

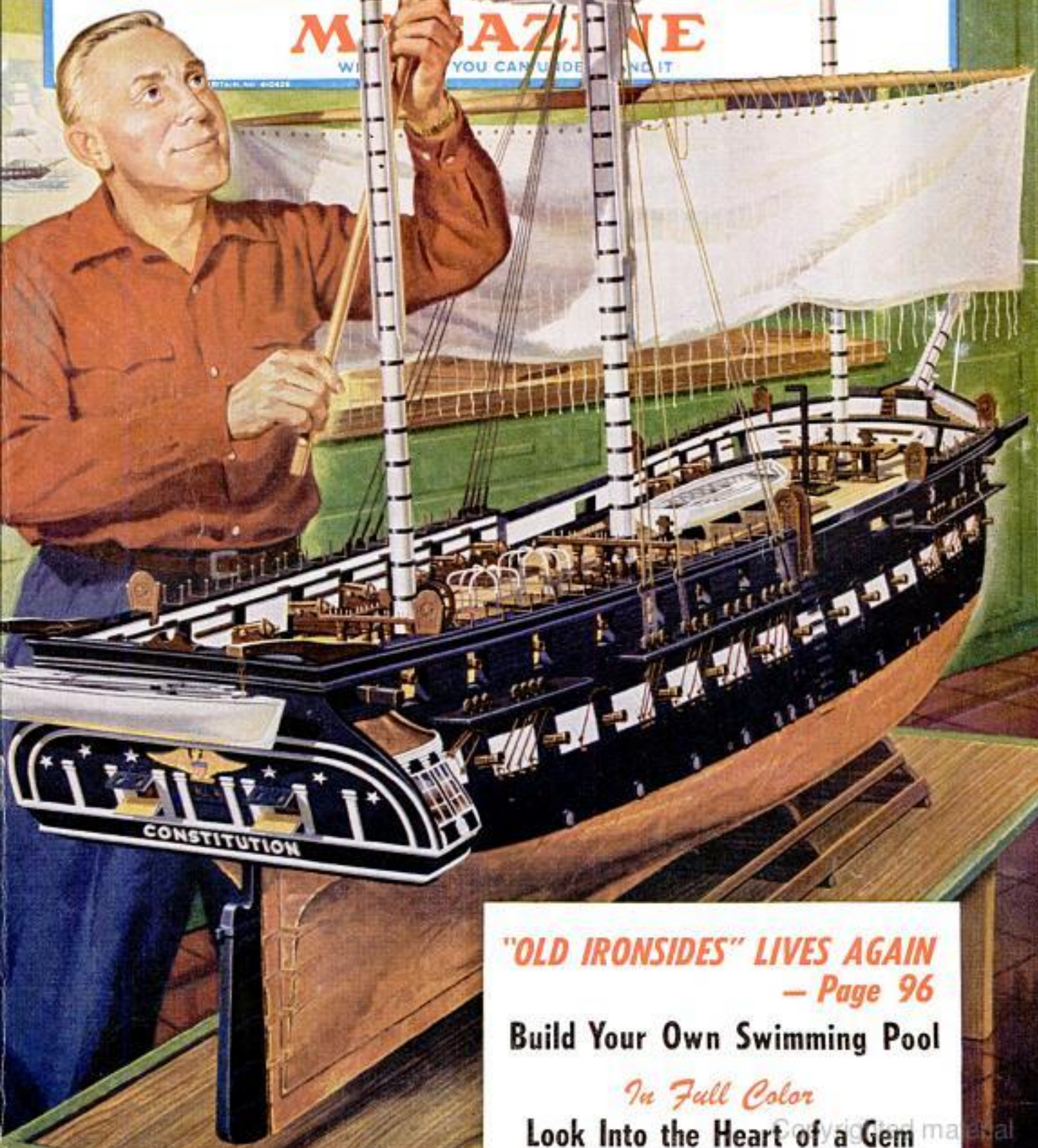
MARCH 1957

35 CENTS

POPULAR MECHANICS

MAGAZINE

WHAT YOU CAN UNDERSTAND IT



"OLD IRONSIDES" LIVES AGAIN
— Page 96

Build Your Own Swimming Pool

In Full Color

Look Into the Heart of a Gem

nine wonderful ways
to welcome spring



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TIPS FROM
TEXACO



HEAVY FOOT WASTES GASOLINE

CAR DRIVERS who watch their footwork can get up to 50% more mileage from a gallon of gasoline. Here are some ways they do it.

Smart drivers take it easy. A "swoosh" start or beating the other guy at the light takes up to 60% more gasoline. Nervous "pumping" of the accelerator pumps unneeded gas to the engine, gives an over-rich mixture, lowers performance, wastes gas.

So much for the accelerator. What about the brake? You make a gas investment to give the car momentum. Useless braking kills momentum, wastes gas. Rushing up to a red light, turn or traffic jam, and then screeching the brake wastes plenty. Look ahead, plan a smooth even pace and you'll save gas—maybe even lives.

So watch your footwork and save!

Here's another gasoline saver:

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MARCH 1957

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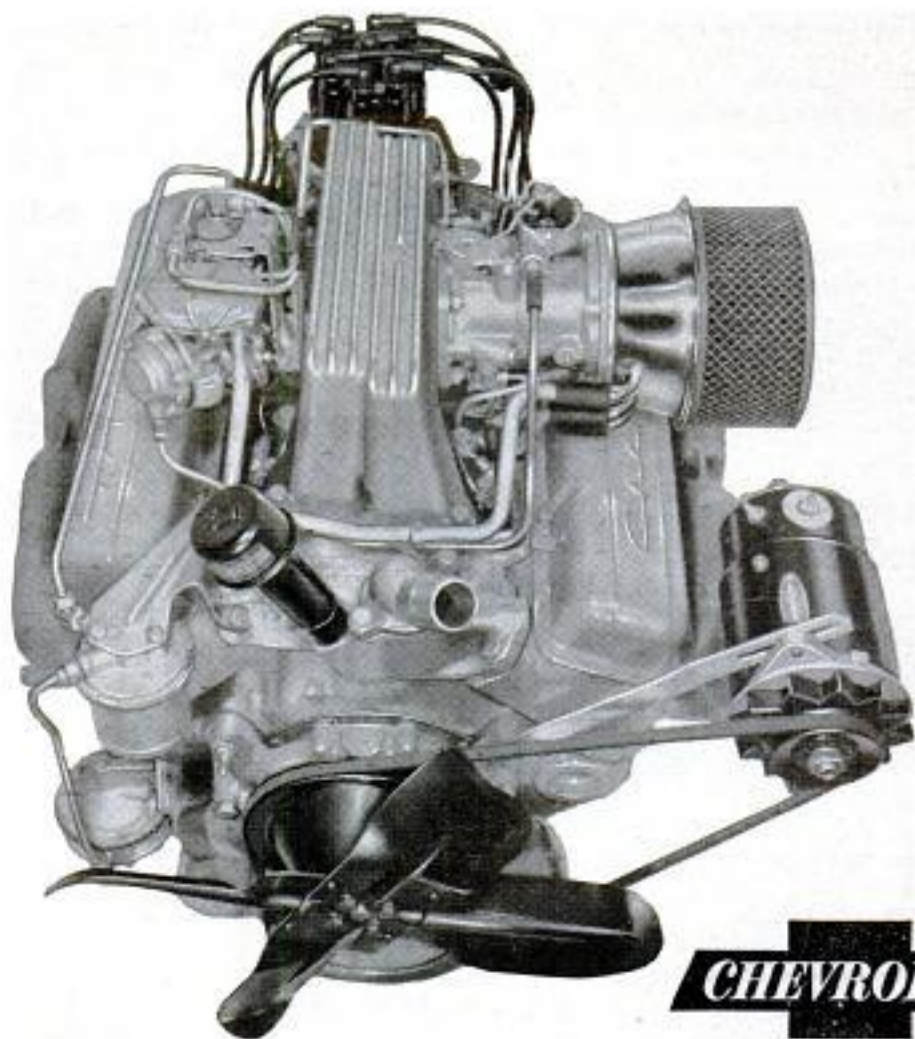
The biggest step forward since overhead valves—FUEL INJECTION!

With Ramjet fuel injection* the auto industry enters upon a whole new era of engine performance. For this is as important an advance as overhead valves—setting new standards of gasoline economy, of *instantaneous* acceleration, of smooth low-speed running and free-breathing maximum performance.

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Next Month

LANDSCAPING is a subject close to the heart of every homeowner whether his yard be large or small. Breath-taking plans for the spacious yard are plentiful—but what about the family with a 50 or 60-foot lot? In the April issue "PM's Landscaping Plan for the Small Yard" reveals the transformation of a desolate mud hole to a spot of real beauty. There are scores of ideas in the plan and photos reproduced in full color. Twenty-one pages of the April issue are devoted to outdoor living with additional articles on shading devices for the yard, outdoor furniture, an innovation called "garage porches" and a page on how to combat pesky mosquitoes

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Sources of further information not listed in the index, starting on page 74, about articles in this issue, frequently are shown in the Where-to-Find-It List prepared for each issue. A copy may be obtained by readers, without charge, from Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, Ill.

Published monthly by Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill. H. H. Windsor, Jr., president; Wm. Harrison Feltz, exec. vice-pres.; Franklin S. Forsberg, operations vice-pres.; D. F. Windsor, vice-president and secretary-treasurer; H. H. Windsor III, vice-president; W. T. Windsor, vice-president; Joseph R. Buell, Jr., advertising manager; Alan M. Deyoe, circulation manager. Single copy in the United States and Canada, 35 cents; subscription rates in the United States and possessions, Canada and countries of the Pan-American Postal Union, 1 year \$3.50; 2 years, \$6.00; 3 years, \$8.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 30 days in advance so you will not miss an issue. Give both your old and new addresses.

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Volume 107 MARCH 1957 Number 3

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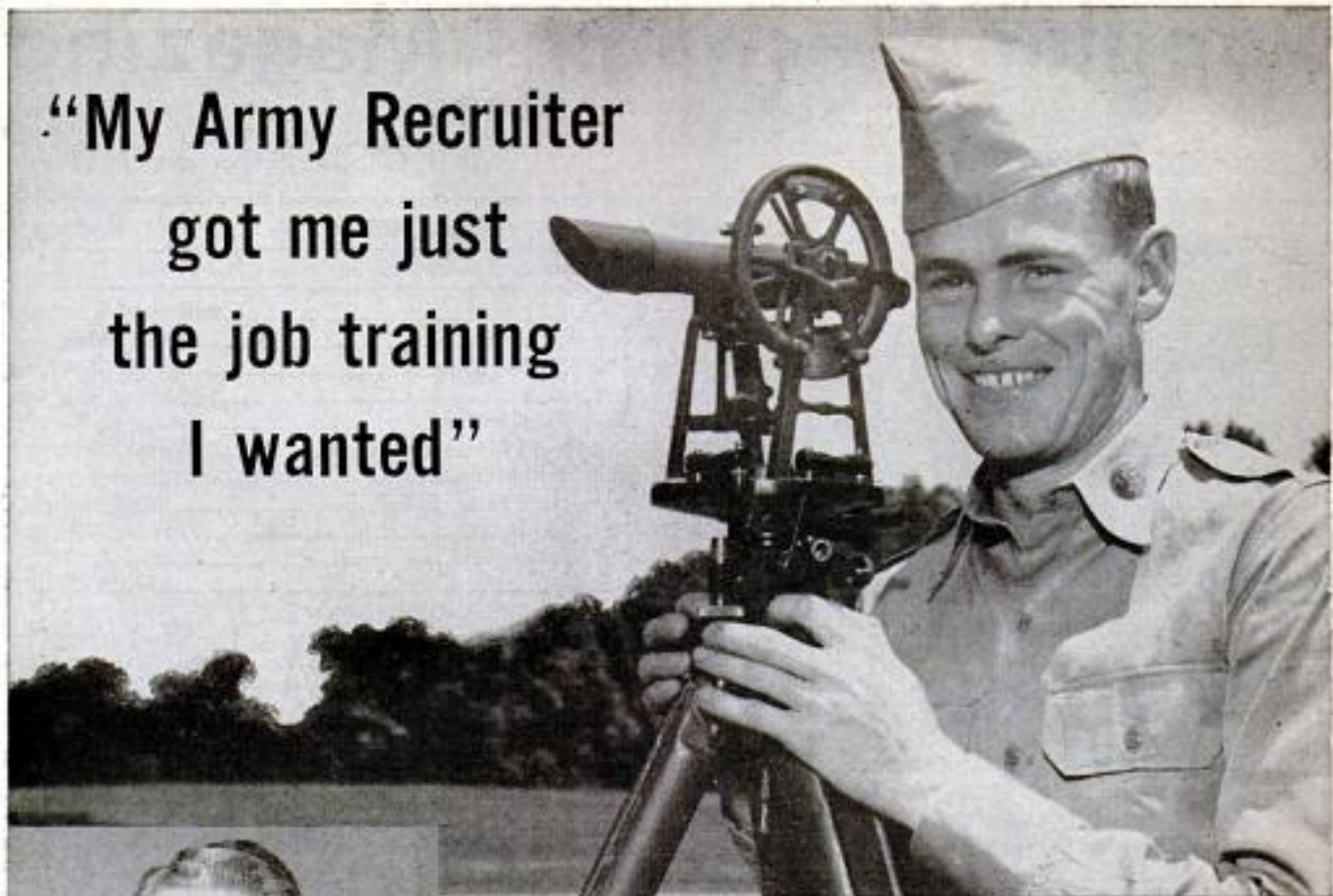
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I wanted"**



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John R. Fox

Pvt. John R. Fox
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ACROSS THE DESK



Who Has the Smallest Town With TV?

George Cadogan's story of "The World's Tiniest Town With TV" brings us some challenges from other hamlets. Cadogan wrote of the TV station at Wingham, Ont., which boasts a population of 2700. Here's what we hear from readers in other small towns:

☆☆☆

I think you will find Poland Spring, Me., about 2000 persons shy of Wingham's 2700, yet it has a TV station, WTMW. Right?

Alan Magary,
Phillips Exeter Academy,
Exeter, N. H.

☆☆☆

We have a TV station out here in Garden City, S. D., seven miles from our farm, and the town has a population of not over 500. It's KDLO, 100,000 watts. I believe this is the smallest TV station.

Emil C. Konvalin,
Route 3,
Clark, S. D.

☆☆☆

KOTI-TV, Klamath Falls, Ore., is located about three miles from Klamath Falls at the campus of Oregon Technical Institute. The station is not owned by the school. Oregon Tech is officially classed as being in Oretch, Ore., has its own post office, fire department, police and a total student population of around 1000.

Thomas Sternburgh,
Bend, Ore.

Credit Is Due

In our account of the steel-roofed auditorium of St. Patrick High School at Kankakee, Ill. (*PM*, Dec. 1956, page 153), we failed to give credit to the designers of the unique building: Architects Belli & Belli, 6040 W. Fullerton Ave., Chicago 39, Ill.

"Every Young Man Can Build It"

So enthusiastic is John D. Murphy about the *Popular Mechanics* ranch house that he writes us:

"I invite anyone who may read this to come to Washington Court House, Ohio, and see this home." Murphy built the house at 605 Albin Ave. It is his second *PM* house, a previous one having been built in Pennsylvania.

(Continued to page 8)

POPULAR MECHANICS

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(Continued from page 6)

"I know that every young man in the United States is capable of building this house—if they would only make up their minds to do so," says Mr. Murphy. "To those whose finances are limited, such as ours, I say roll up your sleeves and go to work if you want a nice home at a minimum of cost. I have, with the help of my wife and friends, built two of *Popular Mechanics'* houses and they are everything you may want in a home . . . some 20 years ahead in design."

To those who might be discouraged by the experts, Mr. Murphy says: "Don't forget that our early settlers did not have the good tools and machinery we have today. As far as tools go, I have one eight-inch Black and Decker saw and the minimum of other tools, but it does not take a lot of tools."

Although tradesmen were hired to help with plumbing, wiring, furnace and fireplace, Murphy says he still saved over \$8000 in building the ranch house. He is a salesman with territory in southern Ohio.

(Continued to page 10)



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(Continued from page 8)

Plans for the PM ranch house were first published in our May 1951 issue and later in a book, *Popular Mechanics Build-It-Yourself Ranch-Type House*.

To the Editor:

Your April 1953 issue (page 96) pictured a folding fishing-and-hunting trailer that I built. Since then I have made improvements that I believe would interest your readers.

I now have the window frames on hinges and as I raise the roof they automatically fall into position. Now when we want to take our large 14-foot boat along I simply



roll our complete rig into the camp trailer, as pictured, and take off. This was done by making a drop gate in the back of the trailer, and building the back window so it could be unfastened and raised. Boat rig is securely fastened to trailer by quick-release turnbuckles. Now when we reach our campsite we leave our camp trailer and take off with the car and boat rig for surrounding water. After our fishing trip is over we lower the roof of our camp trailer and leave it at the coast for the summer, and bring the boat rig home with us until time for the next trip.

Cecil K. Beck,
1420 McCullough Ave.,
San Antonio 2, Tex.

Edison Did Have Some Talent

Even the Russians agree that Thomas A. Edison was a great inventor, but Dr. Yuri Tolstov of the Soviet Academy of Science says a Russian engineer, A. N. Lodygin, invented the incandescent lamp. Edison, according to Dr. Tolstov, did improve on Lodygin's work by devising a bulb that was cheap, durable and suited for mass production. He also credits Edison with inventing the kinoscopic camera, sound film and rotating cement kilns.

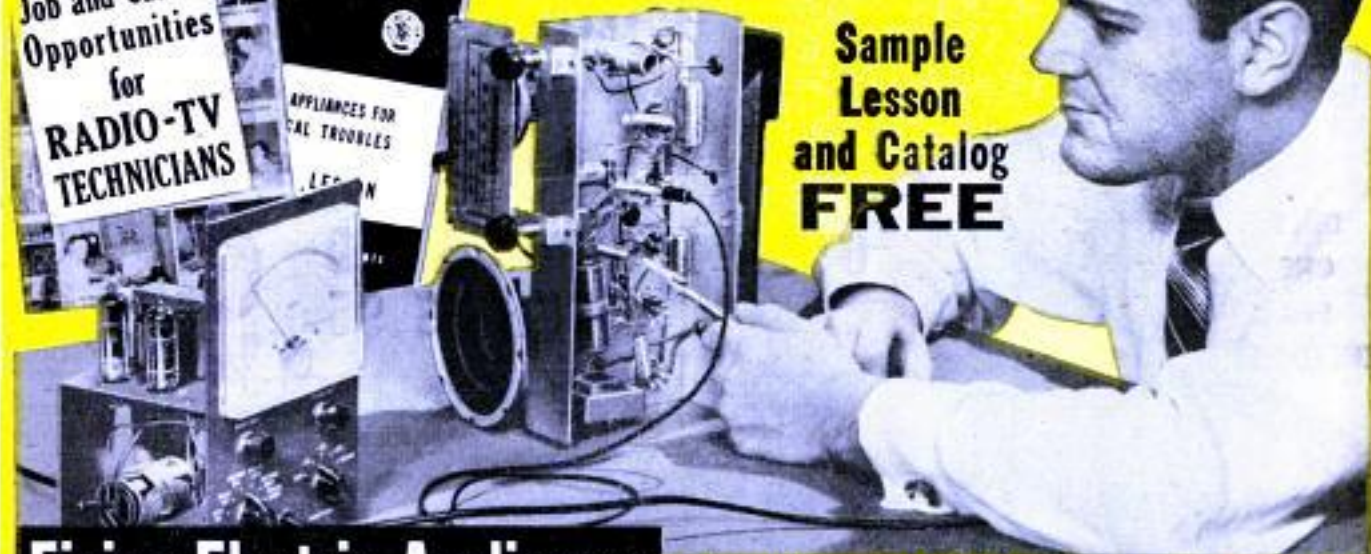
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Soon after starting many NRI men earn extra cash fixing toasters, clocks, fans, vacuum cleaners, etc., or radio and TV sets, for neighbors and friends. Keep your job while learning and earning. Work in your basement, garage, spare room.

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Training PLUS opportunity is the ideal combination for success. Plan now to get into Radio-TV. The technical man enjoys prestige. He does important work, gets good pay for it. NRI can supply training quickly, without expense of going away to school. You learn at home in spare time. NRI training is LEARN-BY-DOING. NRI sends you kits of parts for practical experience; they "bring to life" things you study.

Fast Growing Radio-TV Field Offers Good Pay—Success—Extra Income

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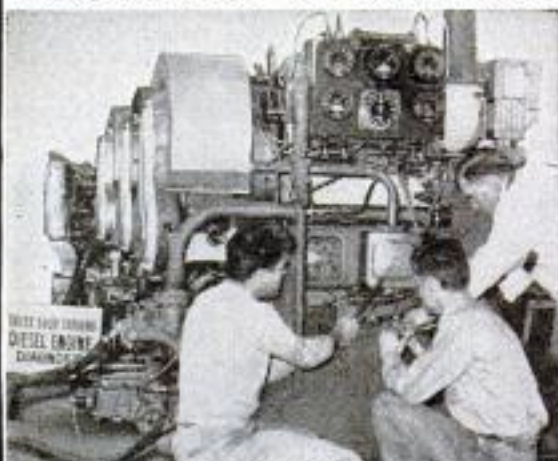
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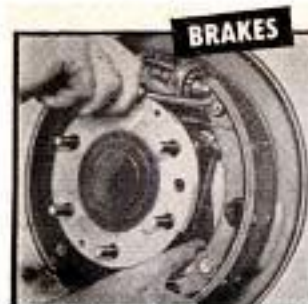
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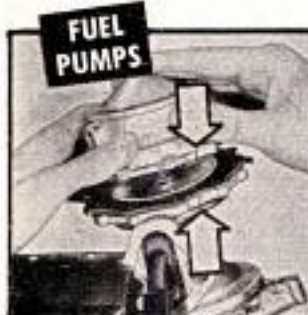


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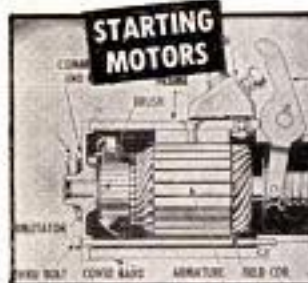


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What a fellow makes in his regular job today is hardly enough to make ends meet. Higher taxes, higher costs of food and rent and almost everything else raise hob with the savings account. And I say that what a fellow puts away is even more important than what he makes. It would worry me sick if I couldn't save a little against a rainy day.



And that makes it almost necessary to make some extra money. There are lots of ways to do it, too. The magazines and newspapers are full of ads for agents to sell things. But if I had to make a living by selling, from house-to-house, I'm afraid I'd starve to death. I like to make something with my hands and either sell it by mail or let the stores sell it for me. There are lots of people like me.

Another thing: Lots of men—and women, too—don't want to get mixed up with something that might hurt them on their jobs. They want a plan they can operate at home—in spare time—one that they can work at any time they please and one that doesn't need any rented store or hired help. And that's where my little money maker rings the bell.



Let's say you're like me. You want to make some extra money but you don't want to do any selling. All right—take a look at what you can do with this machine. I'll give you some facts that I discovered and your own common sense will tell you they're true.

If you're going to make something, it ought to be something that lots of people want—something that lots of people buy. It shouldn't be something that sells at just certain seasons—but all year round. And, it shouldn't be any flash in the pan. It's got to be steady—year after year—something that's not here today and gone tomorrow.

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or basements. Lots of orders come to you by mail when you send out circulars letting mothers know you can do the work. Lots of stores take orders, but they have to turn the work over to you. There are six or seven ways to get orders without making any house-to-house calls. The big job is keeping up with them.

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If you'll just put your name and address on the coupon and mail it to me, I'll send you all the information right away by mail. After you have read all this you will know what you want to do. It will be easy to decide whether you would like to have a "Little Money Maker" of your own. Everything I send you now is free. There is no catch to it and nobody will call to try to sell you anything. I'll send everything free and postage paid. All you have to do is mail the coupon, get the facts and then decide. Mail the coupon right away so I can help you get started making money!

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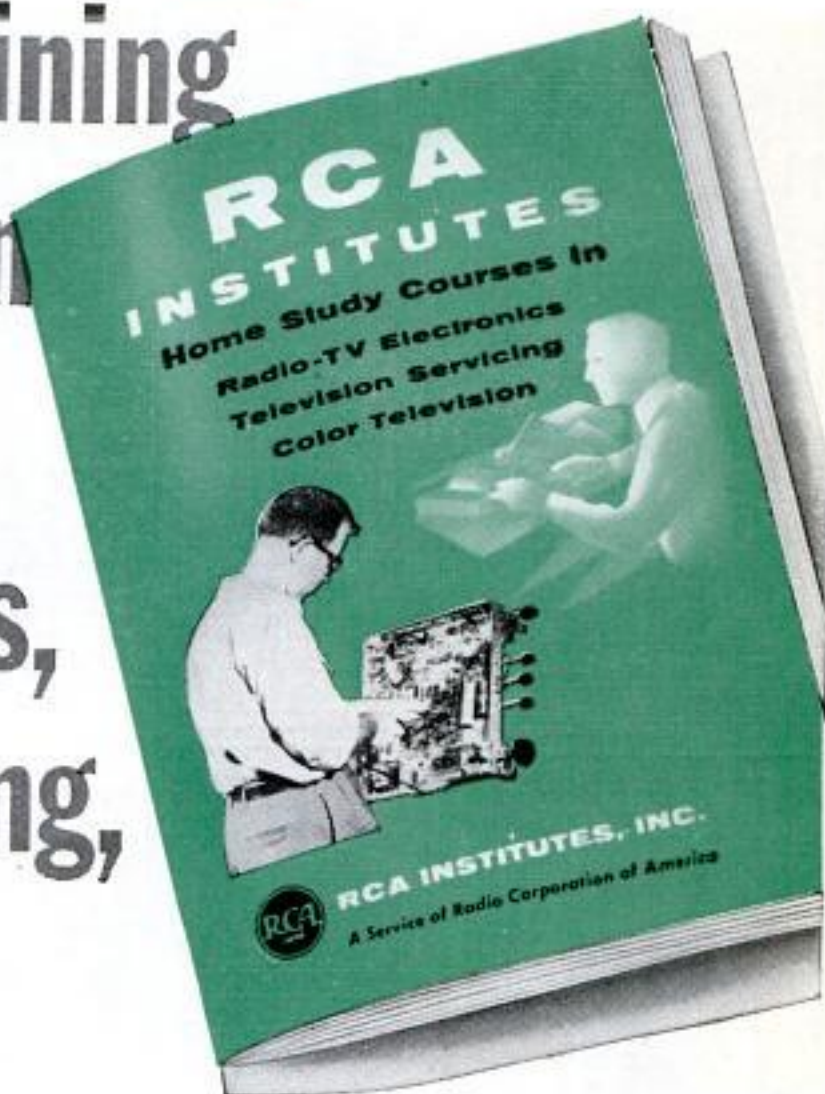
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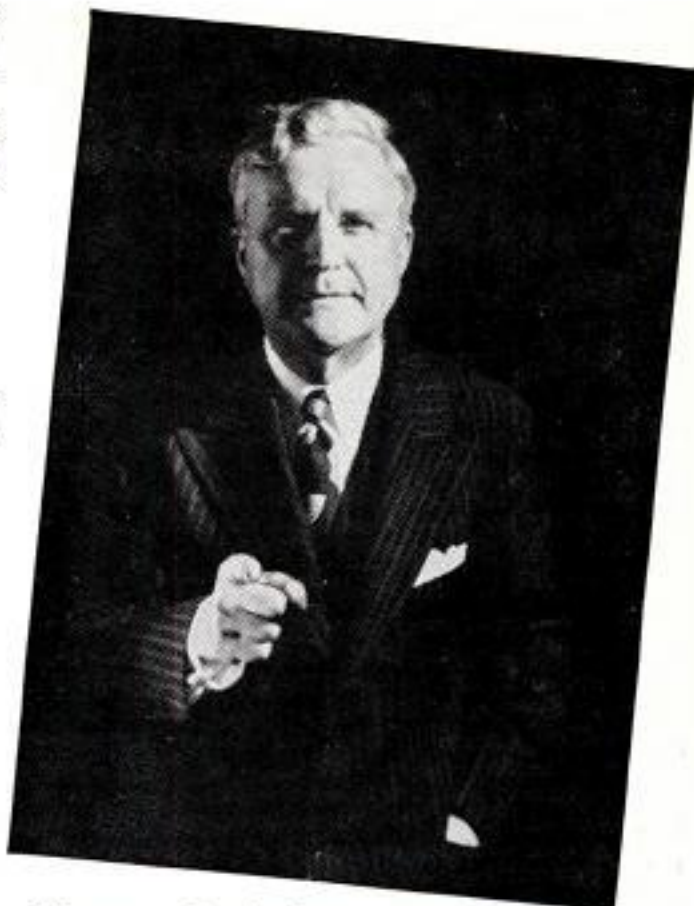
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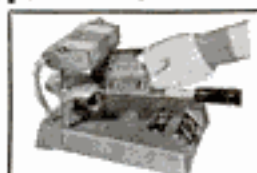
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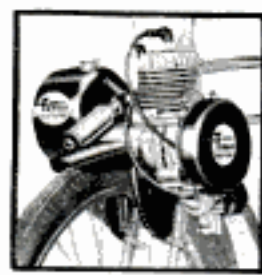
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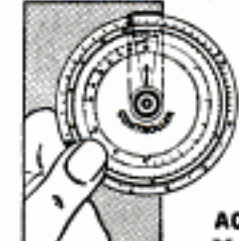
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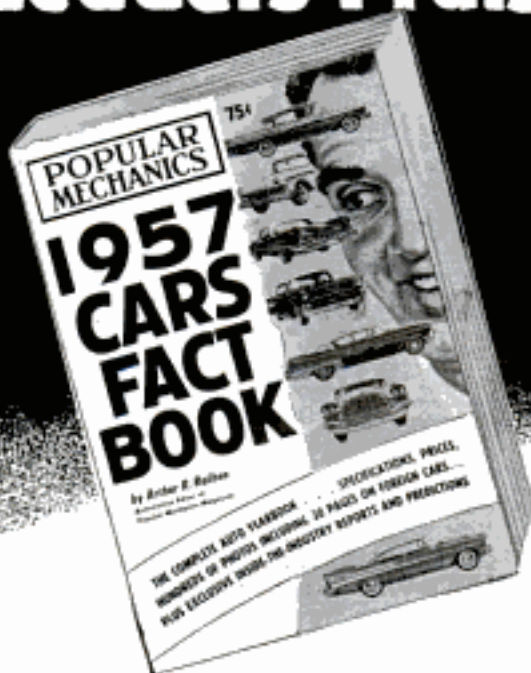
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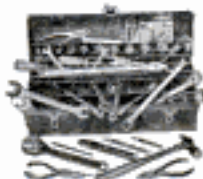
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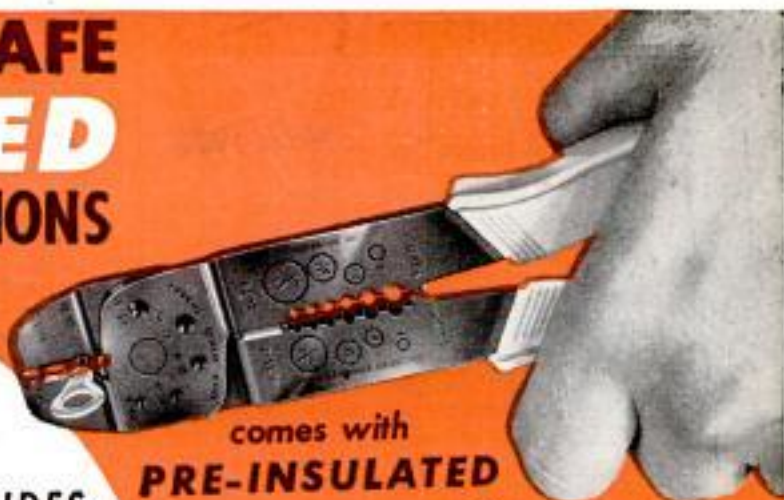
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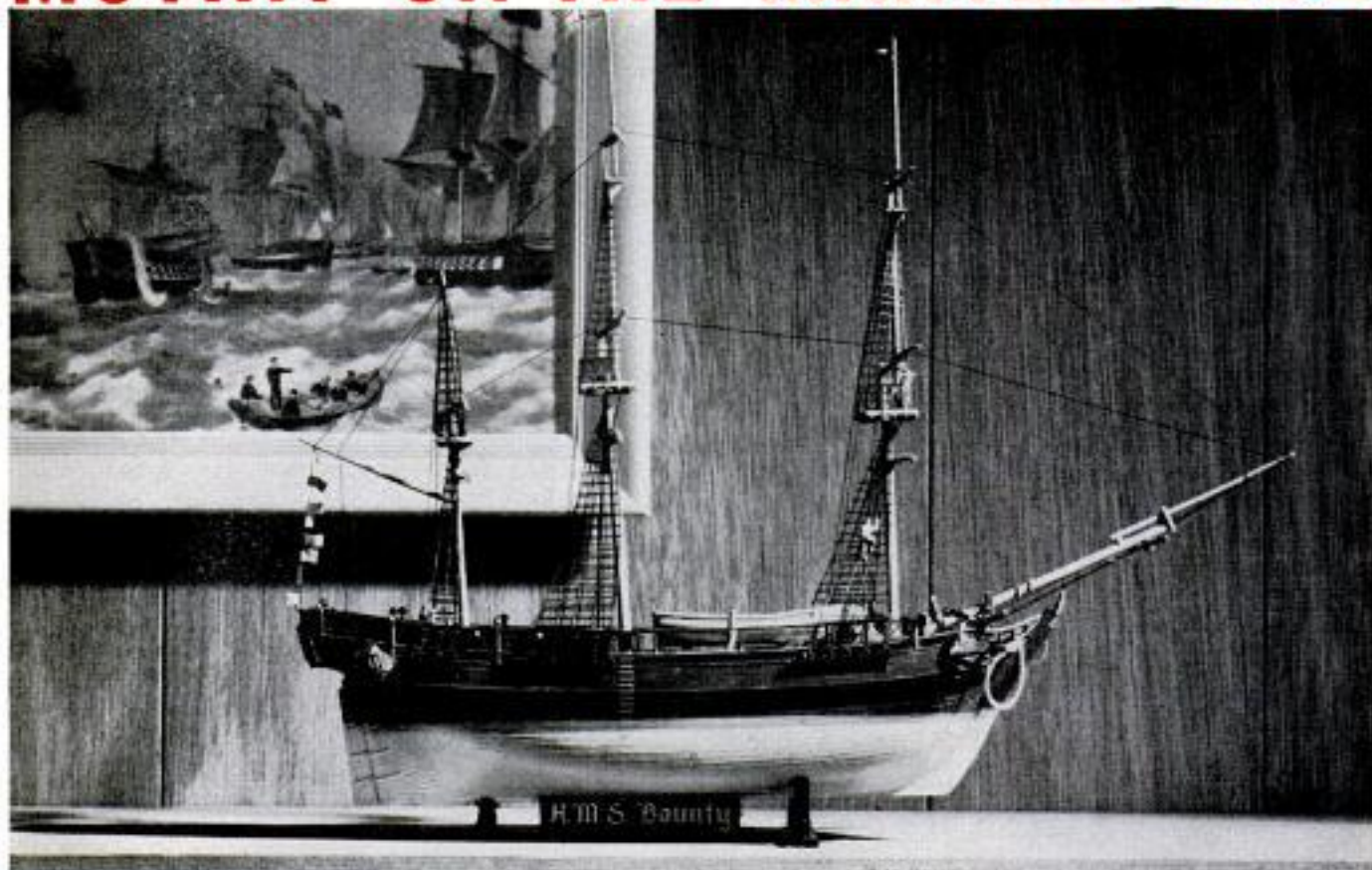
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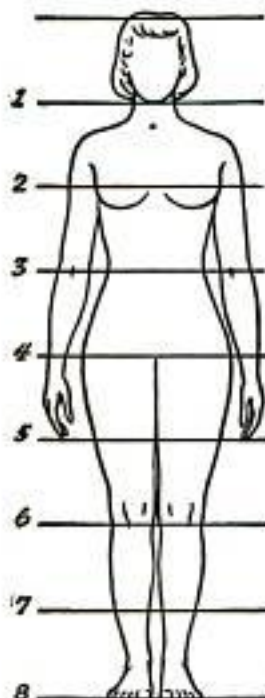
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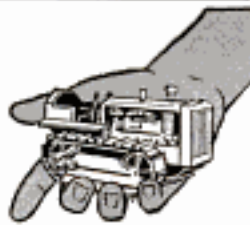
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NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein. In the event that commercial use is to be made of any of the developments reported herein, it is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as indicated, it is the intention of this magazine to report on the latest developments in the mechanical arts.

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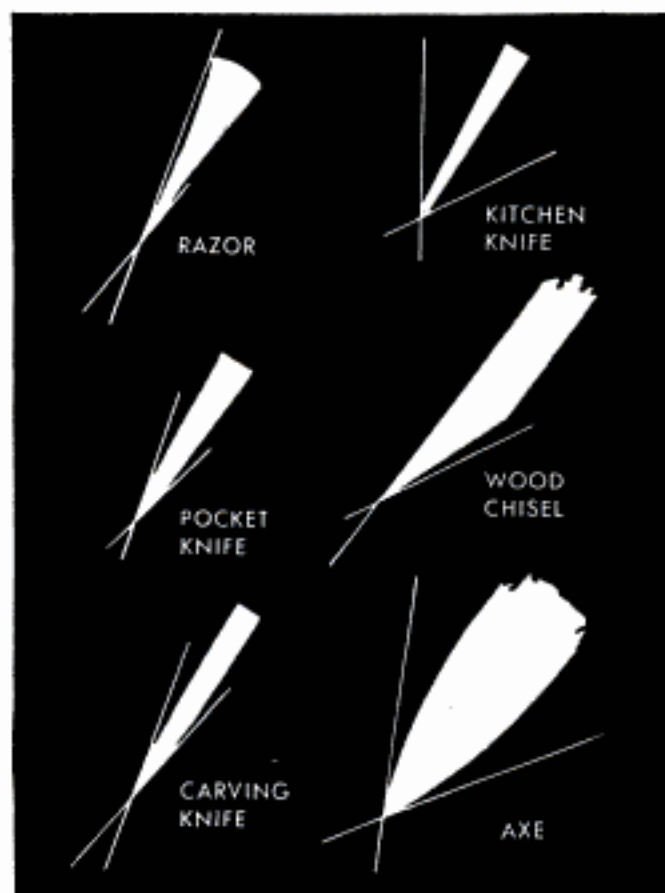
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Back-yard pool with a separate wading area changed the recreational habits of residents of a Texas village

YOU CAN BUILD YOUR OWN SWIMMING POOL

By Shirley P. English

IN APRIL, Mr. and Mrs. Gerald McAfee of Tucson, Ariz., came down with a "malady" that is hitting increasing thousands of American families each year—swimming-pool fever.

They had wanted a back-yard pool for several years but knew in a vague way that the type they wanted would pulverize their budget.

That year they decided at least to plan a pool. With the help of a friend studying engineering at the University of Arizona, they drew up sketches for what many pool builders consider the ideal size—36 feet long, 18½ feet wide and a depth ranging from 3 to 7½ feet.

Then they called in various professional pool builders to bid on the job. The estimates threw them into a mild state of shock.

Possibly they were still in this condition a week later for, although neither of them was experienced in any type of construc-

tion, they decided to build their own pool, using concrete blocks for the walls.

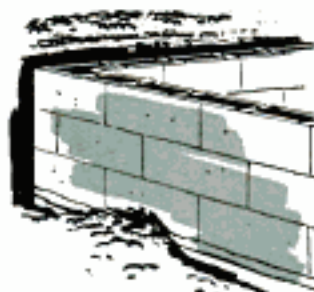
On May 1 they hired a man with a small bulldozer to rough out the hole for \$110, and started to work. Both had jobs and various social and civic obligations which took up most of their spare time. Their pool work was done on Sunday mornings. For five months during the winter, they didn't touch the project.

Even so, 13 months after the man with the bulldozer appeared they took that long-anticipated first swim.

"Believe me, it was worth every hard hour of sweat and labor we put into it," says McAfee. "That first plunge made it all worthwhile. After one season we knew we'd be lost without our pool."

To put it in operation they spent a total of \$1715.98 which included all materials, a \$375 filter, tools (including a secondhand concrete mixer), labor and even a paid-up three-year liability-insurance policy

TIPS FROM POOL BUILDERS



CONCRETE-BLOCK POOLS

Least expensive type, but likely to crack or leak within a few years unless extreme care is used in constructing walls. Pour floor first and have steel-rod

uprights firmly anchored in concrete. Uprights should have threaded tops so clamping plates can be bolted against the top blocks to give the wall greater strength. When wall is finished, fill the blocks completely with semiliquid concrete and let cure for several weeks.

POURED CONCRETE VS. GUNITE

Decide before you start excavation. Guniting takes rounded pool bottom, poured concrete takes vertical walls with bottom at right angle.

Compare local cost of concrete for five or six-inch bottom, eight to ten-inch walls and form lumber against cost of hiring man with Guniting equipment to come out and spray cement on walls and bottom. The Guniting process takes less cement because it is applied under pressure and gives greater strength per inch. If there is no great price advantage to poured concrete, choose Guniting; it will make an excellent pool and be done in one day. For either method, don't skimp on reinforcing steel rods.



EXCAVATION

Amateur builders say that unless you have an exceptionally strong back and a strong urge to work, hire a man with equipment to excavate.



CLEANING POOL

Bottom and walks will need vacuum cleaning twice a week. Buy an underwater vacuum cleaner for \$60 to \$80; a swimming pool service company will charge \$35 to \$50 a month.

LOCAL ADVICE

If you are going to spend several hundred dollars on a filter, you may as well buy it from a dealer or pool builder who will help you plan your pool and overcome construction problems.



FILTER

Costs money but definitely worth it. Owners of pools without filters say they wish they'd spent the extra money and installed one. Without filter, water will look dingy much of the time, you'll run up a heavy water bill refilling the pool every week or so, you'll have to scrub the pool between fillings and your pool will be out of use during draining, scrubbing and refilling. An automatic skimmer is helpful in taking care of leaves and debris, costs about \$20 extra.

PAINT

Not necessary if interior of pool is properly finished. Most paints will not hold up more than two or three seasons. Finish interior with cement plaster made with silicate sand. This off-white finish will give filtered water a sparkling blue appearance. A single row of blue tiles around top of walls will intensify the blue.

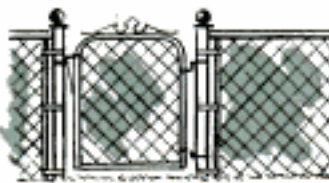


WALKWAY

Build it three or four feet wide clear around the pool; prevents bathers from tracking grass and dirt into water.

COST OF OPERATION

Figure \$5 a week for chemicals, filter sand and electricity during the swimming season.



FENCE

Considered absolutely essential; may keep a child from drowning in pool.

against pool accidents.

Contractor-built, they estimate the pool would have cost \$6000.

In a Hurry for a Swim

About a month after the McAfees started their pool in sun-drenched Arizona, Alvin Gottschalk of Wichita, Kans., also came down with pool fever. But he was in a hurry for a swim. He hired a man with a bulldozer to rough out the hole for a pool 50 by 20 by 8 feet and started on a poured-concrete pool.

Working evenings, week ends and holidays, he finished the pool in 10 weeks. Then, to keep from wasting his form lumber, he used it to build a 60 by 15-foot covered shed, left half of it open as a barbecue patio and enclosed the other half for dressing rooms. His total cost, including filter, underwater lights, diving board, ladder and building came to \$3900. He estimates the layout would have cost \$10,500 if built by a contractor.

The Gottschalk pool, completed in '54, was one of an estimated 15,000 private pools built that year; the McAfee pool was one of about 25,000 completed in 1955. Fifty to sixty thousand private pools were built last year.

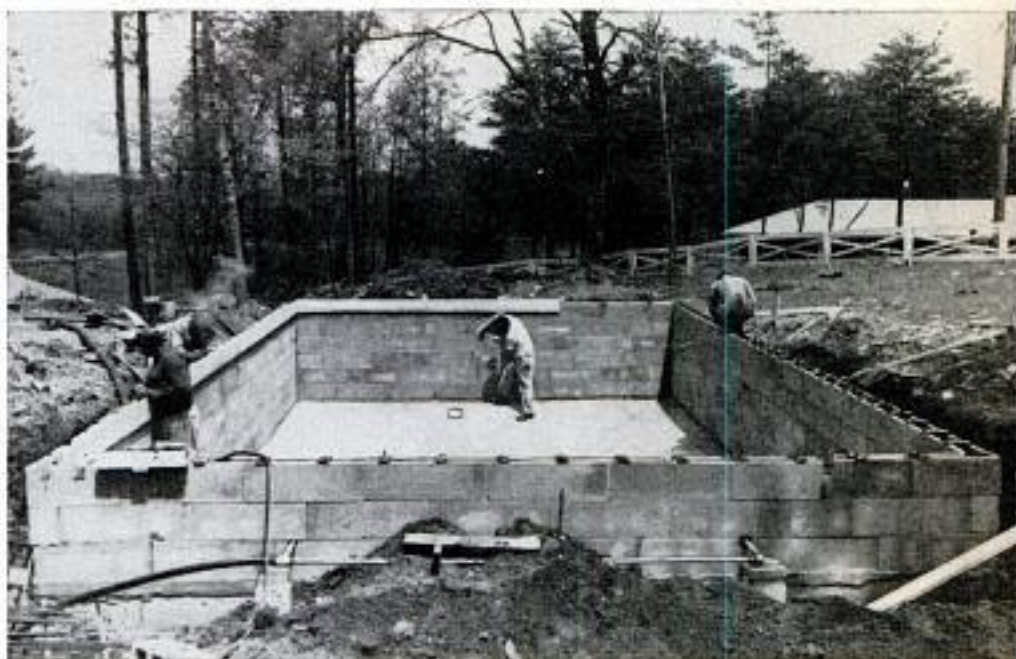
The owner-built Gottschalk and McAfee pools are examples of an important trend in the rapidly expanding pool business—do-it-yourself.

Only a few years ago the words "private swimming pool" conjured up a vision of the estate of a millionaire or movie star. Today, in any fair-sized city, private pools are found not only in expensive residential sections but also in the back yards of \$8000 to \$12,000 homes.

The swimming-pool boom has many causes:



Here are steps in construction of B. F. Aldredge pool. It is a concrete-block, do-it-yourself package. Above, floor is poured concrete, reinforced



Wall blocks interlock and require no mortar. Instead, concrete is poured down hollow centers of the blocks. Uprights are threaded so clamping plates can be bolted over blocks. Below, real enjoyment on a hot afternoon





One day Frank Bernard decided to build a back-yard pool. This enticing photo was taken just 10 months later

Prosperity, more leisure time and the fact that many families in various income brackets are tired of reading about that wonderful world of the future when the average family will enjoy 3D color television, a private swimming pool and a helicopter—all for a 30-hour work week.

They've decided that until 3D TV and inexpensive helicopters come along, they will at least enjoy a private pool.

Feeling of Accomplishment

And many men who could easily afford a professionally built pool have decided to invest their own labor in the project.

They like the feeling of accomplishment.

In commenting on the pool situation in San Diego, Calif., D. P. Asquith of the Rain Beau Water Equipment Company, points out:

"We are finding that more and more the trend is toward owner-built pools or do-it-yourself installations. I do not believe by any means that this is always a result of the over-all cost of a contracted pool, but is a personal desire on the part of the owner to create a luxury item for his family's own use."

No one knows what percentage of the total number of private pools are at least

About \$1700 and 13 months of work went into McAfees' pool. Contractor would have charged about \$6000





Molded glass-fiber pool arrives on the site in four sections. This is the easiest type of do-it-yourself pool

partially built by the owners. Estimates vary widely in different parts of the country. Probably, for the nation as a whole, about a third of the private pools are built at least in part by the homeowner.

His effort may be only supervision of hired labor or it may include personally heaving out every shovel of earth, pouring concrete, handling plumbing and electrical installations and plastering and tile-setting.

Few Kind Words by Professionals

For the owner-built pools, most professional builders have few kind words. One says, "Ninety-nine out of a hundred will do a miserable job; it's like giving a layman

a pile of parts, and expecting him to come up with an automobile of factory quality."

But most owner-builders, even when they realize they've made mistakes and would do things differently next time, remain sold on their pools.

In South Orange, N. J., John Barkhorn hired a contractor, not a professional pool builder, and put in a nonfiltered, poured concrete 40 by 20 by 7-foot pool in a day and half for \$485. He estimates the job would have cost \$2000 if done by a professional pool builder.

But if he had it to do over, he says he would make his walls thicker to avoid

(Continued to page 238)

Sections of the glass-fiber pool are joined with screws and self-curing resins. Pool rests in a bed of sand





Swedish Jet Fighter Intercepts Supersonic Enemy Bombers

To intercept enemy bombers flying at supersonic speeds, Sweden has developed a one-man, all-weather jet aircraft called the Dragon. With a double-delta form, the fighter can travel more than 1000 miles per hour. Equipped with navigation and armament radar, the plane can carry cannons, rockets and air-to-air guided missiles.

Wingspan is 35 feet. Length is 50 feet. Gross weight, loaded for action, is under 20,000 pounds. Combined elevator and ailerons are fitted to trailing edges of wings, leaving the aircraft without a conventional tail plane. Landing gear includes tricycle and braking parachute. The plane has a large space for equipment and fuel.

"Ski Skoot" Goes 50 M.P.H.

Thrill-seekers may now zoom down nautical pleasure paths at 50 miles per hour on motor scooters mounted on skis. These craft sit on two separate in-line skis between which is mounted a 25-horsepower outboard motor.

Right, outboard motor sits →
between two in-line skis



Dog's Life? It's Great!

Man's best friend can now enjoy the best seat in the car. A cover that buttons over the rear seat of a convertible provides protection from wind and sun, if the dog wants to sleep. And, should he want to sit up and take notice, there's an opening on one side through which he can look at the world passing by. The cover provides peace of mind for the owner, too, as it keeps the dog from jumping out of the car.

←Pampered pet pokes head
through "window" in cover



Electric wrist watch receives its power from energizer that is no bigger than the button on a shirt



Manually wound watch is at left. Electric watch is at right, with energizer in circle at top center

No Need to Wind This Watch

ELECTRIC WRIST WATCHES that need no winding or periodic agitation are a recent result of the first basic change in watchmaking in 500 years, Hamilton Watch Co. officials have announced. Chemical energy, stored in a tiny "battery" energizer the size of a shirt button, provides electrical power to run this watch, which is no larger than a conventional timepiece.

Secret of this development is a precise miniature power plant built around a balance wheel, according to Dr. John Van Horn, director of research and development at Hamilton. Chemical energy from the energizer is converted to electrical power, which releases a flood of electrons through a miniature coil on the balance wheel. This microcurrent, interacting with magnetic fields set up by a pair of midget platinum-alloy magnets, spins the balance wheel first toward one magnet, then back toward the other. The oscillating wheel turns gears that turn the watch hands.

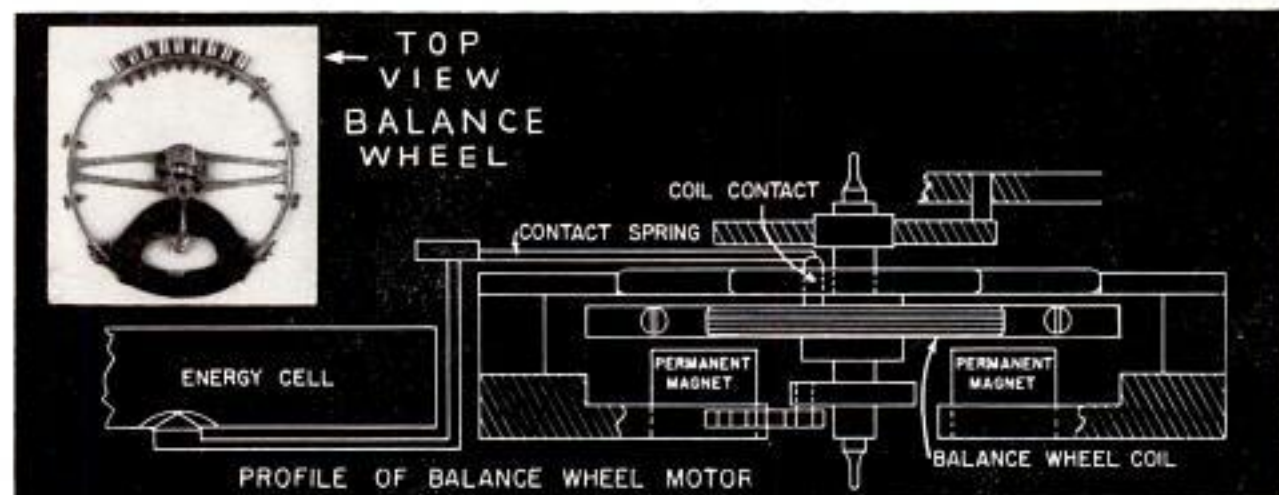
"Combining the power with a balance wheel permits the flow of energy to be

controlled and the speed of the hands to be held to an accuracy of better than 99.995 percent," Doctor Van Horn said.

Windings on the balance-wheel coil are made with wire .0006 inch in diameter. Each wire is one fifth the thickness of a human hair, and three or four strands can be easily threaded through a hole drilled in a human hair. Enough wire for 1000 watches weighs only two ounces but would stretch across the English Channel from Dover to France. Screws holding some parts of the watch together are so small that it takes 80,000 such screws to make one ounce. The platinum magnets in the watch contain less metal than in a paper clip yet, ounce for ounce, these magnets are the most powerful known.

Power stored in the energizer would not run a 100-watt light bulb for more than three seconds, but in one year that power will open and close electrical circuits in the new wrist watch 75,000,000 times and will operate the balance wheel 150,000,000 times.

This balance wheel will operate 150,000,000 times in one year with power from the tiny "battery" energizer



OWNERS REPORT:



How Good Is the 1957 Ford?

We asked owners in these 38 states that question

HERE IS WHAT WE LEARNED:

- What the 1957 Ford owner likes most about his new car is its styling. Handling ease, comfortable ride and flashy performance are next on his best-liked list.
- But he complains about the workmanship in the body. And he doesn't like the rattles and other body noises, nor does he like the poor gasoline economy.
- He does not have seat belts in his Ford (only 6.2% do), but he does have a padded dash (60.5%).
- He does not want any more top speed, nor any faster pickup. It goes fast enough now, he says.
- He traded in a Ford to buy this new Ford (24.2% traded some other make) and he probably will buy a Ford next time (only 12.1% say they definitely will not).

That's a Brief Summary—Read the Whole Story, the Good and the Bad, as Told by the Ford Owners Themselves →

Handling and roadability are among the best-liked features of the 1957 Ford and this photograph shows why



Ford Is Long, Low And Owners Love It

By Owners of 1957 Fords

FORD FOR 1957 is longer, lower and more powerful than ever before and the owners love its length, lowness and power!

That's what our nationwide survey of Ford owners disclosed. We asked the owners to tell us frankly what they thought about their cars and this article is their reply.

(For road test and performance data on the 1957 Ford, see the January 1957 issue of *Popular Mechanics*, page 109.)

You read lots of articles about cars getting too long and too low and too powerful. Certainly they are getting longer and lower and faster, but the people who buy them overwhelmingly approve of these changes.

Only 2.3 percent of the Ford owners object to the length of the new models. Only 11.8 percent object to the lowness and only 9.1 percent object to the power and speed (although another 14.4 percent did not answer).

Best-Liked Features

First on the list of best-liked features is styling with 42.1 percent mentioning it.

"It has wonderful lines. Inside the car is beautiful, also."—Illinois trucker.

"Everyone turns to look at the '57 Ford. I am proud to own one."—Florida clerk.

Next comes handling ease with 34.6 percent of the owners putting it on the best-liked list.

"Excellent over-all handling on all roads. I have driven 2000 miles in past three weeks over mountain roads and was able to maintain average speed of nearly 50 miles per hour."—Colorado contractor.

"So easy to handle in traffic."—Texas truck driver.

The following describe other best-liked features in order of frequency of mention:

"It rides very nice."—Michigan papermaker.

"Good soft stable ride at all speeds."—Idaho cheesemaker.

"Fast acceleration for passing."—New Jersey welder.

"Has so much energy and it's always ready to go with lots of reserve power."—Illinois farmer.

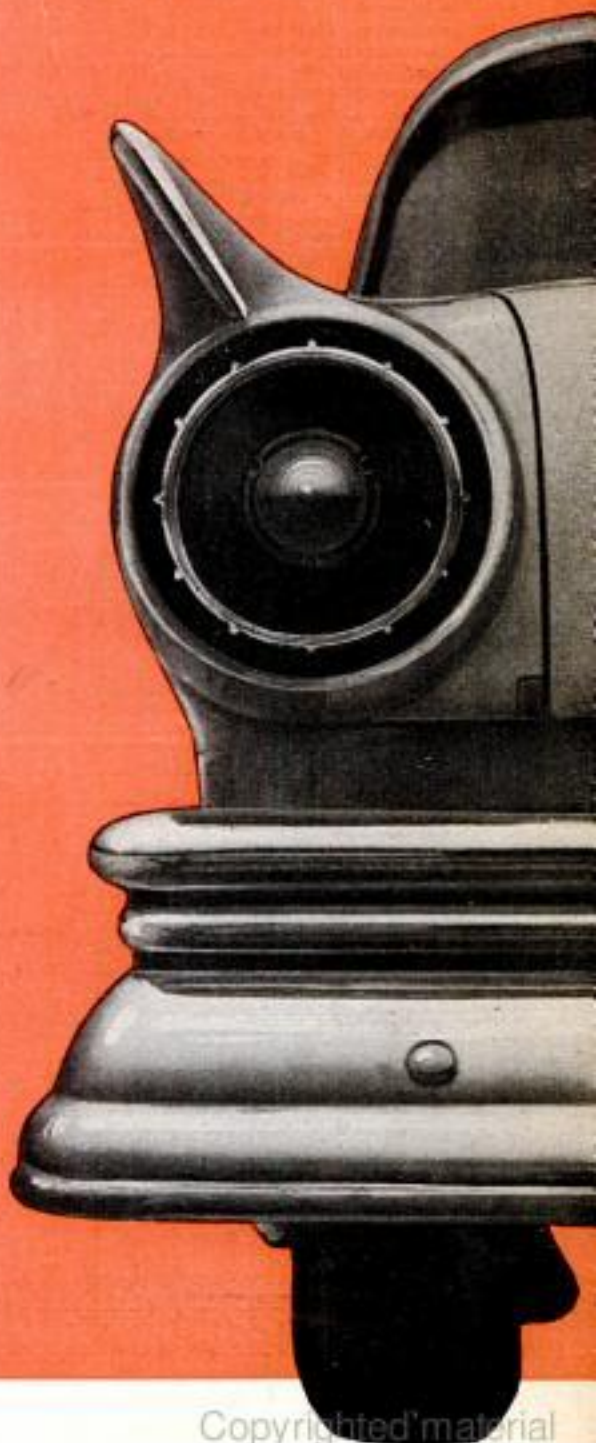
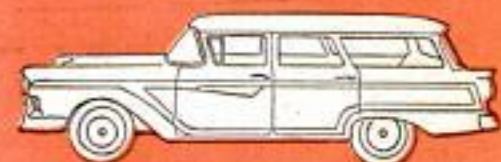
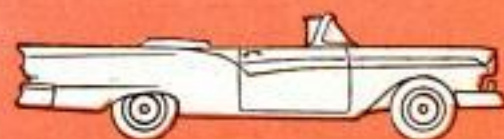
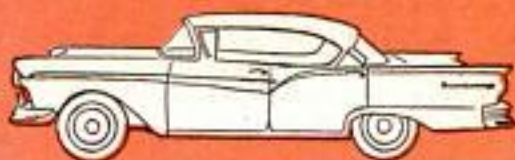
"Ford is no longer a Ford. It's a big car with a big-car look."—Kansas construction worker.

"Looks like a big car instead of one of the low-price three."—Wisconsin teacher.

Most-Frequent Complaints

But owners have complaints too. Some are very articulate about the faults of the new Ford. However, 39.1 percent of the owners make no complaints at all—they're completely satisfied.

Among those who complained, the most frequently mentioned fault is poor workmanship in assembly (22.6 percent).



THE OWNERS' OPINION OF THE '57 FORD

Had trouble with engine?

No trouble	79.8%
Some trouble	16.3%
Considerable trouble	3.9%

What was engine trouble?

Valves, tappets	10.9%
Carburetor, choke	7.0%
Oil leaks	2.3%

Performance

Would like faster acceleration?

Yes, would	25.0%
No, would not	65.9%
Undecided, no answer	9.1%

Would like more top speed?

Yes, would	6.1%
No, would not	65.9%
Undecided, no answer	28.0%

What is car's horsepower?

Knew correct horsepower	68.9%
Did not know	31.1%

Styling

Did styling influence choice?

Yes, did influence	68.2%
No, did not influence	27.1%
Undecided, no answer	4.7%

Best-liked exterior feature?

Lowness of body	30.2%
Tailfin design	10.9%
Rear-opening hood	9.3%
Side-trim design	8.5%

Least-liked exterior feature?

Front grille	13.2%
Headlight styling	7.0%

Best-liked interior feature?

Dashboard design	28.7%
Seat styling	14.0%
Color treatment	13.2%

Least-liked interior feature?

Ash-tray design	20.2%
-----------------	-------

OVER-ALL RATING OF THE FORD

Excellent	Average	Poor
73.6%	17.6%	8.8%

Floor humps, wells	19.4%
Seat covering	3.9%

Safety

Have safety belts in car?

Yes, have belts	6.2%
No, do not	93.8%

Have padded dash, visors?

Yes, have padding	60.5%
No, do not	39.5%

Miscellaneous

Will buy a Ford next time?

Yes, will	59.1%
No, will not	12.1%
Undecided, no answer	28.8%

How is dealer service?

Excellent	50.0%
Average	28.0%
Poor	22.0%

Would buy from him again?

Yes, would	53.8%
No, would not	21.2%
Undecided, no answer	25.0%

What make of car was traded?

Ford	61.4%
Mercury	1.5%
Other makes	22.7%
No trade, no answer	14.4%

Why did they pick Ford?

Exterior styling	35.3%
------------------	-------

Previous ownership

.....	24.8%
Handling, performance	5.3%
Price	3.0%

What should be changed?

Nothing at all	41.4%
Ash-tray design	9.8%
Front grille	6.1%
Floor hump, wells	5.3%
Improve bodywork	5.3%
More gas mileage	3.8%
More room inside	3.0%

Best-Liked Features

Exterior styling	42.1%
Handling	34.6%
Riding comfort	24.1%
Performance	23.3%
Bigness of exterior	12.8%
Road holding	9.8%
Roominess, big trunk	8.3%

Most-Frequent Complaints

No complaints at all	39.1%
Poor workmanship	22.6%
Rattles, body noises	14.3%
Noisy engine	7.5%
Poor gas mileage	7.5%
Inconvenient ash tray	6.8%
Dust and water leaks	6.0%
Too big, too low	5.3%

Ford is longer than ever

Like this length	97.7%
Don't like it	2.3%

Ford is lower than ever

Like this lowness	88.2%
Don't like it	11.8%

Ford is faster than ever

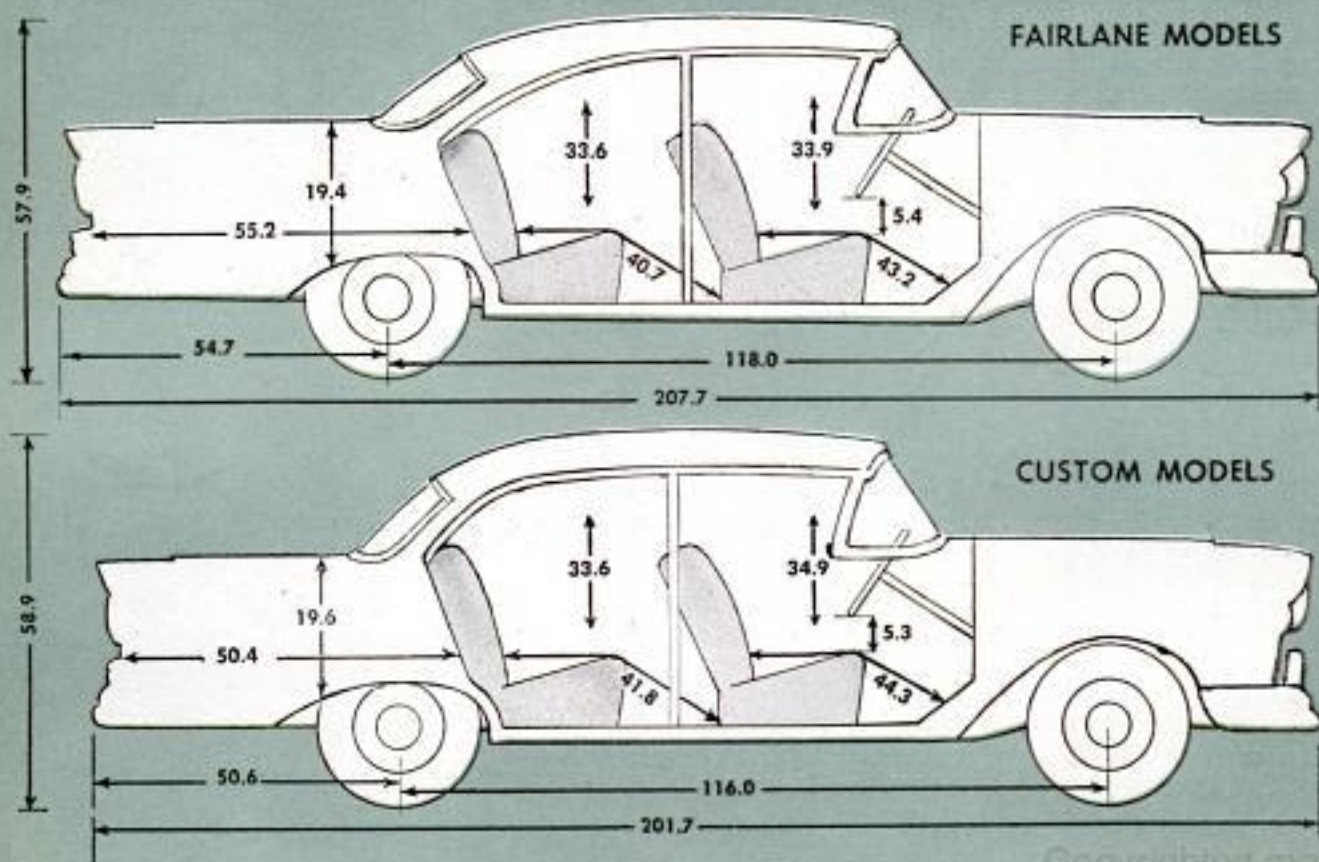
Like this speed	76.5%
Don't like it	9.1%
Don't know, no answer	14.4%

"Body poorly assembled. Window over tailgate (on wagon) will not stay latched."
—Georgia banker.

"Workmanship is very poor on some de-

tails. Trim has a fast rusting rate. Rear window of wagon is set in such a way that road spray is deposited on it by the airflow."
—Illinois electrical engineer.

As these drawings show, the small Custom is roomier than the big Fairlane. All dimensions are in inches



"There should be a law against putting together a car like this and selling it for \$3000."—New Jersey engineer.

Second most-frequently mentioned complaint is body noises and rattles (14.3 percent mention these).

"I was rather disappointed to find, after paying \$3200 for the car, it developed rattles and wind noises which my garage says can't be helped."—Iowa insurance man.

Next on the complaint list are engine noise and poor gasoline mileage with 7.5 percent mentioning each of them.

"After about 25 miles the engine sounded like a truck. They said it was a soft tappet."—California surgeon.

"The 1957 Ford gives fewer miles per gallon than any Ford I have owned (and I've had about 15). Next year I will buy another Ford and hope the miles per gallon is back to normal."—Maryland real-estate broker.

Small things can be very annoying and apparently the Ford ash tray in the dashboard is such an item. Its poor design and location are mentioned by 6.8 percent of the owners.

"It has an ash tray on the dash that you have to reach inside to put the ashes in."—Connecticut apprentice.

"Ash tray not a bit convenient, especially at night."—Illinois businessman.

"Ash tray rattles constantly."—Missouri salesman.

Last year, Ford put a lot of attention on safety in its sales promotion. This year,

(Continued to page 262)

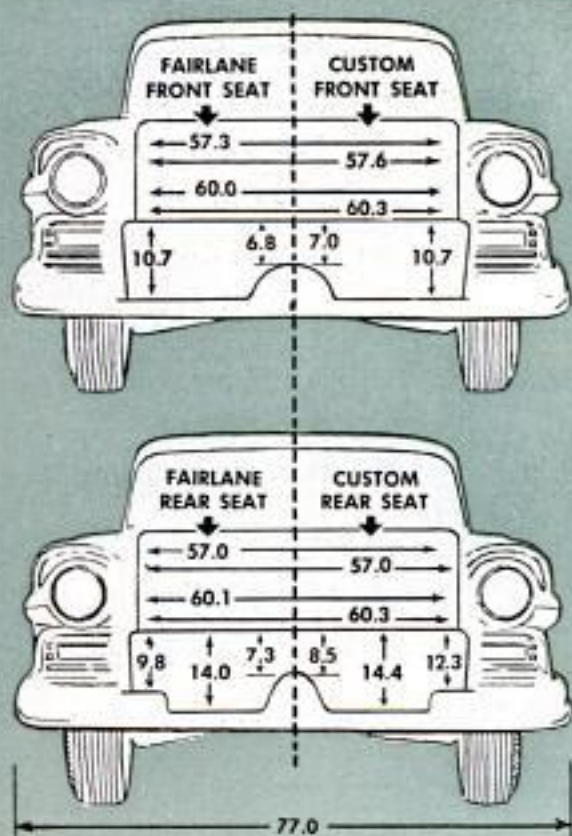


Owners praise front-hinged hood for safety and engine accessibility; others say it's hard to close



High on list of most-wanted changes is the ash tray. It requires smoker to poke cigarette into small hole

Three can't sit comfortably in the front seat. Center passenger has to have knees doubled up in this manner



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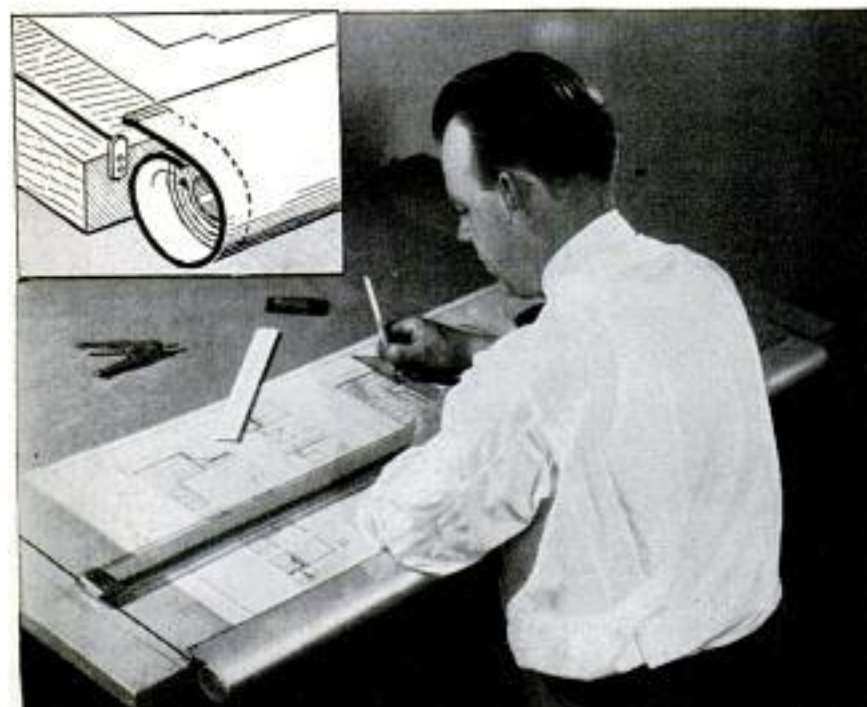


Plane's Intercom Is Transistorized

Appropriately named "Plane Talk," a low-priced transistorized intercom for use between the instructor and his student in a light plane has become available. The unit, housed in a plastic tube 6½ inches long and one inch in diameter, is powered by a self-contained miniature battery that provides 100 hours of use between changes. The entire set consists of a microphone, the tiny amplifier and sensitive, rubber-cushioned earphones.

Puckered Tent

Looking like a partially erect umbrella, an unusual grooved tent is large enough to sleep eight persons yet weighs only 80 pounds. The tent is made of canvas triangles, and the valleys or corrugations allow for rapid water runoff in heavy rains. With a pulley arrangement, one person can raise or lower the tent. A metal dome over the opening at the top of the tent prevents water from entering and also acts as an outlet for the hot air.



Roll-Out Unit For Drawing Board

Draftsmen work more comfortably with less fatigue on large drawings by using a spiral-roll/attachment. The attachment fastens to the edge of the drawing board and permits the draftsman to pull the drawing in and out of the sheet-metal enclosure. In this way, the work is directly in front of the draftsman and eliminates stretching and eyestrain. The device also prevents smudges and keeps the drawing from tearing. The roll-out unit is available in four different lengths.

Water Scooters Thrill Bathers

Swimmers at a beach in England have found excitement in riding water scooters that skim along at 15 miles per hour. The little scooters are powered by gasoline engines. Should the rider topple off, the scooter automatically turns in a tight circle so it can be recaptured by the bather.

Doused swimmer tries to→
corral water scooter which
automatically circles her



Mineral "Divining Rod" Prospects From Plane

That time-honored picture of the bearded prospector with his pickax and mule is vanishing, its place taken by the aerial laboratory hunting ore deposits from the sky. British-built for the Spanish government, the flying lab is a plane equipped with electronic equipment to enable it to spot likely deposits of minerals in hundreds of square miles of countryside daily. This equipment will reveal the presence of iron, nickel, titanium, oil, copper, zinc, lead and uranium in a single flight.



Paddle Wheeler

Paddle wheelers, once a glamorous segment of American river folklore, now fight for survival in British shipyards. The Royal Navy finds these tugs suitable for moving aircraft carriers and warships in confined waters of dockyard basins. Seven new diesel-electric models have been ordered by the British Admiralty to replace seven of ten paddle-tugs currently in service.

☐ Plywood paneling with porcelain-coated steel facing is being produced for use on store fronts, gas stations, kitchen and bathroom walls.



Detroit Listening Post



By Art Railton

WHAT SELLS CARS? Styling? Of course. But the industry apparently has not counted out horsepower despite expensive style changes. How else can you explain the rash of superpowered options now available?

When the 1957 Fords were announced last fall a special high-performance V8 engine was listed as optional. It put out 245 horsepower with a four-barrel carburetor (standard Ford V8s had 212 and 190 horsepower).

Next Ford announced an optional 285-horsepower V8 with two four-barrel carburetors. But that wasn't enough.

Now it offers a 300-horsepower supercharged V8 as optional. It discontinued the 285-horsepower option. Suggested list price on the new engine is \$447.40 plus taxes, making it about \$500.

Plymouth offers a high-performance V8 with 290 horsepower as optional. Its price tag is \$245 plus taxes (this includes, by the way, considerable chassis modification).

Chevrolet is yet to be heard from, but it started the whole spiral with a fuel-injection 283-horsepower V8 which has a price tag of \$480.

Yes, horsepower does seem important—especially around the time of NASCAR's annual Daytona Speed Week. A hot hassle resulted during the writing of rules!

NASCAR puts supercharged cars in the next higher displacement class for flying-mile and acceleration runs. Fuel-injection Chevrolets have Class V almost to themselves. Fury-engined Plymouths compete in Class VI. Supercharged Fords are in Class VII along with Chrysler 300C and other giants. In the 160-mile race, though, all run against each other. Mighty confusing to a prospective car buyer!

Chevrolet is having trouble delivering fuel-injection engines. Ford won't deliver supercharged engines until summer at least. Plymouth says you can get the 290-horsepower engine any time you want.

Situations like this make so-called stock-car racing "so-called."

People and Gloveboxes

Despite the power propaganda, folks who buy cars still go into the showroom to investigate such old-fashioned features as glove compartments. And they're shocked to learn that as the cars get bigger, glove compartments get smaller.

There is a mystery about seating room, too. The six-passenger car is gone—killed by a combination of low seats and high tunnels. You just can't sit comfortably for very long in the middle of either front or back seat. Yet cars are wider than ever.

About the only thing that gets bigger and more useful is the trunk and it can now be called voluminous.

If you want evidence that this is not just an academic discussion read what the buying public has to say about these 1957 models on page 266 of this issue. These letter writers are fighting mad!

Will It Be "GoPower?"

Look for some new word to replace the word "horsepower" in Edsel advertising. The new Edsel (Ford's entry in the medium-price class) will brag about power at normal road speeds, but its advertising men are looking for a new word. Horsepower is frightening; torque is confusing.

According to a top Edsel executive, the car's styling is distinctive. The aim, he says, was to style it so it could be recognized from the top of a 10-story building. That wouldn't be hard to do—but would it sell? The real trick is to make it distinctive from a rooftop yet attractive on the street.

Incidentally, if you think you have problems—the Edsel top brass has just okayed final styling changes for its 1959 models! And the 1958 Edsel hasn't been built yet. That's the big gamble in this business—without knowing how the public will take the 1958 styling, they have to risk millions on the 1959 changes. It's great for ulcers.

Mercury is looking at Buick and rolling up its sleeves. The reports are that Mercury will introduce another series in 1958 to give it four separate price levels to compete with Buick's highly successful four.

Continental is the big question mark at the moment. Will it or won't it? At present, it is doing poorly. Sales are down. There are plenty of guesses as to why. Nobody really knows, of course. Some industry experts say it was doomed because it didn't offer anything that was new, anything that looked ahead. It was built on the idea that it could succeed by lush conservatism.

The industry doesn't work that way. If the Mark II is to survive, the concept of unchanging classic styling will have to go, the experts say, and be replaced by an up-to-date body with advanced engineering.



Blind "See" Through Their Ears With Electronic Eye

Not much larger than a fountain pen, a new instrument permits the blind to "see" through their ears. The instrument differentiates between light and dark objects focused through its lens on a photoelectric cell. Depending upon the amount of light it "sees," it emits a variable sound signal through an earpiece similar to the receiver of a hearing aid. Dark areas produce a low signal; bright objects a high one. Using four different lenses, a blind person can

locate doorways, windows and lamps. He can determine the time by scanning the face of a watch or clock to locate the hands. He can locate the letterhead on stationery, find the level of milk in a baby's bottle and read many types of gauges or dials. The first 50 of the "eyes" are under test. The instrument is an adaptation of an invention by the late Dr. Clifford M. Witcher, a blind research physicist at Massachusetts Institute of Technology.

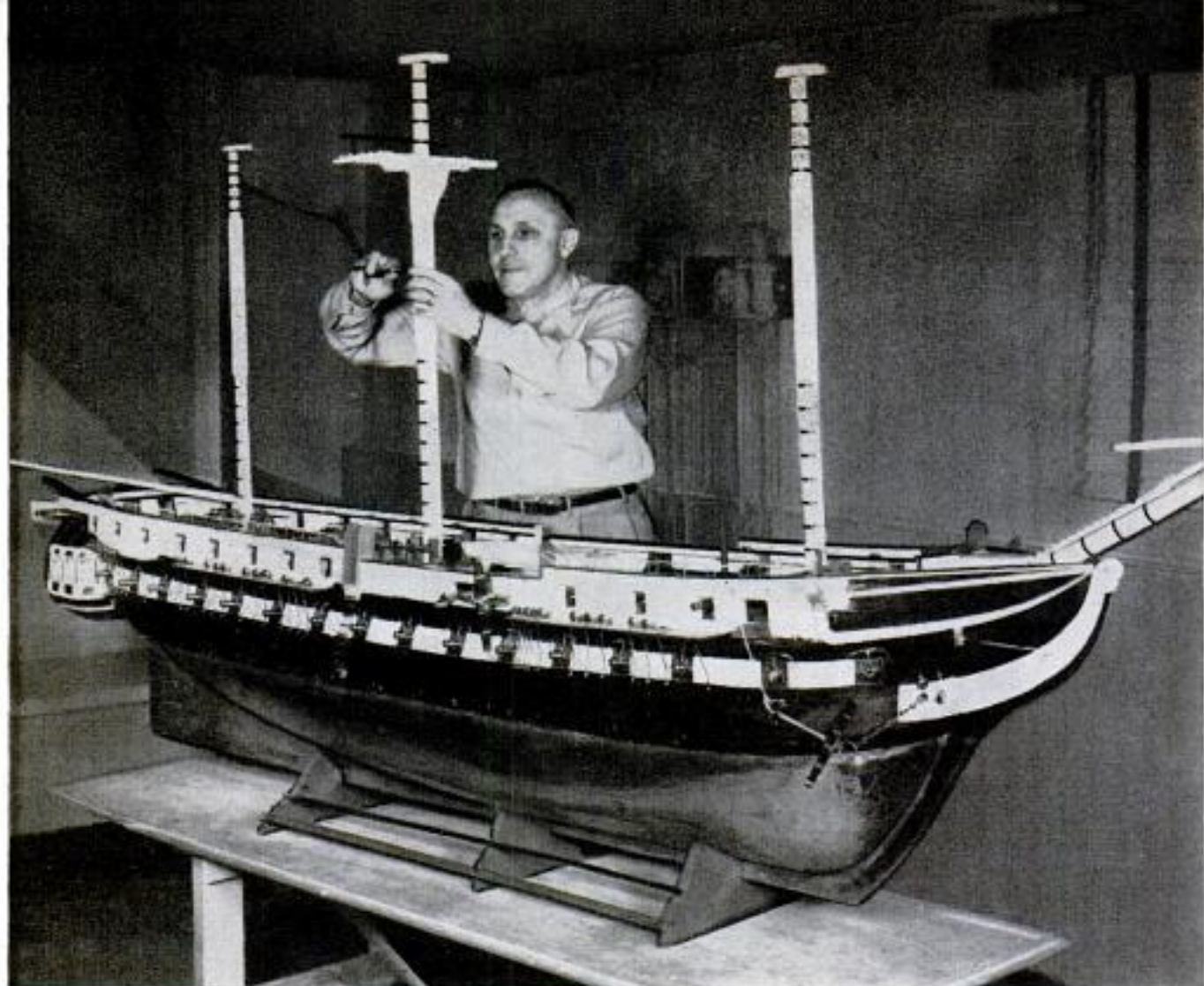
"H" Mark at Heliport Means "Hospital Near"

Marked heliports near hospitals and in small towns will increase efficiency of rescue operations, pilots say. Such a landing spot is the inlaid white stone triangle with 32-foot sides and an "H" in the middle near the Public Health Hospital on Staten Island, N. Y. Helicopters will operate from such designated spots in carrying rescue teams, equipment, supplies and patients in time of emergency.

Glass Fertilizes Soil For Long Periods

Ground-glass fertilizer furnishes potassium to plants at a low rate for prolonged periods. Known as potassium frit, this finely ground substance does not wash away rapidly under heavy rainfall. Thus, potassium frit is effective in areas growing ornamental, cut flowers and vegetable crops which are stimulated by readily draining, well-irrigated soil mixes.





