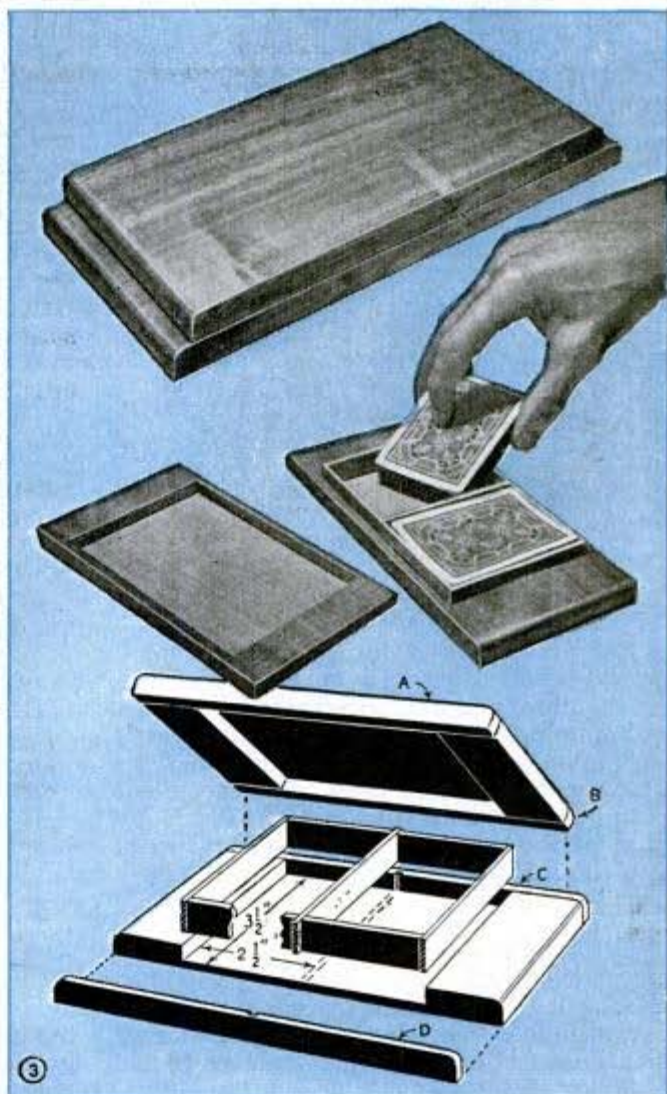
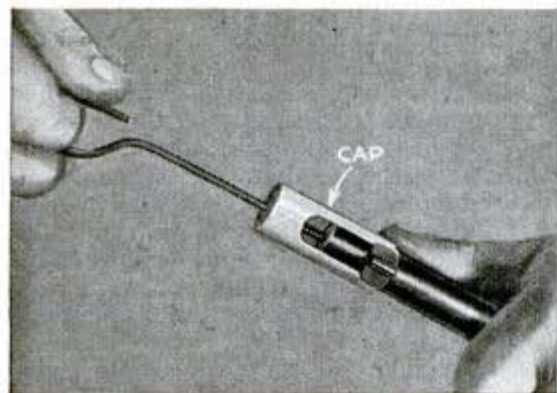
Fig. 5 shows the squirrel nut or candy holder as it appears when completed and also the details of assembly. Just a little outlining of the body in black, which is done with a fine brush, is needed after the wood has been painted a squirrel grey or left natural. A rope handle enables one to tip the container on a dowel arranged crosswise. Or a finger-hold can be provided at the rear lower edge of the container.



Graceful Playing-Card Box Holds Two Decks



Attractive and easy to make, this box for storing playing cards will be a handy accessory for the bridge table. It is made from $\frac{1}{2}$ -in. stock. First, saw cuts are made across each piece to a depth equal to slightly more than half the thickness of the decks to be used. Then the strips intervening between the saw cuts are chiseled away, a wooden block being used as a stop, as shown in Fig. 1, after which the pieces are sanded smooth. Next, strips A, B, C and D, Fig. 3, are glued across the sides to form recesses or wells for the card decks. When the glue has dried, the ends are rounded. Partition and edge strips now are cut to length and glued as shown in Fig. 2, wedges being used to hold them in place.—Charles and Bertram Brownold, Woodmere, N. Y.

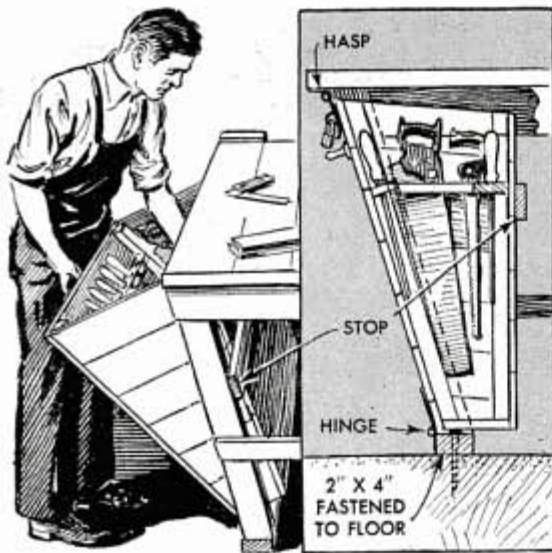


Cap Protects Muzzle of Gun While It Is Being Cleaned

Rifles and handguns should be cleaned from the breech end to avoid wearing the muzzle and damaging the sharp edges of the lands to such an extent that accuracy of the gun would be affected. However, on guns that cannot be cleaned from the breech, such as side-ejecting revolvers and some automatic, lever and slide-action rifles, a removable cap like the one pictured will prevent this wear. It is made from a plastic lipstick container of a size to slip snugly over the end of the barrel. The side of the container is cut out to fit around the front gun sight and the end is drilled to take the cleaning rod. This must be done accurately so that the hole is in exact alignment with the bore of the gun when the cap is in place.

Peter A. Bono, Springfield, Ill.

Tool Bin in Bench Is More Convenient Than Drawers

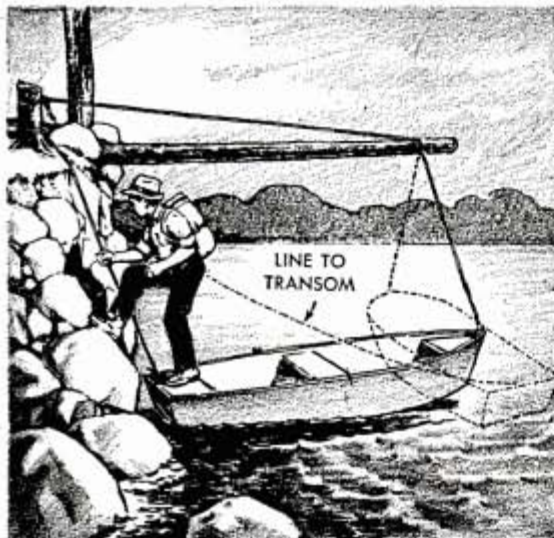


Rabbits Shun Trees Treated With Rosin Repellent

Rabbits will stay away from trees treated with a repellent made by mixing powdered rosin, 8 lbs., and denatured ethyl alcohol, 1 gal. Lump rosin is pulverized with a wooden mallet and dissolved in the alcohol by stirring, without heating. The repellent should be applied with a small brush to any part of the tree which rabbits can reach, but should be applied only when the bark is absolutely dry.

¶ You may save considerable gas by keeping a kettle of water over the pilot light during the hours when the gas stove itself is not in use. A kettle of water placed over the lighter at night is warm enough to use in the morning.

Log Boom Protects Small Boat From Damage Against Rocky Shore

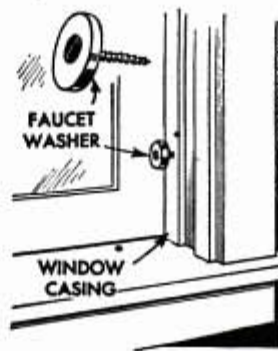


One home craftsman claims that a tool bin that tilts forward to expose its contents is more convenient than the usual drawers under his workbench. The bin can be made any size required to hold the tools and it can be partitioned as desired. Holders of various types for saws, hammers, screw drivers, etc., can be screwed to the inside surfaces and trays for small parts can be fastened inside the bin. Mounting the bin can be done in a number of ways. Usually a length of 2 by 4-in. stock can be screwed to the floor and the bin attached to it with hinges, or it can be hinged to a crosspiece on the bench.

W. H. Fraser, West Palm Beach, Fla.

Faucet Washer Pivoted to Casing Stops Rattling of Window

The annoying rattle caused by a loose-fitting window can be prevented by screwing a faucet washer to the casing so that it

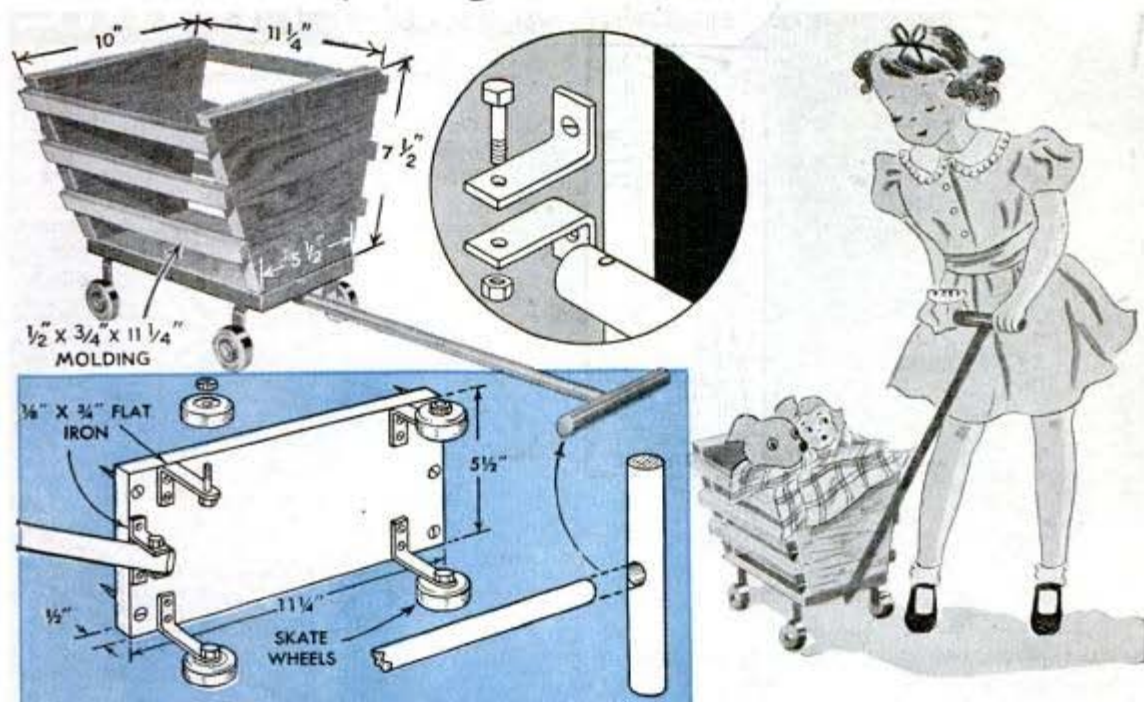


presses against the sash as indicated. Use a screw of a size to permit the washer to rotate freely. In this way, the washer will not interfere with raising or lowering the sash, yet will apply sufficient pressure against the sash to prevent its vibrat-

ing in the wind. If the window is extremely loose, it may be necessary to install a washer at each side of the casing.

While camping on a fast flowing river, the rocky banks made it impossible to secure my rowboat in the usual way. If it were tied to a tree or stake on the bank, it would be damaged against the rocks. To avoid this trouble, a wooden pole was set into the bank to act as a boom to keep the boat away from shore. You can tie the boat directly to the outer end of the pole and use a small line to swing the transom end toward shore for boarding, as indicated, or you can give the anchor rope a couple of turns around the outer end of the pole and bring the rope inshore, tying it to a stake or tree upstream to serve as a brace for the boom. To enter a boat moored by this method, just loosen the anchor rope and let the boom swing downstream until the boat comes in close enough to shore to be boarded.

Child's Utility Wagon Rides on Skate Wheels



Suitable as a sight-seeing bus for dolly, or as a van in which many toys can be moved from an indoor playroom to the garden, this all-purpose wagon is made from a few pieces of scrap wood and 4 skate wheels. Bottom and end pieces are cut from $\frac{1}{2}$ -in. stock and sides are strips of molding, which can be plain or shaped. Wheels are attached by bolts to short

lengths of flat iron drilled and bent, or corner braces can be used. The handle is a length of dowel, which is pivoted between two similar braces, as shown in the circular detail. Color is important to give the wagon a gay look. Ends can be red with green edges, the bottom black with orange edges and the molding bright yellow.

Harold Gluck, Bronx, N. Y.

Counterweighted Plywood Figure Teeters at Edge of Table

At a touch of your finger, this amusing little fellow will rock on one foot at the very edge of a table—but he won't fall off! A length of stiff wire, slightly bowed in-

ward, holds a weight that acts like a pendulum to balance the figure, which is jigsawed from $\frac{1}{4}$ -in. plywood or hard-pressed board. Size is optional, but the wire, which is forced into a snug hole drilled in the lower edge of the raised foot, must be from $1\frac{1}{2}$ to 2 times as long as the figure's height. Lead is pressed over the end as a counterweight. The amount is determined by hanging washers on the wire until balance is found, then an equal weight of lead substituted.—Cpl. Jack L. Masters, Maryland.

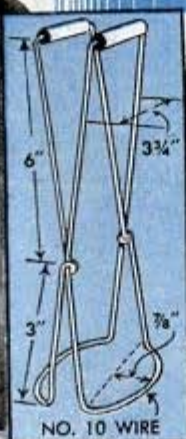


Cushion on Wrist Keeps Pins Handy for Dressmaker

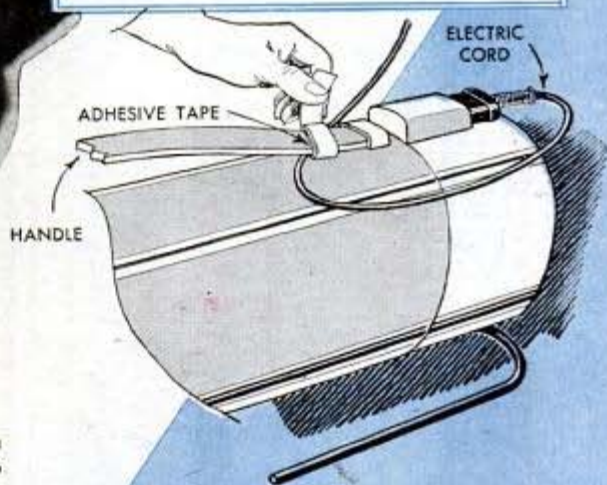
An ample supply of pins is always conveniently at hand if they are kept in a cushion strapped to your wrist. To make a cushion of this type, sew a loop of elastic to a small pincushion and slip it over your wrist, making the elastic loop of a size to fit snugly but not too tightly on the wrist.

J. D. Bates, Big Flats, N. Y.

Solving HOME



On vacuum cleaners of the type shown below, loop cord through handle and tape it to prevent breaking at the plug

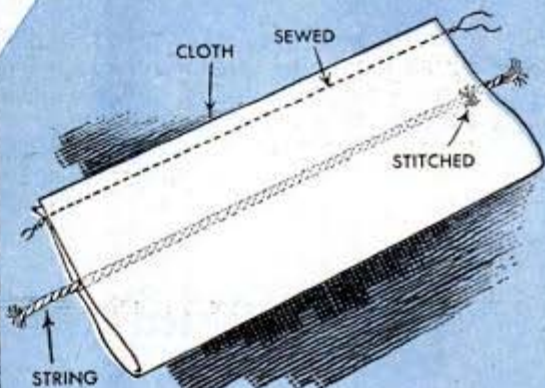


Lifting jars from a canning kettle is simplified if a wire gripper is used as above. The wire is looped to form pivots and handles are lengths of fiber tubing

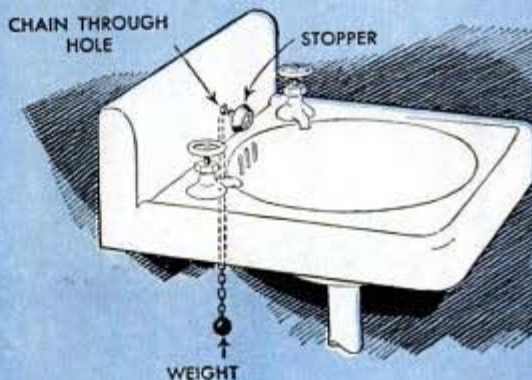
A spool of thread will not fly off the spindle when you wind a bobbin if you clamp a spring-type clothespin on the spindle above the spool as shown at the right



For mashing berries and grapes a one-quart milk bottle can be used as shown below. It can be gripped easily and does not become stained

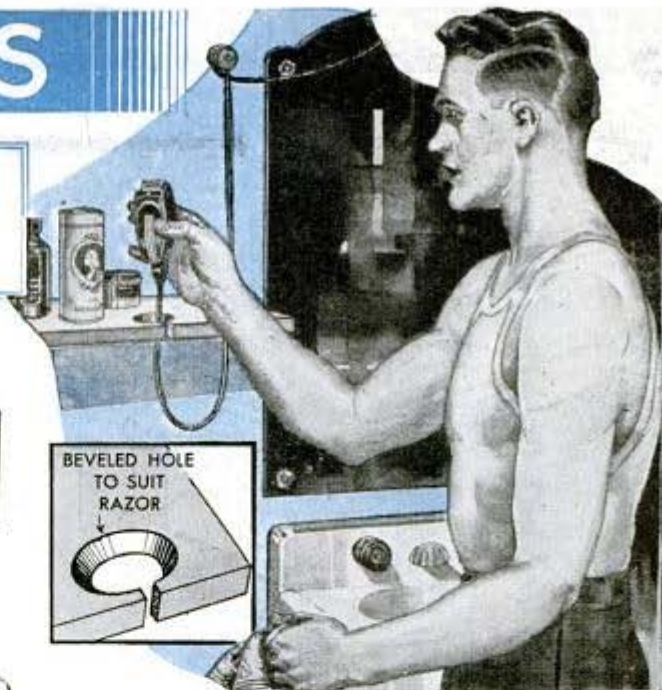
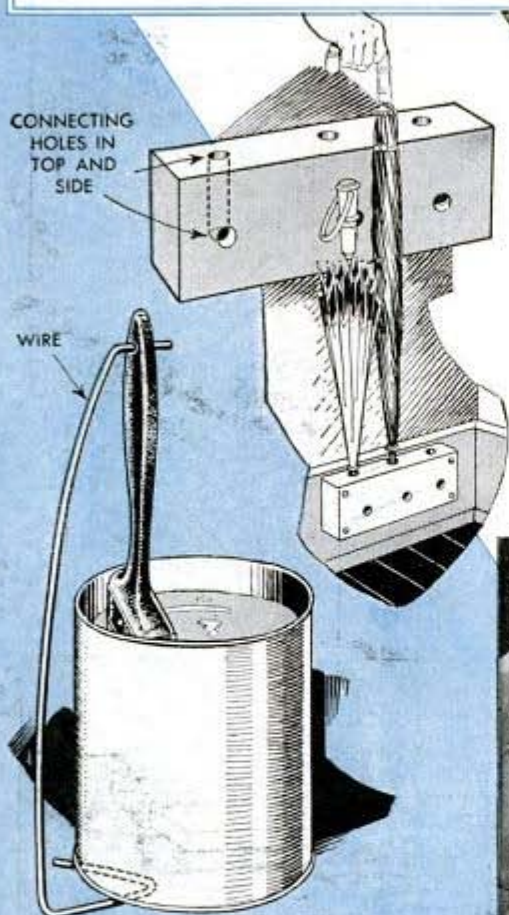


When sewing cloth belts or ties, stitch a string at one end as shown above. It will turn the belt inside out when pulled. Below: Lavatory stopper chain weighted at lower end keeps stopper up out of the way when it is not in use



PROBLEMS

Handy for holding umbrellas, a block of wood drilled as shown below can be screwed to the baseboard in a closet



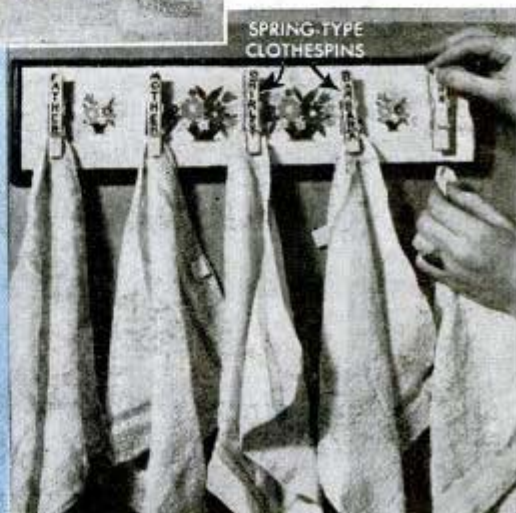
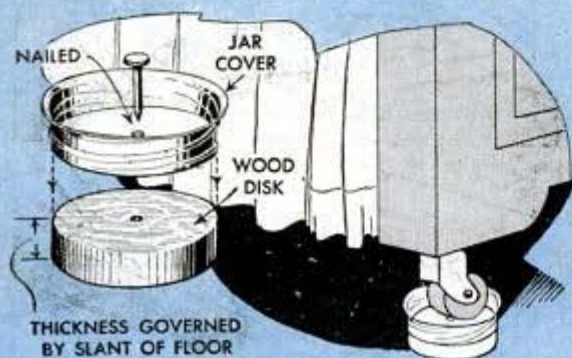
There's no danger of accidentally knocking your electric razor off a shelf if you set it in a hole beveled to suit the razor body, as shown above



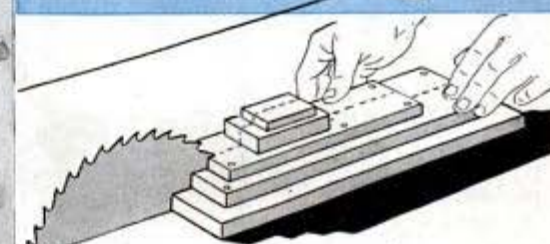
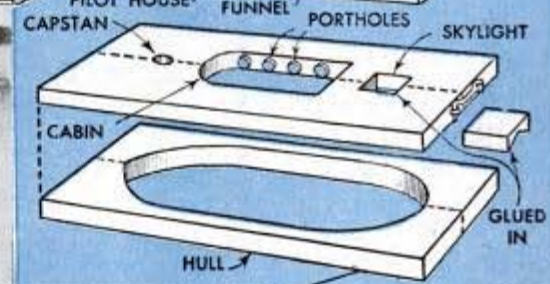
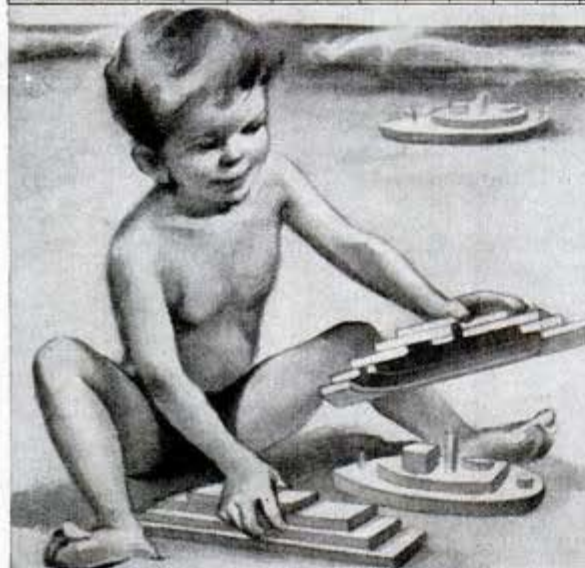
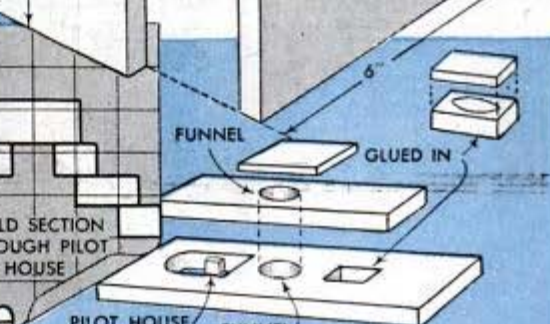
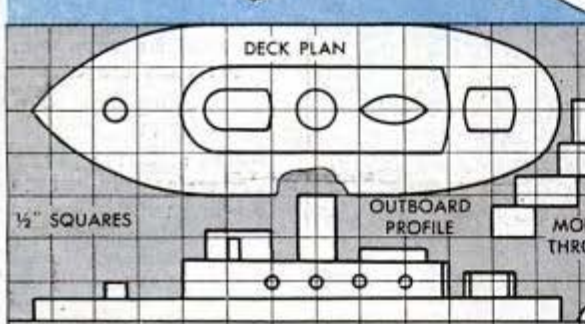
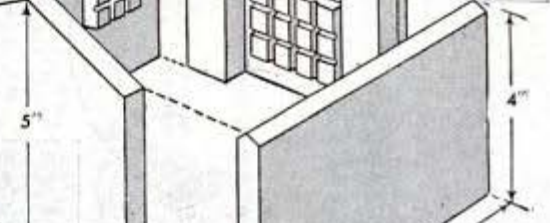
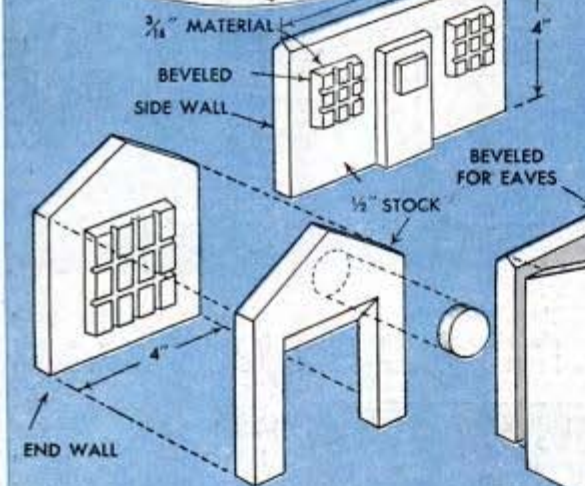
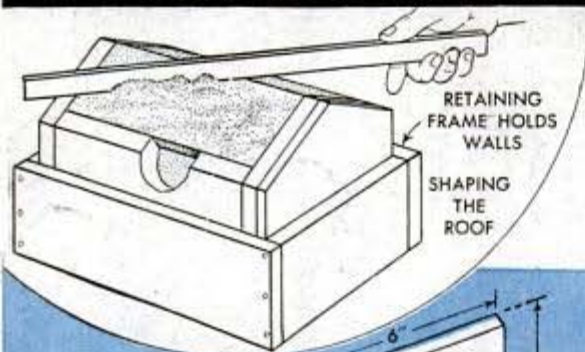
Left: Shelling peas is done easily in a wringer. Loosen the rolls a bit and be sure that the peas are crisp

† When soaking a pointbrush in turpentine, hang it on a hook made as indicated. Below: Tables and other furniture having casters will not creep on a sloped floor if jar covers nailed to wood blocks are set under the casters as illustrated

Below: Spring-type clothespins screwed to a wood panel will hold wash cloths so that they will dry quickly. Names are painted on the pins to identify the cloths



IT'S FUN MOLDING SAND SHIPS AND HOUSES



ASSEMBLED MOLD SAWED THROUGH CENTER

Molding Sand at the Beach

As shown in the drawings on the opposite page, sand houses and ships can be molded by packing wet sand into collapsible molds. A house mold consists of four parts: two ends and two sides, which are held by a retaining frame. Recessed windows are formed by projections on the molds, which are scored for sash. Also, a depression in one end of the mold forms a bay window. This is made up of two pieces glued together. It is a good idea to bevel the edges of all window and door molds slightly so that they will not tear the sand formation when they are removed. All parts should be sanded thoroughly and given a coat of shellac. After sand has been packed into the mold, the roof is formed by scraping across the gables. The retaining frame then is lifted, after tapping gently with a mallet, and the walls are pulled away carefully.

Molding sand ships is done in a similar manner. The mold is turned upside down, sand packed into it and a piece of sheet metal held over the bottom while the mold is flipped over, after which the ends are unhooked to open the mold and remove it, leaving a little steamer complete with pilot house, funnel, life boat, skylight and capstan. The hull and each deck are scroll-sawed from $\frac{3}{4}$ -in. material with inserts in rectangular openings to form the skylight and life boat. A plug is glued in over the capstan hole to bring it down in height. Before assembly, each board should be marked on the centerline so that all parts will register properly, then nailed and glued together in one unit, after which the unit is sawed through the center to form identical halves of the mold. A short dowel in each end of the hull block and hooks screwed into the ends hold the mold together while the sand is being tamped.

Water Preserves Oil Colors



Oil colors left exposed to the air on a palette will dry out quickly, but if they are covered with water this trouble can be avoided. A Washington art instructor recommends that the colors be removed from the palette and put in a pan so that the water covers them. When ready to use the colors again, simply pour off the water and allow a few minutes for it to evaporate from the oils.

G. E. Hendrickson II, San Diego, Calif.

AUGUST, 1945



Scraps of Paper Swept From Floor By "Broom" of Wire Mesh

Small scraps of paper can be removed from a floor by using an improvised "broom" made by attaching a pot scourer or piece of wire mesh to a length of dowel. Used with a sweeping motion, the mesh will grip the paper scraps so that they can be brushed into a dustpan.

Toothpick Used as Stitch Holder

A round toothpick of the type that is pointed at both ends provides an ideal temporary stitch holder, which is necessary in the popular cable pattern. By using the toothpick, you will find it unnecessary to slip the stitches back onto a knitting needle to knit them into the pattern again because the toothpick serves as a miniature knitting needle.—Benj. Nielsen, Aurora, Nebr.



Oars Supported on Side of Boat By Flat-Iron Brackets

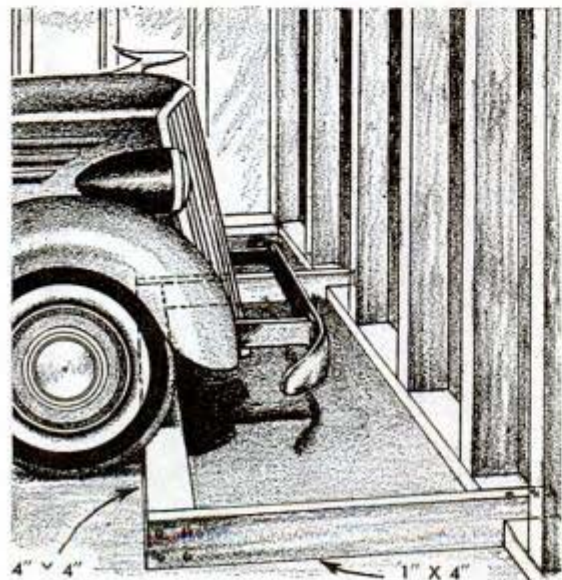


When fishing from a boat a pair of brackets like the ones shown will support your oars out of the way without having water drip from them into the boat. The brackets are shaped from flat iron and hook over the sides of the boat as indicated.

David B. Clapp, Livingston, N. J.

Movable Wheel Block for Garage Prevents Bumping Wall

This simple front-wheel block permits utilization for storage of every inch of space in the end of the garage with complete protection against damage to stored material by wheels and bumper of the car. The block, which is easily lifted out of the way when sweeping, consists of a length of 4 by 4-in. stock having a couple of 1 by 4-in.

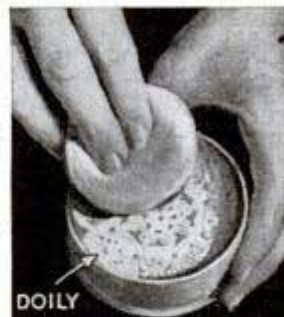


98

arms nailed to the ends, the arms being notched at the rear ends to fit over the floor plate.—L. J. Slaback, Long Beach, Calif.

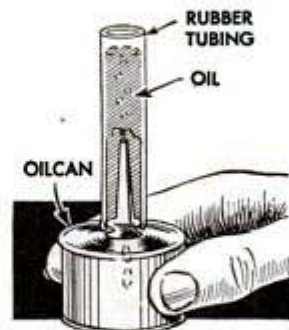
Doily Conserves Face Powder

You won't get more face powder on a puff than is needed if a paper doily is placed on the powder in the box. Sufficient powder will be picked up through the tiny holes of the doily, which is trimmed to size.



Rubber Tube Helps Fill Oilcan With Nonremovable Spout

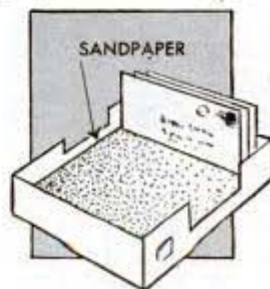
I often had need of a small can of penetrating oil in my tool box, but was unable to purchase the oil in cans smaller than the pint size. To solve the problem, I used a



1-oz. can that came with a sewing machine. This had a nonremovable spout, but I filled it with penetrating oil as shown. I slipped a piece of rubber tubing over the spout and stretched it over the rim at the lower end. Then I poured the oil into the tube, alternately pressing and releasing the sides of the can with my fingers. On some types of cans it may be necessary to press on the bottom. This action will force air from the can and suck in the oil through the spout.—Wm. Lindsey, Seattle, Wash.

Sandpaper Placed in Letter Tray Keeps Envelopes on Edge

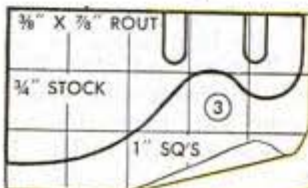
The annoyance of trying to pick up envelopes, notes or other correspondence that has slipped down in a letter tray can be avoided by placing a piece of sandpaper in the bottom of the tray. Place the sandpaper with the abrasive side up and friction will keep envelopes or papers from slipping down flat in the tray.—John Krill, Youngstown, O.