Tops of the model's masts are missing because the basement workshop has a low ceiling. Rigging comes later

TWENTY-FIVE YEARS AGO in Berwyn, Ill., they laid the keel *again* for "Old Ironsides," more properly known as the United States Ship *Constitution*. This year, more than 20,000 man-hours later, this shipbuilding task is coming to an end. Soon to be ready for display is probably the most faithful and accurate model of the frigate *Constitution* ever built.

Back in 1932 the late Dr. William Lange of Berwyn saw an announcement of a forthcoming model-shipbuilding contest in connection with the Chicago world's fair of 1933. He teamed up with Louis Kuebler, a friend, to produce an authentic model of the *Constitution* for that competition. For reasons now forgotten, the contest was called off, but the two amateur shipwrights continued with their project.

Christened in 1933, the completed hull was launched in a local lagoon. A miniature custom-blown bottle of champagne was broken across the bow of the vessel by daughters of the two men, thus making the event official. Then the hull was carried back to the workshop and the real job of building began.

Concern for accuracy and realism explains the length of time it has taken to reproduce the famous old ship. Kuebler

has kept on with the construction since the death of Doctor Lange in 1949. John Palko, another friend, has joined him and has become an expert on Old Ironsides, too. Mr. and Mrs. Kuebler visited the reconstructed hull of the *Constitution* in Boston Navy Yard in 1951; at that time he was asked if the ship—restored by contributions from school children in the 1920s—was fitted out correctly. He replied that, with one or two exceptions, it was the same Old Ironsides.

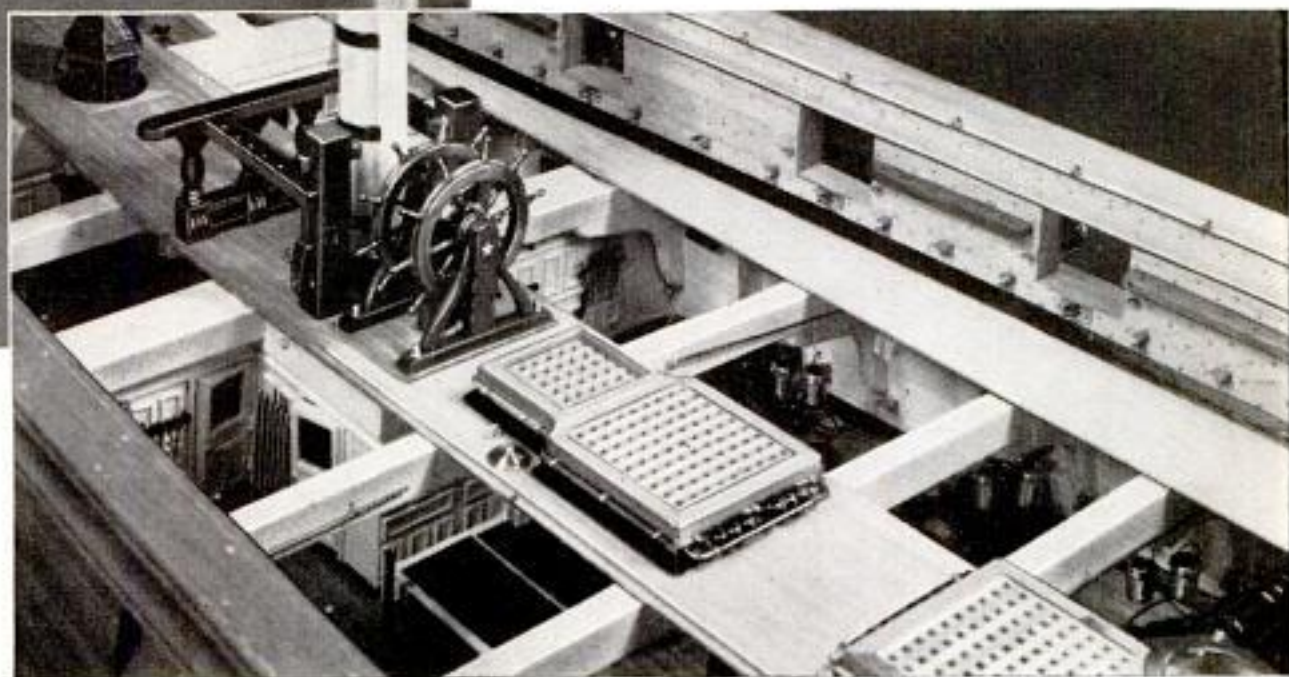
Size of the model was determined by how large the smallest fittings could be made for true reproduction. This attention to detail has resulted in a hull 8½ feet long with a 6-foot bowsprit and 11½ feet between the keel and the top of the highest mast. Every tiny piece of the model has been painstakingly handmade. Galley, crew's quarters and the commodore's cabin near the stern are all reproductions of the original, including made-to-scale tables, chairs, and a "hot shot" stove (a bucket suspended from the ceiling by a chain and holding a hot cannon ball). Even the commodore's copper bathtub is present.

All 52 cannons in the ship's batteries are built to correct scale, accurate to $\frac{7}{1000}$ inch. Each can be fired. Muskets, bayonets, powder horns and officers' swords hanging

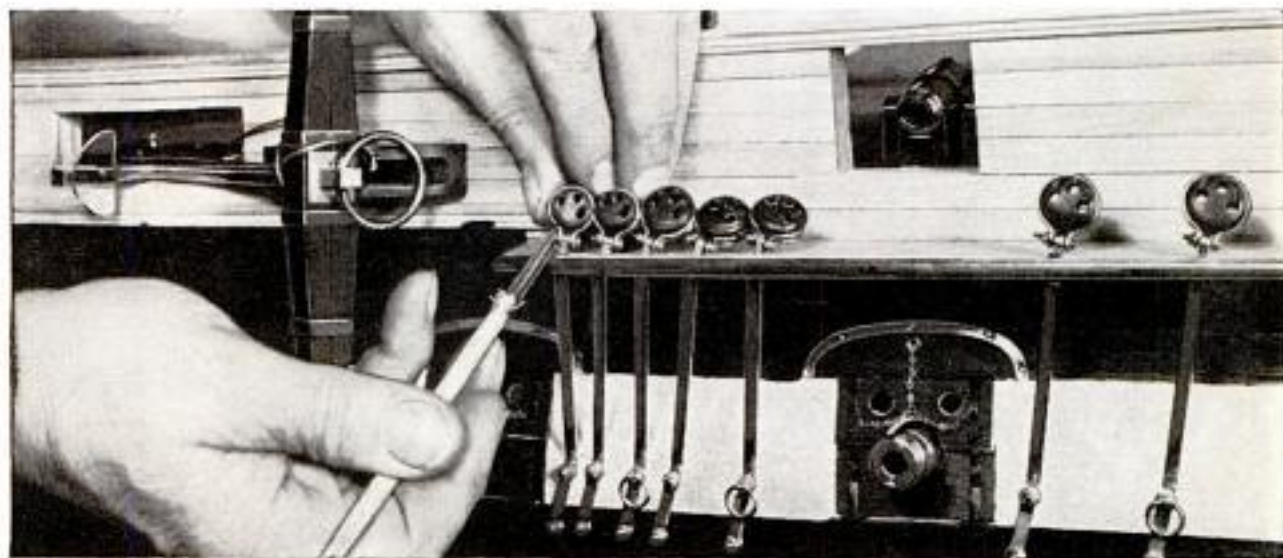
"Old Ironsides"

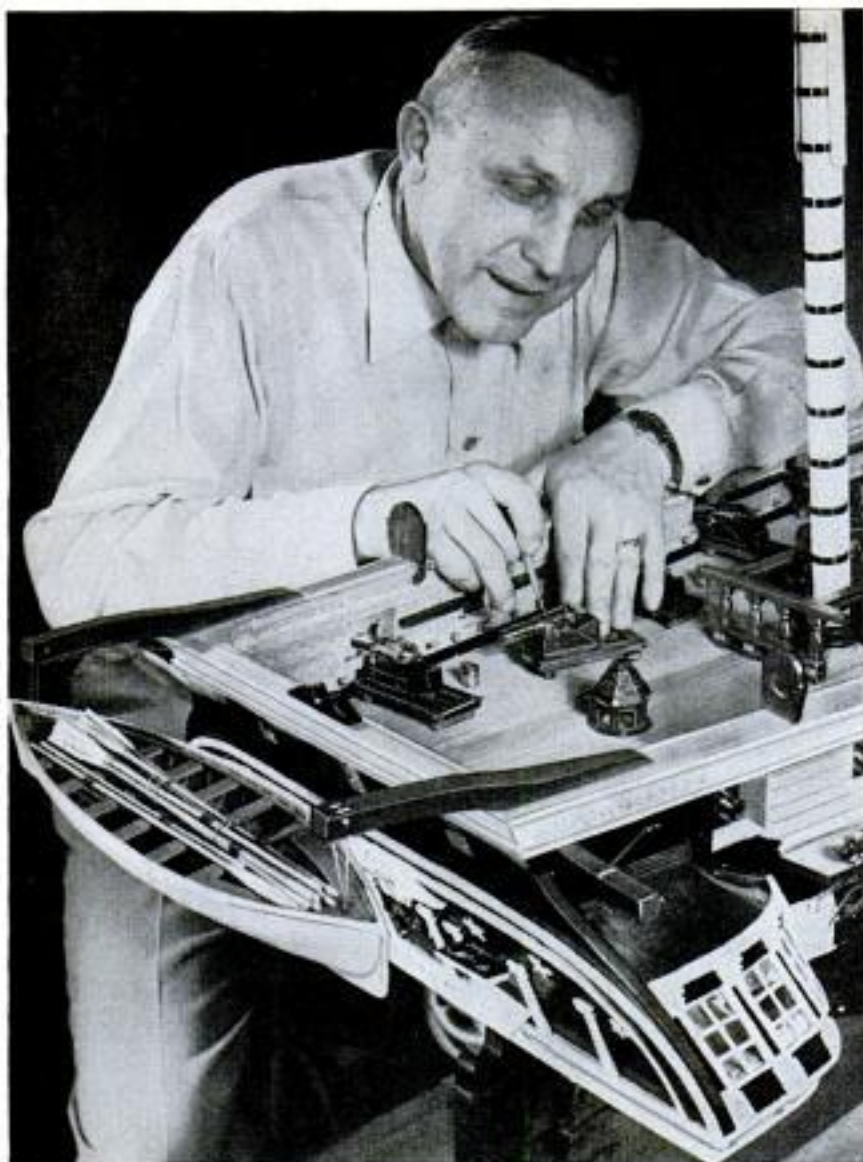
LIVES AGAIN

A quarter century in building, this is probably the most faithful copy of the famous ship ever constructed. Its tiny cannon will really fire!



Above, decking has been removed to show the ship's interior. The steering helm is an exact-scale miniature of the original Constitution. Below, wooden blocks for fastening working lines are installed by Kuebler





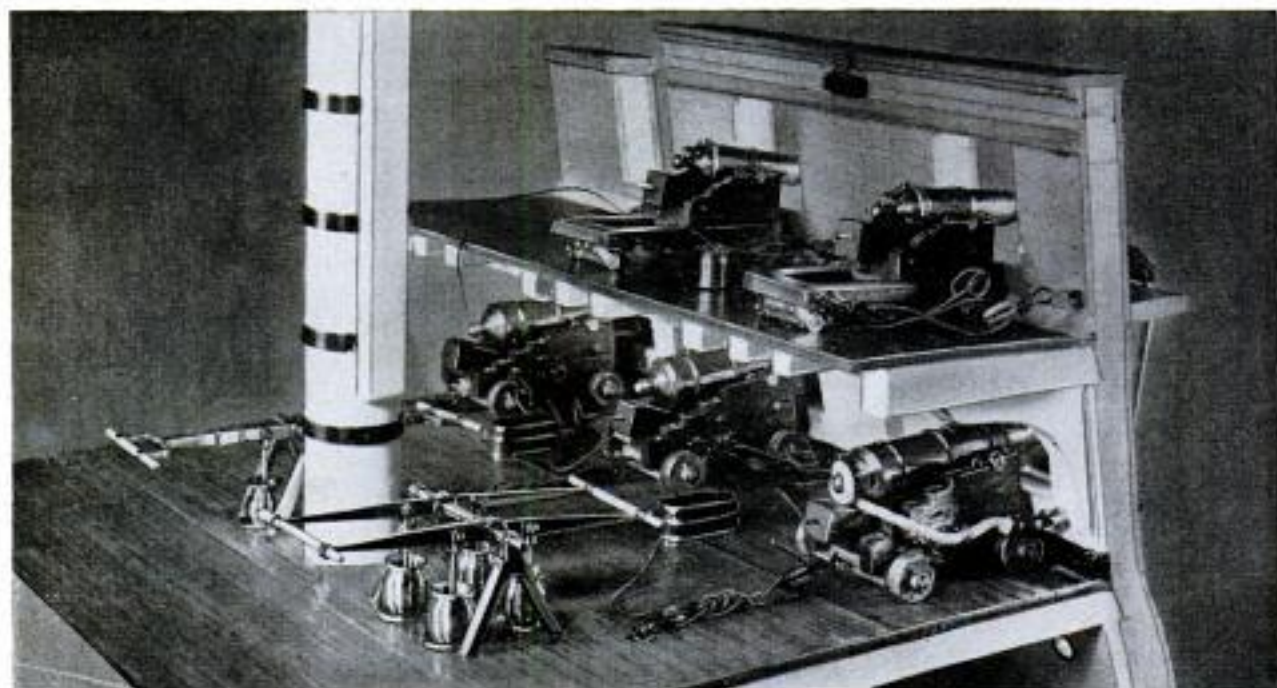
Kuebler installs a small cannon next to the ship's boat hanging over the stern. The mast is bound with metal strips just as on the actual frigate

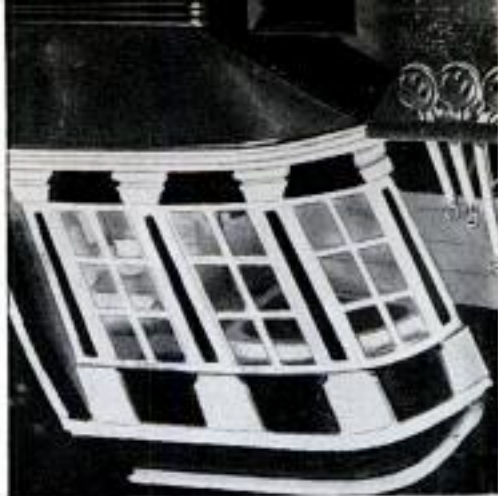
outside the wardroom are working models and exact copies of the originals.

Two bilge pumps have been duplicated from the big ship, one two-cylinder and one four-cylinder pump. Each of these can take water from flooded holds. About 1500 pulley blocks are mounted on the ship. Anchor chains have been fashioned link by link. Three anchors required 90 hours each of workmanship, and their castings were handled by a Detroit foundry.

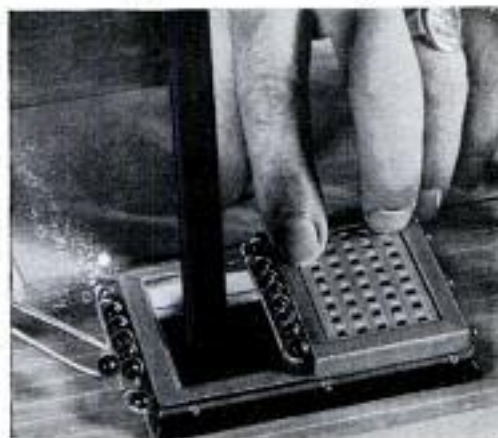
Thirteen different woods are used in this construction. The bottom of the original *Constitution* was covered with copper furnished by Paul Revere's firm, when the ship returned to Massachusetts in 1803 for repairs after battle with Barbary pirates. One hundred and thirty years later, Kuebler used copper sheeting made by the same company for the bottom of his model. Fully rigged and outfitted with sails on completion this year, Kuebler expects to take Old Ironsides on tour throughout the United States. ★ ★ ★

Planning of the model's construction involved making this cutaway section with bilge pumps and cannon

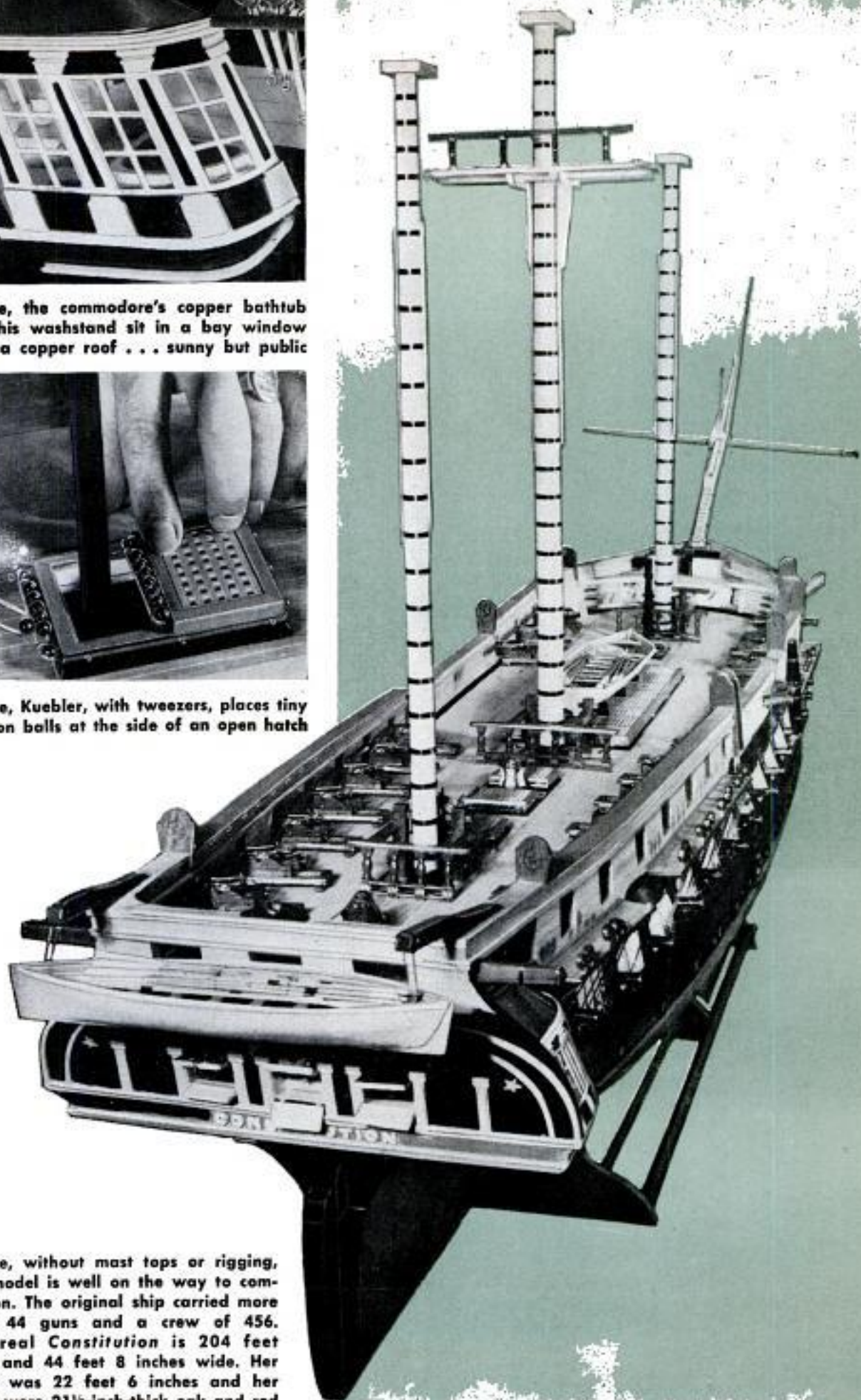




Above, the commodore's copper bathtub and his washstand sit in a bay window with a copper roof . . . sunny but public



Above, Kuebler, with tweezers, places tiny cannon balls at the side of an open hatch



Above, without mast tops or rigging, the model is well on the way to completion. The original ship carried more than 44 guns and a crew of 456. The real *Constitution* is 204 feet long and 44 feet 8 inches wide. Her draft was 22 feet 6 inches and her sides were 21½-inch-thick oak and red cedar. Her guns could shoot cannon balls 1200 yards into the enemy



Hughes' two-man copter is 8½ feet high, 19 feet 5 inches long, and can climb at rate of 1400 feet per minute

New Whirlybirds

*a \$15,000 bargain from Hughes
and a one-man kit from Hiller
for the Marines*

By Ewart Thomas

Rotor blades extend 25 feet in diameter. Engine and V-belt drive are under the seat in the "two man"



IT WILL BE a long time before most people can afford a helicopter. A two-place whirlybird just introduced by Hughes is listed at half the average price, but you still need to write a check for \$15,000 to buy one.

No price tag has been put on a one-man helicopter being developed for the flying Marines by Hiller Helicopters, Palo Alto, Calif. This collapsible job weighs less than 250 pounds and folds up into a neat package for air drops. These aircraft aren't for sale to the public and probably would cost as much as an expensive automobile if they were. Stan Hiller explains that helicopters are still too complicated to sell for a cheap price. A big breakthrough in design is needed to simplify the structure before prices come down. This new Marine one-man copter can be assembled in 10 minutes, after which the pilot fires up its four-cylinder air-cooled engine with a pull-cord, sits on the bicycle-type seat attached to one of the landing struts and operates conventional helicopter controls for flying.

Priced at \$15,000 is the new two-place copter made by Hughes Tool Company, Culver City, Calif. The vehicle weighs 850 pounds empty and has a lifting capacity of 900 pounds. The "two man" can carry a pilot, passenger and 350 pounds of cargo 170 miles at 75 miles per hour. Power comes from a four-cylinder, air-cooled, 170-horsepower engine mounted under the seat to drive the main rotor by a simple arrangement of V-belts. ★ ★ ★



Hiller's one-man helicopter is designed to be collapsed into compact unit for easy transportation or air drop

Pilot reaches just above head to pull small lever which brakes rotor for quick slowdown of machine

Simple snap-out pins are used to connect components in typical joint in the base of the one-man copter



"BEACHCOMBERS"



Trimming Christmas trees by the half-dozen is easier than preparing single trees for shipment to the market

This man is not hanging yuletide ornaments. He is extracting cones from the noble fir tree. Cones in this particular species grow only in the treetops

By Robert H. Forbes

WITHOUT TOUCHING the timber crop, many Pacific Northwesterners are building a bonanza out of tree seeds, wild berries, Christmas greenery and medicinal forest by-products. Sharing this spare-time woods-combing are housewives, school children, oldsters, farmers, ranchers and even passers-by.

For example, Roy Chapman, a rancher from Eureka, Mont., netted \$1000 for one month's labor in rounding up 4000 small Christmas trees, which he sold at a buyer's station in the forest.

Take Montana as a case history. Annual yuletide tree harvests mean clothes and groceries to many western Montanans. The Treasure State reportedly leads the country in furnishing Douglas fir trees to points as distant as Cuba. In fact, Doug firs are to the western U.S. as balsam fir is to the eastern part of our country at Christmastime.

The Forest Service in 1952 estimated the returns of Washington and Oregon brush-pickers at \$6,000,000 or \$7,000,000 per year. Around Puget Sound and on the Oregon coast these gatherers go into the forests for Christmas greens and floral decorations, coming up with salal and evergreen-huckleberry shrub sprays, cedar foliage and swordfern fronds by the bale. Such



of the WOODS

workers receive up to \$35 for a day's harvest. And the mild Pacific Coast climate permits similar forest sideline work almost all year, with only a six-week vacation for pickers when their source of income is in bloom. Landowners' permission for gathering is inexpensive, and National Forests require but a small-fee permit, which local rangers issue.

Supplementing this picture are tree-farm owners and food-crop farmers. Tree farmers want to get maximum production from their land and yet have to wait long periods for their slow-growing tree crops to mature; these businessmen welcome an opportunity for added income from forest by-products. The food-crop farmer, also seeking means to make the woodlot pay, turns happily to profitable sidelines.

Ethel Mae McConnell, lady tree farmer of Goldendale, Wash., started in the forest-incidentals business selling decorative pine cones, "winter bouquet" materials, "pine drops" and other "wildcraft" articles to a New York City firm. "Then I got so many customers of my own that now I sell only to individuals," she says. "In 1954 I added to my woodland wares a line of grasses for lamp shades and am finding it well received."

Winter bouquets have been sought by American clubwomen, who stage contests for unique color effects and unsuspected ingredients of their art. Pine drops are the above-ground portions of plants growing on rotting matter on the ground of Western forests. Their urn-shaped pods appeal to those with an eye for beauty.

Everyone Picks Berries

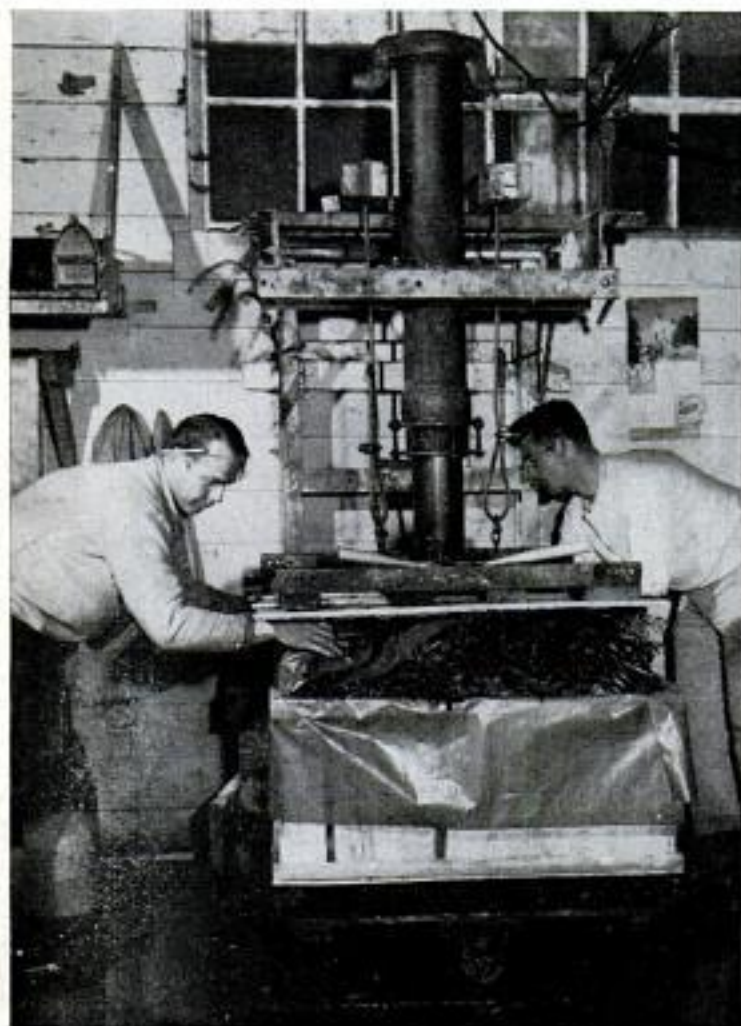
When wild berries are ripe, many rural Northwesterners, their children and vacationers take to the forests to lay in supplies for preserves. A few enterprising berrypickers have gone into the business of buying huckleberries, blackberries and other natural sweets from neighbors. These buyers then sell the berries wholesale for resale in cities. M. E. Mercer of Vaughn, Wash., saw these possibilities and now handles 350 tons a year of tiny huckleberries in his Puget Sound country.

This semimechanical cone-stripping device, used here by Merle Mosar, has lightened the job of helping squirrels collect seeds from hemlock trees





Above, Ethel Mae McConnell makes up a winter-bouquet door charm from forest by-products. Below, workers use a 1000-pound hydraulic press to put a bale of evergreen huckleberry in a packing case for shipment



Lud Esses of Montesano, Wash., has built a fortune by marketing blackberries by the ton, and selling cascara bark and other forest by-products. Esses' bark, from which a laxative is made, comes from the cascara buckthorn tree, identified by tiny leaves in place of fall-winter leaf buds. Bark-peeler pay varies from 20 to 30 cents an air-dry pound, and good peelers can take in 140 to 175 pounds daily. The region ships almost two million pounds of cascara bark yearly.

Cascara bark has been cut for years, until now a tree trunk more than six inches in diameter is rare. The sprout growth from a properly cut stump will often produce a far greater bark-growing surface in a few years than originally. Cascara plantations are gambles, but some of them have been started in our country's Northwest.

Another money-maker, the quinine fungus of living larch trees grows a fruiting body, or "conk," loaded with agaric acid. Europeans like a dash of agaric acid in top-caliber wines and patent medicines, so Northwestern conks have risen in market price to as high



Machine knocks off the prickles from cone scales. Independent gatherers have collected these cones



Fern pickers gather 65 to 70 bunches of fern fronds every day. Below, man holds 20-pound fungus

as two dollars per pound. Conks contain no quinine drug. The name was given for their bitter taste. They grow out from the sides of larch trunks at spots as high as 100 feet in the air. Ted Hay, ranger of the Kootenai National Forest in Montana, secured conks at a "profit" when they sold for only 25 to 75 cents per pound. With his rifle he shot them from trees.

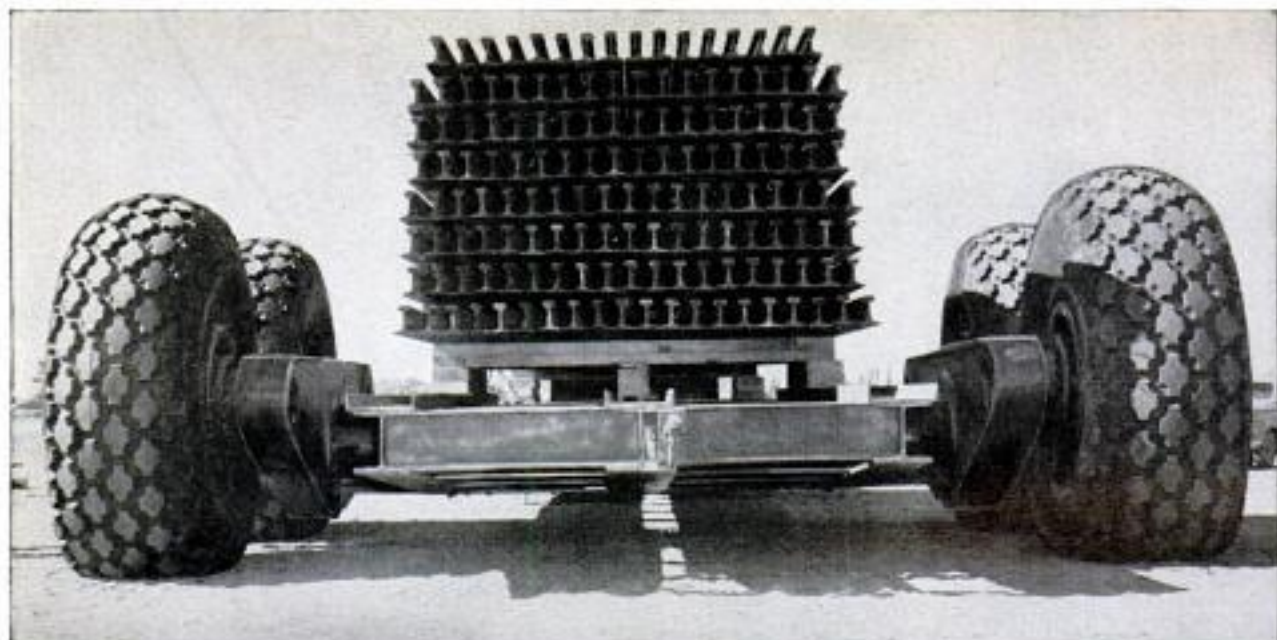
Robbing Squirrels' Nests

Second largest forest sideline in Idaho and Montana is the systematic robbing of squirrels' nests. Some caches, forgotten by bushy-tailed owners, contain quantities of seed worth as much as \$90 to collectors. E. C. Moran, forest tree seed dealer of Stanford, Mont., once purchased seeds from a 70-year-old gatherer who grossed more than \$12,000 in one year.

Hooks, threshing machines for cones and seed driers have been designed but squirrel hoards still provide the best seed yield for tree raisers. Yet, such devices as the 1000-pound hydraulic press that fits evergreen in packing cases play vital roles in shipping from the forest to the customer.

Data on income possibilities for forest sidelines is available at the Extension Service in Pullman, Wash.; Moscow, Idaho; Corvallis, Ore., or Bozeman, Mont.; and at regional offices of the U.S. Forest Service located in Portland, Ore., and Missoula, Mont. ★ ★ ★



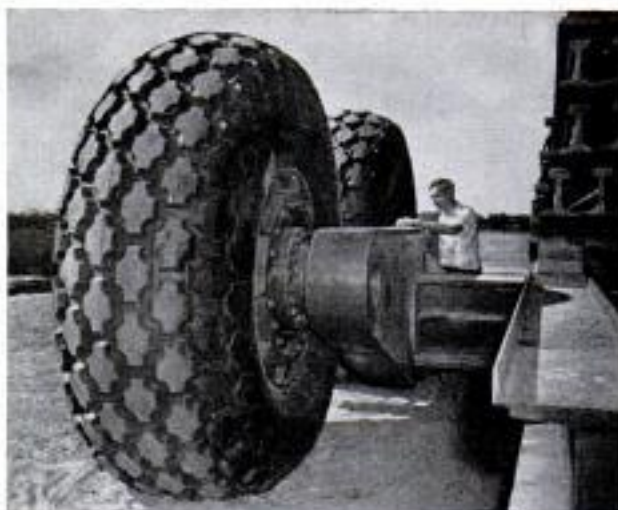


This desert trailer can carry a gross weight load of 200 tons and weighs 75 tons when there is no cargo

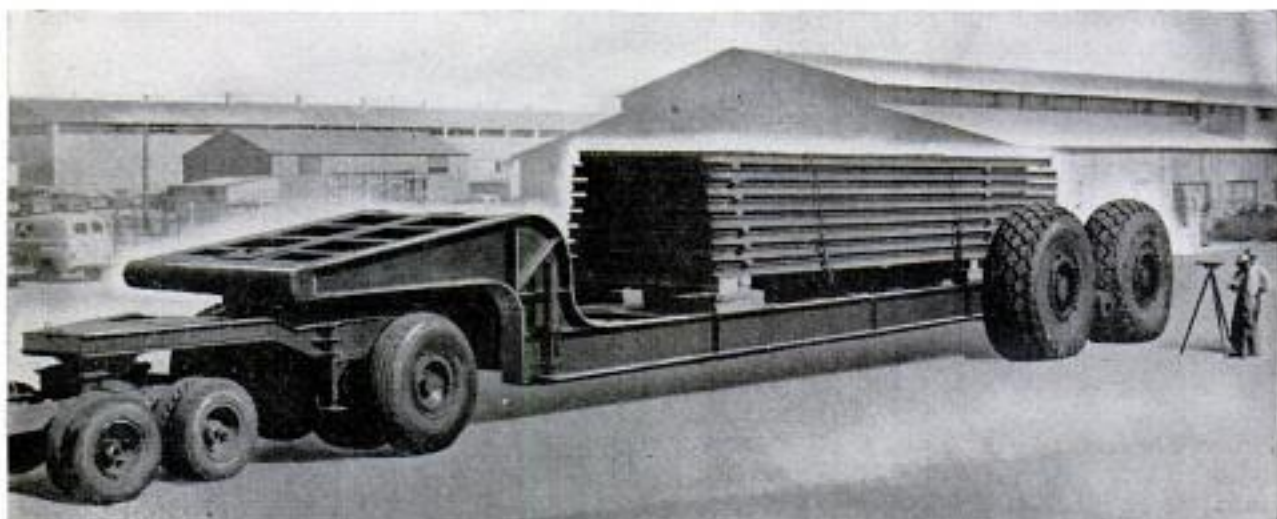
Desert Trailer Carries 200 Tons

CARRYING a weight equivalent to three railroad carloads of oil-field equipment, the world's largest known low-bed trailer traveled 570 miles across Arabian desert from Dammam toward Sidon in 3½ days. Made of steel and pulled by a 320-horsepower tractor, the trailer alone is 82 feet long, 26 feet wide and weighs 75 tons empty. Gross weight loaded can be 200 tons. A single wheel and tubeless-tire assembly of the trailer weighs 9300 pounds and has a diameter of 9 feet 6 inches. This vehicle was developed for the Arabian American Oil Company by Eidal Manufacturing Company of Albuquerque, N. Mex. To haul equipment through vast expanses of highwayless desert, the Eidal firm developed a trailer unit with an extremely low ground pressure.

Each tire is equipped with a specially designed assembly. Diameter of a tire is 9 feet 6 inches



Length of the "big boy" of trailer classes is 82 feet without tractor. Width of the vehicle is 26 feet





Zigzag lines on charts tell Japanese scientist that someone set off an A-bomb near Lake Baikal, Siberia

Atomic-Bomb Detectives Pinpoint Explosion 3000 Miles Away

Although Japan has no atomic weapons, its scientists have perfected a system of nuclear sleuthing that may make it hard for any other nation to conduct future test explosions in secrecy. Soon after the A-bomb and H-bomb detectives went to work, they revealed that the Soviet Union conducted tests in the Lake Baikal region of Siberia. The U.S.S.R. denied this, but the Japanese still stand back of their evidence. The Central Meteorological Observatory in Tokyo is responsible for the global detection system. Checks are made with three basic weather instruments: The seismograph, which records ground waves; the microbarograph, which records atmospher-

ic pressure, and the tidal gauge. These instruments record disturbances caused by atomic and hydrogen explosions 2000 to 3000 miles away. When the readings of a full network of instruments are correlated, they point right to the spot where the blast went off. They also reveal the time it took place and, to some extent, the size of the device tested. The C.M.O. has specially designed microbarographs spotted at 13 of its key weather stations scattered over the four main islands. An extremely sensitive seismograph is located in central Honshu. One main tidal gauge is located on the eastern coast of Honshu and six others are spotted elsewhere.

Jeep Mine-Finder

Jeep-mounted detection gear automatically stops the vehicle when a land mine is located. As the search coil passes over a mine, a spring-loaded, hydraulically operated piston disengages the clutch and sets the brakes. Panel and meter lights, plus an audible signal in the driver's earphones, indicate the mine. Wheels keep the search assembly at a constant height above the ground to cover an arc six feet wide.





Lightweight Rifle

Under test by the Army as a possible successor to the Garand M1 is a new fully automatic rifle that weighs only 6.85 pounds, almost three pounds less than the M1. Made of aluminum alloy and plastics, the new rifle fires a .308-cal. bullet. Instead of a drilled-steel barrel it has a barrel liner made of stainless-steel tubing.

Transportation Bill

Transportation costs take 27 cents out of every sales dollar in the United States each year, according to Chester C. Thompson, president of the American Waterways Operators, Inc. The nation's annual transportation bill is \$15,000,000,000.

Four-Seater Midget Car Has Doors in Front and Rear

Passengers sit back-to-back in a German midget car, named "Janus," with doors in front and rear and its engine in the center. This auto has a two-stroke, 248-cubic-centimeter, 14-horsepower engine and can go 50 miles per hour. The vehicle weighs 880 pounds. Its motor is suspended to minimize

vibration. Brakes are hydraulic and cooled by compressed air. Main advantages of the Janus are reported to be its space-saving compactness, convenient access to the engine, and its ability to hold the road due to distribution of weight. The car holds four persons.



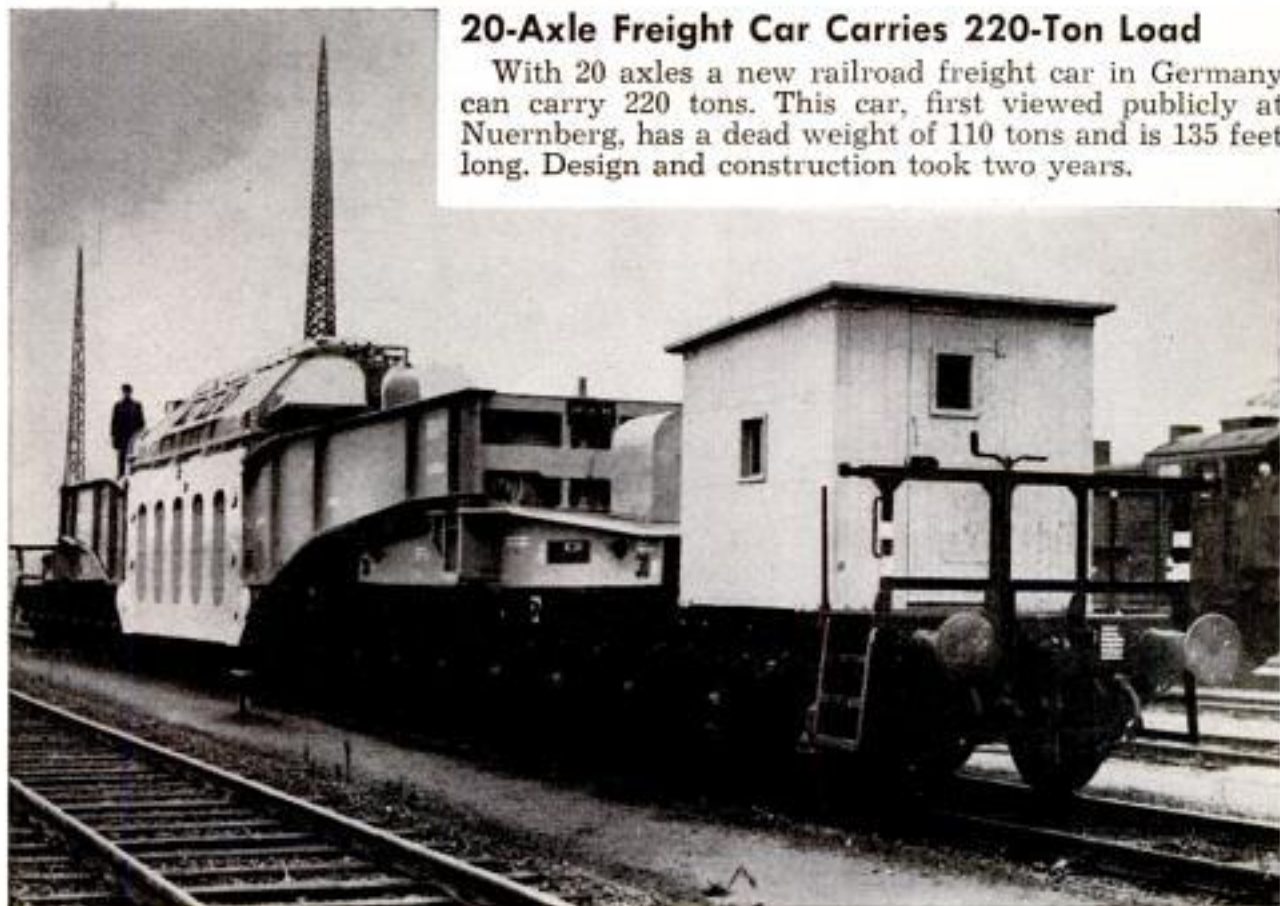


GI Can Blast Own Foxhole

Ground troops can dig defensive foxholes in 90 seconds with a recently developed rocket-explosive device. Inserted in a vertical launching tube on a tripod, the unit (fuse, bazooka rocket motor and charge) is fired two feet into the ground. The resulting explosion creates a crater four feet wide and four feet deep.

20-Axle Freight Car Carries 220-Ton Load

With 20 axles a new railroad freight car in Germany can carry 220 tons. This car, first viewed publicly at Nuernberg, has a dead weight of 110 tons and is 135 feet long.



JEEP JAMBOREE



Winner of the broad jump at the jamboree was this Jeep shown here making a leap of 23 feet 8 inches

HOLD 'ER, COWBOY!" And the cowboys did—but they were holding steering wheels, not reins and their mustangs were mechanical, not animal.

It was an exciting, rip-snorting Jeep jamboree held on South Padre Island in the Gulf of Mexico off Texas as part of a campaign to publicize the place as a winter resort for sun-worshipping Northerners.

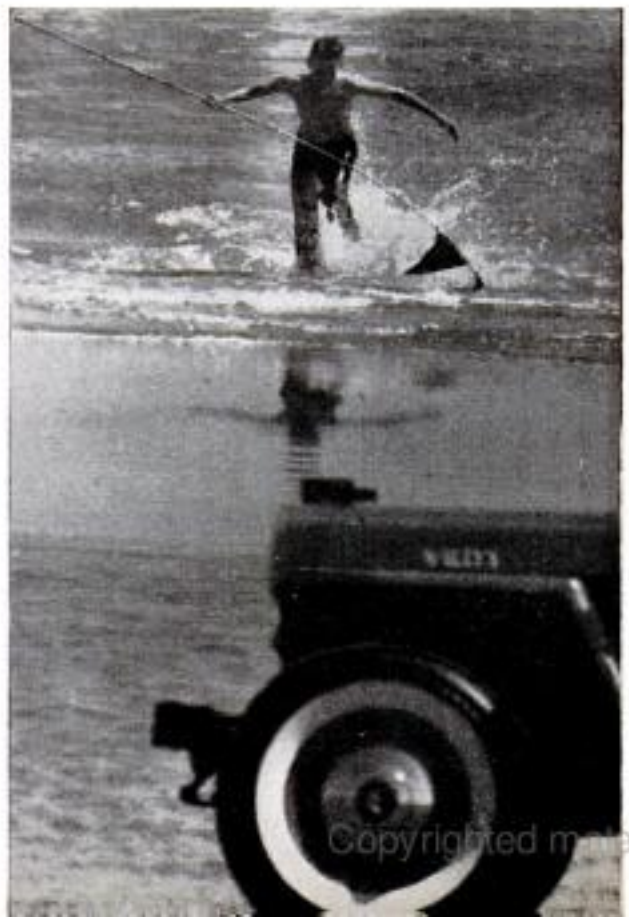
Every entry in the jamboree was a Jeep

driven by a rough-and-tough Texan in the best rodeo tradition. The competition included such unlikely vehicular events as a slalom race in the surf, a broad jump, an obstacle course and a treasure hunt.

The winner? It doesn't really matter. What the jamboree did prove was that the car may yet replace the horse after all—especially if the car is as acrobatic as a Jeep! ★ ★ ★

Spectators dotted the five-mile obstacle course to watch the motorized "sand fleas" roar over the dunes

One wet event required the drivers to speed down the beach and retrieve a pennant 50 feet out in the surf



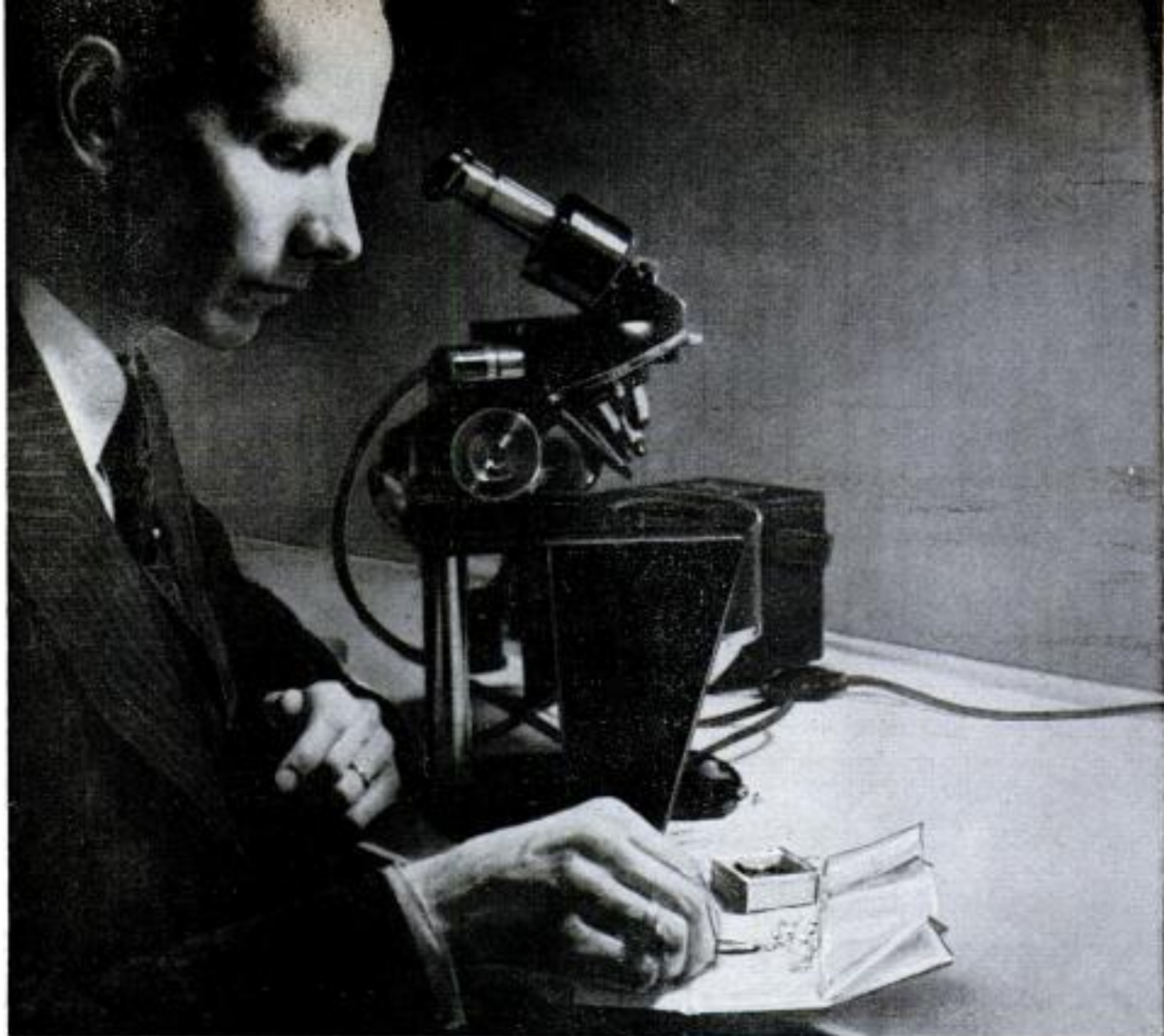


Late in the day Jeeps rested as contestants dug up the beach with bare hands looking for buried treasure



Above, that's not a landing craft coming ashore, it's a Jeep trying to win the slalom in the surf. Here it appears as though the surf is winning! Below, a flat front tire forced this Jeep to retire from the race





Dr. Edward Gubelin, authority on gem inclusions, provides photomicrographs of each stone to the buyer

Look into the Heart of a Gem

Invisible to the unaided eye are telltale "fingerprints" that identify nearly every jewel. It may be a tiny gem within a gem or a bubble. Here's how the gemologist fingerprints precious stones.

By Creighton Peet

Erwin Harvey has elaborate set-up for photographing heart of gem. Examples of his photos appear on the following pages



DEEP WITHIN almost every precious stone and fully visible only with a microscope are fantastic, brilliantly colored identifying marks and structures. In every case they are as different and individual to each stone as are fingerprints of a man.

A lost—or stolen—diamond, ruby, amethyst or sapphire, for example, may turn up in the market recut so it appears to the naked eye to be an entirely different stone. But a gemologist familiar with a particular stone's internal "fingerprints" or, better yet, having a photograph of its inclusions as these microscopic formations are known, can quickly make positive identification.

To date, no court has formally recognized this means of identification, but for almost two years now the New York City Marshal's Office has kept impounded some \$60,000 worth of assorted gem stones whose ownership is in doubt. A specialist in a wholesale jeweler's office from which such a batch of stones was stolen believes he has definitely identified stones from this firm's stock among those held by the police. But in this case he has only his own memory to back him up—not photographs. The grand jurors were impressed by his identification—but not sufficiently to hand over

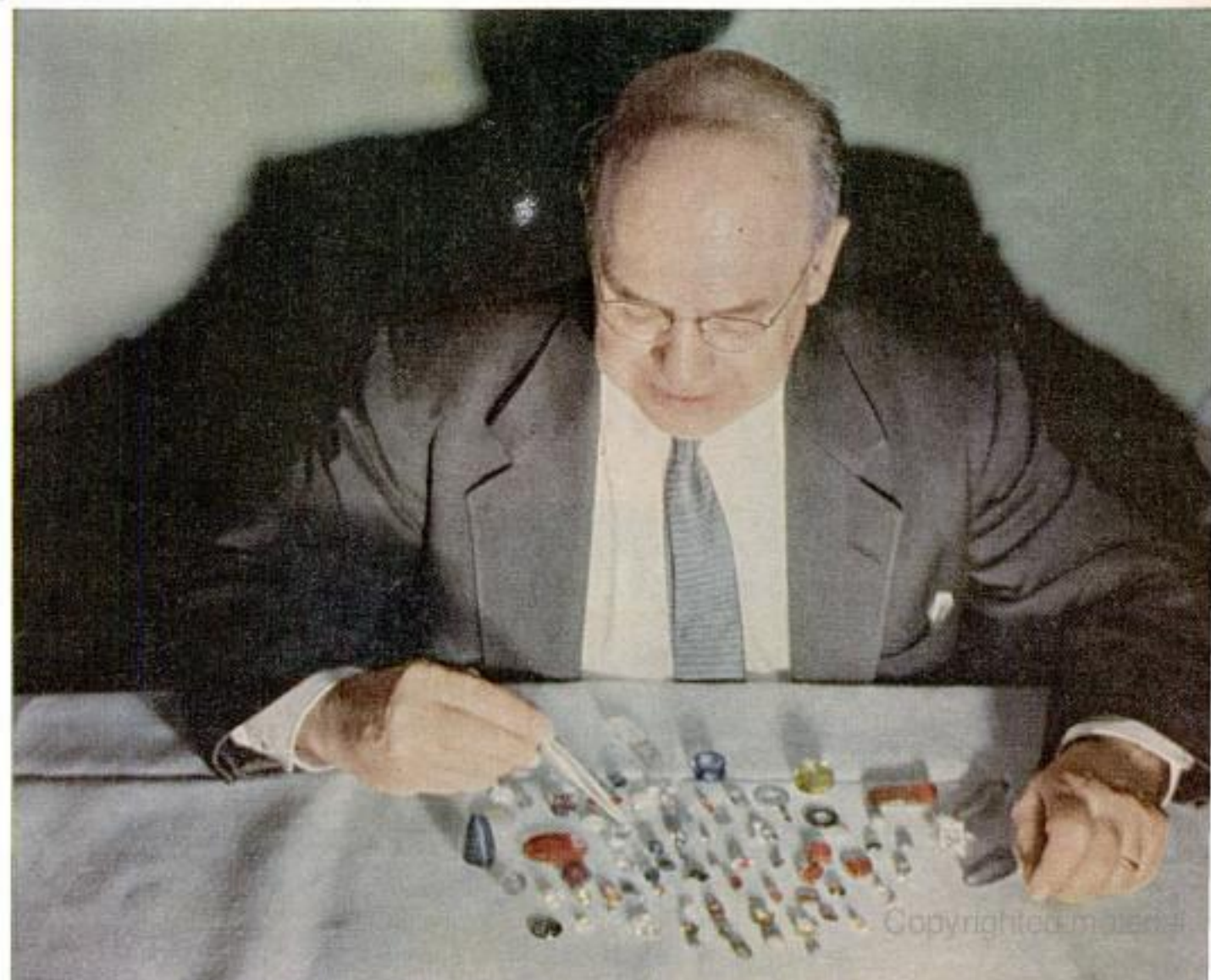


It isn't theoretically possible for a star spinel to have six rays, but here it is. Internal construction dictates that the star have only four rays. This is a rarity, probably the only one in existence

these gems. On the other hand, the dealers in whose possession the stones were found could show no bills of sale. So for the present they belong to nobody.

Dr. Edward Gubelin of Lucerne, Switzerland, a dealer in precious stones and one of the world's leading authorities on inclusions, believes a study of these internal markings is essential in the positive identification of a stone. For this reason, his firm some years ago started the practice of presenting the purchaser of every jewel

Harvey sorts out a fortune in gems. The long stones are synthetics, identical to real ones except for inclusions





GARNET has one inclusion inside another



AMBER has a real insect imprisoned in it



TOURMALINE with graceful tube inclusions



DIAMOND, above, and GARNET, below



with a photomicrograph that shows its inclusions.

In America some leading jewelers have for years made photographs of all diamonds sold of a certain size. These show reflections from the diamond's facets and identify it quite accurately—so long as the stone is not recut. But recutting is one of the first tricks of the gem thieves to make stolen stones safely salable.

Some years ago the Gemological Institute of America, which does research in this field, established a sort of central file of information on diamonds over a certain size, sold by member jewelers all over the United States.

Since inclusions in diamonds are extremely hard to photograph because these stones transmit so much light, the Gem Society's files consist of pen and ink sketches of each stone's inclusions as observed through a microscope and recorded on special blank forms.



You might call inclusions flaws or defects in a stone. In a sense they are, for they are bits of other stones or structural markings left as the stone was being formed millions of years ago. Garnet or zircon crystals may be found deep inside diamonds. Liquid-filled cavities called "feathers," looking a little like rain streaking down a window, are characteristic in Ceylon sapphires.

In some cases dark holes are found surrounding inclusions, the result of radioactivity—now long extinct—in these specks of foreign material. In particular, once-radioactive zircons occasionally appear in sapphires, always surrounded by the tell-tale black halo. Today we produce radioactive materials which have a half-life of 5000 years, but in the life of a stone which may have been formed five million years ago the fragment of radioactivity has long since become ancient history.

More fantastic, in many stones such as emeralds, topazes and sapphires there are inclusions which

Certificate given with purchase of an expensive diamond gives highly accurate description of the stone

Certificate of Diamond

Model No. _____

This Certificate is given to the holder of the diamond described in the following table as being a natural diamond of the highest quality and of the weight and color described in the following table.

The diamond is guaranteed to be a natural diamond of the highest quality and of the weight and color described in the following table.

Color	Weight	Clarity	Cut
_____	_____	_____	_____

Drawings of the diamond are shown on the right side of this certificate.

By the Gemological Institute of America, Inc., New York, N. Y.

are liquid-filled cavities in which small bits of other stones are suspended. Occasionally these "floating" inclusions have been observed to change position as the gem was turned about.

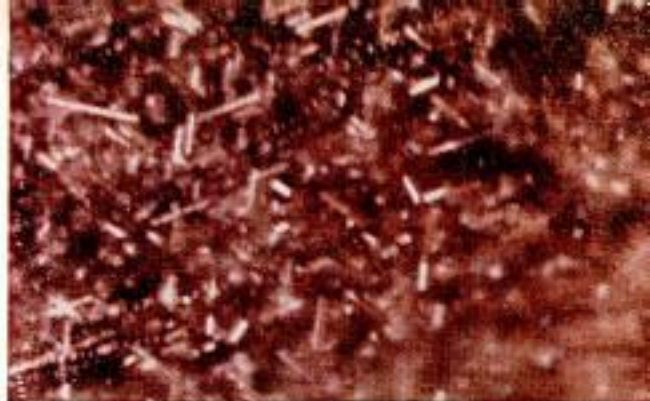
Doctor Gubelin has in his collection a stone containing a liquid inclusion in which is a bubble of what he believes to be carbonic gas. After being heated to 31 degrees C. for several minutes, this bubble becomes absorbed by the liquid and disappears. Then, back at room temperature, the bubble reappears.

The Federal Trade Commission says that if an inclusion can be seen under a 10-power microscope, a stone cannot be sold as "perfect." However, in actual practice very few stones are entirely free from inclusions, and there are some inclusions which make a stone more valuable. The "star" sapphire, for example, is a stone in which three sets of minute "rods" crossing each other at an angle of 60 degrees produce the star effect when seen from above. In many cases a few very small inclusions which do not detract from the outward appearance of the stone can be proof that a stone is genuine. Artificial stones are amazingly good today, and very often the only way a gemologist can decide whether a stone is real or synthetic is by the inclusions. While synthetic stones often have inclusions, they are not the same as those in natural stones.

Photographing gem inclusions is among the more remote and expensive hobbies, but here and there all over the United States jewelers and dealers in precious stones have cameras and microscopes set up in apartments, spare rooms or the backs of shops.

One of the most able of these gemological photographers is Erwin Harvey of East Paterson, N. J., who has made a handsome collection of 35-mm. color slides of literally hundreds of gem stones. These photographs are not of stones he owns, but of unusual stones friends in the trade have loaned him for a few days, knowing his deep interest and his skill. To the outsider this seems a strangely casual business. A stone worth many thousands of dollars will be left with him at the jewelry shop where he works or sent to him through the mails. No receipt or other formal document is involved.

Making a single inclusion photograph may involve a tedious setting-up of apparatus and careful study of the stone to decide precisely the angle to which it should be turned on the microscope slide. Then, since the inclusion or inclusions in a single stone are at some depth from the surface, the photographer must decide where his plane of focus inside the stone should be for maximum effect. In nearly all photographs of inclusions the focus is on the major or most interesting formation. But this usually results in showing other inclusions in the same stone, which are at different depths, out of focus. For a complete "fingerprinting" job, other pictures must be made at these other depths. Precious stones were formed untold ages ago by the tremendous forces of nature. For a comparatively brief span in their unbelievably long life they may adorn our womenfolk. During this period they need never lose their identity if they are properly "fingerprinted" by experts. ★ ★ ★



SPINEL has millions of inclusions



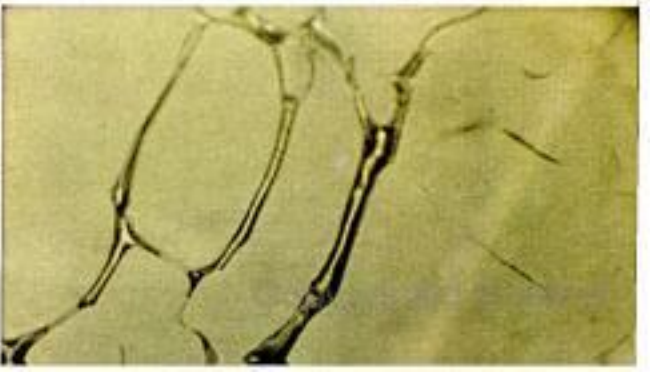
DIAMOND with star formed by inclusions



SAPPHIRE contains "fingerprints" of liquid

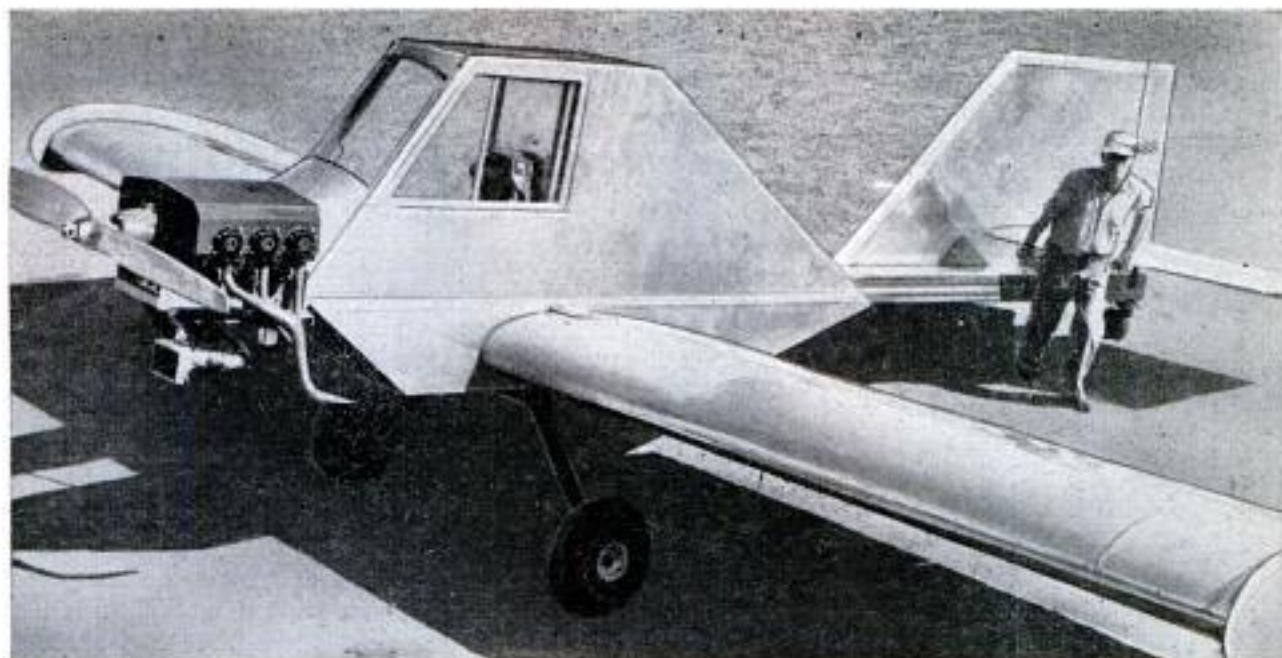


SPINEL with halo, and below, TOPAZ



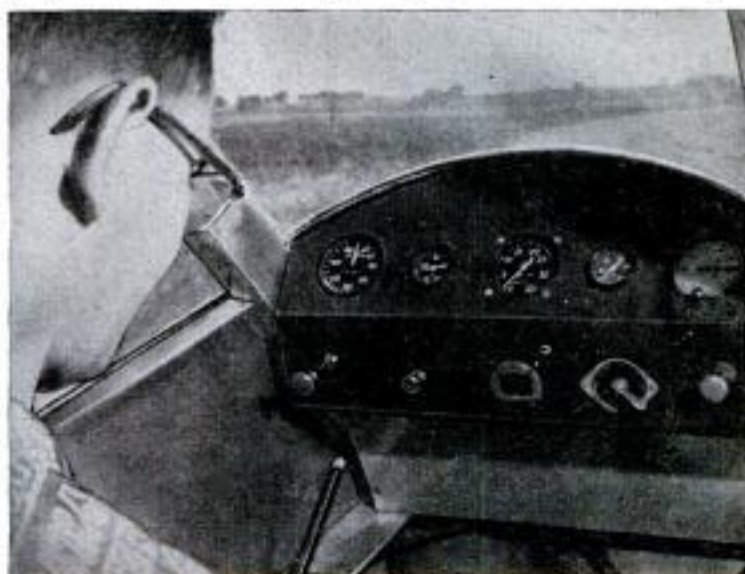
"Flying Girder" Crop Duster





Fashioned around a 20-foot girder, flying spray-duster (above and opposite page) cruises at 120 m.p.h.

DUBBED the "Flying Girder," an aircraft that can dust crops or spray them, or do both simultaneously, has been built around twin six-inch aluminum channels bolted together to form a single 20-foot rigid box fuselage. Controls and other vital parts are set between these channels. William Marlman, Colorado airport operator, created the "Girder" to eliminate costly welded-aluminum-tubing construction common to most commercial aircraft. This ruggedly simple airborne hunk of metal has 14-inch-thick wings to give the high lift and "flyability" necessary to crop spraying and dusting. Fifty-gallon spray tanks are in the wings. A 20-cubic-foot hopper carries dust behind the pilot's skintight compartment. In flight, the Girder rests on a large cushion of lift provided by out-sized wings and flap areas. Liquid sprays and insecticides mist over the fields from pipes concealed in wings; atomized vapors emerge from trailing edges of these wings. Dust sifts from the hopper bottom to drift evenly on fields below, assisted by the plane's slip stream. A four-foot vertical tailfin gives the Girder directional stability. With its 260-horsepower Lycoming engine, the aircraft cruises 120 miles per hour and has a stalling speed of less than 40 miles per hour. The CAA has approved the safety design and performance of the Girder. ★ ★ ★



Above, the aircraft's controls are set between the rigid channels of bolted, twin, six-inch aluminum metal pieces. Below, the "girder's" creator, William Marlman, points to the box fuselage



Canada "Main Street" To Cross Continent

IN A FEW YEARS you'll be able to drive all the way across Canada on the new Trans-Canada Highway that is now being pushed to completion.

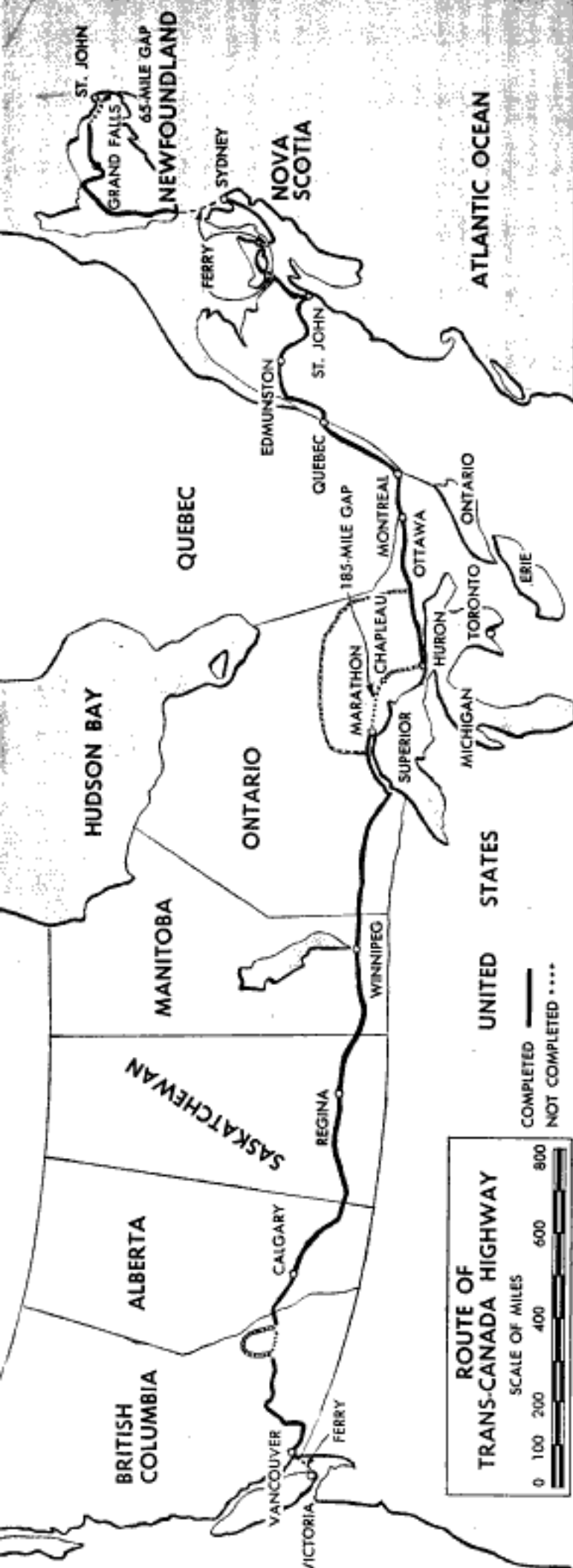
Only a few gaps remain in the new southerly route, known as Canada's ocean-to-ocean "Main Street," and most of these can be detoured. In some areas the route has been completed by joining stretches of existing road, in other districts the road is being driven through virgin country. In Newfoundland, for instance, 600 miles of road and 200 bridges are at present under construction.

The distance between the eastern and western terminals of the route is 5100 miles. Officially, the 520 miles of route through Quebec will not be part of the federal-provincial project. Travelers will pass through the province on the existing paved highways. Of the other 4580 miles of route, 30 percent is paved according to Trans-Canada Highway standards: hard-surfaced, two or more lanes in width, with gentle grades and wide shoulders. An additional 33 percent is paved. The remaining 37 percent is not paved.

Included in the latter total are 250 miles where there is no route of any kind. A gap of 65 miles exists between Clarenville and Gambo Pond, Newfoundland. Between Chapleau and Marathon in Ontario is an impassable gap of 185 miles that at present requires an immense detour. One hundred miles may eventually be clipped off the route in western British Columbia by short-circuiting a horseshoe section of route.

The route begins at St. Johns, Newfoundland, crosses to Nova Scotia by means of an ocean-going ferry, and uses other ferries to cross to Prince Edward Island and then to New Brunswick. On the mainland the route connects many of the large cities across the continent, including Montreal, Ottawa, Winnipeg and Calgary. Farther west the highway passes through portions of Banff and Yoho National Parks and continues to Vancouver, from where Victoria and Nanaimo on Vancouver Island are reached by ferry. Total cost of the route is estimated at close to \$500,000,000.

Map shows route of transcontinental road. It is now possible to drive almost the entire length of it, although only 30 percent now meets Trans-Canada Highway standards and 37 percent is not hard-surfaced



Secret Car Signal Opens Garage Door

Radio-controlled garage doors equipped with a new actuating device will open only in response to a certain coded radio signal from the owner's car. No other transmitter can open the door, so this equipment solves the biggest problem which has faced the owners of electronically operated doors. The manufacturer has over a million of the secret codes available, so there is little chance of repetition from other actuating units.



Tandem Tractor

Engineers at Iowa State College are perfecting a tandem arrangement with which two medium-size tractors can be hooked together to do the work of one large machine. The obvious advantage is that the farmer could buy two smaller tractors which would do most of the farm work; then, when a big tractor was needed, he would simply hook the two together.

Wing on Latest Intercontinental Super Constellation Is 27 Feet Longer

Wingspan is 150 feet on the new Model 1649A Super Constellation slated for intercontinental airline duty in April. The huge wing is 27 feet longer than in previous Super Constellations and holds fuel for nonstop flights of 6300 miles without con-

suming reserves. Future nonstop runs may include San Francisco to London, New York to Rome, and Rio de Janeiro to New York. The aircraft has three-bladed propellers, each measuring 16 feet 10 inches, for its 3400-horsepower engines.



WHAT'S NEW FOR Your Home



1. ROTARY MOWER operator can adjust the cutting height by light toe pressure on a foot pedal without stopping the mower. Blade and mower deck rise horizontally up to four inches. Mounting a 3.6-horsepower engine, this unit cuts a 25-inch path. Geared transmission allows forward and backward movement. A safety clutch can stop the blade.
Midland Company, South Milwaukee, Wis.

2. PORTABLE ELECTRIC ICE CRUSHER breaks ice into fine, intermediate and coarse sizes. Dial can be set while the unit is in operation. Ice cubes are fed into the safety opening with an inward swinging gate at the top of the crusher. Stainless-steel talons smash the ice and drop it into a seamless steel drawer with the capacity of an average ice tray.

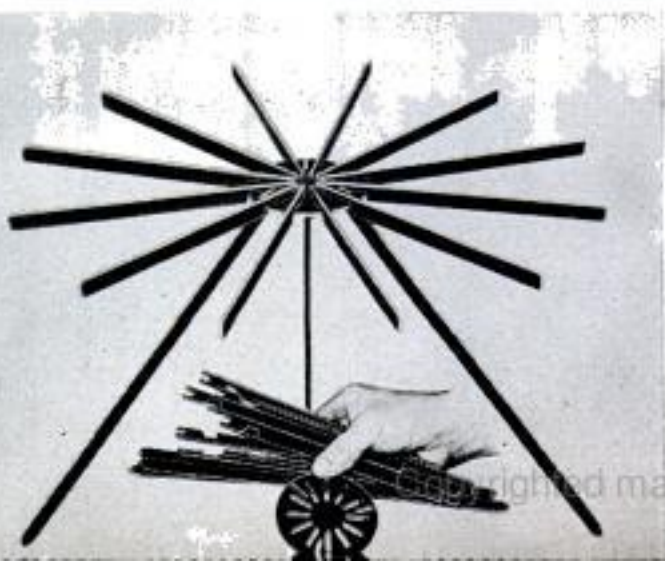
Hival Manufacturing Co., 304th and Bennington, Kansas City 20, Mo.

3. DOUBLE-BOTTOM SHORTENING CUP allows housewife to measure shortening without touching it. This plastic cup, divided into quarter-cup sections, has its double bottom connected to a push rod. When filled with shortening from a can, the cup is inverted; shortening sufficient for the recipe is pushed out, cut off and placed directly in mixing bowl.

Lowry-Johnston Co., 301 Wolverine Bldg., Ann Arbor, Mich.

4. TAKE-APART PORTABLE GRILL for outdoor cooking fits into a pocket or a fishing-tackle box. Measuring 1 by 3½ by 13 inches, this steel grill weighs 2½ pounds. It can be assembled in 15 seconds. The circular grill-top area accommodates two pots and a skillet at the same time and keeps them concentrated over center of fire for quick, convenient cooking.

Multi Products Co., 2052 Grove Ave., Racine, Wis.



5. FLOOR-HUGGING RUBBER DUCT permits extension wire to run from a wall outlet to the center of a room without hampering traffic or cleaning. The extension is rated at 15 amperes and 125 volts and includes two outlet units. The duct is available in four, five, six and ten-foot lengths. Beveled, it can be cemented to floor, without danger of coming loose unexpectedly

CMG Industries Inc., 615 South Second, Laramie, Wyo.



6. WOMEN'S HOSE DRIER holds stockings by the toes. Less than five inches in diameter, this Bakelite polyethylene holder is a flat disk with eight slots around the edge to pinch and hold the toes of four pairs of stockings or other hand-laundered items. A chain attached to the center of the holder has a small hook at one end to form a loop for hanging

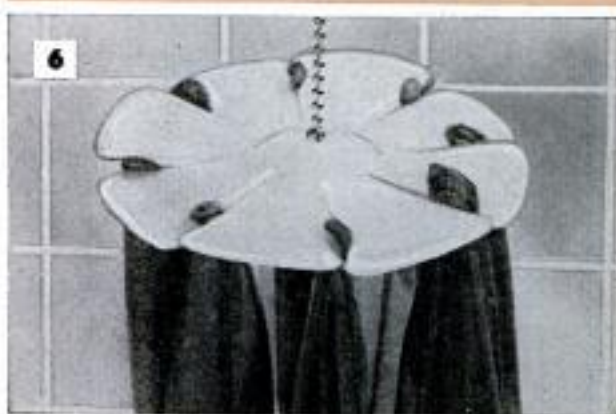
Cosom Industries, Inc., 6012 Wayzata Blvd., Minneapolis 16, Minn.



Cross-section view shows compact rubber duct

7. AUTOMATIC GARBAGE CAN, enclosed in enameled steel cabinet, moves forward on shelf to receive waste when foot pedal on cabinet is pressed. The can moves back into the cabinet when foot pressure is stopped. A regular can cover is unnecessary, as the cabinet keeps out flies and animals. Housewife does not have to handle this garbage can at any time during disposal

Automatic Window Co. of America, 1753 N.W. 20th St., Miami, Fla.



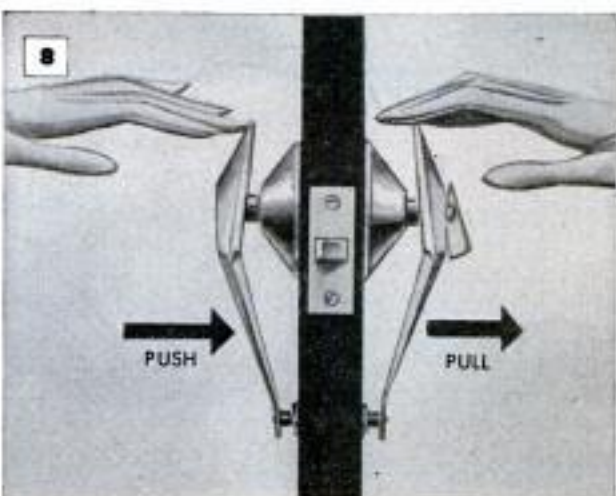
8. LOCK SET does not require a doorknob for turning to unlatch the door. Plates that are pushed or pulled to open the door actuate the latch and release it so the door swings free. Bottoms of the plates are fastened to the door. Tops of the plates are movable. The door can be locked in the usual manner. This lock set can be installed horizontally, if need be

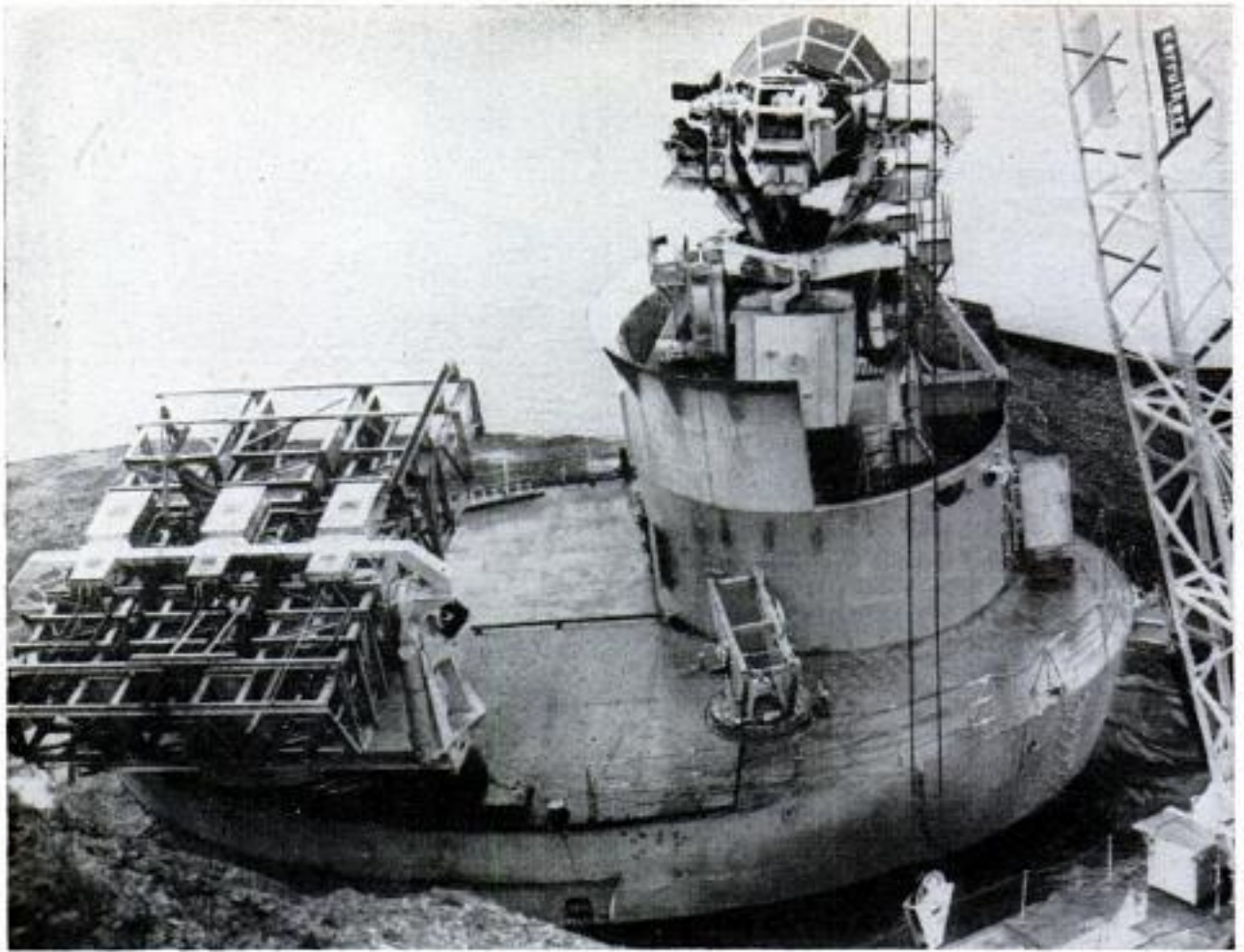
Screw Machine Products Co., 7737 N.E. Killingsworth Ave., Portland 20, Ore.



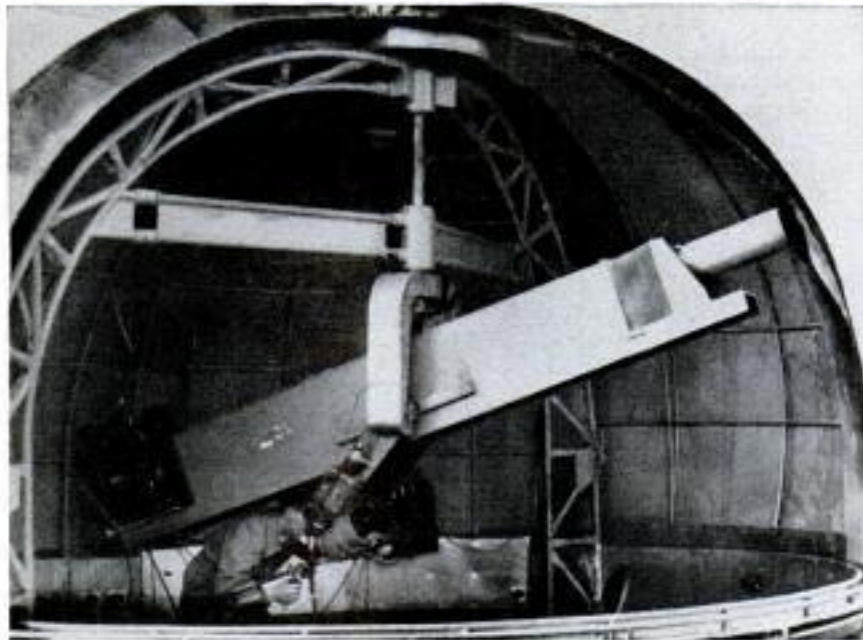
9. CAN OPENER that can be handled by disabled persons has a vacuum base which firmly locks the opener to any flat, smooth, nonporous table surface. The unit opens round, oval and square cans by left or right-handed operation. Cans are placed on an elevator platform, which raises them to proper height for opening. A magnet holds lids severed from the can

Rival Manufacturing Co., 36th and Bennington, Kansas City 29, Mo.





Platform duplicates any movement of ship, permitting tests of naval missiles. Left, tracking camera follows the missiles



Artificial Ship Launches Missiles

Missiles roar skyward from a strange platform in Wales. The platform is used by the British Ministry of Supply to flight-test guided missiles designed for ships. The platform can duplicate any movement of a ship at sea. Nearby is a 100-inch tracking camera which follows the flight of the missiles.

Compressed-Air Bubbles Keep Shipping Lane Ice-Free in Swedish Lake

Compressed-air bubbles kept a shipping lane ice-free last winter in Lake Malar, Sweden. Perforated Neoprene-plastic tubing was laid on the lake bottom along the shipping route between Vasteras and Sodertalje. Air bubbles from the tubing lighten the lower layer of water, which rises to displace the colder water sink-

ing to the bottom. This technique was applied on a large scale in the United States in 1917 to keep water open before the gates of a hydroelectric dam across the Mississippi River at Keokuk, Iowa. The method also has been effective in providing ice-free lakes for migratory waterfowl and in keeping water open in sawmill log ponds.



Motor Is Used to Inflate Rubber Boat Prior to Propelling It

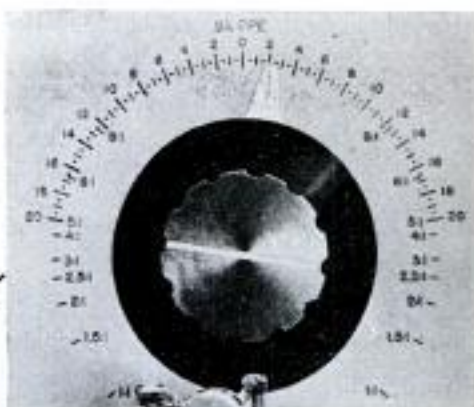
Using a 2.3-horsepower outboard motor which has a built-in air compressor, a collapsible rubber boat made in Germany is easy to inflate. Once the boat has been in-

flated, the specialized motor is attached to the boat and used to propel it. The boat is divided into seven separate compartments to prevent sinking from a puncture.

Control Holds Grader Blade at Precise Angle

Precise grading of a slope with one pass of the grader is possible with a new automatic control. The attachment, designed to speed the grading of highways, holds the grader blade at the desired slope regardless of how uneven the terrain may be. The operator simply sets the desired slope on a dial mounted within easy reach. He raises or lowers the blade to control the depth of cut, but the slope of the blade always remains the same, even when the grader frame is tilted by uneven terrain.

Operator of grader sets desired slope on dial. Blade remains at this angle even if grader frame is tilted

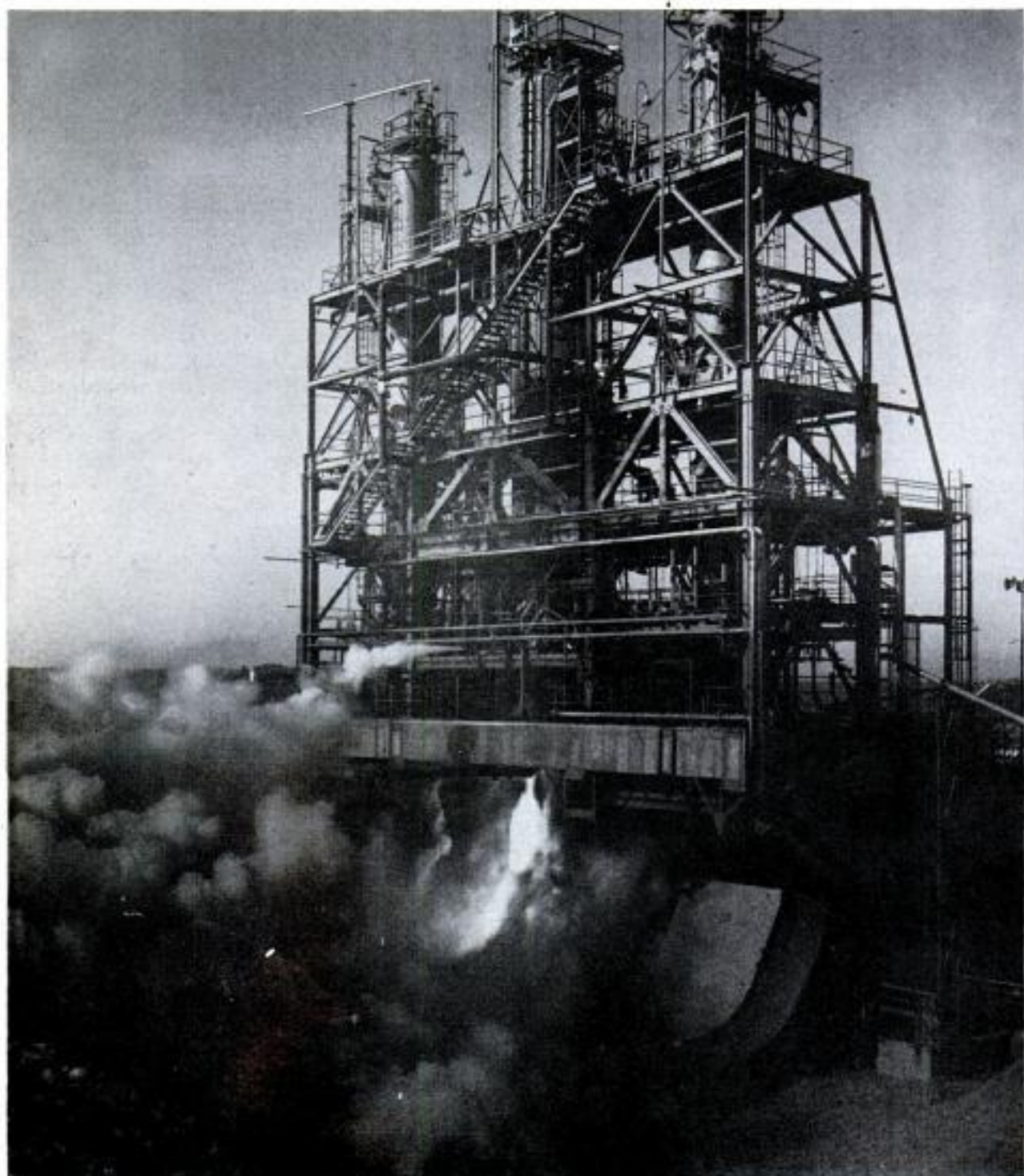


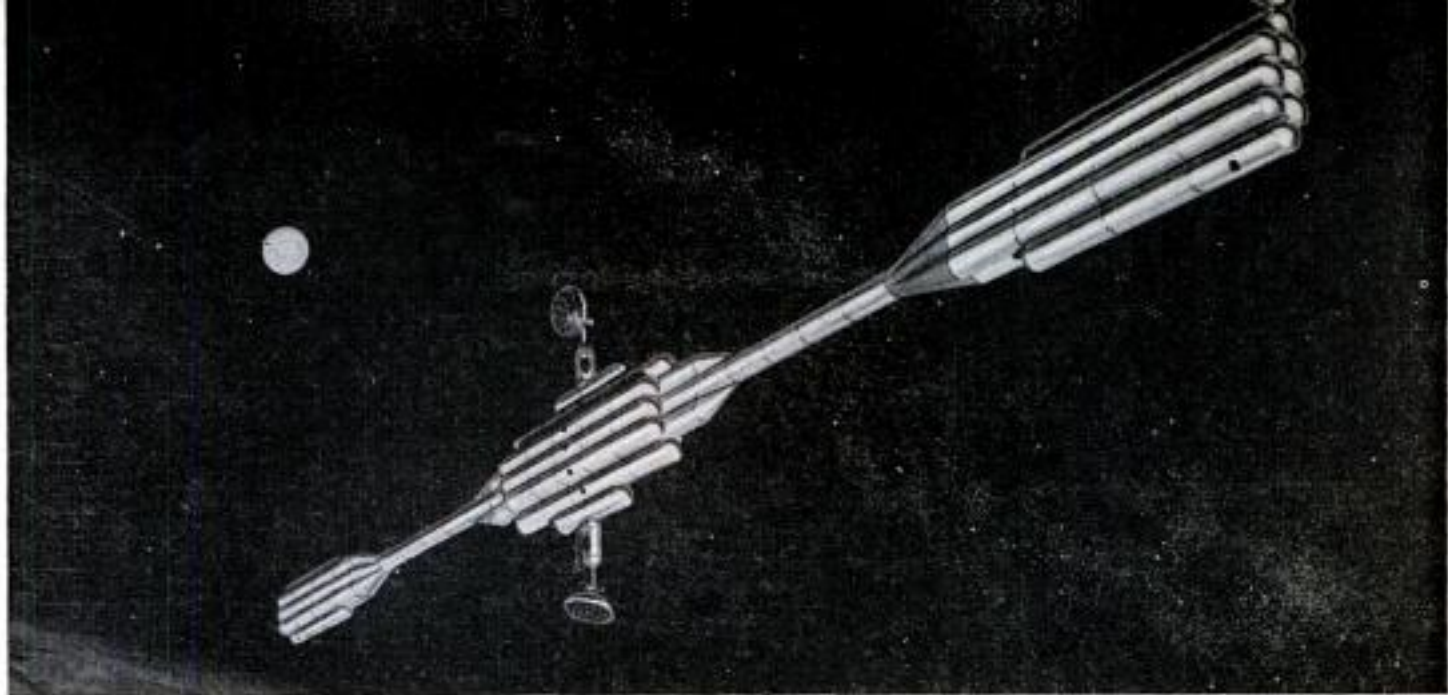
TAXI TO VENUS?

Maybe—if you have time for a year's round trip. But here are some of the problems our aeronautical engineers face as they head into the space-ship business

By Thomas E. Stimson, Jr.

Rocket motors produce tremendous surge of power in test stand. Water on deflection plate turns to steam





Dumbbell-shaped satellite envisioned by Ehricke would have a crew. Rotation would create artificial gravity

WHAT'S THIS RUMOR about Convair getting into the space-flight business? Is it true?" a friend recently asked Krafft A. Ehricke, chief of preliminary design of Convair's astronautics division.

"It certainly is," Ehricke told him. "We are studying advanced instrument satellites and are thinking about space ships that could travel to the moon. And we are considering the sun as a source of power for space propulsion."

Convair is one of the giants of the aviation industry; what is it doing in a field that sounds like science fiction? Why does it have a \$40,000,000 astronautics division?

One reason is that the company is building the "Atlas" intercontinental ballistic missile. This long-range weapon is designed

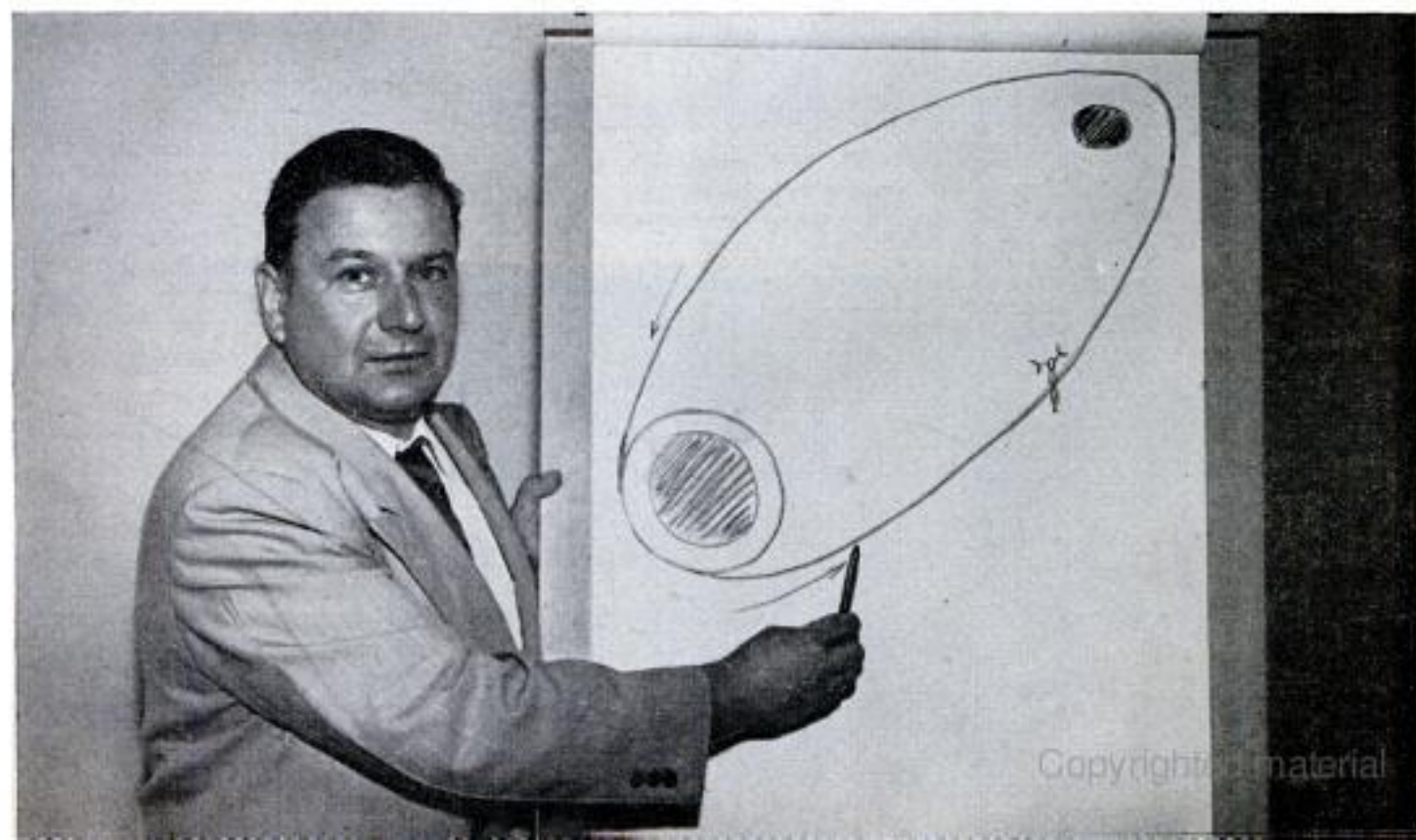
to fly a quarter of the way around the earth in half an hour. En route it will climb some 500 miles above the surface and for a time will be a true space vehicle. Everything that can be learned about conditions in space is affecting the design of the ICBM.

Ballistic Missile

The Atlas is known as a ballistic missile because its trajectory is like that of an artillery shell. It can be guided only during the time its rocket motors are blasting. During the rest of the missile's flight its trajectory is governed by the known laws of ballistics plus a number of new factors such as the effect of the virtual vacuum at extremely high altitude.

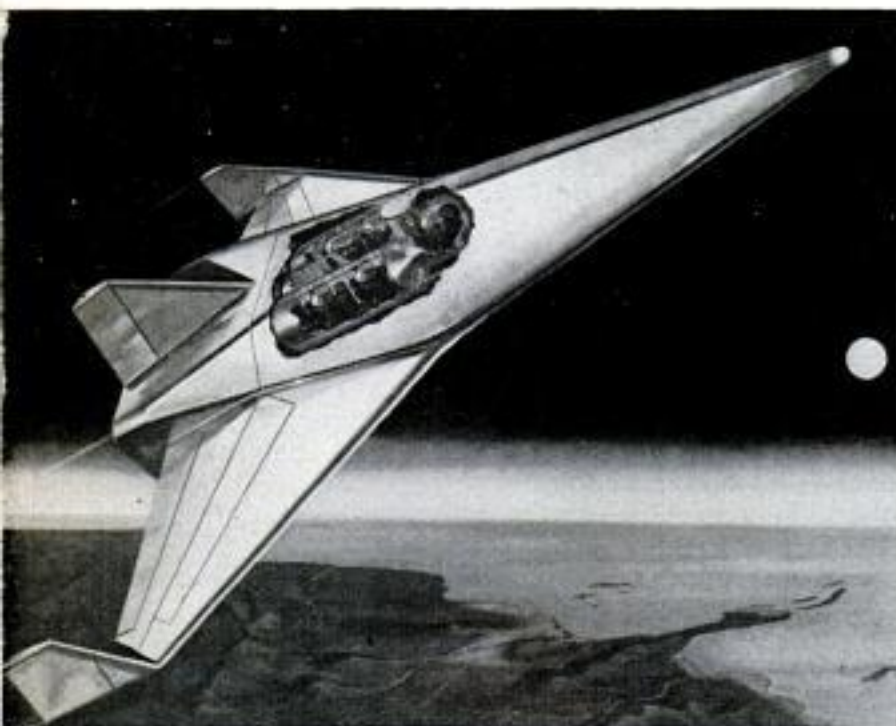
The ICBM has been called the ultimate

Ehricke shows how space ship for circling moon would actually be an earth satellite on long elliptical orbit





Shuttle craft would transport personnel to satellite at 600-mile altitude. Lower rocket portion detaches after take-off



During the return trip, craft stalls with nose high as it settles into dense atmosphere. Pointed nose glows from aerodynamic heat. Below, should anything go wrong, power section could be detached and the craft flown to earth as a glider



weapon. It is designed to carry a thermonuclear warhead that is at least 100 times more destructive than an ordinary atom bomb. Once launched, it is believed to be unstoppable—unlike the winged cruise missiles that are powered with jets or ramjets and that fly at aircraft altitudes and at speeds of around Mach 2. The Atlas will have a hypersonic speed of about Mach 20, some 15,000 miles per hour.

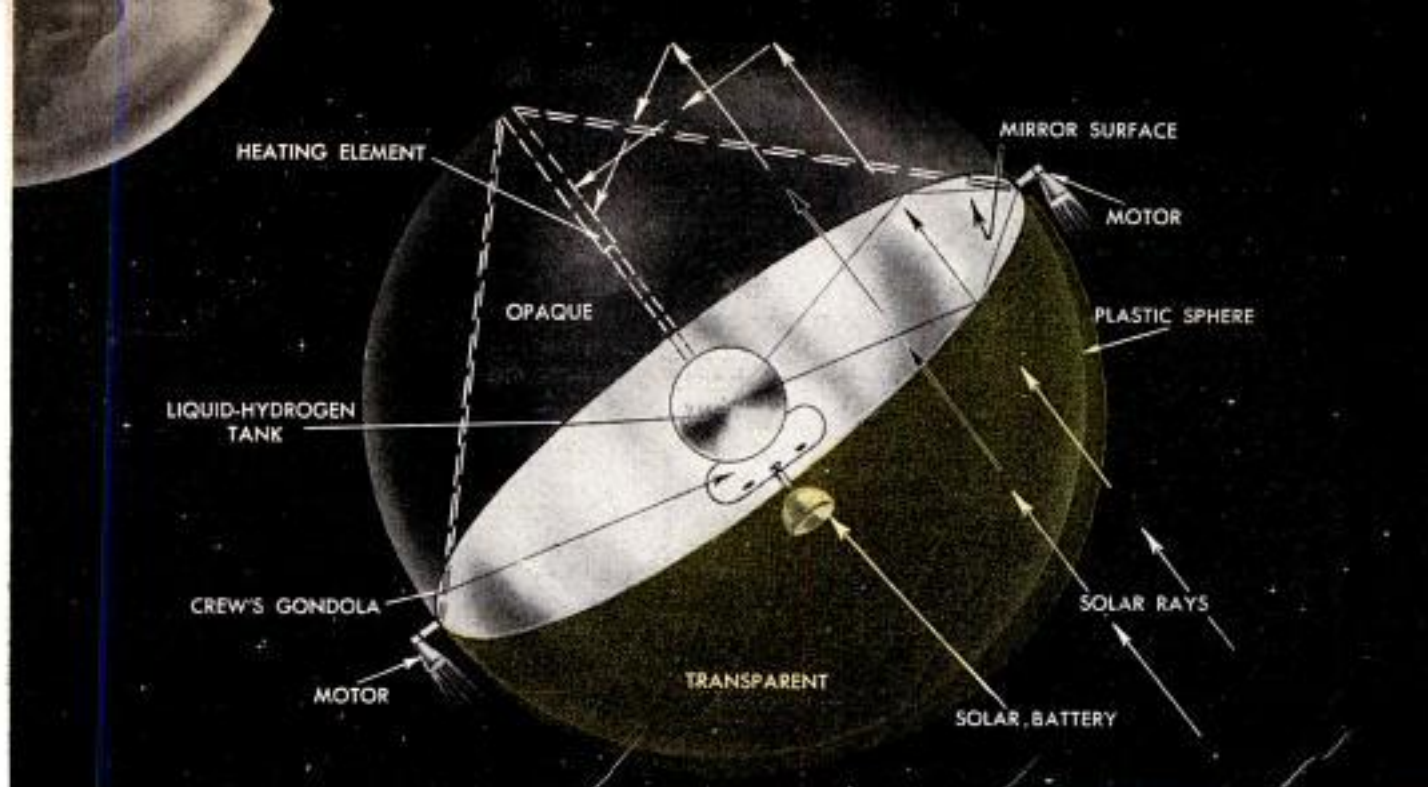
Some perplexing problems must be solved before the first of these multistep rockets is tested. One concerns guidance. During the half hour that the missile is flying, its target will have moved some 500 miles because of the rotation of the earth. If the missile is fired toward the west, the target will move 500 miles toward it during the time the missile is in the air. If the missile is fired in an easterly direction, the target will travel 500 miles away during the half hour. Automatic controls for cutting off the rocket motors at precisely the right times must be adjusted to compensate for the direction in which the missile is fired.

Another problem is that of getting the missile back down through the atmosphere intact. During the plunge to earth its nose will heat up to 5000 degrees and will glow like a meteor. The rocket could disintegrate if the nose melted or if it broke up under thermal stress. It might even ignite with the oxygen in the atmosphere and burn. To prevent any such occurrence the engineers must, in effect, design a better meteor.

One solution they have considered is a very thick nose cone. The molten metal on the surface of the nose would stream away, carrying the heat with it. The rest of the structure would remain relatively cool. Another possibility is some kind of insulation between the outer skin and the warhead itself.

Heat Affects the Air

Even the air that surrounds the missile during its plunge is affected by the heat. The molecules of air collide with so much energy that some of them are broken down into atomic form. The missile is actually surrounded by a new gas, and this could influence its trajectory.



Ehricke suggests space ship made of huge plastic bubble. Solar rays would heat liquid hydrogen to power craft

The whole re-entry problem is so vast that many agencies are studying it. The National Advisory Committee for Aeronautics, for instance, is working with a "light gas" gun in which compressed helium is used to shoot $\frac{1}{4}$ -inch projectiles at speeds of up to 10,000 miles per hour. When fired into the open air these projectiles burn white-hot from friction with the atmosphere. A larger gun now being built will propel $\frac{3}{4}$ -inch projectiles at a speed of 16,000 miles per hour. This speed will be made inside a flight-test chamber where the atmospheric density can be varied to simulate successive portions of a missile's re-entry through the atmosphere.

Space-flight studies are aiding in the design of the Atlas and, in turn, research on the long-range missile is helping solve some of the problems of space vehicles. The small terrestrial satellites to be launched in the next 18 months are only the forerunners of the larger satellites that will follow.

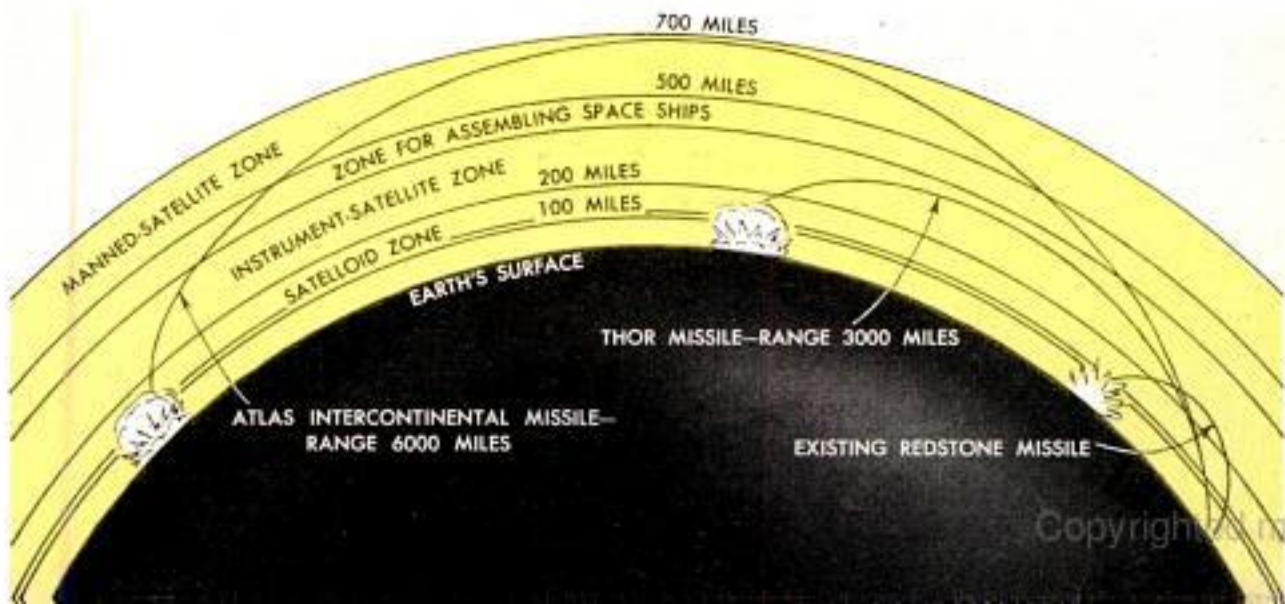
Already contemplated are noninhabited instrument satellites that will be as large as an ordinary room. These will be sent around the earth on long elliptical orbits. They will carry instruments to measure such quantities as magnetic fields in space, pressures, temperatures and the different kinds of solar radiation. All this information will be transmitted to earth by radio.

The Moon on Television

Kraft Ehricke and his fellow engineers expect that large modified instrument satellites will be able to swing close to the moon, including its other side, and will be able to transmit close-up views of the lunar surfaces to earth by television.

"Eventually noninhabited vehicles will be sent far out into interplanetary space," Ehricke predicts. "There the distances are so vast that tracking them is going to be difficult. One idea is to equip such a vehicle with a few small A-bombs that would be released and detonated at regular intervals.

Diagram shows suggested zones for various satellites, and altitudes and ranges of existing or proposed missiles



The light from these explosions would be recorded by cameras on astronomical telescopes and would show the locations of the manmade bodies.

"Probably some of the vehicles will be used as solar probes and will be aimed at the sun. Their radios will telemeter information back to earth right up to the instant when they are consumed in the sun's heat."

In all, the engineers foresee a number of different kinds of space vehicles, each type designed for a special job. The list includes satelloids, satellites, shuttle craft for transferring personnel to the satellites, automatic supply rockets from earth to the satellites and, eventually, huge bubblelike interplanetary cruisers.

"One of the first man-carrying craft may be a satelloid, not a true satellite," Ehrlicke says. "This is a low-altitude craft designed to explore the region from 20 to 100 miles up. The air there is too thin for ordinary aircraft, too dense for a satellite."

"The satelloid would be a rocket-launched hypersonic glider that would circle the earth at 17,500 miles per hour, completing an orbit every hour and a half. It would require some power for staying aloft, possibly the equivalent of five gallons of gasoline for making one revolution around the earth."

Ready for launching, the satelloid would be a three-stage rocket, with the third stage having a deltalike wing and a sealed cabin outfitted for flights of up to a week. After the first and second stages were fired and dropped, the third stage would take up its orbital path. To return to earth the satelloid would be stalled down through the atmosphere at a very high angle of attack to reduce forward speed and prevent excessive aerodynamic heating. Even so, skin temperatures of around 2000 degrees would be experienced and a multiwalled cabin would be required to keep occupants cool.

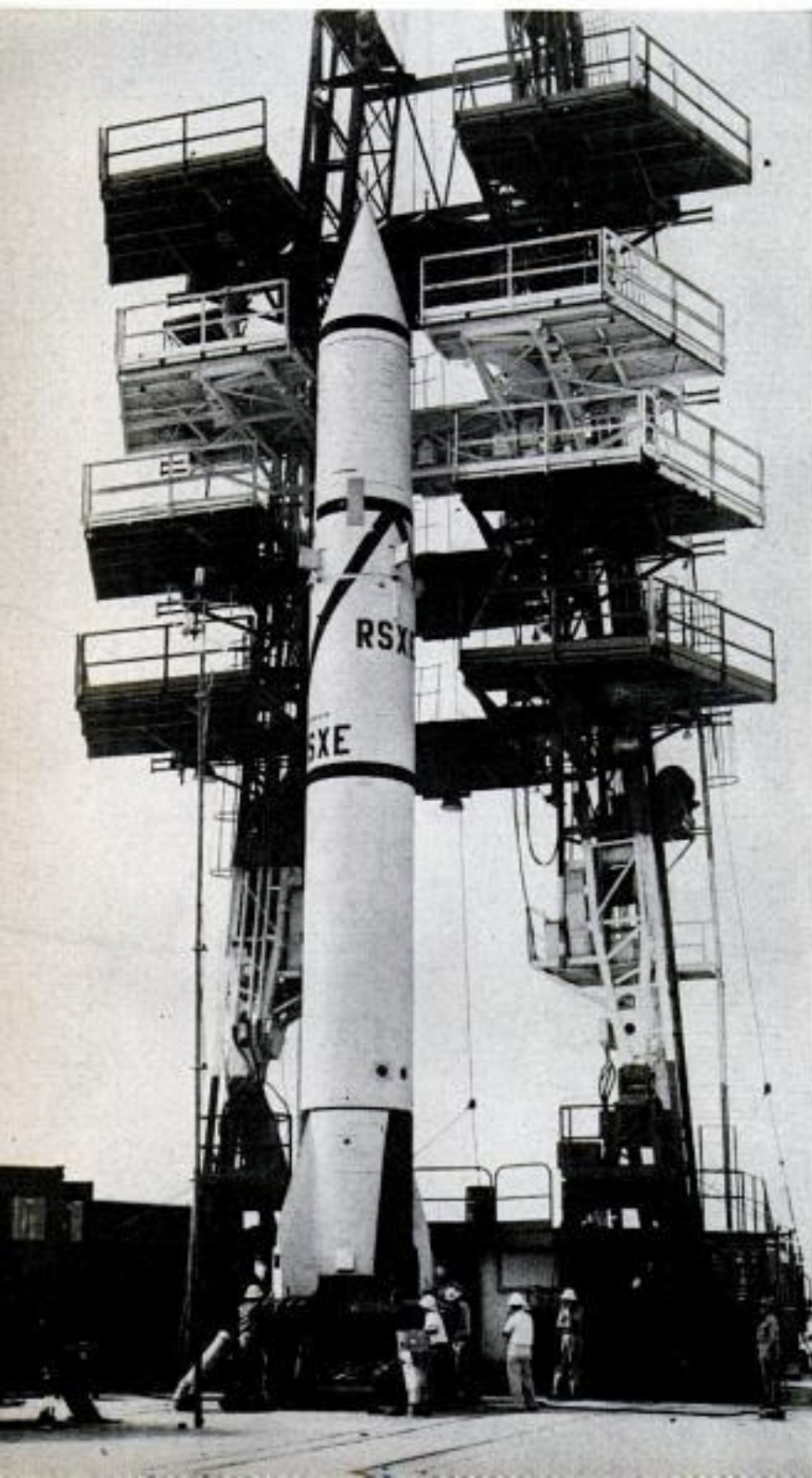
"Not only is the satelloid a useful vehicle for upper-air research," explains Ehrlicke, "it will be an ideal training ship for the crews of the somewhat similar shuttle craft that will carry personnel out to the large manned satellites stationed on orbits some 600 miles out."

Dumbbell—A Home in Space

"Today we believe these manned satellites will be smaller and simpler than previously supposed. Instead of the huge doughnutlike structures that were suggested earlier, a shape like an elongated dumbbell now seems more practicable. The satellite would be set in rotation by small rockets to provide an artificial gravity. The crew would live and work in the rooms at each end of the dumbbell and could move from one end of the structure to the other by climbing half way up the hollow stem and falling the rest of the way.

"Such a satellite would be
(Continued to page 232)

Redstone is a medium-range (several-hundred-mile) missile shown here in test stand. It is 60 feet tall, 70 inches in diameter





Scorpion's Sting Is Rockets in Wing Pods

Recently released photographs show for the first time how the Northrop F-89H Scorpion, America's most heavily armed operational fighter plane, carries its weapons. Each wing-tip pod contains three Falcon guided missiles, which are carried within the pod until firing time, then are extended. Also inside of each pod are 21 air-to-air rockets, which are fired through breakable fairings in the nose of the pods.



Sterilizer Kills Viruses of Polio

Live polio viruses being processed into vaccine are dealt a fatal blow by a mechanical sterilizer. The unit spins the vaccine into a film $\frac{1}{10,000}$ inch thick, while tubular quartz lamps inside the centrifuge kill every particle of virus with ultraviolet light. The vaccine enters a perfectly balanced 15-inch vasselike cup that spins at 1800 revolutions per minute. Centrifugal force pushes a film of the liquid up the walls of the cup to the top rim, where the liquid is drawn off by a special collector. Parke, Davis Co. applies the method.



Mobile Irrigator Depends on Wells

Water shoots from the revolving nozzle of a mobile irrigation unit to drench a circle of land 520 feet in diameter. Three of the diesel-powered units, often working day and night, furnish water to a 300-acre tomato farm near Homestead, Fla. Wells are spotted throughout the acreage. Each unit consists of a centrifugal pump and a diesel engine mounted on a truck.

← Each irrigator has a centrifugal pump and diesel engine mounted on a truck to work from a well

Cool Combine

Any farmer would envy the Cardiff brothers, Charles and John, of Katy, Tex., who ride in their combine in cool comfort. The brothers decided one day to air condition the big machine, sketched their ideas on the floor of their shop and then went to work. They enclosed the cab in aluminum and glass. The two-ton air-conditioning unit, which once had cooled an office, was installed behind the seat and cools the cab about 20 degrees below outside air.



Suspension Bridge With Single Pillar Planned in Germany

Now in the planning stages, a modernistic suspension bridge using only a single tower has been designed to extend across the Rhine River at Cologne, Germany. The tower will be built as a triangle, with the

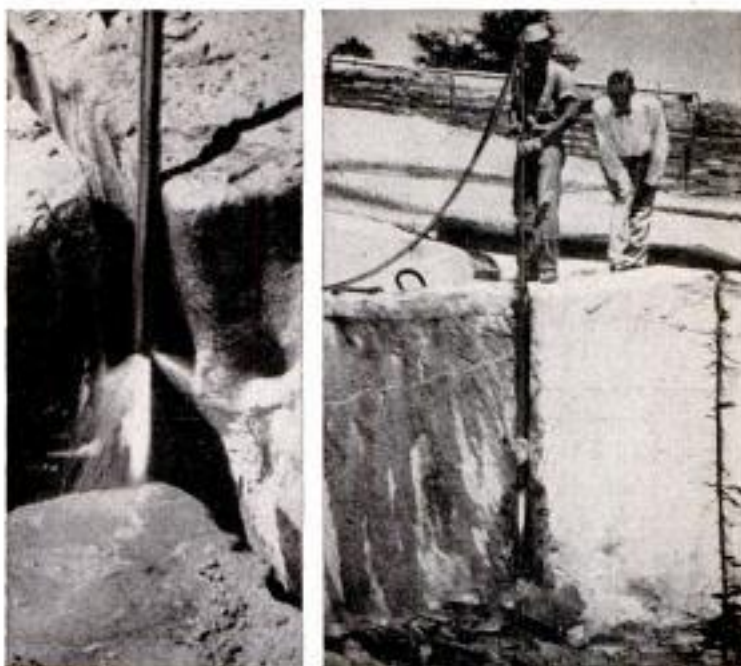
roadway suspended between the two arms which meet at the peak to support the cables. As now planned, an observation tower and a restaurant will be built into the top of the bridge pillar.



3800-Degree Oxygen-Kerosene Flame Carves Granite Blocks

Utilizing oxygen and kerosene to generate a flame of 3800 degrees, a machine for cutting granite blocks from a quarry throws hot burning gases and flame at 6000 feet per minute from a 10-foot blowpipe. Three times as fast as the old drill method used for cutting the four by eight by ten-foot blocks, the jet flame causes a thin surface layer of the granite to expand and break away from the main body as a result of thermally induced stresses. Each pass with the blowpipe flakes one quarter to one half an inch of the granite, and the harder the rock the faster the flaking takes place.

Gas and flame, thrown at 6000 feet→ per minute from a 10-foot blowpipe, cause granite flakes to break off



Subway Cars in Paris To Have Rubber Tires

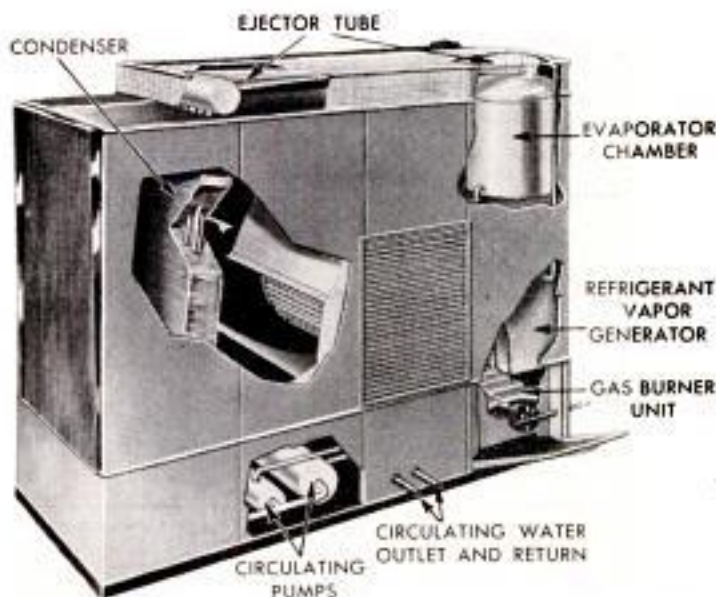
Built by the Renault Works, a subway car employs rubber tires to provide its passengers with a softer, more comfortable ride. The car is scheduled to be put into service on the Paris Metro (subway) soon.

Alcohol Slows Evaporation

Experiments in this country and abroad indicate that evaporation from reservoirs may be retarded by 50 or even 70 percent by covering the pool with a molecule-thick film of cetyl alcohol, derived from sperm oil.

Gas Air Conditioner-Heater For Air or Water Systems

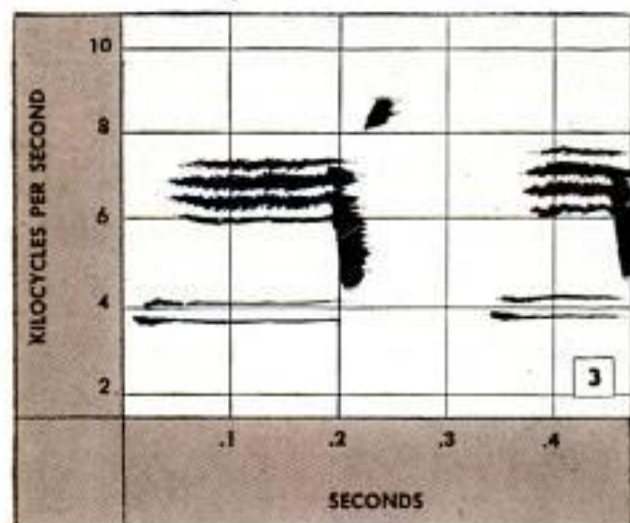
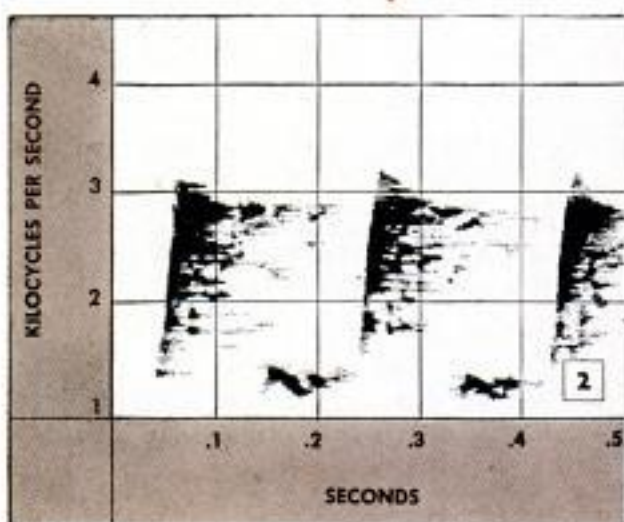
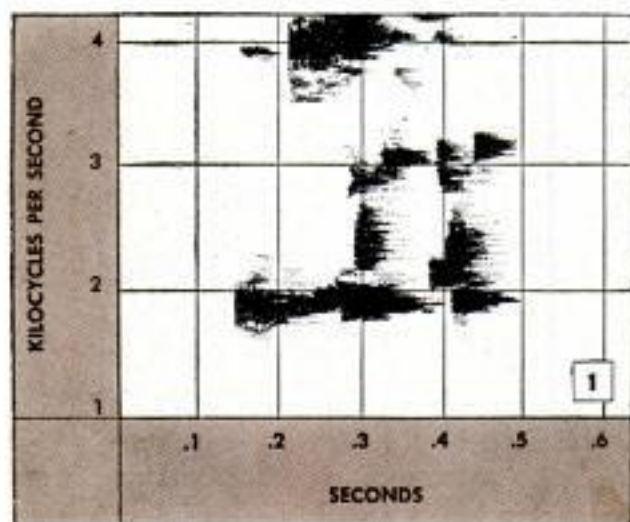
Air conditioning and heating by a gas-fired unit is being investigated for application to either new or existing warm-air or hot-water heating systems. For the warm-air heating systems, a heat-exchanger coil and blower is installed instead of a furnace arrangement. A pump circulates chilled or heated water from the evaporator chamber of the gas-fired unit to the heat-exchanger coil. For hot-water systems, old-fashioned radiators must be replaced with finned coils through which chilled or heated water is pumped. Convector fans circulate air over these coils.



BIRDS WRITE

Their Musical Score

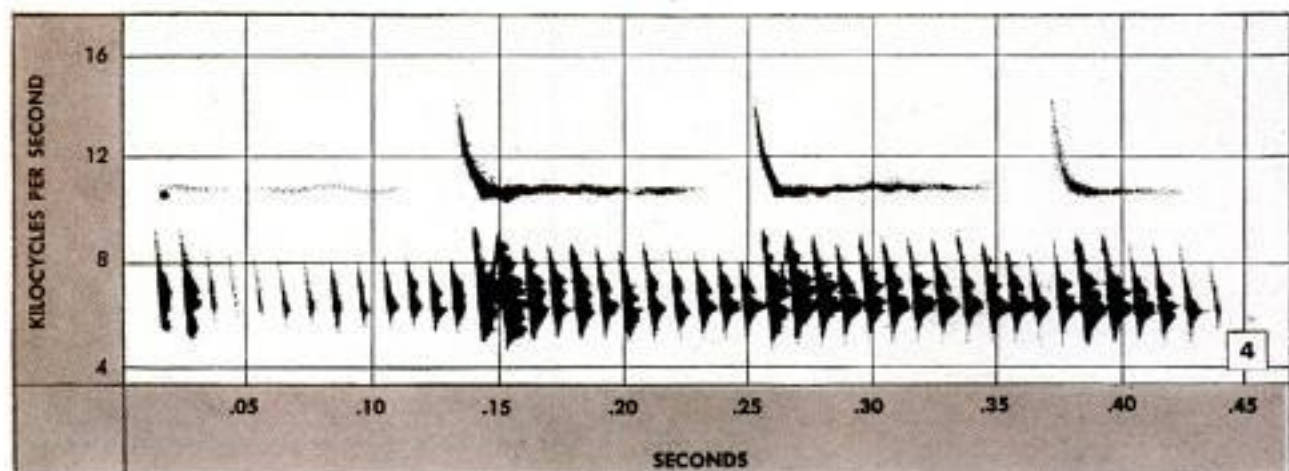
By William F. Rounds, Jr.



POETS AND NATURALISTS have tried for centuries to describe accurately the intricate sounds that birds produce. Now science has taken a hand, using the magnetic-tape recorder and a device known as the audiospectrograph as research tools. Collected data supports one conclusion—as a sound-generating instrument, a bird's throat is unparalleled in nature.

"Birds are vocal gymnasts," say Profs. Donald J. Borror and Carl R. Reese of Ohio State University. These men began

Top left, blue jay sings "squeakily." Top right, cardinal slurs note up an octave in 1/100 second. Left center, song sparrow sings eight notes at once. Below, wood thrush sings 100 pulses per second.



on Tape

studying bird songs four years ago. They used tape recordings and a new visual-research method that charts out the sounds on paper, revealing pitch and timing of each twitter with extreme accuracy. Today their campus library contains 1700 individual bird recordings and is one of the largest in the world. Represented are 200 species recorded in 12 states—ample proof that the complex song of a bird often outstrips the hearing capacity of the human listener. The visual-analysis method, first proposed in 1949 by C. E. G. Bailey, British engineer, should outmode all earlier procedures used to describe birds' vocalizing. Early techniques have included written syllables (like "to-whit to-whooo"), musical notes and line graphs—all inaccurate because they rely chiefly on the limited hearing ability of the observer.

"We soon learned that the human ear registers only a part of most bird songs," Berror says. Obviously, no means of depicting a song can be accurate if it depends on man's imperfect hearing."

The all-electronic method employs high-fidelity recordings, then sets the recorded songs down on paper in easily studied form. As "written" by the audiospectrograph, most bird music looks like a series of smudge marks. Analyzed by experts, these marks disclose in great detail all of the vocal quirks of the singers. For example, many birds have been found capable of uttering individual notes with great rapidity—100 or more per second are not uncommon. This is the rate of pulses the researchers found in a portion of the chart of a wood-thrush song. On tape, it sounds like a high-pitched buzz, but the individual notes show up distinctly on the chart.

Split-Second Timing

Containing many elements is the brief, squeaky song of the blue jay, and the graph shows that these elements are uttered with split-second timing. On the basis of his chart, the cardinal earns the title of vocal acrobat; visual examination of his song



Prof. Carl Reese (left) carries battery-operated tape recorder, as Prof. Donald Berror adjusts parabolic reflector

shows that he can slur a note upward an octave or so in $\frac{1}{1000}$ second. One of the most baffling things discovered by Berror and Reese is that a number of songsters can sing more than one note at a time. The experts have a chart of a song sparrow, recorded in Maine, in which the bird sings all parts of an octet, momentarily holding eight notes simultaneously. How this is done remains unknown.

Mockingbird Is Versatile

The mockingbird has received special attention because of his reputation as a mimic. The professors studied not only his songs but also those of the birds he imitated. One of these was a Carolina wren which, like several species, has numerous song patterns. Scientists concluded that the mockingbird reproduces not just a generalized song pattern of a species but duplicates the actual notes as sung by a particular bird. In 20 minutes of tape-recorded singing, this airborne mimic imitated 47 birds and 2 mammals!

First step in studying any bird's song is to get it on tape. The researchers make



Audiospectrograph makes a chart of a bird's song, which later will be analyzed as part of this research project at Ohio State University

Binoculars and a bird manual may be needed for identifying the songsters. Noise interference from street, rail and air traffic will be hard to escape in city areas, but noise is a problem almost anywhere. After you get a recording, play it back at half-speed and some of the intricacies of the song may become noticeable.

In the second phase of this research, visual analysis by the audiospectrograph is required. The Ohio State men use a \$2500 commercial model. Only at Cornell University and in England is similar equipment being applied to extensive bird-song research, although the audiospectrograph has

their recordings in the field, using a small battery-operated recorder easily carried on a shoulder sling. Their crystal microphone is mounted over a 24-inch aluminum parabola to make it directional. They "aim" it by listening through a headset. Occasionally, they use a 40-inch parabola set on a photographer's tripod. For good fidelity at high frequencies, they prefer a tape speed of 15 inches per second.

Recording at Home

Although Borrer and Reese may travel 50 or 60 miles through the countryside to add 2 or 3 minutes of edited tape to their library, they point out that good recordings can be made at home. If you have a tape recorder, take it into your yard or set it up near an open window, and get those early morning singers. Most true songbirds have "singing perches," locations from which they like to vocalize. A cone formed from a piece of cardboard can take the place of the parabolic reflector.

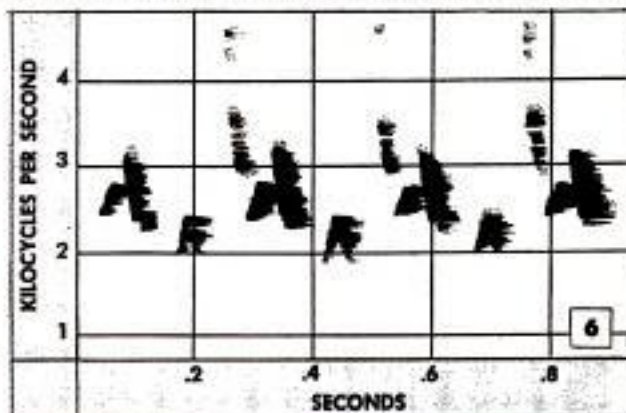
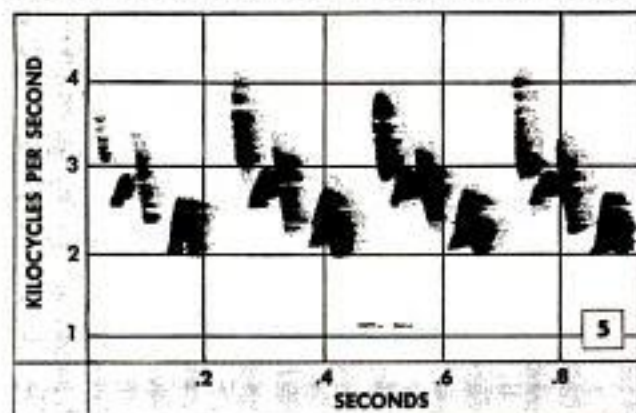
been used by engineers for years in sound analyzing and by speech experts in studying human voices. The song being studied is re-recorded on a magnetic disk in the audiospectrograph. Facsimile paper is wrapped around a cylindrical drum, which revolves as a variable-frequency oscillator "scans" the recorded signal. A marking stylus, mechanically linked to the oscillator, moves across the paper, making a mark when activated by frequencies contained in the recorded song. This results in a "sheet music" graph of the sound.

Charts Highly Accurate

These charts are highly accurate, showing pitch in cycles or kilocycles per second along the vertical axis, and time in seconds along the horizontal axis. Researchers now evaluate the singing of particular birds. Eyeing new horizons in sound, these electronic naturalists are glancing toward the ground, where insects are soon to be investigated acoustically.

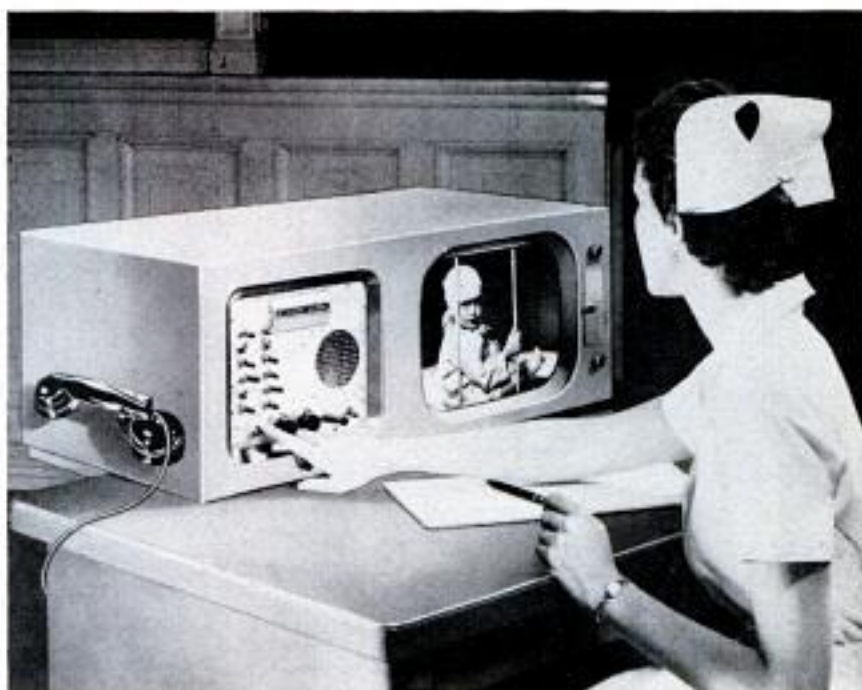
Below left, the mockingbird imitates a Carolina wren

Below right, the original Carolina wren is singing



TV Monitors Needs Of Hospital Patients

Television has come to the rescue of the over-worked hospital nurse. Now a supervisor seated before a television screen can check on a dozen or more rooms at once. Pictures from camera units installed in the rooms appear in rotation on the monitor. Pressing a switch, the nurse can hold the image and talk with a patient. When visitors come, the patient can switch off camera and speaker. If desired, patient's name and room number appear on screen.



Trussless Steel Roof Spans 31,200-Foot Area

One of the world's largest trussless steel roofs, with a clear span 120 feet wide and 260 feet long, extends over the Phoenix Coliseum, Phoenix, Ariz. Erected in 7½ days, the roof consists of curved 18-gauge galvanized corrugated steel sheets, two feet wide and from six to ten feet long, fastened together by nuts and bolts to form self-supporting arches. Eliminated is need for pillars, posts, horizontal raft braces, trusses or supports of any kind. This roof will withstand winds of more than 113 miles per hour and will not crumple under loads up to 42 pounds per square foot (equivalent to 5½ feet of snow).



Above, curved 18-gauge galvanized corrugated steel sheets are hoisted into position in trussless roof. Below left, roof spans area 120 feet wide and 260 feet long. Below right, sheets are bolted together by workers prior to final assembly in roof





"World Wonders" in Ohio

Few schoolbooks or maps show the Eiffel Tower or Pyramid of Cheops as located in Columbus, Ohio. Yet, such is the case. Side by side with these marvels are Niagara Falls and Carlsbad Caverns, the Taj Mahal, Parthenon, Grand Canyon, Leaning Tower of Pisa, the Sphinx and Trevi Fountain of Rome. These 10 "wonders" may be seen—in scale models—in an area 700 feet long and 60 feet wide outside a Columbus shoppers' mart. The project was built without blueprints and is dedicated to the education and culture of all people.



Converted Tenders

What can be done with the tenders when steam locomotives are scrapped? The Milwaukee Road came up with some answers when it converted entirely to diesel and electric power. The old tenders made a trip through the shops and emerged as snowplows, cabooses, water carriers for track-maintenance forces and fuel-oil and sand carriers. The cabooses were made by stripping the tenders to their underframes, then erecting small steel cabs. The cabooses are intended for use only around railroad terminals, not for road service. They are expected to stand up well under the buffeting of such service because of the rugged underframes of the old tenders.





Near Hominy, Okla., this polyethylene-lined storage pit contains 2200 barrels of water for oil-well use

Plastic-Lined Lake

Polyethylene-lined water-storage pits substitute for steel storage tanks during hydraulic fracturing of oil wells near Hominy, Okla. Water from these pits is combined with sand under pressure to create crevices in the oil well to improve the flow. A bulldozer excavates the pit, which is lined with plastic film up to 80 by 400 feet in area.



Intake hoses carry water to truck for blending with sand. Mixture goes to high-pressure pump trucks for transfer to oil well

Polyethylene-lined pits may replace steel tanks such as those at left holding 21,000 gallons of water

Courtesy of Dowell Incorporated



NEAL BEAR RUNS A

HOUSE OF



Neal Bear operates the master intercom-station switch in the communications center located in his kitchen

By **Walter E. Burton**

WHEN HE DRILLED for water in his yard and struck gas at 300 feet, Neal Bear started a series of events that resulted in two more electronic systems for his already thoroughly electrified home. If you were looking for a practical example of how push buttons and electronics can work wonders in everyday living, you would need go no farther than this house, which nestles in a wooded valley about halfway between Akron and Cleveland, Ohio. It probably contains more wire, switches, and relays, and a greater complexity of electrical circuits, than almost any score of conventional homes lumped together—circuits which are used for lighting, entertaining, protecting, controlling, communicating, testing and laborsaving purposes.

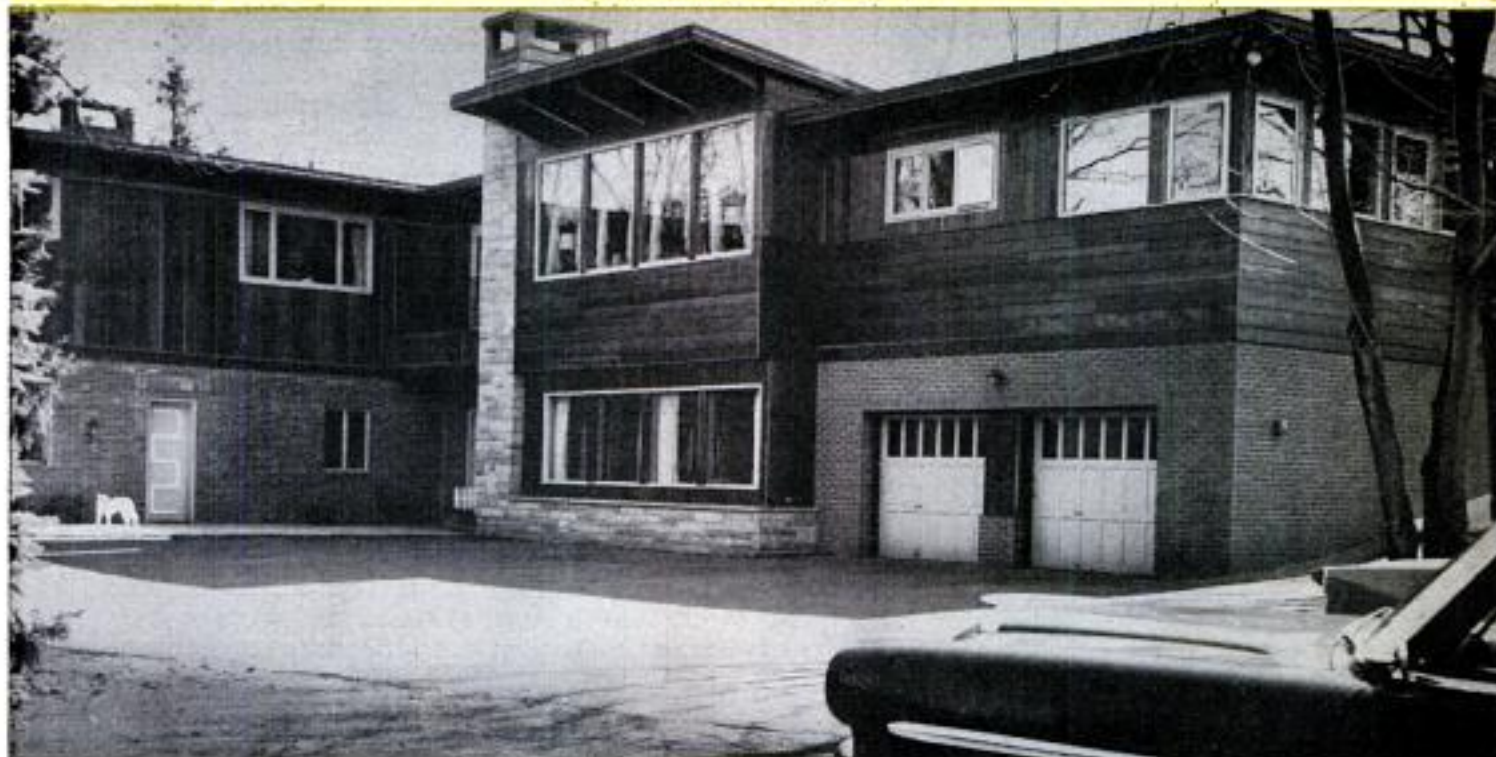
The house evolved into its present state of electrification within a decade. Bear, a manufacturers' representative specializing in electronic equipment, used to have his headquarters in a downtown Cleveland building. Some years ago he got the idea that he might be able to conduct his work from his home in the country, so he erected a small work building between house and garage. The idea proved sound and soon it became necessary to provide more space. He combined the three units into one and

built additions, ending with a sizable two-story house. The first-floor level is devoted to work areas for himself and several others, and the second floor is occupied by living quarters. On a hill near the house is a tenant building that started out as a tower for testing television equipment and working out problems of TV reception.

Well Drillers Get Surprise

After the well drillers struck gas instead of water, Bear learned that there were other shallow gas wells in the vicinity that had been producing for many years. He piped the gas to the boiler of his hot-water heating system. This looked like an easy way to solve the fuel problem—but difficulties developed. A heavy rain came, choked off the gas supply and it turned out that water entered the well at the 290-foot level whenever there was a severe or prolonged rain or melting of much snow. When the weight of the water column in the pipe exceeded the 55-pound pressure of the gas, the gas flow stopped and Bear's house went heatless. If service was to be restored immediately without waiting for natural draining of the well, it was necessary to bail out the well, a tedious job through the 2-inch pipe.

ELECTRIC NERVES



One of several floodlighting units is visible at the corner of the Bear house (upper right) above the garage

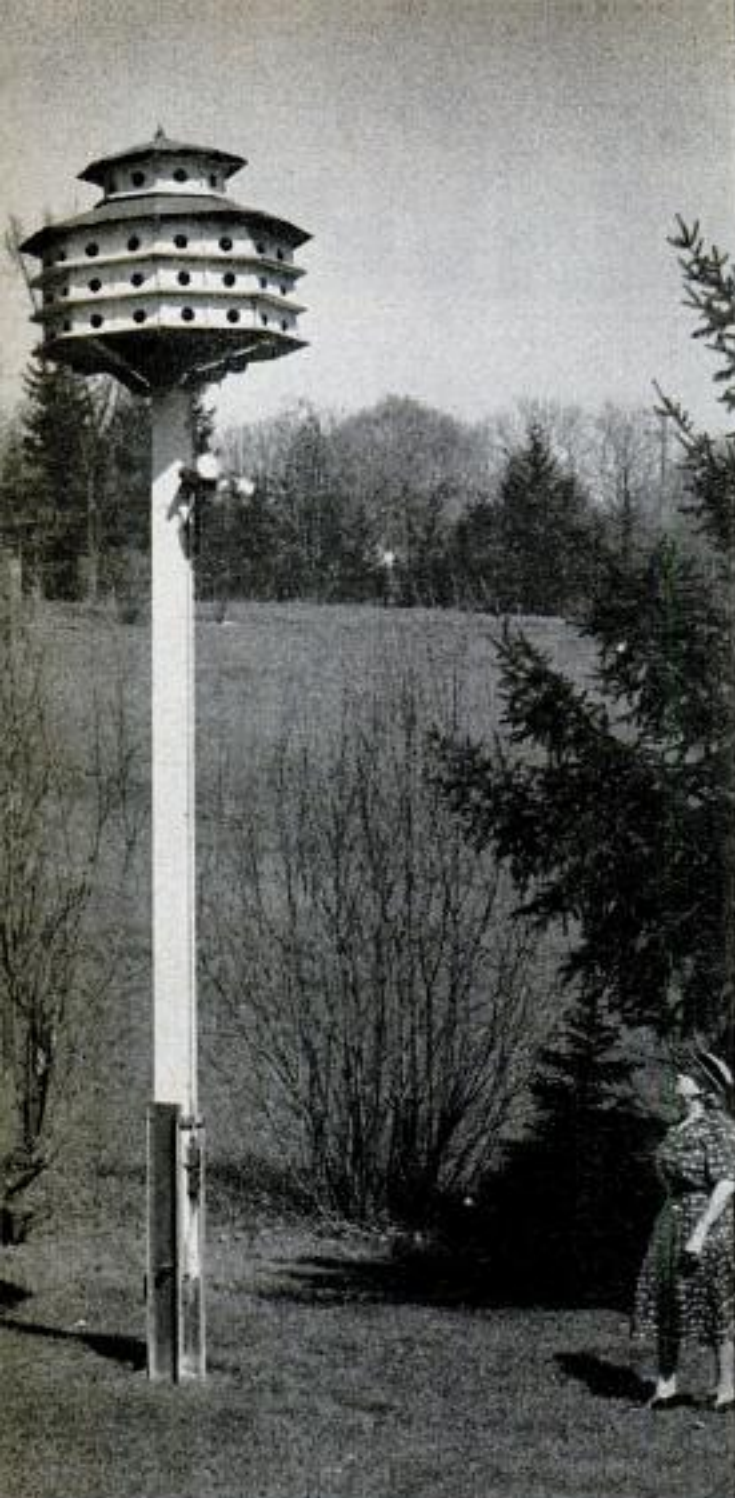
To prevent prolonged heating-plant shut-downs during his absence, Bear installed a conventional oil burner in the center of the fire pot. In the line feeding the gas burner, which encircles the oil unit, he placed a "sensing" valve that responds to small changes in gas pressure. When the furnace water-jacket temperature falls enough to operate a thermostat, this valve measures the gas pressure and feeds its finding into an electronic circuit. If the gas pressure is adequate, the circuit operates controls that turn on the gas burner; but if the pressure has fallen below the minimum point for proper operation, the circuit disconnects the gas burner and turns on the oil unit. Thus there always is heat, whether from gas or oil. In a heating season, the boiler operates about 80 percent of the time on gas, Bear says.

Electric Eye Watches Soot

This, however, did not end his heating-system control problems. He found that, with the two types of burners working in the same firebox, the flame sometimes would contain an excess of carbon, causing heavy soot deposits and resulting loss of heating efficiency. He solved this with another tailor-made electronic system. In the front of the firebox, he drilled a hole and inserted a metal tube finned on the outside

for cooling and equipped with a head containing a photoelectric cell protected from products of combustion by a window of heat-resisting glass. This cell is connected into a circuit that merely stands by so long as light from the furnace flame reaches the cell. But if excessive soot blocks the passage of light through the tube and glass while the burner is operating, the photocell circuit shuts down the furnace completely and rings a bell. Operation is restored after cleaning out the soot and adjusting the burner for proper mixture. With these two electric systems, plus six heating-zone thermostats each controlling a water-circulating pump and a main thermostat regulating burner operation with respect to water-jacket temperature, Bear's heating plant is well equipped to run itself with almost no attention. Routine maintenance includes lubrication of the pump motors, and here Bear uses a system that many other homeowners might copy with profit. He has, in the boiler room, a chart on which every lubrication date is noted, so that no motor is likely to go unoiled.

The complexity and much of the cost of Neal Bear's house are not apparent to anyone merely walking through it, for the wiring and many of the relays and other electrical devices used in the numerous circuits are concealed from normal view.



Above, on this birdhouse pole are mounted floodlights and an intercom unit to serve a lawn area. Below, the terminal board can be swung down to provide access to wires behind it for a major circuit change



A feature of the building is a crawl space, of 2½ feet minimum height, which runs, somewhat like an intermediate floor, between first and second stories. In its chief function, it might be likened to the spinal column of a highly developed organism. Through this space run the wires, ducts and pipes of the building's electrical, heating, air-conditioning and plumbing systems. This crawl space, all parts of which are accessible and can be well-lighted by touching switches, simplified the original installing of the facilities and it makes easy any necessary repairs and modifications.

Lights Have Remote Control

Shortly after Bear built his original home in the valley, he installed several outdoor lights controlled remotely by low-voltage relays. In such an arrangement, all switches are connected directly only to 24-volt circuits by wires much like those used in doorbell and chime systems. These circuits control relays that switch the 120-volt lamps and other equipment on and off. The relay system, relatively new when Bear first tried it, proved so convenient that, when he began plans for expansion, he decided to use it throughout his home.

It took him a month to work out the remote-control-lighting and outlet circuits for the entire house. They were designed for extreme flexibility. For example, his plans called for nine outdoor-lighting circuits — lamps to illuminate drives, floodlight the buildings and even a group on a birdhouse pole to light a lawn area. All these lights were to be controlled from six exterior doors in the main house and two in the building that is now the tenant house. These control stations must be capable of turning any one circuit, any group, or all of them on and off. The indoor circuits he planned were even more intricate.

When Bear had completed his wiring diagrams, he discovered that contractors would have nothing to with them. Too complex, they said—and cost of doing the work would have been prohibitive. So Bear persuaded his oldest son, Barton, to leave his electronics work in Toledo for four months and supervise electricians installing the wiring.

At practically every doorway and at some points in between, there are groups of push-button switches. In the remote-control system of wiring, each switch is a momentary-contact type requiring only a light pressure to operate it. Ceiling lights and base outlets of each downstairs room are controlled simultaneously by a single switch. This is to prevent plugged-in devices from being left connected overnight.



Radio, phonograph, tape and microphone sound are piped from this music panel to main and tenant houses

These outlet and ceiling-light circuits are so wired that a short circuit in one will not interrupt the other.

In a typical three-button doorway-switch installation, one button controls lights and outlets of the room in which the switch is located, another button controls those in the next room to the right, and a third controls those to the left. When there is no left or right-hand choice, only two buttons are needed. At each exterior door is another push-button switch combined with a knob adjustable to nine positions. This unit controls the nine outdoor-lighting circuits, one at a time or, at a twirl of the knob, all together. At some entry doors a third switch is used to control lights in other nearby rooms.

In the second-floor living area a similar switching arrangement is used, but base outlets are on separate switches. One button near each door controls ceiling lights and another handles base outlets of the room in which the switches are located, and a third button controls lights in the room being entered. Two plug-in receptacles in each outlet are switch-operated, one is unswitched so it can be used for continuously operating clocks or various appliances.

The house has an intercom system whose two dozen stations make it as complete as the telephone service in a small community. One important function is to keep track of Bear's younger sons and their playmates. One microphone-speaker is mounted on a birdhouse standard in the east lawn, another in a play yard on a hill behind the main house, still another by a creek that runs through the property, and so on. The children are trained to answer

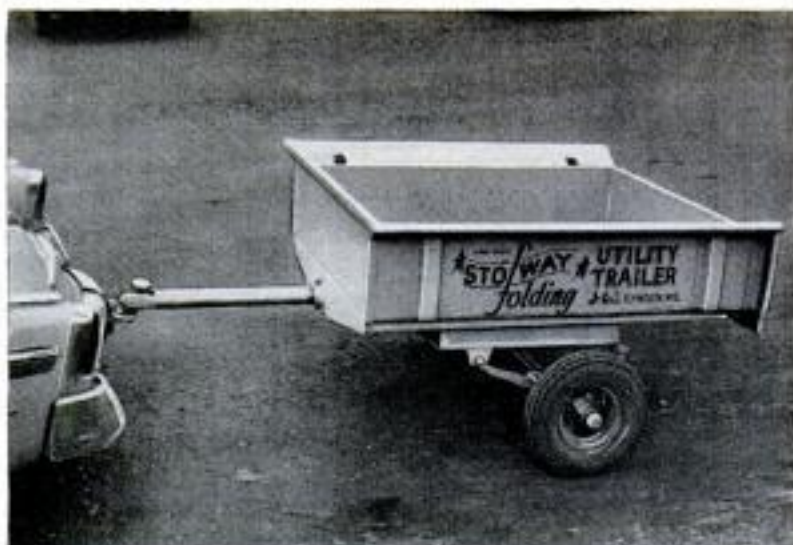
any call that is sent out for them. At night, when the Bears are out, the occupants of the tenant house can check on the children merely by flipping a switch and eavesdropping through bedroom intercom units.

Intercom on Mailbox

An intercom speaker-microphone mounted on the mailbox standard beside the highway operates in conjunction with a colored-light signal system that has proved to be one of the most useful of Bear's electric gadgets. A green light informs the school-bus driver that no one will be coming to board his vehicle at the Bear drive that morning, so he does not stop. When the red light burns, one of Bear's employees, whose morning chore is to drive to a Cleveland-Akron highway to meet a bus bringing other employees, stops at the mailbox and, over the intercom, inquires about special instructions. Maybe the people came from the bus stop by other means, or something is needed from a store.

Signals at the mailbox can be operated from a main control station in the kitchen. This center also includes a master unit of the intercom system and a special telephone-switching arrangement. There are several telephone lines coming into the property, many of which are used for daytime calls. At night, when the family does not want to be bothered with nonpersonal calls, a flick of a switch disconnects all the daytime phones. While someone attempting to call on these lines hears a normal ring, the Bears hear nothing. The regular residence phone remains operative. On special occasions, as when a guest is expecting a call from his home, one of the

(Continued to page 254)



Utility Trailer Can Fold for Storage Like an Ironing Board

Storage space for a utility trailer is reduced to a minimum by a model that folds like an ironing board. The box of this trailer is mounted on a frame which slides backward for the storage operation. Two

choices are available, one in which the sides of the trailer box fold, and one in which they do not fold. These units are for farmers, contractors, field workers and families who need a trailer for vacation.

Portable Railroad-Cargo Carrier

Railroad freight-car bodies made of plastic fasten to lightweight flatcars for transport on the Rock Island Line. Fork lifts or cranes later transfer these demountable cargo carriers to loading docks or flatbed trailer trucks. Refrigerator cars have special adhesive bonding seals at



the joints and are cooled by a thermostatically controlled dry-ice circulating system. Other demountable cargo carriers include closed-box units, open-top gondolas, covered hoppers, tank-car sections, flat-bed pallets for carrying steel, and automobile carriers.

KEEPING UP WITH THE ATOM

EVEN THE SIMPLE flashlight may become something far different in the age of the atom. Atomic flashlights now are producing light which will last for 12 years or more without batteries or external power sources. The flashlight contains radioactive chemicals which give off light. Various chemicals produce white, green, yellow or blue light. The lights are designed to illuminate map boards, instrument dials, diving-gear markings and emergency direction signs in buildings.

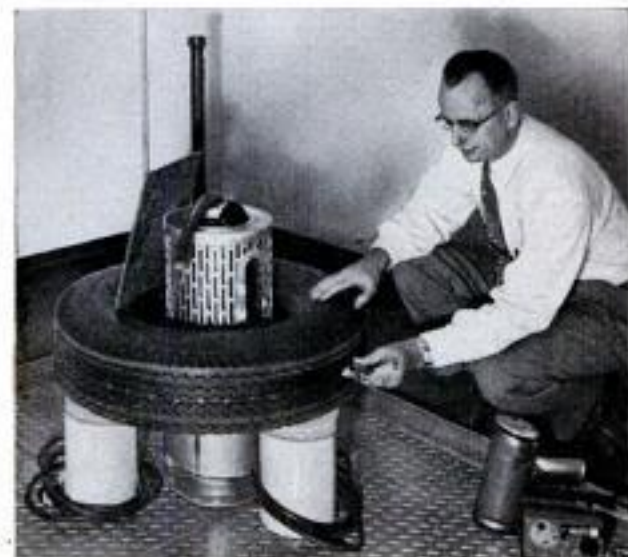
☆☆☆

NOW IT SEEMS to be only a matter of time, brains and dollars until scientists tame the power of hydrogen bombs for peaceful use.

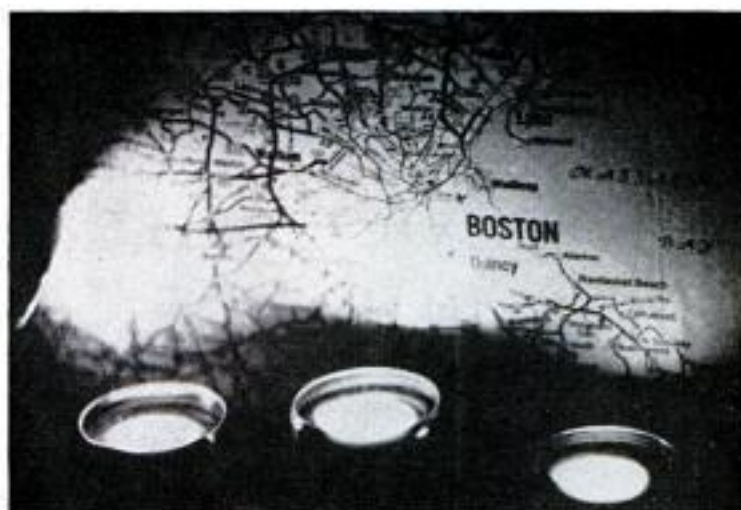
Scientists both here and in Russia seem to be lifting the curtain of secrecy just enough to show progress in the search for power from fusion reactions. The basic problem is one of confining heat. To wrest power from fusion, it is necessary to heat a nuclear fuel to a temperature of 100,000,000 degrees or more and confine it long enough for fusion to take place.

One suggested answer is use of a magnetic field as a container for the reaction.

The code name for the United States research program in this field is Project Sherwood. It seems destined to become even more famous than the Manhattan Project, which first achieved a chain reaction and produced the atom bomb.



MARCH 1957



Early next year work will be started on what is claimed to be the world's largest atomic-power station, at Hunterston, near Glasgow, Scotland. Costing some \$98,000,000, it will begin generating 360,000 kilowatts of electric power by 1961. Twin reactors with 500 tons of natural uranium metal will provide the power. The atomic-power station is expected to save about one million tons of coal per year.

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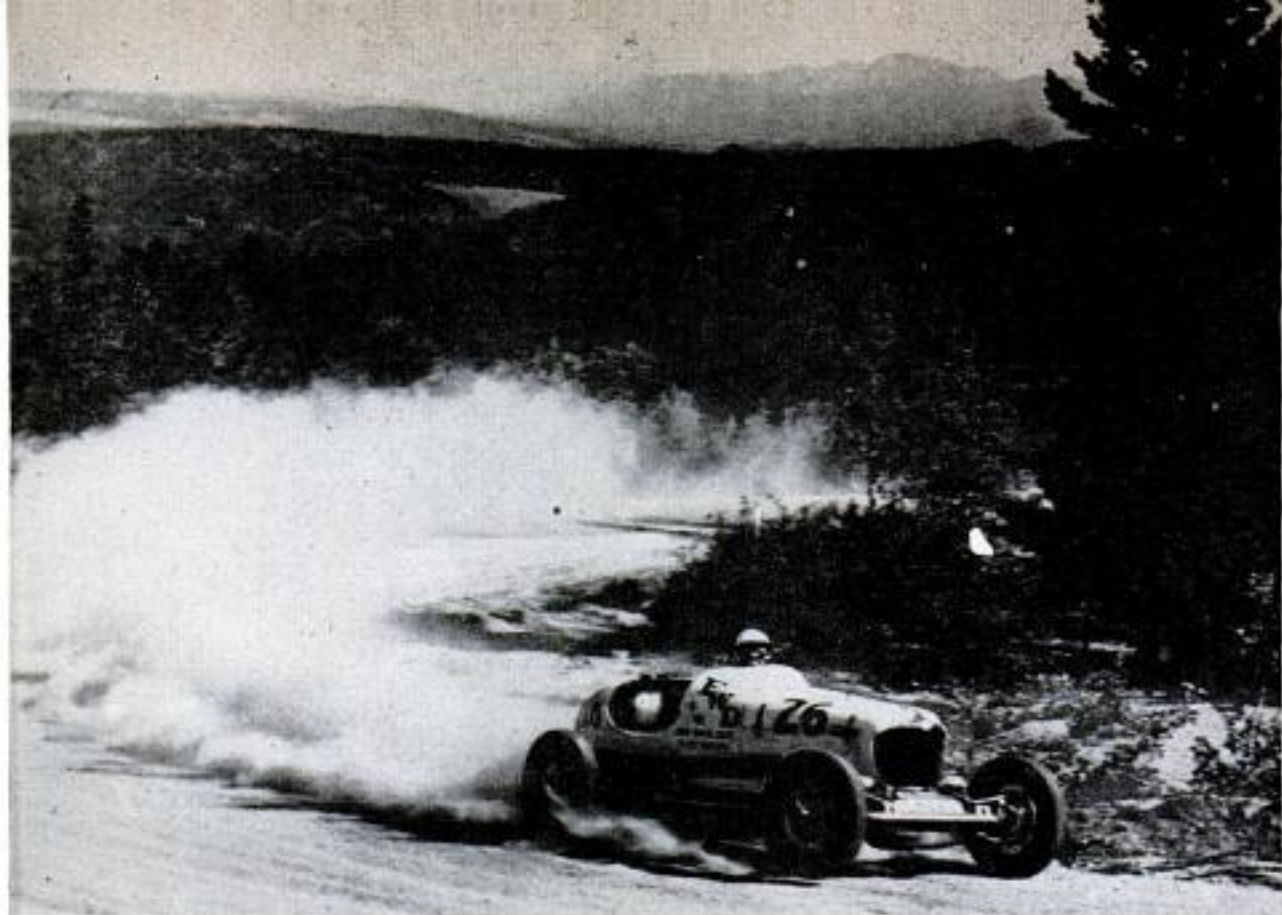
RESEARCH APPARENTLY is under way to solve some of the detailed problems of building the atom plane. Admiral Corporation recently announced a research program to determine the effect of radioactivity on electronic gear of the type required by aircraft. Now Goodyear has built a new laboratory—the first of its kind in the rubber industry—to find out the precise effects of radiation on rubber. In announcing the laboratory, the company stated that "one of the more important projects contemplated is development of radiation-resistant airplane tires which could be used on atomic-powered aircraft of the future."

The Goodyear facility has a heavily shielded area known as the "cave" for housing the radioactive source, which is cobalt 60. This source is raised from the bottom of a 17-foot well into the center of the cave. It can be raised right up through the center of a tire. After the tire has been exposed to the high-energy gamma rays, it is inspected for damage. Rubber is particularly susceptible to radiation damage.