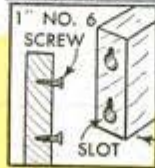
POPULAR MECHANICS

WOODEN RODS for Your Curtains

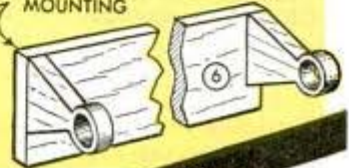
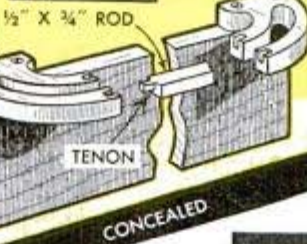
INEXPENSIVE and easy to make, wooden curtain rods are practical and attractive. The utility styles, Figs. 4, 5 and 6, are painted or stained to match the window trim. The ornamental crane type, shown in Fig. 1, looks best if color contrast is introduced, such as stained and lacquered brackets against cream woodwork. The side-mounting bracket shown in Fig. 4 and in the cross-hatched pattern, Fig. 3, is screwed to the side of the window trim. Curtain rods are white-pine sticks, which drop into slots routed in the brackets. An alternate model, which fastens to the face of the window trim, is shown in Figs. 7



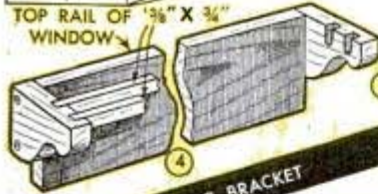
SCREWED TO TOP OF WINDOW



SCREW-AND-SLOT MOUNTING



FESTOON

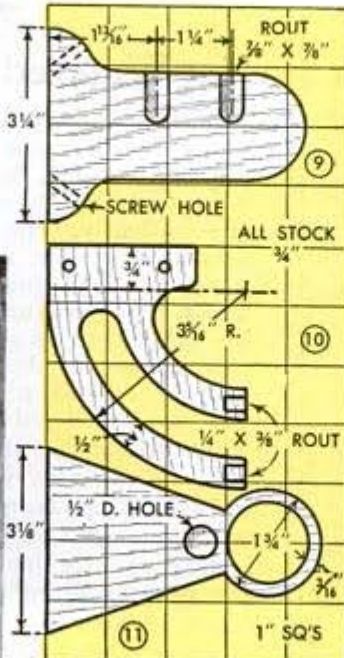


SIDE-MOUNTING BRACKET

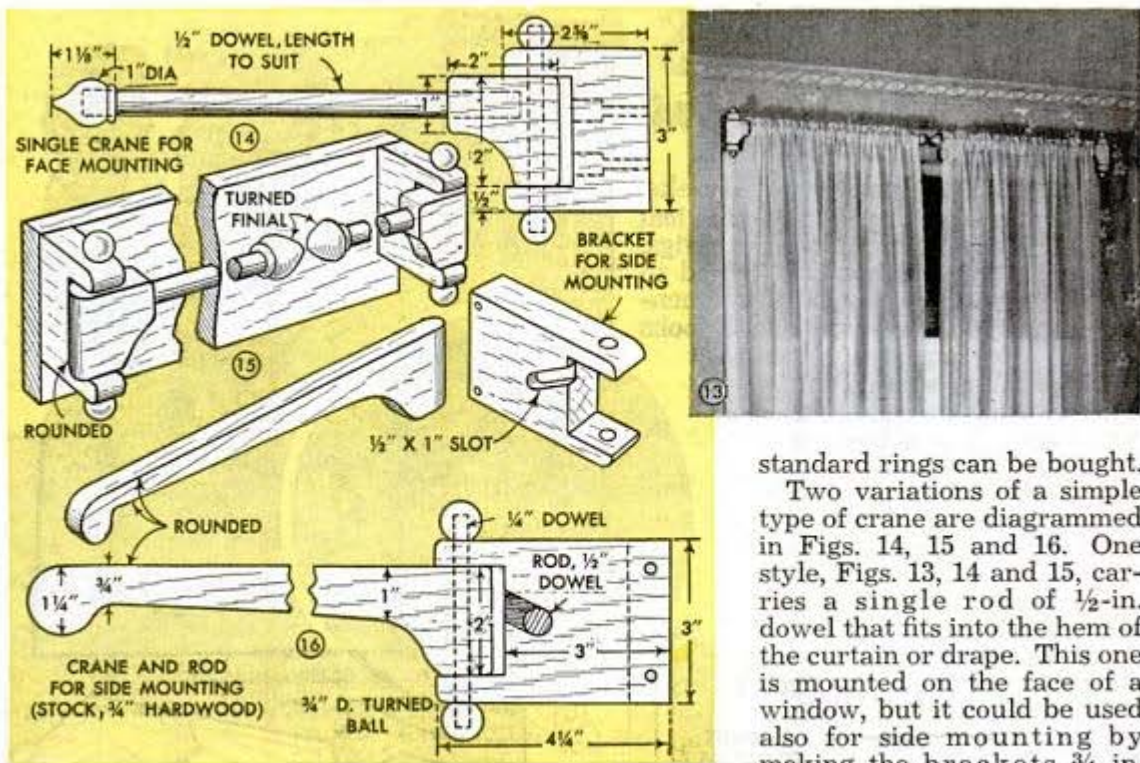
CONCEALED



FACE MOUNTING BRACKET



and 9. A similar style is illustrated in Fig. 8. A concealed type of bracket mounted on top of a window is given in Fig. 5 and detailed in Fig. 10. None of the wood shows in this design, the effect being much the same as conventional metal curtain rods. All three of these brackets are double-rod type, suitable for criss-cross curtains or curtains and drapes. When used with drapes, a decorative plywood cutout can be applied at the center of the front rod and used to good advantage in certain locations, such as the sun-room or kitchen.

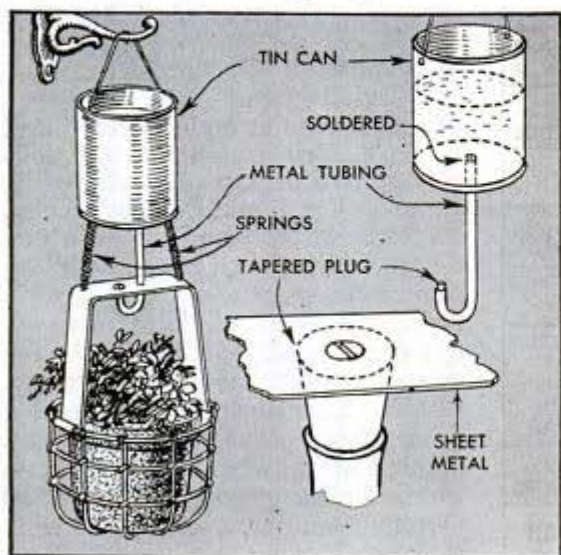


standard rings can be bought. Two variations of a simple type of crane are diagrammed in Figs. 14, 15 and 16. One style, Figs. 13, 14 and 15, carries a single rod of 1/2-in. dowel that fits into the hem of the curtain or drape. This one is mounted on the face of a window, but it could be used also for side mounting by making the brackets 3/4 in. longer. The second type, Fig.

16, has swinging arms cut from solid stock, and a fixed 1/2-in. dowel rod, providing for hanging both curtains and drapes. This is diagrammed for fastening to the side of window trim. Side fastening is neater for all rods as it allows curtains or drapes to cover the full width of the window. All styles provide clearance for window shades. Bracket styles can be made of white pine for a paint finish; cranes will be most attractive in maple with a light-color stain and lacquer finish.

Suitable for the festoon method of hanging curtains, the bracket shown in Figs. 6 and 12 and in the pattern, Fig. 11, also illustrates screw-and-slot mounting. The hole for screw entry and the slot in which the screw head jams should be drilled before the brackets are cut out, as indicated in Fig. 2. This bracket carries a single rod of 1/2-in. dowel stock. The same style could be used also for drapes by fitting a curtain pole through the festoon holes. Rings can be band-sawed from a plastic cylinder, or

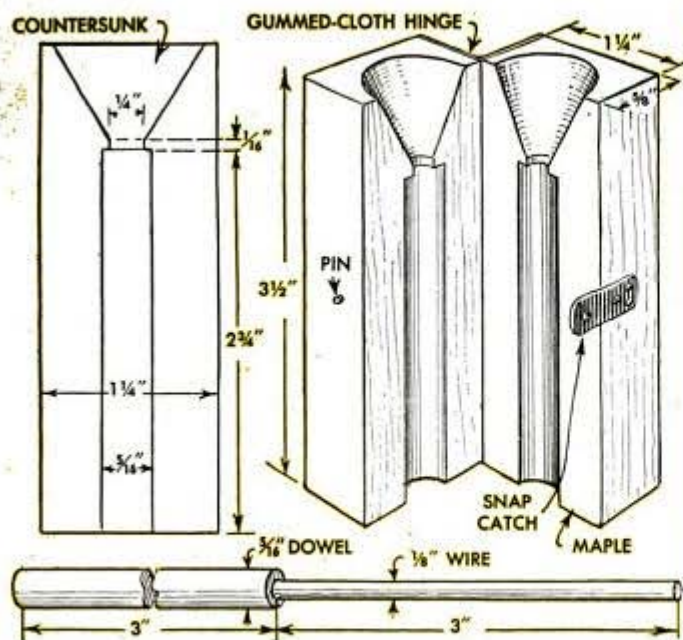
Plants in Hanging Flower Basket Watered Automatically



With a flowerpot holder made like the one shown, all you need do is fill a reservoir with water, hang the assembly from a hook and plants set in it will be watered automatically. The assembly consists of a tin-can reservoir, a filler tube, a flat-iron strap, two coil springs and a wire basket. The can is punctured in the center where the tube, bent as shown in the right-hand detail, is soldered. The tube is flared to fit over a hardwood plug screwed to the strap, and it is inserted through the latter, to which the basket is attached. The strap is held to the reservoir by the springs as shown. When water evaporates from the pot, the decreased weight permits the springs to raise the basket and strap so that the plug is lifted slightly from the filler tube to allow water to drip into the basket.

J. Ervin, Pasadena, Calif.

"Rolling Your Own" Is Easy With This Roller



It is a simple matter to roll round, firm cigarettes if you use a roller like this one. It is made from a block of hardwood, which is drilled lengthwise through the center for a distance of $2\frac{3}{4}$ in. from one end, using a $\frac{5}{16}$ -in. drill, after which the hole is continued with a $\frac{1}{4}$ -in. drill. Next, the end having the smaller hole is countersunk to within $\frac{1}{16}$ in. of the larger hole to leave a shoulder as indicated. Then the block is cut in two exactly in the center with as thin a saw blade as possible and hinged together with a strip of gummed cloth. After providing the hinged parts with a snap catch, fit a 3-in. length of $\frac{5}{16}$ -in. dowel with a piece

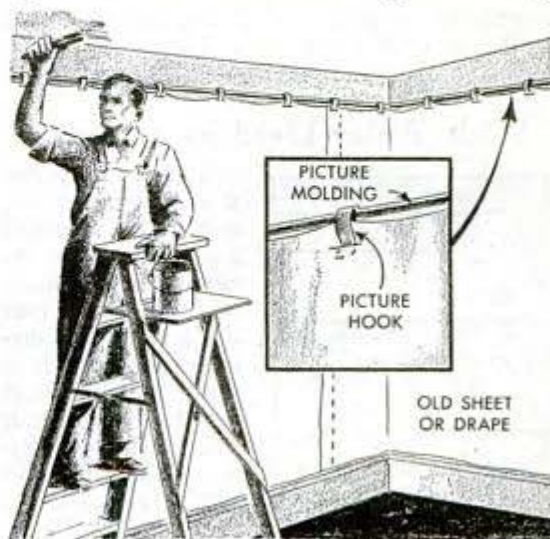
of $\frac{1}{8}$ -in. wire so that the latter projects 3 in. To roll a cigarette, use a gummed cigarette paper and roll it around the dowel and stick it together. Place the dowel and paper in the hinged block, being sure that the upper end of the paper rests against the shoulder. Close the block and withdraw the dowel. Now set the block on end on a smooth surface, such as a table top, pour a little tobacco into the countersunk end and push it through the small hole into the cigarette-paper tube with the wire. Tamp the tobacco firmly for the first $\frac{1}{4}$ in. at both ends of the cigarette, but leave it reasonably loose in the rest of the cigarette.

Walls Protected Against Soiling While Decorating Ceiling

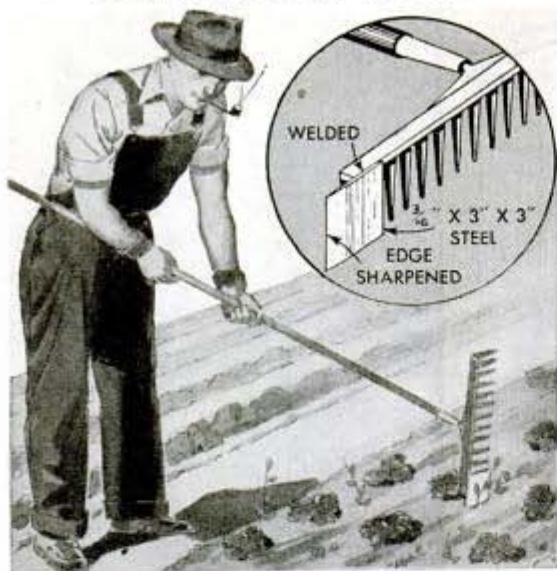
If you want to calcimine or paint a ceiling without decorating the walls, hang old sheets, drapes or other large pieces of cloth from the picture molding to prevent the walls from becoming soiled. The cloth is attached with picture hooks spaced about 2 ft. apart, the hooks being fastened with safety pins. It is unnecessary to cover the entire wall area of the room, since the cloth can be moved along the wall as work on the ceiling progresses.

Roscoe A. Johnson, Portland, Ore.

When cleaning white shoes that have brown or black heels, apply a coat of colorless nail polish to the brown or black leather and allow it to dry thoroughly. This prevents the white cleaner from rubbing off on the dark surfaces.



Cutting Edge on a Garden Rake Removes Large Weeds



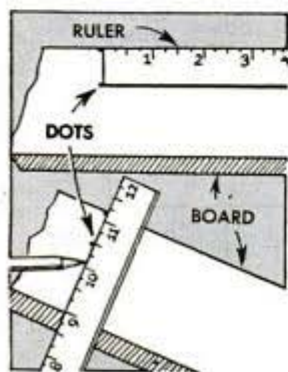
Stooping to pull weeds will be unnecessary when using a garden rake if you weld a steel blade to one end of the rake. Then you can use the end of the rake like a hoe. Although the width of the edge is shown the same as the length of the rake teeth, it would interfere less with regular use of the rake if it were raised so that it covered less than half of their length. Any flat piece of steel or iron sharpened at one end will do.—J. E. McCorkle, Tilley, Alta., Can.

Dart Target Holds Pinned Parts In Model Plane Work

When model plane construction requires the pinning of various parts for gluing or other processes, an old dart board will take the pins more easily than the usual wooden pinning board and the pins stay in a dart board more firmly. If no dart board is available, a piece of composition board makes a satisfactory substitute.

Roger Russell, Jr., Madison, Wis.

Wide Ruler Used as a Square

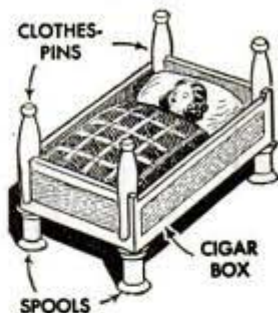


The next time you want to square up a board and there is no carpenter's square at hand, you can do a fairly accurate job with a wide ruler. Just lay the ruler along one edge of the board so that the two edges line up accurately. Then

make two dots at the end of the ruler as indicated, using a sharp-pointed pencil or scriber. Next, place the ruler across the board to line up with the dots and draw your line.—Jacob Hakala, Mahtowa, Minn.

Doll Bed From a Cigar Box

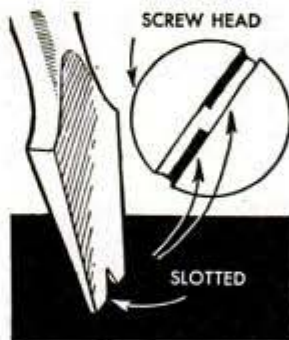
A doll bed that any little girl will appreciate can be improvised easily from a cigar box, four empty thread spools and four clothespins. The spools are glued to the corners of the box to form the legs and the clothespins are slipped over the box edges and glued in place to form the posters over which a canopy then can be spread.



Hilda Withrow, Cincinnati, O.

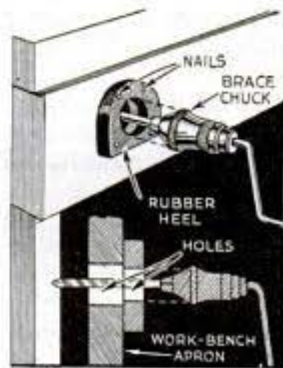
Slotted Screw-Driver Blade Grips Screw Head Securely

The next time you have a tight screw to loosen and the screw driver keeps slipping out of the screw, grind or file a slot in the end of the blade as indicated. This will permit the two sides of the blade to spring slightly and fit snugly against the sides of the screw slot and thus hold securely.—H. Idelson, Brooklyn, N.Y.



Rubber "Vise" to Loosen Chuck On Wood-Auger Brace

If the chuck on your brace often becomes tightened so that it is difficult to loosen, cut a hole in the center of an old rubber heel and nail the heel over another hole cut in the skirt board of your workbench. The hole in the heel must be somewhat smaller in diameter than the chuck of the brace. By inserting the bit and chuck to wedge snugly into the hole in the rubber, you can turn the brace to loosen the chuck.

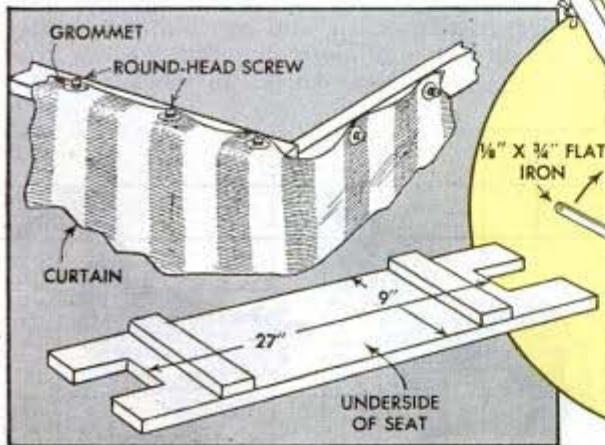
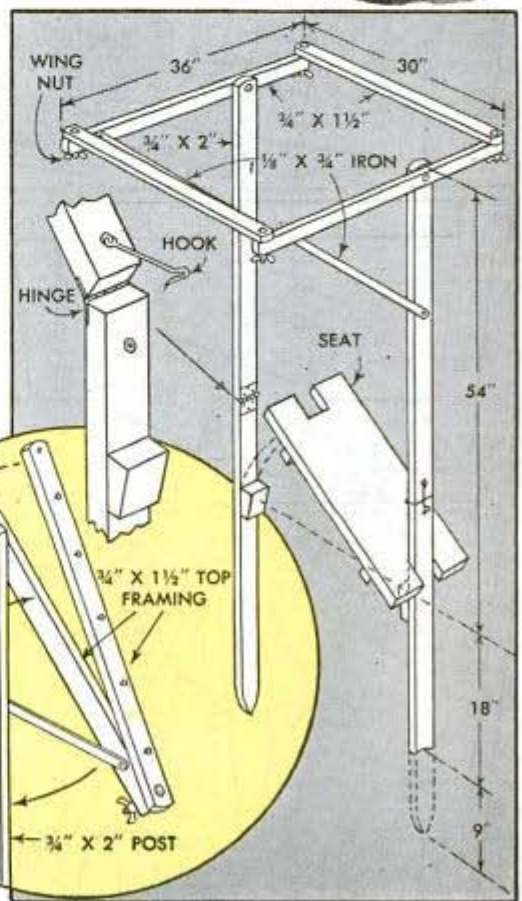


1001 34711 of 1486



PORTABLE Dressing Room FOR THE BEACH

WITH a few yards of cloth and some scrap wood, you can make a beach dressing room that can be assembled or taken apart in a few minutes and carried under your arm. It consists of a wooden frame pivoted to two uprights and held by flat-iron supports; a seat, which rests on blocks screwed to the uprights, and a drape, which is fitted with grommets that slip over projecting round-head bolts in the frame, as shown in the left-hand detail. The circular detail shows how the frame is jointed to fold against the uprights, which are hinged also for ease in carrying. They are held open by screen-door hooks and screw eyes, as indicated in the right-hand detail.



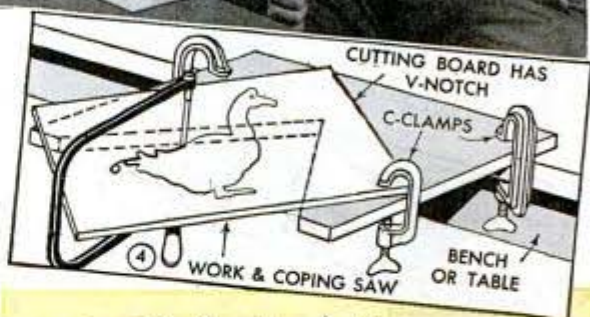


for EVERYBODY

tails of Fig. 2, provide for interlocking the sides so that nails or screws need not be used. Next, a design like the one suggested in Fig. 1 is traced to the side pieces and scroll-sawed. This work is done most easily with the aid of a V-notched cutting board, which is attached to the workbench with C-clamps, as shown in Fig. 4. In assembling the basket, put the sides together first, but do not press the corners tightly. Insert the bottom piece from the top, press it into place and then force the corners together firmly.

The animals, Fig. 3, which are scroll-sawed from any suitable wood, make amusing gifts for children. They can be mounted on slotted boards, like the serviceman cutout in Fig. 5, and used in play barns or zoos. Or clasps can be cemented to them so that they become novelty brooches.

Scrollsaw work is especially applicable to picture frames. The center detail of Fig. 6 gives dimensions for a frame to take a 4 by 5-in. photo, but these measurements can be varied to accommodate larger photos. The lower right-hand detail shows how the frame, photo and a piece of cardboard are assembled and held in place by narrow wooden strips, which are glued or screwed to the back



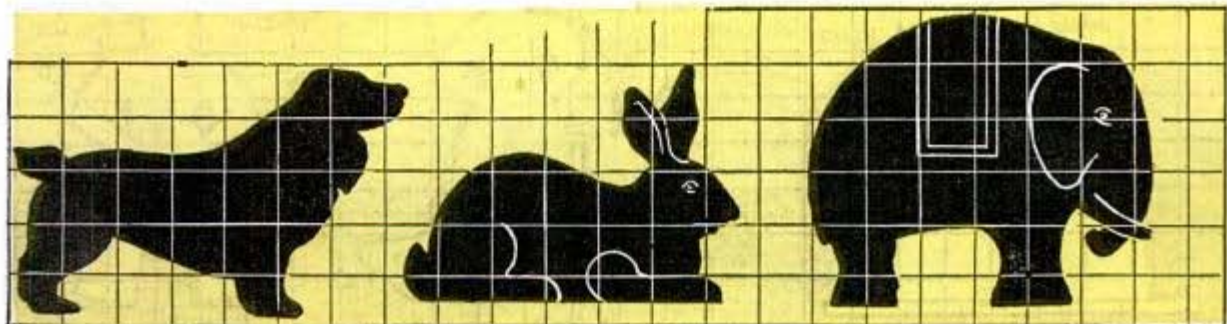
③ *Cutout photos*



LAPEL PINS



CLASP





6 Photo Frames

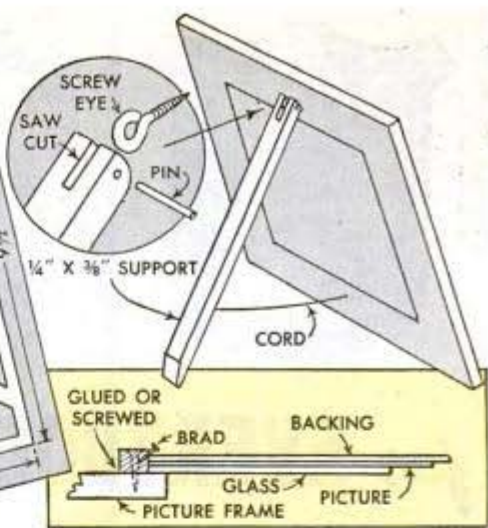
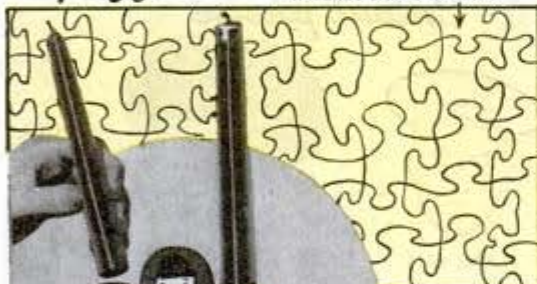


Photo courtesy United Service Organizations—Chicago



7 Jigsaw puzzles



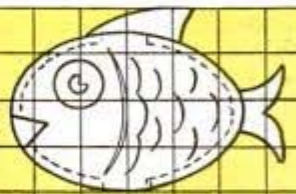
of the frame. If you like an easel-type frame, you can follow the plan shown in the upper right-hand detail, which shows how the support is hinged to the frame by means of a screw eye and pin. Jigsaw puzzles, too, are always popular. By making them yourself you can, of course, select the picture or design to form the puzzle pattern, and make the pieces as easy or as difficult to identify and assemble as you wish. Fig. 7 shows a design being rolled onto a piece of plywood that has been coated with glue. Wrinkles in the design paper must be smoothed out carefully before the glue dries, otherwise the picture will not cover the entire piece of backing. It is best to lay weights on the glued assembly to keep the paper tightly in contact and avoid wrinkles. When the glue has dried, the interlocking pieces can be scrollsawed, a pattern for these being shown



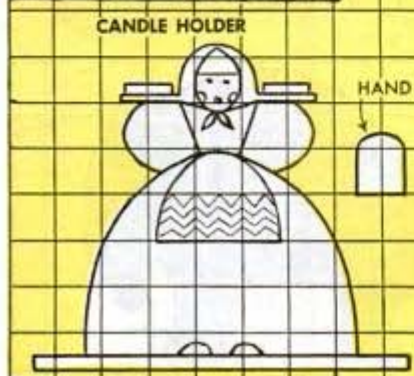
CANDLE HOLDER



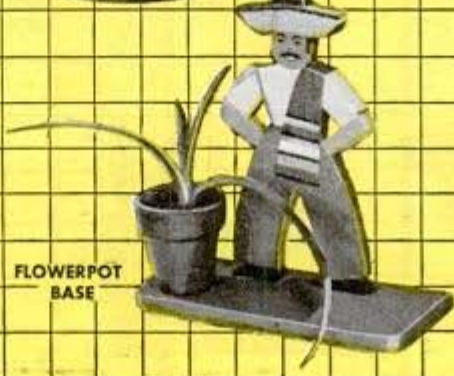
COIN BANK



8 Things for your home



HAND



FLOWERPOT BASE



BLACK

YELLOW

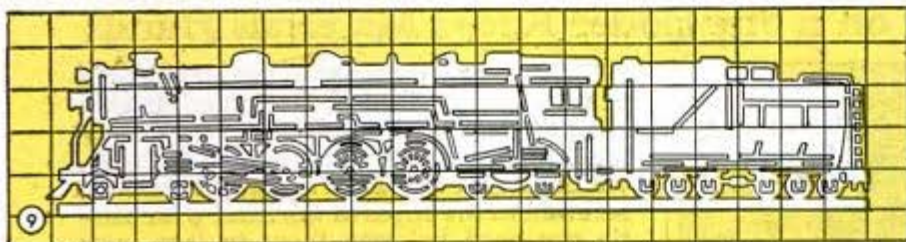
WHITE

FLESH

BLACK

RED

BLUE



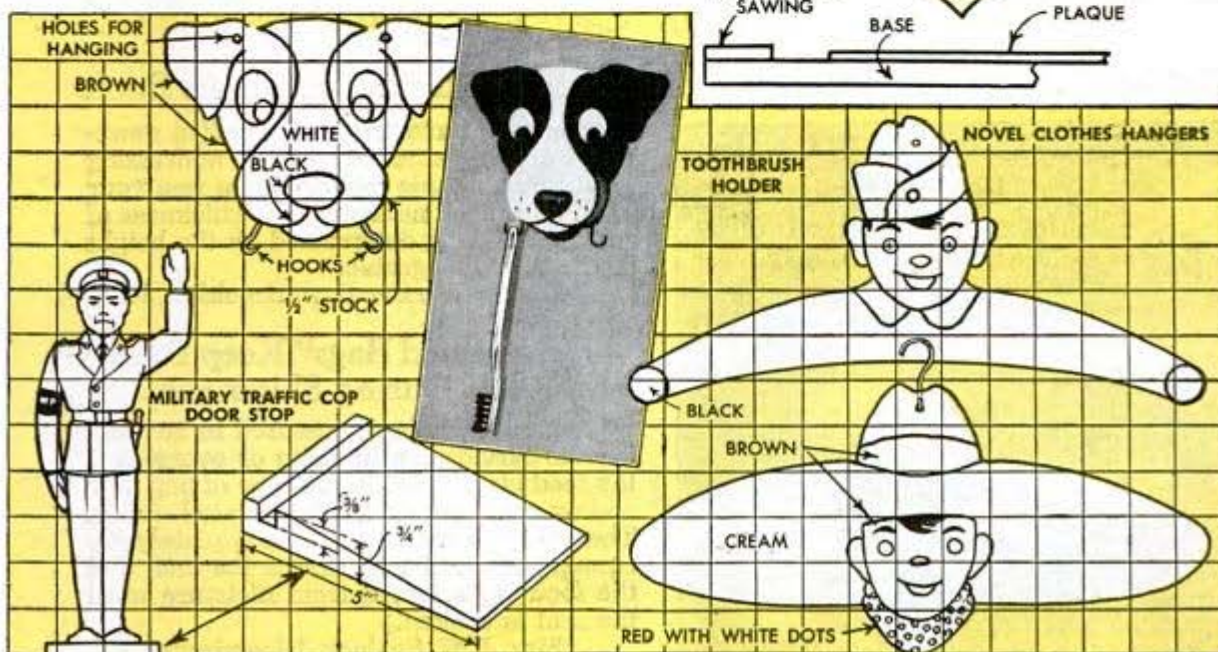
Wall plaques

in the lower detail of Fig. 7.

Several useful articles for your home are illustrated in Fig. 8. For the candle holder, scrollsaw the figure and brad it to a suitable base. Two feet, which can be made by splitting a disk cut from a piece of dowel, are glued in place as shown. The hands, which are glued to the ends of the arms, support rings that hold candles. The rings can be made by drilling a hole lengthwise through a short piece of dowel of suitable diameter, and cutting off the rings so formed. The coin bank consists of two sides, cut to shape as shown, two spacing strips and a base which is screwed to the spacing strips. The strips can be scrollsawed from a solid piece and are glued to the sides so that two slots are provided, the one on top for inserting coins, and the one on the bottom for removing them, which can be done only by taking out the screws holding the base. The flowerpot base is merely a length of wood or plastic to which a figure is attached. The toothbrush holder, door stop and clothes hangers are simple things usually much in demand. Though the wall plaques, Figs. 9 and 10, appear intricate, they are simply cut out of a single piece, then glued to a back, which may be a plain wood panel or one shaped like a shield.



Photo courtesy United Service Organizations—Chicago



Extension Shelf on a Stepladder Keeps Materials Handy

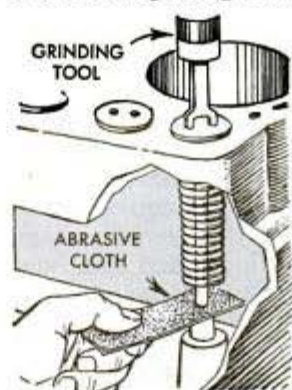


Painters and others who use stepladders in their work will find that an adjustable shelf at the top of a ladder is very handy for keeping tools, paint containers, etc., within easy reach. Four L-shaped brackets screwed to the edges of the shelf with elastic stretched between them to loop over the paint container will keep it in place, and a small tray on the shelf will provide a place for brushes, knives, scrapers, etc. The shelf is supported on two metal arms which slide through holders shaped like pipe straps and screwed to the sides of the ladder. Thumbscrews tapped into the holders lock the shelf at any desired height.

P. B. Horsley, Pembroke, Ont., Can.

Valve Tappets Easily Adjusted By Using Abrasive Cloth

When setting valve tappets that have no means of adjustment, grind the valve stems as close as possible to the desired adjustment, taking care not to overdo it. Then install the valves and springs. Now, to get the exact spacing between the valve stems



and cam lifters, use a piece of abrasive cloth. Lift the valve slightly and insert the cloth between the tappets. Rotate the valve stem against the abrasive. Do this carefully and check frequently until you get the required spacing.

Old Furniture Has Fine Wood For Craft Work

Old and useless furniture that cannot be salvaged will provide an excellent source of fine and rare woods for craft use. Drawers and backs provide 3-ply panels, often of first class quality. From the sides of drawers, which generally are made of gumwood, a hardwood of interesting grain can be salvaged. Many moldings, some of unique shape, can be removed and saved for future use. Of course, wood pieces that can be saved from old furniture will not be very large, but they can be of exceptional value in small craft projects. Hardware also should be removed and stored.

George Barr, Brooklyn, N. Y.

Rolled Package Can Be Easily Addressed by Resting Hand on Book



After you have wrapped a rolled newspaper or magazine for mailing, addressing it will be a simple matter if you rest your hand on a book as indicated. Thickness of the book will be determined by the height of the rolled magazine.

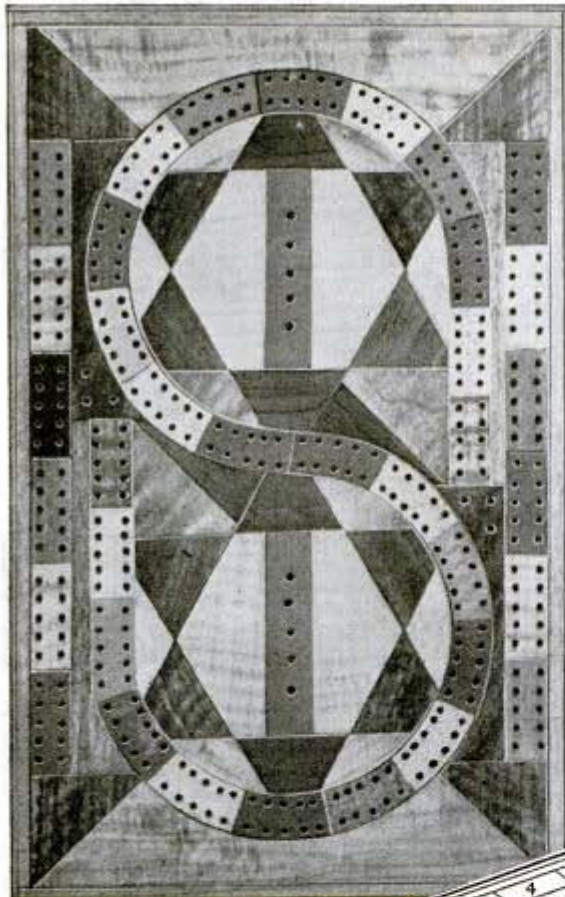
William Swallow, Brooklyn, N. Y.