The laboratory also will be used to investigate the vulcanization of rubber and improvement of plastics by irradiation.

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Cornell Aero Lab photos

Milliken is no armchair scientist. Here's a shot of him speeding up Pikes Peak in a four-wheel-drive racer

William F. Milliken is "Mr. Safety" of the Cornell Aeronautical Laboratories. At home in airplane or racing car, he is working toward this goal:

YOU CAN HAVE SPEED WITH SAFETY



By William Gilman



Left, Cornell Lab's Bill Milliken, is as much at home in a jet airplane as in a fast car. At right is the "rubber airplane" he helped develop to provide a way of pretesting flight characteristics before the new design is built. It is all done by electronic controls



Knobs in front of pilot give plane differing characteristics, making it feel longer, stubbier, wider-tailed

DRIVING THE highways near the Buffalo airport is an odd-looking version of the tail that wags the dog. It's a truck that took two years and \$140,000 to build. Its function? Simply to tow a wheel properly in the safety testing of new tires.

The tester fills an old need. While engineers have added power and beauty to the modern car, Cornell Aeronautical Laboratory engineers felt too little was known

about what actually goes on at the wheels. It is there that, among other things, tire traction fights centrifugal forces when a car screeches around a curve.

The truck's cost is due to complicated electronic instrumentation and safeguards for accuracy. Its towed wheel can be set for different slip angles and cambers. Electronic pickups measure the various forces on tire and axle and relay them to recorders.

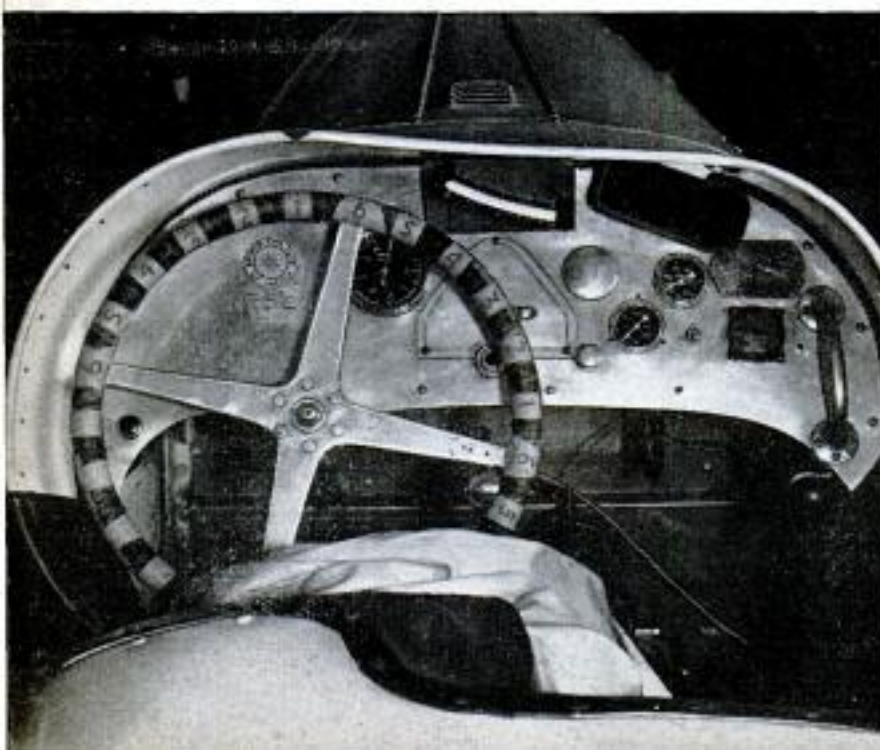
Several tiremakers have tried, unsuccessfully, to buy this rig. However, C.A.L. allows them to take turns using it when it's not needed for testing plane tires (actually it was designed for the Air Force).

How to travel fast with safety is the





Above, four-wheel-drive racing car driven by Milliken has its tachometer mounted over the engine so driver can read it without lowering his eyes dangerously. Below, another of his cars is filled with special instrumentation to measure its stability



chief goal at this research laboratory which Cornell University took over from Curtiss-Wright in 1944 and now runs on a nonprofit basis. That's why experts in its Flight Research department see nothing odd about testing ideas for both the planes and cars of tomorrow.

They're headed by William F. Milliken, a fast-thinking aeronautical engineer who is right at home in racing cars. He is a pioneer in the modern sports-car era in America. "Milliken's Corner" at Watkins Glen, N. Y., is named after a rollover he survived in the first running of the Grand Prix.

But accidents haven't slowed his pace. His current enthusiasm is a special four-wheel-drive job that he races. Powered by the engine from a light tank, it accelerates in 12 seconds from standstill to 138 miles per hour.

However, Milliken points out that not merely speed, but *safe* speed is his business and hobby both. A few years ago, he began parking and rebuilding his racing cars at C.A.L.'s hangar. Out of that grew Flight Research's automotive section where engineers are as interested in why a car skids on wet pavement as in why a plane goes into a tailspin.

The air world knows Milliken for his big specialty—stability and control. His first tussle with these factors came when he was a high-school youngster in Old Town, Me. That's when he cracked up in his homemade airplane powered by a motorcycle engine.

He knew *how* it happened, but didn't start finding out *why* until he was taught the theories of stability and control at the Massachusetts Institute of Technology. From there, he went into practical aviation. He became chief test engineer on those risky first flights of such early big bombers as the B17 and B29.

It took years of engineering experience to evolve his "rubber airplane" idea for improving test flying. Before coming to Buffalo, Milliken had worked with the hush-hush XP79, an all-magnesium jet fighter that was abandoned after killing its test pilot.

Such tragedies had convinced him that the basics of plane design ought to be dug into deeper. He



Photographer snapped Milliken at start of his rollover in the Watkins Glen race. Safety belt saved his life

wanted a variable-stability plane whose flying characteristics could be changed in mid-air.

The "rubber plane" he worked out with colleagues at C.A.L. accomplishes this. It takes new-plane ideas up for test without the need for building such planes or risking test crews in them.

Engineers point out this helps solve aviation's oldest problem. Ever since Orville Wright's first flight, in which he complained of rudder troubles, designers of new planes

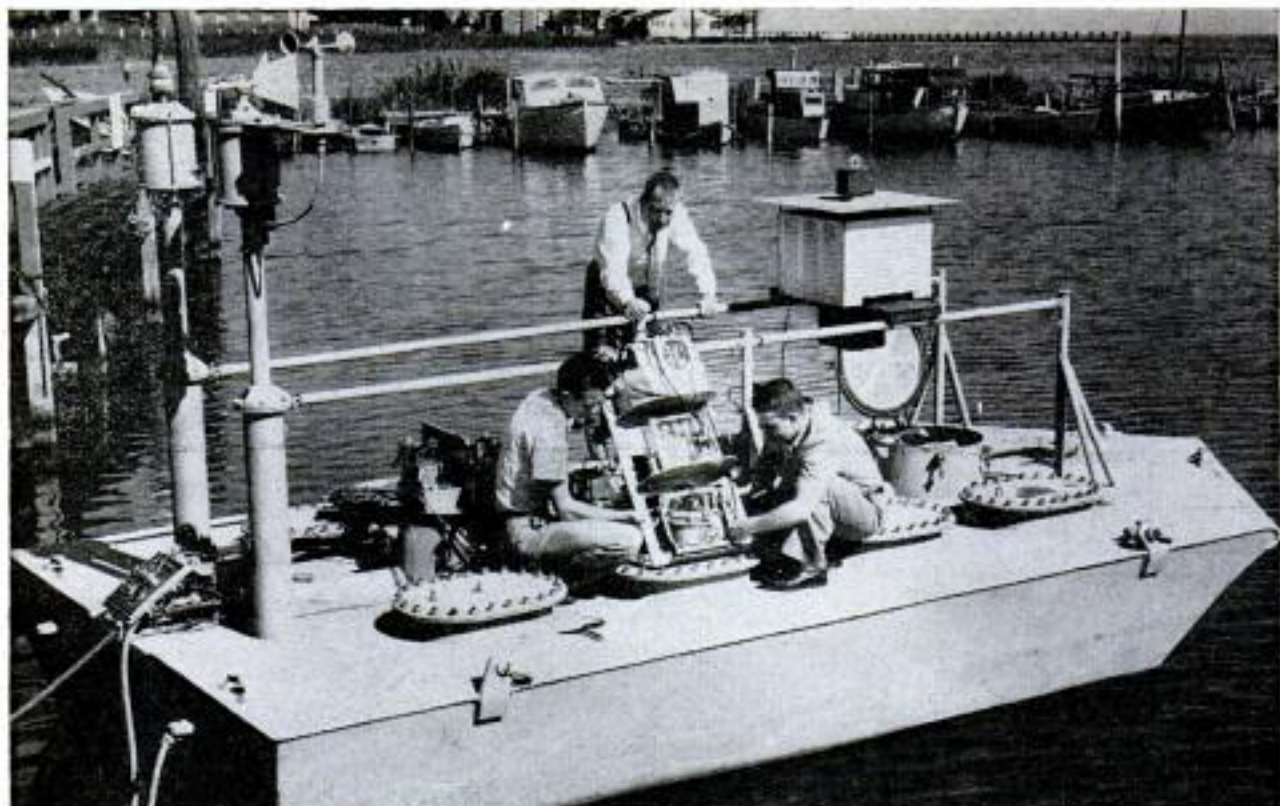
have been fighting the problems of pitching, sideslip, rolling and yawing.

C.A.L.'s quick-change planes use a servo-mechanism solution for the old problem. The trick is done by a "little black box"

(Continued to page 248)



Here's the back end of the \$140,000 tire-testing truck. Mechanic puts needle into tire to get temperature reading. With this rig, much is being learned about wheel stability

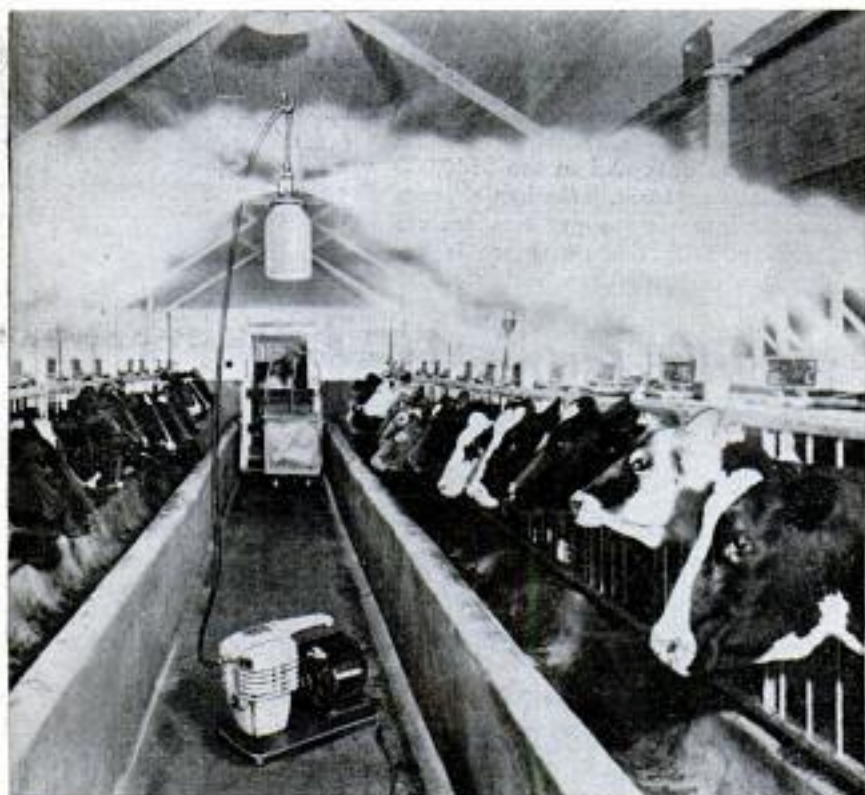


With an 800-mile radio range, this buoy will broadcast periodic information on local marine-weather conditions

Automatic Weather Station Broadcasts Data From Remote Buoy

Local marine-weather data is regularly reported by radio apparatus in a buoy that can be anchored in remote areas and left unattended up to six months. At intervals daily the station broadcasts in code the exact air temperature, water temperature, barometric pressure and wind speed and

direction. Tests show the station to have a radio range of more than 800 miles. Developed by the National Bureau of Standards, this automatic unit is 20 feet by 10 feet in area. It is made of aluminum and other nonmagnetic alloys and can be anchored in waters as deep as 3600 feet.



Suspended Sprayer Kills Barn Flies

Farmers can rid their dairy barns of flies automatically, without endangering their livestock, by using a spraying unit that fills the barn with a fog of insecticide vapor. Spraying lasts only five minutes. Insecticide is ejected in a mist from the nozzles of a half-gallon plastic bottle suspended from the ceiling. Air pressure to operate the fogging bottle comes from an air compressor that can be purchased with the unit. Any $\frac{1}{4}$ -horsepower electric motor can be used to power the compressor, which is adaptable for paint spraying and similar work.



World's Largest Dump Trailer Can Carry 100 Cubic Yards

Built to carry coal down mountainsides in West Virginia, a hopper dump trailer will convey more than 100 cubic yards. Towed by a special tractor, the trailer has

a struck level of 95 cubic yards of coal and carries more when heaped. The unit weighs 100,000 pounds when empty and is nearly 70 feet long.

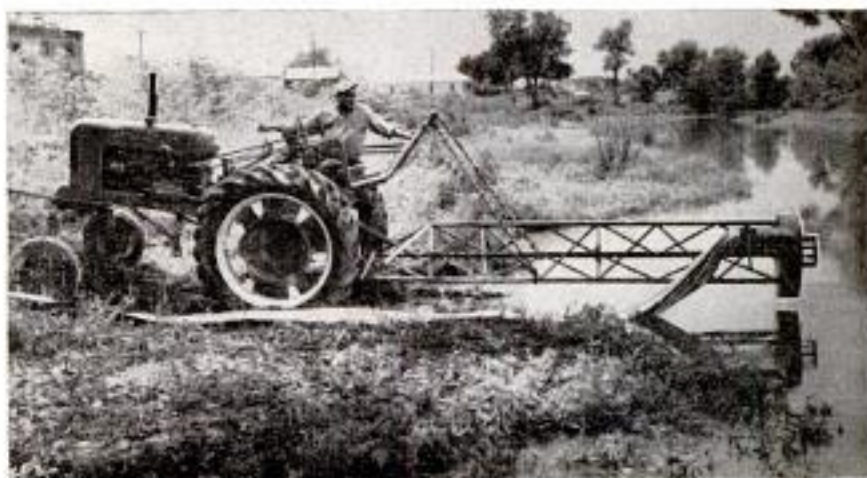


Camera Features Three Film Cases

Interchangeable film cases are featured on a small German camera that permits use of color film for one shot, fast black-and-white for the next and slow black-and-white for the third shot. Replacement of the case can be made in a moment. Three film cases suitable for any kind of film are included with each AD-GX 300, made by the Dr. Schleussner Works in Frankfurt, Germany.

Tractor Furnishes Water By Boom-Mounted Irrigation Pump

Enough liquid to cover $4\frac{1}{2}$ acres hourly with an inch of water is furnished by an irrigation pump boom-mounted on a tractor. Operated from the tractor's power take-off, the unit works by backing the tractor to a water source, clamping a plastic tubing to a discharge outlet and submersing the pump. A 12-foot boom enables the operator to work from steep banks.



Tap the Hillside for WATER



By Leland Elam

THE OLD FARMER who hauled water instead of drilling a well supposedly said, "Water is closer sideways than it is straight down." California farmers who live in areas such as the foothills along the Coast Range Mountains know the statement is true.

Many a Western farmer has taken a tip from the old-timer's remark and is now taking water out of a hillside through a horizontal well. The method was developed after World War II. Farmers get the water from what they call "perched water levels" by drilling a hole into a hillside, sloping it slightly upward so the water will drain down.

Although these wells are not gushers, in many places they produce enough water to turn dry-land ranches into good dairy ranches with irrigated pastures.

These horizontal wells can never be plugged. The pressure that builds up blows out any plug yet devised, so they flow all the time. Some wells produce a trickle, others up to 100 gallons per minute. Most flow at the rate of 30 to 50 gallons per minute.

One feature the farmer likes is that it takes no power to keep the water flowing.

Roland Matteri in Sonoma County is using several hillside wells to good advantage. In 1946 this farmer, who had been operating his ranch as a dry-land pasture for beef cattle because there was not even a flowing spring on the property, heard about horizontal drilling for water.

He drilled several wells into the hillsides and got enough water to start a milking herd of 60 cows. He expanded to 100 head in 1949 and 162 in 1952. Besides watering the cows and giving water for use in the milkhouse, the hillside wells feed into a storage reservoir which irrigates 40 acres of pasture.

Another example is seen on the Bert Allenby ranch in Napa County. It cost him just \$200 to slant a 100-foot well into the hillside to get enough flow to keep a reservoir full so a 500-acre livestock and fruit ranch could be improved.

The farmer has to use these hillside wells because water is not available from any other source.

In many of these lower mountain and foothill areas the farmers have found it impossible to drill straight down and find water, for under the soil there is a blue rock which is simply too thick to drill through.

Such a rock formation prevents farmers from drilling straight down for water except in a few instances where they do find faults in the rock or find it is shallow in depth. Farmers have had to depend on springs and rainwater caught in reservoirs during the summer, or get along without water.

When a farmer has a spring on his ranch which gives water, or which used to give water but has closed up over a period of years, he usually has a good site for a hillside well. If there is no spring on his property, a scout goes up in an airplane and flies over the ranch. From the air he can spot where the vegetation is the greenest. Such a green spot generally will produce a flow of water when drilled.

Horizontal rigs are used to drill the wells. A gasoline engine powers a two-inch drilling bit. The bit is mounted on the end of a one-inch pipe, and as the drill digs into the hillside more pipe is added.

The bit has a hole in the center so that water can be forced through it by a pump to flush out the borings. Water is brought to the scene in tank trucks.

Two hundred feet of drilling is seldom more than a day's work, for in most cases rock is not encountered because drilling is above the blue stone.

Once the water is flowing freely a length of two-inch pipe can be driven into the hole to eliminate cave-ins. ★ ★ ★



Flow is continuous from hillside wells, which can't be capped because of the high pressure. Below, workmen fasten pipe extension on drill bit

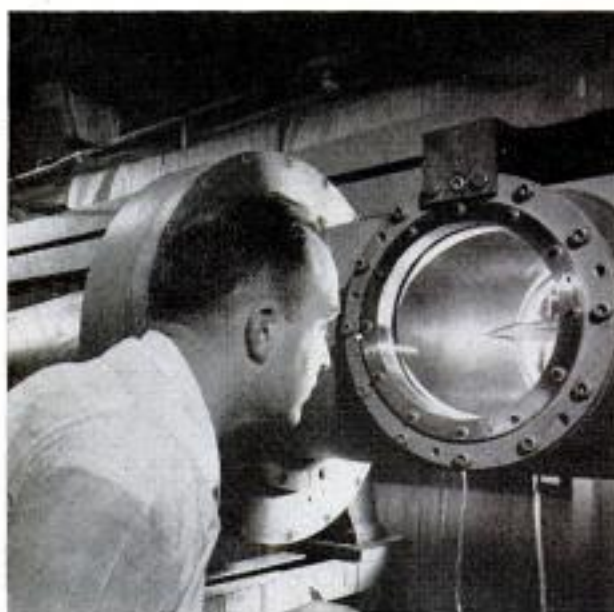




German-Built Diesel Coaches Cut 1½ Days From Mountain Trip

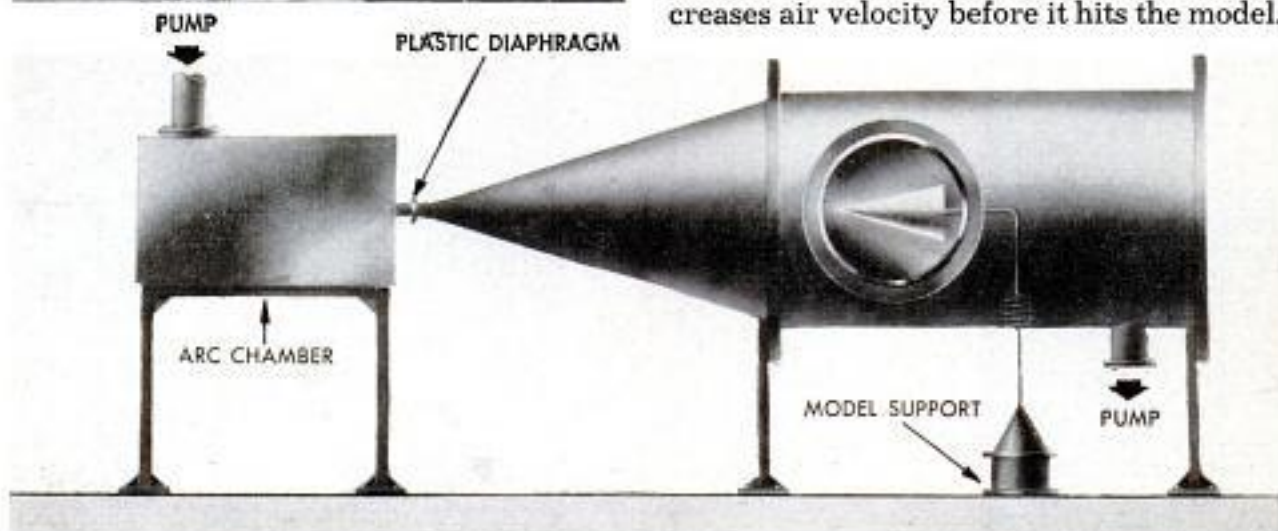
German-built twin diesel rail coaches have reduced travel time on the mountainous, 280-mile Guayaquil-Quito run in Ecuador from two days to 10½ hours. When six coaches being built in Western Ger-

many arrive to supplement four coaches now in service, the trip will be scheduled daily. Each coach has a snack bar and can seat 36 passengers. The hostess, engineer and his assistant form the crew.



Hypersonic Wind Tunnel

Long-range missile and aircraft models, mounted in a 16-inch-diameter hypersonic wind tunnel, "fly" 11,000 miles per hour in 15,000-degree heat under 20,000 pounds' pressure per square inch. Operated by the U. S. Air Force in Tullahoma, Tenn., the tunnel's 1/100-second flights, photographed at high speed, may solve the problem of destructive heat met by ballistic bodies re-entering the earth's atmosphere after outer-space flight. Air is pumped into a storage chamber and sealed by a light plastic diaphragm from the downstream tunnel "vacuum area." An electric charge is sent into the upstream air-storage chamber, pushing heated, high-pressure air through the plastic seal. Stabilized, high-speed air flashes through a conical nozzle, which increases air velocity before it hits the model.



Steamboat Comin'— All 16 Feet of It!

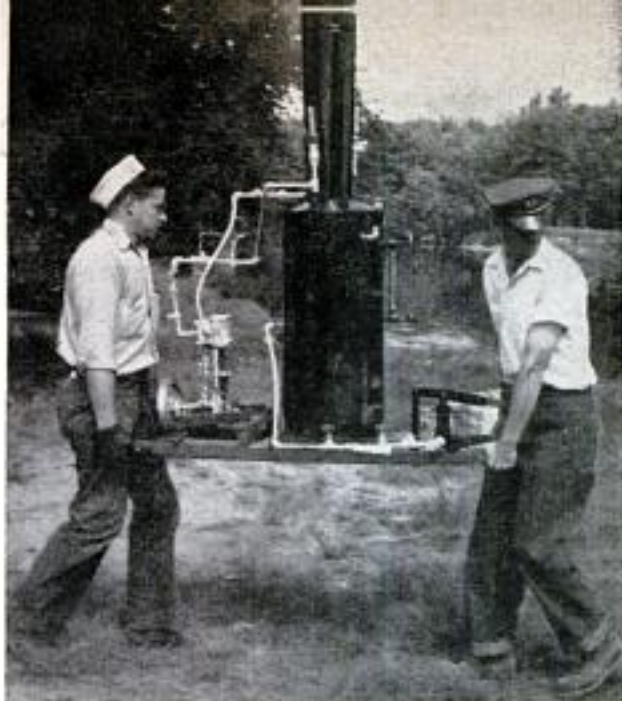
UNWILLING to permit steamboating to pass silently from the American scene, a Wisconsin farmer has rebuilt his 16-foot, flat-bottom vessel into a steam-driven river craft. Skipper of this contrivance is Delmar Kolbe, who raises crops in Marathon County for a living and pilots his nautical brain child when chores permit.

"Captain" Kolbe first altered his boat to hold a steam engine. He then fitted the vessel with a propeller, rudder and four-spoke steering helm. The engine is mounted on a two by four-foot frame for carrying to and from the boat. When the engine has been put in place, a chain drive couples the sprockets on the motor flywheel and the propeller drive shaft. By varying the size of the sprockets, crewmen control speed.

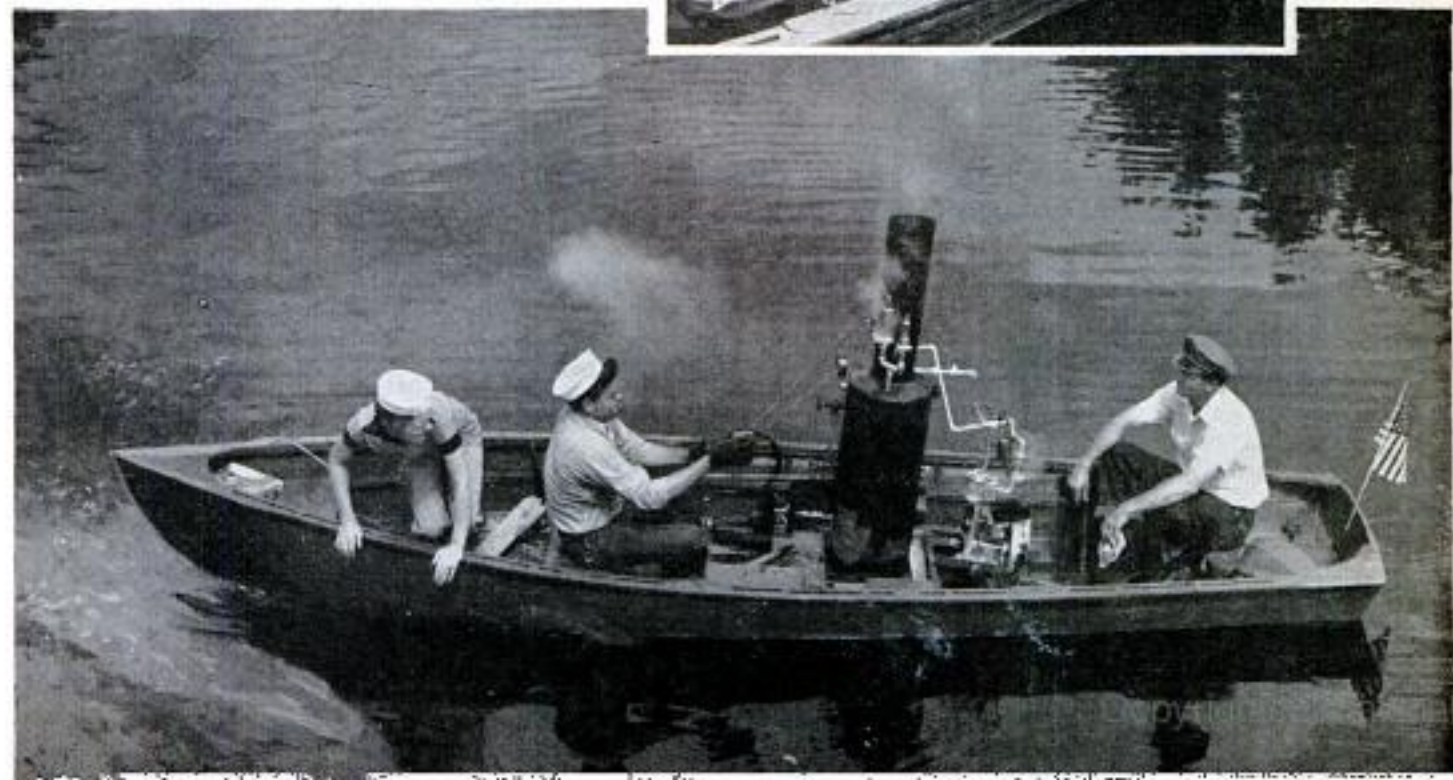
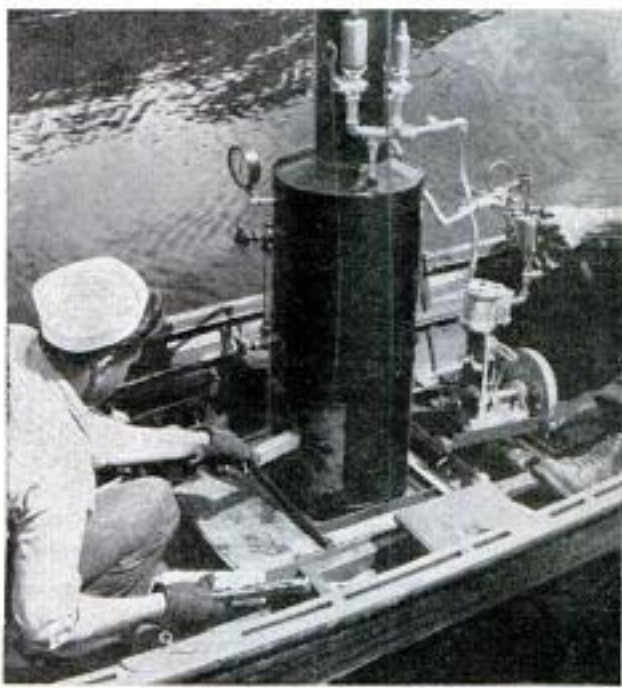
Fuel consists of wood scraps which are fed into the small steam boiler. Power comes from the 120-pound pressure generated in this boiler. The engine operates economically and cost of operation is rock bottom. In addition to supplying the motive power, the engine also provides steam for the boat's twin whistles. Usually, in case of emergency, a supply boat loaded with extra passengers and fuel follows in the wake of Kolbe's craft. Much to the surprise of captain, crew and guests, few emergencies arise.

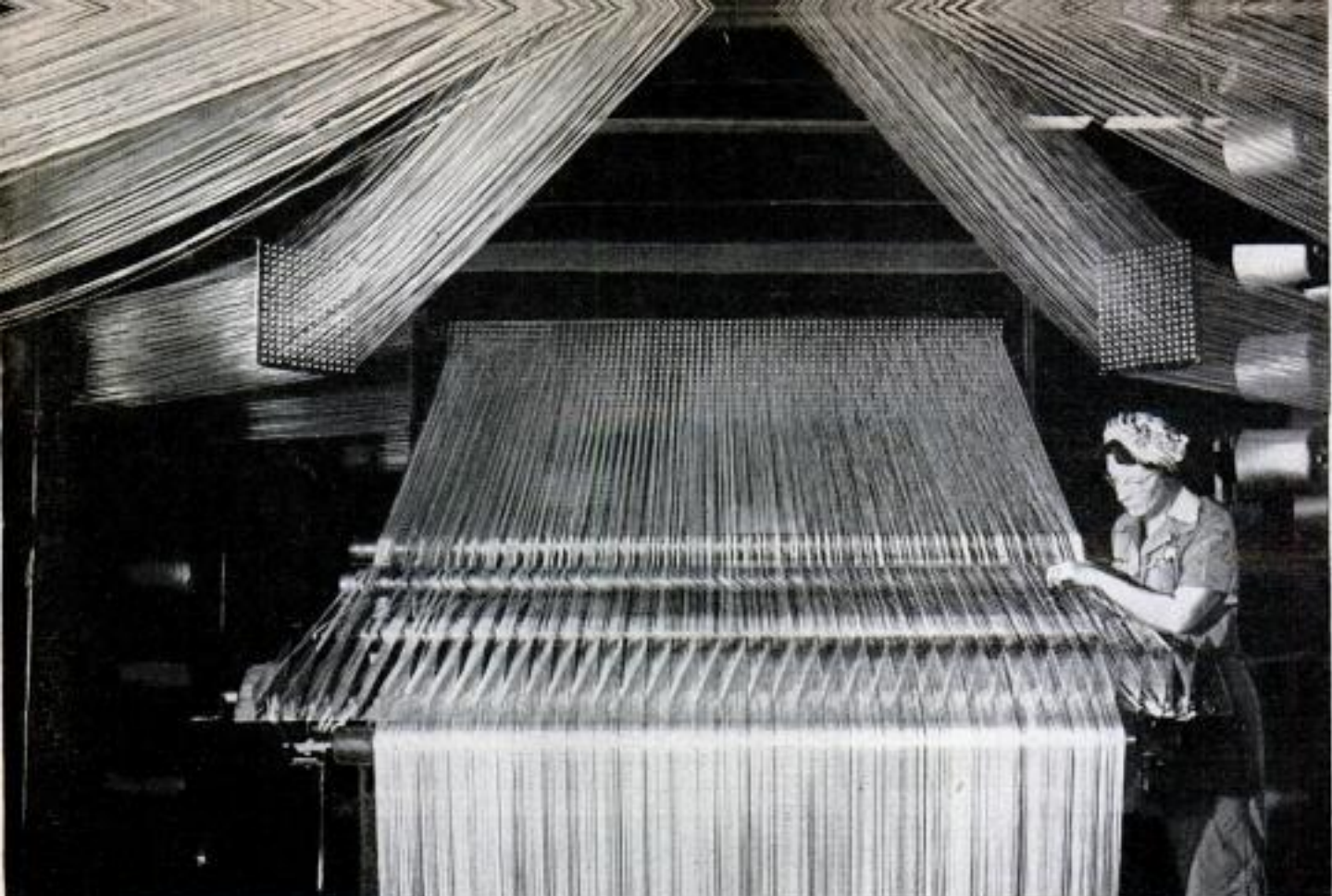
Like its more illustrious forebears on the Mississippi, Ohio and Missouri Rivers, Kolbe's boat has received formal christening. His four-year-old daughter, Jean, broke a bottle over the bow.

All-aboard whistles sound as the craft is readied for an eight-mile trip down Big Rib River in Wisconsin



Above, two crew members carry the steam engine from a truck to its place in Kolbe's craft. Below, the stoker pushes scraps of wood fuel into the steam boiler, which can generate 120 pounds of pressure





Textile cords—millions of miles of them—pass through the creel room where they are processed for tires

Science focuses on textile fibers to give you **MORE MILES ON YOUR TIRES**

High-speed camera shows how waves travel around a tubeless aircraft tire under severe shock of landing

By **Walter E. Burton**



YOU ARE ROLLING along at turnpike speed when there is a sudden "whomp" that makes the car shudder and waver for an instant. Instinctively you know that your right wheels struck one of those unexpected chuckholes that blossom on so many highways in the spring. Visualizing the sharp edges of concrete gouging into your tires, you slow down, waiting for something to let go. But nothing happens, and the car rolls merrily along as if it never had been jounced. Even days and weeks later you don't get a delayed-action flat. With some luck, plus a lot of science that has gone into your tires, you have escaped a blowout—one which, not too many years ago, would have been considered inevitable. Oh, sure—you can have blowouts today from hitting chuckholes and bricks; but as a result of constant research on tire construction, such mishaps are not as common as they used to be.

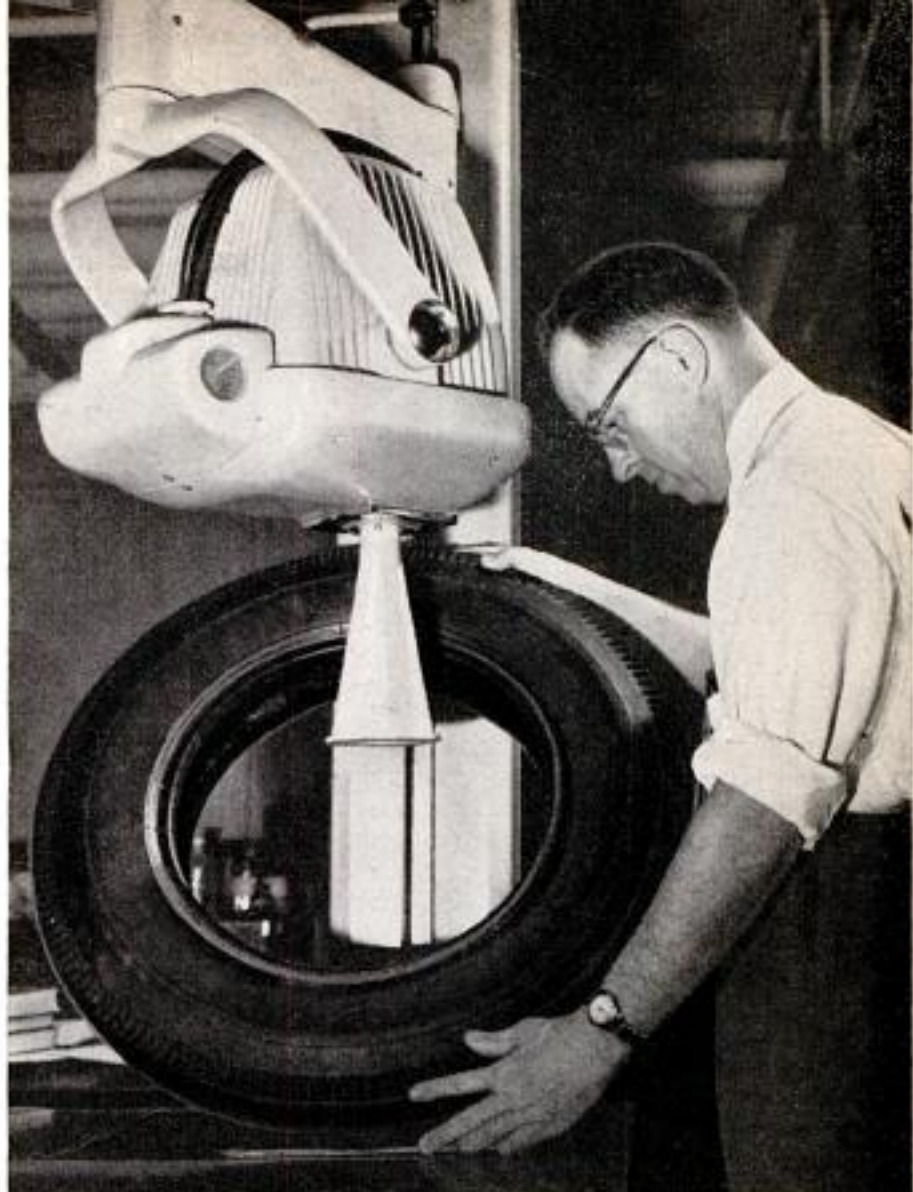
If you go far enough behind the scenes, you will find an instrument that deserves a considerable portion of your thanks for preventing that chuckhole blowout. That instrument is the compound microscope. Often teamed with a camera, the microscope has done key work in giving the motorist and the trucker tires that wear longer and are safer than the best yesterday had to offer. While the motorist has been listening to talk about improvements in rubber compounding, researchers have been quietly directing their skills and their lenses on another, no less important, part of the modern tire—the skeleton composed of textile cords.

"Shock Shield" for Truck Tires

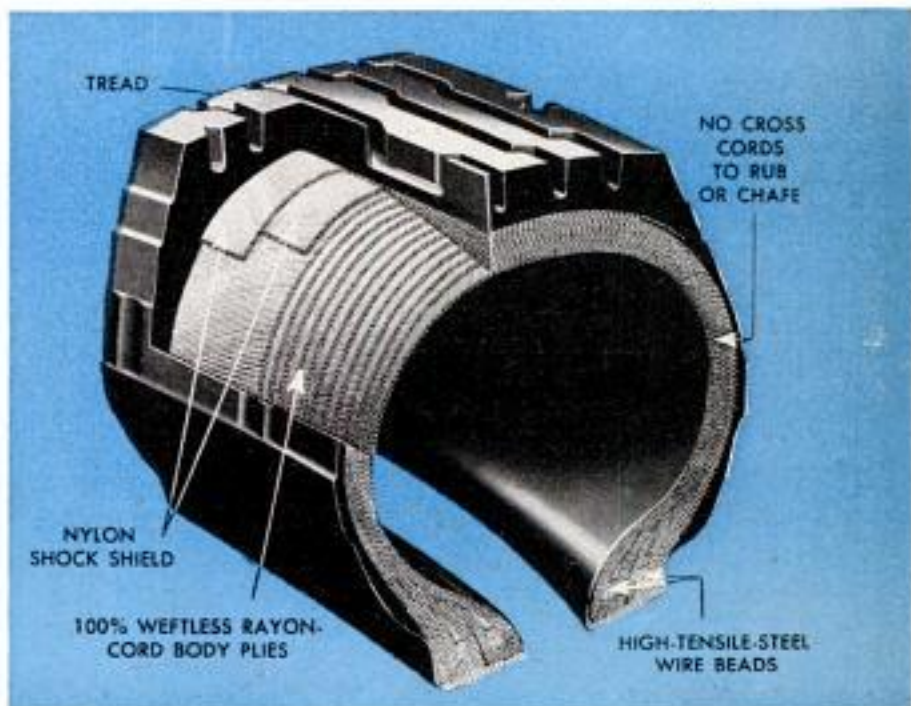
Typical of this work are the studies by microscope of tire cords carried on by R. H. Judson and others in the B. F. Goodrich laboratories at Akron and Brecksville, Ohio. From thousands of photomicrographs, long hours of tedious peering and a seasoning of imagination have come such improvements as a nylon "shock shield" incorporated into truck tires.

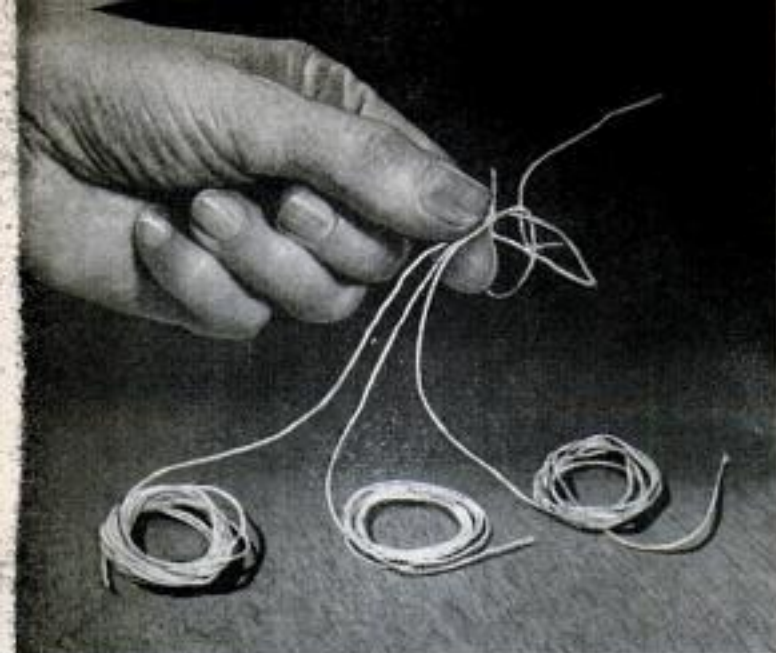
The average motorist gives little thought to the "dry goods" part of his tires. In a typical truck tire there is enough rayon cord—14½ miles of it—to make a good many shirts for him or dresses for his lady. Each cord has 1500 fibers, which makes 21,750 miles of rayon fibers in each truck-tire casing. In a typical (7.60-15) passenger-car tire there are fewer potential shirts or dresses, but still nearly 2½ miles of cord, or 3880 miles of fibers. The manner in which these fibers hold together and behave under such influences as compression and tension has much to do with the tire's behavior and length of life.

The bundle of 1500 fibers in a tire cord measures about .028 inch in diameter, so it is necessary to magnify the fibers greatly—each is smaller than a human hair—in order to discover what they are doing. Tires are sliced into paper-thin sections to reveal how well the cords have united with surrounding rubber, to show the depth of penetration of the adhesive dip, and so on. Individual



X-ray machine can reveal arrangement and damage to cords in a test tire without cutting or otherwise disturbing them. Below, cross section shows layers of rayon-cord plies that build up the body of truck tire, with nylon "shock shield" around them
B. F. Goodrich Co. photo





Three kinds of tire cord are, left to right, cotton, nylon and rayon. Other synthetics may be used soon

cords are jammed into slots in thin metal plates, with nylon fibers packed around them to hold them in place, and the cords and packing fibers are cut crosswise at plate surfaces to provide cross sections that can be examined under the microscope.

Spotting Failures

Before World War II, tire bruising was a common form of tire failure. Today bruising is less common, largely because manufacturers have learned how to use rayon and nylon cord in tires, and such cords are stronger than the cotton ones formerly employed. When a tire does fail, studies with a microscope may reveal what part the cords played in the failure. Because stresses on cords may leave permanent marks, a trained observer, by examining a tire, often can spotlight the cause of failure.

When a plane lands, its tires take a tremendous beating. Cords are compressed six to ten percent, then quickly subjected to tension. Microscopic examination of such a tire reveals numerous tiny cracks in the rubber, each one beginning at a cord. In a section obtained when the tire is sliced parallel to one of these cords, the thin rubber over the textile material shows a regular series of breaks, each coinciding with a twist in the cord and each being in alignment with the twist angle of the cord. Such breaks are caused by the compression-tension-compression cycle.

Judson has made considerable use of color photography in his micro-explorations of tire cords. Color film records the images of textile fibers and other tire elements illuminated by polarized and other types of light. Such pictures reveal many things about the tire—for instance, the depth of penetration of the dip into the cords.

This dip is an adhesive that unites cords

with the surrounding rubber compound. An example is a resorcinol-formaldehyde resin, similar to that used as a glue in making waterproof plywood. It is mixed with latex to serve as a cord-to-rubber adhesive. Action of the dip is controlled so it penetrates only the first few outer layers of fibers forming a cord. Thus at any point along the cord, the outside fibers become anchors to hold the cord in place, while the inner fibers are free to move and adjust themselves to the stresses. Because of the way in which the cord is twisted, fibers that are "inner" at one point have, at a point farther along, changed places with outer fibers. The microscope is used as a means of keeping check on fiber arrangement during manufacture.

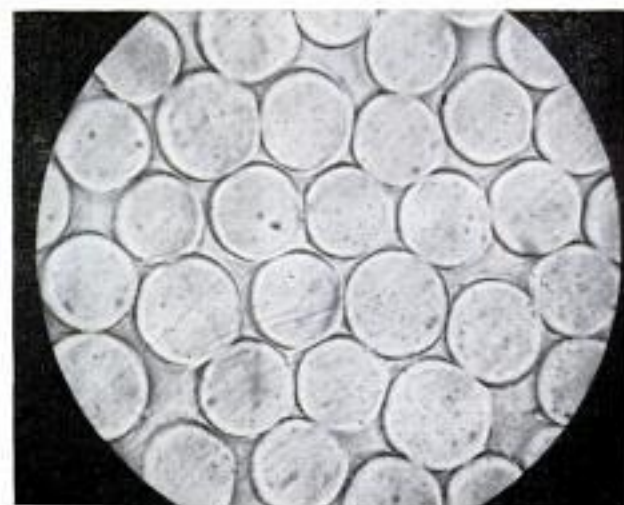
Studies by Radiography

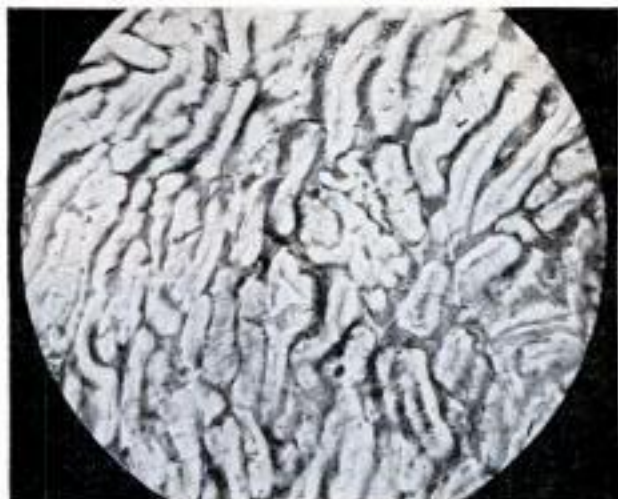
Of course, microstudies of tire fibers are supplemented by other research involving the textile parts of a tire. Thus radiography is employed in studying cord position, failure and other conditions within the tire.

Tire cords are composed of strands twisted together. The number of twists per inch is important. A cord twisted too much or not enough will not behave satisfactorily under such influences as compression. In studying the effect of vibration on blocks of tire rubber containing cords, researchers have watched low-twist cords actually "unthread" themselves, crawling out of the rubber like so many worms.

A tire in use must withstand vibratory flexing which can tear the textile skeleton apart. One of the goals of the tire maker is to put rubber and textile fibers together in such a way that vibrations are made less destructive. The typical tire in service experiences compression and tension where it touches the roadway, but the resulting vibrations travel in waves completely around the wheel. In fact, in laboratory tests, tires

NYLON FILAMENTS shown under microscope in cross section. Each nylon cord contains 240 filaments





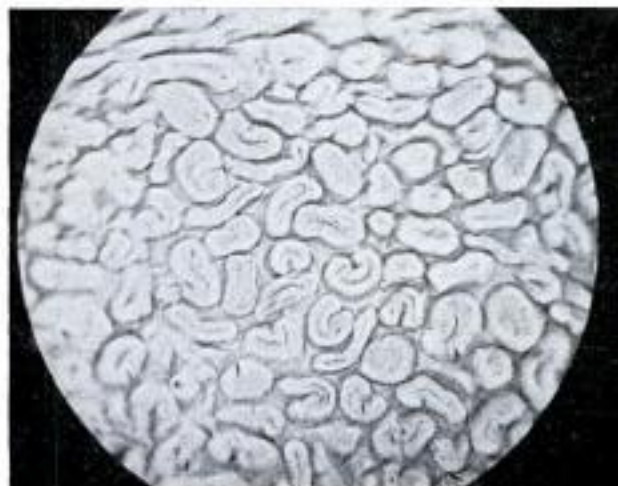
RAMIE FIBERS: Ramie is one of the strongest of natural fibers, but it will not withstand repeated flexing

subjected to vibration have been made to blow out *on top* instead of where they contact the "road."

Tire scientists explain that vibration limits the kinds of textile fibers that can be used successfully in tire cords. So far, the only natural fiber that has been satisfactory is cotton, in which each fiber is a single cell. Two manmade fibers, rayon and nylon, form, with cotton, the trio of cord materials used in tires in recent years. Some wire is employed, too, but is not classed as a textile. Other fibers, including a percentage of hush-hush ones, are constantly being investigated, and something even better than nylon may come out of the laboratories in the future. Natural fibers such as those of linen and ramie are unsatisfactory because each fiber is composed of many cells separated by cross membranes, and vibration of the tire causes breaks at these joints between cells.

At one time cotton was used as the cord material in all tires, but now it is out almost entirely and rayon is reported to be in the lead, while nylon is rapidly catching

COTTON FIBERS: Cotton is the best natural fiber for tire cord because it combines strength and flexibility



MARCH 1957



HUMAN HAIRS: For comparison purposes. The diameter of each hair is more than twice that of tire fibers

up. One tire scientist pointed out that in 1955 eight pounds of rayon were used for every pound of nylon in making tire cords. There have been important improvements in the rayon available for tires. It used to be thought that only rayon made from cotton was satisfactory; now most of it is made from wood pulp and is said to be better than ever. More and more kinds of wood are being utilized, ranging from Florida pine and Mississippi hardwoods to Canadian hemlock.

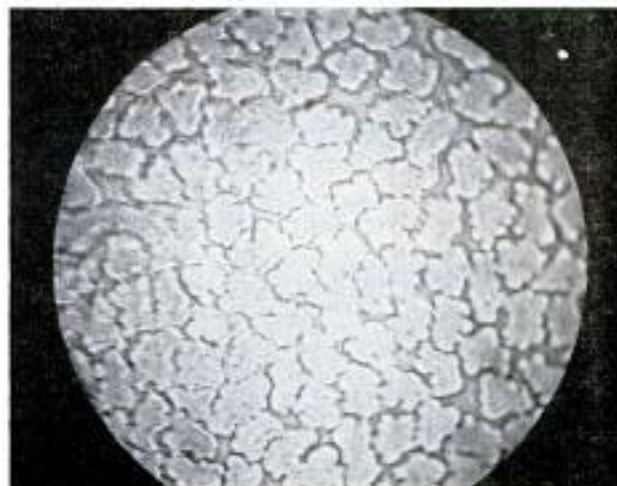
Tire to Outwear Car?

From scientific studies of tire cords and cord materials comes promise of the "perfect" fiber that will do much to make possible a tire that will outwear the car. If researchers could pick out the best characteristics of experimental fibers now known, and combine them into one fiber, such a tire might soon become commonplace.

The tedious business of studying tire cords with the microscope may not be as spectacular as driving tires over rows of

(Continued to page 228)

RAYON FILAMENTS: Each rayon cord contains 1500 individual filaments, each as long as the cord



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Men to Live Underwater Beneath Radar Tower

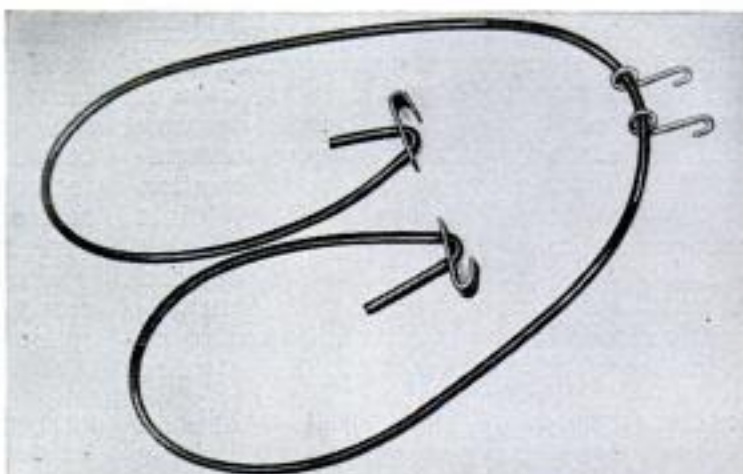
Operators of a newly designed floating radar warning tower are to live 115 feet beneath the surface of the ocean in a 70-man "doughnut" installation. Elevators inside pillars will rise to a helicopter deck and radar units 65 feet above water level. A centrally located atomic reactor will supply electric power and work a small engine to prevent the station from drifting out of position. Towed to mid-ocean, the tower could remain in one spot for three years before being returned for reconditioning. This tower has been created by Northwestern University engineering students to supplement fixed Texas Tower radar structures off the coast of New England.

Weekly Blood Donations

Two Philadelphia physicians report that a blood donor can safely give a pint of blood every week by a method of separating the plasma from the red blood cells and returning the red cells immediately to the donor.

Trick Cord for Trunk

When you can't close the car trunk lid on a bulky object, you can tie the lid down firmly with an adjustable Neoprene rubber cord. Two hooks at the top slip into holes in the under edge of the trunk lid. Clamps on either end of the cord grasp the bottom of the bumper. The 8½-foot cord can be slipped through holes in the bumper clamps to secure proper tension.



Satellite Sees Weather

Weather predictions, based on daily observations of the sun from an earth-circling satellite, might be routine in five or ten years, scientists say. Instruments will measure visible and invisible solar radiation affecting long-term climate and day-to-day weather. Behavior of radio waves in the earth's upper atmosphere is to be studied. Weather patterns evaluated by electronic computers and data gathered during the International Geophysical Year may clarify these solar relationships.





Captain's Custom Car Combines Parts of Many Automobiles

Starting with the chassis of a Willys car, Capt. Paul Jones of Eglin Air Force Base, Fla., built himself a custom car that excites envy wherever it goes. Included in the car

are the front-suspension system of a Hudson, the rear end, transmission and engine of a Ford, plus many parts from Studebakers. Wheels were taken from a Crosley.



Transport Planned For Small Airports

Planned for operation from small airports, a new transport, the F-1 Safari, is now on the drawing boards. The Safari is to be built by the Frye Corporation of Fort Worth, Tex., in the hope that it will prove versatile enough to replace that venerable workhorse, the DC-3, which for 20 years has done the heavy, short-haul lugging for both the military and the airlines.

Ship Model Seems Wingless Aircraft

What appears to be a mixed-up airplane shorn of wings is a ship model designed by Dieter Jansen, a refugee from the Soviet zone of Germany. It scoots along on top of calm water at 60 miles per hour. Six miniature diesel engines, three mounted in a row on each side, turn the ship's airplane-type propellers. A rudder takes care of steering, which is done by remote control.





Four Navy Jet Fighters Refueled Simultaneously

Four Navy jet fighter planes are refueled at the same time by a Convair R3Y-2 Tradewind. Refueling time for the planes was less than five minutes, with the fuel coming from the R3Y's own wing tanks, which hold enough fuel to service eight fighters. The R3Y is a turboprop built to serve as a transport and a tanker.



Telescopic Tracker Lens "Eyes" Weather, Missiles

Tracking and photographing weather balloons, locating airborne missiles, and evaluating radar systems is the job of a new telescopic tracker now under test. The apparatus weighs 1½ tons, is equipped with a 400-pound lens of 160-inch focal length, and can trace objects 300 miles distant on its scope in natural color. Able to automatically photograph targets in black and white, this unit can be remotely controlled to record impact of missiles in danger areas. Experimentation is being conducted by the Army Signal Corps Engineering Laboratories, Fort Monmouth, N. J.

CAA Men Help Italy

Eight Civil Aeronautics Administration specialists have assisted Italy in setting up airway aids and an adequate air-traffic-control organization from methods utilized in the United States.

RADIO



ELECTRONICS



THE PROSPECTOR'S PARTNER— A COMBINATION GEIGER COUNTER-PORTABLE RADIO

By Otto Fried

WITH SPRING just around the corner, thousands of modern prospectors will again try their hands at finding that hidden fortune. It's not gold they'll be looking for, but rather a far more useful and vital mineral—uranium.

The old forty-niner would view with suspicion the tools used by today's prospectors. The panning dish of old has been replaced with a scientific instrument, called a geiger counter which, by a series of rapid clicks, indicates the presence of radioactivity, the "paydirt" of modern prospecting.

But treasure hunting, now as in bygone days, can be a lonely, monotonous business. This project, therefore, was designed to provide not only a sensitive geiger counter, but also an entertaining companion; one who will not ask for a cut of the "take" in the event of a strike—a portable radio.

The versatility of the project is increased by the fact that the experimenter can use the schematic diagram, Fig. 6, to build either a radio or a geiger counter alone,

merely by omitting the undesired portion of the circuit. Or, if a suitable portable radio is already on hand, the counter portion may readily be added to the unit.

Construction Is Simple

To eliminate the most tedious part of construction, the original model was designed to fit into a commercially available cabinet and built on a prepunched chassis. Both of these parts (see parts list) can be purchased at a relatively low cost, but if you prefer to make your own chassis, you can do so by closely following the chassis layout details shown in Fig. 1. In either case, you'll still have to make the necessary brackets, but this is a comparatively simple matter.

Note: If you use the prepunched chassis you will have to add the three small holes which are shown in solid black on the left side of the chassis diagram.

Buy the parts first. Before doing any work at all, you should obtain all the

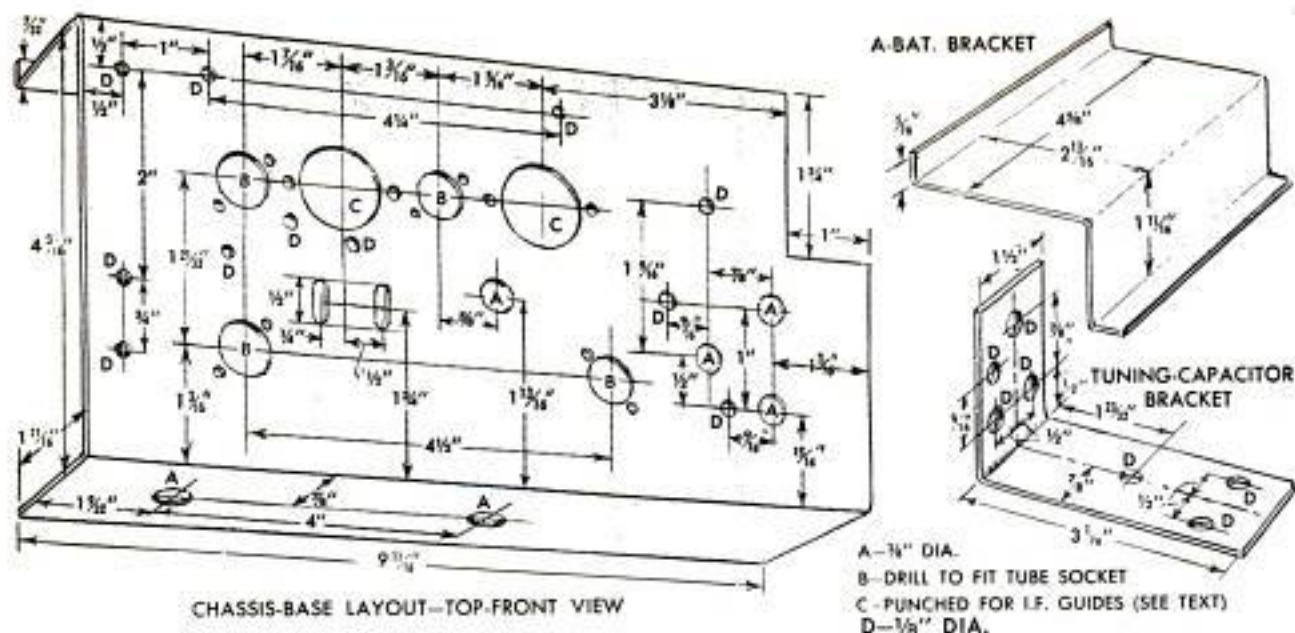


Fig. 1. Chassis and bracket layout showing critical dimensions. Punched chassis is commercially available

required parts. In the event that these are not identical to the ones originally used in the model, you can easily change the location of any mounting holes to fit the parts you have. The recommended i.f. transformers are supplied with mounting plates which fit into standard miniature-tube-socket cutouts. These will not be needed if you use the prepunched chassis, but they will greatly simplify chassis drilling if you intend to do this job yourself.

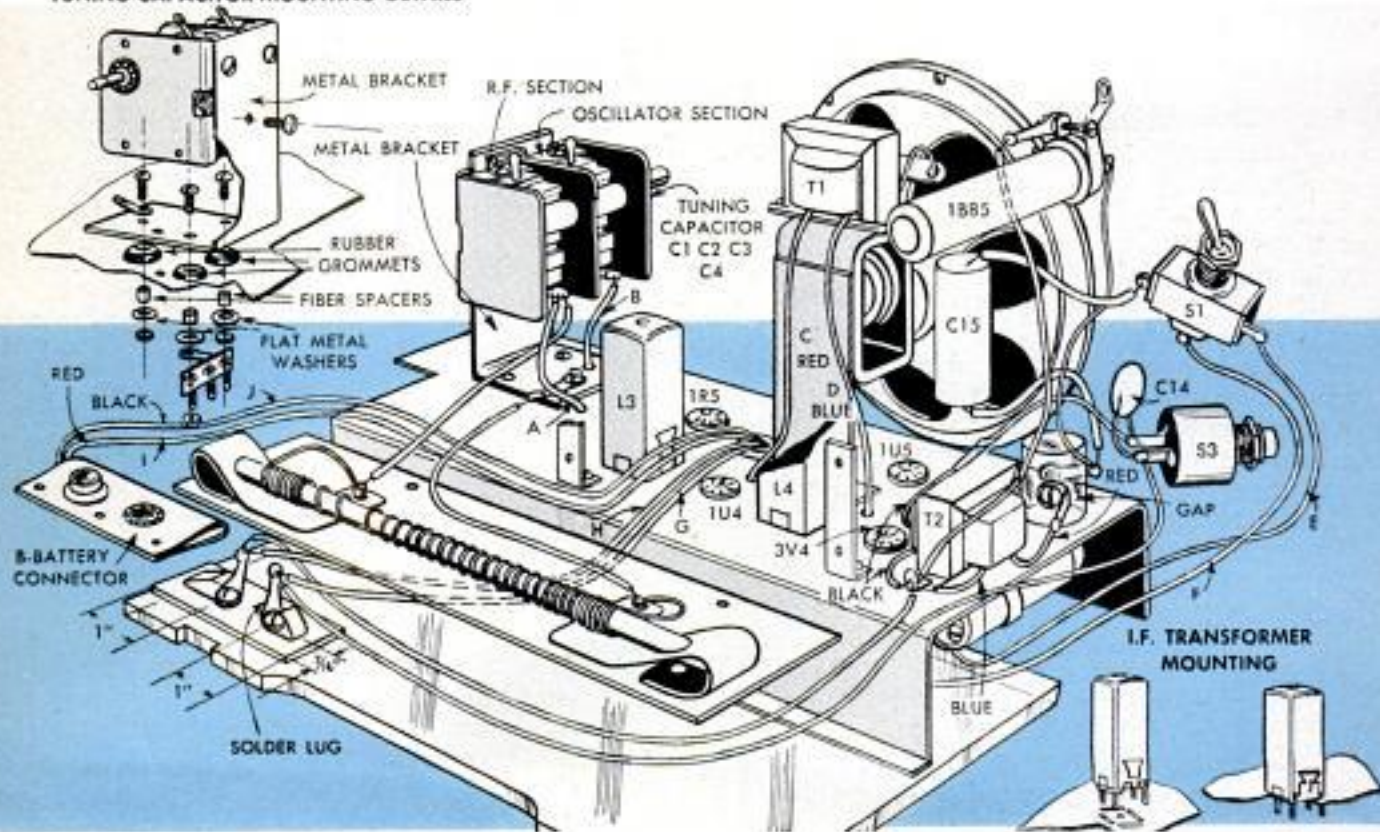
Special care is needed in making the

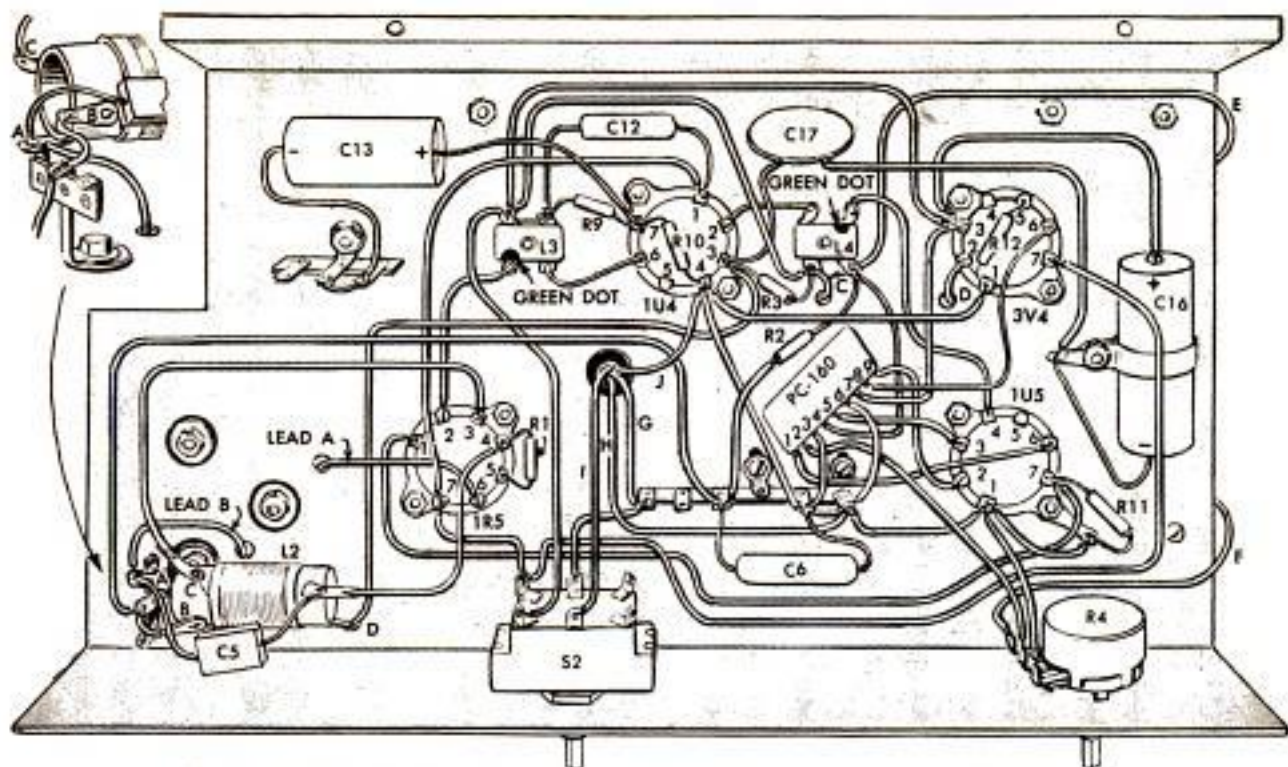
mounting bracket for the variable capacitor, Fig. 1. Note that the four holes in the bottom of the bracket must line up with similarly placed holes in the chassis base, and the three holes in the top portion correspond with the tapped mounting holes in the base of the capacitor itself.

Another homemade part is the spark gap detailed in Fig. 5. This can be made of any nonmetallic material which will not absorb moisture. Nylon rod, $\frac{3}{4}$ in. in diameter, is readily available from hardware stores

Fig. 2. Top-view pictorial of completed model. 1B85 and switches S1 and S3 will mount on side of cabinet

TUNING-CAPACITOR-MOUNTING DETAILS





NOTE: TERMINATIONS OF CODED LEADS (A,B,C, ETC.) ARE SHOWN IN TOP-VIEW PICTORIAL

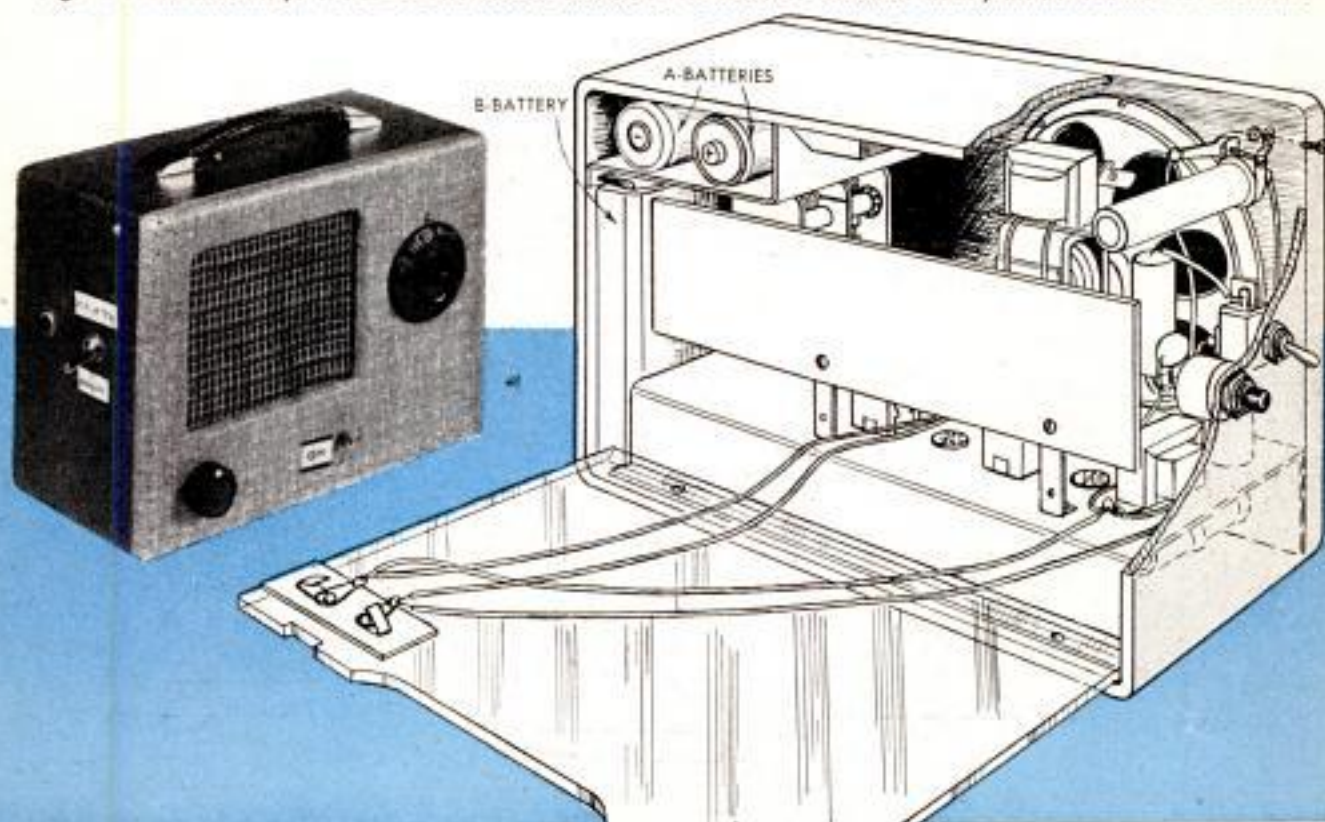
Fig. 3. Wiring pictorial, bottom view. Method of mounting oscillator coil is shown clearly in inset

and is not expensive. But if you happen to have a square block of Bakelite or phenolic material, go ahead and use it—it will work very well. This material merely serves to hold the two self-tapping screws which actually form the gap. Connections to the gap are made to two ground lugs which are soldered to the heads of the gap screws.

This should be done before the screws are inserted in the gap to prevent melting the plastic material during soldering.

Mounting the parts. Now, carefully study the top and bottom-view pictorials, Figs. 2 and 3, and note how the various parts are mounted on the chassis. Pay particular attention to mounting of i.f. transformers

Fig. 4. Final assembly. Wood screws fasten chassis to bottom of cabinet. Ready-made cabinet is available

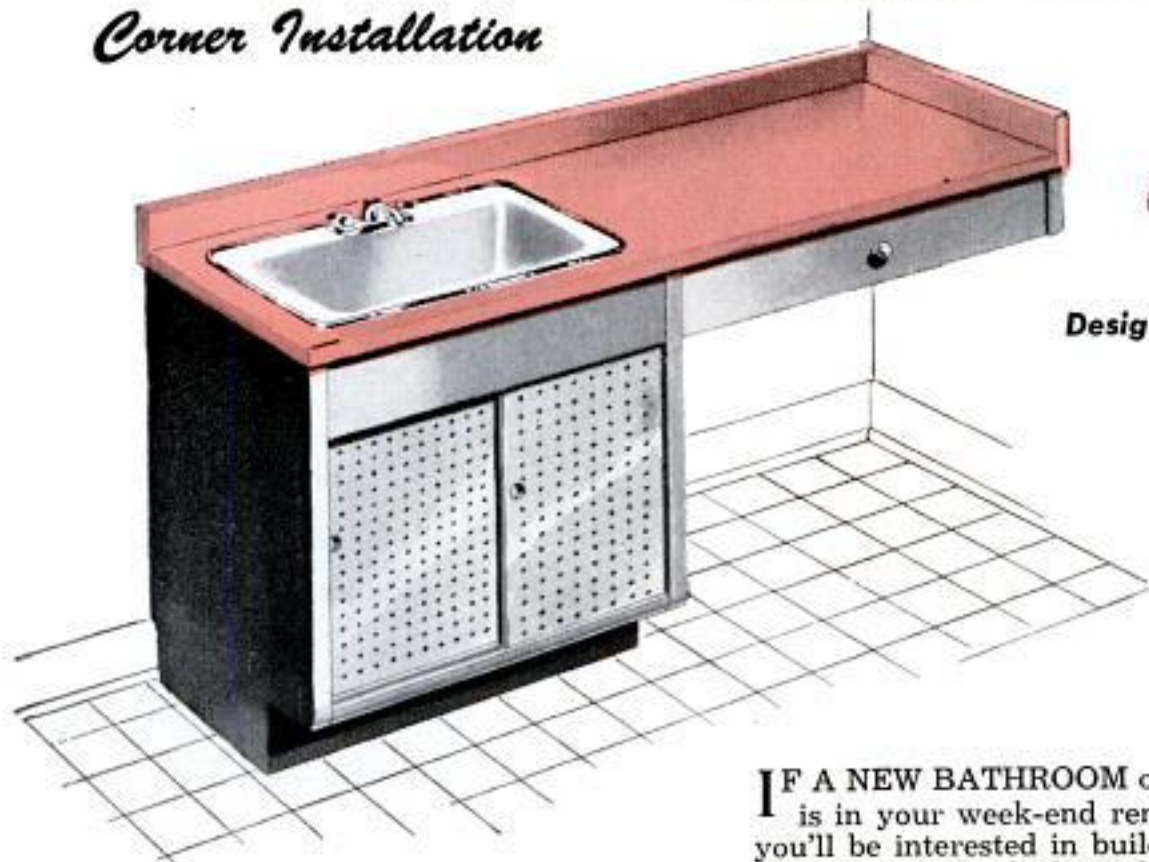


THE

**POPULAR
MECHANICS**

CRAFTSMAN

Corner Installation



WTM 58

Designs by John Bergen

MODERNIZE WITH A VANITY LAVATORY

IF A NEW BATHROOM or powder room is in your week-end remodeling plans, you'll be interested in building this smart vanity lavatory which can be tailored to fit practically any room, large or small. Basically, the unit consists of a plastic-top sink-storage cabinet with bypassing doors which can be expanded, where space permits, to include a powder-room counter and drawer. In all cases, the basic unit is built the same—you simply increase the size of the top to suit your requirements. For a wall installation a leg is added, while for a corner installation a leg is omitted.

Basic Unit



Wall Installation



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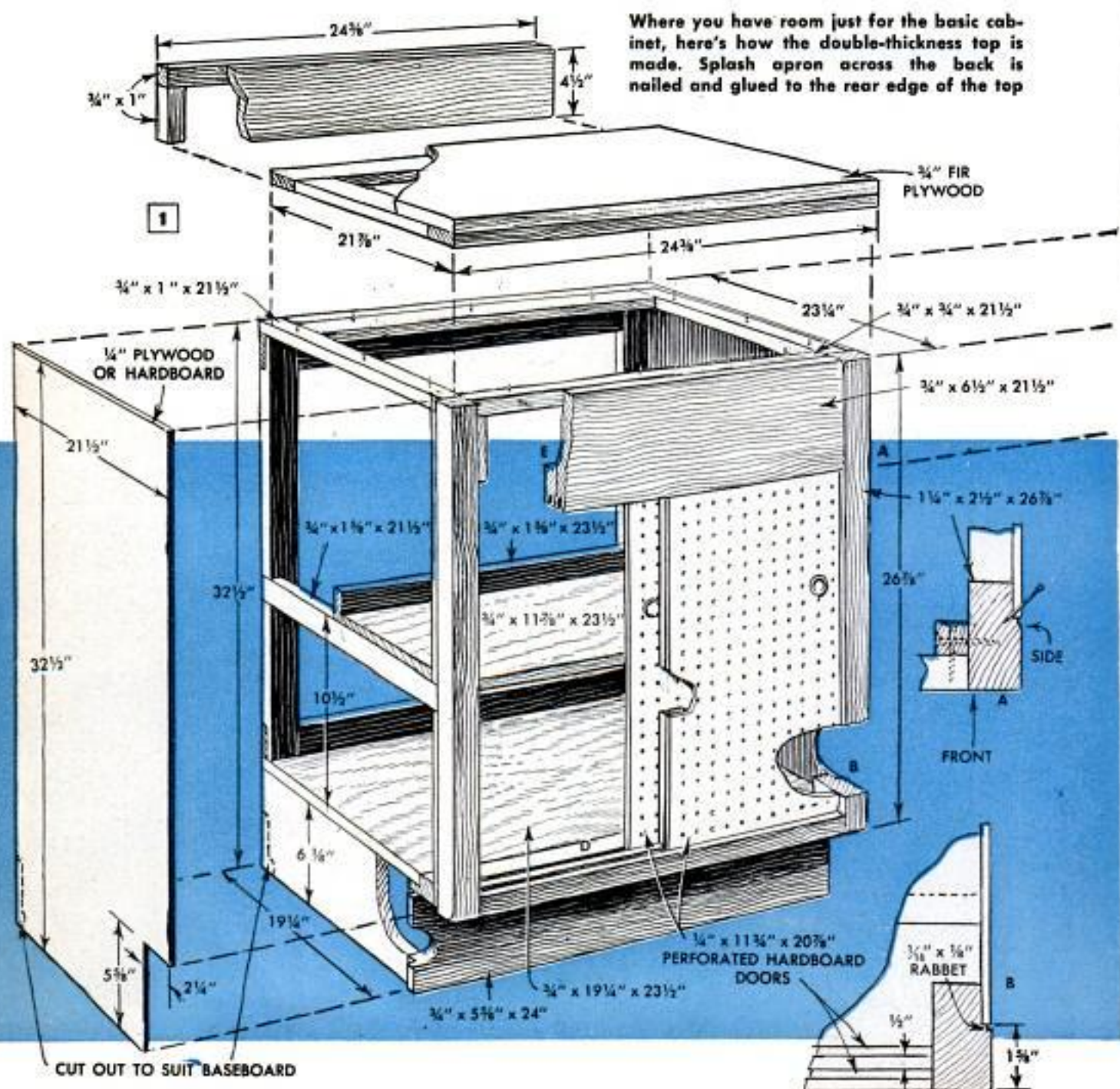
The basic unit will take a standard rim-type sink.

The Basic Unit

The cutaway drawing in Fig. 1 details the basic unit. Start with the 1 1/4-in.-thick piece across the front which is grooved for two sliding doors. Note in detail D that the lower front edge is rounded and that the back edge is rabbeted to house the bottom plywood shelf. Both front corners of the grooved piece are notched for 1 1/4 x 2 1/2-in. posts as in detail B. Note that these notches are made only 1 in. deep to let the cabinet sides set flush in 1/4-in. rabbets in the posts. In detail D you'll see that the front piece is attached to a 5 5/8-in. kickboard with nails driven in the rabbet. The kickboard is 24 in. long and has a 1/4-in. rabbet cut across each end. These extend

1/4 in. at each side. Now the bottom shelf can be glued and nailed in the front rabbet and the two sides of the base added. If the unit is to fit against an existing baseboard, the lower corners of the side members will first have to be cut to fit snugly around it.

Set aside the front posts for the moment and make the back frame. This is made of 3/4 x 2-in. pieces which are half-lapped at the corners. Notice that the frame rests on top of the bottom shelf. Gains are cut in the sides, 10 1/2 in. up from the bottom, to house shelf rails. The back frame can now be nailed and glued to the bottom shelf, keeping it even with the back edge. Shelf-rail notches are now made in the front posts 11 3/4 in. up from the bottom. Note in detail A that a shallow saw cut, 1/16 x 1/8-in., is run alongside the side-panel rabbet in the posts so that when the sides are in

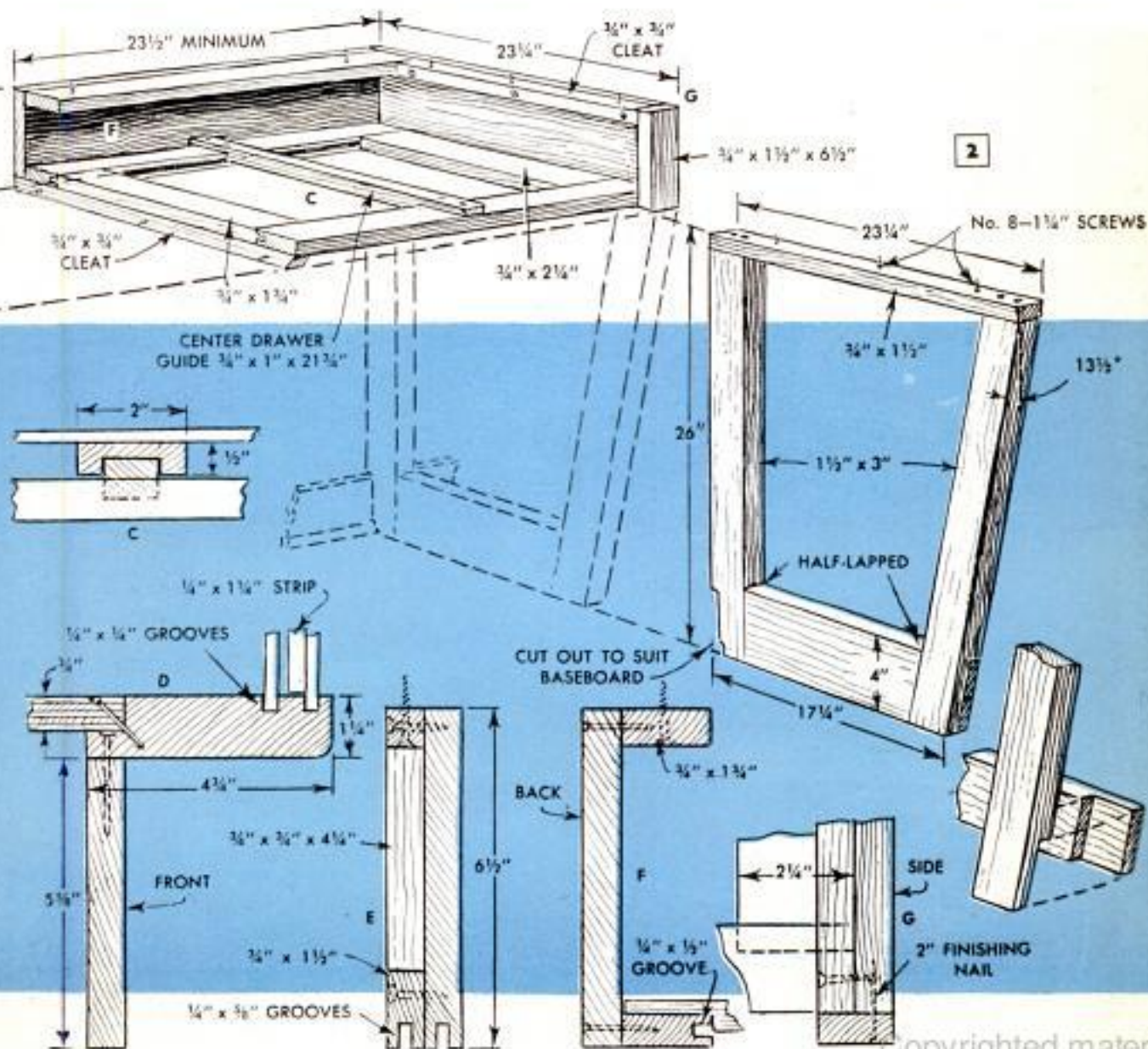


place a decorative groove is formed along each joint. Before the posts can be added to the assembly they must be joined together at the top with a 6½-in. member. As shown in detail E, this is backed up with a ¾ x 1½-in. piece across the bottom and a ¾ x ¾-in. cleat across the top, after which the lower edges are grooved for the sliding doors, spacing them ½ in. apart to match the lower grooves. After notching the upper ends of the posts for the top side rails, you can join the front member to the posts at the top and in turn fasten the lower ends of the posts to the rest of the assembly. Remember that the perforated-hardboard doors must be set in the grooves at the same time. The top side rails, as well as the one across the back, are predrilled for screws which are used later to anchor the top in place. When these pieces are installed, the side panels finally can be added.

Notice that they are notched at the back to fit over the baseboard and at the front to fit the rabbets in the kickboard. Use glue and small finishing nails to hold the sides in place and set and putty the heads on sides that are exposed. The left-hand



Perforated hardboard for the doors is both decorative and practical as it ventilates the interior. Saw the material slowly to avoid chipping the edges





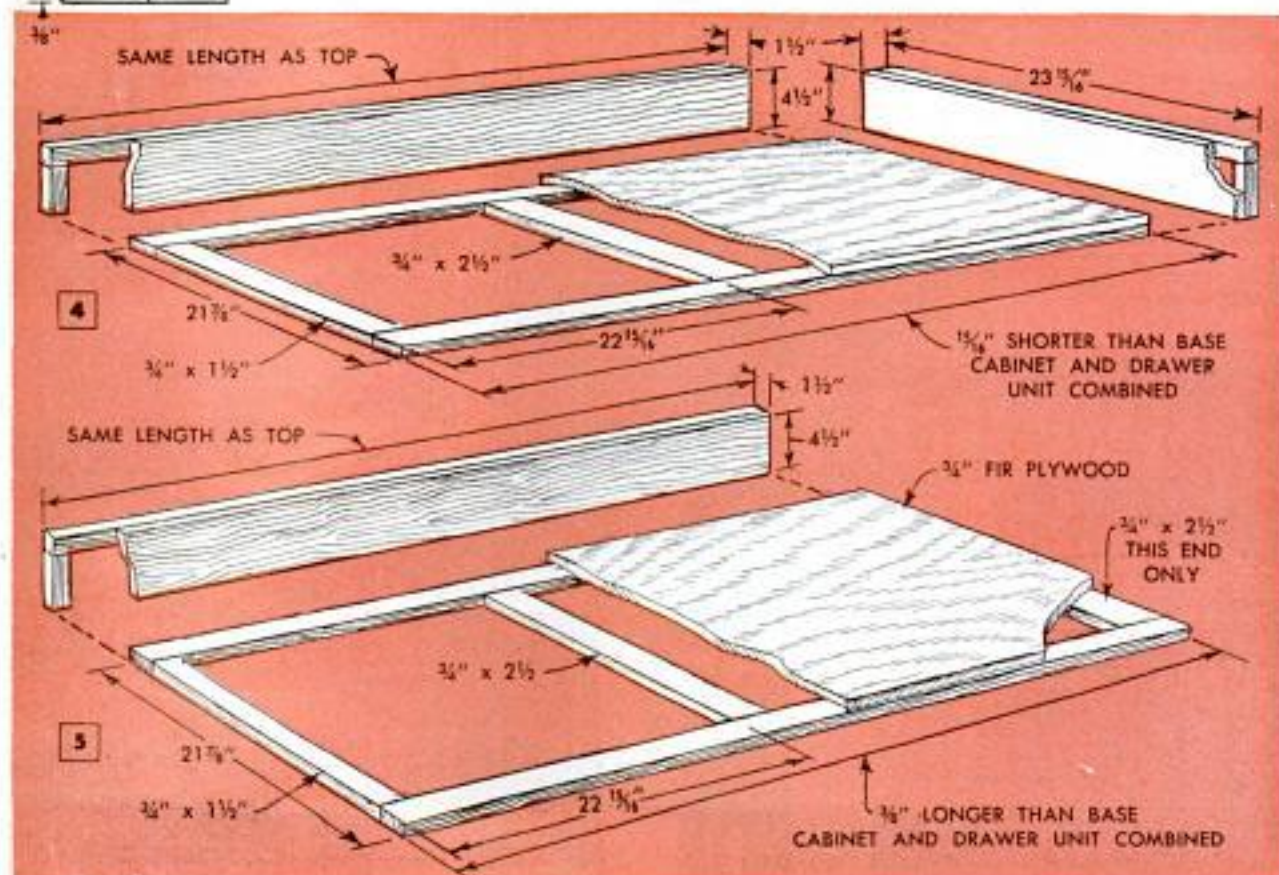
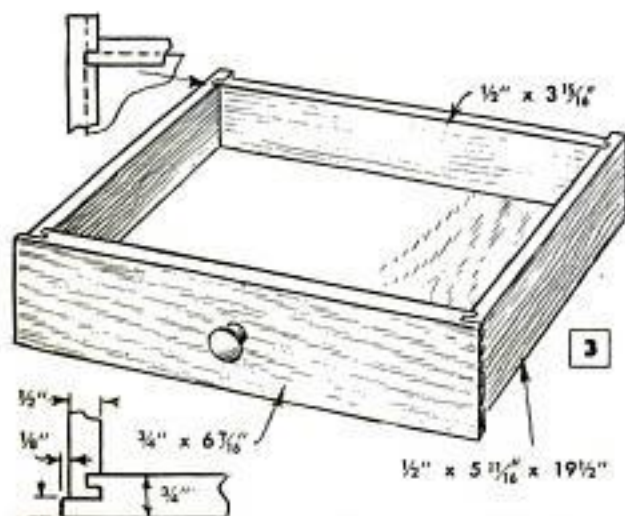
The opening for the rim sink is cut after the counter is covered with sheet plastic. Use a keyhole saw for this

edge of the front sliding door is stiffened on the back with a $\frac{1}{4} \times 1\frac{1}{4}$ -in. strip. Glue and clamp this rather than nail it. The grooves for the bypassing doors should be wide enough to allow for finish and possible shrinking of the wood which would cause the doors to bind. It might be best to paint the doors before they are installed to make final finishing less tricky. Regular recessed finger pulls are used, pressing them in holes centered $1\frac{1}{4}$ in. in from the outer edges of the doors.

The $1\frac{1}{2}$ -in.-thick top consists of a $\frac{3}{4}$ -in.-plywood top piece glued and screwed to an open frame of $\frac{3}{4} \times 2$ -in. material.

Adding Drawer Compartment

The drawer compartment and its supporting leg are detailed in Fig. 2. The compartment is built as a separate unit and is attached to the basic unit with screws passing through a $\frac{3}{4}$ -in.-sq. cleat. Fig. 3 details the drawer which is made to fit the opening. It rides in a guide which slides in a grooved strip attached to the bottom of the drawer. Construction of the tops, Figs. 1, 4 and 5, differs only in size. Where the vanity is to be installed in a corner, the splash apron is carried around the corner. The opening for the sink is made after the top is covered with plastic counter-top material. Cover the edges first and then the top surfaces, using contact cement made for the purpose. ★★★



Pocket Cigarette Lighter Converted to Miniature Blowtorch

Pocket cigarette lighters of the type shown that have wind guards can easily be modified for use as miniature soldering torches. A metal tube $\frac{1}{8}$ -in. dia. or less is soldered in a hole punched in a metal clip formed from a $\frac{3}{8}$ x 1-in. strip of sheet brass folded in half. The clip then is slipped over the wind guard and adjusted so the tube will direct your breath against the flame to control it.



Putty Used as Sanding Block



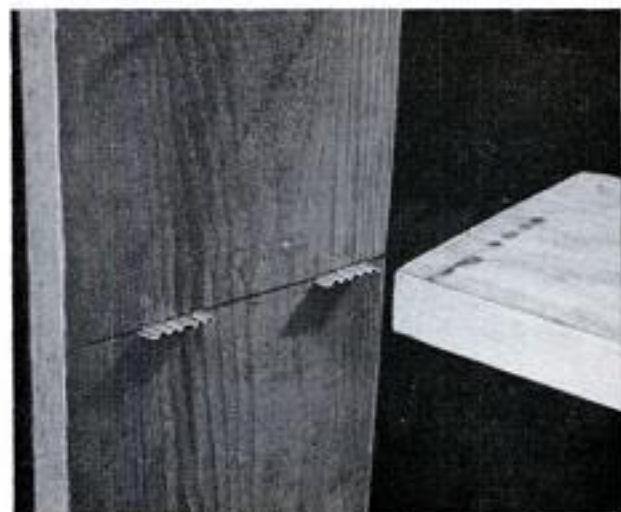
When sanding odd-shaped pieces of wood a ball of putty or modeling clay will provide a "sanding block" that will shape itself to the contour of the work. Held against the abrasive paper as indicated your fingers are protected from sharp splinters.

Allyne Smith, Syracuse, N. Y.

Fasteners Support Shelves

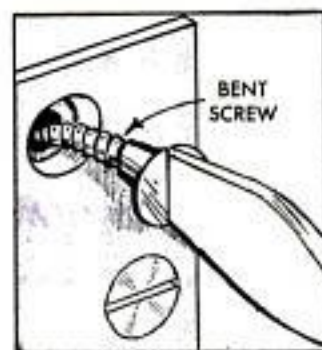
An easy way to build rough shelving is to support the ends of each shelf on corrugated fasteners driven part way into the vertical framework. After the shelves have rested on the fasteners for a while, they will become indented sufficiently to keep from slipping off the supports.

Ken Murray, Colon, Mich.



Bent Hinge Screw Tightens Self In Oversize Hole

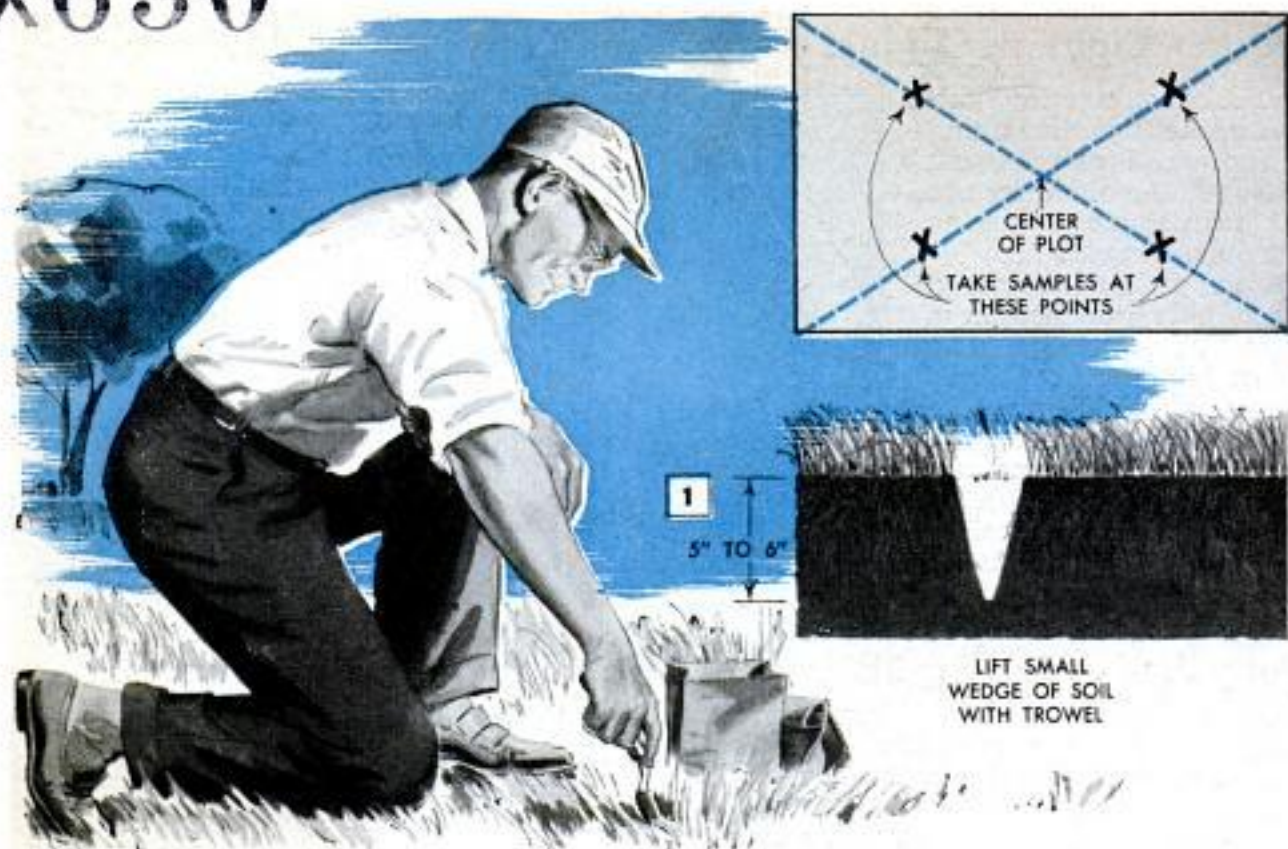
Emergency repair of a loose hinge screw due to oversize screw holes is possible by removing the screw and bending it at a slight angle as indicated. When driven back into the hole, the screw will tighten itself sufficiently to hold the hinge in place until a more permanent repair can be made.



Improvised Lettering "Brush" Made From Cloth and Cotton

There is no need to invest in special brushes to do an occasional job of sign or poster lettering. Just wrap a bit of clean cloth around a cotton ball and tie this to the end of light dowel or wooden skewer. This inexpensive "brush" need not be cleaned, but simply is discarded after being used.





TEST THE SOIL FIRST

By John B. Mullen

ROUTE 1, BARRINGTON, ILL.

WHEN YOU ARE planning to bring your garden plot up to full production of either vegetables or blooms, a soil test is the first step. This will tell you what available plant foods the soil already contains and also determine what amounts of the primary plant-food elements—nitrogen, phosphorus and potassium—must be added for maximum plant growth and yield. Soil acidity and possible lime requirements also can be estimated closely. In small plots soil samples for testing should be taken from the positions shown in Fig. 1. Use a sharp trowel and lift a wedge of soil as indicated. Place the samples in a paper bag and allow to dry overnight. Then remove all roots, gravel and any other foreign matter. Mix the samples thoroughly.

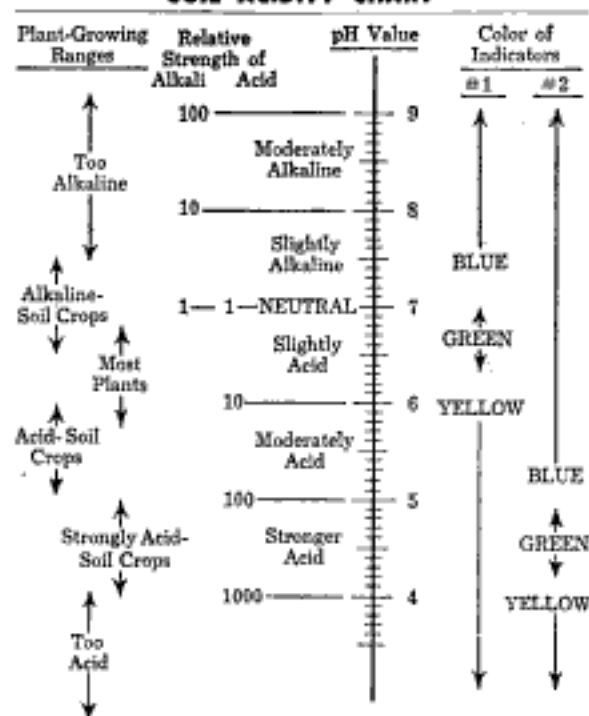
Soil acidity is measured in what are known as pH units, which designate acid, neutral and alkaline conditions by numbers 1 to 14. Note the chart on the opposite page. Acid conditions from strong to weak generally are rated from 1 to 7. A pH of 7 usually is considered neutral. Most plants grow best in a neutral or slightly acid soil with a pH value between 5.5 and 7. However, plants do have definite pH preferences as will be noted from Table III. When testing, the pH is found by adding to the soil sample an indicator solution, Table V,

which changes color, depending on the pH. Note that there are two solutions to cover the normal pH range. When checking colors it is best to place a drop of the solution on a white surface, such as a china plate, where the true color can be more accurately judged. Use only a small portion of the soil sample, about $\frac{1}{4}$ in. in a test tube, and add indicator solution No. 1 to a depth of about $\frac{1}{2}$ in. Cork the tube, shake rather vigorously, and then allow the solids to settle. After an hour or so, check the color of the liquid layer. Then find the pH value in Table VI, column 1. If the liquid is yellow, indicating a pH under 6, repeat the test, using solution No. 2 and find the pH from the color as given in the last column of Table VI.

If the pH value is low (soil too acid) for the plants you want to grow, it will be necessary to lime the soil. Table VII shows how much limestone or hydrated lime to add per 1000 sq. ft. to raise the pH one unit. On the other hand if the pH is too high, add 18 lb. of sulphur per 1000 sq. ft. to lower the pH one unit.

Testing the sample for the primary plant foods—nitrogen, phosphorus and potassium—requires the preparation of a soil extract which is made by dissolving these three elements out of the soil sample with

SOIL ACIDITY CHART



Tests with indicator solutions show pH value of soil, which tells its acidity or alkalinity. pH preferences of various plants are given in Table III.

**TABLE I
CONSUMPTION OF PRIMARY PLANT FOODS**

(Table shows the weight of nitrogen, phosphorus and potassium consumed from an area of 1000 sq. ft. by a growing crop.)

Element	Pounds Consumed	Equivalent Amount of Fertilizer	Effect on Plant of Lack of Element
Nitrogen	3	30 lb. of 10% nitrogen fertilizer	Yellowish-green color. "Firing" or drying of leaves. Slow growth.
Phosphoric acid (P ₂ O ₅)	1 1/4	12 1/2 lb. of a 10% phosphorus fertilizer	Purplish leaves. Slow growth. Low yield of grain or fruit.
Potassium oxide (K ₂ O)	3	30 lb. of 10% potash fertilizer	Curling leaves, ragged edges. Poor roots (plants may fall down). Spotted or streaked leaves.

**TABLE II
SOIL-TESTING CHEMICALS**

Chemical	Used for	Quantity Required
Bromthymol blue indicator	Acidity test	1 gram
Bromocresol green indicator	Acidity test	1 gram
Sodium hydroxide (C.P. pellets)	Acidity test	1/4 lb.
Sodium acetate	Extraction	1/4 lb.
Acetic acid (C.P. Glacial)	Phosphorus, Potassium	1 lb.

**TABLE II—Continued
SOIL-TESTING CHEMICALS**

Chemical	Used for	Quantity Required
Ammonium molybdate	Phosphorus	1 oz.
Tin wire (or foil)	Phosphorus	1 oz.
Sodium cobaltnitrite	Potassium	1 oz.
Sodium nitrite	Potassium	1/4 lb.
Isopropyl alcohol (99%)	Potassium	1 lb.
Diphenylamine	Nitrogen	1 oz.
Sulphuric acid	Nitrogen, Phosphorus	1 lb.

**TABLE III
PREFERRED SOIL pH RANGES FOR VARIOUS PLANTS**

Strongly Acid Soil pH below 5		
Cranberries	Azaleas	
Blueberries	Rhododendron	
Moderately Acid Soil pH 5 to 6		
Eggplant	Hydrangea (Blue)	
Potatoes	Ferns	
Watermelon	Pine, Firs	
Parsnips		
Slightly Acid Soil pH 5.75 to 6.75 (Most plants prefer this pH range)		
Beans	Rye	Hydrangea (Pink)
Broccoli	Wheat	Iris
Brussels	Grasses	Larkspur
Sprouts	Aster	Narcissus
Onions	Carnation	Pansy
Peas	Chrysanthemum	Rose
Peppers	Dahlia	Snapdragon
Squash	Daisy	Tulip
Tomatoes	Delphinium	Zinnia
Turnips	Gladiolus	
Corn		
Neutral or Slightly Alkaline Soil pH 6.5 to 7.5		
Apples	Cineraria	
Asparagus	Clematis	
Cabbage	Geranium	
Carrots	Ivy	
Cauliflower	Morning Glory	
Celery	Nasturtium	
Lettuce	Petunia	

**TABLE IV
EQUIPMENT REQUIRED FOR SOIL TESTING**

Test tubes—3" x 3/8" or 4" x 1/2"
Corks to fit test tubes
Glass filtering funnel
Filter paper to fit funnel
Graduated cylinder—10 ml. or 25 ml.
Medicine droppers

**TABLE V
INDICATOR SOLUTIONS**

	Indicator No. 1	Indicator No. 2
(A) Bromthymol blue (powder)	.01 gram	
Bromocresol green (powder)		.01 gram
Pure grain alcohol (or isopropyl alcohol)	5 ml.	5 ml.
Distilled water	95 ml.	95 ml.
(B) Sodium hydroxide (C.P. pellets)	2 pellets (1/4 gram)	2 pellets (1/4 gram)
Distilled water	1 pint	1 pint

Dissolve powder in alcohol, add distilled water to complete (A); then add solution (B), drop by drop, until color is yellow-green.

TABLE VI
COLORS AND pH VALUES FOR INDICATORS

Indicator No. 1	Color of Solution	Indicator No. 2
pH over 7.5	Blue	pH over 5.25
pH 7 to 7.5	Blue-Green	pH 4.75 to 5.25
pH 6.5 to 7	Green	pH 4.25 to 4.75
pH 6 to 6.5	Yellow-Green	pH 4 to 4.25
pH under 6	Yellow	pH under 4

TABLE VII
USE OF LIMESTONE OR HYDRATED LIME TO RAISE pH OF SOIL

(Table shows number of pounds of crushed limestone or hydrated lime required per 1000 sq. ft. to raise the soil pH one pH unit.)

Type of Soil	Crushed Limestone	Hydrated Lime
Light sandy soil	35 lb.	26 lb.
Sandy loam	45 lb.	33 lb.
Loam soil	70 lb.	52 lb.
Clay loam	80 lb.	60 lb.

TABLE VIII
EXTRACTION SOLUTION

Sodium acetate	20 grams
Acetic acid (C.P. Glacial)	6 ml.
Distilled water	175 ml.

TABLE IX
STANDARD SOLUTION OF PLANT-FOOD ELEMENTS

Stock Solution	
Monosodium phosphate	2 grams
Potassium nitrate	1 gram
Distilled water	1000 ml. (1 liter, or 1.056 qt.)
Standard Solution	
Stock solution	10 ml.
Extraction solution	90 ml.

TABLE X
REAGENT SOLUTION FOR PHOSPHORUS

Phosphorus Reagent A	
Ammonium molybdate	10 grams
Distilled water	40 ml.
Phosphorus Reagent B	
Acetic acid (Glacial)	10 ml.
Distilled water	100 ml.
Sulphuric acid	5 ml.
Mixed Phosphorus Reagent	
Add all of Phosphorus Reagent A to Phosphorus Reagent B and stir to mix well.	

TABLE XI
PHOSPHORUS-TEST COLORS AND REQUIREMENT FACTORS

Color of Test Solution	Amount of Phosphorus in Soil	Phosphorus Requirement Factor
Faint blue or clear	Very low	900
Lighter than standard	Low	750
Like standard	Medium	600
Deeper than standard	Medium high	450
Very deep blue	High	350

TABLE XII
REAGENTS FOR POTASSIUM

Potassium Reagent No. 1	
(A) Sodium cobaltinitrite	5 grams
Sodium nitrite	30 grams
Distilled water	50 ml.
Acetic acid (Glacial)	5 ml.
Distilled water— to make a total volume of	100 ml.
Potassium Reagent No. 2	
(B) Sodium nitrite	15 grams
Water	100 ml.
1. Dissolve the chemicals for (A) in the order listed, and let stand in an unstoppered bottle for a few days.	
2. Prepare solution (B).	
3. Add 5 ml. of (A) to all of (B) to complete Potassium Reagent No. 1.	
Pure isopropyl alcohol	

TABLE XIII
POTASSIUM-TEST COLORS AND REQUIREMENT FACTORS

Appearance of Test Solution	Amount of Potassium in Soil	Potassium Requirement Factor
Trace of cloud	Very low	700
Less cloud than standard	Low	600
Like standard	Medium	400
More cloud than standard	Medium high	200
Dense cloud	High	100

TABLE XIV
REAGENT FOR NITROGEN

Diphenylamine	.05 gram*
Sulphuric acid (C.P. Concentrated)	25 ml.
* Amount the size of a small pea	

TABLE XV
NITROGEN-TEST COLORS AND REQUIREMENT FACTORS

Color of Test Solution	Amount of Nitrogen in Soil	Nitrogen Requirement Factor
No blue	Very low	400
Lighter than standard	Low	300
Like standard	Medium	250
Darker than standard	Medium high	200
Very dark blue	High	100

TABLE XVI
CALCULATING FERTILIZER REQUIREMENTS (EXAMPLE)

Food Element	Fertilizer Material	Anal. No.	Food-Element Requirement Factor	Lb. Req'd. per 1000 sq. ft.
Nitrogen	Sodium nitrate	15	250	250 ÷ 15 = 17 lb.
Phosphorus	Super-phosphate	20	450	450 ÷ 20 = 23 lb.
Potassium	Potassium chloride	52	100	100 ÷ 52 = 2 lb.

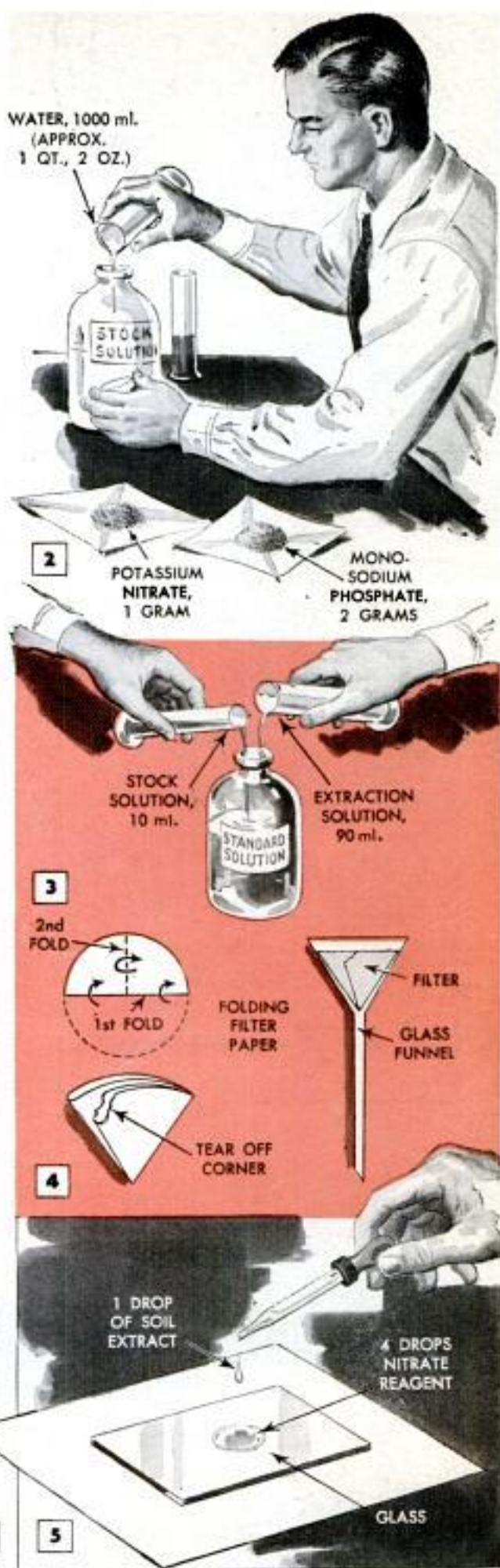
an extraction solution, Table VIII. To prepare extract, fold filter paper as in Fig. 4 and place in a glass funnel. Place a level teaspoonful of soil on the filter. Place a clean test tube (or a small glass tumbler) under the funnel spout. Pour 10 ml. (milliliters) of extraction solution on the soil sample and when the liquid has passed through the filter, lift the latter and squeeze it lightly to force out the remaining extract. Portions of this extract are used in all remaining tests. Now, make a stock solution and a standard solution as in Figs. 2 and 3, also Table IX.

Tables X to XVI inclusive outline the tests for the primary plant foods and show how to calculate fertilizer requirements, Table XVI. Using as an example the test for phosphorus, Table X, pour soil extract into a test tube to a depth of about $\frac{1}{2}$ in., then add an equal amount of the phosphorus reagent (solution). Stir with a pure-tin wire, or add two $\frac{1}{4}$ -in. squares of tin foil and stir with a glass rod, until a full blue color results. Now, in a second test tube mix equal amounts of standard solution and phosphorus reagent and stir with a bright tin wire. Compare the colors and judge the amount of phosphorus present by referring to Table XI. The phosphorus requirement will be used later in estimating the amount of fertilizer needed. Note that two reagents are required for the potassium test, Tables XII and XIII, but that only one reagent is needed to test for nitrogen, Table XIV.

Note that in preparing the nitrogen reagent it will be necessary to handle concentrated sulphuric acid, Table XIV. This acid is extremely corrosive and must be placed in a glass-stoppered bottle, or one with a paraffined cork. Take every precaution against having any of this solution containing sulphuric acid come in contact with the skin, clothing, workbench or any metal object. Protect the eyes against splatters. Wear rubber gloves. In carrying out the test, lay a small pane of glass on a sheet of white paper, Fig. 5, and place four drops of nitrate reagent in the center. Follow with one drop of soil extract. Immediately a blue ring will form, Fig. 6. After allowing three minutes, compare the color with that of a nitrogen standard, prepared in the same way except using one drop of standard solution instead of soil extract. Refer to Table XV for the values. ★ ★ ★



MARCH 1957



OLD WHEELS "ROLL" AGAIN

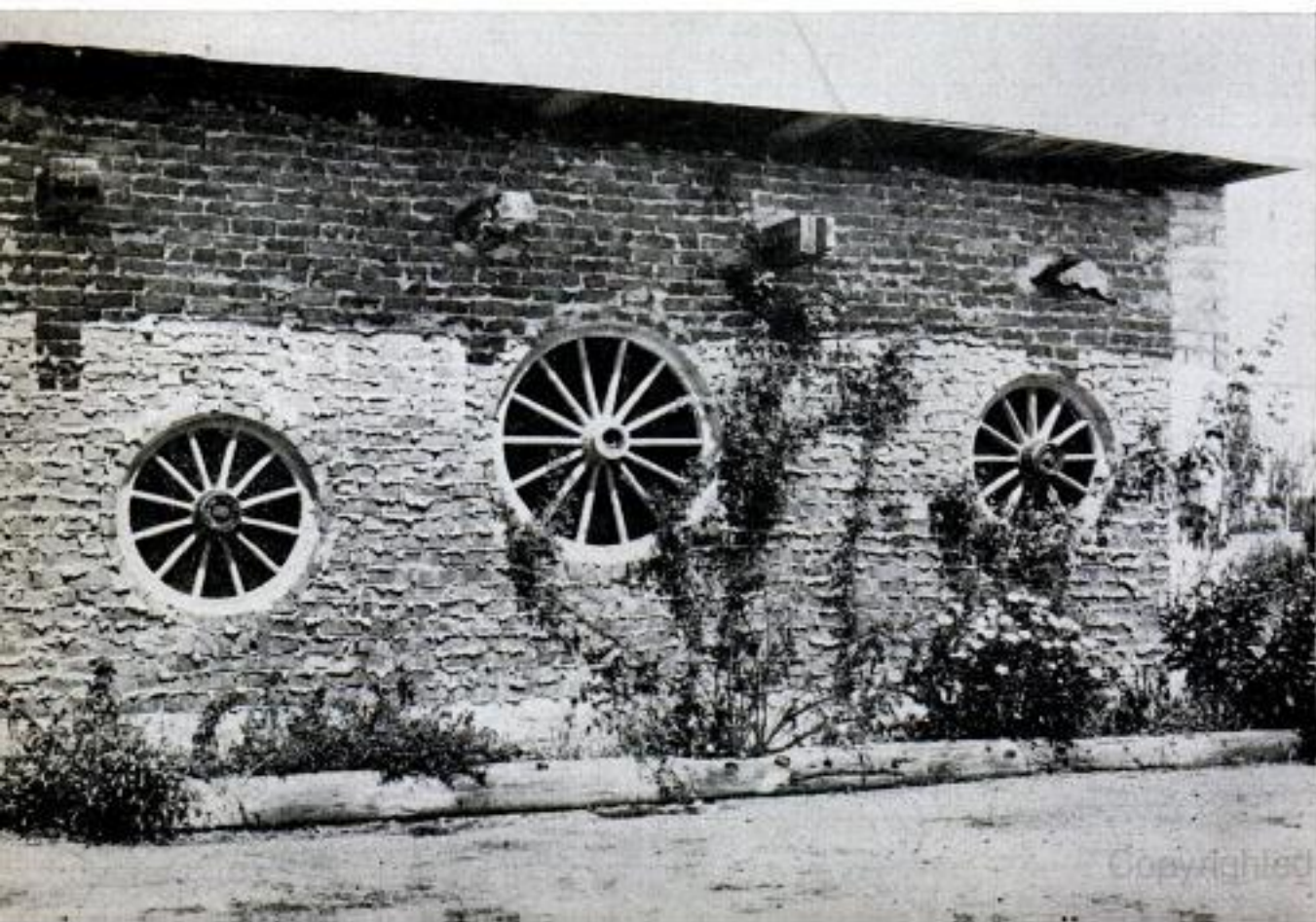
WHAT GOOD is an old wheel? Leland Elam of Sacramento, Calif., found that a wheel doesn't have to be on a wagon or buggy to be useful. A tour of the countryside with his camera showed that Western farmers have put these relics of the horse-and-buggy days to dozens of practical and decorative purposes. Rather than relegate them to the junk pile they have put them back to work in a variety of ways, ranging from serving as decorative windows to supporting rural mailboxes. As this group of photos shows, there are almost endless uses for one or several of these old wooden wheels. For instance, look what three farm-wagon-wheel windows can do to make a plain brick wall really attractive. Such windows can be mortared in a fence-wall for mere decoration or they can be backed with glass to serve as real windows. A single buggy wheel placed flat on the ground makes a novel flower bed, while another mounted on the wall of a building will provide an unusual trellis for a climbing vine. Several large farm-wagon wheels can be leaned against a split-rail fence to add further rustic decoration. A buggy wheel will make a unique vegetable-display rack at a county fair. The wheel is backed with a sheet of plywood and supported at a slant. Place grain between spokes and nest vegetables in grain. ★★



Above, a buggy wheel makes a unique window-trellis for a barn. Below, wheels help decorate rail fence



Below, mortared in walls of an "adobe" structure, three wagon wheels make unusually appropriate windows





As a sturdy farm-mailbox support, a wagon wheel is hard to beat. Here a most unique box rests on a platform of angle iron which is welded to the steel tire



Above, two farm-wagon wheels set in concrete add a decorative touch to an entrance walk. Below, buggy wheel painted white and laid on ground makes novel flower bed. Dirt is poured between the wheel spokes



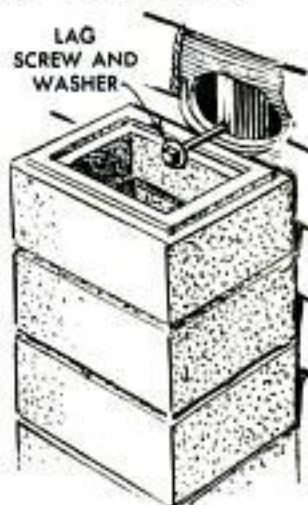
Auto Registration Certificate Carried on Identification Tag

A luggage identification tag containing the auto registration certificate and attached to a key chain as shown in the photo is used by one car owner to assure presence of the certificate on the vehicle whenever it is driven, as required in most states. The key chain and tag are kept on a hook inside the house for the convenience of other members of the family.



Chimney "Screwed" to Building

Instead of using unsightly iron bands to hold a cement-block chimney to a building, try lag screws, placing them about every 5 ft. as the chimney is built. It is necessary to notch the top of the block slightly to form a bed for the lag screw and prevent it from interfering with the next course. Locate the screws so they enter the studs.



Locate the screws so they enter the studs.

Trellis Made With Coat Hangers

Three or four wire coat hangers nailed one above the other on a discarded broom handle or other wooden upright as shown provide an excellent trellis for small climbing plants. Use poultry-wire staples to fasten the hangers and apply wood preservative to the part of the upright that is to go underground. Paint the completed trellis with outdoor paint to prevent the metal hangers from rusting.



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

X342C "PINTO"



Broom Clamp on Ladder Rail Keeps Hammer Handy

If you are doing a job on a ladder for which a hammer occasionally is needed—such as nailing down loose boards while calking—keep the hammer in a broom clamp attached to one of the side rails of the ladder. The hammer will be more easily reached than if it were carried shoved under a belt, and will definitely be more secure than if the claws were hooked over one of the ladder rungs where it easily can be knocked to the ground.

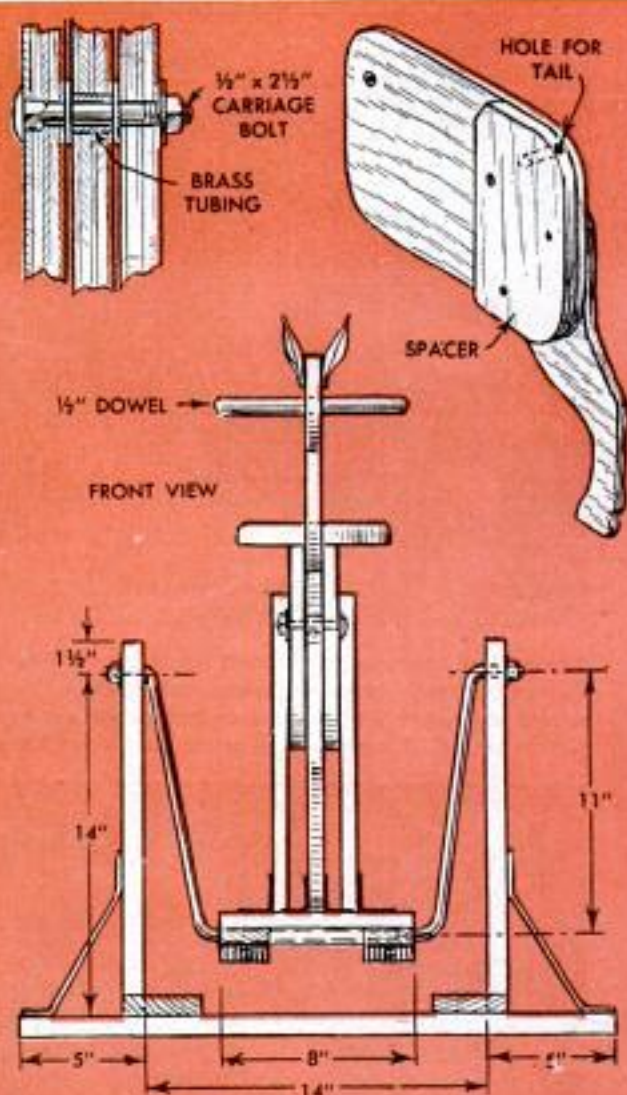
Road-Map Distances Measured By Use of Pipe Cleaner

Want to know how far you will drive to reach a specific destination without adding up all the small mileage figures on a road map? Bend a pipe cleaner along your proposed route, then straighten it and measure the indicated distance on the scale-of-miles diagram at the corner of the map.



HERE IS A sturdy rocking horse designed for the enjoyment of any lively youngster four to seven years of age. The base on which the horse is mounted is made of 1-in. pine lumber nailed together and reinforced with steel braces bent from $\frac{1}{8}$ x $\frac{3}{4}$ -in. stock. The parts for the horse are scrollsawed from $\frac{1}{2}$ -in. plywood, the head and foreleg being in one piece, while the hind legs and body are cut in pairs according to the squared pattern shown for each.

After assembling the horse and base, the hoofs are fastened to small wooden platforms with inside corner plates and the entire unit then is clamped to two U-shaped rods by wooden blocks notched to fit over the rods and screwed to the platforms as shown in one of the details. A length of brass tubing slipped on each of the rods before bending serves as a bearing, permitting a rocking motion when the rider pushes forward on the dowel handle bars.



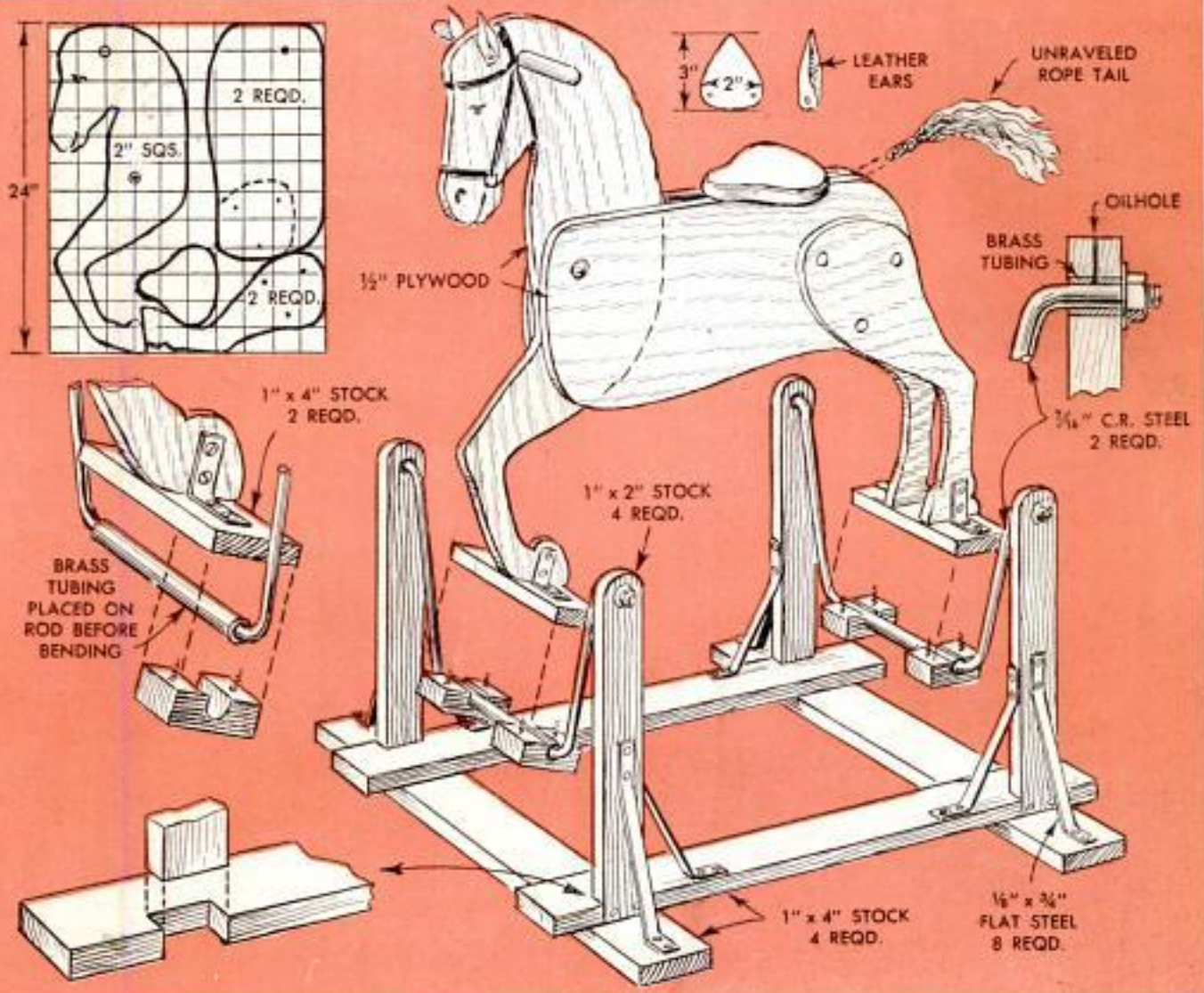
WTM 58

ROCKING HORSE

fitted in the horse's head. Short lengths of brass tubing inserted in holes drilled in the upper ends of the base uprights provide bearing surfaces for the rods. A small hole drilled vertically in the top of each upright, as shown in the detail on the right side of the drawing, provides a means of lubricating the bearing surfaces to reduce wear and noise.

To complete the rocking horse, the base is painted red, the rods green and the horse large irregular black spots on white, for a pinto. The tail is simply unraveled Manila rope bound at one end so that it can be glued in a hole drilled in the body spacer block as shown. The halter, mane and hoofs are painted on the horse in black. The ears are cut from the uppers of discarded leather shoes and glued and nailed on the head.

Hi Sibley, Nuevo, Calif.



SOLVING

Home Problems

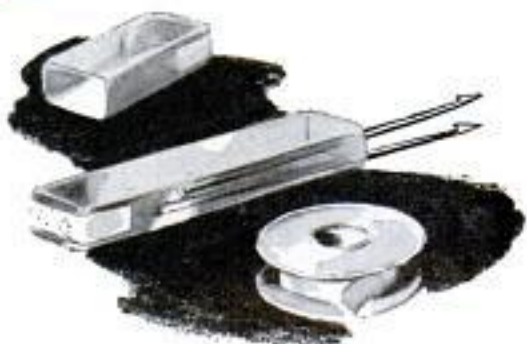
NEWSPAPERS turned into ends of a roll of linoleum will protect edges against damage. When rolling, place papers as shown



PIPE FLANGE makes the low candleholder you need when necessary to improvise a floral centerpiece. Be sure to get right size so threads hold candle

CROCHET HOOKS stored in a toothbrush holder won't snag delicate fabrics or injure fingers. Apply strips of adhesive tape over holder ends to close vents

ONE-DROP OILER for typewriter, guns and fishing tackle can be made by filling an old fountain pen with light lubricating oil. Reaches hard-to-get-at places



SHOE-POLISHING BLOCK faced with lamb's wool makes an ideal padded sanding block for finish-sanding both flat and slightly curved surfaces. Soft, springy padding causes abrasive to conform to surface





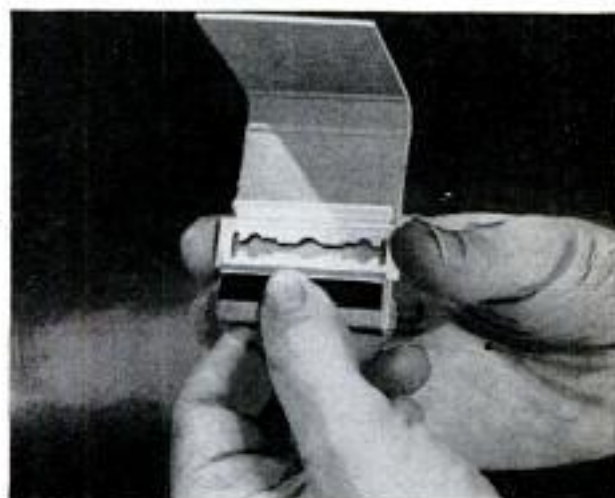
LOOSE HANDLE of your plumber's suction cup can be anchored securely with an ordinary bottle cap. Remove the handle from the rubber cup, screw the bottle cap to the end as pictured and then force handle back in place

FOOT SCRAPER is improvised from a discarded broom and a short length of pipe. The latter is driven into the ground near the stoop. Then bristles of the broom are cut off square and handle is inserted in the pipe



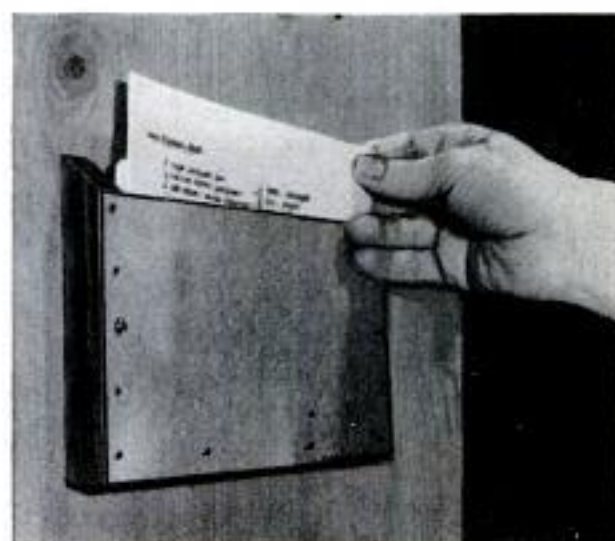
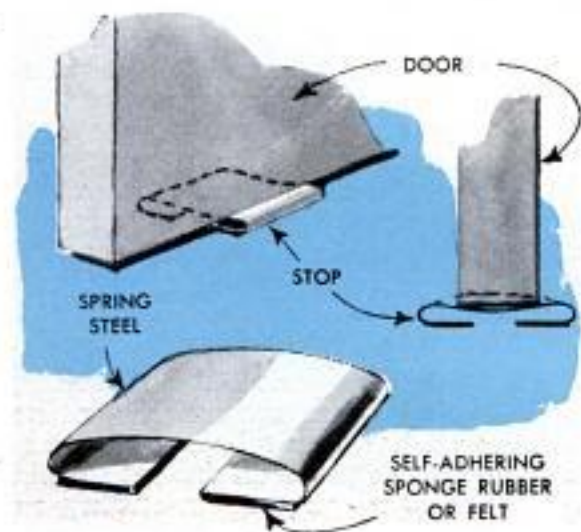
FRICTION LIDS on paper containers which are to be reused are easier to remove if you cut uniformly spaced slits in the cover rim before replacing. Cut the slits the full width of rim with sharp knife

AN EMPTY MATCHBOOK is the safest place to store that safety-razor blade you keep in your sewing kit. Slide edge of blade behind match stubs, then wrap cover tightly and hold securely with a rubber band



HANDY DOORSTOP made from a length of sheet metal holds the door securely when partially or fully open. Bend the metal to the shape indicated and fit pads of sponge rubber or felt to prevent slipping

FAVORITE RECIPES have a way of getting mislaid unless you keep them in this special file pocket attached to the back of a kitchen-cabinet door. Make file of colored plastic or plywood, attach with screws



Mirror Background for Photographing Flowers



The problem of photographing wild flowers surrounded by other vegetation is solved by propping a mirror back of the blooms being photographed. The mirror provides an artificial background, which isolates the subject and catches sky and cloud reflections that sharpen the detail and improve composition.—H. Beatty, New York City.

☐ Fewer insects will be attracted to fresh paint during warm weather if a small amount of a good insect repellent is added when mixing it.

Imitation Inlay Stenciled On Table Top

Beautiful "inlay" patterns are easy to apply on table tops, doors and other woodwork with shellac and a stencil of the desired design. Simply place the stencil on the unfinished wood surface and brush thin, clear shellac over it. After the shellac has dried, stain and finish the work. Only the surface that is not protected by the shellac will receive the stain. Since no two woods take stain alike, experiment on a sample piece.



Emergency Hose Clamp From Wire and Bolt

When you need a hose clamp in a hurry and none is available, try winding two turns of wire around the hose and drawing it tight with a bolt passed through eyes formed in the ends of the wire as shown in the photo.



Fingers From Rubber Gloves "Leakproof" Bottles

Fingers cut from old rubber gloves are ideal for slipping over cosmetic bottles to prevent any possibility of leakage should the caps loosen. These fingers also may be used as guards over the caps of bottles containing poison kept around the home. To apply a finger, first roll it around the edge almost to the end and then stretch it over the cap, rolling it down over the neck of the bottle. To open the bottle, simply roll up the finger to the cap, leaving the rolled finger on the cap. The rubber fingers can be rolled inside out for easy cleaning.

Mrs. Michael Fey, New York City.

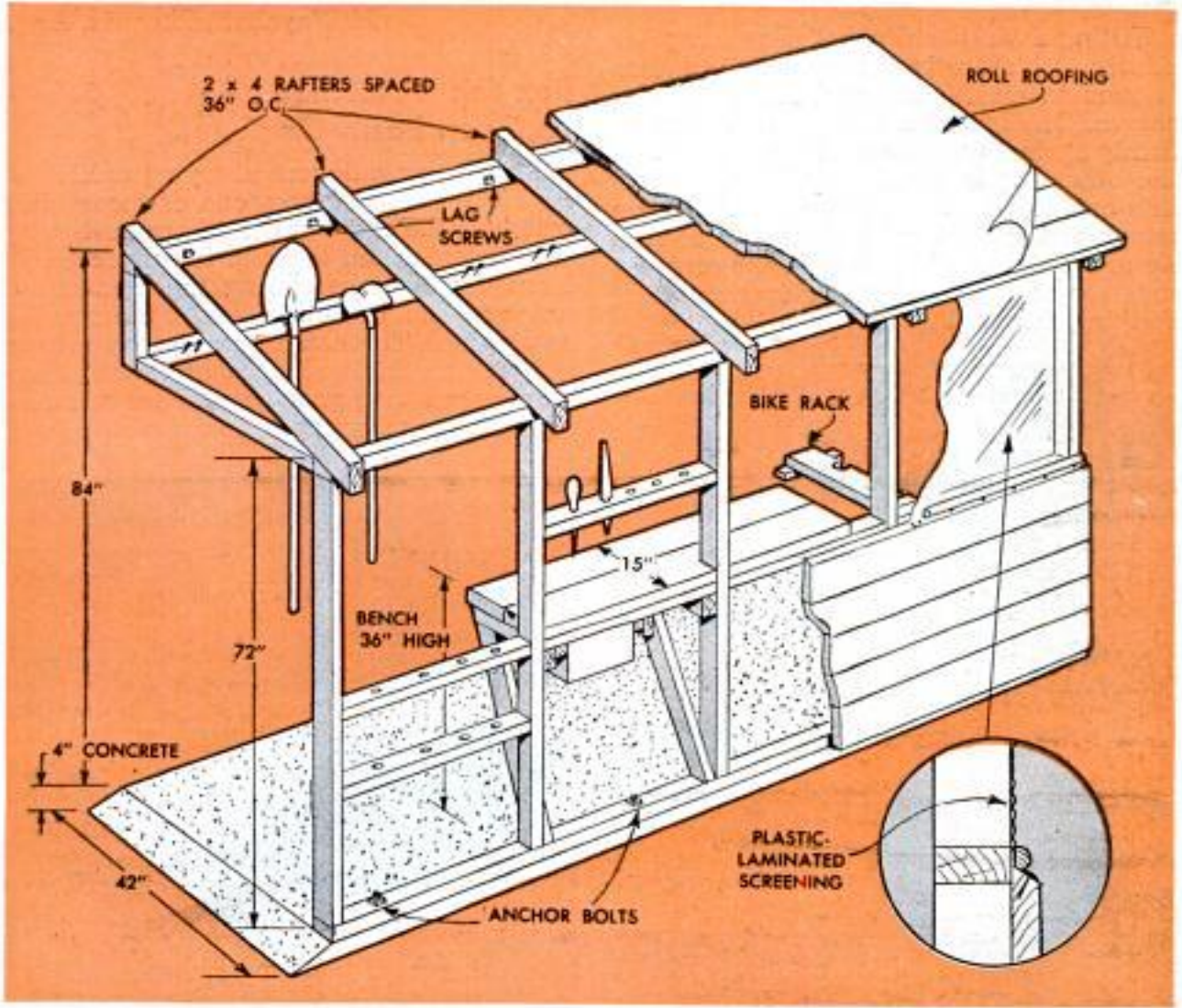
☐ Watch television without disturbing other individuals who are reading in the same room by having a television serviceman install phone jacks on the set so that earphones may be plugged in, cutting off the speaker sound.

WTM 58 + SN 58

LEAN-TO WORKSHOP

Provides Storage and Workspace

IF YOU NEED extra storage and workspace at low cost, this lean-to shed will provide it. Built against any existing structure, the shed provides storage for bicycles, garden tools and similar articles, as well as having space for a small workbench. The shed is built on a 4-in. concrete-slab floor, and its roof can be blended into the roof of the adjoining structure for neat appearance if desired. In this case, matching roofing material would be used. The original shed was roofed with roll roofing and the window openings were covered with plastic-laminated screening nailed in place and attached to the siding below the openings as indicated in the circular detail. No doors were used in the shed, and the end walls were left open. Hand tools can be accommodated in racks fitted between the 2 x 4 studs over the bench and beside it. Drawers under the bench will provide storage for tools that cannot be kept in racks.



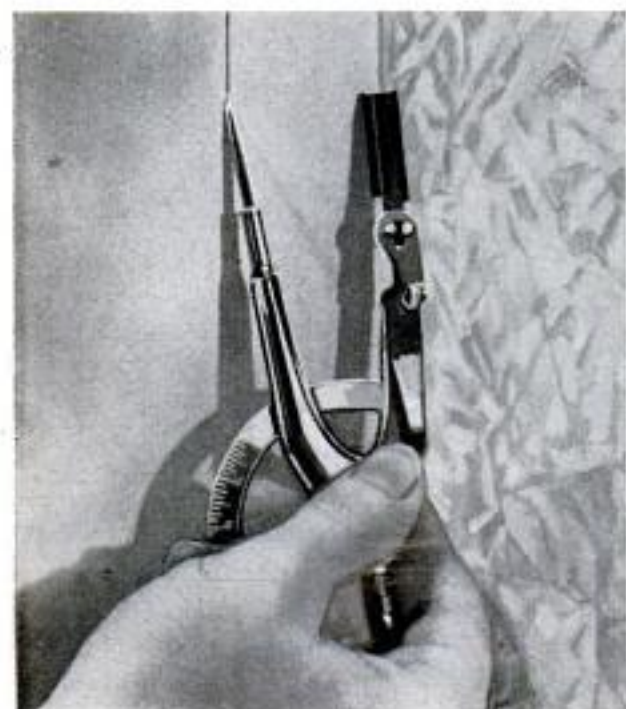
Cement-Roughening "Trowel" Made From Block and Shingle



A roughening "trowel" for finishing a concrete floor or walk may be made by tacking a gravel-surfaced asphalt shingle to a wooden block of suitable size

Compass Traces Corner Deviation On Wallboard Panel for Good Fit

Fitting a wallboard panel in an irregular corner of a room is easy when a compass is used to mark the panel for cutting as shown. One leg of the compass is pressed firmly against the corner of the room while the other leg is used to scribe a vertical line on the wallboard reproducing all the irregularities that exist along the corner. To prevent error, both legs of the compass must be held at the same elevation while scribing the line.



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Shoehorn Used as Gardening Tool For Transplanting Seedlings

Transplanting seedlings and delicate plants with a minimum amount of damage can be done with a shoehorn. The concave body and rounded edge of the shoehorn permit lifting the plants gently with just the right amount of soil, and the curved top of the horn provides a firm grip.—Charles Carroll, Marion, Ohio.



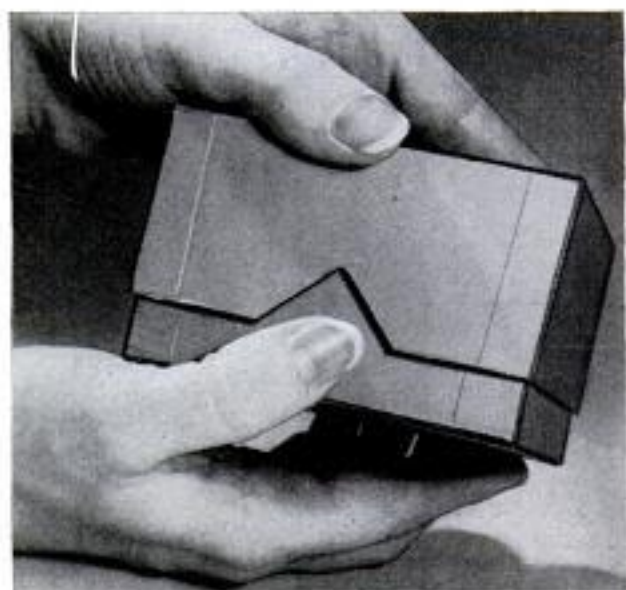
Beads Grouped Between Knots Simplify Restringing Task

Accidental breaking of a necklace is less trouble if the majority of the beads remain on the string, held by a series of knots. A suggested pattern would be to string six beads at a time tying a knot in the string between each group of six, large enough to retain them. In case of breakage, only six beads will fall off.

A. H. Waychoff, Phoenix, Ariz.

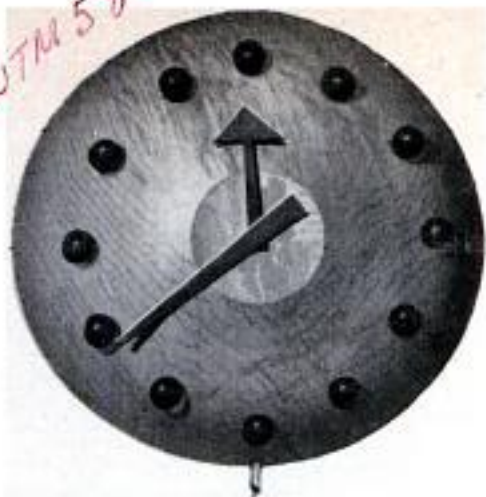
Box Top Is Notched To Open Easily

Ever break a fingernail trying to lift the lid of a cardboard box, one of those kind on which the edges of the lid are flush with the bottom when the box is fully closed? Next time, before closing the box, cut a notch in one, or both, sides of the box lid as pictured. The notch permits you to grip the box while the lid is lifted off. Also works well with gross-size boxes containing screws, screw eyes and hooks.



POPULAR MECHANICS

WTR 58



Salad-Bowl Novelties

By Ron Anderson

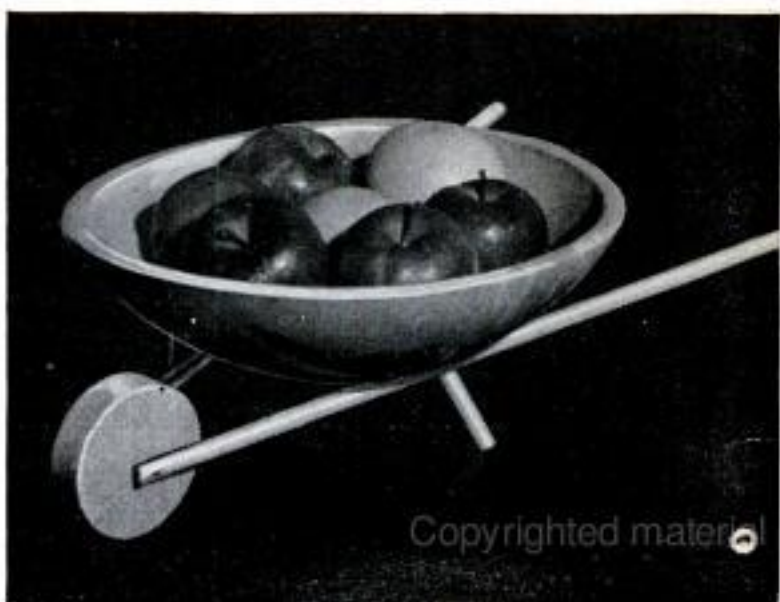
WOODEN SALAD BOWLS become interesting and attractive novelties simply by adding legs, a cover, handles, or making other minor changes or additions as shown in the examples illustrated on this page. Twelve cork balls, a pair of hands cut from copper sheet metal and the works from an old clock are used in making the modernistic wall clock shown above. The dome-shaped birdhouse has a hardboard bottom with a perch attached to the rim of the bowl and an entry cut in one edge.

The bowls are available in various sizes in waxed natural-wood finish, making it easy for anyone to turn out work with a professional appearance. If a painted finish is desired, it is necessary to remove the wax before refinishing.

To make this handy knitting basket, drill three $\frac{3}{8}$ -in. holes nearly through the bottom of large-size bowl and insert dowels 20 in. long for legs



Above, for snack server, glue 8-in. length of $\frac{3}{8}$ -in. dowel in hole drilled in bowl, add leather thong. Below, wheelbarrow fruit bowl is made from four lengths of $\frac{3}{8}$ -in. dowel and 3-in.-dia. wooden wheel





Courtesy Car Bros. Products

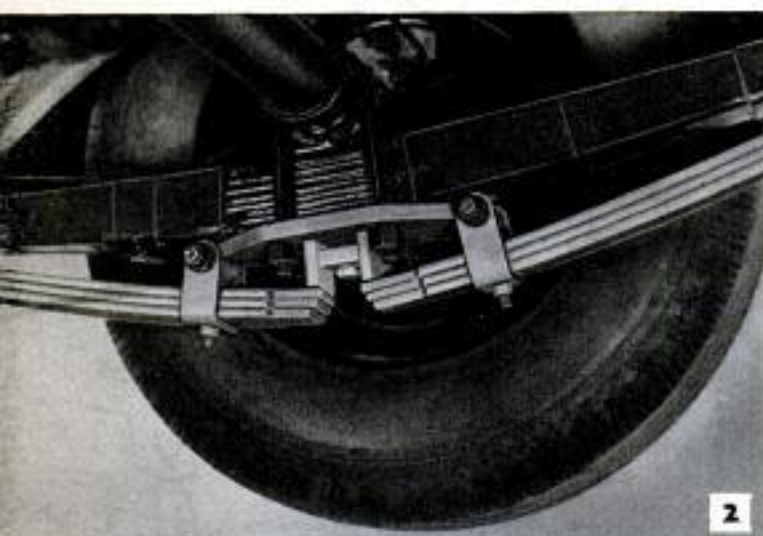
WHEN YOU SHOP FOR

Important fittings for comfort and safe travel are overload springs and hitches that stabilize the load.

REQUIREMENTS for safe, trouble-free travel in a trailer are much the same whether you choose a fully equipped mobile home, Fig. 1, or settle for a light job like that pictured in Fig. 4. The smaller unit will trail better on the highways and back roads when equipped with a weight-distributing hitch and big mobile homes will require both the special hitch and helper (overload) springs on the car for maximum safety and driver comfort while on the road. Special hitches on the trailer and overloads on the car keep both units on an even keel, prevent sway and roll on curves and level out dips on secondary roads that may otherwise cause the car frame to bottom on the axle due to uncontrolled weight on the trailer drawbar. Extreme deflection of the car's rear springs under unstabilized trailer weight has the effect of lightening the front wheels, causes uncertain and hazardous steering, accelerates front-tire wear and at night tilts even the headlight down beams to a point somewhere above the horizon.

Helper Springs

Helper springs, or overloads as they are commonly called, generally are weight-rated and from these ratings it is possible to determine the capacity required as most manufacturers of trailers give the approximate drawbar weights, which usually range from 6 to 12 percent of the total weight. Of course, it should be remembered that the actual drawbar weight, with the

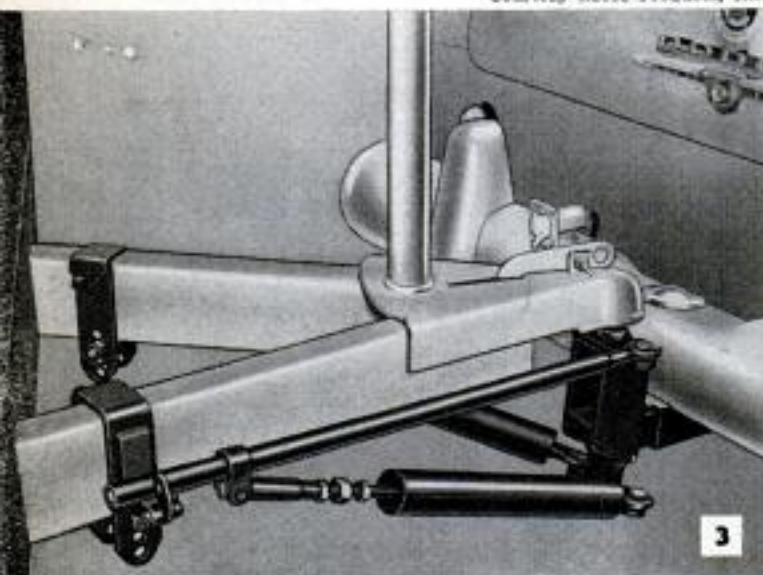


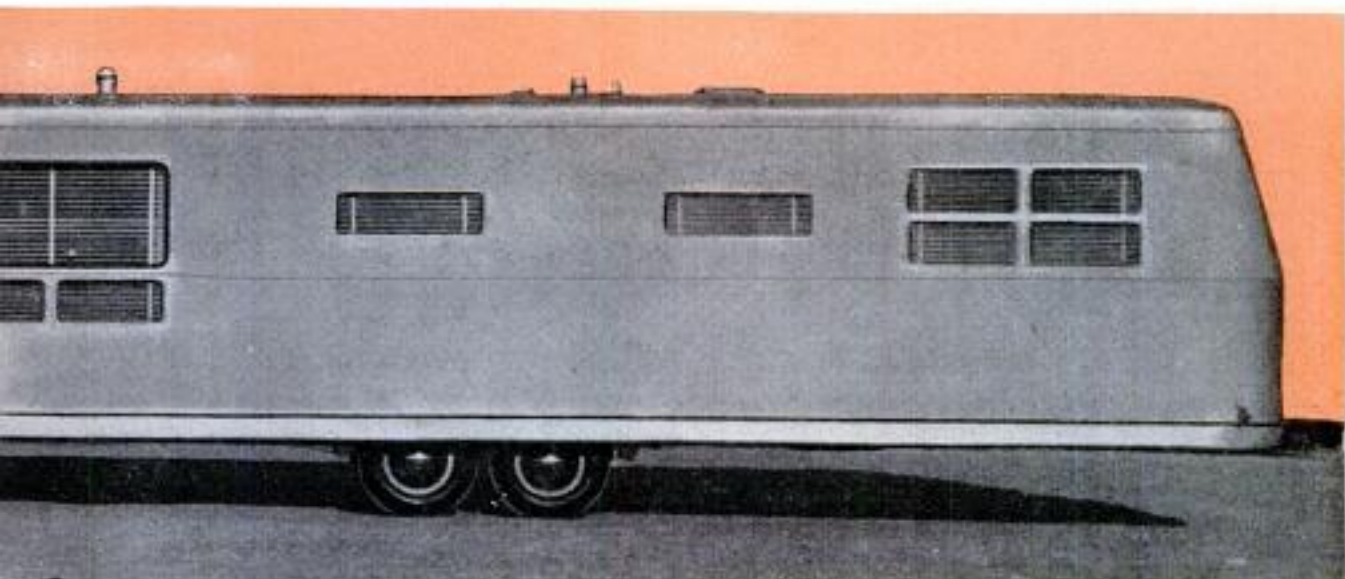
Courtesy Duo-Control Spring Co.

Above, heavy-duty helper spring (overload) attached to rear car spring. Can be released when not in use.

Below, weight-distributing hitch attached to car

Courtesy Reese Products, Inc.





A TRAILER—

By Clinton R. Hull

trailer loaded for the road, depends to a considerable extent on proper distribution of the load.

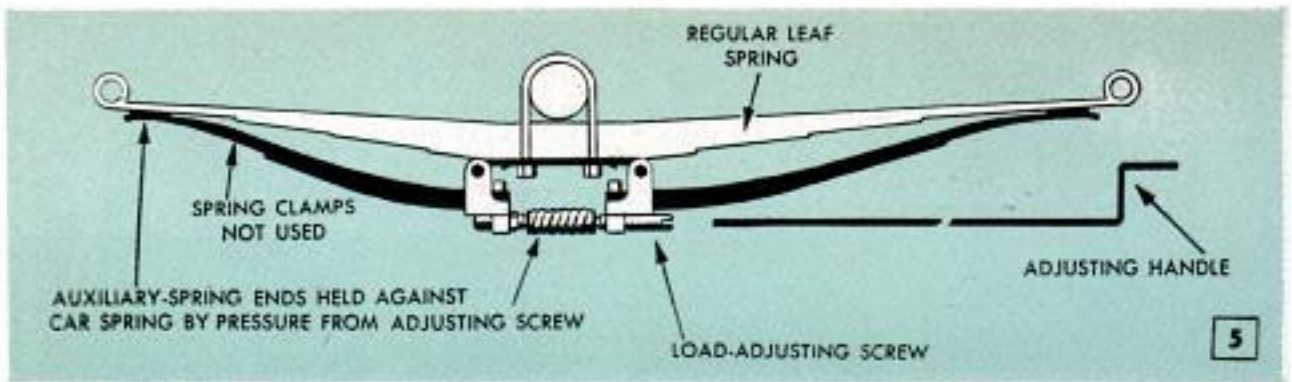
Representative types of overloads are shown in Figs. 2, 5, 6 and 10, but there are other types not pictured. These include half-length overloads, for light trailers, which clamp onto the rear halves of the car springs. There also are pneumatic overloads of several types and of varying capacity. Nearly all overloads throughout the capacity ranges ordinarily supplied are designed to be removed or released easily when not in use. Note as an example, the load-adjusting and releasing devices on the high-capacity overloads in Figs. 5 and 10.

The important consideration in selecting a trailer hitch of the weight-distributing, or compensating, type is to obtain a unit exactly suited to the trailer, the car and the type of service you are going to require.

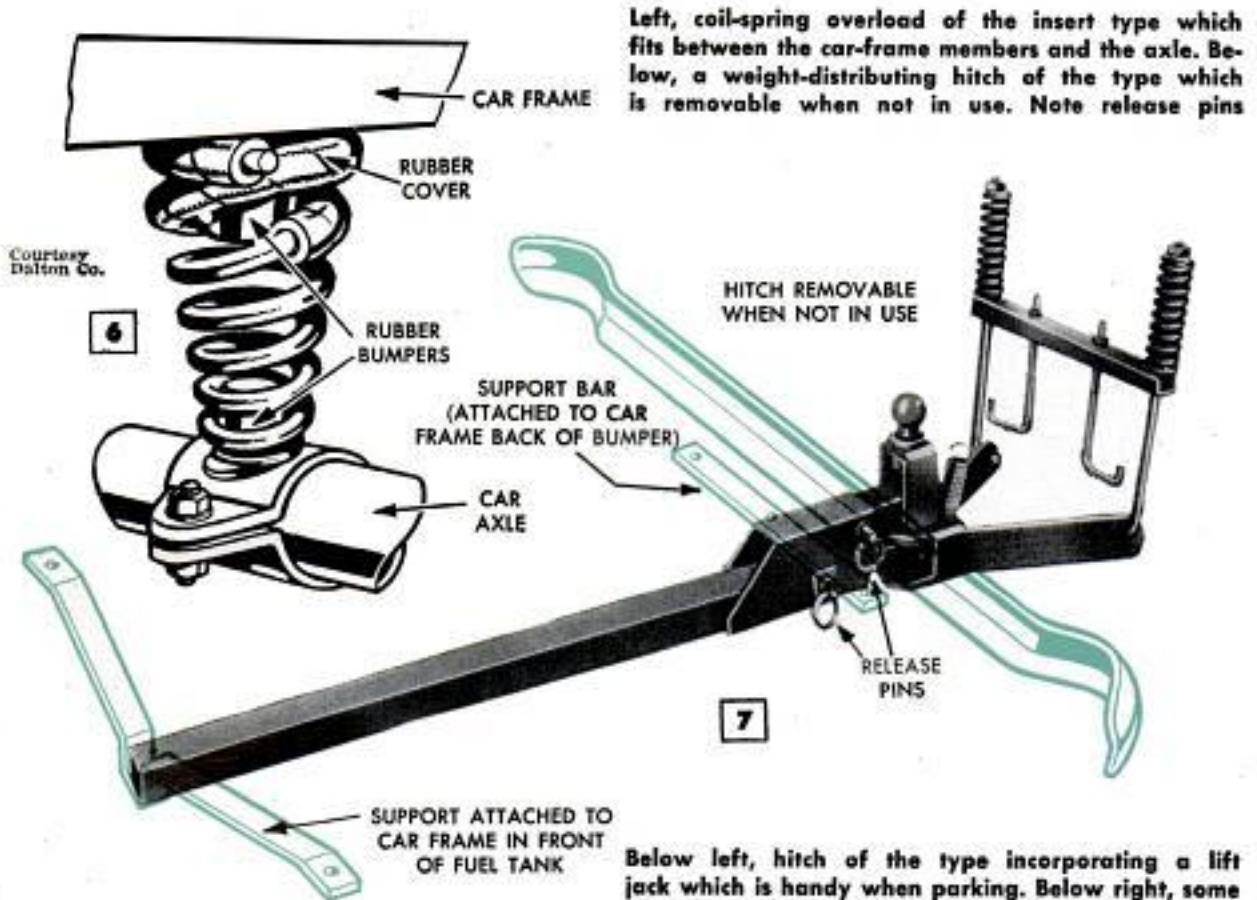
In a general way, weight-distributing hitches are of two types, those that bolt to the car bumper with extensions that extend back to a cross member of the car frame, and those that attach to the bumper and extend back to the rear axle of the car. Weight-distributing hitches of several types are illustrated in Figs. 7, 11 and 12. Hitches shown in these views are of the type that attach to the car frame, or to the frame and body, but not to the rear axle of the car. In some instances these hitches are attached to the car-frame members by welding, but as a rule manufacturers of hitches of this type recommend that the parts be bolted in place. Figs. 13, 14 and 16 picture hitches of the type that attach to the rear axle of the car by means of heavy saddles. On some variations of this special type the hitch ball is mounted directly on the saddle, the trailer being fitted with a

Many trailerists prefer weight-distributing hitches on smaller trailers for maximum safety and driving ease

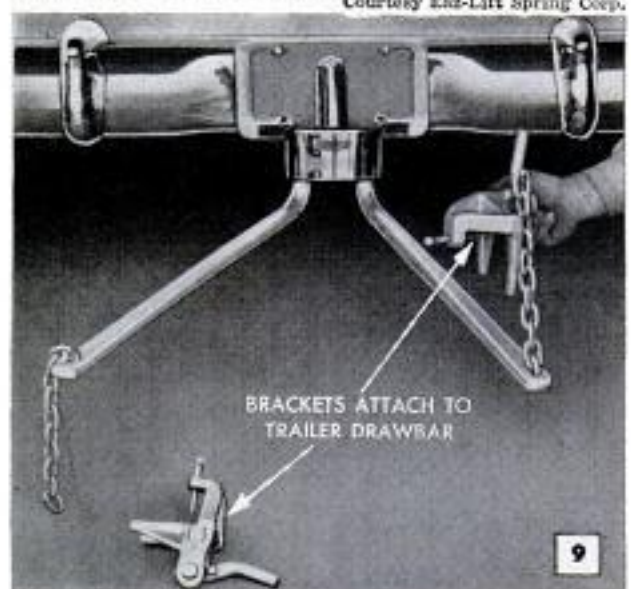
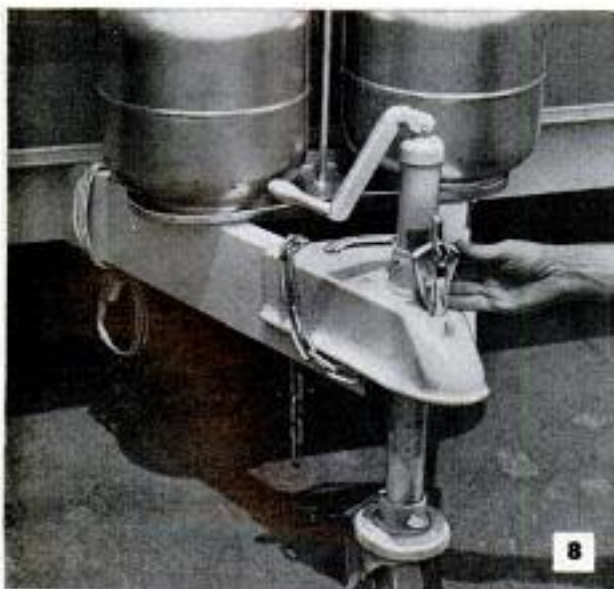


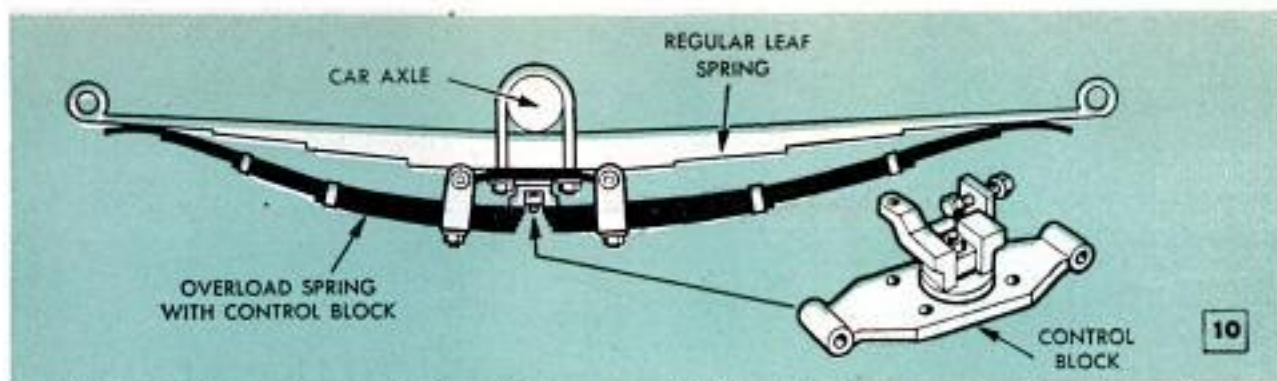


Overload spring of type that can be adjusted or released by means of handle which projects beyond bumper



Courtesy Ear-Lift Spring Corp.