"Dehydrated Bags" Keep Food Fresh During Shipment

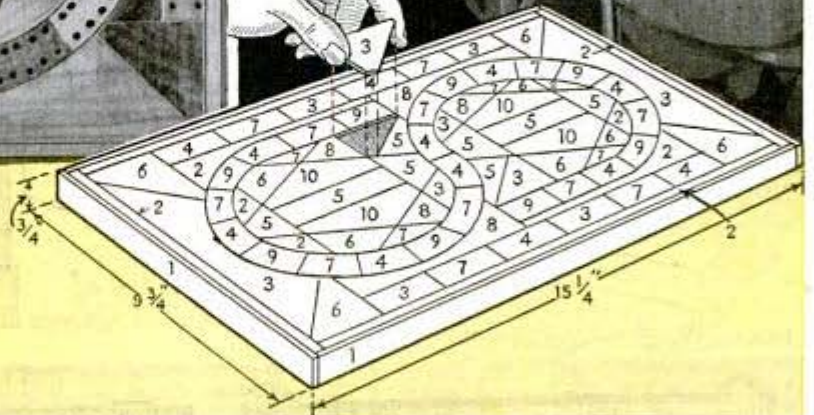
Greater freshness is assured in sending food to servicemen in camp or overseas if the food is wrapped in the type of bag now widely used to hold dehydrated foods. These bags can be sealed completely by running a warm iron across the end, and the food is protected from moisture until the seal is broken.

Mrs. J. H. Sealock, Bloomington, Ill.

Deluxe Cribbage Board Has an Inlaid Surface



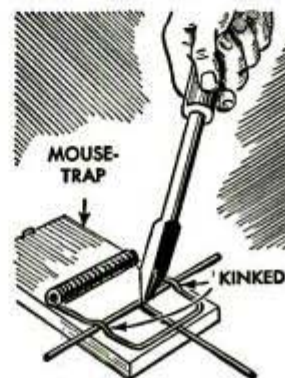
- KEY**
- 1—Olive
 - 2—Sycamore
 - 3—Birch
 - 4—Bird's-eye maple, dyed blue
 - 5—Purple heart
 - 6—Walnut
 - 7—Bird's-eye maple, natural
 - 8—Philippine mahogany
 - 9—Bird's-eye maple, dyed red
 - 10—Burley maple

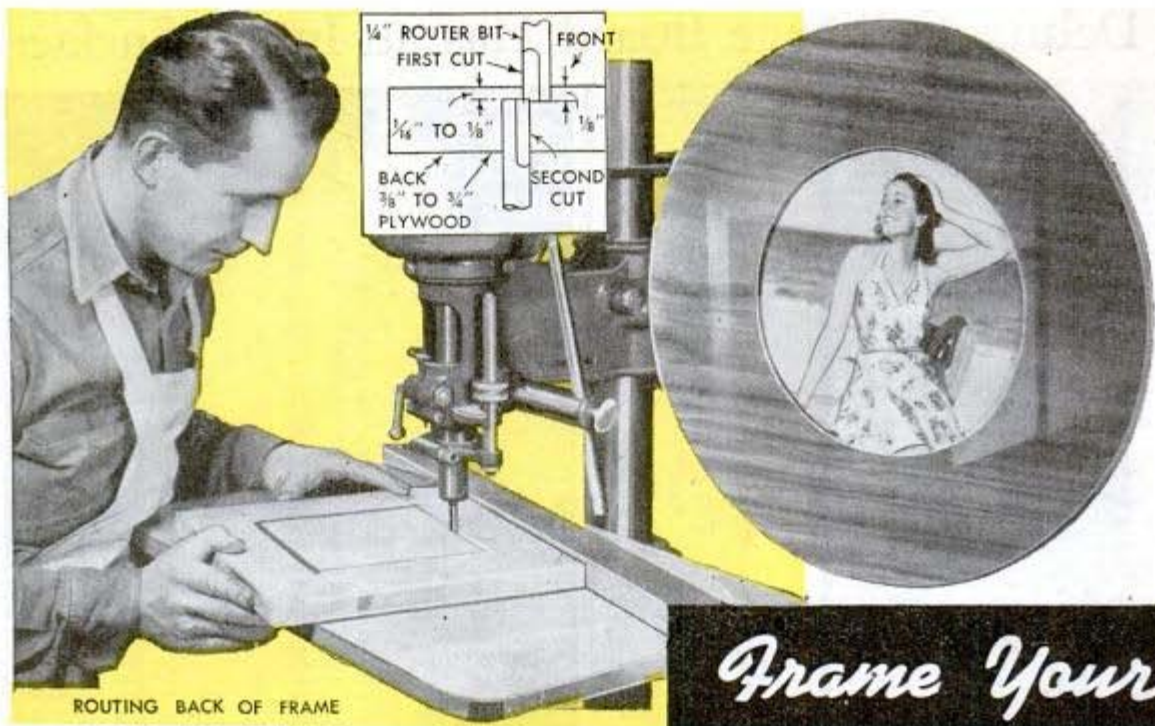


If you like to do wood-inlay work, try your hand at this decorative cribbage board. It's not only a beautiful piece for your own use, but it makes a gift that will be greatly appreciated. Ten different woods are arranged in a pleasing design to produce a colorful yet conservative effect. Positions of the woods in the pattern are indicated by figures in the lower right-hand detail; the key at the left shows the wood represented by each figure. If these woods are not available, it may be possible to make substitutions of a similar color without spoiling the pattern. Use warp-resistant wood for the base and sand it smooth, especially the top surface. Edges of the base are banded with olive wood and the pattern is bordered with strips of sycamore.—Doc Knoles, Bakersfield, Calif.

Mousetrap Serves as a Vise In Soldering Light Work

When making a small grille by soldering wires together, or for other work where two wires must be held at right angles to each other for soldering, a mousetrap will provide a good vise. Bend the jaw of the trap as indicated to hold one wire across the trap and let the other wire extend out under the front of the jaw.

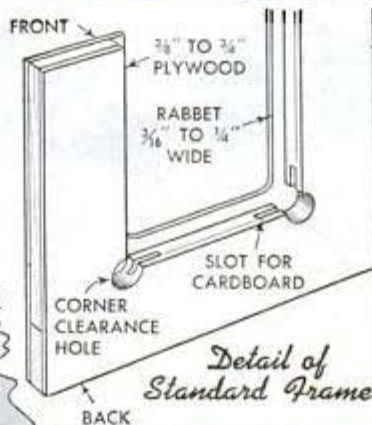




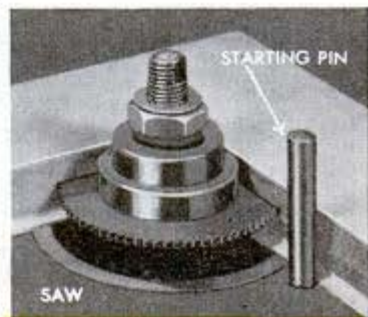
ROUTING BACK OF FRAME

Frame Your

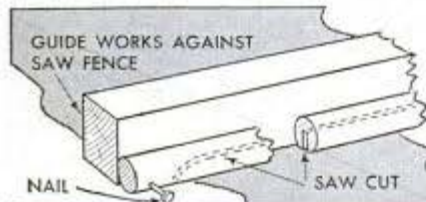
Routing on drill press: First cut is on face side. Then back is routed with successive cuts to form picture rabbet. Note clearance holes as at right. Slots for cardboard tabs cut on shaper, using small saw and depth collar



Detail of Standard Frame

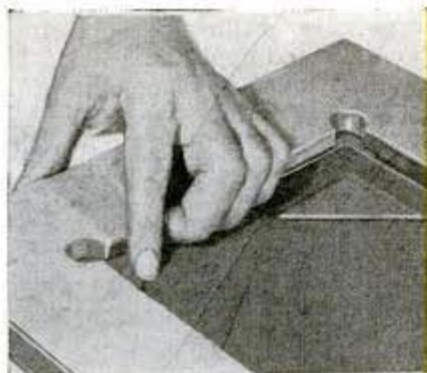


CORNER SLOTS ARE CUT ON SHAPER WITH SMALL SAW



Style 2 PLYWOOD PARTLY FRAMED WITH 1/2" DOWELS NO RECESS AND NO GLASS

Style 3 STANDARD STYLE SAME AS No. 1 BUT WITH TWO CELLULOID-COVERED OPENINGS

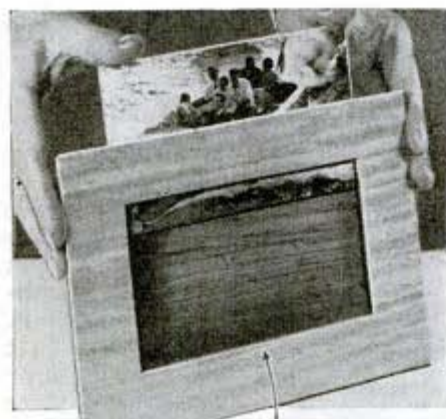


Assemble the picture, glass, cardboard backing and cardboard tabs. The tabs fit into grooved slots. Alternate simpler method is to brad the backing in place



Pictures with Plywood

Style 1 $\frac{3}{16}$ " TO $\frac{3}{4}$ " PLYWOOD WITH CENTER CUT OUT AND RABBETED FOR PICTURE AND GLASS



These attractive plywood frames eliminate mitered corner joints, the center of a solid panel being cut out to take the picture. Frames can be round or square as desired. Best appearance is obtained by selecting a nicely figured face veneer and then giving the frame a liberal margin to show the wood. Style 1 showing basic construction is illustrated above and in photos at top of opposite page. Style 2 is a simple plywood-plaque with picture mounted direct . . . a coat of clear lacquer over picture makes it dirtproof and washable. Style 3 shows how small pictures can be mounted in groups. Style 4 is handy for snapshots. Style 5 makes an attractive mount for small or large pictures. The molding at edges lends a decorative touch and conceals end grain. All frames are finished natural with clear lacquer except edges, which may be stained dark to conceal grain of wood

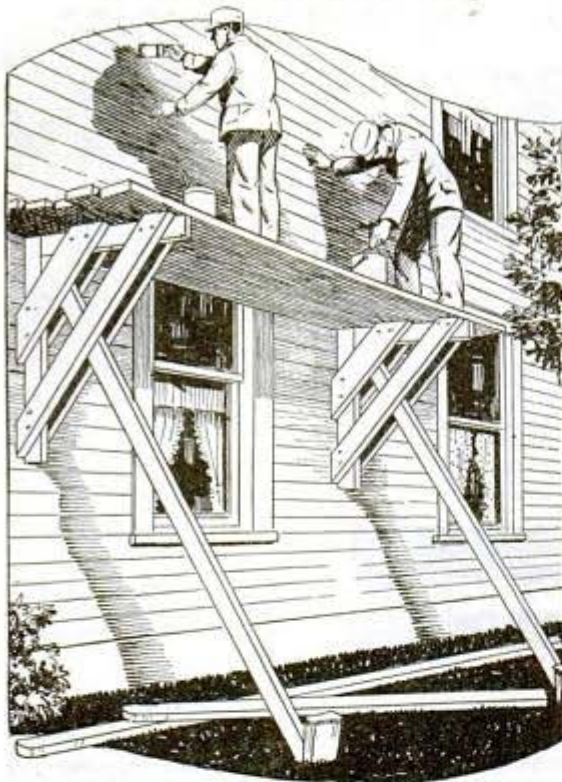
$\frac{3}{16}$ " PLYWOOD $\frac{1}{32}$ " PICTURE RABBET GLUED $\frac{1}{16}$ " PLYWOOD MOLDING GLUED ON

$\frac{1}{16}$ " PLY BACK SCREWED ON PICTURE GLASS $\frac{3}{16}$ " TO $\frac{3}{4}$ " PLY

Style 4 TWO PIECES OF PLYWOOD GLUED TOGETHER. BACK OF FRONT PIECE RABBETED

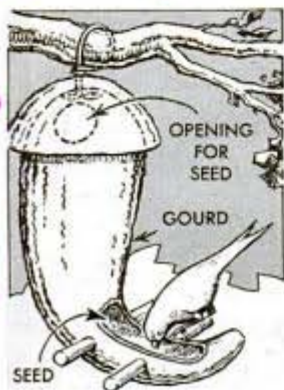
Style 5 DEEP FRAME WITH MOLDING APPLIED TO ALL EXPOSED EDGES

This Scaffold Is Not Attached To Side of the Building



When a job such as painting or other repair work has to be done from a scaffold that must be adjusted in height or be moved along the side of the building frequently, this adjustable scaffold will be found handy. It consists of two right-angle brackets assembled as shown and two supporting planks of 2 by 6-in. stock. The planks are inserted into the brackets, which rest against the side of the building, the planks being supported at the ground by large stakes to prevent slipping. After the brackets have been set up, planks are laid across. Supporting planks of different lengths should be provided so the scaffold can be set at various heights.

Bird Feeders From Gourds



Certain types of ornamental gourds provide attractive and efficient bird feeders. For example, a gourd shaped similar to the one shown can be converted into a feeder by cutting a slot in the upper surface of the curved end and inserting

two dowels for perches. Filling is done through a small hole in the upper end, the hole being covered by a cap cut from the end of a larger gourd. Length of the feeding slot will depend on the exact shape at the point where it is made. The slot should be of a length and shape to permit the birds to peck the feed, yet keep it from spilling.
Lou Everding, Balboa Island, Calif.

Making a Flashlight Buoyant To Float in Water

Fishermen and others who often use a flashlight where it may be dropped into water accidentally can avoid its sinking to the bottom by copying the idea of one fisherman. He attaches a medium size jar, such as one used for olives, to the bottom of the flashlight case to serve as a float. To do this, the cap of the jar is soldered to the bottom of the flashlight. When not needed, the jar is unscrewed and laid away.



Felt Protects Glass Cutter

Your glass cutter will last much longer if you keep it protected with a piece of felt when not in use. Just wrap the felt over the end as indicated and hold it in place with a rubber band or tie it. Saturate the felt with light oil or kerosene to prevent rust and to keep the small wheel of the cutter lubricated.

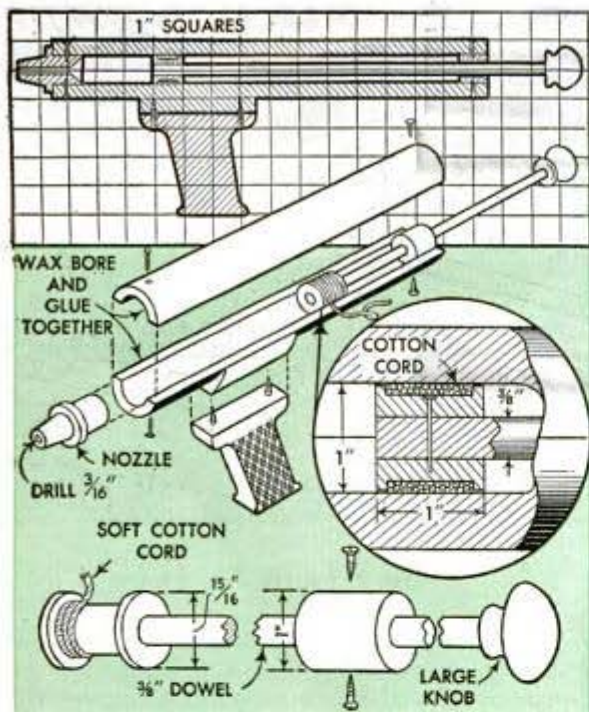


Used Hypo Silver-Plates Copper

Articles of copper and brass can be given a silver-plated appearance by dipping them in old, cloudy hypo that is no longer suitable for fixing photo prints. After the articles have been cleaned thoroughly, a few minutes' immersion is all that is necessary. When plated, the article is washed thoroughly in clear water and polished with a cloth.



Fun at the Beach With a Water-Squirting Gun



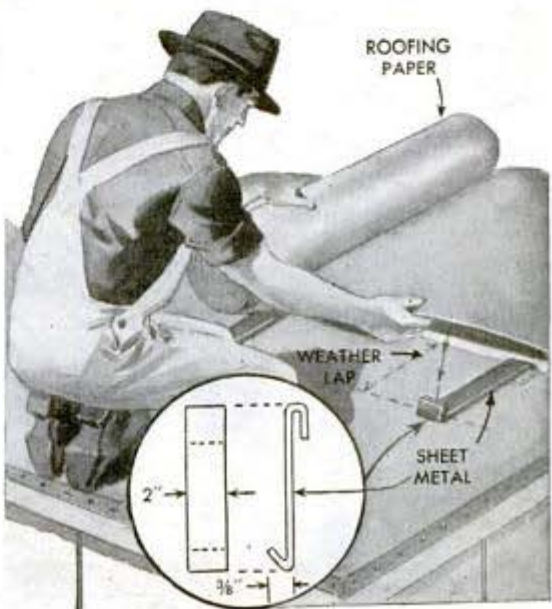
Two "commandos" at the lakeside, each armed with a water-pump gun and appropriately attired for battle, will be assured of plenty of excitement as well as a generous soaking. The gun barrel is made from two pieces of hardwood, each piece being grooved and waxed so that, when glued together as shown in the drawing, they will form a bore for the plunger. The latter is an empty thread spool of suitable diam-

eter. It is wound with cord, which acts as packing, as indicated in the circular detail. The plunger is fitted with a length of dowel for a push rod, which is inserted through a wooden sleeve that fits the bore, where it is fastened with two screws, and a knob is glued at the end of the rod, as shown in the lower detail. The nozzle and handgrip, also of hardwood, are attached as diagrammed in the cross-hatched pattern.

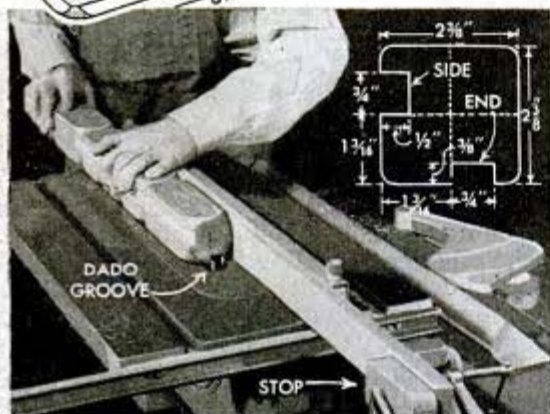
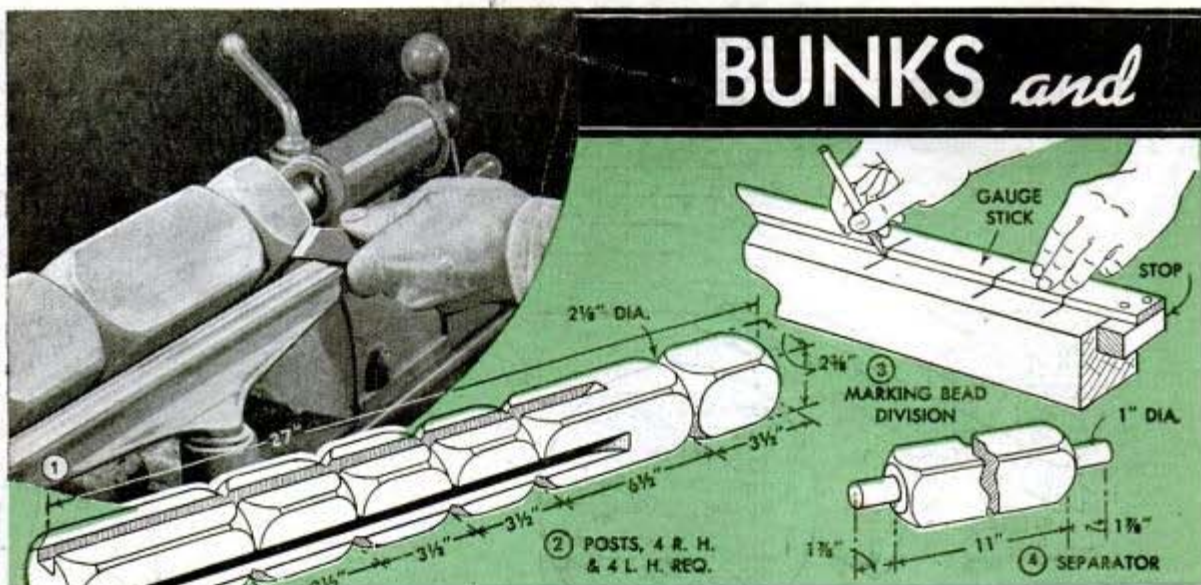
Lap Gauge for Rolled Roofing Holds Edges in Alignment

Laying rolled roofing singlehanded is no problem if you use a gauge like the one shown. It not only serves to get a uniform weather lap the length of the roof, but it also holds the roofing in place while you nail it. Bent to shape from heavy sheet metal, the gauge is made equal in length to the desired width of the weather lap. As many gauges as needed are used, one end of each being hooked over the roofing strip already in place, the other end being used to engage and space the unnailed strip of roofing as it is unrolled. As nailing proceeds across the roof, the gauges are removed and hooked over the edge of the strip above.—A. Gemmell, Ansonia, Conn.

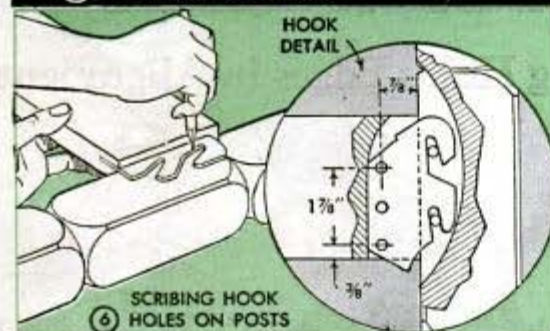
☐ In your handbag or in the glove compartment of your car keep an oiled silk refrigerator bag to carry a piece of soap and a dampened wash cloth while traveling. It proves invaluable where there are children.



BUNKS *and*



5 GROOVING THE POSTS



6 SCRIBING HOOK HOLES ON POSTS



7 HOW KERFS ARE CUT

By Edwin M. Love

BESIDES saving considerable floor space in a crowded room, this bunk-bed unit is equipped with a mammoth drawer that can be used for storage, whether this is spare bedding or a fleet of model airplanes. As the drawer can be pulled out from either side of the bunk all parts of the interior are easily accessible. A plank fitted to the top serves as a handy platform to stand on when making the upper bed, as shown in Figs. 13, 15 and 16. The beds, however, can be separated and used as twin beds.

The first step in construction is to cut the lumber roughly to size. If the wide boards are warped, rip them into narrower pieces and glue together with heart and sap sides alternating. They then can be planed smooth without too much loss of thickness and will remain flat. To turn the posts, square the pieces and center them accurately. Use a gauge stick, Fig. 3, for laying off the bead divisions. As the work turns, score these divisions with the point of a sharp skew chisel held on the tool rest as in Fig. 1, and shape the bead ends by swinging the tool to the right and left. By this method the bead ends are cut without splintering the corners. Chamfer the corners with a light cut on the jointer, or this may be done by hand.

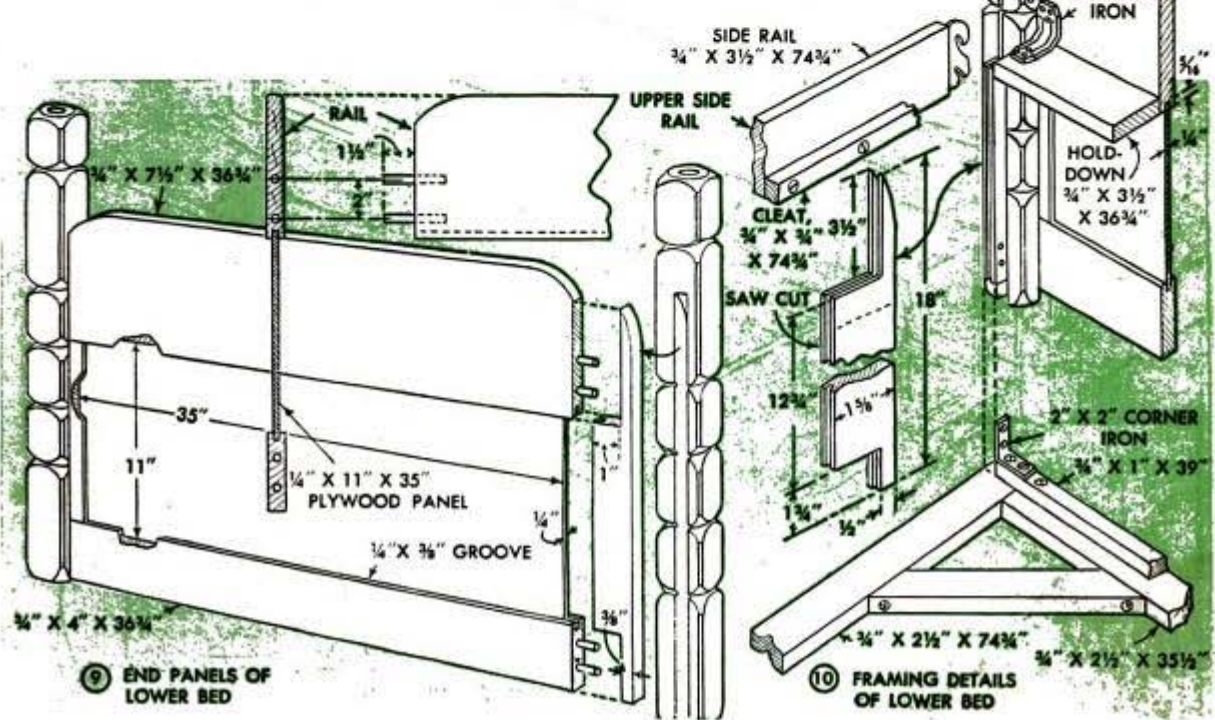
Make separator blocks as detailed in Fig. 4, to join the upper and lower bunk posts, gluing dowels in their ends. If the bunks eventually are to be used as twin beds, turn finial buttons to go into the post holes, and paint them to match the beds. See upper detail of Fig. 10. Disks are sufficient for the unbored tops of the upper bunk posts.

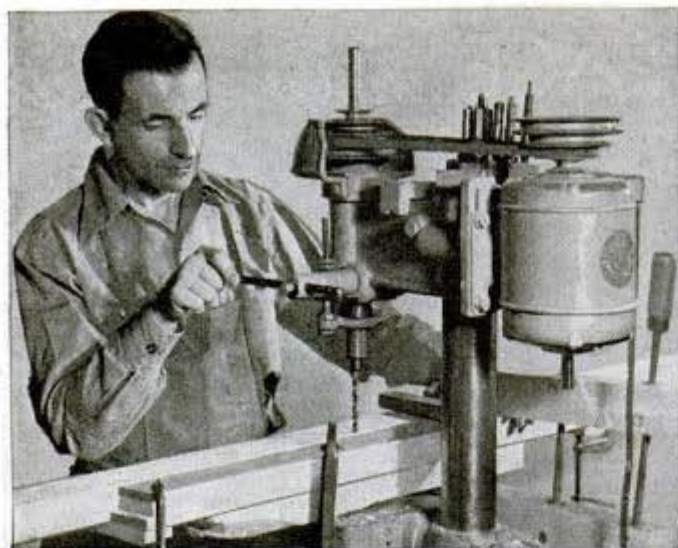
Use one blade of a dado saw to slit the posts and bed-rail ends to take the rail

STORAGE SPACE *in One Unit*

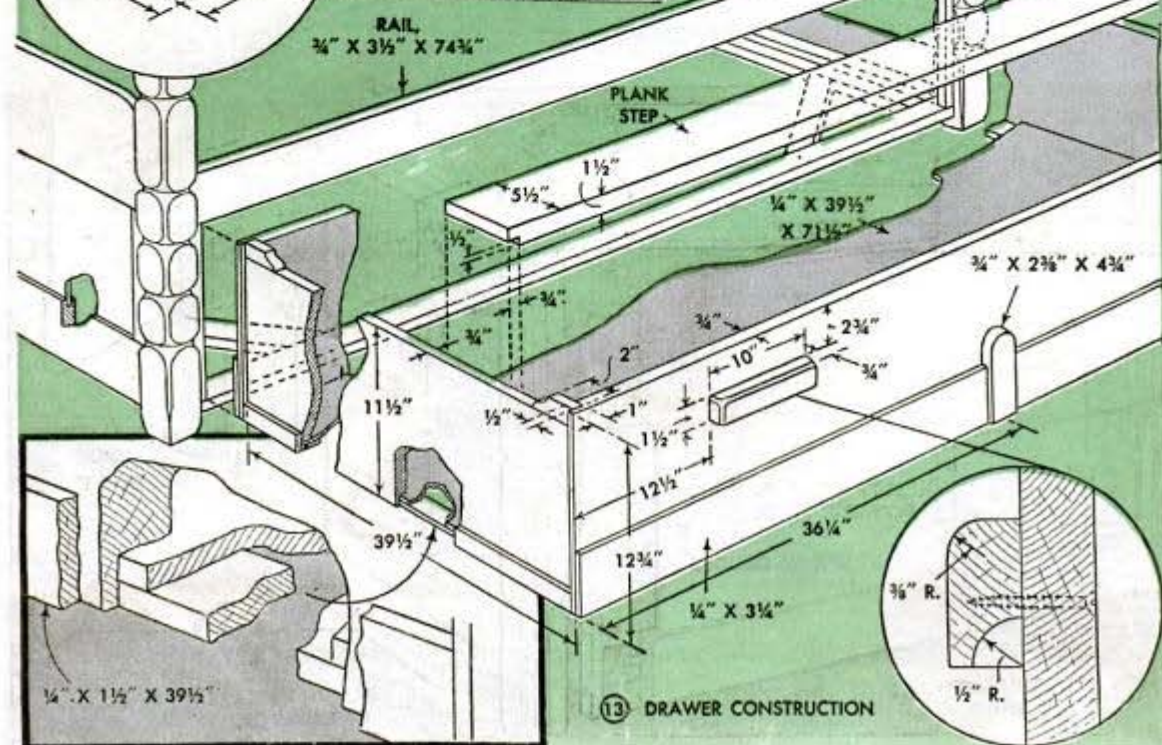
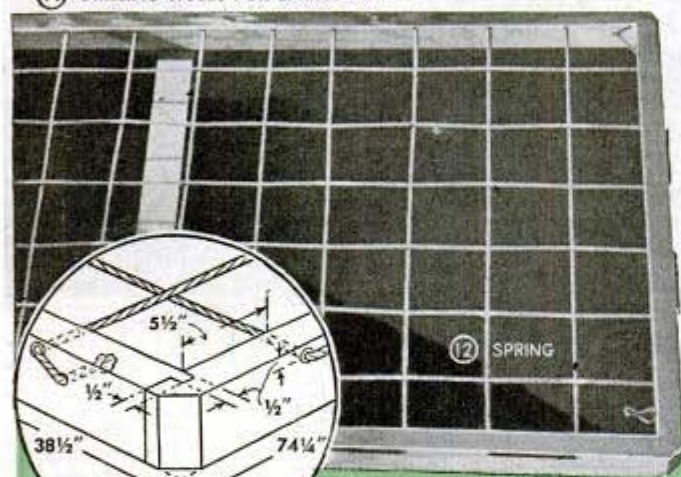


Here's the logical solution to the frequent problem of getting more space in the growing boys' bedroom. Consisting of two separate beds, which can be used individually instead of in bunk formation, this unit is provided with a mammoth drawer that can be pulled out at either side for easy access to its contents





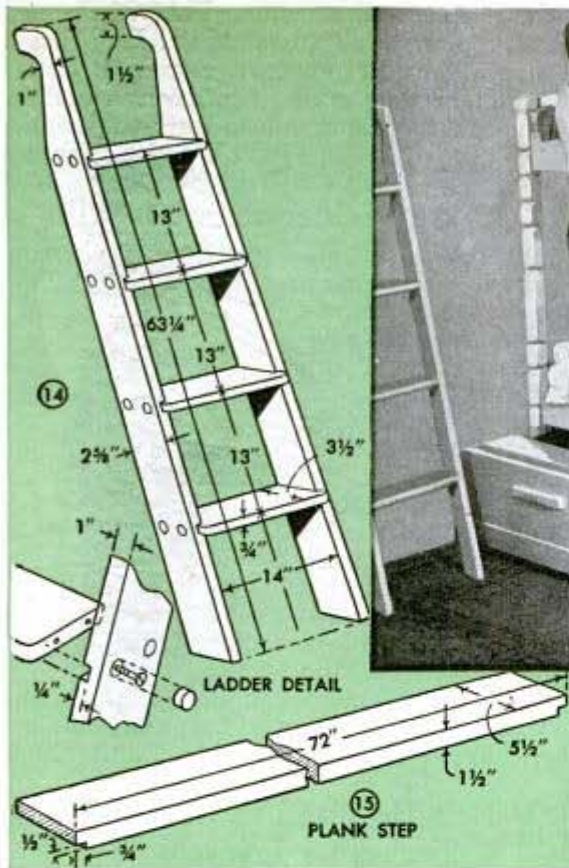
① DRILLING HOLES FOR SPRING TIES



hooks. Install the hooks in the rails and secure the pins with wooden wedges to prevent them from dropping out. Use one rail end fitted with a hook as a template for scribing the pin locations on a post as in Fig. 6, taking a pattern from this for the rest. Center the pins where the hooks will bear against them and draw the rail ends tight when the rail is $\frac{1}{8}$ in. above level. The joints will be rigid when the rails are driven down to position. Then determine the length of the saw kerfs in the posts, and set start and stop blocks on the circular saw to correspond, as shown in Fig. 7.

Next mount a $\frac{3}{4}$ -in. dado head and groove the posts $\frac{1}{2}$ in. deep to receive the panel stiles as shown in Figs. 2 and 5. Make the stiles, rounding the ends to fit the grooves or chiseling the groove ends square, as preferred. The exact position of the grooves is shown in the detail of Fig. 5. Kerf the ends of the drawer stiles to receive the ends of the hooks that project below the rails.

Bore dowel holes in the end rails and use them as patterns for locating the post dowel holes. As-



semble the rails and stiles with the end panels and when the glue is dry assemble with the posts as in Fig. 9. Clean up the ends and attach the side rails. Build the lower frame to fit, screwing in the corner braces as in Fig. 10 and reinforcing all joints with corrugated fasteners driven into the underside. Wax the upper side of the frame. To support the frame make six blocks of suitable thickness, nailing one under each corner, set well back, and one at the center of each drawer rail. Add the drawer guides, which are flush with the sides of the drawer, since this can be pulled from either side. The four corner irons screwed to the guides and inner surfaces of the drawer stiles prevent the frame from dropping if the bunk is lifted. The corner irons are not intended to take the weight of the drawer, for which purpose the blocks, already mentioned, are provided.

Build the drawer with the sides rabbeted into the fronts and the bottom rabbeted into the front and sides as in Fig. 13. Hardwood strips nailed to the ends and across the center take the wear and provide clearance for easy sliding of the drawer. Use plywood to make overlays for the drawer fronts. A wooden overlay shaped to match the post turning is placed at the center. Both sides are made exactly alike.

Before taking the bunk apart, number the four corners of the drawer, the bed and

rail ends, and the lower frame to facilitate assembly in the proper order. Since the bunk can be carried through an ordinary doorway the ends and rails may be assembled by means of dowels, making a rigid housing for the drawer and eliminating the bother of fitting rail hooks. The upper bunk ends are assembled with two posts and a wide rail, and are put together with the rails like any ordinary bed.

Glue and screw cleats inside the rails near the lower edges to carry the springs. Rope springs, Fig. 12, are quite satisfactory, although they tend to sag like hammocks when the ropes stretch, and the ropes cannot be drawn too tightly or the sides bow in unduly. If tight and flat springs are desired, stiffen the sides by nailing a 1 by 6-in. board lengthwise under each edge, setting it in $\frac{3}{4}$ in. to allow for the rail cleats. The rope is laced through holes drilled in the spring frames as shown in Fig. 11, the ends of the rope being knotted. Details of frame corner construction and sizes are given in the circular insert of Fig. 12.