Another type of heavy-duty overload employing a control block rather than a screw and crank for adjustment

special extension drawbar. Such hitches require no overloads as drawbar weight is carried directly to the rear wheels of the car. Manufacturers design hitches to fit nearly all makes and models of cars and supply any special parts necessary for attaching. Complete instructions are furnished. In the illustrations of the general types of hitches it should be noted that in several instances not all parts are shown.

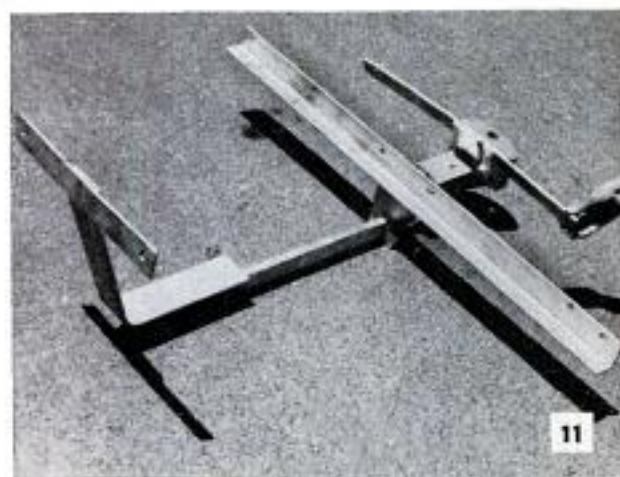
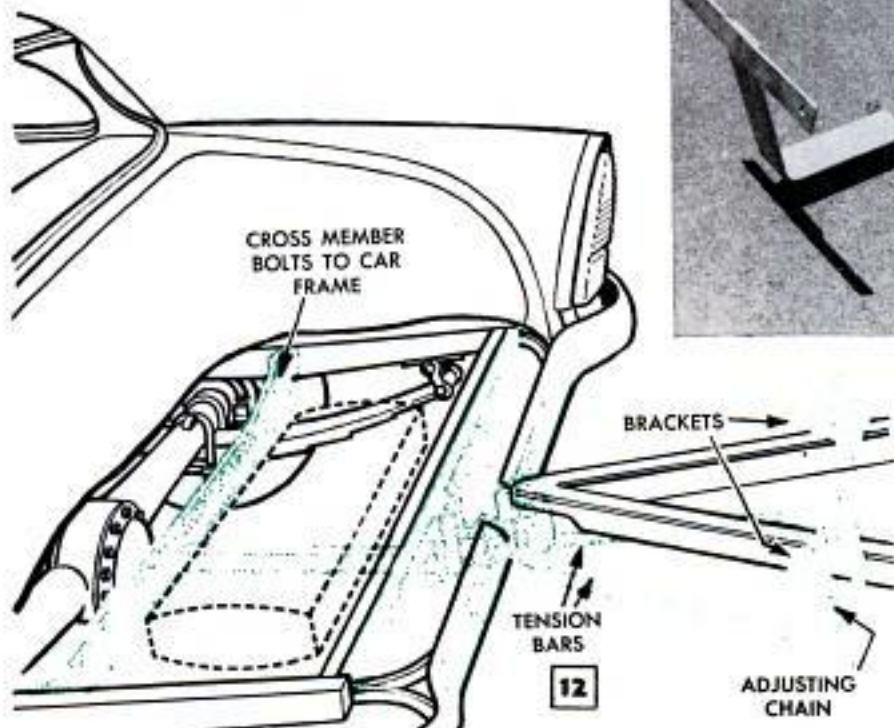
Safe Towing

In addition to providing a safe means of towing the trailer, the special hitches are designed to prevent sideways and to distribute both towing and load stresses in such a way that car and trailer ride level. Various types of equalizing mechanisms are pictured in Figs. 3, 7, 9, 14, 15 and 16, all being designed to distribute total weight of car and trailer uniformly over the four car wheels and the two or four wheels carrying the trailer. This weight distribution, or equalized weight return to the car and trailer wheels, is accomplished by means of coil springs, tension bars or pneu-

matic cylinders, all of which are adjustable.

Weight-distributing trailer hitches call for uniform inflation of tires, on both trailer and car, a general recommendation being an increase in tire pressures from 3 to 5 lb. above those specified for a given tire size. Underinflation of the tires or varying pressure in the tires on either car or trailer can cause uneven braking and hazardous swaying under certain driving conditions. On long trips it's advisable to check the air pressure in all tires once a day.

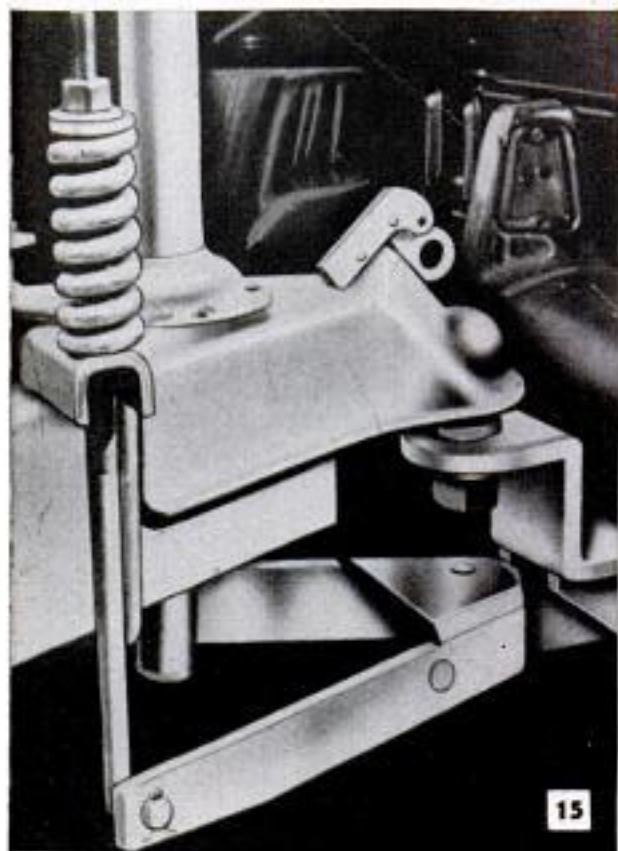
For light and medium-sized trailers 4-ply tires on the trailer and towing car are usually considered adequate for average service. For the heavier jobs having either single or dual axles (four wheels) most experienced trailerists recommend 6-ply tires on both car and trailer. Some use 6-ply tires on the car when towing any type of trailer with drawbar weight sufficient



Above, principal parts of a typical weight-distributing hitch designed to be attached to the bumper and car frame back of the fuel tank. Left, the same general type of hitch with a wide angle-steel cross member which bolts to the side frames of the car, to the rear crossframe and also to the bumper. Note the use of tension bars. See also Fig. 9

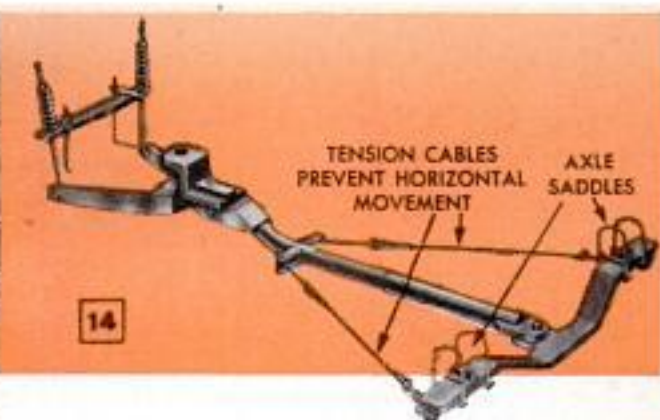


13



15

Above, types of hitches which attach to rear axle of car by means of saddles. Below, saddle-attaching hitches and one type of self-steering front axle



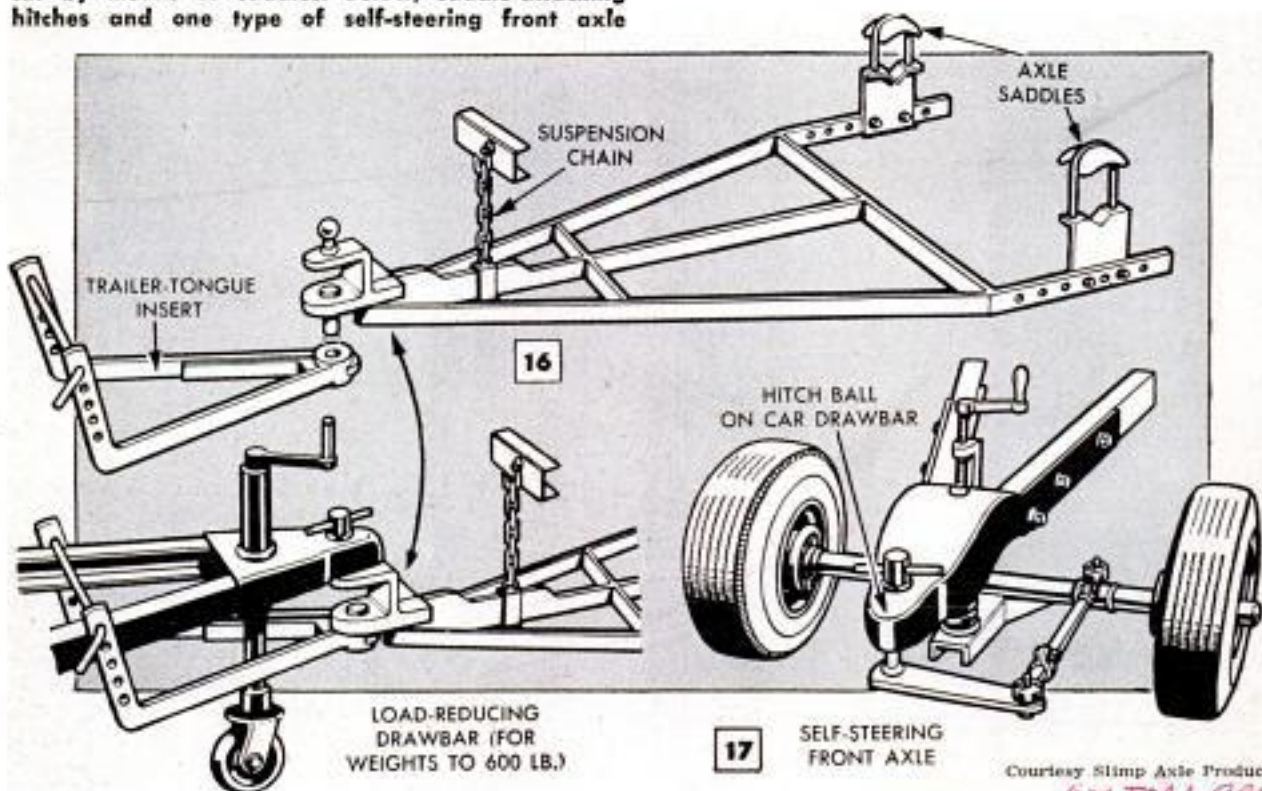
14

Courtesy Mobile Equipment Co.

to require overloads on the car springs. For heavy-duty service, or unusual conditions it is probable that the extra initial cost of 6-ply tires is offset by the added safety factor.

Front Axle

For towing a heavy mobile home, and especially one in which it is not always possible to distribute the load equally, many owners like a self-steering front axle such as that shown in Fig. 17, the right-hand detail. This axle is designed to relieve the car of all stresses except the towing effort, making overloads unnecessary. The hitch from axle to car is so arranged that the axle faithfully follows every movement of the towing vehicle. In this action it differs from the conventional dolly and also the casters which are designed to support the trailer drawbar when at rest and are usually furnished with the drawbar jack as in Figs. 8 and 17, the left-hand detail. ★ ★ ★



16

17

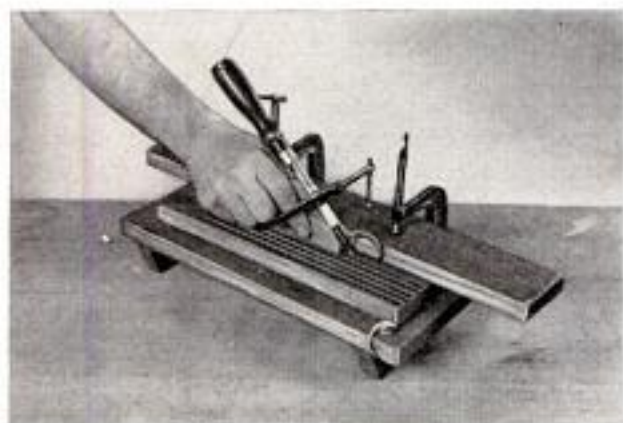
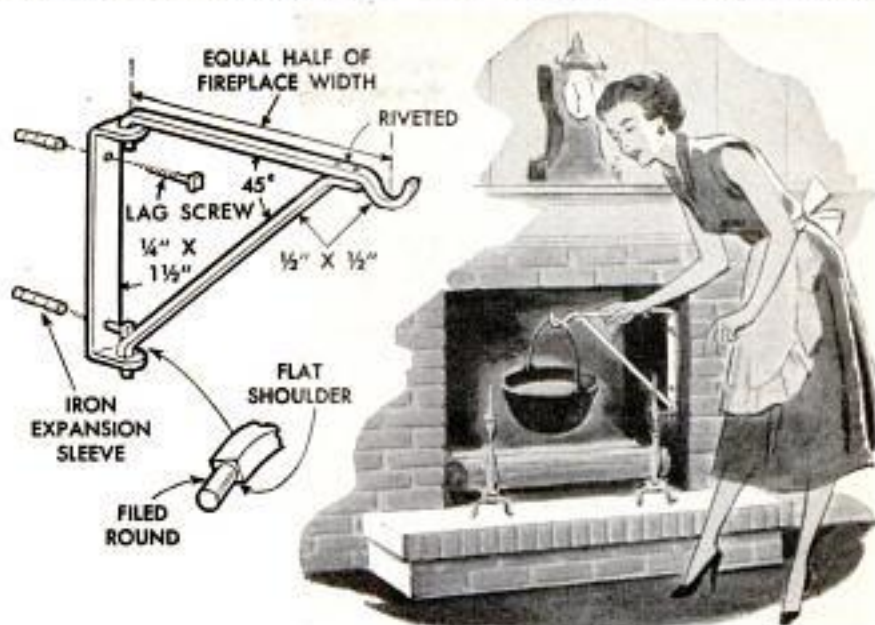
Courtesy Sling Axle Products

COLTON, CALIF.

POPULAR MECHANICS

Pivoted Crane Adds Character to Your Fireplace

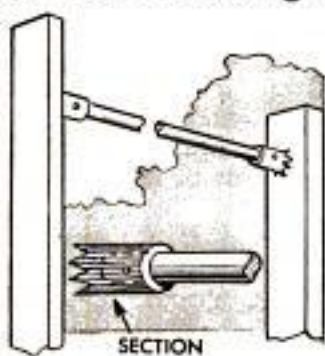
Instead of just setting an iron kettle on the fireplace hearth, create an authentic atmosphere by hanging it on a hinged crane. A flat-steel bracket with its ends bent outward and drilled is bolted to the fireplace wall by means of lag screws turned into steel expansion sleeves, as indicated in the detail. The swinging part of the crane consists of two pieces of square $\frac{1}{2}$ -in. steel rod of sufficient length to locate a hook-shaped end of the upper cross piece in the center of the fireplace.



Improved Fluting Plane

If you have only occasional need for a fluting plane, one can be improvised from a gouge and a block of wood. Cut off the end of the block at an angle of about 45 deg. and clamp the gouge to that end with a C-clamp. Drill a hole through the side of the block to receive the fixed pad of the clamp. To assure a straight cut, clamp a straightedge to the work piece and hold the "plane" against it. Make several shallow cuts, adjusting the gouge to cut more deeply into the wood each time.

Safety Release on Crossbar Of Pole-Vaulting Hurdle



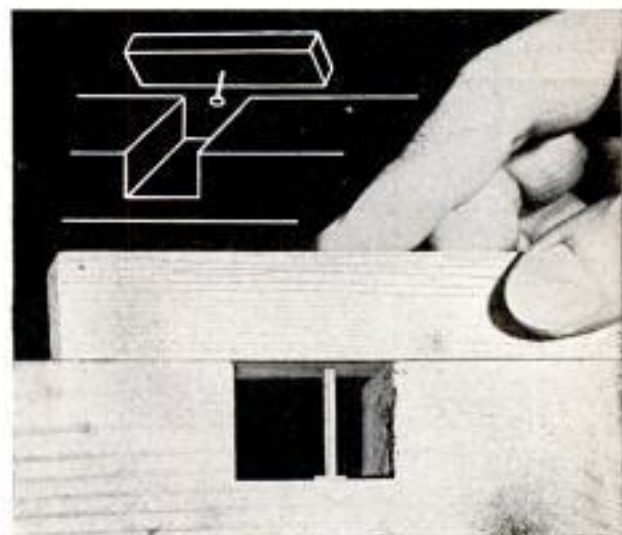
One method of assuring that the crossbar of a pole-vault hurdle becomes dislodged easily if a contestant strikes it when making an unsuccessful jump is to fit a section of serrated rubber hose over each end of the bar.

The friction of the hose will hold the bar in place, but a slight blow from any direction will dislodge it. Hose sections without serrations are not as efficient, because the bar might be inserted so that a blow against it from a certain angle or direction could wedge it firmly in place.

☞ Strong black tea, diluted to provide the desired color, makes antique stain for white pine.

Nail in Stick is Depth Gauge

A nail driven into a block of wood and allowed to project the required distance serves as an improvised depth gauge when cutting lap joints or making notches where the depth of the cut must be uniform. Use a nail having a flat head.



Pep Up HOME MOVIES

By E. R. Haan



Above, colorful wallpaper in simple pattern appropriate to subject provides attractive, unobtrusive background for movie title. Also, carpeting, yard goods, tablecloth and wrapping paper can be used



Scenic background is colored picture which can be cut from calendar, magazine, illustrated travel folder

Plywood suitably stained to bring out wood grain produces simulated aquatic background for rope title



UNLESS YOU'RE a born master of ceremonies, both you and your friends may prefer silent titles spliced into home movies to a running commentary explaining the film and apologizing for its faults. Titles should be used only to convey information that is not evident or readily apparent in the pictures. This article tells how you can make simple titles that are neat and effective, without spending a great deal of time, effort and money.

Use titles sparingly. Make them clear and concise. They should not distract attention from the film story. Lengthy information can be divided into two or three short titles presented in sequence on background boards, Fig. 3, or they can be presented on a scroll, Fig. 18, for continuous filming of the sequence. At times the need for a special title can be avoided by letting some detail in the scenery serve the purpose, such as a signboard giving the name of a park, hotel, city, state or mountain. Such title substitutes should be kept in mind on trips and vacations and worked into the scenery or surroundings for title material. When these opportunities have been missed, it is still possible to insert close-up shots of souvenir decals, pennants, maps (Fig. 7) and illustrated travel folders.

Conventional Titles

Usually, the most attractive printed titles are made with the aid of commercially available letters for titling. These come in kits, some of which also include colored background cards. Also available are letters of different sizes and colors stamped out of paper, cardboard, felt or sheet plastic. Some have gummed backs for repeated use on glass or celluloid backgrounds. Block letters shown in Figs. 1, 2, 4 and 6 produce interesting three-dimensional effects that can be intensified with shadows.

Although the cost of manufactured letters is very low, you may want to make your own. Block letters are easy to cut out on a scrollsaw, from wood, plywood, plastic or soft metal such as aluminum. Rough edges should be sanded smooth and the letters given a coat of flat-white paint.

Novel Titles

The simplest kinds of titles that cost practically nothing are printed or written on suitable backgrounds as in Figs. 8 and

With Titles

Part I

9. Anyone can letter neatly with the aid of a lettering guide obtainable at art stores. You can use chalk on rough surfaces of contrasting color, Fig. 10; black or colored grease pencils on glass or other smooth surfaces such as the script part of the title shown in Fig. 11. Titles can be made using show-card techniques and colors, or "finger paint" used in schools. Also, letters can be formed with colored tape as shown in Figs. 11 and 12. Matches, small twigs, Fig. 17, sea shells, and rope and yarn letters, Fig. 3, produce interesting and novel effects. Letters from alphabet soup and children's blocks can be arranged to spell words. You can scratch titles in damp sand at a beach, Fig. 14, or in snow, and then photograph them, using a strong side light for the contrasting shadow effects necessary for good reproduction. For small titles, typewritten words can be used, but for this an auxiliary lens may be needed to magnify the letters sufficiently.

Selection of Backgrounds

White block letters contrast well with colored backgrounds, but if you wish to use colored letters, be sure that they are complementary to the main background color. Often it is preferred to use one color combination for all the subtitles in a film since radical changes in title technique tend to distract from the film story.

There's no end to the variety of materials available for making distinctive artificial backgrounds. The materials include textured carpeting; patterned wallpapers, Fig. 1; wood, Fig. 12, and plywood, Fig. 3; cloth and yard goods; sheet plastic and glass; corrugated paper, Fig. 6, and decorative wrapping paper; pictures, Fig. 2, and photos. Rough, textured surfaces can be given contrast by side lighting. When positioning letters over rough, uneven backgrounds, place a pane of clean transparent glass on the background, and arrange the letters on it. This method, used in Figs. 4 and 6, permits using household and clothing fabrics with a minimum risk of soiling them. Also, the glass serves to hold the background material flat. Solid letters on the glass will seem to stand out from the background because of the shadows they cast. Sketches and thin-line lettering or writing should not be done on the glass since their shadows on the background will



Fig. 4, photographing background on table is easier than on wall, eliminates gluing title to background. Fig. 5, fabric background and sketch on cellophane protected under glass used for title. Below, strong side light on corrugated paper accents vertical lines





Substitute for title consists of photographing moving hand that traces route of entire trip on map with pencil using colored lead

be confusing. If a sketch is desired, this is put on a sheet of cellophane with a grease pencil and the cellophane laid on the background and under the glass as in Fig. 5.

Title making is considerably easier if all the lettering and background cards are of uniform size throughout a film. However, title sizes often vary. Perhaps the texture of a background material is too fine for a shot taken at 36 in. but requires a close-up of 15 or 20 in. Sometimes only a small area of wallpaper can be used as a title background, or the size of a picture used for a background may be the determining factor. If possible, avoid getting backgrounds that are too small in proportion to the size of the lettering.

Titling Equipment Needed

A titling stand that holds the camera, title and two lights is a great convenience.

Title hand-lettered with charcoal on rough wallpaper easy to do but lacks neatness of printed title



You can buy one for \$20 to \$300, or make one as shown in Fig. 15. When titles can be shot outdoors where illumination is adequate, no separate lights are needed. An auxiliary lens is required only for close-ups taken at distances less than the minimum focusing distance of a camera. A film viewer on an editing board is convenient but it is possible to use the projector instead—simply stop the film, open the projector and apply a small piece of masking tape over selected frames.

For splicing title strips into a film as well as other editing work, a splicer and two geared rewinds are needed. These units are mounted on a single base, the splicer midway between the rewinds. Some of the latest-model projectors are equipped

with splicers that are very handy for this work. A splicer has a built-in knife to cut the film and a scraper to remove a narrow strip of emulsion along one of the cut edges, to which another strip of film is to be cemented. Often water is applied to the edge to soften the emulsion before scraping it off. However, the film must be absolutely dry when the cement is applied or it will not stick. The splicer holds the joined ends of the film together firmly while the cement dries.

Aligning Camera With Title

Titles can be arranged horizontally with the camera above, Fig. 4, or they can be set vertically in front of the camera. The first arrangement usually is the most convenient. Letters can be laid on horizontal backgrounds but must be secured in some way on vertical ones. In either case the

Green script title on panel of red wallpaper in oatmeal pattern is more decorative than printed one





10 Title lettered in chalk on sidewalk utilizes readily available materials appropriate to subject of movie

camera should be mounted rigidly as on a tripod or titling stand. The lens of the camera should be aligned with the center of the background card, with the lens axis at right angles to it.

Getting close-up titles properly positioned on the film is easy if your camera takes pictures in good focus at distances of 36 in. or less and if the view finder is accurate—field of view as seen through the view finder is the same as that transmitted by the lens. If the field of view is not the same for the view finder and lens, a parallax condition may exist and part of the subject might not be recorded on the film. Some cameras are equipped with view finders having parallax correction for distances less than 6 ft., but very few have this correction for distances as close as 18 in. On some cameras using film magazines instead of rolls, accurate close-up focusing is done through the camera lens by means of a special viewer which is momentarily substituted for the magazine.

If your camera does not have provision for close-up focusing of titles, it will be necessary to take careful measurements when aligning the camera with the subject. A great deal of measuring is eliminated when a titling stand is used since it keeps the camera lens centered and aligned with the background. The distances between the camera lens and the titles vary according to the title sizes. In view of this, you should know the exact field of view of your camera at various distances under 4 ft. These figures for 8 and 16-mm. movie cameras equipped with $\frac{1}{2}$ and 1-in. lenses, respectively, are given in Fig. 16. You can determine them for your own camera by making a few test exposures at various distances from a 15 x 20-in. cardboard marked off in 1-in. squares, after centering and aligning the camera with the card.

When no titling stand is used, you can



11 Photo of car, block letters of tape on plastic tabletop background. Script written with grease pencil

Title made of colored tape on mahogany background with scissors—object associated with childhood



center and align a camera lens and a title background card as follows: Take measurements with a string from the center of the lens (after covering it with a lens cap) to each of the four corners of the background. When these distances are identical, centering and alignment are correct. A T-square or suitable straightedge clamped to one leg of a try square may be helpful when obtaining alignment. When a camera is mounted above a horizontal title, a plumb bob may be found useful for centering. Whether a title is square with the camera or not generally can be seen through the view finder.

The background card should be a little larger than the field of view so that the edges of the card will not show on the film if there should be a slight discrepancy in alignment. Ample space should be provided between titles and the edges of the field of view to prevent a crowded effect.

Titling Stand You Can Make

The titling stand shown in Fig. 15 consists of a beam, preferably hardwood,

with a tapped, metal plate at the balancing point, for attachment to a tripod. A sturdy holder at one end supports the camera, which must be centered and properly aligned with the background. A felt-covered plate bent at right angles keeps the camera from turning. A shoulder rest may be added for "panning" scenic backgrounds through a transparent glass background on which a title is mounted.

Title background cards are set in a grooved holder which can be moved back and forth, or tightened at any point on the beam. Smaller backgrounds are cemented to a sheet of hardboard that slips in the holder. A crossarm holding two lamps may be attached to the beam just ahead of the camera (optional). The cross piece can be located behind the camera if the beam extends far enough on both sides of the camera. Also, lamps can be held on separate floor stands.

Correct Timing for Titles

Titles should be timed to give the slowest readers enough time to finish them. About one second per word is sufficient. This does not include the time required for a title fade or other similar effect. When titles are shot against a photo or picture background, extra time should be allowed for viewing the artwork. When preparing titles, don't forget a suitable one at the end, in order to give spectators a smooth, pleasant transition from the movie to reality, instead of ending the picture abruptly.

Scroll Winder for Long Titles

When a great deal of information must be conveyed, this can be done by using a scroll winder, Fig. 18, using two or three separate background cards for presenting the information. The scroll-winder frame can be used in place of the background holder for holding cards, simply by removing the cranks and scroll. In operation, the lines of a title on a scroll move upward

Important element of scenery such as signboard photographed on trip is excellent title material



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and out of view after sufficient reading time, and new lines appear from below. The simplest kind of scroll is a typewritten one on paper 4 or 5 in. wide, which must be shot at a distance of 10 or 12 in. and may require an auxiliary lens. To avoid the latter, a larger scroll can be made and worked on the same principle. For lettering, use the "stick on" type, or print the titles with rubber type of suitable size.

Lighting Suggestions

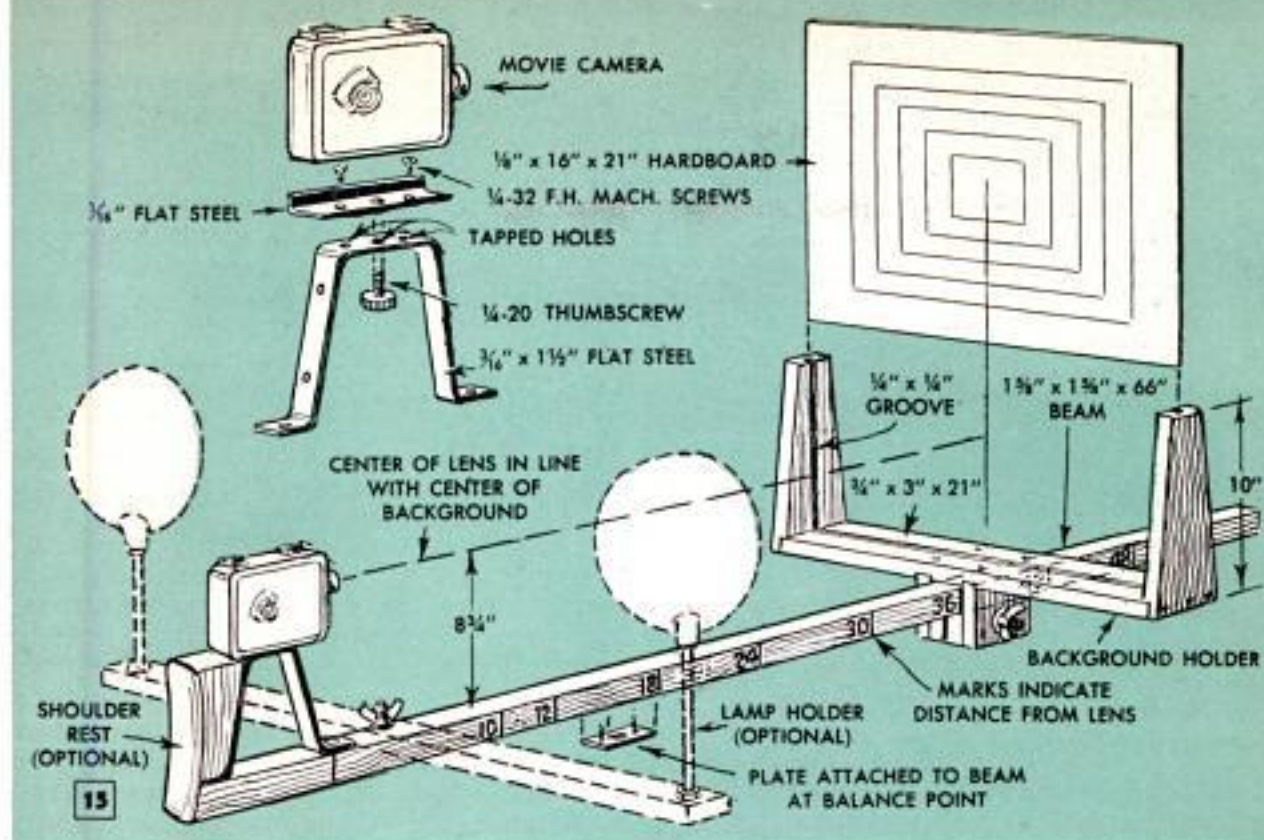
The amount of illumination required for photographing titles varies with the type of film used, the distance between the camera and the title, and the light reflectivity of the title and background. Check the illumination with a light meter or use an exposure guide. Daylight usually is sufficient to shoot titles outdoors. A title background should be lighted uniformly unless strong shadow effects are wanted for block letters or textured backgrounds. For title lighting indoors, a single lamp, either regular or flood, may be sufficient, but this should not be less than 3 ft. from the title to avoid uneven illumination. Two lamps set at an angle of 30 to 45 deg. from the axis of the lens, equidistant from the title and not closer to it than 2½ ft., as indicated by the dotted lines in Fig. 15, are preferable to a single lamp. Check the uniformity of the lighting with an exposure meter. Avoid placing lamps close to the lens axis or in other positions where strong light might be reflected directly into the lens. For shadow effects with block letters or textured backgrounds, one lamp is set closer than the other, or lamps of different sizes are used.

Translucent backgrounds, such as decals and some kinds of ornamental glass, may be lighted from the rear. When doing this, the light intensity must be checked with an exposure meter at a point immediately in front of the camera for the correct exposure. To prevent glare on the lens when

Title scratched in damp sand at beach or in snow photographed with side light for shadow effect



POPULAR MECHANICS



Scroll winder, Fig. 18, can be used as background holder on tiling stand above, after removal of hand cranks

employing this method, a diffusing screen such as tracing paper or opal glass may be needed between the background and the lamp. Avoid placing paper too close to a lamp because of the fire hazard.

In the second half of this article you will be shown how to superimpose titles on real scenery backgrounds, how to fade titles before and after processing film and an easy way of producing wipe-ons and wipe-offs.

16 CAMERA FIELD OF VIEW AT VARIOUS DISTANCES FROM BACKGROUND BOARD
(All dimensions in inches)

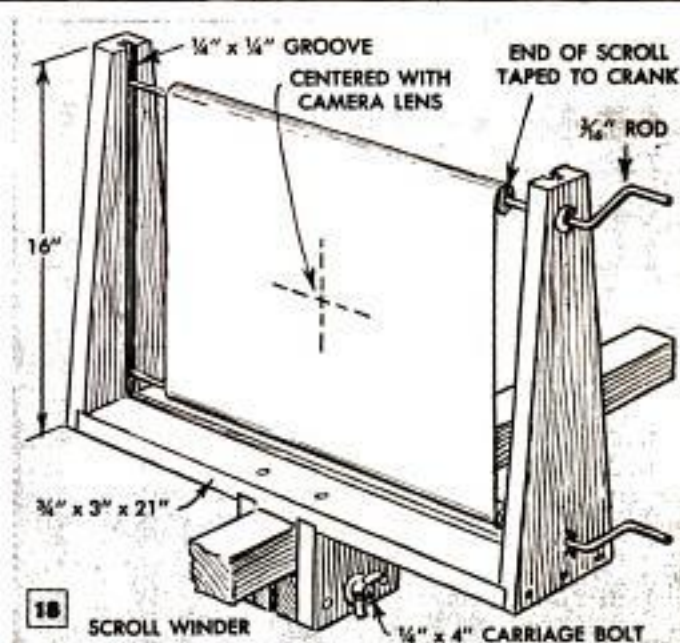
Distance from lens to title	8-mm. cameras having $\frac{1}{2}$ " lens	16-mm. cameras having 1" lens	Recommended size of background card
48	12 $\frac{3}{8}$ x 16 $\frac{1}{2}$	13 $\frac{3}{8}$ x 18	16 x 21
42	10 $\frac{3}{8}$ x 14 $\frac{1}{2}$	11 $\frac{3}{8}$ x 15 $\frac{1}{2}$	14 x 18
36	9 $\frac{3}{8}$ x 12 $\frac{3}{8}$	10 x 13 $\frac{1}{2}$	12 x 15
30	7 $\frac{3}{4}$ x 10 $\frac{1}{4}$	8 $\frac{3}{8}$ x 11 $\frac{1}{4}$	10 x 13
24	6 $\frac{1}{4}$ x 8 $\frac{1}{4}$	6 $\frac{1}{4}$ x 9	8 x 11
18	4 $\frac{3}{4}$ x 6 $\frac{1}{4}$	5 x 6 $\frac{3}{4}$	6 x 8
12	3 $\frac{1}{2}$ x 4 $\frac{1}{2}$	3 $\frac{1}{2}$ x 4 $\frac{1}{2}$	4 x 5
10	2 $\frac{1}{2}$ x 3 $\frac{1}{2}$	2 $\frac{1}{4}$ x 3 $\frac{3}{4}$	4 x 5

Fig. 16, table gives field of view for $\frac{1}{2}$ and 1-in. camera lenses at various distances from background board and sizes of background card required for each distance. Below, lengths of twigs arranged on beach present movie title interestingly

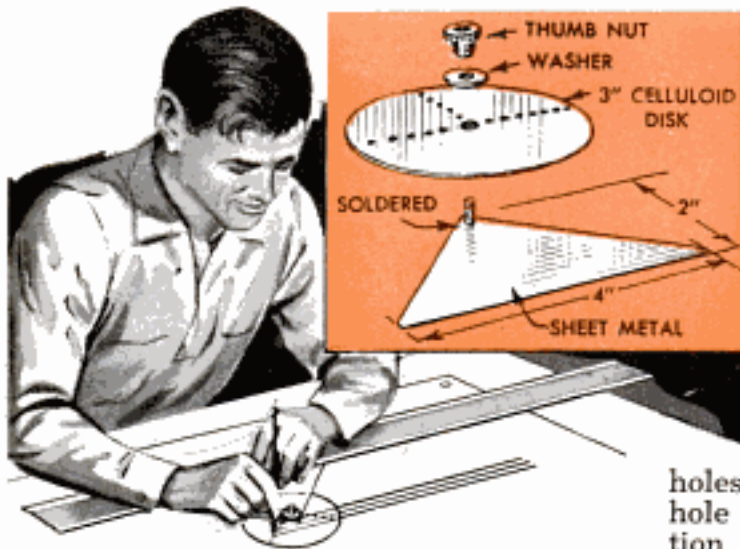


MARCH 1957

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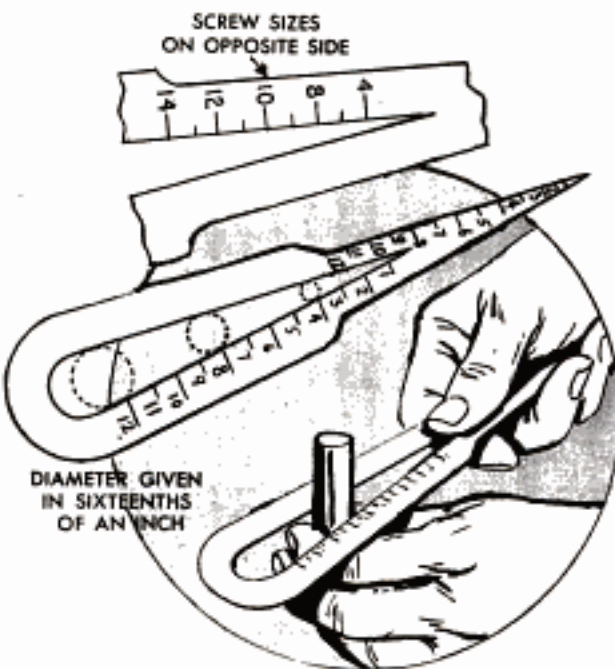


Spaced Lines Ruled Quickly With This Perforated Disk



Gauge Cut From Sheet Metal Measures Various Diameters

Cut from sheet metal to the shape shown, a gauge can be used to measure outside diameters of round stock, inside diameters of pipe and tubing, and diameters of screw sizes. One side of the gauge is marked in sixteenths of an inch for diameters of pipe, tubing and round stock, while the opposite side of the pointed end is marked in wire-gauge sizes of measuring the diameters of



drill bits and screw stock. The method of using the gauge for measuring the outside diameter of round stock is shown in the lower detail in the illustration.

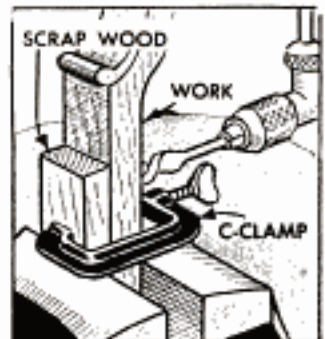
☛ Paint the frayed outer covering of electric cord with shellac to help insulate it against possible short circuits.

Parallel lines can be ruled accurately at any desired spacing with this perforated celluloid disk. It pivots on a screw soldered to a sheet-metal base, but is locked in position with a thumb nut after it has been adjusted. Radial rows of tiny countersunk holes admitting a sharpened pencil point without play are drilled in the disk at equidistant spacing of $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ in., or as desired. In use, the device is moved back and forth along the T-square by means of the pencil engaging successive

holes in the disk. Starting in the outermost hole of a row, the first stroke in one direction rules the top line. Then the pencil point is inserted in the next hole and the return stroke is made, ruling the second line. Spacing of lines is maximum when a row of holes used is at right angles to the T-square, but becomes less as the row approaches the point of being parallel with the T-square.

Wood Scrap Prevents Splitting When Boring Hole With Brace

When boring with a bit and brace, splitting of the wood around the hole can be avoided by first clamping a scrap of wood behind the work. The point of the auger bit will penetrate the wood scrap and allow smooth cutting of the hole, since the back surface of the work cannot split out because of the block.

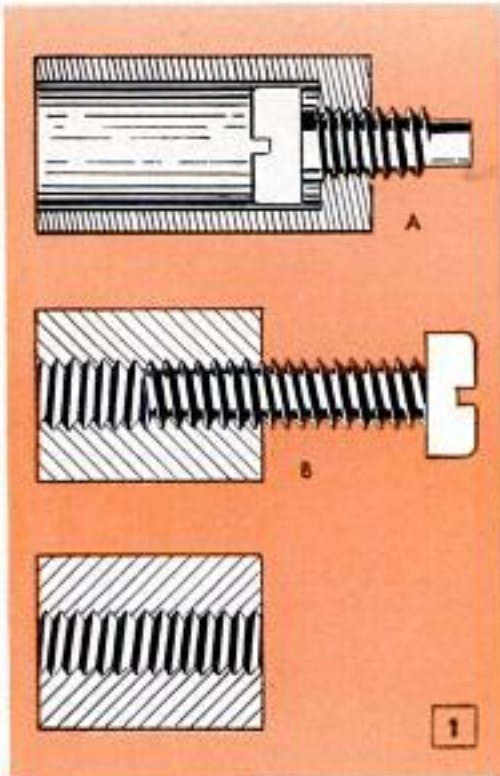


Simple Way to Keep Lamp Shades Clean

To keep lamp shades clean longer, try self-adhering kitchen wrap. Cut the material into strips about 3 in. wide. Use a sharp knife or razor blade and cut through the cardboard tube too. Anchor the first strip to the cross wire at the top of the shade by simply tying a single knot. Then start wrapping from top to bottom on the outside and back up on the inside. When one strip is used up attach the next one with a common pin. The edges of the strips will adhere and completely enclose the shade in a transparent cover.

Veryl Le Masters, Le Mars, Iowa.

SN 58

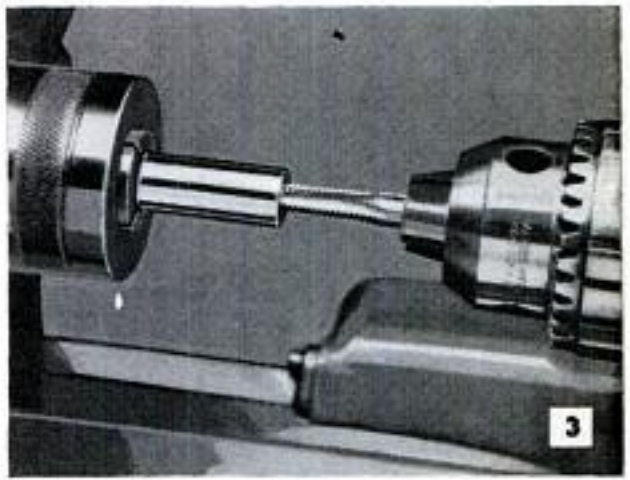


Two-Piece Holder For Machining Screws

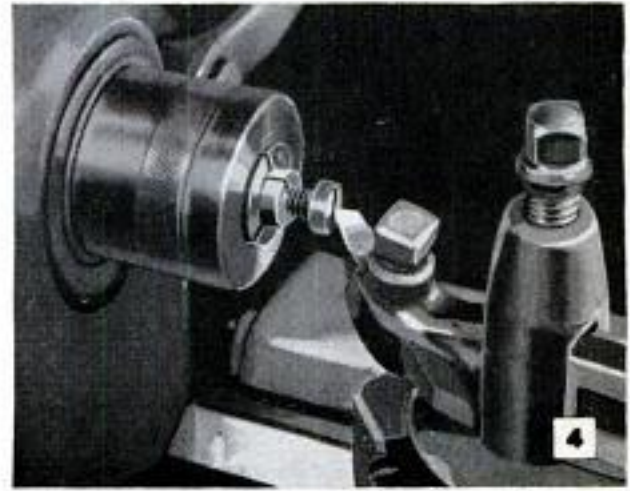
HERE ARE TWO TYPES of holding devices for protecting the threads on screws when it is necessary to chuck them in a lathe or drill press for machining or polishing of either end. Differing from the conventional one-piece manufactured types, these holders are cut in half as shown in details A and B, Fig. 1, so that work can be positioned between the halves and chucked in a lathe in only a few seconds, Figs. 2 and 4. The one shown in detail B is designed for screws requiring work on the head only. The type in detail A has threads at one end with the remaining length drilled to receive the head of a screw to permit machining on the end of it.

The holders can be made of brass or steel in a length suitable for the size of chuck used and in a range of sizes ordinarily used. For use in a chuck they are made of round stock. While round holders can be clamped in vise jaws, square ones will work better. When making a holder, chuck a length of stock in a lathe, square one end, machine the circumference to fit the chuck it is to be used in, and drill-tap the thread size the holder is to accommodate, as shown in Fig. 3. Next, the holder is cut to the desired length and sawed lengthwise entirely through one side and about two thirds of the way through the other. After the two halves of the holder are forced apart it is ready for use.

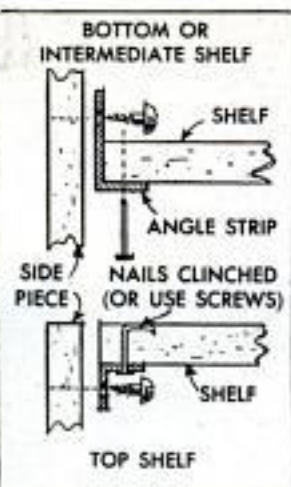
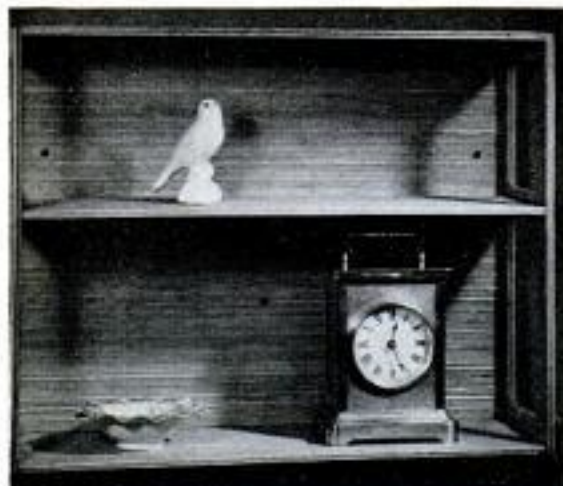
Fig. 1, two types of holders permit modifying screw without damaging threads gripped by lathe chuck



Above, for accurate results, machine surface of holder and drill-tap threads with lathe. Below, screw holder should be long enough to permit positive grip in chuck and sufficient working space



Sheet-Metal Angles Support Shelves in Wall Cabinet

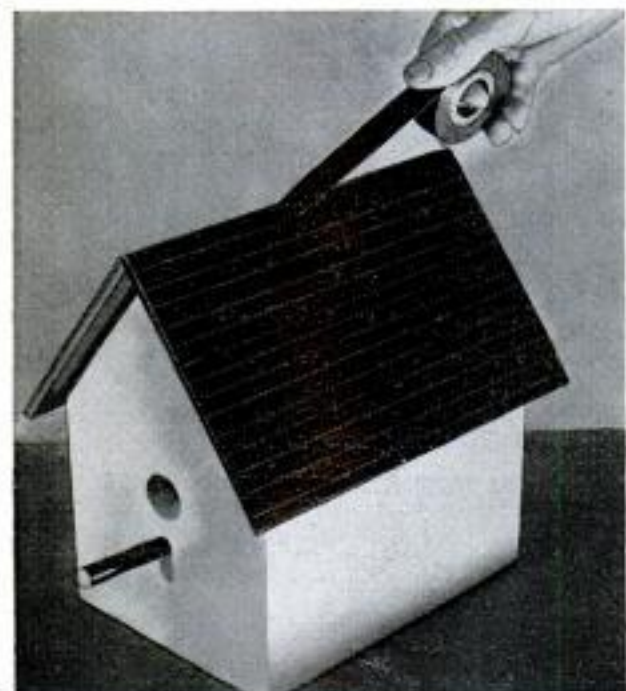


One home craftsman installed plywood shelves in a wall cabinet by nailing thin sheet-metal angles on the ends of the shelves and screwing them to the sides of the cabinet as shown in the detail. The angles were bent from 1-in.-wide strips cut from metal food containers. Additional support for the shelves was provided by gluing and nailing the back panel to the shelves.

Birdhouse Roof "Shingled" With Strips of Adhesive Tape

Before you paint that birdhouse you just finished, "shingle" the roof attractively with strips of tape. Use black tape or any color that suits your fancy. Lay the first strip flush with the eaves, making sure that it is straight. Each succeeding strip should overlap the preceding one about $\frac{1}{8}$ in. at the lower edge. The final strip, which forms "ridge boards," straddles the ridge as pictured. If desired it can be a contrasting color for a novel effect.

David Farkell, White Bear Lake, Minn.



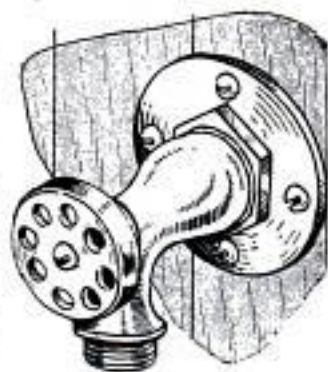
Let's Go "Water Cycling"

Have even more fun on your beach outings with the "Water Pedd," a seagoing bicycle propelled by a paddle wheel. Complete plans for building this unique boat are in next month's issue

Sill Cock Made Rigid

When a sill cock is installed on copper tubing as shown in the detail, it is usually not sturdy and tends to twist when turned on or off. By drilling several holes through the wall flange and screwing the latter to the wall as shown, the entire assembly is made rigid for a more satisfactory installation.

Oliver C. Grant, Springfield, Mass.



Color-Tinting Kitchen Foil

If you use kitchen foil for decorative purposes, make it even more eye-appealing by tinting the shiny side with a transparent color. Spray the sheets, or float them in a shallow tray, using an application of thin shellac colored with alcohol-soluble dye. Add alcohol occasionally to replace that lost by evaporation.

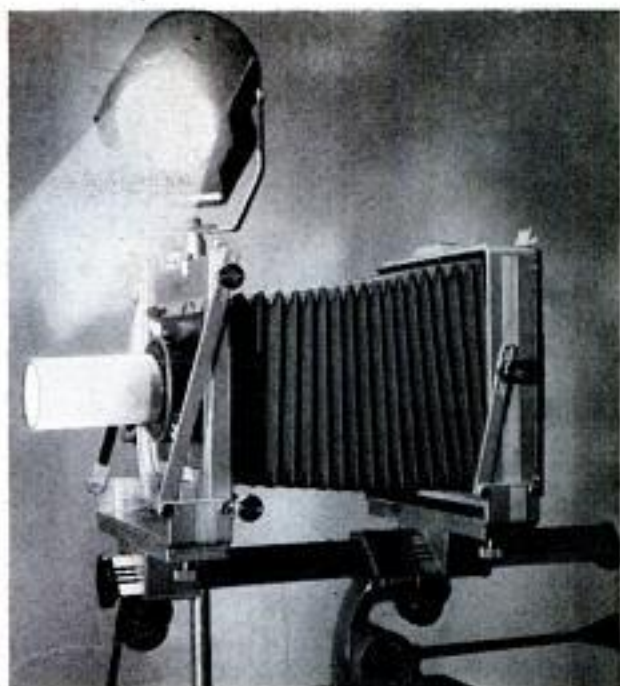
Ken Murray, Colon, Mich.



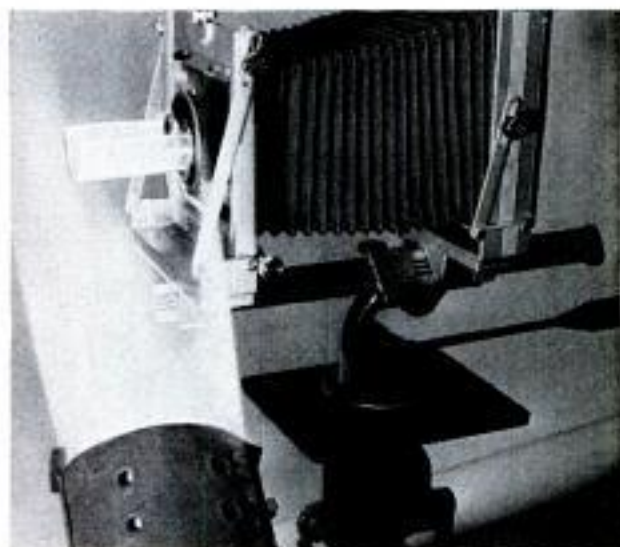


Special-Effects Lens Shades

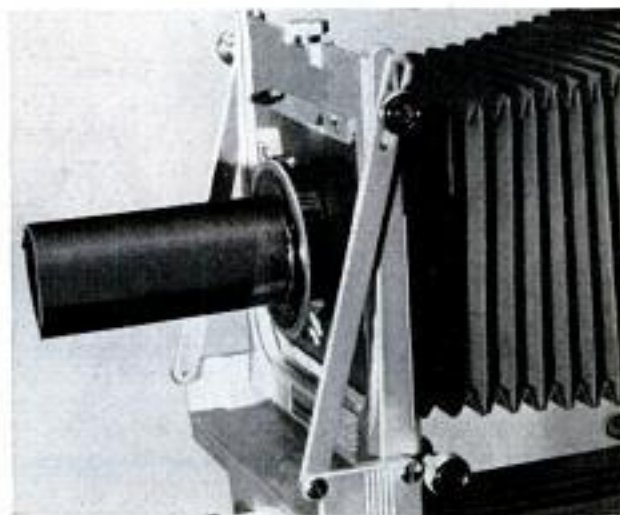
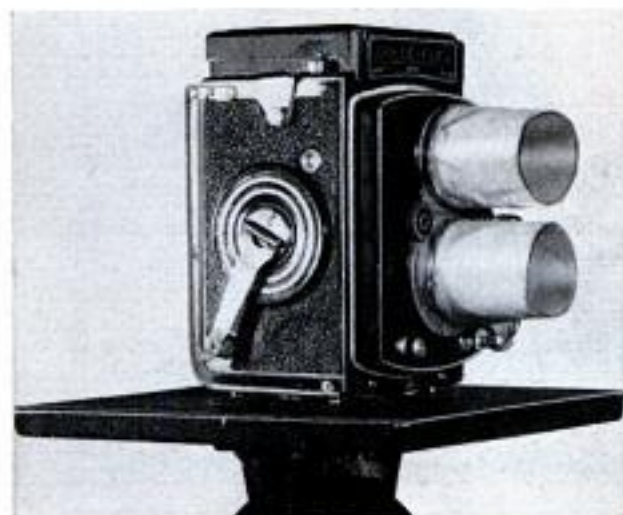
ALTHOUGH an ordinary camera-lens shade is adequate for normal conditions, more protection is required when making studio shots where brilliant highlighting is employed. One photographer improvises a more effective shade by using a cylinder of dull-finish black paper, as in the lower right-hand photo. For an ethereal effect, in which the subject seems to be rising out of a mist, a partial cylinder of translucent paper is fitted around the lower two thirds of the lens, as in the middle right-hand photo, and a small spotlight is focused on it. For a full vignette effect, a complete cylinder of the translucent paper is used, as on the portrait camera in the upper right-hand photo and the reflex-type camera in the lower left-hand photo. The portrait of the pretty girl was taken with this latter method, showing the "halo light" result.—Graphic House, Inc., New York City.



Light on lens shade of translucent paper produces "halo effect" as in portrait of pretty girl at left



Above, partial cylinder of translucent paper provides "ethereal" effect. Below, cylinder of black paper shields camera lens against studio lights. Below, left, reflex-type camera needs two cylinders



Punch Cuts Blind Holes in Cardboard for Coin Collection



DOWEL ABOUT
3" LONG



Holes cut in the cover ply on one side of a square of corrugated cardboard, as shown in the photo, provide an excellent means for storing a coin collection. Punches for cutting the holes, similar to the one shown in the detail, can be made by nailing strips of thin sheet metal to 3-in. lengths of dowels of selected diameters, depending upon the sizes of the coins to be inserted. Sharpen the projecting edge on each punch with a stone.—Burl Knutson, Bismarck, N. D.

Sounding Block Locates Joists

Floor joists are easy to locate when repairing a section of flooring covered on the underside. Just slide a small hardwood block across the floor in the general area to be repaired and tap it with a hammer. Reduced vibration or damped sound usually indicates a supporting timber.

Salt Spout Fitted on Fruit Jar Dispenses Powdered Soap

For a waterproof powdered-soap dispenser, cut the top from a salt box having a metal pouring spout and secure it to a fruit jar with the screw band of a two-piece cap. Use the metal insert for a pattern when cutting the box top.



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Build "THE BUG"

PART II—Conclusion

AFTER ALL WORK described in Part I of this article has been completed, including frame, running gear, suspension, brake and fuel lines and installation of the fire wall and a heater, if one is to be used, construction of the sheet-steel body can be started. On the prototype, 20-ga. sheet steel was used and tools for bending the metal consisted of two steel angles from a bed-spring frame, a number of C-clamps, a hammer and a wooden mallet. Although each builder will have his own ideas and methods, Figs. 1 through 6 detail a method that was worked out on a trial-and-error basis as being the simplest and strongest one of assembling the body.

The width of each body panel should be such that, whenever possible, the $\frac{1}{2}$ -in. flanges of adjacent panels are not only screwed together but also to a vertical frame member, Figs. 6 and 7. Where a vertical member is not located conveniently, the two flanges screwed together provide a stiffening rib in the body covering. Patterns can be employed when making the panels, but it is almost as simple to use the sheet steel itself as a pattern. After bending a $\frac{1}{2}$ -in. flange on each edge of a panel, cut away the flanges wherever necessary to clear the frame tubes. Then wrap the lower two inches of the panel around the lower horizontal frame member and clamp it. Drill through the sheet metal and tubing and drive in sheet-metal screws about every 3 in. Lift the panel upward and press it against the vertical members of the frame and the horizontal top members. Start at the bottom of the panel and drive sheet-metal screws about every 3 in., pressing the metal inward and upward to

force out any distortion. At the top, repeat the process used for the bottom of the panel, wrapping the metal around the frame tube and fastening it with sheet-metal screws. When the top frame member is at an angle to the bottom member, repeat the preceding steps, except that just before fastening the top, mark it and cut it off parallel to the frame tube, allowing $1\frac{1}{2}$ to 2 in. for wrapping. After all body panels have been screwed to the frame and together, they can be tack-welded together and to the frame. Screws are removed and the holes plug-welded. The final result is a type of unit body-and-frame construction.

When making the horizontal panels for the cowl, headlight shrouds and top of the grill, bend flanges on them to support the hood. The hood should be flanged to form a channel cross section along its edges. The hood flange should be about $\frac{1}{8}$ in. less in depth than the body flange to permit insertion of rubber strips that prevent the hood from rattling.

Trunk Lid

Trunk lids will vary in design, according to each builder's ideas. For the prototype, the rear portion of the top of the original car body was used. Compound curves at the rear corners were cut out and replaced with flat pieces of sheet metal cut and bent to shape and welded in place. A flange was bent along the front and rear and along both edges, using the steel bed angles. It is much simpler to use new metal, fitted over a frame of light steel angles and flats as indicated in Fig. 4. A piano-type hinge, butt hinges or offset hinges from the trunk lid of the original car can be installed. Hinging is at the rear in Figs. 4, 13 and 14, so the folding hard top can be swung back



1

WINDSHIELD ASSEMBLY

RUBBER GLASS



TOP CONSTRUCTION AND METHOD OF FOLDING

2



COVER FOR RADIATOR CAP

3



HOOD



TRUNK LID

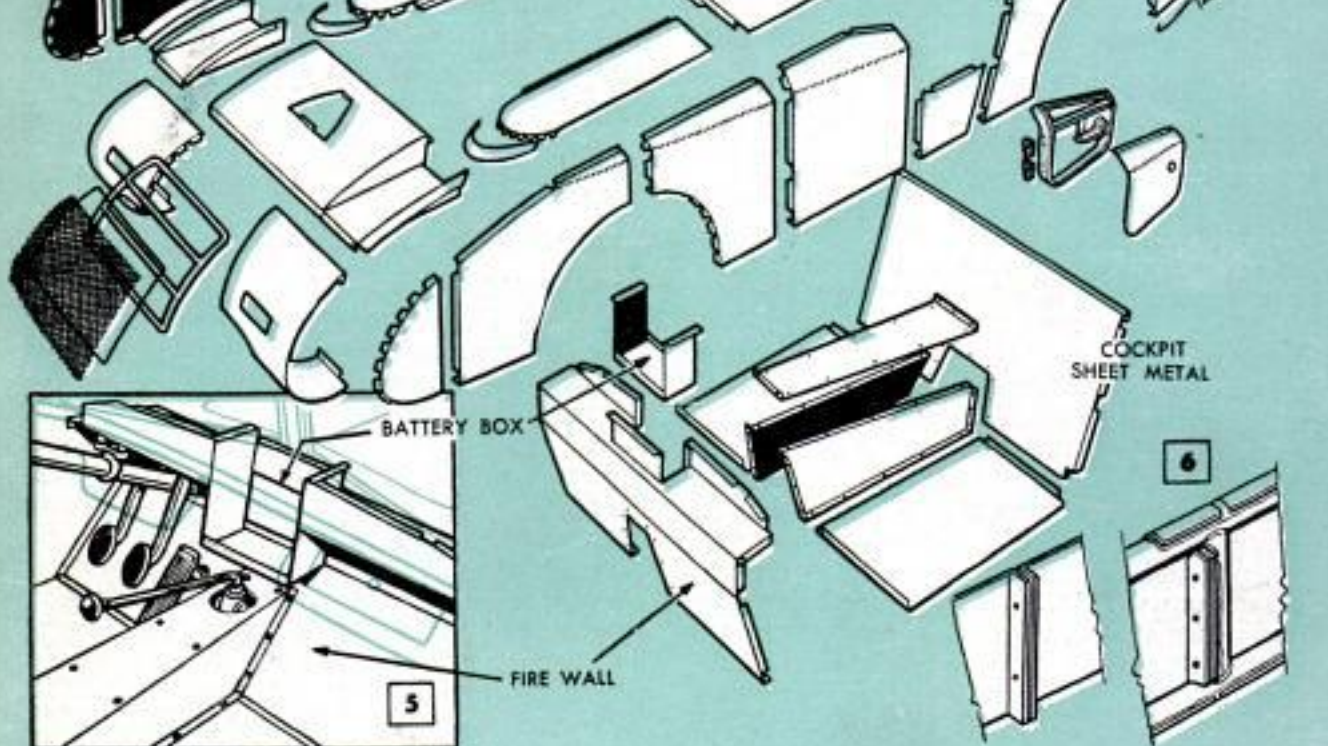
TRUNK LID

TRUNK FLOOR

4



COWL



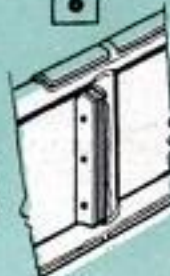
COCKPIT SHEET METAL

BATTERY BOX

FIRE WALL

5

6



and accommodated in the trunk, Fig. 2. If a different type top is used, the trunk can be hinged at the front edge in a more conventional manner.

Top Design

In many cases, construction of the inside of the trunk will be such that there will be no room for a folding top of the design shown in Fig. 2. Ingenuity and imagination take over at this point. A solid top with gull-wing doors, such as is used on some European sports cars can be formed. Or the doors can be designed so that a portion of the roof also swings out when the vertically hinged doors are opened, somewhat like the "dream cars" shown at auto shows. Another method is to use two tops, one a folding canvas top for mild weather, the other a steel top that clamps in place.

Skillful fitting is required for the construction and installation of the folding, one-piece hardtop detailed in Fig. 2. Sheet steel is used in its construction and heavy transparent plastic is used for two roof panels and the rear window. Three hinges are fitted at the rear of the top as indicated with a space cut out between the hinges so the top clears the two angles that form the front flange of the trunk. As shown in Fig. 16, when the top folds down into the trunk, the trunk lid fits down over two steel dowels welded to the angle flange in the same manner as when the top is up.

If maximum frame strength is desired, doors can be omitted entirely. A "cockpit" step is fitted into the sides of the body to permit stepping up and onto the drive-shaft cover, then sliding down under the wheel.

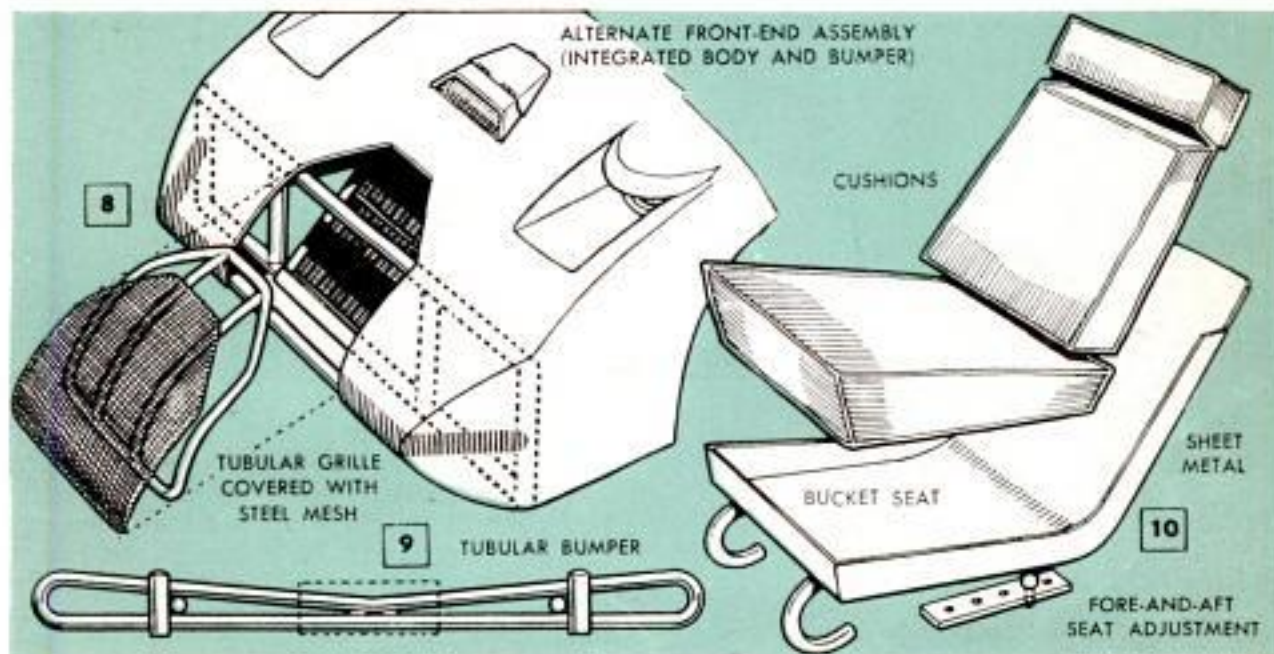
Assembly of the windshield is detailed in Fig. 1. Tubing is used for the three main vertical members and light channel is



welded or screwed to it and to the cowl. Rubber channel then is fitted in the metal channel and the glass is inserted from the top of the frame. Screwing the top channel in place secures the glass. Notched steel dowels welded to the tops of the windshield tubes accommodate a drilled strip of wood that is fitted to the front edge of the top as shown in Fig. 15, when a folding hardtop is used, or some types of soft tops.

Radiator and Grille

Because of the position of the radiator, the filler tube quite likely will project above the curved portion of the front of the car. Fig. 3 shows one method of disguising the filler tube with an attractive air scoop. The main part of the scoop folds down over the filler tube first, then the front, smaller part folds down and wedges

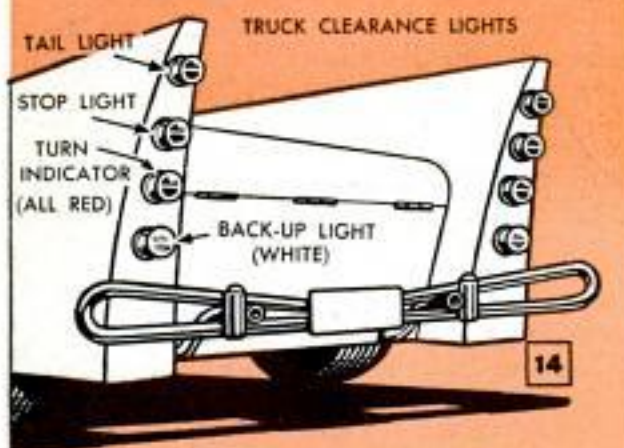




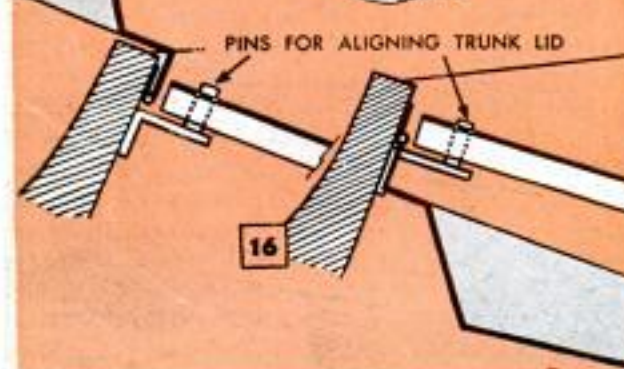
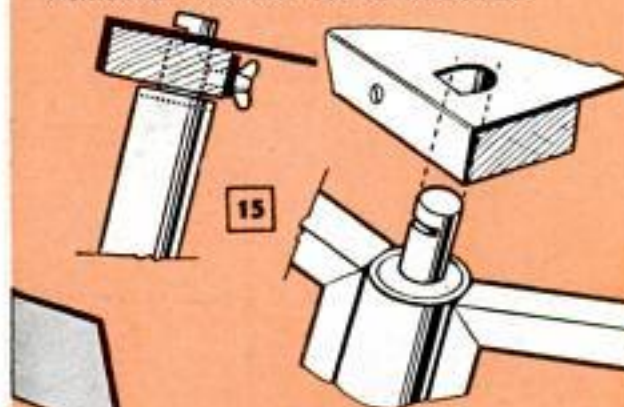
Photos show application of glass fiber and spray painting



TWO METHODS OF MOUNTING SPARE WHEEL



METHOD OF FASTENING TOP TO WINDSHIELD



against the filler tube to keep the air scoop locked in position. Many variations of this system can be devised.

Steel tubing used for the frame also can be used to make bumpers for the sportster, Fig. 9, or the bumpers from the original car can be modified for use. An alternate design of the front end of the car, Fig. 8, shows a method of incorporating body and frame to form an integrated bumper-and-body. The grille for the car can be fabricated from $\frac{3}{4}$ or $\frac{1}{2}$ -in. electrical conduit and wire mesh, Figs. 4 and 8, or in some cases, a stock grille can be modified and installed to simplify the job.

Tailfin and Spare Wheel

Rear-end treatment of the sportster, Fig. 14, depends solely on the builder of the car. Truck-clearance lights can be used as indicated, or any one of a number of stock tail-light assemblies can be used. It is best to choose the taillight before shaping the fins, since they then can be bent, wrapped or angled to fit any type or size of light or combination of lights.

In some instances moving the spare wheel forward or back will aid in making the car handle better by changing the front-to-rear weight distribution, so it should be installed last. The wheel can be mounted inside the trunk, on the trunk lid or at the rear of the body, Fig. 13. Location of the gasoline tank also will have a definite effect on weight distribution, since when full it weighs a considerable amount.

Seat Construction

Bucket seats for the sportster can be bus or truck seats picked up at an auto graveyard, or they can be fabricated from sheet steel as shown in Fig. 10. Cushions for the seats will require the services of an upholstery shop. One method of attaching the seats to the floor, so they can be adjusted fore and aft, is shown in Fig. 10. The rear legs are bolts on which are fitted lock washers and nuts. Seat belts anchored to a frame cross member will aid in keeping both driver and seat in position in case of a sudden stop or collision.

Glass-fiber cloth and resin, and glass-fiber putty are the products that make your body job look professional. All joints, seams and mistakes are covered by glass fiber, which is sanded down, primed and painted as in Figs. 11 and 12. Glass-fiber cloth and resin also can be used to form panels with compound curves that can be inserted between the steel panels of the body. Headlight shrouds, taillight housings and air scoops can be shaped from glass material and cemented to the steel body by using epoxy resin that forms a bond almost as strong as a weld. ★ ★ ★

SN 58

SHOP NOTES



FILING MACHINE FITS YOUR LATHE

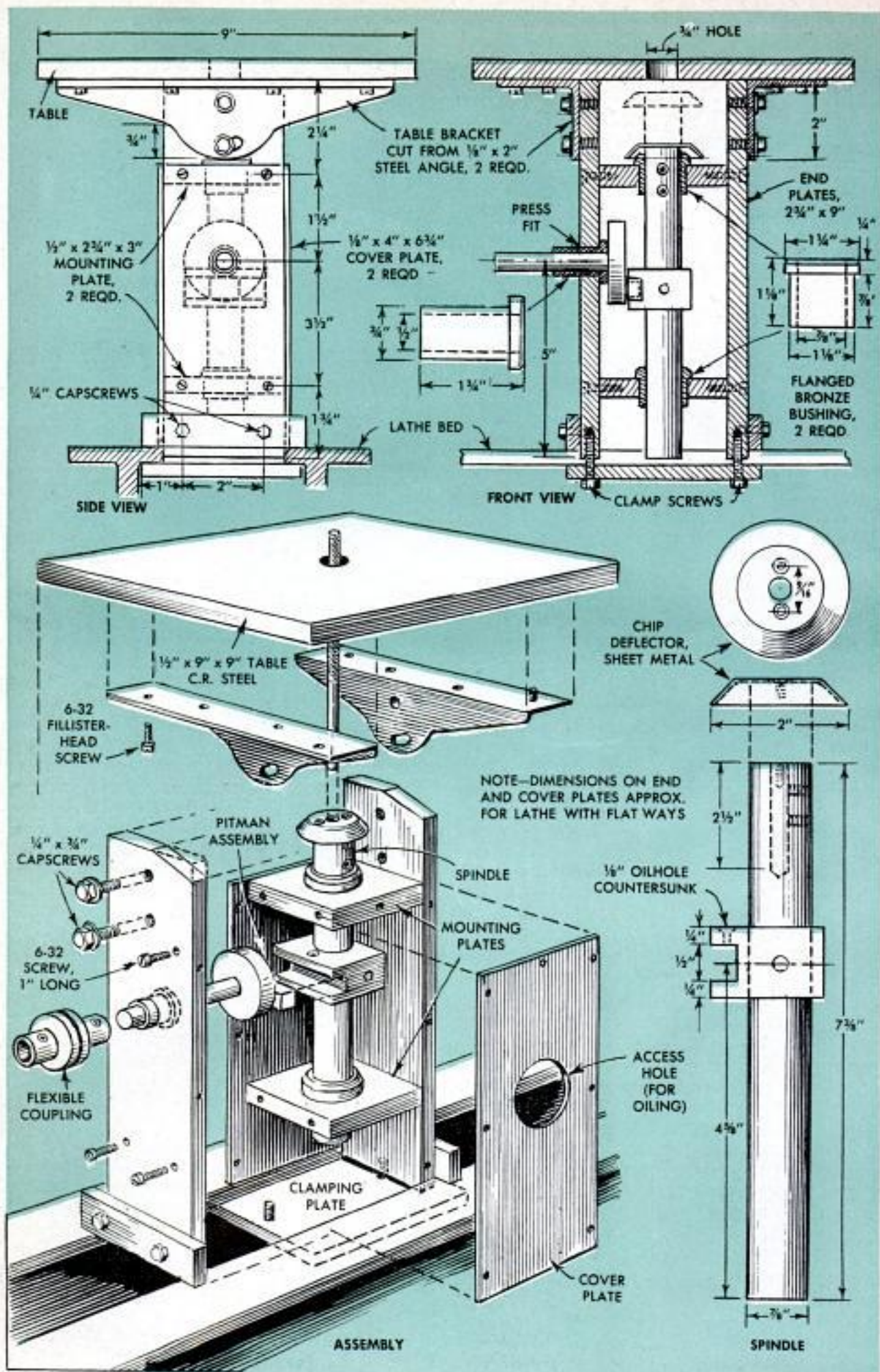
By C. W. Woodson

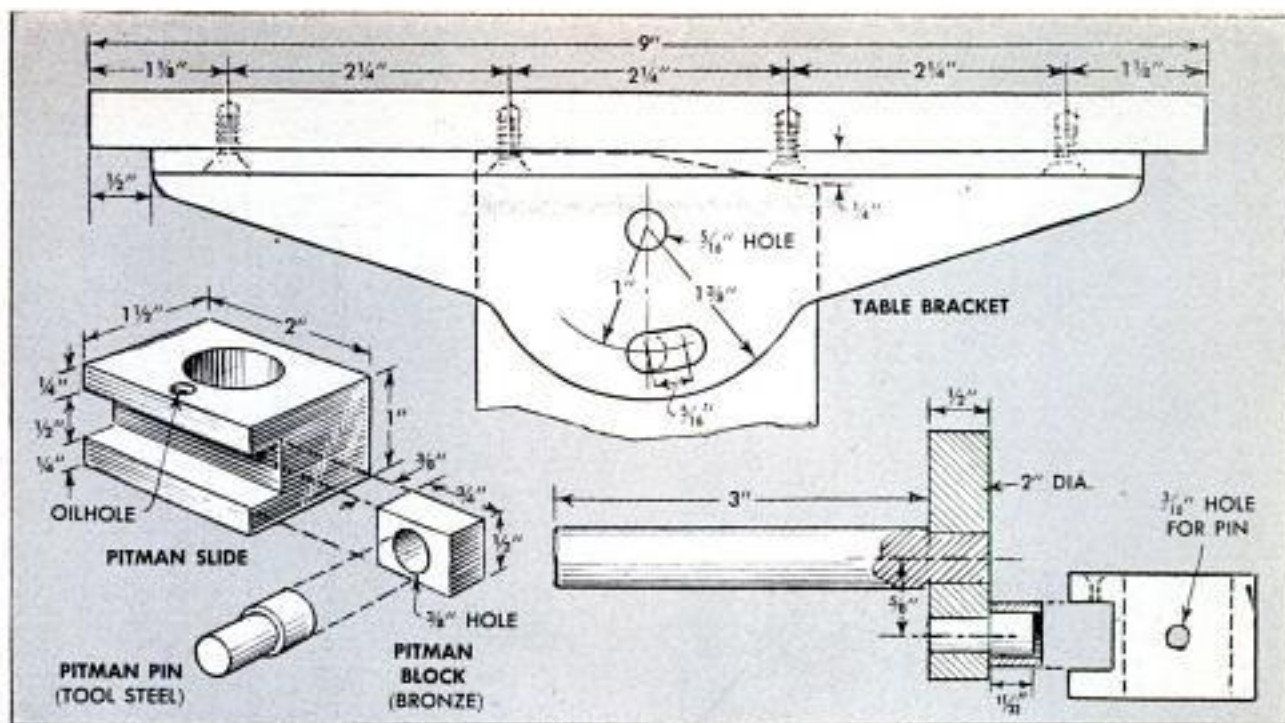
CUSTOM tool-and-die shops having only infrequent use for a die-filing machine can save time and money by making this filer to fit one of the smaller lathes in the shop. The unit is specially designed to mount on the lathe bed and is driven from the lathe spindle through a flexible coupling. Utilizing the lathe as a drive permits a selection of file speeds to meet almost any requirement. The table of the filer is designed to tilt a few degrees to permit filing drafts and tapers. As detailed, the table is only 9 in. square, making it suitable only for work of small size. It can, of course, be made larger to meet your individual requirements.

No castings are necessary as the filer is built up entirely from cold-rolled-steel flats and rounds which are readily available cut to the sizes required. Bronze bushings carry the pitman shaft and the file spindle.

The pitman block also is made from bronze. The dimensions given in the details on the following pages adapt the filer for use on a 9-in. lathe with flat ways, but by making slight changes in the sizes of certain parts and filing or milling vees in the base supports, the unit can be adapted for use on a lathe with V-ways as pictured above.

Although materials lighter than those specified for the table and end plates (all three of which are of 1/2-in. stock) can be used, the weight of the machine, when assembled from the parts specified, reduces vibration to the minimum, making extremely accurate work possible. Note in the lower left-hand detail on the following page that the lower ends of the side plates fit between the lathe-bed ways. When the unit is made to fit on a lathe with V-ways the end plates will have to be located in a





somewhat higher relative position, and corresponding changes must be made in the dimensions in order to bring the pitman spindle to correct height. The hole in the table is given as $\frac{3}{4}$ in. in diameter. To give added support to small parts the hole can be drilled only slightly larger than the diameter of the file to be used, or the table can be set up in a lathe and the hole step-machined from the top surface so that several inserts can be used, each with a different hole diameter.