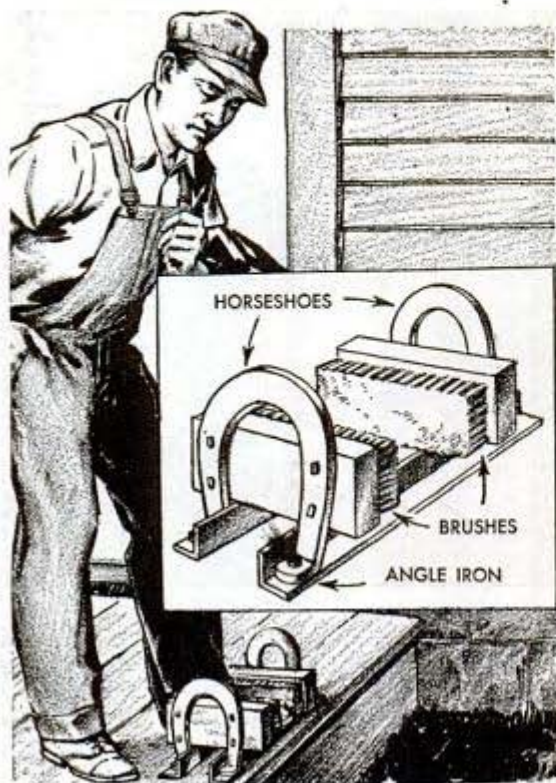
A simple four-step ladder is shown in Figs. 8 and 14. Gain the ends of the steps into the sides of the ladder and secure them with screws having heads sunk in counterbored holes. Glue plugs into the holes and dress them flush when dry. //

Precaution for Night Driving

For greater safety in night driving try tying a white handkerchief or piece of white cloth around the left wrist for signaling. Other drivers can see it clearly in the darkness and an accident may be averted.

Mrs. C. V. Hutchens, Banning, Calif.

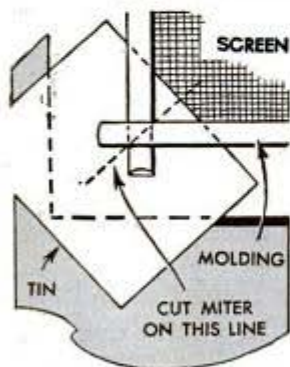
Brushes at Ends of Foot Scraper Clean Sides of Shoes



This rugged foot scraper not only has brushes at the ends to clean the sides of the shoes, but also it is well shielded, so that there is little chance of anyone falling on it and injuring himself. It is made from two lengths of angle iron joined by two horseshoes set on end and bolted in place. The brushes are fastened to the horseshoes by screws inserted through the nail holes in the shoes.

Joseph B. Martin, Dallas, Tex.

Easy Way to Miter Moldings On Window Screens



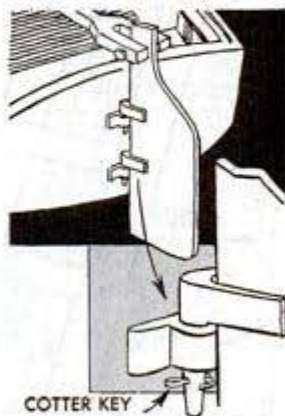
Fitting moldings neatly on window screens is a simple job if you do it as shown. After applying the screen wire, tack on one molding strip, allowing it to project $1\frac{1}{2}$ in. at each end. Then tack on the adjoining strip so that it overlaps the end of the first strip as indicated, driving the nails only about halfway in near the end. Slip a piece of tin or thin wood under the strips at the joint and then make the miter cut through

both pieces of molding. This will give a neat joint when tacked down. It is best to use a thin, fine-toothed saw so that you won't have to spring the severed ends of the molding too much to form the joint.

Paul Weigle, York, Pa.

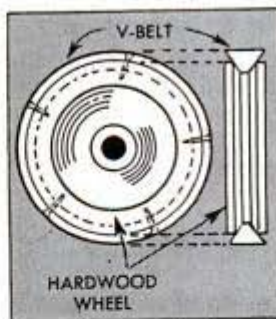
Locking Rudder on Small Sailboat

Because of vibration and other factors the rudders on small sailboats sometimes are dislodged, which is not only annoying but may be dangerous. To avoid this trouble, drill a hole through the pintle just below the gudgeon and insert a cotter key as indicated. This will keep the rudder in place while sailing, yet it is easily removed by pulling the cotter key.—N. Tufford, Grosse Pointe, Mich.



V-Belt Bradded to Wood Wheel Serves as Tricycle Tire

On an all-wood tricycle made for his small son, one man used strips of V-belt for tires. The wheels were grooved to a depth



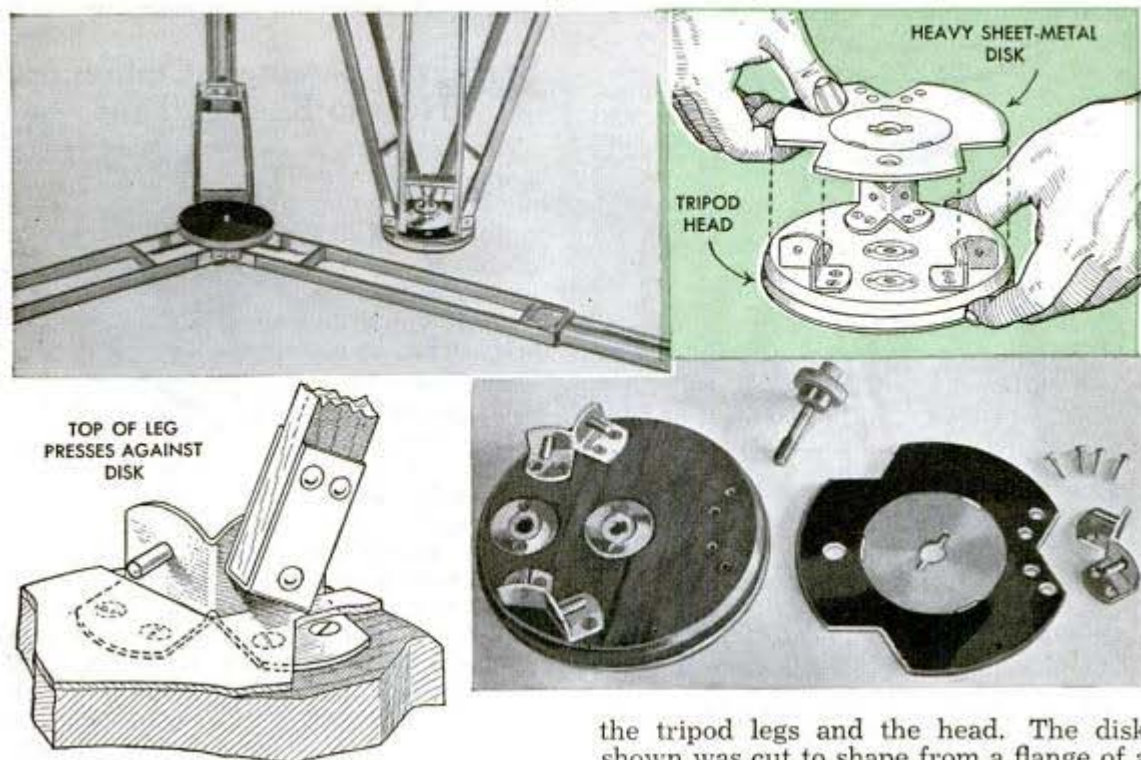
equal to half the thickness of the belt strip, which then was secured with brads set well below the surface to avoid coming in contact with a floor and marring it. — Reg Dunham, Fort Erie, Ont., Can.

Varnish Protects Calibrations On Transparent Ruler

Calibrations on inexpensive, transparent rulers are printed on the back and soon wear off unless they are covered with a protective coating. A thin coat of clear varnish will protect the markings and thus extend the useful life of the ruler. — Edwin M. Love, Palmdale, Calif.



Metal Disk Restricts Spreading of Tripod Legs



Installing a sheet-metal disk under the head of a camera tripod so that the legs butt against it, as shown in the lower drawing, will limit the spread of the legs, as indicated in the right-hand detail of the upper photo. By thus limiting the spread of the legs, there is very little danger of the tripod shifting out of position or collapsing when it is set on a smooth floor. The thickness of the disk is determined by the amount of free space between the ends of

the tripod legs and the head. The disk shown was cut to shape from a flange of a 9½-in. aerial-film spool and was notched to fit over the pivot brackets and under the pivot pins, as shown in the upper drawing. Holes were drilled to coincide with those in the tripod head for pan-head or wide-angle position attachments and for screws that hold one of the pivot brackets, which were removed so that the disk could be installed. The brackets were then slipped back in place under the disk and the screws replaced.

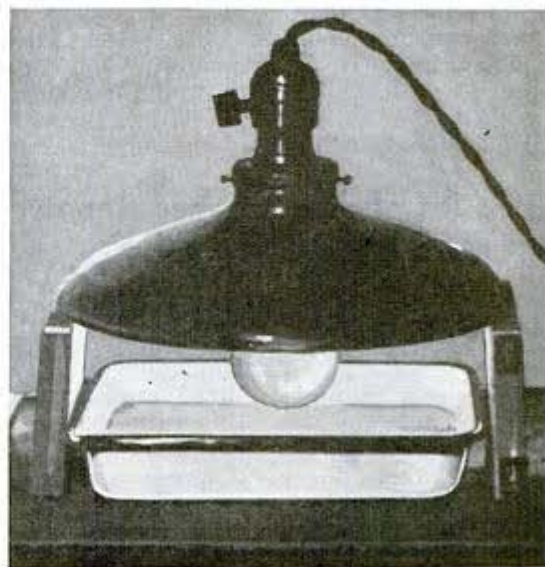
Light Bulb Can Be Used to Warm Photographic Solutions

One amateur photographer claims he can raise the temperature of a tray of developer or other solution 5 degrees in 2 or 3 min. with a 100-watt light bulb in a reflector. He places the reflector on a couple of blocks, as shown, so that the bulb is near the solution. A larger bulb would heat the solution even faster.

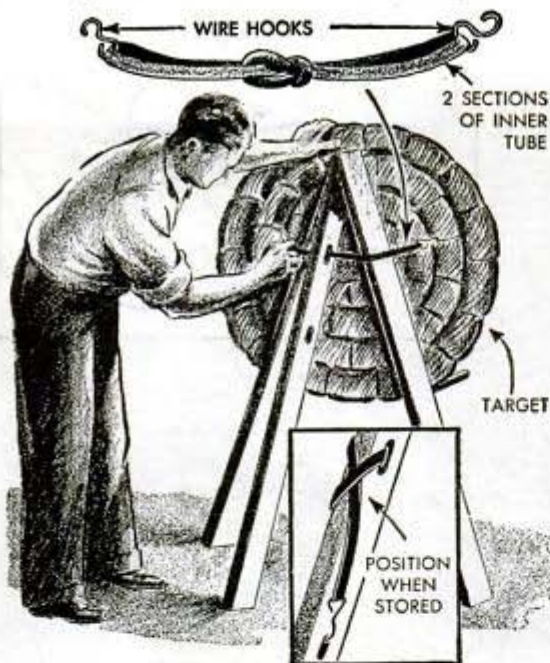
Film Protects Book for Tracing

To protect the pages of books while tracing drawings and sketches from them, one librarian uses old photo negatives from which the emulsion has been removed. A sheet of this clear film is placed over the photo or drawing to be traced, and then the tracing paper is laid over this. The film keeps the pages free from impressions made by the tracing pencil.

Wesley V. Korman, Mitchell, Nebr.



Archery Target Held on Tripod By Rubber Band "Clamp"

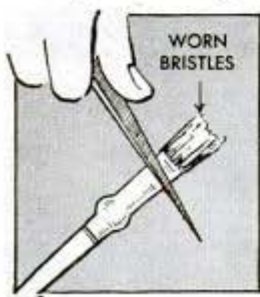


There will be no possibility of a strong wind blowing your archery target off its tripod and possibly breaking expensive arrows if you attach it to the tripod as shown. Two strong rubber bands cut from an old inner tube are fastened together to make one long band and then fitted with hooks. The band is run through a hole in one leg of the tripod and is hooked into the target as indicated. When not in use, the band is hooked into the hole in the tripod leg to prevent losing it.—R. R. Busch, Chicago.

Handy Bird-Seed Container

An empty table-salt container of the type having a pouring spout provides a handy container for bird seed from which the seed can be poured into the feeders without spilling. To fill the container, a small opening can be cut in the top and covered with tape after filling, or a funnel may be used.—Charles T. Pearson, Detroit, Mich.

Bristles of Art Brushes Renewed By Cutting Off the Ferrules



When the bristles of your favorite art brush wear down you can lengthen them simply by cutting off the end of the ferrule. To do this, file around the ferrule until it is severed, taking care not to cut off the

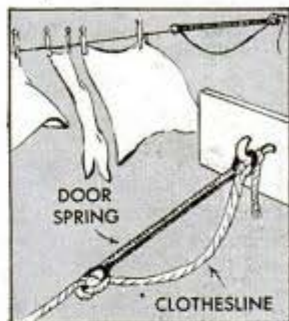
bristles. Press down the severed end of the ferrule to hold the bristles firmly.

S. Bergman, New Rochelle, N. Y.

Springs in Basement Clothesline Help to Keep It Taut

To prevent a basement clothesline from sagging so that it strikes you on the head, tie one end of the line to a screen-door spring as indicated. As these springs are not strong enough to carry the weight of a line of clothes, run the end of the line past the spring and tie it to the hook also, leaving enough slack so that when the spring stretches about one quarter of its length the slack is taken up and the pull comes on the line at the hook in the usual manner. With this arrangement, the springs will keep an empty line taut and not interfere when the line is in use.

T. Dorsey, Jr., Chicago.



Lead Pencil Pointed With Plane



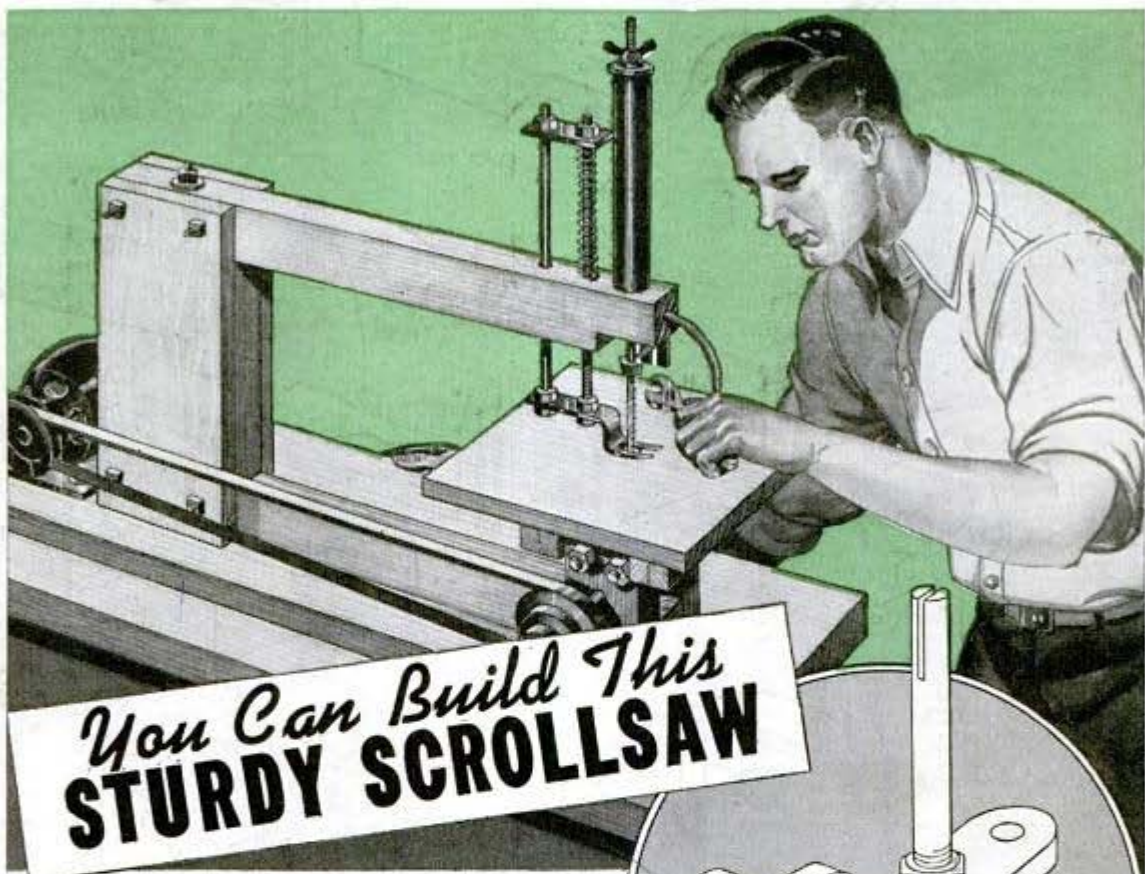
You won't have to hunt for a knife or pencil sharpener to point a lead pencil in your shop if you use a plane. Just turn it over and pull the pencil over the cutting edge at the proper angle.—Stanley Bigows, Youngstown, O.

Substitute for Bronzing Paint Withstands Wear

To make a bronzing paint that possesses much of the luster of gold and yet will stand up under difficult weather conditions or hard wear, I have found that the "imitation striping gold" paint, sold by most artists' supply stores, is a good substitute. This paint does not have the metallic glint of bronze paints, but with the addition of a small amount of the proper shade of bronze powder I have been able to get the desired effect. After bronze powder has been added, the mixture may have to be thinned somewhat with turpentine. This combination results in a paint that dries very quickly, in addition to its other qualities.—A. Dallimore, Orangeville, Ont., Can.



SHOP NOTES



By Will Hooper

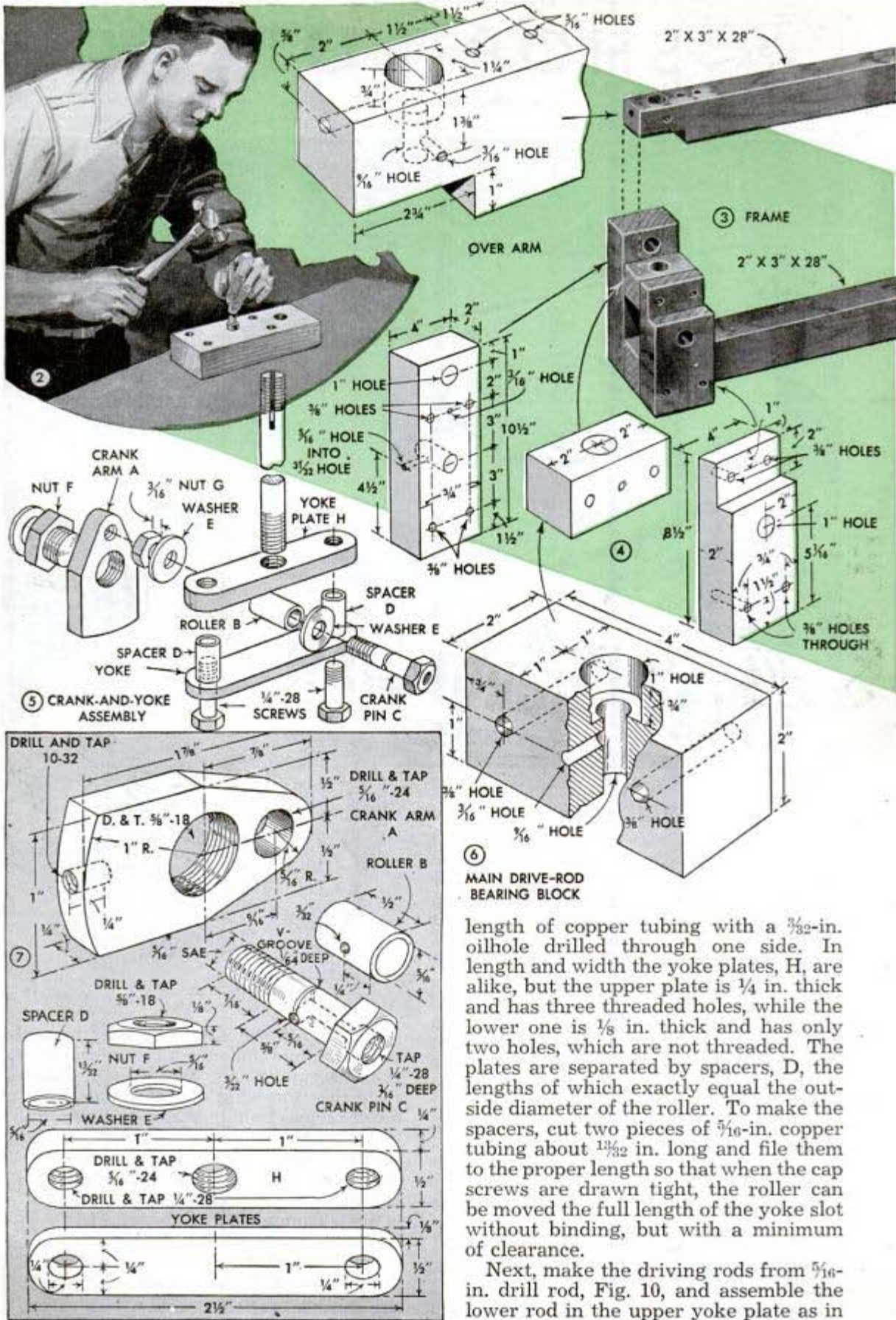
THIS scroll saw can be built at small cost from some scrap materials and a few available new items. Begin construction on the crank and drive mechanism. Cut and drill two pieces of well-seasoned hardwood that are smoothly surfaced to net size, Fig. 4. Cut off the threaded portion from two Ford water-pump bushings (Ford part No. B-8520) and, using the pump shaft (No. A-8510) as a driver, force the bushings into the $3\frac{1}{2}$ -in. hole in the 10 $\frac{1}{2}$ -in. block, Fig. 2. You may have to sand the hole a little and taper the ends of the bushings slightly to make them start. Now cut the shaft to a length of 5 or 6 in. and thread one end $\frac{5}{8}$ -in. 18. With a pulley on the shaft, place it in the bushings and put on a lock nut, F, Fig. 7, which is made from a Ford tire-carrier check nut by drilling and retapping it to $\frac{5}{8}$ -in. 18.

Next, from a 1-in. length of $\frac{1}{4}$ -in. iron, make the crank arm, A, Fig. 7, and place it on the shaft flush with the end. Smooth



① CRANK-AND-YOKE ASSEMBLY

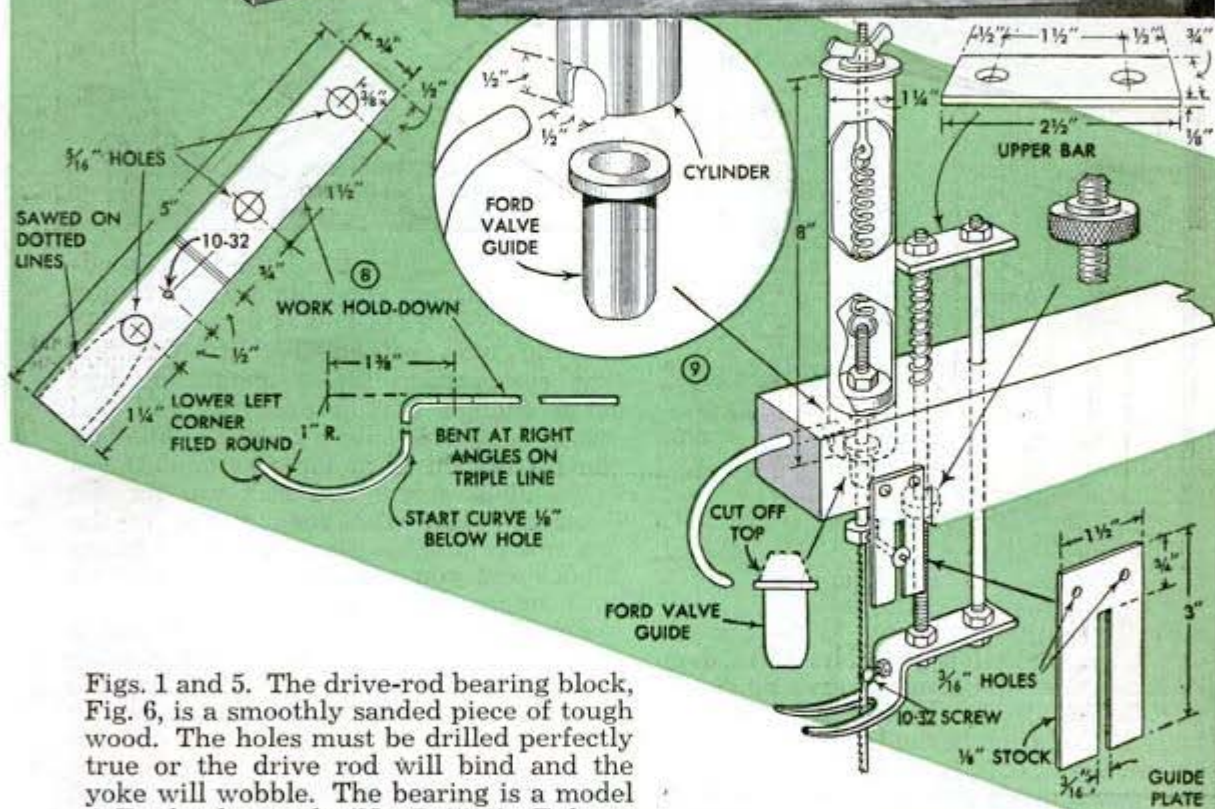
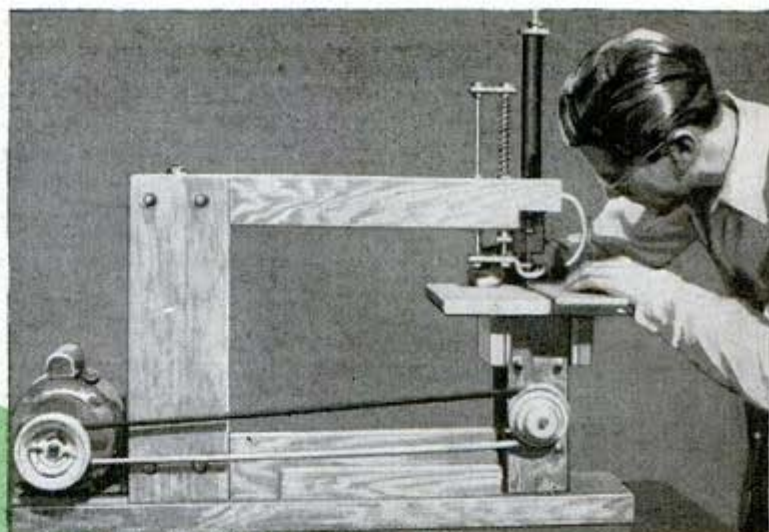
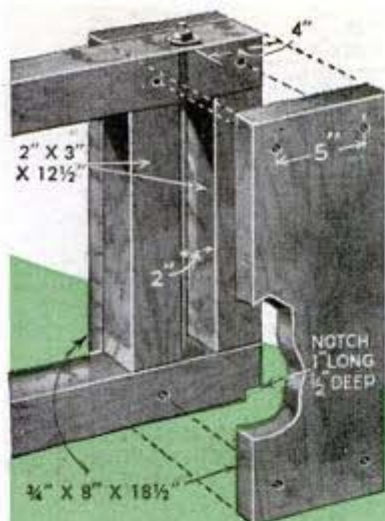
operation of the saw depends upon the accuracy and balance of the crank and yoke assembly, shown in Figs. 1, 5 and 7. Note that the wide end of the crank arm has a tapped hole in which variable counterweights are fitted to get exact dynamic balance. All threaded holes should be straight and true, so a guide must be used to start the taps. The crank pin, C, Fig. 7, is made from a $\frac{7}{16}$ by 2-in. cap screw. This is threaded into the end of the arm, as shown, where it is locked by nut G. The side washers, E, are $\frac{1}{4}$ -in. flat washers drilled out to $\frac{5}{16}$ in. Roller B is a $\frac{1}{2}$ -in.



⑥ MAIN DRIVE-ROD BEARING BLOCK

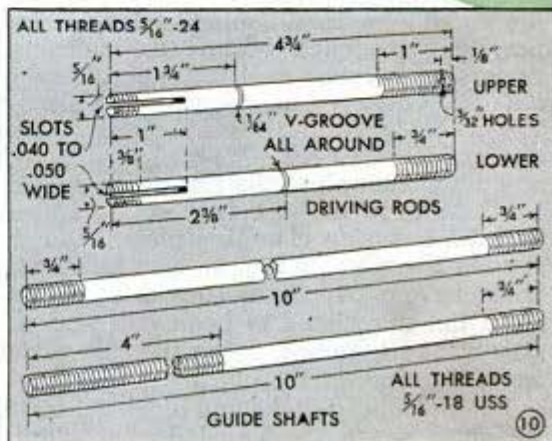
length of copper tubing with a $\frac{3}{32}$ -in. oilhole drilled through one side. In length and width the yoke plates, H, are alike, but the upper plate is $\frac{1}{4}$ in. thick and has three threaded holes, while the lower one is $\frac{1}{8}$ in. thick and has only two holes, which are not threaded. The plates are separated by spacers, D, the lengths of which exactly equal the outside diameter of the roller. To make the spacers, cut two pieces of $\frac{7}{16}$ -in. copper tubing about $1\frac{1}{2}$ in. long and file them to the proper length so that when the cap screws are drawn tight, the roller can be moved the full length of the yoke slot without binding, but with a minimum of clearance.

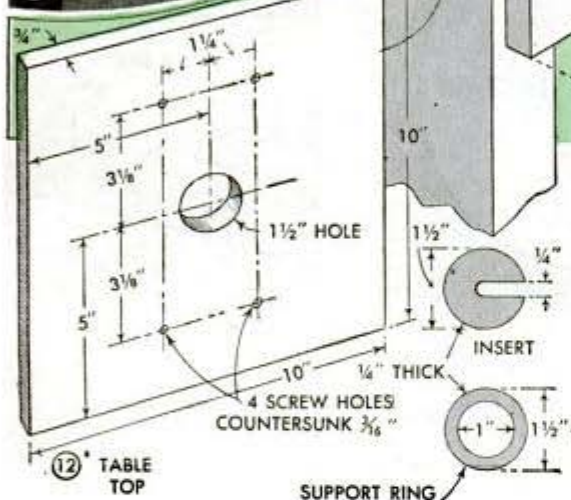
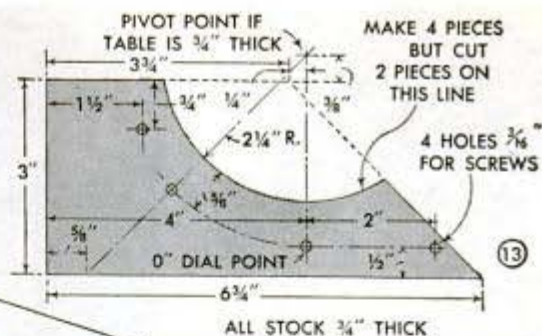
Next, make the driving rods from $\frac{5}{16}$ -in. drill rod, Fig. 10, and assemble the lower rod in the upper yoke plate as in



Figs. 1 and 5. The drive-rod bearing block, Fig. 6, is a smoothly sanded piece of tough wood. The holes must be drilled perfectly true or the drive rod will bind and the yoke will wobble. The bearing is a model A Ford valve guide (No. B-6510). Enlarge the hole slightly by reaming or sanding, but leave it small enough so that the bearing cannot be pressed into it by hand. Coat the wall of the hole with cement and press the bearing in, turning it so that the slits are at right angles to the lubricant duct. Then, using the duct as a guide, drill a $\frac{3}{16}$ -in. hole through one side of the bearing.

Figs. 3 and 9 show the over arm. If you use a Ford tire-pump barrel for the sawdust-blower cylinder, which is shown in Fig. 9, bore a $1\frac{1}{4}$ -in. hole, $\frac{3}{4}$ in. deep, in the 2-in. face at a point 2 in. from one end. Continue on through with a $\frac{9}{16}$ -in. bit. Then saw out a 1 by $2\frac{3}{4}$ -in. notch in the lower side. Enlarge the $\frac{9}{16}$ -in. hole to take





a Ford valve guide, shown in the circular detail, Fig. 9. Drill a $\frac{19}{64}$ -in. hole 2 in. deep in the end of the arm to serve as an air duct for the sawdust blower and drill a $\frac{3}{16}$ -in. hole 1 in. deep in the left side for lubrication. Next, drill two $\frac{5}{16}$ -in. holes for the hold-down guide shafts, which are shown in Fig. 10. These, and the hole for the bearing, must be perpendicular to the arm and parallel with each other. To make the upper-rod bearing, cut off the short end of a Ford valve guide against the flange. When this is installed, use the grease duct as a guide and drill a $\frac{3}{16}$ -in. hole through one side. Complete the frame by making the base arm, the two rear support posts and the two side clamping plates, and assemble these as in Fig. 3. The horizontal holes in the over arm should be drilled after the machine has been run and the stay rod retightened, using the side plates as a guide for the bit.

The work hold-down and blade guide are shown in Fig. 8. The knurled wheel shown

in Fig. 9, by which the hold-down is adjusted, is a Ford windshield-wiper thumb nut (No. B-45482). This is threaded $\frac{5}{16}$ -18 like the guide shaft on which it is screwed. The compression spring should be just large enough to slip over the rod and strong enough to have a 2 or 3-lb. lift when the hold-down is in top position. Use a No. 10-32 screw and lock nut for the blade guide. The regular slot in the screw is suitable for medium and heavy blades and you can saw a slot crosswise to it for finer blades.

For the blower, use a tire pump with a $1\frac{1}{4}$ -in. outside diameter. After enlarging the holes in the plunger valve and washers to $\frac{5}{16}$ in. and placing them on the upper drive rod, insert the rod in a bearing in the over arm. The tension spring, which is held by a 2-in. eyebolt, should be well tempered and about half the size and strength of a screen door spring. To complete the blower, a piece of $\frac{5}{16}$ -in. copper tubing is bent and fitted into the air duct so it will direct an air blast toward the work. Now make the upper-rod guide plate and attach it to the over arm so that the slot will be in line with the rod. This part is necessary only if there is a tendency for the blade to twist. Two blade chucks are made from $\frac{5}{16}$ -in.-24 nuts by drilling through the side and tapping for No. 10-32 setscrews. The screw for the lower chuck should be $\frac{1}{4}$ in. long, while the upper one is 1 in. long so that it will pass through the slot in the guide plate. Install $\frac{1}{4}$ -in. threaded grease fittings in the lubricant ducts and use auto-wheel bear-

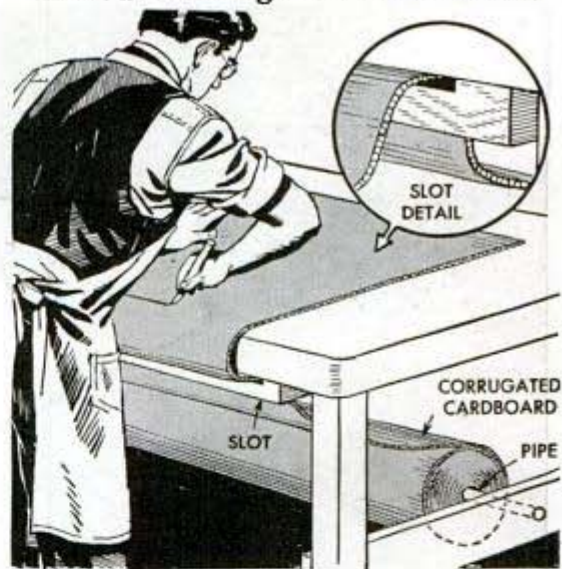
ing grease. Unrefined petroleum jelly is a suitable substitute for auto-wheel bearing grease and a small jar will last for a long time. On the rod bearings, lubricating is done best while the machine is running slowly.