To drive the filer it generally is best to use a drill chuck or a collet chuck in the lathe headstock. Clamp a short length of $\frac{1}{2}$ -in. shafting in the chuck and connect to the filer with flexible coupling as pictured

in the lower left-hand detail on the opposite page and also on page 205. When laying out the height of the pitman spindle care must be taken to center it at the correct height so that it will be in line with the lathe spindle when the filer is clamped in position. This height will vary with lathes of different makes. Note the variations in dimensions for the spindle height on the side and front views, opposite page. Be sure to check the height carefully before drilling the hole for the pitman-spindle bushing. Any appreciable change in dimensions also will affect the location of the mounting plates and the pitman slide. The required dimensions may vary considerably from those given. ★ ★ ★

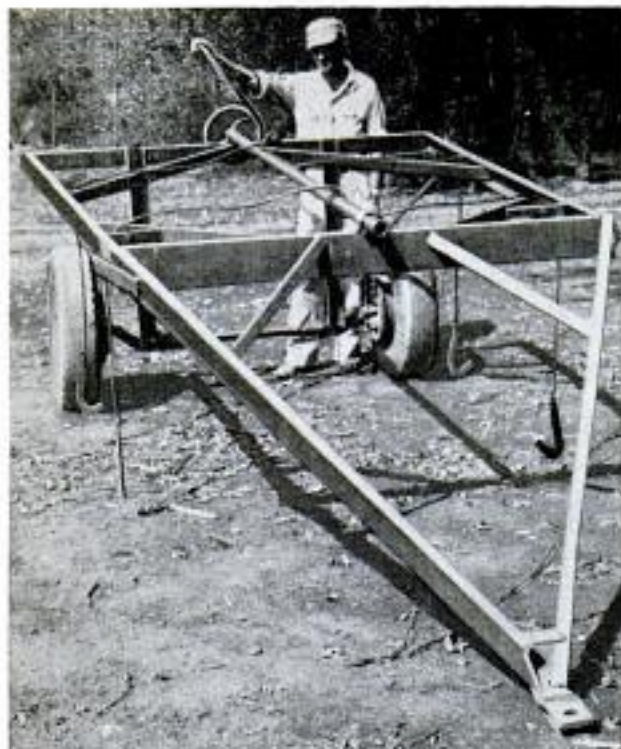
Micrometer Mounted on Base for Checking Duplicate Parts

Duplicate parts can be checked faster if the micrometer is mounted on a base as shown to leave both hands free to handle the work. Setting of the micrometer is easily read so that discrepancies can be noted with little delay. Jaws of the base are adjustable.

Moth Balls Protect Hen

Since it is difficult to dust insect powder into the feathers of a setting hen, one poultryman avoids any disturbance of the fowl by merely dropping a couple of moth balls into the nest. These, he claims, discourage mites and other insects that would often cause the hen to give up the job.





Geared Windlass on Transport Lifts Disks for Hauling

Turning a crank raises 8 and 10-ft. tandem disks clear of the ground for easy hauling under this farm-built transport. An automobile front axle provides the running gear and two lengths of $1\frac{1}{2}$ x 3-in. steel channel welded and braced to the axle locate the transport frame the correct height above the ground. The main frame, welded of the same size channel, measures 6 x 8 ft. Extensions of the frame locate the trailer hitch 6 ft. ahead of the transport. Cables with end hooks wind on a heavy pipe winch to raise the disks. A 10-in. gear on the pipe meshes with a 3-in. gear on the crank to permit easy lifting of the heavy disk units.

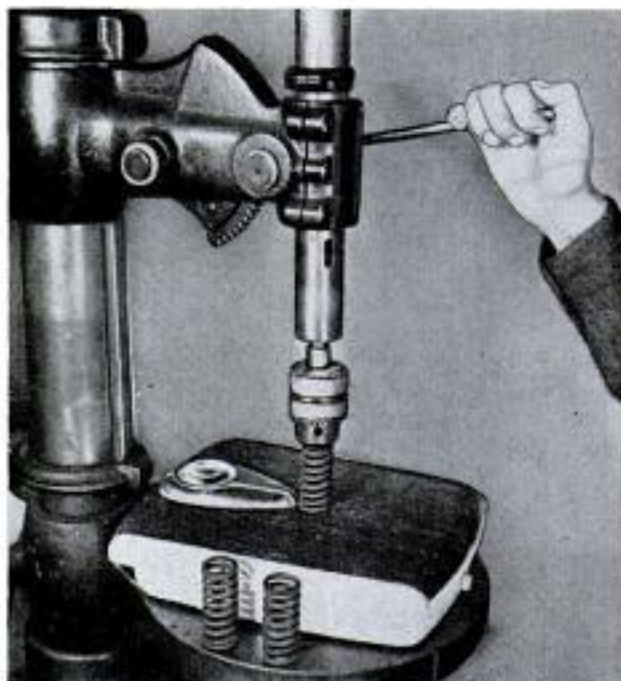
A. M. Wettach, Mt. Pleasant, Iowa.

☐ When through taking cellophane tape from a roll place a button under the loose end so that it will be easy to find the next time tape is needed.

Scale and Drill Press Utilized To Measure Valve-Spring Tension

To make certain that an overhauled engine runs as smoothly as possible, it is good practice to use valve springs that are close to uniform in tension. For measuring the tension of springs removed from the engine, make a setup with a bathroom scale and drill press as shown. Fit a spring under the drill-press chuck and apply pressure with the feed lever until a reading of about 50 lb. is obtained on the scale. Set the feed stop at this point to assure that all springs will be compressed the same amount, then check each spring. Those that vary more than 5 lb. from the average should be replaced with new springs, or special shim washers can be used to increase the tension of weaker springs.

Ed Packer, Oak Park, Ill.

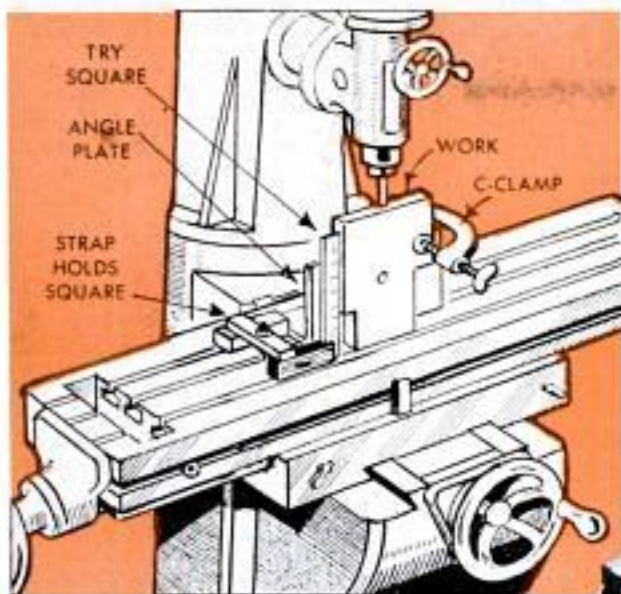


Drawing Dimensions Converted By Dividers Set With Micrometer

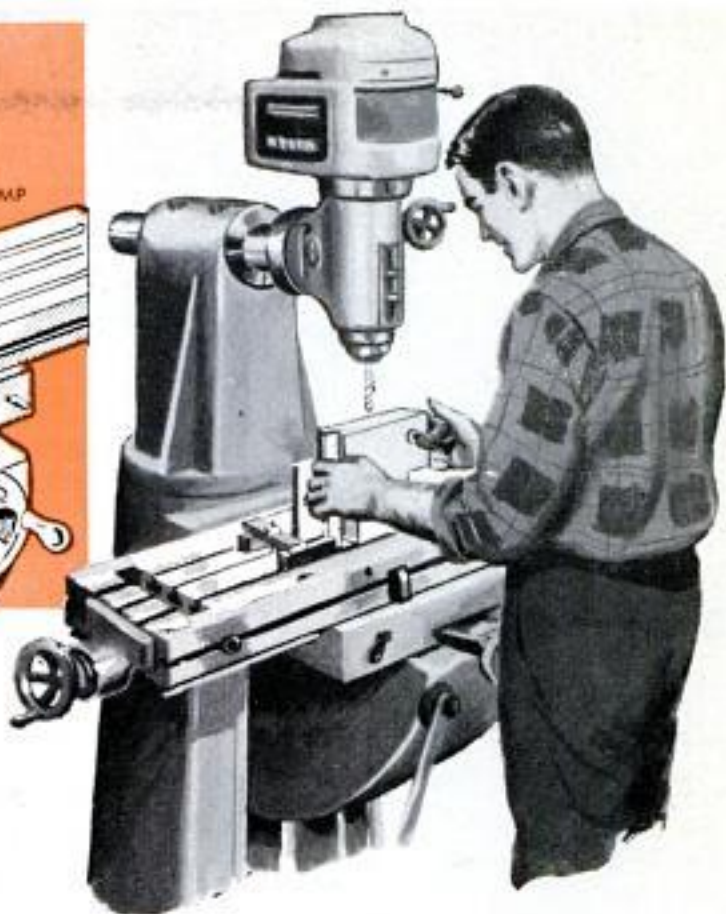
In mechanical drawing or layout work where dimensions are given as decimals, it is often difficult to convert the dimensions to fractions. For a quick and accurate method of determining exact divider settings set a micrometer on the particular dimension called for and adjust the dividers in the gap.—H. Hanscom, Elmhurst, Ill.

☐ If you have a power failure in the dark-room, a safelight can be improvised by slipping a flashlight into an amber or ruby-colored drinking glass.

Try-Square Jig for Quick Milling-Machine Setup



When using a vertical milling machine for drilling, reaming or jig-boring a single piece of work, a try square or machinists' square strapped to the table and an angle plate clamped to the work and bolted to the table as shown will permit a quick and accurate setup without making an elaborate jig or fixture for the work. The jig enables the operator of the machine to square the work vertically and acts as a registering point for measuring to a given dimension for drilling, reaming and other machining operations. To make a setup by this method, simply clamp the work loosely against



the angle plate, then align the work vertically against the try square, bolt the latter to the table as shown in the drawing and secure the angle plate to the table and the work to the angle plate.

Frank LaSaracina, New York City.

Sanding Freshly Glued Joint Seals and Finishes It

To make a joint in a glued-up wooden workpiece less conspicuous, sand the surfaces before the glue has set firmly. Wood dust will mix with the glue to provide a filler that matches the wood. The sanding block assures that the joint is flush with the other surfaces.



Removing Generator Pulley

To remove the pulley from an auto generator without disassembling it, wrap the fan belt around the pulley and grip it in a vise as indicated. While held in this manner the pulley and armature will not turn when a wrench is applied to the nut. Two screwdrivers then are inserted under the pulley to pry it from the shaft.

SN 58

HOW WOULD

By Chris Nelson



1. Q—To turn a bowl with a thin base, how do you mount it on the faceplate so screws do not go through?

A—Screw the faceplate to a block of wood that has been glued to the bowl stock. When gluing bowl stock to block, wipe both surfaces with glue, then insert a piece of newspaper in the joint before clamping. After turning, work and block can be split apart readily and dried glue sanded off base of bowl

2. Q—To prevent the dead-center end of work being turned in a lathe from smoking, what can be done?

A—Squirt a drop or two of oil onto the center to lubricate it as shown in the left-hand photograph. Or, better still, obtain a live cup-center as shown in the right-hand photograph. This type of center rotates on ball or roller bearings and requires only occasional lubrication or none, if the sealed type

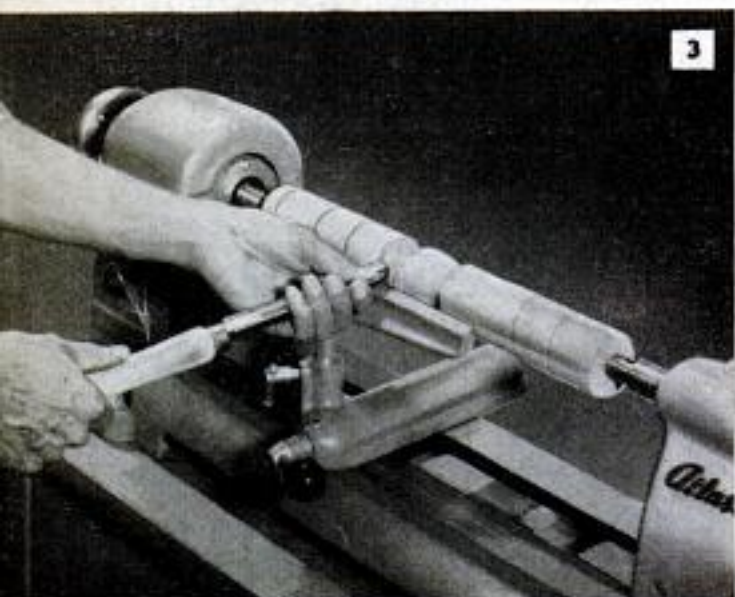


3. Q—Where should your left hand be placed when holding a tool against stock that is rotating in the lathe?

A—Hold the wood-turning tool as indicated in the photograph. Let the tool rest support your left hand which is used to grip the tool near the end. Held against the tool rest this way the left hand controls angle and depth of cut easily. When held farther back on the tool, hand has little control

4. Q—When making a roughing cut on wood 6 in. in diameter, at what speed should the lathe be rotating?

A—Lathe speed should be about 650 r.p.m. for making a rough cut on a piece of stock that is more than 4 in. in diameter. For proper cutting and longer life for a cutting tool, lathe speed should be controlled. Speeds for cutting wood, plastic and nonferrous metals are indicated in the chart



4

LATHE-SPEED GUIDE

Material and Diameter	Roughing Cut (r.p.m.)	Shaping Cut (r.p.m.)	Finishing Cut (r.p.m.)
Wood up to 2"	910	2590	4250
Wood 2" to 4"	810	2375	3380
Wood 4" to 6"	650	1825	2375
Wood 6" to 8"	650	1200	1825
Wood 8" to 10"	650	910	1025
Wood over 10"	650	650	650
Plastics up to 3"	2200	3125	3875
Plastics over 3"	1025	1200	1680
Nonferrous metals up to 3" (with carbide-tipped tools)	650	1300	3125

YOU DO IT?

5. Q—What kind of chisel is used to turn brass, and what is indicated when the chisel starts to chatter?

A—A carbide-tipped chisel is used for turning soft metals or plastics. Because it stays sharp much longer than a regular chisel, a carbide-tipped tool also is ideal for wood turning. If the chisel starts to chatter when turning brass it means that the work is rotating too fast or too deep a cut is being made

6. Q—How far should the lathe tool rest be positioned from the work for best control and maximum safety?

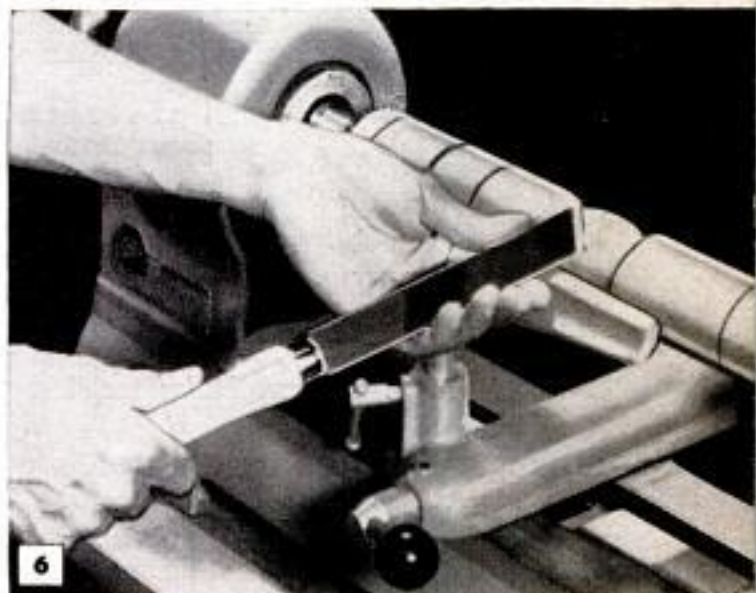
A—As a general rule for all work turned on the lathe, the tool rest should be positioned as close to the stock as is practicable. This practice is both for safety and to assure better control of the chisel as described in answer 3. Stop the work frequently and move in the rest as stock is cut away

7. Q—Of the four common lathe tools, skew, roundnose, gouge and parting tool, which are used for rough cuts?

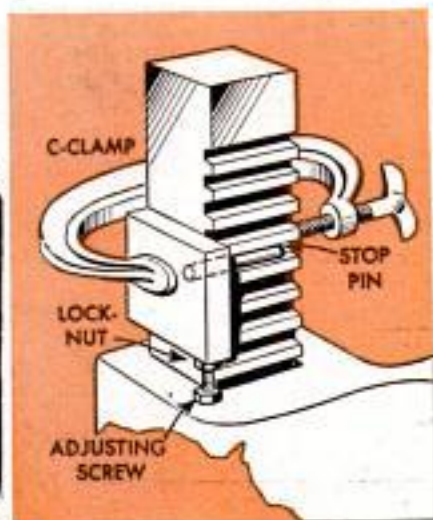
A—A gouge can be used for most cuts except where a portion of the work is to be left square. In this case, many turners prefer to use a skew chisel inverted on the tool rest to turn a shoulder from the square to the round. When properly beveled and sharpened, a skew chisel produces a cleaner cut

8. Q—In what manner can work neatly be cut off the waste portion of stock while still held in the lathe?

A—Do it as shown, always at the headstock end of the lathe. Use a skew chisel to remove as much stock as possible, then place the skew on the tool rest so the point will go through the remaining bit of stock. While making this last cut through the wood, support the rotating work lightly with your right hand



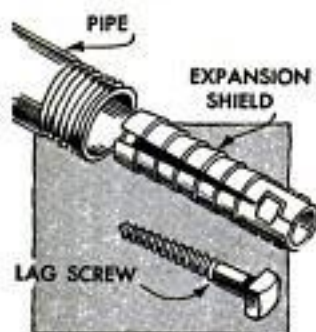
Adjustable Depth Stop for Arbor Press Clamps to Ram



Accurately pressing pins, bushings and other items to a predetermined depth is no problem when an arbor press is fitted with this stop. Since it is held on the arbor ram with only a C-clamp, the stop can be removed, but will not slip when in use because of a steel stop pin that fits between the teeth of the ram. Pin diameter is such that it fits snugly between the teeth. Fine adjustments of the stop are made by means of a $\frac{3}{16}$ or $\frac{3}{8}$ -in. machine

screw turned in a tapped hole on the lower edge of the stop and held in position by a locknut. Suggested size of the steel plate used for the stop is $\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{2}$ in.

Thin-Wall Pipe Nipple Plugged To Prevent Crushing With Wrench



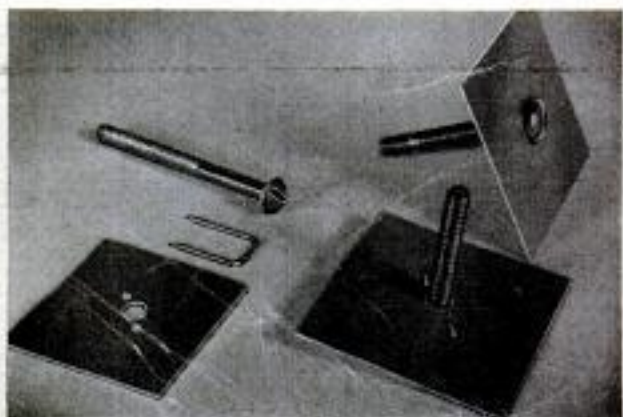
An expansion shield and lag screw installed in the end of a thin-wall pipe nipple will prevent it from being crushed or distorted when clamped in a vise or wrench. Keep a number of shields in various sizes

available for use in pipe nipples of diameters commonly used.

H. J. Gerber, Stillwater, Okla.

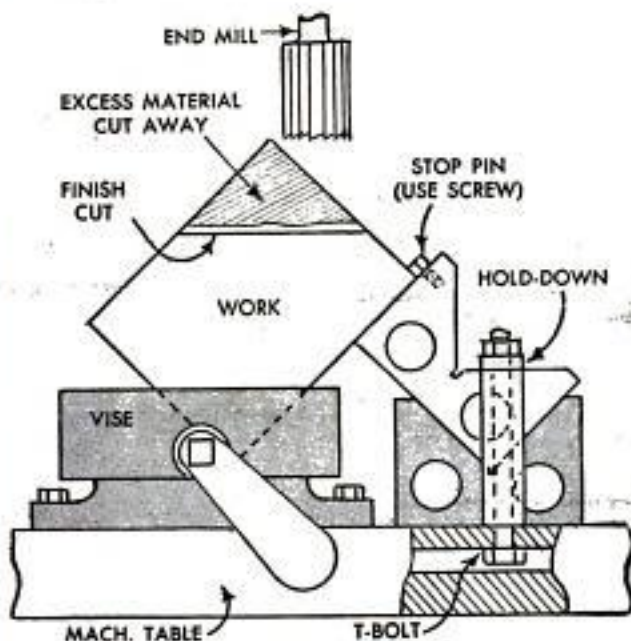
Holding a Bolt in Sheet Metal

To hold a bolt or machine screw in sheet metal and keep it from turning, straddle the head with a staple, seating the staple firmly in the screw slot. The points of the staple go through two small holes drilled near the hole that receives the screw. Clip the ends of the staple short on the other side of the metal and hammer them flat.—Bertram Brownold, Cedarhurst, N.Y.

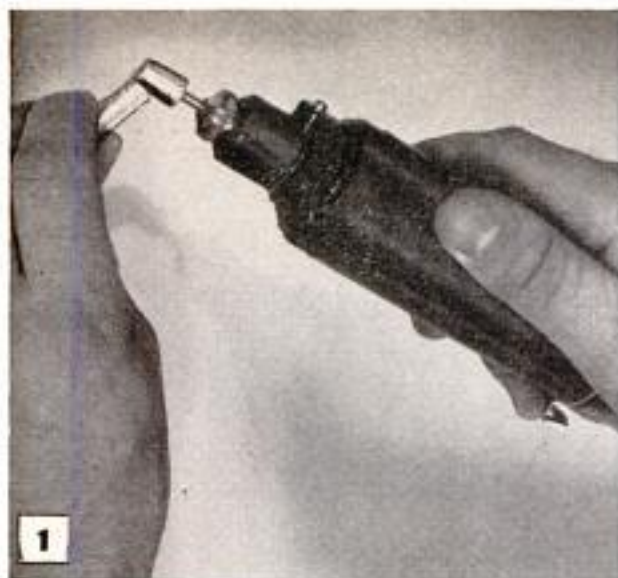


Milling Machine Set Up To Make 45-Deg. Cuts

When a small production job required making 45-deg. angle cuts, one machinist used this simple setup on a vertical milling machine. A machine vise and two V-blocks were bolted and clamped to the machine table and carefully located as indicated. A small capscrew turned into a hole tapped in one block acts as a positive stop. Excess material on the workpieces is first cut away with a metal saw or abrasive wheel. Then the first of the pieces is machined and the setup checked for accuracy. Once accuracy is established within the limits required the operation is simply repeated on each workpiece.



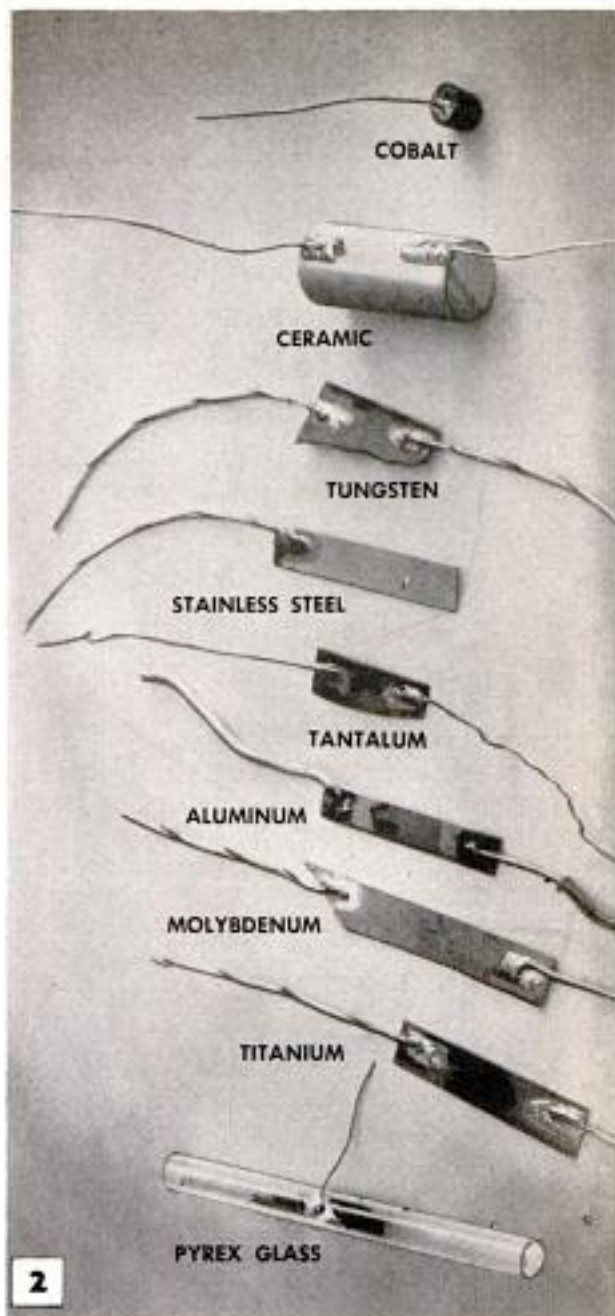
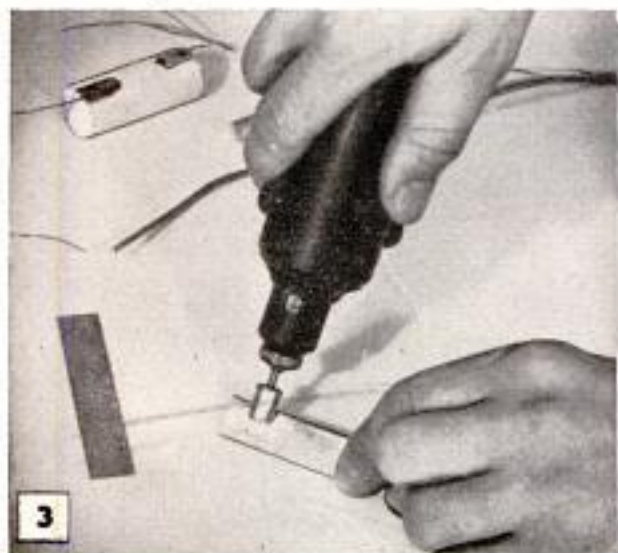
POPULAR MECHANICS



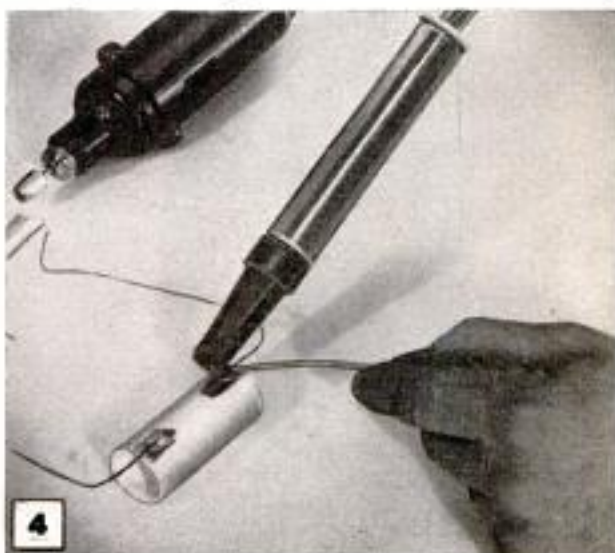
Almost Anything Can Be Soldered

SOLDERING such materials as aluminum, glass and ceramics, which until recently has been either extremely difficult, or impossible without special equipment, now can be done in any home workshop. A technique developed at the Los Alamos laboratory of the University of California requires only the addition of a small hand grinder and 60-40 solder. A medium-grit wheel in the grinder is preheated and rotated against the soft solder, Fig. 1, until it is "loaded" with the metal. The wheel then is rotated against the surface to be soldered, Fig. 3, until a slight abrasion occurs. Heat of friction again melts the solder which flows onto the abraded surface. After this tinning operation, soldering is done with 50-50 solder, Fig. 4.

After wheel is loaded with solder, as in Fig. 1, it is rotated against work to be soldered, as below



Above, various materials soldered with new technique. Below, after tinning, work is soldered in usual way





Trimming Photoprints Without Cutting Board

In the absence of a cutting board, a transparent ruler can be used as a guide for trimming photoprints. Paint a black line on the underside of the ruler at the appropriate distance in from the edge. Align this mark with the exposed area of the print and trim off the excess margin.

O. A. Nelson, Seattle, Wash.

Wet Cloth Cools Developer

When ice or other means of cooling photo developer is not available, it can be cooled to the recommended 68 deg. F. by wrapping the container in a wet cloth and setting it where a draft of air will evaporate the water rapidly. The container should be placed in a shallow pan containing enough water to keep the cloth wet for the ½ to 1 hr. usually required to lower the temperature of the developer to 68 deg. F.



214



Envelope Flap Guides Carbons Into Typewriter

Feeding more than one carbon sheet into the typewriter at a time is a neat trick at the best. When you're pressed for time, or when the typewriter is somewhat worn or out of adjustment, the tendency of the sheets to come through with the edges uneven can be rather trying to one's patience. It's always easier and faster if you slip the edges of the sheets under the flap of an envelope as pictured.

Suede-Shoe Brush Cleans Carvings

When preparing old furniture for refinishing you are almost sure to encounter the problem of removing softened varnish or paint from carvings after the varnish remover has done its work. A suede-shoe brush is handy for this job as the brass bristles have just the right tension, or degree of stiffness, to reach into the grooves and depressions of the relieved surfaces and clean out the softened finish without damaging the wood.

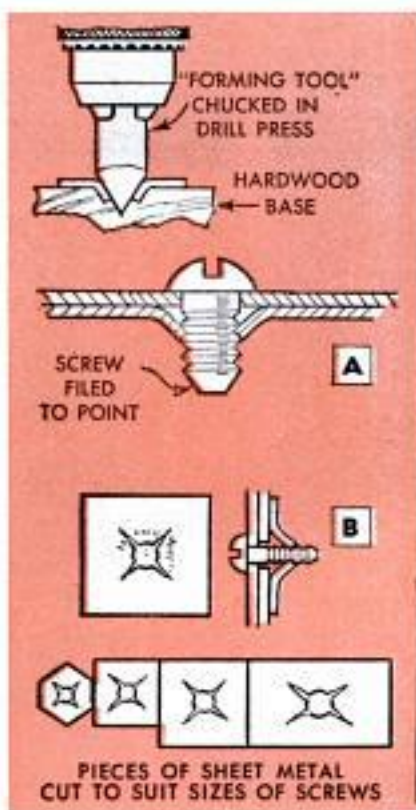


POPULAR MECHANICS

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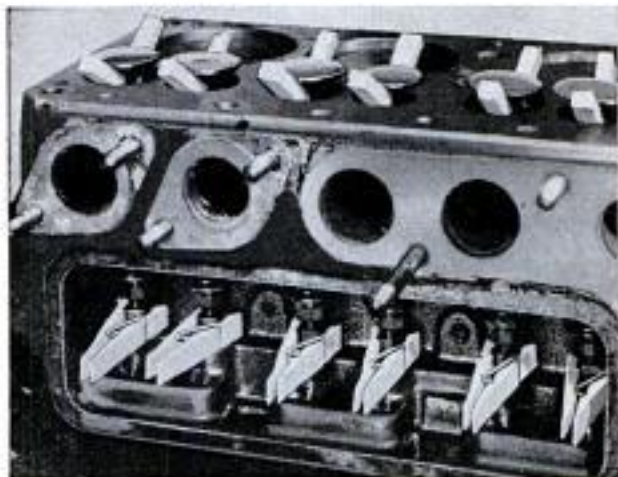
Metal Fasteners Have "Self Locking" Action

Sheet-metal "nuts," that can be made in almost any size and shape, are ideal for emergencies when the standard types are not available, and in some cases may be even more suitable for the job at hand. As a screw is turned into a sheet-metal nut, the edges dig into the threads and provide a "self locking" action. Also, where there is a minimum of space, the extreme thinness of the sheet-metal nuts permits easy installation. A large nail with the head removed, or a length of steel rod ground to a square point is used as a "forming tool" for the nuts. The tool can be chucked in a drill press as indicated in the upper detail and forced through the sheet metal by pulling down on the drill-press feed lever, with a wooden block under the sheet metal. On jobs, the tool can be used manually and struck with a hammer. In this method, as indicated in detail A, the sheet metal itself is "tapped" to permit insertion of machine screws that have had their tips filed or



ground to a slight point to assure easier starting. A block of wood is used to back up the metal under the tool, as shown in the illustration. Detail B indicates the manner in which sheet-metal nuts pull against the threads of a screw.

Carl S. Bates, Chicago.



Valves and Tappets Left in Place When Changing Engine Camshaft

It is not necessary to remove valves and tappets to change a camshaft on a valve-in-block engine if the following method is used: Hold the valves up by slipping small wooden wedges under the heads as the engine is turned. Then lift each tappet and clamp it up with a spring-type clothespin.

Ferrule Replaced on Tool Handle With Soldered-Wire Wrapping

To repair a tool handle from which the ferrule has been lost, wrap it tightly with several turns of wire as shown and secure the wrapping with solder. The starting end of the wire can be anchored in a small hole drilled in the handle. Another method of repairing or reinforcing a handle is to coat it with shellac, apply a wrapping of strong cord and brush more shellac over the cord.



Truck Parked on Hoist to Provide Additional Storage Space



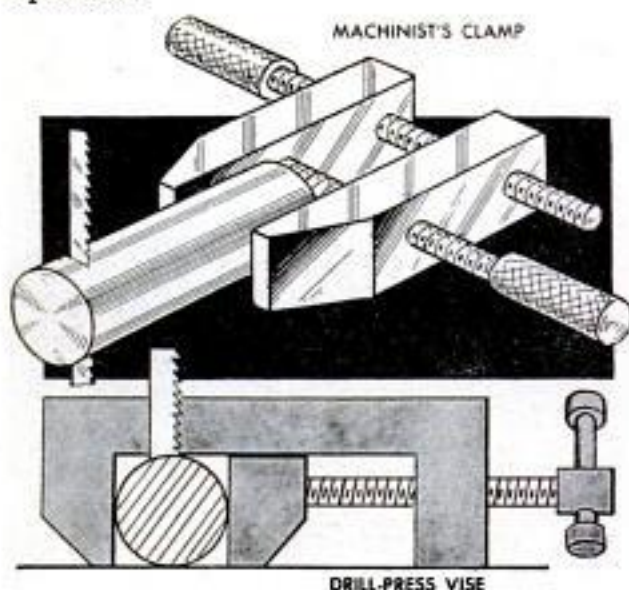
To provide additional storage space in the garage for equipment and material left outside during the day, one service-station operator lifts the station pickup truck on the hoist and leaves it up all night. The floor space under the hoist then can be used for storage, as well as the area adjacent to the hoist where the truck normally would be parked.—Bruce D. Stewart, Winder, Ga.

Cutting Hole In Plaster

To prevent breaking the wood lath away from plaster when cutting a hole for the receptacle box of an electrical outlet, use a hacksaw blade, holding it in the reversed position. Saw with an easy motion, exerting pressure on the cut only on the stroke toward you.

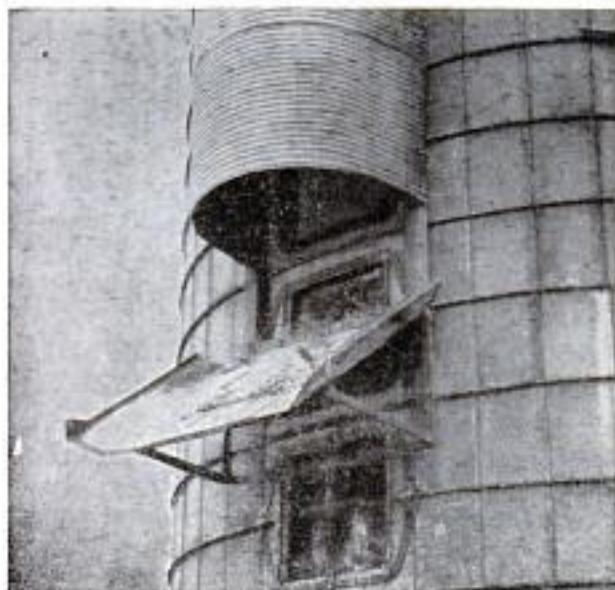
Round Stock Cut With Bandsaw Clamped to Prevent Rolling

When round stock is cut on a bandsaw it should be held in a wood clamp or an inverted drill-press vise to prevent it from rotating by the downward force of the blade. Stock which rolls while being cut may bind against the blade and break it, or the stock may be thrown free of the saw. Either action can cause injury to the operator.



"Hookon" Chute on Silo Keeps Waste at Minimum

Sheet-metal roofing bolted to a steel-angle frame is used to make this chute that directs silage from the silo into a feed wagon with a minimum of waste. The angle frame of the chute hooks over the silo hoops and is lowered to the proper door as the silo is emptied. Sheet metal of fairly heavy gauge should be used for the chute.



On the
MARKET
for Do-It-Yourselfers

1. WIRE BRACKET makes a screen-painting easel of your stepladder. Holds the screen at just the right height for painting the stiles and rails. Suitable for screen frames of any length as bracket can be fitted over the ladder steps at a convenient height.

Max Salisbury Mfg. Co., 2038 Biedmiller, Fort Wayne, Ind.

2. SURFACE-STAIN REMOVER takes off stains and discolorations without dulling the finest finish. Easy to use. Merely wipe it on the surface with a soft cloth. Then wipe off with a very light pressure. Stains, discolorations come off with the material.

Renewize Products, Minneapolis 4, Minn.

2105 4th Ave. S.

3. RUST-PREVENTIVE COATING for metal sash, pipe, outdoor furniture, tanks, gutters and downspouts contains a specially processed sardine oil which bonds to the metal, resists rust and the action of other corrosive agents which may attack the metal.

Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.

4. ALUMINUM PAINT in decorator colors is now available in 1-pt. pressurized containers which greatly enlarge its applications. Two types of paint are furnished, regular type, and another having an asphalt base giving exceptional durability for exterior use.

Duncan-Stewart Industries, Ltd., 715 Fifth Ave., New York City 22

5. DOOR HINGE requires no flush mortising in door or jamb. Hinges are simply located and then screwed to edge of door and to surface of jamb. Hinges have flat-button tips, nonrising pins and staggered screw holes. Available in three finishes.

McKinney Mfg. Co., 1715 Liverpool St., Pittsburgh 33, Pa.



1



2



3



4



5

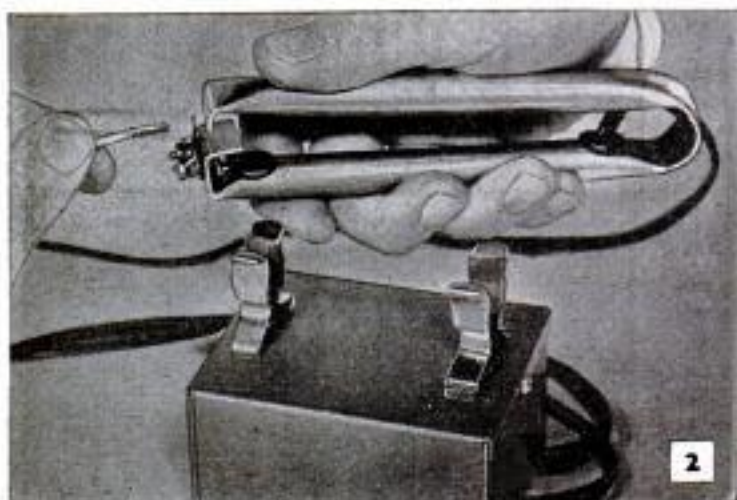
SHOPPING FOR TOOLS



1

1. UNIVERSAL VISE serves as a vise, clamp and holding fixture for use on bench or on machine tables. Two jaws, each consisting of a pivoted arm carrying a swiveling link and pad at each end, can be arranged to hold work of almost any shape, pressure being exerted equally in all directions. Has counter-threaded spindle which moves the jaws in or out simultaneously

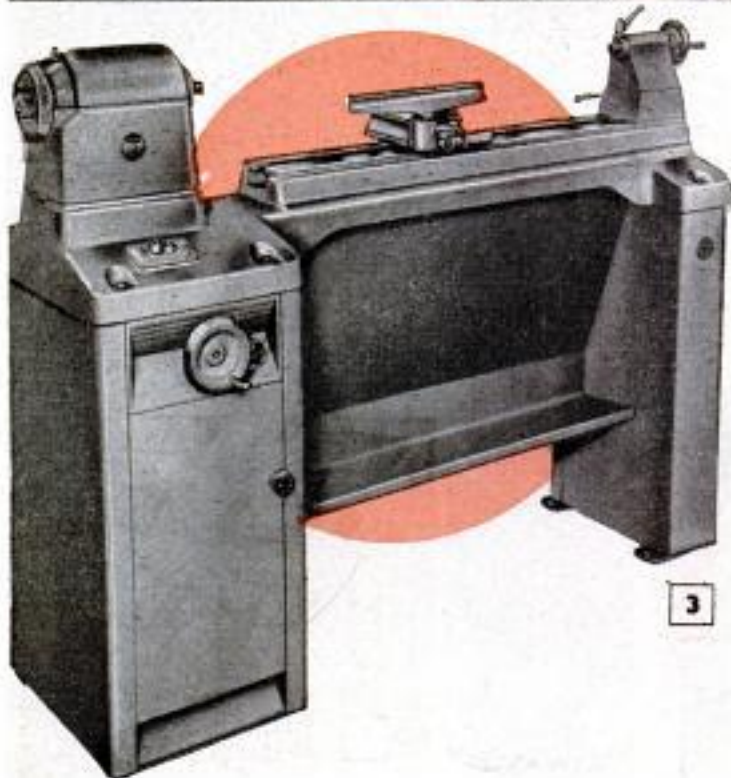
Firearms International Corp.,
6521 Keeby Hill Rd., Washington 22, D.C.



2

2. STRIPPER removes insulation without damaging the wire, as it has no blade. A chrome-nickel wire, heated electrically, cuts insulation without nicking the wire and a slight turn of tool removes severed portion. May be used to strip either solid or stranded wire. Requires no adjustment for different sizes of wire

Western Electronic Products Co.,
655 Colman St., Altadena, Calif.



3

3. VARIABLE-SPEED LATHE for wood turning, metal spinning and light turning of metals has 12-in. swing over bed, 16½-in. swing over gap and takes 38 in. between centers. Comes complete with variable-speed drive having a range of 340 to 3200 r.p.m. Tailstock has quick-acting cam-type clamp for positive positioning on bed

Delta Power Tool Div., Rockwell Mfg. Co.,
457 N. Lexington Ave., Pittsburgh 8, Pa.

4. STRAP-TYPE CLAMP can be placed at any angle up to 45 deg. to hold work securely on machine tables. Requires no block. Curved ends bear on table and surface of work, and single bolt and floating washer equalize pressure when nut is tightened. Curved ends, or pads, require very small space on surface of work

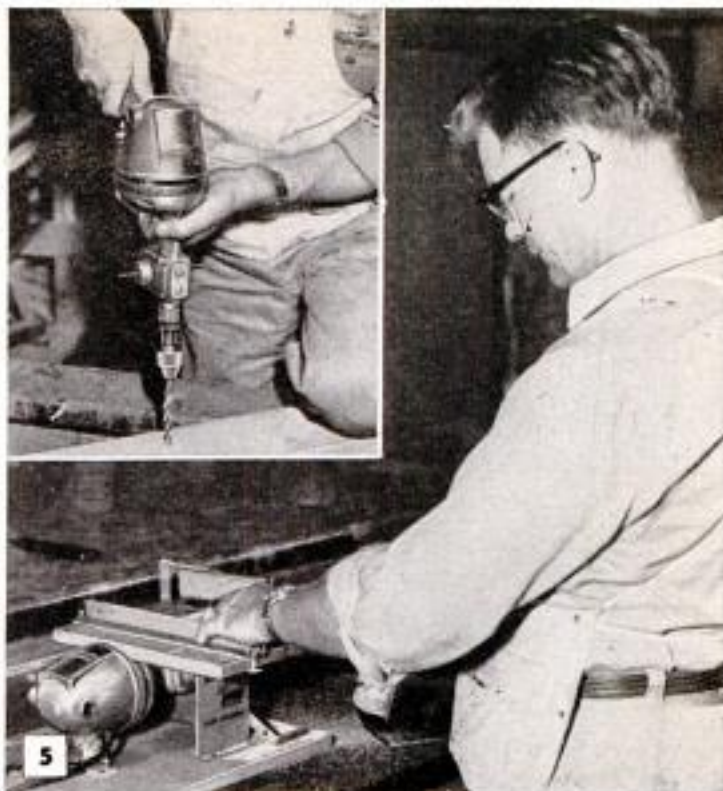
Custanite Corp., 1228 Utica Ave., Brooklyn 3, N.Y.



4

5. ONE-MOTOR WORKSHOP is available with accessories which convert it to a saw, grinder, drill, hedge trimmer, lawn edger, rotary garden cultivator and twin-head floor polisher with counter-rotating polishing brushes. Motor unit weighs 10 lb., has power to handle cultivator-tiller unit, drill and table saw up to full capacity. Small size of saw table and blade makes tool especially suited to modelmakers

Iron Fireman Mfg. Co., Cleveland 11, Ohio



6. NEW CUTTING TOOLS in the familiar form of hand plane and rasp utilize filelike blades each having 450 individual cutting edges set at a 35-deg. angle. Blade is provided with an opening through which chips pass, preventing any tendency to clog. Blades are interchangeable on rasp and plane body, both of which are of lightweight aluminum. Blade will cut wood, fiber, plastic and common nonferrous metals

Stanley Tools, Div. of Stanley Works, New Britain, Conn.

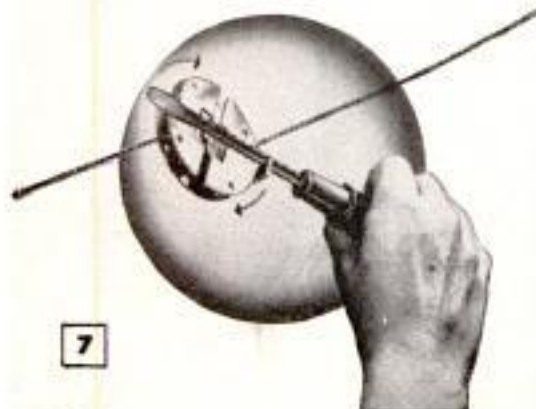


7. WIRE TIGHTENER can take up as much as 30 in. of slack in light wires and cables such as metal clotheslines, TV-antenna guy wires, any type of metal line which cannot be placed under tension conveniently while attaching the ends to anchors or other supports. Consists of a winding drum 2½ in. in dia. and having projecting lugs so that it is easily rotated with a screwdriver in the manner pictured. Locks at any position

BMS Enterprises, 4826 Greenville Ave., Dallas 6, Tex.

8. KIT for attaching solderless terminals consists of a combination cutting, stripping and crimping tool, a plastic-handled screwdriver and an assortment of solderless terminals. Jaws of the tool are specially formed for crimping the terminals. Wire cutters and stripping slots are cut into the meeting edges of the handles between the inner ends of the plastic grips and the pivot. Handles wire from No. 10 to 22

Vaco Products Co., 317 E. Ontario St., Chicago 11



7

8

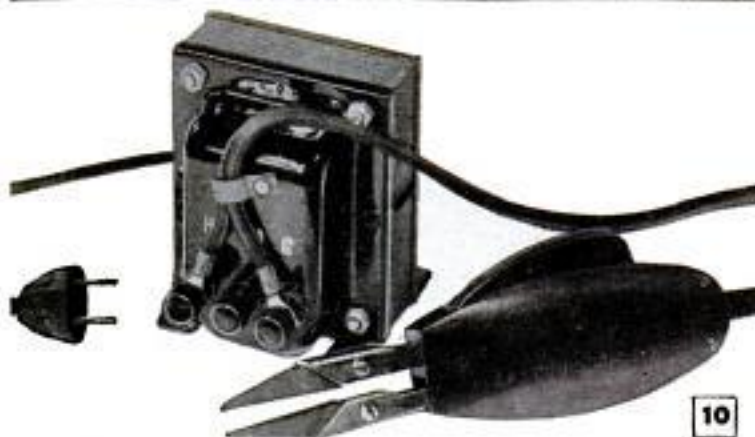


SHOPPING FOR TOOLS

(Continued from preceding page)

9. BAND CLAMP for assembling and gluing chair frames and columns features an exceptionally strong, stretchproof nylon band and a pawl and ratchet for tightening and loosening. Flexible band exerts uniform pressure, assures tight joints

Eagle Products, Meriden, Conn.



10. ELECTRIC SOLDERING TOOL comes with a two-heat transformer and plier-type electrodes which generate almost instantaneous heat when switch in hand piece is closed by light pressure. Electrodes grip work in the same manner as pliers

Triton Mfg. Co., Inc., East Haddam, Conn.



11. JIGSAW has built-in motor with take-off fitted with a chuck for standard 1/4-in. accessories for grinding, drilling, sanding and polishing. By removing over-arm, unit can be operated as a saber saw. Unit is lightweight, easily moved to work

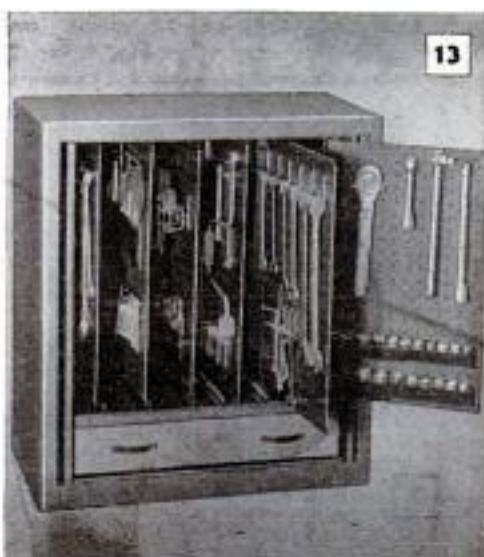
Burgess Vitrocrafters, Grayslake, Ill.

12. WOOD-SCREW HOLDER permits one-hand placement of screws in hard-to-reach locations. Slides over screwdriver bit and grips screw firmly with bit engaging screw slot. Sliding coil spring locks into notches to hold the screw firmly

Cade & Holt, Mfg. Engineers, Millview Works, Barham, Kent, England

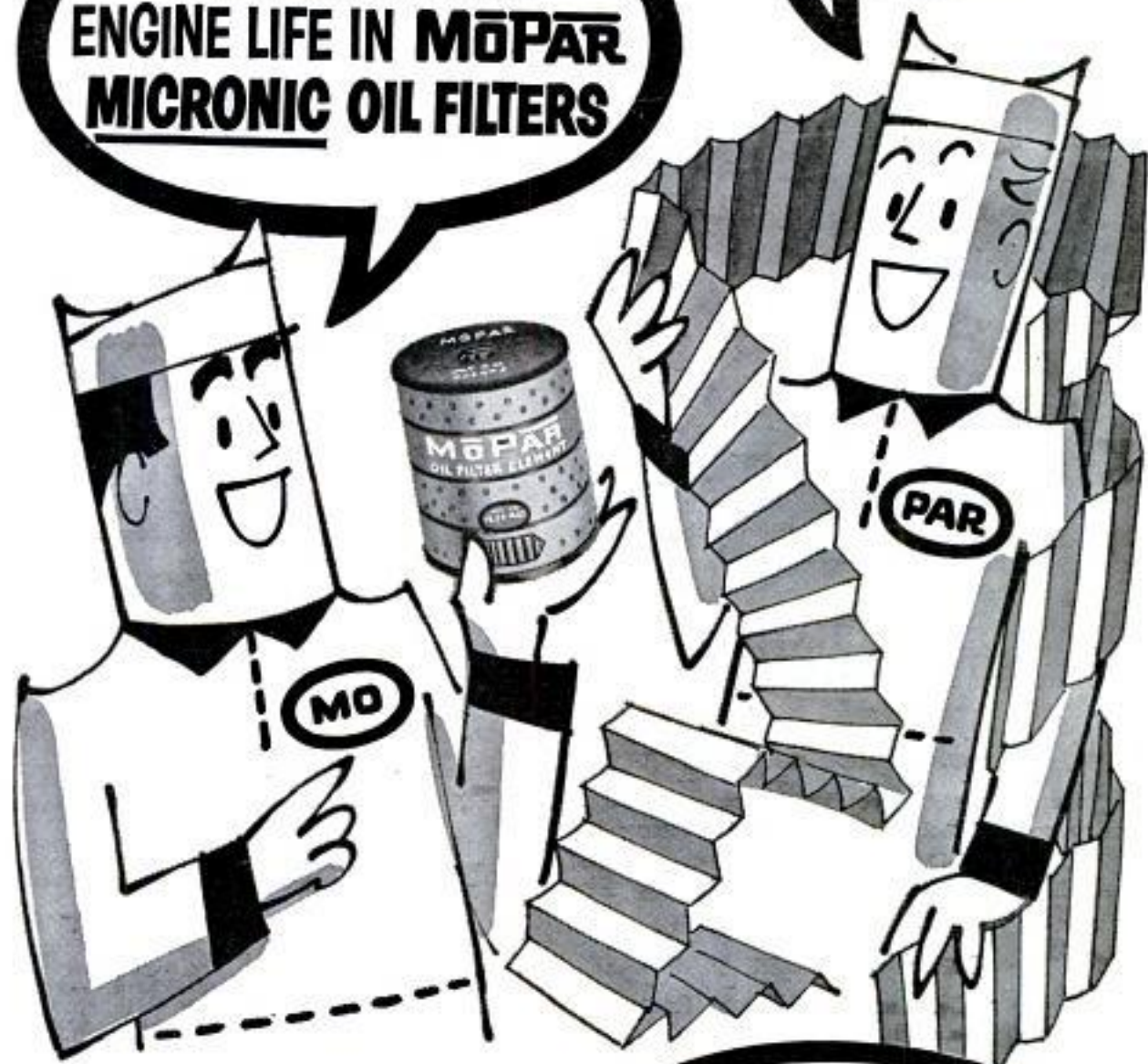
13. STORAGE CABINET for tools is designed to hang on the wall. It is fitted with a drawer and six sliding tool panels providing 24 sq. ft. of tool-storage area. Doors nest into sides of cabinet when opened and are equipped with built-in lock

Huot Mfg. Co., 550 N. Wheeler Ave., St. Paul W4, Minn.



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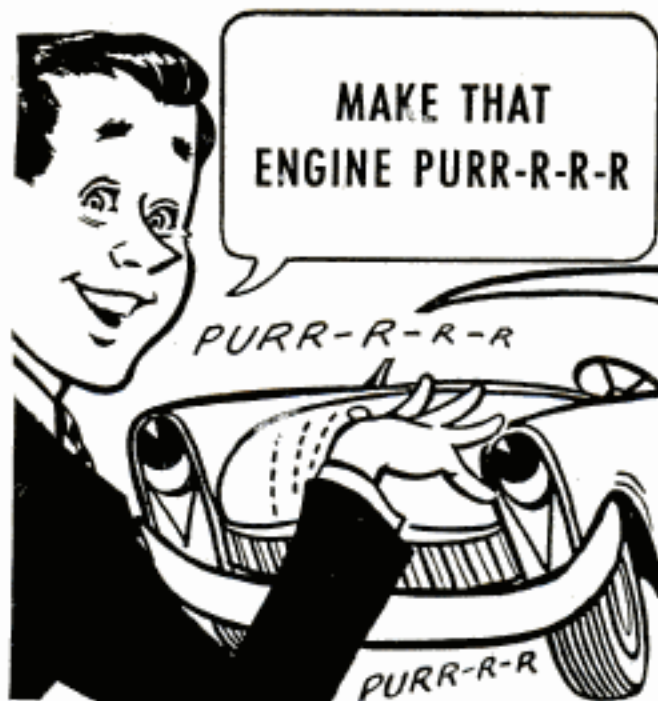


Here's the oil filter that invites you to keep careful tab yourself. MoPar Micronic Oil Filters keep engines purring longer because they trap corrosive, abrasive particles down to .000039 of an inch . . . take out one third more dirt per square inch of filtering surface . . . offer a surface over 8 times that of conventional types. MoPar Filters fit most makes of cars. Make sure you get MoPar Parts — official, authentic Chrysler Corporation Parts, available from your local Plymouth, Dodge, De Soto, Chrysler or Imperial dealer.

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Hilling Plants

Q—Is it always a good gardening practice to hill such growing plants as potatoes, carrots and beets? I'm told that it is, but I don't quite see the reason for hilling vegetables. No one I know of carries out this procedure. It seems to me that the practice may cause the soil to dry out rapidly to a considerable depth, especially between the rows where the soil is taken for hilling. Am I right?
H. L., Ga.

A—We assume you are referring to gardening practice in small plots and not to general field practices. One of the main reasons for hilling root crops, particularly potatoes, is to prevent the tubers from being discolored by exposure to the direct rays of the sun. This would be true of other root crops such as beets and carrots, although to a lesser degree. Some experienced gardeners make a regular practice of hilling potatoes, also carrots, beets, salsify, and some others, in heavy soils. The hills, or ridges, tend to promote drainage of moisture to a lower level, the soil dries and aerates faster after heavy rains and generally remains in a more friable condition. In the lighter, sandy or gravelly soils, level cultivation is generally the best practice. If necessary, low ridges or hills can be built up around the plants to protect the tubers from the sun.



Removing Oil Finish

Q—I have removed the finish from an old table and due to the rather lifeless appearance of the bare wood, I was advised to apply a coat of linseed oil as a first step in refinishing. I was much disappointed in this, as the oil darkened the wood. Now I want to remove the oil, but how? Sanding seems to have little effect.
S. A., Mass.

A—You do not say what kind of wood was used in the construction of the table. This tends to limit our answer to generalities. If the oil has been applied recently, it is just possible that it can be washed out of the wood by using a lacquer reducer, or thinner, which will act as a solvent to remove at least a portion of the oil which has been absorbed. A wash-off type of paint and varnish remover

(Continued to page 224)

ROCKWELL-BUILT

the all new dust collector

DELTA



New Delta Dust Collector shown with Delta Saw-Jointer. It can be attached to any other workshop power tool quickly, easily.

... for dozens of home workshop uses!

The only industrial type dust collector priced for the home workshop!

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ATTACHES TO ANY TOOL—Mounted on casters, rolls where you want it.

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NEVER-STAIN

ALUMINUM trellis

to accent the Beauty of your flowers



- RUSTPROOF — lasts indefinitely
- Never requires painting — maintenance-free
- Attractive "LUSTRE-BRITE" silver-like finish accents beauty of flowers and vines
- Reflects sun's heat and provides numerous surfaces for vines to grip
- Easy to put up — complete instructions in each package
- Ideal for interior treatments such as room dividers, etc.
- Available in 10 ft. and 25 ft. packages complete with hardware. Look for the red-white-blue displays at your favorite store.



ALUMINUM grass stop

for the neatest lawn in your neighborhood



- RUSTPROOF—lasts for years and years
- NEW "safety edge" makes installation easy — no sharp edges. No joints or clips.
- Ideal for use around trees, shrubs, sidewalks and driveways
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ALUMINUM clothesline



- RUSTPROOF — lasts indefinitely
- Once up — always up, summer and winter
- Will not rot, rust, chip or crack
- Solid or stranded in 50 ft. and 100 ft. coils

nichols WIRE & ALUMINUM COMPANY
DAVENPORT, IOWA



(Continued from page 222)

might do the trick. We hesitate to recommend use of an oxalic-acid bleach without knowing the kind of wood that was used in the construction of the table. However, you might try a mild solution on a small inconspicuous area and note the results. If it works satisfactorily, then it may be safe to use the solution on all parts. **Caution:** Lacquer thinner (reducer) is highly flammable. If you use it as a wash, take every precaution against the fire hazard. Handle oxalic-acid solution only with rubber gloves. Avoid inhaling the fumes. Destroy any unused portion.



Damp Basement

Q—I partitioned my basement and built a playroom at one end. I laid a floor of asphalt tile and finished the walls in knotty-pine plywood. Now dampness seems to be loosening the tile and the plywood plies are separating at several points. What can I do to stop the damage?—E. H., Ill.

A—Preventive steps should have been taken at the time the work was done. About the only suggestion we would consider practical now is to install an electric dehumidifier to reduce the humidity of the air in the room to a low level. However, this may not prove a complete cure, as a certain amount of moisture comes through the concrete, both the walls and floor, unless it has been waterproofed. Waterproofing the basement walls from the outside will, of course, prevent this but the cost may be prohibitive. It may well be that after the dehumidifier has been operated a sufficient length of time to dry the walls and floor the dampness will be minimized to such an extent that it will no longer be damaging.

Damaged Tree

Q—I have a young tree about 8 ft. in height. A foot or more of the top end of the trunk has been broken off. I just noticed the damage recently and have no idea what caused it. What will happen now? Will new branches start at the break, and is there danger of insects causing damage where the wood is splintered?—I. L., Conn.

A—You did not say what kind, or variety, of tree you are referring to as being damaged in the manner you describe. This makes it rather difficult for us to outline what we would consider a practical procedure. In general, it sometimes is possible to train a branch, which is located just below the break, to take the place of the missing leader. Although the tree you describe must be fairly well along in growth, it may still be practical to carry out this suggestion. First, cut the trunk below the break, taking special care to make a clean cut at an angle. Protect the cut surface with a coating of asphaltum or other similar coating made for the purpose. Then attach a 1 x 1-in. strip of soft wood to the trunk, the top end extending a foot or more above the break. Pad the strip at all points where it touches the trunk with sponge rubber or some other soft material. Then bend the branch to be trained as a replacement upward as far as it will go without danger of breaking and tie loosely to the strip. After a time repeat the bending process, drawing the branch a little closer to the strip. This may have to be done several times in order to train the branch to grow straight upward. Once this is accomplished, remove the wooden strip.

Condensation in Water-Heater Vent

Q—My gas water heater is installed in the kitchen. When the burner is on, the vent pipe to the chimney drips water onto the floor. Can you tell me what causes this, and how to remedy it?—M. H., Va.

A—One of the products of the combustion of concentrated fuels is water vapor. This tends to condense on the inner surface of the metal vent pipe which is cooler than the gases passing through it. Usually pitching the horizontal run of vent pipe at a somewhat steeper angle minimizes or entirely cures the trouble.



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It's always "open season" with the Savage 340 . . . chambered for 2 great varmint cartridges and America's most popular deer caliber. Stock has medium-high comb and trim lines for steady handling, fine balance and streamlined appearance.

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An economical cartridge that delivers peak accuracy in the Savage 340.

.30-30, 150 and 170 grain bullets

For more than 50 years it has proved its effectiveness on deer and medium-sized game.

The 340's exclusive head space control and specialized Savage manufacturing methods give you extreme accuracy at a price so low you can buy the 340 complete with 'scope for less than you might expect to pay for the rifle alone. See it at your dealer's now.

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Captured flies in the bottle are emptied into one of Wright's zoociliariums for smaller reptiles to feed on

Engineer Makes Fly Traps

Flies and the reptiles that eat them are a full-time business with Ralph Wright of Walnut Creek, Calif. Formerly a mechanical engineer at the University of California radiation laboratory, Wright has switched to production of fly traps and reptile "zoociliariums." The fly trap has three parts: A quart glass bottle, a wood "sandwich" with an internal labyrinth of screen funnels and baffles and a discarded coffee can with fly bait inside. The overturned bottle sits on an opening into the sandwich, which rests on the can of fly bait. Flies, trapped in the screen chamber over the bait, crawl into the glass jar seeking escape.

Fly trap, with bottle replaced by tube to zoociliarium, supplies continuous insect food to caged reptiles



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AREAS

MOW TALL GRASS,
WEEDS, CROPS

BLOW
SNOW
AWAY

MOVE SNOW,
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GRAVELY gets the Job done Better, Faster!

An amazing new experience in *easy, efficient mowing* is yours with the Gravelly, its Steering Sulky and Rotary Mower attachments.

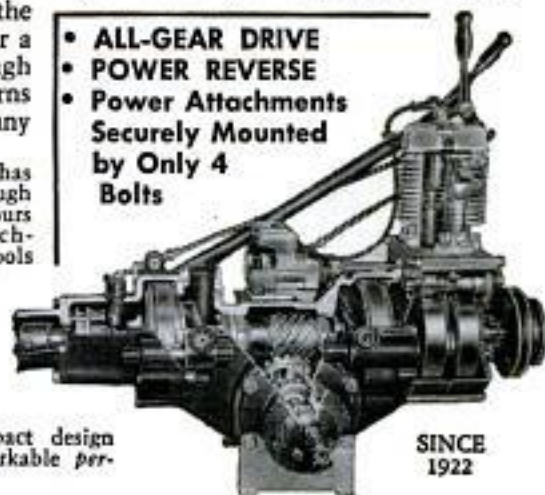
Whether you are mowing the front lawn in riding comfort, or a steep slope bristling with tough grass and weeds, the Gravelly turns in the finest performance of any tractor.

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New Rotary Cultivator

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Please send me "Power vs. Drudgery" Booklet and dealer's name.

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FIELD-TESTED SINCE 1922

More Miles on Your Tires

(Continued from page 157)

spikes to demonstrate their puncture resistance; but work such as that being done by Judson and others will continue to keep tiremaking costs down and to increase tire safety and service life.

What does all this mean to the average motorist? Better, stronger tire skeletons made from miles of textile cord mean greater highway safety. Blowouts resulting immediately from hitting a bad rut or large stone, as well as those occurring days or weeks after the tire is subjected to such abuse, are less likely. Improved tire cords and better ways of uniting them with rubber compound make it possible to build a tire that can outlast more than one tread.

Motorist's Responsibilities

With all the improvements in tires and the materials that go to make them, the passenger-car or truck driver still has some responsibilities. For one thing, he must keep his tires properly inflated.

"Underinflation is particularly bad in high-speed tire performance," Judson explained. "The pressure that is built up in tires by fast driving, as a result of friction that heats air in the tires, never should be let out. In fact, a little higher pressure,

which would cut down flexing, is considered to be actually safer. Higher pressure increases slightly the tendency to bruise, but modern tires are so much stronger than prewar ones that the driver can forget about this effect. On the other hand, low pressure permits increased flexing, and this quite rapidly increases heat buildup and the possibility of failure at high speed. This will be especially true with the lower-pressure tires on some of the 1957 cars.

"Lower operational tire pressures are made possible by improvements in such things as cord dip and adhesion. The pressures at which some modern tires can be run would, 10 years ago, have put them in the semiflat class, and might have resulted in frequent failure of the casing caused by cord separation."

Besides keeping his tires properly inflated, the motorist should drive with reasonable care and—even though his tires are stronger than ever—try to avoid hitting sharp-edged ruts, stones and other obstacles. He should be careful not to pinch his tires or rub their sidewalls against the curb. And he should strive to avoid other tire abuses. Microscopes are wonderful tools in tire-development work, but so far they haven't revealed fibers or anything else that can completely neutralize careless driving habits. ★★★

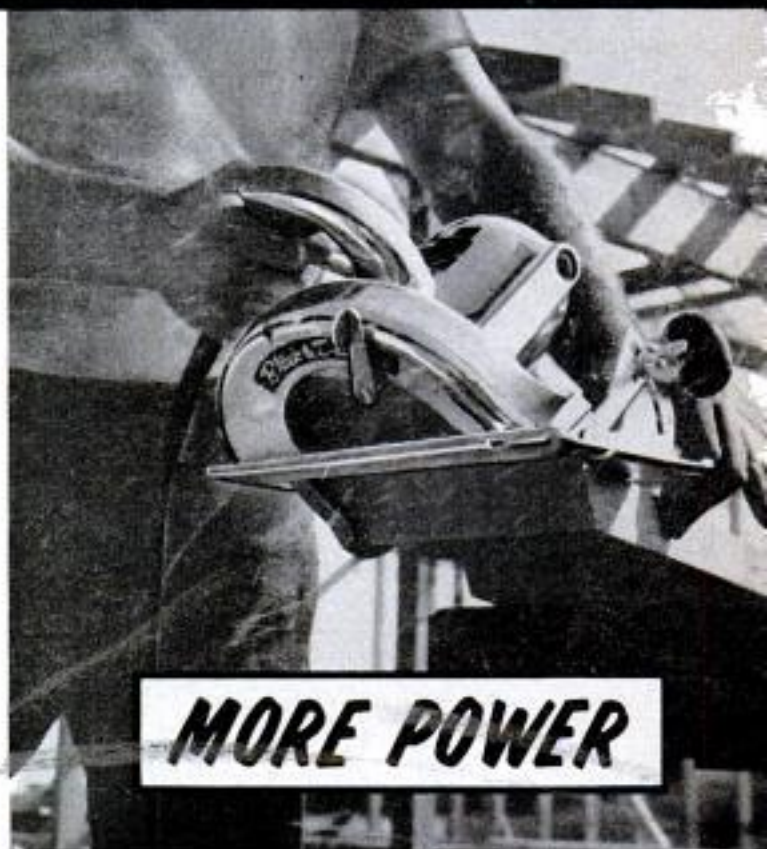
New *Black & Decker*® Saws . . .

**Board for board—
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They're designed with you in mind—to give you more power, better visibility, easier handling, extra ruggedness!

Four heavy-duty models. #63 model which cuts 2 x 4's at 45° to #93 with maximum cutting depth of 3¼".



MORE POWER

Geiger Counter-Portable Radio

(Continued from page 164)

you're wise, you'll tape a piece of heavy cardboard over the speaker cone to prevent accidental damage to this unit during construction. Also, keep the plates of the variable capacitor fully closed. Remember that bent plates can be the cause of considerable trouble.

The mounting detail for the variable capacitor shows three fiber spacers to be inserted in the rubber grommets. Such spacers are often included with a kit of radio hardware, but they may be omitted if not readily available. Note also the solder lug fastened to the capacitor-mounting bracket beneath the head of one of the mounting screws. This lug must make good electrical contact with the bracket and should, therefore, be soldered to the bracket after the screw has been tightened.

Wiring. Under-chassis wiring is simplified through the use of a printed circuit plate, PC-160, which replaces a number of individual resistors and capacitors. Of course, the individual parts may be used, if desired, by following the schematic diagram.

Wires which lead from under the chassis to components mounted above the chassis, or on the cabinet, are coded with capital

letters for easy identification. These leads should consist of flexible, stranded wire.

Fasten the oscillator coil, L2, in place by soldering its terminal, A, to the end lug of the indicated 3-lug terminal strip. The inset in Fig. 3 and the oscillator-coil diagram in Fig. 5 will help you identify the coil terminals.

Final assembly. Fig. 4 shows the completed unit assembled in its cabinet. The battery bracket holding the A-batteries in place fits into two grooved blocks which are already glued to the top and side of the cabinet. The cabinet also contains a metal jumper plate riveted to the inside front panel. This plate is so positioned that when the A-batteries are inserted in the compartment the positive terminal of one is automatically connected to the negative terminal of the other, thus connecting them in series. Two Fahnestock (spring) clips and solder lugs fastened to the wood block on the cabinet back, as illustrated, press against the other terminals of the batteries when the back cover is in place. This wires the batteries into the circuit.

Caution: The solder lugs under the Fahnestock clips must be so positioned that they do not touch the metal battery bracket when the cabinet back is in place. Otherwise, the batteries will be short-circuited.

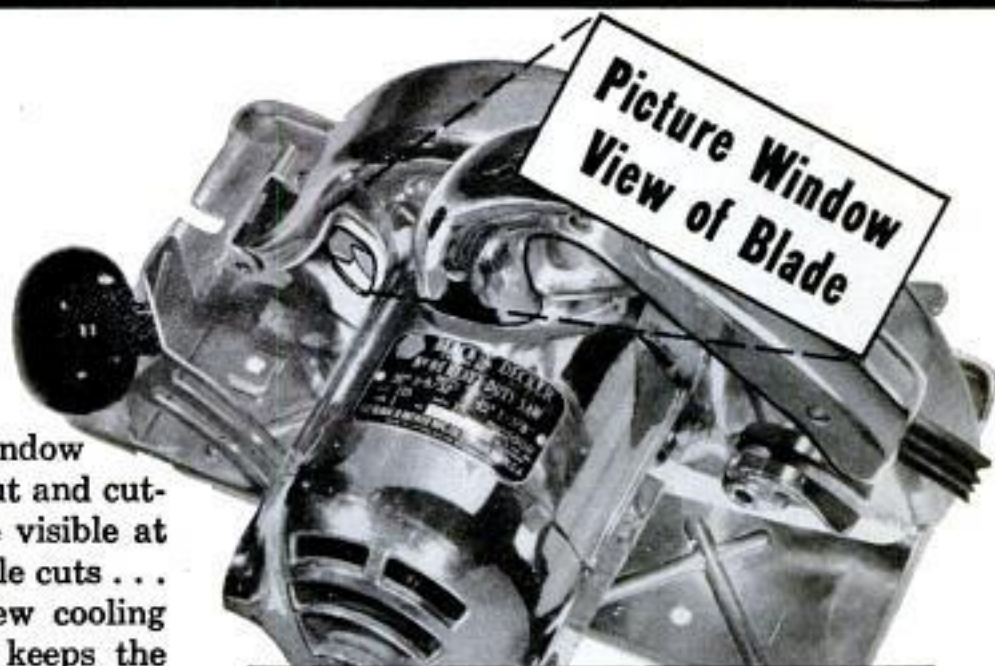
(Continued to page 230)

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New B&D picture window design makes line-of-cut and cutting edge of the blade visible at all times. Ideal for angle cuts . . . perfect for ripping. New cooling fan is so powerful it keeps the line-of-cut clean and blows sawdust clear of the job, clear of your eyes!



BETTER VISIBILITY

The selector switch, S1, and push-button switch, S3, as well as the 1B85 detector tube are fastened to the side of the cabinet. Mounting holes for these will have to be drilled, but their exact positions are not critical.

Testing

With the set completely installed and the back cover in place, turn the unit on and set the selector switch to the "radio" position. Turn volume control to maximum and rotate the tuning knob. You should be able to tune in some of your strong local stations.

Now, set the selector switch to the "counter" position and rapidly "pump" the push-button switch in and out several times. This should produce a slow, intermittent "pop, pop" in the speaker, indicating that the detector circuit is functioning properly.

If you happen to have a wrist watch with a fluorescent dial, bring the watch close to the part of the cabinet housing the detector tube. This should produce a very noticeable increase in the frequency of the "clicks" emanating from the speaker. A stronger source of radioactive material, such as an inexpensive radioactive sample, available from most radio-parts distributors, will literally make the detector "go

crazy," producing a continuous noise similar in sound to static in a radio during a thunderstorm.

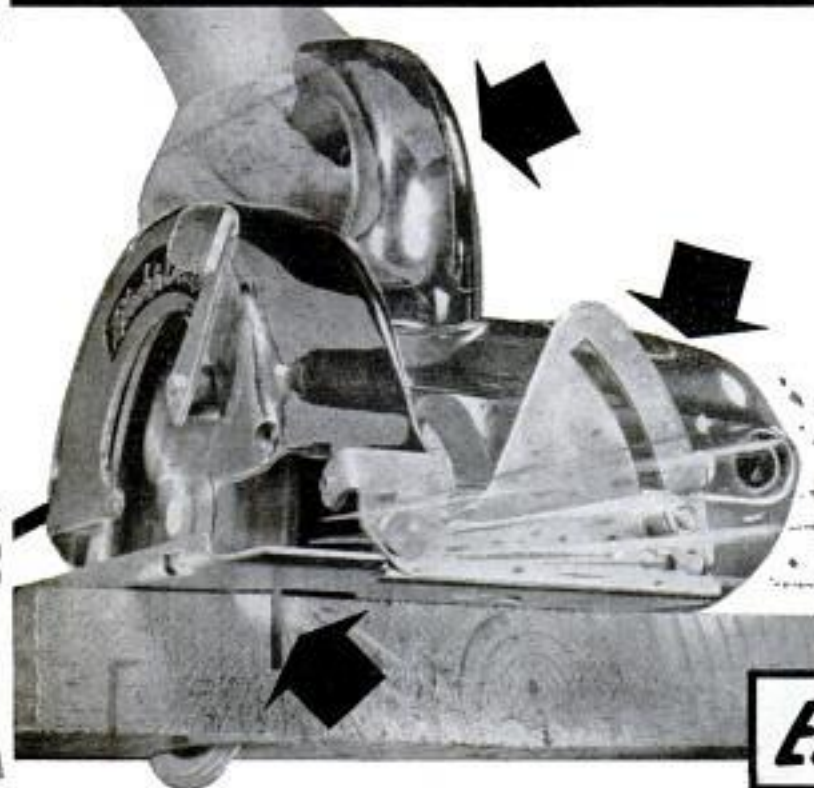
Adjusting the Radio Circuit

Although the loopstick, oscillator coil and variable capacitor have been especially selected to provide proper tracking and the i.f.s are factory aligned, some adjustment may still be required to obtain best results. This involves removal of the unit from the cabinet and, in some manner, connecting the A-batteries to the circuit. This can be done by actually wiring the two batteries in series and temporarily soldering leads G and H (see Fig. 2) directly to the open battery ends. Alternatively, at an additional investment of less than 50 cents, you can buy a separate 3-volt battery with screw terminals (Burgess No. 422 or equiv.) and connect these to the proper Fahnestock clips with clip leads.

Once power is applied to the set, attach the calibrated knob to the variable capacitor shaft so that, with the plates fully closed, the number 55 appears at the top. Now, tune in some station near the center of the band and, with a thin, nonmetallic screwdriver, slightly rotate the slugs through the top and bottom of the i.f. cans (in both directions) to determine the point

(Continued to page 231)

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EASIER HANDLING

of maximum volume. Then, tune in the highest-frequency station in your area and notice if the tuning-dial number now appearing at the top corresponds with the station's frequency. If not, rotate the dial until that number does appear at the top and adjust the small screw of the tuning capacitor's oscillator section until the station comes in at that point. Adjust the trimmer screw of the capacitor's r.f. section for maximum volume to complete the radio alignment.

Operating the Geiger Counter

While the radio portion of this project is completely conventional, a short explanation of the geiger-counter circuitry, shown in red on the schematic diagram, may help you to interpret the results.

When push-button switch S3 is suddenly depressed and released, a surge of current flowing through the low-impedance winding of T2 produces a voltage pulse across this winding. Through transformer action this voltage is greatly stepped up, so that in the secondary transformer winding it is great enough to break the spark gap and permit capacitor C15 to charge up. Rectifier action of the spark gap prevents the capacitor from discharging back through the transformer, with the result

that the voltage across C15 appears at the anode of the 1B85. The more rapidly S3 is pumped (depressed and released) the more quickly the voltage across C15 will become high enough to operate the detector.

In the absence of radiation, the 1B85 represents an open circuit. But, each time a parcel of radioactive energy strikes the tube, the latter conducts and causes a pulse of voltage to appear across the volume control, R4. This voltage pulse is amplified in the audio portion of the radio and produces a pop or click in the speaker.

In actual use, the push-button switch should be pumped rapidly for a period of about 30 seconds. The slow popping sound then heard through the speaker is caused by cosmic radiation from the sun which is present at all times. This is called the "background count." When a radioactive sample is brought near the part of the cabinet housing the detector, the frequency of the count increases until the sound from the speaker resembles that of continuous radio static.

A single charge of the capacitor C15 may last from 3 to 20 minutes, depending on the intensity of the radiation, the quality of the components and the humidity in the air. When the background count is no longer audible, the capacitor must be recharged, as outlined earlier. ★ ★ ★

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MARCH 1957

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Taxi to Venus?

(Continued from page 128)



Electrical leads are attached to body of airman in altitude chamber. They report changes during test

assembled in space from parts that are sent aloft by rockets. In fact, the fuel and oxidizer tanks of the supply rockets would be the principal building blocks of the structure."

A smaller vehicle rebuilt from rocket components could be used for exploring the moon, though not for landing on its surface, Ehrlicke says. The craft could consist of three tanks, one of them a gondola for crew and instruments, one an oxidizer tank containing oxygen or fluorine, and the third a tank of hydrogen to which a thrust chamber is attached. The tanks would be square, for there is no air resistance in space and so no need for streamlining.

Chemically fueled rocket motors of the type used today seem adequate for short space flights such as to the moon, but some new kind of power plant must be devised for true interplanetary travel.

One propulsion system that has possibilities for trips to Mars and Venus is solar drive. In this system, heat from the sun would be used to change liquid hydrogen into a high-temperature gas which would be expelled through nozzles to provide thrust.

A space ship using solar drive might well

(Continued to page 234)

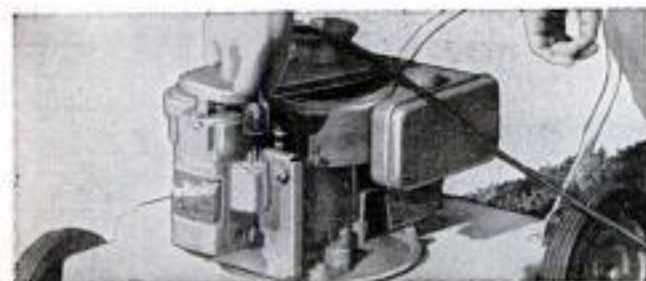
*Why users expect
(and get!) more
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Eclipse mowers*



IT CAN BE assumed that almost any mower will cut grass. But folks who buy an Eclipse expect more than this minimum performance. They expect — and get — low cost, trouble-free mowing year after year. That's why Eclipse is recognized as the standard of comparison . . . the brand most mower users plan to buy "the next time" for sure. User experience quickly points up the need for the kind of built-in quality only Eclipse offers.

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Feature for feature and dollar for dollar, you get more value from Eclipse. This is a direct result of the factory policy of building up to performance standards instead of paring quality down to meet a price. It stands to reason that skilled craftsmen — specializing in quality mowers — can provide a master touch not possible in factories where mowers are only a "sideline" product.



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It may cost just a few dollars more when you first buy an Eclipse. But user reports prove conclusively that the total cost of owning an Eclipse is less than for ordinary mowers. Eclipse mowers are built to last years longer and it's not at all uncommon for families to use an Eclipse for 15, 20 or even 30 years with very little maintenance expense. The rugged construction, the craftsmanship that is acquired only by half a century of specialized manufacture pays off for the user.

A typical letter reported a total expense of 87¢ for maintenance of an Eclipse power mower over a period of 5 years. When you consider ALL your costs, you see why we say, "Eclipse costs you less to own per year."

Free check list to help you choose your power mower

Many families have been confused by mower claims and are not certain as to what type of mower they should buy. Some people insist that a rotary mower is best, while others just as emphatically say the reel type can't be beat. Eclipse makes both kinds — has no special "ax to grind." A check list of 8 easily answered questions will indicate the type of mower that's best for you. Write for your free copy of the folder, "How to select your power mower." The Eclipse Lawn Mower Co., Div. of Buffalo-Eclipse Corporation, 3714-A Railroad St., Prophetstown, Ill.



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Just lay prefinished Bruce oak flooring right over your old floors...no sanding or finishing

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"Scratch Test" Finish — The Bruce factory-applied finish is baked into the pores of the wood. The "Scratch Test" (left) will prove to you that this durable finish does not scratch or chip or mar like an ordinary floor finish.



Moderate in cost — A new Bruce Hardwood Floor will cost you less than a good rug or carpet. Easy to keep clean and beautiful, too. It's just the thing to use in fixing up or adding a room. Let your lumber dealer give you an estimate. Mail coupon below for colorful literature.

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Machine outside the altitude chamber records effects of altitude on brain waves of the subject inside

consist of a huge bubble of transparent polyester plastic, Ehrlicke suggests. "The bubble could be some 300 feet in diameter with a skin only a thousandth of an inch thick," he says. "It would be slightly pressurized to give it a spherical shape. Half the inside surface would be silvered to create a hemispherical mirror that would concentrate the sun's rays on a heating element. In this element the hydrogen would be vaporized.

"Piped to directable nozzles, one at each side of the sphere, the gas would provide thrust for acceleration, braking and maneuvering. The crew's gondola and associated equipment including solar battery for auxiliary power would be supported by a framework in the center of the big sphere.