To make the tilting table, cut out the two friction blocks, Figs. 13 and 14. From two more blocks exactly like these make the trunnion tracks by sawing on the curved line, as in Fig. 13. When laying out this curve, bear in mind that the pivot axis is actually outside the trunnions at a point halfway through the table. Thus, if your table top is to be $\frac{3}{4}$ in. thick, the stationary point of your compass must be $\frac{3}{8}$ in. outside or above the piece being marked, otherwise the tilting axis will not be correctly placed. To get the correct radius for the trunnions, add the width of your saw kerf to the radius used in cutting them. If you use the same radius in both cases, the tracks will be larger than the trunnions, resulting in improper fit. Drill through each trunnion slot with a $\frac{1}{4}$ -in. bit, making a hole through both friction blocks so that the bit will just miss the left upright post. Then insert a $\frac{1}{4}$ by $7\frac{1}{2}$ -in. carriage bolt through these holes, with a washer and wing nut on the front end.

Fig. 12 shows the top of the table, for which plywood is suitable. Countersink the screw holes so they will fit flush or slightly below the surface. The insert and support ring should be sawed from $\frac{1}{4}$ -in. plywood or hardwood. The insert should go into the hole with a free fit, but the supporting ring must be a press fit. When mounting the table top on the trunnions, use paper shims if necessary to align it squarely with the saw blade. One of the trunnion-track mounting screws is on the zero dial point and one is on the 45-deg. point. Fasten a pointer, made of bright tin, on the front trunnion at the center line. Then, with a protractor, locate the 15 and 5-deg. points, indicating them with smaller screws. If the trunnions have a tendency to roll on the tracks, you can steady them by running two tension springs from the locking bolt to screws set in the lower side of the table top at the center line.

A $\frac{1}{4}$ -hp. motor will pull this machine satisfactorily, using a $\frac{3}{8}$ -in. V-belt and regular stock V-pulleys. The ordinary stock sizes of step pulleys are not suitable for use in pairs, as they give speed variations that are too great. A good combination is a 2-in. pulley on the motor and a 4-step pulley on the saw, with pulleys of $4\frac{1}{2}$, $3\frac{3}{4}$, 3 and $2\frac{1}{4}$ -in. size. Of course, either the motor or the saw must be movable. If an endless V-belt of the proper length is not available, $\frac{3}{8}$ -in. round leather belting can be used satisfactorily.

Roll of Corrugated Cardboard Is Fed Through Slot in Bench

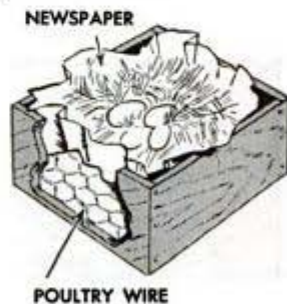


Packers and others who use corrugated cardboard at a bench will find this method of handling it very convenient. The roll of cardboard is mounted on an axle under the bench and is fed up through a slot at the edge of the bench. In this way, the cardboard is pulled up on the bench top and the required amount cut off, after which the severed end of the roll hangs free, close to the slot within easy reach. The slot is made by recessing one side of a wood strip of suitable length and screwing it to the underside of the bench top, making the recess just deep enough to provide a slot.

Gordon B. Dart, Hartford, Conn.

Hens' Nests With Wire Bottoms Are Easy to Clean

Sanitary nests for hens are easy to make by simply constructing wooden frames and fitting them with bottoms of poultry wire. Covering the wire with old newspapers keeps the nesting material from falling through the wire. To clean the nests, simply dump out the paper and nesting material and replace it. The wire provides no corners or crevices for vermin.



Jack Bronte, Grass Valley, Calif.

☛ A blotter or other sheet of paper placed under an office stapler or any heavy object will effectively prevent it from marring the surface of a desk.

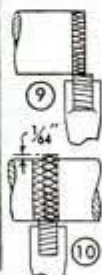
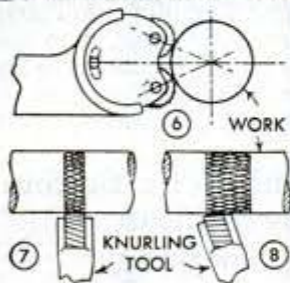


① DIAMOND (COARSE) ② DIAMOND (MEDIUM) ③ DIAMOND (ONE PASS) ④ DIAGONAL

How to do a **CLEAN**

THE SECRET of clean knurling, such as shown in Figs. 1 to 4, is pressure, which must be applied before the work or rolls can make one complete revolution. If you give this matter a little thought, you will see that the knurling tool is not perfect—if you run any toothed wheel around a piece of round stock, it is not likely that after making a complete revolution the teeth will again engage in the same place as before. However, if the initial engagement is under heavy pressure, the teeth will make a deep track; then on the second revolution the teeth will hit one side or the other of this track, maintaining the pattern.

The preliminary setup is to have the tool on center as in Figs. 5 and 6. It



Set the tool square with the work and check the tailstock support. Then apply oil to work surface and to knurling rolls

With lathe idle, advance cross-feed .050 in. Rock the work by hand and apply more pressure on tool without springing work

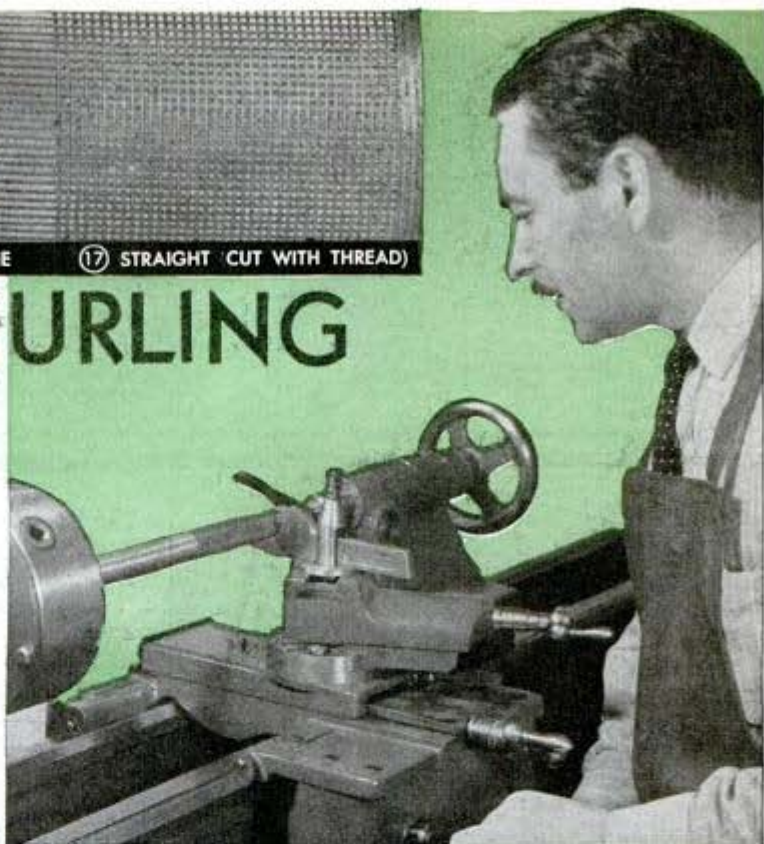
Run lathe at about 50 r.p.m., and make test knurling pattern. If satisfactory, engage long feed at about .030 in. per rev.



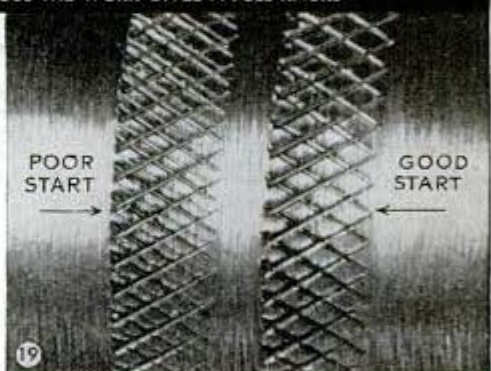
(15) HERRINGBONE (16) STRAIGHT LINE (17) STRAIGHT CUT WITH THREAD

JOB of KNURLING

is a good idea to make a special tool-post ring, as in Fig. 11, to insure proper positioning on every job. The knurling rollers should be square with the work, Fig. 7. When you make the setup, put a light or a white piece of paper under the work, as shown in Fig. 12, in order to see plainly the parallelism between work and rollers. Now, advance the cross-feed by hand, Fig. 13, setting up a heavy pressure—about all your two hands can apply. The lathe is not running. Oil the knurling rollers and the work, using any kind of machine oil. Start the lathe. Do not make a full revolution, but stop about halfway and give an extra twist on the feed screw if possible. Start the lathe again and let it run for three or four revolutions, Fig. 14. Then stop the lathe and check the pattern. If you get a clean pattern on this first ring, the job is as good as done. You can then engage longitudinal feed to run the knurling tool any required distance along the work. At the end of the cut, reverse the feed, take another bite of about .005 in., and run back to the starting point as in Fig. 18. These two passes should bring up a full knurl, but another pass or two can be made if desired. You can reverse and stop the lathe as often as you like—the only rule you have to follow is that you should keep the knurls en-



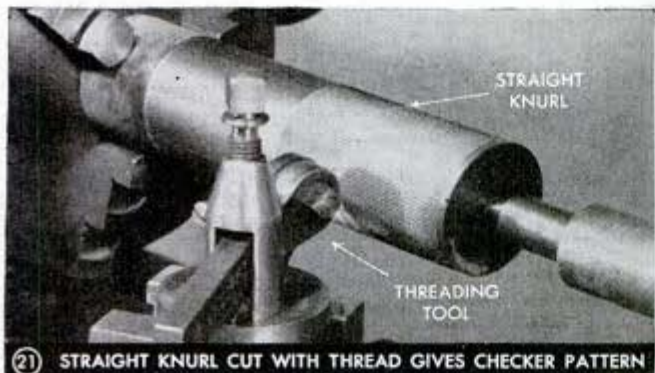
(18) TWO PASSES ACROSS THE WORK GIVES A FULL KNURL



In a poor start the pattern is split. Try again somewhere else on the work



Knurling rollers will reshape the pattern after a good track is established



(21) STRAIGHT KNURL CUT WITH THREAD GIVES CHECKER PATTERN



Face knurling: One wheel contacts work for straight pattern, both wheels for diamond pattern

gaged until the job is done.

Do all knurling at slow speed, about 50 r.p.m. The feed should be about .030 to .040 in. per revolution (24 to 32 threads). If the work is extremely hard, the knurling rollers can be set at a slight angle, Fig. 8, to assist penetration. Since this leaves a light cut at the end of travel, it is useful only when

the knurled area can be run over length and trimmed to size. If the knurl runs from the end of the work, engage only the half width of roller, Fig. 9, the idea again being easy penetration. Another good method of sinking the tool is to turn a slight shoulder about half of the knurl width, Fig. 10, and make the initial run on this. This is good practice if you want just a light cross hatching of lines as shown in Fig. 3. Once the knurls are tracking, they will hold true in a light cut, but they will not start in a light cut. If the work is light of body and long, always use a center rest or follower rest as a support—pressure alone is useless if the work springs. The preferable mounting is between centers with feed on the first run toward the headstock. If you use a chuck be sure to stop the work against the chuck itself or against some kind of stop inside the spindle—otherwise it will creep and spoil the job.

A poor start on a diagonal or straight knurl often can be corrected with more pressure. However, this does not work with the diamond pattern. When you split the diamond on the initial pass, extra pressure does not help. In this case, check the setup carefully and try again in another place, Fig. 19. Once a good track is established, the knurling rolls will roll out almost any depth of pattern in a poor start, Fig. 20.

Sometimes you want a novelty pattern. Try the straight knurl cut with a thread, as shown in Figs. 16, 17 and 21. Another novelty pattern is the herringbone, Figs. 15 and 22. Make this with a diamond knurling tool, but use only one roller at a time. This setup is easily made by using the milling attachment as a hold-

ing device, permitting the necessary raising and lowering to engage one roller only. Another method of engaging one roller is to turn the tool over, as shown in Fig. 23.

While knurling is most used for traction and ornamentation, it makes a good holding device for fastening thin metal sleeves over wood, as shown in Fig. 24. Use it also for drive fits, Fig. 25. The knurl increases diameter of work about .010 in.—often you can save an undersize job by this method.

Both straight-line and diamond patterns can be run on the face of the work. The straight knurl should be worked with single roller only, Fig. 26, while the diamond permits engagement of both rollers, Fig. 27. For these setups, lock the carriage and use compound for feed. Pressure required is much heavier than for spindle work, and knurling of this nature is best confined to narrow rims or light impressions.

Handy Holder for Gas Coupons Made From Tobacco Can

A busy service-station attendant prevents loss of gas-rationing coupons and makes the task of collecting them easier by depositing them in a tobacco can carried in his shirt pocket. The coupons are dropped into the can through a slot in the hinged cover, which permits them to be removed easily at the end of the day.

G. E. Machauer, Memphis, Tenn.



Fingernail Clipper Provides Good Wire Stripper

A stripping tool for removing insulation from wire is easy to make from a fingernail clipper of the type shown. Just file V-notches in the cutting edges of the clipper as indicated, making one pair of notches to strip stranded wire and the other for solid wire. Care must be taken when filing the notches not to make them too large. It is best to test them at frequent intervals as the filing proceeds. When filed to the right size, sharpen the edges of the notches.



Cart to Move Batteries in Shop Helps Prevent Damage



Repeated breakage of the cases of shop batteries and recurrent injuries to personnel due to dropping batteries on their feet led one foreman to use this simple cart for moving the batteries about the shop. The cart is nothing more than a strong box of suitable size mounted on four large piano casters. Handles at each end permit lifting the cart and battery whenever necessary. A length of rope looped over the front handle enables the mechanic to pull the cart about the shop, thus making it unnecessary to carry the battery.

Ronald L. Ives, Tooele, Utah.

Spacing Rings Extend Work To Be Faced in Lathe

When facing parts in a lathe it is best to grip them in a chuck if they can be extended so that the jaws will not strike the lathe tool. Although strips of metal may be used, suitable pieces are not always at hand, and also, they are sometimes difficult to keep in place while centering the work. A better method is to use short lengths of soft wire of various gauges. These are bent around an object slightly smaller than the outside diameter of the work to be faced, leaving a short length at one end to form a handle. If the ring of wire is not perfectly flat, a slight pressure will flatten it.

Russell J. Hunt, Chicago.



Wrapping-Twine Cutter in Counter Top Is Always Handy



This combination holder and cutter for wrapping twine will be very handy if inserted into the counter top within convenient reach of a worker who wraps packages. The cutter consists of an old safety razor, the handle of which is inserted into a large cork, and the assembly is set into a hole drilled in the counter top. The cork is slit on one side and the twine is fed up through the slit. When the twine is cut by being pulled against the razor blade, the severed end is held by the cork where it is easy to reach when needed again. The blade is well shielded against any accidental injury to the hands by the teeth of the razor comb.

Holder for Carrying Chisel Bits Used in Air Hammer

A workman who operates an air hammer in an eastern shipyard uses a holder like the one shown to keep the various chisels for the hammer conveniently at hand. The

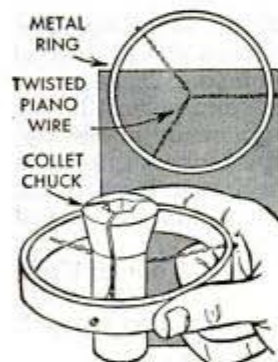


holder is a bucket in which are fitted two metal disks. One is placed about an inch above the bottom of the bucket and the other is located about $2\frac{3}{4}$ in. above the bottom. The disks are drilled to take the shanks of the chisels as indicated. The center of the upper disk provides a place for an oilcan or other small container used in the work.

E. W. P. Downing, Norfolk, Va.

Quick-Acting Collet Cleaner

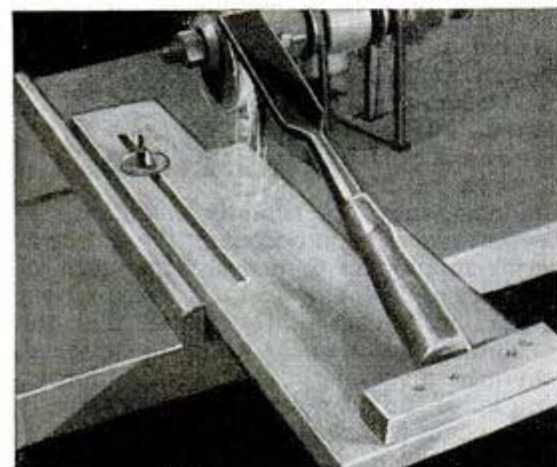
Cleaning the slots in a collet chuck is no problem if you use a cleaning tool like the one shown. It consists of a metal ring having three



wires spaced uniformly around it and tied in the center to slip into the slots. Thus, all three slots are freed of chips in one operation. Although single strands of wire will do for the cleaner, it is better

to twist two strands of fine piano wire together to provide rough strands that do a better job of cleaning than smooth ones.

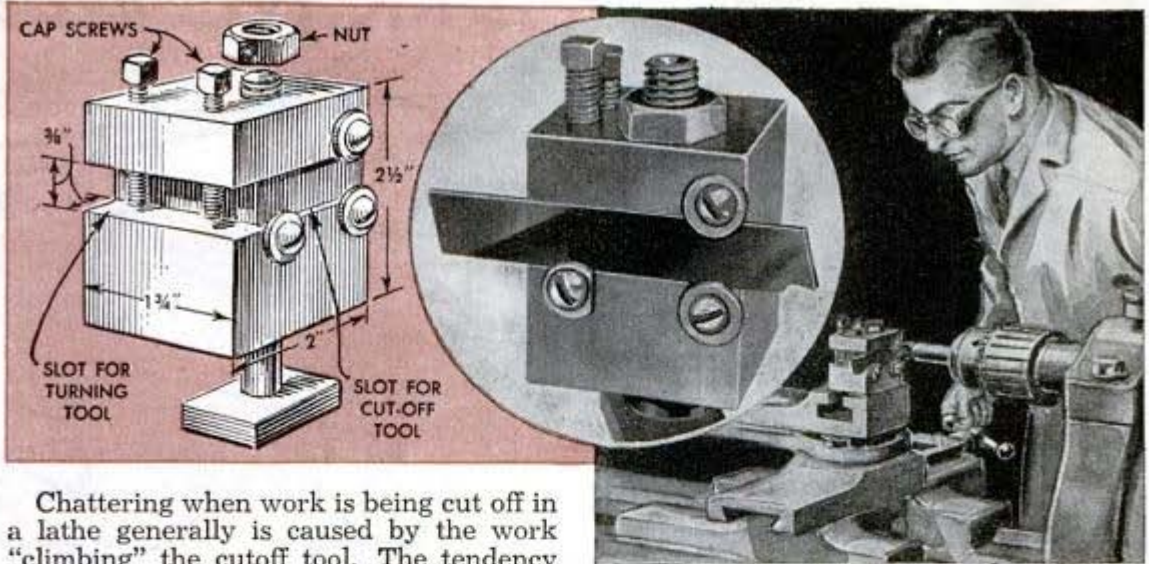
This Easy-to-Make Grinding Jig Assures Uniform Bevel on Edge Tools



This simple jig will aid in grinding chisels, plane irons and other edge tools by enabling you to hold them easily at the correct angle against the grinding wheel. The jig consists of a short board slotted to take a bolt and wing nut with which it is adjusted to get the correct grinding angle of the tool. The latter rests against a cleat at the front end of the board, which slides against a guide strip nailed to the grinding bench. In some cases, it may be necessary to step-cut the board at the edge next to the grinder so that the latter will not interfere with adjustment of the jig. Length of the jig will be determined by the height of your particular grinder.

Joseph Goulart, New Bedford, Mass.

Cutoff Tool Feeds Into Work Toward Operator



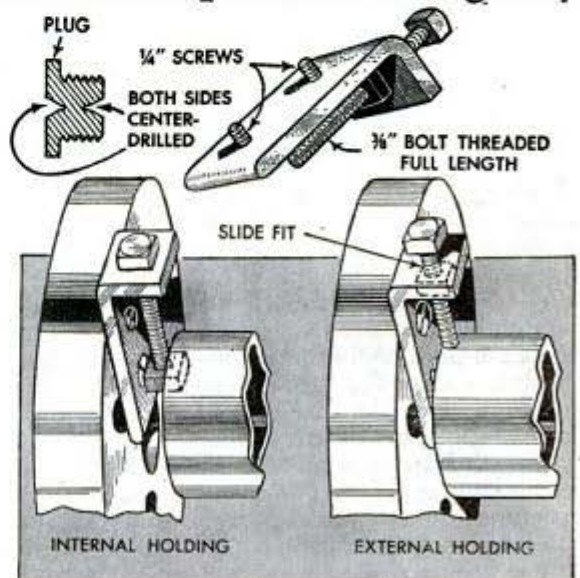
Chattering when work is being cut off in a lathe generally is caused by the work "climbing" the cutoff tool. The tendency to "climb" is due to play in the spindle, which, though necessary to permit it to turn, causes the weight of spindle, chuck and work to press on the tool so that it is forced downward past work center. Also, if a cutoff tool is forced into work or fed too rapidly it may break off. To prevent this "climbing" and its resulting chatter, as well as to permit the tool to be fed into the work more rapidly without being broken, one mechanic made the cutoff-tool holder shown. This is set behind the work and at-

tached by a T-bolt to the compound slide, so that it can be fed into the work toward the operator instead of away from him, as is usually done. Of course, the tool bit must be turned over with the cutting lip facing downward, as shown in the circular detail. The holder is made of cold-rolled steel and is slotted for the cutoff tool, which is held by three bolts and washers. Another slot can be cut in the end of the holder for a turning bit, which is held by setscrews as indicated.—Paul Hobson, Chicago.

Lathe Chuck Is Improvised From Faceplate in Emergency

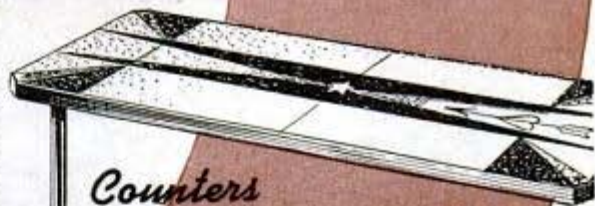
If you have no lathe chuck, or an extra one is needed in an emergency, one can be improvised from a faceplate by fitting it with four "jaws," or work holders, which are spaced equidistant around the faceplate. Each one is provided with a bolt to press against the work and hold it in place, a nut being run on the bolt to rest against the underside of the jaw. If desired, the nut can be run to the end of the bolt and used to hold the work internally as indicated in the lower left-hand detail. However, the screw holes in the jaws can be tapped, thus eliminating use of the nuts. The jaws are attached to the faceplate with screws and small nuts. In some cases, it may be desirable to mount the improvised chuck at the tailstock. This can be done by making a plug to screw into the hole in the center of the faceplate, center-drilling the plug so that it can be supported in place by the lathe centers. The plug should be screwed in from the back side of the faceplate so that it will not come out when the faceplate is rotated.

Roy N. Van Epps, Dulzura, Calif.

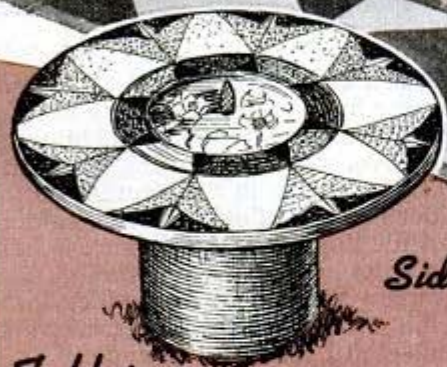


Instead of cutting paper to put on the pan when weighing chemicals, use coffee filter papers. You get about one hundred in a package and they save time.

WORKING with

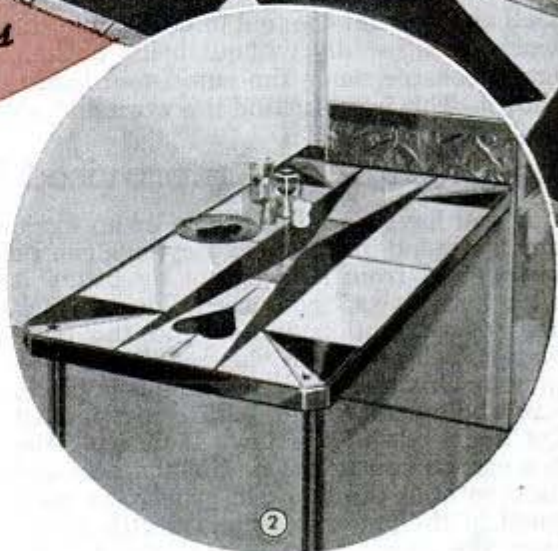


Sundials



Tables

Sidewalks



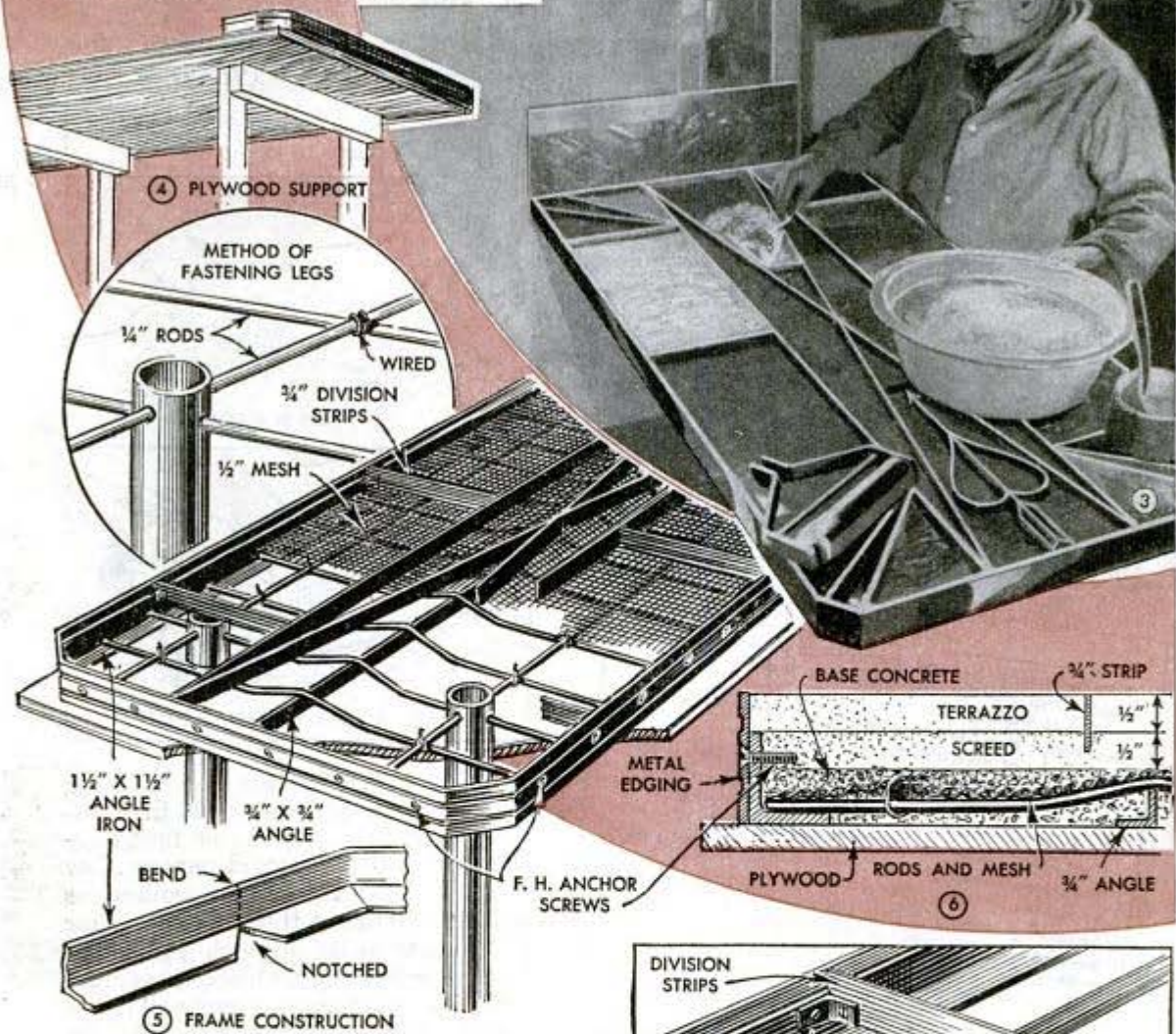
TERRAZZO, a mixture of cement and marble chips, provides a hard surface that is almost everlasting for use as table and counter tops, benches, sundials, sidewalks and many other surfaces subject to hard use or exposure to the weather. Use of cement-coloring materials permits countless color designs to be worked out in the finished surfaces.

Since terrazzo is applied like concrete, it is necessary that a form be used; either a removable one for precasting, or one that becomes part of the completed project. In the latter case the table pictured in Fig. 2 is a good example. Here the form is shaped from angle iron to form a frame as in Fig. 5. A piece of angle iron at the center of the frame supports the reinforcing rods, which are placed crosswise of the frame. Legs can be attached as desired, but one way is to use lengths of metal tubing, which are drilled at the upper end so that the reinforcing rods can be passed through them as in Fig. 5. This method helps provide rigidity, but does not permit removal of the legs. Next, wire mesh is placed over

the rods. Following this, a metal edging is screwed to the frame, the latter being drilled and tapped for the screws, which project inside and tend to anchor the terrazzo to the frame.

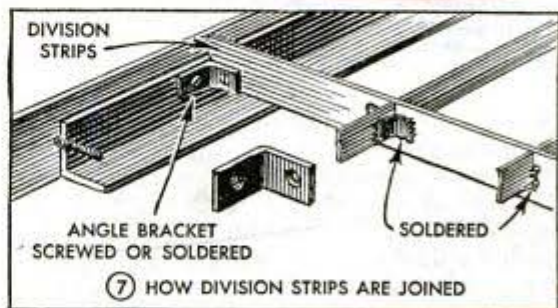
If a color design is to be used, strips of thin brass or other non-rusting metal are next installed to serve as division strips to keep the colors from mixing when the terrazzo is applied. Usually the strips are soldered together as in Fig. 7 to provide a single unit of the desired shape, which then is set in position and fastened in place

TERRAZZO

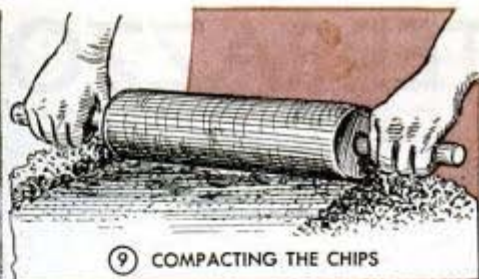


so that the upper edges project slightly above the trim. Figs. 1 and 3 show the division-strip unit in place for this particular table. The frame must be placed on a base while pouring the top. This can be a plywood panel supported on legs or sawhorses as in Fig. 4.

Now you are ready to pour the table top, which consists of a base layer of concrete, then a screed layer and finally the terrazzo, as indicated in Fig. 6. Formulas for mixing the various layers are given in the table under Fig. 8. Mix the ingredients for the base layer dry and then add water to produce a plastic that can be worked into the form. Proportion the thickness of the layers as in Fig. 6. After the base has set for a while, scratch the surface with a piece of wire mesh as in Fig. 8 and leave it overnight, covering it with damp burlap. Then scrape the roughened surface with the edge of a trowel and blow out all loose par-



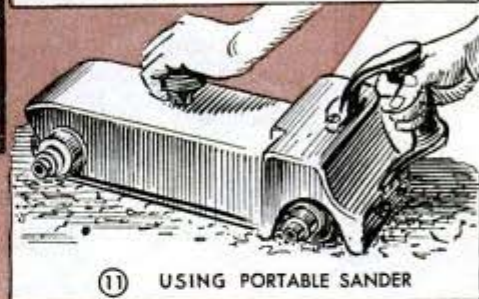
ticles. A bellows or tire pump is ideal for this. Next, mix and apply a thick coat of grout and follow this immediately with a 1/2-in. layer of screed. If obtainable, add to each gallon of water used in mixing the grout a cup of Antihydro, a product for hastening the setting of concrete. Also, cover the base concrete with this water, let it stand for a few minutes and then soak up the surplus with a sponge. Trowel the screed well in between the division strips and level it. Scratch the screed layer and treat it exactly as you did the base layer. After applying the grout coat on the



9 COMPACTING THE CHIPS



10 HAND-SURFACING



11 USING PORTABLE SANDER

FORMULAS

Base concrete: pea gravel, coarse clean sand, and cement, equal parts. Mix dry, then add water to make mix plastic enough to work easily.

Grout mix: pure cement with enough water to bring to consistency of thick cream.

Screed mix: coarse, clean sand, 2 parts; cement, 1 part; water to make thick paste.

Terrazzo: white cement, 1 part; white or colored marble chips, 2 parts by volume; water to make stiff, workable mix.

Red cement: oxide of iron, 1 part; white cement, 10 parts by volume. Mix dry, then moisten.

Separating compound: stearic-acid crystals and clean lard, equal parts. Mix together over medium fire. Apply hot with brush.

screed, you are ready to place one color of the terrazzo. White terrazzo is placed first; then each stronger color in succession. Black is always placed last. Start at the tight corners first. The idea is to have the marble chips packed evenly and as tightly as possible against each other. Let the terrazzo mount $\frac{1}{8}$ in. higher than the division strips. When all white portions of the design have been filled, trowel the terrazzo and let it set for a while. Then roll it as in Fig. 9 to squeeze out the surface cement, which is removed with a moist paintbrush. This process packs the marble chips evenly one against another. Let the terrazzo set an hour or so and then trowel repeatedly to a hard finish. When the terrazzo sets enough to feel hard to the touch, cover it carefully with clean waxed paper, then cover with damp burlap and let cure overnight. Burlap will stain terrazzo so be sure all surfaces are first covered with the waxed paper.

The following morning soak all the work in Anti-hydro water after first having removed the waxed paper. Now mix the next color and proceed as before, following this procedure for each color to be applied. After the last color has been placed, cover the whole surface with waxed paper and moist burlap and let cure for six days. At the end of this time the terrazzo surface is ground down and polished.

There are two methods of grinding: the wet and the dry method. A flexible shaft grinder with a silicon-carbide rim wheel and a wet spindle head will do fast and fine work. Follow coarse wheels with progressively finer grades. Let the wheel move over the surface with an easy motion. Avoid grinding rings or holes in the surface. Follow this with a hand stone, Fig. 10; an ordinary carpenter's silicon-carbide stone is fine for this work.

A portable sander used as in Fig. 11 does good work as a dry grinder. However, one may grind entirely by hand, using a coarse silicon-carbide brick fitted with a handle and a finer oil stone for the polishing. While grinding, use clean water and a sponge to clean the surface so that you can observe your progress. Grind down the surface until it is free of scratches, then polish the metal parts in the pattern with

a fine hand stone. Follow this with a thorough cleansing with water.

Some air holes may have been left in the terrazzo through improper placing and rolling of the aggregates. These can be filled with a grout mix of the proper color. Cover the repaired parts with waxed paper and let cure overnight. Then grind again with a fine stone, grinding only enough to remove the surplus grout. Clean with several applications of water; sponge and let dry for 24 hrs. There are numerous preparations for waterproofing terrazzo and making it stainless. A readily available preparation is boiled linseed oil and turpentine mixed in equal parts. Apply to the dry terrazzo surface and wipe off all surplus. Repeat each day for three days as above. Let the final coat dry for 24 hrs. Follow with auto or furniture wax and bring to a polish.

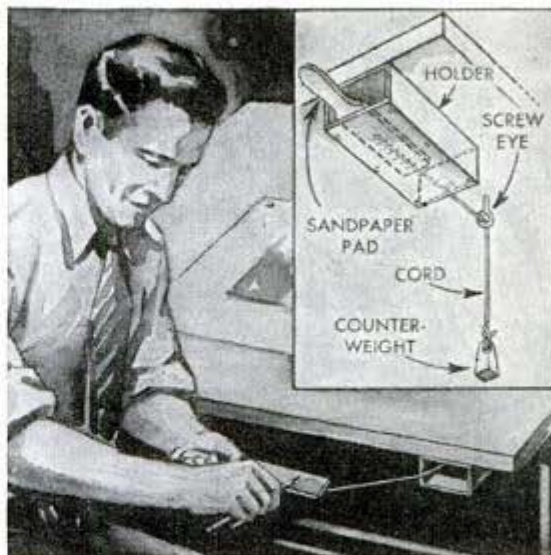
When terrazzo is used outdoors where metal division strips and edging would not be satisfactory, or when the expenditure for metal is undesirable, the terrazzo can be precast into blocks of the colors and shapes required and then assembled on a base. The terrazzo is cast in wooden forms of the size and shape desired and of uniform depth. The forms first must be varnished and coated with a separating compound to prevent the terrazzo from sticking to them, the compound being made as described in the formula table. Pouring and curing of the terrazzo in the forms is handled in the same way as was done for the table. When completed, the forms are removed and the surface and edges of the terrazzo blocks are ground and placed on a base consisting of concrete and screed built up as for the table, using reinforcing rods and wire mesh in a wooden form, which also must be varnished and coated with the separating compound. Before placing the terrazzo blocks, a grout coat is applied to the base and also between the joints after the blocks have been placed. Grinding and polishing of the terrazzo surface, after curing, completes the job.

"Bin Number" Helps Estimate Amount of Grain

Estimating the number of bushels of grain in bins is simplified by this method: After taking accurate measurements of each bin, calculate the number of bushels a bin would contain if it were filled to a height of one foot. This number then is painted on the bin. Then whenever an estimate of the contents is needed multiply the height of grain in the bin by its number and the result will be the approximate number of bushels of grain in the bin.

Iver Madsen, Wheatland, N. D.

Sandpaper Pad Kept in Holder By Counterweighted Cord

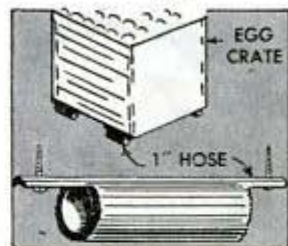


Draftsmen will find that a holder attached to the underside of the drawing-table top is a handy place in which to keep a sandpaper pad. The holder is a small wood or cardboard box with one end open and a hole in the other. The box should be just large enough to enclose all but the pad handle. A counterweighted cord running through a screw eye driven into the table is attached through the hole in the box to the end of the sandpaper pad to keep it within the holder when not in use.

James G. Carley, Brooklyn, N. Y.

Rubber Feet Cushion Egg Case

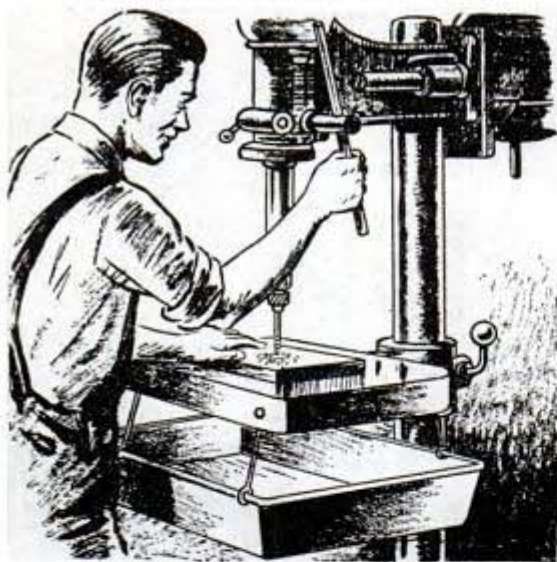
Breakage of eggs caused by hauling over rough roads was avoided by one poultryman who fitted his egg case with rubber feet made by cutting short pieces of rubber hose and screwing them under each corner of the case as indicated. Any road shock was absorbed by the flexing of the hose pieces.



Cement Anchors Drawings

Artists and draftsmen will find that rubber cement is a good substitute for thumb-tacks in holding down work. Also, it does not obstruct the use of a T-square or other instruments and does not perforate the drawing or board. A light dab of cement on the corners of the drawing paper will hold it flat and permanently on the board. The dried cement can be removed easily by rubbing it.—M. A. Jacobson, Chicago.

Drip Pan Under Drill-Press Table Catches Oil and Shavings



You will have less trouble keeping the floor clean under a drill press if you suspend a pan under the drill table to catch shavings, oil and other refuse. An ordinary black-iron pan of the type used by housewives will serve the purpose nicely. It should be about 2½ in. deep and should be large enough to extend an inch or two beyond the table on all sides. Small holes can be drilled through the sides of the table for wires with which the pan is suspended.

Cloth Flap on Welder's Helmet Protects His Neck From Sun



While working on an outdoor pipe line one welder prevented the sun from burning his exposed neck by attaching a cloth flap to his helmet. The flap was held in place by buttons fastened to the helmet with wire. When working inside the flap was removed and carried in his pocket.

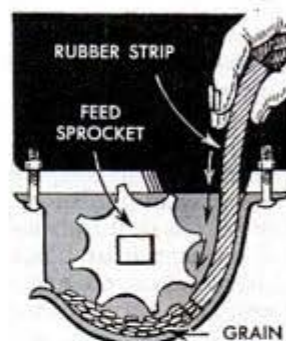
Flame-Cutting Armor Plate

Cutting and shaping armor plate with an oxygen flame usually is an unpredictable method and, when shaping tank parts of this supertough steel by flame-cutting, the pieces produced invariably were warped. Close tolerances were practically impossible as the pieces had to undergo a lengthy straightening and machining process to bring them up to the specifications. A new

method of flame-cutting now in use has made the problem of warping and loss of original heat treatment almost nonexistent and has greatly stepped up production. With the new method, the armor plate is submerged in a tank of water so that the water covers the plate to a depth of exactly ¼ in. The oxygen flame then cuts the plate through the layer of water. Should less water be used, the plate will warp. In the case of more water over the plate, the flame will not cut efficiently.

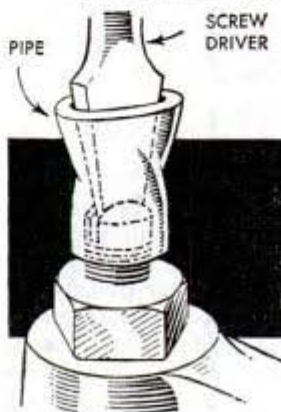
Easy Way to Clean Feed Cups On Farm Grain Drill

It is important that the feed cups on a grain drill be cleaned each time the drill is to be used to plant a different kind of seed, especially if registered or other high quality seed is being used. If this is not done, seeds of different kinds will be mixed so that the particular strain of grain will not be suitable for registering. For years I have cleaned the cups with strips from the sidewalls of old auto tires. Strips ½ in. wide and 5 in. long will do the job. You can use only one strip and push it through each cup, or you can use several at a time and run them through the cups by rotating the feed rod. In either case the strips will fill the space between the cup bottoms and feed sprockets and thus push all the grain from the cups.



Robert J. Roder, Alberta, Can.

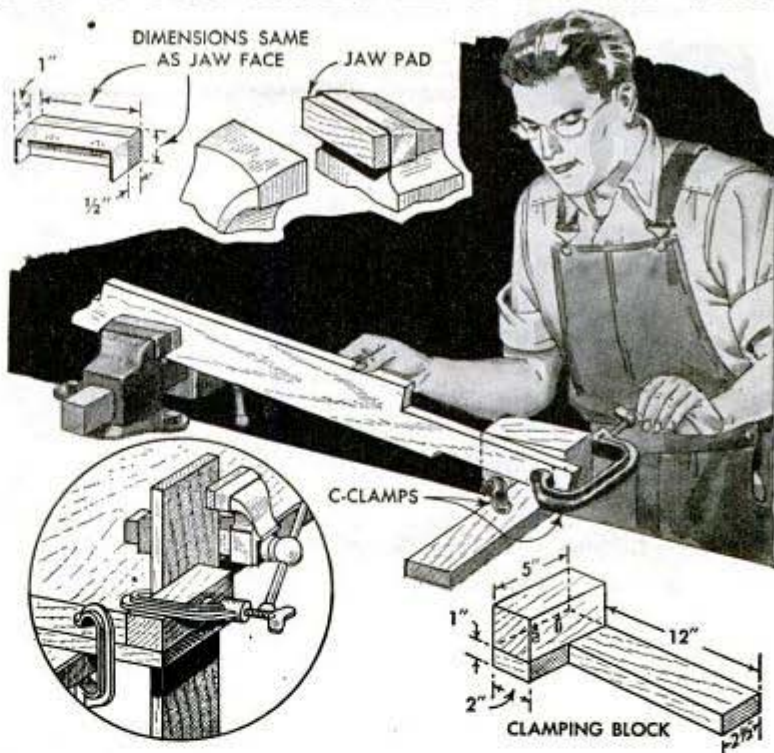
Sleeve for Screwdriver Blade Aids in Adjusting Valves



Usually, valves of an overhead-valve motor are adjusted while the motor is operating at idling speed, which makes it difficult to keep a screwdriver in the push-rod slots to do the work. This trouble can be avoided if you use a sleeve that fits over the end of the push rod and screw-driver blade as indicated. The sleeve can be shaped from small pipe or tubing. Brother Wymer, South Bend, Ind.

Jaw Pads Protect Wood Held in a Metal Vise

Two of the main drawbacks of using a metal vise for working with wood—they mar the wood surfaces and are not large enough to hold the work securely—may be overcome by using jaw pads and a clamping block. The pads are hardwood and are screwed to sleeve-like pieces of metal which hold them on the jaws. Each sleeve is bent from a single piece of sheet metal and has a $\frac{3}{32}$ -in. flange bent on the edge to fit into a slot cut across the top and sides of the vise jaw 1 in. from the face. The clamping block is a wood block screwed to a board, which is sawed to the size and shape shown.—Pfc. H. P. Mack, St. Louis, Mo.



Jack-and-Chain Unit Loosens Large Tires From Rims

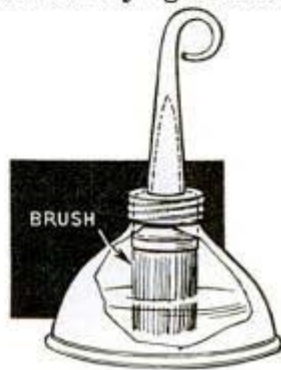
A simple and easy way to loosen a large tire from the rim is to employ an ordinary jack as indicated. First, drill a hardwood block to take two lengths of $\frac{3}{4}$ -in. shafting as shown. Then, with the wheel lying flat on the ground, place four blocks at the ends. Set

the jack on the block of the rod assembly, run a chain through openings on opposite sides of the wheel and hook it into a piece of flat metal drilled to take the hooks. If there are no openings in the wheel, drop the chain through the hub and insert a bar through the chain on the underside. Now hold the flat metal with the chain hooked to it on top of the jack and operate the latter. The combined pressures of the jack pushing up and the rods pressing down will loosen the tire easily from the rim.

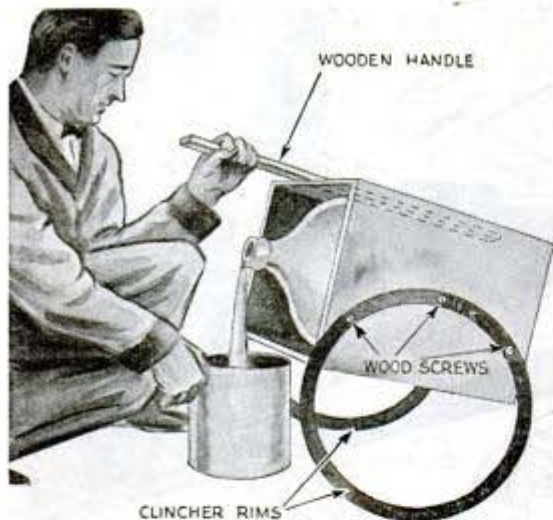


Sealed Applicator for Blue Ink Used in Layout Work

Workmen in machine shops who use a quick-drying ink in layout work will find this container and applicator highly efficient. It keeps the ink from drying out and is always ready for use. The container is an oilcan and the applicator is a small brush having the handle whittled to fit tightly into the spout, which is bent over at the upper end to form a handle. — Wm. Hanson, Akron, O.



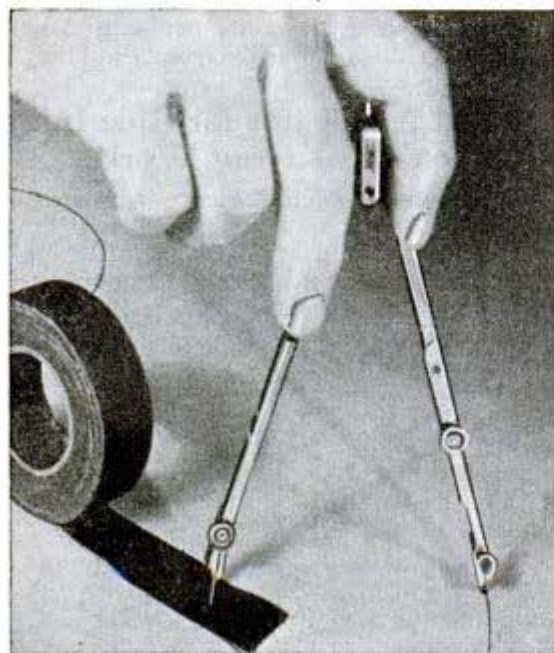
Pouring Contents of Heavy Bottle Simplified by Rockers



Fitting clincher rims and a handle to the crate or box in which a large bottle is stored provides an easy way of tipping the bottle for pouring without lifting it, which often results in spilling some of the contents. Wheels instead of clincher rims can be used for rockers. These are screwed on the sides of the crate as shown, the lower edge of the rim being flush with the floor when the box is in a vertical position.

Slipping of Compass on Metal Prevented by Tape

To keep the point of a compass from slipping when scribing sheet metal, attach the end of a roll of electricians' tape to the center of the area to be scribed and insert the



compass point through it. The tape may be removed quickly when the scribing has been completed and no point mark need show on the metal.

Self Cleaning Rabbit Hutches

You can avoid the chore of cleaning rabbit hutches by building the floor on a 15 or 20 degree incline. Use 1-in. mesh chicken wire for the front of the hutch, extending the wire along the bottom of the incline where it is used as a flooring for the last 5 in. at the lower end of the incline. Refuse will be scattered down the incline by the rabbits and will then drop through the holes in the wire.

J. W. Langham, Jr., Seattle, Wash.

Burring Tool for Metal Workers

Sheet-metal workers will find this home-made tool ideal for burring the edges of metal. All you need is a putty knife and a knife sharpener of the type having eight hardened disks. Remove the disks and rivet them to the knife as indicated, first grind-



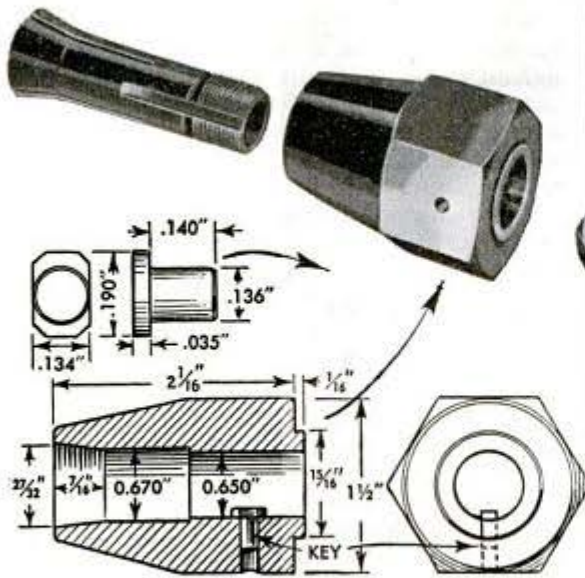
ing the end of the knife to the shape shown. In use, the tool is pulled over the edge to be burred while held at an angle of 45 degrees to the work with the edge between the disks.—W. B. Collins, North Wilkesboro, N. C.

It Is Easy to Make Your Own Copper-Wire Gauge

If you are unable to purchase a copper-wire gauge, one can be made quite easily by riveting two strips of metal together as indicated to provide a slot that will take the common sizes of wire. The longer the gauge is made the more accurate it will be. Wires of known sizes then are fitted into the slot and their points of contact marked. If metal dies are available, the wire sizes and electrical resistance per foot of the wire can be stamped into the gauge. Black enamel rubbed into the stamped figures will help to make them easy to read.

WIRE SIZE	OHMS 1000 FT.
#28	64.9
#22	16.1
#18	6.39
#14	2.53
#12	1.59
#10	.999
#8	.628

Simple Collet Vise to Hold Small Round Work



This little tool provides a convenient method of holding cylindrical parts in a vise mounted on a bench or machine tool. It uses standard draw-in collets of the type employed on lathes and consists of three parts, the body, a small key and a hexagon nut.

The body is made from tool steel to the dimensions shown. Those given are for standard collets as used on a popular lathe, but may be varied to suit. The lower portion of the body is of hexagon shape, which is convenient when the tool is to be used for holding parts on which a hexagon head is to be milled. Indexing is accomplished by changing the position of the fixture in the vise jaws. When machining the bore, make the angle of the tapered portion to match the corresponding angle on the collet. The lower portion of the bore should be of a size in which the collet body will

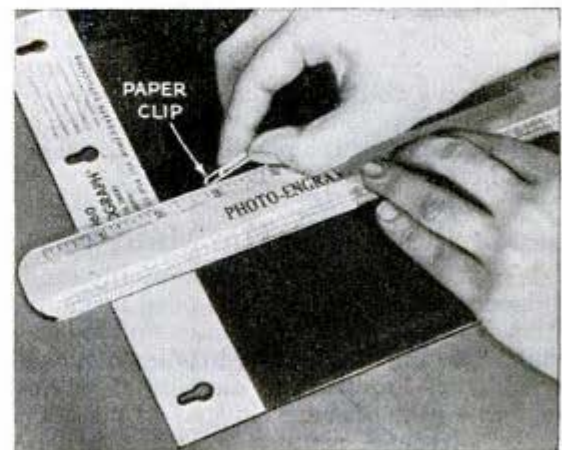


fit without appreciable looseness. For ordinary work, it matters little whether or not there is play between the collet and bore; but there should be none present when the fixture is used for indexing.

The key that keeps the collet from turning in the body is made from a piece of drill rod or similar steel. It is a drive fit in the hole in the body. If a nut to fit the collet threads is not available, you can bore out a standard nut and retap it. An improvement not shown is to drill a hole through the nut and thread it to receive a short handle. Then, with the fixture held in a vise so that the handle can move through a portion of a turn, you can loosen and tighten the collet when handling a number of duplicate pieces. It is best to harden the parts for maximum resistance to wear.—Walter E. Burton, Akron, O.

Wire Paper Clip Serves as a Stylus for Ruling Stencils

In an emergency, you can use an ordinary wire paper clip as a stylus to rule a mimeograph stencil. Just use a ruler as a straightedge and draw the rounded end of the clip over the stencil as indicated. The clip will impress a clear line in the stencil without cutting through it.



Marking Triangles With Ink

Identification marks may be put on draftsmen's triangles without scoring their surfaces if the marks are made with India ink and then covered with two or three coats of clear fingernail polish. This will provide a hard coating for the marks that will last indefinitely.



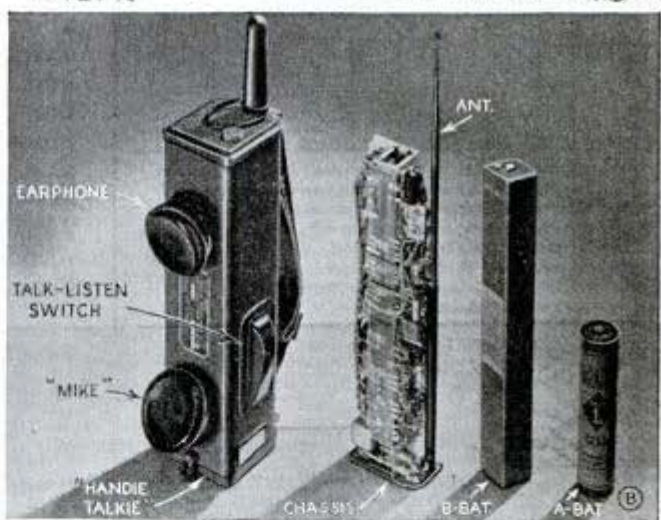
Portable "Talkies"

ALTHOUGH not new to American radio amateurs, the wartime "walkie-talkie" now has become a familiar piece of portable radio equipment to people in all parts of the world. The idea, originating from the pre-Pearl Harbor homemade "walkie-talkie" or "transceiver," a combination amateur transmitter and receiver used in various forms in annual A.R.R.L. field day activities, has developed into an important military communications instrument.

In both its new and ultracompact "handie-talkie" and larger "walkie-talkie" forms it offers many peacetime possibilities. The Federal Communications Commission in its recently proposed frequency allocations included a spot in the spectrum between 460 and 470 megacycles for a "citizens' radio-communication service" in which this type of equipment may be employed.

Currently used military types appear in illustrations A, B, C and D. The Galvin "handie-talkie" shown is about 3 by 3 by 12 inches long and weighs a little over 5 pounds. The mouth and ear piece are directly attached for convenient one-hand operation. The self-contained assembly is a marvel of compactness, as shown in photo B.

The larger pack type "walkie-talkie" shown in photos C and D weighs about 35 pounds and has greater range than the "handie-talkie." It is about 17 in. high, 12 in. wide and 7 in. thick and employs a separate hand set.



FM "WIRELESS" RECORD PLAYER

By Arthur Trauffer



THIS simple one-tube frequency-modulated phono oscillator will reproduce records through your FM receiver without wired connections. The low-power ultra-high-frequency Hartly oscillator is assembled on top of a hardwood pickup tone arm. No claim is made for absolute perfection as FM record reproduction is still in the experimental stage. However, the FM record player is a challenge to the experimenter and opens up a new field. Results obtained with this unit have been very satisfactory as demonstrated by tests in Popular Mechanics radio laboratory.

The motor and turntable of any a.c. record player may be used; the capacity pick-up is simply a straight-shank sapphire-tipped phono needle held in a chuck with soft rubber trunnion bearings. A small stationary plate (electrode "E") is spaced about $\frac{1}{32}$ in. from and faces the needle shank. The needle chuck was obtained by cutting the end off a common crystal pick-up. As the needle rides in the record grooves it is rapidly shifted from side to side, which results in a change of spacing between needle and stationary plate proportional to the lateral wave forms in the record grooves. When the needle and stationary plate "E" are connected in parallel

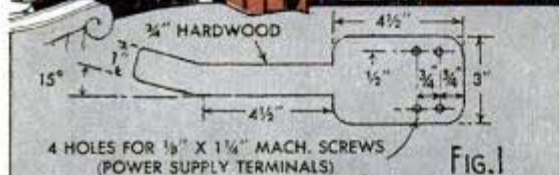


FIG. 1

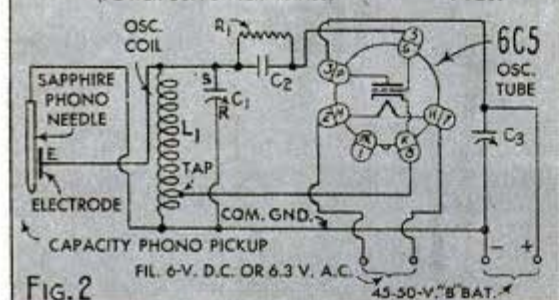


FIG. 2

- L1—Oscillator coil. 8 turns No. 20 enameled copper wire close-wound. Coil tapped at second turn from bottom
- C1—Midget 5-plate variable condenser. Minimum capacity about 5 mmfd., maximum capacity about 50 mmfd.
- R1—Grid resistor. 50,000 ohm, $\frac{1}{4}$ watt
- C2—Grid condenser. Midget .00025 mfd., mica
- C3—Plate condenser. Ceramic-base trimmer condenser, 200 mmfd. maximum capacity

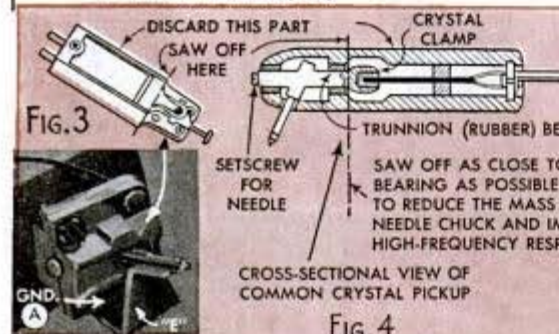
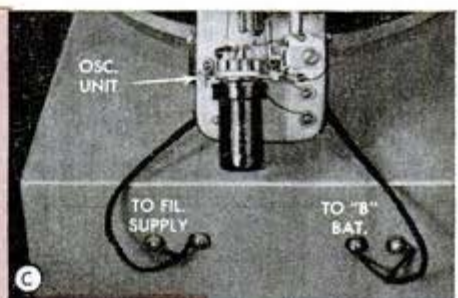


FIG. 3



C

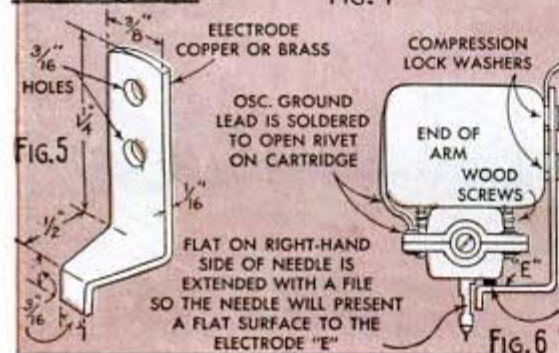


FIG. 5

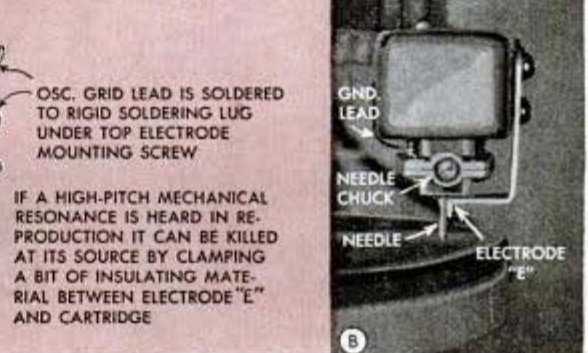
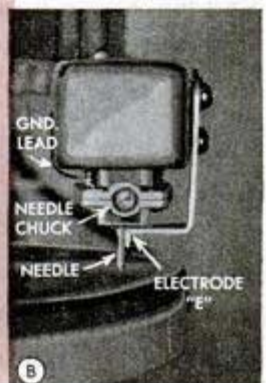


FIG. 6



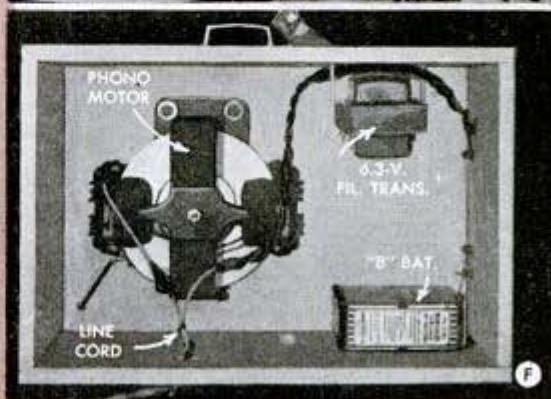
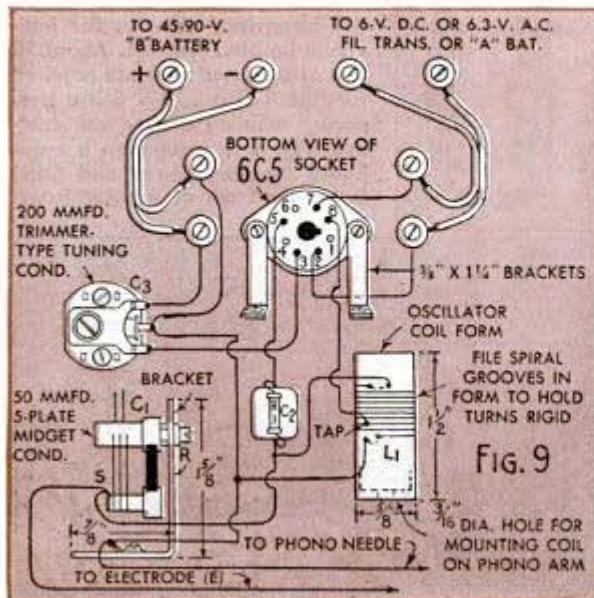
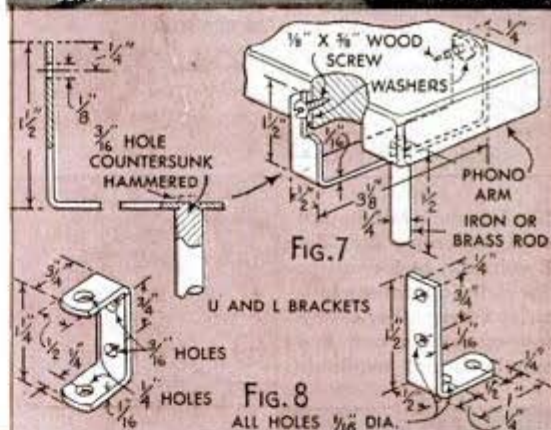
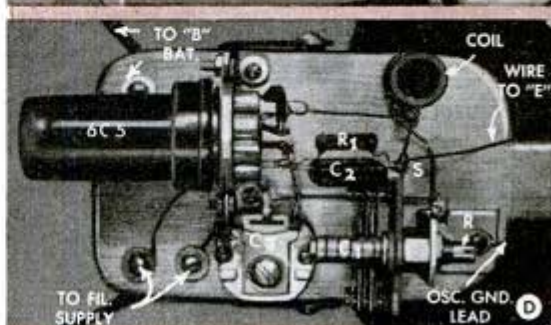
B

USES CAPACITY PHONO-PICKUP

with the main tuning condenser of the oscillator, the mean frequency of the oscillator is shifted from side to side by the small varying capacity in direct proportion to the wave forms in the grooves. Quality of frequency-modulation reproduction is limited only by the record and the audio portion of the FM receiver employed.

A detailed diagram of the hardwood tone arm and oscillator platform appears in Fig. 1. After the arm is sanded smooth it is given two coats of shellac and holes are drilled for machine screws which serve as binding posts for the connections to the separate A and B-power supply for the oscillator. The schematic circuit diagram for the 6C5 oscillator is given in Fig. 2. Figs. 3, 4, 5, 6, 7 and 8 show all pickup arm construction details; a pictorial wiring diagram of the oscillator appears in Fig. 9. The coil form was a Bakelite container from a "dime store" styptic pencil. The bottom of the container was used for mounting the form. Photos A to F should be studied carefully before starting construction. All oscillator leads must be as short and rigid as possible. The cabinet, made from $\frac{3}{4}$ -in. stock, is 12 in. wide, 17 in. long and $5\frac{3}{4}$ in. high.

The range is about 25 ft. and no antenna is required. To operate, tune the oscillator to a quiet spot in the FM band. To do this adjust C_3 until a "plop" is heard in the receiver when condenser C_1 is rotated. If band is missed either add or remove one turn from grid end of coil L_1 . Detailed student material list is R-336.



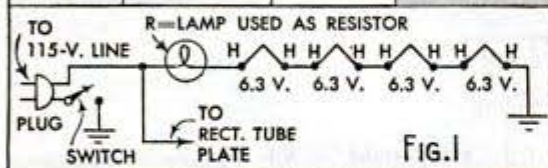


Helpful RADIO HINTS

(A) Ordinary lamp bulb substitutes for a line cord resistor or wire-wound resistors for emergency repairs or experimental hookups. For the a.c.-d.c. tube lineup in Fig. 1 using four 6.3-volt, .3-amp. tubes with the filaments in series, the required resistance is determined by Ohm's law. Adding the voltage the four 6.3-volt tubes require about 25 volts from the 115-volt line, leaving 90 volts to be dropped. As these tubes are of the .3-amp. (300-ma.) type, the table indicates a 40-watt lamp may be used for the necessary 300 ohms

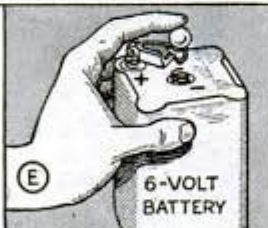
Table of Approximate Lamp Resistances

Watts	32 Volts	115 Volts
25	41 ohms	484 ohms
40	25.5 ohms	302 ohms
75	13.5 ohms	161 ohms
100	10.25 ohms	121 ohms



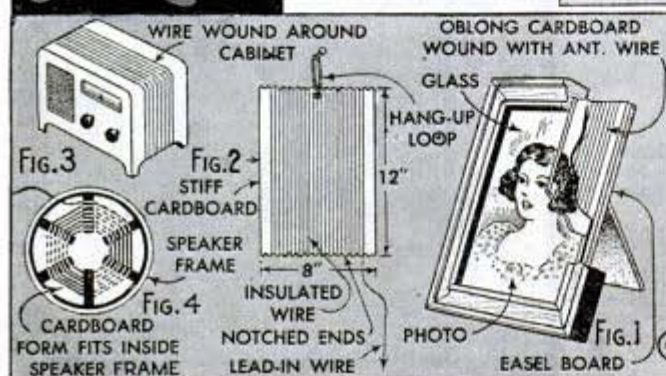
(B) Narrow lever key designed for electronic equipment where small size is important. Eighteen-spring capacity permits many switching combinations. (C) Charger for wet flashlight (storage) batteries operates from the ignition system of your automobile

(D) One-man hand-operated generator provides 8 volts d.c. at 5 amperes for charging storage batteries where other charging apparatus and line supply is not available



(E) Heavy-duty lantern battery, spring clip and a .15-amp. auto light bulb make a code practice blinker light. (F) Soldering iron includes a safety ground connection

(G) Emergency antenna for individual hospital patients. About 30 feet of insulated wire are required for Figs. 1 and 2. Fig. 3 is a temporary winding around the cabinet. Fig. 4 is wound on a cardboard "spider" form and fitted inside the front of speaker frame



American Flagships like this DC-6 are now on order for delivery as soon as war needs permit. The ultimate in comfort and luxury, they will take you coast-to-coast in approximately 8½ hours.