"It should be remembered that a space ship uses power only during its initial acceleration. The vehicle coasts the rest of the trip. Nevertheless it should carry large reserves of propellant.

"Here the solar drive has real advantage. Its heat-collecting device, the hemispherical mirror, weighs possibly 1000 pounds as compared to a much greater weight of oxidizer that would need to be carried in a comparable chemical rocket. This saving in weight permits additional hydrogen to be carried.

"Solar drive provides low thrust as compared to the very high thrust of a chemical rocket. This is a good thing, for the fragile plastic bubble will tolerate only low accelerations. It will be necessary to remain under power for hours to achieve the acceleration obtained in minutes by a chemical power plant."

Obviously a solar-driven space ship

(Continued to page 236)

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Other professional-quality machines in the Toro home power tool line include: a 10-inch Deluxe and an 8-inch Standard Tilt-

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can't be assembled on earth and then shot out into space. After manufacture it must be disassembled, taken out to a satellite station, and there carefully put together and inflated.

Patches for the Space Ship

One thing that isn't known is how long a large bubble can remain in good condition under the bombardment of cosmic dust and tiny meteors that undoubtedly exist in space. Since a round trip to Venus would take nearly a year, engineers are sure they will need to make provision for patching numerous holes in the plastic membrane during the trip.

Convair is not the only group that is studying the vehicles that will be used in conquering space. A score or more of other agencies are all doing research on portions of the problem. These range all the way from the Air Force's Department of Space Medicine at Randolph Field, that is learning how man can live away from the earth, to the metallurgical concerns that are testing new metals from which the space ships will be built. ★ ★ ★

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It may not tempt any fish, but it relaxes the fisherman. A new massager keeps cramps out of the angler's legs while he tries for hours to boost his catch. The massager is attached to a foam-rubber pad. Built-in motors provide a gentle rubbing action. It can be operated on alternating current or batteries.



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SPECIFICATIONS—375 h.p., 9:25 to 1 compression ratio. 2 four-barrel carburetors. Special high output camshaft. Torsion bar anti-dip front suspension. High spring rate—low deflection. Length 219.2 in. Height 54.7 in.

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BE SURE IT'S A GENUINE CHANNELLOCK



CHAMPION DEPARTMENT TOOL Co. MEADVILLE, PA.

You Can Build Your Own Swimming Pool

(Continued from page 85)

cracks, would put in more patio paving to cut down the grass clippings kids track into the pool, would put in a filter system and would pay the contractor extra to take time to get the edges of the pool perfectly level and flush with the patio paving.

In spite of its faults, Barkhorn remains an enthusiastic pool owner and maintains, "For family pleasure, it's been more than worth the trouble and expense."

Many amateur builders, however, work like fury and come up with pools which would be a credit to the best professional builders in the country.

In Dallas, Tex., Frank P. Bernard built a 28 by 12 by 7-foot pool which would come under this classification. Guided by many suggestions from a friendly professional builder, John A. Corrick of Corrick-Paddock Pools, Bernard ended up with a poured-concrete pool with strong, eight-inch walls, a heavy-duty filter system, automatic skimmer, tile edging and nicely plastered interior. Including the \$325-filter system, the pool cost him \$1400; he estimates a comparable pool by a professional builder would have cost \$4000.

Tough Luck

Bernard built his pool the hard way and ran into tough luck which cost him extra time and money. He personally removed about 70 tons of earth and rock; when he got down 2 1/2 feet he found solid limestone and spent several spine-jarring week ends with a rented air hammer breaking his way down to the desired depth.

Working mostly on week ends, he spent 10 months on the pool; of this period, five months were spent in digging the hole. Bernard didn't skimp on materials; he used 2500 feet of reinforcing steel and poured 24 yards of ready-mix concrete.

If he had it to do over, Bernard says he would definitely pay a man with machinery to rough out the excavation.

That is one point on which all amateur pool builders seem agreed: Hire someone to dig your hole.

They'd Do It Again

In general, about seven out of eight pool builders say that with some changes in procedure they'd do it over again, that the pool is worth the money and work.

H. D. Dobson of Wichita, Kans., is probably typical of the eighth man who says, "I strongly recommend a professional builder

(Continued to page 240)

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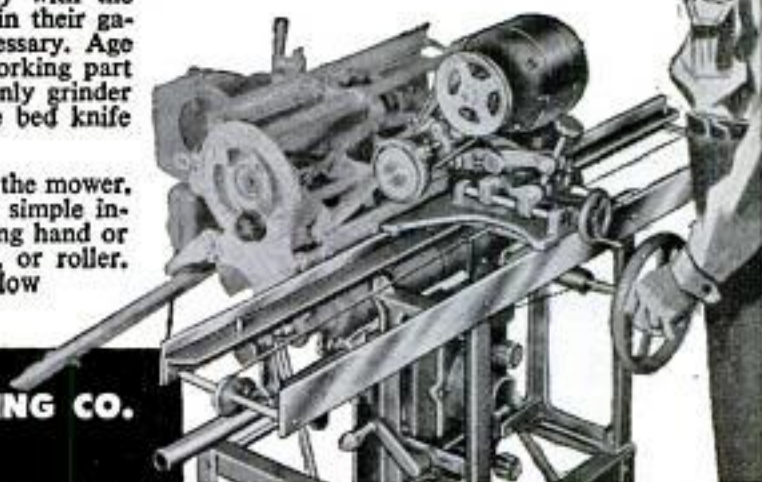
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to do the whole job from beginning to end."

Dobson, although he bulled his way through to completion of a fine pool, ran into unforeseen troubles from the beginning. He planned a circular pool, 30 feet in diameter with a maximum depth of 5½ feet. The first trouble was the pool site. While still steamed up with enthusiasm, he discovered that the layout of his house, lot and neighbor's shrubbery was such that it was impossible to get any sort of earth-moving machinery to the pool site.

"We had to dig it by hand," says Dobson, "put the dirt in a wheelbarrow, wheel it to the front of the house and dump it in a truck. As you can imagine, this took considerable time and effort." After a couple of days of this, Dobson discovered he needed a firm base for his wheelbarrow so he suspended pool operations while he put in a patio and sidewalk.

He had wanted a concrete-block pool but then began to doubt his ability as an amateur to put in the steel uprights properly and to bind down the blocks and fill them well enough to make his walls strong and watertight. He switched plans, put in the complex system of steel bracing necessary for Gunitite and hired an operator to come out and spray the concrete for the floor and walls.

No Filter System

Dobson built his pool without a filter and tried chlorine as a purifying agent, but 10 days after he filled the pool it began to bloom with tremendous amounts of algae. He emptied the pool, tore up some of the completed work and installed a \$400 filter system.

Finally, when everything was working properly, he hired a fence contractor to put a circular fence around the pool. But, it seems, fence contractors who can put in a large, circular fence are rare creatures; after many experiments and arguments Dobson settled for a 12-sided fence.

Back-yard swimming pools are, of course, popular not only with the owner's family but with friends, neighbors and relatives. Each pool owner has to work out his own policy on use of the pool by outsiders.

Any person who helped build the pool usually has swimming rights; almost always close neighbors and their children are welcome—if an adult is present while children are using the pool—and many owners establish "open" days and hours for friends and neighbors to drop by for a swim without invitation.

Mr. and Mrs. B. F. Aldredge, Jr., of Florence, Ala., bought a package do-it-yourself pool. Then they decided they

(Continued to page 242)

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would rather supervise the job and let hired labor do it. However, they personally poured the concrete for the deck and put in the fence. They consider the fence an absolute necessity to reduce the possibility of some child accidentally falling in the pool.

During the first summer their pool was a novelty in the neighborhood and was so popular Mrs. Aldredge was forced to limit uninvited neighbors and their children to three hours in the afternoon. During their second summer however, there was less traffic and regular hours weren't necessary—neighbors merely called to see if they could use the pool during certain hours.

In at least one instance, a private pool has changed the recreational habits of a whole town and become a community recreation center.

"Kitty" for Donations

L. L. Brown of the village of Friendswood, Tex., population 500, built a large poured-concrete pool, 55 by 25 by 8 feet, in the spring of 1955. He opens the pool to all comers three afternoons a week and has a "kitty" for donations toward the cost of operating the pool. During a typical summer afternoon, about 10 percent of the entire population will drop by for a swim.

Brown did none of the actual work himself but hired and supervised local labor. Exclusive of \$1400 for a covered patio, dressing rooms and fence, his pool cost about \$4400 and he believes it would have cost \$10,500 if built by a professional builder.

A large part of his total cost, \$2749 went for an elaborate filter and underwater-lighting system. Excavation cost \$225; concrete \$1365; hired labor \$300, and trim \$870. Total construction time was six weeks.

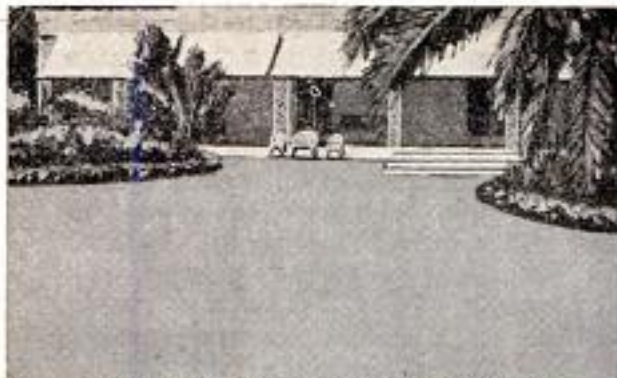
Children Dig the Hole

Not all pools are major projects. Mrs. Edward Grant of Manchester, Conn., decided it would be nice if her children had a back-yard pool; not a big one, but just a place to splash and learn to swim. She asked her children and some of the neighborhood kids if they would dig a hole and help with construction if she would buy the materials for the pool and hire necessary outside labor.

The kids thought it a fine idea and began to dig. Three weeks later they had a fine swim-splash pool measuring 12 by 9 by 3½ feet. August didn't seem as hot as July.

Total cost of the pool was \$143.32; cement \$23.30; 160 concrete blocks \$32.40, and hired labor \$70. The pool has no filter

(Continued to page 244)



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system. Mrs. Grant empties it in the winter, puts her lawn furniture in it for storage and covers it with a wooden lid.

New Developments

Literally dozens of materials and techniques have been used for pools, including stone, steel, aluminum, inflated plastic, tar paper, plywood, poured concrete, concrete blocks, Gunite and vinyl.

Of these, most professionals recommend only two—poured concrete and Gunite. Concrete-block pools, though seeming easiest to most amateurs, are really the most difficult to handle properly, according to the builders. They point out that "unless they are very carefully reinforced, filled and tied to the floor of the pool (by steel uprights embedded in the poured-concrete floor), there is danger of cracking and leaking."

Vinyl shells, according to some builders, can be punctured, do not have sufficient rigidity and "are sometimes eaten by field mice."

Glass-Fiber Pools

In 1955 something new hit the swimming-pool industry: Glass-fiber pools made of four or more molded sections which join together.

Pool suppliers and contractors not financially wedded to one of the older methods of pool construction are downright enthusiastic about the glass-fiber pools. D. C. Siminson of American Pool Company of Briarcliff, N. Y., which sells chemicals, filters and miscellaneous equipment such as ladders and diving boards, says, "Until the glass-fiber pool appeared on the market there was not a truly satisfactory do-it-yourself pool that would stand up in all climates and yet be simple to install. This material is very strong, is impervious to acids and pool chemicals and has the color impregnated into it so it never has to be painted."

A pool contractor who represents several companies and builds pools by any of the standard methods says, "We feel the new glass-fiber pools will become the leader for all types of pools installed. This particular pool has all the necessary structural requirements along with many other advantages not found in concrete pools."

One popular make of glass-fiber pools comes in four sizes, 30 by 15 by 5 feet (too shallow for diving) up to 35 by 15 by 7 feet.

The pools, shipped in four sections from the California factory, vary in price according to freight charges. In central Texas, for example, the small pool costs

(Continued to page 246)

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The glass-fiber pools appear excellent for the amateur pool builder in that they are practically foolproof. Their cost, however, is still high compared to owner-built pools of blocks, poured concrete or Gunite.

Enthusiastic dealers, who now install poured concrete, Gunite or glass-fiber pools for about the same price, predict mass production of glass-fiber pools may bring their price way down. They hope to see the day when an adequate glass-fiber back-yard pool will cost about \$1000 installed—and less if you do it yourself. ★ ★ ★

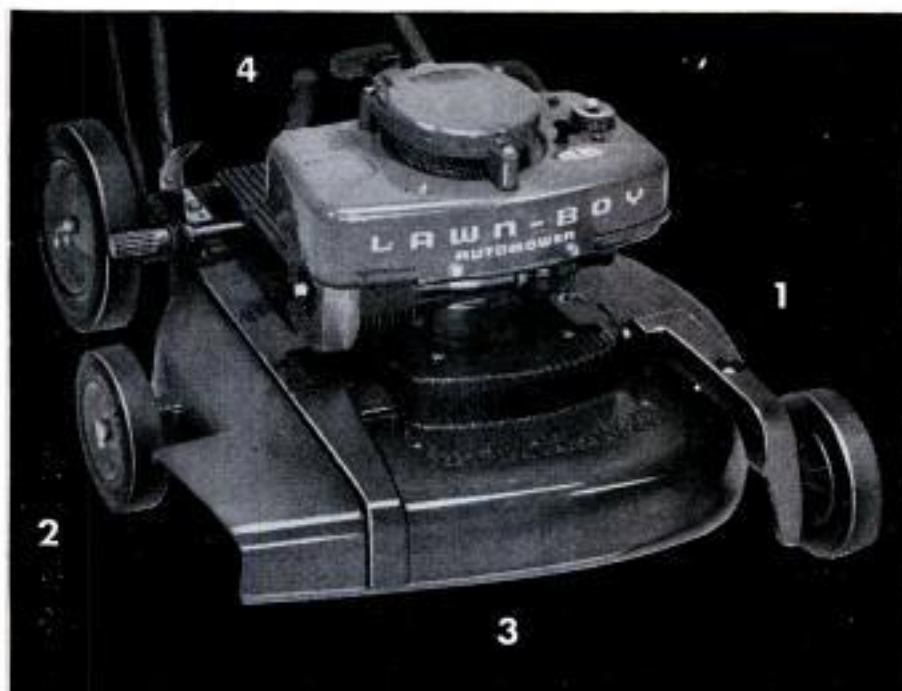


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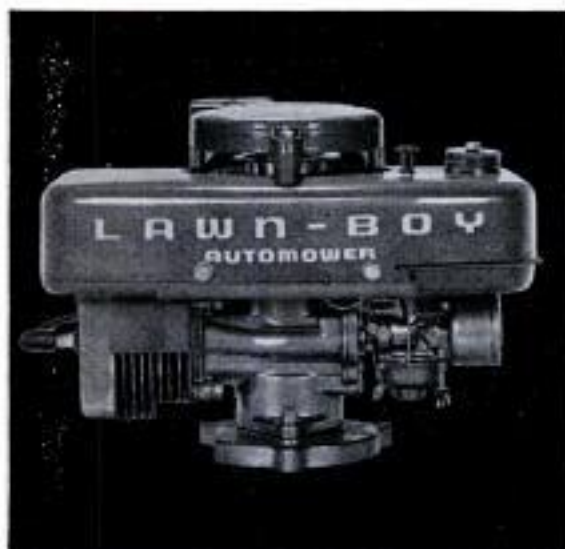
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You Can Have Speed With Safety

(Continued from page 147)

mounted in the plane. Its electronic circuits are complicated, but the basic idea is simple.

When mounted in a conventional plane like F94 Starfire jet or B26 attack bomber, this box can make the craft act like it's been rebuilt in a split second while in flight. Working on the plane's automatic controls, it makes the plane seem to have been given a longer fuselage, wider tail, stubbier wings, and so on.

Control knobs in the cockpit set the robot to do the jobs wanted. Dual controls allow the human pilot to cut out this electronic "interference" when he wishes.

Working with Milliken are other old hands at safety research. As far back as 1929, C.A.L.'s present head, T. P. Wright, won the Guggenheim \$100,000 safe-aircraft award.

Milliken says a pressing task is to provide safe-driving controls for the radically new kinds of planes being invented. "Jets are becoming old hat. We're now dreaming up flying platforms, convertiplanes, tail sitters and so on."

Even the safe helicopter, he points out, isn't as simple as many believe, "because it has the worst controls imaginable." He concedes its future is great since here's a craft that rises vertically, hovers, flies sideways, backward and forward.

But it's not easy on the pilot. The tail surfaces of a fixed-wing plane are virtually useless to a copter when it hovers or comes straight down. To overcome pilot fatigue, C.A.L. is working for the Navy and other clients to put more stabilizing devices into helicopters and to improve operation in bad weather.

With his twin interests in flying and auto racing, Milliken is convinced there will eventually be a really practical combination of auto and plane. He points out many ideas one craft can borrow from the other. A simple example is the ordinary car's steering wheel, which Milliken sees as one answer to easier and safer flying.

"We take it for granted," he explains, "but it's a magnificent engineering device. It allows two cars going 50 miles per hour to pass each other neatly, almost fender to fender. Compare that to the first cars, which were steered by the buggy-tongue principle. And that's just about where airplanes still are. Aviation concentrated on things like wings and speed, and left the rest up to plenty of room in the wide-open spaces.

"But those spaces are getting crowded.

(Continued to page 250)

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Planes can't continue roving in the air and waddling all over runways like awkward ducks. Adapting the steering wheel to plane controls looks like a fine answer. Besides, most everybody can handle one, so it will make plane flying much easier to teach."

The experts don't always agree on details. Where Milliken praises the steering wheel, E. R. Dye, head of C.A.L.'s industrial division, considers it a "harpoon" that can be fatal in an auto crash and wants it banished in favor of side levers.

These researchers have many new ideas on the griddle. One thing they're working on is highway black top that you can see at night, especially at curves. To cut down the danger and cost of crashes, they're planning rubber highway guards, plastic fenders—and also very different instrumentation for tomorrow's cars. It would go with a wrap-around dashboard and result in fewer distractions for the driver.

"Our idea is that the driver is a navigator," says Dye, "and things should be made easier for him. An older person has trouble adjusting his vision from far to near. Even the younger driver risks an accident every time he shifts his glance from the bright highway 50 feet ahead of him to the dashboard's comparative darkness only a couple feet away."

To overcome this, C.A.L. is working on a substitute for today's lineup of instruments. Everything except speed would be handled by a row of color panels staying green when the car is running right. In case of something like generator or temperature trouble, the appropriate panel would flash red, and the driver could pull off the road to study the situation.

The only instrument for him to watch would be the speedometer. It's planned for mounting almost at hood level, and will announce only your current speed—in large numbers (Studebaker has a similar speedometer on its cars now.)

Milliken uses somewhat the same idea on racing cars when he mounts a tachometer on top of the hood, so he doesn't have to take his eyes off the track.

He claims that, as far as safety is concerned, he'd rather pilot a fast plane or drive a racer than be the average motorist. The latter is less prepared for sudden accidents, and is packaged badly—more like a delicate vase loose inside a large packing case.

That's why, borrowing an air idea, the lab worked out its most popular idea—safety belts for the motorists. The result is the estimated 80,000 seat belts per month now being manufactured.

But the lab isn't entirely happy over the
(Continued to page 252)

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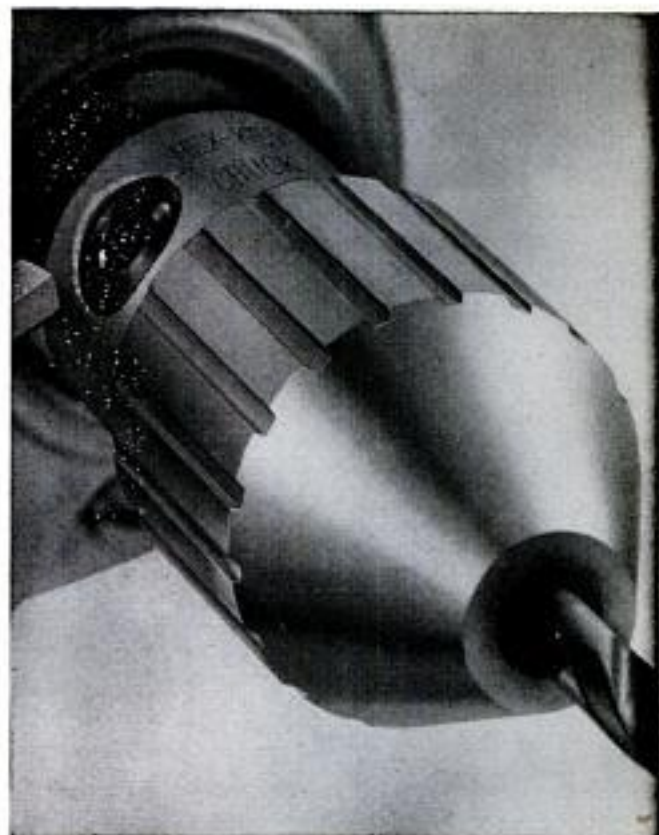
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outcome of this project. Dye warns too many belts give false security because they're weakly made, or aren't installed properly.

Milliken is an old campaigner to put safety belts into racing cars. When he helped write the rules for first running of the Grand Prix in 1948, belts were required.

In the 1948 Watkins Glen race, while driving a Bugatti, Milliken had a close call at "Milliken's Corner." It's a sharp turn at the bottom of a hill. On the last lap, his car went into a skid, slammed into some hay bales serving as guard rail and rolled over.

"If I hadn't had a safety belt on," he comments, "I probably wouldn't have walked away from there."

He was wearing one when he drove the Pikes Peak Race with a borrowed four-wheel-drive. Built by Harry Miller, it had been raced several times by Mauri Rose, three-time winner at Indianapolis Speedway. A sprint car rather than road racer, it had "only the barest excuse for brakes."

Halfway up, its transfer-drive casing broke, leaving the engine no longer connected to the wheels. Milliken got out of that without damage, but concedes, "That's a time I could understand why most of the Pikes Peak racers were against safety belts. It's a tough decision to make out there, faced with going over the edge of a high cliff. Nevertheless, you can do better driving with a seat belt, and it has been proven time and again that you can make better time."

Even when driving his own Austin-Healey along highways for a relaxing hobby, Milliken is thinking of safety at a fast pace, and is an outspoken crusader against speed traps. They're no solution, and even dangerous, he contends, because they give "false security." For example, their speed limits don't take into account the driving difference between night and day or wet and dry conditions.

He concedes that slowing down in towns makes sense. But on the open highway, his solution is safer-built cars and better-trained drivers for them.

He feels that speed-with-safety would put lots more pleasure into driving an auto which he looks on as one of the nicest "toys" man has yet invented. ★ ★ ★

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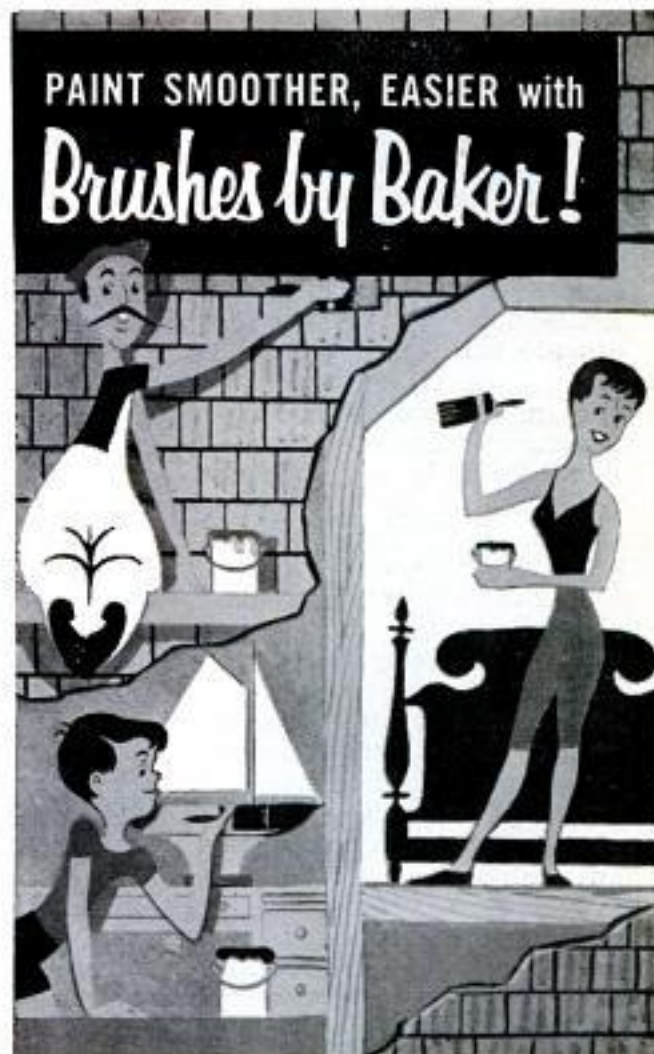
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House of Electric Nerves

(Continued from page 141)

daytime numbers can be used, and the call switched directly to the guest room. Bear worked out special circuits in cooperation with the local telephone company.

In Bear's private study is one terminus of his "traffic control" system. This consists of three switches operating colored lights in the study and at a prominent point outside the room. When he flips on the green light, others know that he is in and will see anyone. An amber light indicates that he has time only for important callers. A red light warns that he does not want to be disturbed.

Hi-Fi Network in House

Before hi-fi became a household expression, Bear did considerable pioneering work on audio equipment and installations. So naturally, when he enlarged his house, he planned a built-in sound-distributing network of majestic proportions. There are two sound centers containing record players, tape recorders and players, microphones and radio receivers, plus elaborate switching facilities. One of these centers is in his private study, the other is on the second floor in a room he calls the hi-fi den and library. Music from either room can be

heard through speakers in all parts of the house, and the systems can be operated

(Continued to page 256)



Robert Bear works remote-control-lighting switch. The switches at the top are for lights in other areas

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Outlets for television receivers are scattered throughout the house. A coaxial distribution system enables each receiver to function as if it had its individual antenna. Auxiliary electronic equipment is used wherever necessary to isolate signals so that any connected receiver can get all channels.

Located in the kitchen and other rooms

(Continued to page 258)

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 A standard duty 6" saw featuring Kickproof Clutch, instant depth and bevel adjustments and a safe telescoping guard. Regularly \$49.50 — with any saw trade-in \$44.50.



SAVE \$20 ON MODEL 528 SPEEDMATIC!
 World's finest professional saw. Big capacity 8 1/4" blade with new telescoping guard, Kickproof Clutch and many more features. Regularly \$135 — with electric saw trade-in . . . \$115.



SAVE \$15 ON MODEL 521 SAW!
 Famous Speedmatic saw with 7 1/2" blade, Kickproof Clutch, depth and bevel adjustments, and other professional features. Regularly \$117.50 — with electric saw trade-in . . . \$102.50.



SAVE \$15 ON MODEL 108 SAW!
 Rugged 8 1/4" saw for the builder who needs extra speed and power on all cutting jobs. Features Kickproof Clutch. Regularly \$99.50 — with electric saw trade-in \$84.50.



SAVE \$15 ON MODEL 157 SAW!
 Heavy duty 7 1/4" saw with blade on left. Weighs only 13 lbs. Professional features throughout include exclusive Kickproof Clutch. Regularly \$95.00 — with electric saw trade-in . . . \$80.00

Soldering is Easy

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INSTANT STARTING

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Torch

only **\$2.95**

THE ONLY THROW-AWAY FUEL-CONTAINER WITH SELF-SEALING SAFETY VALVE.

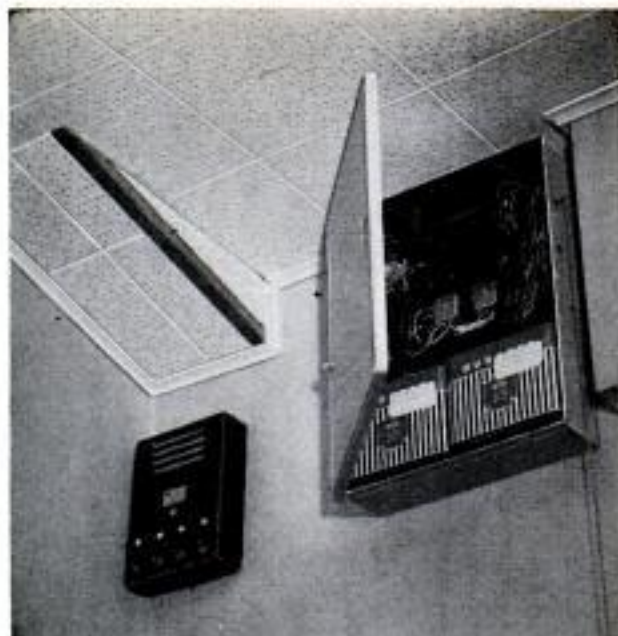
Here's what you can do:

- regular soldering,
- sweat fittings,
- silver soldering,
- refinish furniture,
- remove paint and putty.

Available at Hardware Counters Everywhere

Write for FREE
Soldering Instructions

THE *Lenk* MFG. CO.
BOSTON 15, MASS.



At left is control box for four fire-alarm circuits. Right, cabinet holds rectifiers, stand-by batteries

where a TV receiver is not installed are extension speakers that can be turned on to bring in the audio portion of TV programs. These are of particular convenience during baseball seasons. Listeners can follow the games without neglecting work and, for particularly interesting plays, can dash into a nearby room to watch the action on the screen. When maximum audio fidelity is desired, the sound portion of a TV program can be switched to one of the hi-fi amplifiers.

A Pioneer in Television

In TV as in hi-fi, Bear has been a pioneer. Back in the days when the only video signals available in northern Ohio came from WWJ-TV in Detroit, he began experimenting with receivers and antennas. On the hill behind his house he erected a 99-foot tower. He and his engineers used it to experiment with ways of picking up weak signals. Bear formed a company for the development of community-antenna systems to bring TV programs to areas screened by hills and mountains. The organization made numerous installations in Pennsylvania, West Virginia and Ohio. The coaxial system in Bear's home might be likened to such an antenna system.

Mrs. Bear, who assists her husband in his electronics work, objected to the appearance of the TV tower and the shed that had been built at its base. So her husband agreed to construct a more substantial-looking tower building. It was found that a normal structure could not be squared with the tower and at the same time properly oriented with respect to the residence.

(Continued to page 260)



'Tugit' GETS YOU GOING AGAIN!

When snow or mud imprisons your car, 'Tugit' gets it out fast! This powerful lever-operated hoist works smoothly at any angle. A 40 lb. pull on the handle lifts or shifts a ton! Compact 'Tugit' operates where a standard hoist would be too big. You get action when the handle end moves only 3½". In placing a heavy part in a tight spot, you can move the load ½" at a time. A finger-tip control makes it simple to change from "up" to "down" or into "free wheeling." 'Tugit' Makes 1,000's of Jobs Easy. Get a 1 or 2-ton 'Tugit' for your tool box, car trunk or truck. Small size weighs only 16½ lbs. In building a home or fence, fixing a tractor or clearing a woodlot, portable 'Tugit' saves time, trouble, expense. \$63.50 up. See your Shaw-Box Distributor or write us for Bulletin 388.

- Hauls rocks, logs
- Tightens guy wires
- Moves wreckage
- Positions parts
- Lifts boats, motors
- Shifts machinery
- Squares frames
- Spots trailers
- Hoists tanks, vats
- Pulls out posts
- Handles pipe, concrete slabs



578-3

MANNING, MAXWELL & MOORE, INC.
SHAW-BOX CRANE & HOIST DIVISION
354 W. BROADWAY MUSKEGON, MICHIGAN

**MASTER & SLAVE
HYDRAULIC
REMOTE CONTROL SET**

ITEM #415—Designed for remote operation of controls on engines, boats, special machinery, etc. Eliminates complicated mechanical linkages, cables, pulleys, etc. The master unit connects to the slave unit with a single 1/4" tube.

When master control lever is moved, slave lever follows exactly. Light, compact, aluminum alloy construction.

Dim. of both unit: 5 1/4" W, 9" H, 1 3/4" D. (exclusive of handle) Ship. Wt. 8 lbs. **27.50** pair
F.O.B. Chicago.
(Note — tubing not supplied.)

**VICKERS
HYDRAULIC PUMP
PISTON TYPE
COMPACT — POWERFUL**

ITEM #39

For direct or pulley drive. Rated 8 Gal. per min. at 3750 R. P. M. Delivers 1000 lbs. per sq. in. Ball bearing construction. Standard foot mounting, 1/2" shaft, 1/2" pipe thread ports.

U. S. Air Force cost \$136.00 Our low price **24.95** Postpaid.

**SAVE \$30.30 ON THIS PESCO
HYDRAULIC CONTROL VALVE**

ITEM #371V

FOR SAFE POSITIVE CONTROL OF HYDRAULIC CYLINDERS AND MOTORS

• FULLY-INSULATED RELIEF VALVE — ESCALATOR SET AT 1200 P.S.I. • FOUR-WAY VALVE — to operate one double acting cylinder • OPEN CENTER — with valve in neutral, cylinder is locked in position and pump is unloaded. • SPRING RETURN TO NEUTRAL • FULLY BALANCED PLUNGER • EASILY STACKED INTO 2, 3, or 4 valve combinations for multiple cylinder operation. • 8 gal. per min. capacity, at 1500 P.S.I. — 3/4" pipe ports • CONNECT PUSH RODS TO HANDLE FOR REMOTE CONTROL • EASY MOUNTING • LIST PRICE — \$46.80. • YOU SAVE \$30.30. • DIMENSIONS — 9"x4 1/2"x 2 1/2" — Ship. Wt. — 8 lbs. F.O.B. Chicago. **16.50**

**SELECTED
TOP VALUE SPECIALS!
SURPLUS ITEMS AT FRACTION OF ORIGINAL GOV'T. COST
AT GROBAN'S**

1 1/2 H. P. HYDRAULIC SPEED REDUCER

ITEM #115 — 1 1/2 H.P. Output rotation reversible. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **72.50**

with **FINGERTIP CONTROL**

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps.

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1 1/2 H.P. Shafts 3/8" diam. Input rotation counter-clockwise facing shaft. Input speed 750 R.P.M. 7/8"x7 1/2"x 1 1/2". Output rotation reversible. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **72.50**

**DOUBLE ACTION
HYDRAULIC CYLINDERS**

ITEM #31C — 3 1/2" bore, 11" stroke. Alloy steel cylinder wall. Micro-Honed and all steel 1 1/2" diameter piston rod. 19 1/2" overall length closed. Clevis mounting at base and shaft. Will lift 9625 lbs. with 1000 PSI Pump Pressure. Uses 3/8" tubing fittings. (Fittings to pipe thread: two 3/8" MPT @ 35c.) A \$102.00 value. Shipping weight 11 lbs. FOB Chicago. **25.00**

ITEM #16-C — 1 1/2" bore, 26" stroke. Will lift 1760 lbs. with 1000 lbs. pump pressure. Great for hay loaders, etc. 1" stainless steel piston rod. Postpaid **16.95**

**16-TON "SIMPLEX"
SCREW JACKS
BRAND NEW**

ITEM #505 • For house movers, railroads • Construction Equipment • Machinery, rigging.

16-Ton Simplex screw jacks, 1 3/4" x 16", 4-way head type, with malleable iron base, and heat-treated steel handle. Shipping Wt. 35 lbs. F.O.B. Chicago. EA. **9.50**

Set of 4 - \$35.
F.O.B. Chicago

FREE — 1957 CATALOG — JUST OUT!

60 PAGES — Chuckfull of unsurpassed War Surplus and newly manufactured Equipment Bargains for farm, home, factory, workshop. Write letter today.

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For Phone Orders Call **WEBSTER 9-3793**

GROBAN SUPPLY CO. Dept. **PM-3**
1139 S. WABASH AVE., CHICAGO 5, ILL.

**A. C. ELECTRIC
GENERATOR**

ITEM #G-75-D 7 1/2 K.W. (7500 WATTS) single phase, 110/220 volt output. 3 wire system. 2 bearing construction. 5 groove 8" V belt pulley included. Self-excited. Foot mounted. Drive generator from tractor or stand by engine. Ample power for 6 room house. Dimensions: 34" x 11 1/2". Shipping Wt. 420 lbs. **295.00**

Complete control box for these generators includes A.C. rheostat, automatic voltage regulator, field rheostat, and voltmeter, already wired and ready to connect to generator. List price \$167.00. Our Price **56.45**

**G.E. SEALED BEAM
300 WATTS 110 VOLTS
SPOTLIGHTS**

ITEM #418
General Electric "Mazda" 5 1/2" Sealed Beam

Uses conventional 110 Volt current A.C. — D.C. Fine for lighting up driveways, signs, parking lots, displays, garages. Built for use as Flashing Signal for U.S. Navy — to stand heavy surge loads. Shipping Wt. 2 lbs. U. S. Govt. Cost \$12.68 ea.

Now Each. **2.50** Postpaid

Lots of 3 — 6.00 Postpaid

**BRAND NEW 1 H.P.
12 Volt Electric Motor**

ITEM #308

Rated 1 H.P. — 100 amps., 5000 R.P.M., 12 volts, D.C. — This double shaft motor of ball-bearing construction may be run on 6 volts for lower horsepower requirements. — Standard 3/8" shafts, flange mounting. — Dimensions: 2" x 4 1/2" x 4 1/2". Ship. wt. 19 lbs. A real value at **12.50** Chicago

- For electric wheel chairs (Pop. Mech. design — Mar. — 1953)
- For electric golf carts
- For self-propelled scooters, children's mid-gt cars.

**2 H.P.
ELECTRIC MOTOR**

24 Volts, 90 Amps, 4000 RPM. Splined shaft both ends. Style similar to above. Mfgd. by Hobart or Diehl. **ITEM #315** **13.00**
F.O.B. Chicago.

NEW SPEED PROPELLERS

for JOHNSON AND EVENRUDE 18 & 35 HP OUTBOARDS, SCOTT ATWATER 20 & 40, AND FAGEOL 35 HP.

If you own one of these great motors by all means investigate MICHIGAN'S new, style SMC, 3-blade propellers engineered specifically for them, to provide more speed, better skiting, more fun. Send postcard for FREE 1957 catalog. Also contains outstanding bargains in skis, speedometers, boat accessories. .

Dept. P-3, Michigan Wheel Co., Grand Rapids 3, Mich.

**DO EVERY FASTENING JOB
10 TIMES FASTER!**

Amazing one-hand operation, 10 times faster than hammer & nails. Can't jam.

ARROW
DO-IT-YOURSELF
TACKER, No. T-50

for ceiling tile, insulation, wire fence & every home job

At your local hardware dealer or lumber yard

Arrow Fastener Co., Inc., 1 Junius St., Brooklyn, N. Y.

**Bore 35 standard holes
with just one tool**

New IRWIN Expansive Bit

lets you dial your size

Just turn the dial and you're set to go with this new Irwin Expansive bit. No hunting for the size you need. Fits all hand bit braces. Clean, fast, accurate boring action from $\frac{3}{8}$ " to 3"—35 standard hole sizes in all!

And what a really fine precision tool to own. It's drop-forged from special bit steel, heat treated full length, machined for accuracy and sharpness, highly polished, too. Two cutters supplied with each bit. Model No. 21 with $\frac{5}{8}$ " to $1\frac{3}{4}$ " boring range also available. Ideal for home handyman, professional woodworker, or farm. See your independent hardware dealer soon.



IRWIN

Wilmington, Ohio

the original solid
center auger bit
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screw drivers
screw driver bits

PAINT Comes off FAST!



Apply Wonder Paint Remover to *any* finish. In a few minutes, wash it off with water. Then when surface is dry, refinish. You're through in half the time! Paste-like—stays put on up-rights. **NON-FLAMMABLE**. Ideal for furniture, woodwork, walls, boats, etc.

At paint and hardware stores.

● Write for free Wonder Remover folder or send 25¢ for illustrated Manual on Refinishing. Wilson-Imperial Co., 119 Chestnut St., Newark 5, N. J.

WONDER

water wash off Paint Remover

So a large central chamber, designed as a laboratory and conference room, was aligned with the tower, and the outer walls of the building with the house. Between these walls and the inner chamber, odd-shaped guest rooms were built. Not long ago, when his TV-antenna studies had been completed, Bear dismantled the entire tower and converted the building into a tenant house.

Running through the crawl space and thence to various parts of the main house are other electrical circuits whose purpose is to increase convenience and safety. About the simplest of these is an alarm system that warns of too-high temperature in the deep-freeze room. Another is an elaborate fire-alarm network.

Because of the country location, special attention was given to fire-alarm facilities. The house is divided into four alarm zones, each with its fire-detecting circuit. Heat-sensitive elements are spotted at every point where a blaze might conceivably start. The circuits are brought to a control panel centrally located in a hallway on the ground floor and parallel to a duplicate panel in the living quarters.

Fire Alarm Also Works on Batteries

When Bear was developing the system, he decided that it should operate normally from an alternating-current circuit, but should be arranged to switch automatically to stand-by batteries in case the a.c. power failed. But the equipment he acquired for this proved to be somewhat short of perfect; whenever a switchover was made, the alarm bells and siren would sound. So he had to redesign equipment and circuits so that, at no time during a switchover, would the relays be fooled. The batteries have a rated shelf life of one year and are replaced every nine months. The system is tested periodically. If a fire should break out, the control panels on the two floors would indicate, by pilot lights, in which of the four zones it is located. Bells in various parts of the house and a siren on the roof would go into action, and continue to operate until someone pulled a chain dangling from the battery and rectifier box in the ground-floor hall. Normally, by means of various signal lights, a glance will reveal whether the fire-alarm system is operating on a.c. or batteries, and whether someone has inadvertently pulled the cut-off switch.

The conveniences that Neal Bear has developed have one thing in common: They were created by the use of generally available parts and equipment, and anyone sufficiently skilled in such work could reproduce them on a scale suitable for his particular requirements. ★ ★ ★

NEW! MODEL 400 SIMPLEX Lawnmower Sharpener

Many Exclusive Features . . .

The NEW SIMPLEX is the fastest, most accurate straight-line lawnmower grinder ever built . . . gives you all these advantages:

- Grinds all mowers—reel type, rotary, hand or power, any size.
- No dis-assembly needed, gas and oil remain in engine, support bar rotates.
- Grinding head feeds both horizontally and vertically, turns 90° for bed knives.
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- Rugged, long life construction and many other features.

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returns
Big Profits!



Get the facts on the new Simplex 400
before you buy any sharpener.

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ARE YOU SURE YOU NEED A DEEP WELL WATER SYSTEM?



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**BURKS
PUMPS**
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DECATUR PUMP CO., 61F ELK ST., DECATUR, ILL.

FUN-WORK YARD TRACTOR WHEEL-HORSE RIDE-AWAY



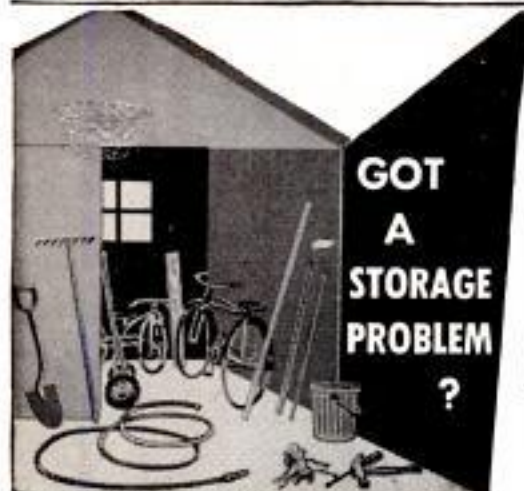
SENSATIONAL
LOW PRICE

Turn work into FUN! Do a dozen back-breaking jobs in a jiffy. Yard-size tractor with 5 forward speeds and 1 reverse. 3 1/2 hp (or 2 1/2 hp) engine. Heavy channel steel chassis. Mow 5-foot swath at 5 mph. Plow snow, cultivate, haul compost, pull any of 22 attaching tools for yard and garden. Write for details, and name of dealer.

WHEEL-HORSE PRODUCTS

2644-D Dixieway North

South Bend, Indiana



GOT
A
STORAGE
PROBLEM
?



When you need TURNBUCKLES Perforated Board fixtures to end space-wasting clutter and to keep everything neatly in place until needed. TURNBUCKLES do-it-yourself fixtures come in a wide variety of shapes and sizes . . . fit easily into any wall-hung perforated board . . . and hold everything from clothing and kitchen utensils to hand tools and garden equipment. Send for your free copy of space-saving suggestions for home, farm and workshop.



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CITY _____

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MARCH 1957

261

you know
this means
quality*...

PET
POWER TOOLS

NOW LET'S TALK PRICE!

- YOU:** Can I get a better 6½" power saw at any price?
- US:** Not to our knowledge, or to the knowledge of a famous research institute.
- YOU:** Well, how much do I save?
- US:** Anywhere from \$10 to \$20! And it has ball bearings for smooth running, a full horsepower motor and the exclusive Automatic Safety Clutch, which increases the work life of the Pet saw up to 15 times.
- YOU:** How?
- US:** It eliminates motor burnout, the major cause of saw damage, and kickback, the major cause of accidents. This Pet saw is really the best buy on the market. Only \$49.95. At your hardware dealer's.

* report by a famous research institute proves that this Pet saw equals or exceeds any other make, regardless of price!

NEW!

Exclusive Automatic Safety Clutch adds up to 15 times more work life!

NEW!

1 h.p. Universal ac/dc motor develops 4850 r.p.m.!



NEW!

Retracting lever on automatic blade guard!

NEW!

Exclusive Tru-Guide for right, left or on-line sawing—stops guesses!

*Those who depend
on their tools depend on*

**JOB
TESTED**

T.M.

PORTABLE ELECTRIC TOOLS, Inc.
Chicago 20, Illinois

PET
POWER TOOLS

Ford Is Long, Low And Owners Love It

(Continued from page 91)

the emphasis is on styling and performance. As a result, perhaps, the sale of seat belts has dropped sharply.

In the 1956 Owners Report on the Ford, (PM, July 1956), 15.7 percent of the Ford owners had seat belts in their new cars. This year only 6.2 percent have seat belts.

However, there has been an increase in the percentage of Fords with padded dashboards and visors from 48.0 percent in 1956 to 60.5 percent in 1957.

As previously, only a small fraction of the owners who have seat belts wear them all the time. Most of them say they wear them only during high-speed highway driving.

Apparently Ford is having trouble stocking belts for its 1957 models:

"I ordered seat belts and was told they weren't available for 3 or 4 months."—Ohio assembler.

What Should Be Changed?

In each questionnaire we ask the owner what changes he would like to have made in his new car. Many owners of the Ford are fully satisfied, 41.4 percent answering that nothing need be changed.

Those who are not altogether satisfied mention suggested changes in the following order: Ash-tray design, front grille, eliminate floor humps and rear-seat floor wells, improve body work, increase gasoline economy and provide more room inside the car.

More Best-Liked Features

Here, in order of frequency of mention, are quotations describing other best-liked features (for percentages see page 90):

"Holds the curves well. Gives you the feeling of belonging."—Nebraska trucker.

"Doesn't throw you when you round a bend."—Florida teacher.

"Enjoy the spacious trunk, but the length makes it harder to park. Don't care for cutaway seats."—Kansas investigator.

"Most economical car in its price range. Drives longer without trouble."—North Carolina superintendent.

"It isn't using as much gas as I was led to believe it would."—New York teacher.

"I like its lowness. Radiator cap is on side and I can't see fluid."—Illinois owner.

"I can see over the steering wheel and don't sink to the floor."—Utah steelworker.

"Easy starting in winter."—New York steelworker.

"I like the low hood and the way it opens

(Continued to page 264)

GIGANTIC
SAVE-TO-70%

MAIL SALE

WAR SURPLUS
EXCESS INVENTORY
BANKRUPT STOCK

GOLF CAR BATTERY MOTOR

● Precision built, powerful ball bearing unit. Operates on 6, 12, or 24-v DC. Reversible 100-300 rpm output. For golf car, midget auto, motorized wheel chair, automatic feeders, etc. Wt. 31 lbs. Cost \$245. SALE.....\$19.46 FOB

TRACTOR WEED SPRAYER

● Latest design, 5-row (17') outfit. Complete outfit using ball bearing high pressure roller pump. T-jet nozzles, relief valve, hoses, controls. List \$175. SALE.....\$97.65 Ppd.

SURPLUS BARGAINS

- Hyd. Cyl. 3 1/2"x24" S.A. 9021 push FOB \$27.95
- Fuel Rotary Hand Pump..... FOB \$19.32
- Burglar-Fire Alarm System..... Ppd \$13.95
- Tree & Pole Climbers (pair)..... Ppd \$1.79
- New Heavy Tarpaulin 8x10'..... Ppd \$6.80
- 200 Amp Welding Generator..... FOB \$17.91
- Portable Elec. Saw (clutch) 6 1/4" Ppd \$25.05
- Pneumatic Tree Trimmer..... FOB \$6.59
- 1000-Lb. Hand Winch..... Ppd \$6.25
- Contour Survey Level, tripod, rod Ppd \$47.00

SPEED REDUCER

● Wonderful 80-to-1 gear reduction unit. Contains 8 roller bearing, multiple gears. Decreases speed—increases torque. Reduces standard motor to 21 rpm. Shafts 3/4" input, 1 1/4" output. Many uses—power winches, revolving signs, door openings, etc. Gov't. cost \$66. SALE.....\$7.49 Ppd.

HYDRAULICS—PUMPS—AIR COMPRESSORS

● Bargains in finest quality surplus and new factory items. 3" Cyl. 6" stroke, \$14.95; 2" Cyl. 9" stroke, \$12.95; 1500 16-gauge \$3.49; Control Valve \$12.95; Air Compressor \$19.95; Gauge 160-lb. \$1.89; Air Regulator \$3.29; Air Compressor Kit \$39.49; 2 1/2" 270 gpm Pump \$44.37; Automatic Sump Pump \$42.95; Plastic Pipe 1/2" 8c, 3/4" 12c, 1" 20c. All prepaid. Many other items in each line. Write for our catalog.

STAINLESS STEEL TANKS

● Brand new 12"x24" 400-lb. capacity air corps tanks. 100s uses—air storage, air horn port, tire inflating tank, etc. Two 1/4" pipe thread openings. Last chance to get these popular tanks. Air-filling valve furnished free. Wt. 17 lbs. Gov't. Cost over \$30. SALE.....\$16.95 FOB

SPECIAL OF THE MONTH!

GEARED AC MOTOR

● Powerful A-C motor with fully enclosed gear reduction drive. Gear ratio 334-1, output 8 1/2 rpm, clockwise. Motor rated 90-w AC. Runs on 115-v using from 60 to 300 watt light bulb in series. Motor is fan cooled for continuous operation. 100s uses, window display, coil winding, etc. Motor 3 1/4" dia. with 1/16" dia. shaft. Original Cost \$12.50 SALE.....\$2.86 Ppd.

GEAR REDUCTION MOTOR

● Multiple gear, ball bearing motor with enclosed 42-to-1 reduction gear box. High torque, 10 to 200 rpm output, reversible. Runs on 6 or 12 v DC or 110 AC through series resistors. Many uses. Cost \$35. SALE.....\$4.97 Ppd.

ARMY POWER PLANTS

● Amazing buys surplus Army and factory-to-you plants and generators. Save to 60%.

- 1000-w, 115-v, 60-c \$179.50 Ppd.
- 2000-w, 115-v, 60-c \$269.95 Ppd.
- 3000-w, 115-v, 60-c \$299.50 Ppd.
- 5000-w, 115-v, 60-c \$497.50 Ppd.

Many other plants, generators. Get catalog.

ORDER FROM AD or write for big new FREE CATALOG 1000s items at tremendous savings. We pay frt. except where FOB.

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805 "O" St., LINCOLN, NEBRASKA



START A BUSINESS this Quick Way


"I have taken in 100 mowers in 5 weeks since I got my Foley," says George C. Wise.

FOLEY LAWN MOWER SHARPENER

Start in spare time and make a quick CASH PROFIT. The Foley handles up to 3 or 4 mowers per hour—prices run \$1.50 to \$3.00 for hand mowers, \$5.00 to \$8.00 for power mowers. You make 99% profit!

FREE VALUABLE ILLUSTRATED BOOK shows how to sharpen all leading makes of power mowers. Foley prices are low—easy payments available. FREE PLAN tells how to start. Write today—no salesman will call.

FOLEY MFG. CO., 307-7 Foley Bldg., Mpls. 18, Minn.



KEY-BAK KEY-REEL

Carry your keys on a KEY-BAK key-reel. Keeps keys handy! Safe! Keeps clothing neat. 24" long stainless-steel chain reaches all locks. Pocket-watch size. Sturdily constructed to last for years. GUARANTEED. For all who use and carry keys. Dealers Wanted!

LUMMIS MFG. CO., Pasadena 8, Calif. CTL CO., Wausau, Wis. **\$2.95 Ppd.**

HELPFUL BOOKS

Send post card asking for FREE catalog

Popular Mechanics Press, 200 E. Ontario, Dept. 601, Chicago 11



WELD IT YOURSELF IN A JIFFY!

Weld, Cut, Braze, Solder; Iron, Steel, Brass, Bronze, Aluminum and other metals safely and easily. Make your wrought iron furniture, porch railings, fences, knick-knacks and other metal specialties. With this fine equipment anyone can do professional-like work with little practice. Tool and equipment breakdowns are annoying and costly. Don't let them bother you. The Dynamic will pay for itself quickly in both time and money and is designed to operate from any properly wired 110 volt AC line.

Order your Dynamic Industrial type transformer Arc Welder for Workshop or Industrial use today. Order from this ad.

Literature on larger equipment available on request.

DYNAMIC WELDER COMPANY, 1808 S. Federal Street, Dept. D2-C, Chicago 16, Illinois

BUILD YOUR OWN POWER TOOLS—With GIL-BILT PARTS-PLAN KITS

10" TILT/ARBOR SAW

Sturdy wood, steel, and aluminum construction, NEW DEPARTURE ball bearings. Capacity and performance of floor saws selling for \$150.00 and up. Plans, all metal parts in kit with 10" comb. blade \$25.90, less blade \$22.95, F.O.B. St. Louis.

12 IN. and 18 IN. BAND SAWS

(12" only illustrated)

Ball bearing drive, rigid cast aluminum wheels, rubber tires. Rigid cast aluminum tilt and tension mechanisms. 18 inch saw handles stock to 6" thick, cuts to center of 36" circle. Extra large tilting tables. Capacity and performance of hand saws selling for \$80 to \$300. Plans and all metal parts for 12" band saw \$25.95. Plans and all metal parts for 18" band saw \$39.95.

For shipments up to 600 miles, add 1% over 500 add 10%. Amount in excess of actual postage will be refunded.

Also Build-it-yourself 6" Belt Sander, Shaper, 8" Tilt-Table Saw. Simplified plans, build easily with hand tools only. Advertised and sold for 10 years, over 33,000 units in use. Money back Guarantee. FREE CATALOG.

GILLIOM POWER TOOLS DEPT. 80-C, LAMBERT FIELD ST. LOUIS 21, MISSOURI

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IMPERIAL Rapid Brush Cleaner

cleans hard-caked paint brushes in a jiffy. No long soaking. Bristles stay springy—never flabby. At paint and hardware stores.

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toward the front. It is a safety feature."—Massachusetts housewife.

And More Complaints

Ford, like all cars, has faults and the owners mention them frankly in our survey. Here are more quotations describing their complaints in order of frequency.

"My convertible leaks so much I might as well leave the top down."—Louisiana juke-box mechanic.

"It's too low. I am a farmer and have to go places I can't with a low car. I also am substitute mail carrier and find the low Ford is not for dirt roads."—North Carolina farmer.

"Three persons can't sit in the front seat. The one in the center has knees too high."—Kansas contractor.

"Seats too low and entry too difficult. Too long. Too heavy."—Minnesota teacher.

"Rear floor with its three different levels makes it unpleasant at times."—Michigan bookkeeper.

"Don't like two holes in back floor."—Alabama hospital attendant.

"Front vent windows are hard to open. Wind noises from vents too great."—Michigan welder.

"Like everything about the Ford but the dealer's service."—Ohio factory worker.

"Ford sure has a poor dealer in my town."—Wisconsin scale clerk.

"Front-fender shape throws mud on top of hood."—Washington postmaster.

"Loop-twist mats hard to clean."—Maryland factory worker.

"Have hard time closing hood. Service attendants reach over fenders and scratch them and mark hood with rings on fingers as they try to get it closed."—New York owner.

"No padding on top of seats."—West Virginia millworker.

"I own two 1957 Fords. Radios on both cars are no good. Have had them in three different shops and have been told they cannot be improved."—Colorado salesman.

"Gas gauge always incorrect."—Washington, D.C., embassy secretary.

"Don't like headlights. Look like a round plug in a square hole."—California owner.

"Upper door in rear of wagon requires two hands to fasten in open position."—California executive.

"Should add handle to rear door of wagon. It's hard to open when frozen shut."—Illinois salesman.

There you have it—the good and the bad as described by the owners themselves. These quotations are the true test of a car. They describe the cars that are delivered to the buyers—as, in fact, one would be delivered to you. ★ ★ ★



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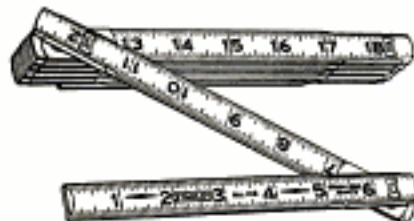
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Have you seen the new Stanley Glide-O-Matic? This smooth acting tape rule locks blade in place, marks work with metal scribes and retracts automatically. The best in tape rules. 8, 10 and 12 ft. lengths. Try one yourself and see.



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STANLEY

The Tool Box of the World

Readers Sound Off

IN THE "Detroit Listening Post" last December we asked you what you think of the '57 cars.

It's human nature that the satisfied customers don't talk as loudly as the unsatisfied. The people who like American cars buy them at a rate of 125,000 cars per week. As a sample of those who disagree with the Detroit automobile makers, here are some random excerpts from our mailbag, written to us in answer to our December question:

For years the characteristic "tails" of the Cadillac radiated aristocratic grandeur, not unlike the headlights on the front fenders of the Pierce-Arrow. I truly mourn that Cadillac is now a peon, peasant in looks.

A.W.S., Pennsylvania

☆☆☆

This year's cars, with a few notable exceptions, have too many unnecessary frills which do not make sense to the sensible. Those artificial wrinkles, nooks, crevices and fins add air resistance as well as areas to be cleaned and polished, gather dust unduly (being somewhat inaccessible), obstruct the rear view and are an eyesore (the rear end of the average 1957 car looks at you like a pig-eared donkey). The "wing" or "flight" motif is not mindful of an airplane but of the little birdie in the designer's head.

H.L., Florida

☆☆☆

What do I think of the 1957 cars? For the person who has no financial worries they may be fine, but for the person in the low-income bracket like myself and buying a house or paying high rent, well stand back—here it comes:

1. They are much bigger than necessary.
2. They cost too much.
3. They depreciate too fast.
4. Gasoline consumption too high.
5. Engineering and designing poor (other than body); steer hard, so power steering is extra; brake hard, so power brakes are extra.
6. Poor workmanship, body squeaks and rattles.
7. Some parts made to last only one or two years (mufflers and tailpipes, batteries and brake linings) could and should be improved greatly.
8. Service on new cars is very poor in most cases.

POPULAR MECHANICS

About '57 Cars

9. Wrap-around windows on some cars are hideous when door is open and dangerous getting in and out of car.

10. Engines too great horsepower, unnecessarily wasting fuel.

11. Weight distribution should be closer to 50/50 front and back wheels for better traction on snow and ice and for better handling.

My family needs transportation at low cost, trouble-free operation and ease of handling, not flashy colors and body design which is outdated in one year anyway. The cheapest full-sized car here (Ontario) costs \$2600, but after a five-minute talk with a salesman drops to \$2200. Why do these dealers fool around with this "fake list price" so much?

My 1951 Ford dropped in 5½ years from \$2300 to \$400—\$350 per year, plus repairs, maintenance, insurance, etc. . . . too much to lose.

J.H.G., Ontario, Can.

Editor's note: This Canadian reader solved his particular problem by buying a small European car which, he says, "will do everything the bigger cars do, and then some, at half the cost of operation and depreciation. We were very sorry, however, to see our money going to a foreign land instead of to Windsor, Detroit or Oshawa."

☆☆☆

There are many important and useful developments in today's cars. Perhaps most important is automatic transmissions.

The bodies are much too long and too wide. They have far too much overhang at the rear (I have seen many of them drag on sidewalks when leaving sloping driveways). What those hideous fins are for is something far beyond me. . . . The general idea of the Rambler strikes me as being just about right.

A.R.H., Connecticut

☆☆☆

The following are the features I do not approve of:

1. The added length and width since 1950 make parking and driving in congested traffic much more difficult.

2. The oversized rear fins on some models are downright unsightly and only add extra weight.

3. The over-wrapped windshields on some do not add any more to driver's visibility while making the protrusions into the front door quite objectionable.

4. Wider doors are very impractical to

(Continued to page 268)

MARCH 1957

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open in close quarters such as garages, parking lots, at the curb, etc.

5. The oversized headlamp hoods have no practical value and only catch dirt and offer more wind resistance.

6. I do not like the hood opening from the rear on some makes.

7. I do not like the all-metal drive-selector levers; a plastic knob is easier to handle, especially in freezing weather.

8. Brake pedals on some makes with "automatics" are too small.

9. Hooded taillights on one make, and too small on others, are not in the best interests of safety.

10. Bumpers have no "give" to them and are simply massive ornaments.

11. Too much dazzling chrome trim, especially in front of the driver.

Since we are not living in a dream world why doesn't Detroit wake up and build more practical cars again instead of "dream cars."

E.M., Arizona



I've ordered a small German car.

W.W.M., California



I have never been so thoroughly disgusted as I was after looking at these new monstrosities. . . .

The way Detroit believes that style is all-important and engineering is secondary is nauseating. I, for one, am revolting against this trend.

G.F.S., New York



All the cars are becoming more and more alike. Each year they become more and more V8. Each year more power, more speed and more deaths. There is surely some other way to sell cars.

The public may turn to Europe so as to get something different in their automobiles. I along with many thousands of others have already done that.

For some time I have had features just being announced on American cars. Fuel injection, step-down floors, a frame even ahead of Cadillac's and an engine with only five moving parts. Smooth running is accomplished with only two cylinders. Cruising speed is faster than most states permit. Ride is excellent. In fact we can ride farther without tiring than in our American cars.

J.R.H., Kansas



What choice does the auto buyer have? He wants a new car and has to take what

the industry rams down his throat, and if Detroit brings out new cars with flapping wings instead of stationary ones, he has to buy them or look to the foreign market.

General Motors still has the best-balanced-looking and conservatively styled cars, without going overboard with excessive frills like exaggerated fins (except Cadillac), wagon-wheel taillights and so forth. I am thinking less of this year's Chevy whose fins I dislike, but the Olds, Pontiac and Buick still look like automobiles, not Halloween jet planes or space rockets, and GM still sells most cars. The independents have also some well-designed cars and out of principle I will always give the little guy who fights for his existence the preference. I have always liked Chrysler products but 1955 is as far as I can go with them. After that their crazy styling just hurts my self-respect. I still drive a '51 Imperial and I will stick to it because I like its conservative styling in addition to the magnificent engine and performance. Incidentally the 1956 Imperial looks good also. I have not yet seen the '57.

H.L., Florida

☆☆☆

When the auto manufacturers switched to the 12-volt battery for the electrical system it was announced as the greatest thing for the cold-morning "no start" motorist. . . . Now that the motorist has that extra six volts to play with, what do the auto boys do—you guessed it, they put two extra headlights on the front to double the current drain on the poor 12-volt battery (not to mention the air conditioners). Seems to me that this puts the motorist right back where he started as far as battery efficiency is concerned—and guess who pays for this "improvement"?

Can someone give me just one logical reason why the auto makers insist on mounting the front (and sometimes rear) license plate bracket where it is a cinch to be mangled on the first parking attempt?

K.G., Illinois

☆☆☆

Why don't they open their ears to the demands of the growing minority and give us a small car that is efficient, economical and minus all the useless trim, ultrasonic, supermatic and automatic devices that only add to the cost of the product? Give us a car that can really be called a low-priced car, one that can be handled easily without needing power steering and power transmission. There are still many of us who still have energy to shift gears.

H.S., Washington, D. C.

MARCH 1957

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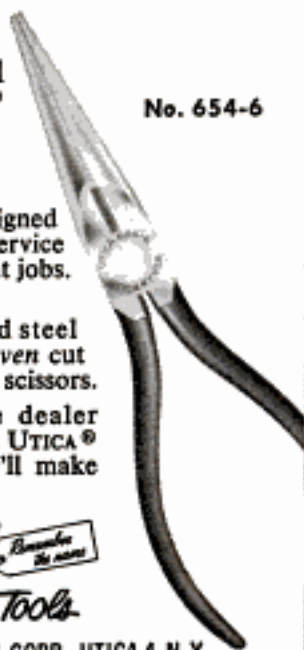
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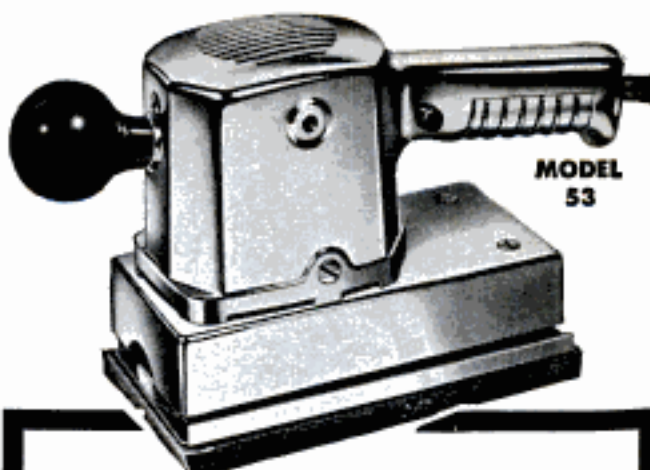
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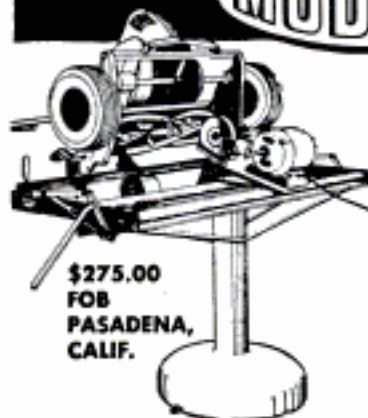
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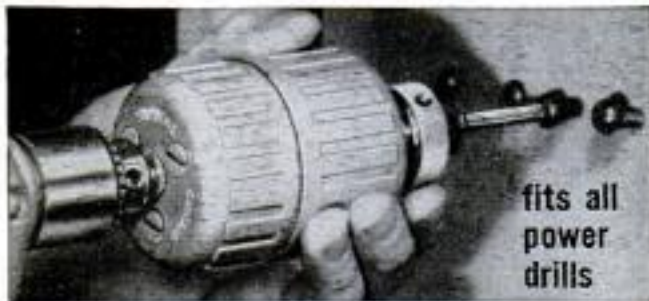
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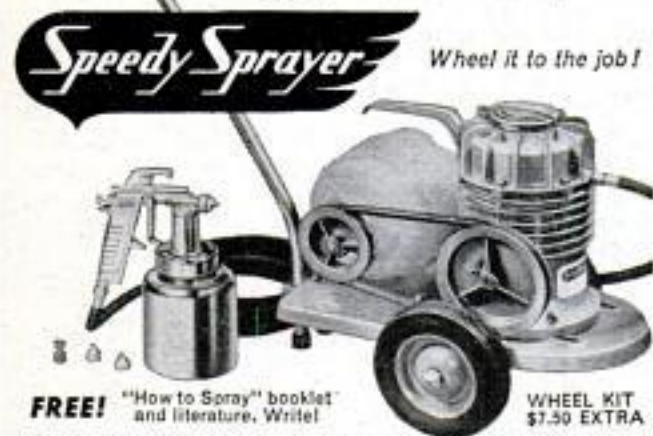
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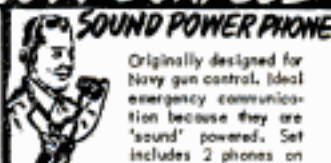
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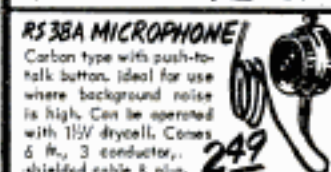
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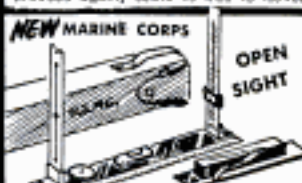
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1500 WATT PLANT
115v. 60 cyc. AC Push Button Start. Powered by a 3 1/2 HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22) Wt. 110 lbs. Reg. \$475 value, Factory price... **\$239.50**



1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery. Charging built-in. Factory price... **\$279.50**

MASTER-LITE 2500 Watt Plant
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 8-10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price \$648.00 (Item 21) Factory Price... **\$329.50**



(Item 21)

DUAL VOLTAGE 110/220 — \$30 additional.

EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable, 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **\$8.95**



No. 10-2 Power Cable. Heavy duty, very flexible, 20 ft. with male and female fittings. Wt. 4 lbs. (Item 818b)..... **\$5.15**
20 ft. without fittings (818a)..... **\$4.15**
50 ft. (Item 502) with fittings..... **\$13.45**
100 ft. (Item 135) with fittings..... **\$25.95**

No. 12-2 Power Cable. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) Wt. 8 lbs. **\$6.95**. 100 ft. (Item 200)..... **\$12.95**

No. 8-2 Conductor Power Cable. 30 ft. heavy duty, very flexible rubber covered with male & female plug (Item 817)..... **\$12.95**

"RIGID" PIPE STRAP WRENCH

This new, unusual strap wrench grips pipes, nuts, and large fittings vise tight without tearing. Ends all marring and slipping on polished or chrome pipes and fittings. Takes all the sweat out of cleaning sink traps, handling nuts, large unions, fittings, etc. where ordinary wrenches are not big enough. The harder you pull, the tighter it grips. Big 12" handle and 1 1/2"x24" heavy web strap will last a lifetime! Wt. 3 lbs. (Item 382) Reg. \$3.95. Our special... **\$1.95**
Super 15" model—larger for more leverage and bigger fittings. (Item 383A)..... **\$2.95**



MASTER DC ARC WELDERS

Now! a portable rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes are easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate. **WELDER ONLY — DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 386) Wt. 110 lbs. \$450 value... **\$119.50**

WELDER ONLY — 400 AMP. MODEL same as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 388) \$500.00 value... **\$139.50**

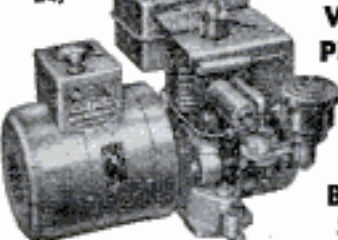
COMPLETE POWER MASTER (illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Complete with welder costing \$1200. Factory Special... **\$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **\$10.50**

BUY
at dealer prices

direct from
MASTER MECHANIC'S
factory
700 WATT PLANT

(Item 24)



PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2.2 HP. easy starting Briggs engine. No wiring necessary! Just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 Watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Regular \$275.00 value... **\$143.50**
1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output... **\$199.50**

Double Acting Hydraulic Cylinder



A powerful cylinder mfr'd. by Massey Harris which develops both a pushing and a pulling action. Will push 8,100 lbs., with a 1000 PSI pump pressure. Cylinder in 3 3/4" O.D. with 6 1/2" stroke—standard heavy duty clevises on both ends. Has standard 1/2" pipe thread openings. Can be used for tilting buckets or blades, raising or lowering implements, hydraulic presses, etc. Can also be used as an air cylinder. (Item 802) Wt. 17 lbs. Reg. \$68 value, Special... **\$14.95**

OTHER DOUBLE ACTING CYLINDERS

8" stroke — 3" bore	\$34.00
10" stroke — 3" bore	34.80
12" stroke — 3" bore	43.00
24" stroke — 3" bore	47.50

HYDRAULIC CONTROL VALVE — 4 way open center valve with built-in adjustable relief. Controls 1 double, or 2 single acting cylinders. Equalizing feature permits easy control even under heavy loads. 3/4" pipe thread on inlet & outlet. 1 1/2" mounted, finger tip control. Wt. 16 lbs. (Item 822)..... **\$21.50**

SCREW-TYPE PRESS

A tremendously powerful press capable of exerting nine tons of pressure. Pays for itself straightening bent parts, or pushing out bearings and bushings. Ideal for manufacturing and assembly operations because of precise control. Massive 1 1/2" screw permits precise control over vertical travel. Extra heavy ribbed yoke has a throat 2 1/2" high—depth capacity for working to the center of an 11" object. Includes 8" x 15 1/2" vise-type table and two pushing arbors. Wt. 150 lbs. (Item 797) Reg. \$149.50. Special... **\$49.50**

HYDRAULIC PRESS. Nine ton capacity. See Feb. Pop. Mech's ad for details—or write, Complete, Wt. 110 lbs. (Item 464)..... **\$69.50**

RUBBER HOSE

Genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies—yet completely flexible. Equipped with standard thread male and female fittings. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc.—or pump gas. Factory prices—save more inside! Dia. Length Price

1"	10 ft.	5.95
1 1/4"	10 ft.	8.95
1 1/4"	25 ft.	12.95
1 1/4"	50 ft.	24.75
1 1/2"	100 ft.	49.95
1 1/2"	10 ft.	10.95
1 1/2"	25 ft.	14.75
2"	10 ft.	16.50
2" (no cord plies)	10 ft.	9.50
2" (suction)	14 ft.	21.50
2 1/2" (discharge)	10 ft.	21.75
3"	10 ft.	25.50

TERRIFIC VALUES!

and fuel oil. Volume factor 60%.

LESS THAN WHOLESALE

GIANT 2500 WATT PLANT

110-120 v. 60 cyc. AC. absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 1000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price \$585. Special at... **\$299.50**

Same plant with electric self starter (Item 31a)..... **\$359.50**

Generator only and control box.... **\$169.50**



DIESEL LIGHT PLANT

(Item 1660) Diesel Master—11-12 kw. 110/220 v. AC single or 3 phase. 1800 rpm direct connected. Electric self-starting. Engineered for permanent power where continuous low-cost, heavy duty service is important. Wt. 1350 lb. Reg. list \$3650.00. Factory Price... **\$1995.00**

We make every type and size of light plants —Write, giving us your requirements!



(Item 1660)

Rugged, ball bearing WINCH

Sturdy ball bearing winch—super tough aluminum alloy construction. Powered by an easy starting 2 1/2 HP Briggs gas engine thru gear reduction drive — it exerts up to 3000 lbs. of terrific force for hoisting materials or pulling. Combination gear and pulley reduction results in tremendous multiplication of engine power. Idler pulley clutch arrangement and built-in drum brake (with ratchet hand lever) enables operator to ease loads down gently and lock at any point desired. Drum handles 400 ft. of 3/4" cable or 600 ft. of 1/2" cable. Ideal for contractors, farm implement trailers and unlimited other uses! (Item 795) Wt. 125 lbs. Only... **\$149.50**

HAND WINCH—Same winch with large crank handle for extra leverage and 2 speed drive. (Item 794) Wt. 80 lbs... **\$59.50**



(Item 795)

HI-FLO Centrifugal PUMP

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. 1" — Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Pre-lubricated, sealed bearings for years of heavy low-cost service. Big 1 1/2" Model, Item 502, Wt. 70 lbs. Factory price... **\$134.50**

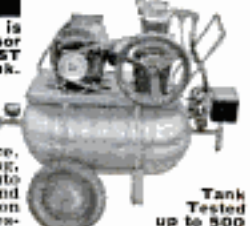
2" Model (150 gal. per min.) with 2 1/2 HP engine. Item 502a, 90 lbs. Fact. Spec. **\$154.50**



MASTER AIR COMPRESSOR

COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 209) High pressure type (4 c.f.m.) large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing, sand blasting, etc. Piston type 2 1/2 horse compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 3100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed SAFE. Low factory prices. 1 1/2 HP Model (cap. 85 lbs.) Reg. \$175. (Item 209)..... **\$109.50**

1/2 HP heavy duty model, Reg.-Ind. motor & unloader switch (Item 209a) **\$129.50**



Tank Tested up to 500 lbs. per sq. in.

Send check or M.O. Prices f.o.b. Factory. 10 Day Money back guaranteed. SEND 10c for... **BIG 1957 Catalog**

MASTER MECHANIC MFG. CO., DEPT. EM-3

Burlington, Wis.



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STEEL AND BRASS COLLETS



BALL BEARING LIVE CENTER



HANDWHEEL COLLET ATTACHMENT



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YOU CAN DO MORE WITH SOUTH BEND LATHES because of the very complete line of practical attachments available. Only a few are shown here. Send for complete catalog.



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South Bend Attachments will enable you to do more and better lathe work. Write for your copy of our new catalog 5700.

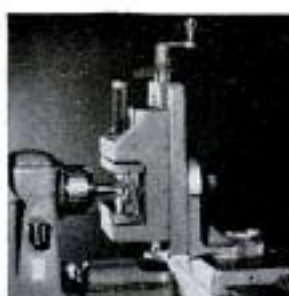
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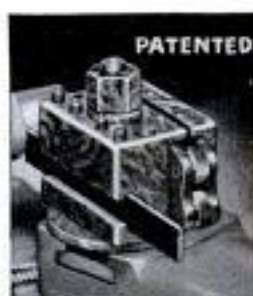
TELESCOPIC TAPER ATTACHMENT



EXTERNAL GRINDER



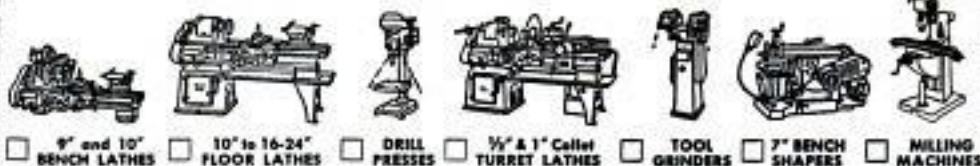
MILLING ATTACHMENT



PATENTED
10 in 1 TOOL BLOCK



PLEASE SEND INFORMATION CHECKED:

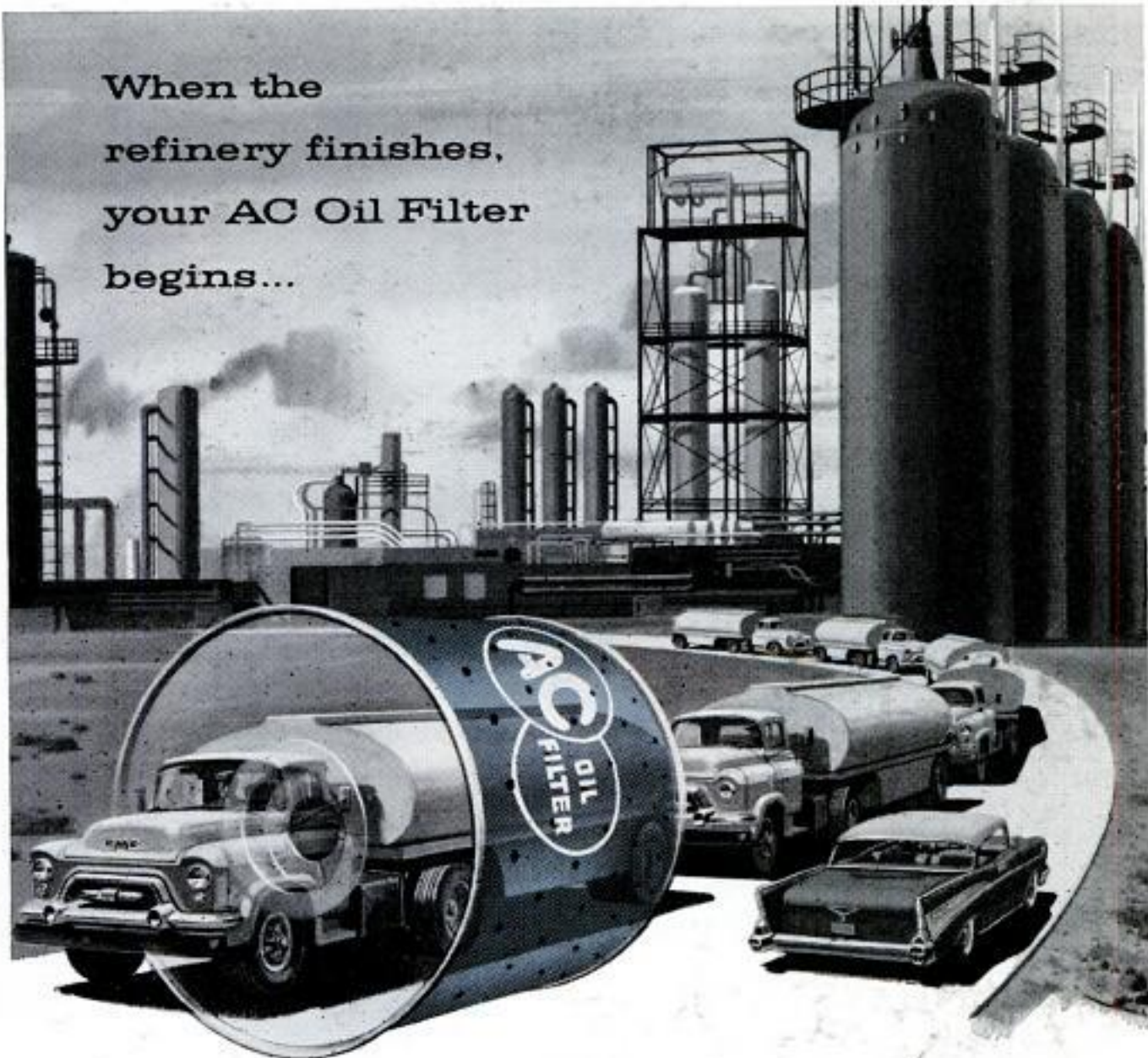


9" and 10" BENCH LATHES 10" to 16-24" FLOOR LATHES DRILL PRESSES 1/2" & 1" Collet TURRET LATHES TOOL GRINDERS 7" BENCH SHAPERS MILLING MACHINES

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When the
refinery finishes,
your AC Oil Filter
begins...



...cleaning 36,000 gallons
of oil every 5,000 miles!

Change your



**OIL
FILTER**
every
5,000 miles



Mark MADE WIDE WORLD-NBC-TV

An almost unbelievable volume of oil recirculates through your AC Full-Flow Oil Filter in 5,000 miles of driving—as much as 36,000 gallons.

Your oil filter is faced with the job of cleaning that vast quantity of oil in six months or less of average driving . . . a full six quarts for every 30 seconds at normal speeds.

That's why it's so important for you to change your AC Oil Filter regularly. A fresh AC Filter takes out dirt and bits of metal as small as 1/100,000 of an inch. It keeps your oil clean and on the job . . . protects the vital engine parts in your car from the damage dirt can do.

When you change your oil, check the mileage since your last filter change. For your engine's sake, change to a new AC Oil Filter at least every six months or every 5,000 miles your car is driven.

AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

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People keep saying how really good Winstons taste! And...how the exclusive Winston filter—*snowy-white and pure*—lets that rich flavor come through! Try today's most talked-about flavor-filter combination. Latch onto a pack of Winstons — for flavory filter smoking!

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