Now AMERICAN AIRLINES SPECIFIES DEPENDABLE CHAMPION SPARK PLUGS 100%

American Airlines, Inc., the nation's largest domestic airline—in miles flown, passengers carried and planes operated—now specifies Champion Spark Plugs 100%. This tribute to Champions is directly traceable to "better performance, longer life, less servicing time, and lower operating costs."

Thus once again the qualities which have made Champions first choice of motorists, and outstanding in aircraft engines, both military and commercial,

are convincingly and emphatically confirmed.

Champion Spark Plugs for your car have the same heritage of prestige and better performance as these aircraft types. The same basic materials, research, engineering and manufacturing are back of every Champion regardless of type. Now more than ever it will pay you to insist on the spark plugs that are Champions in fact as well as in name.

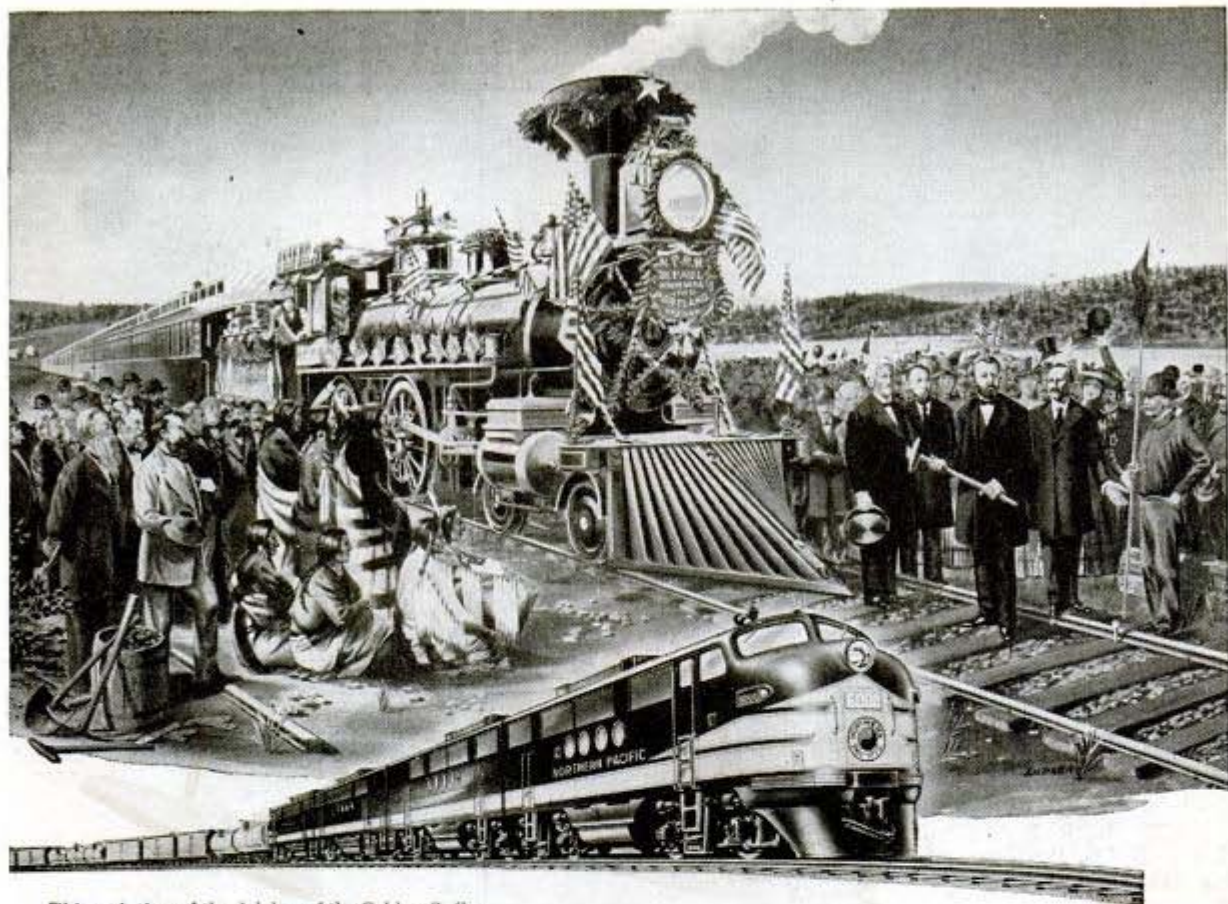


CHAMPION SPARK PLUGS

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO



**TO SAVE
GASOLINE
—KEEP SPARK
PLUGS CLEAN**



This painting of the driving of the Golden Spike on September 8, 1883, is a composite, in Currier & Ives style, of an actual photograph of the historic engine and a mural now decorating the Montana State Capitol in Helena.

WRITING NEW RAILROAD HISTORY

Sun glinting on yellow metal marked a great moment in railroad history that day in September, 1883. At Gold Creek, Montana, General U. S. Grant drove home a golden spike—and the Northern Pacific, first of the northern transcontinental railroads, was completed.

Shortly after, a special train puffed over the spot, carrying officials and distinguished guests from the East and Europe, on the first through train trip from St. Paul to Portland, Oregon.

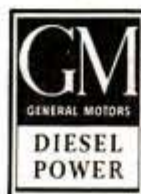
History is still being made on the Northern Pacific, as great trains of battle-bound

freight hurry westward in support of fighting forces.

For here mighty GM Diesel freight locomotives are writing a brilliant record of accomplishment over steep and twisting mountain grades.

Hauling greater tonnages faster and at lower cost, they are showing today what tomorrow can bring when whole lines are GM Dieselized. Then this momentous power will usher in an era when freight will travel faster, passengers ride with greater comfort, speed and luxury, and the whole land benefit from lower railroading costs.

ON TO FINAL VICTORY
BUY MORE WAR BONDS



LOCOMOTIVES ELECTRO-MOTIVE DIVISION, La Grange, Ill.

ENGINES . . 150 to 2000 H.P. . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland II, Ohio

ENGINES . . 15 to 250 H.P. DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.

Why Speed Nuts are *FIRST* with all five



ENGINEERING



MANAGEMENT



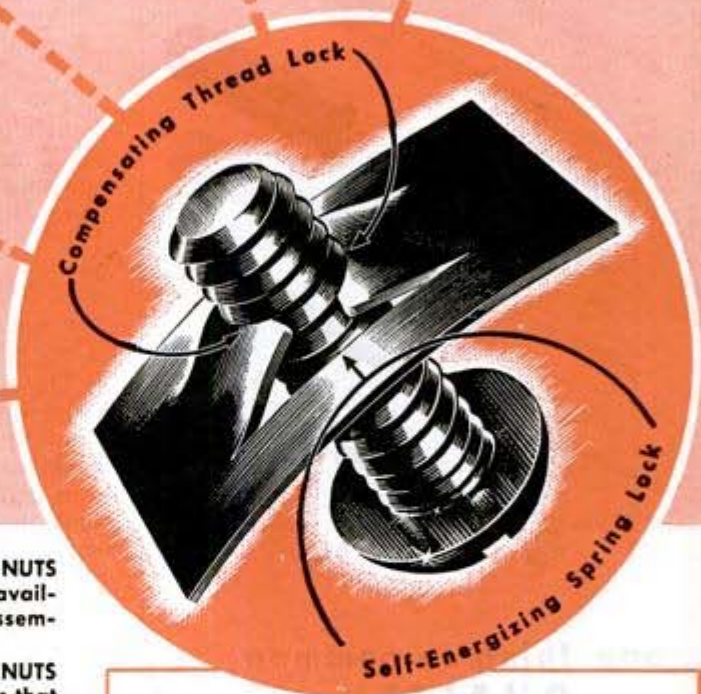
PURCHASING



PRODUCTION



TIME STUDY AND COSTS



FIRST with Engineering because SPEED NUTS simplify design problems and are either available, or can be produced to meet any assembly requirements.

FIRST with Management because SPEED NUTS are time-tested, vibration-proof fasteners that improve the quality, and prolong the life of the finished product.

FIRST with Purchasing because SPEED NUTS lower inventory costs, reduce stocking problems, and are DELIVERED on time. Production and service facilities are unlimited.

FIRST with Production because SPEED NUTS eliminate extra handling of production parts, are applied faster and easier, and compensate for a wider range of commercial tolerances.

FIRST with Time Study and Cost because SPEED NUTS slash total net assembly costs to a fraction of other assembly methods.

Investigation will prove that SPEED NUTS should be YOUR first choice, too. Write for information today.

NOTHING LOCKS LIKE A SPEED NUT

TWO distinct forces are exerted on the screw, as a SPEED NUT is tightened.

First, a compensating thread lock, as the two arched prongs move inward to lock against the root of the screw thread. These free-acting prongs compensate for screw thread tolerance variations.

Second, a self-energizing spring lock, created by the compression of the arch in both the prongs and base. The combined forces of the thread lock and spring lock definitely prevent vibration loosening.

TINNERMAN PRODUCTS, INC. • 2023 Fulton Road, Cleveland 13, Ohio

Speed Nuts PATENTED *Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS... OVER 3000 SHAPES AND SIZES

TOOLS TO FIT THE TASK



one thing in common
QUALITY

From the powerful, smooth-acting spiral ratchet models to delicate jeweler's sizes, there's a Millers Falls Screw Driver to fit every job. Each is the best for the task; each a tested, balanced, long-lived tool which you will keep and use with pride.

Today, more and more Millers Falls quality tools are becoming available. Consult your dealer.

**MILLERS FALLS
TOOLS**

SINCE
1868

MILLERS FALLS CO.

GREENFIELD, MASS.

Steam Up on the Backyard Railroad

(Continued from page 36)

Engineer Billy Jones of Southern Pacific's "Daylight" operates a full-sized locomotive at work and a one-third-sized duplicate at his Los Gatos, Calif., ranch as a hobby. Jones' model engine is of the 2-6-2 Prairie type and operates over 2000 feet of 18-inch gauge track. It's an oil burner, 22 feet long, weighs 4½ tons and has started 200,000 pounds of load on a level track. It develops 250 horsepower under 125 pounds working pressure. True to tradition, a gold plated spike was driven in the final tie of Jones' "Wild Cat Railroad" at the dedication ceremony of the system.

The largest rolling stock of all in the hands of railroad enthusiasts is the full-sized narrow gauge steamer, tender and passenger car operated by Ward Kimball over three-foot trackage on his San Gabriel, Calif., ranch. The engine was the pride of a Nevada railroad almost a century ago. Kimball and his friends reconditioned the engine and operate it on week ends. They call it the "Grizzly Flats R.R."

The smaller live steam models, however, from one inch to the foot and down are more versatile. They can operate for many scale miles per day over a backyard system and can pound along the right-of-way at scale speeds of 100 miles per hour. The sound effects that are made by a tiny live steamer are the same as the sounds that issue from a big transcontinental locomotive, right down to the rumbling over the switch points and the clicking on the rails.

Diesels to the Front

(Continued from page 25)

for tractor-trailer combinations that haul loads up to 38 tons for hundreds of miles. The Diesel engines perform well on long hauls and have extra power for steep grades. More than 5000 such units are helping move war products on the coast.

Another field in which Diesel engineers predict expansion after the war is that of public and private utilities. Already numerous airports, factories, hospitals, department stores and farms get light and power from Diesel plants, many of which are of an auxiliary nature. The Diesel engine will make possible the complete electrification of American farms within 10 years or less after the war, according to Gordon Lefebvre, president of the Cooper-Bessemer Corporation.

What about Diesel engines for automom-

(Continued to page 150)

IT TAKES MORE THAN A LUBRICANT to make your car "feel" better



The very best lubricant cannot keep your car chassis in good condition unless it *stays* on the job. Summer heat will cause ordinary grease to flow right off bearing surfaces. A lubricant lacking in cohesive and adhesive properties is squeezed out of bearings by the continuous jouncing of your car as you drive along. In the absence of the cushioning effect of the lubricant, road shocks are transmitted to the car chassis. Your car no longer rides smoothly.

Marfak chassis lubricant is scientifically designed to overcome these faults. You can *feel* its cushioning effect as you drive. Figures 1 and 2 show that the combination of its ingredients gives Marfak both cohesive and adhesive qualities so that it resists flow-out, jar-out,

wash-out and squeeze-out. *You can feel the difference!*

Marfak also resists oxidation that causes ordinary lubricants to dry out and gum up. Marfak stays fresh right up to the time your car is ready for another lubrication job. That's why Marfak keeps chassis joints limber, reducing wear and saving money by eliminating costly repairs.

Change to Marfak today! It will keep your car on the road!

THE TEXAS COMPANY



Figure 1. Marfak resists tendency to flow when heated. Ordinary lubricant flows under the effect of heat.



Figure 2. Marfak cushions the blow, sticks to the job, doesn't spatter when given the hammer test. Ordinary lubricant spatters in all directions, flying away from the job.



Don't miss the **TEXACO STAR THEATRE** on Sunday nights with **JAMES MELTON** and famous guest stars. See your newspaper for time and station

You're welcome at **TEXACO DEALERS**



ANCIENT PIPE OF FRANCE



Today you see the

LHS
STERNCREST
STERLING

in FRANCE, and everywhere

Strutting along the Rue de Rivoli, right now, is an American G. I. puffing away on his LHS — and many others are doing likewise, the world over.

That's why LHS's are limited in supply, but not in workmanship or materials.

War over (and would that it were!) we couldn't produce a better pipe than the Sterncrest of today. It's prewar quality, from its briar bowl to its hard rubber bit.

After the war, more models to choose from, but no finer pipes.

\$5

This is No. 46
Plain Finish

Also in Antique finish.
Dozens of other models

Other LHS Pipes:

\$10 — LHS
Sterncrest Ultrafine
\$7.50 — LHS
Sterncrest 14K
\$3.50 — LHS
Certified Purex



Supplies limited
— you may have
to wait for some
models, but it's
worth it!

IMPORTED
BRIAR

AT YOUR DEALERS



Write for "Pointers on Pipes"—FREE
L & H Stern, Inc., Stern Bldg., 56 Pearl St., Bklyn 1, N.Y.

biles and airplanes? Leading Diesel engineers agree that there will be no Diesel automobile in the near future. The Diesel engine may be more economical to operate than a gasoline engine, but the initial cost is two or three times greater. In addition, the engine is heavier and makes more noise.

Any discussion of Diesel engines for aircraft should be preceded by the fact that the present aircraft engine weighs about 1¼ pounds per horsepower. Diesels, however, burn less fuel and that fuel is of a nonexplosive nature. W. W. Davies, superintendent of research for United Air Lines, said recently that "within perhaps 10 years we will see a considerable increase in the use of Diesel engines in civil aircraft."

One factor that held the Diesel back before the war was the scarcity of mechanics who were trained to service the engines. There will be no such scarcity after the war, for thousands of mechanics in the Army, Navy, Coast Guard and Merchant Marine are well acquainted with the sturdy Diesel engine that went along with them to the front.

Ride 'Em, Ferry Pilot!

(Continued from page 79)

recognition of impending stalls with the landing gear and flaps up, with the gear down and with both the flaps and gear down. Overshooting procedure and recovery is simulated at a safe altitude and maintenance of control during partial power failures also is rehearsed. Finally the pilot is brought down into the traffic around a field and makes normal landings, as well as short approach landings such as are necessary during restricted visibility. Then he is ready for his final examination that includes recovery after overshooting the field, partial power loss on the takeoff and landings with partial power loss.

Flying a large aircraft is an exceedingly complicated task. The pilot of a B-17 has more than a dozen different things to do even before he is ready to start his engines. Then he runs through some 60 additional operations before he is ready to take off. In the air there is another score of tasks while settling down to normal cruising.

You can imagine the perplexity of one Class 5 pilot who recently landed a B-17 at one field and was asked to ferry a single-engine trainer to a nearby factory immediately. He warmed up the trainer's motor and took off, using the throttle and stick which are its only controls, then worried during the entire flight for fear he had forgotten half a dozen other things that he should be doing.



Delta Homecraft*
Power Tools

You can't SEE much difference between these power tools...

Brand X-Y-Z
Power Tools

but advanced engineering of the Delta units helps you enjoy greater woodworking satisfaction

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MILWAUKEE
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Homecraft
REG. U.S. PAT. OFF.
Power Tools

The line of Delta Power Tools includes Delta Scroll Saw, Delta Band Saw, Delta Circular Saw, Delta Lathe, Delta Drill Press, Delta Jointer, Delta Grinder, Delta Shaper.

In selecting any power tool — it pays to choose Delta, to get built-in, "hidden" values like these:

1 *Lubricated-for-life Ball Bearings.* You don't have to worry about oiling these bearings — they're lubricated for life when they leave the factory. And they are double-sealed against harmful dust, to assure you of longer bearing life.

2 *Pre-loaded Bearings.* This is the result of an extra manufacturing operation that reduces the "play" in the bearings, to help you enjoy long-time operating efficiency and accuracy.

3 *Precision-bored Bearing Seats.* These bearing seats help keep all parts lined up properly, so that you have greater assurance of producing finished pieces exactly according to dimensions.

4 *Precision-ground Shafts.* These are shafts built to run without any "wobbling" which might throw off your measurements.

5 *Dynamically-balanced Pulleys.* The pulleys which transmit the power from your motor to your power tool are balanced to help eliminate annoying, damaging vibration.

It's industrial-type construction features like these that give Delta Power Tools their wide reputation for quality . . . that help you enjoy assurance of accuracy, dependability, safety, economy.

Right now, War Bonds are the soundest investment for you. After total Victory, reinvest your accumulated savings wisely in Delta Homecraft Power Tools — for a full measure of the fun and healthful recreation that woodworking offers you.

Tear out coupon and mail today!

THE DELTA MANUFACTURING CO.
680H E. Vienna Ave., Milwaukee 1, Wis.

I am enclosing 25¢ in full payment for full-size patterns for wooden duck decoys.

Name.....
Address.....
City..... (.....) State.....



Full-size Pattern for Wooden Duck Decoys
It's fun to make your own duck decoys. Quick and easy, with these clear instructions in words, drawings, photographs. Mallard type and teal or canvas-back type. Send coin, postal note, or money order today. Use coupon at right. **25¢**

*Trade Mark Reg. U. S. Pat. Off.

EXPERT CRAFTSMANSHIP

In ages past men spent fortunes to own Damascus swords. Their fame and value were due to the expert craftsmanship of the makers whose skill could not be duplicated.

Plumb tools, too, are the work of expert craftsmen who pride themselves in turning out the finest products obtainable.

The one-piece steel head of flawlessly tempered steel, the carefully-shaped handle of shock-absorbing, close-grained hickory, the hang and perfect balance of each Plumb tool are features of craftsmanship. And these qualities have made Plumb tools the favorite of craftsmen for over 90 years. Fayette R. Plumb, Inc., Philadelphia 37, Pennsylvania.



NAIL HAMMER



BALL PEIN HAMMER



HALF HATCHET

PLUMB

HAMMERS • HATCHETS • AXES • SLEDGES

Superservice for Superforts

(Continued from page 54)

by ship was taken off and flown to Iwo.

Superfort repair and maintenance men work around the clock in hot sunshine or nippy nights. Iwo is so small that it can accommodate only a limited number of B-29s at any one time. Crew chiefs continually urge their men to "get 'em into the air." After one mass raid on the Japanese empire, there was a record number of 60 silvery bombers on Iwo at one time—40 low on gas, 20 with mechanical trouble. This meant all work and no play for the mechanics and fuel handlers.

When a B-29 radios that it is coming in for a landing at Iwo, an electric tension fills the air. Shot-up planes, hydraulic systems out of whack, damaged landing gear often mean but one thing: a crash landing. In fireproof clothing and with chemical extinguishers, crash crews stand by; doctors and medical assistants wait in ambulances.

Some planes skid in on one wing and ground loop; others without the benefit of landing gear plow a deep furrow with their bellies; some land smoothly but without brakes and roll to a crazy, jolting stop off the edge of the runway. Quick action by crash crews and medical men has saved many lives. And before the smoke and dust have barely cleared away, the mechanics are trying to see what they can salvage of the plane itself.

B-29 maintenance crews are highly skilled specialists. They have been carefully schooled in the intricacies of the giant plane and quickly become veteran craftsmen through practice. They know the Superfort as a mother knows her baby. They are so familiar with the 850-part motors and the 3000-part planes that they almost could take them apart and put them together again blindfolded.

One of the vast assemblage of ships that sailed to Iwo was a special B-29 maintenance and repair ship. When it dropped its hook off one of the Iwo beaches, it looked just like any other Liberty ship. But inside was a maze of lathes, drill presses, machine tools of all kinds and hundreds of B-29 parts. It served as a floating machine shop until permanent facilities could be set up on the island.

Special B-29 maintenance ships were first used at Saipan where the original strikes against Japan by the Superforts began. Others have been outfitted for use at other islands. They are commanded by veteran Army aviators who are specialists in engine repair and the crew is a combi-

(Continued to page 154)

GIVES HORSEPOWER MORE ZIP!



CASITE

Guarantees better and smoother performance or double-your-money-back

**CLEANS OUT MOTORS
KEEPS MOTORS CLEAN**

Enjoy the thrill of a clean, smoother running motor. Use CASITE! It's simple, swift, sure . . . just a pint in the crankcase every oil change and a pint through the air intake every three months. At service stations, car dealers and garages, everywhere.

GUARANTEE

Add Casite to crankcase and run through air intake according to instructions, then drive your car 100 miles or for 60 days, whichever is first. If not convinced that Casite gives you better and smoother performance, you get double-your-money-back by filling out guarantee certificate and mailing it to The Casite Corporation, Hastings, Michigan. Maximum refund is \$1.30 per pint, twice the nationally advertised price of Casite.

THE CASITE CORPORATION
Hastings, Michigan



65¢ A PINT

LESS WORK!

Because My Floors Stay Lovely Longer!"

Why make yourself extra work doing floors over and over every few days? Use *Self-Polishing Simoniz*. It saves you plenty of work because it's so amazingly tough and wear-resistant. Wears ever so much longer than ordinary polishes, yet nothing ever made your floors look lovelier. Nothing easier to use, either; no rubbing—no polishing—just pour, spread and let dry. In twenty minutes your floor sparkles with the same lasting loveliness that makes *Simoniz* so perfect for automobiles. Cleaning, too, is worlds easier. A damp cloth whisks up dust and dirt, and your floors shine like new again. Why not enjoy this blessing of lovelier floors with less work? Get *Self-Polishing Simoniz* at grocery, hardware, drug, paint or department stores.

THE SIMONIZ COMPANY
CHICAGO 16, ILL.



SELF-POLISHING
SIMONIZ
FOR FLOORS

nation of merchant mariners and Army mechanics. Some of these strange ships have helicopters which fly from the deck to the B-29 field on shore carrying parts and personnel that are needed in a hurry.

Shortage of fuel causes many Superforts to put into Iwo. During the first grueling weeks of operation, fueling crews performed heroically in loading drums of 100-octane fuel into LCTs and getting them ashore. Fuel often was poured by hand from steel drums into B-29 tanks—extremely dangerous, but necessary because fueling equipment and trucks were not yet ready. The superservice station for B-29s now is served by pipe lines, tank farms and gasoline trucks.

"Those boys who fueled the B-29s in those early days performed as courageously as any man who flew over Tokyo," said a hard-bitten Army colonel.

The value of Iwo Jima is summed up in a poignant drama that took place on the wind-swept, sulphuric little island not long ago. A young, curly-haired Superfort pilot, shot up over Tokyo, brought his damaged plane to Iwo. The landing gear was gone. The B-29 circled and swung in low over the field. When it touched earth, it plowed a great furrow down the airstrip. The crew was shaken and bruised, but each man crawled out of the plane and walked away from the crumpled mass of metal.

The pilot was the last to leave. As he clambered out he looked toward the American flag fluttering from the top of Suribachi on the southwest tip of the island.

He said simply and reverently:

"My brother was a Marine. He was killed here. But his death saved my life today."

Get in Line for Your '46 Car

(Continued from page 10)

but not to the extent once predicted for the "dream car of the future." The light metals will form parts particularly suited for their weight, such as doors which will open and close more easily. Many companies probably will return to using aluminum for pistons instead of cast iron which was used in the 1942 models due to early wartime shortages of this critical metal.

The postwar car's rubber parts—numbering more than 400—will be made of oil-resistant, long-wearing synthetic rubber. Distributor wiring, for example, will have a synthetic rubber covering resistant to moisture, dirt and oil.

Automobile springs made of rubber have been developed by the B. F. Goodrich Company. Half a million of these "torsilastic"

(Continued to page 156)

REPEAT PERFORMANCE

On plane after plane, "rising suns" line up beside "swastikas" as the men and planes that helped smash the Nazis join the fight against the Japs. ★ Strange are the island-dotted open seas to the pilots who earned their "swastikas" over the

hedgerows and winding rivers of the European Continent.

★ But familiar as the voice of an old friend is the smooth-running power of their Allison engines.

Pilots learned half a world away that the name Allison means quality workmanship—and a reliable, dependable product.

KEEP AMERICA STRONG
BUY MORE WAR BONDS

POWERED BY ALLISON

P-38—Lightning
P-39—Airacobra
P-40—Warhawk
A-36 and P-51A—Mustang
P-63—Kingcobra

More than 65,000 Allison engines have been built for the above planes of the U. S. Army Air Forces.

LIQUID-COOLED AIRCRAFT ENGINES

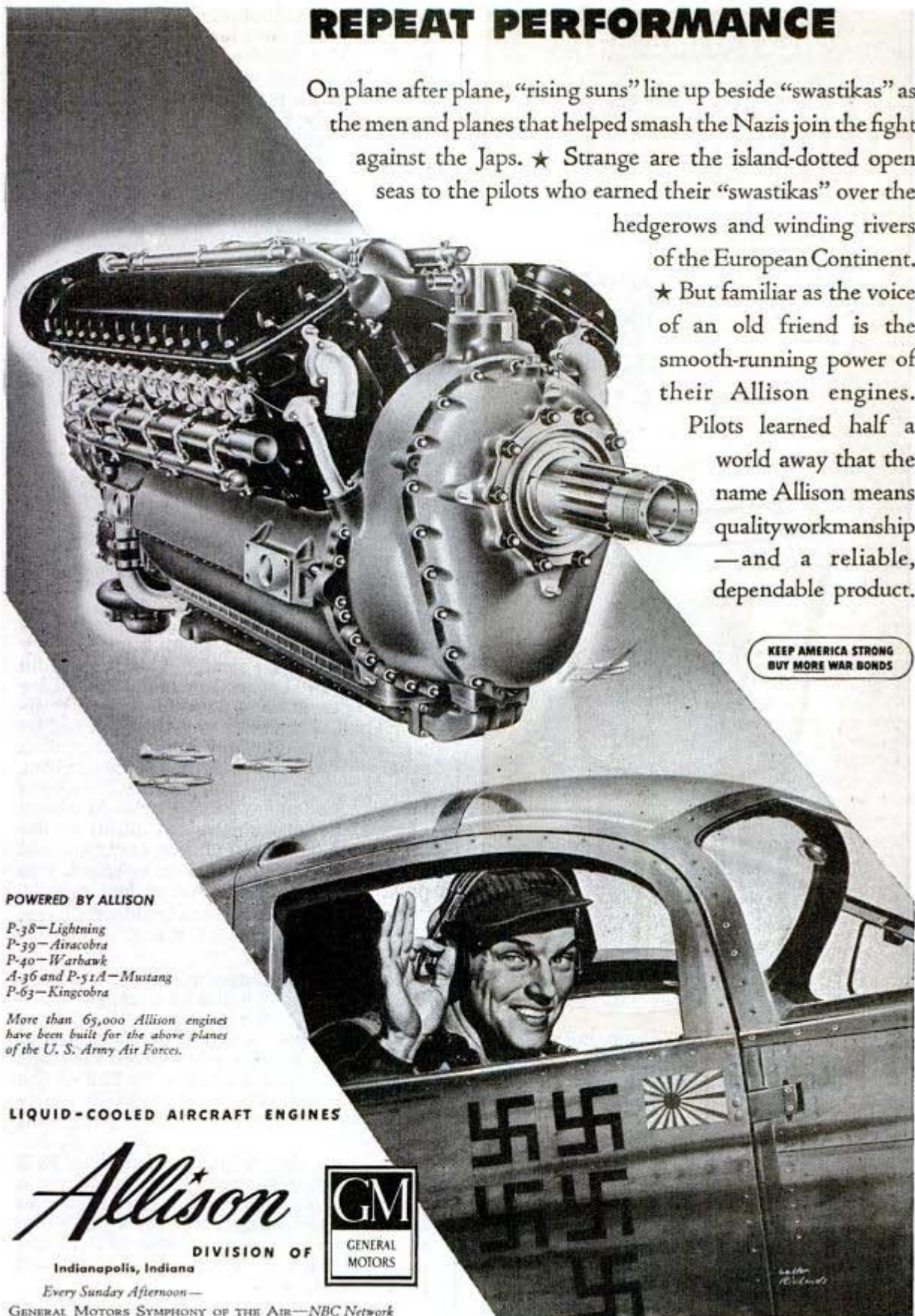
Allison

DIVISION OF

Indianapolis, Indiana

Every Sunday Afternoon—

GENERAL MOTORS SYMPHONY OF THE AIR—NBC Network



NEXT TIME SAY
BRIGHT STAR

and you will get a
FLASHLIGHT & BATTERIES

famous since 1909

for **QUALITY,**

STYLE and

SERVICE



BRIGHT STAR BATTERY CO. CLIFTON N. J.

springs, which eliminate both noise and lubrication, have gone to war in LVTs (Landing Vehicles, Tracked). Most welcome of synthetic rubber products to the average motorist is an inner tube which requires inflation only three or four times a year. It is made of butyl, a rubber derived entirely from petroleum gases.

Willys-Overland solved the question of whether there would be a postwar jeep recently by announcing that the postwar jeep already exists. They say it is the first vehicle to combine the functions of a light truck, tractor, mobile power unit and passenger vehicle.

The four-wheel drive postwar jeep will be powered by the same engine used in the military model. Two important differences are a special power takeoff and changed gear ratios in the transmission, transfer case and axles. The power takeoff can be used with the spline shaft for direct power or with the belt pulley. It delivers up to 30 horsepower to anything from a buzz saw to a threshing machine. The new jeep performs efficiently at speeds ranging from 7½ to 60 miles an hour.

Among the new postwar cars, not to be confused with the immediate postwar cars, is a lightweight Ford, handmade models of which already have been built. Henry Ford II is taking a personal interest in the development of this car, which will sell for 15 to 20 percent less than the regular postwar Ford. Engineers say this will not be a midget auto, but they hint it will possess some sensational features. Three engines, of four, five and eight cylinders have been tested. The four-cylinder engine has been eliminated, but tests are continuing on the other two. The five-cylinder engine, about which no details have been released, was proving the more efficient at last reports.

General Motors will not build a \$500 car, but is planning a smaller and more economical Chevrolet.

The Crosley Corporation will concentrate on the production of a midget automobile which will be several inches longer than the prewar model. It will be powered by a four-cylinder engine which develops 28 horsepower compared with 12.5 of the prewar Crosley. Previous models were designed to give close to 50 miles per gallon of gasoline.

Graham-Paige, which produced no 1942 model, is in a position to manufacture a completely new car which is expected to be in production by early 1946. This car, or one built by some newcomer to the automotive field, may furnish some pleasant postwar surprises.

(Continued to page 158)

WHEN YOU NEED A KNIFE— YOU'LL DO BETTER WITH X-ACTO!

1st Choice of Hobbycrafters Because it's Sharper— Easier to Use

Hobbycrafters everywhere are whooping it up for X-acto—the knife that's keen as a surgeon's scalpel, easy to use as a pencil.

Made of finest surgical steel, specially tempered, precision-ground, X-acto cuts effortlessly through wood, rubber, even ivory. The bulldog-grip safety handle holds the blade tight, so it can't fold under; gives your hand greater skill and cutting control. Scientifically shaped blades get in and around the smallest, most difficult places.

No home, no workshop, no hobby den, should be without this tough and ready wonder-knife. Get an X-acto and cut yourself in on a lot more fun . . . beginning today!

THE KNIFE OF A MYRIAD USES

No matter what your hobby is, you'll turn out a slicker job with X-acto. For instance, here are just a few uses:



Modelmakers

X-acto gets those hard-to-reach places, cuts clean, sharp curves and corners. Prevents splitting, shredding, and other common faults.



Artists

A favorite tool for cutting friskets, silhouetting, trimming dummies, drawings and Ben-Day screens. Super-efficient, inexpensive.



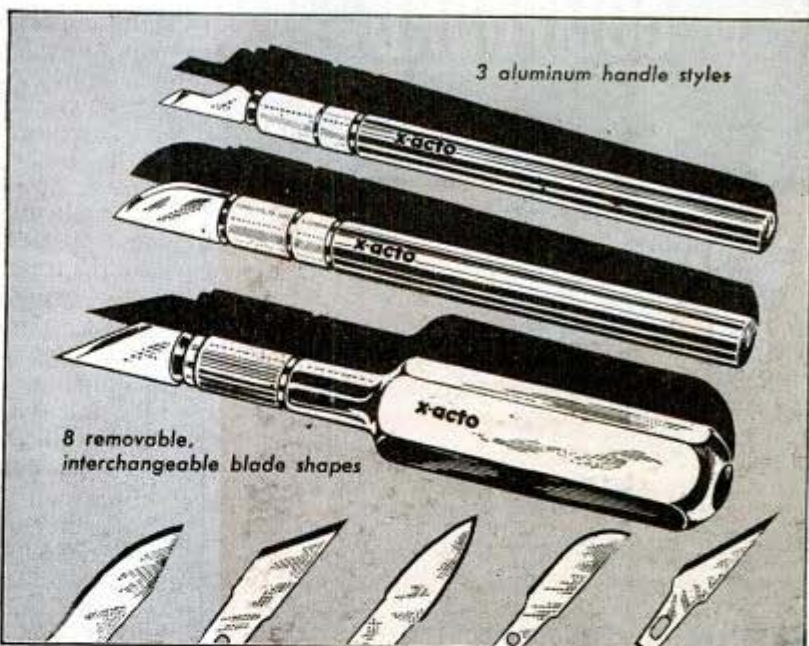
Photographers

X-acto's keen, clean cut and sure, firm grip are unexcelled for stripping, patching, retouching negatives and prints, cutting mats and stencils.



Leathercraft

X-acto gives a smooth, true cut. No pulled edges. It's the super-sharp knife you need for angles, bev-els, cut-out and incised pattern effects.



3 aluminum handle styles

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Change Blade in Just 5 Seconds



A twist, a twirl, and the dull blade's out, the new, sharp blade's in. X-acto's *always sharp, always ready*, with the perfect knife-and-blade combination for every purpose.

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X-acto Planner, single-bevel blade . . .	\$1.00
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X-acto Hand Drill & Pin Vise75
X-acto Hobbycrafters' Saw (not shown) . . .	1.25
X-acto Balsa Stripper, movable guide . . .	1.00



Send for "HOW TO" Booklets:



How to Build Scale Model Planes; Whittler's and Woodcrafters' Handbook; Twelve Techniques—The Knife as a Drawing Instrument; Commercial Artists' Handbook. Only 10¢ each. Full of ideas.

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X-acto KNIVES & TOOLS

At better hardware, hobby, and gift shops—or if not available write direct to X-acto Crescent Products Co., Inc., 440 Fourth Ave., New York 16, N. Y.

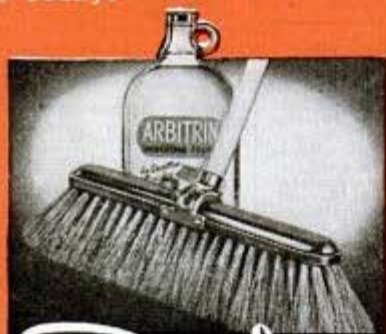
No. 1 X-acto for fine delicate cutting 50¢ ea. With 5 extra blades	\$1.00
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No. 62 X-acto Double set with 10 extra blades . . .	2.00
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Every war innovation, such as the alcohol-water injector, is being carefully studied by engineers in the automotive Big Ten. The injector was used successfully on aircraft engines to provide a sudden burst of power for takeoff or in combat. It may work perfectly, but in a highly competitive market the engineer has to ask himself whether the automobile buyer will be willing to pay accordingly for improved performance. The same reasoning holds true in regard to such items as the supercharger or a newly invented electric immersion heater. This heater is immersed in the car's cooling system to preheat the water, making it possible to start the engine in 20 seconds in zero weather.

Despite the low quality of gasoline doled out to civilian motorists during the war, great advancements have been made in improving fuels and lubricants. Less than a half ounce of a new chemical added to 100 gallons of gasoline eliminates gum formation which might clog fuel lines.

Some indication of the tremendous strides in fuel research and development is evidenced by a recent test with triptane. A 12-cylinder Allison airplane engine was operated on a 60 percent blend of triptane and 100-octane gasoline. With this blend of fuel the engine developed 2500 horsepower although its rated horsepower with 100-octane aviation gasoline is only about 1500. Advances such as this point to significant postwar developments in the power plants of automobiles as well as aircraft.

When you walk into an automobile showroom and pick out your 1946 car, you are sure to find many improvements despite all the "face-lifting" talk. But don't look in the trunk for a spare tire because there won't be one. That's just the WPB's way of reminding you that there's still a war on.

Guardians of the Wilderness

(Continued from page 5)

sending up an occasional puff of smoke before they found by accident that it was only a "lightning struck tree." The fire was smoldering inside the trunk. An airplane patrol would have caught this in a jiffy.

The practice of releasing parachutists, or "smoke jumpers," directly over or near a fire and then delivering their tools and other supplies via 'chutes probably will be expanded after the war. There's a job for ex-paratroopers.

With its ability to speed over pock-marked terrain, steep grades and swiftly flowing creeks the Army jeep should be very valuable to us in dispatching ground

(Continued to page 160)

**Over a MILLION★
Gone to War!**



★ Over a million Coleman Military Burners have gone to the military services—miniature burners for the Medical Corps—powerful 2-burner units for sterilizers, water stills, field hospitals and for 20-man cooking units—tent heater burners—and this amazing one-man "GI" Stove that enables our fighters to have hot food, hot drinks, purify water and even keep warm in foxholes!

You'll Want This Grand Sport Stove for Every Outdoor Trip "Tomorrow"

After the war, this new Coleman "Pocket" Stove will be the grandest little sport stove outdoor-loving Americans ever touched a match to... it will be the perfect portable quick-cooking pal for hunters, fishermen, picnickers, vacationers. Thousands of uses around the home.

Burns Any Kind of Gasoline—White or Leaded—Ready in minutes for cooking, heating drinks, purifying water. Compact—its telescoping case

provides two handy cooking utensils. Easy to carry as a quart size can of food. Only 8½ inches high; 4½ inches in diameter. Expertly designed and quality built for years of trouble-free service. Watch for the Coleman "Pocket" Stove. You'll want one!



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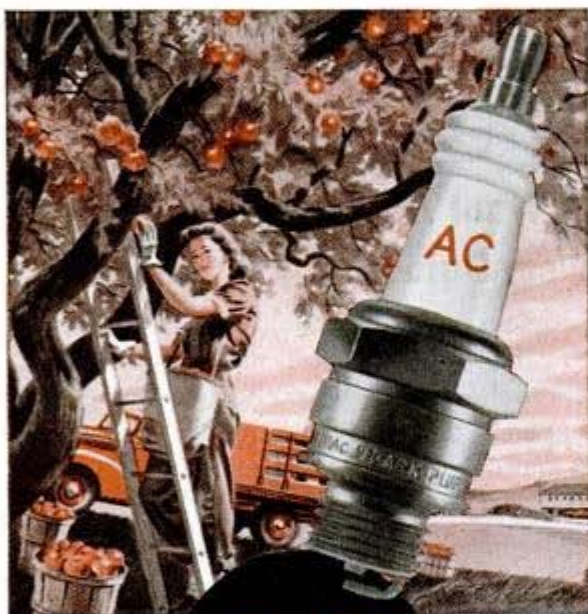


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Coleman
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PLUGS SAVE UP
TO ONE GALLON
OF GAS IN TEN

SPARK PLUGS

SPEED FINAL VICTORY—BUY WAR BONDS

crews and equipment promptly to fires. The fire fighters would be in better shape for their jobs if they weren't fatigued from carrying hoses and other implements.

Among the modern equipment we are already using is the "snoplane," a vehicle mounted on skis and having retractable wheels for roads which are not snowbound. Powered in the rear with an airplane engine which generates 50 horsepower at 7000 feet, the machine makes a three-day ski trip in three or four hours. Postwar designs are expected to give the snoplane lighter construction and a heavier engine.

Other modern devices include scientific "samplers" to measure the water content of snow; two-way radios for automobiles and dog sleds; mine slings made of 5/8-inch specially woven rope that will not easily unravel or twist for hauling accident victims up or down a cliff; stretchers fashioned from wire and steel and fastened to toboggans; freight-type sleds for drawing elk behind a tractor; bear traps on wheels and aerator hoses for supplying fish with oxygen while they are being transported in cans on trucks. Formerly, rangers had to slosh the cans back and forth continually during the journey to keep the fish from dying.

The mobile bear trap is an oval corrugated tank used to capture troublesome bears who encroach on camp grounds and other "civilized" areas. A trigger in the front end is baited with bacon or some other morsel. A pull on the bait drops a steel door, sealing the bear in the tank. The animal is marked with paint to show that he has behaved badly, transported to some remote part of the park and released.

Don't let the partial mechanization of the rangers persuade you that the national parks themselves are being modernized. Far from it. While the sons of Mars have been destroying scenic and historic landmarks throughout the globe, the rangers have been busy preserving the geysers, the waterfalls, the dramatic geological miracles, the mammoth trees and the abundant wild life in their original form. Once travel restrictions are lifted, you'll find them waiting for you.

Your Solar Home Is All Wrapped Up

(Continued from page 16)

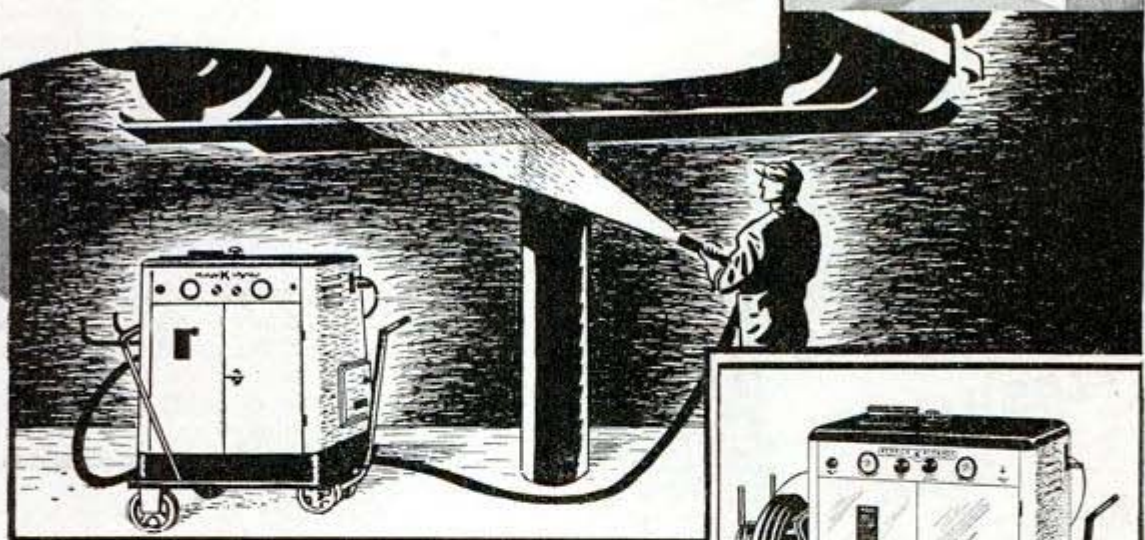
place with the hearth above floor level to provide a storage space for wood.

Facing south from the top of a slope, the model home is 58 feet six inches long and contains 16,000 cubic feet of space. Facing south are master bedroom, convertible

(Continued to page 162)

Ingenious New Technical Methods

Presented for Your Peacetime Use



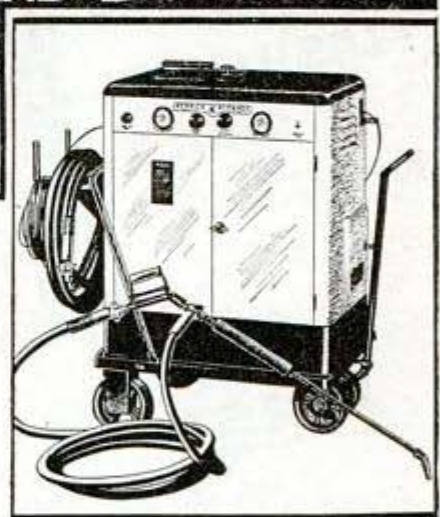
Coming to Users of Gas-Powered Equipment 80% SAVINGS IN CLEANING TIME with Steam Rig Now the Army's Standby

An economical solution to the problem of cleaning and degreasing trucks, passenger cars, tractors, locomotives, excavators and the like will be available to garages, service stations, all users of oil-burning equipment, as soon as war demands permit. It is a more efficient steam cleaner now in use by the thousands in the Armed Forces.

Neat "housekeeping" has too often been neglected by industry due to the costliness of hand labor. But the best housekeepers in the World, the U. S. Army, Navy and Marine Corps, dare not neglect frequent and thorough cleaning of all equipment to safeguard against fire and malfunctioning, and to permit fast, certain inspection. This cleaner, developed to meet their high standards, removes grease, dirt and grit 5 times as fast as any other method. It cleans by a balanced combination of heat, detergent, water and friction. It is typically "army" in simplicity of design and operation; in 30 minutes, the entire machine can be dismantled and completely cleaned.

Wartime uses of Wrigley's Spearmint Gum also point the way that industry may benefit when this quality product again becomes available. It will *again* be a "help on the job" in many ways. Right now *no* Wrigley Spearmint Gum is being made, as present conditions do not permit the manufacture of Wrigley's Spearmint in quantity and quality sufficient for all. But remember the Wrigley's Spearmint wrapper—it is a certificate of highest quality and flavor—and will always remain just that.

You can get complete information from
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The Kerrick Kleaner



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conditions
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bedroom, living room, dining room and kitchen, in that order from west to east. A corridor along the north wall connects the major rooms and the bath and utility room.

Built-in wardrobe units with ample drawers and closets eliminate conventional dressers in the bedrooms. The master bedroom has a built-in vanity, beneath a huge square mirror, and shelves for books and radio in the wall at the head of the bed.

Ingenious accordion-like partitions fold back against the north wall to allow the convertible bedroom to become part of the living room or to close the living room off entirely for use as an emergency bedroom. This multiple use arrangement utilizes space for general living that ordinarily is employed only a few hours at night for sleeping. With partitions folded back the living room, convertible bedroom and dining room combine to form a spacious 33-foot room for modern living.

The kitchen, with its pleasant view over the front lawn, contains automatic washing machine, ironer, refrigerator and a table-top unit which includes sink, stove and electric garbage disposal machine. This package also includes special cabinets and a ventilator over the stove. Besides the gas-fired heating unit, the utility room contains gas laundry drier, water softener, workbench and closets with adjustable shelves for canned goods.

Lights are turned on with a touch of the toe. Switches along the floor are operated by pressure on a short rod projecting from and parallel with the fixture. The house requires far less artificial light in daytime and lamps needn't be turned on for an hour or more after they can be seen in neighboring dwellings.

You might expect daytime brightness to be a strain on the eyes, but actually the reverse is true. Strain really comes from dark interiors and the effect of glare is created by the eye readjustment necessary when you step outside into the sunlight. I found to my own satisfaction that you don't have to squint when you walk outside from the Solar Home, for your eyes are geared to nature's own illumination.

Complete with all equipment, the Rockford type of house, five rooms, bath and utility room, will sell for approximately \$6500 without the lot, which is 144 by 164 feet. Garage or car port are at the owner's option. A lot 100 by 100 feet is considered large enough, but a site should be carefully selected for a view that will remain a permanent pleasure. In restricted quarters, of course, a tall hedge, evergreens and a garden can be laid out to insure privacy and a pleasant outlook.



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Early, the Ford Motor Company saw the need for personal service, precision tools, trained mechanics. From all over the world men came to the Ford plant for service method training. In a sense, they took with them part of the factory itself, methods and ideals, and thus Ford service became universal.

Through the development of special-purpose tools and scientific methods, Ford was first to

make it possible for dealers to give service measuring up to the precision built into the original car. Today Authorized Ford Service dealers everywhere have available a complete line of factory-approved tools that mean finer workmanship, greater economy for the car owner. And the Ford Motor Company continues to supervise the training of men who will use these tools.

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When buying a saw, follow the example of those who know saws best. Remember, Disston is the saw most carpenters use. Long experience with saws on every type of work, has proved to them that they can count on Disston Saws for faster, truer, smoother sawing and longer saw life.

Disston Saws—products of America's largest and foremost manufacturer of saws—are made of the famous Disston Steel, by highly skilled saw makers, to provide you with the finest saws that can be made.

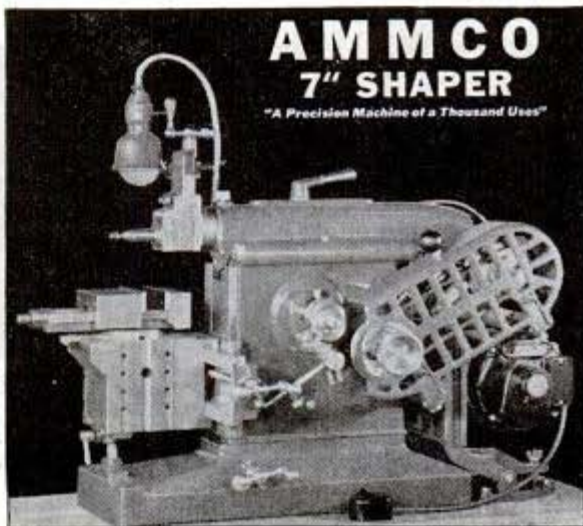
Take care of your Disston Saws and they will continue to serve you well. Many hardware retailers and saw repairmen provide a special saw sharpening service. They will be glad to help you keep your Disston Saw—or other quality make—in good, serviceable condition.

If you need a new Disston Saw or other tool for essential work, talk to your local hardware retailer—he may be able to help you.

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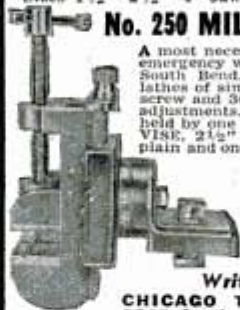
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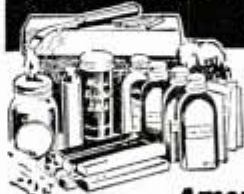
Width	Depth	Opening	Jaw	Height	Price
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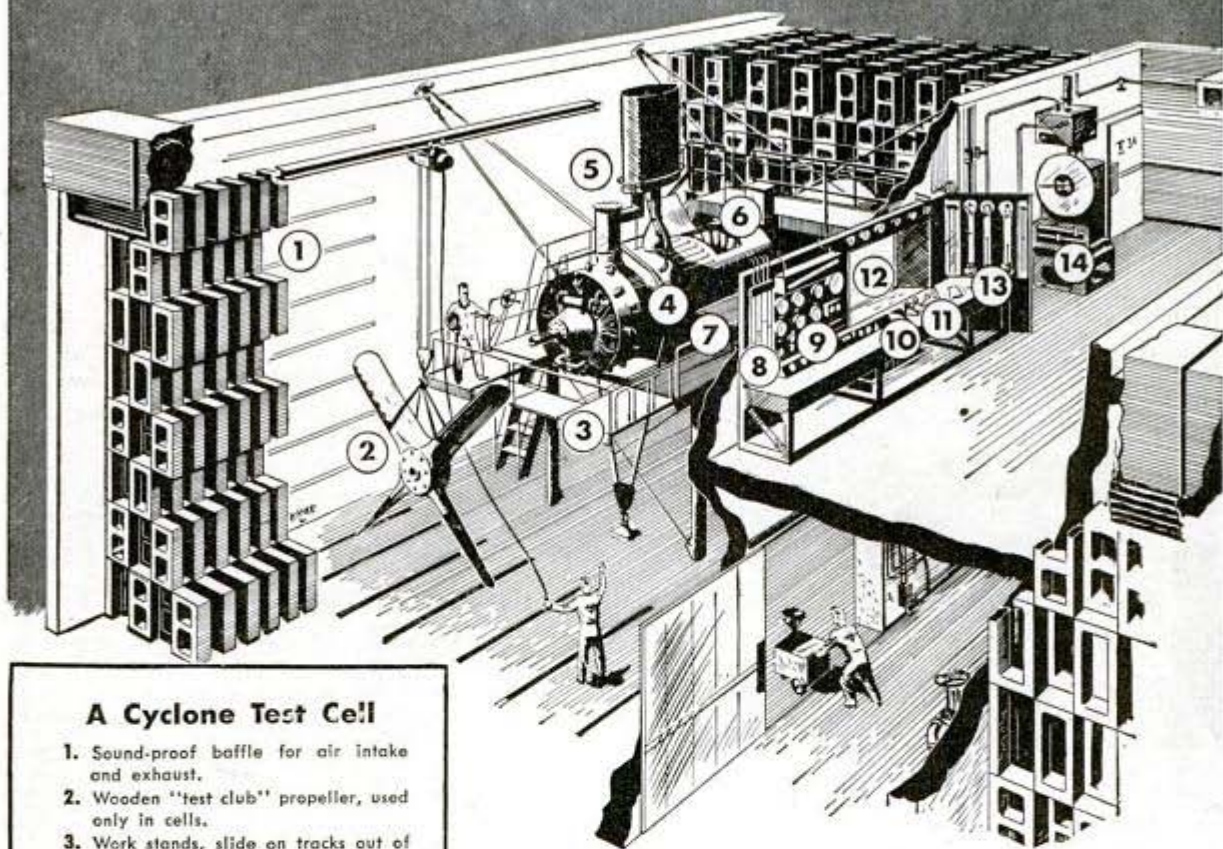


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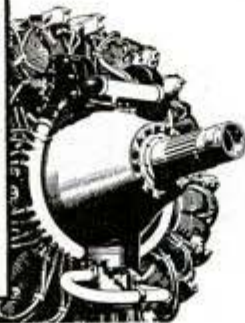
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After the 3½ hour test, the "green" Cyclone is disassembled and each part inspected. A second time it is assembled and run for 3 hours in a final test. Every Cyclone is thus twice assembled, twice tested. It is the way Wright Aeronautical double checks precision construction and assures Cyclone performance in the air.



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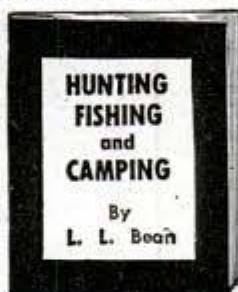
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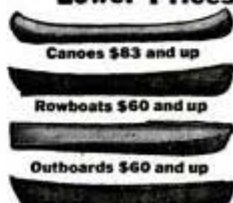


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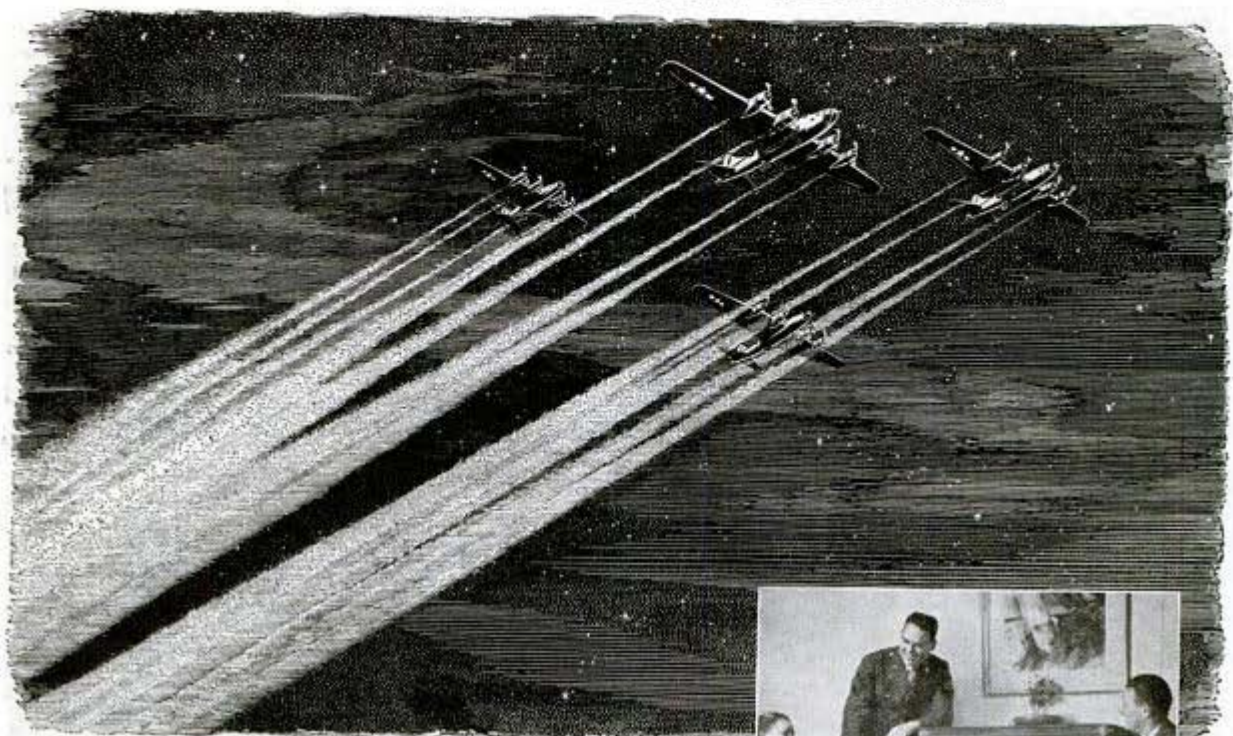
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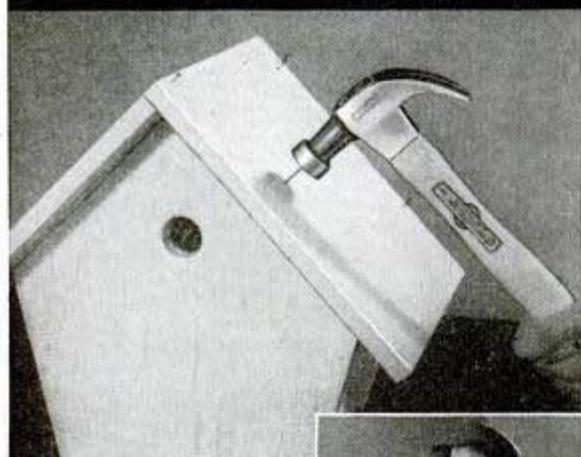
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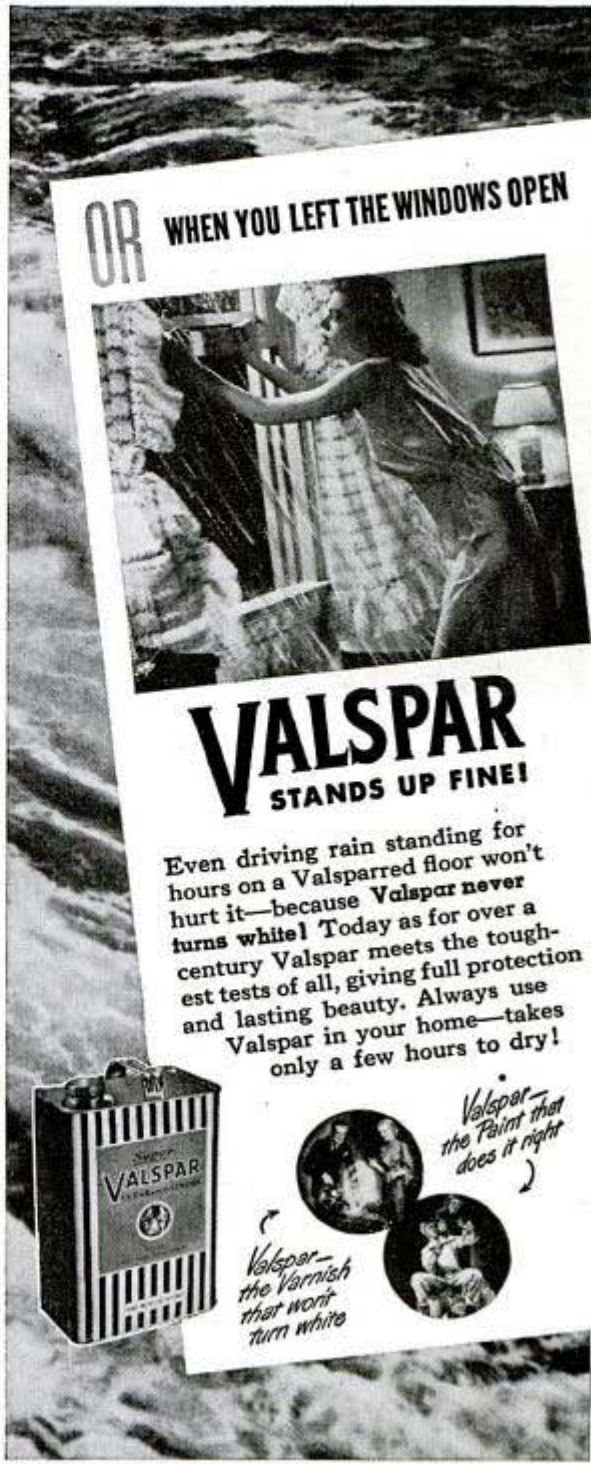
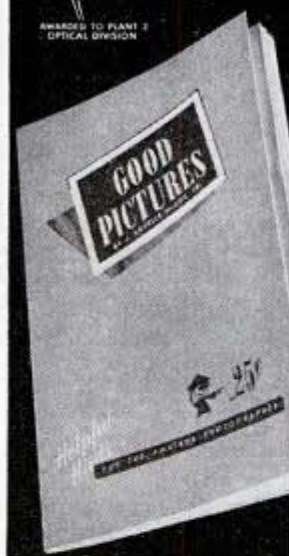
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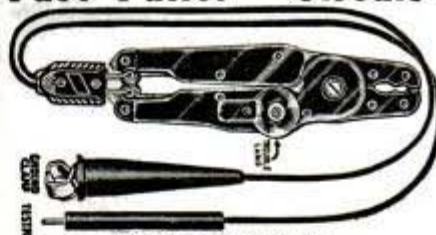
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7/16	3.50	6"	1/4, 5/16 or 3/8"	1-3/4"
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9/16	4.25	6"	3/8, 7/16 or 1/2"	2"
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5/8	5.00	6"	3/8, 7/16 or 1/2"	2"
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11/16	5.50	6"	7/16, 1/2 or 5/8"	2"
	5.75	8"	7/16, 1/2 or 5/8"	2"
3/4	6.25	8"	1/2, 5/8 or 11/16"	2"
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	7.25	10"	1/2, 5/8 or 3/4"	2"
7/8	7.75	8"	1/2, 5/8 or 3/4"	2"
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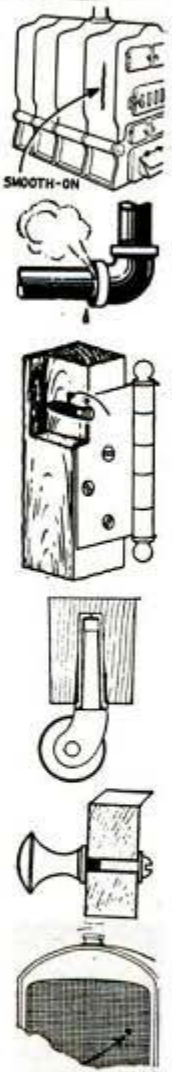
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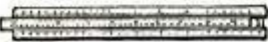
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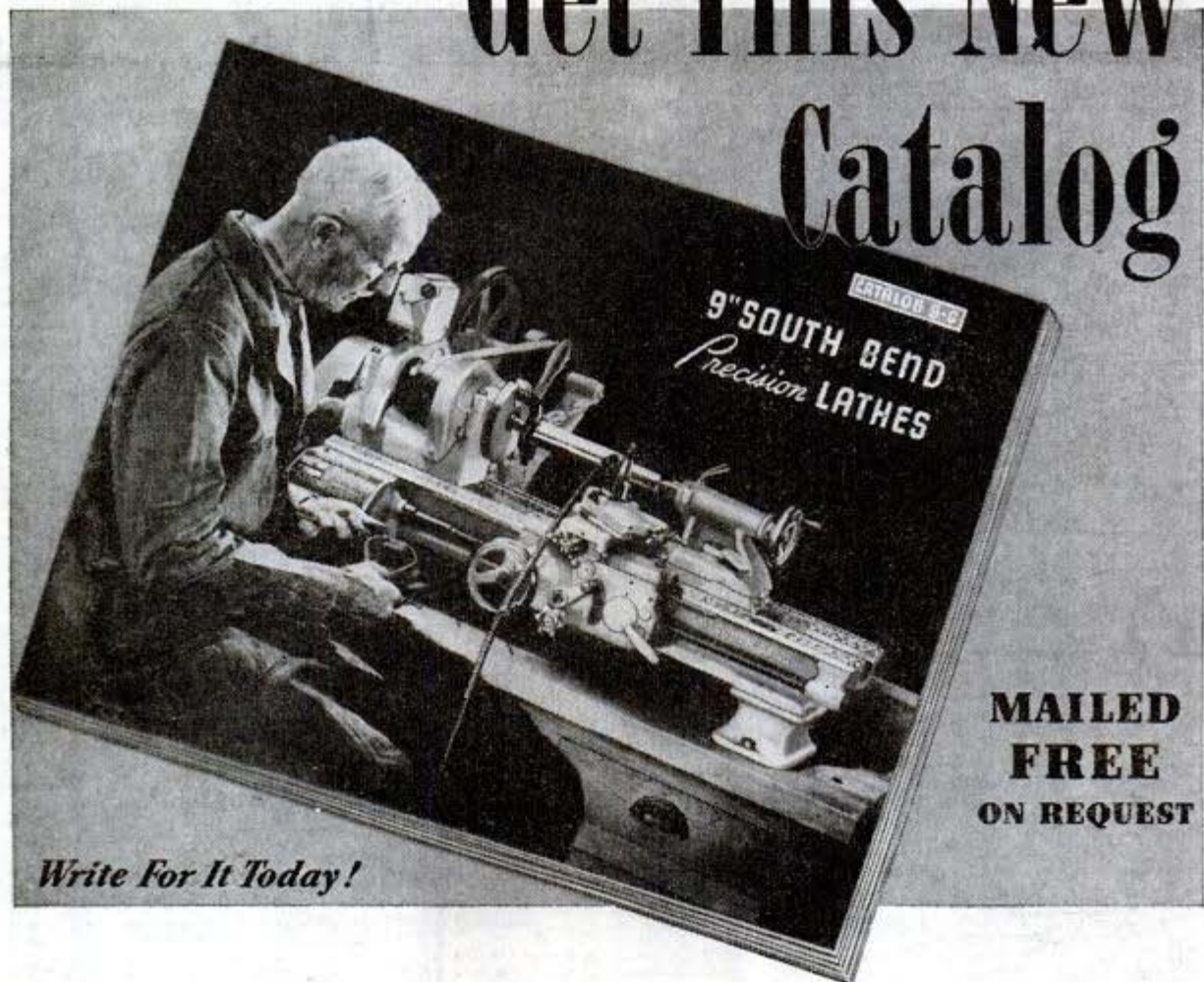
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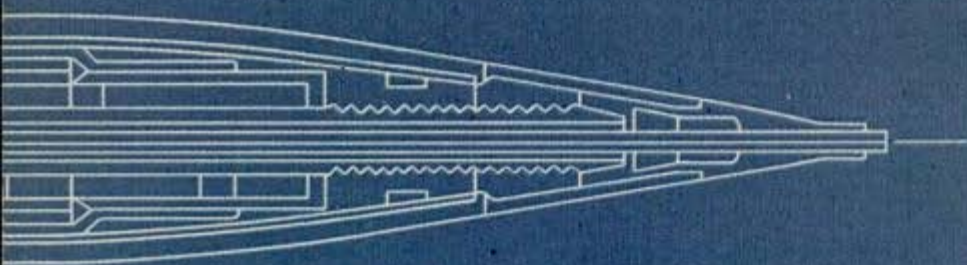
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